2015 Valley Branch Watershed District Infrastructure and Conveyance Systems Inspections

Prepared for
Valley Branch Watershed District Board of Managers

January 2016
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I hereby certify that this report was prepared by me or under my direct supervision and that I am a dulyLicensed Professional Engineer under the Laws of the State of Minnesota.

Nathan Campeau
PE #: 44917

January 26, 2016
Date
1.0 Executive Summary

The Valley Branch Watershed District (VBWD) owns, operates, and/or maintains a number infrastructure and conveyance systems throughout the VBWD, including streams, storm sewers, manholes, catch basins, water level control structures, infiltration basins, bank stabilizations, and dams. Natural and constructed, these systems convey, store, or treat surface water throughout the VBWD.

This report describes 19 VBWD systems (Figure 1-1) inspected by Barr on a regular basis. Observations made by Barr staff during each inspection, including recommendations for maintenance and further inspection are provided. This report also documents maintenance activities performed by VBWD in 2015, including many activities recommended by Barr in the 2014 inspection report. Where maintenance or inspection is recommended in 2016 a cost estimate and priority level (high, medium, and low) are provided.

In general, the VBWD systems continue to perform well, with some exceptions as documented in the report. Barr recommends that the managers authorize Barr to continue monitoring VBWD systems (natural and constructed) in 2016. Barr recommends that several of the systems be inspected only biannually; those systems would not be scheduled to be re-inspected until 2017. In addition, two of the systems were constructed in 2015 and are still under warranty; they will be inspected by Barr under a separate VBWD budget. Barr recommends that 11 of the 19 systems be inspected by Barr staff in 2016, for a total estimated cost of $24,000.

Barr recommends 20 maintenance activities, classified as Low, Medium, and High priority. While completing all repairs would cost an estimated $454,000, Barr recommends that VBWD authorize the completion of all High priority maintenance activities, for a total estimated cost of $86,000.

Barr estimates that the completion of all 2016 inspection and maintenance activities recommended in this report (assuming only High priority items are addressed in 2016) would cost $110,000.

In addition, Barr recommends that the Managers consider requiring the Washington Conservation District (WCD) to submit annual inspection reports or direct Barr to inspect and report on all projects that VBWD supported with contributions of more than $5,000. The cost for Barr to inspect and report on these projects is not included in this report.
Figure 1-1

INFRASTRUCTURE AND CONVEYANCE SYSTEMS

2015 Valley Branch Watershed District Infrastructure and Conveyance Systems Inspections Report
Valley Branch Watershed District
2.0 Systems Inspections

This section summarizes Barr’s inspections of Valley Branch Watershed District (VBWD) infrastructure and natural conveyance systems and subsequent maintenance recommendations. VBWD systems are shown on Figure 1-1 and maintenance recommendations are shown on Figure 4-1. Systems are generally organized geographically from northwest to southeast.

2.1 Project 1007

Background

In 1987, the VBWD constructed Project 1007—a large flood control project ($4.25 million). This project provides an outlet for many landlocked and flood-prone lakes in the northwest portion of the watershed, directing water to a Minnesota Department of Transportation (MnDOT) storm sewer along Interstate 94 and, ultimately, to the St. Croix River. The project included construction of new outlets for Long Lake, Lake Olson, Deer Pond, Hedges Pond, Hedges Bog, Lake Jane, Crombie Pond, Beutel Pond, Eagle Point Lake, Lake Elmo, Horseshoe Lake, the West Lakeland Storage Site (North, Middle, and South Ponds), and the MnDOT Rest Area Pond. VBWD has operated Project 1007 since construction. Project 1007 comprises approximately 5 miles of pipe, 60 manholes, and water level control structures (including over 40 catch basins/manholes), two dams, and approximately 2 miles of open channels.

VBWD performs periodic maintenance on system components, as needed. This includes annual mowing of the Rest Area Pond and the side slopes of the channels between Horseshoe Lake and Interstate 94 and the West Lake Storage Site South Pond.

Several Project 1007 components were repaired in 2015 as part of 2015 Capital Improvements Project Maintenance (2015 CIP). Those repairs are listed in Section 3.0. In addition, VBWD’s contractor removed fallen trees across the Project 1007 portion of Raleigh Creek in winter and fall 2015.

Observations

Barr staff inspects Project 1007 open channels, water level control structures, and dams on an annual basis. The remaining manholes and catch basins are inspected every 3 years on a rotating basis, unless maintenance activities necessitate more frequent inspection. On November 4 and 6, 2015, Patrick Brockamp, EIT, and Josh Phillips, EIT, conducted the regular (annual) inspection of Project 1007 components, as well as components repaired as part of the 2015 CIP. On November 6, 2015, Nathan Campeau, PE, inspected the Rest Area Pond Dam and the Eagle Point Lake Dam (part of the Project 1007 system). All open channels, manholes, catch basins, and structures were accessible for inspection.

During this inspection, we observed water flowing in portions of the Project 1007 system—typical for the time of year the inspections were performed. Appendix A provides a summary of the discharges observed throughout the system.
Appendices B and C contain separate inspection reports on Eagle Point Lake Dam and the Rest Area Pond, previously provided to the Managers.

Barr staff noted a number of issues that require maintenance, as noted below.

**Recommendations**

All of Project 1007’s components appeared to be performing adequately; however, we suggest the Managers consider the maintenance items listed below. Relevant photos are provided below these recommendations.

1. Continue annual mowing of the Rest Area Pond Dam and spillway.
2. Continue annual mowing of the side slopes of the channels between Horseshoe Lake and Interstate 94, including the West Lakeland Storage Site South Pond.
3. Clean threads and replace bolts at Manhole 37.
4. Remove:
   a. Downed trees (two locations) in Raleigh Creek, south of 28th Street North (Photo 1 and Photo 2).
   b. Downed tree and debris (two locations) in Raleigh Creek, north of 28th Street North (Photo 3 and Photo 4).
5. Collaborate with 3M Tartan Park to remove debris, downed trees, and old pedestrian bridges in the channel from Lake Elmo through Tartan Park (Photo 5, Photo 6, Photo 7, and Photo 8).
6. Remove trees at West Lakeland Storage sites (Photo 9, Photo 10, Photo 11, and Photo 12), including:
   a. Downed trees (two locations) in West Lakeland Storage Site Channel, south of the South Pond.
   b. Downed trees (three locations) in West Lakeland Storage Site Channel between the Middle and North Ponds.
   c. Small trees (two locations) growing near flared-end sections of reinforced-concrete pipe (RCP) in West Lakeland Storage Site Channel between Middle and North Ponds.
7. Remove accumulated dead trees and debris near the Rest Area Pond outlet and within the pipe to Structure 2 (Photo 13).
8. Inspect the Project 1007 storm sewer via video. This storm sewer has not been inspected since construction in 1987; many municipalities make video inspections of their infrastructure every 5 to 10 years.
9. Replace wooden stop logs with aluminum stop logs at all water level control structures (3, 4, 5, 10, 11, and 12).
10. Replace wooden stop logs at Structure 6. These have significant leakage and should be replaced quickly (Photo 14).
11. Develop a step-by-step set of procedures to implement the existing Minnesota Department of Natural Resources (MnDNR)-approved operations (emergency drawdown) plan. See Appendix D for the existing lake operations plans.

12. Prepare and distribute literature to Tri-Lakes area residents regarding the history and benefits of Project 1007.

13. Prepare and publish a newspaper article documenting the completion of the Project 1007 inspection and describing the history and benefits of the project.

14. Monitor the Rest Area Pond Dam for the presence of animal burrows similar to those observed on the downstream face in 2015

15. Request that Washington County remove two small trees near Structure 7 at Eagle Point Lake Dam and spray stumps with herbicide to prevent regrowth (Photo 15). Barr made this request in December 2015.

Barr recommends continuing the annual inspection of Project 1007, including the associated dams. As noted in the Rest Area Pond Dam Report in Appendix C, Barr recommends continued monitoring of animal burrows (similar to those observed on the downstream face in 2015) as part of annual inspections.

Photo 1 (Nov. 2015): Barr recommends removing fallen trees from Raleigh Creek, downstream of the 2013 culvert removal site.
Photo 2 (Nov. 2015): Barr recommends removing fallen trees from Raleigh Creek, downstream of the 2013 culvert removal site (28th Street North).

Photo 3 (Nov. 2015): Barr recommends removing fallen tree and accumulated debris from Raleigh Creek, upstream of the 2013 culvert removal site (28th Street North).
Photo 4 (Nov. 2015): Barr recommends removing accumulated debris from Raleigh Creek, upstream of the 2013 culvert removal site.

Photo 5 (Nov. 2015): Barr recommends removing fallen trees in channel from Lake Elmo to Tartan Park.
Photo 6 (Nov. 2015): Barr recommends removing fallen trees in channel from Lake Elmo to Tartan Park.

Photo 7 (Nov. 2015): Barr recommends removing fallen trees in channel from Lake Elmo to Tartan Park.
Photo 8 (Nov. 2015): Barr recommends removing old bridges on channel banks from Lake Elmo to Tartan Park.

Photo 9 (Nov. 2015): Barr recommends removing fallen trees in West Lakeland Storage Site channel, south of South Pond.
Photo 10 (Nov. 2015): Barr recommends removing fallen trees in West Lakeland Storage Site channel, south of South Pond.

Photo 11 (Nov. 2015): Barr recommends removing fallen tree in West Lakeland Storage Site channel, south of North Pond.
Photo 12 (Nov. 2015): Barr recommends removing small trees in West Lakeland Storage Site channel, between the Middle and North Ponds, near flared ends of reinforced-concrete pipe (RCP).

Photo 13 (Nov. 2015): Barr recommends removing dead trees and debris from Rest Area Pond Outlet.
Photo 14 (Nov. 2015): Hole in stop logs in Structure 6 at Eagle Point Lake Dam. Barr recommends replacing wooden stop logs with aluminum stop logs at all structures (3, 4, 5, 6, 10, 11, 12).

Photo 15 (Nov. 2015): Barr recommends coordinating with Washington County to remove small trees near Structure 7 at Eagle Point Lake Dam. Barr contacted the County in December 2015 to complete this request.
2.2 Echo Lake Outlet

Background
The Echo Lake Outlet was a cooperative project with the City of Mahtomedi to construct a new restricted outlet from Echo Lake. The City of Mahtomedi modified the Echo Lake Outlet in 1999 to restrict outflows and protect downstream areas from flooding, as required by the VBWD. In 2002, the city installed a metal fence in front of the outlet to prevent debris from accumulating on the outlet structure.

Observations
Patrick Brockamp and Josh Phillips inspected the Echo Lake Outlet on November 6, 2015, and found the structure in good condition.

Recommendations
Barr recommends continuing the annual inspection of this project.

2.3 Weber Pond Outlet

Background
Weber Pond is a 7.5-acre wetland in the City of Mahtomedi that is split in two by an old streetcar embankment. In 2001, VBWD constructed a restricted outlet from the larger upstream portion of Weber Pond to the smaller downstream portion of Weber Pond to replace the previous temporary outlet and limit the flood level of Long Lake.

Observations
The overflow structure and weir appeared in good condition.

Recommendations
Barr recommends continuing the annual inspection of this project.

2.4 Long Lake Ravine Stabilization Project

Background
The Long Lake Ravine Stabilization Project was constructed by the VBWD in 2009. The project included channel grading, riprap, and natural vegetation to stabilize the head of a ravine entering Long Lake from the west. A portion of the stream entering the ravine is contained within a culvert and manhole to give neighboring landowners access to their property.
**Observations**

Jeff Weiss, PE, visited the site in August 2014. The project area was in good condition with well-established vegetation and no signs of erosion; however, vegetation was too tall to allow safe access and full inspection of all portions of the project. There was no water flowing at the time of inspection.

**Recommendations**

Barr recommends continuing the biannual inspection of this project, as scheduled for 2016.

### 2.5 DeMontreville Ravine Stabilization Project

**Background**

The DeMontreville Ravine Stabilization Project was constructed by the VBWD in 2009. The ravine runs through the City of Lake Elmo’s DeMontreville Wildlife Park, connecting the ponds downstream of Long Lake with Lake DeMontreville. Boulder cross vanes, straight vanes, and natural vegetation were installed to repair and stabilize the stream banks throughout the ravine. To reduce the amount of sediment entering Lake DeMontreville, a sedimentation basin was also installed.

**Observations**

On November 6, 2015, Patrick Brockamp and Josh Phillips inspected the project, observing accumulated sediment in the DeMontreville Ravine sedimentation basin and in Lake DeMontreville at the outlet from the basin to the lake. The basin is now completely full, allowing additional sediment to accumulate in the lake.

The vegetation along the entire ravine is well-established, including the tree and shrub plantings.

In 2014, Barr observed significant gaps between boulders where small rock and gravel had washed away and accumulated in the ravine channel immediately downstream of several boulder cross vanes. There were also several areas of erosion in the channel near cross vanes and a fallen tree near one of them. VBWD’s contractor repaired these items as part of the 2015 CIP.

Following flooding in the summer of 2014, the City of Lake Elmo requested the installation of a vortex-inducing device on Catch Basin 47 at the downstream end of DeMontreville Ravine. The purpose of the device is to keep the grate clear of debris and allow more efficient flow from the ravine to the catch basin. VBWD’s contractor installed a baffle box around the existing outlet structure as part of the 2015 CIP, and the flat, slotted grate was replaced with a stool-type grate to prevent accumulation of debris. The improvements appear to be functioning well, with no observed plugging or flow backup observed in November 2015.

**Recommendations**

To restore the sediment-removal capacity of the basin and the lake shoreline, Barr recommends removing sediment from the sedimentation basin and from Lake DeMontreville at the outlet from the basin to the lake (see Photo 16 and Photo 17). New state rules regarding sediment removal require sediment sampling
and permitting, as well as special landfill disposal of excavated materials. Barr recommends continuing the annual inspection of this project.

Photo 16 (Oct. 2014): Barr recommends removing the accumulated sediment in the basin on the downstream end of the DeMontreville Ravine and at the basin outlet to Lake DeMontreville.

Photo 17 (Oct. 2014): Barr recommends removing the accumulated sediment in Lake DeMontreville.
2.6 Olson Lake Estates Pond Outlet Project

Background

VBWD constructed the Olson Lake Estates Outlet in 1996 to connect the overflow from the Olson Lake Estates Pond (located west of Lake Olson in an Oakdale housing development) to Project 1007. This allows the stormwater runoff from the housing development to bypass Lake Olson and discharge to Project 1007 downstream of Crombie Pond—protecting the water quality of Lake Olson. The project included the construction of 19 manholes. These are inspected every 3 years on a rotating basis, unless maintenance activities necessitate more frequent inspection.

Observations

As part of the 2015 CIP, VBWD’s contractor repaired six leaking manholes in October. Patrick Brockamp and Josh Phillips inspected these manholes (and four others) on November 6, 2015, to verify that the repair work had been completed. Repairs primarily addressed leaking caps and tubes near the bottom of the manholes and staff observed that the work was complete and adequate.

Recommendations

Barr recommends that VBWD inspect the storm sewer via video. The Olson Lake Estates Pond Outlet Project storm sewer has not been inspected since construction in 1996. Many municipalities use video to inspect their infrastructure every 5 to 10 years. Barr also recommends continuing the annual inspection of this project.

2.7 Raleigh Creek Bank Stabilization Project

Background

The VBWD Raleigh Creek Bank Stabilization Project, constructed in 2009, includes two reaches. The first reach is in Oakdale’s Anna’s Grove development. It is located approximately between the railroad tracks and 31st Street North, primarily on City of Oakdale property. A small section of the creek meanders onto the private property, currently owned by Tony Ulrich (7650 31st Street North). The second reach is approximately 350 feet upstream of Tablyn Park in Lake Elmo on private properties currently owned by David Moore, Jr. (8680 Stillwater Boulevard) and Michael Reid (8740 Stillwater Boulevard). Stabilization work included installation of cross vanes for grade control, two new outlets for stormwater ponds, root wads, live stakes, and plantings.

Observations

Jeff Weiss and Manager Ed Marchan visited the erosion sites on May 9, 2015. Most areas within the project extents remained in stable condition; however, minor erosion was present upstream of a rock vane installed on the Moore property (8680 Stillwater Boulevard). The channel upstream of the project extent was incised with some undercut banks.
Recommendations

Barr recommends continued biannual monitoring of the minor erosion on the Moore property (8680 Stillwater Boulevard) and the stream upstream of the property to determine if any additional action is necessary. The next planned inspection is in 2017.

2.8 Raleigh Creek

Background

Raleigh Creek is a perennial stream that drains water from portions of Oakdale and Lake Elmo, ultimately discharging to Eagle Point Lake. Both Project 1007 and the Raleigh Creek Bank Stabilization Project (described in Section 2.1 and 2.7) include the reach of Raleigh Creek downstream of Stillwater Boulevard (CSAH 6).

Observations

During inspections of past stabilization and maintenance projects, Barr staff members have regularly observed a variety of Raleigh Creek reaches; however the last comprehensive inspection of the creek occurred 5 years ago.

Recommendations

Barr recommends completing a biannual inspection of the entire creek, with the next inspection in 2016.

2.9 Farney Creek Stabilization Project

Background

VBWD constructed the Farney Creek Stabilization Project in 2005 on the property currently owned by Brad and Annette Weiss (8171 21st Street North) within the Torre Pines subdivision of Lake Elmo. In March 2013, VBWD installed riprap to repair bank erosion caused by a July 2011 storm. In May 2013, the contractor returned to make final adjustments and repair minor damage to the lawn and sprinkler caused during riprap installation. In the spring of 2014 the homeowners noted new erosion downstream of the repaired area and adjacent to a private walking bridge.

Observations

Jeff Weiss conducted a site investigation May 9, 2015, with Manager Ed Marchan. Christian Frias, a water resources specialist with Barr, also surveyed the stream on the property currently owned by Joe and Tammy Dunckel (8219 21st Street North), immediately downstream of the Weiss property, to investigate landowner complaints about bank erosion. Weiss and Marchan observed the erosion downstream of the previously repaired area and upstream of the private walking bridge. The cause of the erosion downstream of the previously repaired area was not apparent; however, grasses and flowers previously planted on the bank were colonizing the eroded area and should help provide some vegetative reinforcement. At the eroding bank upstream of the walking bridge, they observed that the contours of
the stream bed were directing base flow into the toe of the bank. Frias observed an incised channel with eroding banks on the Dunckel property. This situation is exacerbated by turf grass mowed to the top of the bank.

**Recommendations**

Barr recommends continued monitoring of the new erosion on the Weiss property and an inventory of Farney Creek upstream of Ideal Avenue. This will help determine whether systemic issues are contributing to the erosion problems, including the potential headcut observed on the Dunckel property ([Photo 18](image), [Photo 19](image), and [Photo 20](image)). Barr recommends continuing the annual inspection of this project.

**Photo 18 (2013):** Bank erosion downstream of riprap installed on Farney Creek in 2013. Barr recommends completion of an erosion inventory upstream of Ideal Avenue to determine whether systemic issues are contributing to erosion along Farney Creek at the Weiss property (8171 21st Street North).
Photo 19: Bank erosion near a private walking bridge on Farney Creek. Barr recommends an erosion inventory upstream of Ideal Avenue to determine whether systemic issues are contributing to erosion along Farney Creek at the Weiss property.

Photo 20: Debris jam and potential headcut on Farney Creek. Barr recommends an erosion inventory upstream of Ideal Avenue to determine whether systemic issues are contributing to erosion along Farney Creek at the Weiss property.
2.10 Goetschel Pond Ravine Stabilization Project

Background

VBWD constructed the Goetschel Pond Ravine Stabilization Project in 2008 in the City of Lake Elmo, with final plantings installed in early 2009. The ravine drains to Goetschel Pond and affects land on property currently owned by:

- Julie and Michael Nelson (4768 Larkspur Lane North)
- Kevin and Maureen Tholen (4854 Linden Trail North)
- Anthony and Sara Yocum (4886 Linden Trail North)
- Mitchell and Karen Jorgensen (4910 Linden Trail North)
- Parcels owned by the Fields of St. Croix Homeowners Association
- Out lots owned by the Robert Engstrom Companies

Prior to the project, residents reported erosion and accumulation of sediment at the downstream end of the ravine. Stabilization required:

- Importing fill to rebuild the base.
- Installing an armored channel to prevent future erosion of the base.
- Installing vegetated reinforced soil slope (VRSS) to stabilize a steep slope adjacent to a private residence.
- Repairing an upstream detention pond to prevent stormwater seepage near the outlet pipe.

Observations

Barr staff last visited the site on May 16, 2014, and observed no problems; the site is inspected on a biannual basis. On January 12, 2016, a representative from the Fields of St. Croix Homeowners Association contacted Barr and reported that sediment has accumulated at the downstream end of the ravine and plugged a culvert under a trail.

Recommendations

Barr recommends completing an inspection with the representative from the Fields of St. Croix Homeowners Association to investigate the report of accumulated sediment. Barr also recommends continuing the biannual inspection of this project, with the next inspection in the spring of 2016.

2.11 Goose Lake Ravine Stabilization Project

Background

VBWD constructed the Goose Lake Ravine Stabilization Project in 2008 on the properties currently owned by David and Diane Zimmerhakl (9200 10th Street North) and Dennis and Karen Geffre (9140 10th Street
North) to stabilize significant erosion at the head of the ravine. Final plantings were installed early in 2009. Mr. Zimmerhakl had made several attempts to stabilize the channel on his property with mixed results. The initial project included installation of rock vanes, plantings, and an armored channel through the steepest and most actively eroding portion of the channel. High flows in the following years undermined the armoring and caused additional erosion in the armored channel. Two large rock vanes were installed in the ravine in December 2012 to act as grade control and stop erosion.

Observations
Jeff Weiss and Manager Ed Marchan visited the project site on May 9, 2015. Despite installation of the two rock vanes in December 2012, erosion problems have persisted and boulders in one of the vanes have been displaced. The channel has widened between the vanes and shows downcut upstream of the upstream vane (see Photo 21).

Recommendations
Barr recommends (1) installing two more vanes to prevent additional downcutting, (2) repairing the vane with the displaced boulder, and (3) installing armoring in select places to prevent general bank erosion and keep erosion and headcutting from moving around the sides of the vanes. Barr also recommends continued annual inspection of this project.

Photo 21: Barr recommends installation of two additional vanes and some armoring on the Goose Lake Ravine (above: channel widening and erosion at Goose Lake Ravine).
2.12 Downs Lake Flood Duration Reduction Project

Background
VBWD constructed the Downs Lake Flood Duration Reduction Project in 2002 to provide an emergency flood outlet from Downs Lake and a complex of wetland and lowlands adjacent to it. The project created a lower overflow from Downs Lake to Horseshoe Lake, which is part of the Project 1007 system. Efforts included the installation of pipes, a check valve (which acts as a flap gate), and two gates (which require manual operation). The operating plan for the gates allows the water level on Downs Lake to be lowered under certain conditions.

VBWD’s contractor removed vegetation surrounding the cover of one of the gatewell structures and one of the manholes as part of the 2015 CIP.

Observations
Patrick Brockamp and Josh Phillips inspected the project on November 4, 2015. With the exception of missing and sheared bolts on Gatewell Structure 2, all components were operational and in good condition.

Recommendations
Barr recommends removal and replacement of the sheared bolt and replacement of the missing bolt on Structure 2. Barr also recommends inspection of the storm sewer via video. This storm sewer has not been inspected since construction in 2002. Many municipalities conduct a video inspection of their infrastructure every 5 to 10 years. Barr recommends continuing the annual inspection of this project.

2.13 Oakgreen Avenue Infiltration Basin

Background
VBWD completed the Oakgreen Avenue Infiltration Basin Project in 2008. The project involved the construction of a large infiltration basin at the top of an eroding ravine that feeds runoff directly to Valley Creek. The basin is approximately 0.4 acres and reduces runoff volume and sediment to Valley Creek.

Observations
John Hanson, PE, visited the project in June 2015 and found it in good condition.

Recommendations
Barr recommends continuing the biannual inspection of this project, with the next inspection in 2017.
2.14 Landucci Ravine (CWF Ravine Stabilizations Project)

Background
The Landucci Ravine Stabilization Project stabilized approximately 1,000 feet of eroding ravine in Afton with 17 check dams and a riprapped drop structure. A grant from the Clean Water Fund paid for construction of the project, completed in December 2015.

Observations
Aside from construction observation inspections, no formal inspections were completed.

Recommendations
Warranty inspections will be conducted through 2016, the end of the warranty period. After 2016, Barr will determine whether the project should be inspected annually or biannually.

2.15 2010 Stabilization Project—Blasko Dam Removal

Background
VBWD completed the Blasko Dam Removal Project in late summer 2010. The existing dam was removed and replaced with a series of boulder weirs to maintain upstream water levels. This action was desired by the landowner and prevented channel downcutting at the upstream bridge on Valley Creek Trail. The boulder weirs are beneficial because they allow upstream fish passage and result in less upstream pool area. They also reduce solar input to the stream, which is detrimental to trout. The project is located on the property currently owned by Scott and Audrey Blasko (14020 Valley Creek Trail South).

Observations
Tom MacDonald, PE, and Managers Jill Lucas and Ed Marchan inspected the project on April 22, 2015. Scott Blasko was present during the inspection. The project site was in good overall condition, with no observed erosion issues. There has not been a large flood at this site since construction; these typically occur following rapid snowmelt or large precipitation events when the ground is frozen.

Mr. Blasko expressed concern that someone placed sandbags below the Valley Creek Trail Bridge at the upstream end of his property. These sandbags have encouraged beavers to construct a dam below the bridge, backing up water and reducing flow through his property. The bridge is the responsibility of the City of Afton. The City of Woodbury confirmed these sandbags were not placed as part of their flow monitoring effort. Barr attempted to contact (via voicemail) the City of Afton, but city staff did not respond.

Recommendations
Mr. Blasko intends to put his property on the market in the near future. If the property is sold, the new owner should be informed about the project. Improvement of the riparian buffer (buckthorn removal,
establishment of additional native vegetation) may provide further improvement to this site. If the property does not sell, the site should be re-visited and inspected in 2–3 years.

2.16 Valley Creek Upstream Stabilization Project

Background

The Valley Creek Upstream Stabilization Project addressed bank erosion on properties currently owned by Jeff and Angela Polacek (14100 Valley Creek Trail South) and Joseph Meissner (14186 Valley Creek Drive South) that was exacerbated by a severe flood in the spring of 2007. Work on the Polacek property consisted of stabilizing a short portion of streambank using a root wad, grading, biolog, and revegetation. More extensive repairs were required on the Meissner property, located several hundred feet downstream from Polacek. VBWD repaired two significant eroded banks using a combination of grading, root wads, boulder vanes, and riprap. VBWD replaced an illegal weir/culvert with a boulder riffle that is more amenable to fish passage. VBWD also repaired one bank in 2009 to address erosion from a contributing ravine.

Observations

On April 22, 2015, Tom MacDonald and Managers Jill Lucas and Ed Marchan inspected the project work on the Meissner property. They found the site to be largely stable and in good condition. The project has improved trout habitat by creating a greater diversity of channel depth and replacing the impassable culvert with a fish-friendly boulder weir. Staff observed the presence of trout near root wads installed at the upstream bend. Barr staff also observed minor bank erosion at two sites that is unrelated to the project work. This site should be re-inspected in 2–3 years. Barr did not receive permission to inspect the Polacek site.

Recommendations

Barr recommends continuing the biannual inspection of this project, with the next inspection in 2017.

2.17 Valley Creek Downstream Stabilization Project

Background

In 2009, VBWD completed the Valley Creek Downstream Stabilization Project (formerly owned by Tom Johnson and now owned by Mr. and Mrs. Rivas [15901 Putnam Boulevard South] and Susan Stanton [2398 St. Croix Trail South]). The purpose of the project was to stabilize the badly eroded and incised channel reach. To accomplish this, VBWD:

- Installed a series of eight boulder riffles to achieve channel grade control.
- Created floodplain terraces to provide connectivity to the floodplain.
- Restored the riverbanks with native vegetation.
Channel banks that were susceptible to erosion were stabilized using bioengineering methods (primarily root wads). A native vegetation buffer was also established along the project corridor to provide additional protection and habitat value.

The project has been largely successful and the impacted reach of Valley Creek is considered stable. The current landowner of the upstream property has not maintained the established native buffer, increasing the susceptibility of the project reach to future erosion. In addition, the channel is eroding the east bank at the upstream-most riffle and in need of repair to prevent further erosion.

**Observations**

Tom MacDonald inspected the creek corridor on the Rivas property with VBWD Managers Jill Lucas and Ed Marchan on April 22, 2015. During the inspection staff noted that the project buffer had not been maintained. Mr. Rivas attended the May 28, 2015, VBWD Board Meeting to discuss the District’s desire to maintain the buffer and agreed to a follow-up meeting on July 7, 2015. John Hanson and Tom MacDonald and Managers Jill Lucas and Ed Marchan attended this meeting at the Rivas residence.

**Recommendations**

In 2015, Barr recommended repairing the upstream riffle (Riffle 8, Photo 22)—repositioning the boulders on the left side of the riffle (looking downstream) and adding additional boulders to further reinforce the riffle. A small amount of riprap bedding would likely be necessary, and the immediate channel bank would need to be graded, seeded, and protected with erosion-control blanket.

Barr also recommended repairing the bank immediately downstream of Riffle 8, provided that Mr. Rivas agrees to stop mowing the overbank adjacent to the erosion area. The stabilization would consist of installing three root wads in the bank, preferably from the Rivas property (15901 Putnam Boulevard South). The adjacent bank would be graded, seeded, and protected with erosion-control blanket.

Based on input from the Managers at their July 23 meeting, Barr developed construction drawings for the repairs and solicited quotes from two contractors who were working on other projects in the area (Nadeau Companies, LLC, and G.F. Jedlicki, Inc.). Tom MacDonald met with both contractors on site; both submitted quotes by Monday, September 28. On October 2, the Minnesota Department of Natural Resources (MnDNR) area hydrologist and fisheries staff met with Barr staff and advised that construction activity could not occur during the spawning activity restriction period (September 1, 2015 to April 1, 2016). MnDNR also requested some minor modifications to the stabilization design; these will be incorporated before spring 2016. Nadeau and Jedlicki will be given an opportunity to revise their bids prior to the 2016 construction period; other bids may also be solicited. Construction will take place between April 2 and August 31, 2016, as flow conditions allow. Barr recommends continuing the biannual inspection of this project, with the next inspection in 2017.
2.18 30th and Trading Post (CWF Ravine Stabilizations Project)

Background
VBWD stabilized approximately 325 feet of an eroding ravine near the intersection of 30th Street South and Trading Post Trail South in Afton with a concrete drop structure and 130 feet of 60-inch-diameter pipe. A grant from the Clean Water Fund paid for construction of the project, completed in December 2015.

Observations
Aside from construction observation inspections, no formal inspections were completed at this location.

Recommendations
Barr will conduct warranty inspections through 2016, the end of the warranty period. After 2016, Barr will determine whether the project should be inspected annually or biannually.

2.19 Kelle’s Creek

Background
Kelle’s Creek is part of a subwatershed that was formally part of the Lower St. Croix Watershed Management Organization (LSCWMO) and added to VBWD in 2009. The perennially flowing portion of
the creek is located in a steep-walled valley that drains to the St. Croix River. Information from the LSCWMO indicated that there were potential erosion issues. In 2012 and 2013, Barr completed an erosion assessment and a survey of eroding banks. After reviewing a summary of options (on-going monitoring or stabilization) and screening-level cost estimates prepared by Barr, the Managers elected to monitor the erosion in 2015.

**Observations**

Barr staff visited the erosion areas with Managers Lucas and Marchan on April 16, 2015. Two eroding areas where fallen trees appeared to be directing flow into the stream bank and exacerbating localized erosion were observed. Barr recommended that the fallen trees be removed from the creek and placed outside the creek banks so they would not return to the channel. In 2015, Buelow Excavating removed the fallen trees from properties currently owned by:

- Robin McDowell (15612 36th Street)
- Thomas and Connie Johnson (6 Coulee Ridge Road)
- Coulee Ridge Homeowner’s Association

**Recommendations**

Barr recommends biannual inspection of Kelle’s Creek, with the next inspection in 2017.
### 3.0 Maintenance Work Performed in 2015

The Managers took the following actions in 2015:

1. Hired Buelow Excavating to:
   a. Mow the Rest Area Pond Dam crest and spillway ($500).
   b. Mow the side slopes of the channels between Horseshoe Lake and Interstate 94, including the West Lake South Storage Sites ($1,800).
   c. Remove several fallen trees along Raleigh Creek between Tablyn Park and Lake Elmo Park Reserve ($1,425).
   d. Remove a fallen tree along Raleigh Creek, roughly 500 feet north of 28th Street North ($1,200).

2. Hired G. F. Jedlicki, Inc. to perform various maintenance repairs at Downs Lake Flood Duration Reduction Project, Olson Lake Estates Pond Outlet Project, Project 1007, and DeMontreville Ravine Stabilization Project ($23,205; see Table 3-1).

The total cost of these repairs was $28,130, excluding Barr fees.

**Table 3-1: Maintenance Completed for 2015 Capital Improvement Projects**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Open manhole casting (Structures 11, 15, and 33)</td>
</tr>
<tr>
<td>2</td>
<td>Replace broken catch basin grate, Neenah casting R-4342 (Catch Basin 23)</td>
</tr>
<tr>
<td>3</td>
<td>Repair leaks between stop logs in Structure 3</td>
</tr>
<tr>
<td>4</td>
<td>Repair leaks between stop logs in Structure 12</td>
</tr>
<tr>
<td>5</td>
<td>Repair displaced stop log (Structures 5 and 10)</td>
</tr>
<tr>
<td>6</td>
<td>Repair missing/deteriorated mortar between adjusting rings at Structure 4</td>
</tr>
<tr>
<td>7</td>
<td>Apply herbicide to kill poison ivy near Lake Elmo Outlet</td>
</tr>
<tr>
<td>8</td>
<td>Repair leaking plastic repair tube in Manhole 40</td>
</tr>
<tr>
<td>9</td>
<td>Repair leaking plug in Manhole 7</td>
</tr>
<tr>
<td>10</td>
<td>Inspect manholes 2, 3, 4, 5, and 6</td>
</tr>
<tr>
<td>10</td>
<td>Remove vegetation near Structure 2</td>
</tr>
<tr>
<td>11</td>
<td>Remove vegetation and sediment near Manhole 2</td>
</tr>
<tr>
<td>12</td>
<td>Remove accumulated small rocks and gravel from ravine near Rock Vanes 1 and 2</td>
</tr>
<tr>
<td>13</td>
<td>Install mixed field stone gravel and cobbles (well-graded 0.5&quot; to 6&quot;) at Cross Vanes 1–4</td>
</tr>
<tr>
<td>14</td>
<td>Repair bank erosion with grading, seeding, and erosion-control blanket—multiple locations</td>
</tr>
<tr>
<td>15</td>
<td>Remove fallen tree downstream of Rock Vane 4</td>
</tr>
<tr>
<td>16</td>
<td>Install baffle box and replace grate at CB47</td>
</tr>
</tbody>
</table>
4.0 Recommendations

We recommend that the Managers consider the inspection, operation, and maintenance items summarized in Table 4-1 and Table 4-2. If the Managers agree to the recommended actions, we will obtain bids from contractors to perform the recommended and approved work and present those bids to the Managers for consideration. Several recommended projects could be grouped and performed by a single contractor to reduce costs. Maintenance locations are shown on Figure 4-1.

The Managers have not received any reports from Washington Conversation District (WCD) regarding best management practices (BMP) cost-share projects (e.g., Top50! projects such as the Wiessner sedimentation basin, the Wiessner/Hill gully stabilization, the Murphy grass waterway, and the Wamstad grass waterway). Barr recommends that the Managers consider requiring that WCD submit annual inspection reports or direct Barr to inspect and report on all projects that VBWD supported with contributions of more than $5,000. The cost for Barr to inspect and report on these projects is not included in this report.

4.1 Inspections

Table 4-1 summarizes the recommended inspection and reporting frequency and cost for each VBWD system described in Section 2.0.

<table>
<thead>
<tr>
<th>System</th>
<th>Inspection Frequency</th>
<th>Last Inspected</th>
<th>Next Recommended Inspection</th>
<th>Estimated 2016 Inspection/Reporting Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project 1007</td>
<td>Annual</td>
<td>2015</td>
<td>2016</td>
<td>$13,000</td>
</tr>
<tr>
<td>Echo Lake Outlet</td>
<td>Annual</td>
<td>2015</td>
<td>2016</td>
<td>$500</td>
</tr>
<tr>
<td>Weber Pond Outlet</td>
<td>Annual</td>
<td>2015</td>
<td>2016</td>
<td>$500</td>
</tr>
<tr>
<td>Long Lake Ravine Stabilization Project</td>
<td>Biannual</td>
<td>2014</td>
<td>2016</td>
<td>$500</td>
</tr>
<tr>
<td>DeMontreville Ravine Stabilization Project</td>
<td>Annual</td>
<td>2015</td>
<td>2016</td>
<td>$1,000</td>
</tr>
<tr>
<td>Olson Lake Estates Pond Outlet Project</td>
<td>Annual</td>
<td>2015</td>
<td>2016</td>
<td>$2,500</td>
</tr>
<tr>
<td>Raleigh Creek Bank Stabilization Project</td>
<td>Biannual</td>
<td>2015</td>
<td>2017</td>
<td>NA</td>
</tr>
<tr>
<td>Raleigh Creek</td>
<td>Biannual</td>
<td>2014</td>
<td>2016</td>
<td>$3,000</td>
</tr>
<tr>
<td>Farney Creek Stabilization Project</td>
<td>Annual</td>
<td>2015</td>
<td>2016</td>
<td>$500</td>
</tr>
<tr>
<td>Goetschel Pond Ravine Stabilization Project</td>
<td>Biannual</td>
<td>2014</td>
<td>2016</td>
<td>$500</td>
</tr>
<tr>
<td>Goose Lake Ravine Stabilization Project</td>
<td>Annual</td>
<td>2015</td>
<td>2016</td>
<td>$500</td>
</tr>
<tr>
<td>Downs Lake Flood Duration Reduction Project</td>
<td>Annual</td>
<td>2015</td>
<td>2016</td>
<td>$1,500</td>
</tr>
<tr>
<td>Oakgreen Avenue Infiltration Basin</td>
<td>Biannual</td>
<td>2015</td>
<td>2017</td>
<td>NA</td>
</tr>
<tr>
<td>Landucci Ravine (CWF Ravine Stabilizations)</td>
<td>TBD*</td>
<td>2015</td>
<td>2016</td>
<td>NA**</td>
</tr>
<tr>
<td>2010 Stabilization Project—Blasko Dam</td>
<td>Biannual</td>
<td>2015</td>
<td>2017</td>
<td>NA</td>
</tr>
<tr>
<td>Valley Creek Upstream Stabilization Project</td>
<td>Biannual</td>
<td>2015</td>
<td>2017</td>
<td>NA</td>
</tr>
</tbody>
</table>
### 4.2 Operations and Maintenance Items

Table 4-2 summarizes responsible parties, planning-level cost estimates, and estimated priority (*High, Medium, or Low*) for recommended maintenance activities. Costs include all project-related costs including contractor and Barr time and expenses.

**Table 4-2  Recommended Operations and Maintenance Activities Based on 2015 Inspections**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Responsible Party</th>
<th>Planning-Level Cost Estimate</th>
<th>Estimated Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project 1007</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Annual mowing of the Rest Area Pond Dam and spillway</td>
<td>VBWD</td>
<td>$500</td>
<td>High</td>
</tr>
<tr>
<td>2</td>
<td>Annual mowing of the side slopes of the channels between Horseshoe Lake and Interstate 94, including the West Lakeland Storage Site South Pond</td>
<td>VBWD</td>
<td>$2,000</td>
<td>High</td>
</tr>
<tr>
<td>3</td>
<td>Clean threads and replace bolts at MH 37</td>
<td>VBWD</td>
<td>$200</td>
<td>Medium</td>
</tr>
<tr>
<td>4</td>
<td>Remove:</td>
<td>VBWD</td>
<td>$3,000</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>- Downed trees (two locations) in Raleigh Creek, south of 28th Street North (<em>Photo 1</em> and <em>Photo 2</em>)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Downed tree and debris (two locations) in Raleigh Creek, north of 28th Street North (<em>Photo 3</em>, and <em>Photo 4</em>)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Collaborate with 3M Tartan Park to remove debris, downed trees, and old pedestrian bridges in the channel from Lake Elmo through Tartan Park (<em>Photo 5</em>, <em>Photo 6</em>, <em>Photo 7</em>, and <em>Photo 8</em>)</td>
<td>VBWD/3M Tartan Park</td>
<td>$0</td>
<td>High</td>
</tr>
</tbody>
</table>

* Barr will determine inspection frequency in 2016, following the expiration of the construction warranty period.
** Inspections of Landucci and 30th and Trading Post are included in the warranty inspection budget for those respective projects. Future inspections of these systems will be under the systems inspections budget.
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
</table>
| 6    | Remove:  
- Downed trees (two locations in West Lakeland Storage Site Channel, south of the South Pond  
- Downed trees (three locations) in West Lakeland Storage Site Channel between the Middle and North Ponds  
- Small trees (two locations) growing near flared-end sections of reinforced-concrete pipe (RCP) in West Lakeland Storage Site Channel between Middle and North Ponds (Photo 9, Photo 10, Photo 11, and Photo 12) |
|      | VBWD | $2,000 | High |
| 7    | Remove accumulated dead trees and debris near the Rest Area Pond outlet and within the pipe to Structure 2 (Photo 13)                         |
|      | VBWD | $1,500 | High |
| 8    | Inspect the Project 1007 storm sewer via video                                                                                            |
|      | VBWD | $85,000 | Low  |
| 9    | Replace wooden stop logs with aluminum stop logs at all structures (3, 4, 5, 10, 11, 12)                                                    |
|      | VBWD | $85,000 | Low  |
| 10   | Replace wooden stop logs at Structure 6 with aluminum stop logs (Photo 14)                                                                  |
|      | VBWD | $15,000 | High |
| 11   | Prepare a comprehensive emergency drawdown plan                                                                                        |
|      | VBWD | $5,000  | High |
| 12   | Prepare and distribute literature to Tri-Lakes area residents regarding the history and benefits of Project 1007                             |
|      | VBWD | $2,000  | High |
| 13   | Prepare and publish a newspaper article documenting the completion of the Project 1007 system inspection as well as describing the history and benefits of the project |
|      | VBWD | $2,000  | High |

**DeMontreville Ravine Stabilization Project**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Remove accumulated sediment from the sedimentation basin at the downstream end of the ravine and the outlet into Lake DeMontreville (Photo 16 and Photo 17)</td>
</tr>
<tr>
<td></td>
<td>VBWD</td>
</tr>
</tbody>
</table>

**Olson Lake Estates Pond Outlet Project**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Inspect the Olson Lake Estates storm sewer via video</td>
</tr>
<tr>
<td></td>
<td>VBWD</td>
</tr>
</tbody>
</table>

**Farney Creek Stabilization Project**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Complete an erosion inventory upstream of Ideal Avenue to determine whether there are systemic issues contributing to erosion at the Weiss and Dunckel properties and complete recommended stabilization measures (Photo 18, Photo 19, Photo 20)</td>
</tr>
<tr>
<td></td>
<td>VBWD</td>
</tr>
<tr>
<td></td>
<td>VBWD</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>17</td>
<td>Install two additional vanes and armoring to prevent additional erosion <em>(Photo 21)</em></td>
</tr>
<tr>
<td>18</td>
<td>Remove sheared bolts, clean threads, and replace bolts at Structure 1 and Structure 2</td>
</tr>
<tr>
<td>19</td>
<td>Inspect the Downs Lake Flood Duration Reduction Project storm sewer via video</td>
</tr>
<tr>
<td>20</td>
<td>Update design drawings for Rivas site repair, submit for MnDNR Permit, obtain new bids, construct project <em>(Photo 22)</em></td>
</tr>
</tbody>
</table>

### 4.3 Maintenance Costs

Table 4-3 summarizes the estimated project costs by priority.

#### Table 4-3 Summary of Maintenance Costs

<table>
<thead>
<tr>
<th>Priority Rank</th>
<th>Planning-Level Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Priority</td>
<td>$86,000</td>
</tr>
<tr>
<td>Medium Priority</td>
<td>$170,500</td>
</tr>
<tr>
<td>Low Priority</td>
<td>$197,500</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$454,000</strong></td>
</tr>
</tbody>
</table>
### Figure 4-1

**MAINTENANCE RECOMMENDATIONS**

2015 Valley Branch Watershed District Infrastructure and Conveyance Systems Inspections Report

Valley Branch Watershed District

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Annually mow Rest Area Pond Dam</td>
</tr>
<tr>
<td>2</td>
<td>Annually mow West Lakeland Storage Sites</td>
</tr>
<tr>
<td>3</td>
<td>Replace bolts at MW 37</td>
</tr>
<tr>
<td>4</td>
<td>Remove downed trees on Raleigh Creek</td>
</tr>
<tr>
<td>5</td>
<td>Remove debris and downed trees in Tartan Park</td>
</tr>
<tr>
<td>6</td>
<td>Remove downed trees at West Lakeland Storage Sites</td>
</tr>
<tr>
<td>7</td>
<td>Remove downed trees and debris at outlet of Rest Area Pond</td>
</tr>
<tr>
<td>8</td>
<td>Inspect Project 1007 storm sewer via video</td>
</tr>
<tr>
<td>9</td>
<td>Replace wooden stop logs at all structures (1, 4, 5, 10, 11, 12) (Low Priority)</td>
</tr>
<tr>
<td>10</td>
<td>Replace wooden stop logs at Structure 6 (High Priority)</td>
</tr>
<tr>
<td>11</td>
<td>Prepare a comprehensive emergency drawdown plan</td>
</tr>
<tr>
<td>12</td>
<td>Prepare and distribute literature to Tri-Lakes area residents about Project 1007</td>
</tr>
<tr>
<td>13</td>
<td>Prepare and publish a newspaper article about Project 1007</td>
</tr>
<tr>
<td>14</td>
<td>Remove sediment from basin and outlet</td>
</tr>
<tr>
<td>15</td>
<td>Inspect Olson Lake Estates storm sewer via video</td>
</tr>
<tr>
<td>16</td>
<td>Complete an erosion inventory upstream</td>
</tr>
<tr>
<td>17</td>
<td>Install two rock vanes and armoring</td>
</tr>
<tr>
<td>18</td>
<td>Replace bolts at Structures 1 and 2</td>
</tr>
<tr>
<td>19</td>
<td>Inspect storm sewer via video</td>
</tr>
<tr>
<td>20</td>
<td>Update Rivas design and construct project</td>
</tr>
</tbody>
</table>
Appendix A

Summary of Project 1007 Discharges Observed during Inspections
During the inspections conducted on November 4 and 6, 2015, Barr staff noted some flowing water in the upstream portions of the Project 1007 system, from the outlet at Long Lake through Horseshoe Lake. However, there was no discharge from Hedges Pond/Lake Jane. Nor was flowing water observed from the area furthest downstream of the West Lakeland storage areas. Table A-1 summarizes the main observations at the various structures along Project 1007.

**Table A-1  Summary of Discharges along Project 1007 in 2015 — Upstream to Downstream**

<table>
<thead>
<tr>
<th>Structure</th>
<th>Location</th>
<th>Observations/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure 12</td>
<td>Long Lake Outlet</td>
<td>Discharge from Long Lake over the top of the weir; lake water level was approximately 0.15 feet above the top of the stoplogs. Significant leakage through stoplogs was repaired as part of the 2015 CIP.</td>
</tr>
<tr>
<td>Structure 11</td>
<td>Lake Olson</td>
<td>Discharge over the top of the weir; water 0.18 feet above the top of the stoplogs.</td>
</tr>
<tr>
<td>Structure 10</td>
<td>Hedges Pond/Lake Jane</td>
<td>No discharge; lake water level was approximately 0.8 feet below the top of the second stoplog; top stoplog out of place at time of inspection (not in metal slot), but has since been repaired as part of the 2015 CIP.</td>
</tr>
<tr>
<td>Structure 9</td>
<td>Crombie Pond</td>
<td>Discharge from Crombie Pond with approximately 0.17 feet of flow over weir.</td>
</tr>
<tr>
<td>Structure 8</td>
<td>Buetel Pond</td>
<td>Discharge from Buetel Pond with approximately 0.14 feet of flow over weir.</td>
</tr>
<tr>
<td>--</td>
<td>Raleigh Creek</td>
<td>Significant discharge in Raleigh Creek channel compared to recent years; observed discharge through metal culvert where the creek enters Lake Elmo Park Reserve.</td>
</tr>
<tr>
<td>Structure 7</td>
<td>Eagle Point Lake Dam Emergency Overflow</td>
<td>No discharge from Eagle Point Lake Dam emergency overflow.</td>
</tr>
<tr>
<td>Structure 6</td>
<td>Eagle Point Lake Dam</td>
<td>Discharge from Eagle Point Lake over the top of the weir; lake water level approximately 0.1 feet above the top of the stoplogs.</td>
</tr>
<tr>
<td>Structure 5</td>
<td>Old Lake Elmo Outlet</td>
<td>No discharge.</td>
</tr>
<tr>
<td>Structure 5A</td>
<td>Lake Elmo</td>
<td>Discharge from Lake Elmo over the top of the weir; lake water level approximately 0.2 feet above the top of the stoplogs.</td>
</tr>
<tr>
<td>Structure 4</td>
<td>Downstream Side of Eagle Point Lake Dam</td>
<td>Discharge from Eagle Point Lake Dam; approximately 0.2 feet of flow over the top of the weir.</td>
</tr>
<tr>
<td>--</td>
<td>Channel from Lake Elmo to Horseshoe Lake</td>
<td>Discharge through channel with flow depths approximately 1 to 2 feet.</td>
</tr>
<tr>
<td>Structure 3</td>
<td>Horseshoe Lake</td>
<td>Discharge from Horseshoe Lake over the top of the weir; lake water level approximately 0.1 feet above the top of the stoplogs. Significant leakage through stoplogs was repaired as part of 2015 CIP.</td>
</tr>
<tr>
<td>Structure 2B</td>
<td>West Lakeland Storage</td>
<td>Flowing water was observed in the channel between the upstream (north), middle, and downstream (south) ponds; however, there was no discharge in the channel downstream of the south storage pond. No discharge from the channel into Structure 2B.</td>
</tr>
<tr>
<td>Structure 2</td>
<td>Rest Area Pond Dam</td>
<td>No discharge through outlet pipe from Rest Area Pond.</td>
</tr>
<tr>
<td>Structure 1</td>
<td>Connection to MnDOT system along I-94</td>
<td>No discharge.</td>
</tr>
</tbody>
</table>
Appendix B

2015 Eagle Point Lake Dam Inspection Report
November 19, 2015

Mr. Jason Boyle
Dam Safety Unit
Division of Waters
Minnesota Department of Natural Resources
510 Lafayette Road
St. Paul, MN 55155

Re: 2015 Annual Inspection of Eagle Point Lake Dam
Valley Branch Watershed District

Dear Mr. Boyle:

On November 4 and 6, 2015, Patrick Brockamp, EIT (Barr Engineering Co.), and I performed an inspection of the Eagle Point Lake Dam and its control structures. This was done in accordance with Special Provision 8 of the Minnesota Department of Natural Resources permit for the dam, issued to the Valley Branch Watershed District (VBWD). The inspection report form and photographs of the dam and control structures are enclosed. The results of the inspection are summarized below.

- The inspection revealed the dam to be in generally good condition.
- The water level of Eagle Point Lake was typical for this time of year - within the primary outlet structure, but above the elevation of the weir (approximately 0.1 feet above the top of the weir).
- Looking upstream, some damage to the left bottom stoplogs was noted, possibly caused by animal activity. The sheeting covering the downstream face of the stoplogs is also damaged. We will continue to monitor the stoplog condition and investigate the cost of stoplog replacement.
- No debris was encountered in either the primary or secondary outlet structures.
- Two small-diameter trees were observed growing on the upstream (west) side of the secondary structure. VBWD will coordinate with Washington County Parks to remove the trees to grade and treat the stumps with herbicide to prevent regrowth (Photos 7 and 8).
- A group of animal burrows on the upstream face near the left (north) abutment were observed during the 2013 annual inspection, but not during 2014 or 2015 inspections. We will continue to monitor the embankment for the presence of animal burrows; if burrows are found we will excavate them, if necessary, and fill them with earth and concrete according to FEMA guidance for "mud-packing."

If you have any questions or need additional information, please contact me at 952-832-2854.
Sincerely,

[Signature]

Nathan Campeau, P.E.

Enclosures

c: VBWD Managers
# Inspection Report

**Eagle Point Lake Dam**

**Valley Branch Watershed District**

Inspected by Nathan Campeau, P.E., and Patrick Brockamp, EIT

November 4 and 6, 2015

<table>
<thead>
<tr>
<th>Feature</th>
<th>Deficiency Observed</th>
<th>Remarks</th>
<th>Photo #</th>
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<tbody>
<tr>
<td><strong>I. OUTLET STRUCTURES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Accumulation of debris</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Cracking or spalling of concrete</td>
<td>X</td>
<td></td>
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<tr>
<td>C. Deterioration of concrete</td>
<td>X</td>
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<tr>
<td>D. Abnormal leakage</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>E. Unusual or inadequate operational behavior</td>
<td>X</td>
<td>Damage to downstream side of stoplogs in Structure 6</td>
<td>7</td>
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<tr>
<td><strong>II. UPSTREAM EMBANKMENT SLOPE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Wave erosion</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Cracks</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Slides or sloughs</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. Subsidence</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. Damage to slope protection</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F. Other erosion</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G. Vegetation failure</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H. Tree growth</td>
<td>X</td>
<td>Two small diameter (~1&quot;) trees on upstream face of secondary structure should be removed</td>
<td>8 and 9</td>
</tr>
<tr>
<td>I. Animal burrows</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>III. DOWNSTREAM EMBANKMENT SLOPE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Wave erosion</td>
<td>X</td>
<td></td>
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</tr>
<tr>
<td>B. Cracks</td>
<td>X</td>
<td></td>
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<tr>
<td>C. Slides or sloughs</td>
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<tr>
<td>D. Subsidence</td>
<td>X</td>
<td></td>
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</tr>
<tr>
<td>E. Other erosion</td>
<td>X</td>
<td></td>
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<tr>
<td>F. Excessive seepage or boils</td>
<td>X</td>
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<td></td>
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<tr>
<td>G. Vegetation failure</td>
<td>X</td>
<td></td>
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<tr>
<td>H. Tree growth</td>
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<td></td>
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<tr>
<td>I. Animal Burrows</td>
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</table>
PHOTOGRAPH (continued)

EAGLE POINT LAKE DAM
Valley Branch Watershed District

PHOTOGRAPHS

Photo 1: Upstream face, looking toward left abutment (north)

Photo 2: Downstream face, looking toward left abutment (north)

Photo 3: Downstream face, looking toward right abutment (south)

Photo 4: Upstream face, looking toward right abutment (south)

Photo 5: Downstream side of weir in primary outlet

Photo 6: Upstream side of weir in primary outlet
Photo 7: Damage to downstream side of stoplogs in Structure 6

Photo 8: Inlet to secondary structure and trees

Photo 9: Inlet to secondary structure and trees

Photo 10: Inside of secondary structure

Photo 11: Outlet pipe from secondary structure
Appendix C

2015 Rest Area Pond Dam Inspection Report
November 17, 2015

Mr. Bryce Fossand, P.E.
MnDOT Water Resources Engineering
1500 West County Road B2
Roseville, MN 55113

Re: 2015 Interstate 94 Rest Area Dam Inspection

Dear Mr. Fossand:

On November 6, 2015, you, Eric Brenna of MnDOT, Patrick Brockamp, EIT (Barr Engineering Co.), and I inspected the Interstate 94 Rest Area Dam (Permit 86-6270). Two copies of related documents are enclosed:

- Chart of historic water levels
- Completed Rest Area Dam inspection form
- Comment sheet
- Photographs from the inspection

We found the dam and outlet structure to be in good condition. No immediate repairs or maintenance appear to be needed. The water level of the pond was estimated to be at Elevation 832.4 feet, approximately 1.6 feet below the low-flow outlet elevation of the pond. Some possible animal burrows were observed at the north end downstream face of the dam, between the transmission tower and Structure 2. Valley Branch Watershed District (VBWD) will continue to monitor this location during future inspections.

VBWD has hired a contractor, Buelow Excavating, to annually mow the entire dam and spillway. This work was completed after the inspection.

Please contact me with any corrections to the inspection form. If we do not hear from you, we will assume that you have forwarded this information to Jason Boyle at the Department of Natural Resources Dam Safety Unit, 510 Lafayette Road, St. Paul, MN, 55155. If you have any questions or need additional information, please contact me at (952) 832-2854.

Sincerely,

Nathan Campeau, P.E.

Enclosures

C: VBWD Managers
<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td>1. Vegetation Cover</td>
<td>Good</td>
<td>See note</td>
</tr>
<tr>
<td>2. Rip Rap</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>3. Spillway</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>4. Seepage Rate</td>
<td>None Observed</td>
<td>None Observed</td>
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<tr>
<td>5. Pond Elevation</td>
<td>Approx. 829</td>
<td>Approx. 831</td>
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<tr>
<td>6. Changes in Stream Area</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>7. Photographs</td>
<td>Taken 11-06-12</td>
<td>Taken 10-29-13</td>
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<tr>
<td>8. Structure #2</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>9. 60&quot; RCP</td>
<td>Good</td>
<td>Good</td>
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<tr>
<td>10. RCP</td>
<td>Good</td>
<td>Good</td>
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Year 2015 Remarks
1. Dam and spillway were mowed in November 2015 including the dam crest and embankments. Mowing occurred AFTER inspections were performed.
2. Minor woody debris was noted on the upstream side of Structure 2, but will not affect structure performance.
3. Possible animal burrows on north side of downstream face.

Year 2014 Remarks
1. Dam and spillway were mowed in October 2014 including the dam crest and embankments.
2. Minor woody debris was noted on the upstream side of Structure 2, but will not affect structure performance.

Inspected By: Date: Nov. 6, 2012
Peter Hinck and Patrick Brockamp

Inspected By: Date: Oct. 2, 2013
Peter Hinck and Jennifer Koehler

Inspected By: Date: Oct. 27, 2014
Jennifer Koehler and Amy Anderson

Inspected By: Date: Nov. 6, 2015
Nathan Campeau and Patrick Brockamp

Bridge Inspections Engineer
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>Condition of vegetation cover (brush and trees cleared)</td>
</tr>
<tr>
<td>2</td>
<td>Condition of Rip Rap</td>
</tr>
<tr>
<td>3</td>
<td>Condition of Spillway</td>
</tr>
<tr>
<td>4</td>
<td>Check drainage pipe on downstream side</td>
</tr>
<tr>
<td>5</td>
<td>Top pond water elevation</td>
</tr>
<tr>
<td>6</td>
<td>Look for changes of downstream area (new building, excavation, etc.)</td>
</tr>
<tr>
<td>7</td>
<td>Take representative photos</td>
</tr>
</tbody>
</table>

**Rating**

- **G** - Good – No repairs needed
- **F** - Fair – Minor repairs
- **P** - Poor – Repairs needed
- **U** - Unsatisfactory – Repairs needed immediately
Elevation (ft, MSL)

Date

REST AREA POND WATER LEVELS
Valley Branch Watershed District

- Water Elevation
- Discharge Elevation
- 100-Year Flood Level
**Comments**

**2015 I-94 Rest Area Pond Dam Inspection**  
**Valley Branch Watershed District**

<table>
<thead>
<tr>
<th>Other Comments and Observations</th>
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<tr>
<td>• In general, dam and appurtenant structures are in good condition.</td>
</tr>
<tr>
<td>• The water level of the pond is below the control elevation and water was not leaving the pond.</td>
</tr>
<tr>
<td>• Dam and spillway were mowed after the inspection occurred on November 6, 2015.</td>
</tr>
<tr>
<td>• Woody debris was observed at the pond outlet (flared end inlet to Structure 2), but does not need to be addressed at this time.</td>
</tr>
<tr>
<td>• Possible animal burrows were observed on the downstream face of the dam (north side), between the transmission tower and Structure 2. This location will be monitored during future inspections.</td>
</tr>
</tbody>
</table>
2015 I-94 Rest Area Pond Dam Inspection Photographs (11-06-15)

Photo 1: Upstream face, looking toward right abutment (south)

Photo 2: Spillway, looking east-northeast

Photo 3: Crest, looking toward right abutment (south)

Photo 4: Downstream face, looking toward right abutment (south)
Photo 5: Possible animal burrows

Photo 6: 60-inch-diameter reinforced-concrete pipe outlet

Photo 7: Outlet structure, upstream side of weir

Photo 8: Outlet structure, downstream side of weir
Appendix D

Existing Operating (Emergency Drawdown) Plans
INTRODUCTION

This plan is submitted by Valley Branch Watershed District in fulfillment of Condition 22 of Permit 86-6265, issued August 1, 1986. It will set an operating plan for the Long Lake outlet structure.

GOALS

The goals of this operating plan are as follows:

1. To reduce the threat of flooding, particularly under spring snowmelt conditions.

2. To minimize fluctuations on Long Lake.

PROCEDURE

The plan of operation will be adopted tentatively for a period of one year and reviewed at that time, before permanent adoption. It will be reviewed thereafter on a two-year basis.
HYDROLOGY

The tributary area of Long Lake is 2488 acres and the area of the lake itself is 81 acres. The normal operating level of the lake is 937.5 ft. Denoting the water equivalent of the snowpack as "x" inches, the volume of water stored in the lake above Elevation 937.5 ft and in the snowpack can be expressed as inches over the watershed in the following manner:

Inches of water over the watershed = x + 0.3617 * (Lake Elevation - 937.5)

PROPOSED PLAN OF OPERATION

1. Except as noted below, the control elevation shall be 937.5 ft.

2. During the period from February 15 to April 15 of each year the level of Long Lake may be lowered. Drawdown levels shall be determined from Table 1, based upon snowpack measurements and upstream lake levels. Snowpack and upstream lake levels shall be measured before drawdown and continued at weekly intervals during drawdown. The drawdown target elevation shall be adjusted according to Table 1 as snowpack and storage change. The regional hydrologist shall be notified five working days prior to initiation of drawdown.

3. Water levels on Long Lake will be increased according to Table 1, as the water equivalent of the snowpack decreases. When the water equivalent of the snowpack is reduced to 3 inches or less, the normal water level will be restored.

RESPONSIBLE PARTIES

It is anticipated that operation will be relatively infrequent. The Board of Managers will direct the operation of the control structures. Actual operation will be carried out by the City of Lake Elmo crews, if available, or by a District representative.

LLOP/327,0
In the event of emergency, the following persons may be contacted, in the order indicated.

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen Dornfeld</td>
<td>2867 Hamlet Ave. No. Oakdale, MN 55119</td>
<td>777-5590</td>
</tr>
<tr>
<td>Russell Kirby</td>
<td>13131 40th Street No. Stillwater, MN 55082</td>
<td>439-4319</td>
</tr>
<tr>
<td>Ray Brenner</td>
<td>2525 E. 18th Ave. No. St. Paul, MN 55109</td>
<td>777-3241 (h) 540-9607 (w)</td>
</tr>
<tr>
<td>William Rohrer</td>
<td>2989 Lake Elmo Ave. No. Lake Elmo, MN 55042</td>
<td>770-2806 (h) 227-6500 (w)</td>
</tr>
<tr>
<td>Gordon Moosbrugger</td>
<td>13956 10th St. No. Stillwater, MN 55082</td>
<td>436-5522 (h) 224-3879 (w)</td>
</tr>
<tr>
<td>Nels Nelson</td>
<td>Barr Engineering Co. 7803 Glenroy Road Bloomington, MN 55435</td>
<td>830-0555 (w) 926-4252 (h)</td>
</tr>
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TABLE 1  
VALLEY BRANCH WATERSHED DISTRICT  
PROPOSED PLAN OF OPERATION  
FOR  
LONG LAKE OUTLET STRUCTURE  
February 15 - April 15  

<table>
<thead>
<tr>
<th>Water Equivalent of Snow, Inches*</th>
<th>Drawdown Target Elevation**</th>
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<tbody>
<tr>
<td>6 or more</td>
<td>936.5</td>
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<tr>
<td>5</td>
<td>936.5</td>
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<tr>
<td>4</td>
<td>937.0</td>
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<tr>
<td>3</td>
<td>937.5</td>
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</table>

REMAINDER OF YEAR  

The outlet structure will maintain the lake level at Elevation 937.5 ft.  

*To be determined in accordance with VBWD "Snowpack Monitoring Plan" dated February 2, 1988.  

**All elevations are referenced to local MNDNR datum as described in permit. This may not coincide with USGS 1929 Mean Sea Level Datum.
VALLEY BRANCH WATERSHED DISTRICT
OPERATING PLAN FOR LAKE OLSON
December 28, 1990

INTRODUCTION

This revised plan is submitted by the Board of Managers of the Valley Branch Watershed District to replace the May 25, 1988 operating plan, which fulfilled Condition 22 of Permit 86-6269, issued August 1, 1986. It will set an operating plan for the Lake Olson outlet structure.

Because Lakes Olson and DeMontreville are hydraulically connected, the Lake Olson outlet structure also controls the level of Lake DeMontreville. The tributary area of Lakes Olson and DeMontreville is 4,250 acres and the combined surface area of the two lakes is 263 acres. The normal operating level of the lakes is at Elevation 928.5 feet.

GOALS

The goals of this operating plan are as follows:

1. To reduce the threat of flooding on Lakes Olson and DeMontreville, especially under spring snowmelt conditions.

2. To maintain, to the greatest degree possible, a summer pool at Elevation 928.5 feet or higher.

PROCEDURE

The plan of operation will be adopted tentatively for a period of one year and reviewed at that time before permanent adoption. It will be reviewed thereafter on a two-year basis.

PROPOSED PLAN OF OPERATION

1. Except as noted below, the control elevation shall be 928.5 feet.

2. During the period from February 15 to April 15 of each year the level of Lakes Olson and DeMontreville may be lowered. Drawdown levels shall be determined from Table 1, based upon snowpack measurements, with consideration given to upstream lake levels. For example, if upstream lake levels are low, the water level of Lakes Olson and DeMontreville may not need to be lowered as much as shown in Table 1. Conversely, if
upstream lake levels are high, the water level of Lakes Olson and DeMontreville may need to be lowered more than what snowpack measurements alone would dictate. Snowpack and upstream lake levels shall be measured before drawdown and continued at weekly intervals during drawdown. Target elevations shall be adjusted according to Table 1 as snowpack and lake levels change. The regional hydrologist shall be notified five working days prior to initiation of drawdown.

RESPONSIBLE PARTIES

It is anticipated that operation will be relatively infrequent. The Board of Managers will direct the operation of the control structures. Actual operation will be carried out by the City of Lake Elmo crews, if available, or by a District representative.

In the event of an emergency, the following persons may be contacted, in the order indicated.

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>Telephone #</th>
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<tr>
<td>Allen Dornfeld</td>
<td>2867 Hamlet Ave. N. Oakdale, MN 55128</td>
<td>777-5590 (H)</td>
</tr>
<tr>
<td>William Rohrer</td>
<td>2989 Lake Elmo Ave. N. Lake Elmo, MN 55042</td>
<td>770-2806 (H)</td>
</tr>
<tr>
<td>Russell Kirby</td>
<td>13270 4th Street N. Stillwater, MN 55082</td>
<td>227-6500 (W)</td>
</tr>
<tr>
<td>Gordon Moosbrugger</td>
<td>13956 10th Street N. Stillwater, MN 55082</td>
<td>540-9628 (W)</td>
</tr>
<tr>
<td>Karen Chandler</td>
<td>Barr Engineering Co. 7803 Glenroy Road Bloomington, MN 55439</td>
<td>436-5522 (H)</td>
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<td>224-3879 (W)</td>
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<td>897-5503 (W)</td>
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<td>593-1936 (H)</td>
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### TABLE 1
VALLEY BRANCH WATERSHED DISTRICT
PROPOSED PLAN OF OPERATION
FOR
LAKE OLSON OUTLET STRUCTURE
February 15 - April 15

<table>
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<tr>
<th>Water Equivalent of Snow, Inches</th>
<th>Lake Level Target Elevation</th>
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<tr>
<td>6 or more</td>
<td>926.5</td>
</tr>
<tr>
<td>more than 5 but less than 6</td>
<td>927.5</td>
</tr>
<tr>
<td>more than 4 but less than 5</td>
<td>928.0</td>
</tr>
<tr>
<td>more than 3 but less than 4</td>
<td>928.5</td>
</tr>
</tbody>
</table>

**REMAINDER OF YEAR**

The outlet structure control elevation will be maintained at Elevation 928.5 feet.

* To be determined in accordance with VBWD "Snowpack Monitoring Plan" dated February 2, 1988.

** All elevations are referenced to local MNDNR datum as described in permit. This may not coincide with USGS 1929 Mean Sea Level Datum.
VALLEY BRANCH WATERSHED DISTRICT
OPERATING PLAN FOR
CROMBIE, DEER AND HEDGES’ PONDS
AND LAKE JANE
May 25, 1988

INTRODUCTION

This plan is submitted by Valley Branch Watershed District in fulfillment of Condition 18 of Permit 86-6268, issued August 1, 1986. It will set an operating plan for control structures at Crombie Pond and Hedges’ Pond. These structures will also control the levels of Deer Pond, Hedges’ Bog and Lake Jane.

GOALS

The goals of this operating plan are as follows:

1. To reduce the threat of flooding on Lake Jane and nearby ponds.

2. To prevent Olson Lake outflow from entering Deer Pond and Crombie Pond and to divert the outflow from Deer Pond around Lake Jane.

3. To preserve the aesthetic and habitat values of the ponds.

4. To promote efficient operation of the fish screen at the Crombie Pond outlet.

PROCEDURE

The plan of operation will be adopted tentatively for a period of one year and reviewed at that time before permanent adoption. It will be reviewed thereafter on a two-year basis.
HYDROLOGY

The tributary area of Lake Jane is 4649 acres and the area of the lake itself is 165 acres. The normal operating level of the lake is 922.5 ft. Denoting the water equivalent of the snowpack as "x" inches, the volume of water stored in the lake above Elevation 922.5 ft and in the snowpack can be expressed as inches of water over the watershed in the following manner:

Inches of water over the watershed = x + 0.4259 * (Lake Elevation - 922.5)

PROPOSED PLAN OF OPERATION

1. Except as noted below, the control elevations shall be as follows:

   Crombie Pond (82-386W)          Elevation 921.5
   Deer Pond (82-385W)              Elevation 921.5
   Hedges' Bog (82-384W),           Elevation 922.5
   Hedges' Pond (82-387W)
   and Lake Jane (82-104)

2. During the period from February 15 to April 15 of each year the level of Lake Jane, Hedges' Pond and Crombie Pond may be lowered. Drawdown levels shall be determined from Table 1, based upon snowpack measurements and upstream lake levels. Snowpack and upstream lake levels shall be measured before drawdown and continued at weekly intervals during drawdown. Drawdown target elevations shall be adjusted according to Table 1 as snowpack and storage change. The regional hydrologist shall be notified five working days prior to initiation of drawdown.

3. If the level of Lake Jane is lower than Elevation 922.0, the control elevation of Crombie Pond may be increased to a level sufficient to cause water to flow from Deer Pond to Lake Jane. Normal control elevations shall be restored when the level of Lake Jane exceeds Elevation 922.5.
RESPONSIBLE PARTIES

It is anticipated that operation will be relatively infrequent. The Board of Managers will direct the operation of the control structures. Actual operation will be carried out by the City of Lake Elmo crews, if available, or by a District representative.

In the event of emergency, the following persons may be contacted, in the order indicated.

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<tr>
<th>Name</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Allen Dornfeld</td>
<td>2867 Hamlet Ave. No.</td>
<td>777-5590</td>
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<td></td>
<td>Oakdale, MN 55119</td>
<td></td>
</tr>
<tr>
<td>Russell Kirby</td>
<td>13131 40th Street No.</td>
<td>439-4319</td>
</tr>
<tr>
<td></td>
<td>Stillwater, MN 55082</td>
<td></td>
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<tr>
<td>Ray Brenner</td>
<td>2525 E. 18th Ave.</td>
<td>777-3241 (h)</td>
</tr>
<tr>
<td></td>
<td>No. St. Paul, MN 55109</td>
<td>540-9607 (w)</td>
</tr>
<tr>
<td>William Rohrer</td>
<td>2989 Lake Elmo Ave. No.</td>
<td>770-2806 (h)</td>
</tr>
<tr>
<td></td>
<td>Lake Elmo, MN 55042</td>
<td>227-6500 (w)</td>
</tr>
<tr>
<td>Gordon Moosbrugger</td>
<td>13956 10th St. No.</td>
<td>436-5522 (h)</td>
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<td>Stillwater, MN 55082</td>
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<td>Barr Engineering Co.</td>
<td>830-0555 (w)</td>
</tr>
<tr>
<td></td>
<td>7803 Glenroy Road</td>
<td>926-4252 (h)</td>
</tr>
</tbody>
</table>

Bloomington, MN 55435
### TABLE 1

**VALLEY BRANCH WATERSHED DISTRICT**

**PROPOSED PLAN OF OPERATION FOR**

**LAKE JANE, HEDGES’ POND AND HEDGES’ BOG CONTROL STRUCTURE**

**AND CROMBIE POND CONTROL STRUCTURE**

**February 15 - April 15**

<table>
<thead>
<tr>
<th>Water Equivalent of Snow, Inches*</th>
<th>Drawdown Target Elevations**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lake Jane</td>
</tr>
<tr>
<td>6 or more</td>
<td>920.3</td>
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<tr>
<td>5</td>
<td>921.0</td>
</tr>
<tr>
<td>4</td>
<td>922.0</td>
</tr>
<tr>
<td>3</td>
<td>922.5</td>
</tr>
</tbody>
</table>

**REMAINDER OF YEAR**

The control structure for Lake Jane, Hedges’ Pond and Hedges’ Bog will maintain their water levels at Elevation 922.5 ft. The control structure for Crombie Pond will maintain the water level at 921.5 ft.

*To be determined in accordance with VBWD "Snowpack Monitoring Plan" dated February 2, 1988.

**All elevations are referenced to local MNDNR datum as described in permit. This may not coincide with USGS 1929 Mean Sea Level Datum."
VALLEY BRANCH WATERSHED DISTRICT
OPERATION, INSPECTION AND MAINTENANCE PLAN FOR EAGLE POINT LAKE DAM

INTRODUCTION

This plan is submitted by Valley Branch Watershed District (Watershed District) to fulfill Special Provision 8 of Protected Waters Permit 86-6264, issued July 7, 1986 by the Minnesota Department of Natural Resources (MnDNR). It describes the operation, inspection and maintenance plan for the Eagle Point Lake Dam.

PROCEDURE

This Operation, Inspection and Maintenance Plan will be adopted tentatively for a period of one year after which it will be reviewed before permanent adoption. It will be reviewed thereafter on a two-year basis.

OPERATION PLAN

1. Under normal conditions, no operation of the dam or control structures is anticipated.

2. The water level of Eagle Point Lake is controlled by a stoplog weir which is set at Elevation 894.0 feet. The stoplog design was chosen so that MnDNR staff could temporarily raise and lower the water level of Eagle Point Lake to aid in fish rearing. Additional stoplogs may be added to raise the water level to Elevation 896.0 feet and stoplogs may be removed to lower the water level to Elevation 893.0 feet. The MnDNR shall notify the Watershed District five working days in advance of any proposed water level changes. Otherwise, stoplogs are not to be added or removed.

INSPECTION PLAN

The dam and control structures shall be inspected annually by a registered engineer. A report of the inspection shall be submitted to the Dam Safety Unit of the Division of Waters of the MnDNR.
1. The outlet structures and outlet works shall be inspected annually for evidence of:
   o accumulated debris
   o cracking or spalling of concrete and opening of joints
   o deterioration of concrete
   o abnormal leakage through concrete surfaces or along pipe outlet
   o unusual or inadequate operational behavior

2. Upstream embankment slopes shall be inspected annually for evidence of:
   o wave erosion
   o cracks
   o slides
   o sloughs
   o subsidences
   o damages to slope protection
   o other signs of serious erosion
   o failure of vegetation
   o growth of trees, brush or other unsuitable vegetation
   o animal burrows

3. Downstream slopes shall be inspected annually for evidence of:
   o wave erosion
   o cracks
   o slides
   o sloughs
   o subsidences
   o damages to slope protection
   o other signs of serious erosion
   o springs
   o seeps
   o boggy areas
   o failure of vegetation cover
   o establishment of brush or trees
   o animal burrows

4. During periods of low reservoir levels, the exposed portions of the abutments and lake bottom shall be examined annually for sinks or seepage holes, and cracking.

5. During periods of sustained high water (above Elevation 898.0 feet), a weekly inspection shall be made of the embankment for evidence of abnormal development, with particular attention being given to:
the crest of the dam
the visible portions of the upstream slope protection
downstream slope protection
areas downstream from the dam

The Watershed District shall promptly notify the MnDNR of any abnormal developments.

MAINTENANCE PLAN

The Watershed District shall be responsible for and promptly perform all necessary dam maintenance. Possible maintenance activities include the following:

1. Vegetative cover shall be maintained on the dam.
   - Lost or destroyed vegetative cover shall be reseeded or resodded. The reshaping, fertilizing, reseeding and resodding shall follow the original construction specifications.
   - Vegetation shall be fertilized as necessary to maintain the desired vegetative stand.
   - Vegetation shall be mowed at regular intervals to a minimum height of 3 to 4 inches. Trees and deep rooting plants shall be removed.

2. The structural integrity and function of the earth dam and outlet structures shall be maintained.
   - Soil removed by burrowing animals shall be replaced.
   - The outlet piping system and the toe drains shall be cleaned or replaced as necessary.
   - Any slides on the embankment areas shall be stabilized as soon as practical.
   - Any settled portions of the dam shall be restored to their proper elevation.
   - Eroded material shall be replaced and the eroded areas revegetated.
   - Unusual seepages, boils, subsidences or settlements in fill areas shall be investigated and repaired.
- Eroded materials around pipe outlets and inlets shall be restored.
- Deteriorated or damaged concrete shall be restored.
- The outlet structures shall be maintained in proper working order. Ice and debris that may hamper its function shall be removed. Damaged protective coatings shall be restored.
INTRODUCTION

This plan is submitted by Valley Branch Watershed District in fulfillment of Condition 18 of Permit 86-6267, issued August 1, 1986. It will set an operating plan for the Lake Elmo outlet structure.

GOALS

The goals of this operating plan are as follows:

1. To reduce the threat of flooding on Lake Elmo.

2. To maximize the amount of flow carried by the Lake Elmo bypass pipe, reducing the amount of nutrient-laden water from Eagle Point Lake that reaches Lake Elmo.

PROCEDURE

The plan of operation will be adopted tentatively for a period of one year and reviewed at that time before permanent adoption. It will be reviewed thereafter on a two-year basis.

HYDROLOGY

The tributary area of Lake Elmo is 5365 acres and the actual surface area of the lake is 299 acres. The normal operating level of the lake is 884.5 ft. Denoting the water equivalent of the snowpack as "x" inches, the volume of water stored in the lake above Elevation 884.5 ft and in the

LEOP/327,0
snowpack can be expressed as inches over the watershed in the following manner:

\[
\text{Inches of water over the watershed} = x + 0.6688 \times (\text{Lake Elevation} - 884.5)
\]

**PROPOSED PLAN OF OPERATION**

1. Except as noted below, the control elevation shall be 884.5 ft.

2. During the period from February 15 to April 15 of each year the level of Lake Elmo may be lowered. Drawdown levels shall be determined from Table 1, based upon snowpack measurements and levels of upstream lakes. Snowpack and upstream lake levels shall be measured before drawdown and continued at weekly intervals during drawdown. Drawdown target elevations shall be adjusted according to Table 1 as snowpack and storage change. The regional hydrologist shall be notified five working days prior to initiation of drawdown.

3. Water levels on Lake Elmo will be increased according to Table 1, as the water equivalent of the snowpack decreases. When the water equivalent of the snowpack is reduced to 3 inches or less, the normal water level will be restored.

**RESPONSIBLE PARTIES**

It is anticipated that operation will be relatively infrequent. The Board of Managers will direct the operation of the control structures. Actual operation will be carried out by the City of Lake Elmo crews, if available, or by a District representative.
In the event of emergency, the following persons may be contacted, in the order indicated.

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>Phone</th>
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</thead>
<tbody>
<tr>
<td>Allen Dornfeld</td>
<td>2867 Hamlet Ave. No. Oakdale, MN 55119</td>
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<td>439-4319</td>
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<td>2525 E. 18th Ave. No. St. Paul, MN 55109</td>
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<td>Barr Engineering Co. 7803 Glenroy Road Bloomington, MN 55435</td>
<td>830-0555 (w) 926-4252 (h)</td>
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</table>
VALLEY BRANCH WATERSHED DISTRICT
OPERATING PLAN FOR HORSESHOE LAKE
May 25, 1988

INTRODUCTION

This plan is submitted by Valley Branch Watershed District in fulfillment of Condition 19 of Permit 86-6266, issued August 1, 1986. It will set an operating plan for the Horseshoe Lake outlet structure.

GOALS

The goals of this operating plan are as follows:

1. To reduce the threat of flooding on Horseshoe Lake and upstream lakes.

2. To manage Horseshoe Lake as a wildlife preserve by further lowering of the lake.

PROCEDURE

The plan of operation will be adopted tentatively for a period of one year and reviewed at that time before permanent adoption. It will be reviewed thereafter on a two-year basis.

HYDROLOGY

The tributary area of Horseshoe Lake is 7757 acres and the area of the lake itself is 96 acres. The normal operating level of the lake is 875.9 ft. Denoting the water equivalent of the snowpack as "x" inches, the volume of water stored in the lake above Elevation 875.9 ft and in the
snowpack can be expressed as inches of water over the watershed in the following manner:

\[ \text{Inches of water over the watershed} = x + 0.1485 \times (\text{Lake Elevation} - 875.9) \]

PROPOSED PLAN OF OPERATION

1. Except as noted below, the control elevation shall be 875.9 ft.

2. During the period from February 15 to April 15 of each year the level of Horseshoe Lake may be lowered. Drawdown levels shall be determined from Table 1, based upon snowpack measurements and upstream lake levels. Snowpack and upstream lake levels shall be measured before drawdown and continued at weekly intervals during drawdown. Drawdown target elevations shall be adjusted according to Table 1 as snowpack and storage change. The regional hydrologist shall be notified five working days prior to initiation of drawdown.

3. Water levels on Horseshoe Lake will be increased according to Table 1, as the water equivalent of the snowpack decreases. When the water equivalent of the snowpack is reduced to 3 inches or less, the normal water level will be restored.

RESPONSIBLE PARTIES

It is anticipated that operation will be relatively infrequent. The Board of Managers will direct the operation of the control structures. Actual operation will be carried out by the City of Lake Elmo crews, if available, or by a District representative.
In the event of emergency, the following persons may be contacted, in the order indicated.

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TABLE 1
VALLEY BRANCH WATERSHED DISTRICT
PROPOSED PLAN OF OPERATION
FOR
HORSESHOE LAKE OUTLET STRUCTURE
February 15 - April 15

<table>
<thead>
<tr>
<th>Water Equivalent of Snow, Inches*</th>
<th>Drawdown Target Elevation**</th>
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<tr>
<td>6 or more</td>
<td>870.0</td>
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<tr>
<td>5</td>
<td>871.0</td>
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<tr>
<td>4</td>
<td>873.0</td>
</tr>
<tr>
<td>3</td>
<td>875.9</td>
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</table>

REMAINDER OF YEAR

Control structure will maintain the lake level at Elevation 875.9 ft.

*To be determined in accordance with VBWD "Snowpack Monitoring Plan" dated February 2, 1988.

**All elevations are referenced to local MNDNR datum as described in permit. This may not coincide with USGS 1929 Mean Sea Level Datum.
I. INSPECTION

a. A yearly inspection will be made jointly by the Valley Branch Watershed District and Minnesota Department of Transportation District 9. The inspection will be made and a report submitted to the Dam Safety Unit prior to July 1 of each year that the permit is in effect.

b. The outlet structure and outlet works should be inspected for evidence of 1) accumulated debris, 2) cracking or spalling of concrete and opening of joints, 3) deterioration of concrete, 4) abnormal leakage through concrete surfaces or along pipe outlet, and 5) unusual or inadequate operational behavior.

c. Upstream embankment slopes should be inspected for evidence of: 1) wave erosion, 2) cracks, 3) slides, 4) sloughs, 5) subsidences, 6) damages to slope protection, 7) other signs of serious erosion, 8) failure of vegetation, 9) growth of trees, brush or other unsuitable vegetation, and 10) animal burrows.

d. Downstream slopes should be inspected for evidence of: 1) cracks, 2) slides, 3) sloughs, 4) subsidences, 5) springs, 6) seeps, 7) boggy areas, 8) failure of vegetation cover, 9) establishment of brush or trees, and 10) animal burrows.

e. During periods of low reservoir level, the exposed portions of the abutments and reservoir floor should be examined for sinks or seepage holes, unusual beaching conditions, or cracking.

f. During periods of sustained high reservoir level above Elevation 848, weekly inspection should be made of the embankment for
evidence of abnormal development, with particular attention being given to: 1) the crest of the dam, 2) the visible portions of the upstream slope protection, 3) downstream slope protection, 4) areas downstream from the dam

g. The spillway should be inspected to ensure that riprap and filter blanket have remained in place and form a continuous protection layer over the crest, slope and toe of the dam.

h. The piezometer data for the dam should be reviewed and included in the report to ensure that no major deviations from assumptions made in the foundation design have occurred.

II. MAINTENANCE

a. During normal dam operations, the embankment slopes should be mowed as necessary to maintain good sod cover and prevent emergence of shrubs and trees.

b. Debris will be removed from inlet pipe, orifice, weir and downstream outlet pipe at least once per month.

c. Burrowing animals in the embankment shall be poisoned or trapped.

d. Surface erosion of the embankment shall be repaired and vegetation re-established.

e. To reduce the quantity of floating debris in the reservoir, dead trees adjacent to the water's edge shall be removed annually.

f. Water surface elevations will be measured on a monthly basis.

III. OPERATION

a. Under normal conditions, no operation of the dam is anticipated.
b. In the event that downstream flooding in the City of Lakeland endangers life or property, the Department of Transportation may place stoplogs in the dam structure to reduce such flows through the duration of the storm event to mitigate such emergency conditions.

c. Stoplogs will not be placed until the upstream gate at the outlet from the West Lakeland Storage Site to I-94 system (Structure 2B) has been closed.

d. Stoplogs will not be placed when the reservoir level exceeds Elevation 848.

e. The stoplogs will be removed as soon as the immediate threat to life and property has been eliminated downstream.

f. The stoplogs are not intended as permanent flow control devices and any permanent placement of stoplogs shall require approval by the Dam Safety Unit of the Division of Waters of the Department of Natural Resources.