Snail Lake Overflow/Grass Lake Optimization Study Phase IIa

Snail Lake to Sucker Lake Pumping Evaluation

Snail Lake to Sucker Lake Pumping Evaluation

Critical Event 100-yr, 96-hour

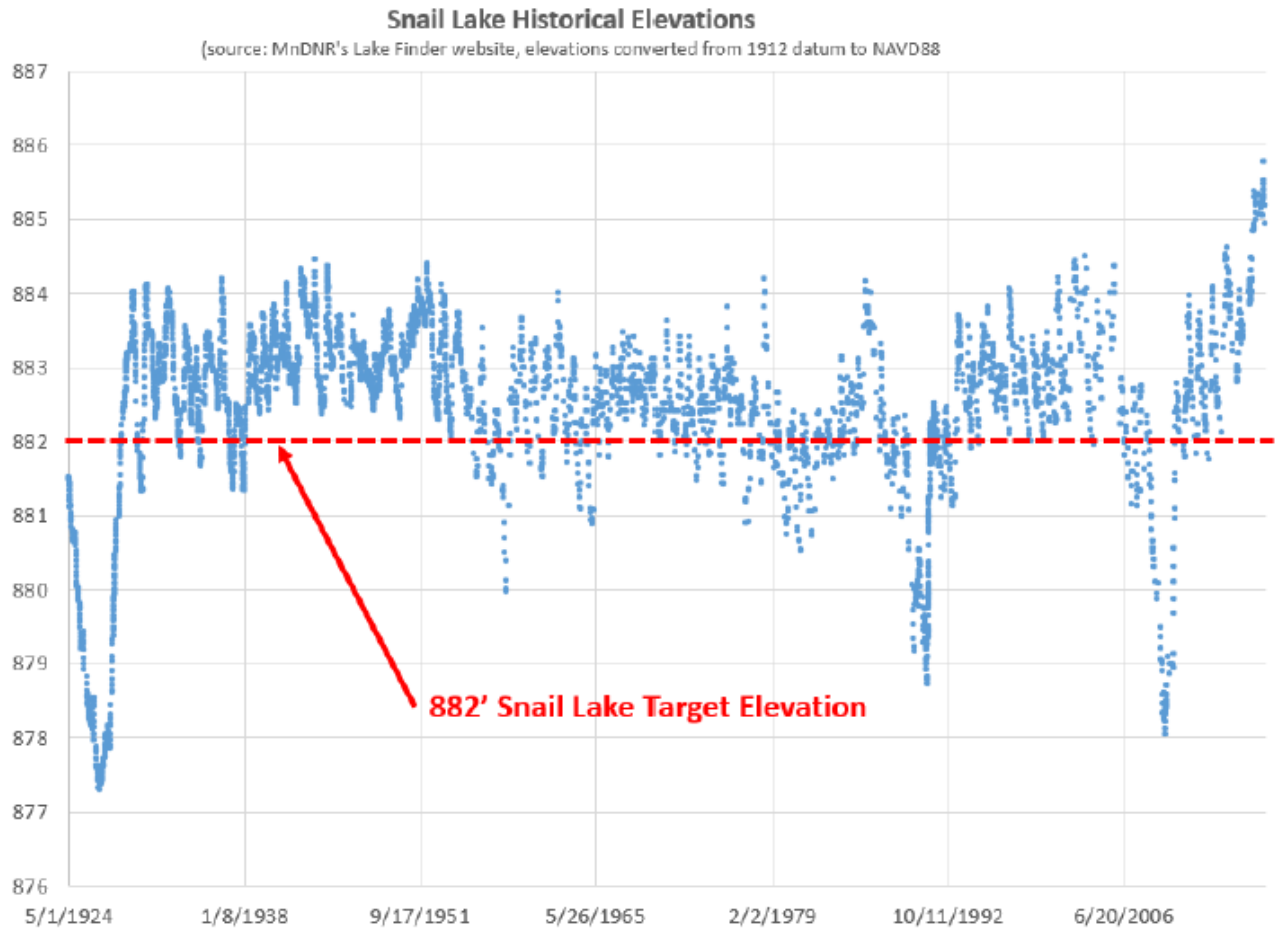

Figure 2 – Snail Lake Historical Elevations

Table 1 – Summary of 2017 Survey of Low Habitable Structures at Snail Lake

Snail Lake Habitable Structure	Unofficial 2017 Survey of Low Elevation at Habitable Structure (NAVD88)
4322 Lake Point	893.65
668 Highway 96	891.32
4154 Reiland Lane	889.66
4324 Lake Point	889.26
4320 Lake Point	888.80
4380 Reiland Lane	886.01

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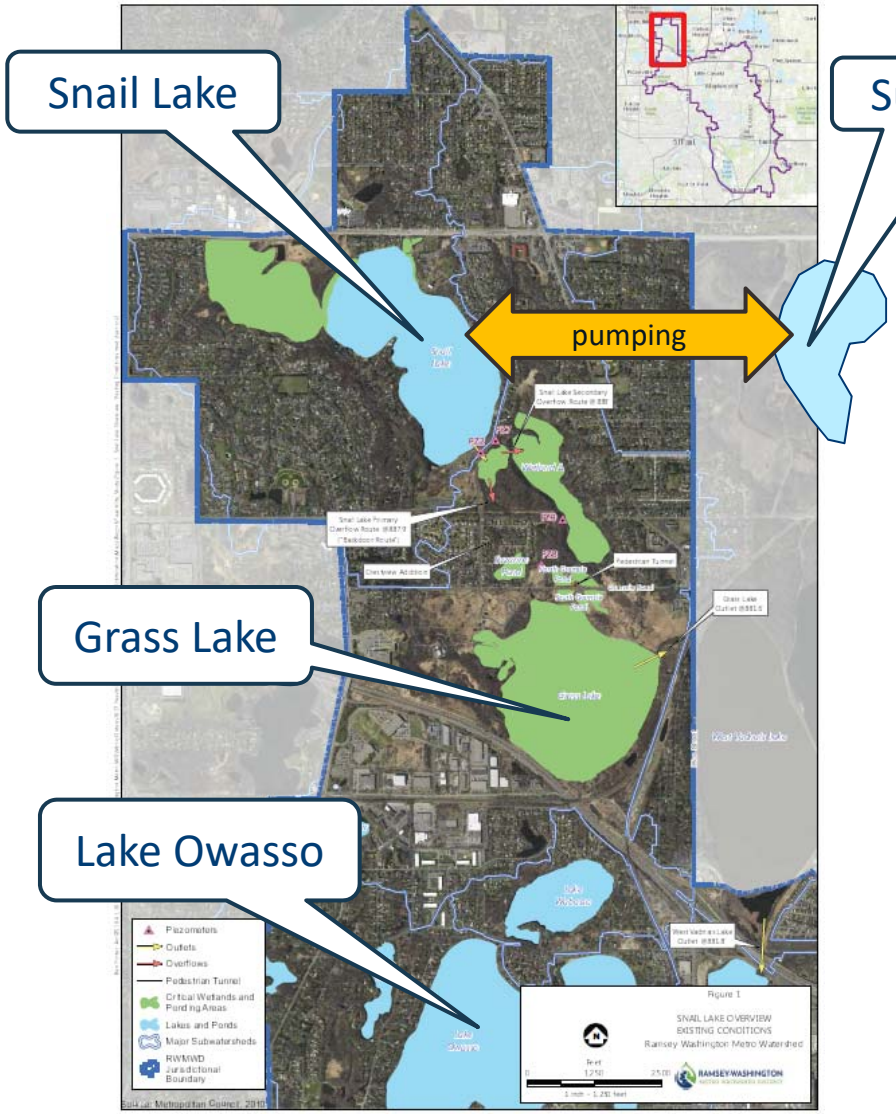
Snail Lake to Sucker Lake Pumping Evaluation

Existing Snail Lake Augmentation pumping system



Existing pumping Sucker to Snail
Along Snail Lake Road
1,800 gpm (4 cfs)

Evaluated pumping Snail to Sucker
Two alignment concepts
1.2 cfs, 10.0 cfs and 20.0 cfs options

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Can we pump Snail Lake water to Saint Paul Regional Water Services (SPRWS) ?

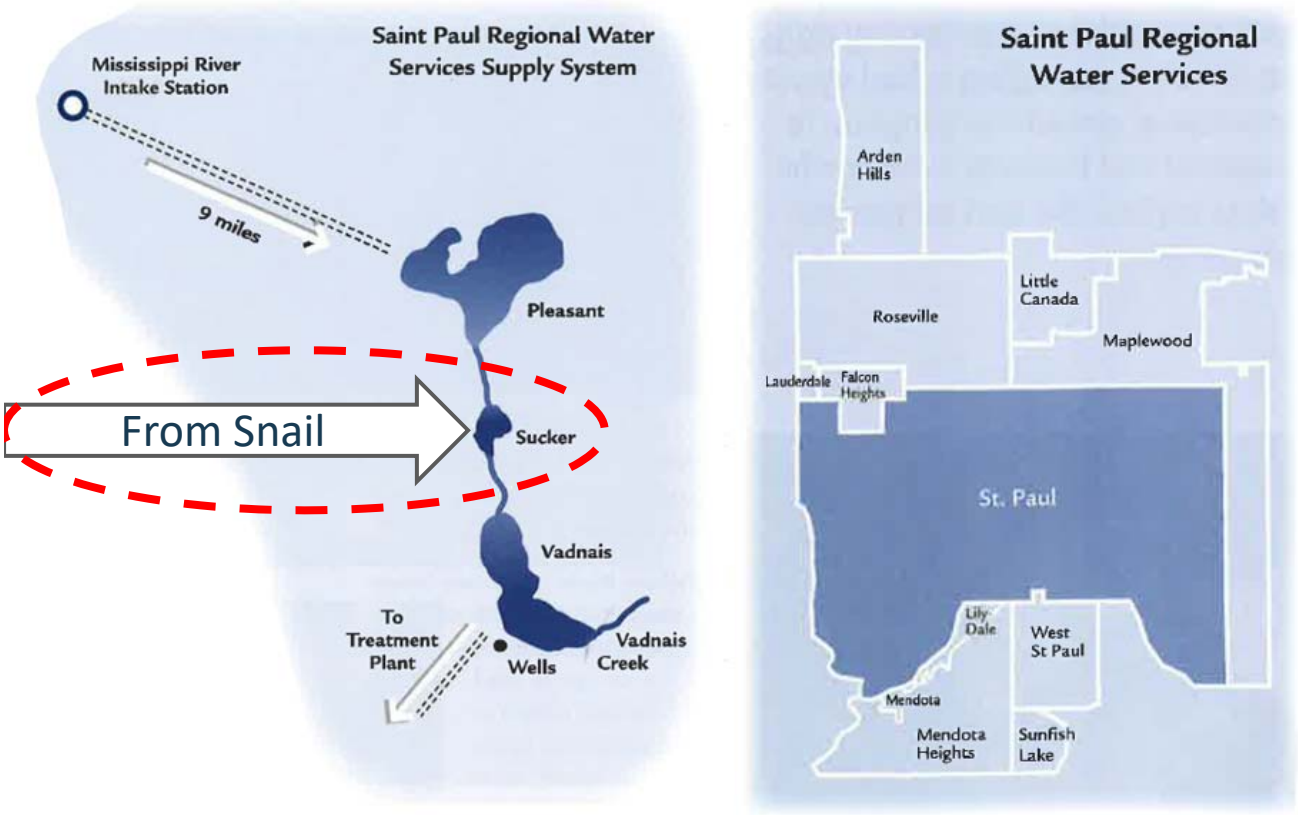

Figure 3 – Overview: SPRWS Supply System and Service Area

38 million gallons
(SPRWS avg. daily use)

80 million gallons
(1.2 cfs critical event drawdown, 100 days)

160 million gallons
(10 cfs critical event drawdown, 24 days)

170 million gallons
(20 cfs critical event drawdown, 13 days)

Image courtesy of Saint Paul Regional Water Services. The Saint Paul Regional Water System 2016 average annual water use was 14,603 million gallons with a maximum pumping capacity of 144 million gallons per day for an average 2016 daily water use of 38.2 million gallons (59 cfs).

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Snail Lake to Sucker Lake Pumping Evaluation

Permitting needs

Table 2 – Permitting Considerations

Approval Entity	Permit/Approval	Justification
U.S. Army Corps of Engineers	Section 404 Permit	Required for work activities below the ordinary high water level (OHWL) of waters/wetlands under agency jurisdiction.
U.S. Fish and Wildlife Service	Section 7 (Endangered Species Act) compliance	Required as part of USACE's Section 404 permitting process.
Minnesota Department of Natural Resources	• Work in Public Waters Permit • Water Appropriations Permit	• Required for work activities below the OHWL of a designated public water • Required for withdrawing more than 10,000 gallons of water per day or 1 million gallons per year. Also required to appropriate or transport any amount of infested water
Minnesota Pollution Control Agency	General Stormwater Permit for Construction	Required for projects that result in more than 1 acre of ground disturbance
Minnesota Wetland Conservation Act	Project compliance`	Required for impacts to wetlands that are not under the jurisdiction of the USACE or MNDNR. Administered by the VLAWMO and RWMWD in their jurisdiction.
State Historic Preservation Office	Section 106 (National Historic Preservation Act) compliance	Required as part of USACE's Section 404 permitting process.
City of Shoreview (Snail Lake is in Shoreview)	• Erosion/Excavating/Grading Permit • Right-of-Way Excavation Permit • Floodplain Management Special District compliance • Shoreland Management Special District compliance	• Project activities are expected to require movement of more than 10 cubic yards of soil and disturb an area of more than 1,000 square feet. • Construction would occur in City of Shoreview right-of-way • Required for projects in floodplain overlay district • Applied to all projects within 1,000 feet of a protected waterbody
City of Vadnais Heights (Sucker Lake is in Vadnais Heights)	• Excavation Permit • Engineering and Public Works Approval • Utilities Approval • Floodplain Area Approval • Shoreland Area Approval	• Project activities are expected to require movement of more than 6 cubic yards of soil • Engineering and Public Works Department typically provides input on significant projects. • Project will require modifications to city utilities • Required for projects that take place within designated Floodplain Area • Required for all work within 1,000 feet of designated Shoreland Area

2 Cities
- Shoreview
- Vadnais Heights

3 Water Jurisdictions
- RWMWD
- VLAWMO
- SPRWS (Drinking Water)

Crossing Two State Aid Roadways

Wetlands at Pumping Inlet & Outlet

Invasives Species
- Snail (EWM)
- Sucker (EWM, ZM)

MnDNR Appropriations

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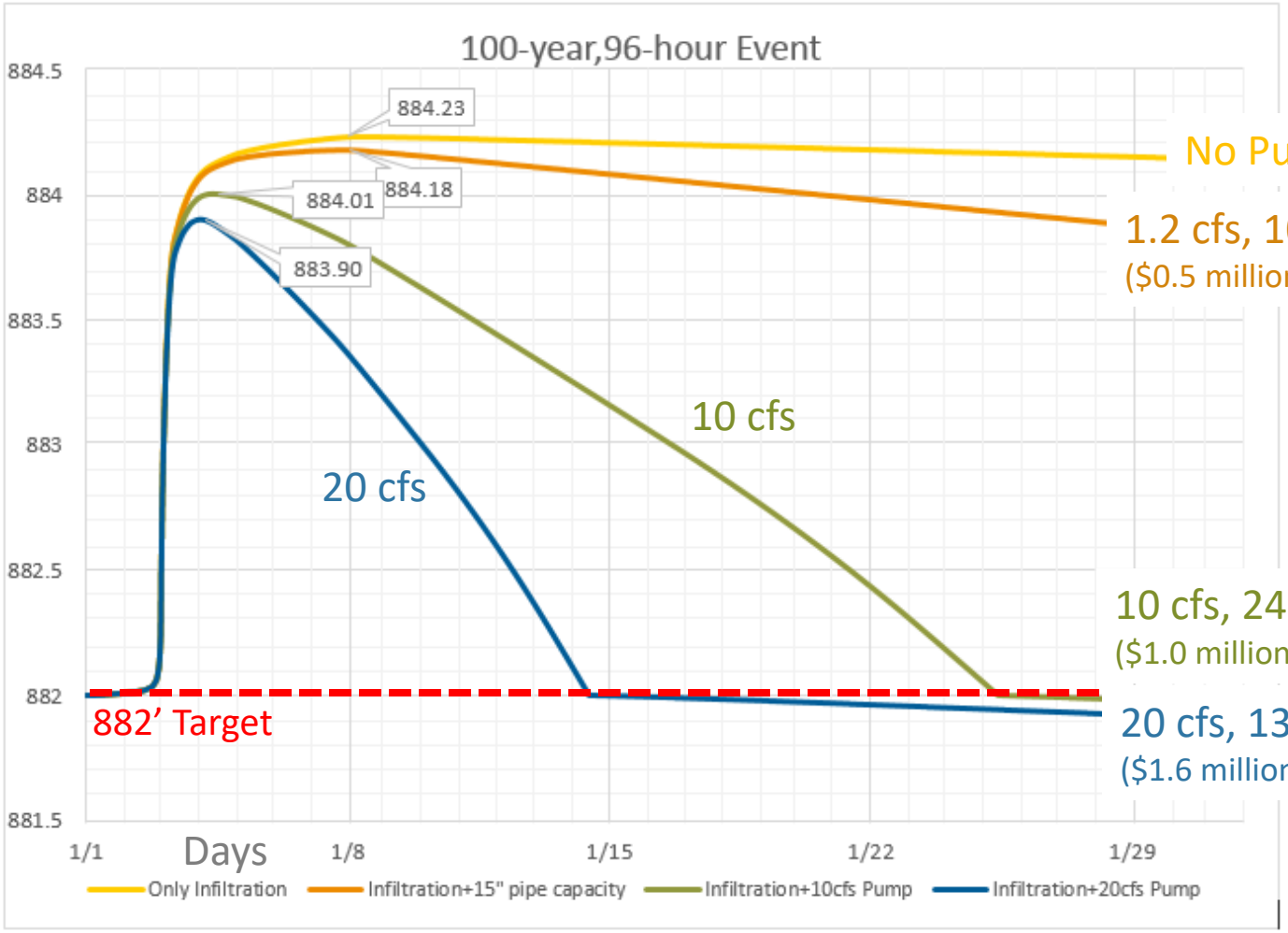
Snail Lake to Sucker Lake Pumping Evaluation

Model estimated Snail Lake Drawdown



No Pumping, 200 days

1.2 cfs, 100 days, $1.0 million
($0.5 million to $2.2 million), 8"+ pipe

10 cfs, 24 days, $2.2 million
($1.0 million to $4.8 million), 1x24" pipe

20 cfs, 13 days, $3.5 million
($1.6 million to $7.6 million), 2x24" pipes

Figure 4 – XP SWMMM Hydrologic Model Results:
Typical Snail Lake Water Surface Elevation Response to 100-yr, 96-hr Critical Event vs. No. Drawdown Days

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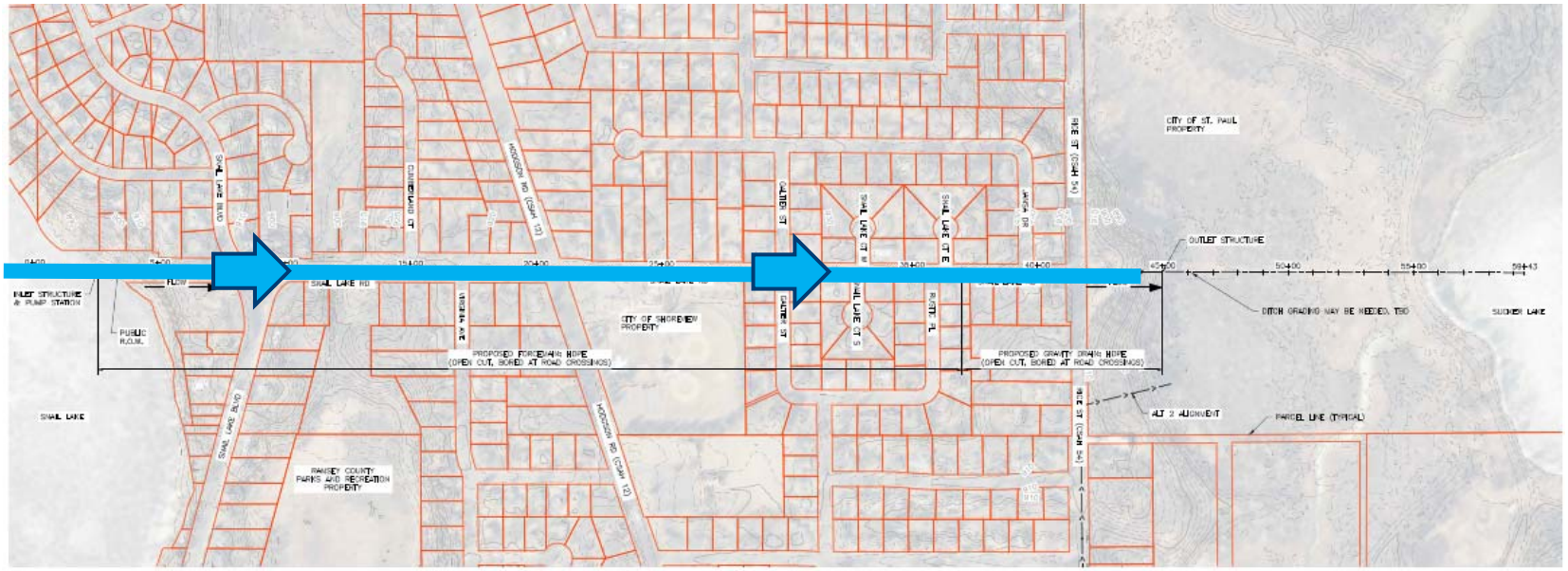
Snail Lake to Sucker Lake Pumping Evaluation

Snail Lake Road Alignment Concept

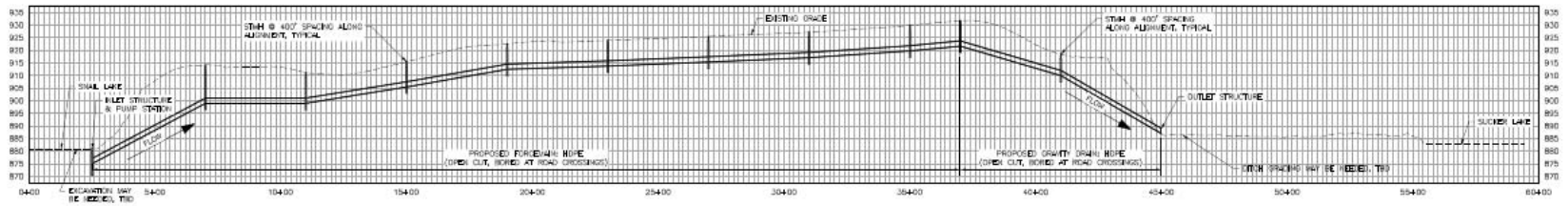
Snail Lake



Sucker Lake

1 PLAN: PROPOSED FORCEMAIN AND GRAVITY DRAIN ALONG SNAIL LAKE ROAD

4,200 LF +/-



2 PROFILE: PROPOSED FORCEMAIN AND GRAVITY DRAIN ALONG SNAIL LAKE ROAD

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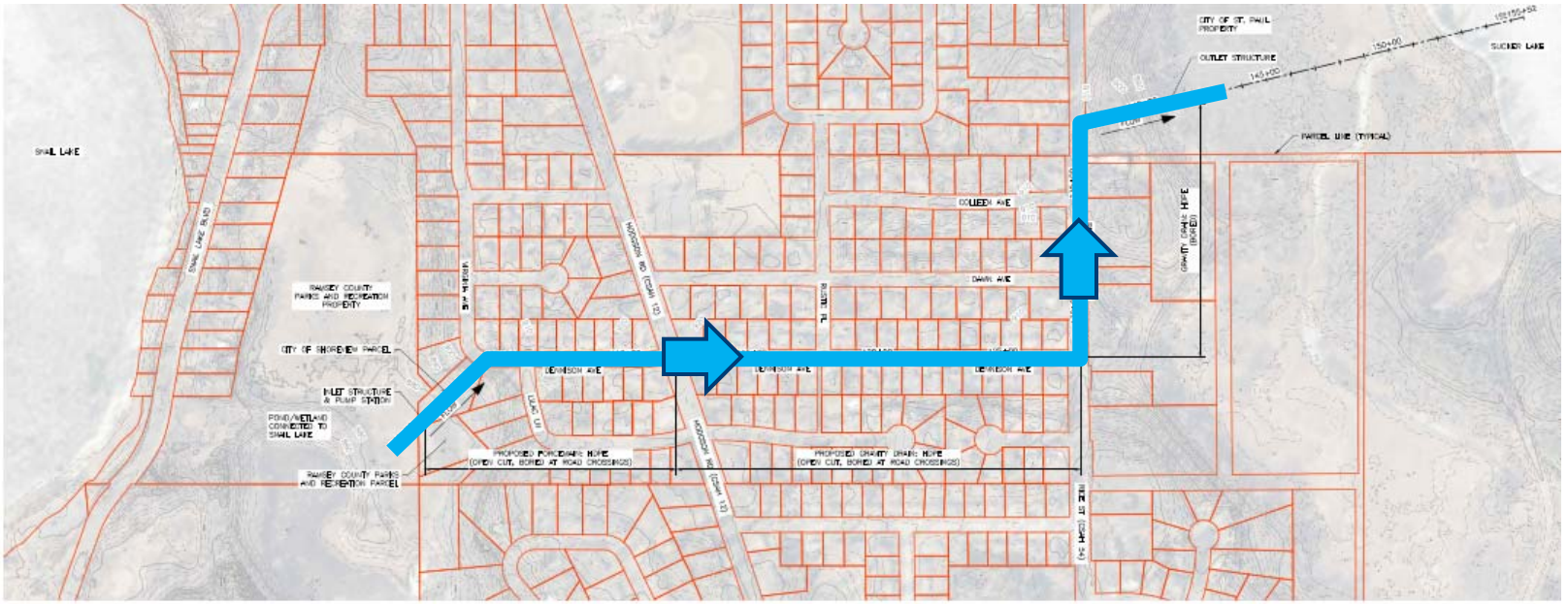
Snail Lake to Sucker Lake Pumping Evaluation

Dennison Avenue Alignment Concept

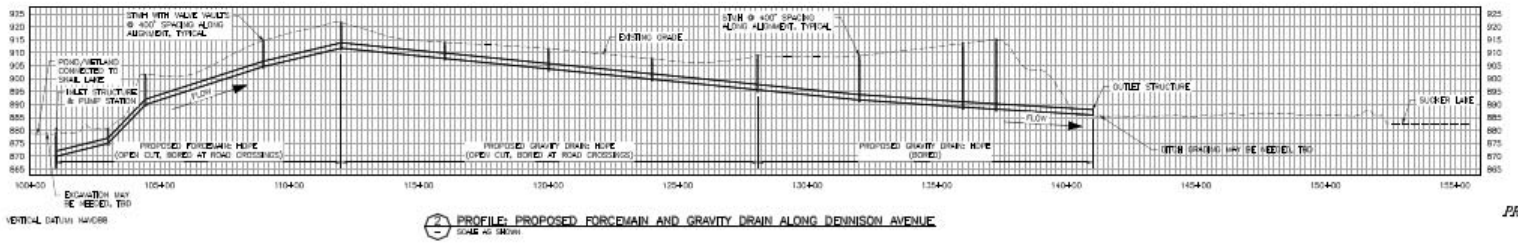
Snail Lake



Sucker Lake

1 PLAN: PROPOSED FORCEMAIN AND GRAVITY DRAIN ALONG DENNISON AVENUE

4,200 LF +/-



2 PROFILE: PROPOSED FORCEMAIN AND GRAVITY DRAIN ALONG DENNISON AVENUE

PRELIMINARY DRAFT

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Snail Lake to Sucker Lake Pumping Evaluation

Recommendations, Next Steps

Conceptual Alternative	Snail Lake Drawdown Time (Days)	No. of Permits	O&M	Capital Cost	Implementation Timeline	What Else ? ? ?
Snail Lake to Grass Lake 15" Gravity Pipe (1.2 cfs)						
Snail Lake to Sucker Lake Pumping (1.2 cfs, 10 cfs, 20 cfs)						
West Vadnais to East Vadnais Pumping - study is underway -						

The costs and feasibility issues associated will be evaluated against and compared to the other conceptual options

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