REPORT / RECOMMENDATION

To: Edina Transportation Commission

Agenda Item #: VI.A.

From: Ross Bintner PE, Environmental Engineer

Action [X]
Discussion [ ]
Information [ ]

Date: November 21, 2013

Subject: 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.

There are two separate reports attached: The report titled "Edina Promenade Phase 4 - Conceptual Plan Outline and Narrative" authored by URS Corporation describes the pedestrian and bike trails, landscaping and irrigation, public lighting, public art and surface water feature. Taken together, these features provide the following services: parks/public open space, bike and pedestrian transportation and leisure, arts and cultural expression, and aesthetic public space. Development of these concepts followed the guiding vision in the 2007 Edina Promenade Urban Design Plan. The purpose of this fourth phase of the Promenade is to complete an aesthetically pleasing pond and stream feature interwoven with an existing bike and permanent pedestrian path with intermixed art nodes between Centennial Lakes and Hazelton road.

The report titled "Edina Centennial Lakes Runoff Volume Reduction Plan" authored by Barr Engineering describes the underground stormwater infiltration feature. This feature provides the stormwater management for the site, and enhances flood protection and clean water services of the Centennial Lakes stormwater management system. The purpose of the underground regional infiltration system is to provide clean surface waters, flood protection, and cost-effectively generate stormwater credits for future redevelopment. Development of this concept followed the policy described in the Comprehensive Water

Resources Management Plan. This report includes four potential options, of which the preferred option is B/D.

A collaborative approach to inform, engage and develop feedback from City boards and commissions on these plans included meetings with the Parks Board, Transportation Commission, Energy and Environment, and Arts and Culture Commissions. This agenda item was intended to be on the October meeting of the ETC, but was inadvertently missed. The City also engaged the Nine Mile Creek Watershed District Board (9MCWD) as a project partner through a cooperative agreement, and has coordinated review of design and schedules with the nearby Byerly's development. Concerns and opportunities expressed by these project stakeholders were used to inform the concept, and will help guide the design process. A few examples of this valuable input include: From the Parks Board, the need to reduce and plan for the ongoing maintenance expense of the new feature; from the Arts and Culture Commission, the need to integrate and plan the relocation of the "Three Trees" installation; and from the Energy and Environment Commission, the apparent conflict between expanding water system sustainability with a tradeoff of increased energy use.

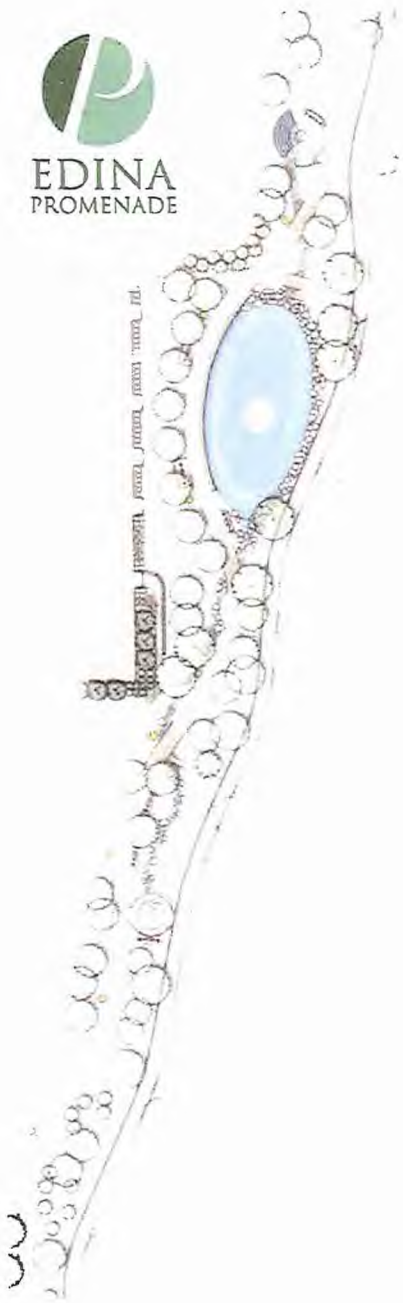
The project is a unique convergence of a variety of City goals and enhances the following service levels: Bike and pedestrian transportation, parks and public spaces, flood protection and clean water, and arts and culture in the public realm. The two separate parts of the promenade phase 4 concepts serve different purposes, but the combination of surficial and underground water, parks, trails, landscaping and stormwater into a single project produces a variety of efficiencies. The parts share: construction and contracting effort, construction and operation of a single pump station, efficient use of public space, reduction in irrigation water demand, groundwater recharge, and development of stormwater credits for future park redevelopment.

Next Steps:

This review by the transportation commission follows 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 and contract award in May, and constructed from June-October. 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 on the following page are the concept level estimate and funding sources for this project:

Project Element:	Cost Estimate	Proposed Funding Sources
Water feature, public art nodes, and ½ share of pump station.	$599,500	
Public lighting, electric controls and irrigation.	$203,800	
Pedestrian walk, crossings, and associated grading and wall.	$236,700	
Design, engineering, plans, specs.	$120,000	
SUBTOTAL (A) WATER FEATURE, LIGHTING AND TRAIL.	**$1,160,000**	$600,000 from 7171 France park dedication fees, Remainder from HRA/Centennial Lakes TIF district (CIP item HRA-11-002)
Underground regional infiltration feature and shallow gardens with rock channel and ½ share of pump station.	$591,350	
Design, engineering, plans, and specs.	$76,000	
SUBTOTAL (B) STORMWATER	**$667,350**	Equal shares from 9MCWD and City of Edina stormwater utility
Project management and construction oversight		HRA/Centennial Lakes TIF district (CIP item HRA-11-002) and City of Edina stormwater utility
TOTAL (A+B)	**$1,827,350**	

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

URS

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.

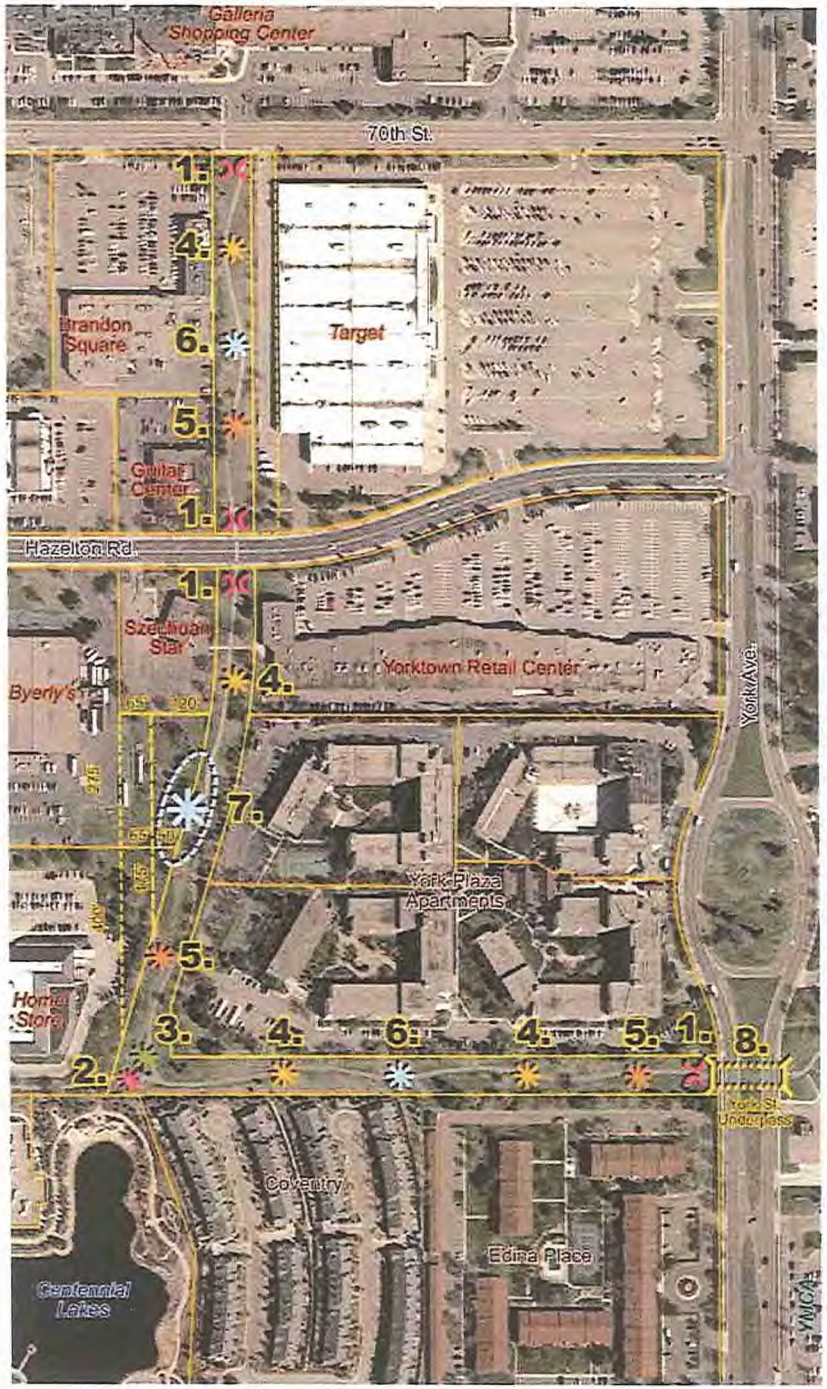


Figure 33

Promenade Component Plan

Promenade Design

Legend

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

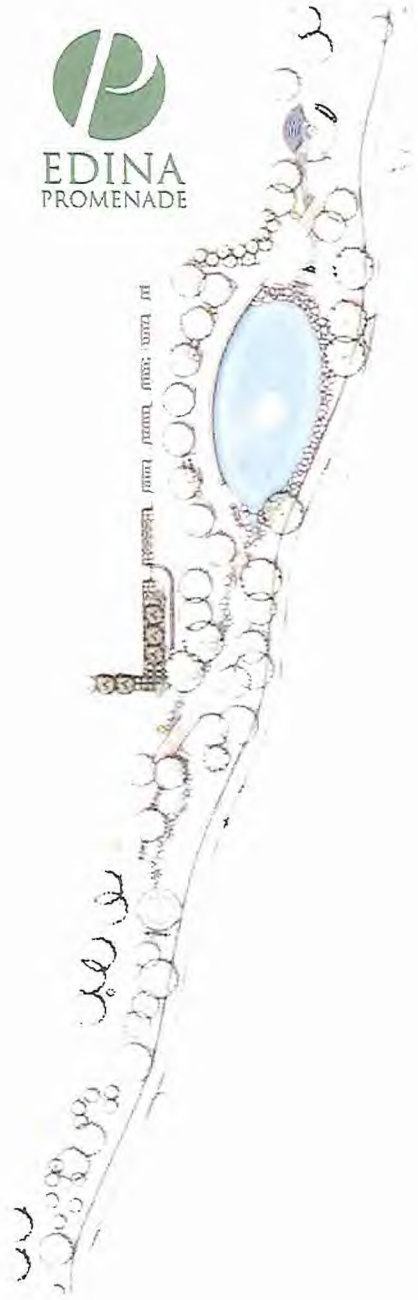
0 100 300 Feet

EDINA PROMENADE

Urban Design Plan

July 2007

URS



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.

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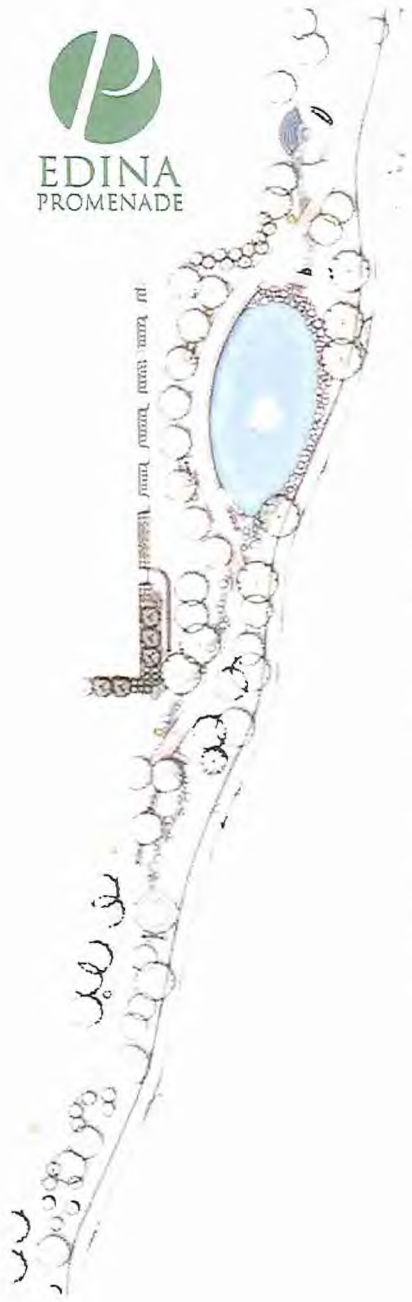
EDINA
PROMENADE



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.

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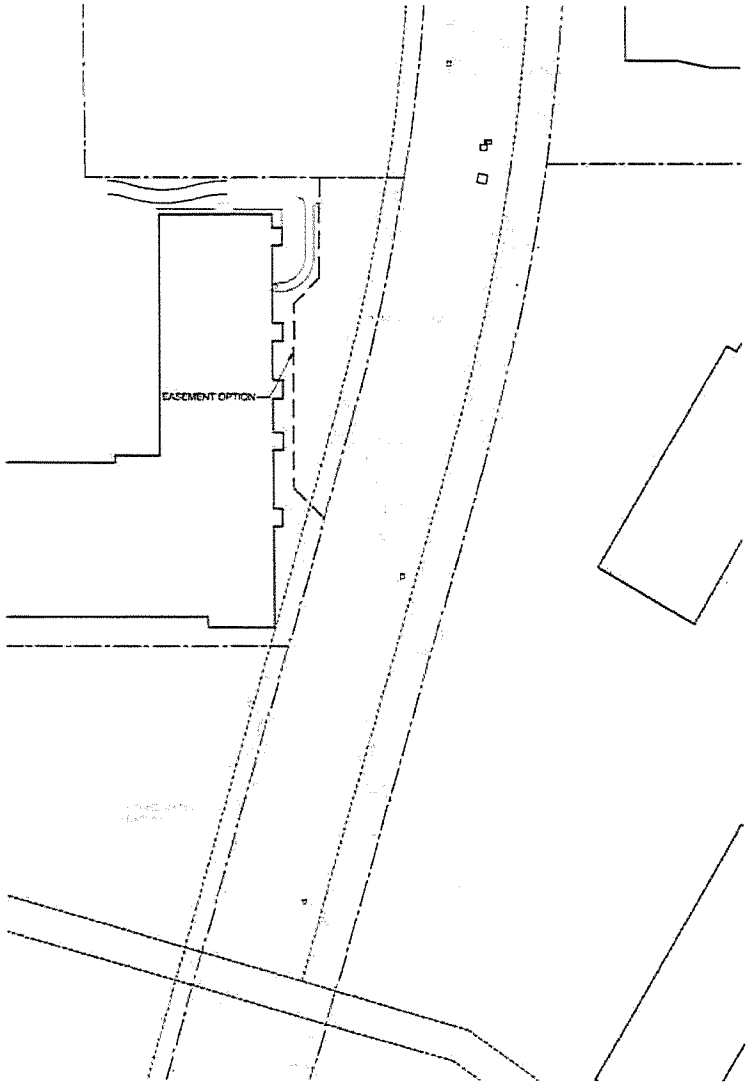
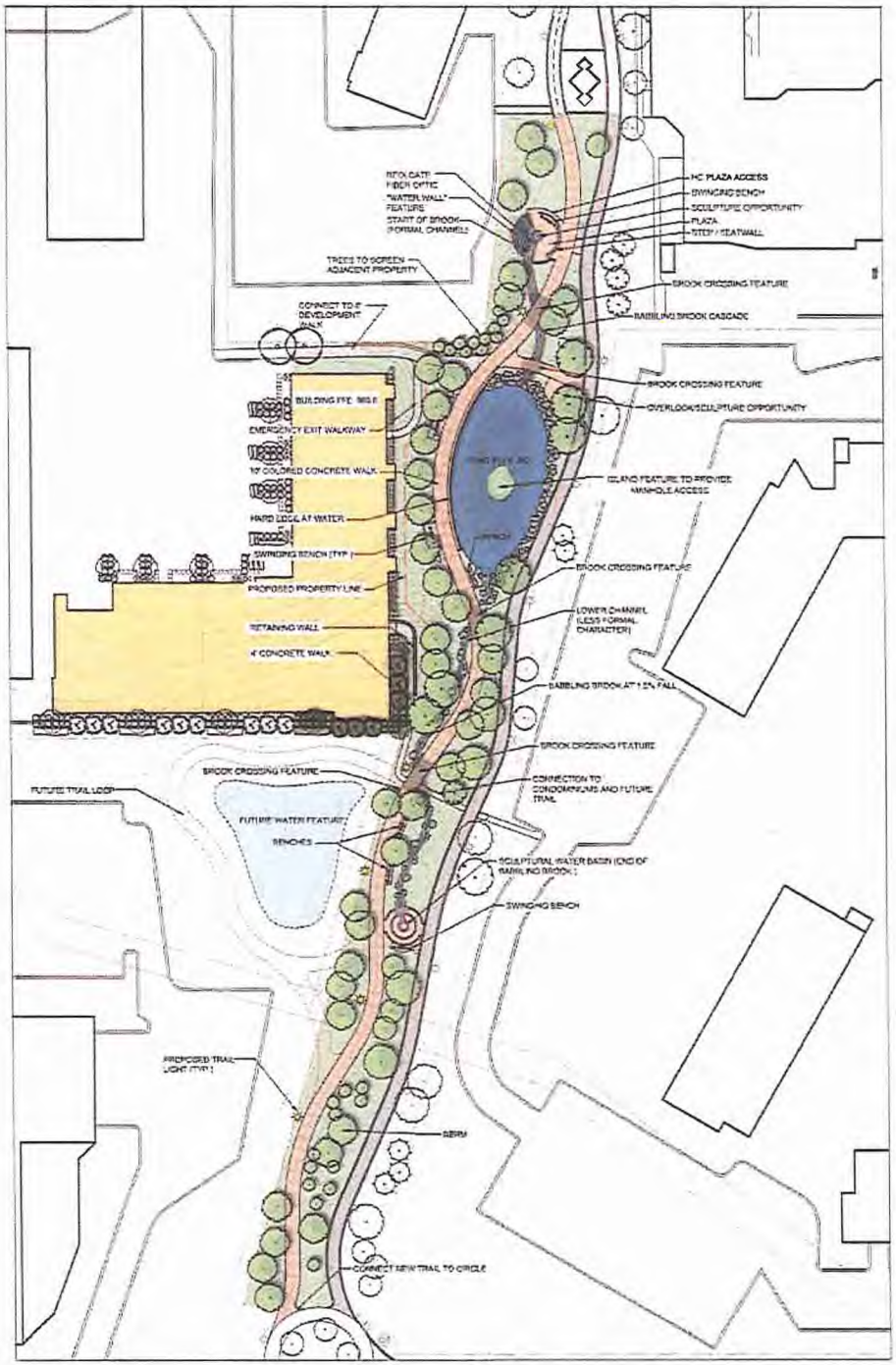
EDINA PROMENADE PHASE 4

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



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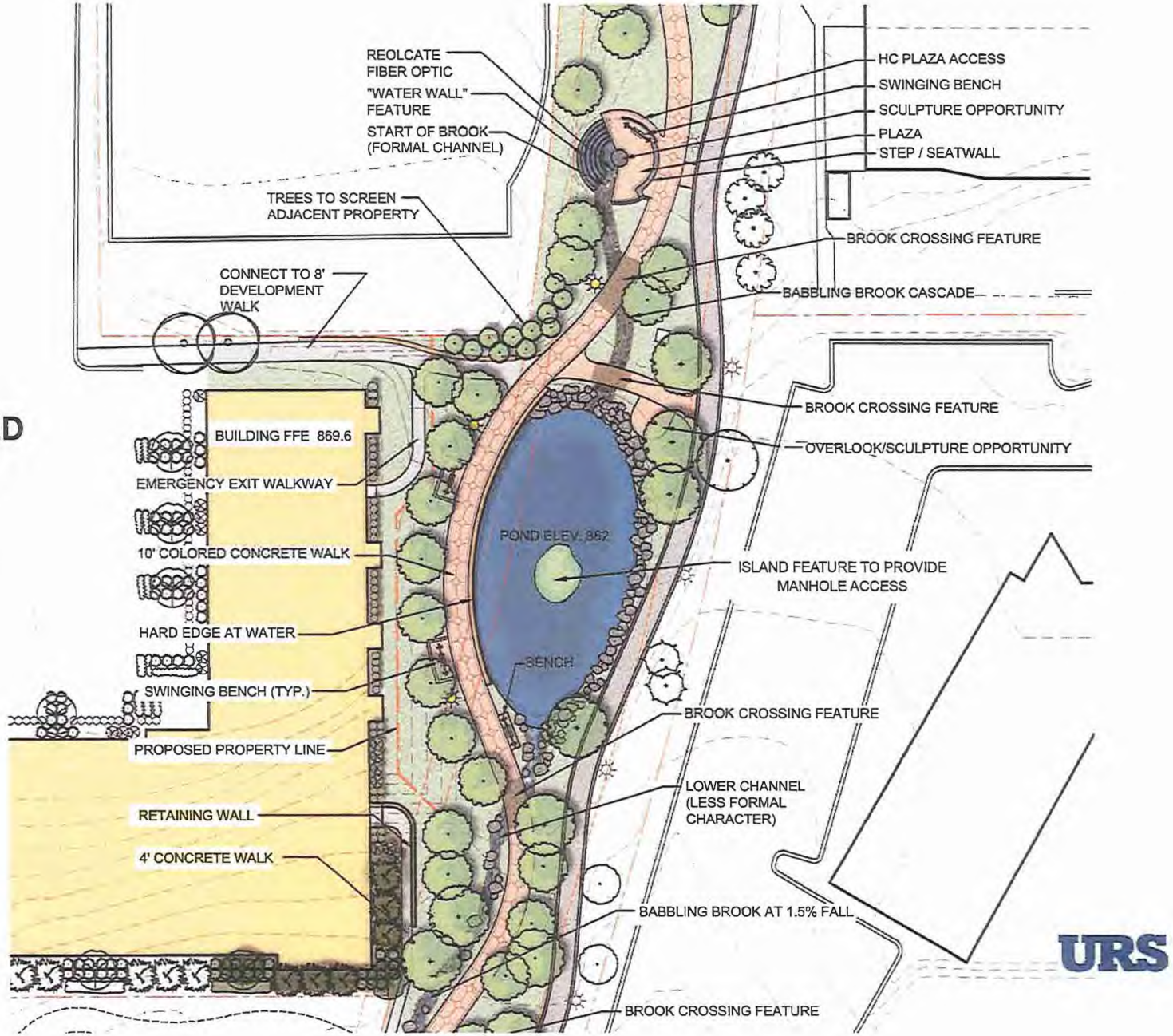
PROPOSED MASTER PLAN: NORTH



PROPOSED MASTER PLAN: SOUTH

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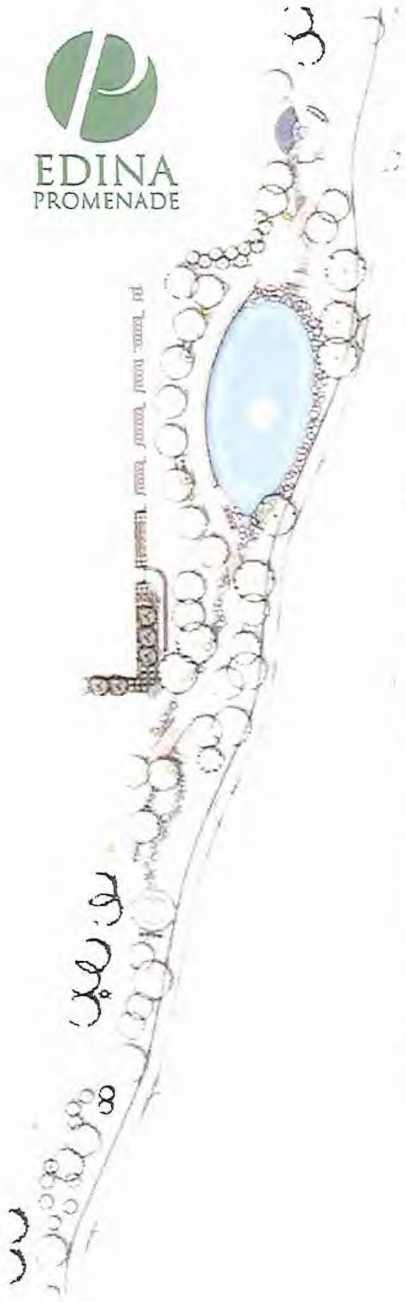
EDINA
PROMENADE



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

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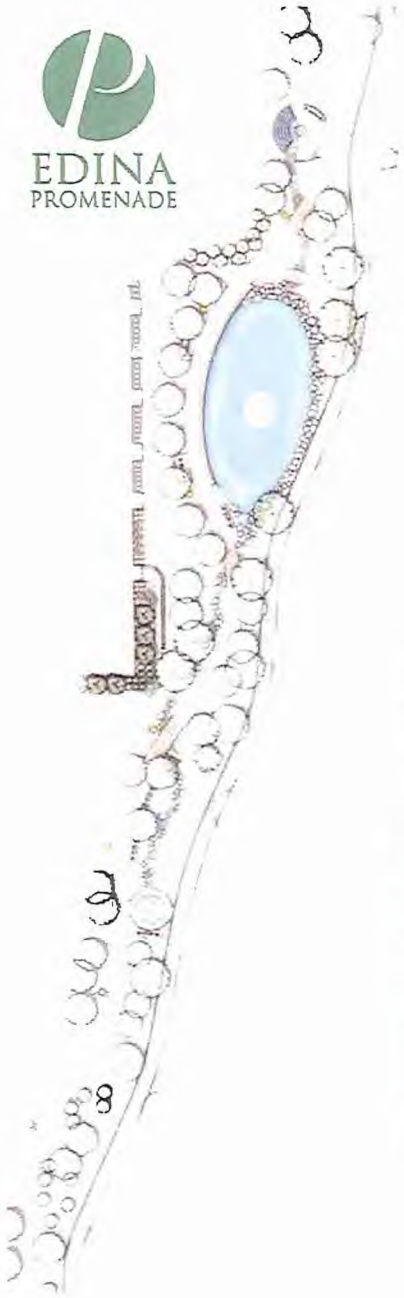
PROMENADE



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.

SMALL DROPS SPACED ALONG LENGTH OF BROOK

SIMPLE ELEGANT SCULPTURE IN SMALL FORMAL POOL

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.

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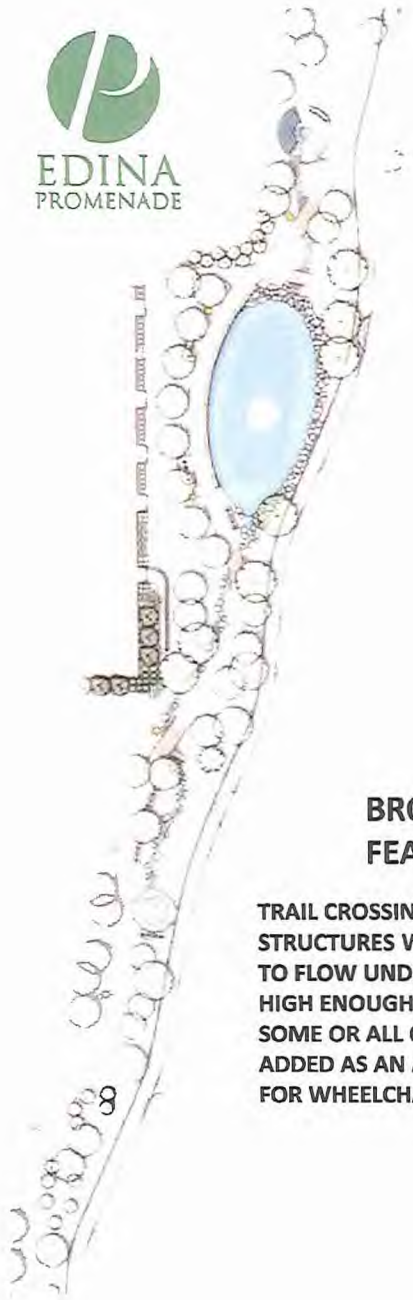

POND CONCEPT

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.

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Edina Centennial Lakes Runoff Volume Reduction Plan

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

October 18, 2013

BARR

Edina Centennial Lakes Runoff Volume Reduction Plan

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

October 18, 2013

BARR

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Edina Centennial Lakes Runoff Volume Reduction Plan
October 18, 2013

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1.0 Project Background and Objectives

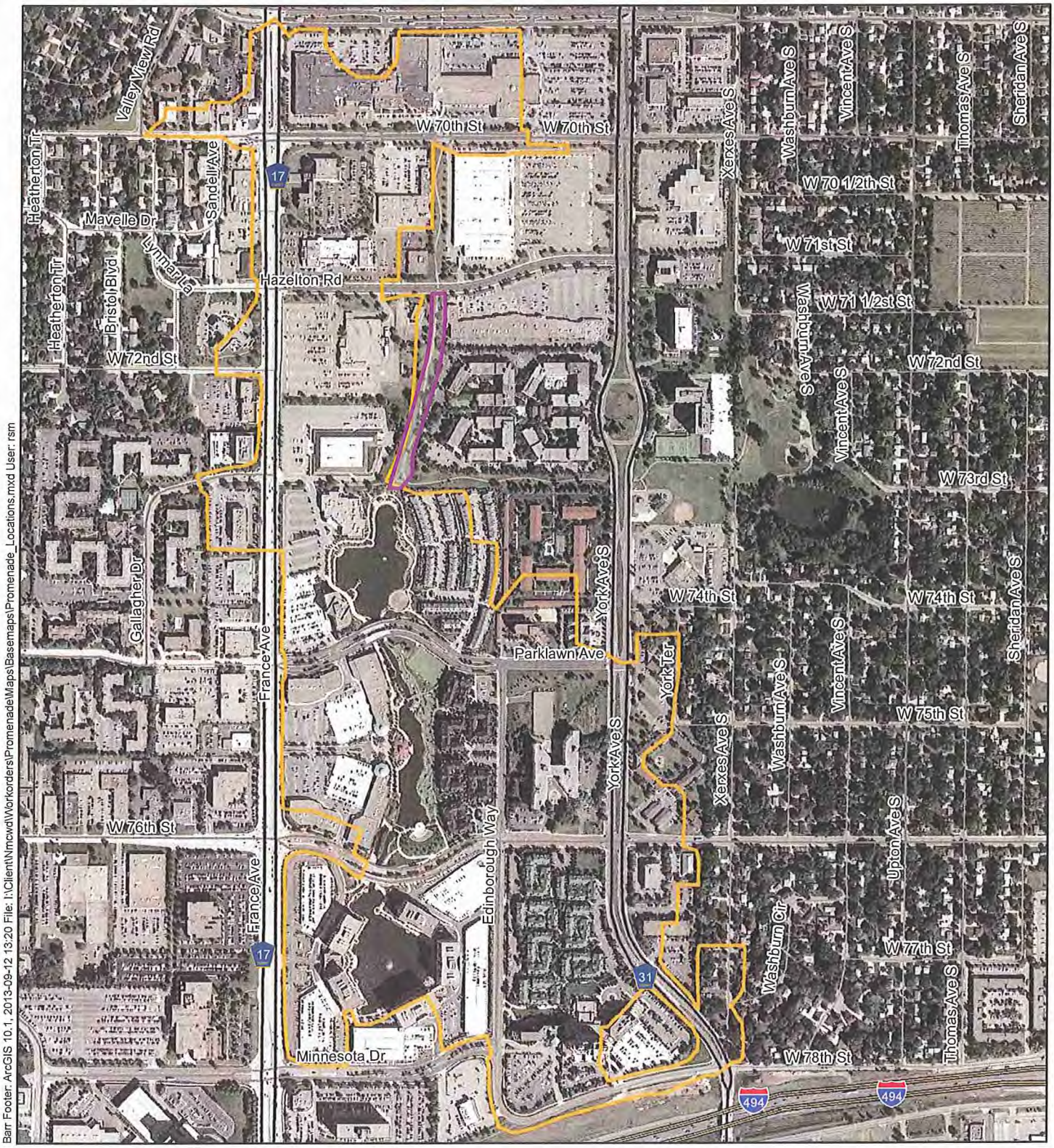
1.1 Background

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\Nmcwd\Workorders\Promenade\Maps\Basemaps\Promenade_Locations.mxd User: rsm

N

0 375 750

Feet

1 inch : 750 feet

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 draintile beneath the proposed pathway and outward into smaller draintile 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

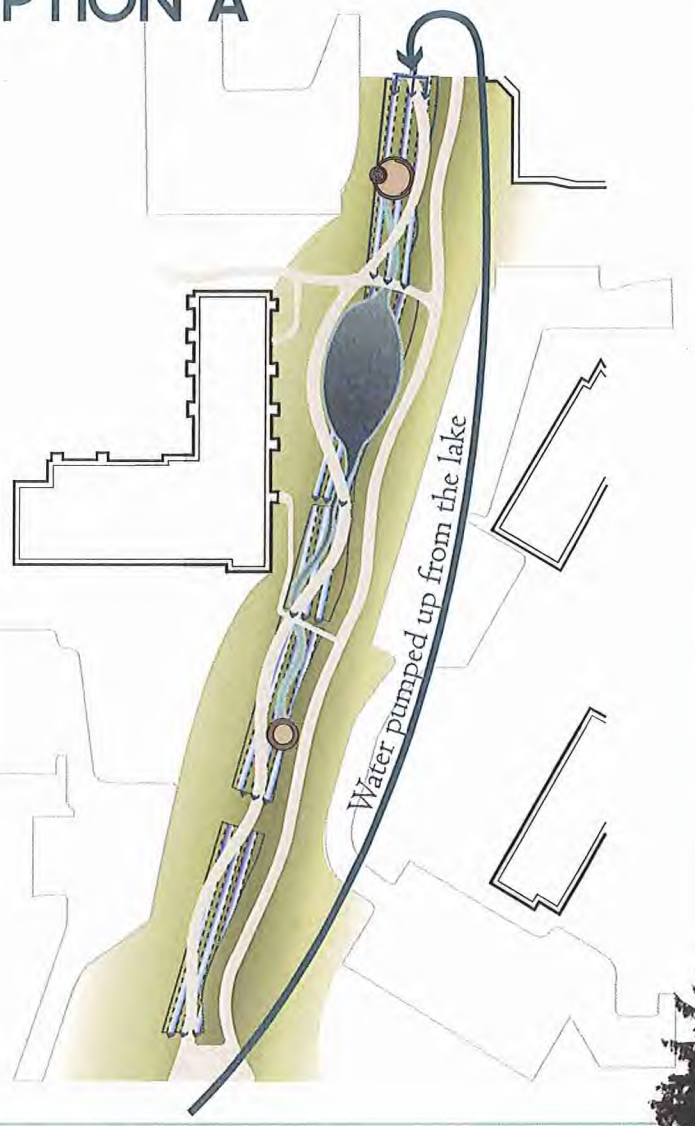


FIGURE 2:

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.

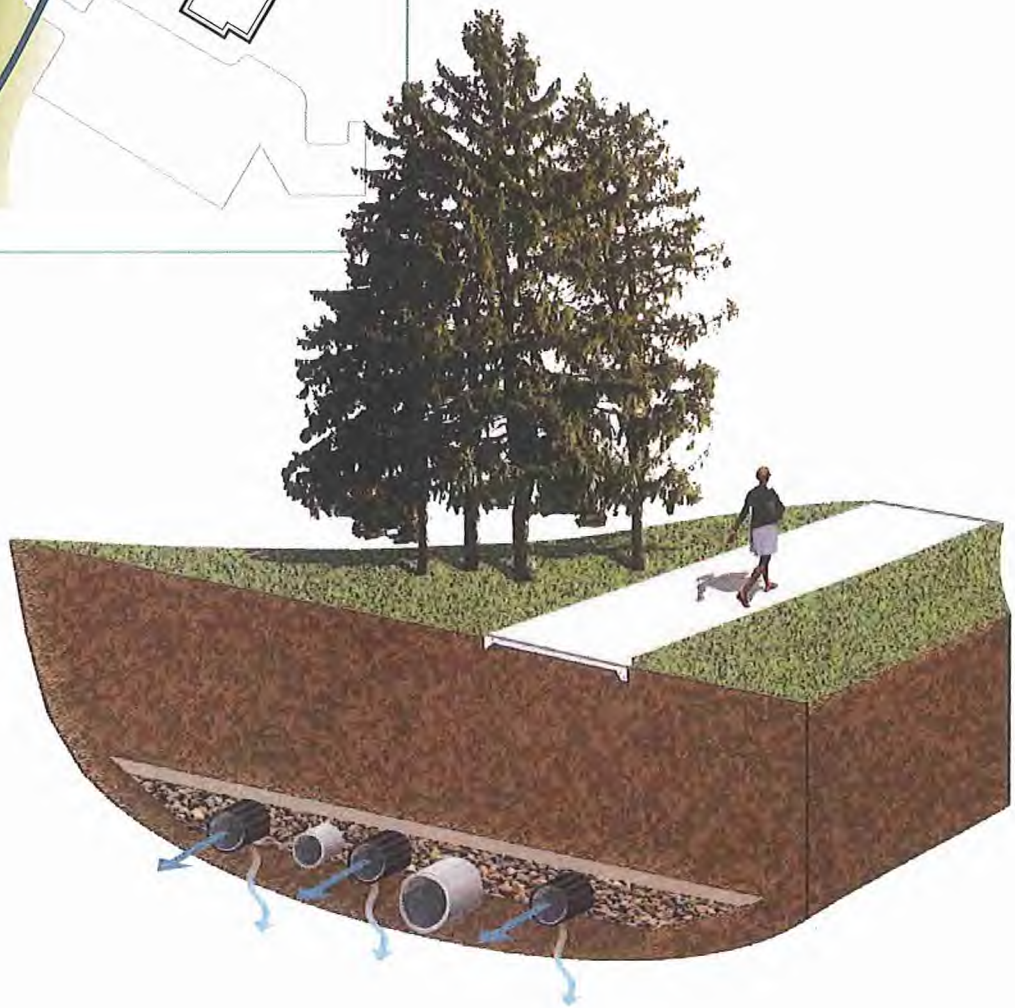


FIGURE 3:

SHALLOW UNDERGROUND IRRIGATION/ INFILTRATION

Water pumped up from the lake travels through draintile beneath the proposed pathway. It flows from the main draintile into smaller draintile 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.

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.

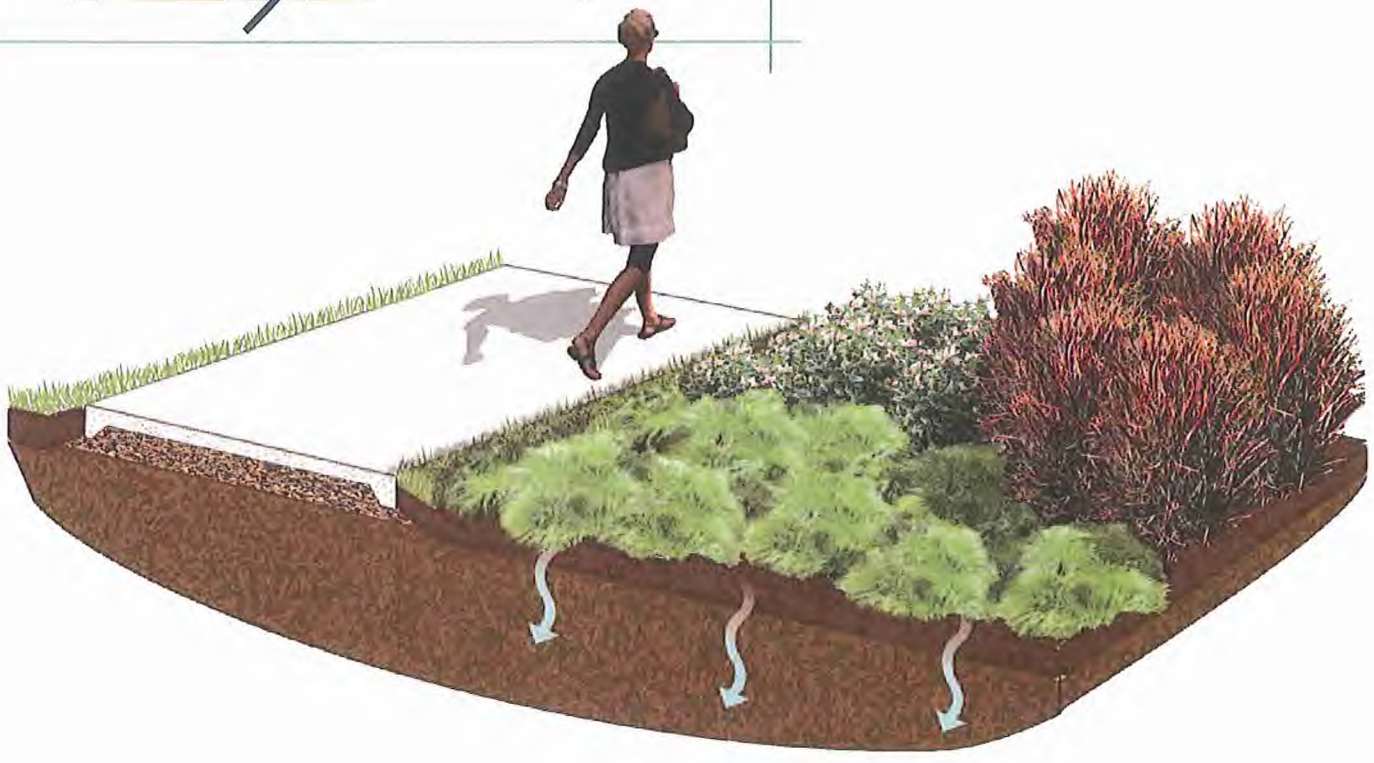


FIGURE 5:

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.

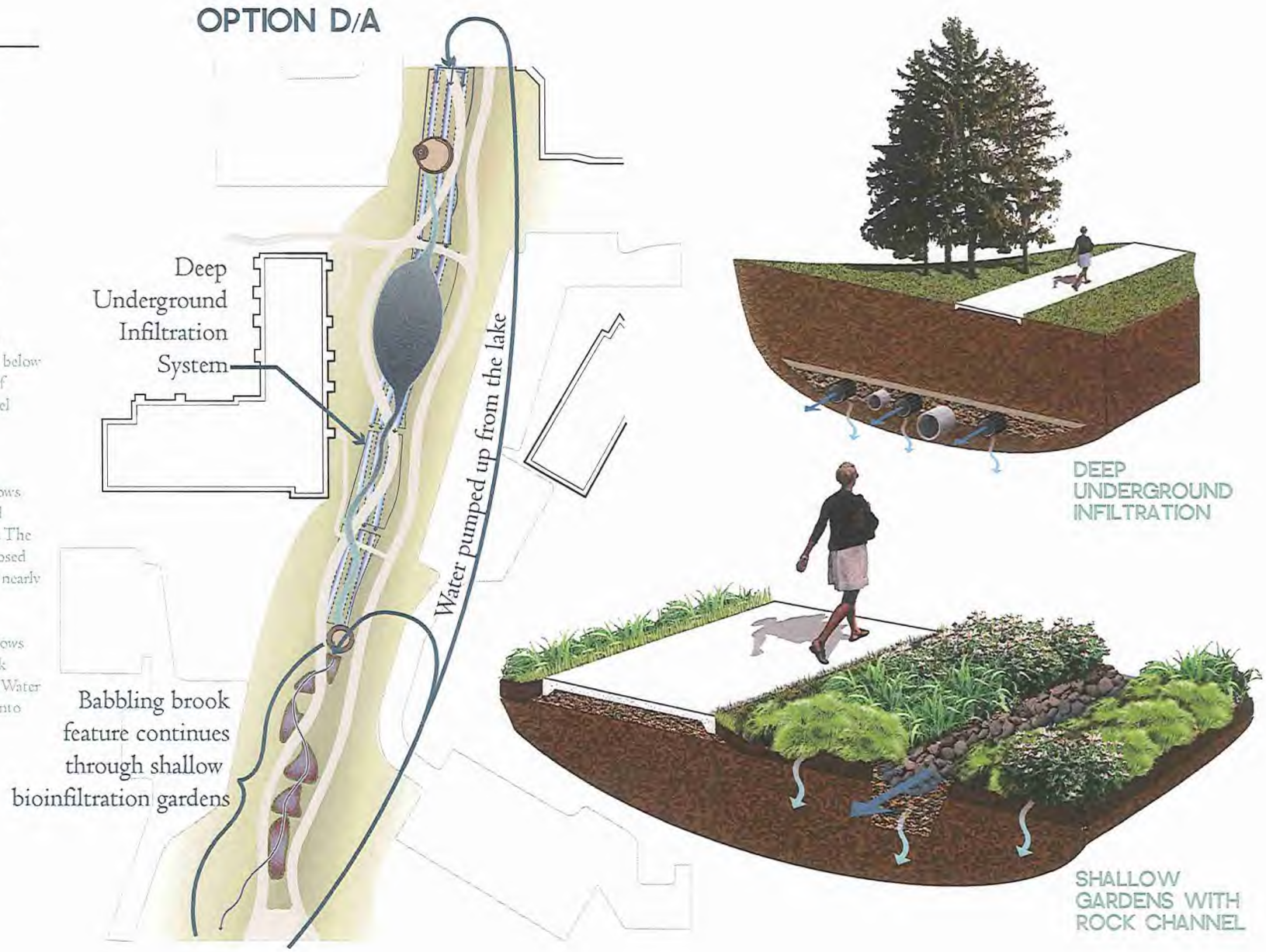


FIGURE 6:

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 draintile beneath the proposed pathway. It flows from the main draintile into smaller draintile 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.

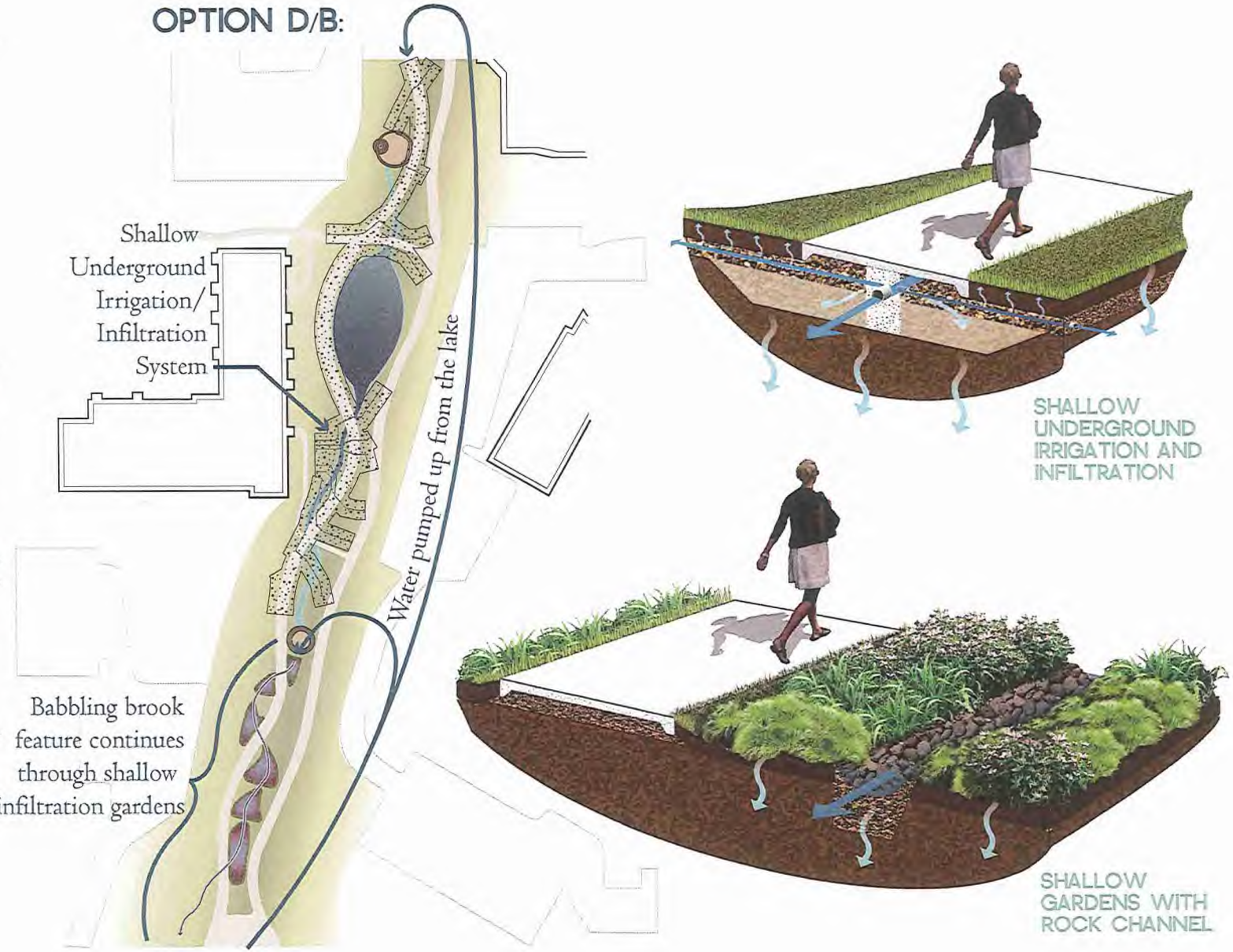


TABLE 1. CONCEPT LEVEL ENGINEER'S OPINION OF COST
CENTENNIAL LAKES VOLUME REDUCTION OPTIONS
10/7/2013

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 Infiltration[1]

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 Channel[1]

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 Reduction[1]	Estimated Average Annual Phosphorus Removal[1] (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 Cost[1]	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

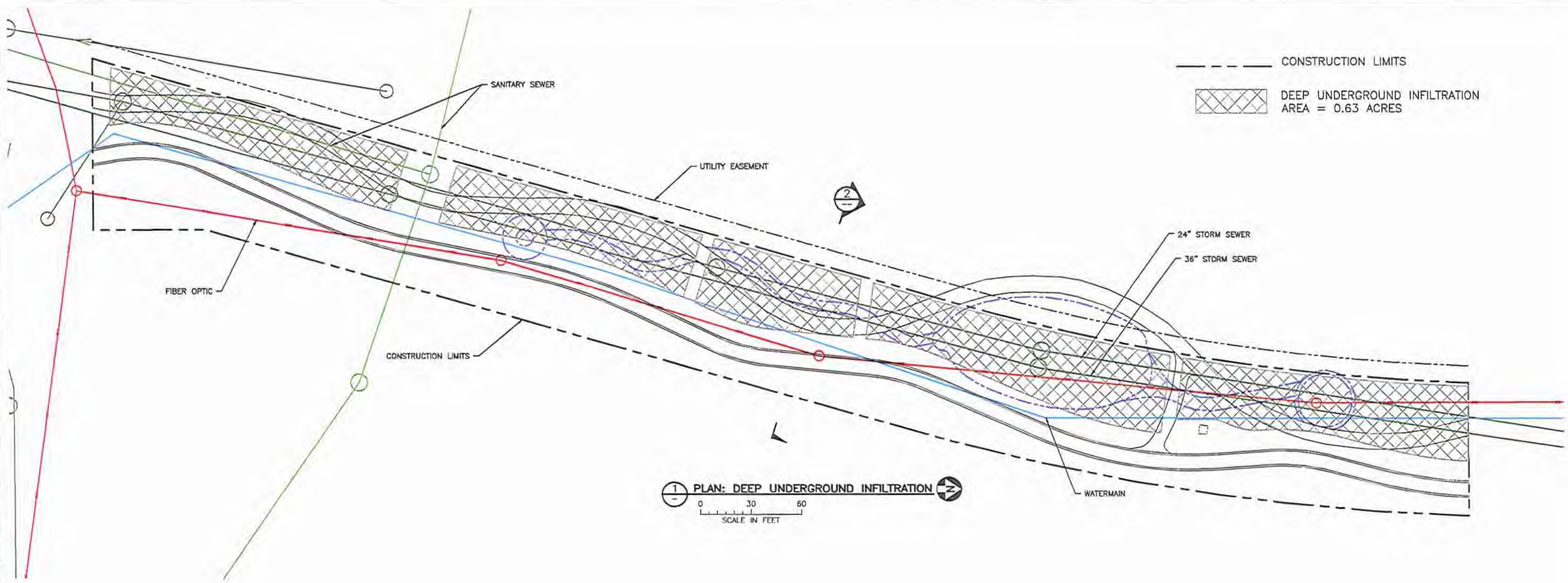
CITY OF EDINA
PROMENADE IMPROVEMENTS

PRELIMINARY CONCEPT DESIGN
JULY 26, 2013

URS

Appendix B

Preliminary Plan Sheet Drawings



1 PLAN: DEEP UNDERGROUND INFILTRATION

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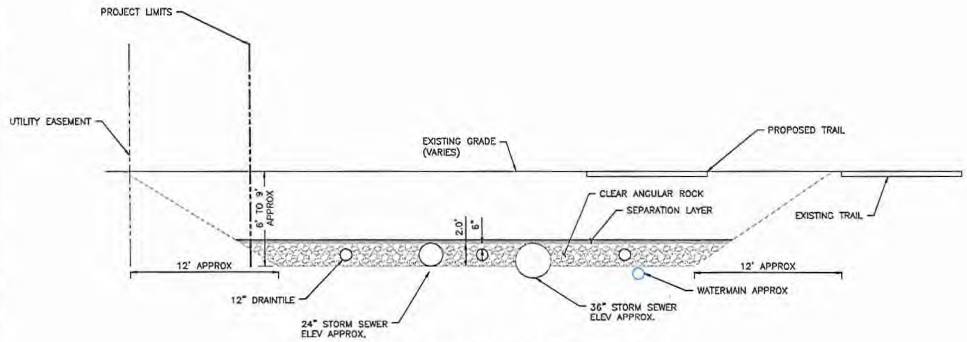

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CITY OF EDINA
EDINA, MN

CENTENNIAL LAKES
VOLUME REDUCTION

OPTION A
DEEP UNDERGROUND INFILTRATION

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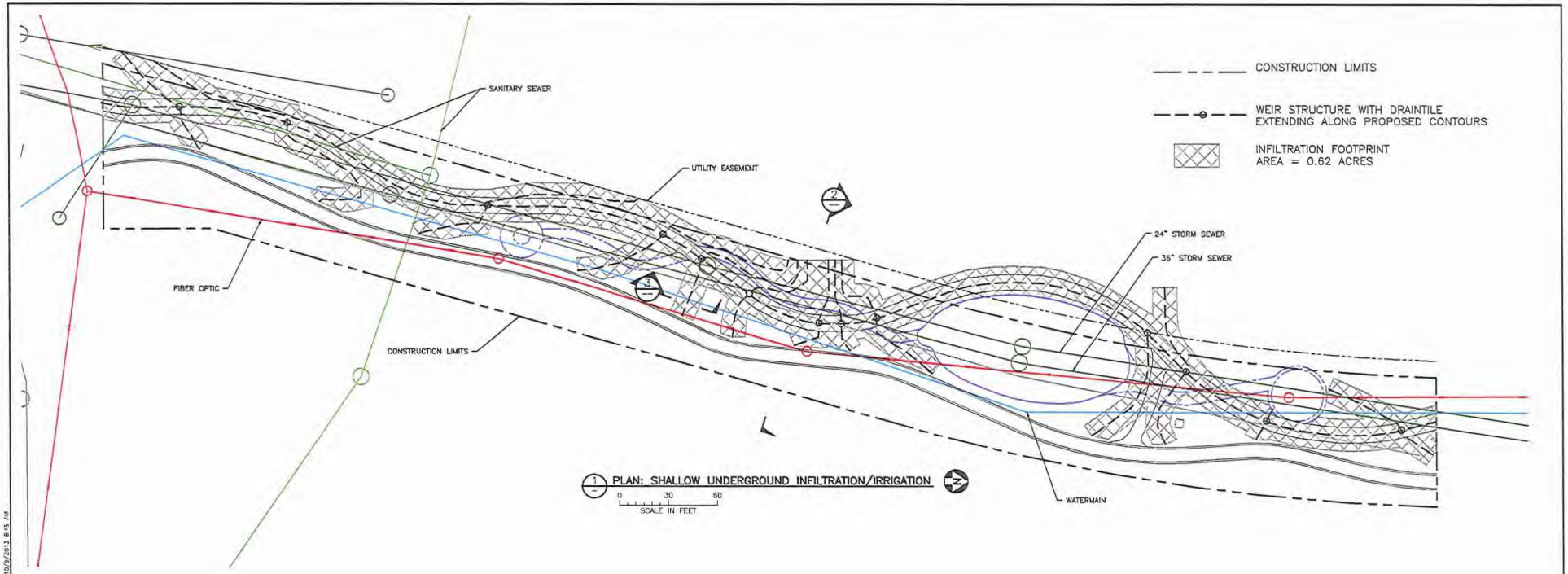
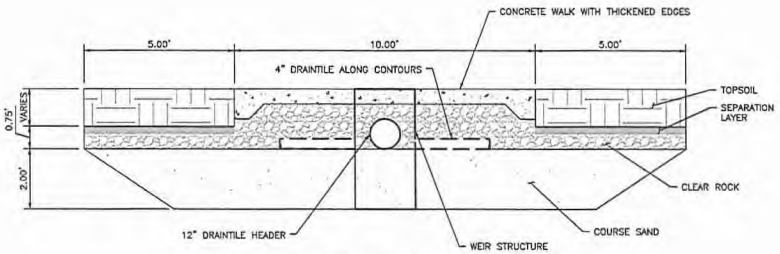
DWG. No. C1
REV. No.



1 PLAN: SHALLOW UNDERGROUND INFILTRATION/IRRIGATION



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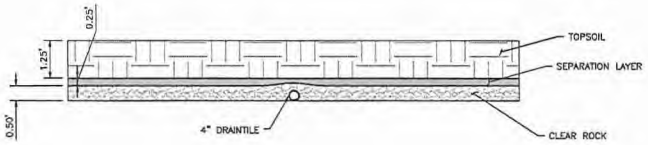

3 SECTION: 4" DRAINTILE ALONG CONTOURS
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CENTENNIAL LAKES
VOLUME REDUCTION

OPTION B
SHALLOW UNDERGROUND INFILTRATION/IRRIGATION

BARR PROJECT No. 23271309
CLIENT PROJECT No.
DWG. No. C2
REV. No.

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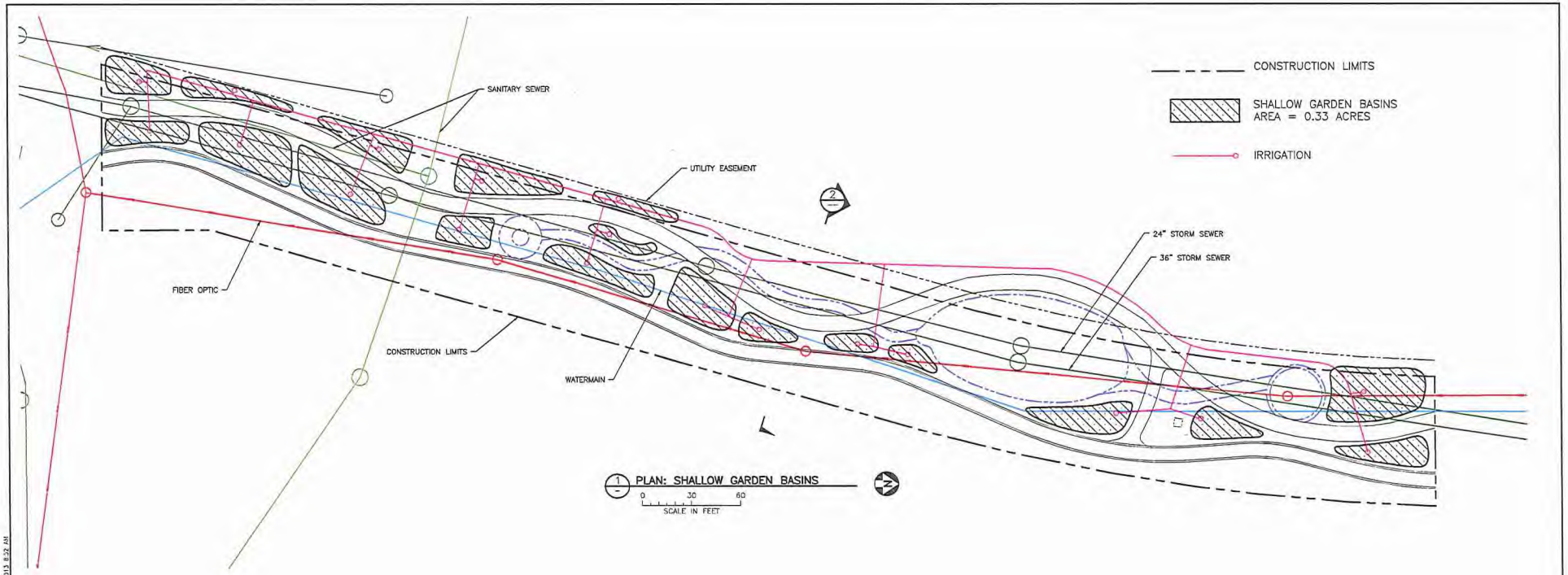

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CENTENNIAL LAKES
VOLUME REDUCTION

OPTION C
SHALLOW GARDEN BASINS

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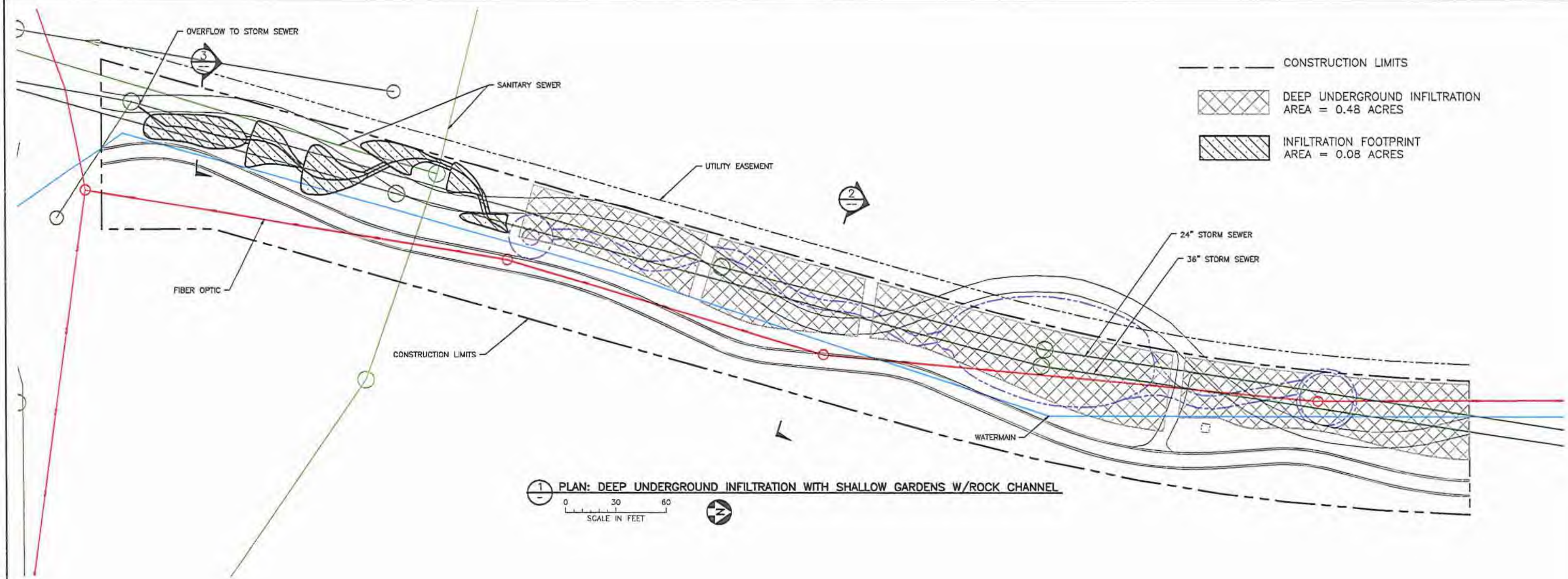
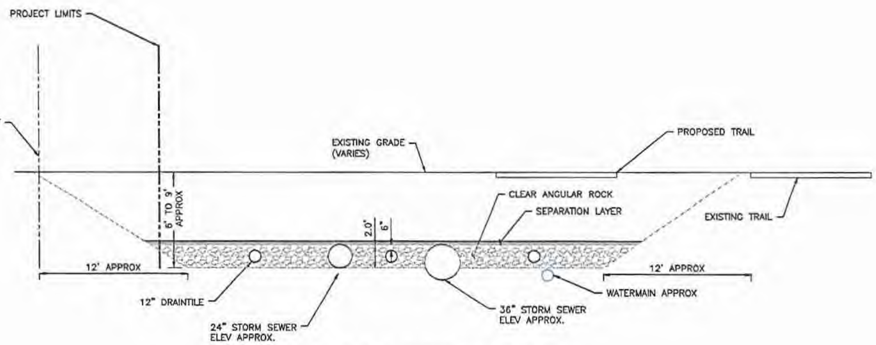
DWG. No. C3
REV. No.



1 PLAN: DEEP UNDERGROUND INFILTRATION WITH SHALLOW GARDENS W/ROCK CHANNEL



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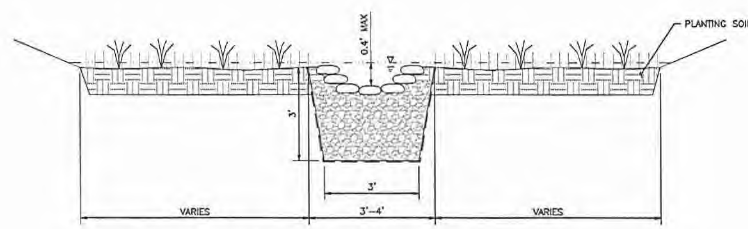

3 SECTION: SHALLOW GARDENS W/ ROCK CHANNEL
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CENTENNIAL LAKES
VOLUME REDUCTION

OPTION D/A
DEEP UNDERGROUND W/ SHALLOW GARDENS

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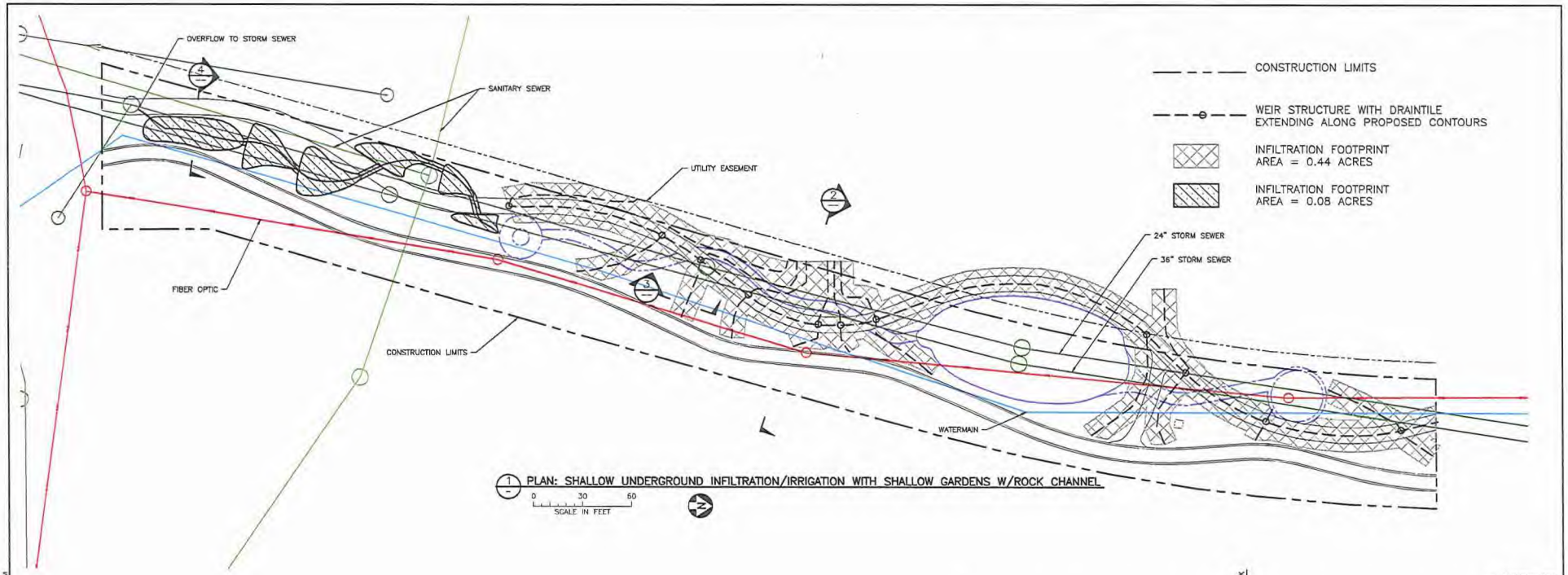
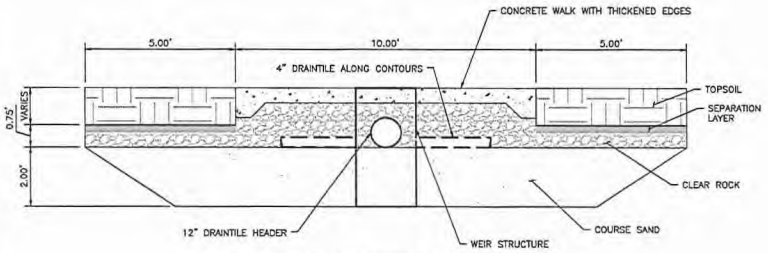


1 PLAN: SHALLOW UNDERGROUND INFILTRATION/IRRIGATION WITH SHALLOW GARDENS W/ROCK CHANNEL



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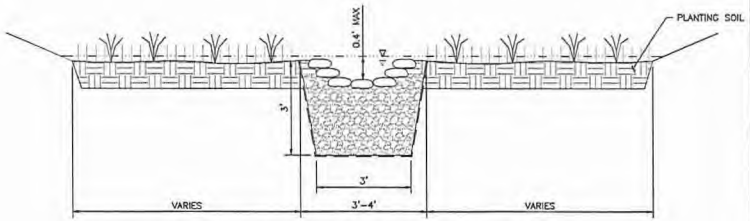

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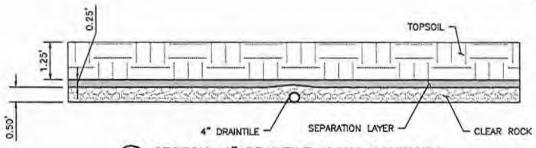

3 SECTION: 4" DRAINTILE ALONG CONTOURS
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VOLUME REDUCTION

OPTION D/B
SHALLOW UNDERGROUND W/ SHALLOW GARDENS

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