

TABLE OF CONTENTS

Summary

- Site Location
- Site Conditions
 - o Soils
- Proposed Improvements
- Water Quality
 - o Table 1 – Annual Phosphorus
- Rate Control
 - o Table 2 – Rate Comparison
 - o Table 3 – Ponding Evaluation
- Conclusion

Figures

- Existing Drainage Map
- Existing Storm Sewer Map
- Proposed Drainage Map
- Proposed Storm Sewer Map

Water Quality Model Summaries

- MIDs Calculator Modeling Results
 - o Existing
 - o Proposed
 - o Proposed - IESF

Rate Control Model Summaries

- 1 Year Rainfall Event
 - o Existing
 - o Proposed
- 10 Year Rainfall Event
 - o Existing
 - o Proposed
- 100 Year Rainfall Event
 - o Existing
 - o Proposed

SUMMARY

Maintenance activities including grading of a small wet retention pond in the existing stormwater collection area on the northwest side of Freeman Park abutting the south side of the Lake Minnetonka LRT Regional Trail, replacement of the outlet control structure under the trail, installation of two wet retention ponds on the property at 26245 Smithtown Road (Parcel No. 3211723420004), and installing a storm sewer connection between Shorewood Oaks Drive and the wet retention ponds at 26245 Smithtown Road are proposed to improve or resolve multiple drainage issues in the area. The proposed work will disturb 7.3 acres and require a National Pollution Discharge Elimination System (NPDES) stormwater permit, and Minnehaha Creek Watershed District (MCWD) Stormwater and Erosion Control permits.

SITE LOCATION:

The project is located at Section 32, Township 117N, Range 23W, within Hennepin County parcels 3211723420004 and 3211723410003 in Shorewood, MN.

SITE CONDITIONS:

Runoff from the north Strawberry Lane neighborhood drains to a channel east of the road, identified as Pebble Creek. Pebble Creek conveys flow to the culvert crossings at Smithtown Road and the Grant Lorenz Channel downstream of the crossings. Immediately upstream of the crossing, Pebble Creek merges with the drainage way conveying flow from Freeman Park, identified as the Freeman Park Channel for purposes of this report. Pebble Creek, Freeman Park Channel, and the Grant Lorenz Channel experience erosive flows during larger rainfall events resulting in severe gully erosion in the drainage ways. Strawberry Lane has a rural section with minimal storm sewer resulting in extended durations of inundation in low areas during wet periods. In addition, a large portion of existing impervious surface does not receive treatment to remove pollutants prior to discharge downstream.

Runoff from the south Strawberry Lane, Shorewood Oaks, Shorewood Ponds, Hendrickson Acres, and Freeman Park neighborhoods drain to a basin on the northwest side of Freeman Park. An outlet control structure conveys the water from the basin under the Lake Minnetonka LRT Regional trail, where the Freeman Park Channel continues north until it connects with Pebble Creek on the south side of Smithtown Road. The Freeman Park basin outlet control structure has an 18-inch orifice inlet at an elevation of 960.26 to control the discharge from a 48" RCP pipe. The orifice experiences frequent clogging due to vegetation and sedimentation buildup, and the design contributes to erosive flows in the Freeman Park Channel. Additionally, this structure controls high water elevations upstream, with potential inundation impacts to Freeman Park's interior trails and the Shorewood Oaks neighborhood.

The total impervious area within the watershed is 66.45 acres.

Soils

Soils in the area are classified by the Natural Resources Conservation Service (NRCS) Web Soil Survey as predominantly Type C/D soils. GIS was utilized to create weighted CN values for each subbasin based on impervious area, vegetation type, and soil classification. CN values ranged from 63.8 to 98.

PROPOSED IMPROVEMENTS:

Smithtown Pond System

Construction of two wet retention ponds at 26245 Smithtown Road is proposed. Runoff from Strawberry Lane that previously discharged to Pebble Creek will be redirected to the south pond (Smithtown Pond C2), flow into the north pond (Smithtown Pond C1), then reconnect with Pebble Creek on the south side Smithtown Road. The ponds are proposed to provide sufficient storage and treatment to meet upstream needs as well as reduce downstream flows.

Smithtown Pond C2 will have a normal water level (NWL) of 955.0' and provide 320,365 CF of live storage. Smithtown Pond C1 will have a NWL of 951.5' and provide 199,487 CF of live storage. The outlet control structure details for ponds C1 and C2 are shown as "Precast Outlet Control Structure 16" and "Precast Outlet Control Structure 13", respectively in the project plan set. Additional information about the ponds is presented in the Water Quality and Rate Control sections below.

The improvements will provide water quality treatment and reduce flows in Pebble Creek, Grant Lorenz Channel, and Freeman Park Channel. Additional improvements to minimize flooding potential on Strawberry Lane (i.e. urban street section, storm sewer, catch basins, ditch cleaning, etc.) are to be addressed as part of the Strawberry Lane Street and Utility improvements.

Smithtown Pond C2 was designed to accommodate an iron enhanced sand filter to provide additional water treatment if desired. 60' long by 3' wide iron enhanced sand filters would be installed on each side of the pond outlet pipe. The outlet control structure for this pond will allow 5,685 CF of stormwater to pond above the sand filters before the water will over top its weir wall.

Freeman Park Wet Retention Pond

Construction of a wet retention pond in the Freeman Park basin and replacement of the outlet control structure with two new outlet structures is proposed. These two outlets will have submerged inlets to reduce clogging potential and lower the existing high-water level.

The wet retention pond (PR-2510-FP-Pond1) will have a normal water level of 960.3.

The primary outlet will convey all stormwater ponding up to the 2-year storm event to Freeman Park Channel north of the Lake Minnetonka LRT Regional Trail.

The secondary outlet will begin conveying stormwater to the proposed Smithtown ponds once ponding in Freeman Park basin reaches an elevation of 963.3. This combination of outlets was selected to minimize impacts to the Freeman Park Channel by maintaining low flow through the channel and diverting the large erosive storm events through the Smithtown pond system. The profile for the primary outlet structure is shown as structures FES-23, MH-24, and FES 25 on sheet C5.05 and the detail for the secondary outlet is shown as "Precast Outlet Control Structure 10" on sheet C1.05.

The Smithtown and Freeman Park improvements will involve the removal of 0.25 acres of driveways, trails, and buildings. The proposed design will involve the addition of 0.25 acres of trails for no net change in impervious area.

Shorewood Oaks Footing Drain System

The footing drain system in the Shorewood Oaks neighborhood will be disconnected from the adjacent storm sewer system, and a new connection will be made directly to Smithtown Pond C2. The new connection will bypass the Freeman Park Basin, mitigating flooding potential in the homes in the Shorewood Oaks neighborhood.

WATER QUALITY:

MCWD rules require a no net increase from existing conditions in phosphorus discharged from the site under proposed conditions. The total existing impervious area within the watershed is 66.451 acres. The Strawberry Lane Street and Utility improvements are expected to increase the impervious area to 66.996 acres. Table 1 shows the existing and proposed phosphorus loads released from the watershed.

Table 1. Phosphorus Load Generation Comparison

	Particulate Phosphorus (lb/yr)		Dissolved Phosphorus (lb/yr)		Total Released (lb/yr)
	Generated	Removed	Generated	Removed	
Existing	105.67	26.49	86.46	0	165.64
Proposed	106.07	87.59	86.78	0	105.26
Proposed - IESF	106.07	94.79	86.78	60.41	37.65

Directing areas previously not routed to BMPs and adding additional pieces to the treatment chain reduces the amount of phosphorus discharged from the watershed by 60.4 lb/yr. An iron enhanced sand filter would reduce the phosphorus discharge by 127.99 lb/yr. Additional water quality information is available in the attached MIDS model reports.

RATE CONTROL:

MCWD rules require peak runoff rates for the proposed 1-, 10-, and 100-year storm events not exceed the rates generated under existing conditions. The proposed runoff rates were analyzed in Pebble Creek (Pebble Creek-4), Freeman Park Channel (Freeman Park Channel-5), and Grant Lorenz Channel (Link-247). The location of Pebble Creek, Freeman Park Channel, and Grant Lorenz Channel are called out on the attached drainage map Figures 1 and 2. Table 2 shows the rate comparison between existing and proposed conditions for the two channels.

Table 2. Rate Comparison

Location	Storm	Existing (cfs)	Proposed (cfs)	Rate Change (cfs)
Pebble Creek (Pebble Creek-4)	1-yr	5.86	3.98	-1.88
	10-yr	18.56	15.31	-3.25
	100-yr	45.01	38.90	-6.11
Freeman Park Channel (Freeman Channel-5)	1-yr	13.41	11.04	-2.37
	10-yr	32.24	17.90	-14.34
	100-yr	68.08	32.93	-35.15
Grant Lorenz Channel (Link-247)	1-yr	15.62	14.31	-1.31
	10-yr	45.75	36.51	-9.24
	100-yr	124.32	77.27	-47.05

The flow rates do not increase in any of these channels for the 1-, 10-, and 100-year storm events.

The high-water levels were evaluated for Freeman Park basin, Smithtown Ponds C1 and C2, and at Pebble Creek at the Smithtown Road culvert entrance to ensure the ponding depths do not create a flooding hazard for nearby structures.

Table 3. Ponding Evaluation

Location	Existing High-Water Level (ft)	Proposed High-Water Level (ft)	Nearby Structure Low Opening
Freeman Park basin (FreemanPark-Basin) (PR-2510-FP-Pond1)	969.15	968.83	975.64
Smithtown Pond C2 (PR-Smithtown Pond C2)	n/a	957.63	*n/a
Smithtown Pond C1 (PR-SmithtownPondC-1)	n/a	955.39	959.59
Pebble Creek (3010-STP-Pond1)	954.87	953.62	959.59
Freeman Park Wetland (2410-FP-Wetland)	977.42	977.42	~983

Location	Existing High-Water Level (ft)	Proposed High-Water Level (ft)	Nearby Structure Low Opening
Shorewood Ponds (ShorewoodPonds-Pond1)	982.10	982.09	~983

*If pond C2 overtops its banks, the water would flow to Pond C1, Freeman Channel, or Pebble Creek.

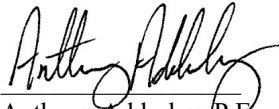
The Freeman Park basin high-water level is higher than several of the basement elevations in the Shorewood Oaks neighborhood, however it is lowered from the existing high-water level of 969.28 ft and the water level above the 968.04 elevation has been reduced by over 5 hours. In addition, hydraulically separating the footing drainage system from the Freeman Park basin will further mitigate basement flooding in the Shorewood Oaks neighborhood.

CONCLUSION:

The proposed design meets MCWD requirements for rate control when incorporating future Strawberry Lane improvements into the design and exceeds requirements for water quality control. The HWL in the Freeman Park basin will be reduced and the time the water level is above the 960' elevation will be reduced by several hours.

If you have any questions or comments, please contact me to discuss further.

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.


 Anthony Adderley, P.E.
 Reg. No. 57131

August 17, 2021
 Date

DRAINAGE MAPS