



GOLDEN LAKE IRON-ENHANCED SAND FILTER



Project Summary

Golden Lake, located in the City of Circle Pines, has been on the Minnesota Pollution Control Agency 303(d) impaired waters list since 2002 for aquatic recreation due to excess nutrients (phosphorus). The approved Total Maximum Daily Load identified stormwater runoff as an important contributor to the impairment. A 2012 stormwater retrofit analysis identified an iron-enhanced sand filter (IESF) retrofit to an existing pond in Centennial Green Park in the City of Blaine as one of the most cost-effective projects for phosphorus removal.

In 2014 the Rice Creek Watershed District (RCWD), City of Blaine and the Anoka Conservation District (ACD) partnered to install the project. Together, they applied for a Clean Water Fund grant, which was awarded and the project was installed in the summer and fall of 2015.



Project Specifications

IESF Size4,725 SF
 Date Installed September 2015
 Watershed Treated202 acres
 Phosphorus Reduction27 lbs/yr
 Annual Maintenance ~\$1,500/yr
 30-year cost per lb-TP removed.... \$267*

Project Cost

Feasibility Analysis\$7,785
 Design.....\$7,845
 Administration\$9,888
 Construction Oversight.....\$9,134
 Installation.....\$136,334
 Total Project Cost\$170,986

Project Funding

CWF\$88,590
 RCWD\$40,614
 City of Blaine.....\$24,440
 ACD.....\$8,552
 NPEAP.....\$8,790
 Total\$170,986

Iron Enhanced Sand Filter Project Location



The 202 acre contributing watershed (GL-5 catchment) is composed of 564 parcels; primarily medium density residential. In addition to installing the IESF, this project replaced the damaged outlet to the pond, restoring the pond's ability to capture 63lbs/yr total phosphorus (TP) and 24,286 lbs/yr total suspended solids (TSS).

The table below summarizes WinSLAMM model results for TP, TSS, and volume reductions related to street cleaning, a fully functional pond and installing the IESF.

GL-5 Catchment	Base Loads	Street Cleaning	Pond	IESF
TP (lbs/yr)	126.4	8	63	27
TSS (lbs/yr)	36,553	3,562	24,286	
Volume (acre-feet/yr)	86.25	NA	0.69	NA

*The 30-year cost per unit of pollutant removal includes actual installation, design, construction oversight, project development, and administration costs as well as estimate maintenance costs over the 30-year life of the project.

How Iron-Enhanced Sand Filters Work

IESFs work because dissolved phosphorus chemically binds to iron filings that are added to the sand filter medium. As the pond level rises after a storm event it floods over the IESF and infiltrates through it to a drain tile at the bottom of the filter. The drain tile discharges to the pond's emergency overflow. 80% of all water coming into the pond will leave through the IESF. Water discharging from the IESF has on average 80% less dissolved phosphorus and is free from suspended solids. Pretreatment is important to remove the bulk of sediment and debris to guard against clogging the filter. It is also important to have the iron and sand mixed evenly at 5-8% iron by weight.

Golden Lake Iron-Enhanced Sand Filter Installation

1. Draw down the stormwater pond.



2. Clear the site of trees and brush.



3. Install treated plywood wall with level top at precise elevation so water enters filter evenly.



4. Excavate the trench for sand media to specified elevation.



5. Install a impermeable membrane to keep groundwater out of the filter.



6. Install a sockless perforated drain tile with risers for inspection and maintenance.



7. Cover the drain tile with pea gravel and then overtop with well-mixed iron-enhanced sand.



8. Install rock on the pond-side of the plywood for reinforcement.



9. Install and pond outlet structure with emergency overflow and connect the drain tile.



10. Stabilize the outlet to the ditch with rock, revegetate bare soil, and let the treated water flow.



Project Partners

This project was made possible with funding from the Clean Water Fund of the Clean Water, Land, and Legacy Amendment, the Rice Creek Watershed District, the City of Blaine, the Anoka Conservation District, and the Non-Point Engineering Assistance Program.

