DeCola Ponds B and C Improvement Project
Feasibility Study

Golden Valley, Minnesota

May 2018

Prepared for
Bassett Creek Watershed Management Commission

4300 MarketPointe Drive, Suite 200
Minneapolis, MN 55435
Phone: 952.832.2600
Fax: 952.832.2601

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Contents

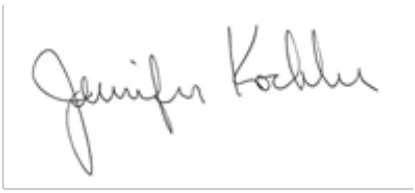
List of Tables

List of Figures

List of Appendices

Certifications

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



5/9/2018

Jennifer Koehler, PE
PE #: 47500

Date

1.0 Executive summary

1.1 Background

The Bassett Creek Watershed Management Commission's (BCWMC) current Capital Improvement Program (CIP) (Table 5-3 in the 2015-2025 Bassett Creek Watershed Management Plan) includes BC-2, 3, 8, 10: Medicine Lake Road and Winnetka Avenue Area Long-Term Flood Mitigation Plan (MLRWA Plan) Implementation. The first phase of this CIP is the DeCola Ponds B & C Improvement Project (BC-2, 3, 8), the subject of this feasibility study. At their meetings in September and October 2017, the Commission approved a proposal and an addition to the proposal (respectively) to conduct a feasibility study for this project.

The DeCola Ponds B & C Improvement Project builds on the City of Golden Valley's Liberty Crossing flood mitigation and conveyance project that was completed in 2017. The Liberty Crossing project was the first flood mitigation project implemented from the Medicine Lake Road and Winnetka Avenue Area Long-Term Flood Mitigation Plan Report (Barr, 2016). The City of Golden Valley city council is supportive of this specific project (and the larger long-term flood mitigation plan) with the flood mitigation projects identified in the plan being included in the City of Golden Valley's CIP. In 2015, the City of Golden Valley adopted their Natural Resources Management Plan, which specifically listed the proposed flood mitigation goals for the Pennsylvania Woods Nature Area and DeCola Ponds B and C. This project is also the City's top legislative priority for 2018 and is included in the Minnesota state bonding bill within Minnesota Department of Natural Resources (MnDNR) flood damage reduction projects, due to continued efforts by City staff.

As is required for BCWMC CIP Projects, a feasibility study must be completed prior to BCWMC holding a hearing and ordering the project. This study examines the feasibility of developing flood storage volumes in the Pennsylvania Woods area around DeCola Ponds B & C, developing additional water quality treatment volume, modifying the DeCola Pond C outlet structure, and removing accumulated sediment that has collected at the storm sewer outfall on the north end of DeCola Pond B. The goal of the project is to alleviate flooding around the low point on Medicine Lake Road, reduce downstream flooding at DeCola Ponds A through D, and to improve water quality downstream of the DeCola Ponds by trapping additional sediment and pollutants in the ponds and expanded storage areas, thus minimizing sediment passing downstream to Bassett Creek. The proposed project will also improve ecology and wildlife habitat, enhance active and passive recreation opportunities, and provide educational opportunities.

Three conceptual flood mitigation designs were investigated during this feasibility study. The first conceptual design examined a scenario maximizing flood storage, the second represented a scenario maximizing tree preservation (while still developing flood storage), and the third scenario was a hybrid of the previous two scenarios, trying to balance flood mitigation and tree preservation. Furthermore permitting requirements for each conceptual design were reviewed and cost estimates are provided.

The proposed DeCola Ponds B & C Improvement Project was identified as a priority in the MLRWA Plan and is proposed as "Phase I" of this CIP project to mitigate flooding and improve water quality in the Medicine Lake Road and DeCola Ponds B & C area. Based on the CIP (and if ordered), the project will be

implemented in 2019 and 2020. The BCWMC CIP funding (ad valorem tax levied by Hennepin County on behalf of the BCWMC), is not the sole source of funding for this project. The remainder of the funding will come from a variety of sources, including the City of Golden Valley, Hennepin County, Minnesota Department of Natural Resources (MnDNR) Flood Damage Reduction Grant program, and other sources (e.g. other grants, as appropriate).

1.2 Site conditions

DeCola Ponds B and C and the Pennsylvania Woods area are located in the City of Golden Valley east of Rhode Island Avenue and south of Medicine Lake Road. DeCola Ponds B and C are listed as Public Water Inventory Basins and are Minnesota Department of Natural Resources (MnDNR) public waters (#27-0647P). Although all proposed concepts described in this report propose normal water level (NWL) changes to DeCola Ponds A, B, and C due to outlet modifications, no other impacts are expected for DeCola Pond A, which is also a MnDNR public water (#27-0630P). DeCola Ponds B and C are located within Pennsylvania Woods Nature Area, a public, urban, walking park consisting of deciduous forest, wooded knolls, and various wetland communities. The walking trails are used heavily by the single family and multi-family residential communities surrounding the nature area. DeCola Ponds A, B, and C discharge downstream to DeCola Ponds D, E and F, which continues to Honeywell Pond and ultimately discharges to Bassett Creek. Any improvements to runoff water quality within DeCola Ponds A, B, and C will result in improvements to the Main Stem of Bassett Creek which is currently listed as impaired. The affected use is aquatic life based on fish bioassessments, and although a stressor identification study has not been completed to determine the exact cause of this impairment, reductions in sediment and pollutant loads to the creek can likely help address this impairment.

The area directly north of DeCola Pond B is located on property owned by Dover Hill Apartments, LLC (from here forward, referred to as the Dover Hills area). This area consists of deciduous forest and a delineated wetland area of approximately 0.12 acres. As part of the City of Golden Valley's flood mitigation project on the Liberty Crossing Development site, city staff engaged the owners of the apartments. The property owners supported the improvement project and a drainage and utility easement was secured in 2015 at no cost to the City of Golden Valley. No additional easement acquisition is anticipated for the area north of DeCola Pond B. A temporary construction easement on residential land may be needed for the implementation of the outlet modification and raising of the overflow between DeCola Ponds B and C. Adequate permanent easements already exist on the residential parcels on the north end of DeCola Pond D for the outlet and overflow modifications.

As part of the Liberty Crossing project, the City of Golden Valley performed wetland delineations on the Dover Hill property and around DeCola Pond B (2015), completed Phase 1 and Phase 2 environmental site assessments, developed a Response Action Plan (2015), and completed bathymetric surveys of DeCola Ponds A, B, and C and sediment sampling and testing (2015). For the DeCola Ponds B & C Improvement Project Feasibility Study, topographic and tree surveys were completed (2017), a Phase 2 site investigation was completed with soil test trenches (2018), and desktop reviews of cultural resource and threatened and endangered species databases (2017) were finalized. The results of these studies were utilized as much as applicable to define the conceptual designs and quantify impacts for this feasibility study.

1.3 Project alternatives

Three conceptual designs were evaluated for developing flood storage volume within the DeCola Ponds B and C and the Dover Hills areas. The first conceptual design focused on developing maximum flood storage volume, the second focused on tree preservation (while still providing flood storage), and the third concept concentrated on developing flood storage volume between the first and second alternatives while also trying to preserve trees and develop new habitat.

In addition of expanding flood storage within varying footprints within the project area, measures considered for potential implementation in all scenarios included the following:

- Lowering the normal water level (NWL) of DeCola Ponds A, B, and C from 893.8 ft MSL to 893.5 ft MSL to provide additional flood mitigation volume without needing to excavate that volume.
- Installing a 14′ x 4′ box culvert that will connect the Liberty Crossing flood storage features to the expanded storage in theDover Hills and DeCola Ponds B and C areas.
- Developing a sediment forebay in the permanent easement on the Dover Hills area to develop water quality treatment volume, improve ease of maintenance, enhance water quality in downstream locations, and to allow lowering the normal water level of DeCola Ponds A, B, and C in order to increase flood storage capacity, while preserving or increasing the water quality treatment provided by the DeCola Ponds system.
- Increasing the DeCola Ponds B and C open water area, and increasing associated water quality treatment volume through expanding contours below the NWL and dredging accumulated sediment in DeCola Pond B. The proposed expansion does not change the overall depth of the existing ponds, but will provide additional water quality treatment volume and provide additional aquatic habitat for fish, macroinvertebrates, and macrophytes.
- In addition to increasing the open water areas, expanding the storage around DeCola Ponds B and C allows for the opportunity to create and restore wetlands. For all conceptual designs, a 25-foot wetland buffer will be placed around the proposed open water areas within the projected disturbed limits, based on the City of Golden Valley's wetland management classification for these ponds (Manage 2/3). Additionally, all areas outside of the buffer areas that fall below elevation 896.0 feet MSL will be restored as wetland habitats.
- Modifying the DeCola Pond C outlet structure and overflow to lower the NWL (and provide additional flood storage volume) while increasing the overflow on the south end of DeCola Pond C (to increase the flood storage in DeCola Ponds A, B, and C). The modified outlet will also prevent the accumulation of debris on the inlet pipe which is currently a major maintenance issue for the City.
- Preserving trees on the large knolls between DeCola Ponds A, B, and C, and preserving screening trees along the east and south side of DeCola Pond B and along east side of DeCola Pond C. Tree removal is expected within project disturbance limits. However, upland areas will be restored with native vegetation and replanted with trees at a density potentially ranging from savanna (~35 trees/acre) to forest (~110 trees/acre) – to be determined during final design.

- Replacing disturbed trails with ADA-compliant trails to preserve park use and improved walking trail opportunities.

The alternatives are discussed in more detail in Sections 5.0 and 6.0.

1.4 Relationship to Watershed Management Plan

The BCWMC included the DeCola Ponds B and C Improvement Project in its CIP, based on the following "gatekeeper" policy from the BCWMC Plan. Those items in bold italics represent those that directly apply to the DeCola Ponds B and C Improvement Project.

110. The BCWMC will consider including projects in the CIP that meet one or more of the following "gatekeeper" criteria.

- Project is part of the BCWMC trunk system (see Section 2.8.1, Figure 2-14 and Figure 2-15 of the report)
- ***Project improves or protects water quality in a priority waterbody***
- Project addresses an approved TMDL or watershed restoration and protection strategy (WRAPS)
- ***Project addresses flooding concern***

The BCWMC will use the following criteria, in addition to those listed above, to aid in the prioritization of projects:

- Project protects or restores previous Commission investments in infrastructure
- ***Project addresses intercommunity drainage issues***
- Project addresses erosion and sedimentation issues
- ***Project will address multiple Commission goals (e.g., water quality, runoff volume, aesthetics, wildlife habitat, recreation, etc.)***
- ***Subwatershed draining to project includes more than one community***
- ***Addresses significant infrastructure or property damage concerns***

The BCWMC will place a higher priority on projects that incorporate multiple benefits, and will seek opportunities to incorporate multiple benefits into BCWMC projects, as opportunities allow.

The DeCola Ponds B and C Improvement Project meets multiple of the gatekeeper criteria— the project addresses flooding concerns (main objective) and the project will improve water quality by reducing the amount of sediment and pollutants that reach Bassett Creek. Additionally, this project will address intercommunity drainage concerns, multiple communities (the Cities of Golden Valley, Crystal, and New Hope) are within the project's subwatershed, and the project will address multiple Commission goals by capturing increased runoff volume, enhancing water quality, providing recreation opportunities, and improving wildlife habitat.

1.5 Project impacts and estimated costs

Potential impacts of the proposed project (increasing the flood storage and water quality treatment volumes of DeCola Ponds B and C and developing a forebay area in the existing Dover Hills area north of DeCola Pond B) are summarized in Table 6-1 and discussed in Section 6.0. This section also summarizes permit requirements (e.g., Minnesota Department of Natural Resources public waters work permit), temporary impacts to wetlands, the disposal of contaminated sediment, tree loss, and closure of the pedestrian trails.

Of the project impacts, the most significant consideration is the development of the flood storage volume and the impact on flood elevations, passage of emergency vehicles and public safety, and reducing the number of structures at-risk of flooding. One of the main purposes of the proposed DeCola Ponds B & C Improvement Project is to lower the flood depths on Medicine Lake Road to allow passage of emergency vehicles during larger storm events, maintain access to Rosalyn Court, and protect structures around this area. The DeCola Ponds B and C improvement project builds on the Liberty Crossing Flood Mitigation Project implemented by the City of Golden Valley, which lowered the 100-year flood elevation on the Medicine Lake Road low point from 4.8 to 3.1 feet and reducing the number of structures at-risk of flooding by five. Of these five structures, two were commercial buildings along Medicine Lake Road and three were 12-unit condominiums at Rosalyn Court.

The proposed feasibility concept designs for the DeCola Pond B and C Improvement Project aimed to improve upon the flood reductions resulting from the Liberty Crossing Flood Mitigation Project. The XP-SWMM results for this project indicate that for all three concepts the 10-year recurrence interval flood depth on Medicine Lake Road is reduced from 1.5 feet to 1.0 feet at the low point. For the 100-year flood event, the flood depth on Medicine Lake Road is reduced from 3.1 feet to 1.7 – 1.8 feet, depending on the concept. Reductions in flood elevations can translate to structures no longer being at-risk of flooding. For all three concepts, one structure is expected to be removed from the at-risk properties list for the 100-year event, which includes 2740 Rosalyn Court, a twelve unit condominium, in New Hope. While reductions in the 10-year and 100-year flood elevations on DeCola Ponds A, B, C, and D are anticipated (0.3 to 1.0 feet), the reductions in flood elevations do not result in reducing the number of at-risk structures surrounding these ponds.

The proposed projects will result in increased permanent pool volume and sediment storage volume in the forebay and both ponds and, therefore, reduce sediment and phosphorus loading to the main stem of Bassett Creek and all downstream water bodies, including the Mississippi River. Estimates of existing pollutant loadings are presented in Section 6.0. The estimated increase in annual total phosphorus removal ranges from approximately 8.0 pounds per year (Concept 2) to 10.5 pounds per year (Concept 1).

In order to develop the flood storage volume, tree removals within the project disturbance/grading limits will be required. Since a portion of the project area is within a public nature area and is a popular walking area, community resistance to tree removal is a concern. Wetland and upland restoration, including planting of new trees and shrubs, will occur in all areas disturbed by construction, and many existing trees

will be preserved in key areas, such as the knoll with hardwoods between DeCola Ponds B and C and trees that provide screening along the edges of DeCola Ponds A and B.

The feasibility-level opinion of costs for implementing the various concepts for the 2019-2020 DeCola Ponds B & C Improvement Project is presented in Table 1-1. This table also lists the 30-year annualized total phosphorus reduction costs (based on the estimated cost of the water quality improvement work only) and the project costs per acre foot of flood mitigation volume developed. For a complete summary of the estimated impacts and costs of the concepts, including the methodology and assumptions used for the cost estimate, refer to Section 6.0, Section 7.0, and Table 6-1.

Table 1-1 Feasibility-level Cost Estimates Summary

Concept	Total Project Cost (-20%/30%)	30-Year Annualized Cost per Pound of Total Phosphorus Removed[1]	Cost per Acre-Foot of Flood Mitigation Volume Developed
1	$5.7 million ($4.5 – 7.4 million)	$8,900	$173,900
2	$3.5 million ($2.8 - $4.6 million)	$11,100	$203,400
3	$3.8 million ($3.0 – $4.9 million)	$9,600	$173,400

[1] The costs presented represent the portion of the total project cost allocated to water quality improvements

The cost per pound of phosphorus removed for this project using the current P8 model analysis is high when compared to other BCWMC CIP projects—for example, the previous high costs per pound of phosphorus removed for a BCWMC CIP project was $5,900 for the Northwood Lake Improvement Project. The high cost per pound of phosphorus removed for this project is due to do the fact that the DeCola Ponds B and C Improvement Project's primary goal is to mitigate flooding. A major portion of the construction costs are for the development of flood storage volume and for the restoration of the graded areas rather than for water quality improvement.

1.6 Recommendations

Based on review of the project impacts for each of the three concepts, the recommended concept is Concept 3, which balances the development of flood mitigation volume with tree preservation. However, we also recommend that during the design process, the city pursue opportunities to increase the flood mitigation volume within the general concept disturbance footprint, with the goal to maximize the reduction of flood elevations around the low point on Medicine Lake Road and the downstream DeCola Ponds.

Concept 3 develops approximately 22 acre-feet of additional flood storage for the 100-year flood frequency event, which brings the 100-year flood elevation on the Medicine Lake Road low point from 3.1 feet of depth to approximately 1.8 feet of depth. This flood depth reduction on Medicine Lake Road is close to achieving the goal outlined in the *Medicine Lake Road Winnetka Avenue Long Term Flood*

Mitigation Plan (Barr, 2016) and will allow passage of emergency vehicles during large, intense rain events. Additionally, lowering the 100-year flood elevation eliminates one structure (12-unit condominium on Rosalyn Court) from being at-risk of flooding and improves access to Rosalyn Court during the 100-year design storm event). There are also reductions in the flood elevations on DeCola Ponds A, B, C, and D. With the combination of the Liberty Crossing Flood Mitigation Project and the recommended DeCola Ponds B and C Improvement Project, a total of six structures (two commercial properties and four 12-unit condominiums) would no longer be at-risk of flooding during the 100-year event.

Additionally, the concept increases the phosphorus load reduction by 9.0 pounds per year. The estimated tree disturbance area for Concept 3 only slightly greater than for Concept 2 and also results in the restoration of 1.7 acres of wetland and 1.0 acres of upland habitat.

The planning level estimated cost for the recommended Concept 3 is $3.8 million (-20%/+30%). The BCWMC CIP budget for this project is $1.6 million. The BCWMC CIP funding (ad valorem tax levied by Hennepin County on behalf of the BCWMC), is not the sole source of funding for this project. The remainder of the funding will come from a variety of sources, including the City of Golden Valley, Hennepin County, Minnesota Department of Natural Resources (MnDNR) Flood Damage Reduction Grant program, and other sources (e.g. other grants, as appropriate). The current request for the MnDNR Flood Damage Reduction Grant is $2.3 million. This request is currently included in the state bonding bill, which is still under discussion at the state legislature as of the date of this feasibility report. The legislative session should be complete by May 21, 2018, when it will be known if the complete flood damage grant amount requested by the Cities of Golden Valley, Crystal, and New Hope will be secured for implementation of this project. Approximately $700,000 in funds from Hennepin County and the City of Golden Valley will also be available for use on this project.

Because this feasibility report was completed before the State of Minnesota legislative session closes and the status of the project funding is unknown, we anticipate the following potential outcomes:

- ***Project is fully-funded***: If the Cities of Golden Valley, Crystal, and New Hope MnDNR Flood Damage Reduction grant request is fully funded is obtained ($2.3 million), the recommended DeCola Ponds B & C Improvement project (Concept 3) can proceed as anticipated with the other funding sources in place. For project construction to occur in 2019, project design would be scheduled to begin in fall 2018, after an agreement is reached between the City of Golden Valley and the BCWMC.
- ***Project is partially-funded:*** If the Cities of Golden Valley, Crystal, and New Hope MnDNR Flood Damage Reduction grant request is partially funded, the recommended DeCola Ponds B & C Improvement project (Concept 3) could proceed as recommended, depending on the level of state funding that is obtained. For example, if half of the original MnDNR flood damage reduction request is secured (e.g. $1.15 million), there may be sufficient funding (e.g. $3.45 million) to implement the major components of the recommended concept, with minor modifications to help bring the anticipated design and proposed project into alignment with the available budget and/or look at potential opportunities to phase the project. For project

construction to occur in 2019, project design would be scheduled to begin in fall 2018, after an agreement is reached between the City of Golden Valley and the BCWMC.

- ***Project is not funded:*** If the Cities of Golden Valley, Crystal, and New Hope MnDNR Flood Damage Reduction grant is not funded during this legislative session, the recommended DeCola Ponds B & C Improvement project (Concept 3) will need to be delayed until the Cities can re-request MnDNR Flood Damage Reduction grant funds during the next legislative session. This could potentially delay the implementation of the DeCola Ponds B & C Improvement project construction. Although not preferred, BCWMC CIP funds do not have to be expended in the same year they are levied and can be held until all of the funding comes together, even if the project is delayed a year or two.

2.0 Background and objectives

The BCWMC's 2015-2025 Watershed Management Plan (BCWMC, 2015) addresses the need to increase flood storage volume within the Bassett Creek Watershed to provide increased flood mitigation and decreased downstream sediment transport. This project is consistent with the goals (Section 4.1) and policies (Sections 4.2.1, 4.2.2, and 4.2.10) in the Plan. The Plan's 10-year CIP (Table 5-3 in the Plan) includes projects BC-2, BC-3, BC-8, and BC-10, Medicine Lake Road and Winnetka Avenue Long Term Flood Mitigation Plan Implementation. The first phase of the BCWMC's CIP is the DeCola Ponds B and C Improvement Project (BC-2, 3, & 8). The BCWMC approved the 5-year (working) CIP at their March 2017 meeting, and at their September 2017 meeting, the Commissioners discussed the proposal to conduct a feasibility study for the Medicine Lake Road and Winnetka Avenue Area Long Term Flood Mitigation Plan Implementation Phase I: DeCola Ponds B & C Improvement Project. At their October 2017 meeting, the BCWMC approved the proposal from the BCWMC Engineer to prepare a feasibility study for the DeCola Ponds B & C Improvement Project. The DeCola Ponds B & C Improvement Project builds on the City of Golden Valley's Liberty Crossing flood mitigation and conveyance project that was completed in 2017. The Liberty Crossing project was the first in a series of capital flood mitigation project implemented from the *Medicine Lake Road and Winnetka Avenue Area Long-Term Flood Mitigation Plan Report* (Barr, 2016).

This feasibility study follows the protocols developed by the U.S. Army Corps of Engineers (USACE) and the BCWMC for projects within the BCWMC Resource Management Plan (RMP). Although this flood mitigation study is not included in the RMP, the USACE has allowed the RMP protocols to be applied to other projects not specifically included in the RMP.

2.1 Project area description

DeCola Pond B is located east of Rhode Island Avenue and south of Medicine Lake Road. DeCola Pond A discharges into the southern portion of DeCola Pond B through a 72" diameter culvert, and storm sewer from Rhode Island Avenue discharges to the northwest portion of DeCola Pond B. Bathymetry surveys and sediment borings indicate substantial sediment accumulation has occurred in the northern portion of DeCola Pond B at the storm sewer outfall and that the accumulated sediment is contaminated with polycyclic aromatic hydrocarbons (PAHs), not uncommon in stormwater runoff and sediments. The outlet structure from DeCola Pond B is a 68" diameter culvert discharging to DeCola Pond C. DeCola Pond B is approximately 2.3 acres in area.

DeCola Pond C is located directly east of DeCola Pond B. The pond is located south of the Dover Hill Apartments. In addition to discharges from DeCola Pond B, a storm sewer carrying water from east of the railroad tracks discharges to the northeast portion of the pond. The outlet structure from DeCola Pond C is a 15" diameter culvert discharging to DeCola Pond D. Debris often accumulates on the culvert inlet. DeCola Pond C is approximately 2.5 acres in area.

The area located directly north of DeCola Pond B (the Dover Hills area) consists of deciduous forest and a delineated wetland area of approximately 0.12 acres and is owned by Dover Hill Apartments, LLC. However, as part of the City of Golden Valley's flood mitigation project on the Liberty Crossing

Development site, city staff engaged the owners of the apartments and obtained a drainage and utility easement in 2015 for the construction of the DeCola Ponds B and C improvement project. No additional easements are anticipated for this area.

DeCola Ponds B and C and the Pennsylvania Woods area are located within a public, urban, nature area, which consists of deciduous forest, wooded knolls, and various wetland communities. The walking trails are used heavily by the single family and multi-family residential communities surrounding the nature area.

Figure 2-1 shows the DeCola Ponds B and C project area.

2.2 Goals and objectives

The goals and objectives of the feasibility study are to:

1. Review the feasibility of developing increased flood storage areas in the Dover Hills area, the Pennsylvania Woods Nature Area, and around DeCola Ponds B and C, and identify and evaluate three alternatives.
2. Develop three conceptual designs, including preliminary grading in AutoCAD Civil 3D, modeling hydrology and hydraulics using XP-SWMM, and modeling water quality improvements using P8.
3. Provide a planning level opinion of cost for design and construction of the alternatives.
4. Identify potential project impacts and permitting requirements.
5. Develop visual representations of the three alternatives for public input.

The goals and objectives of the flood mitigation project are to:

1. Develop additional flood mitigation volume in the project area to help reduce flooding at the low point on Medicine Lake Road to allow for passage of emergency vehicles during the 100-year design storm event, and reduce flood elevations and flood damage to structures, properties, and infrastructure around DeCola Ponds A, B, C, and D.
2. Reduce sediment loading to the Main Stem of Bassett Creek and improve water quality in the MnDNR protected waters downstream by providing additional water quality treatment volume in a constructed forebay in the permanent easement in the Dover Hills area, and expanding the open water area and water quality treatment volume of DeCola Ponds B and C.
3. Remove accumulated, PAH-contaminated sediment at the storm sewer outfall into DeCola Pond B to restore water quality treatment capacity and provide enhanced aquatic habitat.
4. Preserve the knolls and significant hardwood trees on the knolls located between DeCola Ponds A, B, and C and preserving natural screening trees along the south and west sides of DeCola Pond B.
5. Restore natural habitat quality and species diversification by establishing a wetland buffer around the DeCola Ponds and restoring wetland and upland habitat within the project disturbance limits,

including investigation of various flooding frequencies for the restoration of habitat within the nature area (e.g., wetland meadows).

6. Create accessible trails that are positioned above the 10-year flood frequency event to ensure at least one loop of the Pennsylvania Woods Nature Area trails can be utilized following larger precipitation events. This will allow the nature area habitat to be enjoyed more frequently by the public.
7. Develop an outlet structure design concept for DeCola Pond C that prevents the accumulation of debris on the outlet pipe (reducing the need for maintenance) and minimizes bounce in DeCola Ponds A, B, and C for smaller precipitation events, while also ensuring that flood elevations downstream are not impacted.

2.3 Considerations

Key considerations for project alternatives included:

1. Maximizing the amount of permanent pool storage, flood storage up to the 100-year event, and water quality benefit.
2. Minimizing the permitting required to construct the project.
3. Maintaining or improving the functionality of DeCola Ponds B and C, including water quality, flood control, and habitat functions.
4. Minimizing wetland impacts.
5. Balancing tree loss and flood storage development while preserving healthy, significant hardwoods trees in upland areas.
6. Maintaining or improving the functionality of the walking trails, enhancing the Pennsylvania Woods Nature Area user experience, and providing flood mitigation and water quality educational opportunities.

The considerations listed above played a key role in determining final recommendations and will continue to play a key role through final design.

MEDICINE LAKE ROAD

Medicine Lake Rd

RHODE ISLAND AVE

Rhode Island Ave N

Winnetka Ave N

Above Ground Flood Storage Basin

Underground Flood Storage Tank

Dover Hill Apartments

The Liberty Crossing Development

DeCola Pond B (PWI 27-0647P)

DeCola Pond C (PWI 27-0647P)

Pennsylvania Woods Park

DeCola Pond A (PWI 27-0630P)

DeCola Pond D

Railroad

Existing City Trails

Existing Storm Sewer

Existing Sanitary Sewer

DeCola Pond B & C Project Area

Hennepin County Parcels

N

200 100 0 200

Feet

PROJECT AREA
DeCola Ponds B & C
Improvement Project
BCWMC

FIGURE 2-1

BARR

Barr Footer: ArcGIS 10.4.1, 2018-04-16 10:44 File: I:\Client\BassettCreek\Work Orders\2018\DeCola Feasibility\Maps\Report\Figure2-1 ProjectArea.mxd User: KJN2

3.0 Site conditions

3.1 Proposed Project Location and Characteristics

The watershed area tributary to DeCola Ponds B and C is approximately 431 acres and drains portions of the cities of Crystal, New Hope, and Golden Valley. The watershed is fully-developed; the existing land use includes a mixture of single-family residential, commercial/industrial, parks and open spaces, multi-family residential, and open water surface.

DeCola Ponds B and C and the Dover Hills area are located east of Rhode Island Avenue and south of Medicine Lake Road. The ponds and nature area are located completely within Golden Valley. The low point on Medicine Lake Road is located just west of the intersection of Rhode Island Avenue and Medicine Lake Road and is located on the border of the Cities of New Hope and Golden Valley.

3.1.1 Existing Flooding Conditions

Significant flooding has been an on-going concern at the low point on Medicine Lake Road. The road runs east to west and the low point is located at the boundary of Golden Valley and New Hope; the flooding at the low point creates a complex intercommunity water management issue. Flooding at the low point presents significant public safety and access issues (with depths of flooding that do not allow for the passage of emergency vehicles). The flooding also resulted in damages to adjacent structures, such as the former VFW building (demolished, now part of Liberty Crossing), apartment buildings at Rosalyn Court, and the Dairy Queen.

Documented flooding impacts have been noted since the early 1970s. More recent examples of rainfall events that have resulted in notable flooding along Medicine Lake Road include:

- May 7 – 8, 2006: 4.0 inches of rainfall fell within 3.5 hours
- June 25, 2010: 3.0 – 3.7 inches (depending on watershed location) of rainfall fell within 1.9 hours
- June 21, 2013: 2.7 inches of rainfall fell
- July 28, 2015: 2.5 inches of rainfall fell within approximately 1.0 hours

Directly downstream of the Medicine Lake Road low point are the DeCola Ponds. The DeCola Ponds are a series of six ponds (DeCola Ponds A through F) that are connected by a storm sewer system. The series of ponds were constructed in the 1960s where several were developed within an existing wetland area. The ponds were originally designed for the 50-year flood event, which was standard for that time. These ponds receive watershed runoff from portions of the cities of Crystal, Golden Valley, and New Hope. Historical, chronic flooding has been observed on the system of ponds, especially in DeCola Ponds D, E, and F. One home is known to flood on DeCola Pond A. One reason for the persistent chronic flooding is that approximately 18 homes were built with low floors and openings below the 50-year and 100-year flood events, common during this period of construction. The DeCola Ponds are not within a Federal Emergency Management Agency (FEMA) mapped floodplain, due to the size of the drainage area. However, five flood insurance claims from property owners have been made in the past and eleven residents have flood insurance policies.

Various studies and flood mitigation projects have been completed since 1979, aiming to alleviate the severe flooding that occurs within the cities of Golden Valley, New Hope, and Crystal. However, flooding continues to be an issue. Most recently, in 2016, the *Medicine Lake Road and Winnetka Avenue Area Long-Term Flood Mitigation Plan* (Barr, 2016) was developed by the Cities of Golden Valley, New Hope, and Crystal; it outlines critical flood mitigation projects and planning level costs that can be used to direct future efforts. The report presents eight potential flood mitigation projects.

In 2017, the first flood mitigation projects were implemented. In the upper DeCola Ponds watershed, the City of Crystal modified the storm sewer through Yunker Park and slightly expanded the flood mitigation storage in the park. Additionally, the City of Golden Valley constructed flood mitigation storage areas as part of the Liberty Crossing re-development project, located in the southeast quadrant of the intersection of Winnetka Avenue and Medicine Lake Road. Subsurface and surface storage areas were constructed on the site to hold and treat stormwater runoff from the direct watershed and from Medicine Lake Road overflows.

The Liberty Crossing project alone will have a significant impact on the flood depths experienced at the Medicine Lake Road low point and the associated flooding of structures. The existing 10-year and 100-year flood elevations on the Medicine Lake Road low point prior to the Liberty Crossing re-development were approximately 904.0 and 905.3 respectively (NAVD88). After the implementation of the Liberty Crossing flood mitigation projects, the 10-year and 100-year flood elevations reduced to 902.0 and 903.6 respectively (NAVD88). The lowering of the flood elevations at the low point on Medicine Lake Road had the following impact on flood depths and impacted structures:

- 100-year depth of flooding reduced from 4.8 ft to 3.1 ft
- The following structures are no longer at-risk of flooding during the 100-year event:
    - 7825 Medicine Lake Road (Dairy Queen)
    - 7775 Medicine Lake Road (former VFW building, removed as part of redevelopment)
    - 2700 Rosalyn Court (12 units)
    - 2710 Rosalyn Court (12 units)
    - 2730 Rosalyn Court (12 units)

Despite substantial flood reductions on Medicine Lake Road, the resulting 100-year flood depth is still above the recommended depth for emergency vehicle passage; the goal is to reduce flooding to 1.5 feet. Therefore, additional flood mitigation projects, such as this DeCola Ponds B and C Improvement Project, are needed to further reduce flooding on Medicine Lake Road and on the DeCola Ponds.

3.1.2 Site access

Construction access will be fairly straightforward because the project is located on public property (DeCola Ponds B and C) or within a City of Golden Valley drainage and utility easement that was obtained from Dover Hill Apartments, LLC, for the Liberty Crossing Development Project (Dover Hills area). Relatively few obstacles or infrastructure elements block access to the proposed work areas. Potential site access locations are along Rhode Island Avenue N, within the project area, along the trail constructed as

part of the Liberty Crossing Project, and along trails in Pennsylvania Woods accessed from 23rd Avenue and from Pennsylvania Avenue

3.1.3 Sediment sampling and bathymetric survey - 2015

In 2015, sediment characterization and bathymetric surveys were completed for DeCola Ponds A, B, and C in association with the Liberty Crossing flood mitigation project, in preparation for this next phase of work. Sediment sampling was conducted in accordance with the MPCA's *Managing Stormwater Sediment, Best Management Practice Guidance June 2015* (MPCA, 2015). This document provides technical guidance for characterizing sediment in stormwater ponds, including the number of samples that should be collected and potential contaminants to be analyzed. The baseline parameters listed in the MPCA guidance are arsenic, copper, and polycyclic aromatic hydrocarbons (PAHs). PAHs are organic compounds that are formed by the incomplete combustion of organic materials, such as wood, oil, and coal. They are also naturally occurring in crude oil and coal.

The objectives of the 2015 DeCola Ponds study completed were to (1) collect bathymetric survey data to assess the current volume of the ponds and identify areas of accumulated sediment; and (2) to characterize sediment contamination for dredging and filling purposes. Dredged materials that do not exceed the Minnesota Pollution Control Agency's (MPCA) Residential Soil Reference Values (SRV) are considered unregulated fill and are suitable for use or reuse on properties within all land use categories, including residential (MPCA, 2012).

Results are presented in Section 3.1.3.2 below. A full summary of the sediment sampling and bathymetric survey process and results, including figures and tables, is in Appendix A.

3.1.3.1 Bathymetric Survey

Bathymetric surveys of DeCola Ponds A, B, and C were performed on July 2, 2015. The bathymetric survey of DeCola Pond B indicated much of the northern portion of the pond is shallow due to a large volume of accumulated sediment. Bathymetry data and sediment cores from DeCola Ponds A and C did not indicate any areas of large sediment accumulation in these ponds.

GPS and elevation data from the stormwater pond surveys were imported into AutoCAD Civil 3D software. The geographically-referenced survey data points were used to create elevation contours, which represent the current pond bottom conditions. These contours were used to calculate the existing permanent flood pool storage and to assist in calculating the sediment volume removals of the proposed dredging locations.

Figure 3-1 shows a conceptual profile of a typical stormwater pond. The permanent pool, or dead storage volume, is the volume below the pond's outlet elevation. The flood pool is the volume between the outlet elevation and the flood elevation. Using the contours created of each pond in AutoCAD Civil 3D, AutoCAD Civil 3D volume calculation tools, and the outlet elevation data, the permanent pool volume and wetted surface area of each pond were determined.

A full summary of the sediment sampling and bathymetric survey process and results, including figures and tables, is in Appendix A.

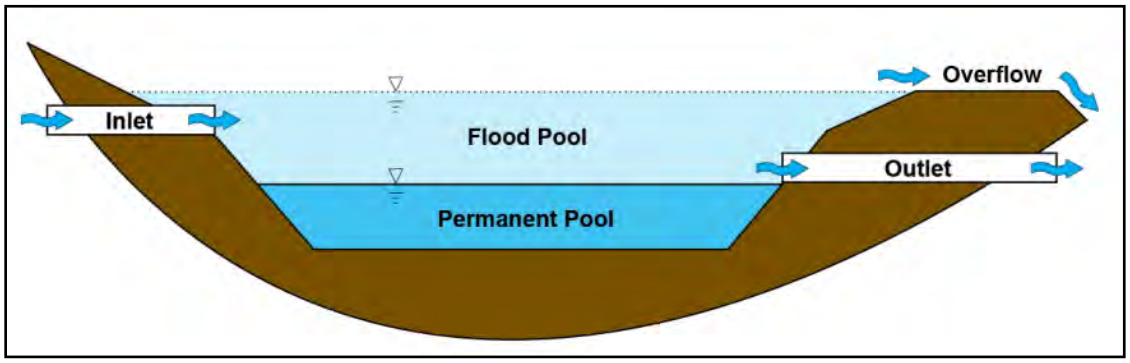


Figure 3-1 Typical storm water pond configuration

3.1.3.2 Sediment Characterization

Sediments from the ponds were tested for a variety of contaminants to define the disposal requirements for any material removed from the ponds as part of future maintenance and projects. The sediment samples were analyzed by Pace Analytical for the following parameters:

- Resource Conservation and Recovery Act (RCRA) metals: arsenic, barium, cadmium, chromium, copper, lead, selenium, silver and mercury
- Polycyclic aromatic hydrocarbons (PAHs), measured using BaP (benzo[a]pyrene) equivalent values

Sediment characterization indicates the sediment from DeCola Pond A, the southern portion of DeCola Pond B, and DeCola Pond C meets guidelines for unregulated fill and is suitable for reuse under the MPCA's Unregulated Fill Policy (MPCA, 2012). The BaP equivalents value in one of the sediment cores collected from the northern portion of DeCola Pond B exceeded the MPCA's Residential Soil Leaching Value (SLV) and Industrial Soil Reference Values (SRV); therefore, sediment from that portion of DeCola Pond B would require landfill disposal. Based on the location of the sample from the northern portion of DeCola Pond B, the PAH impacts are likely associated with accumulated sediments entering the pond through stormwater inflow from the culvert in the northwest corner of the pond. During final design, it is recommended that the sediment characterization data be reevaluated to verify the data is sufficient and representative of the planned dredge locations and depths, and compared to the MPCA SRVs in effect at that time.

If sediments from the DeCola Ponds are reused on other properties, spreading of non-native Chinese Mystery Snail is a concern. While collecting sediment samples in DeCola Pond C, field staff noted large numbers of large round snails in the near shore areas of the pond. Although the snails were discovered in DeCola Pond C, it is likely the snails are present in all three ponds given their close proximity and

connection via channel or culvert. Dredged, non-contaminated sediment should not be placed in other waterbodies.

3.1.4 Phase II Site Investigation and Response Action Plan (RAP) - 2015

3.1.4.1 Summary

As part of the Liberty Crossing flood mitigation project, a Phase I Environmental Site Assessment (ESA) (2015) and a Phase II ESA investigation and Response Action Plan/Construction Contingency Plan (RAP/CCC) (2015) were developed for the Liberty Crossing project areas as well as the DeCola Pond B, DeCola Pond C and the Dover Hills areas. The 2015 Phase II investigation indicated that the wooded area north of DeCola Pond B is likely filled with debris, and that a leaking underground storage tank (LUST) is located on the Dover Hill Apartments property.

Some unexpected low-level contamination was encountered on the Dover Hill Apartments property during the Liberty Crossing construction in 2017. Thus, additional investigation of the Pennsylvania Woods area was recommended by the BCWMC engineer to delineate the extent of debris/fill and assess whether contamination associated with fill or the LUST site is present in the soils north of DeCola Pond B.

3.1.4.2 2018 Test Trenches

To further assess the nature and extent of potential environmental impacts in the soils and to identify soil management and disposal requirements for the soils in the area north of DeCola Pond B, four additional test trench investigations were completed in the Pennsylvania Woods area on the Dover Hill Apartments, LLC part of the project site (Dover Hills area) in February 2018.

A full summary of the 2018 Phase II Site Investigation process and results, including figures and tables, is included in Appendix B.

The four test trenches were excavated north of DeCola Pond B with the following approximate dimensions: 3 feet wide, 9 – 12 feet long, and 9 – 10 feet deep. The soils from the test trenches were continuously logged, the samples were inspected for visual and odorous evidence of contamination, and were tested for headspace volatile organic vapor concentrations. Four three-point composite samples were also collected from each test trench and analyzed for PAHs, Resource Conservation and Recovery Act (RCRA) metals, and Diesel Range Organics (DRO). Additionally, arsenic samples were taken from layers of peat.

Detectable concentrations of PAHs and RCRA metals were found for all analyzed soil samples; however, concentrations did not exceed the MPCAs SLVs or Residential SRVs. DRO were also detected in the soil samples, but were at concentrations below 100 mg/kg, which are below the MPCA's screening level for unregulated fill (MPCA, 2012). Headspace volatile organic vapor concentrations were 0.0 parts per million (ppm) in each of the test trenches. Debris, including trace metals and plastic, were observed in the northern test trenches (TT-18 and TT-5). Debris-containing fill should be disposed at a permitted landfill. For final design, excavation plans should include the excavation and disposal of contaminated sediment in the northern portion of the Dover Hills area within the permanent easement.

3.1.5 Topographic, Utility, and Tree Surveys

A topographic and utility survey occurred in fall 2017. A Topcon GR5 VRS, base/receiver, and PS Total Station were used to gather topographic information within the project extents. Topographic information was collected in Hennepin County NAD83 horizontal datum and NAVD88 vertical datum. A detailed survey of the outlet structure and overflow at DeCola Pond C was undertaken. Underground utilities were located based on the location of manhole structures, as-built/construction plan drawings from the City, and through a Gopher State One Call utility locate. Topographic survey information was imported into AutoCAD Civil 3D along with the 2016 pond bathymetric data and proposed construction surface for the Liberty Crossing project site to create an existing conditions surface for this feasibility study.

A tree survey was conducted in fall 2017, where species, condition, and diameter data were collected for trees greater than four inches in diameter. The survey did not include the large wooded knoll at the southern end of the site, as the goal is to preserve all hardwood trees in this area. Figure 3-2 shows the location of the surveyed trees extents. Since an expansive tree survey of the entire Pennsylvania Woods Nature Area was not completed, the tree removal summaries presented as a percentage in Table 6-1 are skewed, as they are not based on all trees within the Pennsylvania Woods Park and represent tree removals in the proposed excavation areas only.

Based on the survey data collected, trees were classified in accordance with the City of Golden Valley tree ordinance. The survey showed that approximately 50% of the trees 4" and greater in the nature area are box elder, 16% are cottonwood, 15% are ash, and approximately 5% are buckthorn, an invasive species. It was observed that a larger percentage of trees under 4" are buckthorn. The remaining 14% consist of species such as basswood, aspen, basswood, elm, hackberry, maple, mulberry, oak, pine, and willow. Of the trees surveyed, approximately 35% were found in good condition, 46% in fair condition, 10% in poor condition, and 9% that were dead or dying.

3.1.6 Wetland Delineations

In 2015 a wetland delineation was completed for the Liberty Crossing site, including delineation along DeCola Pond B, and in the Dover Hills area. In 2017, the delineation was expanded to include field wetland delineations around DeCola Pond C and the northern edge of DeCola Pond A.

Four wetlands were delineated within the project area. Descriptions and assessments of each wetland are provided below. Appendix C provides a full summary of the wetland delineation, including figures and field data sheets.

The wetland delineation report was prepared in accordance with the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual ("1987 Manual," USACE, 1987), the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (USACE, 2010) and the requirements of the Minnesota Wetland Conservation Act (WCA) of 1991. The BCWMC Engineer delineated the wetland boundaries and determined wetland types within the evaluation areas on October 16, 2015 and September 22, 2017. The amended wetland delineation was approved by the technical evaluation panel (TEP) on November 22, 2017.

The delineated wetland boundaries and sample points were surveyed using a Global Positioning System (GPS) with sub-meter accuracy. Wetlands were classified using the U.S. Fish and Wildlife Service (USFWS) Cowardin System (Cowardin et al., 1979), the USFWS Circular 39 system (Shaw and Fredine, 1956), and the Eggers and Reed Wetland Classification System (Eggers and Reed, 1977).

Wetland plant communities within each delineated pond were also identified and are summarized in the following sections.

3.1.6.1 DeCola Pond B

DeCola Pond B delineated wetland area is 2.55 acres. The wetland is primarily a Type 5 (PUBG), shallow open water wetland with a Type 2 (PEMB), wet meadow fringe in some areas that was dominated by reed canary grass. The majority of the periphery of DeCola Pond B consists of steep and abrupt slopes that lead into the open water. No dominant emergent vegetation within the shallow open water community was observed during the survey. Some submergent macrophytes were present, but were not identified because a watercraft was required. Dominant vegetation at the sampling point included Eastern cottonwood (FAC), ash-leaf maple (FAC), and reed canary grass (FACW). The transition to upland was defined by the lack of hydrology and hydric soil indicators.

3.1.6.2 DeCola Pond C

DeCola Pond C delineated wetland area is 2.88 acres. The wetland is primarily a Type 5 (PUBG), shallow open water wetland with Type 2 (PEMB) wet meadow fringe in some areas. Similarly to DeCola Pond B, the periphery of DeCola Pond C consists of steep and abrupt slopes that lead into the open water. No dominant emergent vegetation was observed, but some submerged macrophytes were present (not identified). Reed canary grass was dominant in open areas along the eastern edge of DeCola Pond C in the wet meadow community. Dominant vegetation observed in the surveyed areas include ash-leaf maple, white mulberry (FAC), and Canadian clearweed (FACW). The transition to upland was defined by the lack of hydrology and hydric soil indicators.

3.1.6.3 Dover Hills Area (North of DeCola Pond B)

A delineated wetland in the Dover Hills area north of DeCola Pond B is 0.12 acres. The wetland is a non-vegetated Type 1 (PEMA), seasonally flooded basin. It is likely flooded during most of the growing season, inhibiting the growth of emergent vegetation. Eastern cottonwood, sugar maple (FACU), and European buckthorn were present along the upland areas adjacent to the delineated wetland in the Dover Hills area; however, these trees were not present within the wetland area. The transition to upland was defined by the lack of vegetation, hydrology and hydric soil indicators.

3.1.6.4 DeCola Pond A

DeCola Pond A is a Type 5 (PUBG), shallow open water wetland with steep and abrupt slopes that lead into the open water along the delineated northern edge. The purpose of delineating only the northern portion of DeCola Pond A was to ensure complete avoidance of impacts during construction. There was no dominant emergent vegetation observed, but some submerged macrophytes were noted. Dominant

vegetation found in the sampling area include ash-leaf maple, peach-leaf willow (FACW), and green ash. The transition to upland was defined by the lack of hydrology and hydric soil indicators.

3.1.7 Threatened and Endangered Species

In 2017, Barr performed a desktop review of threatened and endangered species to determine the potential for adverse impacts to state and federally-listed species due to the proposed project. The specific types of habitat that will be impacted by the project include emergent wetlands, forested wetlands, forested uplands, open water, and artificially paved surfaces (walking trails).

Barr reviewed the Natural Heritage Information System (NHIS) database through a licensed agreement (LA-898) with the Minnesota Department of Natural Resources (MnDNR) to review potential species' impacts. The results of the analysis indicated that no state-listed or tracked species had been recorded within the project footprint or within a 1-mile radius. However, when the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Conservation (IPaC) tool was reviewed, two federally-listed species were noted as potentially occurring in the vicinity of the proposed project. These two species included the Higgins eye pearly mussel (endangered) and the northern long-eared bat (threatened).

The Higgins eye pearly mussel occurs within medium to large streams and is only known to occur in the Mississippi River within Hennepin County. The Mississippi River is located approximately 5 miles east of the project location and since the project will not impact any flowing stream water, no-effect is predicted for this species.

The northern long-eared bat hibernates in caves during the winter and utilizes forested areas for roosting and foraging during the active season of April through September. Suitable roost trees for this species are trees measuring greater than 3" in diameter at breast height with loose, peeling bark or crevices. Numerous trees exceeding 3" at breast height are proposed for clearing as part of this project. According to data provided by the MnDNR and USFWS, there are no known, occupied roost trees or hibernacula located with several miles of the project site. Additionally, northern long-eared bats are unlikely to use trees in highly-developed areas. However, because the project occurs within the range of the northern long-eared bat and a notable portion of trees will be cleared for the development of flood storage, the possibility of direct and indirect impacts cannot be completely discounted. Therefore, the project may affect, but is not likely to adversely affect, the northern long-eared bat. Furthermore, per the USFWS' final 4 (d) rule and associated programmatic Biological Opinion publication, no prohibited take of the northern long-eared bat will occur as part of this project due to the lack of roost trees and hibernacula in the project vicinity. A prudent, but not mandatory, measure to avoid all direct impacts to the northern long-eared bat is to remove the proposed trees outside of the active season (outside of April—September).

3.1.8 Cultural Resources

In October 2017, Barr submitted a data request to the State Historic Preservation Office (SHPO) for information related to known historic and archaeological resources in the vicinity of the project (i.e. the same section of land that the project is located within). SHPO responded to the data request with information indicating that there are numerous recorded historic and archaeological resources within the

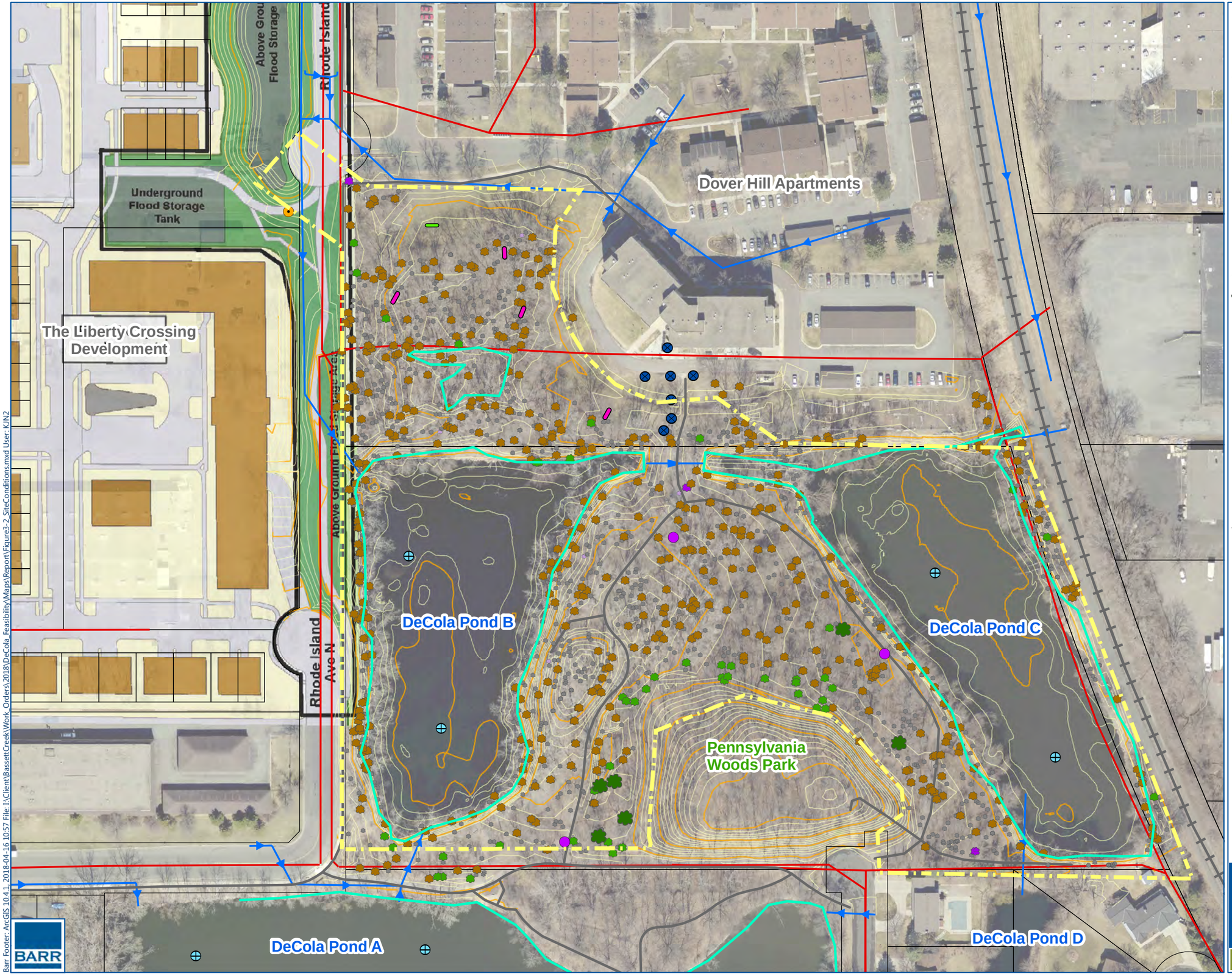
evaluated area. Recorded resources include: one school, one industrial building, one bridge, one roadway segment, two railroad segments, and 19 residences. Five of the residences appear to have been removed since being listed, and the bridge, listed as located over the Soo Line Railroad at Medicine Lake Road, no longer appears to be in place.

No historic or archaeological resources were identified within the defined project area (DeCola Ponds A, B, and C and Pennsylvania Woods). The nearest SHPO-recorded resource is approximately 740 feet east of the project.

Further cultural resources evaluation may be required as part of future design and permitting efforts to ensure that the project develops in a way that avoids and minimizes impacts to cultural resources.

3.1.9 Ordinary High Water Level

In early 2018, the MnDNR surveyed DeCola Ponds A, B, and C to determine the ordinary high water level (OHWL). As defined in Minnesota Statutes 103G.005, the OHWL for water basins is "an elevation delineating the highest water level that has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly the point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial." The MnDNR determined that the OHWL for DeCola Ponds A, B, and C is 895.3 (NAVD88 datum). The OHWL is the same for all three basins since the basins equalize due to their storm sewer connections and are ultimately controlled by the outlet at DeCola Pond C.



Existing Storm Sewer
Existing Sanitary Sewer
Existing City Trails
Railroad
DeCola Pond B & C Project Area
Hennepin County Parcels
Wetland Delineation (Barr, 2015, 2017)
Sediment Sampling Location (Barr, 2015)

Phase 2 ESA Investigations

Geoprobe Location (Peer, 2011)
Push Probe Boring (Barr, 2015)
Geotechnical Boring (Barr, 2015)
Test Trench Location (Barr, 2015)
Test Trench Location (Barr, 2018)

Tree Survey (Barr, 2017)*

Other Trees, Less than 6" diam
Legacy Hardwood, > 30" diam
Significant Hardwood, 6" - 30" diam
Significant Softwood, > 12" diam
Species Not Listed, Significant, > 12" diam
Species Not Listed, 6" - 11" diam

Existing Conditions Contours

5' contours
1' contours

* Tree classifications per City of Golden Valley ordinance.

N

120 60 0 120

Feet

SITE CONDITIONS
DeCola Ponds B & C
Improvement Project
BCWMC

FIGURE 3-2

Barr Footer: ArcGIS 10.4.1, 2018-04-16 10:57 File: I:\Client\BassettCreek\Work Orders\2018\DeCola_Feasibility\Maps\Report\Figure3-2_SiteConditions.mxd User: KJN2

4.0 Stakeholder input

4.1 Public Stakeholder Meetings

4.1.1 Public Stakeholder Open House 1

The first public stakeholder open house was held on November 9, 2017, from 5 to 7:30 pm at Golden Valley City Hall. Approximately 25-30 residents attended the open house, where BCWMC and City staff were available to talk with residents about the historic flooding in the area, discuss the long-term flood mitigation planning effort completed by the Cities of Golden Valley, New Hope and Crystal, and talk about the proposed BCWMC feasibility study for the DeCola Ponds B and C improvement project. Residents asked questions and provided comments on their use and the conditions of the current Pennsylvania Woods Nature Area and their thoughts/concerns/desires about the proposed project.

The comments received by the City staff were grouped into several themes including the following:

- General support for flood mitigation, protection of homes, and preservation of the neighborhood
- Desire for trail accessibility and maintenance
- Management of debris, litter, and trash
- Management of invasive species
- Management of trees
- Tree preservation and screening
- Concerns about stagnant water and sedimentation
- Concerns about safety and security (due to undergrowth/lack of visibility)
- Concerns about pond safety
- Special assessment for property owners

These comments were considered as part of the development of the feasibility study concepts and will continue to be considered as the project progresses through final design.

4.1.2 Public Stakeholder Open House 2

A second public stakeholder open house was held at Golden Valley City Hall on April 11, 2018, from 5 to 7:30 pm. Approximately 19 residents attended the open house. BCWMC and City staff were available to talk with residents about the historic flooding in the area and long-term flood mitigation planning effort completed by the Cities of Golden Valley, New Hope and Crystal, and outline the conceptual designs for the three alternatives for the DeCola Ponds B and C Improvement Project. Residents asked questions and provided comments on the three feasibility concepts.

Public feedback received at the meeting indicated general support for the project; however, the preferred option varied. A few resident wanted to preserve the maximum number of existing trees for noise reductions and tree screening (Concept 2), while other residents suggested that the BCWMC/City should pursue the maximum amount of flood storage regardless of tree impacts (Concept 1) as it has the biggest impact on Medicine Lake Road and DeCola Pond D flood levels. Several residents indicated their support of Concept 3, the hybrid concept that balances flood mitigation and tree preservation.

4.1.3 City of Golden Valley Meeting with Dover Hill Apartment Representatives

On April 3, 2018, City of Golden Valley staff met with representatives of the Dover Hill Apartments, LLC to discuss the status and schedule of the DeCola Ponds B and C Improvement Project, outlining the benefits of the Liberty Crossing and proposed projects to their property and other key locations, and to specifically focus on the DeCola Ponds B and C Improvement Project. The three conceptual designs were presented to the Dover Hill Apartments representatives.

Summary points from the meeting include:

- As with the Liberty Crossing flood mitigation project, the Dover Hill Apartments representatives were very supportive of the DeCola Ponds B and C Improvement Project and efforts to reduce flood levels in the area.
- Dover Hill Apartment representatives were accepting of the plan to construct a sediment forebay in the Dover Hill area after learning that the pond would be constructed to meet industry design standards for safety and that the City would be responsible for maintaining the pond and surrounding vegetation.
- Dover Hill Apartments representatives liked that no fences were proposed for their property
- Dover Hill Apartments representatives were supportive of the tree removal plan on their property. They said, given the choice to preserve or remove, they prefer removal of the large softwood trees due to safety and maintenance issues. Enhanced sunlight exposure for the gardens north of DeCola Pond C through the removal of trees was also seen as a benefit.
- The City of Golden Valley staff asked the Dover Hill Apartments representatives if their residents have been engaged in the project details and if the residents would have concerns about the replacement of existing trees with new wetland and upland habitat. The representatives did not feel this would be an issue for the residents.
- The City of Golden Valley mentioned the importance of posting signs in the hallways or emailing notices for residents to attend the public open house on April 11. Notices were posted for the first open house in November 2017, but no residents participated; however one meeting attendee indicated she was attending on behalf of some Dover Hill residents.
- The Dover Hill Apartments representatives approved the proposed walking trails looping through the easement on their property, but did not support the trail tying into their private sidewalk (as currently shown) citing winter maintenance and access issues. The Dover Hills Apartment representatives suggested two parallel trails near their entrance as an alternative. The City of Golden Valley mentioned that this trail alternative would be reviewed and discussed with the representatives more as part of the final design.

4.2 Technical Stakeholder Meetings

Several meetings were held with technical stakeholders to solicit feedback on and discuss permitting requirements for the proposed DeCola Ponds B and C improvement project. The anticipated permitting requirements as discussed at the meetings/calls outlined below are summarized in Section 6.4 of this feasibility study.

4.2.1 Technical Stakeholder Meeting

A technical stakeholder meeting with regulatory agencies was held at Golden Valley City Hall on December 8, 2017 from 11:00 am – 12:30 pm to discuss the proposed project. Attendees included representatives from the BCWMC, the City of Golden Valley, the City of Crystal, the Minnesota Department of Natural Resources (MnDNR), and the Minnesota Pollution Control Agency (MPCA). Background on the flooding and the general goals and design concept for the DeCola Ponds B and C Improvement Project were presented, which was followed by discussion related to technical feedback and permitting input. The items discussed included:

- Review of project background and history
- Review of site information compiled to date and site investigation work completed
- Review of potential design concepts
- Discussion of regulatory issues and potential permit requirements
- Discussion of grant opportunities
- Discussion of feasibility study

4.2.2 Conference Call with United States Army Corps of Engineers (USACOE)

Because USACOE staff were not able to attend the larger regulatory agencies' meeting held on December 8, 2017, a separate conference call was held with USACOE staff regarding the DeCola Ponds B and C improvement project on December 6, 2017. This meeting included a discussion of the flooding history, the long-term flood mitigation planning, and the proposed project in the context of potential USACOE permitting requirements.

4.2.3 Meeting with Metropolitan Council Environmental Services (MCES)

A MCES gravity sanitary sewer line runs from east to west through the area north of DeCola Pond B. Because of the potential impacts to the sanitary sewer, a separate meeting with MCES staff was held on December 28, 2017 at Golden Valley City Hall to discuss the project.

The focus of the discussion was the condition of the existing MCES gravity line through the project area and design considerations/requirements. The following were key takeaways from the MCES meeting:

- The existing pipe is in good condition and MCES has no plans to rehabilitate the system in this location, meaning that if any concepts would propose to relocate the gravity sanitary system, the MCES would not cover the cost to relocate those utilities.

- MCES requested that the rims of any sanitary manholes located within the project area be above the 100-year flood elevation and make the manholes' rims and covers water tight, etc.

- Locating a trail above the MCES gravity sanitary line is acceptable, as long as MCES can access their structures/system.

- MCES staff would allow reducing some cover over the gravity sanitary sewer, which is fairly deep; however, proposed loadings during construction will need to be considered.

- Temporary inundation over the gravity sanitary sewer is acceptable; however, the preference is not to have a wet pond/standing water over the sanitary sewer line.

5.0 Potential improvements

This section provides a summary of the three conceptual designs developed and evaluated for the DeCola Ponds B and C and Dover Hills areas for this feasibility study.

5.1 Analyzed alternatives for DeCola Ponds B & C Improvement Project

When selecting a conceptual design alternative for detailed design and construction, the BCWMC and the City of Golden Valley may decide to select one of the alternatives, but further discussions and suggestions are encouraged to best meet the overall project budget and goals.

The following sections outline the components of each of the three concepts. Section 6.0 summarizes the impacts of the conceptual designs.

5.1.1 Concept 1— Maximize Flood Storage

The primary focus of the Concept 1 design is to maximize the development of flood storage in the project area without significant negative consequences or unnecessary economic expense, including preserving hardwood trees on the large knoll and screening trees along the south and east edges of DeCola Pond B. However, many of the trees that are proposed to be removed are located in the low area between DeCola Ponds B and C. Figure 5-1 shows a visual representation of the proposed features of Concept 1. This alternative includes the following design components:

- Installing a 14' x 4' box culvert (outlet invert at elevation 893.0 ft MSL) that will connect the Liberty Crossing flood storage features to the expanded storage in the Dover Hills and DeCola Ponds B and C areas. A weir (at elevation 896.0 ft MSL) is proposed on the upstream end of the box culvert system to prevent the bounce in the pond during normal, smaller storm events from backing up into the Liberty Crossing site. The existing storm sewer along Rhode Island Avenue will tie into this proposed box culvert system.
- Constructing a sediment forebay in the existing Dover Hills area easement north of DeCola Pond B at the outlet of the proposed box culvert system. This forebay will provide a water quality treatment volume of 5.2 ac-ft and will be separated from DeCola Pond B by a berm and channel overflow connection. Construction of a sediment forebay will include a maintenance access and would allow the city to perform more frequent, smaller maintenance projects to remove sediment from the forebay area and would prevent the larger scale sedimentation of DeCola Pond B, a MnDNR public water, which requires more permitting to perform maintenance activities.
- Lowering the normal water level (NWL) of DeCola Ponds A, B, and C from 893.8 ft MSL to 893.5 ft MSL. The lowering of the NWL provides additional flood mitigation volume without requiring excavation to develop that volume. Including the sediment forebay in the design allows the NWL to be lowered without reducing the water quality treatment provided by the DeCola Pond system.

- Modifying the DeCola Pond C outlet structure and overflow to lower the NWL to 893.5 ft MSL (and provide additional flood storage volume) while increasing the overflow on the south end of DeCola Pond C to elevation 901.5 ft MSL (to increase the flood storage in DeCola Ponds A, B, and C). The modified outlet will prevent the accumulation of debris on the inlet pipe, which is currently an issue for the City. Also, the proposed outlet and overflow modifications will decrease the amount of bounce on DeCola Ponds A, B, and C during smaller storm events (1-year/2-year events) while not increasing the 10-year or 100-year flood elevations on the downstream ponds. This will allow for enhanced establishment of shoreline vegetation along DeCola Ponds B and C.

  The existing outlet from DeCola Pond C is a 15" RCP. Figure 5-2 shows the proposed outlet design. The proposed 24" submerged pipe will prevent the accumulation of debris at the inlet. A notched five foot weir will allow adequate water to pass downstream for smaller storm events, which will reduce the bounce observed in DeCola Ponds A, B, and C. However, the 12" storm sewer outlet pipe and raised overflow elevation (to 901.5 ft MSL) will control discharge rates for larger storm events, mitigating downstream flooding concerns. The outlet structure and overflow elevation were designed so that the downstream 10-year and 100-year flood elevations were either not changed or decreased.
- Increasing the total flood mitigation volume for DeCola Ponds A, B, and C and the Dover Hills area by 32.8 ac-ft from existing conditions through excavation and regrading in the nature area and lowering the normal water level. To maximize flood storage, the berm between DeCola Ponds B and C will be removed.
- Increasing the DeCola Ponds B and C open water area by 2.7 acres (including sediment forebay area), and increasing associated water quality treatment volume by 5.1 ac-ft in DeCola Ponds B and C through expanding contours below the NWL and dredging accumulated sediment in DeCola Pond B. The proposed expansion does not change the overall depth of the existing ponds, but will provide additional water quality treatment volume and provide additional aquatic habitat for fish, macroinvertebrates, and macrophytes.
- Since the berm between DeCola Ponds B and C is proposed to be removed in this concept, an ADA-compliant boardwalk or floating trail will be necessary to connect the existing trails to the Dover Hill Apartments. An estimated 385 feet of boardwalk/floating trail will be required for this design. Approximately 1,417 feet of paved trail will be constructed above elevation 900 throughout the disturbed nature area (above the 10-year flood elevation).
- Preserving trees on the knoll between DeCola Ponds A, B, and C, screening trees along the east and south sides of DeCola Pond B, and along the east side of DeCola Pond C. Tree removal is expected within project disturbance limits. However, 1.7 acres of upland areas are to be restored with native vegetation and replanted with trees at a density potentially ranging from savanna (~35 trees/acre) to forest (~110 trees/acre) – to be determined during final design.
- Restoring 2.3 acres of wetland habitat.

5.1.2 Concept 2—Maximum Tree Preservation Alternative

Conceptual design 2 is focused on developing flood storage while maximizing tree preservation. Figure 5-3 shows a visual representation of the proposed features of Concept 2. This alternative includes the following design components:

Components from Concept 1:

- Installing a 14′ x 4′ box culvert that will connect the Liberty Crossing flood storage features to the expanded storage in the Dover Hills and DeCola Ponds B and C areas.
- Constructing a sediment forebay in the existing Dover Hills area easement north of DeCola Pond B at the outlet of the proposed box culvert system to provide water quality treatment and access for long-term maintenance.
- Lowering the normal water level (NWL) of DeCola Ponds A, B, and C from 893.8 ft MSL to 893.5 ft MSL to provide additional flood mitigation volume without requiring excavation to develop that volume.
- Modifying the DeCola Pond C outlet structure and overflow to lower the NWL to 893.5 ft MSL (and provide additional flood storage volume) while increasing the overflow on the south end of DeCola Pond C to elevation 901.5 ft MSL (to increase the flood storage in DeCola Ponds A, B, and C).

Components unique to Concept 2:

- Increasing the total flood mitigation volume for DeCola Ponds A, B, and C and the Dover Hills area by 17.2 ac-ft from existing conditions through excavation and regrading the nature area and lowering the normal water level.
- Increasing the DeCola Ponds B and C open water area by 1.6 acres (including the sediment forebay area), and increasing associated water quality treatment volume by 1.3 ac-ft (DeCola Ponds B and C) through expanding contours below the NWL and dredging accumulated sediment in DeCola Pond B. The proposed expansion does not change the overall depth of the existing ponds, but will provide additional water quality treatment volume and provide additional aquatic habitat for fish, macroinvertebrates, and macrophytes.
- Maintaining the berm between DeCola Ponds B and C so that the entire walking trail loop could be constructed at elevations greater than the 10-year flood elevation without requiring a boardwalk or floating system. An estimated 1,421 feet of ADA-compliant paved trail will be constructed within the project area.
- Disturbing the least amount of trees possible as a result of the proposed grading. Preserving trees on the knoll between DeCola Ponds A, B, and C, and preserving the screening trees along the east and south sides of DeCola Pond B, and along the east side of DeCola Pond C were also a priority. Tree removal is expected within project disturbance limits. However, 1.1 acres of upland areas are to be restored with native vegetation and replanted with trees at a density potentially ranging from savanna (~35 trees/acre) to forest (~110 trees/acre) – to be determined during final design.

- Restoring 1.4 acres of wetland habitat.

5.1.3 Concept 3—Hybrid Alternative

Conceptual design 3 consists of creating a design that reflects a hybrid of Concepts 1 and 2, with the goals of developing flood storage while trying to also maximize tree preservation. Figure 5-4 shows a visual representation of the proposed features of Concept 3. This alternative includes the following design components:

Components from Concept 1:

- Installing a 14′ x 4′ box culvert that will connect the Liberty Crossing flood storage features to the expanded storage in the Dover Hillsand DeCola Ponds B and C areas.
- Constructing a sediment forebay in the existing Dover Hills area easement north of DeCola Pond B at the outlet of the proposed box culvert system to provide water quality treatment and access for long-term maintenance.
- Lowering the normal water level (NWL) of DeCola Ponds A, B, and C from 893.8 ft MSL to 893.5 ft MSL to provide additional flood mitigation volume without requiring excavation to develop that volume.
- Modifying the DeCola Pond C outlet structure and overflow to lower the NWL to 893.5 ft MSL (and provide additional flood storage volume) while increasing the overflow on the south end of DeCola Pond C to elevation 901.5 ft MSL (to increase the flood storage in DeCola Ponds A, B, and C).

Components unique to Concept 3:

- Increasing the total flood mitigation volume for DeCola Ponds A, B, and C and the Dover Hills area by 21.9 ac-ft from existing conditions through excavation and regrading the nature area and lowering the normal water level.
- Increasing the DeCola Ponds B and C open water area by 1.9 acres (including sediment forebay area), and increasing associated water quality treatment volume by 2.3 ac-ft (DeCola Ponds B and C) through expanding contours below the NWL and dredging accumulated sediment in DeCola Pond B. The proposed expansion does not change the overall depth of the existing ponds, but will provide additional water quality treatment volume and provide additional aquatic habitat for fish, macroinvertebrates, and macrophytes.
- Maintaining the berm between DeCola Ponds B and C so that the entire walking trail loop could be constructed at elevations greater than the 10-year flood elevation without requiring a boardwalk or floating system. An estimated 1,383 feet of ADA-compliant paved trail will be constructed throughout the disturbed nature area.
- Maximizing both flood storage development and tree preservation as a priority (hybrid of conceptual designs 1 and 2). Preserving trees on the knoll between DeCola Ponds A, B, and C, and preserving the screening trees along the east and south sides of DeCola Pond B, and along the east side of DeCola Pond C are also a priority. Tree removal is expected within project disturbance limits. However, 1.0 acres of upland areas are to be restored with native vegetation

and replanted with trees at a density potentially ranging from savanna (~35 trees/acre) to forest (~110 trees/acre) – to be determined during final design.

- Restoring 1.7 acres of wetland habitat.

Connect Existing Storm Sewer Box Culvert

Installation of 14'x4' Box Culvert with Inlet Weir at 896.0

Forebay for Water Quality Treatment

Proposed Trail

Proposed ADA Boardwalk/ Floating Trail

Expansion of Open Water Area

DeCola Pond B

DeCola Pond C

Wetland Habitat Restoration

Remove Accumulated Sediment in DeCola Pond B

Expansion of Open Water Area

Native Upland Habitat Restoration

Preservation of Existing Trees Outside Project Grading Extents

Provide Signage, Fencing or Landscaping as Barrier

Modify Outlet Structure (Lower NWL to 893.5 and Raise Overflow to 901.5) and Add Maintenance Access

DeCola Pond A

900
895
890
885
895
895
895
900
905
910
915
920

Rhode Island Ave N

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Key

- Project Grading Extents
- Expanded Open Water
- Wetland Habitat
- Upland Habitat
- Tree Preservation Area
- Existing Pond Footprint
- 14'x4' Box Culvert
- Proposed Paved Trail
- Proposed Boardwalk/ Floating Trail
- Modified Outlet Structure
- Proposed Contour
- Existing Contour
- Existing Storm Sewer
- Existing Sanitary Sewer
- Existing City Trail
- Existing Rail

N

0 60 120
Feet

Figure 5-1
Concept 1
Maximize Flood Storage

DeCola Ponds B&C Improvement Project
Feasibility Study

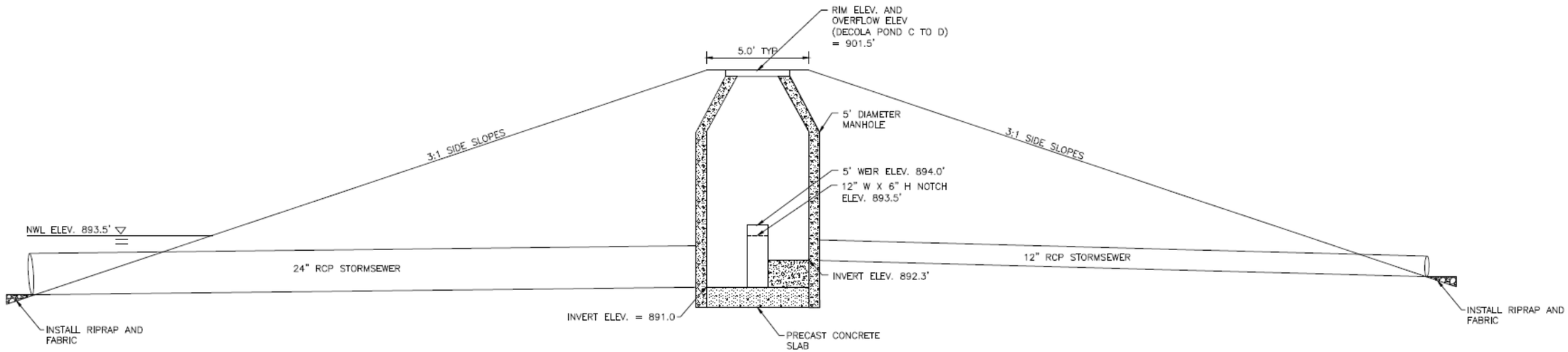
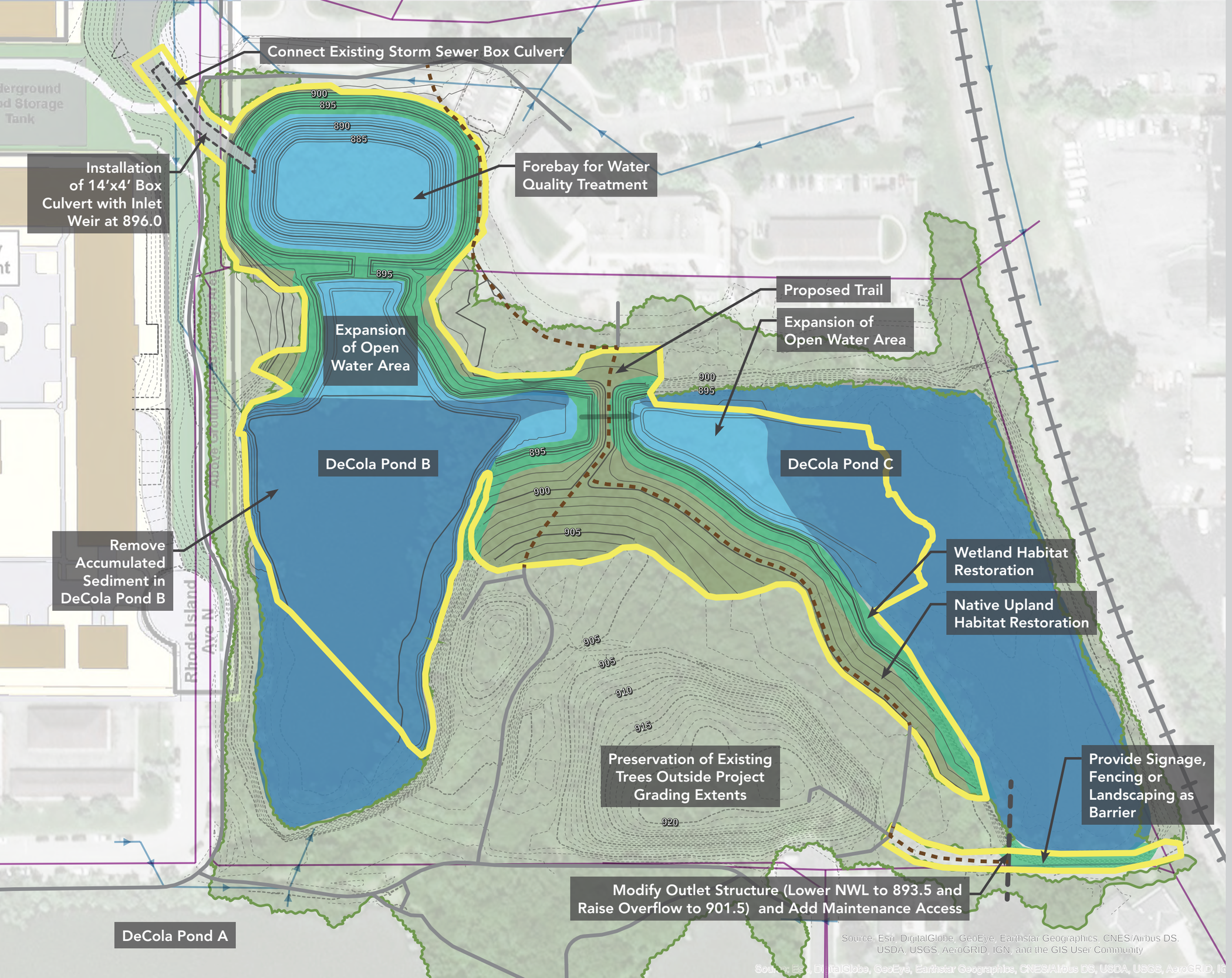


Figure 5-2 Proposed DeCola Pond C Outlet Structure



Key

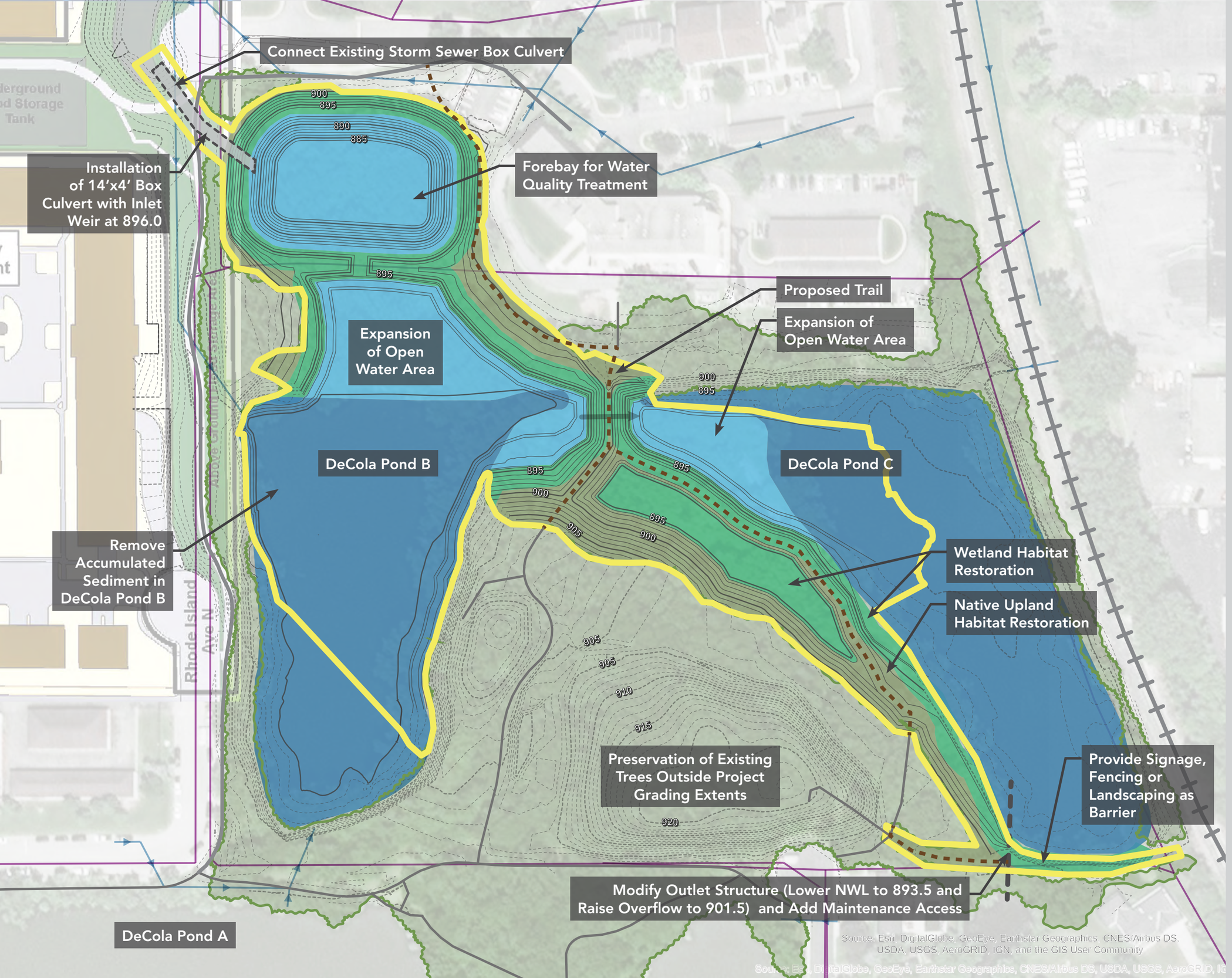
- Project Grading Extents
- Expanded Open Water
- Wetland Habitat
- Upland Habitat
- Tree Preservation Area
- Existing Pond Footprint
- 14'x4' Box Culvert
- Proposed Paved Trail
- Proposed Boardwalk/ Floating Trail
- Modified Outlet Structure
- Proposed Contour
- Existing Contour
- Existing Storm Sewer
- Existing Sanitary Sewer
- Existing City Trail
- Existing Rail

N

0 60 120
Feet

Figure 5-3
Concept 2
Maximize Tree Preservation

DeCola Ponds B&C Improvement Project
Feasibility Study



Key

- Project Grading Extents
- Expanded Open Water
- Wetland Habitat
- Upland Habitat
- Tree Preservation Area
- Existing Pond Footprint
- 14'x4' Box Culvert
- Proposed Paved Trail
- Proposed Boardwalk/ Floating Trail
- Modified Outlet Structure
- Proposed Contour
- Existing Contour
- Existing Storm Sewer
- Existing Sanitary Sewer
- Existing City Trail
- Existing Rail

N

0 60 120
Feet

Figure 5-4
Concept 3
Hybrid of Concepts 1 & 2

DeCola Ponds B&C Improvement Project
Feasibility Study

6.0 Project Modeling Results and Potential Impacts

This section discusses the results of the hydrologic, hydraulic, and water quality modeling and provides information on potential project impacts, including permitting requirements. Table 6-1summarizes the design features and potential impacts of the three concepts, in comparison to the project area's existing conditions.

6.1 Hydrologic, Hydraulic, and Water Quality Modeling

6.1.1 Available Models

Hydrologic and hydraulic information and water quality information are available for the project area in the form of a XP-SWMM hydrologic and hydraulic model and a P8 water quality model. The BCWMC completed the Phase 2 XP-SWMM model in 2017 for Bassett Creek and its contributing watersheds. The BCWMC developed the P8 model in 2012 for Bassett Creek and its contributing watersheds, and updates the model annually.

The 2017 BCWMC Phase 2 XP-SWMM model was utilized for hydrologic and hydraulic modeling efforts for this project. This existing BCWMC Phase 2 Model was updated to include the Liberty Crossing development features, flood mitigation subsurface storage area, and the surface flood mitigation basins and channels. This updated model was used to represent existing conditions for the project area and its flood elevation results were used as a basis of comparison for the proposed conceptual designs.

The updated existing conditions BCWMC Phase 2 XP-SWMM model was hydrologically and hydraulically modified to model the three conceptual designs. Watershed parameters, storage curves, storm sewer routing, and outlet control structures were revised to represent the proposed grading contours and culvert designs for the three concepts. Maximum flood elevations for the 1-, 2-, 10-, and 100-year recurrence intervals were analyzed and compared for the conceptual designs.

This study also included updating the P8 model with current site conditions for the DeCola Ponds areas, and using the P8 water quality model to estimate the water quality improvement expected from each proposed alternative at each pond location.

Final design efforts should include additional refinements to the XP-SWMM and P8 water quality modeling. The improvements that will ultimately be constructed should also be incorporated into the BCWMC XP-SWMM model and the P8 model after completion of the project.

6.1.2 XP-SWMM Flood Elevation Results

Table 6-1 (the comparative matrix) provides the maximum 10-year and 100-year flood elevations for existing conditions and the three conceptual designs for the following locations:

1) The low point on Medicine Lake Road
2) DeCola Ponds A, B, and C (ponds equalize during precipitation events)
3) DeCola Pond D
4) DeCola Ponds E and F

Table 6-2 provides the 10-year and 100-year flood elevations for existing conditions and the three conceptual designs for key flood areas within the cities of New Hope, Crystal, and Golden Valley. The key flood areas were originally defined in the 2016 *Medicine Lake Road and Winnetka Avenue Area Long-Term Flood Mitigation Plan* and are based on known historical flooding concerns.

A main purpose of the proposed DeCola Ponds B & C Improvement Project is to lower the flood depths on Medicine Lake Road to allow passage of emergency vehicles during larger storm events, to reduce flood damage, and to protect structures around this area. The XP-SWMM modeling results indicate that for all three concepts the 10-year recurrence interval flood depth on Medicine Lake Road is reduced from 1.5 feet to 1.0 feet at the low point. For the 100-year flood event, the flood depth on Medicine Lake Road is reduced from 3.1 feet to 1.7 – 1.8 feet, depending on the concept. This flood elevation reduction on Medicine Lake Road builds off of the reductions experienced from the Liberty Crossing Flood Mitigation Project. For details on the impacts of the Liberty Crossing Project, refer to Section 3.1.1.

Reductions in flood elevations can translate to structures no longer being at-risk of flooding. Table 6-3 lists all of the potentially at-risk properties as originally identified in the 2016 *Medicine Lake Road and Winnetka Avenue Area Long-Term Flood Mitigation Plan*. The table provides summaries of the 10-year and 100-year flood elevations and depth of flooding over the low opening elevation at each structure for existing conditions (after the implementation of the Liberty Crossing Flood Mitigation Project) and for each of the conceptual designs.

For all three concepts, one multifamily residential structure comprised of 12 units is expected to be removed from the at-risk properties list for the 100-year event, which is located at 2740 Rosalyn Court. All three concepts are expected to lower the 100-year flood elevations in Rosalyn Court area by approximately 1.0 foot. Garage flooding and driveway access should also improve in the surrounding area, although it may not be fully-eliminated at the low areas on the site. With the combination of the Liberty Crossing Flood Mitigation Project and the recommended DeCola Ponds B and C Improvement Project, a total of six structures (two commercial properties and four 12-unit condominiums) would no longer be at-risk of flooding during the 100-year event.

A secondary purpose of the proposed DeCola Ponds B & C Improvement Project is to reduce flood elevations on DeCola Ponds A and D and potentially slightly reduce flood elevations on DeCola Ponds E and F. For the three concepts, the expanded flood storage reduces the 10-year flood elevations on DeCola Ponds A, B, and C by 0.5 feet (Concept 2) to 1.0 feet (Concept 1). Additionally, 10-year flood reductions of 0.3 feet on DeCola Pond D were estimated for all three concepts.

For the 100-year event, the flood elevations on DeCola Ponds A, B, and C are estimated to be reduced by 0.3 feet (Concept 2) to 0.6 feet (Concept 1). This translates to a reduction on DeCola Pond D by 0.4 feet (Concept 2) to 1.2 feet (Concept 1).

The impact of the expanded flood storage in DeCola Ponds B and C will have minimal impact on reducing the flood elevations on DeCola Ponds E and F because the primary driver of flooding at these ponds is the runoff volume from the area east of the railroad tracks that discharges into the northeast corner of

DeCola Pond F and the direct watersheds to Ponds E and F. The results of the XP-SWMM modeling indicate that all three concepts will have no impact on the 10-year peak elevations at DeCola Ponds E and F and will reduce the 100-year flood elevations by 0.1 feet.

Table 6-1: DeCola Ponds B & C Improvement Project Concept Matrix Summary

Category	Item	Existing Conditions	Concept 1: Maximize Flood Storage	Concept 2: Maximize Tree Preservation	Concept 3: Hybrid Alternative
Outlet Modifications	Normal Water Level (NWL)	893.8	893.5	893.5	893.5
	Overflow Elevation (DeCola Pond C)	899.5	901.5	901.5	901.5
	Ordinary High Water Level (OHWL)	895.3	895.3	895.3	895.3
Flood Mitigation	Connection to Liberty Crossing (Box Culvert)	-	14' x 4'	14' x 4'	14' x 4'
	Box Culvert Inlet Weir Elevation	-	896	896	896
	Total Flood Mitigation Volume (ac-ft) (DeCola Ponds A, B, & C)	140.3	173.1	157.5	162.2
	Increase in Flood Mitigation Volume (ac-ft)	-	32.8	17.2	21.9
	10-Year Flood Elevation (Low Point Medicine Lake Road)	902.0	901.5	901.5	901.5
	10-Year Flood Depth (Low Point Medicine Lake Road)	1.5	1.0	1.0	1.0
	10-Year Flood Elevation (DeCola Ponds A, B, & C)	899.4	898.4	898.9	898.7
	10-Year Flood Elevation (DeCola Pond D)	894.1	893.8	893.8	893.8
	10-Year Flood Elevation (DeCola Pond E)	893.3	893.3	893.3	893.3
	10-Year Flood Elevation (DeCola Pond F)	893.2	893.2	893.2	893.2
	# of Potentially At-Risk Structures (10-year)	11	11	11	11
	100-Year Flood Elevation (Low Point Medicine Lake Road)	903.6	902.2	902.3	902.3
	100-Year Flood Depth (Low Point Medicine Lake Road)	3.1	1.7	1.8	1.8
	100-Year Flood Elevation (DeCola Ponds A, B, & C)	902.3	901.7	902.0	901.8
	100-Year Flood Elevation (DeCola Pond D)	902.3	901.1	902.0	901.8
	100-Year Flood Elevation (DeCola Pond E)	896.1	896.0	896.0	896.0
	100-Year Flood Elevation (DeCola Pond F)	896.1	896.0	896.0	896.0
	# of Potentially At-Risk Structures (100-year)	35	34	34	34
Water Quality	Open Water Surface Area (ac) (DeCola Ponds B & C and Pennsylvania Woods)	4.8	7.5	6.4	6.7
	Increase in Open Water Surface Area (ac) (DeCola Ponds B & C and Pennsylvania Woods)	-	2.7	1.6	1.9
	Forebay Water Quality Treatment Volume (ac-ft)	-	5.2	5.2	5.2
	Pond Water Quality Treatment Volume (ac-ft) (DeCola Ponds A, B, & C)	50.5	55.6	51.8	52.8
	Additional Pond Water Quality Treatment Volume (ac-ft)	-	5.1	1.3	2.3
	Total Phosphorus Removal (lbs/yr)	143.0	153.5	151.0	152.0
	Increase in Total Phosphorus Removal (lbs/yr)	-	10.5	8.0	9.0
	Accumulated Sediment Removal Volume in DeCola Pond B (Cu. Yd.)	-	3480	2760	3040
Trees	Total # of Surveyed[1] Trees (> 4 inches)	1591	1591	1591	1591
	Tree Removal Estimate	-	1156	672	687
	Percentage of Total Surveyed[1] Trees Removed	-	73%	42%	43%
	Percentage of Total Surveyed[1] Trees Preserved	-	27%	58%	57%
	# of Significant Trees Removed	535	386	235	245
	# of Legacy Trees Removed	6	2	0	1
	# of Other Trees (< 6 inches diameter) Removed	915	674	373	371
	# of Dead/Dying Trees Removed	135	94	64	70
	Tree Planting Estimate	-	60 - 180	40 - 120	35 - 105
	Preservation of Hardwood Trees on Knoll	Yes	Yes	Yes	Yes
	Preservation of Screening Trees	Yes	Yes	Yes	Yes

Category	Item	Existing Conditions	Concept 1: Maximize Flood Storage	Concept 2: Maximize Tree Preservation	Concept 3: Hybrid Alternative
Other Habitat	Wetland Impact Area (ac)	-	3.09	2.53	2.53
	Restored Wetland Area (ac)	-	2.31	1.37	1.68
	Restored Native Upland Area (ac)		1.70	1.10	1.00
Trails	Legnth of Trail to be Removed (ft)	-	1426	984	946
	Length of New Paved Trail (ft)	-	1417	1421	1383
	Length of New Boardwalk/Floating Trail (ft)	-	385	-	-
	Connection to Railroad Right of Way	No	No	No	No
Project Costs	Feasibility Level Opinion of Cost	-	$ 5.7 million	$3.5 million	3.8 million
	Feasibility Level Opinion of Cost Range (-20% to +30%)	-	$4.5 - 7.4 million	$2.8 - $4.6 million	$3.0 - 4.9 million
	30-Year Annualized Cost Estimate	-	$303,500	$193,700	$208,500
	Cost per Acre-Ft of Flood Mitigation Volume	-	$173,900	$203,400	$173,400
	Annualized Cost per Pound of Total Phosphorus Removed (Total Project)	-	$28,900	$24,200	$23,200
	Annualized Cost per Pound of Total Phosphorus Removed (Water Quality Treatment)	-	$8,900	$11,100	$9,600

[1] Does not reflect a complete survey of all trees in the DeCola Ponds B and C (Pennsylvania Woods) area; Trees on large, upland knoll were not included in the original survey as the goal was not to impact those trees as part of this flood mitigation project.

Table 6-2: Medicine Lake Road and Winnetka Avenue Project Area - Key Flood Areas and Flood Elevation Summary

Flood Area	Flood Area Description	Flood Elevation (ft-NAVD88)							
		Existing Conditions (Phase 2 XP-SWMM Model)[1]		Concept 1 - Maximize Flood Storage		Concept 2 - Maximize Tree Preservation		Concept 3 - Hybrid Alternative	
		10-yr	100-yr	10-yr	100-yr	10-yr	100-yr	10-yr	100-yr
1	Terra Linda Low Point	906.6	907.3	906.5	907.3	906.5	907.3	906.5	907.3
2	Medicine Lake Road Low Point/Rosalyn Court	902.0	903.6	901.5	902.2	901.5	902.3	901.5	902.2
3	Rhode Island Ave Low Point	900.8	903.6	898.5	901.7	898.9	902.0	898.7	901.8
4	Dover Hill Apartments	900.7	902.3	900.6	901.7	900.6	902.0	900.6	901.8
5	Decola Pond A	899.4	902.3	898.4	901.7	898.9	902.0	898.7	901.8
6	Decola Pond B	899.4	902.3	898.4	901.7	898.9	902.0	898.7	901.8
7	Decola Pond C	899.4	902.3	898.4	901.7	898.9	902.0	898.7	901.8
8	Decola Pond D	894.1	902.3	893.8	901.1	893.8	901.9	893.8	901.8
9	Decola Pond E	893.3	896.1	893.3	896.0	893.3	896.0	893.3	896.0
10	Decola Pond F	893.2	896.1	893.2	896.0	893.2	896.0	893.2	896.0
11	Medicine Lake Road East of Railroad	911.5	912.3	911.5	912.3	911.5	912.3	911.5	912.3
12	East of Railroad to Decola Pond C	899.5	902.3	899.5	901.7	899.5	902.0	899.5	901.8
13	East of Railroad at Low Point on Nevada	903.0	903.8	903.0	903.8	903.0	903.8	903.0	903.8
14	East of Railroad at Low Point on Sandburg	902.5	903.8	902.5	903.8	902.5	903.8	902.5	903.8
15	East of Railroad to Decola Pond F	899.0	901.5	899.0	901.5	899.0	901.5	899.0	901.5
16	Honeywell Pond	883.4	886.3	883.4	886.4	883.4	886.4	883.4	886.4

[1] Existing conditions flood elevations include the Liberty Crossing flood mitigation project

Table 6-3: Medicine Lake Road and Winnetka Avenue Project Area - At-Risk[1] Properties

Address[1]	City	Property Type	Flood Area	Elevation of Lowest Opening (ft - NAVD88)[2]	Existing Conditions[5]				Concept 1 - Maximize Flood Storage				Concept 2 - Maximize Tree Preservation				Concept 3 - Hybrid Alternative			
					10-Year Flood Elevation (ft - NAVD88)[3]	100-Year Flood Elevation (ft - NAVD88)[3]	10-year Flood Depth (ft)[4]	100-year Flood Depth (ft)[4]	10-Year Flood Elevation (ft - NAVD88)[3]	100-Year Flood Elevation (ft - NAVD88)[3]	10-year Flood Depth (ft)[4]	100-year Flood Depth (ft)[4]	10-Year Flood Elevation (ft - NAVD88)[3]	100-Year Flood Elevation (ft - NAVD88)[3]	10-year Flood Depth (ft)[4]	100-year Flood Depth (ft)[4]	10-Year Flood Elevation (ft - NAVD88)[3]	100-Year Flood Elevation (ft - NAVD88)[3]	10-year Flood Depth (ft)[4]	100-year Flood Depth (ft)[4]
7145 SANDBURG RD	GOLDEN VALLEY	Business	15	901.00	899.0	901.5	0.0	0.5	899.0	901.5	0.0	0.5	899.0	901.5	0.0	0.5	899.0	901.5	0.0	0.5
7825 MEDICINE LAKE RD	GOLDEN VALLEY	Business	2	903.95	902.0	903.6	0.0	0.0	901.5	902.2	0.0	0.0	901.5	902.3	0.0	0.0	901.5	902.2	0.0	0.0
7775 MEDICINE LAKE RD	GOLDEN VALLEY	Business	2	904.68	902.0	903.6	0.0	0.0	901.5	902.2	0.0	0.0	901.5	902.3	0.0	0.0	901.5	902.2	0.0	0.0
2740 ROSALYN CT[6]	**NEW HOPE**	**Multi-Residential**	**2**	**903.43**	**902.0**	**903.6**	**0.0**	**0.2**	**901.5**	**902.2**	**0.0**	**0.0**	**901.5**	**902.3**	**0.0**	**0.0**	**901.5**	**902.2**	**0.0**	**0.0**
2710 ROSALYN CT	NEW HOPE	Multi-Residential	2	904.63	902.0	903.6	0.0	0.0	901.5	902.2	0.0	0.0	901.5	902.3	0.0	0.0	901.5	902.2	0.0	0.0
2700 ROSALYN CT	NEW HOPE	Multi-Residential	2	904.40	902.0	903.6	0.0	0.0	901.5	902.2	0.0	0.0	901.5	902.3	0.0	0.0	901.5	902.2	0.0	0.0
2730 ROSALYN CT	NEW HOPE	Multi-Residential	2	904.49	902.0	903.6	0.0	0.0	901.5	902.2	0.0	0.0	901.5	902.3	0.0	0.0	901.5	902.2	0.0	0.0
7500 WINNETKA HEIGHTS DR	GOLDEN VALLEY	Residential	5	899.98	899.4	902.3	0.0	2.3	898.4	901.7	0.0	1.7	898.9	902.0	0.0	2.0	898.7	901.8	0.0	1.8
2155 KELLY DR	GOLDEN VALLEY	Residential	8	900.32	894.1	902.3	0.0	2.0	893.8	901.1	0.0	0.8	893.8	901.9	0.0	1.6	893.8	901.8	0.0	1.4
2145 KELLY DR	GOLDEN VALLEY	Residential	8	899.84	894.1	902.3	0.0	2.5	893.8	901.1	0.0	1.3	893.8	901.9	0.0	2.1	893.8	901.8	0.0	1.9
2135 KELLY DR	GOLDEN VALLEY	Residential	8	899.31	894.1	902.3	0.0	3.0	893.8	901.1	0.0	1.8	893.8	901.9	0.0	2.6	893.8	901.8	0.0	2.4
2125 KELLY DR	GOLDEN VALLEY	Residential	8	898.73	894.1	902.3	0.0	3.6	893.8	901.1	0.0	2.4	893.8	901.9	0.0	3.2	893.8	901.8	0.0	3.0
7350 WINNETKA HEIGHTS DR	GOLDEN VALLEY	Residential	8	898.31	894.1	902.3	0.0	4.0	893.8	901.1	0.0	2.8	893.8	901.9	0.0	3.6	893.8	901.8	0.0	3.4
7400 WINNETKA HEIGHTS DR	GOLDEN VALLEY	Residential	8	898.43	894.1	902.3	0.0	3.9	893.8	901.1	0.0	2.7	893.8	901.9	0.0	3.5	893.8	901.8	0.0	3.3
7450 WINNETKA HEIGHTS DR	GOLDEN VALLEY	Residential	8	898.37	894.1	902.3	0.0	3.9	893.8	901.1	0.0	2.7	893.8	901.9	0.0	3.6	893.8	901.8	0.0	3.4
2120 PENNSYLVANIA AVE N	GOLDEN VALLEY	Residential	8	899.18	894.1	902.3	0.0	3.1	893.8	901.1	0.0	1.9	893.8	901.9	0.0	2.8	893.8	901.8	0.0	2.6
2140 PENNSYLVANIA AVE N	GOLDEN VALLEY	Residential	8	897.98	894.1	902.3	0.0	4.3	893.8	901.1	0.0	3.1	893.8	901.9	0.0	4.0	893.8	901.8	0.0	3.8
2200 PENNSYLVANIA AVE N	GOLDEN VALLEY	Residential	8	898.06	894.1	902.3	0.0	4.2	893.8	901.1	0.0	3.0	893.8	901.9	0.0	3.9	893.8	901.8	0.0	3.7
2220 PENNSYLVANIA AVE N	GOLDEN VALLEY	Residential	8	897.26	894.1	902.3	0.0	5.0	893.8	901.1	0.0	3.8	893.8	901.9	0.0	4.7	893.8	901.8	0.0	4.5
2240 PENNSYLVANIA AVE N	GOLDEN VALLEY	Residential	8	897.09	894.1	902.3	0.0	5.2	893.8	901.1	0.0	4.0	893.8	901.9	0.0	4.9	893.8	901.8	0.0	4.7
7820 TERRA LINDA DR	NEW HOPE	Residential	1	905.80	906.6	907.3	0.8	1.5	906.5	907.3	0.7	1.5	906.5	907.3	0.7	1.5	906.5	907.3	0.7	1.5
1920 PENNSYLVANIA AVE N	GOLDEN VALLEY	Residential	9	892.43	893.3	896.1	0.9	3.7	893.3	896.0	0.8	3.5	893.3	896.0	0.8	3.5	893.3	896.0	0.8	3.5
7450 DULUTH ST	GOLDEN VALLEY	Residential	9	892.71	893.3	896.1	0.6	3.4	893.3	896.0	0.6	3.3	893.3	896.0	0.6	3.3	893.3	896.0	0.6	3.3
7400 DULUTH ST	GOLDEN VALLEY	Residential	9	891.18	893.3	896.1	2.1	4.9	893.3	896.0	2.1	4.8	893.3	896.0	2.1	4.8	893.3	896.0	2.1	4.8
7350 DULUTH ST	GOLDEN VALLEY	Residential	9	891.99	893.3	896.1	1.3	4.1	893.3	896.0	1.3	4.0	893.3	896.0	1.3	4.0	893.3	896.0	1.3	4.0
7310 DULUTH ST	GOLDEN VALLEY	Residential	9	897.37	893.3	896.1	0.0	0.0	893.3	896.0	0.0	0.0	893.3	896.0	0.0	0.0	893.3	896.0	0.0	0.0
1925 KELLY DR	GOLDEN VALLEY	Residential	9	890.96	893.3	896.1	2.3	5.1	893.3	896.0	2.3	5.0	893.3	896.0	2.3	5.0	893.3	896.0	2.3	5.0
1945 KELLY DR	GOLDEN VALLEY	Residential	9	893.24	893.3	896.1	0.1	2.8	893.3	896.0	0.03	2.7	893.3	896.0	0.04	2.7	893.3	896.0	0.03	2.7
1965 KELLY DR	GOLDEN VALLEY	Residential	9	892.36	893.3	896.1	0.9	3.7	893.3	896.0	0.9	3.6	893.3	896.0	0.9	3.6	893.3	896.0	0.9	3.6
2005 KELLY DR	GOLDEN VALLEY	Residential	9	893.47	893.3	896.1	0.0	2.6	893.3	896.0	0.0	2.5	893.3	896.0	0.0	2.5	893.3	896.0	0.0	2.5
2015 KELLY DR	GOLDEN VALLEY	Residential	9	893.93	893.3	896.1	0.0	2.2	893.3	896.0	0.0	2.0	893.3	896.0	0.0	2.0	893.3	896.0	0.0	2.0
2035 KELLY DR	GOLDEN VALLEY	Residential	9	894.29	893.3	896.1	0.0	1.8	893.3	896.0	0.0	1.7	893.3	896.0	0.0	1.7	893.3	896.0	0.0	1.7
2065 KELLY DR	GOLDEN VALLEY	Residential	9	894.88	893.3	896.1	0.0	1.2	893.3	896.0	0.0	1.1	893.3	896.0	0.0	1.1	893.3	896.0	0.0	1.1
2080 KELLY DR	GOLDEN VALLEY	Residential	10	895.75	893.2	896.1	0.0	0.3	893.2	896.0	0.0	0.2	893.2	896.0	0.0	0.2	893.2	896.0	0.0	0.2
2060 KELLY DR	GOLDEN VALLEY	Residential	10	894.16	893.2	896.1	0.0	1.9	893.2	896.0	0.0	1.8	893.2	896.0	0.0	1.8	893.2	896.0	0.0	1.8
2040 KELLY DR	GOLDEN VALLEY	Residential	10	894.31	893.2	896.1	0.0	1.8	893.2	896.0	0.0	1.7	893.2	896.0	0.0	1.7	893.2	896.0	0.0	1.7
2020 KELLY DR	GOLDEN VALLEY	Residential	10	893.70	893.2	896.1	0.0	2.4	893.2	896.0	0.0	2.3	893.2	896.0	0.0	2.3	893.2	896.0	0.0	2.3
2000 KELLY DR	GOLDEN VALLEY	Residential	10	892.21	893.2	896.1	1.0	3.9	893.2	896.0	1.0	3.8	893.2	896.0	1.0	3.8	893.2	896.0	1.0	3.8
1940 KELLY DR	GOLDEN VALLEY	Residential	10	893.28	893.2	896.1	0.0	2.8	893.2	896.0	0.0	2.7	893.2	896.0	0.0	2.7	893.2	896.0	0.0	2.7
1920 KELLY DR	GOLDEN VALLEY	Residential	10	892.68	893.2	896.1	0.6	3.4	893.2	896.0	0.5	3.3	893.2	896.0	0.6	3.3	893.2	896.0	0.6	3.3
1925 MARYLAND AVE N	GOLDEN VALLEY	Residential	10	891.48	893.2	896.1	1.8	4.6	893.2	896.0	1.7	4.5	893.2	896.0	1.8	4.5	893.2	896.0	1.8	4.5
1935 MARYLAND AVE N	GOLDEN VALLEY	Residential	10	899.38	893.2	896.1	0.0	0.0	893.2	896.0	0.0	0.0	893.2	896.0	0.0	0.0	893.2	896.0	0.0	0.0
2400 RHODE ISLAND AVE N (Garage)	GOLDEN VALLEY	Multi-Residential	4	903.74	900.7	902.3	0.0	0.0	900.6	901.7	0.0	0.0	900.6	902.0	0.0	0.0	900.6	901.8	0.0	0.0
2400 RHODE ISLAND AVE N (Garage)	GOLDEN VALLEY	Multi-Residential	4	903.75	900.7	902.3	0.0	0.0	900.6	901.7	0.0	0.0	900.6	902.0	0.0	0.0	900.6	901.8	0.0	0.0

1 - Properties determined to be at-risk of flooding based on comparison of modeled flood elevations and surveyed low openings.
2- Lowest openings determined from 2014 survey (Barr), 2006 survey (from New Hope/Stantec), and 1978 survey (Barr, verified in 2014)
3 - Flood elevation based on XP-SWMM modeling utilizing the Atlas 14 precipitation depths and nested storm distribution
4 - Flood depth above low opening of structure, based on difference between the flood elevation and the lowest opening of structure
5- BCWMC Phase 2 XP-SWMM model was updated to include the Libertry Crossing flood mitigation project
6- Structure removed from being at-risk during the 100-year storm event

6.1.3 P8 Water Quality Modeling Results

Although the primary goal of the DeCola Ponds B and C improvement project is to develop flood mitigation volume, there is also an opportunity to improve the water quality treatment provided by the system.

The pollutant (total phosphorus) removals for DeCola Ponds A, B, and C and for the Dover Hills area for each conceptual design alternative were estimated using the BCWMC P8 model. The model was first updated to reflect existing conditions, using the bathymetric survey data collected during this study. The model was then updated to reflect the additional permanent pool and flood pool volumes provided by each of the alternatives, reflecting the reduction in the NWL, the proposed forebay volume, and the expansion of the volume in DeCola Ponds B and C.

Under current conditions, the P8 model estimates that approximately 143 pounds of total phosphorus are removed annually in DeCola Ponds A, B, and C. With implementation of Concept 1, the total phosphorus removal rate would increase to approximately 153.5 pounds per year (additional removals of 10.5 pounds of total phosphorus per year). The implementation of Concept 2 would increase the total phosphorus removal rate to around 151.0 pounds per year (additional removal of 8.0 pounds of total phosphorus removal per year). With the implementation of Concept 3, the total phosphorus removal rate would increase to approximately 152.0 pounds of total phosphorus per year (additional 9.0 pounds of total phosphorus removal per year).

The Main Stem of Bassett Creek is currently listed as impaired. The affected use is aquatic life based on fish bioassessments. Although a stressor identification study has not been completed to determine the exact cause of this impairment, reductions in sediment and pollutant loads to the creek can likely help address this impairment.

6.2 Wetland and Upland Creation and Restoration

Since a large portion of the direct DeCola Ponds B and C watersheds will be disturbed during construction, wetland and upland creation and/or restoration is a major component of this project. The final restoration approach will consider water level fluctuations, a variety of habitat restoration as well as the park user experience.

For all three concepts, there will be creation of additional open water surface along with additional permanent pool volume. However, the proposed grading in DeCola Ponds B and C does not result in a significant change in the overall wetland/pond depth.

For all conceptual designs, a 25-foot wetland buffer will be placed around the proposed open water areas within the projected disturbed limits, based on the City of Golden Valley's wetland management classification for these ponds (Manage 2/3). Additionally, all areas outside of the buffer areas that fall below elevation 896.0 feet MSL will be restored as wetland habitats. This elevation was selected as the wetland limit elevation because this was the approximate elevation of the existing delineated wetland areas. Enhanced wetland areas should allow for increased water quality treatment and enriched wetland

fringe communities for animal and plant species. The total restored and created wetland areas for each concept are summarized in Table 6-1.

For all conceptual designs, tree removal will be required in the disturbance limits to develop the additional flood storage. However, the upland areas will be restored with native plants, shrubs, and trees. The density of trees in these restored area will be determined during final design, although it is anticipated that the tree density that will be replanted will range from a savannah type ecosystem (~35 trees per acre) to a forest ecosystem (~110 trees per acre). These trees should provide shade and aesthetically pleasing views for park users and provide habitat for upland dwelling wildlife.

Existing trees will be preserved in areas outside the disturbance limits and no trees will be removed from the heavily wooded knoll at the southern end of the nature area. The screening trees along the west side of DeCola Pond B and the east side of DeCola Pond C will remain.

6.3 Easement acquisition

Nearly all of the proposed work is located on City of Golden Valley property, right of way, or within existing drainage and utility easements obtained by the City from Dover Hill Apartments, LLC. A temporary construction easement on residential land may be needed along the south end of DeCola Pond C to accommodate raising the overflow berm elevation between DeCola Ponds C and D, to facilitate access to the site, construction staging, and grading efforts. Adequate permanent easements already exist on the residential parcels on the north end of DeCola Pond D for the outlet and overflow modifications. . The planning level opinions of cost include the estimated cost of an easement in this area.

6.4 Permits required for the project

The proposed project is expected to require the following permits/approvals, regardless of the selected concept:

- Clean Water Act Section 404 Permit from the U.S. Army Corps of Engineers
- Public Waters Work Permit from the Minnesota Department of Natural Resources (MnDNR)
- Section 401 Water Quality Certification from the Minnesota Pollution Control Agency (MPCA)
- Construction Stormwater General Permit from the MPCA
- Compliance with the MPCA's guidance for managing dredged material
- Compliance with the MPCA's guidance for managing contaminated material and debris-containing fill
- Compliance with the Minnesota Wetland Conservation Act
- Environmental Assessment Worksheet (EAW) per Minnesota Environmental Quality Board (EQB) rules
- City of Golden Valley Right-of-Way (ROW) Permit (no fee)
- City of Golden Valley Stormwater Permit (no fee)

6.4.1 Section 404 Permit and Section 401 Certification

According to Section 404 of the Clean Water Act (CWA), the USACE regulates the placement of fill and certain dredging activities in jurisdictional wetlands and other waters of the United States. Jurisdictional wetlands and other waters are those that the USACE determines to have a significant nexus with navigable waters. The proposed project is hydrologically connected to Bassett Creek, triggering the need for a Section 404 permit.

6.4.2 MnDNR Public Waters Work Permit

The MnDNR regulates development activities below the ordinary high water level in public waters and public waters wetlands. Public waters regulated by the MnDNR are identified on published public waters inventory maps. The DeCola Ponds are identified as MnDNR public waters; as such, the proposed project will require a MnDNR Public Waters Work Permit for the work completed in the public waters and for the proposed modifications to the outlet structure and normal water level.

6.4.3 Section 401 Water Quality Certification

In order to issue a Section 404 permit, the USACE must ensure that the proposed project does not violate established water quality standards under Section 401 of the CWA. In Minnesota, Section 401 Water Quality Certification is administered by the MPCA. Section 401 certification may be issued as part of the Section 404 permit or may require independent coordination, depending on the type of Section 404 permit the proposed project qualifies for.

6.4.4 Construction Stormwater General Permit

A National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Construction Stormwater General Permit from the MPCA authorizes stormwater runoff from construction sites. A Construction Stormwater General Permit is required as the proposed project will disturb more than one acre of soil. Preparation of a stormwater pollution prevention plan explaining how stormwater will be controlled within the project area during construction will be required as part of this permit.

6.4.5 Guidance for Managing Dredged Material

Dredged material is defined as waste by Minnesota Statute 115.01, and its management and disposal are regulated by the MPCA. It is anticipated that sediment dredged as part of the proposed project would be removed from the project site and disposed of at an appropriate landfill, in compliance with the MPCA's guidance for managing dredged materials.

6.4.6 Guidance for Managing Contaminated Soils and Debris-Containing Fill

Phase II investigations indicate the soils in the project area meet the MPCA's guidelines for unregulated fill, with the exception of debris-containing fill, which should be disposed at a permitted landfill. Debris-free soils with no field evidence of environmental impacts must be managed in accordance with MPCA's Best Management Practices for the Off-Site Reuse of Unregulated Fill (MPCA, 2012) and the provisions of the Response Action Plan and Site Contingency Plan (Barr, 2015).

6.4.7 Minnesota Wetland Conservation Act

The Minnesota Wetland Conservation Act (WCA) was enacted to protect wetlands not protected under the MnDNR's public waters work permit program. The WCA regulates filling and draining of all wetlands and regulates excavation within Type 3, 4, and 5 wetlands. The WCA is administered by a local governmental unit (LGU), and it is expected that the city of Golden Valley will be the LGU for WCA-regulated wetland impacts associated with the proposed project. Impacts that may be regulated under the WCA include excavation in wetland areas above the ordinary high water level, and any access to or across the project area that goes through wetland areas.

6.4.8 Environmental Assessment Worksheet (EAW)

Because the DeCola Pond B and C improvement project is proposing to change the cross section of a public waters, an EAW will need to be completed in accordance with the Minnesota Environmental Quality Board (EQB) rules. The EAW is a brief document designed to lay out the basic facts of a project necessary to determine if an Environmental Impact Statement (EIS) is required for the proposed project. The EAW also provides permit information, informs the public about the project, and helps identify ways to protect the environment. The EAW is not meant to approve or deny a project, but instead act as a source of information to guide other approvals and permitting decisions. The EAW is completed by the Responsible Governmental Unit (RGU) designated according to Minnesota Rules 4410. For this project, the RGU is the City of Golden Valley.

6.4.9 City of Golden Valley Permits

It is likely that this project will also trigger several City of Golden Valley Permits, such as the Right-of-Way (ROW) permit (for any disturbance or work within the ROW) and the stormwater management permit.

6.5 Other project impacts

6.5.1 Temporary Closure of Nature Area Trails

DeCola Ponds B and C are located within a walking nature area that contains paved trails that connect Rhode Island Ave, the Dover Hill Apartments, and Pennsylvania Avenue. Since a portion of the walking trails will be impacted by the construction activities within DeCola Ponds B and C and Pennsylvania Woods, it will be necessary to close the trail loop during construction activities. Trail closure signs and barricades will be installed and a pedestrian detour route will be determined during final construction. Every effort will be made to minimize the duration of the trail closure, including considering winter construction to minimize impacts to park users.

6.5.2 Tree Removals

For the proposed conceptual designs 42 – 73% of the surveyed trees are estimated for removal (those located within the project disturbance/grading limits). While a good portion of these trees are < 6" in diameter or are dead/dying, many classified as significant (by Golden Valley ordinance) will be removed and a few legacy trees (also defined by Golden Valley ordinance) may be impacted. It is expected that residents and community members may have concerns about the tree removals. It will be essential to

show and describe the restoration efforts that will be put in place to mitigate the tree losses. Specific details on site restoration can be found in Section 6.2.

6.5.3 Impacts to Bats

Preservation of bat species in Minnesota has recently become an important issue. White Nose Syndrome (WNS) has been attributed to the deaths of millions of bats in recent years across the United States, and all four species that hibernate in Minnesota are susceptible to the disease (MnDNR, 2015). Bats typically hibernate in sheltered areas such as caves, but some bats nest in trees during summer months. Extensive tree removals are to be avoided when bats are in their active season (April – September) so that nests or forging areas are not inadvertently destroyed. During final design, there should be additional consultation with the US Fish and Wildlife Service or MnDNR regarding the timing of any tree removals and the potential impacts to bats.

7.0 Project cost considerations

This section presents the feasibility-level opinion of cost of the evaluated alternatives, discusses potential funding sources, and provides an approximate project schedule.

7.1 Opinion of Cost

The opinion of cost is a Class 4 feasibility-level cost estimate as defined by the American Association of Cost Engineers International (AACI International) and uses the assumptions listed below and detailed in the following sections.

1. The cost estimate assumes a 30% construction contingency.
2. Costs associated with design, permitting, and construction observation (collectively "engineering") is assumed to be 30% of the estimated construction costs.
3. Although much of the project area is located on City of Golden Valley property, right-of-way, or within a drainage and utility easement obtained from Dover Hill Apartments LLC, a temporary construction easement may be necessary along the south end of DeCola Pond C for the modifications to the outlet and raising of the overflow; a minor cost was included for a construction easement in the feasibility-level opinion of cost.

The Class 4 level cost estimates have an acceptable range of between -15% to -30% on the low range and +20% to +50% on the high range. Based on the development of concepts and initial vetting of the concepts by the City of Golden Valley, it is not necessary to utilize the full range of the acceptable range for the cost estimate; and we assume the final project costs may be between -20% and +30% of the estimated project budget.

The feasibility-level total construction cost estimates, 30-year annualized total construction cost estimates, cost per acre-foot of flood mitigation volume, and annualized costs per pound of total phosphorus removed for each recommended concept are summarized in Table 6-1. Detailed cost-estimate tables for all three concepts are provided in Appendix D.

7.1.1 Temporary easements

Most of the project is located on property owned by the City of Golden Valley or in areas where the City has previously acquired a drainage and utility easement. Adequate permanent easements already exist on the residential parcels on the north end of DeCola Pond D for the outlet and overflow modifications.

7.1.2 Off-site sediment disposal

All of the conceptual design alternatives assume that excavated soil and sediment will be removed from the site.

Based on the sediment sampling investigation that was completed in 2015, the sediment from Decola Pond A, the southern portion of DeCola Pond B, and DeCola Pond C meets guidelines for unregulated fill

and is suitable for reuse under MPCA's Unregulated Fill Policy (MPCA, 2012). However, the BaP equivalents value in one of the sediment cores collected from the northern portion of Decola Pond B exceeded the MPCA's Residential SRV and Industrial SRV; therefore, sediment from that portion of Pond B will require landfill disposal. A line item for sediment dredging and disposal of contaminated sediment from DeCola Pond B is included in the feasibility cost estimates. It assumes all sediment dredged from the northern portion of DeCola Pond B will require landfill disposal. Additional testing and onsite observation during excavation and hauling should be considered.

Based on the Phase II site investigation completed in February 2018, which included four test trenches in the area north of DeCola Pond B (Dover Hills area), debris (including trace metals and plastic) were observed in the northern test trenches (TT-18 and TT-5). Debris-containing fill must be disposed at a permitted landfill. The cost estimates include a line item for the excavation and disposal of contaminated soil, based on the assumption that the northern portion of the Dover Hills area (approximately 0.5 acres) contains debris in the top 5 feet of soil that will require landfill disposal. Additional testing and onsite observation during excavation and hauling should be considered.

7.1.3 Wetland mitigation

The wetland delineation for DeCola Ponds A, B, and C and the Pennsylvania Woods areas identified wetlands at the pond peripheries, within the ponds, and within the forested area in the permanent easement on the Dover Hills area north of DeCola Pond B. The goal of the proposed alternatives is to minimize the amount of wetland impacts, restore all impacted wetland areas to the existing wetland type, and develop new wetland habitat and wetland buffers in the disturbed extents. Therefore, it is not anticipated that the projects will require additional costs for wetland mitigation.

7.1.4 30-year cost

The 30-year cost for each alternative is based on anticipated maintenance and replacement costs. The 30-year cost for each alternative is calculated as the future worth of the initial capital cost (including contingency and engineering costs) plus the future worth of annual maintenance and significant maintenance at the end of the alternative's estimated useful life. A 3% rate of inflation is assumed. The annualized cost for each alternative is calculated as the value of 30 equal, annual payments of the same future worth as the 30-year cost. The 30-year annualized cost estimates for each concept are presented in Table 6-1.

7.1.5 Annualized pollutant reduction cost

Estimated annual loading reductions for total phosphorus (TP) are included for each recommended conceptual design alternative in Section 6.1.3 and in Table 6-1. The total phosphorus load reductions were found by modifying the BCWMC P8 model to include the proposed alternatives. The annualized pollutant-reduction cost for each alternative is presented in two ways. The first value is the annualized 30-year total project cost (including both flood and water quality portions of the project) divided by the annual load reduction. The second value is the estimated annualized 30-year water quality treatment project cost divided by the annual load reduction. The water quality treatment project cost was estimated by summing the itemized project costs related to water quality improvement, comparing this to the total project cost,

and utilizing that fraction of the total project cost. The 30-year annualized total phosphorus removal cost was analyzed using two different methods since the project goal is primarily for flood mitigation and secondarily for water quality improvement.

The cost per pound of phosphorus removed for this project using the current P8 model analysis is high compared to other BCWMC CIP projects—for example, the previous high costs per pound of phosphorus removed for a BCWMC CIP project was $5,900 for the Northwood Lake Improvement Project. The high cost per pound of phosphorus removed for this project is likely due to the DeCola Ponds B and C Improvement Project's primary goal is to develop flood volume, with a major portion of the construction costs for the excavation of flood storage volume and restoration of the graded areas. Water quality improvement is an added benefit of the project rather than a main focus.

7.1.6 Miscellaneous costs

The feasibility level costs include erosion control and other miscellaneous items needed during construction (e.g., a rock construction entrance, silt fence or biologs, and restoration of access paths). Based on previous project experience, the estimate for each alternative includes some costs that could be applied to these miscellaneous items.

7.2 Funding sources

The planning level estimated cost for the recommended Concept 3 is $3.8 million (-20%/+30%) (see Section 8.0). The BCWMC proposes to use $1.6 million of its CIP funds (ad valorem tax levied by Hennepin County on behalf of the BCWMC: $1.1 million levied in 2019 and $0.5 million levied in 2020) to help pay for the DeCola Ponds B and C Improvement Project. As a result, the BCWMC CIP funds alone will not fully cover the implementation of this project. Other sources of funding for this project are required and include:

- City of Golden Valley,
- MnDNR Flood Damage Reduction Grants (through the state legislature/project bonding bill),
- Hennepin County, and
- Other sources, including potential grants (e.g. Hennepin County Natural Resource Opportunity grants, Hennepin County Environmental Response Fund (ERF) grants)

The current request for the MnDNR Flood Damage Reduction Grant is $2.3 million. This request is currently included in the state bonding bill, which is still under discussion at the state legislature as of the date of this feasibility report. The legislative session should be complete by May 21, 2018, when it will be known if the complete flood damage grant amount requested by the Cities of Golden Valley, Crystal, and New Hope will be secured for implementation of this project. Approximately $700,000 in funds from Hennepin County and the City of Golden Valley will also be available for use on this project.

Because this feasibility report was completed before the State of Minnesota legislative session closes and the status of the project funding is unknown, we anticipate the following potential outcomes:

- **Project is fully-funded:** If the Cities of Golden Valley, Crystal, and New Hope MnDNR Flood Damage Reduction grant request is fully funded is obtained ($2.3 million), the recommended DeCola Ponds B & C Improvement project (Concept 3) can proceed as anticipated with the other funding sources in place. For project construction to occur in 2019, project design would be scheduled to begin in fall 2018, after an agreement is reached between the City of Golden Valley and the BCWMC.
- **Project is partially-funded:** If the Cities of Golden Valley, Crystal, and New Hope MnDNR Flood Damage Reduction grant request is partially funded, the recommended DeCola Ponds B & C Improvement project (Concept 3) could proceed as recommended, depending on the level of state funding that is obtained. For example, if half of the original MnDNR flood damage reduction request is secured (e.g. $1.15 million), there may be sufficient funding (e.g. $3.45 million) to implement the major components of the recommended concept, with minor modifications to help bring the anticipated design and proposed project into alignment with the available budget and/or look at potential opportunities to phase the project. For project construction to occur in 2019, project design would be scheduled to begin in fall 2018, after an agreement is reached between the City of Golden Valley and the BCWMC.
- **Project is not funded:** If the Cities of Golden Valley, Crystal, and New Hope MnDNR Flood Damage Reduction grant is not funded during this legislative session, the recommended DeCola Ponds B & C Improvement project (Concept 3) will need to be delayed until the Cities can re-request MnDNR Flood Damage Reduction grant funds during the next legislative session. This could potentially delay the implementation of the DeCola Ponds B & C Improvement project construction. Although not preferred, BCWMC CIP funds do not have to be expended in the same year they are levied and can be held until all of the funding comes together, even if the project is delayed a year or two.

7.3 Project schedule

Assuming the MnDNR Flood Damage Reduction Grant funding is secured for this project as part of the current legislative session (May 2018), for project construction to occur in 2019, project design would be scheduled to begin in fall 2018. The BCWMC will hold a public hearing on September 20, 2018 on this project. Pending the outcome of the hearing, the project will be officially ordered by the BCWMC, the BCWMC will enter into an agreement with the City of Golden Valley to design and construct the project, and the BCWMC will certify to Hennepin County a final 2019 tax levy for this project. Following this meeting, the City of Golden Valley will need to take action finalizing and approving the agreement. Designs are not to begin prior to the finalization of the BCWMC and City of Golden Valley's agreement process.

The construction work would likely begin in the fall of 2019, as tree removal should occur in the period from October through March, outside of the northern long-eared bat's active season (April through September). Additionally, excavation during the winter would be appropriate to complete the major earthwork during periods with less frequent runoff events. Construction would be completed in the spring/summer 2020.

If project construction is scheduled for fall or winter, spring or summer 2019 bidding is recommended. This will give contractors adequate scheduling time to complete the project at a reasonable price. In the intervening time, the City would gather public input, prepare the final design, and obtain permits.

8.0 Alternatives assessment and recommendations

Concept 1 results in the development of the most flood mitigation volume when compared to Concepts 2 and 3; however, the difference in the flood reduction at Medicine Lake Road is only a 0.1 feet difference during the 100-year event. The most significant difference between Concept 1 and Concepts 2 and 3 is the estimated flood reduction at DeCola Pond D for the 100-year event, where Concept 1 reduces the flood elevation by 1.2 feet, while Concepts 2 and 3 reduce flooding on Pond D by 0.3 feet and 0.5 feet, respectively. However, all three concepts result in one structure no longer being at-risk of flooding.

The existing DeCola Ponds already remove a significant amount of pollutants; however, the expansion of the water quality treatment volume of the ponds and in the forebay result in an increase in the treatment provided by the project. This increase in phosphorus removal is similar for all three concepts, ranging from 10.5 pounds per year for Concept 1, 8.0 pounds per year for Concept 2, and 9.0 pounds per year for Concept 3 (an increase of approximately 6-8% from existing conditions).

Although tree preservation is targeted for certain areas within the Pennsylvania Woods Nature Area (e.g. the knoll with hardwoods, screening trees along the south and west edge of DeCola Pond B), tree impacts are expected for all three concepts. Concept 1 has the most significant tree impacts due to the larger disturbance extents for the maximized flood mitigation storage volumes. For Concept 1 it is estimated that approximately 73% of the surveyed trees will be impacted, of which 33% are considered significant trees Concept 2 has the least amount of impacted trees due to the smaller disturbance extents. It is estimated that approximately 42% of the surveyed trees will be impacted to develop the storage volume for Concept 2, of which 35% are significant trees. For Concept 3, the estimated tree impacts are only slightly greater than for Concept 2. While Concepts 2 and 3 have comparable tree impacts, the estimated flood mitigation volume for Concept 3 is 4.7 acre-feet greater than Concept 2, making this a preferable option. It should be noted that tree impact percentages are only based on the surveyed trees in the project extents, and do not represent all the trees in the Pennsylvania Woods Nature Area (e.g. trees on large knolls were not surveyed as they were to be preserved as part of any concept).

Because a major portion of the Pennsylvania Woods area around DeCola Ponds B and C and within the Dover Hills area will be disturbed during construction, wetland and upland creation and/or restoration is a major component of this project. For all three concepts, there will be creation of additional open water surface, along with additional permanent pool volume (although the anticipated pond bottom elevation will not change nor will the pond depth be significantly different). The expanded permanent pool volume will allow for increased water quality treatment and provide added aquatic habitat for wildlife, fish, macroinvertebrates, and macrophytes. Additionally, for all concepts, a 25-foot wetland buffer will be placed around the proposed open water areas within the disturbance limits (based on the City of Golden Valley wetland management classifications (Manage 2/3)), and all areas outside of the buffer areas that fall below approximately elevation 896.0 feet MSL will be restored as wetland habitats. Enhanced wetland areas should allow for increased water quality treatment and enriched wetland fringe communities for animal and plant species. Areas outside of the restored wetland will be restored as upland with native plants, shrubs, and trees. The density of trees in these upland areas will be determined during final

design, although it is anticipated that the tree density that will be replanted will range from a savannah type ecosystem (approximately 35 trees per acre) to a forest ecosystem (approximately 110 trees per acre). These trees should provide a transition from the created wetland habitat to the existing trees, habitat for upland dwelling wildlife, and shade for park users.

The planning level budget that the City of Golden Valley has been using for budgeting is $4.6 million (-20%/+40%). Concept 1 has a point opinion of cost of $5.7 million, exceeding the planned budget by nearly $1.1 million (24%). The point opinions of cost for Concepts 2 and 3 are $3.5 and $3.8 million, respectively, and fall within the range of the original planning level budget.

Based on review of the project impacts for each of the three concepts and the overall project costs, the Commission Engineer recommends constructing Concept 3, which balances the development of flood mitigation volume with tree preservation. However, we also recommend that during the final design process, the city pursue opportunities to increase the flood mitigation volume within the Concept 3 disturbance footprint, with the goal to maximize the impact on flood elevation reductions around the low point on Medicine Lake Road and the downstream DeCola Ponds, especially DeCola Pond D. Concept 3, the recommended concept, is anticipated to have the following impacts:

- Developing approximately 22 acre-feet of flood storage
- Adding a 14' x 4' box culvert to connect the expanded storage at DeCola Ponds B and C with the Liberty Crossing development site.
- Constructing a sediment forebay, which will create 5.2 acre-feet of water quality storage volume allowing the normal water level of DeCola Ponds A, B, and C to be lowered to 893.5. This provides flood mitigation volume without the need for excavation. Ease of inspection and maintenance is an added benefit for the development of the forebay.
- Replacing the existing outlet structure to improve performance, reduce accumulation of debris, and reduce maintenance needed at the structure and increasing the overflow between DeCola Ponds C and D
- Reducing flooding at Medicine Lake Road to 1.8 feet and one property no longer at risk of flooding during the 100-year event
- Reducing flooding on DeCola Ponds A, B, and C by 0.5 feet during the 100-year event
- Reducing flooding on DeCola Pond D by 0.5 feet during the 100-year event
- Reducing flooding on DeCola Ponds E and F by 0.1 feet during the 100-year event
- Removing an additional 9.0 pounds of total phosphorus per year
- Creating 1.9 acres of additional open water area
- Restoring 1.7 acres of wetland
- Restoring 1.0 acres of upland habitat
- Creating approximately 440 feet of new trail through the Pennsylvania Woods and Dover Hills area
- Providing an opportunity to improve trash management, tree management, and incorporate other recreational amenities such as overlooks, benches, and wildlife habitat/features.

The planning level cost for Concept 3 is $3.8 million (-20%/+30%).

9.0 References

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