Memorandum

To: Anna Hotz, MPCA
    Jim Brist, MPCA

From: Madison Rogers
      Pete Willenbring, PE

Date: May 21, 2020

Re: Northeast Lino Lakes Drainage Area Improvement Project
    MPCA Water Quality Certification Review
    WSB Project No. 013084-000

A water quality analysis for the Northeast Lino Lakes Improvement Project (the Project) has been completed and the results and supporting information are outlined in this memo and supporting documents. The Project involves:

- Construction of a 60" RC stormwater pipe from 20th Avenue to Peltier Lake Drive
- Construction of a 60" Culvert under 20th Avenue
- Construction of a Box Culvert under Peltier Lake Drive

The Project *does not* include any change in land use, proposed impervious surface, or changes in drainage patterns. Additionally, there are no permanent wetland impacts from the Project. However, because the Project will be facilitating future drainage systems, the MPCA has required that the City show there is a non-degradation of the downstream waterbody assuming future conditions for the planned land use and impervious surface area within the watershed that will drain to the Project.

The water quality analysis shows that the Project and the future land use changes will decrease pollutant loading to the downstream waterbody, Peltier Lake, and show no adverse impact to the watershed.

**PROJECT BACKGROUND**

The City has been developing this project since 2015 as a part of their future land use planning efforts. Previous studies and reports that involve the future land use plan and discussion of the Northeast Lino Lakes Drainage Area include:

- Northeast Lino Lakes Improvement Project Feasibility (2016)
The existing agricultural drainage system is unable to meet demands of future development within the watershed (Figure 1). The project will provide a new outlet that meets the needs of future development and maintains existing flood elevations throughout the Rice Creek Chain of Lakes. (Figure 2, 3). Projects that connect to the outlet will be required to provide water quality treatment prior to connection to the outlet.

PROJECT PHASING AND TIMELINE

The CSMP area contains three main regions. The project for this application includes installation of the storm sewer connection between the Central Region, West Region, and Peltier Lake. Future improvements will connect the East Region to the Central Region. Below is an approximate timeline and effects to the drainage system with each development.

2020/2021

- City constructs storm sewer outlet from Central Region through West Region to Peltier Lake (see attached Plan Set).
- No watershed conditions are changed as part of this project. The City does not propose any new impervious or change in land use as a part of construction of this storm sewer system.
- No anticipated flow into constructed pipe as a result of the project. Future development tie-ins will occur as development occurs upstream.

2021

- Central Region completes development work and begins discharging to storm sewer system.

Future

- As development occurs according to the City’s approved Land Use Planning Documents, private developers may discharge treated stormwater into the City’s storm sewer system.
- All development will be required to have approved Stormwater Management Plan that meets requirements of the City, Rice Creek Watershed District, and MPCA.
- When an approved development plan for the East Region occurs, the City plans to construct a culvert under 35E to allow proposed development to discharge to the constructed storm sewer outlet to Peltier Lake.
- The City plans to use a similar process to what is described in this memo to facilitate development in the East Region.

WATER QUALITY ANALYSIS

The Minnesota Pollution Control Agency’s Minimal Impact Design Standards (MIDS) calculator was used to generate runoff and pollutant loading for the watershed conditions analyzed. The MIDS calculator was used to provide transparency on the land cover and total phosphorus assumptions. This modification was made based on previous feedback from MPCA regarding curve number designations and Event Mean Concentrations for Total Phosphorus.

Water quality calculations factor in:

- Land use – impervious percentage is the primary variable (See Figure 4 and 5 for existing and proposed land use assumptions respectively).
• Pervious surfaces – the MIDS calculator uses Land Cover ("Open space/forested area" or "Managed Turf") to designate different pervious land uses.
  o Agricultural area in existing condition is considered managed.
  o All proposed condition pervious area is assumed to be managed, except for the City’s future park area next to the lake, including the area above the proposed pipe (shown as undeveloped on Figure 5).
• Soil Types – Pervious surfaces and agricultural land use have different runoff characteristics depending on soil type (Figure 6). NRCS soil survey was used to determine soil types.
• Phosphorus Loading – A phosphorus EMC of 0.3mg/L is used for both existing and proposed conditions (per MIDS guidance).
• TSS Loading – A TSS load of 54.5 mg/L was used (per MIDS guidance).

The purpose of this water quality analysis is to show that full build out conditions will improve water quality conditions to the downstream impaired Peltier Lake. Table 1 shows the anticipated impervious percent anticipated in each of the region’s future planned land use.

<table>
<thead>
<tr>
<th>Region</th>
<th>Total Area</th>
<th>Existing % Impervious</th>
<th>Future Estimated % Impervious</th>
</tr>
</thead>
<tbody>
<tr>
<td>West</td>
<td>152.5</td>
<td>1%</td>
<td>33%</td>
</tr>
<tr>
<td>Central</td>
<td>428.5</td>
<td>5%</td>
<td>36%¹</td>
</tr>
</tbody>
</table>

¹This estimate uses the Watermark Development proposed impervious from their stormwater management plan

The MIDS calculator was used to generate rainfall volume, Total Phosphorus (TP), and Total Suspended Solids (TSS) for existing conditions, proposed conditions, and the proposed area that has been identified as potentially suitable for infiltration. The CSMP identified areas where infiltration is suitable based on existing soil types. These areas are shown on Figure 7. At this time, it is not possible to provide information beyond desktop review of infiltration potential within these areas. When development occurs, soil borings will be required to confirm infiltration feasibility.

For this analysis, we have accounted for the water quality benefit of infiltration BMPs that would be required as part of City, RCWD, and MPCA requirements in only the areas identified as suitable for infiltration. In the areas where infiltration is not feasible, wet detention ponds are utilized to achieve load reductions.

Table 2 shows the results from the MIDS calculator.

• **Column 2**: Existing TP load from MIDS based on existing land use and corresponding EMC.
• **Column 3**: Proposed TP load from MIDS based on proposed land use and corresponding EMC. No BMP reductions incorporated.
• **Column 4**: The areas identified as suitable for infiltration were modeled in MIDS to develop a separate pollutant loading from the others that are not suitable for infiltration. Then, a 90% reduction of the pollutant load from the infiltration areas was applied. The 90% is based on MIDS research that indicates that 90% of all rain events in Minnesota are represented by the 1.1-inch performance goal. No BMPs were modeled within the MIDS calculator due to the high-level planning of this analysis and BMP details are unknown at this time.
• **Column 5**: It is assumed that the remaining TP loading from the proposed condition will be treated via stormwater detention ponds, where a 50% TP removal is calculated.
• **Column 6**: Column 3 – Column 4 – Column 5
The same analysis process was completed for the TSS load in Table 3. Per MPCA guidance, it is assumed that 85% of TSS will be removed from ponding BMPs.

Table 2: Existing and Proposed Total Phosphorus (TP) Loading – Infiltration and Ponding BMPs

<table>
<thead>
<tr>
<th>Region</th>
<th>Column 2</th>
<th>Column 3</th>
<th>Column 4</th>
<th>Column 5</th>
<th>Column 6</th>
<th>Column 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing TP Load (lb/yr)</td>
<td>Proposed Estimated TP Load assuming no BMPs (lb/yr)</td>
<td>Estimated TP Removed from Infiltration (lb/yr)</td>
<td>Estimated TP Removed from Ponding (lb/yr)</td>
<td>Proposed Estimated TP Load with BMPs (lb/yr)</td>
<td>Change in TP Load from Existing to Proposed (lb/yr)</td>
</tr>
<tr>
<td>West</td>
<td>51.8</td>
<td>130.9</td>
<td>25.7</td>
<td>52.6</td>
<td>52.6</td>
<td>0.8</td>
</tr>
<tr>
<td>Central</td>
<td>218.4</td>
<td>403.7</td>
<td>0¹</td>
<td>201.9</td>
<td>201.9</td>
<td>-16.5</td>
</tr>
<tr>
<td>Total</td>
<td>270.2</td>
<td>534.6</td>
<td>25.7</td>
<td>254.5</td>
<td>254.5</td>
<td>-15.7</td>
</tr>
</tbody>
</table>

¹The development plan in place for this region has deemed infiltration unfeasible, therefore no infiltration is assumed.

Table 3: Existing and Proposed Total Suspended Solids (TSS) Loading – Infiltration and Ponding BMPs

<table>
<thead>
<tr>
<th>Region</th>
<th>Column 2</th>
<th>Column 3</th>
<th>Column 4</th>
<th>Column 5</th>
<th>Column 6</th>
<th>Column 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing TSS Load (lb/yr)</td>
<td>Proposed Estimated TSS Load assuming no BMPs (lb/yr)</td>
<td>Estimated TSS Removed from Infiltration (lb/yr)</td>
<td>Estimated TSS Removed from Ponding (lb/yr)</td>
<td>Proposed Estimated TSS Load with BMPs (lb/yr)</td>
<td>Change in TSS Load from Existing to Proposed (lb/yr)</td>
</tr>
<tr>
<td>West</td>
<td>9404</td>
<td>23773</td>
<td>4659</td>
<td>16247</td>
<td>2867</td>
<td>-6537</td>
</tr>
<tr>
<td>Central</td>
<td>39676</td>
<td>73345</td>
<td>0¹</td>
<td>62343</td>
<td>11002</td>
<td>-28675</td>
</tr>
<tr>
<td>Total</td>
<td>49080</td>
<td>97118</td>
<td>4659</td>
<td>78590</td>
<td>13869</td>
<td>-35212</td>
</tr>
</tbody>
</table>

¹The development plan in place for this region has deemed infiltration unfeasible, therefore no infiltration is assumed.

If infiltration is not feasible in areas shown as potentially suitable for infiltration in Figure 7, future development may use stormwater reuse as an alternative BMP to provide volume reduction for the site. A separate analysis has been completed for the combination of stormwater reuse and ponding BMPs in Table 4 and 5.

The RCWD has an approved capacity for an irrigation practice of 0.5 inches/week for no greater than a 26-week growing season. This assumption is used to estimate an annual irrigated volume based on an irrigated area. The source for irrigation is assumed to be ponding. A 50% TP and 85% TSS load reduction is assumed for ponding based on previous input from the MPCA. Pollutants removed during the ponding prior to stormwater reuse is accounted for in the equations below. The following equations are used to calculate column 4 in Table 4 and 5.

\[
\text{Area Irrigated} \times 0.5 \text{inches/week} \times 26 \text{ weeks/year} \times 0.3 \text{mgTP/L} \times 50\% \text{(Particulate P Removed from Ponding)} = \text{Estimated TP Removed from Stormwater Reuse}
\]

\[
\text{Area Irrigated} \times 0.5 \text{inches/week} \times 26 \text{ weeks/year} \times 54.5 \text{mgTSS/L} \times 15\% \text{(TSS Removed from Ponding)} = \text{Estimated TSS Removed from Stormwater Reuse}
\]
It is estimated that the Watermark Development will irrigate approximately 6.3% of their total site. It is assumed in Tables 4 and 5 that future development in the West Region will irrigate a similar percentage of the land area since the impervious coverage for the two regions are similar.

**Table 4** shows the results from the MIDS calculator and stormwater reuse equation.

- **Column 2**: Existing TP load from MIDS based on existing land use and corresponding EMC
- **Column 3**: Proposed TP load from MIDS based on proposed land use and corresponding EMC. No BMP reductions incorporated.
- **Column 4**: Proposed TP removed from Stormwater Reuse based on stormwater reuse equation.
- **Column 5**: It is assumed that the remaining TP loading from the proposed condition will be treated via stormwater detention ponds, where a 50% TP removal is calculated.
  - Column 5 = Column 3 x 50%
- **Column 6**: Column 3 – Column 4 – Column 5
- **Column 7**: Column 6 – Column 2

The same analysis process was completed for the TSS load in **Table 5**. An 85% TSS removal is calculated for TSS removal from Ponding.

**Table 4:** Existing and Proposed Total Phosphorus (TP) Loading – Stormwater Reuse and Ponding BMPs

<table>
<thead>
<tr>
<th>Region</th>
<th>Column 1 Existing TP Load (lb/yr)</th>
<th>Column 2 Proposed Estimated TP Load assuming no BMPs (lb/yr)</th>
<th>Column 3 Estimated TP Removed from Stormwater Reuse (lb/yr)</th>
<th>Column 4 Estimated TP Removed from Ponding (lb/yr)</th>
<th>Column 5 Proposed Estimated TP Load with BMPs (lb/yr)</th>
<th>Column 6 Change in TP Load from Existing to Proposed (lb/yr)</th>
<th>Column 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>West</td>
<td>51.8</td>
<td>130.9</td>
<td>4.2</td>
<td>65.5</td>
<td>61.2</td>
<td>9.4</td>
<td></td>
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<tr>
<td>Central</td>
<td>218.4</td>
<td>403.7</td>
<td>10.2</td>
<td>201.8</td>
<td>191.7</td>
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<tr>
<td>Total</td>
<td>270.2</td>
<td>534.6</td>
<td>14.4</td>
<td>267.3</td>
<td>252.9</td>
<td>-17.3</td>
<td></td>
</tr>
</tbody>
</table>

**Table 5:** Existing and proposed Total Suspended Solids (TSS) Loading – Stormwater Reuse and Ponding BMPs

<table>
<thead>
<tr>
<th>Region</th>
<th>Column 1 Existing TSS Load (lb/yr)</th>
<th>Column 2 Proposed Estimated TSS Load assuming no BMPs (lb/yr)</th>
<th>Column 3 Estimated TSS Removed from Stormwater Reuse (lb/yr)</th>
<th>Column 4 Estimated TSS Removed from Ponding (lb/yr)</th>
<th>Column 5 Proposed Estimated TSS Load with BMPs (lb/yr)</th>
<th>Column 6 Change in TSS Load from Existing to Proposed (lb/yr)</th>
<th>Column 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>West</td>
<td>9404</td>
<td>23773</td>
<td>231</td>
<td>20207</td>
<td>3335</td>
<td>-6069</td>
<td></td>
</tr>
<tr>
<td>Central</td>
<td>39676</td>
<td>73345</td>
<td>555</td>
<td>62343</td>
<td>11002</td>
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<tr>
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<td>82550</td>
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<td>-34744</td>
<td></td>
</tr>
</tbody>
</table>
Tables 2-5 show that there is a reduction in pollutant loading from the West and Central CSMP areas. Future City permit applicants will need to show they meet City and RCWD requirements and show that they are not increasing pollutant loading from existing conditions. The City will track this information as development progresses and will use an in-aggregate analysis for the CSMP area to confirm this condition is being met.

The analysis outlined in this memo shows that when these areas are developed and begin to discharge into the City’s storm sewer system, there will be a positive impact on Peltier Lake with fewer pollutants reaching the impaired downstream waterbody. This analysis is a conservative estimate of the proposed condition. The following points are not taken into consideration.

- Developments will likely not reach their maximum allowed impervious area. For example, the development in the Central Region was estimated to be 74% impervious in the CSMP report, however, the development’s planned construction is less than half the planned amount. The reduction in impervious was largely due to the area needed for ponding to meet regulatory requirements, as shown in Figure 8 for the development’s land use plan.
- This analysis does not include any of the increased pollutants that are resulting from the existing agricultural practices that make up a majority of the existing watershed. The TP and TSS concentration for existing and proposed is assumed to be the same to present a conservative analysis.
- Calculations for stormwater reuse pollutant reduction are extremely conservative. The University of Minnesota Extension estimates a weekly irrigation rate of 1 inch/week. RCWD allows for an additional 0.5 inch to be taken credit for after monitoring the site. Using a higher irrigation rate would increase pollutant reduction for the site.