Heart of the Valley
METROPOLITAN SEWERAGE DISTRICT

801 Thilmany Road | Kaukauna, WI 54130

# Inflow Reduction Model Update

## September 2023 – DRAFT

DONOHUE

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Donohue Project No.: 13649

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## ABBREVIATIONS

| | |
|---|---|
| ADWF | Average dry weather flow |
| AMM | Antecedent Moisture Model |
| CMAR | Compliance maintenance annual reporting |
| DHI | Danish Hydraulic Institute |
| DNR | Department of Natural Resources |
| EPA | Environmental Protection Agency |
| gpm | Gallons per minute |
| GWI | Groundwater infiltration |
| HGL | Hydraulic grade line |
| HOV | Heart of the Valley Metropolitan Sewerage District |
| HOVMSD | Heart of the Valley Metropolitan Sewerage District |
| I/I | Inflow and infiltration |
| LOS | Level-of-service |
| LTS | Long-term simulation |
| RDII | Rainfall dependent inflow and infiltration |
| SSOAP | Sanitary Sewer Overflow Analysis and Planning |
| WRRF | Wastewater reuse and recovery facility |
| WWTP | Wastewater treatment plant |

# 1. PROJECT BACKGROUND

## 1.1 CLEARWATER REDUCTION PROGRAM

In 2004, the Heart of the Valley Metropolitan Sewerage District (HOV) received notification from Wisconsin DNR that it must reduce wet weather flows by 30% during the 100-year storm. On June 9, 2004, HOV submitted a Facility Plan indicating it would meet this goal. Approval of the Facility Plan was contingent upon the following conditions:

- Sewer system evaluation survey, complete within 2 to 3 years (2006-2007)
- Meet the targeted goal of removing 30% clearwater based on a 100-year storm event, complete within 7 to 10 years (2011 – 2014). Community-specific goals were prescribed based on individual contributions to wet weather flows. Table 1-1 summarizes progress towards meeting those goals.
- Submit annual progress reports to monitor the effectiveness of clearwater removal

By 2012, the communities had completed many repairs including:

- HOV interceptor manhole repairs
- Elimination of overflows in communities
- Sewer replacements and rehabilitations
- Manhole repair/replacement/chimney seals
- Siphon elimination
- Clear water inspections
- Replace/line private laterals
- Sump pumps / storm laterals

To quantify progress towards meeting I/I reduction targets, HOV developed an Antecedent Moisture Model (AMM). The model was calibrated to pre-rehabilitation flows (2004-2006). Each year, measured rainfall was input into the model, which approximated how the system would have behaved had no I/I reduction efforts been made. Modeled flows were then compared to actual flows to estimate increases or decreases in peak and average flows.

Each year, scatter plots were prepared to approximate the reductions in I/I. Figure 1.1 is an example of this analysis comparing measured wet weather flows (x-axis) to modeled flows (y-axis), which is what the model predicts the flow would have been had there been no rehabilitation efforts. A point above the “reference line” indicates I/I has been reduced; a point below the “reference line” indicates I/I has increased. Due to scatter in the results, trend lines were added. By 2011, it was estimated that the communities had made modest progress towards meeting peak flow reduction goals.

**Table 1-1: 2011 Peak Wet Weather Flow Reduction Progress**

| | Peak Flow Reduction Goal | Yearly Cumulative Reduction | | | |
|---|---|---|---|---|---|
| | | 2008 | 2010 | 2011 | Trend |
| Kaukauna | 35% | 10% | 10% | 0% | 10% |
| Darboy | 0% | 0% | 0% | -45% | -25% |
| Little Chute | 25% | 15% | 25% | -5% | 15% |
| Kimberly | 40% | 0% | 0% | 20% | 10% |
| Combined Locks | 35% | 0% | 15% | 5% | 10% |
| HOVMSD | 30% | - | 11% | 2% | 7% |

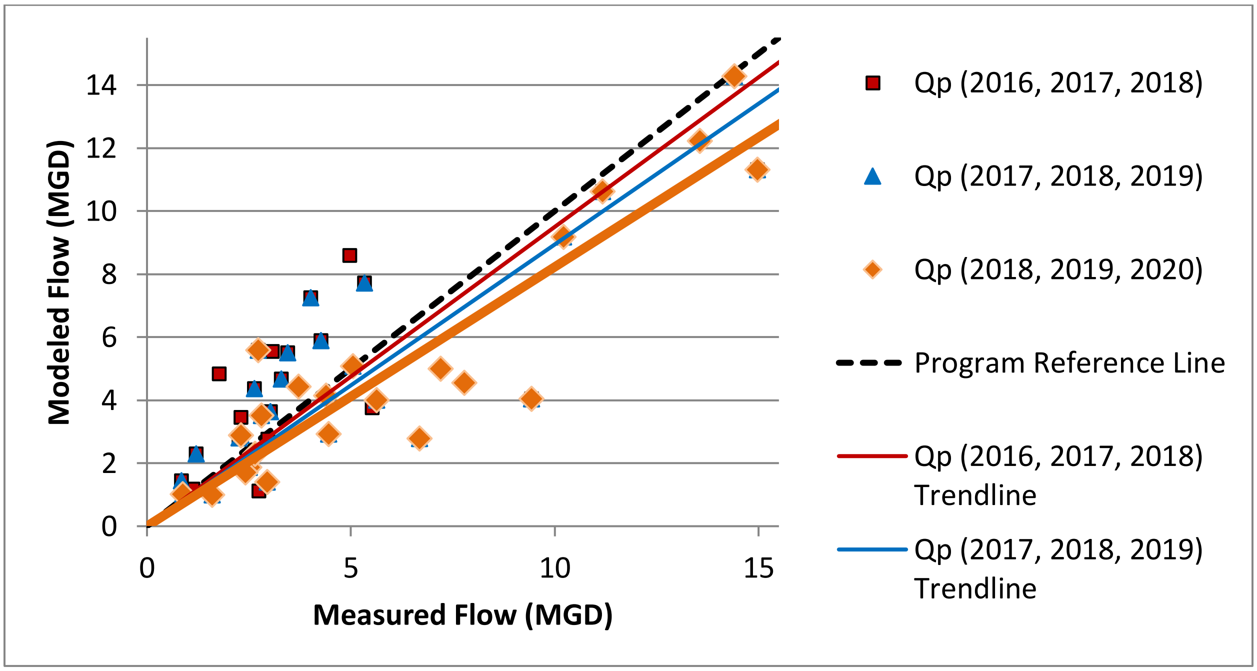



**Figure 1.1: Example "Scatter Plot"**

## 1.2 SUSTAINABILITY PLAN

By 2010, $14.8M had been spent on sewer rehabilitation projects. Hydraulic modeling at the time indicated that with the interceptor system sealed, it could not overflow into the river. There was also no risk of interceptor surcharging exacerbating basement backups.

As a result, in 2012, the Facility Plan was amended to reflect a new "Sustainability Plan" approach. Under this new approach, HOV would "self-regulate" I/I. However, HOV would also submit annual Compliance Maintenance Annual Reports (CMARs), summarizing dry and wet weather flows each year. The goal is for HOV to maintain or extend the Wastewater Treatment Plant (WWTP) hydraulic capacity and interceptor hydraulic capacity by maintaining or decreasing clear water intrusion. HOV will continue to monitor system performance by analyzing plant flows, AMM, and member community CMARs (annually). The CMARs have been updated to reflect 2022 flows (Appendix).

HOV provided its last wet weather flow analysis using 2020 flow data. Notable findings were as follows:

- Kaukauna's sewers seem to be experiencing degradation as I/I had increased over the preceding 3 years.
- Combined Locks 3-year rolling average I/I improved slightly, but remains below the success line. In other words, flows have increased slightly since 2004.
- Little Chute's 3-year rolling average indicates ongoing deterioration relative to success line.
- Darboy's 3-year rolling average shows improvement and is now above the success line.
- Kimberly's 3-year rolling average shows slight deterioration but remains slightly above the success line.

# 2. MODEL UPDATE

Until 2021, the system had been modeled using a proprietary model developed by OHM Advisors. The proprietary OHM model was calibrated, or benchmarked, to 2004-2006 pre-rehabilitation flow data. This model platform was the best available technology at the time, but has several limitations as compared to more modern modeling tools.

First, the model could not be updated or re-calibrated. Therefore it could only be used to evaluate what wet weather flows would have been in response to rainfall prior to any system repairs. Second, it lacks a hydraulic model, therefore it could only predict flows into HOV's interceptor system, but could not simulate the ability the interceptors to convey the flows. As a result, HOV decided to switch to the MIKEURBAN modeling platform developed by the Danish Hydraulic Institute (DHI). Table 2-1 notes several benefits in switching from the OHM model to the MIKEURBAN model.

**Table 2-1 – OHM vs. MIKEURBAN Model Comparison**

| OHM | MIKEURBAN |
|---|---|
| Proprietary | Commercial |
| "Black box" | Replicates known hydrologic principals |
| Cannot replicate some forms of I/I | More robust I/I capabilities |
| Cannot be updated | Can be modified |
| Calibrated to 2009 | Can re-calibrated as often as needed |
| No hydraulic model | Can route flows through interceptors |

## 2.1 MIKEURBAN MODEL CONFIGURATION

HOV decided to develop a new hydrologic and hydraulic model on a commercially available platform, MIKEURBAN by DHI. Figure 2.1 is a schematic of the MIKEURBAN model, indicating the interceptor network, metering locations, and corresponding "metersheds", or areas tributary to each flow meter.

## 2.2 2021 MODEL CALIBRATION

This model was initially calibrated / benchmarked using 2021 flow and rainfall data. Measured rainfall was input into the model. Simulated flows were compared to measured flows. Adjustments were made to model hydrologic parameters to obtain a better match between measured and simulated flows. The Appendix contains line graphs and scatter plots comparing measured and simulated flows.

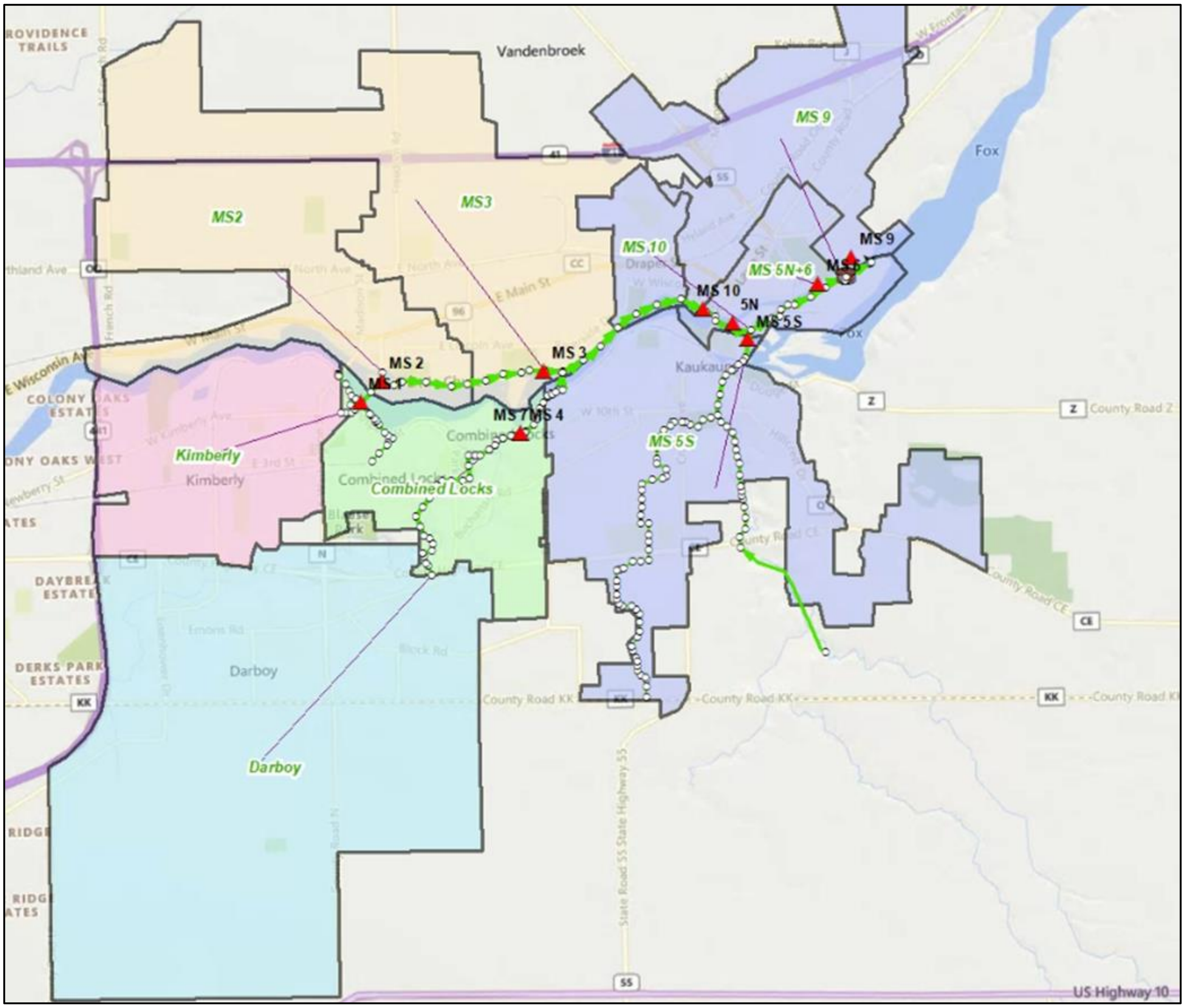



**Figure 2.1 – MIKEURBAN Model Schematic**

# 3. INFLOW & INFILTRATION ANALYSIS

## 3.1 TYPICAL YEAR SELECTION

There are many pathways by which inflow & infiltration (I/I) can enter a sanitary sewer system (Figure 3.2). Traditionally, I/I rates are estimated from flow data. However, I/I is highly weather dependent, and variations in whether from one year to the next can make it difficult to ascertain whether I/I is trending up or down due to sewer repairs and/or degradation. The longer term effects of water retained in the soil (antecedent moisture), makes ascribing I/I rates to sewer condition particularly challenging.

Henceforth, I/I will be quantified using the process illustrated below. First the model is calibrated to measured rainfall and flows each year. Then a standard, or "typical" year of climate data is run through the calibrated model. By recalibrating the model and then using a consistent set of weather data, it should be possible to better ascertain trends in I/I.

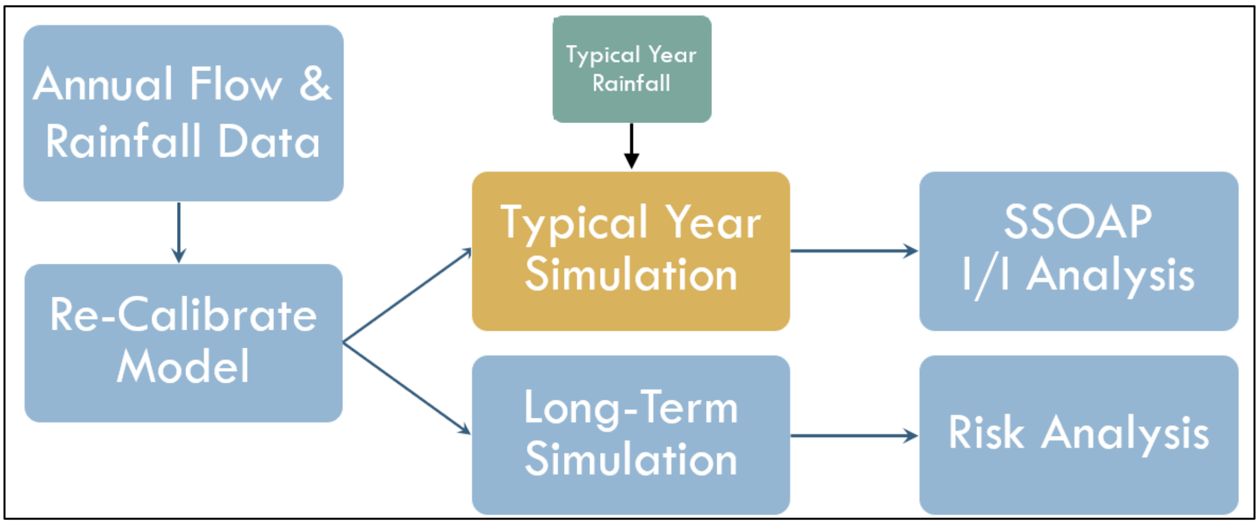



**Figure 3.1 – I/I Analysis Flow Chart**

After reviewing 50 years of rainfall data, 1983 was selected as the "Typical Year". This is because the total amount of rainfall that year was close to the long-term annual average (Figure 3.3). In addition, the accumulation of rainfall over the course of the year was close to the annual average (Figure 3.4).

In August of 1983, there was an intense event where 2.57 inches of rainfall fell over 14 hours. That storm had recurrence intervals of 3 months, 24 months, 27 months, and 25 months on a peak 1-hour, 3-hour, 6-hour, and 12-hour basis respectively. This approximately 2-year event produced the maximum flows for the year.

## 3.2 EPA SSOAP ANALYSIS

Once the MIKURBAN model had been calibrated, the 1983 weather data was input into the model and run. The model produced flow hydrographs which were then broken down into their dry and wet weather components using a tool called The EPA Sanitary Sewer Overflow Analysis and Planning (SSOAP) Toolbox (Figure 3.5) which can break flows down into dry and wet weather components.

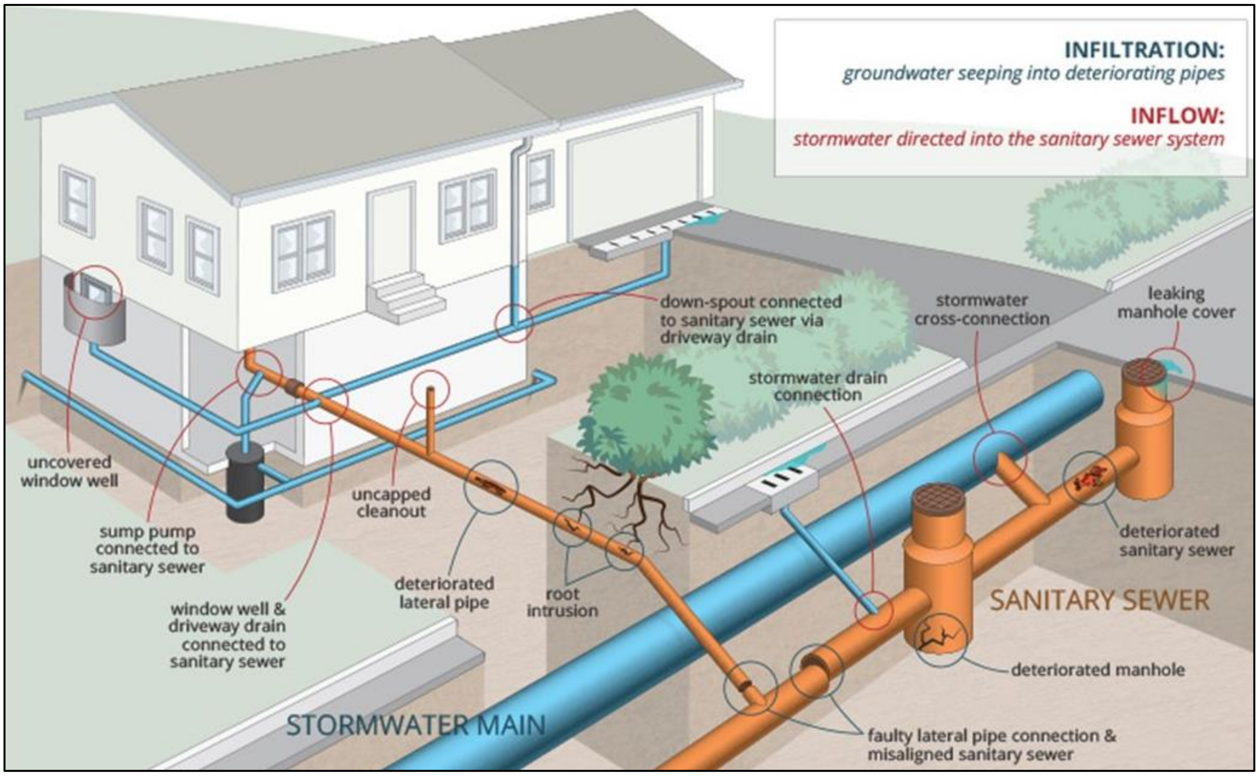



**Figure 3.2 – I/I Pathways**

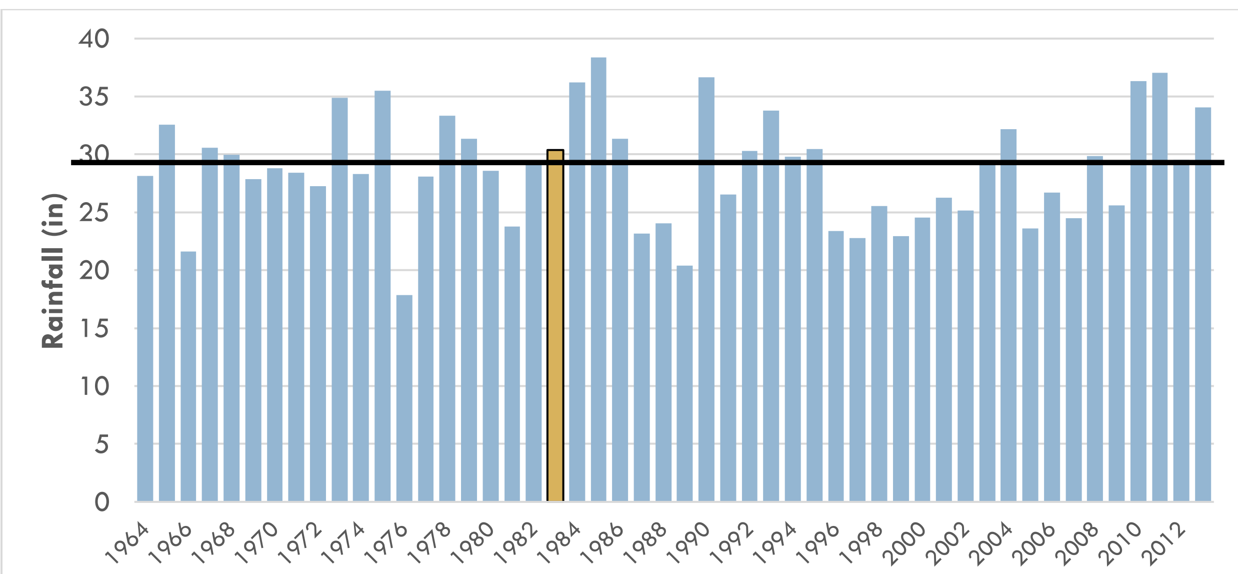



**Figure 3.3 – Annual Rainfall Totals**

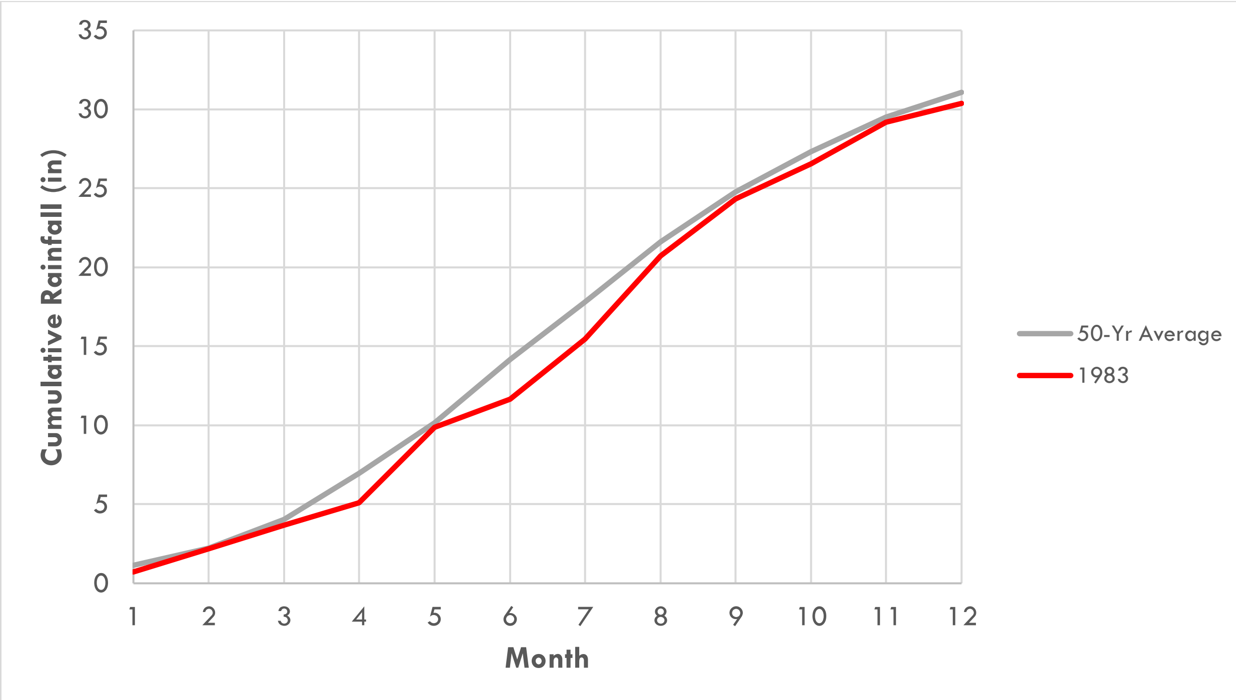



**Figure 3.4 – Typical Year Annual Rainfall Accumulation**

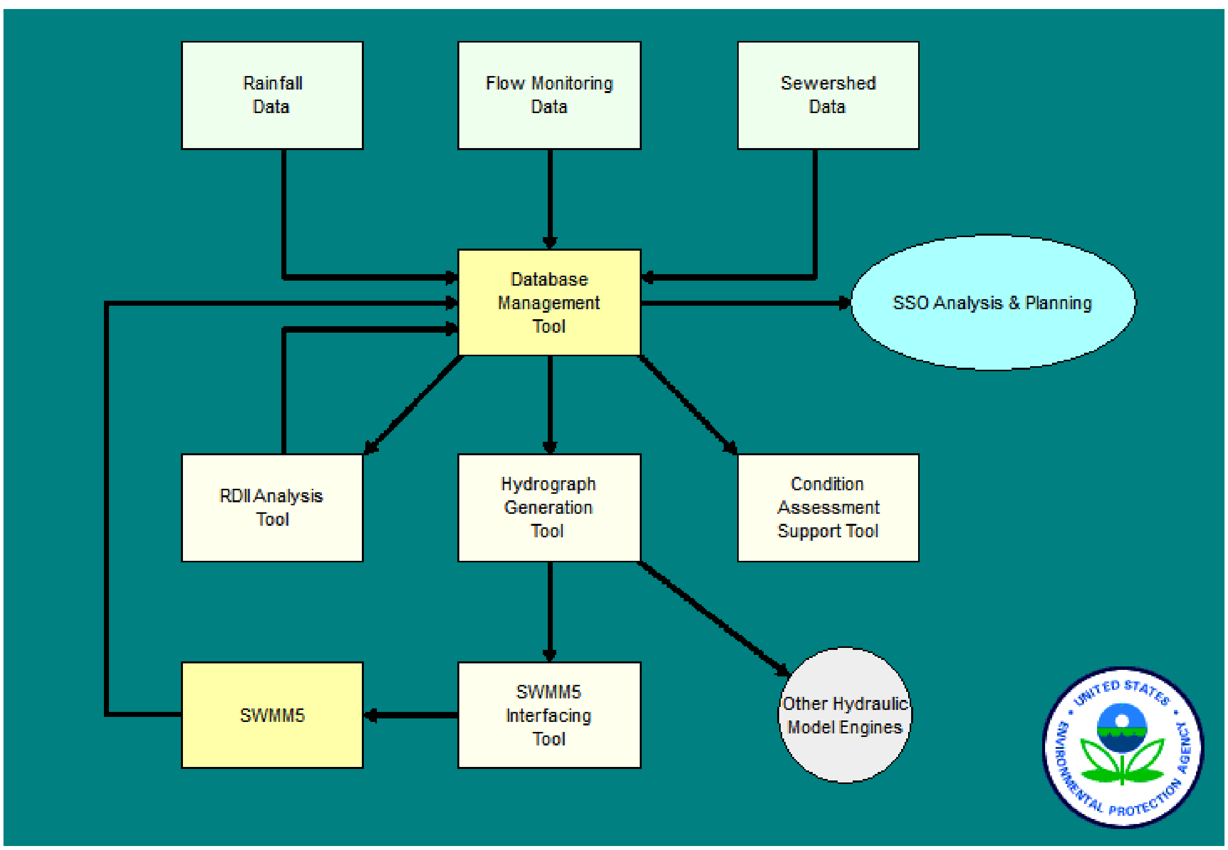



**Figure 3.5 – EPA SSOAP Toolbox Schematic**

1983 hydrographs at each metering station were run through SSOAP and broken down into wastewater, groundwater infiltration, and rainfall-dependent I/I (RDII) components. These were summarized for a series of rainfall events during the year.

## 3.3 2021 I/I ANALYSIS

After running the results of the model simulation through SSOAP, summary tables of significant events were created for each communities' flow meter(s) using a series of dry and wet weather flow metrics. Flows were normalized by population, volume of sewer [inch*diameter*miles], and length of sewer. These are included in the Appendix. A summary table comparing each community's I/I metrics and detailed "report cards" for each community are provided in the Appendix.

Please note the following limitations & observations:

- **General Comments**
    - These results are based on running the "Typical Year", 1983, through the calibrated model, to quantify average flow rates & volumes.
    - The "scorecards" in the Appendix indicate the costs to treat the major flow components. These are not the actual costs incurred in 2021; rather, using the model calibrated to 2021 flow & rainfall data to estimate annual average costs.
    - Costs are estimates of what it would cost to treat the flow during a "Typical Year" (1983). These are based on a rate of $0.71 per 1,000 gallons.
    - The event on August 21 was the largest during the Typical Year (1983), producing the type of wet weather flows most likely to create conveyance and treatment challenges.
    - Cross connections between the meter 5S and 6 metersheds made it impossible to clearly delineate them, therefore they were combined into a single metershed.
- **Darboy** – Very little I/I; well below industry standards for what is considered excessive.
- **Kimberly** – Base groundwater infiltration does not appear to be excessive. Average wet weather flows, however, exceed the EPA standard for what it considers excessive, 275 gpcd. With a peak wet weather flow of 963 gpcd and a peaking factor of 8.9 on August 21, Kimberly might benefit from I/I mitigation.
- **Combined Locks** – Groundwater infiltration (GWI) does not appear to be excessive. While the average wet weather flow of 215 gpcd does not exceed the standard of 275 gpcd, several events had significant peak flows, including 539 gpcd and a peaking factor of 6.4 on August 21. While mitigation efforts may not be warranted at this time, Combined Locks may want to consider implementing them in the future should the collection system further degrade.
- **Little Chute**
    - **MS2** – The average dry weather flow of 158 gpcd exceeds EPA's threshold for what it considers excessive, 120 gpcd. However, a portion of what the analysis ascribes to GWI may be from 24-hour commercial/industrial operations. Water billing records would reduce this uncertainty. With an average wet weather flow of 423 gpcd, and a peak of 916 gpcd and a peaking factor of 5.4 on August 21, Little Chute may want to consider implementing an I/I mitigation program.

- **MS3 –** This metershed appears to experience excessive GWI. Without water billing records, however, it's not possible to ascertain with certitude whether this is from GWI or 24-hour commercial/industrial operations. Wet weather flows seem high on a per capita basis, however, due to the relatively low peaking factor, mitigation efforts are not recommended at this time.

- **Kaukauna**
  - **MS 5S –** This metershed, along with MS 5N + 6, experiences the worst I/I in the HOV service area, particularly regarding wet weather flows. Without water billing records, however, it's difficult to quantify GWI. Mitigation efforts are recommended.
  - **MS 5N + 6 –** This metershed experiences the worst I/I in the HOV service area, particularly regarding wet weather flows. Without water billing records, GWI cannot be quantified with certitude, particularly given the strange diurnal pattern. Mitigation efforts are recommended.
  - **MS 9** – This metershed experiences almost no wet weather flow. While high early morning flows make GWI appear high, it could be due to 24-hour commercial/industrial operations.
  - **MS 10** – This metershed likely has excessive GWI and certainly excess wet weather flow. Mitigation efforts are recommended.

## 3.4 2022 I/I ANALYSIS

For 2022, the model was re-calibrated to 2022 flow data. Rather than include all calibration results, Figure 3.6 compares measured and simulated flows at the WWTP.

Once the model was re-calibrated, 1983 climate data was run through the re-calibrated model. Dry and wet weather flow metrics were re-calculated and each community's report card was updated. The 2022 results are in the Appendix.

As described below, there were generally modest decreases in I/I, primarily due to reduced GWI. This may likely be the result of different hydrologic conditions in 2022 as compared to 2021 such as a lower groundwater table.

- **Kimberly** – Total I/I volume decreased by approximately 40%. Much of this is due to reduced GWI, but wet weather flows were also about 20% less than in 2021.
- **Darboy** – I/I decreased by approximately 35% due to reduced GWI.
- **Combined Locks** – I/I decreased by approximately 25% due to a 54% reduction in GWI. Wet weather flows, however, increased by approximately 50%.
- **Little Chute –** Metershed MS2 I/I decreased by approximately 10% due to a 35% reduction in wet weather flows. Metershed MS3 I/I, however, increased by approximately 10%, primarily due to increased RDII volumes, but not peak wet weather flow rates.
- **Kaukauna –** MS 10 saw about a 60% reduction in GWI.  Wet weather flows were relatively unchanged.

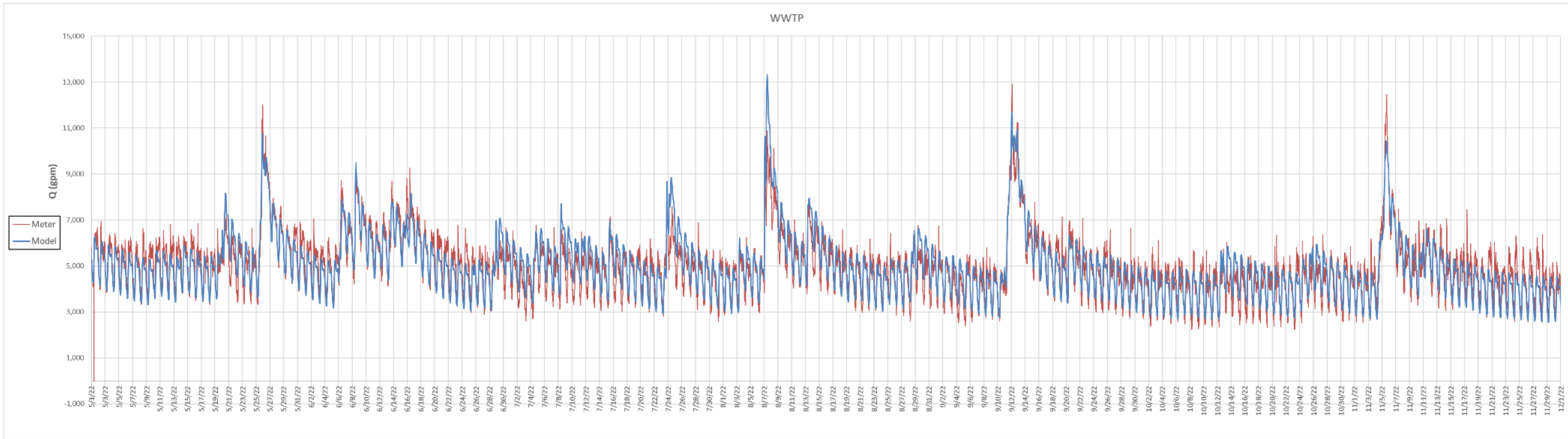



**Figure 3.6 – 2022 Model Calibration**

# 4. 2022 FLOW FREQUENCY ANALYSIS

## 4.1 MODEL UPDATE

The model was first updated to reflect the interceptor lining project. While this reduced pipe diameters slightly, the reduced pipe roughness is expected to increase conveyance capacity.

## 4.2 FLOW FREQUENCY ANALYSIS

The procedure illustrated below was used to determine the frequency of wet weather flows throughout the collection system. 50 years' of climate data was run through the model. Model results provided the frequency, or recurrence, of flows and water levels throughout the HOV interceptor system.

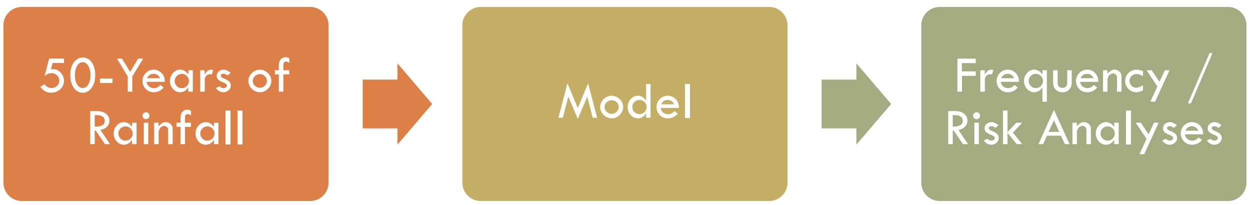



**Figure 4.1 – Flow Frequency Analysis Process**

For example, the results of the 50-year simulation were used to create the flow frequency analysis illustrated below. The y-axis is the flow rate at the WRRF, while the x-axis is the frequency with which the flow is expected to occur. Blending typically occurs when the WRRF influent flow exceeds 26 MGD, which, according to the figure below, is expected to occur an average of once every 20 months.

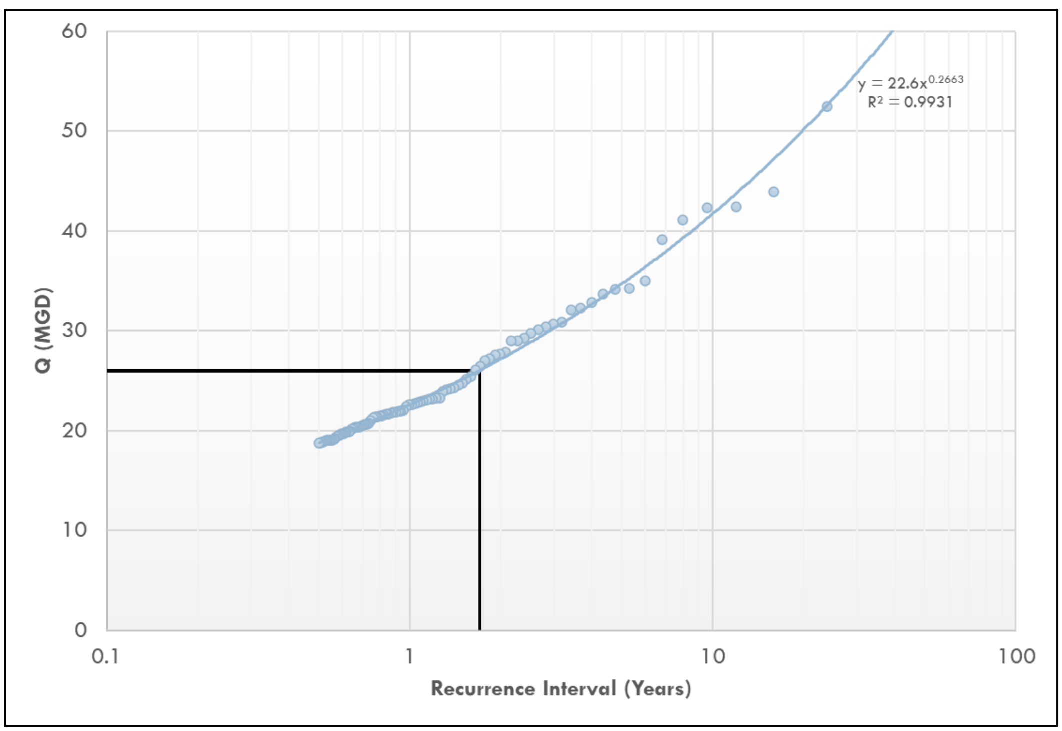



**Figure 4.2 – WRRF Flow Frequency Analysis**

## 4.3 INTERCEPTOR SYSTEM LEVEL OF SERVICE

The hydraulic model, consisting of the interceptors, manholes, etc, was use to evaluate the ability of the interceptor system to convey flows to the WWRF.

### 4.3.1 PROBABAILITY OF SURCHARGE

Figure 4.3 indicates the peak hydraulic grade line (HGL) from the 50-year long-term simulation (LTS). This event occurred on June 22, 1990. Statistically, this was a about a 30-year event. However, due to high antecedent soil moisture resulting from the 4.75” of rainfall that fell over the 3 weeks that preceded this event, it produced the highest flows that occurred during the simulation. As you can see, there is some modest surcharging just upstream of the WRRF.

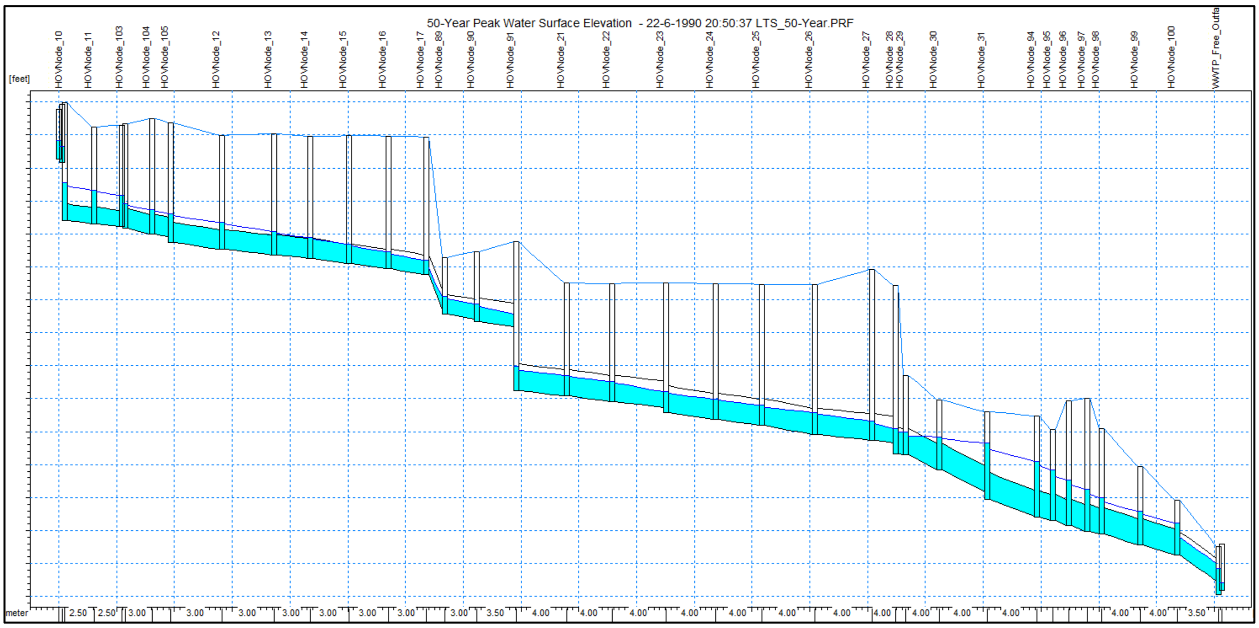



**Figure 4.3 – Interceptor 50-Year Hydraulic Profile**

There was no surcharging during the second largest, or 25-year, event. This event occurred on August 28, 1975, and was approximately a 30-year event on a 24-hour basis. The interceptor system will have about a 50-year level-of-service (LOS) once the rehabilitation project is complete. Or more accurately, there is a 2% probability of a storm exceeding interceptor capacity during any given year.

The model indicates the southern branch of the interceptor system, however, has only a 10-year LOS. In other words, there is a10% probability of significant surcharging along this sewer during any given year. Pipe capacity is almost half of what it would need to be to reliably convey the 25-year storm (Figure 4.4). Donohue recommends that this be studied further to confirm these preliminary observations.

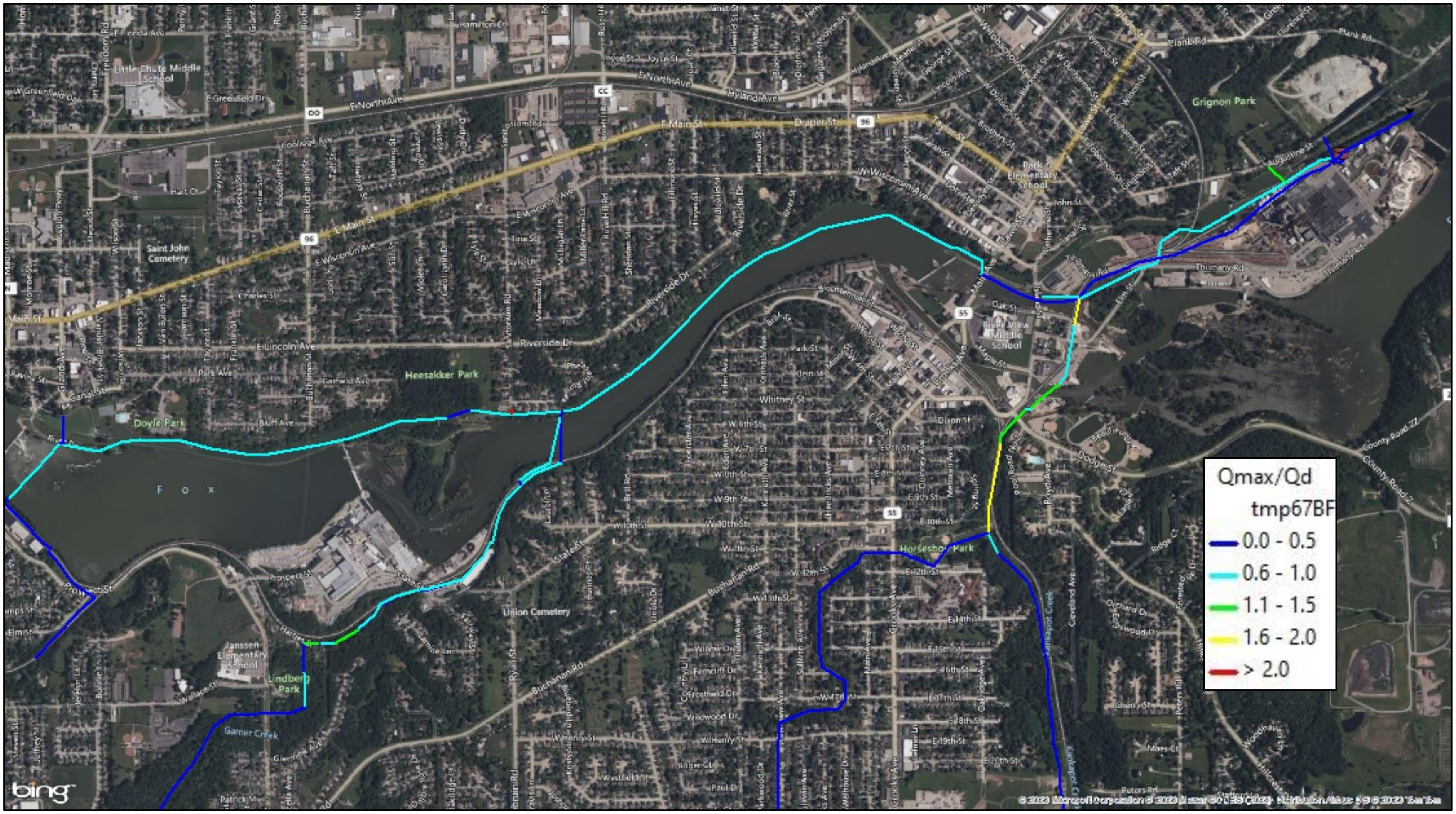



**Figure 4.4 – Pipe 25-Year Qmax/Qd**

### 4.3.2 WRRF BLENDING FREQUENCY ANALYSIS

Referring to Figure 4.2, the LTS predicts that a blending event is likely to occur an average of once every 20 months. Table 4-1 compares 11 years' of observed WRRF flows to the LTS. The model predicts that a blending event is likely to occur about 60% as often as what was observed. The observed and simulated annual average blended volume are similar.

**Table 4-1 – Comparison of Observed & Predicted Blending Frequency**

| | 2010 – 2020 Flows | 50-Year LTS |
|---|---|---|
| **Blending Recurrence Interval** | 7 Months | 1.7 Years |
| **Probability of At Least Once Blending Event During Any Given Year** | 73% (8 of 11 years) | 42% (20 of 48 years) |
| **Annual Average Blended Volume** | 2.8 MG | 2.2 MG |

## 4.4 LONG-TERM WRRF FLOWS VS. RAINFALL

An analysis of observed rainfall and WRRF flows over a 13-year period is illustrated in Figure 4.5. It attempts to normalize total annual flow by total rainfall. However, unusually dry or wet years can cause the normalized flow volumes to jump up or down respectively.

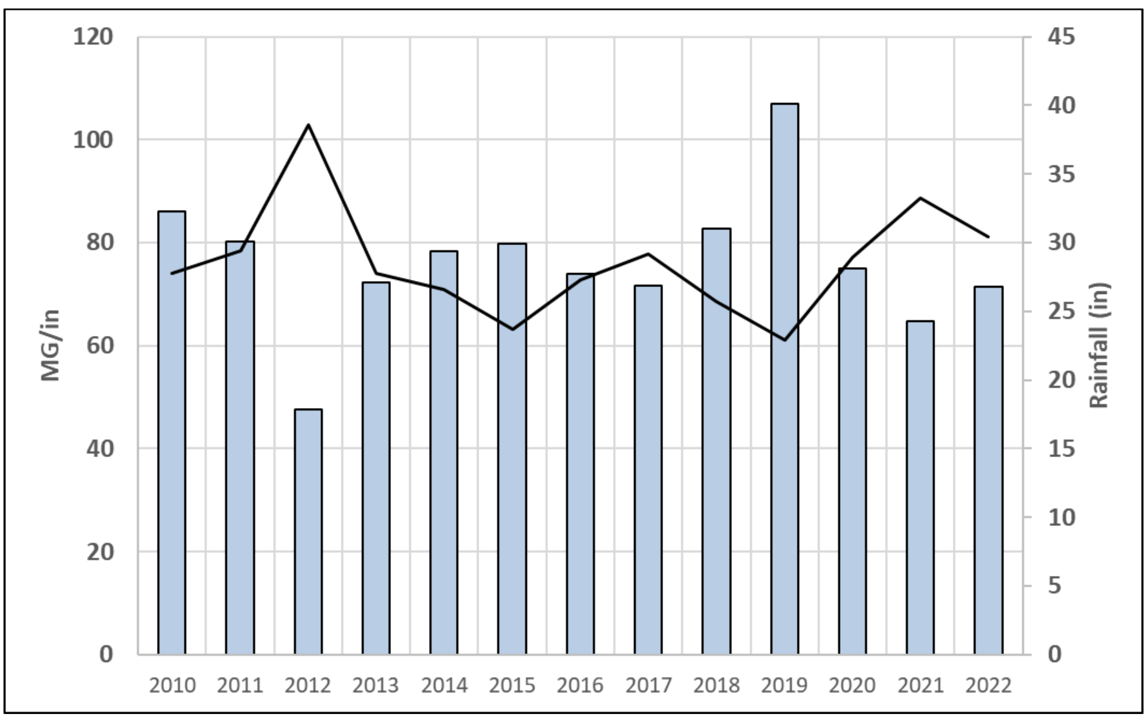



**Figure 4.5 – Long-Term WRRF Flows & Rainfall**

Figure 4.6 illustrates the same data on a scatter plot and notes the year of each point. As expected, as total annual rainfall increases, so does total annual WRRF flow. Most importantly, there appears to be little change in this relationship from 2010 to 2022. This indicates that system-wide, wet weather flows in proportion to rainfall have not increased or decreased by any statistically significant amount.

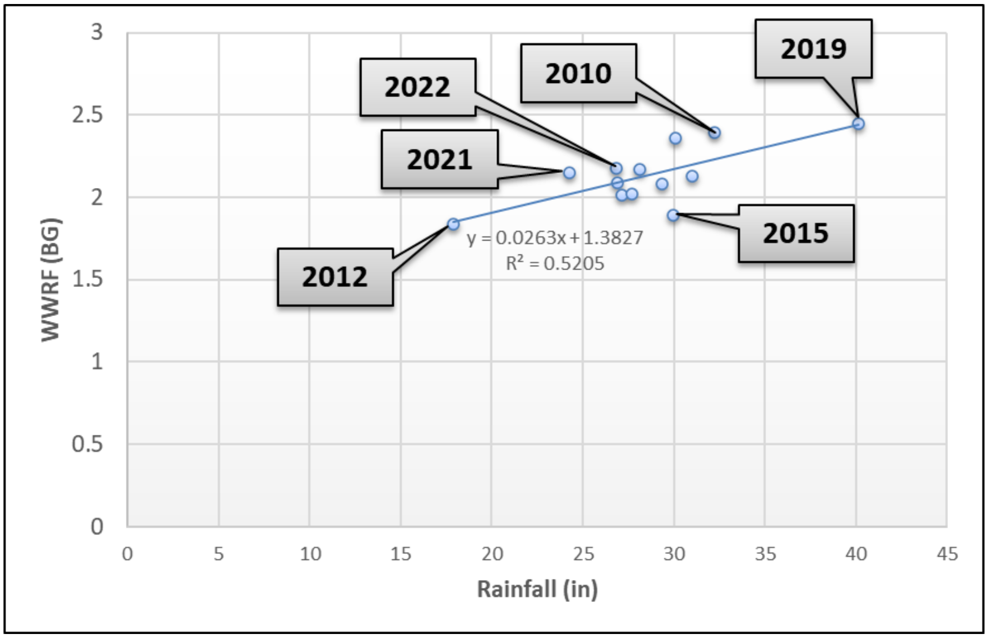



**Figure 4.6 – Annual WRRF Flows vs. Rainfall**

## 4.5 SPRING 2023 BLENDING EVENT

April 1, 2023 there was a “blending event” at the WRRF. Even though, as indicated in Section 4.3.2, these should be expected to occur an average of every 1-2 years, there had not been one in at least two years prior, so it appeared abnormal and something that warranted further analyses.

During this storm, approximately 1.9 inches of rain fell over 24 hours, making this only about a 9-month storm. However, it occurred at a time of year with high soil moisture, when groundwater and baseflows are typically elevated. As a result, dry weather flows preceding the event were approximately 2X long-term ADWF. Therefore, even though it was only a 9-month storm, it would have produced a wet weather response with a much larger recurrence interval. The fact that flows were sufficient to cause a blending event at the WRRF is not surprising and something that is to be expected.

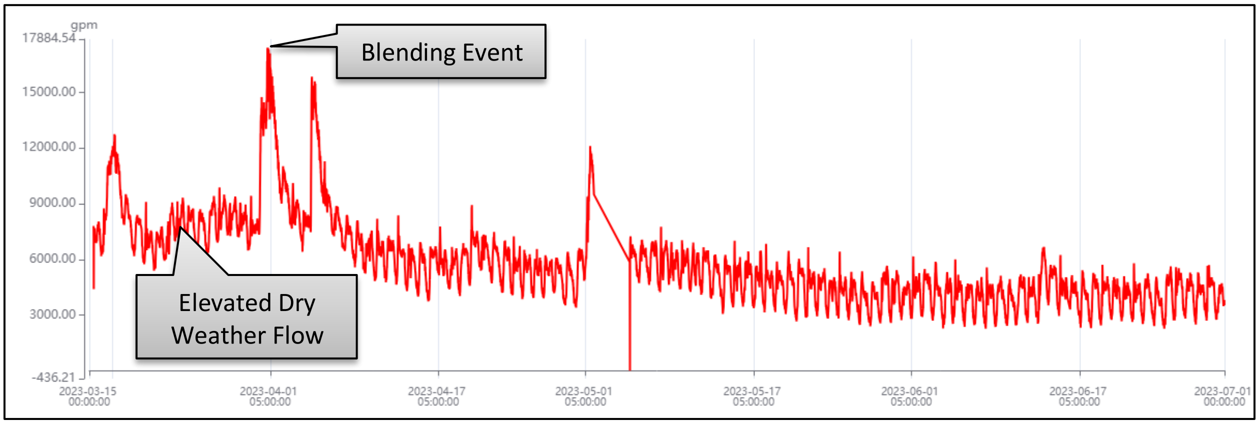
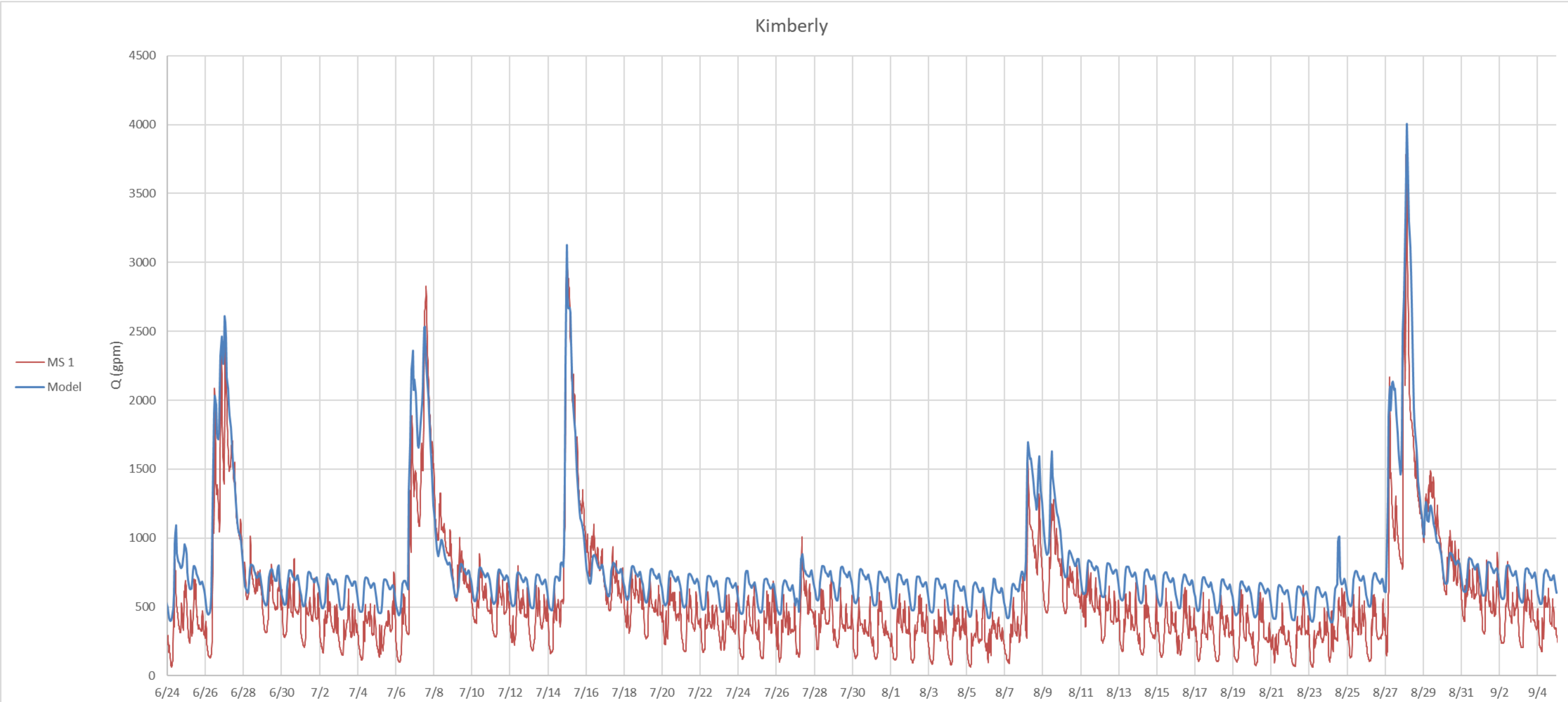



**Figure 4.7 – Spring 2023 WRRF Influent Flow**

# 5. APPENDIX

## 5.1 2021 MODEL CALIBRATION


Kimberly
Q (gpm)
MS 1
Model
0
500
1000
1500
2000
2500
3000
3500
4000
4500
6/24
6/26
6/28
6/30
7/2
7/4
7/6
7/8
7/10
7/12
7/14
7/16
7/18
7/20
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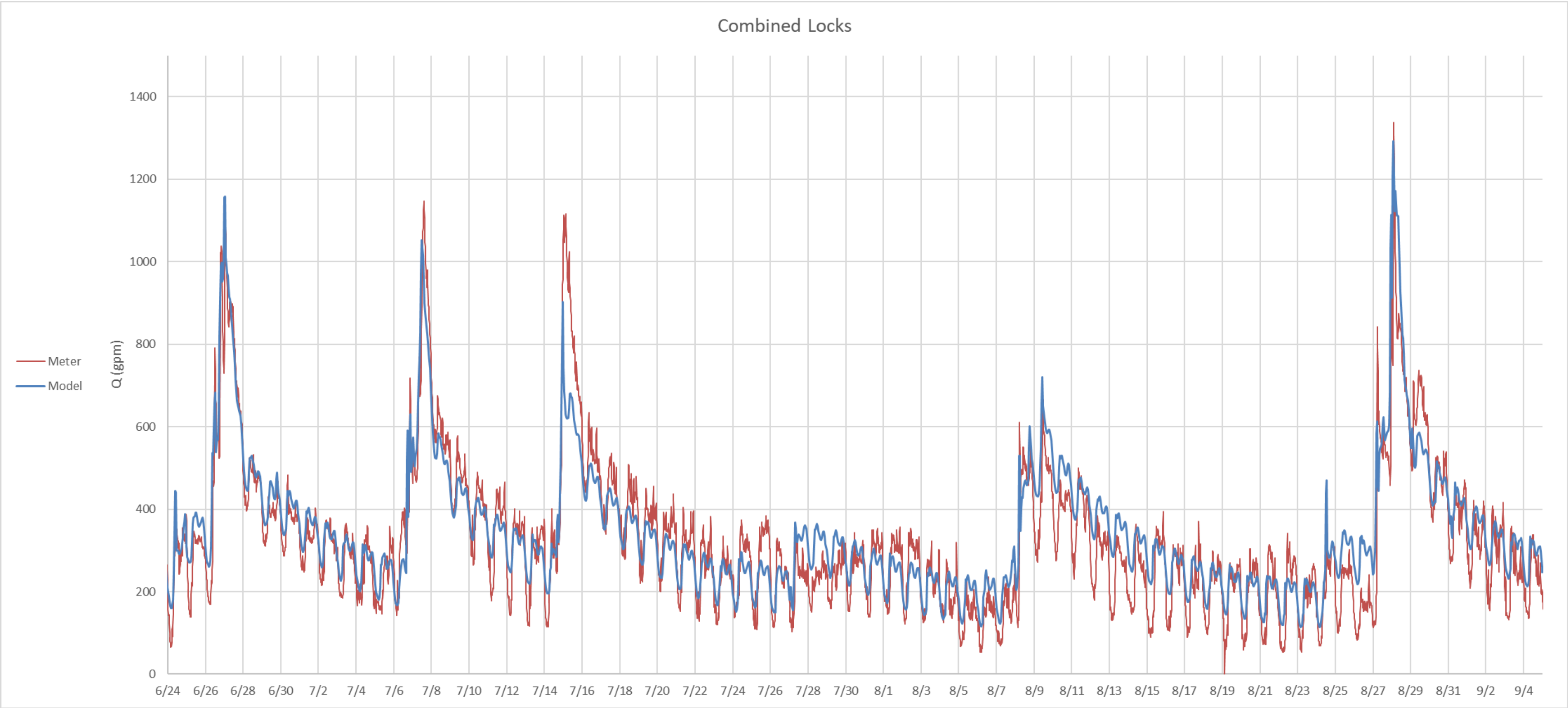
9/2
9/4


Combined Locks
Meter
Model
Q (gpm)
0
200
400
600
800
1000
1200
1400
6/24
6/26
6/28
6/30
7/2
7/4
7/6
7/8
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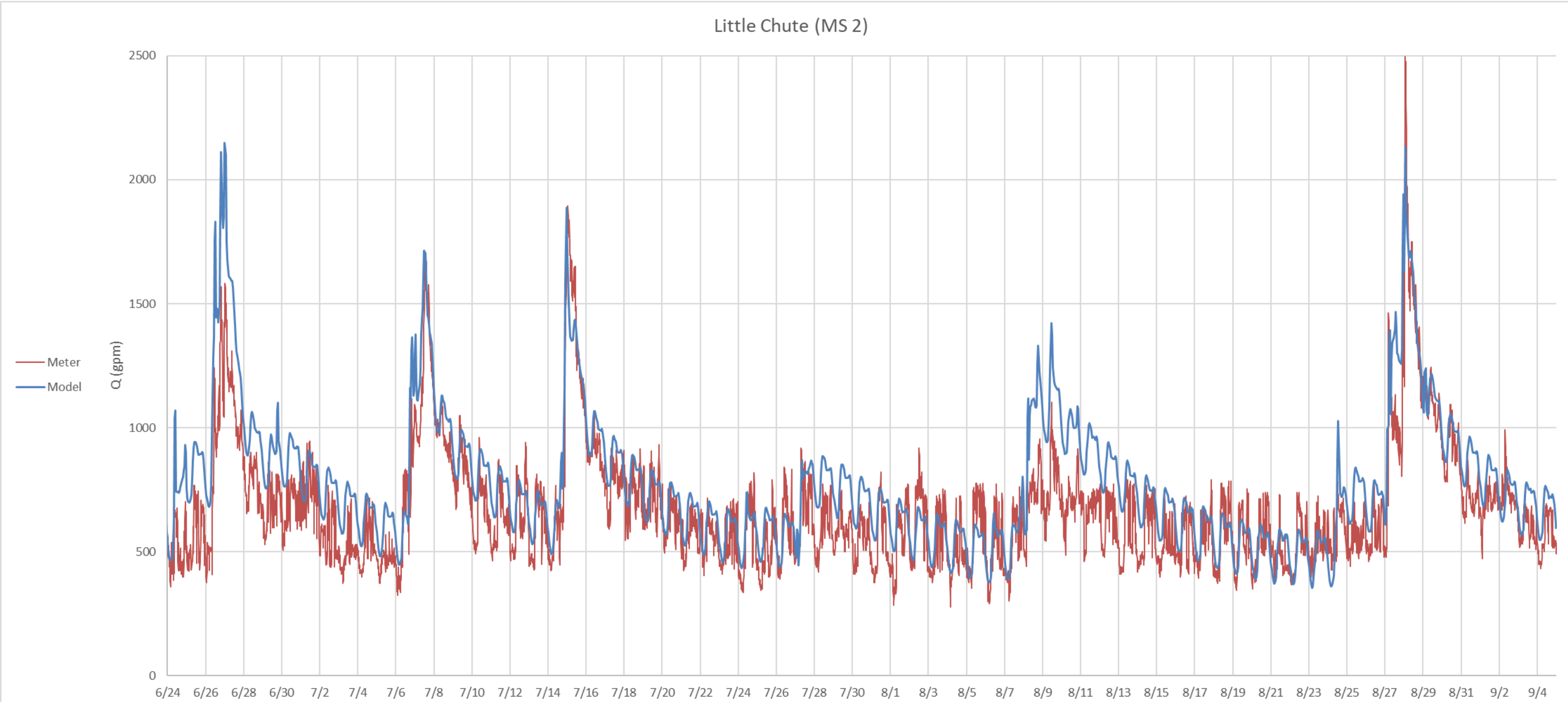
8/31
9/2
9/4


Little Chute (MS 2)
Meter
Model
Q (gpm)
2500
2000
1500
1000
500
0
6/24
6/26
6/28
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7/2
7/4
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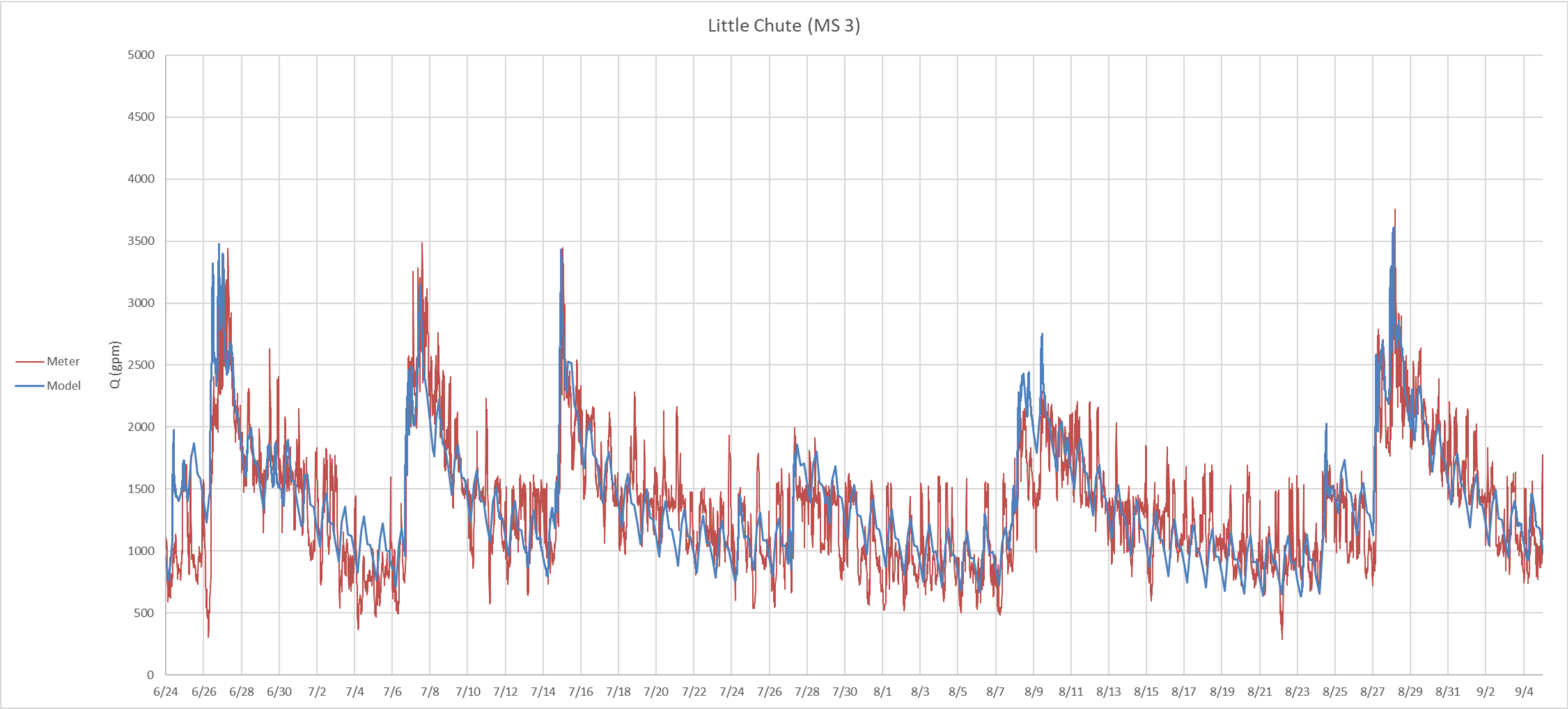
Little Chute (MS 3)
Meter
Model
Q (gpm)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
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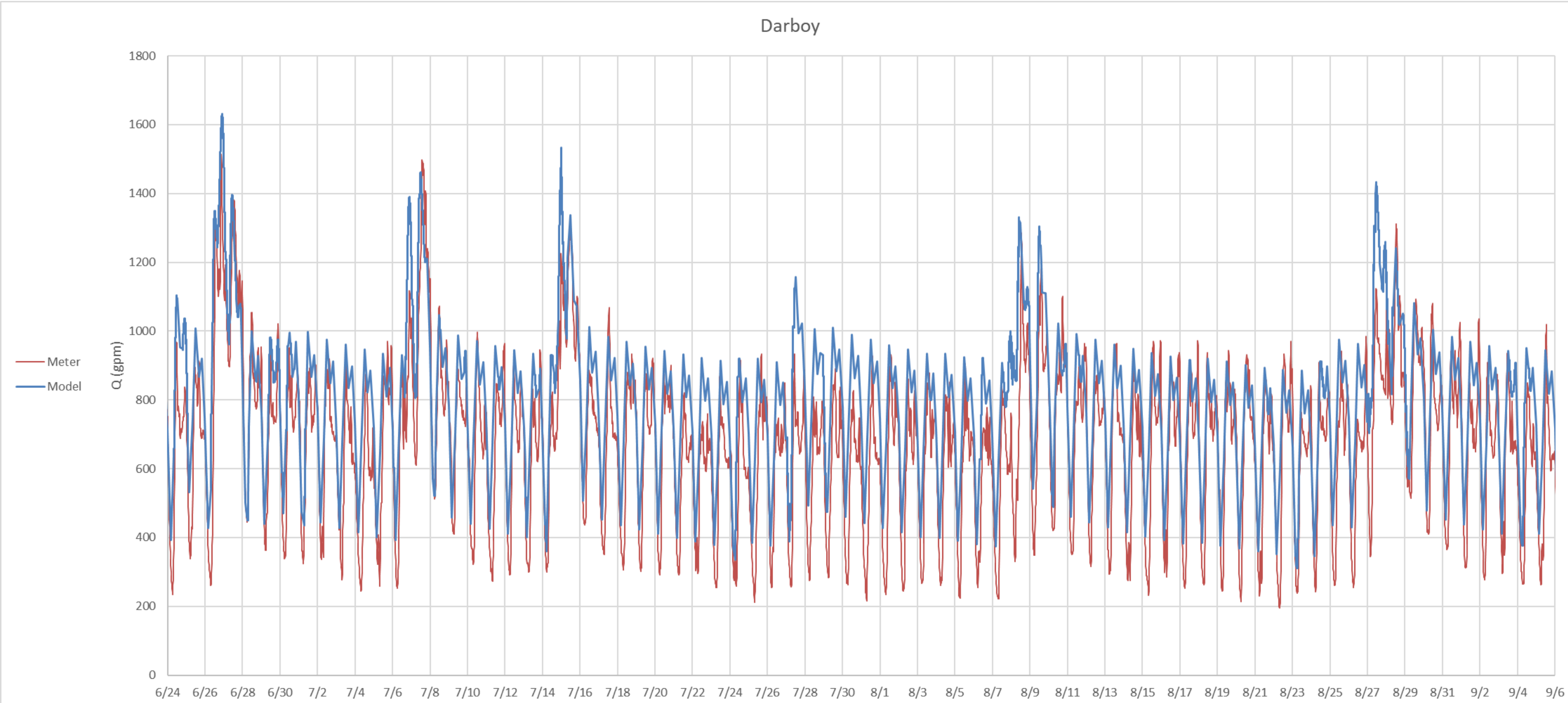
9/4


Darboy
Meter
Model
Q (gpm)
0
200
400
600
800
1000
1200
1400
1600
1800
6/24
6/26
6/28
6/30
7/2
7/4
7/6
7/8
7/10
7/12
7/14
7/16
7/18
7/20
7/22
7/24
7/26
7/28
7/30
8/1
8/3
8/5
8/7
8/9
8/11
8/13
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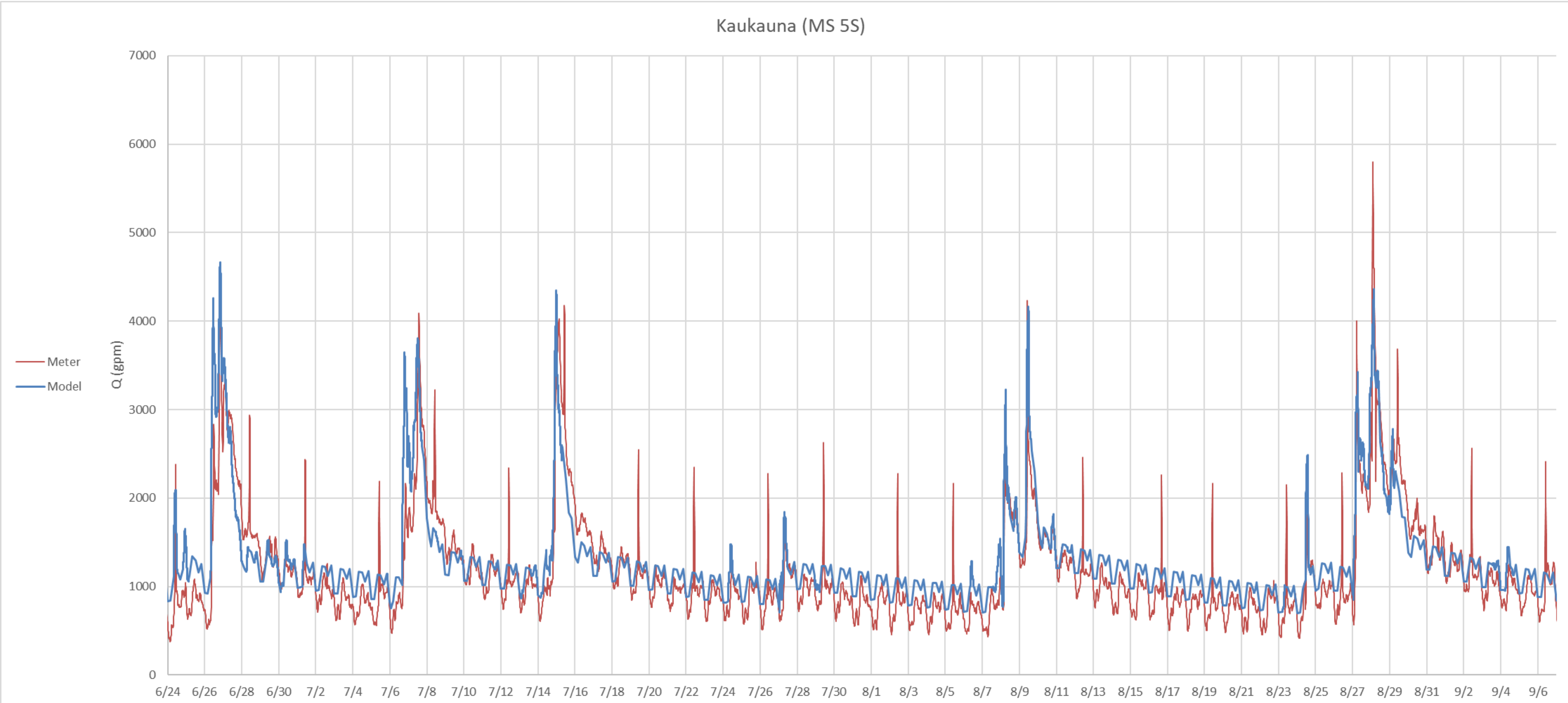
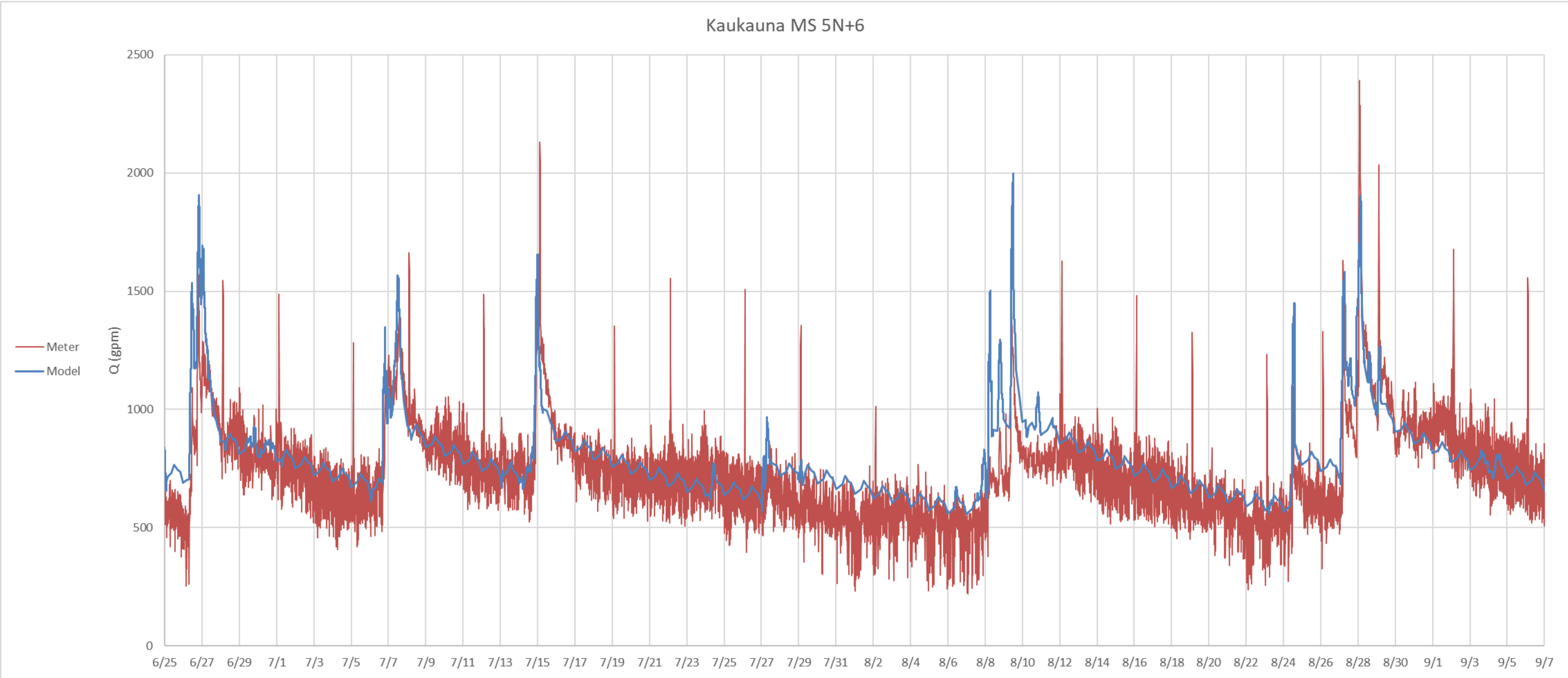
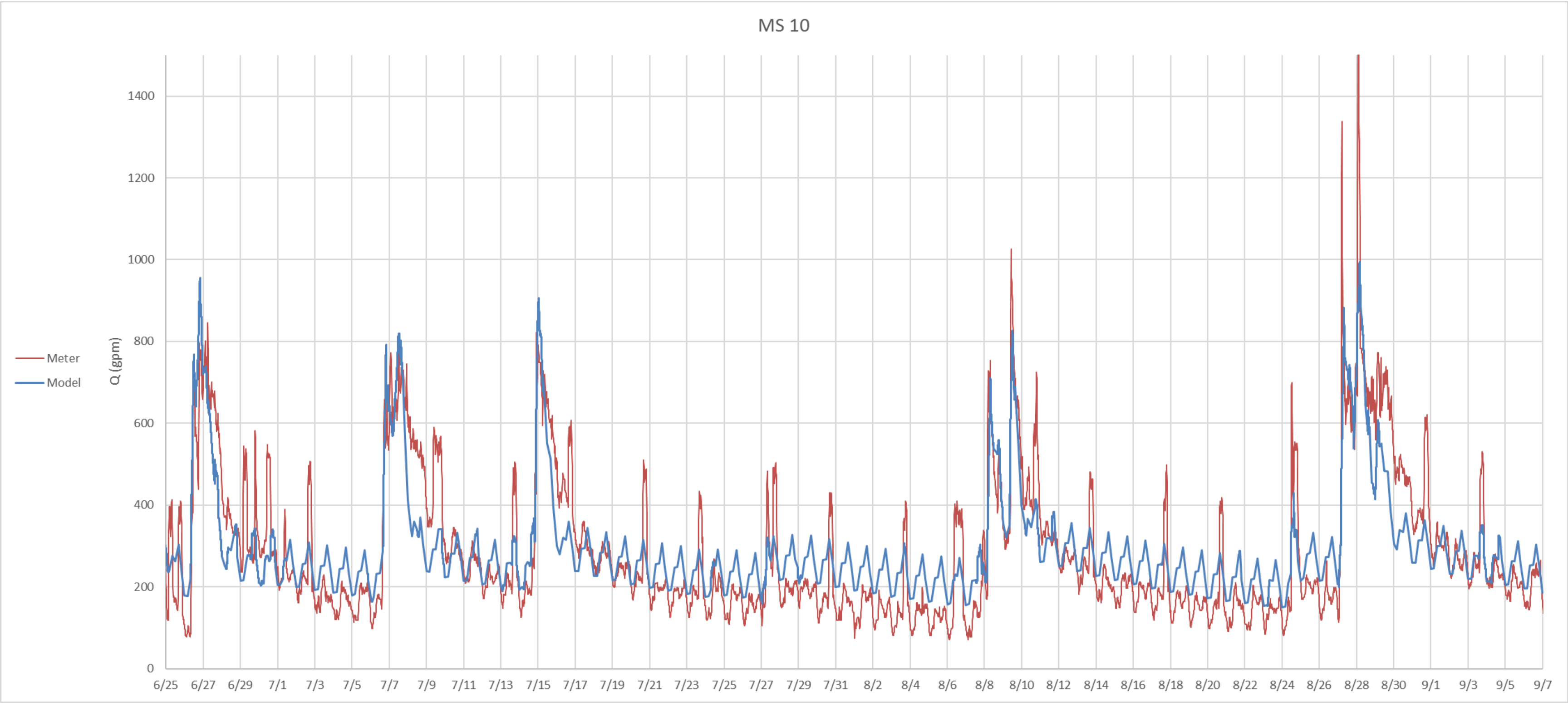
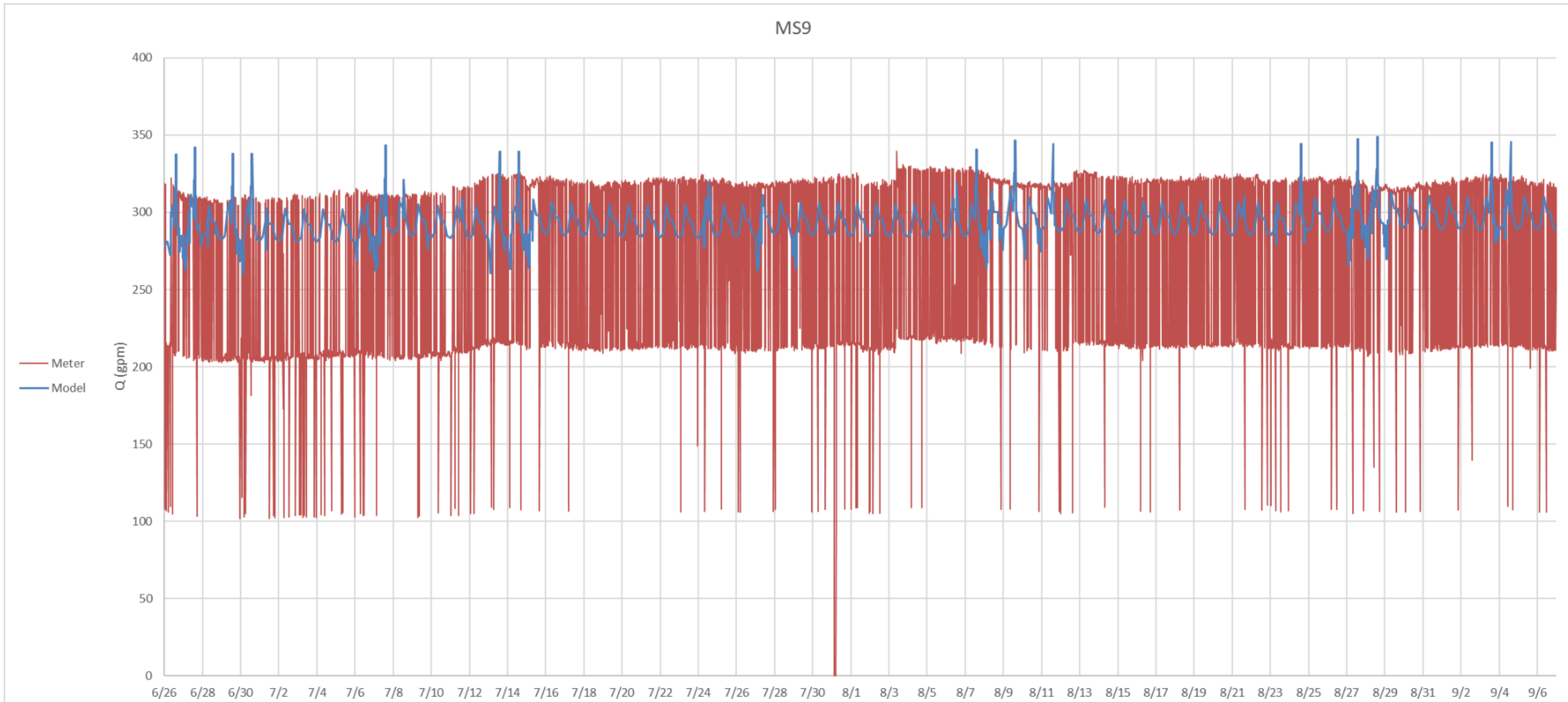
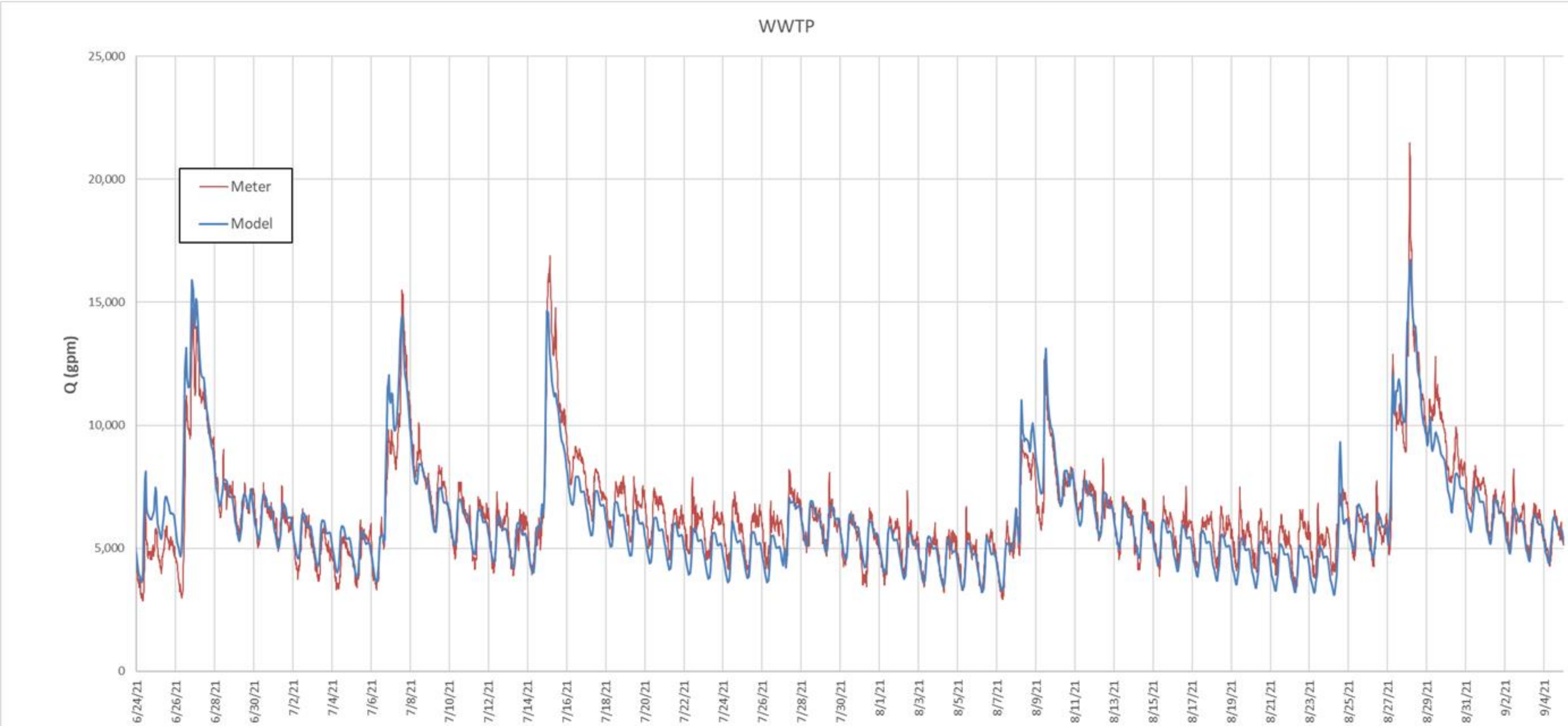
8/19
8/21
8/23
8/25
8/27
8/29
8/31
9/2
9/4
9/6


Kaukauna (MS 5S)
Meter
Model
Q (gpm)
7000
6000
5000
4000
3000
2000
1000
0
6/24
6/26
6/28
6/30
7/2
7/4
7/6
7/8
7/10
7/12
7/14
7/16
7/18
7/20
7/22
7/24
7/26
7/28
7/30
8/1
8/3
8/5
8/7
8/9
8/11
8/13
8/15
8/17
8/19
8/21
8/23
8/25
8/27
8/29
8/31
9/2
9/4
9/6


Kaukauna MS 5N+6
Meter
Model
Q (gpm)
2500
2000
1500
1000
500
0
6/25
6/27
6/29
7/1
7/3
7/5
7/7
7/9
7/11
7/13
7/15
7/17
7/19
7/21
7/23
7/25
7/27
7/29
7/31
8/2
8/4
8/6
8/8
8/10
8/12
8/14
8/16
8/18
8/20
8/22
8/24
8/26
8/28
8/30
9/1
9/3
9/5
9/7


MS 10
Meter
Model
Q (gpm)
0
200
400
600
800
1000
1200
1400
6/25
6/27
6/29
7/1
7/3
7/5
7/7
7/9
7/11
7/13
7/15
7/17
7/19
7/21
7/23
7/25
7/27
7/29
7/31
8/2
8/4
8/6
8/8
8/10
8/12
8/14
8/16
8/18
8/20
8/22
8/24
8/26
8/28
8/30
9/1
9/3
9/5
9/7


MS9
Q (gpm)
400
350
300
250
200
150
100
50
0
6/26
6/28
6/30
7/2
7/4
7/6
7/8
7/10
7/12
7/14
7/16
7/18
7/20
7/22
7/24
7/26
7/28
7/30
8/1
8/3
8/5
8/7
8/9
8/11
8/13
8/15
8/17
8/19
8/21
8/23
8/25
8/27
8/29
8/31
9/2
9/4
9/6
Meter
Model


WWTP
25,000
20,000
15,000
10,000
5,000
0
Q (gpm)
Meter
Model
6/24/21
6/26/21
6/28/21
6/30/21
7/2/21
7/4/21
7/6/21
7/8/21
7/10/21
7/12/21
7/14/21
7/16/21
7/18/21
7/20/21
7/22/21
7/24/21
7/26/21
7/28/21
7/30/21
8/1/21
8/3/21
8/5/21
8/7/21
8/9/21
8/11/21
8/13/21
8/15/21
8/17/21
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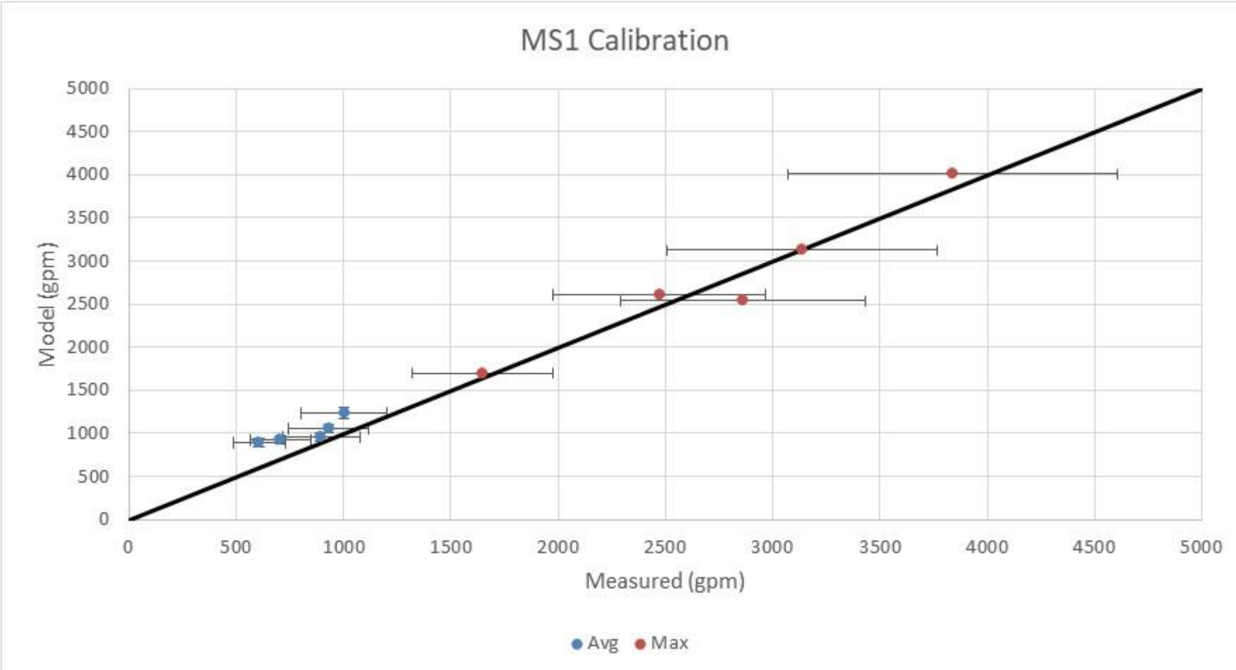
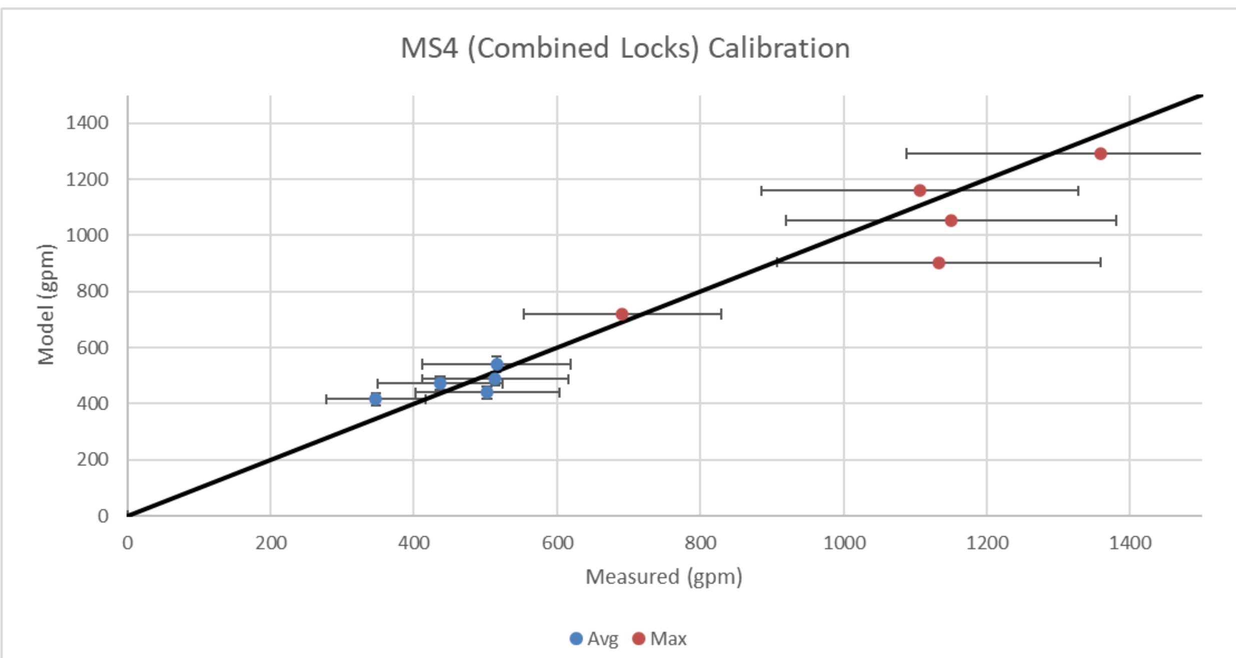
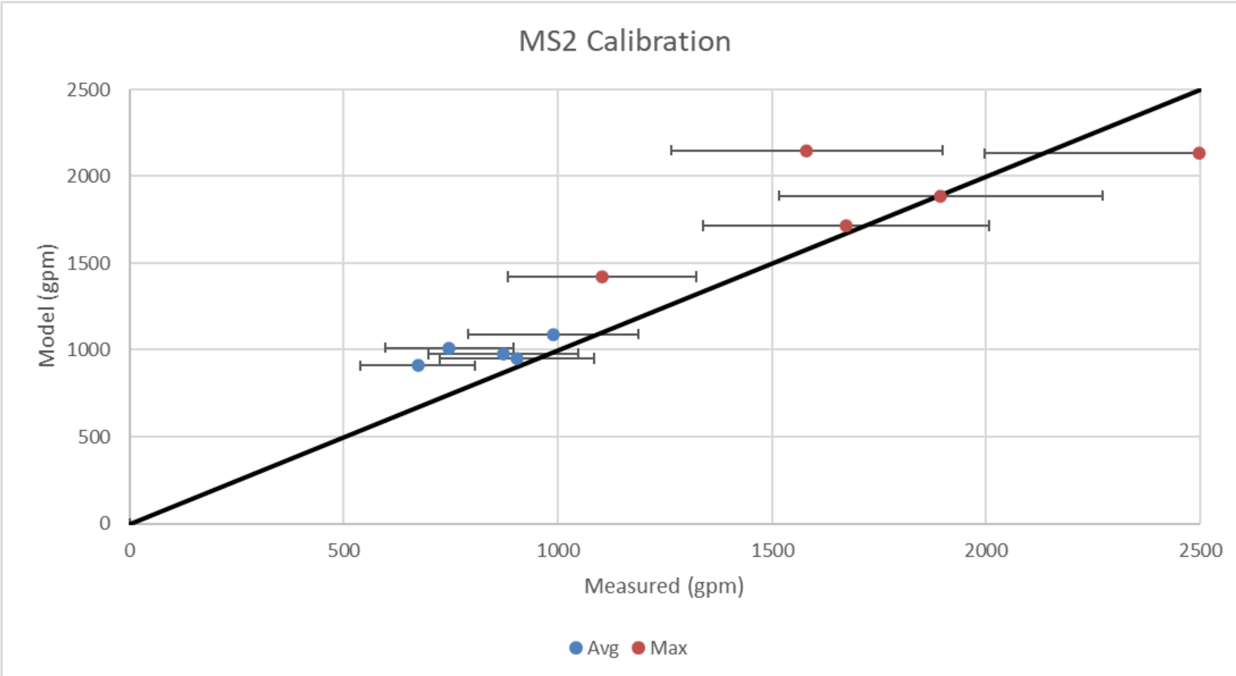
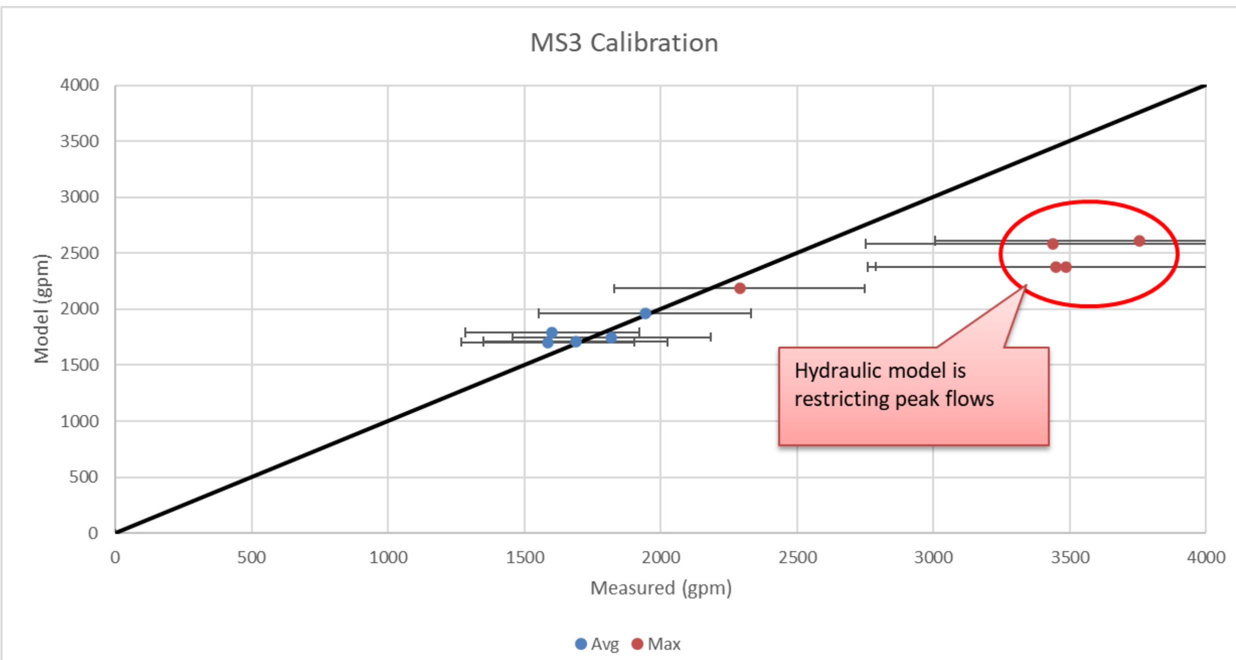
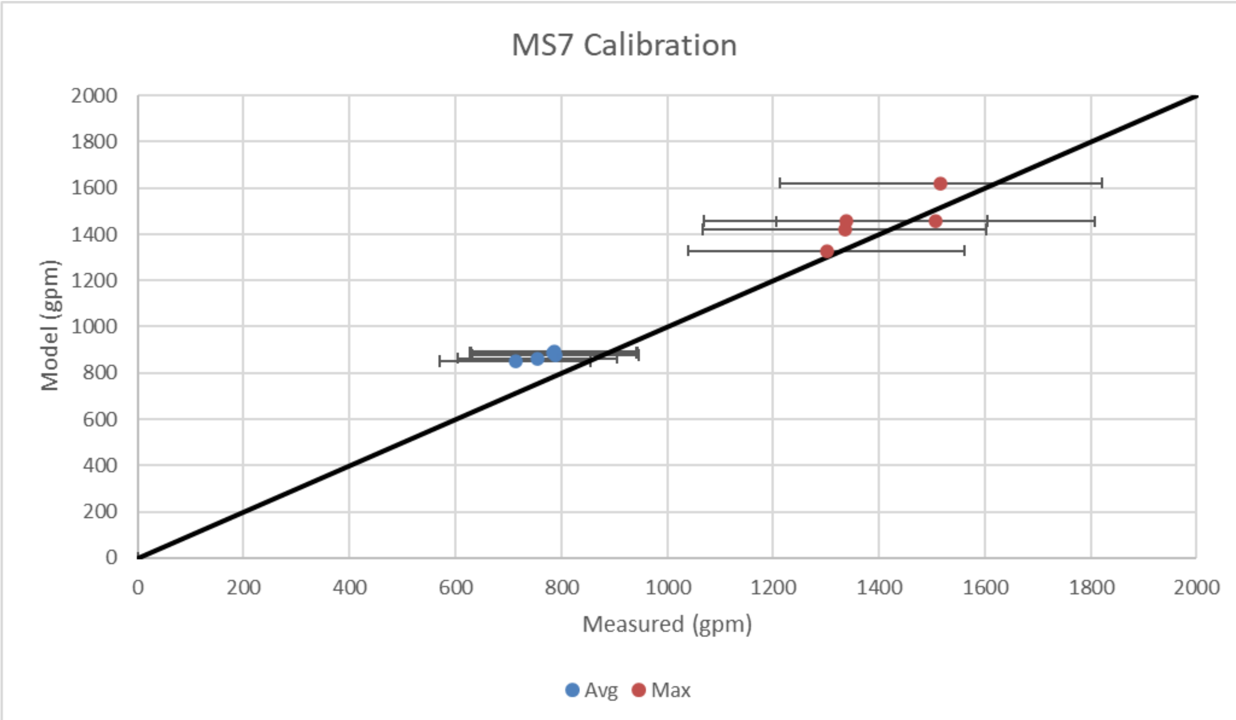
8/31/21
9/2/21
9/4/21

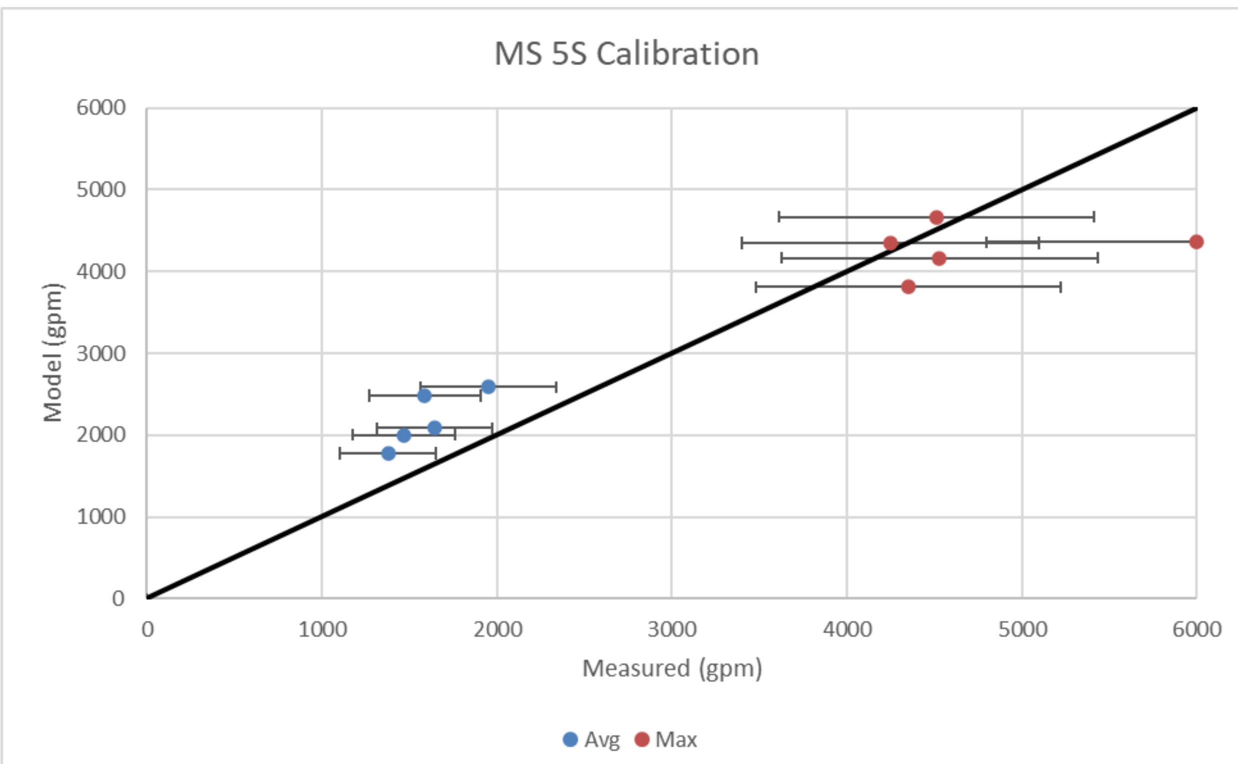

MS1 Calibration
Model (gpm)
Measured (gpm)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Avg
Max

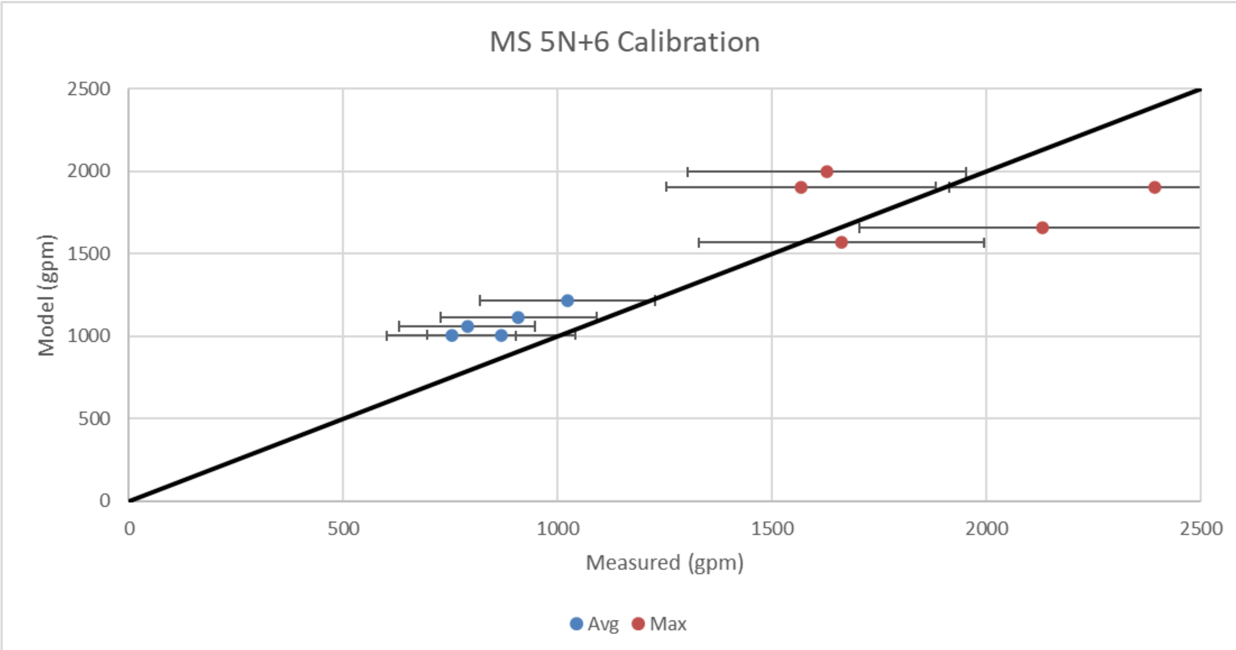

MS4 (Combined Locks) Calibration
Model (gpm)
Measured (gpm)
0
200
400
600
800
1000
1200
1400
Avg
Max

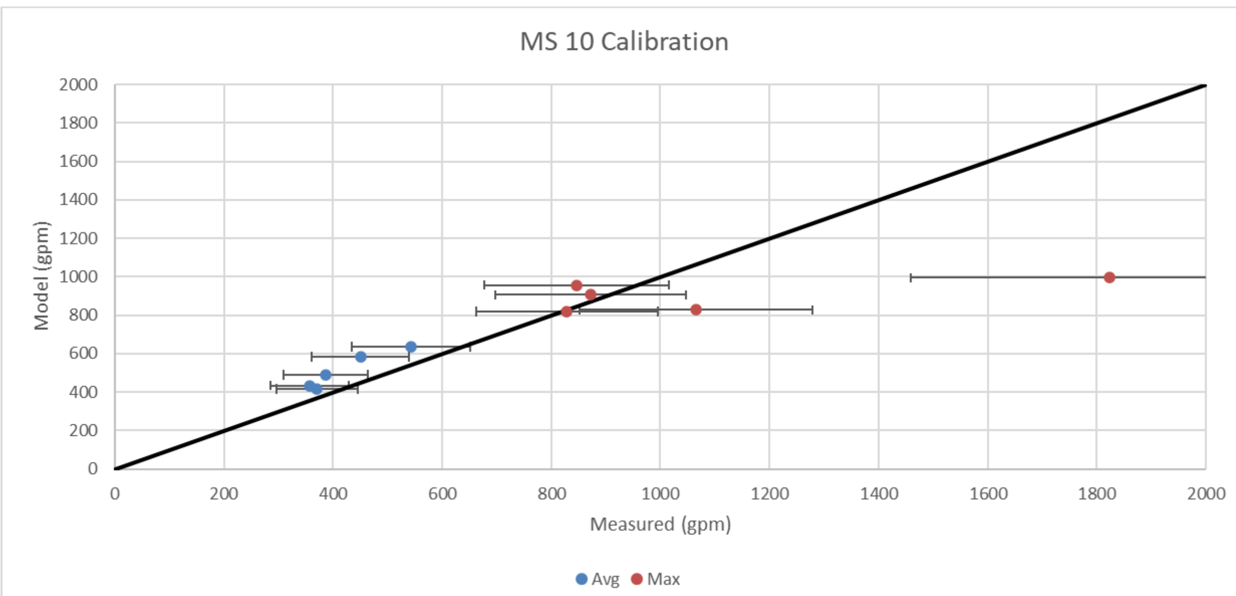

MS2 Calibration
2500
2000
1500
1000
500
0
Model (gpm)
0
500
1000
1500
2000
2500
Measured (gpm)
Avg
Max


MS3 Calibration
4000
3500
3000
2500
2000
1500
1000
500
0
Model (gpm)
0
500
1000
1500
2000
2500
3000
3500
4000
Measured (gpm)
Hydraulic model is restricting peak flows
Avg
Max


MS7 Calibration
Model (gpm)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Measured (gpm)
Avg
Max


MS 5S Calibration
Model (gpm)
6000
5000
4000
3000
2000
1000
0
0
1000
2000
3000
4000
5000
6000
Measured (gpm)
Avg
Max


MS 5N+6 Calibration
Model (gpm)
Measured (gpm)
0
500
1000
1500
2000
2500
Avg
Max


MS 10 Calibration
Model (gpm)
Measured (gpm)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Avg
Max

## 5.2 APPENDIX A – 2021 I/I SCORECARDS

| Community | Dry Weather Flow | | | | Wet Weather Flow | | | | RDII Volume | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ADWF (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Qmax (mgd) | Qmax (gpcd) | Max RDII (gpm/mi) | Peaking Factor | RDII (gal/mi) | Capture Coefficient |
| Kimberly | 109 | 52 | 1,327 | 8.4 | 2.16 | 295 | 30 | 2.75 | 0.070 | 4.0% |
| MS 2 | 158 | 112 | 2,360 | 16.4 | 1.96 | 423 | 37 | 2.49 | 0.176 | 6.0% |
| MS 3 | 230 | 149 | 2,221 | 16.6 | 2.92 | 490 | 27 | 2.18 | 0.125 | 5.6% |
| Little Chute Sub-Total | 199 | 132 | 2,269 | 16.5 | 4.88 | 461 | 31 | 2.33 | 0.143 | 5.7% |
| Combined Locks | 88 | 35 | | 4.4 | 0.78 | 215 | 14 | 2.50 | 0.070 | 3.3% |
| Darboy | 72 | 26 | | 3.2 | 1.80 | 128 | 5.0 | 1.92 | 0.013 | 0.5% |
| MS 5S | 141 | 91 | | 15.0 | 4.17 | 406 | 40 | 3.04 | 0.050 | 3.2% |
| MS 5N+6 | 168 | 118 | | 14.0 | 1.30 | 882 | 86 | 5.43 | 0.320 | 12.5% |
| MS 9 | 183 | 123 | | 8.0 | 0.36 | 210 | 0.23 | 1.14 | 0.0005 | 0.05% |
| MS 10 | 163 | 104 | | 15.0 | 0.90 | 573 | 55 | 3.64 | 0.084 | 5.9% |
| Kaukauna Total | 151 | 99 | | 13.2 | 6.73 | 448 | 37 | 2.90 | 0.070 | 3.7% |

ADWF (gpcd) – Average Dry Weather Flow in gallons per capita per day.
GWI (gpcd) – Groundwater Infiltration in gallons per capita per day.
GWI (gpd/IDM) – Groundwater infiltration in gallons per day per inch*diameter*mile of sewer.
Qmax (mgd) – Maximum flow rate in millions of gallons per day.
Qmax (gpcd) – Maximum flow in gallons per capita per day.
Max RDII (gpm/mi) – Maximum rainfall-dependent inflow and infiltration in gallons per minute per mile of sewer.
Peaking Factor (Dimensionless) – Qmax / ADWF
RDII (gal/mi) – Rainfall-dependent I/I volume in gallons per mile of sewer.
Capture Coefficient (Dimensionless) – Volume of RDII / Total volume of rainfall.

## Kimberly 2021 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/5/1983 | 6.0 | 111 | 57 | 54 | 1,388 | 8.8 | 17 | 1.1 | 1.4 | 5.1 | 145 | 4 | 0.2 | 0.01 | 1.4% |
| 2 | 3/18/1983 | 7.5 | 110 | 57 | 53 | 1,334 | 8.5 | 19 | 1.2 | 1.5 | 6.6 | 162 | 6 | 0.5 | 0.02 | 2.5% |
| 3 | 4/9/1983 | 10.7 | 107 | 57 | 50 | 1,282 | 8.1 | 37 | 1.4 | 1.8 | 9.3 | 190 | 12 | 0.9 | 0.03 | 2.3% |
| 4 | 5/1/1983 | 3.3 | 104 | 57 | 47 | 1,195 | 7.6 | 18 | 1.0 | 1.2 | 2.7 | 133 | 8 | 0.2 | 0.01 | 1.0% |
| 5 | 5/6/1983 | 5.9 | 104 | 57 | 47 | 1,207 | 7.7 | 34 | 1.8 | 2.3 | 5.5 | 244 | 20 | 1.0 | 0.03 | 3.0% |
| 6 | 5/12/1983 | 8.0 | 105 | 57 | 48 | 1,225 | 7.8 | 56 | 1.5 | 1.9 | 7.2 | 204 | 15 | 1.1 | 0.03 | 1.9% |
| 7 | 5/22/1983 | 22.9 | 106 | 57 | 49 | 1,263 | 8.0 | 85 | 3.1 | 3.9 | 22.6 | 419 | 48 | 4.8 | 0.15 | 5.6% |
| 8 | 6/14/1983 | 6.8 | 108 | 57 | 51 | 1,297 | 8.2 | 13 | 1.1 | 1.4 | 5.9 | 153 | 6 | 0.5 | 0.02 | 4.1% |
| 9 | 6/27/1983 | 14.9 | 105 | 57 | 48 | 1,234 | 7.8 | 50 | 1.5 | 1.9 | 13.4 | 208 | 18 | 1.9 | 0.06 | 3.9% |
| 10 | 7/19/1983 | 7.5 | 107 | 57 | 50 | 1,271 | 8.1 | 24 | 2.1 | 2.6 | 7.5 | 285 | 28 | 1.7 | 0.05 | 6.8% |
| 11 | 7/27/1983 | 9.1 | 112 | 57 | 55 | 1,419 | 9.0 | 76 | 3.4 | 4.4 | 9.6 | 469 | 63 | 2.1 | 0.07 | 2.8% |
| 12 | 8/6/1983 | 8.7 | 119 | 57 | 62 | 1,567 | 10.0 | 52 | 2.1 | 2.7 | 9.0 | 290 | 28 | 1.4 | 0.05 | 2.8% |
| 13 | 8/21/1983 | 8.9 | 122 | 57 | 65 | 1,660 | 10.5 | 133 | 7.0 | 8.9 | 12.3 | 953 | 133 | 4.4 | 0.14 | 3.3% |
| 14 | 9/15/1983 | 15.9 | 110 | 57 | 53 | 1,358 | 8.6 | 89 | 3.9 | 4.9 | 18.7 | 527 | 71 | 5.9 | 0.19 | 6.6% |
| 15 | 10/7/1983 | 14.9 | 112 | 57 | 55 | 1,407 | 8.9 | 70 | 2.2 | 2.8 | 15.7 | 302 | 28 | 3.5 | 0.11 | 4.9% |
| 16 | 11/19/1983 | 19.9 | 103 | 57 | 46 | 1,170 | 7.4 | 71 | 1.3 | 1.7 | 18.6 | 178 | 12 | 3.7 | 0.12 | 5.2% |
| 17 | 12/11/1983 | 12.8 | 108 | 57 | 51 | 1,289 | 8.2 | 38 | 1.1 | 1.4 | 11.5 | 155 | 5 | 1.4 | 0.05 | 3.8% |
| | | **Average** | **109** | **57** | **52** | **1,327** | **8.4** | **883** | **2.16** | **2.75** | **181** | **295** | **30** | **35.2** | **0.07** | **4.0%** |

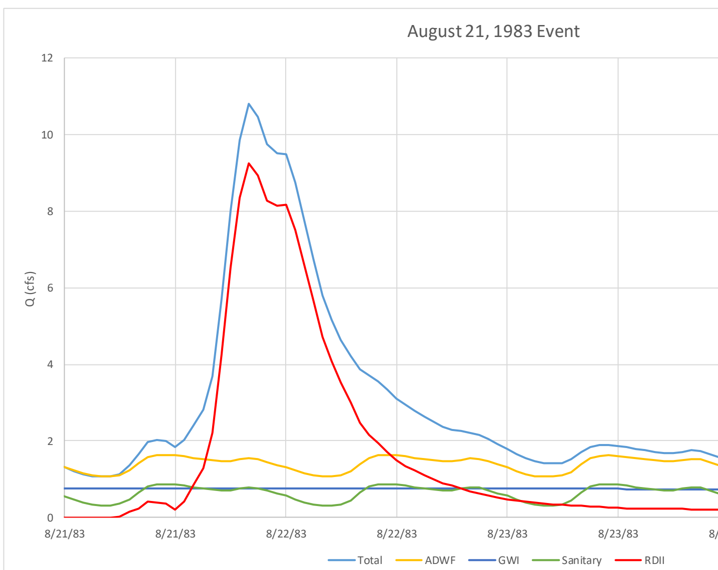
| Subcatchment Parameters | |
|---|---|
| **2010 Population:** | 7320 |
| **Area (acres):** | 1360 |
| **Sewer Length (miles):** | 31 |
| **Sewer IDM:** | 285 |

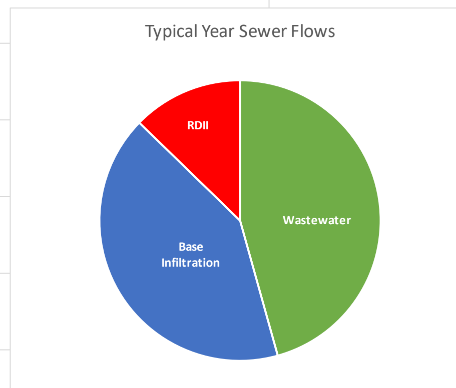
**2022 Water Billing Records**

| | | |
|---|---|---|
| Winter Consumption: | 417,246 | gpd |
| | 57 | gpcd |

**Financial Analysis**

| | V (X1000) | Cost / Year |
|---|---|---|
| Wastewater | 152,295 | $ 108,129 |
| Base Infiltration | 138,739 | $ 98,504 |
| RDII | 42,378 | $ 30,089 |
| **Total** | **333,412** | **$ 236,722** |



## Darboy 2021 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/6/1983 | 6.8 | 73 | 47 | 26 | | 3.22 | 58 | 1.4 | 1.5 | 7.2 | 99 | 2 | 0.2 | 0.003 | 0.4% |
| 2 | 3/18/1983 | 6.0 | 71 | 47 | 25 | | 3.10 | 70 | 1.5 | 1.6 | 6.4 | 105 | 2 | 0.3 | 0.004 | 0.4% |
| 3 | 4/9/1983 | 10.7 | 70 | 47 | 23 | | 2.85 | 134 | 1.5 | 1.6 | 11.5 | 106 | 3 | 0.9 | 0.012 | 0.7% |
| 4 | 5/21/1983 | 6.0 | 75 | 47 | 29 | | 3.64 | 190 | 2.2 | 2.4 | 7.1 | 157 | 8 | 0.8 | 0.010 | 0.4% |
| 5 | 6/27/1983 | 11.9 | 70 | 47 | 24 | | 2.94 | 181 | 1.5 | 1.6 | 13.1 | 108 | 3 | 1.4 | 0.018 | 0.8% |
| 6 | 7/19/1983 | 7.4 | 68 | 47 | 21 | | 2.72 | 88 | 1.7 | 1.8 | 8.4 | 120 | 5 | 1.3 | 0.016 | 1.4% |
| 7 | 7/27/1983 | 9.2 | 70 | 47 | 23 | | 2.98 | 277 | 2.0 | 2.1 | 10.3 | 141 | 8 | 1.3 | 0.018 | 0.5% |
| 8 | 8/6/1983 | 3.7 | 72 | 47 | 25 | | 3.16 | 98 | 1.7 | 1.8 | 4.3 | 117 | 4 | 0.5 | 0.007 | 0.5% |
| 9 | 8/10/1983 | 4.8 | 73 | 47 | 26 | | 3.28 | 91 | 1.7 | 1.8 | 5.4 | 120 | 3 | 0.4 | 0.006 | 0.5% |
| 10 | 8/21/1983 | 13.0 | 76 | 47 | 29 | | 3.67 | 529 | 3.0 | 3.2 | 15.6 | 214 | 16 | 1.7 | 0.023 | 0.3% |
| 11 | 9/15/1983 | 14.5 | 76 | 47 | 29 | | 3.72 | 324 | 1.9 | 2.0 | 17.0 | 135 | 7 | 1.6 | 0.021 | 0.5% |
| 12 | 10/7/1983 | 11.9 | 73 | 47 | 27 | | 3.38 | 254 | 1.8 | 2.0 | 13.7 | 131 | 6 | 1.4 | 0.018 | 0.5% |
| 13 | 11/19/1983 | 18.0 | 73 | 47 | 26 | | 3.34 | 258 | 1.8 | 1.9 | 20.0 | 124 | 5 | 1.5 | 0.019 | 0.6% |
| 14 | 12/11/1983 | 12.8 | 71 | 47 | 24 | | 3.05 | 137 | 1.5 | 1.6 | 13.8 | 109 | 3 | 1.1 | 0.014 | 0.8% |
| | | **Average** | **72** | **47** | **26** | | **3.22** | **2,688** | **1.80** | **1.92** | **154** | **128** | **5** | **14** | **0.013** | **0.5%** |

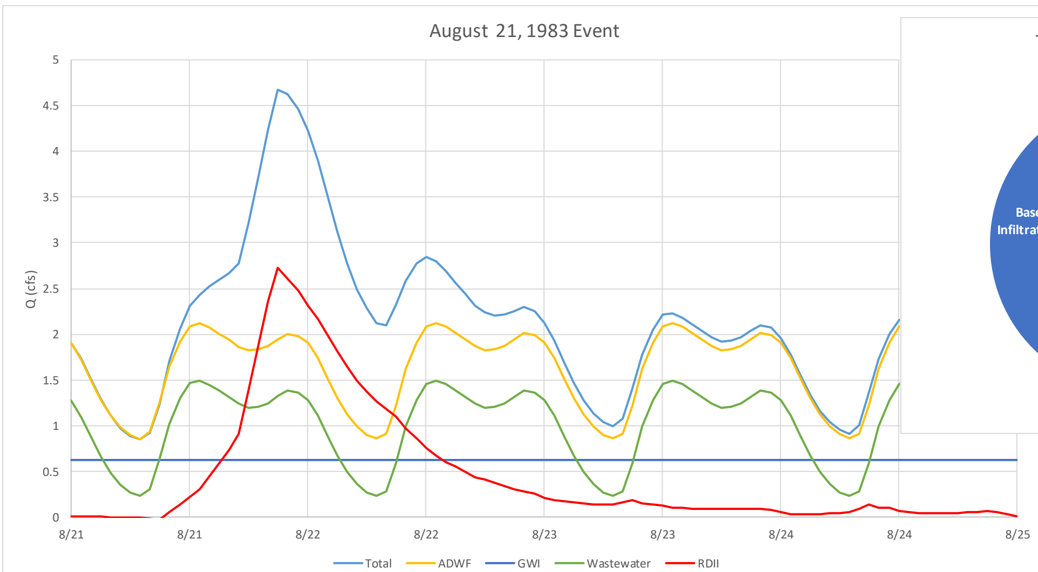
| Subcatchment Parameters | |
|---|---|
| **2021 Population:** | 14,114 |
| **Area (acres):** | 4,931 |
| **Sewer Length (miles):** | 77 |
| **Sewer IDM:** | |

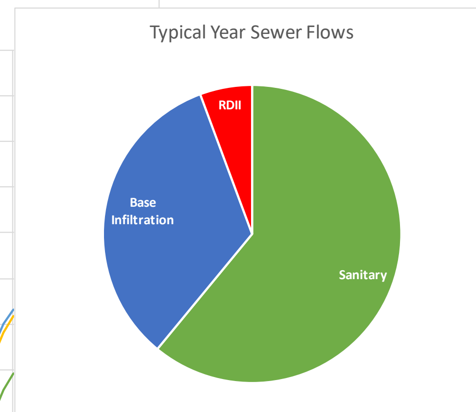
**2022 Water Billing Records**

Winter Consumption: 657,649 gpd
47 gpcd

**Financial Analysis**

| | V (X1000) | Cost / Year |
|---|---|---|
| Sanitary | 240,042 | $ 170,430 |
| Base Infiltration | 131,472 | $ 93,345 |
| RDII | 22,272 | $ 15,813 |
| **Total** | **393,786** | **$ 279,588** |



## Combined Locks 2021 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/6/1983 | 5.7 | 84 | 53 | 31 | | 3.83 | 14 | 0.5 | 1.5 | 2.1 | 124 | 3.9 | 0.4 | 0.017 | 2.6% |
| 2 | 3/18/1983 | 3.3 | 92 | 53 | 40 | | 4.87 | 15 | 0.5 | 1.6 | 1.3 | 133 | 3.2 | 0.2 | 0.009 | 1.3% |
| 3 | 4/9/1983 | 8.5 | 87 | 53 | 34 | | 4.22 | 30 | 0.5 | 1.7 | 3.5 | 144 | 6.0 | 0.8 | 0.035 | 2.5% |
| 4 | 5/6/1983 | 6.9 | 73 | 53 | 21 | | 2.70 | 28 | 0.7 | 2.2 | 3.1 | 186 | 11.4 | 1.3 | 0.060 | 4.6% |
| 5 | 5/13/1983 | 5.4 | 86 | 53 | 33 | | 4.09 | 23 | 0.6 | 2.0 | 2.3 | 170 | 10.0 | 0.6 | 0.028 | 2.6% |
| 6 | 5/22/1983 | 10.9 | 98 | 53 | 46 | | 5.67 | 58 | 0.9 | 3.0 | 6.0 | 256 | 16.4 | 2.1 | 0.096 | 3.5% |
| 7 | 6/27/1983 | 12.9 | 72 | 53 | 19 | | 2.50 | 40 | 0.6 | 1.9 | 5.1 | 162 | 10.0 | 1.7 | 0.081 | 4.3% |
| 8 | 7/19/1983 | 17.3 | 89 | 53 | 36 | | 4.51 | 82 | 1.0 | 3.3 | 8.8 | 274 | 25.0 | 3.2 | 0.150 | 3.9% |
| 9 | 8/6/1983 | 8.4 | 101 | 53 | 48 | | 5.93 | 42 | 0.8 | 2.7 | 4.1 | 226 | 14.2 | 1.0 | 0.047 | 2.4% |
| 10 | 8/21/1983 | 12.7 | 97 | 53 | 44 | | 5.42 | 117 | 2.0 | 6.4 | 7.1 | 539 | 50.1 | 2.6 | 0.124 | 2.3% |
| 11 | 9/15/1983 | 12.6 | 88 | 53 | 35 | | 4.43 | 73 | 1.0 | 3.2 | 7.4 | 271 | 22.5 | 3.4 | 0.160 | 4.7% |
| 12 | 10/7/1983 | 11.6 | 88 | 53 | 35 | | 4.41 | 56 | 0.7 | 2.2 | 5.7 | 191 | 10.4 | 2.0 | 0.094 | 3.6% |
| 13 | 11/19/1983 | 6.6 | 86 | 53 | 33 | | 4.11 | 31 | 0.6 | 1.9 | 2.9 | 159 | 7.2 | 0.8 | 0.037 | 2.5% |
| 14 | 11/27/1983 | 7.3 | 85 | 53 | 32 | | 4.21 | 27 | 0.6 | 2.1 | 3.2 | 173 | 8.2 | 1.0 | 0.045 | 3.6% |
| | | **Average** | **88** | **53** | **35** | | **4.35** | **636** | **0.78** | **2.5** | **63** | **215** | **14.2** | **21.0** | **0.070** | **3.3%** |

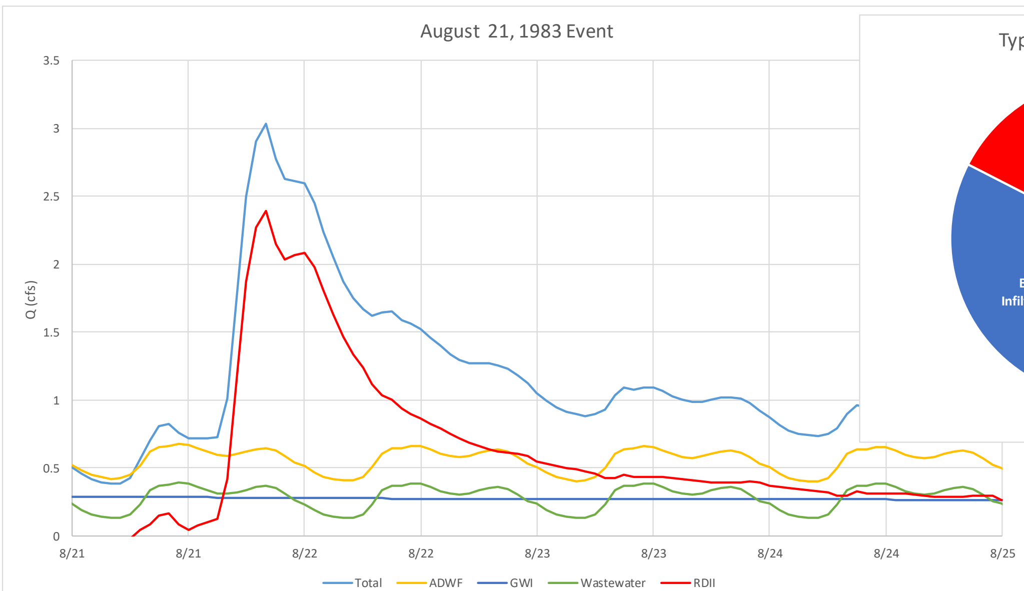
| **Subcatchment Parameters** | |
|---|---|
| **2010 Population:** | 3,641 |
| **Area (acres):** | 1,104 |
| **Sewer Length (miles):** | 21 |
| **Sewer IDM:** | |

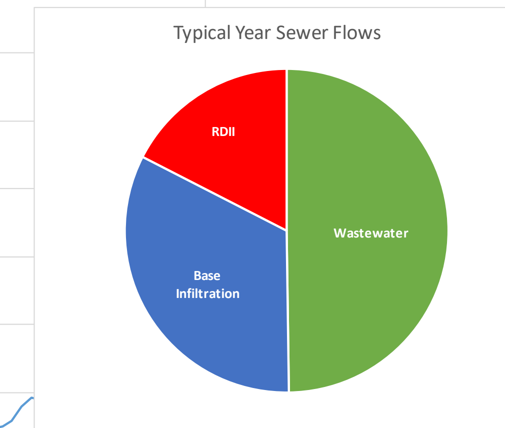
**2022 Water Billing Records**

| | | |
|---|---|---|
| Winter Consumption: | 192,339 | gpd |
| | 53 | gpcd |

**Financial Analysis**

| | V (X1000) | Cost / Year |
|---|---|---|
| Wastewater | 70,204 | $ 49,845 |
| Base Infiltration | 46,200 | $ 32,802 |
| RDII | 24,629 | $ 17,486 |
| **Total** | **141,032** | **$ 100,133** |



## Little Chute MS2 2021 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/18/1983 | 7.3 | 156 | 47 | 110 | 2,319 | 16 | 22 | 1.2 | 1.5 | 6.5 | 252 | 10 | 1.2 | 0.055 | 5.6% |
| 2 | 4/9/1983 | 11.5 | 147 | 47 | 100 | 2,108 | 15 | 43 | 1.3 | 1.6 | 10.9 | 275 | 16 | 3.1 | 0.141 | 7.2% |
| 3 | 5/6/1983 | 7.3 | 139 | 45 | 94 | 1,987 | 14 | 40 | 1.7 | 2.1 | 7.9 | 360 | 29 | 3.2 | 0.148 | 8.1% |
| 4 | 5/13/1983 | 8.5 | 156 | 47 | 109 | 2,302 | 16 | 65 | 1.5 | 1.9 | 8.8 | 329 | 25 | 2.6 | 0.121 | 4.1% |
| 5 | 5/22/1983 | 10.9 | 173 | 46 | 126 | 2,677 | 19 | 84 | 2.4 | 3.0 | 13.2 | 518 | 48 | 4.5 | 0.205 | 5.4% |
| 6 | 6/27/1983 | 16.9 | 136 | 46 | 89 | 1,893 | 13 | 58 | 1.4 | 1.8 | 15.7 | 306 | 25 | 5.1 | 0.230 | 8.7% |
| 7 | 7/19/1983 | 8.0 | 147 | 46 | 101 | 2,129 | 15 | 28 | 2.1 | 2.7 | 9.4 | 455 | 44 | 3.9 | 0.179 | 13.8% |
| 8 | 7/27/1983 | 9.0 | 169 | 46 | 123 | 2,599 | 18 | 89 | 2.9 | 3.6 | 10.3 | 615 | 72 | 3.2 | 0.146 | 3.6% |
| 10 | 8/6/1983 | 8.4 | 178 | 47 | 131 | 2,776 | 19 | 61 | 2.0 | 2.5 | 10.0 | 425 | 34 | 3.0 | 0.139 | 5.0% |
| 11 | 8/21/1983 | 20.7 | 161 | 47 | 115 | 2,428 | 17 | 172 | 4.2 | 5.4 | 22.9 | 916 | 107 | 7.4 | 0.339 | 4.3% |
| 12 | 9/15/1983 | 15.3 | 163 | 46 | 116 | 2,462 | 17 | 104 | 2.8 | 3.5 | 19.2 | 597 | 65 | 7.6 | 0.347 | 7.3% |
| 13 | 10/7/1983 | 14.6 | 168 | 47 | 121 | 2,564 | 18 | 81 | 1.8 | 2.3 | 16.4 | 392 | 29 | 5.0 | 0.229 | 6.2% |
| 14 | 11/19/1983 | 8.4 | 164 | 47 | 117 | 2,470 | 17 | 44 | 1.4 | 1.8 | 8.8 | 309 | 18 | 2.4 | 0.112 | 5.5% |
| 15 | 11/27/1983 | 11.0 | 155 | 46 | 109 | 2,307 | 16 | 39 | 1.5 | 2.0 | 11.2 | 331 | 22 | 3.2 | 0.147 | 8.3% |
| 16 | 12/11/1983 | 9.6 | 160 | 47 | 112 | 2,375 | 16 | 38 | 1.2 | 1.5 | 9.3 | 265 | 13 | 2.2 | 0.102 | 5.9% |
| | | **Average** | **158** | **47** | **112** | **2,360** | **16** | **968** | **1.96** | **2.49** | **181** | **423** | **37** | **58** | **0.176** | **6.0%** |

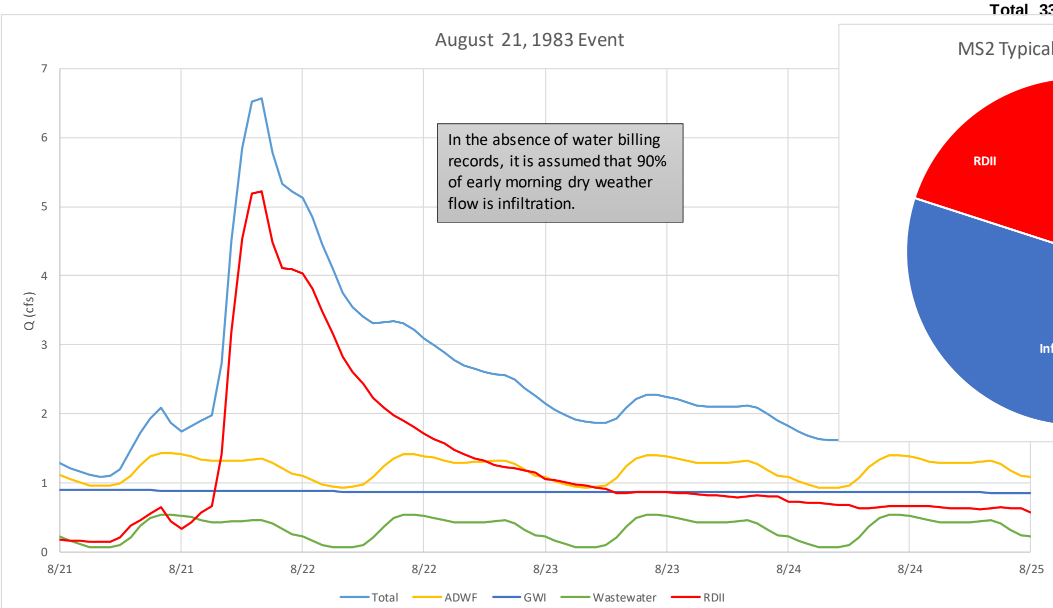
| Subcatchment Parameters | |
|---|---|
| 2010 Population: | 4,636 |
| Area (acres): | 1,586 |
| Sewer Length (miles): | 22 |
| Sewer IDM: | 219 |

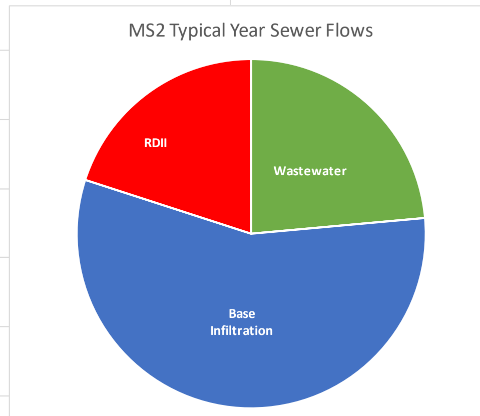
**2022 Water Billing Records**

| | | |
|---|---|---|
| Winter Consumption: | | gpd |
| | | gpcd |

**Financial Analysis**

| | V (X1000) | Cost / Year |
|---|---|---|
| Wastewater | 78,800 | $ 55,948 |
| Base Infiltration | 188,684 | $ 133,965 |
| RDII | 66,914 | $ 47,509 |
| **Total** | **334,398** | **$ 237,422** |



## Little Chute MS3 2021 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | RDII V (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/18/1983 | 8.8 | 191 | 81 | 110 | 1,670 | 13 | 51 | 2.2 | 1.6 | 21.4 | 365 | 13 | 3.8 | 0.099 | 7.4% |
| 2 | 4/9/1983 | 5.3 | 213 | 81 | 132 | 1,978 | 15 | 33 | 2.5 | 1.9 | 13.6 | 417 | 14 | 2.1 | 0.055 | 6.4% |
| 3 | 5/6/1983 | 9.5 | 207 | 82 | 125 | 1,884 | 14 | 67 | 2.6 | 2.0 | 25.8 | 445 | 19 | 4.9 | 0.127 | 7.3% |
| 4 | 5/13/1983 | 3.7 | 204 | 82 | 122 | 1,840 | 14 | 23 | 2.4 | 1.8 | 9.9 | 404 | 17 | 2.0 | 0.051 | 8.5% |
| 5 | 5/22/1983 | 5.8 | 233 | 81 | 152 | 2,266 | 17 | 61 | 3.0 | 2.3 | 18.0 | 508 | 27 | 3.5 | 0.092 | 5.8% |
| 6 | 6/27/1983 | 4.7 | 241 | 80 | 162 | 2,405 | 18 | 51 | 2.6 | 1.9 | 13.0 | 434 | 20 | 1.7 | 0.043 | 3.3% |
| 7 | 7/19/1983 | 5.9 | 259 | 81 | 178 | 2,646 | 20 | 96 | 3.3 | 2.5 | 21.0 | 557 | 34 | 4.5 | 0.116 | 4.7% |
| 8 | 7/27/1983 | 11.8 | 197 | 81 | 116 | 1,757 | 13 | 90 | 2.7 | 2.0 | 33.2 | 456 | 23 | 7.6 | 0.197 | 8.4% |
| 9 | 8/6/1983 | 7.2 | 210 | 81 | 130 | 1,948 | 15 | 44 | 3.0 | 2.3 | 23.4 | 504 | 35 | 6.1 | 0.159 | 13.9% |
| 10 | 8/6/1983 | 6.0 | 231 | 80 | 150 | 2,239 | 17 | 127 | 3.2 | 2.4 | 19.7 | 542 | 38 | 4.4 | 0.116 | 3.5% |
| 11 | 8/21/1983 | 8.4 | 246 | 81 | 165 | 2,450 | 18 | 94 | 3.0 | 2.2 | 27.2 | 502 | 27 | 5.2 | 0.136 | 5.6% |
| 12 | 9/15/1983 | 8.7 | 264 | 82 | 182 | 2,700 | 20 | 238 | 3.9 | 2.9 | 32.2 | 662 | 49 | 7.2 | 0.187 | 3.0% |
| 13 | 10/7/1983 | 11.3 | 257 | 81 | 176 | 2,612 | 20 | 161 | 3.4 | 2.5 | 44.3 | 566 | 38 | 11.3 | 0.293 | 7.0% |
| 14 | 11/19/1983 | 3.6 | 266 | 84 | 182 | 2,698 | 20 | 72 | 3.0 | 2.2 | 13.3 | 504 | 28 | 2.9 | 0.076 | 4.1% |
| | | **Average** | **230** | **81** | **149** | **2,221** | **17** | **1,208** | **2.92** | **2.18** | **316** | **490** | **27** | **67** | **0.125** | **5.6%** |

| Subcatchment Parameters | |
|---|---|
| **2010 Population:** | 5,951 |
| **Area (acres):** | 2,453 |
| **Sewer Length (miles):** | 38 |
| **Sewer IDM:** | 415 |

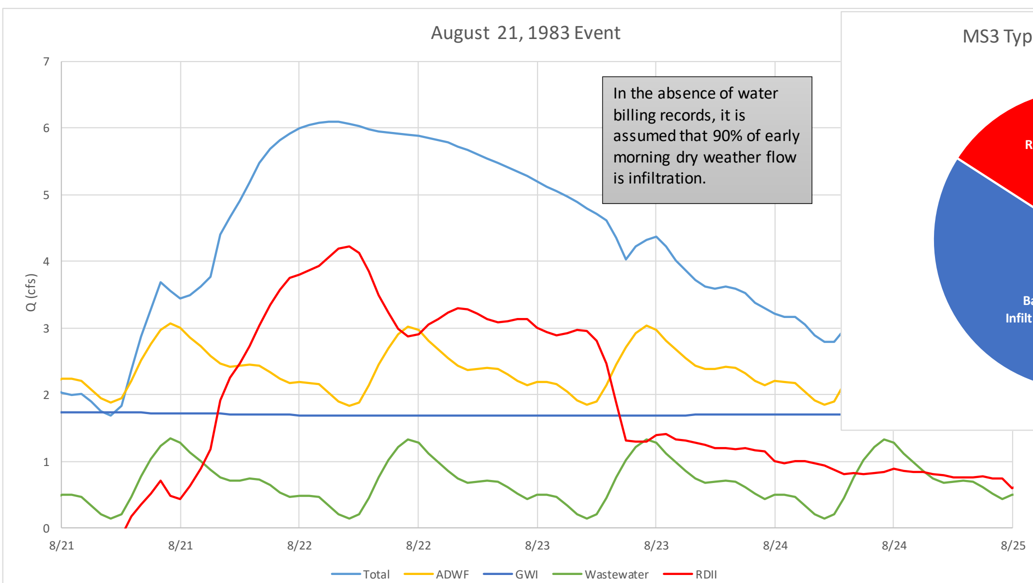
**2022 Water Billing Records**

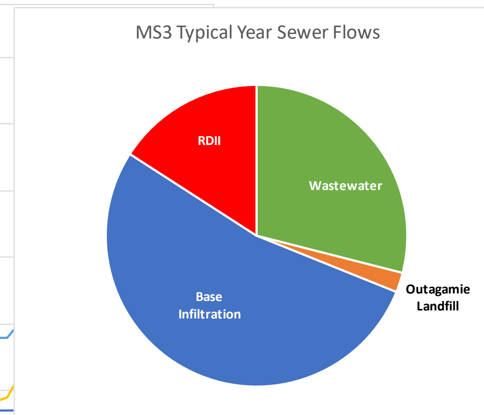
Winter Consumption: gpd

gpcd

**Financial Analysis**

| | V (X1000) | Cost / Year |
|---|---|---|
| Wastewater | 176,579 | $ 125,371 |
| Outagamie Landfill | 12,893 | $ 9,154 |
| Base Infiltration | 323,155 | $ 229,440 |
| RDII | 96,842 | $ 68,758 |
| **Total:** | **609,468** | **$ 432,722** |



## Kaukauna MS 5S 2021 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/18/1983 | 2.3 | 134 | 51 | 83 | | 14 | 31 | 2.0 | 1.5 | 3.6 | 199 | 7 | 0.4 | 0.009 | 1.3% |
| 2 | 5/22/1983 | 2.5 | 156 | 52 | 104 | | 17 | 87 | 5.7 | 4.1 | 6.1 | 552 | 57 | 2.1 | 0.045 | 2.4% |
| 3 | 6/27/1983 | 3.6 | 124 | 50 | 74 | | 12 | 37 | 2.2 | 1.6 | 5.5 | 211 | 12 | 0.9 | 0.019 | 2.3% |
| 4 | 7/3/1983 | 2.4 | 137 | 48 | 89 | | 14 | 25 | 2.6 | 2.0 | 3.9 | 257 | 19 | 0.5 | 0.010 | 1.9% |
| 5 | 7/21/1983 | 2.7 | 147 | 49 | 98 | | 16 | 10 | 3.8 | 2.8 | 5.0 | 365 | 32 | 1.0 | 0.021 | 10.0% |
| 6 | 7/29/1983 | 2.9 | 154 | 51 | 103 | | 17 | 113 | 6.2 | 4.5 | 6.5 | 602 | 73 | 1.9 | 0.041 | 1.7% |
| 7 | 8/6/1983 | 2.9 | 143 | 50 | 93 | | 15 | 46 | 3.9 | 2.8 | 5.3 | 375 | 35 | 1.0 | 0.022 | 2.2% |
| 8 | 8/10/1983 | 2.1 | 145 | 52 | 93 | | 15 | 43 | 3.5 | 2.6 | 4.1 | 344 | 26 | 1.0 | 0.021 | 2.3% |
| 9 | 8/21/1983 | 7.8 | 149 | 51 | 98 | | 16 | 229 | 10.7 | 7.8 | 18.4 | 1,043 | 136 | 6.4 | 0.138 | 2.8% |
| 10 | 9/15/1983 | 11.4 | 133 | 51 | 83 | | 13 | 153 | 5.6 | 4.1 | 24.5 | 544 | 64 | 8.9 | 0.193 | 5.8% |
| 11 | 10/7/1983 | 3.8 | 139 | 52 | 87 | | 14 | 70 | 2.7 | 1.9 | 7.2 | 261 | 18 | 1.8 | 0.039 | 2.5% |
| 12 | 10/11/1983 | 5.1 | 142 | 50 | 92 | | 15 | 41 | 2.9 | 2.1 | 10.1 | 283 | 24 | 2.6 | 0.057 | 6.3% |
| 13 | 11/27/1983 | 4.0 | 137 | 50 | 87 | | 14 | 56 | 2.5 | 1.8 | 7.4 | 241 | 18 | 1.8 | 0.039 | 3.2% |
| | | **Average** | **141** | **50** | **91** | | **15** | **942** | **4.17** | **3.04** | **107** | **406** | **40** | **30** | **0.050** | **3.2%** |

| Subcatchment Parameters | |
|---|---|
| **2010 Population:** | 10,281 |
| **Area (acres):** | 2,336 |
| **Sewer Length (miles):** | 46.1 |
| **Sewer IDM:** | |

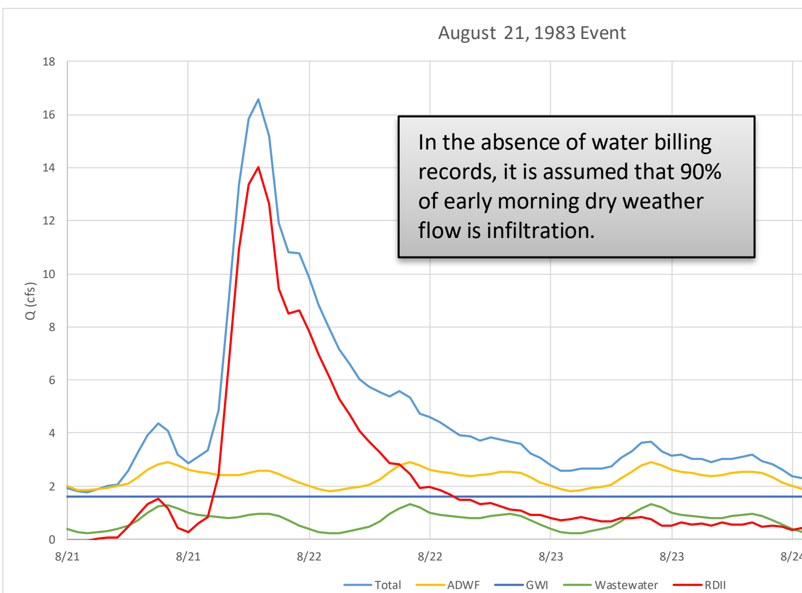
**2022 Water Billing Records**

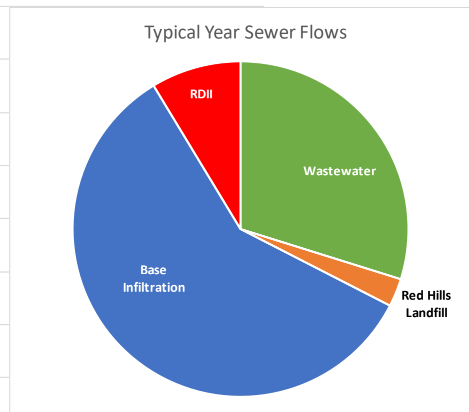
Winter Consumption: gpd

gpcd

**Financial Analysis**

| | V (X1000) | Cost / Year |
|---|---|---|
| Wastewater | 173,331 | $ 123,065 |
| Red Hills Landfill | 15,772 | $ 11,198 |
| Base Infiltration | 341,610 | $ 242,543 |
| RDII | 50,319 | $ 35,726 |
| **Total** | **581,032** | **$ 412,533** |



## Kaukauna MS 5N + 6 2021 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/18/1983 | 12.4 | 164 | 50 | 114 | | 14 | 8 | 0.5 | 1.9 | 3.9 | 312 | 16 | 0.9 | 0.10 | 11.2% |
| 2 | 4/9/1983 | 14.5 | 157 | 50 | 107 | | 13 | 15 | 0.7 | 3.1 | 5.0 | 503 | 42 | 1.6 | 0.19 | 10.9% |
| 4 | 5/6/1983 | 7.2 | 135 | 50 | 85 | | 10 | 14 | 0.8 | 3.4 | 3.2 | 558 | 51 | 1.7 | 0.20 | 12.7% |
| 5 | 5/13/1983 | 5.4 | 148 | 50 | 97 | | 12 | 11 | 0.9 | 3.6 | 2.4 | 582 | 52 | 1.3 | 0.15 | 11.4% |
| 7 | 5/22/1983 | 12.3 | 172 | 50 | 122 | | 15 | 28 | 1.5 | 6.2 | 7.5 | 1,011 | 102 | 4.3 | 0.51 | 15.3% |
| 10 | 6/27/1983 | 6.6 | 148 | 50 | 98 | | 12 | 14 | 0.6 | 2.4 | 2.6 | 391 | 29 | 1.1 | 0.13 | 8.0% |
| 12 | 7/19/1983 | 8.1 | 163 | 50 | 113 | | 14 | 10 | 1.4 | 5.7 | 4.1 | 925 | 92 | 2.2 | 0.25 | 22.5% |
| 13 | 7/27/1983 | 9.5 | 180 | 50 | 131 | | 16 | 30 | 2.1 | 8.6 | 5.5 | 1,396 | 146 | 2.9 | 0.34 | 9.7% |
| 14 | 8/6/1983 | 3.7 | 193 | 51 | 142 | | 17 | 11 | 1.3 | 5.5 | 2.2 | 892 | 84 | 1.1 | 0.13 | 10.4% |
| 17 | 8/21/1983 | 20.7 | 228 | 50 | 178 | | 21 | 59 | 3.8 | 15.9 | 11.5 | 2,587 | 283 | 4.6 | 0.53 | 7.8% |
| 18 | 9/15/1983 | 21.6 | 191 | 50 | 141 | | 17 | 43 | 1.7 | 7.2 | 12.1 | 1,173 | 118 | 6.1 | 0.71 | 14.1% |
| 19 | 10/7/1983 | 27.7 | 146 | 50 | 96 | | 11 | 28 | 0.9 | 3.9 | 11.2 | 641 | 56 | 5.2 | 0.61 | 18.8% |
| 20 | 11/27/1983 | 13.0 | 162 | 50 | 112 | | 13 | 13 | 0.7 | 3.1 | 5.4 | 498 | 42 | 2.2 | 0.26 | 16.7% |
| | | **Average** | **168** | **50** | **118** | | **14** | **283** | **1.30** | **5.43** | **76** | **882** | **86** | **35** | **0.32** | **12.5%** |

| **Subcatchment Parameters** | |
|---|---|
| **2010 Population:** | 1,473 |
| **Area (acres):** | 537 |
| **Sewer Length (miles):** | 8.6 |
| **Sewer IDM:** | |

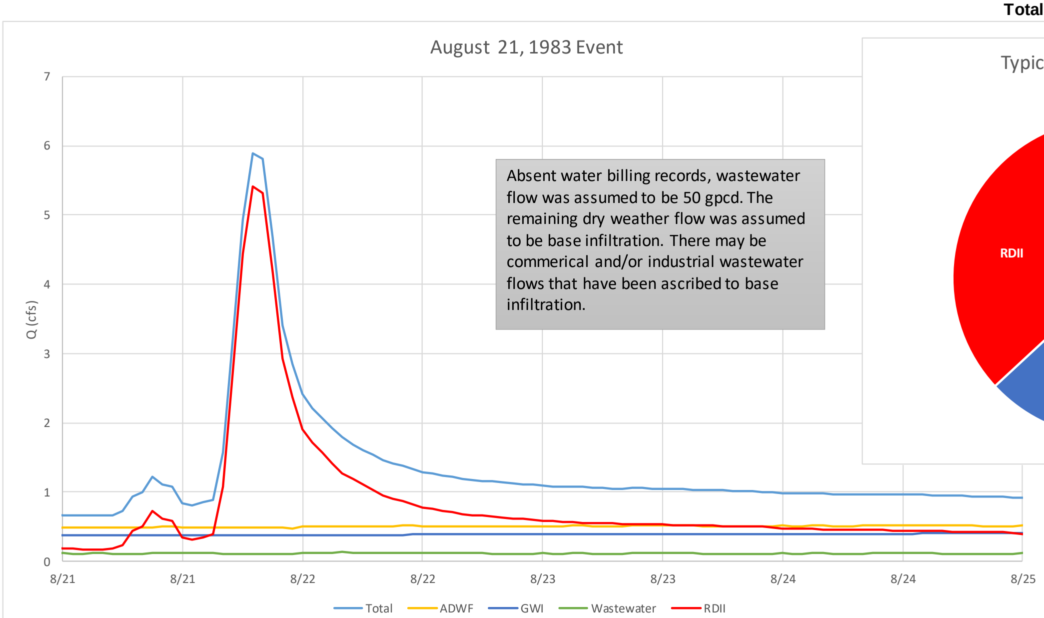
**2022 Water Billing Records**

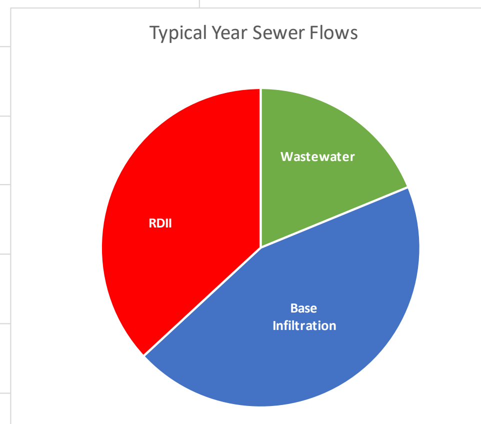
Winter Consumption: gpd

gpcd

**Financial Analysis**

| | **V (X1000)** | **Cost / year** |
|---|---|---|
| Wastewater | 26,954 | $ 19,137 |
| Base Infiltration | 63,558 | $ 45,126 |
| RDII | 52,893 | $ 37,554 |
| **Total** | **143,406** | **$ 101,818** |



## Kaukauna MS 9 2021 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5/2/1983 | 4.6 | 179 | 60 | 119 | | 7 | 19 | 0.4 | 1.1 | 1.4 | 205 | 0.24 | 0.011 | 0.0006 | 0.06% |
| 2 | 7/17/1983 | 3.6 | 186 | 60 | 127 | | 8 | 21 | 0.4 | 1.2 | 1.2 | 214 | 0.22 | 0.010 | 0.0005 | 0.05% |
| | | **Average** | **183** | **60** | **123** | | **8** | **41** | **0.36** | **1.14** | **2.6** | **210** | **0.23** | **0.020** | **0.0005** | **0.05%** |

| Subcatchment Parameters | |
|---|---|
| **2010 Population:** | 1,713 |
| **Area (acres):** | 1,435 |
| **Sewer Length (miles):** | 19.4 |
| **Sewer IDM:** | |

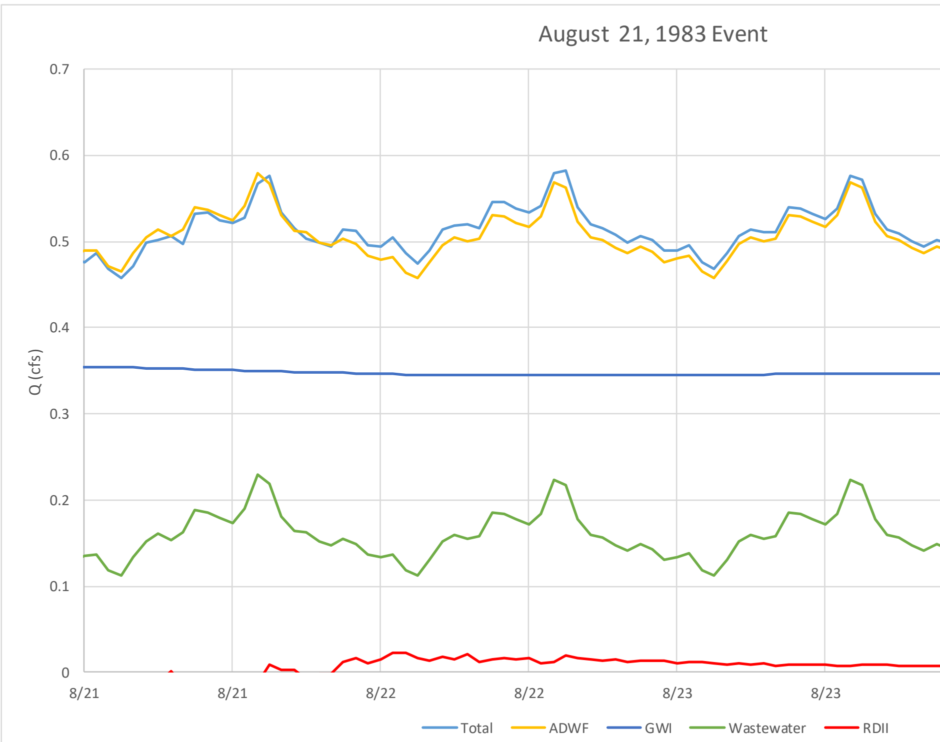
**2022 Water Billing Records**

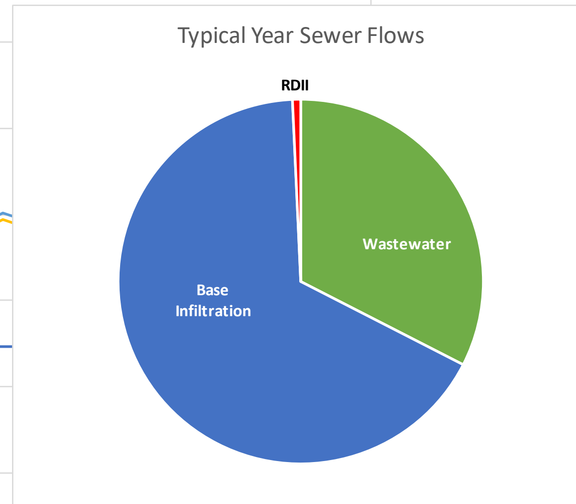
Winter Consumption: gpd

gpcd

**Financial Analysis**

| | V (X1000) | Cost |
|---|---|---|
| Wastewater | 37,456 | $ 26,594 |
| Base Infiltration | 76,819 | $ 54,542 |
| RDII | 835 | $ 593 |
| **Total:** | **115,110** | **$ 81,728** |



## Kaukauna MS10 2021 I/I Report Card (1983 Typical Year)

| ent # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 3/18/1983 | 1.5 | 139 | 56 | 84 | | 12 | 4 | 0.4 | 1.6 | 0.4 | 253 | 9.7 | 0.09 | 0.012 | 2.1% |
| 3 | 4/9/1983 | 1.4 | 148 | 67 | 81 | | 11 | 5 | 0.5 | 1.8 | 0.4 | 300 | 17.3 | 0.09 | 0.012 | 1.7% |
| 4 | 5/6/1983 | 3.8 | 146 | 59 | 87 | | 12 | 8 | 0.6 | 2.3 | 1.1 | 361 | 29.1 | 0.25 | 0.032 | 3.3% |
| 5 | 5/13/1983 | 2.3 | 156 | 62 | 94 | | 13 | 7 | 0.6 | 2.2 | 0.7 | 353 | 18.8 | 0.12 | 0.015 | 1.8% |
| 6 | 5/22/1983 | 3.6 | 166 | 59 | 106 | | 15 | 12 | 1.1 | 4.5 | 1.6 | 704 | 74.5 | 0.67 | 0.086 | 5.4% |
| 7 | 6/27/1983 | 5.6 | 144 | 59 | 85 | | 12 | 8 | 0.4 | 1.6 | 1.6 | 259 | 8.8 | 0.29 | 0.037 | 3.5% |
| 9 | 7/19/1983 | 5.2 | 158 | 57 | 101 | | 14 | 6 | 0.8 | 3.2 | 1.8 | 505 | 43.9 | 0.51 | 0.066 | 8.9% |
| 10 | 7/29/1983 | 2.5 | 175 | 53 | 122 | | 17 | 16 | 1.2 | 5.0 | 1.3 | 765 | 88.2 | 0.56 | 0.072 | 3.6% |
| 11 | 8/6/1983 | 2.9 | 187 | 57 | 130 | | 18 | 6 | 0.8 | 3.1 | 1.0 | 486 | 32.9 | 0.18 | 0.024 | 2.9% |
| 13 | 8/21/1983 | 3.7 | 192 | 61 | 132 | | 19 | 26 | 2.8 | 11.2 | 2.5 | 1,789 | 221.3 | 1.43 | 0.184 | 5.4% |
| 14 | 9/15/1983 | 14.3 | 161 | 58 | 103 | | 14 | 21 | 1.3 | 5.5 | 6.0 | 853 | 105.1 | 2.43 | 0.314 | 11.5% |
| 15 | 10/7/1983 | 10.4 | 172 | 58 | 113 | | 16 | 16 | 0.8 | 3.2 | 4.1 | 496 | 44.3 | 1.25 | 0.162 | 7.6% |
| 16 | 11/27/1983 | 7.0 | 171 | 57 | 114 | | 16 | 8 | 0.5 | 2.1 | 2.4 | 322 | 14.2 | 0.55 | 0.071 | 7.1% |
| | | **Average** | **163** | **59** | **104** | | **15** | **144** | **0.90** | **3.64** | **25** | **573** | **54.5** | **8.43** | **0.084** | **5.9%** |

| Subcatchment Parameters | |
|---|---|
| **2010 Population:** | 1,568 |
| **Area (acres):** | 322 |
| **Sewer Length (miles):** | 7.7 |
| **Sewer IDM:** | |

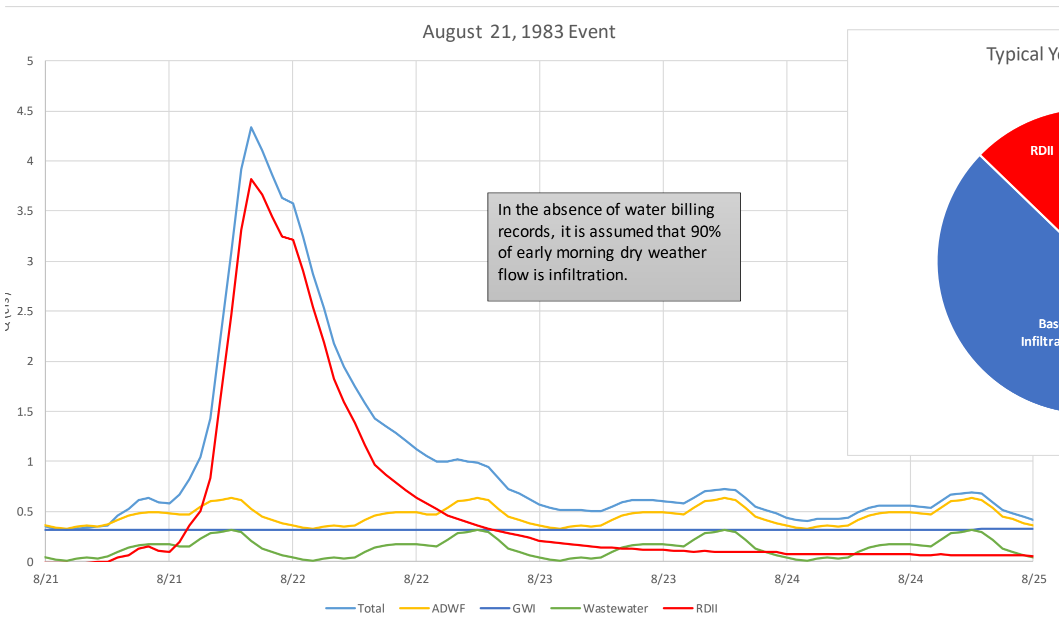
**2022 Water Billing Records**

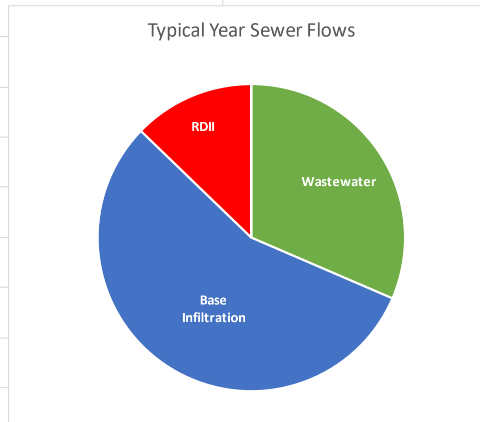
Winter Consumption: gpd

gpcd

**Financial Analysis**

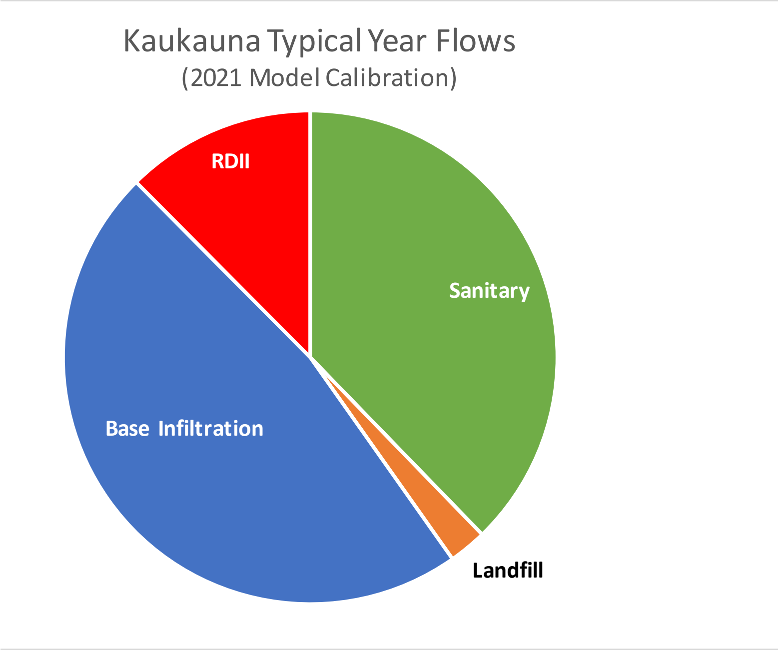
| | V (X1000) | | Cost |
|---|---|---|---|
| Wastewater | 33,590 | $ | 23,849 |
| Base Infiltration | 59,506 | $ | 42,249 |
| RDII | 13,630 | $ | 9,677 |
| **Total** | **106,726** | **$** | **75,775** |

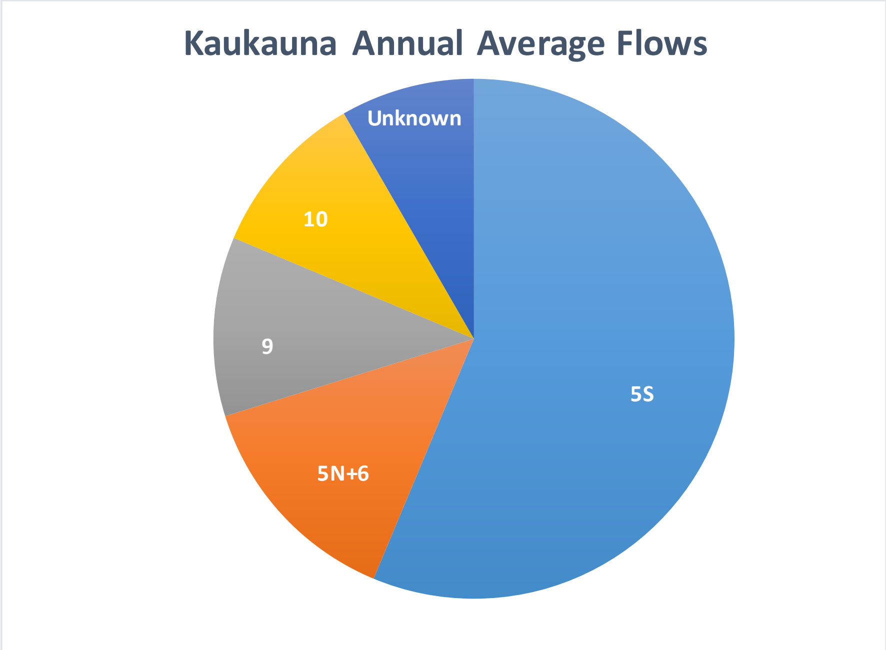


## *Kaukauna Typical Year Flows*
### *(2021 Model Calibration)*

| | 5S | 5N+6 | 9 | 10 | Sub-Total | Unknown | Adjusted Total | Cost | GPCD |
|---|---|---|---|---|---|---|---|---|---|
| | Gallons X 1000 | | | | | | | | |
| Sanitary | 173,331 | 26,954 | 37,456 | 33,590 | 271,331 | 85,880 | 357,211 | $ 253,620 | 57.6 |
| Landfill | 15,772 | | | | | | 23,472 | $ 16,665 | 3.8 |
| Base Infiltration | 341,610 | 63,558 | 76,819 | 59,506 | 541,493 | | 447,913 | $ 318,018 | 72.2 |
| RDII | 50,319 | 52,893 | 835 | 13,628 | 117,675 | | 117,675 | $ 83,549 | 19.0 |
| Total | 581,032 | 143,405 | 115,110 | 106,724 | 946,271 | 85,880 | 946,271 | $ 671,852 | 152.5 |



## 5.3 APPENDIX B – 2022 I/I SCORECARDS

| Community | Dry Weather Flow | | | | Wet Weather Flow | | | | RDII Volume | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ADWF (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Qmax (mgd) | Qmax (gpcd) | Max RDII (gpm/mi) | Peaking Factor | RDII (gal/mi) | Capture Coefficient |
| Kimberly | 86 | 57 | 737 | 4.7 | 1.68 | 230 | 22 | 2.83 | 0.049 | 3.0% |
| MS 2 | 162 | 110 | 2,336 | 16.0 | 1.52 | 328 | 23 | 2.09 | 0.082 | 2.7% |
| MS 3 | 206 | 127 | 1,905 | 14.0 | 2.83 | 475 | 29 | 2.41 | 0.192 | 7.3% |
| Little Chute Sub-Total | 187 | 120 | 2,054 | 14.7 | 4.35 | 411 | 27 | 2.25 | 0.154 | 5.7% |
| Combined Locks | 69 | 16 | | 1.9 | 0.90 | 246 | 20 | 4.50 | 0.072 | 3.4% |
| Darboy | 59 | 13 | | 1.2 | 1.63 | 115 | 5.0 | 2.15 | 0.014 | 0.6% |
| MS 5S | 138 | 98 | | 16.0 | 4.13 | 401 | 40 | 3.26 | 0.067 | 3.8% |
| MS 5N+6 | 156 | 106 | | 13.0 | 1.20 | 817 | 79 | 5.03 | 0.330 | 13.4% |
| MS 9 | 183 | 123 | | 8.0 | 0.37 | 214 | 0.44 | 1.16 | 0.0006 | 0.05% |
| MS 10 | 104 | 43 | | 6.0 | 0.88 | 564 | 61 | 6.42 | 0.079 | 5.5% |
| Kaukauna Total | 141 | 96 | | 12.8 | 6.58 | 437 | 37 | 3.25 | 0.080 | 4.1% |

## Kimberly 2022 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/4/1983 | 9.9 | 85 | 57 | 28 | 720 | 4.6 | 30 | 0.9 | 1.5 | 6.9 | 119 | 3 | 0.7 | 0.022 | 2.3% |
| 2 | 3/18/1983 | 7.5 | 85 | 57 | 28 | 687 | 4.4 | 19 | 0.9 | 1.5 | 5.3 | 120 | 3 | 0.6 | 0.020 | 3.2% |
| 3 | 4/9/1983 | 11.7 | 83 | 57 | 26 | 667 | 4.2 | 37 | 0.9 | 1.5 | 8.2 | 124 | 4 | 1.0 | 0.033 | 2.8% |
| 4 | 5/1/1983 | 3.2 | 82 | 57 | 25 | 634 | 4.0 | 18 | 0.8 | 1.4 | 2.1 | 111 | 3 | 0.2 | 0.005 | 0.9% |
| 5 | 5/6/1983 | 6.9 | 86 | 57 | 29 | 751 | 4.8 | 29 | 1.4 | 2.4 | 5.3 | 197 | 16 | 1.0 | 0.031 | 3.3% |
| 6 | 5/13/1983 | 3.7 | 92 | 57 | 35 | 858 | 5.5 | 28 | 1.0 | 1.6 | 2.8 | 130 | 5 | 0.3 | 0.010 | 1.1% |
| 7 | 5/21/1983 | 6.0 | 96 | 57 | 39 | 990 | 6.3 | 53 | 3.0 | 5.1 | 6.1 | 413 | 51 | 1.9 | 0.061 | 3.6% |
| 8 | 6/27/1983 | 12.9 | 81 | 57 | 24 | 612 | 3.9 | 50 | 1.0 | 1.8 | 9.1 | 142 | 10 | 1.5 | 0.047 | 3.0% |
| 9 | 7/19/1983 | 6.5 | 85 | 57 | 28 | 687 | 4.4 | 24 | 1.4 | 2.3 | 5.4 | 192 | 16 | 1.4 | 0.045 | 5.8% |
| 10 | 7/27/1983 | 6.0 | 89 | 57 | 32 | 819 | 5.2 | 71 | 2.4 | 4.1 | 5.5 | 334 | 38 | 1.6 | 0.051 | 2.2% |
| 11 | 8/6/1983 | 8.5 | 90 | 57 | 33 | 829 | 5.3 | 52 | 1.4 | 2.3 | 6.8 | 186 | 15 | 1.2 | 0.037 | 2.2% |
| 12 | 8/20/1983 | 8.0 | 92 | 57 | 35 | 898 | 5.7 | 133 | 5.7 | 9.6 | 8.9 | 775 | 112 | 3.5 | 0.114 | 2.7% |
| 13 | 9/15/1983 | 13.6 | 85 | 57 | 28 | 700 | 4.4 | 89 | 2.4 | 4.1 | 12.5 | 332 | 45 | 4.0 | 0.129 | 4.5% |
| 14 | 10/7/1983 | 13.8 | 84 | 57 | 27 | 696 | 4.4 | 70 | 1.6 | 2.6 | 10.8 | 213 | 18 | 2.3 | 0.073 | 3.2% |
| 15 | 11/19/1983 | 18.8 | 82 | 57 | 25 | 629 | 4.0 | 71 | 1.3 | 2.1 | 13.6 | 171 | 13 | 2.3 | 0.075 | 3.3% |
| 16 | 12/11/1983 | 14.8 | 81 | 57 | 24 | 615 | 3.9 | 37 | 0.9 | 1.5 | 9.9 | 120 | 3 | 1.1 | 0.036 | 3.0% |
| | | **Average** | **86** | **57** | **29** | **737** | **4.7** | **812** | **1.68** | **2.83** | **119** | **230** | **22** | **24.6** | **0.049** | **3.0%** |

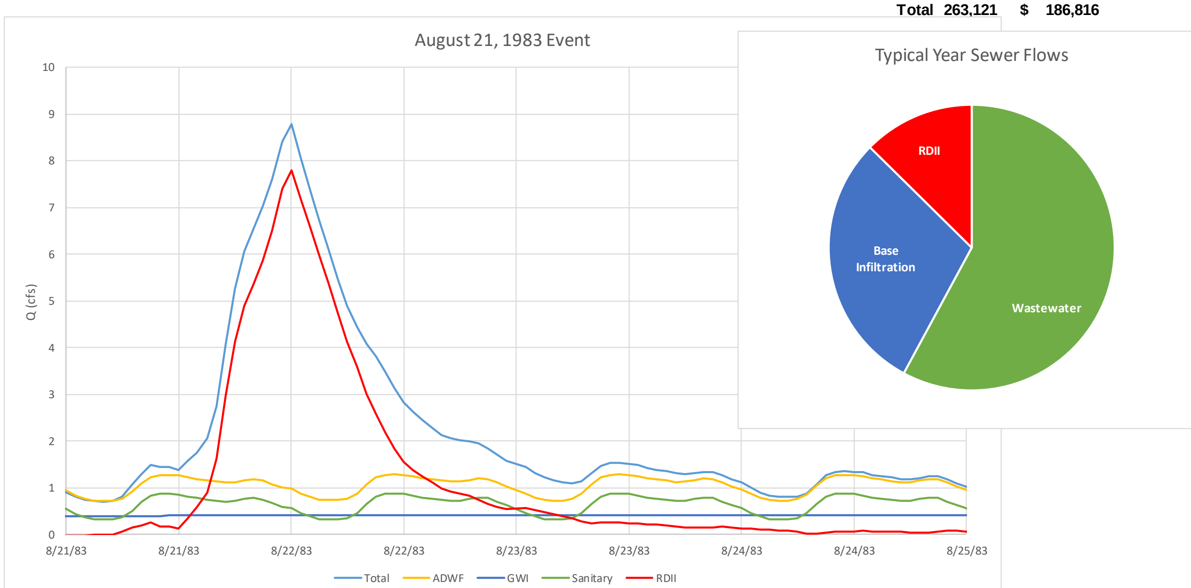
| **Subcatchment Parameters** | |
|---|---|
| **2010 Population:** | 7320 |
| **Area (acres):** | 1360 |
| **Sewer Length (miles):** | 31 |
| **Sewer IDM:** | 285 |

**2022 Water Billing Records**

| | | |
|---|---|---|
| Winter Consumption: | 417,246 | gpd |
| | 57 | gpcd |

**Financial Analysis**

| | V (X1000) | Cost / Year |
|---|---|---|
| Wastewater | 152,295 | $ 108,129 |
| Base Infiltration | 77,664 | $ 55,141 |
| RDII | 33,162 | $ 23,545 |
| **Total** | **263,121** | **$ 186,816** |



## Darboy 2022 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/6/1983 | 6.8 | 65 | 47 | 18 | | 1.90 | 63 | 1.3 | 1.7 | 6.5 | 93 | 1 | 0.3 | 0.004 | 0.5% |
| 2 | 3/18/1983 | 6.0 | 61 | 47 | 14 | | 1.39 | 70 | 1.4 | 1.8 | 5.6 | 97 | 2 | 0.4 | 0.006 | 0.6% |
| 3 | 4/9/1983 | 10.7 | 58 | 47 | 11 | | 0.96 | 134 | 1.4 | 1.8 | 9.8 | 96 | 3 | 1.1 | 0.015 | 0.9% |
| 4 | 5/21/1983 | 6.0 | 63 | 47 | 16 | | 1.65 | 193 | 2.1 | 2.8 | 6.1 | 150 | 8 | 0.8 | 0.010 | 0.4% |
| 5 | 6/27/1983 | 11.8 | 56 | 47 | 9 | | 0.78 | 181 | 1.3 | 1.8 | 10.8 | 95 | 3 | 1.4 | 0.019 | 0.8% |
| 6 | 7/19/1983 | 7.3 | 56 | 47 | 10 | | 0.76 | 88 | 1.5 | 2.0 | 7.0 | 107 | 5 | 1.1 | 0.015 | 1.3% |
| 7 | 7/27/1983 | 9.2 | 60 | 47 | 14 | | 1.28 | 277 | 1.8 | 2.4 | 8.7 | 128 | 8 | 0.9 | 0.011 | 0.3% |
| 8 | 8/6/1983 | 3.7 | 62 | 47 | 15 | | 1.48 | 98 | 1.5 | 1.9 | 3.6 | 103 | 4 | 0.3 | 0.004 | 0.3% |
| 9 | 8/10/1983 | 4.8 | 61 | 47 | 15 | | 1.48 | 91 | 1.5 | 2.0 | 4.4 | 105 | 3 | 0.3 | 0.004 | 0.3% |
| 10 | 8/21/1983 | 12.9 | 62 | 47 | 15 | | 1.50 | 529 | 2.8 | 3.7 | 12.9 | 200 | 16 | 1.7 | 0.022 | 0.3% |
| 11 | 9/15/1983 | 14.4 | 59 | 47 | 12 | | 1.12 | 324 | 1.7 | 2.2 | 14.3 | 121 | 7 | 2.3 | 0.030 | 0.7% |
| 12 | 10/7/1983 | 7.4 | 61 | 47 | 15 | | 1.61 | 253 | 1.6 | 2.2 | 7.3 | 117 | 5 | 0.9 | 0.011 | 0.3% |
| 13 | 11/19/1983 | 12.3 | 53 | 47 | 6 | | 0.49 | 257 | 1.5 | 2.1 | 11.5 | 110 | 4 | 2.3 | 0.030 | 0.9% |
| 14 | 12/11/1983 | 7.2 | 53 | 47 | 6 | | 0.49 | 118 | 1.3 | 1.8 | 6.6 | 94 | 3 | 1.2 | 0.015 | 1.0% |
| | | **Average** | **59** | **47** | **13** | | **1.21** | **2,675** | **1.63** | **2.15** | **115** | **115** | **5** | **15** | **0.014** | **0.6%** |

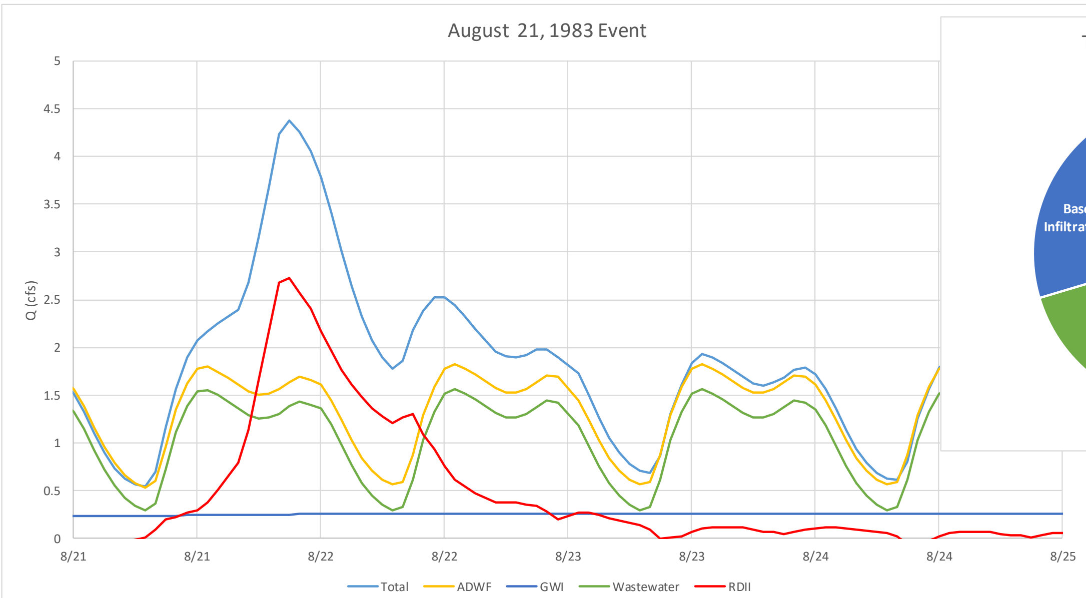
| Subcatchment Parameters | |
|---|---|
| **2021 Population:** | 14,114 |
| **Area (acres):** | 4,931 |
| **Sewer Length (miles):** | 77 |
| **Sewer IDM:** | |

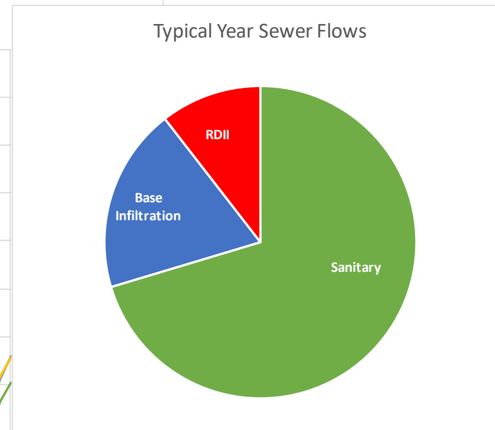
**2022 Water Billing Records**

| | | |
|---|---|---|
| Winter Consumption: | 657,649 | gpd |
| | 47 | gpcd |

**Financial Analysis**

| | V (X1000) | Cost / Year |
|---|---|---|
| Sanitary | 240,042 | $ 170,430 |
| Base Infiltration | 65,270 | $ 46,341 |
| RDII | 35,816 | $ 25,429 |
| **Total** | **341,127** | **$ 242,200** |



## Combined Locks 2022 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/6/1983 | 5.7 | 79 | 53 | 26 | | 3.03 | 14 | 0.4 | 2.1 | 1.9 | 114 | 2.6 | 0.2 | 0.011 | 1.7% |
| 2 | 3/18/1983 | 6.3 | 67 | 53 | 14 | | 1.63 | 15 | 0.4 | 2.2 | 2.0 | 122 | 5.0 | 0.5 | 0.023 | 3.3% |
| 3 | 4/9/1983 | 11.5 | 62 | 53 | 9 | | 1.06 | 30 | 0.5 | 2.4 | 3.8 | 130 | 6.7 | 1.2 | 0.058 | 4.1% |
| 4 | 5/6/1983 | 6.9 | 75 | 53 | 22 | | 2.64 | 23 | 0.7 | 3.4 | 2.7 | 184 | 11.4 | 0.9 | 0.040 | 3.7% |
| 5 | 5/13/1983 | 5.4 | 75 | 53 | 22 | | 2.53 | 23 | 0.5 | 2.6 | 2.0 | 144 | 6.6 | 0.5 | 0.024 | 2.3% |
| 6 | 5/22/1983 | 10.9 | 73 | 53 | 20 | | 2.41 | 58 | 1.4 | 7.2 | 5.0 | 389 | 35.8 | 2.1 | 0.096 | 3.5% |
| 7 | 6/27/1983 | 12.9 | 58 | 53 | 5 | | 0.64 | 40 | 0.5 | 2.4 | 4.4 | 132 | 8.1 | 1.7 | 0.078 | 4.1% |
| 8 | 7/19/1983 | 17.3 | 62 | 53 | 10 | | 1.14 | 82 | 1.3 | 6.3 | 7.3 | 346 | 35.8 | 3.3 | 0.156 | 4.1% |
| 9 | 8/6/1983 | 8.4 | 73 | 53 | 20 | | 2.41 | 42 | 0.6 | 3.0 | 3.5 | 163 | 10.1 | 1.3 | 0.059 | 3.0% |
| 10 | 8/21/1983 | 12.7 | 80 | 53 | 27 | | 3.13 | 117 | 3.0 | 14.8 | 6.2 | 814 | 85.0 | 2.5 | 0.116 | 2.1% |
| 11 | 9/15/1983 | 12.6 | 69 | 53 | 16 | | 1.91 | 73 | 1.4 | 7.3 | 6.2 | 395 | 40.7 | 3.1 | 0.144 | 4.2% |
| 12 | 10/7/1983 | 14.6 | 62 | 53 | 10 | | 1.10 | 56 | 0.8 | 4.0 | 5.6 | 216 | 15.8 | 2.3 | 0.107 | 4.1% |
| 13 | 11/19/1983 | 6.6 | 67 | 53 | 14 | | 1.56 | 31 | 0.5 | 2.5 | 2.5 | 138 | 7.1 | 0.9 | 0.042 | 2.9% |
| 14 | 11/27/1983 | 10.0 | 63 | 53 | 10 | | 1.21 | 27 | 0.6 | 2.9 | 3.6 | 157 | 8.9 | 1.3 | 0.060 | 4.7% |
| | | **Average** | **69** | **53** | **16** | | **1.89** | **632** | **0.90** | **4.5** | **57** | **246** | **20.0** | **21.7** | **0.072** | **3.4%** |

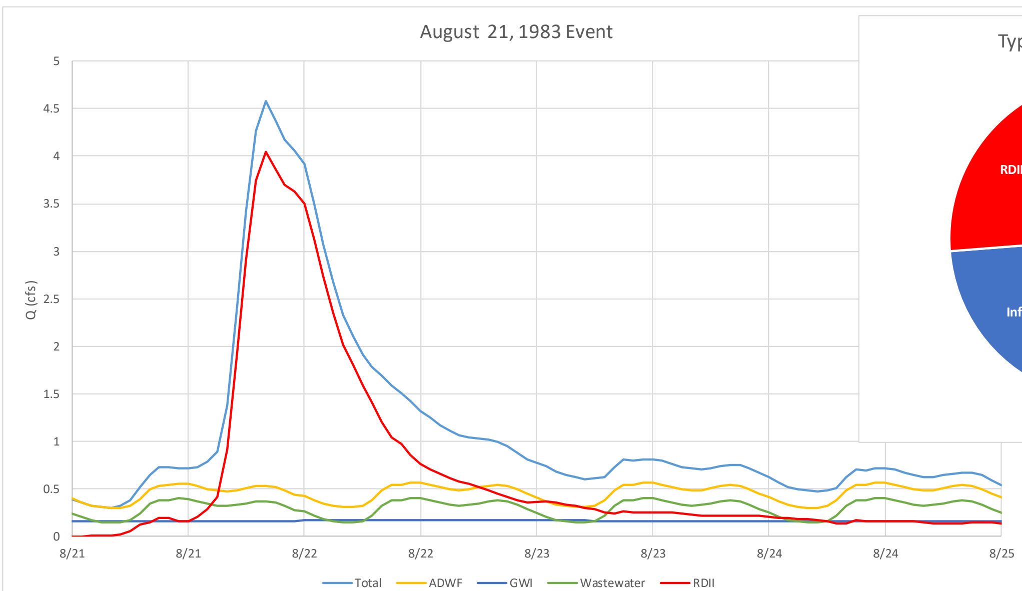
| Subcatchment Parameters | |
|---|---|
| **2010 Population:** | 3,641 |
| **Area (acres):** | 1,104 |
| **Sewer Length (miles):** | 21 |
| **Sewer IDM:** | |

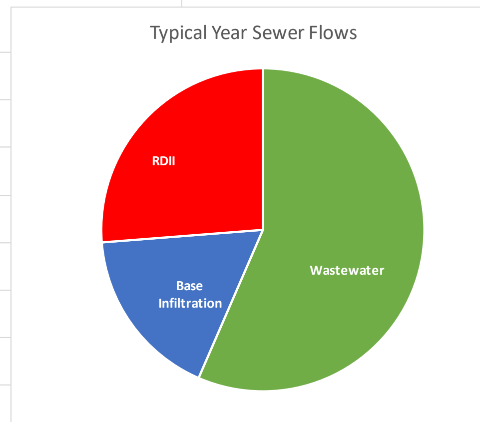
**2022 Water Billing Records**

| | | |
|---|---|---|
| Winter Consumption: | 192,339 | gpd |
| | 53 | gpcd |

**Financial Analysis**

| | V (X1000) | Cost / Year |
|---|---|---|
| Wastewater | 70,204 | $ 49,845 |
| Base Infiltration | 21,419 | $ 15,208 |
| RDII | 32,597 | $ 23,144 |
| **Total** | **124,220** | **$ 88,196** |



## Little Chute MS2 2022 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/18/1983 | 4.3 | 168 | 52 | 116 | 2,462 | 17 | 22 | 1.0 | 1.4 | 3.8 | 224 | 5 | 0.4 | 0.019 | 1.9% |
| 2 | 4/9/1983 | 11.5 | 163 | 52 | 111 | 2,350 | 16 | 43 | 1.1 | 1.5 | 9.9 | 229 | 7 | 1.2 | 0.054 | 2.7% |
| 3 | 5/6/1983 | 6.9 | 158 | 51 | 107 | 2,270 | 16 | 34 | 1.2 | 1.7 | 6.3 | 270 | 13 | 1.2 | 0.057 | 3.7% |
| 4 | 5/13/1983 | 5.5 | 163 | 53 | 110 | 2,333 | 16 | 33 | 1.1 | 1.5 | 4.9 | 244 | 10 | 0.7 | 0.033 | 2.2% |
| 5 | 5/22/1983 | 11.9 | 167 | 51 | 116 | 2,455 | 17 | 84 | 2.0 | 2.8 | 11.5 | 441 | 38 | 2.3 | 0.104 | 2.7% |
| 6 | 6/27/1983 | 13.9 | 159 | 51 | 107 | 2,267 | 16 | 58 | 1.1 | 1.5 | 11.9 | 228 | 10 | 1.6 | 0.075 | 2.8% |
| 7 | 7/19/1983 | 8.0 | 155 | 51 | 104 | 2,198 | 15 | 28 | 1.5 | 2.0 | 7.6 | 314 | 21 | 1.8 | 0.082 | 6.3% |
| 8 | 7/27/1983 | 9.0 | 157 | 51 | 105 | 2,230 | 15 | 89 | 1.9 | 2.6 | 8.5 | 402 | 42 | 2.0 | 0.090 | 2.2% |
| 9 | 8/6/1983 | 14.4 | 159 | 52 | 107 | 2,274 | 16 | 84 | 1.3 | 1.8 | 13.1 | 277 | 16 | 2.5 | 0.112 | 2.9% |
| 10 | 8/21/1983 | 13.7 | 162 | 52 | 110 | 2,329 | 16 | 168 | 3.5 | 4.8 | 13.8 | 752 | 84 | 3.6 | 0.162 | 2.1% |
| 11 | 9/15/1983 | 13.3 | 166 | 52 | 114 | 2,422 | 17 | 104 | 2.0 | 2.7 | 13.6 | 431 | 42 | 3.3 | 0.152 | 3.2% |
| 12 | 10/7/1983 | 14.6 | 163 | 52 | 111 | 2,353 | 16 | 81 | 1.4 | 1.9 | 13.3 | 300 | 16 | 2.3 | 0.105 | 2.9% |
| 13 | 11/19/1983 | 8.2 | 165 | 52 | 113 | 2,389 | 17 | 44 | 1.1 | 1.5 | 7.2 | 237 | 7 | 1.0 | 0.044 | 2.2% |
| 14 | 11/27/1983 | 9.0 | 163 | 51 | 112 | 2,368 | 16 | 39 | 1.1 | 1.6 | 8.0 | 248 | 8 | 1.2 | 0.053 | 3.0% |
| | | **Average** | **162** | **52** | **110** | **2,336** | **16** | **911** | **1.52** | **2.09** | **133** | **328** | **23** | **25** | **0.082** | **2.7%** |

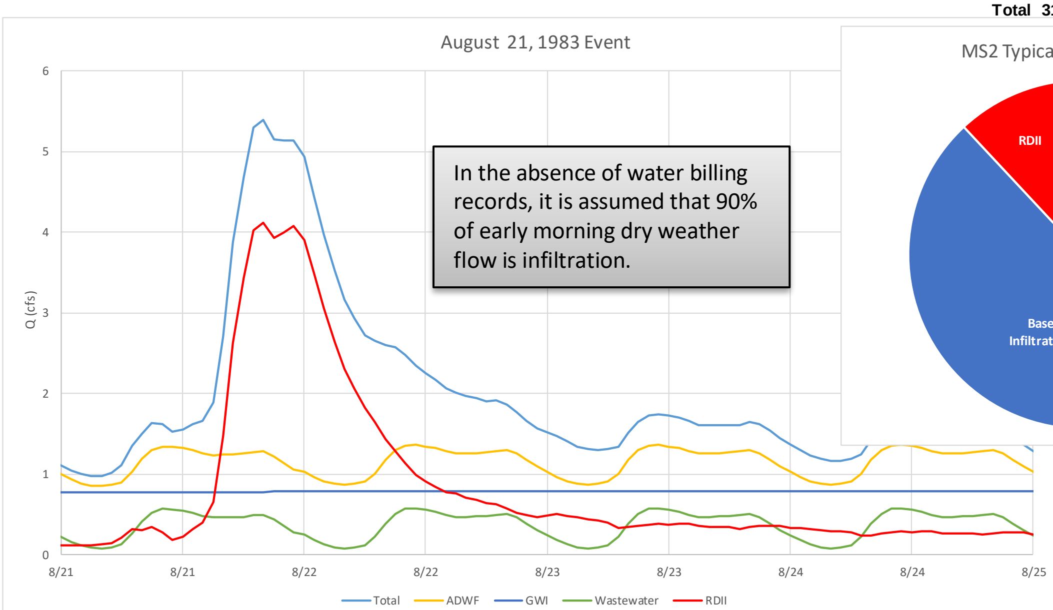
| Subcatchment Parameters | |
|---|---|
| 2010 Population: | 4,636 |
| Area (acres): | 1,586 |
| Sewer Length (miles): | 22 |
| Sewer IDM: | 219 |

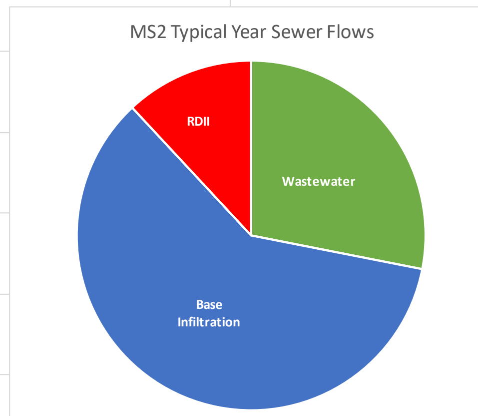
**2022 Water Billing Records**

Winter Consumption: gpd
gpcd

**Financial Analysis**

| | V (X1000) | Cost / Year |
|---|---|---|
| Wastewater | 87,482 | $ 62,112 |
| Base Infiltration | 186,771 | $ 132,607 |
| RDII | 37,215 | $ 26,423 |
| **Total** | **311,469** | **$ 221,143** |



## Little Chute MS3 2022 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | RDII V (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/18/1983 | 10.8 | 238 | 79 | 158 | 2,356 | 18 | 54 | 2.4 | 2.1 | 29.7 | 411 | 12 | 4.0 | 0.104 | 7.4% |
| 2 | 4/9/1983 | 6.3 | 236 | 79 | 157 | 2,341 | 18 | 33 | 2.6 | 2.3 | 17.5 | 445 | 18 | 2.5 | 0.065 | 7.5% |
| 3 | 5/6/1983 | 10.5 | 213 | 80 | 133 | 1,994 | 15 | 67 | 2.7 | 2.3 | 29.4 | 453 | 21 | 5.7 | 0.148 | 8.5% |
| 4 | 5/13/1983 | 3.7 | 187 | 79 | 108 | 1,637 | 12 | 23 | 2.5 | 2.1 | 10.3 | 413 | 19 | 2.6 | 0.066 | 11.0% |
| 5 | 5/22/1983 | 6.8 | 186 | 79 | 107 | 1,628 | 12 | 52 | 2.8 | 2.4 | 20.6 | 469 | 33 | 5.8 | 0.150 | 11.1% |
| 6 | 6/27/1983 | 7.5 | 188 | 80 | 109 | 1,643 | 12 | 101 | 2.6 | 2.2 | 20.8 | 440 | 21 | 5.1 | 0.133 | 5.1% |
| 7 | 7/19/1983 | 21.9 | 190 | 79 | 111 | 1,677 | 13 | 154 | 3.1 | 2.6 | 61.3 | 521 | 40 | 14.9 | 0.387 | 9.7% |
| 8 | 7/27/1983 | 13.8 | 192 | 79 | 113 | 1,704 | 13 | 90 | 2.7 | 2.3 | 37.2 | 450 | 24 | 8.3 | 0.215 | 9.2% |
| 9 | 8/6/1983 | 7.2 | 186 | 79 | 107 | 1,624 | 12 | 44 | 2.8 | 2.4 | 23.1 | 466 | 31 | 7.0 | 0.183 | 16.0% |
| 10 | 8/21/1983 | 9.0 | 194 | 79 | 115 | 1,737 | 13 | 138 | 3.0 | 2.6 | 26.9 | 505 | 37 | 7.0 | 0.181 | 5.0% |
| 11 | 9/15/1983 | 14.4 | 204 | 79 | 125 | 1,885 | 14 | 131 | 2.7 | 2.4 | 43.3 | 462 | 27 | 10.4 | 0.272 | 8.0% |
| 12 | 10/7/1983 | 14.7 | 218 | 80 | 138 | 2,068 | 15 | 261 | 3.6 | 3.1 | 47.7 | 604 | 48 | 11.8 | 0.308 | 4.5% |
| 13 | 11/19/1983 | 13.3 | 231 | 79 | 152 | 2,273 | 17 | 161 | 3.2 | 2.7 | 48.5 | 535 | 37 | 13.0 | 0.338 | 8.1% |
| 14 | 11/27/1983 | 8.4 | 218 | 78 | 140 | 2,099 | 16 | 109 | 2.8 | 2.4 | 25.4 | 475 | 33 | 5.5 | 0.143 | 5.0% |
| | | **Average** | **206** | **79** | **127** | **1,905** | **14** | **1,418** | **2.83** | **2.41** | **442** | **475** | **29** | **103** | **0.192** | **7.3%** |

| Subcatchment Parameters | |
|---|---|
| **2010 Population:** | 5,951 |
| **Area (acres):** | 2,453 |
| **Sewer Length (miles):** | 38 |
| **Sewer IDM:** | 415 |

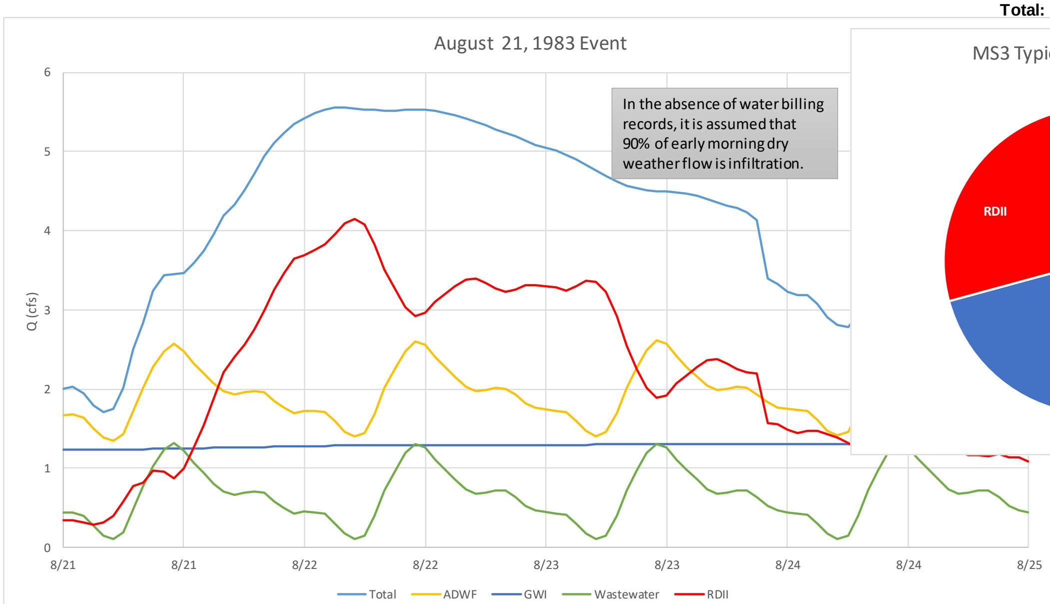
**2022 Water Billing Records**

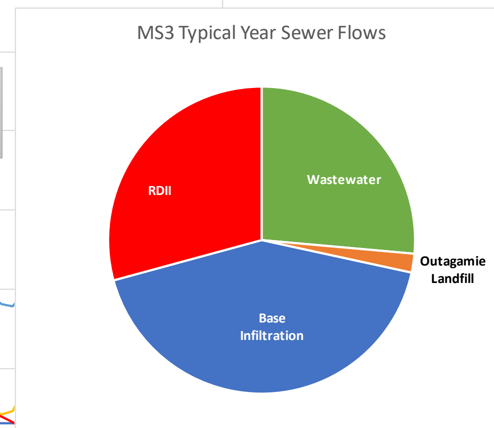
Winter Consumption: gpd

gpcd

**Financial Analysis**

| | V (X1000) | Cost / Year |
|---|---|---|
| Wastewater | 171,623 | $ 121,852 |
| Outagamie Landfill | 12,893 | $ 9,154 |
| Base Infiltration | 275,305 | $ 195,467 |
| RDII | 189,860 | $ 134,801 |
| **Total:** | **649,681** | **$ 461,274** |



## Kaukauna MS 5S 2022 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/18/1983 | 6.3 | 126 | 40 | 86 | | 14 | 32 | 2.0 | 1.6 | 9.3 | 199 | 8 | 1.1 | 0.024 | 3.5% |
| 2 | 5/22/1983 | 20.8 | 139 | 40 | 99 | | 16 | 146 | 5.7 | 4.5 | 35.4 | 552 | 58 | 5.7 | 0.124 | 3.9% |
| 3 | 6/27/1983 | 3.6 | 119 | 40 | 80 | | 13 | 37 | 2.2 | 1.7 | 5.5 | 211 | 12 | 1.0 | 0.022 | 2.8% |
| 4 | 7/3/1983 | 7.2 | 127 | 40 | 88 | | 14 | 25 | 2.6 | 2.1 | 10.8 | 257 | 21 | 1.4 | 0.031 | 5.8% |
| 5 | 7/21/1983 | 2.7 | 148 | 38 | 110 | | 18 | 10 | 3.8 | 3.0 | 5.0 | 365 | 31 | 0.9 | 0.020 | 9.6% |
| 6 | 7/29/1983 | 4.9 | 150 | 40 | 110 | | 18 | 113 | 6.2 | 4.9 | 9.7 | 602 | 74 | 2.2 | 0.047 | 1.9% |
| 7 | 8/6/1983 | 3.5 | 150 | 40 | 109 | | 18 | 46 | 3.9 | 3.0 | 6.2 | 375 | 35 | 0.9 | 0.019 | 1.9% |
| 8 | 8/10/1983 | 4.7 | 150 | 41 | 109 | | 18 | 43 | 3.5 | 2.8 | 8.4 | 344 | 25 | 1.2 | 0.025 | 2.7% |
| 9 | 8/21/1983 | 7.8 | 145 | 40 | 105 | | 17 | 229 | 10.7 | 8.5 | 18.4 | 1,043 | 136 | 6.7 | 0.145 | 2.9% |
| 10 | 9/15/1983 | 11.4 | 127 | 40 | 87 | | 14 | 153 | 5.6 | 4.4 | 24.5 | 544 | 65 | 9.6 | 0.209 | 6.3% |
| 11 | 10/7/1983 | 10.8 | 140 | 40 | 100 | | 16 | 121 | 2.9 | 2.3 | 20.5 | 283 | 24 | 5.0 | 0.108 | 4.1% |
| 12 | 11/27/1983 | 6.1 | 137 | 40 | 97 | | 16 | 56 | 2.5 | 2.0 | 10.8 | 241 | 19 | 2.3 | 0.049 | 4.0% |
| 13 | 12/11/1983 | 9.8 | 130 | 40 | 90 | | 15 | 56 | 2.1 | 1.6 | 15.2 | 203 | 12 | 2.1 | 0.045 | 3.7% |
| | | **Average** | **138** | **40** | **98** | | **16** | **1,067** | **4.13** | **3.26** | **180** | **401** | **40** | **40** | **0.067** | **3.8%** |

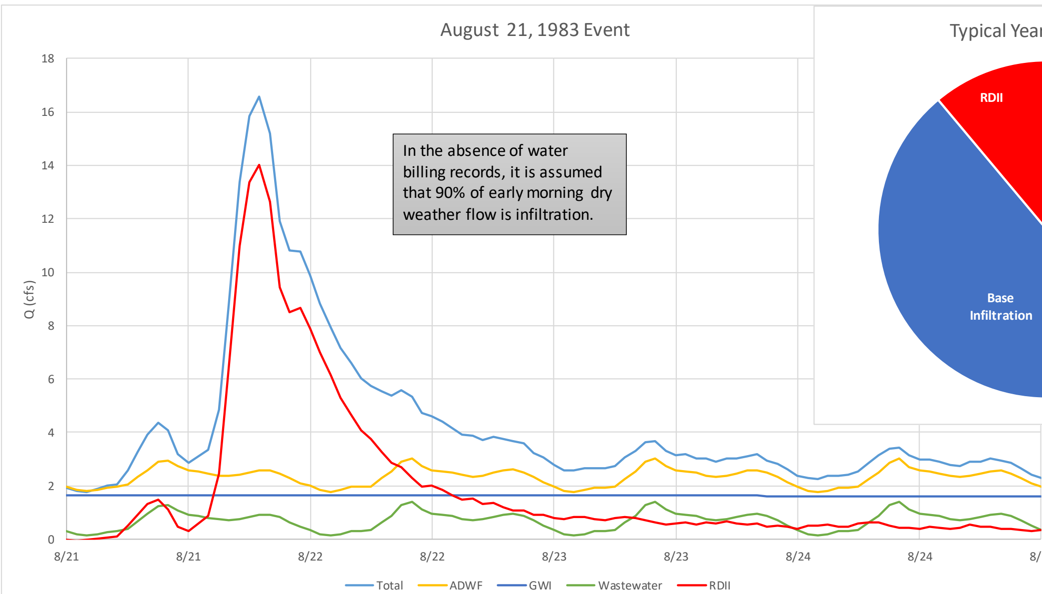
| Subcatchment Parameters | |
|---|---|
| **2010 Population:** | 10,281 |
| **Area (acres):** | 2,336 |
| **Sewer Length (miles):** | 46.1 |
| **Sewer IDM:** | |

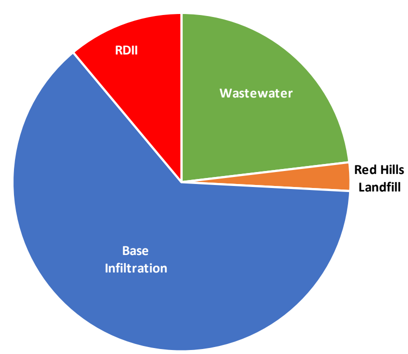
**2022 Water Billing Records**

| | |
|---|---|
| Winter Consumption: | gpd |
| | gpcd |

**Financial Analysis**

| | V (X1000) | Cost / Year |
|---|---|---|
| Wastewater | 134,223 | $ 95,298 |
| Red Hills Landfill | 15,772 | $ 11,198 |
| Base Infiltration | 366,211 | $ 260,010 |
| RDII | 64,324 | $ 45,670 |
| **Total** | **580,530** | **$ 412,176** |



## Kaukauna MS 5N + 6 2022 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/18/1983 | 13.4 | 159 | 50 | 109 | | 13 | 8 | 0.5 | 1.9 | 4.1 | 312 | 17 | 1.0 | 0.11 | 12.1% |
| 2 | 4/9/1983 | 13.5 | 159 | 50 | 109 | | 13 | 15 | 0.7 | 3.1 | 4.7 | 503 | 42 | 1.5 | 0.18 | 10.5% |
| 4 | 5/7/1983 | 6.0 | 139 | 50 | 89 | | 11 | 6 | 0.8 | 3.4 | 2.7 | 558 | 51 | 1.5 | 0.17 | 22.6% |
| 5 | 5/13/1983 | 5.3 | 150 | 50 | 100 | | 12 | 11 | 0.9 | 3.6 | 2.4 | 582 | 52 | 1.2 | 0.14 | 11.1% |
| 7 | 5/22/1983 | 12.3 | 174 | 50 | 124 | | 15 | 28 | 1.5 | 6.2 | 7.4 | 1,011 | 102 | 4.3 | 0.50 | 15.1% |
| 10 | 6/27/1983 | 6.7 | 147 | 50 | 97 | | 12 | 14 | 0.6 | 2.4 | 2.6 | 391 | 29 | 1.1 | 0.13 | 8.1% |
| 12 | 7/19/1983 | 7.9 | 139 | 50 | 89 | | 11 | 10 | 1.4 | 5.7 | 4.0 | 925 | 95 | 2.4 | 0.28 | 25.1% |
| 13 | 7/27/1983 | 9.6 | 151 | 50 | 101 | | 12 | 30 | 2.1 | 8.6 | 5.5 | 1,396 | 149 | 3.4 | 0.39 | 11.1% |
| 14 | 8/6/1983 | 3.7 | 159 | 51 | 109 | | 13 | 11 | 1.3 | 5.5 | 2.2 | 892 | 88 | 1.3 | 0.15 | 12.1% |
| 17 | 8/21/1983 | 20.7 | 191 | 50 | 141 | | 17 | 59 | 3.8 | 15.9 | 11.5 | 2,587 | 288 | 5.7 | 0.67 | 9.7% |
| 18 | 9/15/1983 | 21.4 | 173 | 50 | 123 | | 15 | 43 | 1.7 | 7.2 | 12.1 | 1,173 | 119 | 6.6 | 0.77 | 15.4% |
| 19 | 10/7/1983 | 27.7 | 129 | 50 | 79 | | 9 | 28 | 0.9 | 3.9 | 11.2 | 641 | 59 | 5.9 | 0.69 | 21.4% |
| 20 | 11/9/1983 | 18.8 | 120 | 50 | 70 | | 8 | 24 | 0.7 | 2.7 | 5.8 | 445 | 38 | 2.5 | 0.29 | 10.4% |
| 21 | 11/27/1983 | 13.3 | 163 | 50 | 113 | | 14 | 13 | 0.7 | 3.1 | 5.4 | 498 | 42 | 2.2 | 0.26 | 16.6% |
| 22 | 12/11/1983 | 13.7 | 180 | 50 | 130 | | 16 | 15 | 0.5 | 2.1 | 5.1 | 346 | 20 | 1.4 | 0.17 | 9.7% |
| | | **Average** | **156** | **50** | **106** | | **13** | **315** | **1.20** | **5.03** | **87** | **817** | **79** | **42** | **0.33** | **13.4%** |

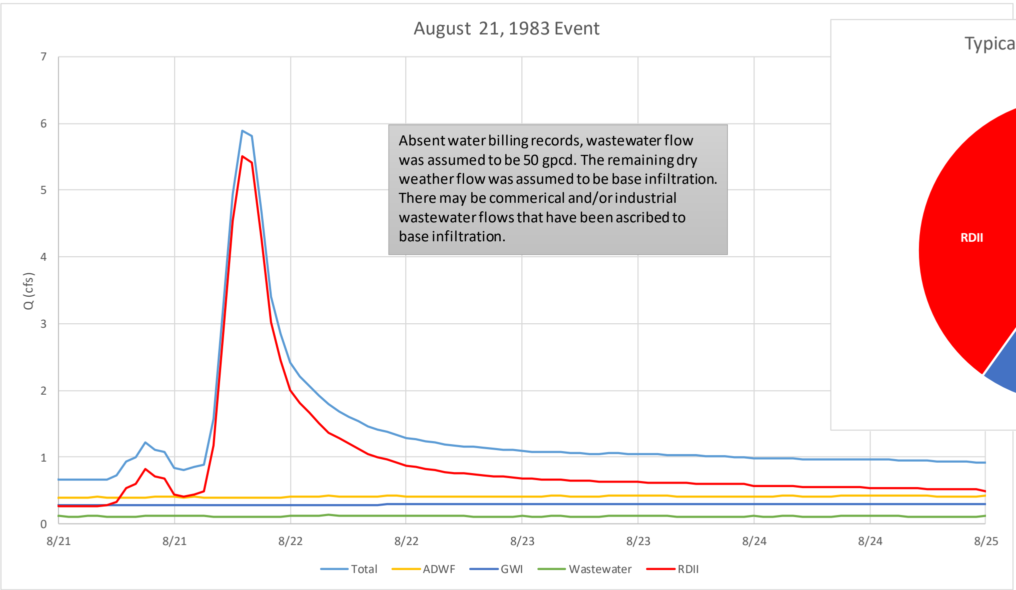
| Subcatchment Parameters | |
|---|---|
| **2010 Population:** | 1,473 |
| **Area (acres):** | 537 |
| **Sewer Length (miles):** | 8.6 |
| **Sewer IDM:** | |

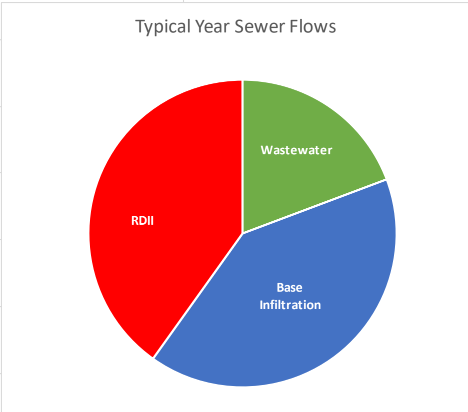
**2022 Water Billing Records**

| | | |
|---|---|---|
| Winter Consumption: | | gpd |
| | | gpcd |

**Financial Analysis**

| | V (X1000) | Cost / year |
|---|---|---|
| Wastewater | 26,961 | $ 19,143 |
| Base Infiltration | 56,778 | $ 40,313 |
| RDII | 56,127 | $ 39,850 |
| **Total** | **139,867** | **$ 99,306** |



## Kaukauna MS 9 2022 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5/2/1983 | 4.6 | 179 | 60 | 119 | | 7 | 19 | 0.4 | 1.1 | 1.4 | 211 | 0.52 | 0.010 | 0.0005 | 0.05% |
| 2 | 7/17/1983 | 5.0 | 186 | 60 | 127 | | 8 | 27 | 0.4 | 1.2 | 1.6 | 217 | 0.37 | 0.015 | 0.0008 | 0.05% |
| 3 | 8/21/1983 | 1.7 | 194 | 63 | 131 | | 8 | 119 | 0.4 | 1.2 | 0.6 | 226 | 0.86 | 0.008 | 0.0004 | 0.01% |
| | | **Average** | **183** | **60** | **123** | | **8** | **47** | **0.37** | **1.16** | **3.0** | **214** | **0.44** | **0.025** | **0.0006** | **0.05%** |

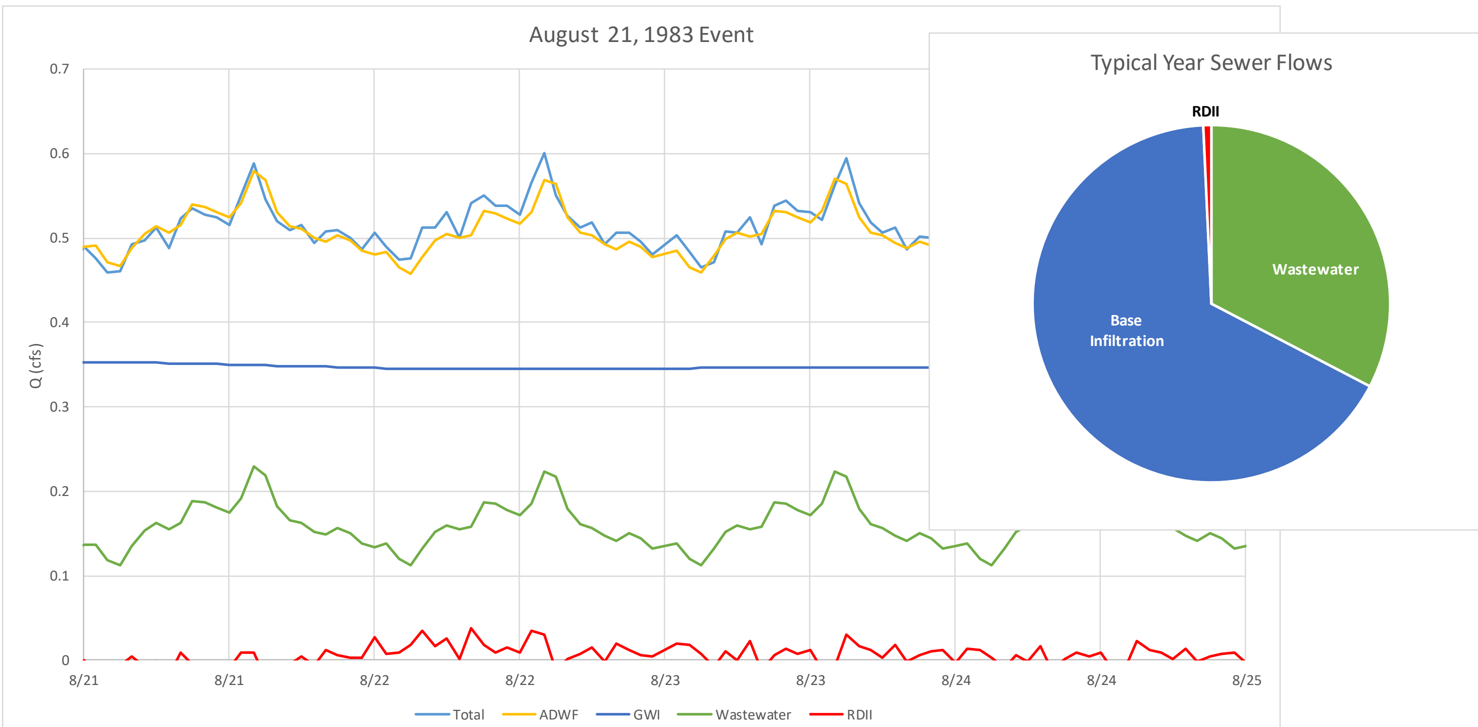
| Subcatchment Parameters | |
|---|---|
| **2010 Population:** | 1,713 |
| **Area (acres):** | 1,435 |
| **Sewer Length (miles):** | 19.4 |
| **Sewer IDM:** | |

**2022 Water Billing Records**

| | | |
|---|---|---|
| Winter Consumption: | | gpd |
| | | gpcd |

**Financial Analysis**

| | V (X1000) | Cost |
|---|---|---|
| Wastewater | 37,606 | $ 26,700 |
| Base Infiltration | 76,734 | $ 54,481 |
| RDII | 834 | $ 592 |
| **Total:** | **115,173** | **$ 81,773** |



## Kaukauna MS10 2022 I/I Report Card (1983 Typical Year)

| Event # | Start Date | Duration (Days) | DWF (gpcd) | Sanitary (gpcd) | GWI (gpcd) | GWI (gpd/IDM) | GWI (gpm/mi) | Rainfall (MG) | Max Flow (MGD) | Peaking Factor | Event V (MG) | Qmax (gpcd) | Max RDII (gpm/mi) | V RDII (MG) | RDII (gal/mi) | Capture Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 3/18/1983 | 6.3 | 92 | 61 | 31 | | 4 | 4 | 0.3 | 2.3 | 1.1 | 198 | 7.4 | 0.23 | 0.030 | 5.4% |
| 3 | 4/9/1983 | 9.7 | 92 | 60 | 32 | | 5 | 9 | 0.3 | 2.5 | 1.8 | 221 | 13.2 | 0.42 | 0.054 | 4.8% |
| 4 | 5/6/1983 | 5.8 | 102 | 60 | 42 | | 6 | 6 | 0.6 | 4.0 | 1.3 | 354 | 35.3 | 0.36 | 0.047 | 5.8% |
| 5 | 5/13/1983 | 4.6 | 115 | 62 | 53 | | 7 | 7 | 0.4 | 2.9 | 0.9 | 258 | 10.7 | 0.11 | 0.015 | 1.7% |
| 6 | 5/22/1983 | 5.8 | 121 | 61 | 60 | | 8 | 12 | 1.6 | 11.5 | 1.9 | 1,010 | 123.6 | 0.78 | 0.101 | 6.2% |
| 7 | 6/27/1983 | 5.8 | 89 | 61 | 28 | | 4 | 8 | 0.3 | 2.4 | 1.1 | 209 | 9.4 | 0.31 | 0.040 | 3.8% |
| 9 | 7/19/1983 | 6.2 | 97 | 60 | 37 | | 5 | 6 | 0.7 | 5.3 | 1.6 | 463 | 45.9 | 0.62 | 0.080 | 10.7% |
| 10 | 7/29/1983 | 2.9 | 109 | 59 | 50 | | 7 | 16 | 1.3 | 9.4 | 1.1 | 807 | 101.1 | 0.59 | 0.076 | 3.8% |
| 11 | 8/6/1983 | 3.4 | 116 | 62 | 53 | | 8 | 6 | 0.6 | 4.5 | 0.8 | 405 | 32.3 | 0.20 | 0.026 | 3.2% |
| 13 | 8/21/1983 | 3.8 | 112 | 62 | 50 | | 7 | 27 | 2.9 | 21.1 | 2.0 | 1,880 | 246.2 | 1.34 | 0.173 | 5.0% |
| 14 | 9/15/1983 | 13.3 | 103 | 60 | 43 | | 6 | 21 | 1.3 | 9.5 | 3.8 | 824 | 109.1 | 1.64 | 0.211 | 7.7% |
| 15 | 10/7/1983 | 10.6 | 101 | 60 | 40 | | 6 | 16 | 0.6 | 4.4 | 2.6 | 385 | 37.8 | 0.91 | 0.118 | 5.6% |
| 16 | 11/27/1983 | 9.0 | 99 | 59 | 40 | | 6 | 8 | 0.5 | 3.6 | 1.9 | 314 | 21.3 | 0.47 | 0.061 | 6.0% |
| | | **Average** | **104** | **61** | **43** | | **6** | **147** | **0.88** | **6.42** | **22** | **564** | **61.0** | **8.00** | **0.079** | **5.5%** |

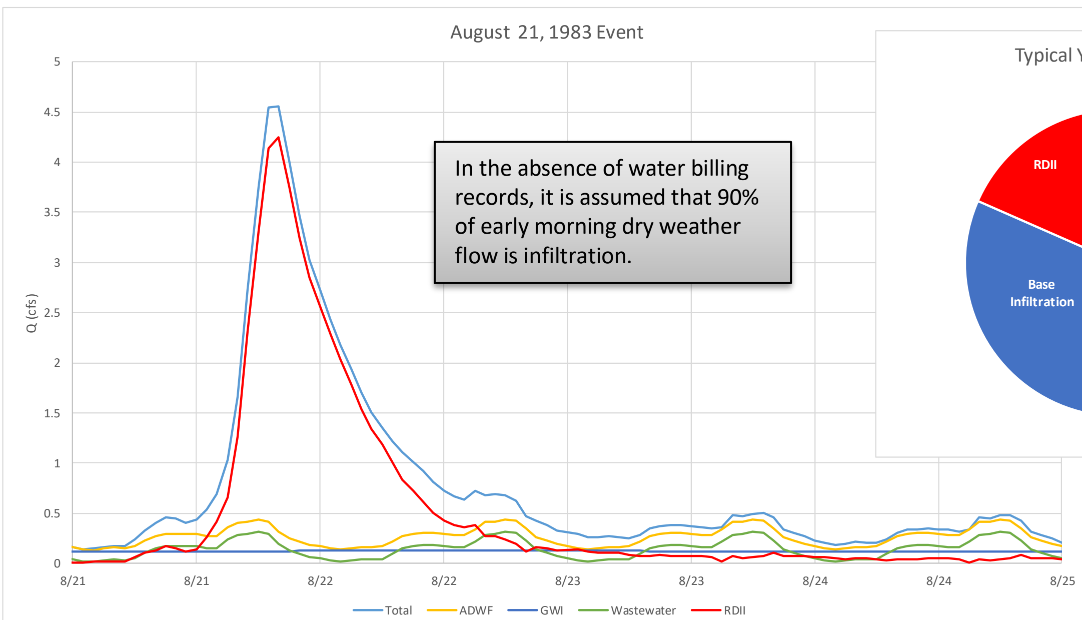
| Subcatchment Parameters | |
|---|---|
| **2010 Population:** | 1,568 |
| **Area (acres):** | 322 |
| **Sewer Length (miles):** | 7.7 |
| **Sewer IDM:** | |

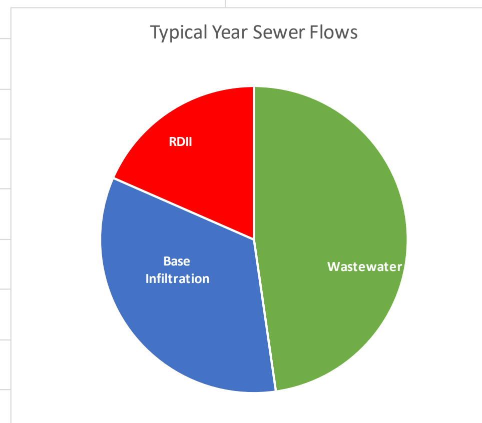
**2022 Water Billing Records**

| | |
|---|---|
| Winter Consumption: | gpd |
| | gpcd |

**Financial Analysis**

| | V (X1000) | Cost |
|---|---|---|
| Wastewater | 34,699 | $ 24,636 |
| Base Infiltration | 24,628 | $ 17,486 |
| RDII | 13,391 | $ 9,508 |
| **Total** | **72,718** | **$ 51,630** |

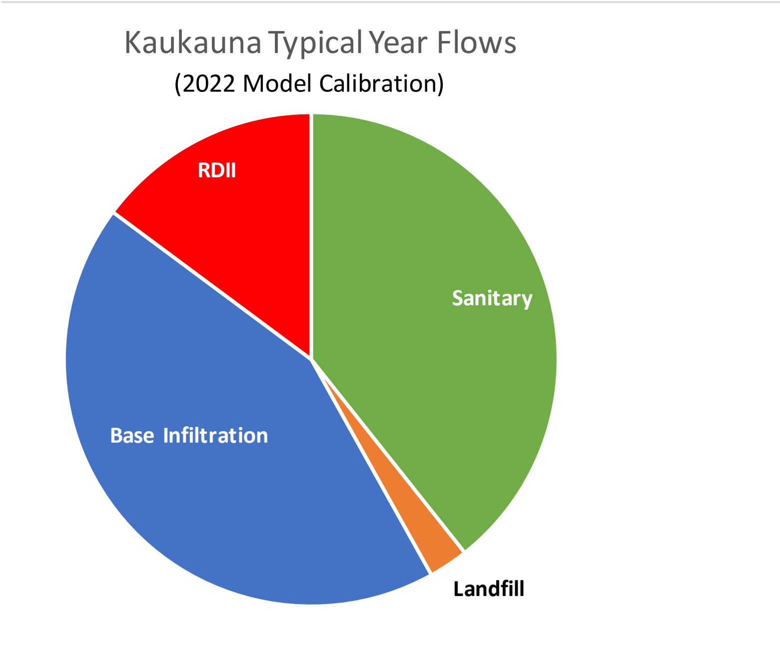


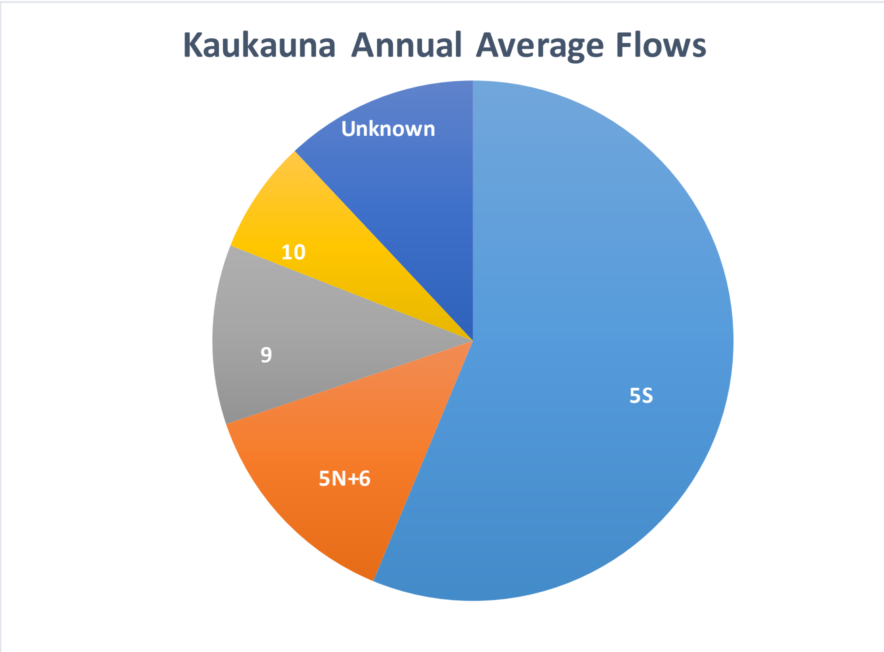



## *Kaukauna Typical Year Flows*

***(2022 Model Calibration)***

| | 5S | 5N+6 | 9 | 10 | Sub-Total | Unknown | Adjusted Total | Cost | GPCD |
|---|---|---|---|---|---|---|---|---|---|
| | Gallons X 1000 | | | | | | | | |
| Sanitary | 134,223 | 26,961 | 37,606 | 34,699 | 233,489 | 123,722 | 357,211 | $ 253,620 | 57.6 |
| Landfill | 15,772 | | | | | | 23,472 | $ 16,665 | 3.8 |
| Base Infiltration | 366,211 | 56,778 | 76,734 | 24,628 | 524,351 | | 392,929 | $ 278,980 | 63.3 |
| RDII | 64,324 | 56,127 | 834 | 13,391 | 134,676 | | 134,676 | $ 95,620 | 21.7 |
| Total | 580,530 | 139,866 | 115,174 | 72,718 | 908,288 | 123,722 | 908,288 | $ 644,884 | 146.4 |



## 5.4 APPENDIX C – 2022 COMPLIANCE MAINTENANCE ANNUAL REPORTING

**Heart of the Valley Metropolitan Sewerage District**

## Member Community Compliance Maintenance Annual Report: Peaking Factor Ratios

January 2010 - December 2022

| Metric | Kaukauna | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 [9] | 2020 [10, 11] | 2021 [13] | 2022 [14] |
| Rainfall (in) | | | | | | | | | | | | | |
| Average daily flow in MGD | 3.07 | 3.53 | 2.36 | 2.35 | 2.60 | 2.25 | 2.41 | 2.66 | 2.85 | 3.38 | 3.18 | 2.69 | 2.78 |
| Peak monthly flow in MGD | 4.92 | 5.50 | 3.39 | 4.16 | 4.08 | 3.59 | 3.90 | 3.50 | 3.89 | 4.15 | 4.55 | 4.82 | 4.16 |
| Month of peak monthly flow in MGD | July | April | March | April | April | December | March | June | April | September | March | March | April |
| Peak hourly flow in MGD | 20.20 | 14.22 | 16.03 | 12.94 | 18.16 | 20.12 | 12.52 | 9.90 | 22.43 | 20.86 | 20.22 | 20.22 | 11.66 |
| Peaking factor ratio Peak Monthly:Annual Daily Avg | 1.60 | 1.55 | 1.44 | 1.77 | 1.57 | 1.60 | 1.61 | 1.32 | 1.37 | 1.23 | 1.43 | 1.79 | 1.49 |
| Peaking factor ratio Peak Hourly:Annual Daily Avg | 6.58 | 4.02 | 6.80 | 5.51 | 6.99 | 8.93 | 5.19 | 3.72 | 7.88 | 6.17 | 6.36 | 7.52 | 4.19 |
| Top 10 peak hourly flow in MGD: 1 | 20.20 | 14.22 | 16.03 | 12.94 | 18.16 | 20.22 | 12.52 | 9.90 | 22.43 | 20.86 | 20.22 | 20.22 | 11.66 |
| 2 | 18.90 | 12.50 | 10.74 | 12.93 | 15.95 | 20.12 | 11.37 | 9.33 | 21.12 | 17.99 | 13.28 | 13.16 | 10.93 |
| 3 | 18.04 | 12.30 | 9.66 | 9.98 | 14.62 | 17.42 | 8.33 | 9.20 | 17.57 | 16.27 | 11.98 | 11.98 | 8.56 |
| 4 | 17.76 | 11.40 | 8.67 | 9.40 | 10.70 | 8.31 | 7.65 | 9.16 | 17.34 | 14.05 | 11.16 | 11.16 | 8.11 |
| 5 | 10.78 | 10.19 | 7.38 | 8.45 | 10.66 | 8.28 | 7.34 | 8.89 | 15.33 | 11.89 | 10.05 | 9.93 | 7.97 |
| 6 | 10.64 | 10.19 | 7.26 | 7.33 | 7.99 | 8.01 | 6.90 | 8.62 | 14.15 | 11.63 | 9.07 | 9.41 | 7.82 |
| 7 | 10.58 | 10.18 | 7.02 | 7.22 | 7.92 | 7.71 | 6.75 | 8.55 | 11.53 | 11.56 | 9.07 | 9.07 | 7.75 |
| 8 | 10.43 | 10.04 | 6.76 | 7.01 | 7.67 | 7.64 | 6.68 | 8.51 | 11.10 | 11.44 | 8.71 | 9.07 | 7.45 |
| 9 | 10.01 | 9.98 | 6.76 | 6.90 | 7.67 | 6.76 | 6.57 | 8.30 | 10.71 | 9.83 | 8.36 | 8.46 | 7.34 |
| 10 | 9.77 | 9.95 | 6.75 | 6.87 | 7.57 | 6.68 | 6.50 | 8.24 | 10.29 | 9.77 | 8.24 | 8.36 | 7.08 |
| Peaking factor ratio Ave Top 10 Peak Hourly:Annual Daily Avg | 4.47 | 3.14 | 3.69 | 3.79 | 4.19 | 4.94 | 3.34 | 3.33 | 5.32 | 4.00 | 3.47 | 4.12 | 3.04 |

Peak monthly flow is the highest average rate for any given calendar month
Peak hourly flow is the highest average rate for any four consecutive 15-minute reporting intervals

9 Data omitted from 9/30/19 7:00 to 23:45 because it is not available.
10 Data omitted from 8/07/20 14:30 to 12/01/20 9:30 because suspect it erroneous.
11 Data omitted from 12/03/20 13:45 to 12/09/20 8:00 because suspect it erroneous.
13 Data omitted from 01/06/21 8:45 to 03/11/21 8:15, from 6/1/21 11:15 to 6/2/21 11:45, from 9/18/21 7:15 to 9/29/21 11:30, and from 11/25/21 4:00 to 12/02/21 2:15 because suspect it erroneous.
14 and from 11/25/21 4:00 to 12/02/21 2:15 because suspect it erroneous.

**Heart of the Valley Metropolitan Sewerage District**

## Member Community Compliance Maintenance Annual Report: Peaking Factor Ratios

January 2010 - December 2022

| | Kimberly | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Metric** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** [1] | **2016** | **2017** | **2018** [2] | **2019** [8,9] | **2020** [12] | **2021** [14] | **2022** [15] |
| Average daily flow in MGD | 0.98 | 0.84 | 0.68 | 0.68 | 0.75 | 0.65 | 0.76 | 0.77 | 0.84 | 0.92 | 0.73 | 0.67 | 0.60 |
| Peak monthly flow in MGD | 1.68 | 2.01 | 1.04 | 1.37 | 1.32 | 0.95 | 1.25 | 1.20 | 1.36 | 1.11 | 1.36 | 1.31 | 1.06 |
| Month of peak monthly flow in MGD | July | April | March | April | April | December | March | April | April | May | March | April | April |
| Peak hourly flow in MGD | 10.90 | 7.05 | 5.11 | 4.52 | 6.99 | 9.32 | 4.14 | 5.26 | 9.95 | 7.08 | 8.74 | 5.42 | 5.19 |
| Peaking factor ratio Peak Monthly:Annual Daily Avg | 1.71 | 2.39 | 1.53 | 2.00 | 1.76 | 1.46 | 1.64 | 1.56 | 1.63 | 1.21 | 1.85 | 1.96 | 1.77 |
| Peaking factor ratio Peak Hourly:Annual Daily Avg | 11.07 | 8.36 | 7.56 | 6.62 | 9.32 | 14.25 | 5.43 | 6.83 | 11.91 | 7.73 | 11.92 | 8.10 | 8.66 |
| Top 10 peak hourly flow in MGD: 1 | 10.90 | 7.05 | 5.11 | 4.52 | 6.99 | 9.32 | 4.14 | 5.26 | 9.95 | 7.08 | 8.74 | 5.42 | 5.19 |
| 2 | 10.02 | 4.62 | 4.83 | 4.07 | 6.77 | 6.55 | 3.82 | 4.48 | 9.67 | 6.40 | 4.94 | 4.41 | 4.01 |
| 3 | 9.71 | 4.47 | 4.46 | 3.91 | 6.22 | 4.47 | 3.11 | 3.88 | 6.84 | 6.12 | 4.76 | 4.38 | 3.72 |
| 4 | 8.04 | 4.32 | 4.07 | 3.78 | 5.18 | 2.97 | 2.91 | 3.85 | 6.66 | 5.82 | 4.61 | 4.11 | 3.52 |
| 5 | 7.66 | 4.14 | 3.17 | 3.15 | 4.93 | 2.86 | 2.69 | 3.24 | 5.42 | 5.61 | 3.83 | 4.05 | 3.17 |
| 6 | 6.06 | 4.10 | 2.81 | 2.75 | 3.89 | 2.68 | 2.47 | 3.10 | 5.28 | 4.61 | 3.46 | 3.99 | 3.07 |
| 7 | 5.33 | 4.05 | 2.77 | 2.64 | 3.84 | 2.62 | 2.35 | 2.95 | 4.02 | 4.13 | 3.44 | 3.45 | 2.89 |
| 8 | 5.27 | 3.98 | 2.66 | 2.58 | 3.70 | 2.55 | 2.31 | 2.94 | 3.92 | 4.11 | 3.30 | 3.29 | 2.79 |
| 9 | 5.22 | 3.63 | 2.44 | 2.35 | 2.95 | 2.51 | 2.23 | 2.86 | 3.79 | 4.10 | 3.24 | 3.21 | 2.56 |
| 10 | 5.07 | 3.37 | 2.44 | 2.26 | 2.93 | 2.49 | 2.14 | 2.58 | 3.61 | 3.95 | 3.24 | 2.83 | 2.35 |
| Peaking factor ratio Ave Top 10 Peak Hourly:Annual Daily Avg | 7.45 | 5.19 | 5.14 | 4.69 | 6.32 | 5.96 | 3.69 | 4.56 | 7.08 | 5.67 | 5.94 | 5.85 | 5.56 |

Peak monthly flow is the highest average rate for any given calendar month
Peak hourly flow is the highest average rate for any four consecutive 15-minute reporting intervals

1 Data from 6/9/15 17:30 to 6/11/15 14:00 at the Kimberly meter station was omitted from analysis.
2 Kimberly data omitted from 7/20/18 00:45 to 7/27/18 7:45 because suspect it erroneous.
8 Kimberly data omitted from 9/19/19 3:00 to 9/22/19 22:30 because suspect it erroneous.
9 Data omitted from 9/30/19 7:00 to 23:45 because it is not available.
12 Data omitted from 01/03/20 15:15 to 01/05/20 12:00, from 04/26/20 00:45 to 04/28/20 6:30, from 04/28/20 11:15 to 04/29/20 5:15, and from 06/15/20 6:30 to 06/18/20 11:30 because suspect it erroneous.
14 Data omitted from 01/07/21 3:45 to 03/11/21 11:30 and from 05/12/21 10:45 to 05/26/21 13:15 because suspect it erroneous.
15 Data omitted from 03/15/22 to 03/17/22 and from 04/26/21 1:00 to 04/28/2 9:15 because suspect it erroneous.

**Heart of the Valley Metropolitan Sewerage District**

## Member Community Compliance Maintenance Annual Report: Peaking Factor Ratios

January 2010 - December 2022

| Metric | | Little Chute | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 [1] | 2019 [7,9] | 2020 | 2021 [15] | 2022 [16] |
| Average daily flow in MGD | | 1.46 | 1.49 | 1.16 | 1.39 | 1.45 | 1.25 | 1.36 | 1.57 | 1.56 | 1.92 | 1.73 | 2.01 | 2.34 |
| Peak monthly flow in MGD | | 2.42 | 3.05 | 1.73 | 2.43 | 2.42 | 1.93 | 2.25 | 2.37 | 2.76 | 2.30 | 2.79 | 2.96 | 3.43 |
| Month of peak monthly flow in MGD | | July | April | March | April | April | December | March | April | April | May | March | July | April |
| Peak hourly flow in MGD | | 13.86 | 8.42 | 6.02 | 6.66 | 8.73 | 11.66 | 6.37 | 5.20 | 10.60 | 10.02 | 8.84 | 9.95 | 10.03 |
| Peaking factor ratio Peak Monthly:Annual Daily Avg | | 1.66 | 2.05 | 1.50 | 1.75 | 1.67 | 1.54 | 1.65 | 1.50 | 1.77 | 1.20 | 1.61 | 1.47 | 1.47 |
| Peaking factor ratio Peak Hourly:Annual Daily Avg | | 9.49 | 5.65 | 5.20 | 4.80 | 6.01 | 9.33 | 4.68 | 3.30 | 6.79 | 5.22 | 5.10 | 4.94 | 4.29 |
| Top 10 peak hourly flow in MGD: | 1 | 13.86 | 8.42 | 6.02 | 6.66 | 8.73 | 11.66 | 6.37 | 5.20 | 10.60 | 10.02 | 8.84 | 9.95 | 10.03 |
| | 2 | 12.20 | 6.42 | 5.91 | 5.62 | 8.13 | 6.63 | 5.57 | 5.19 | 10.18 | 7.47 | 6.72 | 7.75 | 8.52 |
| | 3 | 11.10 | 6.07 | 5.44 | 5.49 | 7.12 | 6.19 | 4.83 | 5.00 | 8.93 | 7.40 | 6.29 | 7.32 | 7.93 |
| | 4 | 8.66 | 6.01 | 4.45 | 5.44 | 6.25 | 5.61 | 3.86 | 4.88 | 7.09 | 6.66 | 6.10 | 7.26 | 7.48 |
| | 5 | 7.39 | 5.61 | 3.92 | 4.98 | 5.34 | 4.49 | 3.85 | 4.71 | 7.04 | 5.85 | 5.82 | 6.39 | 6.70 |
| | 6 | 5.25 | 5.51 | 3.63 | 4.27 | 5.11 | 4.07 | 3.84 | 4.64 | 5.81 | 5.46 | 5.29 | 6.27 | 6.57 |
| | 7 | 5.01 | 5.49 | 3.43 | 4.00 | 4.96 | 4.04 | 3.54 | 4.31 | 5.60 | 5.13 | 5.14 | 6.12 | 6.38 |
| | 8 | 4.75 | 5.10 | 3.41 | 3.83 | 4.59 | 3.61 | 3.43 | 4.26 | 5.58 | 5.09 | 5.04 | 5.52 | 6.20 |
| | 9 | 4.67 | 5.04 | 3.34 | 3.77 | 3.99 | 3.53 | 3.35 | 4.22 | 5.52 | 4.91 | 4.95 | 5.38 | 5.77 |
| | 10 | 4.67 | 5.00 | 3.32 | 3.69 | 3.87 | 3.47 | 3.30 | 3.99 | 5.14 | 4.90 | 4.77 | 5.31 | 5.12 |
| Peaking factor ratio Ave Top 10 Peak Hourly:Annual Daily Avg | | 5.31 | 3.94 | 3.71 | 3.44 | 4.00 | 4.27 | 3.08 | 2.95 | 4.58 | 3.28 | 3.40 | 3.34 | 3.02 |

Peak monthly flow is the highest average rate for any given calendar month

Peak hourly flow is the highest average rate for any four consecutive 15-minute reporting intervals

1 Little Chute data omitted from 2/23/18 15:45 to 4/10/18 10:00 because suspect it erroneous.

7 Little Chute data omitted from 6/03/19 7:45 to 10/25/19 12:00 because suspect it erroneous.

9 Data omitted from 9/30/19 7:00 to 23:45 because it is not available.

15 Data omitted from 01/04/21 19:00 to 01/13/21 13:15 and from 02/09/21 12:30 to 03/11/21 because suspect it erroneous.

16 Data omitted from 03/15/22 to 03/17/22 and from 04/26/21 1:00 to 04/28/2 9:15 because suspect it erroneous.

**Heart of the Valley Metropolitan Sewerage District**

## Member Community Compliance Maintenance Annual Report: Peaking Factor Ratios

January 2010 - December 2022

| Metric | Combined Locks | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2011 | 2012 | 2013 | 2014 [1] | 2015 | 2016 [2] | 2017 | 2018 [3] | 2019 [9] | 2020 | 2021 [16] | 2022 [17] |
| Rainfall (in) | | | | | | | | | | | | | |
| Average daily flow in MGD | 0.38 | 0.38 | 0.30 | 0.34 | 0.36 | 0.31 | 0.32 | 0.35 | 0.35 | 0.43 | 0.36 | 0.32 | 0.38 |
| Peak monthly flow in MGD | 0.68 | 0.80 | 0.47 | 0.63 | 0.63 | 0.56 | 0.57 | 0.53 | 0.54 | 0.56 | 0.64 | 0.50 | 0.66 |
| Month of peak monthly flow in MGD | July | April | March | April | April | December | March | April | April | April | March | July | April |
| Peak hourly flow in MGD | 4.13 | 2.51 | 2.33 | 2.15 | 2.73 | 3.75 | 1.75 | 2.31 | 3.46 | 2.67 | 2.85 | 1.89 | 2.01 |
| Peaking factor ratio Peak Monthly:Annual Daily Avg | 1.78 | 2.13 | 1.56 | 1.83 | 1.75 | 1.79 | 1.81 | 1.51 | 1.54 | 1.29 | 1.79 | 1.58 | 1.72 |
| Peaking factor ratio Peak Hourly:Annual Daily Avg | 10.77 | 6.65 | 7.74 | 6.26 | 7.64 | 12.04 | 5.53 | 6.61 | 9.94 | 6.14 | 7.91 | 5.94 | 5.28 |
| Top 10 peak hourly flow in MGD: 1 | 4.13 | 2.51 | 2.33 | 2.15 | 2.73 | 3.75 | 1.75 | 2.31 | 3.46 | 2.67 | 2.85 | 1.89 | 2.01 |
| 2 | 3.19 | 1.77 | 2.01 | 1.92 | 2.58 | 2.90 | 1.57 | 1.79 | 3.44 | 2.57 | 1.98 | 1.65 | 1.81 |
| 3 | 3.18 | 1.59 | 1.64 | 1.51 | 2.44 | 2.58 | 1.33 | 1.64 | 2.98 | 2.34 | 1.74 | 1.61 | 1.54 |
| 4 | 3.17 | 1.58 | 1.37 | 1.37 | 2.44 | 1.36 | 1.15 | 1.63 | 2.26 | 2.13 | 1.65 | 1.54 | 1.39 |
| 5 | 2.79 | 1.54 | 1.17 | 1.24 | 1.78 | 1.32 | 1.11 | 1.35 | 2.22 | 1.72 | 1.55 | 1.49 | 1.37 |
| 6 | 1.96 | 1.53 | 1.16 | 1.22 | 1.77 | 1.28 | 1.05 | 1.33 | 2.18 | 1.70 | 1.47 | 1.48 | 1.36 |
| 7 | 1.85 | 1.49 | 1.14 | 1.21 | 1.54 | 1.26 | 1.04 | 1.23 | 1.75 | 1.49 | 1.42 | 1.40 | 1.21 |
| 8 | 1.65 | 1.41 | 1.11 | 1.14 | 1.32 | 1.14 | 1.04 | 1.19 | 1.60 | 1.44 | 1.40 | 1.06 | 1.17 |
| 9 | 1.61 | 1.30 | 1.08 | 1.04 | 1.29 | 1.11 | 1.01 | 1.13 | 1.50 | 1.44 | 1.38 | 1.01 | 1.16 |
| 10 | 1.59 | 1.27 | 0.99 | 1.00 | 1.24 | 1.10 | 0.99 | 1.07 | 1.49 | 1.43 | 1.36 | 1.01 | 1.10 |
| Peaking factor ratio Ave Top 10 Peak Hourly:Annual Daily Avg | 6.55 | 4.24 | 4.65 | 4.03 | 5.34 | 5.72 | 3.81 | 4.20 | 6.57 | 4.36 | 4.66 | 4.45 | 3.70 |

Peak monthly flow is the highest average rate for any given calendar month
Peak hourly flow is the highest average rate for any four consecutive 15-minute reporting intervals

1 Data from 7/9/14 9:00 to 7/15/14 16:45 at Combined Locks and Darboy meter stations was omitted from analysis. Interceptor maintenance caused surcharging at meter station.
2 No Combined Locks data available until 1/15/16.
3 Data from 5/4/18 6:30 am to 5/4/18 9:30 am at Combined Locks and Darboy meter stations was omitted from analysis. Interceptor maintenance caused surcharging at meter station.
9 Data omitted from 9/30/19 7:00 to 23:45 because it is not available.
16 Data omitted from 01/19/21 13:00 to 03/11/21 10:00 because suspect it erroneous.
17 Data omitted from 03/14/22 to 03/12/22.

**Heart of the Valley Metropolitan Sewerage District**

## Member Community Compliance Maintenance Annual Report: Peaking Factor Ratios

January 2010 - December 2022

| Metric | Darboy | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2011 | 2012 | 2013 | 2014 [1] | 2015 | 2016 [2] | 2017 | 2018 [3] | 2019 [9] | 2020 | 2021 [17] | 2022 [18] |
| Rainfall (in) | | | | | | | | | | | | | |
| Average daily flow in MGD | 0.95 | 0.96 | 0.94 | 1.02 | 1.06 | 0.92 | 0.82 | 0.94 | 0.92 | 0.98 | 0.92 | 0.94 | 0.96 |
| Peak monthly flow in MGD | 1.13 | 1.26 | 1.04 | 1.27 | 1.35 | 1.05 | 1.18 | 1.11 | 1.08 | 1.09 | 1.16 | 1.10 | 1.11 |
| Month of peak monthly flow in MGD | July | April | March | April | April | December | March | March | April | March | March | March | April |
| Peak hourly flow in MGD | 3.43 | 2.61 | 3.10 | 2.82 | 3.18 | 3.93 | 2.32 | 2.46 | 3.63 | 3.51 | 2.66 | 2.18 | 2.63 |
| Peaking factor ratio Peak Monthly:Annual Daily Avg | 1.19 | 1.31 | 1.11 | 1.25 | 1.27 | 1.14 | 1.43 | 1.18 | 1.17 | 1.12 | 1.27 | 1.17 | 1.15 |
| Peaking factor ratio Peak Hourly:Annual Daily Avg | 3.60 | 2.71 | 3.29 | 2.76 | 2.99 | 4.27 | 2.82 | 2.61 | 3.93 | 3.59 | 2.90 | 2.33 | 2.74 |
| Top 10 peak hourly flow in MGD: 1 | 3.43 | 2.61 | 3.10 | 2.82 | 3.18 | 3.93 | 2.32 | 2.46 | 3.63 | 3.51 | 2.66 | 2.18 | 2.63 |
| 2 | 3.34 | 2.58 | 2.78 | 2.67 | 2.80 | 2.76 | 2.29 | 2.08 | 3.56 | 2.96 | 2.56 | 2.15 | 2.49 |
| 3 | 3.24 | 2.52 | 2.72 | 2.51 | 2.75 | 2.45 | 2.14 | 2.00 | 2.96 | 2.61 | 2.22 | 2.07 | 2.43 |
| 4 | 2.82 | 2.26 | 2.38 | 2.45 | 2.41 | 2.28 | 2.08 | 1.98 | 2.92 | 2.55 | 2.21 | 1.98 | 2.23 |
| 5 | 2.82 | 2.18 | 2.10 | 2.44 | 2.37 | 2.22 | 2.06 | 1.95 | 2.43 | 2.29 | 2.20 | 1.92 | 2.15 |
| 6 | 2.76 | 2.16 | 2.06 | 2.33 | 2.27 | 2.18 | 2.02 | 1.95 | 2.18 | 2.25 | 2.17 | 1.88 | 2.12 |
| 7 | 2.70 | 2.14 | 2.03 | 2.26 | 2.18 | 2.15 | 1.94 | 1.91 | 2.08 | 2.24 | 2.14 | 1.88 | 2.04 |
| 8 | 2.37 | 2.12 | 1.98 | 2.21 | 2.17 | 2.14 | 1.92 | 1.91 | 2.08 | 2.18 | 2.12 | 1.86 | 1.97 |
| 9 | 2.35 | 2.08 | 1.96 | 2.17 | 2.15 | 2.01 | 1.92 | 1.91 | 2.06 | 2.13 | 2.10 | 1.84 | 1.94 |
| 10 | 2.09 | 2.05 | 1.96 | 2.15 | 2.09 | 1.99 | 1.91 | 1.90 | 2.05 | 2.12 | 2.04 | 1.82 | 1.89 |
| Peaking factor ratio Ave Top 10 Peak Hourly:Annual Daily Avg | 2.93 | 2.36 | 2.45 | 2.35 | 2.29 | 2.62 | 2.50 | 2.13 | 2.81 | 2.54 | 2.44 | 2.09 | 2.28 |

Peak monthly flow is the highest average rate for any given calendar month
Peak hourly flow is the highest average rate for any four consecutive 15-minute reporting intervals

1 Data from 7/9/14 9:00 to 7/15/14 16:45 at Combined Locks and Darboy meter stations was omitted from analysis. Interceptor maintenance caused surcharging at meter station.
2 Darboy data omitted until 2/9/16 because suspect it erroneous.
3 Data from 5/4/18 6:30 am to 5/4/18 9:30 am at Combined Locks and Darboy meter stations was omitted from analysis. Interceptor maintenance caused surcharging at meter station.
9 Data omitted from 9/30/19 7:00 to 23:45 because it is not available.
17 Data omitted from 01/09/21 21:15 to 03/10/21 14:30 and from 04/26/21 1:00 to 04/28/2 9:15 because suspect it erroneous.
18 Data omitted from 03/15/22 to 03/17/22 and from 04/26/21 1:00 to 04/28/2 9:15 because suspect it erroneous.