

REPORT / RECOMMENDATION



To: Park Board

Agenda Item #: VI.A.

From: Ross Bintner P.E.
Environmental Engineer

Action
Discussion
Information

Date: November 12, 2013

Subject: Centennial Lakes Promenade Phase 4

Action Requested:

Resolution of support for concept plan, provide input on additional design considerations.

Information / Background:

Phase 4 of the Edina Promenade includes pedestrian, water and public art features from Hazelton Rd. to just north of the Centennial Lakes/Promenade connection. This capital improvement plan (CIP) item (HRA-11-002) coordinates with the new trail connection at 7171 France and completes the Promenade between Hazelton Rd. and York Ave.

Two attached reports describe a concept plan for an underground water feature, pedestrian trail, bike trail connections, landscaping, public art and a surficial water feature. Development of the concept followed the guiding vision in the 2007 Edina Promenade Urban Design Plan and policy described in the Comprehensive Water Resources Management Plan. The purpose of the parks and trail feature is to complete an aesthetically pleasing pond and stream feature with intermixed art nodes between Centennial Lakes and Hazelton Rd. and install a permanent pedestrian trail, public lighting, sound and irrigation. The purpose of the underground regional infiltration system is to provide clean surface waters and flood protection and cost effectively generate stormwater credits for future redevelopment.

A collaborative approach to inform, engage and develop feedback from city boards and commissions on these plans included two prior meetings with the Park Board, two with the Transportation Commission, and one each with the Energy and Environment, and Arts and Culture commissions. The city also engaged the Nine Mile Creek Watershed District Board as a project partner through a cooperative agreement, and has coordinated review of design and schedules with the nearby Byerly's development. The project is a unique convergence of a variety of City goals and enhances the following service levels: bike and pedestrian transportation, parks and public spaces, flood protection and clean water, and arts and culture in the public realm.

Next Steps:

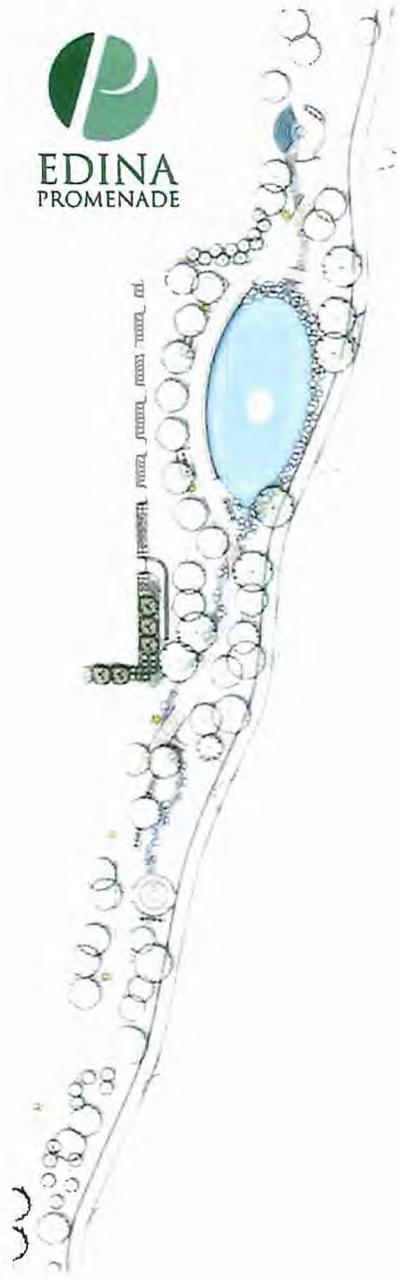
This review by the Park Board is the last step prior to a November 19 consideration by City Council/Edina HRA and November 20 consideration by the Nine Mile Creek Watershed District Board.

If the City Council/Edina HRA and Nine Mile Creek Board approve the project, the proposed schedule would have the project designed from December to March, bid in April, and constructed from June-October 2014. This schedule could be adjusted to coordinate work with the Byerly's / 7171 France apartment buildings project if cost savings or site access issues present themselves during the design. Summarized below are the concept level estimate and funding sources for this project; not included in the estimate are values of easements at 7171 France, as spelled out in the development agreement, which total \$183,625. This value is paid as a credit to parks dedication fees of \$5,000/unit, which are expected to generate \$1,170,000 from the expected 234 units.

| Project Element: | Concept Estimate | Funding Sources |
|--|-------------------------|---|
| Parks water feature, public lighting, public art nodes and pedestrian trail and ½ share of pump station. | \$1,040,000 | \$600,000 from 7171 France park dedication fees Remainder from HRA/Centennial Lakes TIF district (CIP item HRA-11-002) |
| Design, engineering, plans, specs, and construction admin. support. | \$140,000 | |
| Underground regional infiltration feature and shallow gardens with rock channel and ½ share of pump station. | \$591,350 | Equal shares from Nine Mile Creek Watershed District and City of Edina stormwater utility |
| Design, engineering, plans, specs, and construction admin support. | \$85,000 | |
| Project management and construction oversight | Engineering staff time | HRA/Centennial Lakes TIF district (CIP item HRA-11-002) and City of Edina stormwater utility |
| TOTAL | \$1,856,350 | |

Attachments:

- URS Promenade Phase 4 Conceptual Plan Outline and Narrative
- Barr Engineering Centennial Lakes Runoff Volume Reduction Plan



Edina Promenade Phase 4 Conceptual Plan Outline and Narrative

October 18, 2013



Introduction

This project represents the completion of the Promenade Master Plan that was adopted in 2007. The proposed project incorporates a water feature into the central segment of the Promenade as envisioned in the 2007 Masterplan. The background information for the Promenade in general and the water feature can be found in the “Edina Promenade, Urban Design Plan”, which was prepared by URS in 2007.



Figure 33

Promenade Component Plan

Promenade Design

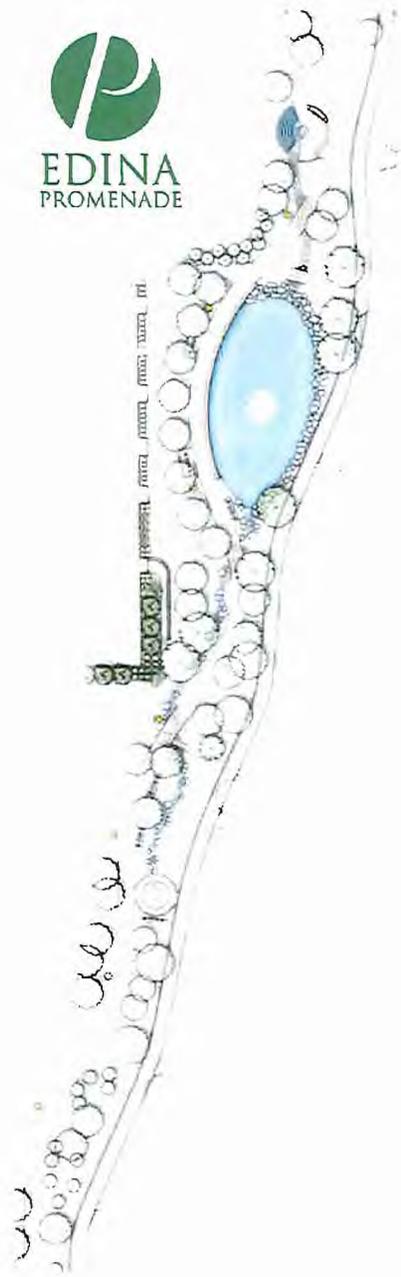
Legend

-  Gateway
-  Crossroads Feature
-  Landscaping Feature
-  Single Sculpture
-  Sculpture Group
-  Sculpture Fountain
-  Pond / Stream and Fountain
-  York Ave. Underpass



July 2007

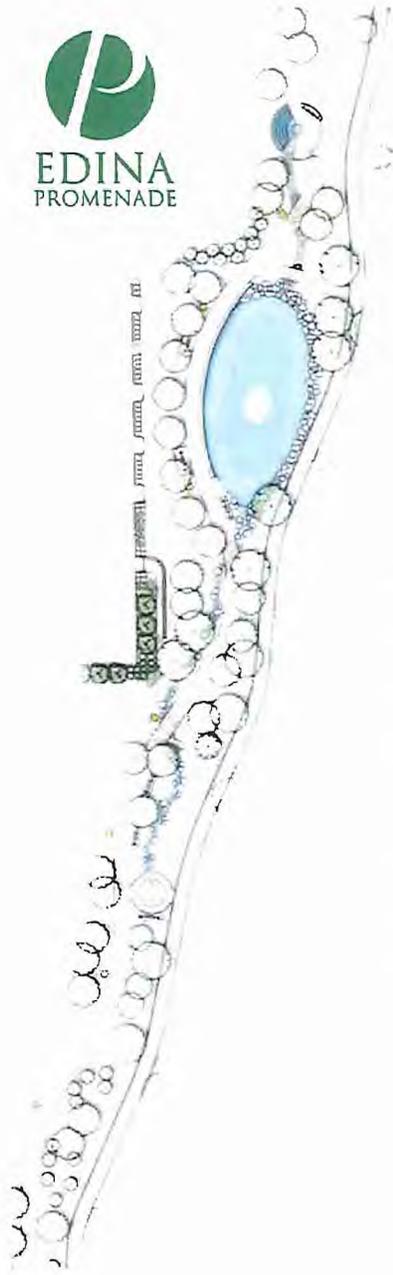




Core Component - Water

The project intends to complete the Promenade segment between Centennial Lakes and 70th Street by creating the missing central water feature south of Hazelton. The overall concept for Centennial Lakes was to create a 'necklace' of special features or spaces that ring the lakes. For the Promenade, which is a very linear and narrow corridor and which was programmed to include a walking path and a bike trail that is part of the Three Rivers Regional Trail, the concept was to create a series of small plazas or spaces that would incorporate public art as the main features and attractions. The plan also called for a major central water feature that would add extra interest in the middle of the Promenade corridor and that would provide a thematic link or connection to Centennial Lakes. The water feature is a key element for the Promenade, since water, especially fountains and a flowing stream, will add motion and liveliness to the Promenade environment.

The redevelopment of the Byerly's parcel is the catalyst that allows us to incorporate this water feature into the Promenade.



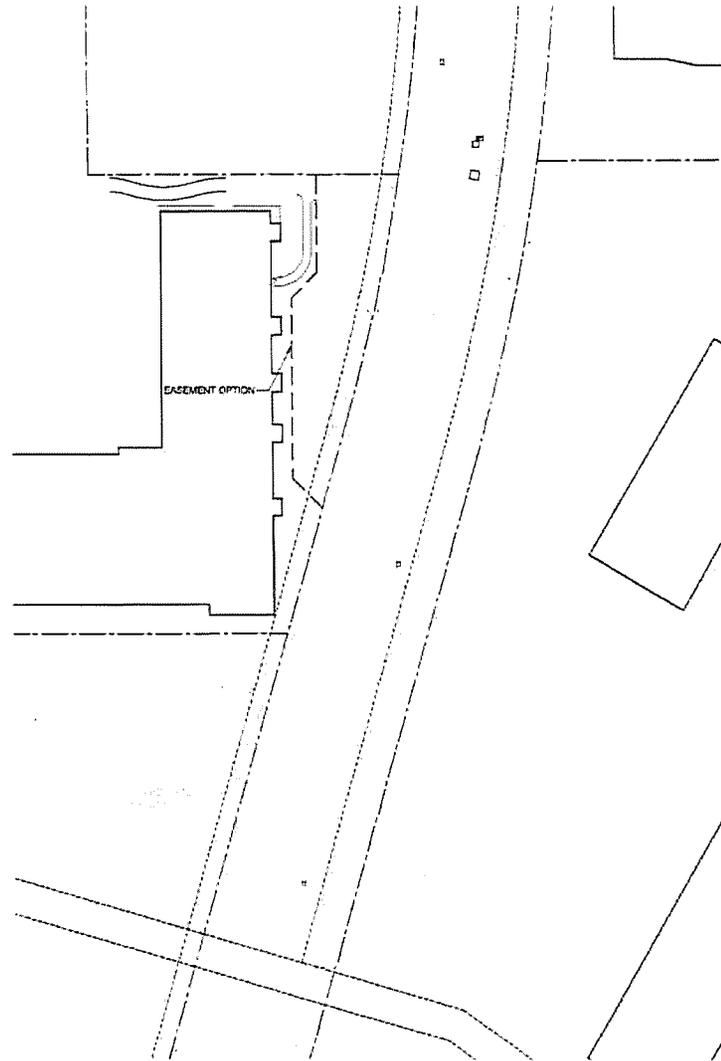
Design Approach

The key constraint was the narrowness of the Promenade corridor. This was overcome by weaving the two paths in such a fashion as to create viable small plazas for public art between the paths. The opportunity area is the central segment of the corridor where the space to create a larger water feature results from the adjacent redevelopment and associated easement. This segment of the Promenade naturally slopes down to the south which provides the opportunity to create a flowing stream. The original concept envisioned a sizable water feature with a number of water-related attractions. Development plans for the area have resulted in less area than anticipated being available for the special water feature. However, it is still large enough to provide room for the essential design elements, such as a small pond, the flowing stream, and a few special water-related features.

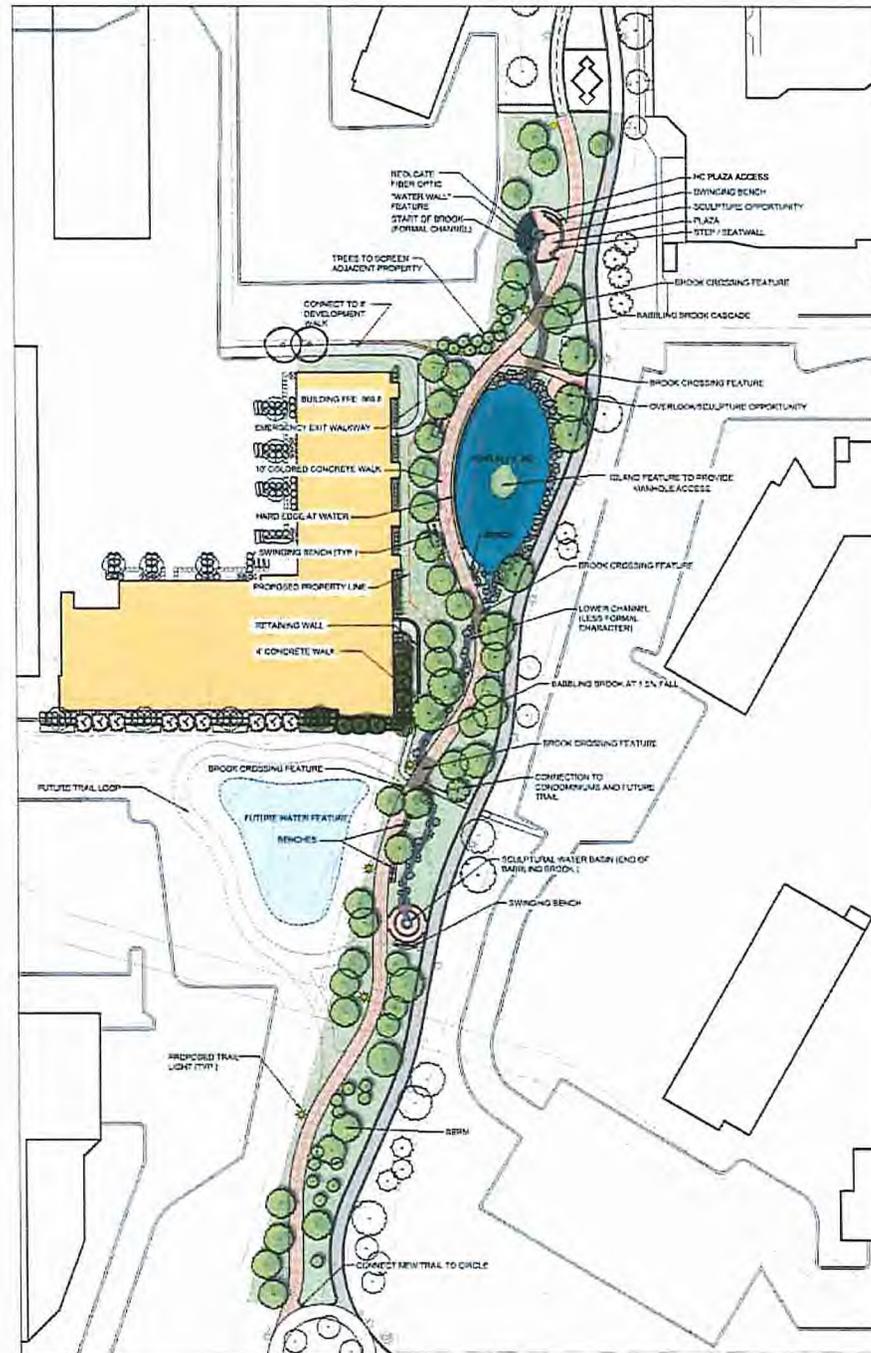
EDINA PROMENADE PHASE 4

Phase 4 Project Elements:

- Will be integrated with a Water Quality Infiltration Project
- Will include an easement for the trail and water feature
- Replaces the temporary pedestrian path with a permanent colored concrete trail
- Provides swinging benches and other seating at key locations for enjoyment of features
- Incorporates three water features including a plaza at the north end where the water will enter the corridor, a central pond which will be the focal point and provide water treatment, and a basin at the south end where the water will enter back into the circulation system
- Provides opportunities for many additional trees, shrubs and perennial plantings
- Connects the park features with a “Babbling Brook” channel which will meander from north to south creating interesting nodes and user experiences



PROPOSED MASTER PLAN OVERVIEW

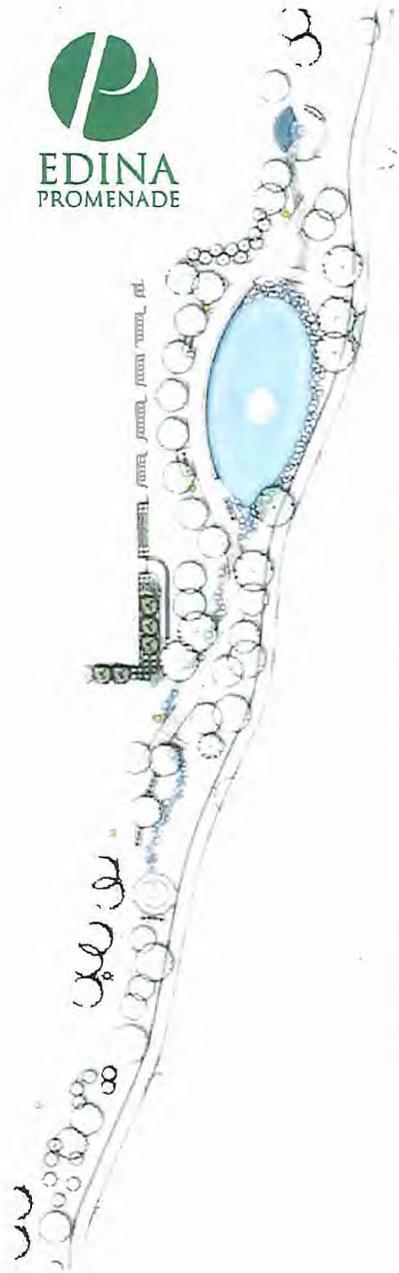


**PROPOSED
MASTER
PLAN:
NORTH**



PROPOSED MASTER PLAN: SOUTH





BROOK CONCEPT

THE BROOK CHANNEL IS ENVISIONED TO BE FAIRLY NARROW: 2' AT THE BOTTOM WITH EDGES BEING 1-3' DEPENDING ON THE CONDITIONS. THE UPPER CHANNEL WILL BE MORE FORMAL WITH STONE OR FORMED CONCRETE EDGES (EXAMPLE PHOTO 1). THE CHANNEL BELOW THE POND WILL BE LESS FORMAL, WITH SCATTERED BOULDERS MEANDERING ALONG THE CHANNEL (EXAMPLE PHOTO 2).

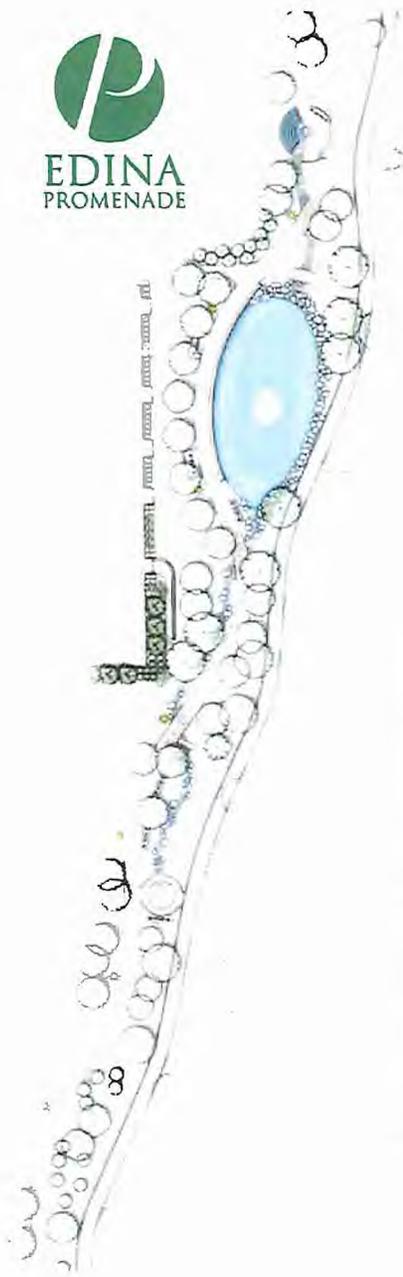
THE WATERWAY WILL BE LINED IN SOME WAY, MOST LIKELY WITH PLAIN OR COLORED CONCRETE.



EXAMPLE PHOTO 1: FORMAL HARD EDGE w/SMOOTH CHANNEL BOTTOM



EXAMPLE PHOTO 2: GRAVEL CHANNEL WITH ROCKS AS GRADE DROPS FORMING SMALL POOLS, INFORMAL ROCK EDGE



SCULPTURAL NODE CONCEPT

THERE WILL BE THREE OR FOUR LOCATIONS FOR SCULPTURAL INSTALLATIONS. THE BEGINNING AND END OF THE "BABBLING BROOK" CHANNEL ARE IMPORTANT NODES IN THIS PORTION OF THE PROMENADE. THESE NODES WILL BE PERMANENTLY INTEGRATED INTO THE WATER FEATURES AND BE PART OF THE WATER CIRCULATION SYSTEM. OTHER LOCATIONS MAY BE USED FOR TEMPORARY INSTALLATIONS.



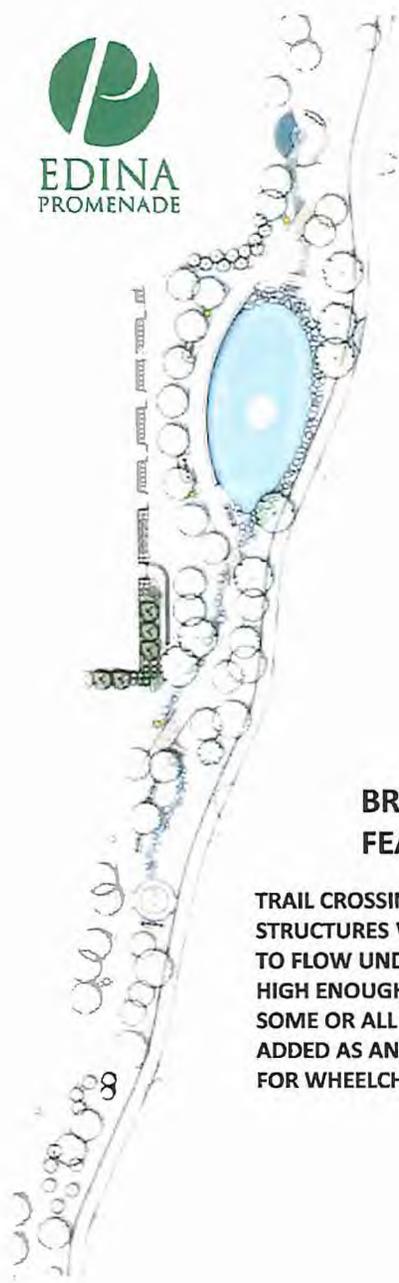
SIMPLE ELEGANT SCULPTURE IN SMALL FORMAL POOL



SMALL DROPS SPACED ALONG LENGTH OF BROOK

CASCADING WATER CONCEPT

THE TOTAL GRADE CHANGE FROM THE TOP OF THE WATERWAY TO THE LOWER OUTLET AREA IS ABOUT 10'. MOST OF THE CHANNEL WILL BE FAIRLY FLAT. TRANSITION AREAS FLOWING TO AND FROM THE POND WILL BE MAXIMIZED TO PROVIDE SOME INTERESTING CASCADING FEATURES.



POND CONCEPT

THE POND WILL BE LINED WITH COLORED CONCRETE TO FACILITATE PERIODIC MAINTENANCE / FLUSHING. THE WEST EDGE WILL BE A SHORT WALL, 2.5' MAXIMUM AND WILL NOT REQUIRE A RAILING. THE EAST EDGE WILL BE LINED WITH LARGE BOULDERS TO DISCOURAGE PEOPLE FROM GOING INTO THE WATER. THE WATER WILL BE CIRCULATING AT ALL TIMES AND WILL BE PUMPED FROM THE NORTH POND OF CENTENNIAL LAKES. IT'S FUNCTION WILL BE TO PROVIDE A PASSIVE RECREATIONAL ENVIRONMENT FOR TRAIL USERS WHILE INCREASING THE RUN-OFF TREATMENT CAPACITY FOR CENTENNIAL LAKES STORM WATER SYSTEM AND PROPOSED BYERLY'S SITE DEVELOPMENT.

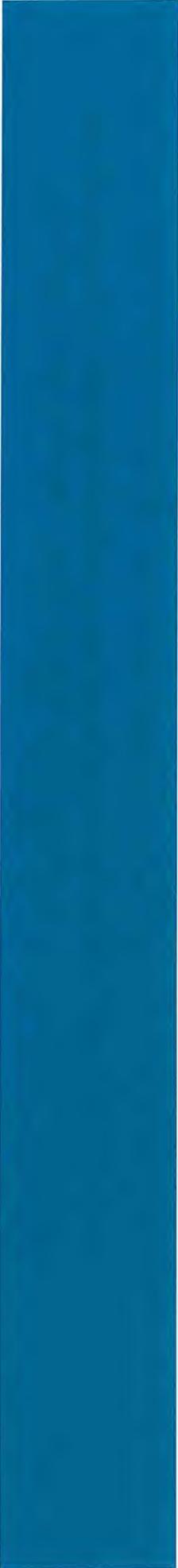


MIX CONCRETE WALK/EDGE WITH RIP-RAP EDGE

BROOK CROSSING FEATURE CONCEPTS

TRAIL CROSSINGS WILL BE SIMPLE STRUCTURES WHICH WILL PERMIT WATER TO FLOW UNDERNEATH WITHOUT BEING HIGH ENOUGH TO REQUIRE RAILINGS. IN SOME OR ALL CASES A "BUMPER" MAY BE ADDED AS AN ADDED SAFETY MEASURE FOR WHEELCHAIRS, STROLLERS, ETC.





***Edina Centennial Lakes Runoff Volume
Reduction Plan***

***Prepared for
Nine Mile Creek Watershed District
and the City of Edina***

October 18, 2013



Edina Centennial Lakes Runoff Volume Reduction Plan

***Prepared for
Nine Mile Creek Watershed District and the City of Edina***

October 18, 2013



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Edina Centennial Lakes Runoff Volume Reduction Plan October 18, 2013

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1.0 Project Background and Objectives

1.1 Background

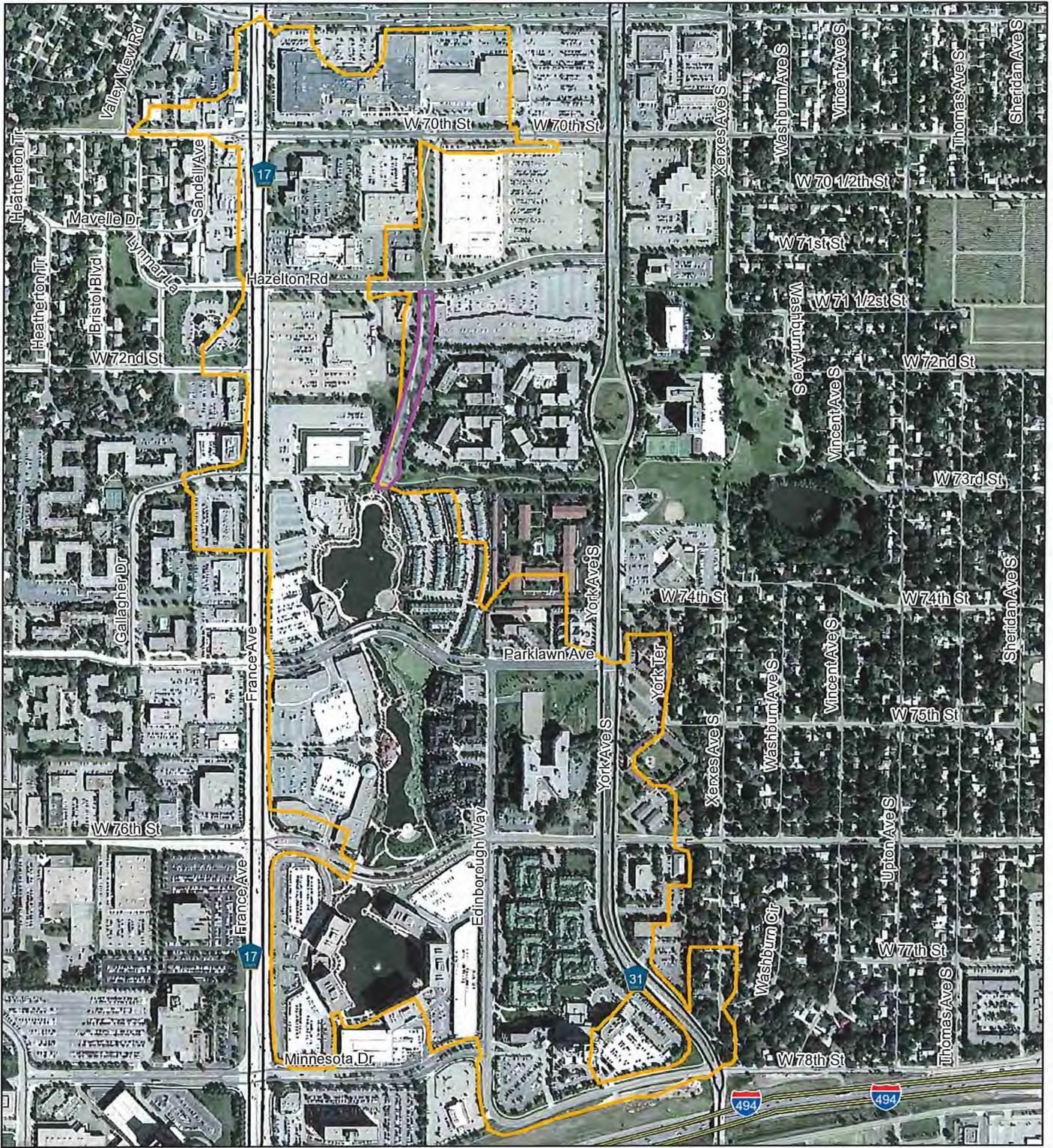
The Edina Promenade, located in the greater Southdale area near Centennial Lakes, is an 80-foot wide greenway that connects Centennial Lakes Park to the nearby retail and residential areas (see Figure 1). The corridor, owned by the City of Edina, currently provides walking and bike paths, and plans are underway for installation of a pond and babbling brook feature that would serve as an amenity and backdrop for several art sculptures. The proposed water feature along the Promenade will use water pumped from Centennial Lakes.

Current land use in the area around the Promenade is generally commercial and high-density residential, with much of the land cover being impervious surface. Runoff from much of the surrounding area is conveyed to Centennial Lakes through storm sewer pipes; minimal stormwater treatment is provided prior to discharge to the lake.

1.2 Project Objectives

The soils in the Centennial Lakes watershed are generally sandy and conducive to infiltration. The City's goal is to utilize the sandy soils along portions of the Promenade for stormwater infiltration, while maintaining current and proposed functions of the greenway (walking, biking, aesthetic viewing). To do so, the City and Nine Mile Creek Watershed District asked Barr to develop a volume-reduction plan for the portion of the Promenade between Hazelton Avenue and Centennial Lakes, including several conceptual stormwater infiltration options. The infiltration concepts are described in further detail below.

Barr Footer: ArcGIS 10.1, 2013-09-12 13:20 File: I:\Client\Nimc\wd\Workorders\Promenade\Basemaps\Promenade_Locations.mxd User: rsm



Legend

-  Edina Promenade Volume Reduction Study Area
-  Centennial Lakes Watershed

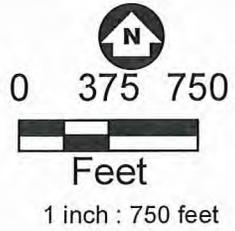


Figure 1

EDINA PROMENADE LOCATION MAP
 Centennial Lakes Volume Reduction Plan
 Nine Mile Creek Watershed District
 Edina, MN

2.0 Infiltration Design Concepts

2.1 Design Considerations

Four conceptual infiltration system designs were developed for the Promenade to maximize the volume reduction potential within the design constraints summarized in the following sections.

2.1.1 Lake as Storage

Typical stormwater infiltration best management practices (BMPs) are designed to capture a specified amount of rainfall runoff (such as one inch of runoff from impervious surfaces), then infiltrate the runoff into the ground. This type of design requires a fairly significant land footprint, especially on sites with a large amount of impervious area draining to the infiltration practice. With the existing walking and bike paths and the proposed pond and babbling brook feature, the remaining available land along the Promenade for surface infiltration BMPs is limited.

Given the limited land available for storage of runoff prior to infiltration and the plans to install a pump from Centennial Lakes to feed the proposed water feature, it was decided that water from Centennial Lakes will be pumped into the Promenade stormwater infiltration system. This approach of using Centennial Lakes for runoff storage decreases the surface and/or underground storage costs and increases the amount of runoff volume that can be infiltrated.

2.1.2 Centennial Lakes Water Level Fluctuations

As mentioned above, the primary objective of this project is to infiltrate stormwater runoff stored in Centennial Lakes. However, caution must be taken so that water level fluctuations in Centennial Lakes remain acceptable to stakeholders (nearby residents, businesses, and park users). In an effort to avoid significant water level fluctuations, the concepts were designed and evaluated under the assumption that levels in Centennial Lakes would be allowed to drop a maximum of 0.5 feet below the normal control elevation of 838 MSL, with the volume of water being used for infiltration.

2.1.3 Conflicts with Existing Infrastructure

The location of existing infrastructure within the Promenade study area was a significant consideration when developing the infiltration system conceptual designs. Each of the conceptual infiltration designs avoid disturbance of the recently constructed bike trail. There are several existing utilities located below the Promenade study area, including storm sewer, sanitary sewer, fiber optic, and watermain. The conceptual infiltration systems were designed under the assumptions that the watermain and fiber optic lines could be relocated as needed, but the storm sewer and sanitary sewer would not be disturbed. For the proposed infiltration areas above the existing sanitary sewer, it was assumed that the sanitary system would be slip-lined as part of the project to minimize inflow and infiltration into the sanitary system.

2.1.4 Coordination of Design with Proposed Promenade Water Feature

The City of Edina has been working with the consulting firm URS, Inc. to design a water feature throughout a portion of the Promenade, including a pond and babbling brook-type feature that recirculates water pumped from Centennial Lakes. A rendering developed by URS, Inc depicting the most recent water feature conceptual plan is included in Appendix A. The conceptual infiltration system designs were developed to work around or in conjunction with the proposed URS, Inc. water feature layout.

2.2 Design Concepts

The following conceptual infiltration system designs were developed for consideration based on the design constraints described above and multiple discussions with NMCWD and City staff:

1. Option A: Deep Underground Infiltration System
2. Option B: Shallow Underground Infiltration/Irrigation System
3. Option C: Shallow Surface Garden Basins
4. Option D: Shallow Surface Gardens with Rock Channel, in combination with underground system Option A or B

Each of these four conceptual designs, and combinations thereof, are described in further detail below and shown in Figures 2 through 6. Preliminary plan sheet drawings of each concept are also included in Appendix B. Infiltration footprints have been estimated for each of the concepts to help quantify the potential benefits of each option. The estimated infiltration footprint areas, shown on the plan sheet drawings in Appendix B, are currently based on a concept level of design and likely to vary upon final design.

2.2.1 Design Option A: Deep Underground Infiltration System

The deep underground infiltration system, shown in Figure 2, consists of installation of perforated pipes within an underground infiltration bed. Water pumped from Centennial Lakes would flow into the underground infiltration system and spread out via the rows of perforated pipes. The underground infiltration bed would optimize the available infiltration footprint within the Promenade area, covering 0.63 acres, and would be installed approximately six to nine feet below the proposed pathway and water feature.

2.2.2 Design Option B: Shallow Underground Irrigation/Infiltration System

The shallow underground infiltration system, also shown in Figure 3, consists of installation of shallow infiltration beds below and alongside the proposed pathway. Water pumped from Centennial Lakes would travel through a main draitile beneath the proposed pathway and outward into smaller draitile pipes that would distribute the water into shallow rock trenches. Water in these trenches would be wicked up through roots and used to irrigate lawn and plantings, as well as infiltrate into the ground. The shallow underground irrigation/infiltration system would optimize the available

footprint within the Promenade area, covering 0.62 acres, without interfering with the proposed pathway and water feature.

2.2.3 Design Option C: Shallow Garden Basins

This conceptual design would consist of a series of shallow (less than six inches deep) garden infiltration basins that would be located amid the proposed pathway and water feature (see Figure 4). The basins would be planted to enhance the landscape and maintain consistency with the planning themes of the Promenade and Centennial Lakes Park. Because these gardens would be located amidst the proposed pathway and water feature, the infiltration surface area would be less than the underground infiltration options (0.33 acres).

2.2.4 Design Option D: Shallow Gardens with Rock Channel

This conceptual design, which is limited to the lower portion of the Promenade study area, would consist of a series of shallow (less than six inches deep) garden infiltration basins connected by a rock channel resembling a stone creekbed. Water pumped from Centennial Lakes would flow through the channel and series of gardens, infiltrating into the ground and providing water for garden plants. This option, which would be installed in the portion of the Promenade south of the proposed water feature, is intended to be installed in conjunction with one of the underground options installed below the proposed water feature. Option D in combination with the deep underground infiltration system (Option A) is shown in Figure 5. Option D in combination with the shallow underground irrigation/infiltration system (Option B) is shown in Figure 6. The estimated infiltration footprint of options D/A and D/B are 0.56 acres and 0.52 acres, respectively.

2.3 Cost Estimates

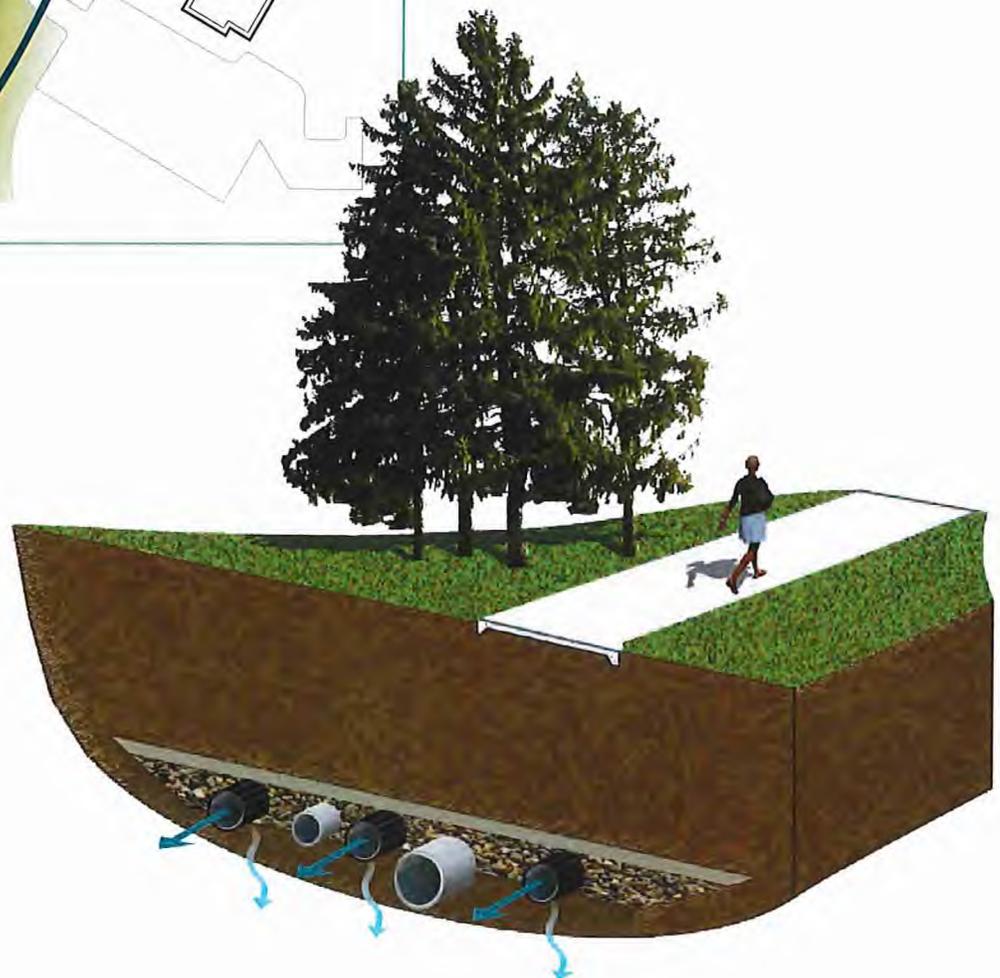
Planning level engineer's opinions of probable construction cost were prepared for the proposed pumping system and each design option. The opinions of probable cost, summarized in Table 1, are based on our experience and the level of information available to determine costs for the proposed projects. Given that the costs are based on concept-level designs, a contingency of 20% was applied to the estimated construction costs.

OPTION A



FIGURE 2: DEEP UNDERGROUND INFILTRATION

Water pumped up from the lake flows into an underground infiltration bed and spreads out via rows of perforated pipes. The infiltration bed lays 6-9' below the proposed pathway and water feature, and occupies over a half acre footprint.

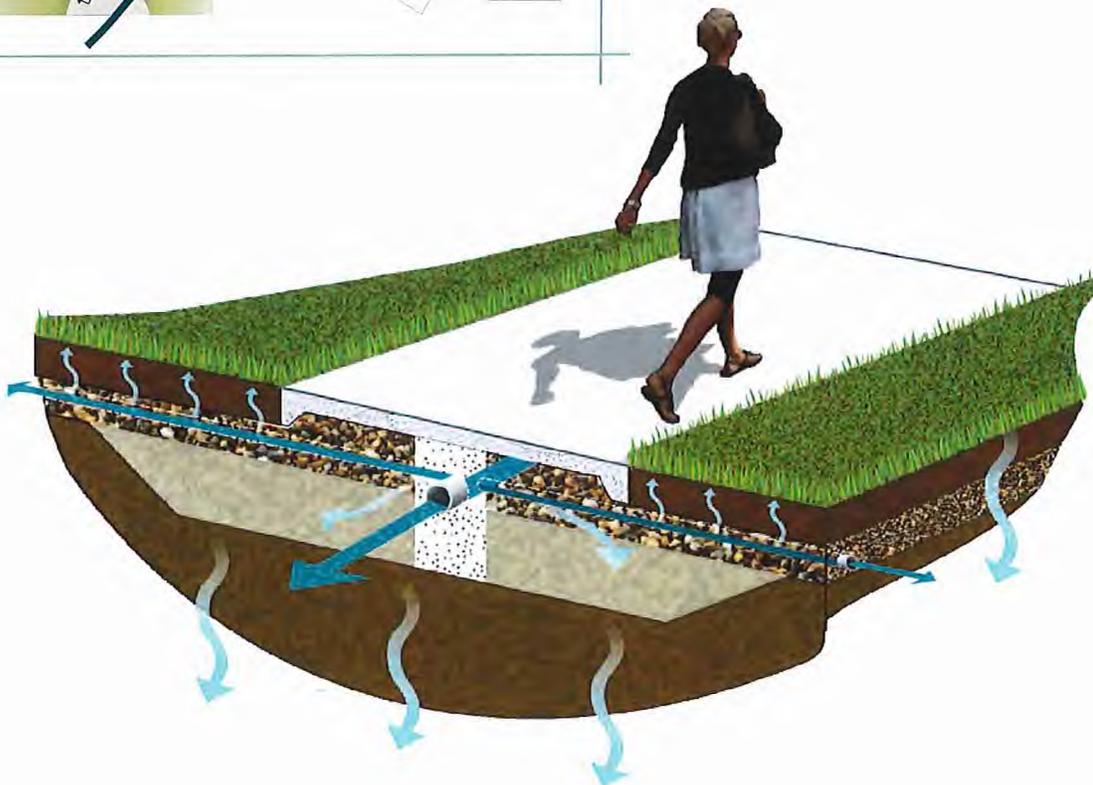


OPTION B



FIGURE 3: SHALLOW UNDERGROUND IRRIGATION/ INFILTRATION

Water pumped up from the lake travels through daintile beneath the proposed pathway. It flows from the main daintile into smaller daintile pipes that distribute the water throughout a shallow rock trench so that it can be wicked up through roots and used to irrigate lawns and plantings. Water not taken up by the plants infiltrates into the ground.



OPTION C



FIGURE 4: SHALLOW GARDEN BASINS

Water pumped up from the lake irrigates a series of about 20 shallow (< 6" deep) garden infiltration basins. Basins will be planted to enhance the landscape and maintain consistency with the planting themes of the Promenade and Centennial Lakes Park. To reduce cost, it may be possible to have turf grass in some portion of the basins.



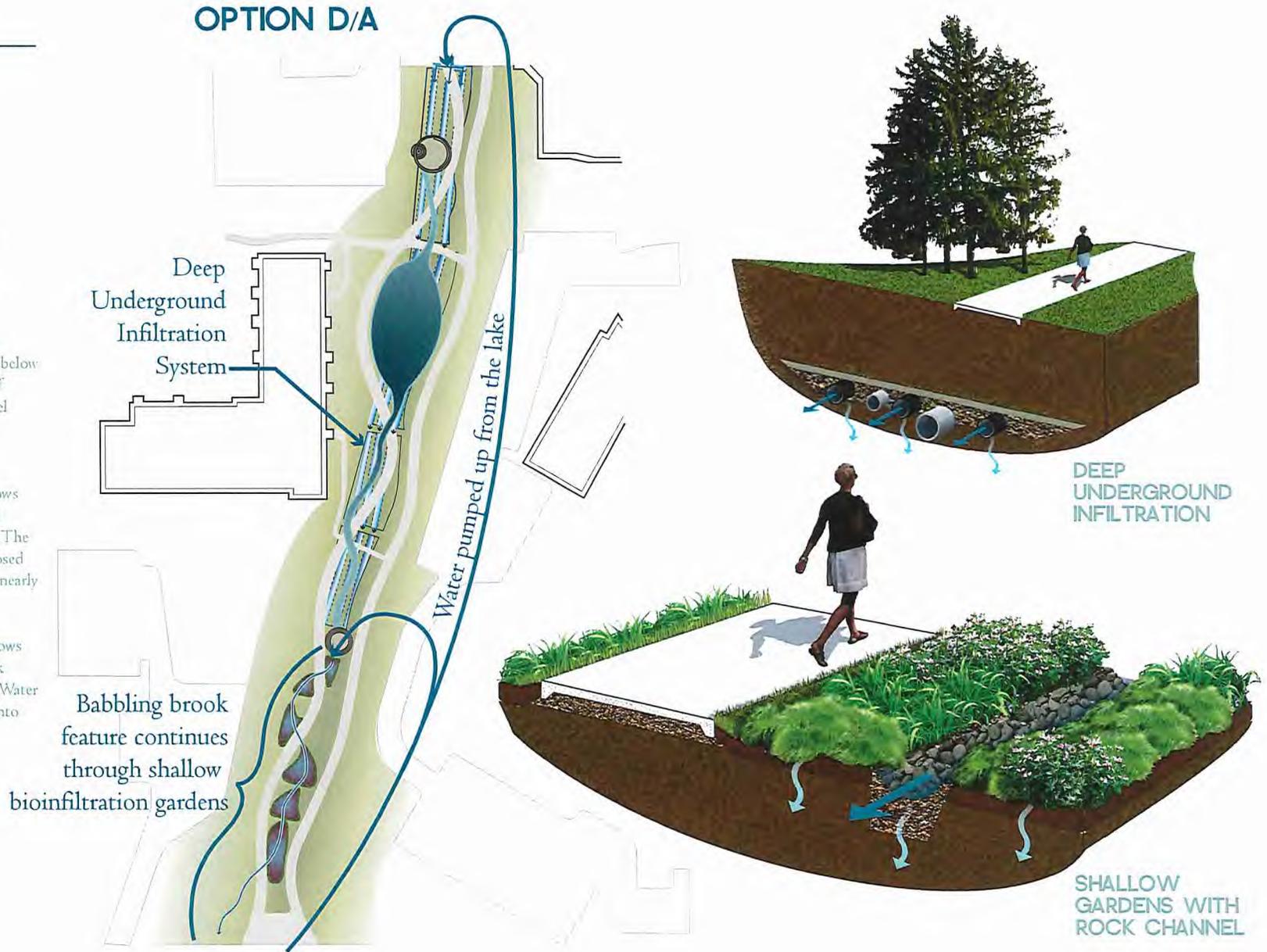
FIGURE 5:

**DEEP UNDERGROUND INFILTRATION
+
SHALLOW GARDENS WITH ROCK CHANNEL**

Design Option D/A combines the deep underground infiltration system concept below the proposed water feature and a series of visible surface gardens with a rock channel throughout the lower portion of the Promenade.

Some water pumped up from the lake flows into an underground infiltration bed and spreads out via rows of perforated pipes. The infiltration bed lays 6-9' below the proposed pathway and water feature, and occupies nearly a half acre footprint.

Other water pumped up from the lake flows into a series of shallow gardens via a rock channel that resembles a stone creekbed. Water is taken up by the plants and infiltrates into the ground.



Deep Underground Infiltration System

Water pumped up from the lake

Babbling brook feature continues through shallow bioinfiltration gardens

DEEP UNDERGROUND INFILTRATION

SHALLOW GARDENS WITH ROCK CHANNEL

FIGURE 6:

**UNDERGROUND IRRIGATION AND INFILTRATION
+
SHALLOW GARDENS WITH ROCK CHANNEL**

Design Option D/B combines the shallow underground irrigation and infiltration system concept below the proposed water feature and a series of visible surface gardens with a rock channel throughout the lower portion of the Promenade.

Some water pumped up from the lake travels through drain tile beneath the proposed pathway. It flows from the main drain tile into smaller drain tile pipes that distribute the water throughout a shallow rock trench so that it can be wicked up through roots and used to irrigate lawns and plantings. Water not taken up by the plants infiltrates into the ground.

Other water pumped up from the lake flows into a series of shallow gardens via a rock channel that resembles a stone creekbed. Water is taken up by the plants and infiltrates into the ground.

Babbling brook feature continues through shallow bioinfiltration gardens

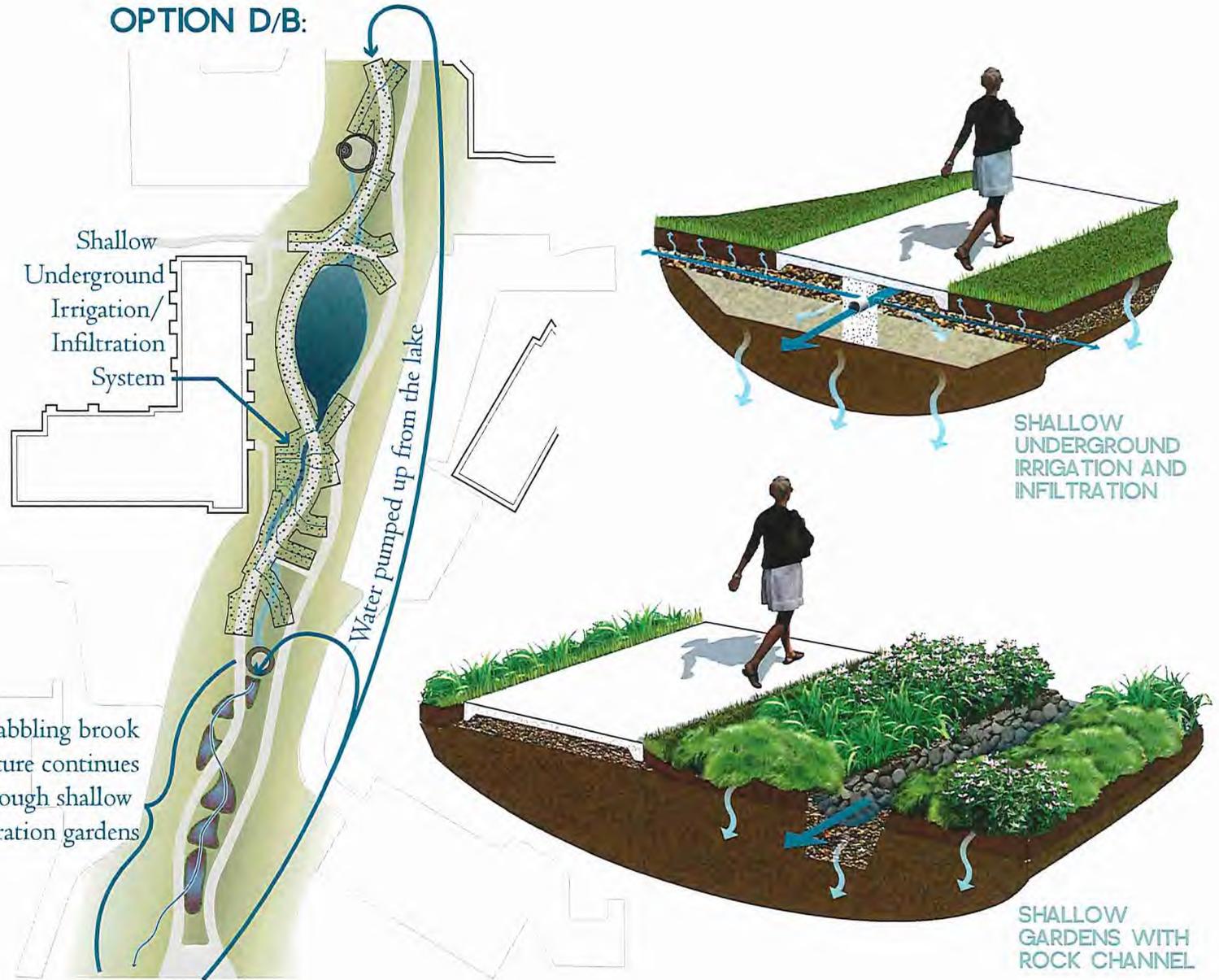


TABLE 1. CONCEPT LEVEL ENGINEER'S OPINION OF COST
CENTENNIAL LAKES VOLUME REDUCTION OPTIONS
 10/7/2013

| Pumping System & Sanitary I/I Prevention Costs (costs apply to each option presented below) | | | | |
|--|-------------|---------------------------|--|----------------------|
| Item Description | Unit | Estimated Quantity | Unit Price | Extension |
| PUMPING STATION | LS | 1 | \$ 25,000 | \$ 25,000.00 |
| 6" HDPE (PUMP STATION) | LF | 3000 | \$ 20 | \$ 60,000.00 |
| SLIP LINE 8" VCP SEWER WITHIN INFILT FOOTPRINT | LF | 360 | \$ 40 | \$ 14,400.00 |
| APPURTENANCES | | | (20%) | \$ 20,000.00 |
| MOBILIZATION/DEMOBILIZATION | | | (5%) | \$ 6,000.00 |
| | | | SUBTOTAL | \$ 125,400.00 |
| CONTINGENCY | | | (20%) | \$ 25,000.00 |
| | | | ESTIMATED CONSTRUCTION SUBTOTAL | \$ 150,400.00 |
| ENGINEERING & ADMINISTRATION | | | (30%) | \$ 45,000.00 |
| | | | TOTAL | \$ 195,400.00 |

OPTION A: Deep Underground Infiltration¹

| Item Description | Unit | Estimated Quantity | Unit Price | Extension |
|------------------------------|-------------|---------------------------|--|---------------------|
| COMMON EXCAVATION | CY | 2720 | \$ 12 | \$ 32,640.00 |
| TOPSOIL | CY | 670 | \$ 20 | \$ 13,400.00 |
| CLEAR ROCK | CY | 1800 | \$ 35 | \$ 63,000.00 |
| GRANULAR SEPARATION LAYER | CY | 250 | \$ 50 | \$ 12,500.00 |
| SOD | SY | 4000 | \$ 4.0 | \$ 16,000.00 |
| 12" DRAINTILE | LF | 2300 | \$ 30 | \$ 69,000.00 |
| APPURTENANCES | | | (20%) | \$ 41,000.00 |
| MOBILIZATION/DEMOBILIZATION | | | (5%) | \$ 12,000.00 |
| | | | SUBTOTAL | \$ 259,540.00 |
| CONTINGENCY | | | (20%) | \$ 52,000.00 |
| | | | ESTIMATED CONSTRUCTION SUBTOTAL | \$ 311,540.00 |
| ENGINEERING & ADMINISTRATION | | | (30%) | \$ 93,000.00 |
| | | | TOTAL | \$404,540.00 |

¹ Opinion of probable cost does not include potential costs for relocating watermain on north portion of Promenade study area.

OPTION B: Shallow Underground Infiltration/Irrigation

| Item Description | Unit | Estimated Quantity | Unit Price | Extension |
|------------------------------|-------------|---------------------------|--|---------------------|
| COMMON EXCAVATION- EXPORT | CY | 4270 | \$ 12 | \$ 51,240.00 |
| TOPSOIL - 18" AVERAGE | CY | 2000 | \$ 20 | \$ 40,000.00 |
| CLEAR ROCK | CY | 1000 | \$ 25 | \$ 25,000.00 |
| CLEAN WASHED SAND | CY | 1100 | \$ 25 | \$ 27,500.00 |
| GRANULAR SEPARATION LAYER | CY | 170 | \$ 50 | \$ 8,500.00 |
| SOD | SY | 4000 | \$ 4.0 | \$ 16,000.00 |
| 12" DRAINTILE | LF | 900 | \$ 15 | \$ 13,500.00 |
| 4" DRAINTILE | LF | 1300 | \$ 7 | \$ 9,100.00 |
| WEIR STRUCTURES | EA | 13 | \$ 1,500 | \$ 19,500.00 |
| SOIL LOOSENING | SY | 2000 | \$ 2 | \$ 4,000.00 |
| APPURTENANCES | | | (20%) | \$ 43,000.00 |
| MOBILIZATION/DEMOBILIZATION | | | (5%) | \$ 13,000.00 |
| | | | SUBTOTAL | \$ 270,340.00 |
| CONTINGENCY | | | (20%) | \$ 54,000.00 |
| | | | ESTIMATED CONSTRUCTION SUBTOTAL | \$ 324,340.00 |
| ENGINEERING & ADMINISTRATION | | | (30%) | \$ 97,000.00 |
| | | | TOTAL | \$421,340.00 |

OPTION C: Shallow Garden Basins

| Item Description | Unit | Estimated Quantity | Unit Price | Extension |
|---------------------------------|------|--------------------|------------|---------------------|
| GARDENS (COMPLETE) | SF | 14700 | \$ 10 | \$ 147,000.00 |
| IRRIGATION SYSTEM | LS | 1 | \$ 10,000 | \$ 10,000.00 |
| APPURTENANCES | | | (20%) | \$ 31,000.00 |
| MOBILIZATION/DEMobilIZATION | | | (5%) | \$ 9,000.00 |
| SUBTOTAL | | | | \$ 197,000.00 |
| CONTINGENCY | | | (20%) | \$ 39,000.00 |
| ESTIMATED CONSTRUCTION SUBTOTAL | | | | \$ 236,000.00 |
| ENGINEERING & ADMINISTRATION | | | (30%) | \$ 71,000.00 |
| TOTAL | | | | \$307,000.00 |

OPTION D/A: Deep Underground Infiltration WITH Shallow Gardens w/Rock Channel¹

| Item Description | Unit | Estimated Quantity | Unit Price | Extension |
|------------------------------------|------|--------------------|------------|---------------------|
| COMMON EXCAVATION | CY | 2050 | \$ 12 | \$ 24,600.00 |
| TOPSOIL | CY | 500 | \$ 20 | \$ 10,000.00 |
| CLEAR ROCK | CY | 1350 | \$ 35 | \$ 47,250.00 |
| GRANULAR SEPARATION LAYER | CY | 200 | \$ 50 | \$ 10,000.00 |
| SOD | SY | 3000 | \$ 4.0 | \$ 12,000.00 |
| 12" DRAINTILE | LF | 1700 | \$ 30 | \$ 51,000.00 |
| ROCK INFILTRATION TRENCH W/ STREAM | LF | 210 | \$ 50 | \$ 10,500.00 |
| OVERFLOW STRUCTURE | EA | 5 | \$ 1,000 | \$ 5,000.00 |
| GARDENS (COMPLETE) | SF | 3200 | \$ 10 | \$ 32,000.00 |
| SIDEWALK CROSSINGS | EA | 2 | \$ 1,500 | \$ 3,000.00 |
| APPURTENANCES | | | (20%) | \$ 41,000.00 |
| MOBILIZATION/DEMobilIZATION | | | (5%) | \$ 12,000.00 |
| SUBTOTAL | | | | \$ 258,350.00 |
| CONTINGENCY | | | (20%) | \$ 52,000.00 |
| ESTIMATED CONSTRUCTION SUBTOTAL | | | | \$ 310,350.00 |
| ENGINEERING & ADMINISTRATION | | | (30%) | \$ 93,000.00 |
| TOTAL | | | | \$403,350.00 |

¹ Opinion of probable cost does not include potential costs for relocating watermain on north portion of Promenade study area.

OPTION D/B: Shallow Underground Infiltration/Irrigation WITH Shallow Gardens w/Rock Channel

| Item Description | Unit | Estimated Quantity | Unit Price | Extension |
|------------------------------------|------|--------------------|------------|---------------------|
| COMMON EXCAVATION- EXPORT | CY | 3000 | \$ 12 | \$ 36,000.00 |
| TOPSOIL - 18" AVERAGE | CY | 1400 | \$ 20 | \$ 28,000.00 |
| CLEAR ROCK | CY | 700 | \$ 25 | \$ 17,500.00 |
| CLEAN WASHED SAND | CY | 780 | \$ 25 | \$ 19,500.00 |
| GRANULAR SEPARATION LAYER | CY | 120 | \$ 50 | \$ 6,000.00 |
| SOD | SY | 3000 | \$ 4.0 | \$ 12,000.00 |
| 12" DRAINTILE | LF | 620 | \$ 15 | \$ 9,300.00 |
| 4" DRAINTILE | LF | 950 | \$ 7 | \$ 6,650.00 |
| WEIR STRUCTURE | EA | 11 | \$ 1,500 | \$ 16,500.00 |
| ROCK INFILTRATION TRENCH W/ STREAM | LF | 210 | \$ 50 | \$ 10,500.00 |
| OVERFLOW STRUCTURE | EA | 5 | \$ 1,000 | \$ 5,000.00 |
| GARDENS (COMPLETE) | SF | 3200 | \$ 10 | \$ 32,000.00 |
| SIDEWALK CROSSINGS | EA | 2 | \$ 1,500 | \$ 3,000.00 |
| APPURTENANCES | | | (20%) | \$ 40,000.00 |
| MOBILIZATION/DEMobilIZATION | | | (5%) | \$ 12,000.00 |
| SUBTOTAL | | | | \$ 253,950.00 |
| CONTINGENCY | | | (20%) | \$ 51,000.00 |
| ESTIMATED CONSTRUCTION SUBTOTAL | | | | \$ 304,950.00 |
| ENGINEERING & ADMINISTRATION | | | (30%) | \$ 91,000.00 |
| TOTAL | | | | \$395,950.00 |

3.0 Summary of Project Benefits

3.1 Volume Reduction

While typical infiltration basins capture and infiltrate site runoff only following a precipitation event, the proposed systems function on a continuous basis (with the exception of times when water levels in the lake drop 0.5 feet below the control elevation). Given these differences, it was important to evaluate the effectiveness of the proposed infiltration systems on a long-term basis. To do so, the City's XP-SWMM model for the Centennial Lakes watershed was modified to incorporate a range of pumping scenarios that reflect a range of infiltration area "footprints" and run for a 35-year time period using 15-minute precipitation data from Golden Valley, Minnesota (Barr, 2011).

Model results from the 35-year time period were used to estimate the average annual volume reduction achieved through a Promenade infiltration system. Table 2 summarizes the modeled infiltration area "footprints" and corresponding pumping rates. The pumping rates were computed using a saturated hydraulic conductivity of 1.6 inches/hour, based on an assumption that soils within the Promenade are generally sandy. The average annual volume reduction achieved for each infiltration footprint was computed by quantifying the average volume pumped from the lake annually during the typical nonfrozen-ground period of April 7th through December 6 (Barr, 2011).

Based on the 35 years of modeling results, the estimated average annual infiltration from a system ranging from 0.1 to 0.6 acres in size is between 73 acre-feet and 175 acre-feet. The corresponding average annual percent reduction in discharge volume from Centennial Lakes ranges from 17 to 41 percent, depending on the infiltration footprint. The percent annual volume reduction calculation includes flow that is periodically pumped to Centennial Lakes from Adam's Hill Pond in Richfield.

3.2 Phosphorus Removal

Phosphorus is recognized as a primary pollutant of concern for urban water bodies within Minnesota, and the City of Edina has several goals and policies to promote removal of phosphorus from its stormwater. The estimated phosphorus removals from implementation of a proposed Promenade infiltration system were estimated for a range of infiltration footprints, based on the estimated average annual volume reductions. In the absence of water quality monitoring data from Centennial Lakes, corresponding phosphorus reductions were estimated assuming an average in-lake phosphorus concentration of 150 µg/L. Table 2 summarizes the estimated phosphorus removals achieved for a range of infiltration footprints and corresponding pumping rates.

Table 2 Volume reduction and phosphorus removal for a range of infiltration areas

| Infiltration Footprint (acre) | Corresponding Pumping Rate (cfs) | Average Annual Volume Reduction (acre-feet) | % Average Annual Volume Reduction¹ | Estimated Average Annual Phosphorus Removal¹ (lbs) |
|--------------------------------------|---|--|--|--|
| 0.1 | 0.16 | 73 | 17 | 30 |
| 0.2 | 0.32 | 115 | 27 | 47 |
| 0.3 | 0.5 | 139 | 33 | 57 |
| 0.4 | 0.66 | 153 | 36 | 62 |
| 0.5 | 0.81 | 164 | 38 | 67 |
| 0.6 | 0.97 | 175 | 41 | 71 |

¹ Values are rounded to nearest whole number

3.3 Comparison of Cost/Benefit

Table 3 summarizes the estimated design and construction costs for the evaluated design options. These upfront capital costs were divided by the estimated average annual volume reduction and phosphorus removal to compute a volume reduction or treatment capacity cost for each option for comparative purposes. The volume reduction capacity and treatment capacity costs, which are summarized in Table 3, do not include life-cycle efficiency or incorporate operation and maintenance costs.

Table 3 Cost comparison of conceptual design options

| Design Option | Infiltration Footprint (acres) | Estimated Design and Construction Cost¹ | Volume Reduction Capacity Cost (\$/acre-foot) | Phosphorus Removal Capacity Cost (\$/lb TP) |
|----------------------|---------------------------------------|---|--|--|
| A | 0.63 | \$600,000 | 3,370 | 8,291 |
| B | 0.62 | \$617,000 | 3,486 | 8,575 |
| C | 0.33 | \$502,000 | 3,503 | 8,618 |
| D/A | 0.56 | \$599,000 | 3,512 | 8,639 |
| D/B | 0.52 | \$591,000 | 3,558 | 8,752 |

¹ Dollars rounded to nearest thousand

3.4 Other Benefits and Risks

The four conceptual design options were compared in terms of costs, benefits, and risks to help understand the advantages and disadvantages of each option. Table 4 ranks several project costs, benefits, and risks as high, medium, or low based on discussion with City of Edina and NMCWD staff.

Table 4 Comparison of benefits, costs, and risks of conceptual design options

| | Option A | Option B | Option C | Option D (stand-alone) | Option D (combined with Option A or B) |
|--|-----------|------------|-------------|---------------------------|--|
| BENEFITS | | | | | |
| Volume reduction | High | High | Medium | Low | High |
| Education | Medium | Medium | High | High | High |
| Evapotranspiration | Very Low | Medium | High | High | Medium |
| COSTS | | | | | |
| Construction Cost | Medium | Medium | Medium | Low | Medium |
| Incremental Volume Reduction and Phosphorus Removal Costs | Low | Low | Low | Low | Low |
| Short-term Maintenance Cost | Low | Low/Medium | Medium/High | Medium/High | Medium |
| Long-term Maintenance Cost | Very High | High | Medium | Medium | Medium/High |
| RISKS | | | | | |
| Public Acceptance | High | High | Low | Medium/High | High |

References

Barr Engineering Co., *Assessment of MIDS Performance Goal Alternatives: Runoff Volumes, Runoff Rates, and Pollutant Removal Efficiencies*. Prepared for Minnesota Pollution Control Agency. June 2011.

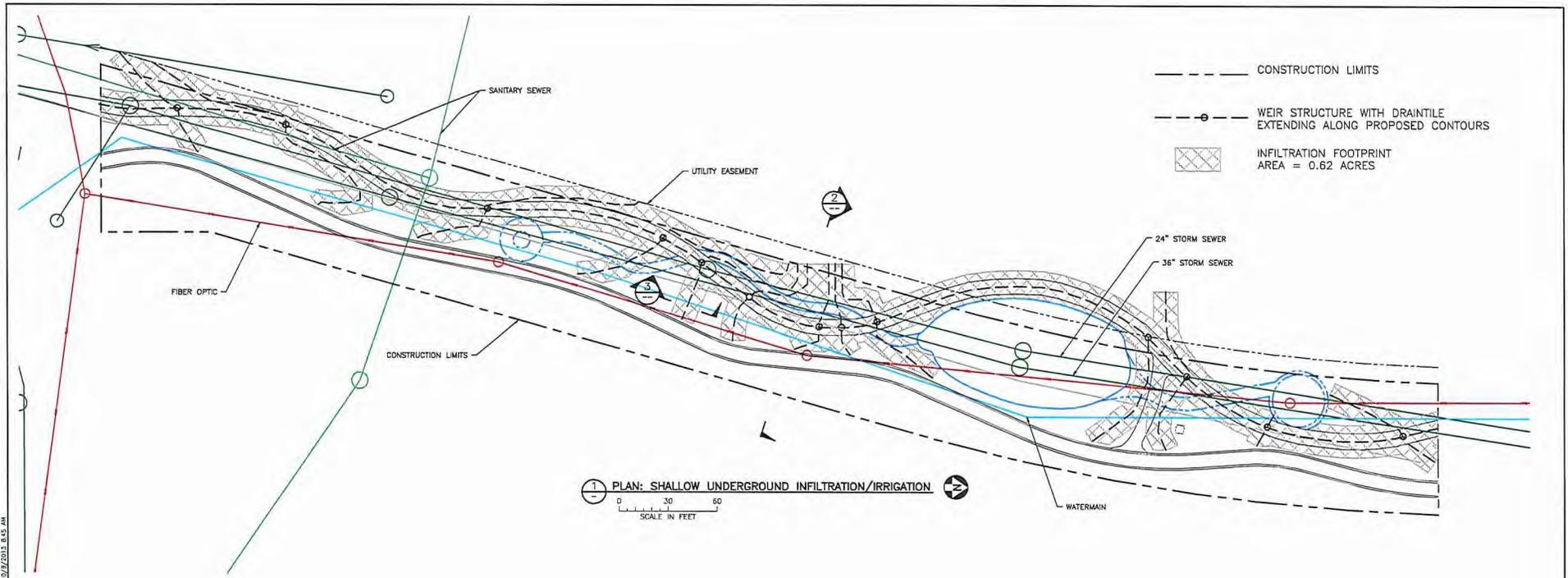
Appendix A

URS Preliminary Concept Design

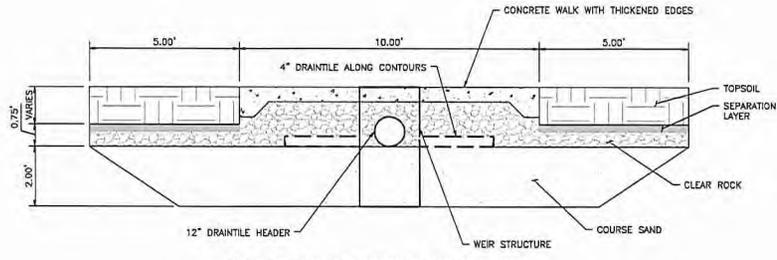


Appendix B

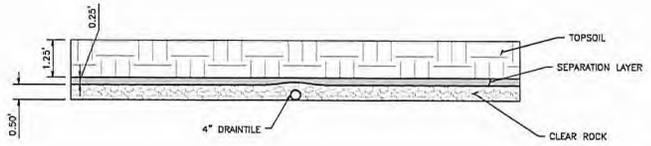
Preliminary Plan Sheet Drawings



1 PLAN: SHALLOW UNDERGROUND INFILTRATION/IRRIGATION
 SCALE IN FEET



2 SECTION: 12" DRAINTILE UNDER WALK
 SCALE AS SHOWN



3 SECTION: 4" DRAINTILE ALONG CONTOURS
 SCALE AS SHOWN

PRELIMINARY DRAFT

| NO. | BY | CHK | APP | DATE | REVISION DESCRIPTION |
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| 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. SIGNATURE _____ PRINTED NAME _____ DATE _____ REG. NO. _____ | CLIENT CITY OF EDINA CONSTRUCTION RELEASED TO/ FOR _____ DATE RELEASED _____ |
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 Fax: (612) 832-2601
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 4700 WEST 77TH STREET
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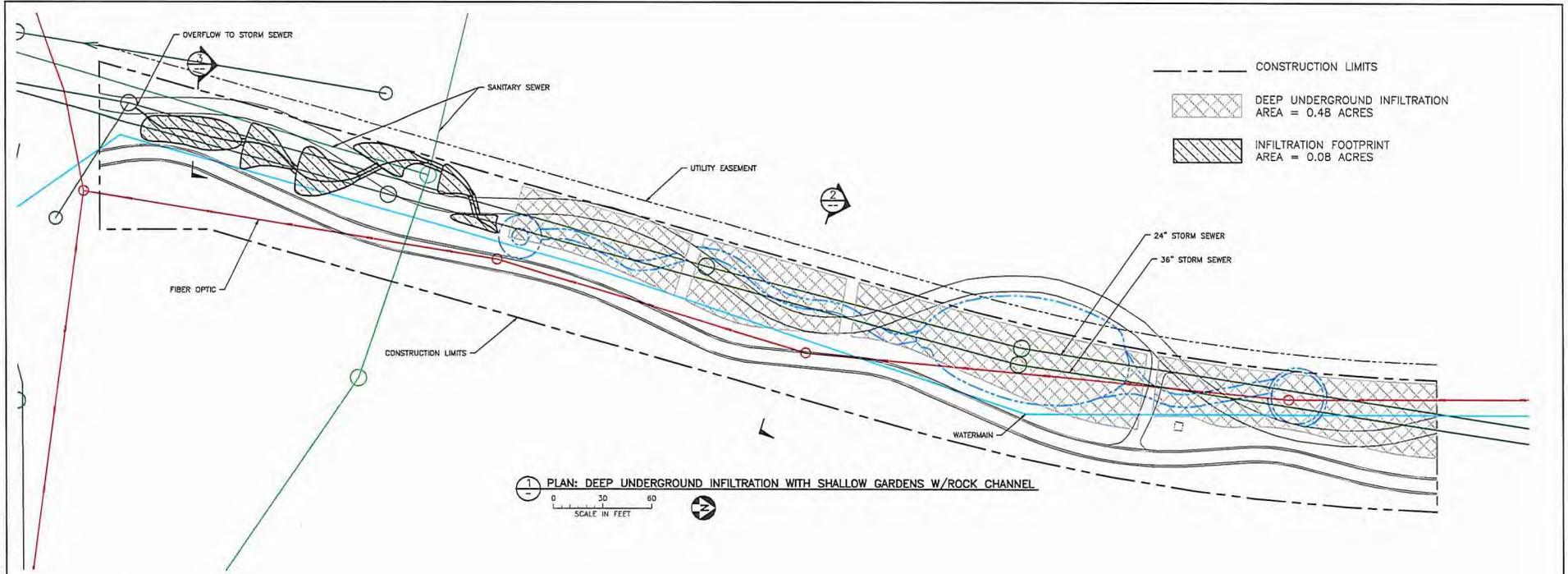
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| DATE | AS SHOWN |
| 10/19/2013 | Drawn |
| | Checked |
| | Designed |
| | Approved |

CITY OF EDINA
 EDINA, MN

CENTENNIAL LAKES
 VOLUME REDUCTION
 OPTION B
 SHALLOW UNDERGROUND INFILTRATION/IRRIGATION

| | |
|--------------------|----------|
| BARR PROJECT NO. | 23271309 |
| CLIENT PROJECT NO. | |
| DWG. No. | C2 |
| REV. No. | |

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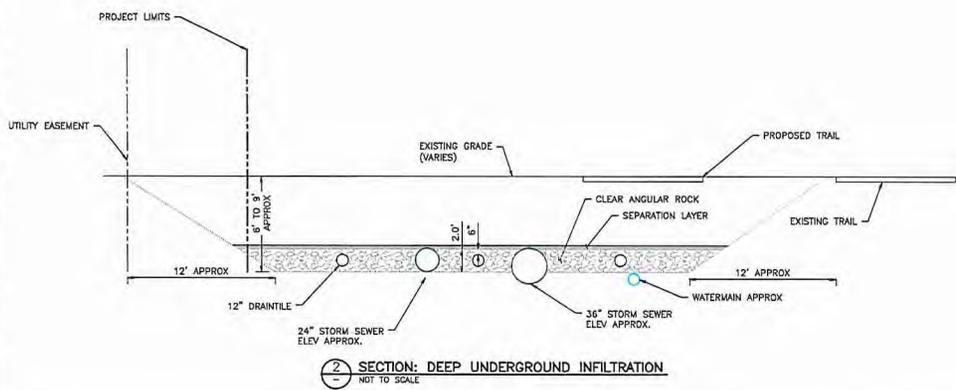


--- CONSTRUCTION LIMITS

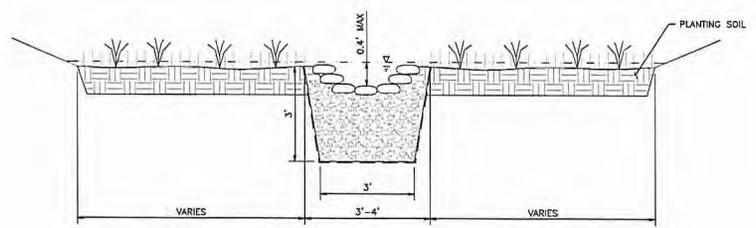
▨ DEEP UNDERGROUND INFILTRATION
AREA = 0.48 ACRES

▨ INFILTRATION FOOTPRINT
AREA = 0.08 ACRES

1 PLAN: DEEP UNDERGROUND INFILTRATION WITH SHALLOW GARDENS W/ROCK CHANNEL
0 30 60
SCALE IN FEET



2 SECTION: DEEP UNDERGROUND INFILTRATION
NOT TO SCALE

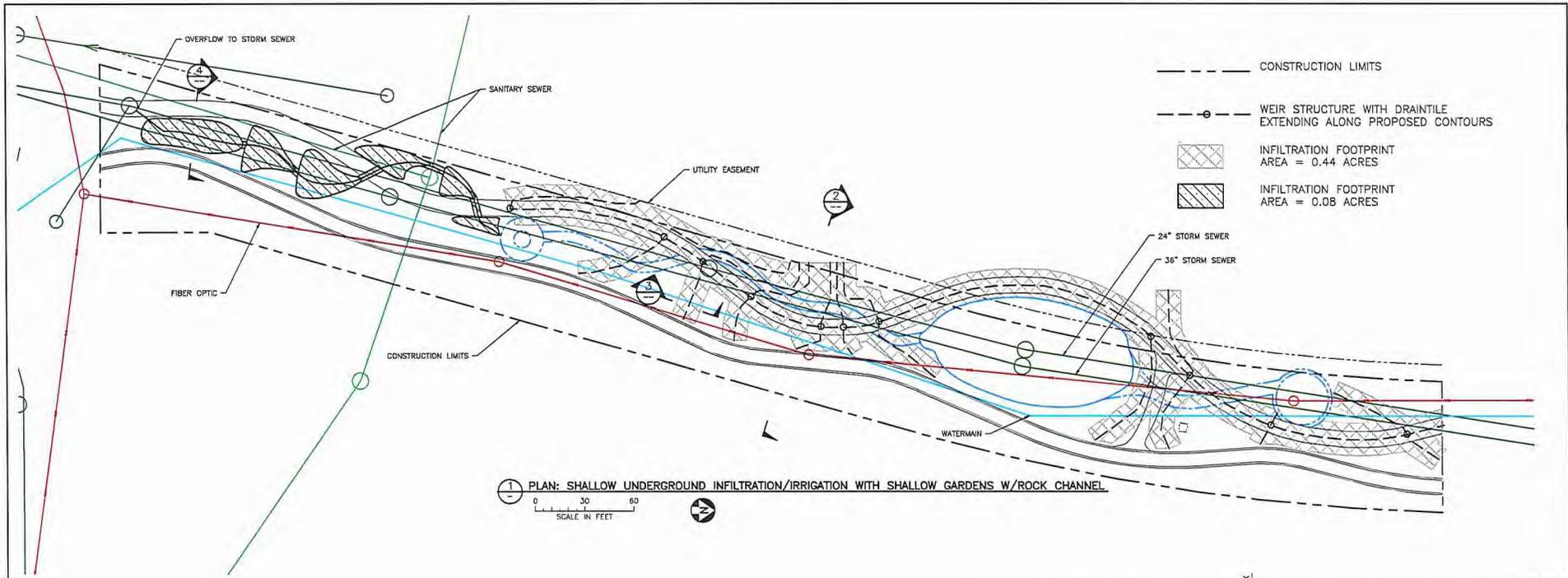


3 SECTION: SHALLOW GARDENS W/ ROCK CHANNEL
SCALE AS SHOWN

PRELIMINARY
DRAFT

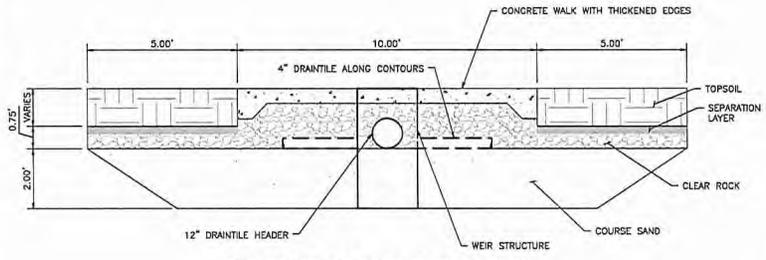
| | | | | | | | | | | | | | | | | | | | | | |
|---|----|-----|-----|---|----------|-------------|-----------------|---|---|---|---|---|---|----------------------------|---------------|---|--|---|--|-----------------------------------|--|
| I HEREBY CERTIFY THAT THE FINAL SPECIFICATION OF REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A duly LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA. | | | | BARR Corporate Headquarters Minneapolis, Minnesota Ph: 1-855-832-2277 | | | | Project Office: BARR ENGINEERING CO. 4700 WEST 77TH STREET MINNEAPOLIS, MN. 55425-4803 Ph: 1-800-832-2277 Fax: (952) 832-2601 www.barr.com | | | | Date: AS SHOWN Date: 10/9/2013 Drawn: PEB Checked: Designed: Approved: | | CITY OF EDINA EDINA, MN | | CENTENNIAL LAKES VOLUME REDUCTION OPTION D/A DEEP UNDERGROUND W/ SHALLOW GARDENS | | BARR PROJECT NO. 23271309 CLIENT PROJECT NO. | | DWG. NO. C4 REV. NO. | |
| NO. | BY | CHK | APP | DATE | REVISION | DESCRIPTION | RELEASED TO/FOR | A | B | C | 0 | 1 | 2 | 3 | DATE RELEASED | | | | | | |

4500 WEST 77TH STREET, EDINA, MN 55425-4803
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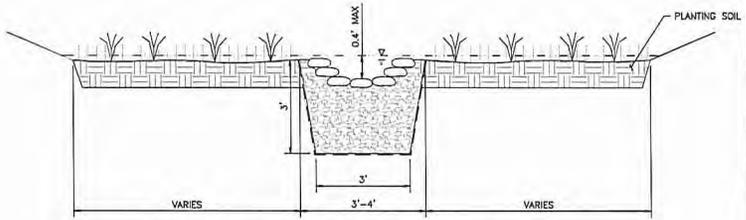


1 PLAN: SHALLOW UNDERGROUND INFILTRATION/IRRIGATION WITH SHALLOW GARDENS W/ROCK CHANNEL
 SCALE IN FEET

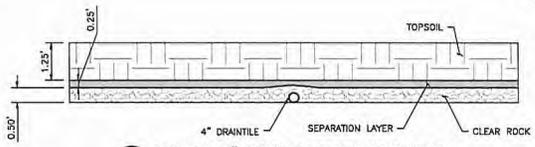
- CONSTRUCTION LIMITS
- WEIR STRUCTURE WITH DRAINTILE EXTENDING ALONG PROPOSED CONTOURS
- ▨ INFILTRATION FOOTPRINT AREA = 0.44 ACRES
- ▩ INFILTRATION FOOTPRINT AREA = 0.08 ACRES



2 SECTION: 12" DRAINTILE UNDER WALK
 SCALE AS SHOWN



4 SECTION: SHALLOW GARDENS W/ ROCK CHANNEL
 SCALE AS SHOWN



3 SECTION: 4" DRAINTILE ALONG CONTOURS
 SCALE AS SHOWN

PRELIMINARY DRAFT

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 Approved:

CITY OF EDINA
 EDINA, MN

CENTENNIAL LAKES
 VOLUME REDUCTION
 OPTION D/B
 SHALLOW UNDERGROUND W/ SHALLOW GARDENS

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 CLIENT PROJECT NO.
 DWG. No. C5
 REV. No.

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