City of Golden Valley
7800 Golden Valley Road • Golden Valley, MN 55427

FEASIBILITY Report

September 10, 2014

Honeywell Pond Enhancement/Improvement Project

City of Golden Valley
Hennepin County, Minnesota

WSB Project No. 1473-31

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FEASIBILITY REPORT

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For:

City of Golden Valley and Bassett Creek Watershed District

September 10, 2014

Prepared By:

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CERTIFICATION

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.

Peter R. Willenbring, P.E. Reg. No. 15998

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1 Summary, Conclusions and Recommendations

1.1 Summary

The Honeywell Pond Enhancement/Improvement Project (HPE/IP) consists of a number of projects that will directly address the need to provide treatment for runoff from Douglas Drive, including improvements associated with the Douglas Drive Improvement Project that is scheduled for construction in 2016. If the project also includes additional options, the HPE/IP will also be able to expand and enhance the treatment of storm water flowing into and through the area from the upstream watershed prior to its discharge to Bassett Creek, as well as reduce the runoff rate, volume and provide habitat enhancements and educational opportunities in the area.

The Honeywell Pond Enhancement/Improvement Project options include:

1. Diverting low flows into the pond from the two storm lines running south on Douglas Drive.
2. Expanding the size and depth of the Honeywell pond.
3. Creating a habitat/buffer area around the perimeter of the pond.
4. Constructing an iron-sand filtration system.
5. Construct an interpretative kiosk/outdoor area.
6. Construct an underground infiltration system on the Sandburg Learning Center ball fields.
7. Build and connect a force main to the irrigation system at the Sandburg Learning Center ball fields.
8. Build and connect a force main to the irrigation system on the Honeywell property.
9. Build and connect a force main to the Douglas Drive Infiltration System.
10. Build and construct the iron-sand filtration system, force main to the irrigation system on the Sandburg Learning Center ball fields, force main to the irrigation system on the Honeywell property, and force main to the Douglas Drive Infiltration System

Most of the above options provide water resource and environmental benefits to the area. The first two options are needed to address the water quality impacts of the proposed improvements to Douglas drive. The other options reflect enhancements to the project that if implemented will serve to further reduce the pollutant load, discharge rate and volume of water directed from this watershed to Bassett Creek. **Table 1.1** below shows a summary of the options and their individual cost/benefits.

Table 1.1 - Summary Breakdown of Options				
	Estimated 30 Year Cost	Estimated lbs Phosphorous Removed per Year	Cost/lb Removed	Estimated Flood Storage Reduction
Construct Low Flow Trunk Diversion from Douglas Drive	$76,000	10	$250	0.4 ft
Expand Pond Footprint/Pond Depth	$939,362	12.8	$2,400	None
Enhance Habitat around Pond Perimeter	$40,000 - 60,000	None	None	None
Construct Iron-Sand Filtration System	$493,149	8.6	$1,900	None
Construct Interpretative Kiosk/Outdoor Area	$10,000 - 40,000	NA	NA	None
Construct Sandburg Learning Center Baseball Field Infiltration System	$970,542	10.1	$3,200	None
Use Stormwater for Irrigation of the Sandburg Learning Center Baseball Fields	$370,271	12	$1,000	None
Use Stormwater for Irrigation of Honeywell Site	$370,271	12	$1,000	None
Use Stormwater to Enhance Benefits of the Douglas Drive Infiltration System	$338,181	8	$1,200	None
Combination of Section 4.7, 4.8, and 4.9	$806,723	32	$540	None

The only option that is estimated to reduce flood storage is expanding the pond. Even though many of the options would be able to help reduce flood storage needed, this feasibility study does not count them when taking into consideration flood storage reduction. This is due to many factors that cannot be predicted such as frequency of events and how much rain falls in a rain event. Many of the options can only be used if there is enough water in the pond or evidently fallowing a rain even. The options that require pumping will not be able to be used if pumping will result in lowering the elevation of the pond to 875.4, one foot below the normal water level of 876.4.

The volume of water the BMP with pumps can treat per year cannot be estimated due to the same reasons the flood storage reduction could not be calculated.

A P8 model was conducted to determine the amount of phosphorous entering the pond and the amount of phosphorus leaving the pond. The amount entering the pond is 0.17 ppm while the amount leaving the existing pond was found to be 0.14 ppm. In this report, 0.16 ppm was used as the staring value when determining how much phosphorus a specific BMP would be able to remove.

All of the options that will require pumping were assumed to be operated for 120 days out of the year. This is due to the winter months and dry periods thought the year when pumping is not an option.

1.2 Conclusions and Recommendations

Based on the request from the City of Golden Valley, it is recommended that improvement options 1 (diverting low flows to the Honeywell Pond), 2 (expanding the pond footprint and depth), and 3 (enhancing the habitat and pond perimeter) be undertaken as the primary options to be construct. If funding is still available, option 7 (build a force main to connect to the irrigation system on the Sandburg Leaning Center ball fields) is recommended as the first alternative to be constructed. If additional funding is still available through other sources, the most attractive of the remaining improvement options could also be implemented to further enhance the water quality entering into Bassett Creek and to help educate the general public on issues related to the area.

The sections below explain in more detail the individual enhancement/improvement options, their benefits, impacts, costs, and cost/benefits, permits that may be needed, the estimated project schedule, and reasons as to why this project may qualify for funding from the Bassett Creek Watershed District.

2 INTRODUCTION

The City of Golden Valley is planning to rebuild and expand Douglas Drive. This construction project will increase the existing impervious area by approximately 1.5 acres and reconstruct approximately 14 acres of existing impervious surface. Runoff from this impervious surface currently receives minimal treatment prior to it discharging into Bassett Creek.

Furthermore, in this area, during intense rainfall events, the City of Golden Valley has identified flooding problems in residential areas west of the Honeywell pond which direct runoff to a storm sewer tributary to this pond. The City and Watershed have also noted the need to treat currently untreated stormwater runoff from this watershed prior to discharging this water to Bassett Creek, enhance the level of treatment currently provided, reduce projected high water levels in upstream areas, and enhance the water quality and habitat values within and around the pond.

This Honeywell Pond Enhancement/Improvement Project feasibility report outlines options available to provide storm water treatment for water diverted from Douglas Drive as well as additional water quality treatment for the surrounding area. The options identified have varying potentials to enhance the ability of the pond to perform a wide range of functions and values that include:

- Retain stormwater runoff and reduce the volume of water conveyed downstream to Bassett Creek.
- Retain stormwater runoff with the intention of reducing the flow rate of water downstream to Bassett Creek and reduce flood elevations in upstream ponds.
- Reduce pollutant loads downstream to Bassett Creek.
- Store and pump stormwater to the Sandburg Learning Center baseball fields to the north for irrigation and or infiltration purposes.
- Store and pump stormwater as an alternative source of water for irrigation or other needs at the Honeywell site.
- Capture and treat low flows of untreated runoff currently bypassing the basin and being directed untreated to Bassett Creek via the trunk storm line on Douglas Drive.
- Enhance the habitat and aesthetics of the pond as well as provide environmental education.

This feasibility report provides additional information on the options, cost and benefit, and provides recommendations on the most cost effective feasible options for implementation should this project be ordered.

3 BACKGROUND

3.1 Existing Conditions

The Honeywell Pond is located on the south side of Honeywell's property in Golden Valley, between St. Croix Avenue North and Hampshire Place, on the west side of Douglas Drive North. The outlet is located on the south side of the pond and discharges south along the Canadian Pacific Railroad into Bassett Creek. There is one 54-inch Reinforced Concrete Pipe (RCP) inlet on the west side of the pond that receives runoff from much of the west side of the Honeywell property and some of the area in the neighborhoods to the west. There are also two more inlets on the north side of the pond (24-inch RCP on west side and 30-inch RCP on the east side) that receive water from much of the east side of the Honeywell property. A map of the pond, existing contours, and storm sewers can be seen in **Figure 1**.

3.1.1 Pond Characteristics

At its normal water level (NWL) of 876.4 feet, the surface area of the pond is about 1.5 acres and the average pond depth is approximately 3 feet deep. The existing dead pool storage volume is approximately 3.7 acre-feet. The current high water level (HWL) of the pond is 884.2 feet, which corresponds to the pond capable of providing live pool storage of approximately 20.2 acre-feet of water. The ponding area consists of a Type 4 (Deep Marsh) wetland. The north and east boundary of this wetland was delineated and approved in November 2011. Runoff from the surrounding watershed and the storm sewers are routed through the pond and discharge south to Bassett Creek through a 42-inch storm pipe. A map of the pond can be seen in **Figure 1**.

3.1.2 Drainage Area

The indirect drainage area of the Honeywell Pond receives runoff from many ponds northwest of the Honeywell pond including the Decola Ponds. This area is approximately 620 acres consisting of land in the cities of Golden Valley, Crystal, and New Hope. A map of the indirect drainage area can be seen in ***Appendix C***.

The direct drainage is approximately 88 acres and consists of much of the runoff from the Honeywell property including any water that discharges out to the pond located on the northeast part of the Honeywell property. The direct drainage area also consists of runoff from several of the homes on Duluth Street and much of the SEA School property at Duluth Street and Kelly Drive. A map of this area can be seen in **Figure 2**.

3.1.3 Soils

The Natural Resource Conservation Service (NRCS) soil survey was used to approximate the soil types of the area of the pond and the surrounding area. The soils in the upland areas of the watershed tributary to the pond appear to be mostly in Hydrologic Soil Group B. A map of the NRCS soil survey can be seen in **Figure 2**.

3.1.4 Vegetation

Vegetation within the basin is limited, likely due to the average depth of 2.5 – 3 feet and an often fluctuating depth during storm events. Vegetation is present along the shoreline, and consists of Canadian goldenrod (Solidago canadensis), Kentucky bluegrass (Poa pratensis), sandbar willow (Salix exigua), and eastern cottonwood (Populus deltoids). The herbaceous vegetation present provides little wildlife habitat or shoreline protection.

3.1.5 Pollutant Removal

A P8 model for the area indicates that the Honeywell Pond currently has a total inflow of 210.3 pounds of Total Phosphorus (TP) per year. The pond's total outflow of TP is 174.0 pounds per year. This gives the existing pond a TP load reduction of 36.3 pounds, which corresponds to a 17.3% removal. One of the reasons this removal percentage is lower than might be expected, is much of the indirect drainage is pretreated in upstream ponds prior to it being routing through the Honeywell Pond.

4 POTENTIAL IMPROVEMENTS

4.1 Construct Low Flow Trunk Diversion from Douglas Drive

A low flow storm sewer can be run from each of the existing storm lines flowing south on Douglas Drive to the Honeywell Pond. These low flow lines will help alleviate high volumes of water and flow rates within the exiting trunk system and reduce pollutant loads downstream. By building these low flow sewers, it is estimated that 15-25 acres of previously untreated water will be able to be treated.

4.1.1 Benefits

Building a low flow storm sewer will:

- Lower the volume of water flowing through the exiting trunk line.
- Lower the flow rate of the water through the existing trunk line.
- Remove approximately 7-12 pounds of TP per year from an area that is currently being untreated.

4.1.2 Impacts

There are no foreseeable impacts to diverting low flows into the Honeywell Pond.

4.1.3 Estimated Cost

It is estimated that the cost of constructing the low flow storm line and connecting to the exiting trunk line will be $76,000. **Table 4.1** below shows the price breakdown

Table 4.1 - Estimated Cost for Low Flow Trunk Diversion System

Description	Units	Quantity	Unit Price	Total Price
LOW FLOW TRUNK DIVERSION SYSTEM	LUMP SUM	1	$50,000	$50,000
			Sub-Total	$50,000
			25% Contingency	$13,000
			25% Indirect Costs/Engineering Fees	$13,000
			Total	$76,000

4.1.4 Cost Benefit Analysis (Total Phosphorous)

It is assumed that this untreated area will have about one pound per acre of phosphorus runoff per year. By diverting low flows into the Honeywell pond it is estimated that 50% of the phosphorus from the direct drainage area will be removed from the water in these low flow systems. In this case, 7-12 pounds of TP is estimated to be removed. **Table 4.2** below shows the price breakdown.

Table 4.2 - Price/Pound/Year TP Removed for the Low Flow Trunk Diversion System	
Inflation Rate (i)	3.00%
Years Until Reconstruct	50
Capital Cost	$76,000.00
Annualized Cost of Low Flow Diversion System	$2,953.78
Estimated Maintenance Cost 2014	$0.00
Total Cost of Maintenance for 30 Year Period	$0.00
Total Cost (Over 30 Years)	$76,000.00
lb/yr of TP Removed	10
Price/Pound/Year TP Removed	$250.00

4.2 Expand Pond Footprint/Pond Depth

Live and dead pool storage volume in the pond can be increased by expanding the surface area of the pond, or increasing the depth of the pond. Based on discussions with Honeywell representatives, excess land may be available to allow the pond to be expanded from 1.75 acres to 2.6 acres. The average depth of the pond could also be increased from an average depth of 3 to 6 feet. Expanding the pond will provide stormwater treatment for much of the runoff generated within the right-of-way of Douglas Drive.

This would result in the expanded pond increasing live pool storage from 22.0 to 25.8 acre-feet, and increasing dead pool storage from 4.8 to 12.6 acre-feet. See **Figure 3**.

4.2.1 Benefits

By increasing the live storage capacity of the pond the following benefits area achieved:

- Reduce the peak rate of runoff directed downstream during smaller rain events.
- Reduce the peak elevation in the pond approximately 0.4 feet.
- Increase the percent of Total Phosphorus removal from 17.3 to 23.3%.
- Increase the Total pounds of phosphorus removed annually by 12.8 pounds (from 36.3 to 49 pounds).

4.2.2 Impacts

Increasing the pond surface area and or pond depth will change the change the functions and values of the pond/wetland area. Several permits may be needed. See Section 4.6.2 and Section 5 for more information. Also, a significant number of trees and upland vegetation will need to be removed.

4.2.3 Estimated Cost

The total cost of the pond construction is estimated at $707,000. The cost of expanding the pond depends greatly on the condition of the soil currently in the pond. If the soil contains contaminates, it will need to be taken off site and disposed of properly. If the soil is free of contaminates, it can either be used as fill or be removed and used somewhere else. Soil samples will need to be taken in the Honeywell Pond prior to construction. This cost estimate assumes that the soils will be free of contaminates. The cost for muck excavation will greatly increase if contaminates are found. The estimated cost break down for the pond can be seen in **Table 4.3** below.

Table 4. 3 - Estimated Cost for the Pond Construction

Description	Units	Quantity	Unit Price	Total Price
MOBILIZATION	LUMP SUM	1	$23,000	$23,000
CLEARING	ACRE	3	$9,000	$23,400
GRUBBING	ACRE	3	$9,000	$23,400
DEWATERING	LUMP SUM	1	$20,000	$20,000
COMMON EXCAVATION	CU YD	15,000	$12	$180,000
MUCK EXCAVATION	CU YD	6,000	$30	$180,000
EROSION CONTROL BLANKETS CATEGORY 3	SQ YD	7,900	$1.50	$11,850
SEEDING	ACRE	2	$5,000	$8,500
			Sub-Total	$470,150
			25% Contingency	$118,000
			25% Indirect Costs/Engineering Fees	$118,000
			Total	$707,000

4.2.4 Cost Benefit Analysis (Total Phosphorus)

The Price/Pound/Year of TP removed for the pond construction is approximated to be $2,400. **Table 4.4** below shows the price breakdown.

Table 4.4 - Price/Pound/Year TP Removed for the Honeywell Pond Expansion	
Inflation Rate (i)	3.00%
Years Until Reconstruct	50
Capital Cost	$707,000.00
Annualized Cost of Pond Construction	$27,477.90
Estimated Maintenance Cost 2014	$2,000.00
Total Cost of Maintenance for 30 Year Period (Maintenance is needed every year)	$232,361.55
Total Cost (Over 30 Years)	$939,361.55
lb/yr of TP Removed	12.8
Price/Pound/Year TP Removed	$2,400.00

4.3 Enhance Habitat around Pond Perimeter

Several design considerations will enhance the pond and infiltration basin for area wildlife. These enhancements are listed below:

- Create an undulating edge along the shoreline.
- Create a wildlife bench along the outer edge of the entire ponding area.
- Plant the wildlife bench with seed and live plugs.

4.3.1 Benefits
The items outlined above will improve the shoreline of the existing pond and create additional wildlife habitat onsite. A more natural, undulating pond edge with shallow wildlife bench will allow vegetation to become established. A wetland mix appropriate for the depth of the wildlife bench, along with live plugs, will be used to establish vegetation. This will provide area wildlife (e.g., ducks, geese) with both nesting and feeding opportunities. In addition, the vegetation will also provide shoreline protection from wave action and erosion during storm events.

4.3.2 Impacts
Potential impacts will occur to the existing wetland, including filling along the outer edge of the pond area. Consultation with regulatory agencies and permit approvals will be required due to the wetland alternations. Permits required for this project are outlined in Section 5. In addition, monitoring and maintenance of the vegetative community will be necessary to ensure establishment of native plants.

4.3.3 Estimated Cost
The perimeter of the pond is approximately 1,500 feet. For this amount of area it is estimated that the cost for habitat enhancements around the perimeter of the pond to cost $40,000 – $60,000.

4.3.4 Cost Benefit Analysis (Total Phosphorus)

This option does not provide a significant amount of phosphorus removal. The pond buffer will provide some treatment, but the benefits of this improvement are more focused on habitat and aesthetics.

4.4 Construct Iron-Sand Filtration System

An iron-sand filtration system could be utilized to help reduce phosphorus levels in the Honeywell Pond. This system would be located on an upland area of the pond on the northwest side. The iron-sand storage area can hold approximately 80,000 gal of water. The pump will fill the storage area with water from the pond and the water will infiltrate thought the iron-sand media (the bottom two feet of the storage area). The water will then return to the pond though drain tile.

It is assumed that the infiltration rate of this system will be 2 inches per hour. If the pump is able to run 12 hours per day and 120 days per year the system will be able to filter approximately 7.5 million gallons of water per year. A 100 gallon per min pump should be used with this system.

The pump and force main system could also be fitted with tees and valves off the force main to allow the system to furnish water to other irrigation and infiltration options that are referenced in this report. . **Figure 3** shows the location of the iron-sand filtration system.

4.4.1 Benefit

An iron-sand filtration system has the ability to remove soluble phosphorus from stormwater runoff, and increase the total phosphorus remove percentage for water directed into the Honeywell pond. It is estimated with an iron-sand filtration system of 4200 square feet and an infiltration rate of 2 inches per hour can remove 8.5 pounds of phosphorus per year in addition to the 49 pounds per year the pond has been estimated to remove. This is assuming that the filter is 85% effective based on a study performed by the University of Minnesota. The results of this study can be seen in ***Appendix B***. If a pump is installed for either an infiltration system or irrigation system as part of one of the other pond enhancements, the pump could be used for all three systems, thus lowering the cost of pumping for any individual system.

4.4.2 Impacts

- The construction of this filtration system would result in the loss of trees and vegetation that currently exist there.
- The lifespan of the iron material is unknown.
- The iron-sand filtration media can become clogged after time and will require maintenance.
    - A maintenance plan clarifying maintenance responsibilities will be required.

4.4.3 *Estimated Cost*

The total cost of the iron-sand filtration system is estimated at $370,000. The cost break down of the system can be seen in **Table 4.5** below.

Table 4.5 - Estimated Cost for the Iron-Sand Filtration System

Description	Units	Quantity	Unit Price	Total Price
MOBILIZATION	LUMP SUM	1	$11,800	$11,800
CLEARING	ACRE	0.2	$9,000	$1,800
GRUBBING	ACRE	0.2	$9,000	$1,800
COMMON EXCAVATION (P)	CU YD	800	$12	$9,600
IRON ENHANCED FILTRATION MEDIUM (HAUL & PLACE)	CU YD	350	$225	$78,750
DRAIN TILE BACK TO POND	LIN FT	500	$20	$10,000
LIFT STATION*	LUMP SUM	1	$130,000	$130,000
EROSION CONTROL BLANKETS CATEGORY 3	SQ YD	800	$1.50	$1,200
SEEDING	ACRE	0.167	$5,000	$900
			Sub-Total	$245,850
			25% Contingency	$62,000
			25% Indirect Costs/Engineering Fees	$62,000
			Total	$370,000

*The lift station cost may be able to be shared with other options identified within this study

4.4.4 *Cost Benefit Analysis (Total Phosphorus)*

The Price/Pound/Year of TP removed for the Iron-Sand Filtration System Construction is approximated to be $1,900. **Table 4.6** below shows the price breakdown.

Table 4.6 - Price/Pound/Year TP Removed for the Iron-Sand Filtration System	
Inflation Rate (i)	3.00%
Years Until Reconstruct	50
Capital Cost	$370,000.00
Annualized Cost of Pond Construction	$14,380.23
Estimated Maintenance Cost 2014	$5,000.00
Total Cost of Maintenance for 30 Year Period (Maintenance is needed every 5 years)	$123,148.56
Total Cost (Over 30 Years)	$493,148.56
lb/yr of TP Removed	8.6
Price/Pound/Year TP Removed	$1,900.00

4.5 Construct Interpretative Kiosk/Outdoor Area

With increased pond size, water quality improvements, and habitat enhancements, the new pond could become a desirable and aesthetically pleasing passive recreation area. This can be done by installing several lookouts with benches and/or picnic tables. This area can also become an educational space by installing signs with information involving the environmental enhancements the pond utilizes.

4.5.1 Benefits

The benefits of creating an area near the pond for habitat observation and education include:

- It provides an area for employees of Honeywell to take breaks from their jobs throughout the work day.
- It provides an area for people to walk and be active.
- Provides an opportunity for Honeywell to work toward achieving their corporate sustainability goals.
- Properly designed and strategically placed signs can educate people on the environmental improvements the pond contributes to the surrounding community and environment.

4.5.2 Impacts

- Increased foot traffic in the area will increase the maintenance needed to upkeep the area.
- Greater human interaction in the area may deter wildlife in the area.

4.5.3 Estimated Cost

A kiosk area with benches, picnic tables, and educational signs is estimated to cost $10,000 – $40,000.

4.5.4 Cost Benefit Analysis (Total Phosphorus)

This option will not provide any direct phosphorous removal benefits, but through education, may indirectly reduce pollutant loads by increasing awareness and implementation of good housekeeping practices and programs.

4.6 Construct Sandburg Learning Center Baseball Field Infiltration System

A way to increase the ponds infiltration capacity is to pump water to an area with a higher infiltration rate. The baseball fields directly to the north of the Honeywell property will provide some infiltration however the soils in this location are not ideal for infiltration. The estimated size of this infiltration system is 14 5 foot by 300 foot trenches. This provides for a 21000 square foot infiltration area. It is estimated only 1 foot of storage will be provided over this area. It is assumed that the soils will provide an infiltration rate of 0.4 in/hr. If this infiltration rate is correct one could pump to this system at a constant rate of 87 gal per min. It is assumed that the system will be able to be used form April through October granted the water level of the pond is high enough to allow for pumping. For an image see **Figure 4**.

4.6.1 Benefits

Building an underground infiltration system to the baseball fields to the north can create several benefits to the area which include:

- Reduce downstream runoff rates and volume.
- Reduce need for using City water for irrigation and recharge ground water.
- Can provide for infiltration credits for areas where infiltration is not feasible.
- The pump/force main can be used for multiple purposes if other options within this report are constructed.
- Can remove approximately 10.1 pounds of phosphorus per year in addition to the ponds removal of approximately 49 pounds per year.
    - This is assuming a 0.4 inches per hour infiltration rate.

4.6.2 Impacts

The potential impacts of building this infiltration system can include:

- Routine maintenance will be needed on the system.
- Infiltration rates may decrease over time.

4.6.3 Estimated Cost

The total cost of the Sandburg Learning Center Baseball Field Infiltration System is estimated at $622,000. The cost break down of the Sandburg Learning Center Baseball Field Infiltration System can be seen in **Table 4.7** below.

Table 4.7 - Estimated Cost for the Sandburg Learning Center Baseball Field Infiltration System				
Description	Units	Quantity	Unit Price	Total Price
MOBILIZATION	LUMP SUM	1	$20,000	$20,000
COMMON EXCAVATION	CU YD	2400	$12	$28,800
INFILTRATION TRENCH	LIN FT	4200	$30	$126,000
4" FORCE MAIN*	LIN FT	2300	$35	$80,500
LIFT STATION*	LUMP SUM	1	$130,000	$130,000
SEEDING	ACRE	2.3	$5,000	$11,500
EROSION CONTROL BLANKETS CATEGORY 3	SQ YD	11000	$1.50	$16,500
			Sub-Total	$413,300
			25% Contingency	$104,000
			25% Indirect Costs/Engineering Fees	$104,000
			Total	$622,000

*The lift station and force main costs may be able to be shared with other options identified within this study

4.6.4 Cost Benefit Analysis (Total Phosphorus)

The Price/Pound/Year of TP removed for the Sandburg Learning Center Baseball Field Infiltration System Construction is approximated to be $3,200. **Table 4.8** below shows the price breakdown.

Table 4.8 - Price/Pound/Year TP Removed for the Sandburg Learning Center Baseball Field Infiltration System	
Inflation Rate (i)	3.00%
Years Until Reconstruct	50
Capital Cost	$622,000.00
Annualized Cost of Pond Construction	$24,174.34
Estimated Maintenance Cost 2014	$3,000.00
Total Cost of Maintenance for 30 Year Period (Maintenance is needed every year)	$348,542.32
Total Cost (Over 30 Years)	$970,542.32
lb/yr of TP Removed	10.1
Price/Pound/Year TP Removed	$3,200.00

4.7 Use Stormwater for Irrigation of the Sandburg Learning Center Baseball Fields

The pond can be used as an alternative source of water to potable city water for irrigating the Sandburg Leaning Center Baseball Fields. This could be done with a valve that would draw from the pond in times of high water levels or from the City source in times of normal/low pond water levels. The approximate irrigation area on ball fields is 14 acres. It is assumed that 2 feet of water will be able to be irrigated over the 14 acre area each year. This area can be seen in **Figure 4**.

4.7.1 Benefits

The benefits of using the pond water as an alternative irrigation source include:

- Reduce the amount of city water used for irrigation purposes.
    - The system can switch between city and pond water as the irrigation source depending on the volume of water in the pond.
- Reducing the levels of phosphorus.
- Reduce the volume of water the pond would need to store.
- The pump/force main can be used for multiple purposes if other options within this report are constructed.

4.7.2 Impacts

- Routine maintenance will need to be performed on this system.

4.7.3 Estimated Cost

The estimated cost for the Sandburg Learning Center Irrigation System reflects the cost for the high pressure lift station and force main at the site. The cost for the irrigation system construction on the site is not included in this cost estimate of $317,000. The cost break down of the system can be seen in **Table 4.9** below.

Table 4.9 - Estimated Cost for the Sandburg Learning Center Irrigation System

Description	Units	Quantity	Unit Price	Total Price
LIFT STATION*	LUMP SUM	1	$130,000	$130,000
4" FORCE MAIN*	LIN FT	2300	$35	$80,500
			Sub-Total	$210,500
			25% Contingency	$53,000
			25% Indirect Costs/Engineering Fees	$53,000
			Total	$317,000

*The lift station and force main costs may be able to be shared with other options identified within this study

4.7.4 Cost Benefit Analysis (Total Phosphorus)

Assuming 2 feet of water is irrigated over the area; approximately 12 pounds of phosphorus can be removed on top of the 49 pounds the expanded pond removes. The estimated cost per pound per year of TP removed by the irrigation system is $1,000. **Table 4.10** below shows the price breakdown.

Table 4.10 - Price/Pound/Year TP Removed for the Sandburg Learning Center Irrigation System	
Inflation Rate (i)	3.00%
Years Until Reconstruct	50
Capital Cost	$196,000.00
Annualized Cost of Pond Construction	$7,617.64
Estimated Maintenance Cost 2014	$1,500.00
Total Cost of Maintenance for 30 Year Period (Maintenance is needed every year)	$174,271.16
Total Cost (Over 30 Years)	$370,271.16
lb/yr of TP Removed	12
Price/Pound/Year TP Removed	$1,000.00

4.8 Use Stormwater for Irrigation of Honeywell Site

The pond can be used as an alternative source of water to potable city water for irrigating the Honeywell site. This could be done with a valve that would draw from the pond in times of high water levels or from the City source in times of normal/low pond water levels. The approximate irrigation area on Honeywell property is 14.5 acres. It is assumed that 2 feet of water will be able to be irrigated over the 14.5 acre area each year. This area can be seen in **Figure 5**.

4.8.1 Benefits

The benefits of using the pond water as an alternative irrigation source include:

- Reduce the amount of city water used for irrigation purposes.
  - The system can switch between city and pond water as the irrigation source depending on the volume of water in the pond.
- Reducing the levels of phosphorus.
- Reduce the volume of water the pond would need to store.
- The pump can be used as a multipurpose pump if other options within this report are constructed.

4.8.2 Impacts

- Routine maintenance will need to be performed on this system.

4.8.3 Estimated Cost

The estimated cost for the Honeywell Irrigation System is $196,000. The cost break down of the system can be seen in **Table 4.11** below.

Table 4.11 - Estimated Cost for the Honeywell Irrigation System

Description	Units	Quantity	Unit Price	Total Price
LIFT STATION*	LUMP SUM	1	$130,000	$130,000
			Sub-Total	$130,000
			25% Contingency	$33,000
			25% Indirect Costs/Engineering Fees	$33,000
			Total	$196,000

*The lift station cost may be able to be shared with other options identified within this study

4.8.4 Cost Benefit Analysis (Total Phosphorus)

Assuming 2 feet of water is irrigated over the area; approximately 12 pounds of phosphorus can be removed on top of the 49 pounds the expanded pond removes. The estimated cost per pound per year of TP removed by the irrigation system is $1,000. **Table 4.12** below shows the price breakdown.

Table 4.12 - Price/Pound/Year TP Removed for the Honeywell Irrigation System

Inflation Rate (i)	3.00%
Years Until Reconstruct	50
Capital Cost	$196,000.00
Annualized Cost of Pond Construction	$7,617.64
Estimated Maintenance Cost 2014	$1,500.00
Total Cost of Maintenance for 30 Year Period (Maintenance is needed every year)	$174,271.16
Total Cost (Over 30 Years)	$370,271.16
lb/yr of TP Removed	12
Price/Pound/Year TP Removed	$1,000.00

4.9 Use Stormwater to Enhance Benefits of the Douglas Drive Infiltration System

With the reconstruction of Douglas Drive an underground infiltration system is being constructed as well to satisfy the water quality needs for the project. The exact size and location of the system are still unknown. However for the purposes of this report, it was assumed that the infiltration area of this system will be 18,000 square feet. An infiltration rate of 0.4 inches per min was used to analyze the phosphorus removal for this system.

Currently this infiltration system will only function after rain events. However, if water were to be pumped from the Honeywell Pond the infiltration system could be utilized during periods with little rain. This would also depend on whether there is enough volume of water in the Honeywell Pond to pump out and still maintain a healthy pond level. An approximate location and size of this system can be seen in **Figure 6**.

4.9.1 Benefits

The benefits of pumping water from the Honeywell Pond to the Douglas Drive Infiltration System include:

- The ability to infiltrate water during periods without rain.
- Help to regulate the water level of the Honeywell Pond.
- Reduce pollutant loads from the Honeywell Pond.

4.9.2 Impacts

The impacts of pumping water from the Honeywell Pond to the Douglas Drive Infiltration System include:

- Shortening the life span of the infiltration system.
- Increasing the frequency in which the infiltration system will need maintenance.

4.9.3 Estimated Cost

The length of the force main from the Honeywell Pond to the Douglas Drive Infiltration System is 500 feet. The cost break down of the system can be seen in **Table 4.13** below.

Table 4.13 - Estimated Cost for the Link to the Douglas Drive Infiltration System

Description	Units	Quantity	Unit Price	Total Price
4" FORCE MAIN*	LIN FT	500	$35	$17,500
LIFT STATION*	LUMP SUM	1	$130,000	$130,000
			Sub-Total	$147,500
			25% Contingency	$37,000
			25% Indirect Costs/Engineering Fees	$37,000
			Total	$222,000

*The lift station cost may be able to be shared with other options identified within this study

4.9.4 Cost Benefit Analysis (Total Phosphorus)

Assuming the infiltration rate of the soil is 0.4 inches per hour and the pump runs for half of the season, 8 pounds of phosphorus can be removed from the pond from pumping to the Douglas Drive Infiltration System on top of the 49 pounds the expanded pond removes. The estimated cost per pound per year of TP removed by the force main linked to the Douglas Drive Infiltration System is $1,110. **Table 4.14** below shows the price breakdown.

Table 4.14 - Price/Pound/Year TP Removed for the Link to the Douglas Drive Infiltration System	
Inflation Rate (i)	3.00%
Years Until Reconstruct	50
Capital Cost	$222,000.00
Annualized Cost of Pond Construction	$8,628.14
Estimated Maintenance Cost 2014	$1,000.00
Total Cost of Maintenance for 30 Year Period (Maintenance is needed every year)	$116,180.77
Total Cost (Over 30 Years)	$338,180.77
lb/yr of TP Removed	8
Price/Pound/Year TP Removed	$1,200.00

4.10 Build and construct the iron-sand filtration system, force main to the irrigation system on the Sandburg Learning Center ball fields, force main to the irrigation system on the Honeywell property, and force main to the Douglas Drive Infiltration System

This section combines sections 4.7, 4.8, and 4.9 together to help visualize cost if all three options are selected.

4.10.1 Benefit

The benefits of choosing sections 4.7, 4.8 and 4.9 include:

- Lest cost than all three individually
- Being able to remove more phosphorous from the pond.

4.10.2 Impacts

The impact of choosing section 4.7, 4.8, and 4.9 with the uncertainty of how much water will be available to be pumped could decrease the individual use of each option.

4.10.3 Estimated Cost

The length of the force main includes both the distance from the Honeywell Pond to the Sandburg Learning Center ball fields and to the Douglas Drive Infiltration System. The cost break down of the combination of the systems can be seen in **Table 4.15** below.

Table 4.15 - Estimated Cost for the Combination of Sections 4.7, 4.8 and 4.9				
Description	Units	Quantity	Unit Price	Total Price
LIFT STATION*	LUMP SUM	1	$130,000	$130,000
4" FORCE MAIN*	LIN FT	2800	$35	$98,000
			Sub-Total	$228,000
			25% Contingency	$57,000
			25% Indirect Costs	$57,000
			Total	$342,000

4.10.4 Cost Benefit Analysis (Total Phosphorus)

If the pond stores enough water for run all three systems combined using the same assumptions made in sections 4.7, 4.8, and 4.9 than the systems will be able to remove 32 pounds of phosphorous per year. **Table 4.16** below shows the price breakdown.

Table 4.16 - Price/Pound/Year TP Removed for the Combination of Sections 4.7, 4.8 and 4.9	
Inflation Rate (i)	3.00%
Years Until Reconstruct	50
Capital Cost	$342,000.00
Annualized Cost of Pond Construction	$13,292.00
Estimated Maintenance Cost 2014	$4,000.00
Total Cost of Maintenance for 30 Year Period (Maintenance is needed every year)	$464,723.09
Total Cost (Over 30 Years)	$806,723.09
lb/yr of TP Removed	32
Price/Pound/Year TP Removed	$540.00

5 PERMITS

The proposed project may require:

1. Clean Water Act Section 404 permit from the USCAE, and Section 401 certification from the Minnesota Pollution Control Agency (MPCA)
2. Compliance with the Minnesota Wetland Conservation Act
3. Minnesota Pollution Control Agency National Pollution Discharge Elimination (NPDES) System Construction Stormwater Permit
4. Bassett Creek Watershed Management Commission Development Permit
5. City of Golden Valley Stormwater Permit
6. City of Golden Valley ROW Permit

Section 404 Permit

The USACE regulates the placement of fill into wetlands, if the wetlands are hydrologically connected to a Waters of the United States, under Section 404 of the Clean Water Act (CWA). In addition, the USACE may regulate all proposed wetland alterations if any wetland fill is proposed. The MPCA may be involved in any wetland mitigation requirements as part of the CWA Section 401 water quality certification process for the 404 Permit. USACE staff anticipates that the review timeline to review and approve a Section 404 General Permit (< 0.50 acre of impact) could require 120 days to complete. Review and approval of a Letter of Permission (0.50 – 5 acres of impact) would require more than 120 days.

Minnesota Wetland Conservation Act

The Wetland Conservation Act (WCA) regulates the filling and draining of wetlands and excavation within Type 3, 4, and 5 wetlands. In addition, the WCA may regulate all types of wetland alteration if any wetland fill is proposed. The WCA is administered by local government units (LGU), which include cities, counties, watershed management organizations, soil and water conservation districts, and townships. The City of Golden Valley is the LGU for the proposed project. The Minnesota Board of Water and Soil Resources (BWSR) oversee the administration of the WCA statewide. Wetland Conservation Act approvals can require up to 60 days to complete.

NPDES Construction Stormwater Permit

The Minnesota Pollution Control Agency (MPCA) regulates the discharge of stormwater off construction sites. A NPDES Construction Stormwater Permit is required for any construction activity that disturbs one acre or more of soil. Permit coverage begins seven days following the submittal of a complete application.

Bassett Creek Watershed Management Commission Development Permit

The Bassett Creek Watershed Management Commission regulates development/redevelopment within their watershed which involves the alteration of floodplain, water resources, land use, or utilities. Development Permit approvals require at least 21 days for review and approval.

Local Permits
The City of Golden Valley requires permits for grading work within their jurisdiction. Their requirements should be reviewed in the context of each site's work.

6 PROJECT SCHEDULE

The schedule for this project is as follows:

- Feasibility completed in fall 2014
- Final design completed in 2015
- Construction completed in 2016/2017

7 SUITABILITY OF PROJECT FOR FUNDING AS PART OF BASSETT CREEK CAPITAL IMPROVEMENT PROGRAM

It is understood that the Bassett Creek Watershed Management Commission (BCWMC) will consider including projects in their Capital Improvement Program (CIP) that meet one or more of their "gatekeeper" criteria. The Honeywell Pond Enhancement/Improvement Project meets all four of the "gatekeeper" criteria which area listed below:

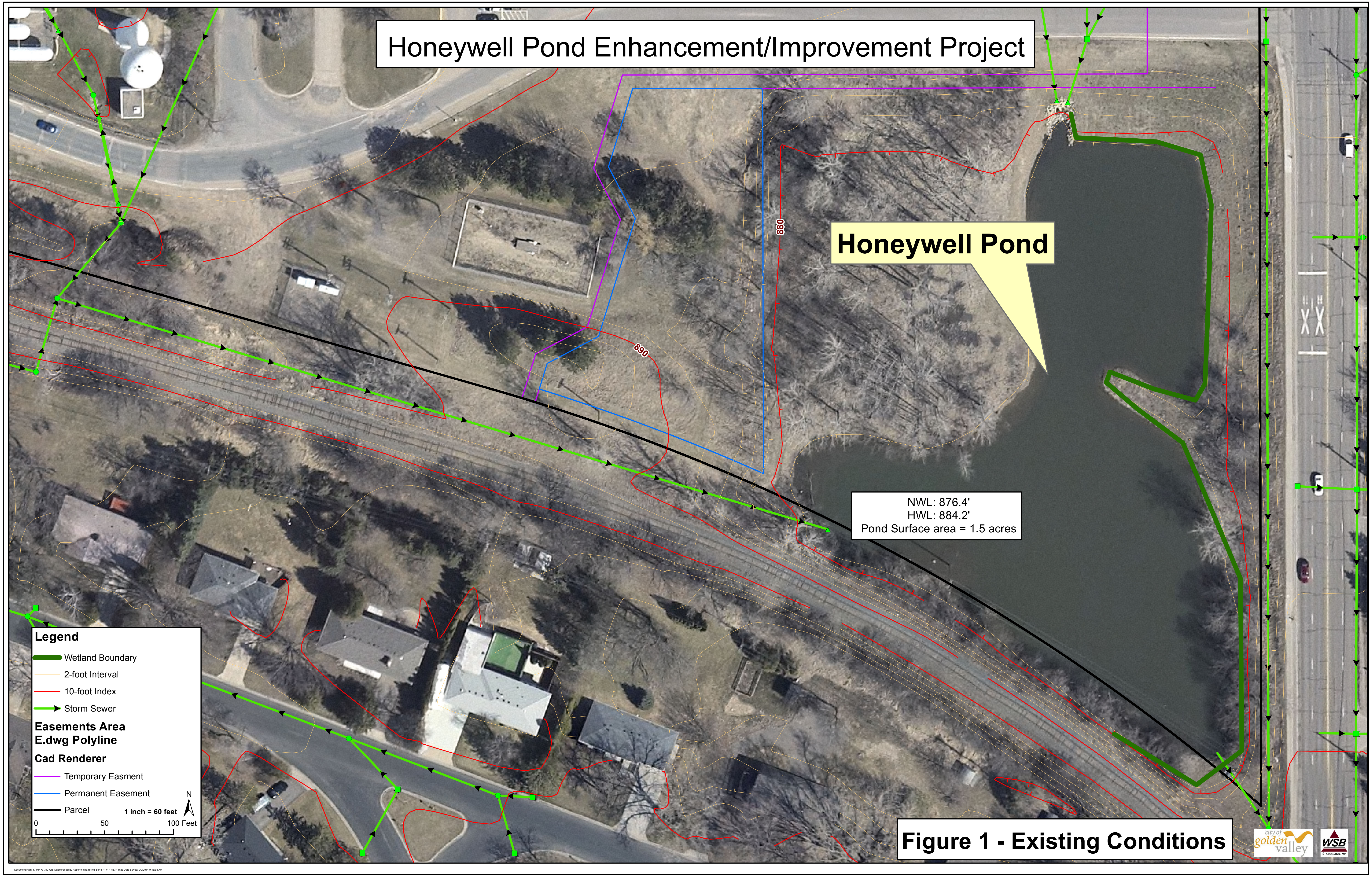
- Project improves water quality in a priority waterbody.
  - The Honeywell Pond will improve the water quality of Bassett Creek.
- Project addresses an approved Total Maximum Daily Load (TMDL).
  - The HPE/IP will reduce downstream phosphorus loading which are consistent with the TMDL for Bassett Creek.
- Project addresses flooding concern.
  - By expanding the pond, the HPE/IP will help to address flooding in the area by producing additional flood storage.

The BCWMC will use the following additional criteria to aid in the prioritization of projects:

- Project protects or restores previous Commission investments in infrastructure.
  - The System will direct runoff with improved quality to Bassett Creek, which has been the focus of a wide range of improvements by the Commission. This project will clearly protect past Commission investments in infrastructure.
- Project improves water quality in a priority waterbody.
  - The Honeywell Pond will improve the water quality of Bassett Creek.
- Project addresses an approved TMDL.
  - The HPE/IP will reduce downstream phosphorus loading which are consistent with the TMDL for Bassett Creek.
- Project addresses intercommunity drainage issues.
  - The HPE/IP's drainage area includes runoff from Golden Valley, Crystal, and New Hope. Selected locations with this drainage area are subject to flooding. This project is projected to slightly reduce flood elevations in this area.
  - Significant sedimentation and corresponding sediment deltas have been created within the City of Minneapolis, as a result of upstream suspended solids loading to the Creek. This project has the ability to reduce the sediment loading to the creek from this watershed.
- Project addresses flooding concern.
  - By expanding the pond, the HPE/IP will help to reduce projected flood elevations in the area.
- Project addresses erosion and sedimentation issues.
  - The HPE/IP will reduce downstream total suspended solids loads.
- Project will address multiple Commission goals (e.g., water quality, runoff volume, wildlife habitat, aesthetics, recreation, etc.)
  - The HEP/IP will improve water quality, runoff volume, wildlife habitat, and aesthetics. See Section 4 for more details.

- Subwatershed draining to project includes more than one community.
    - The HPE/IP assists in managing runoff from subwatersheds within the communities of Golden Valley, Crystal, and New Hope.
- Addresses significant infrastructure or property damage concerns.
    - The HPE/IP will help control flooding in the Decola Ponds area. The buildings in the Decola Pond area are currently being flooded.

Appendix A
Figures



Honeywell Pond Enhancement/Improvement Project
Honeywell Pond
880
890
NWL: 876.4'
HWL: 884.2'
Pond Surface area = 1.5 acres
Legend
Wetland Boundary
2-foot Interval
10-foot Index
Storm Sewer
Easements Area
E.dwg Polyline
Cad Renderer
Temporary Easment
Permanent Easement
Parcel
1 inch = 60 feet
N
0
50
100 Feet
Figure 1 - Existing Conditions
city of golden valley
WSB

Honeywell Pond Enhancement/Improvement Project

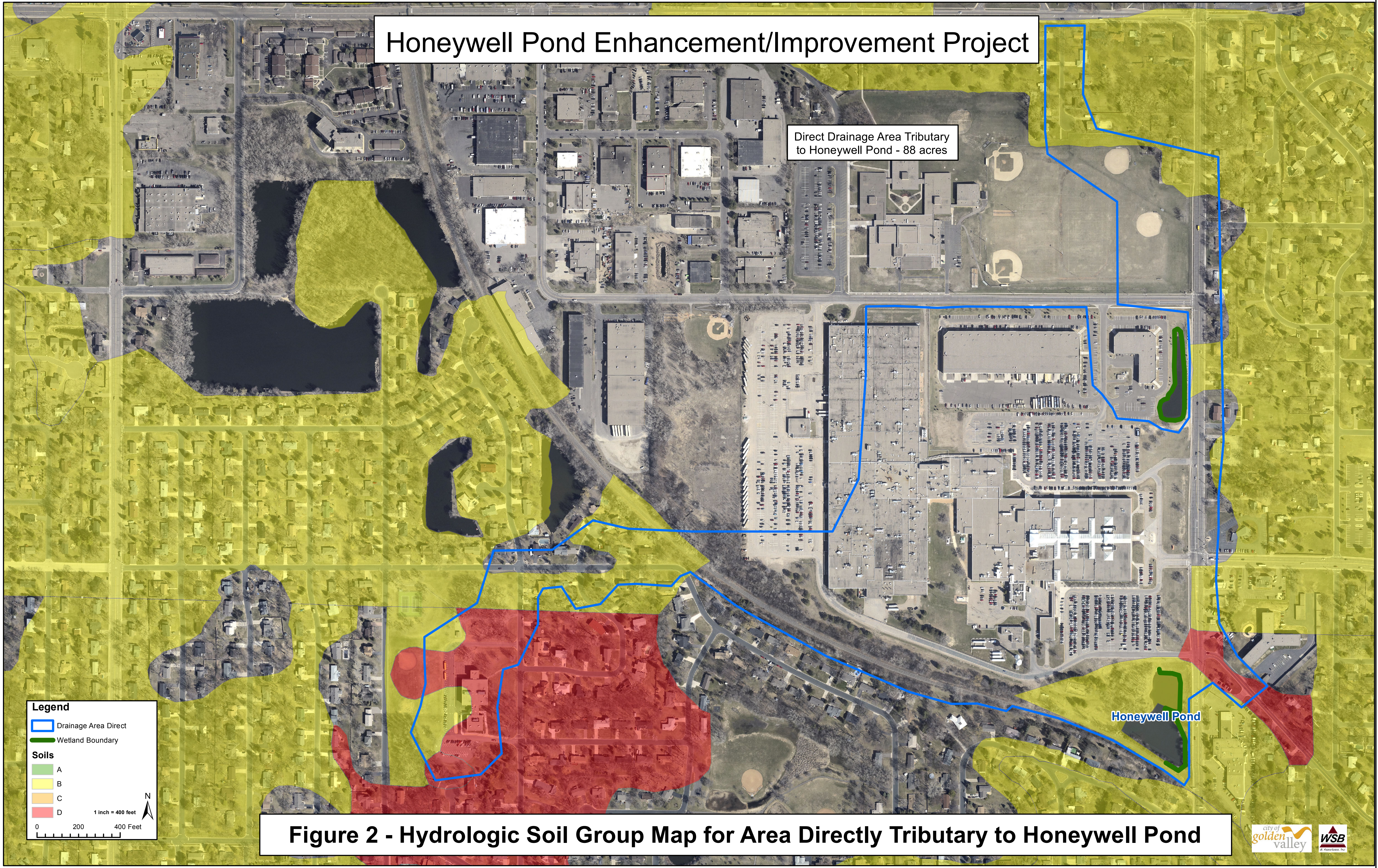


Figure 2 - Hydrologic Soil Group Map for Area Directly Tributary to Honeywell Pond

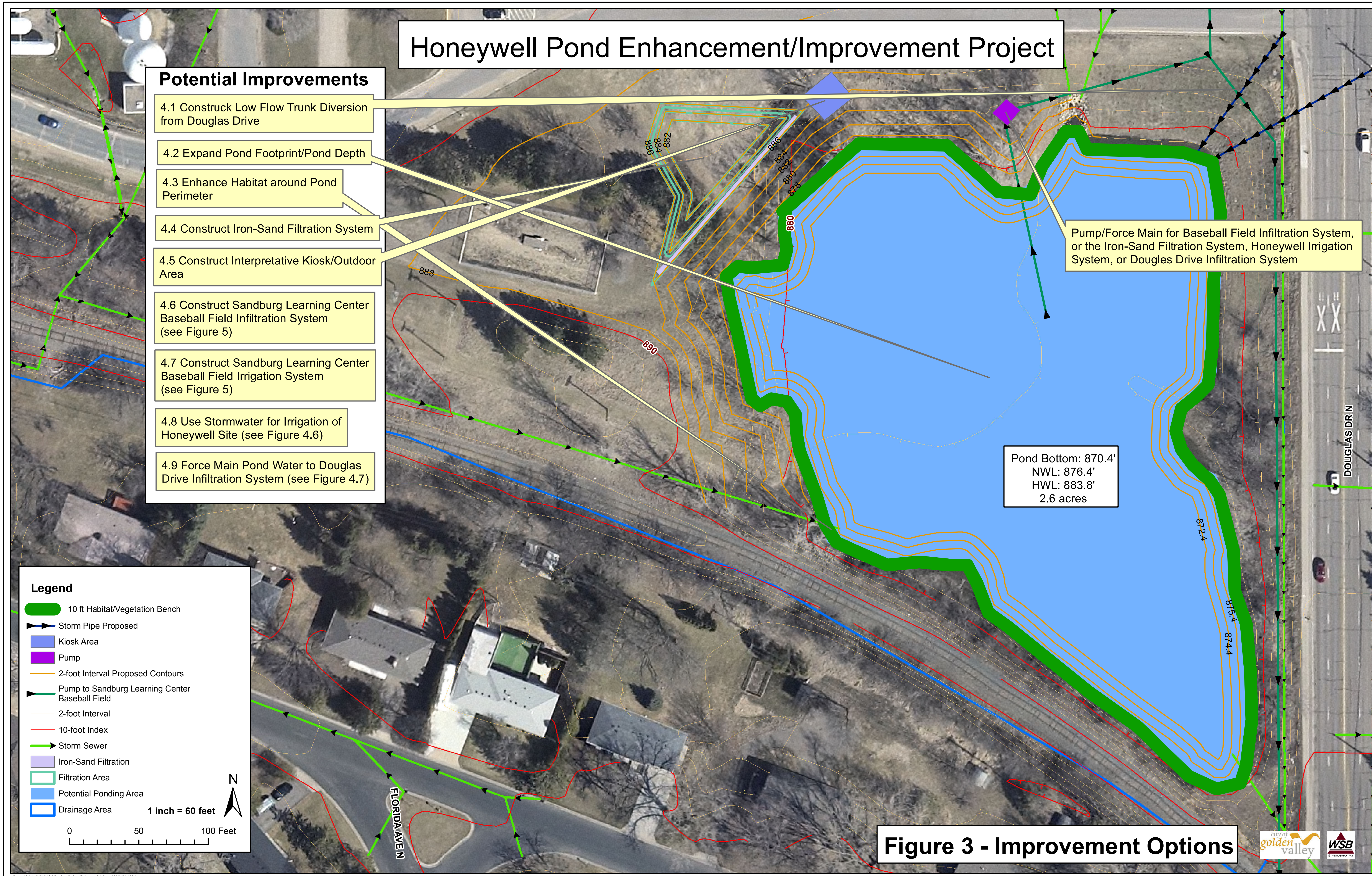


Figure 3 - Improvement Options

Honeywell Pond Enhancement/Improvement Project

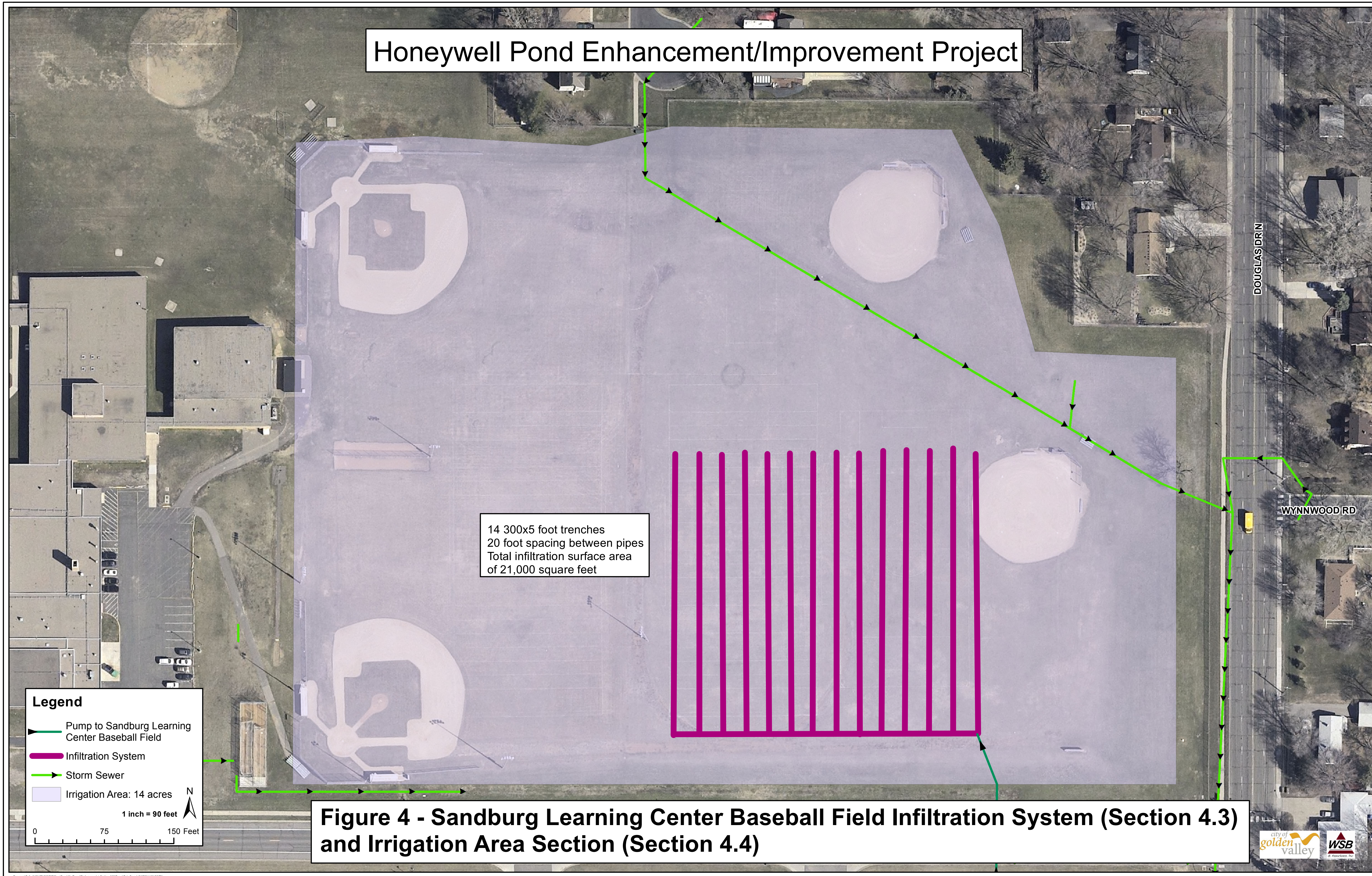


Figure 4 - Sandburg Learning Center Baseball Field Infiltration System (Section 4.3) and Irrigation Area Section (Section 4.4)

Honeywell Pond Enhancement/Improvement Project

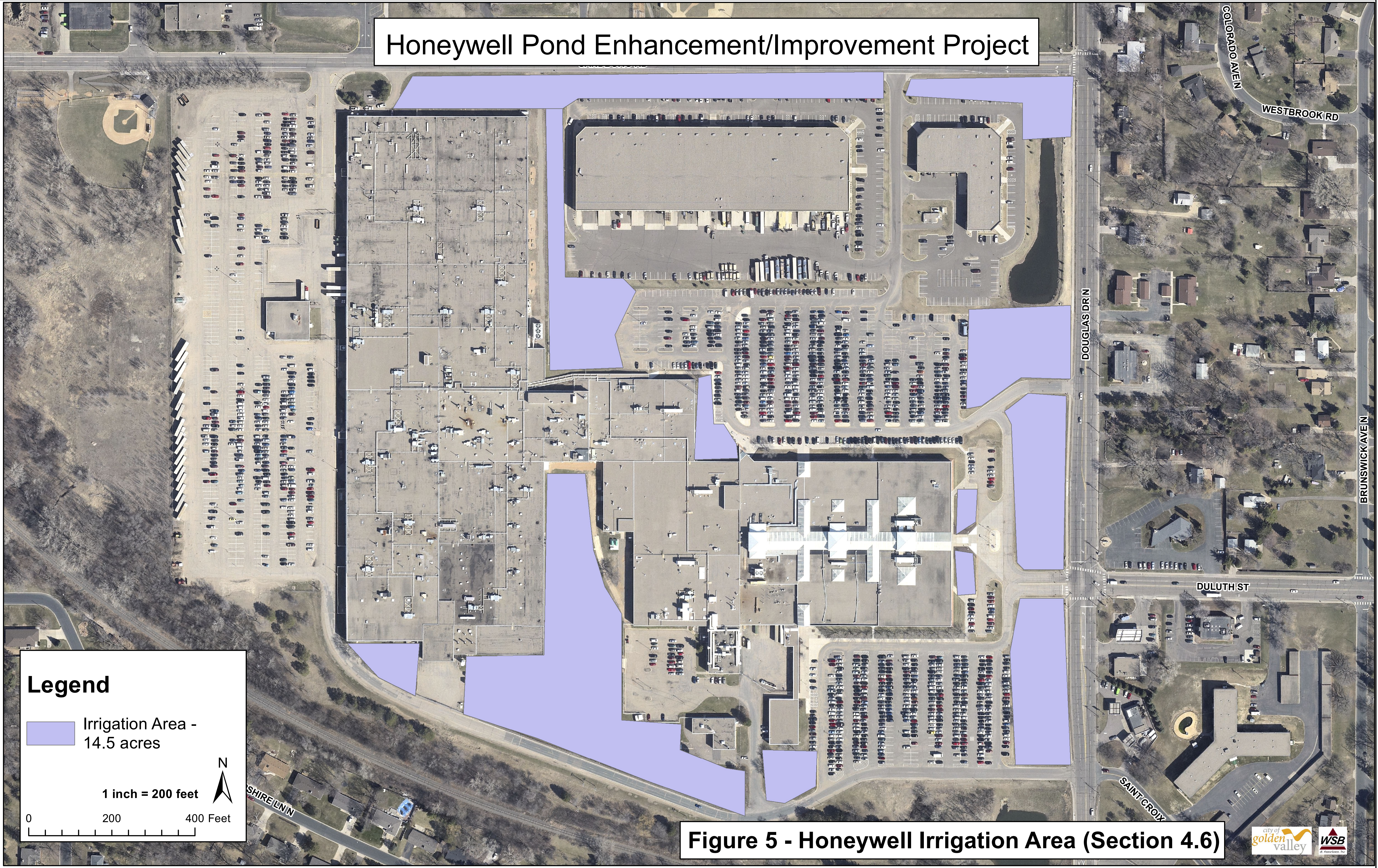


Figure 5 - Honeywell Irrigation Area (Section 4.6)

Honeywell Pond Enhancement/Improvement Project

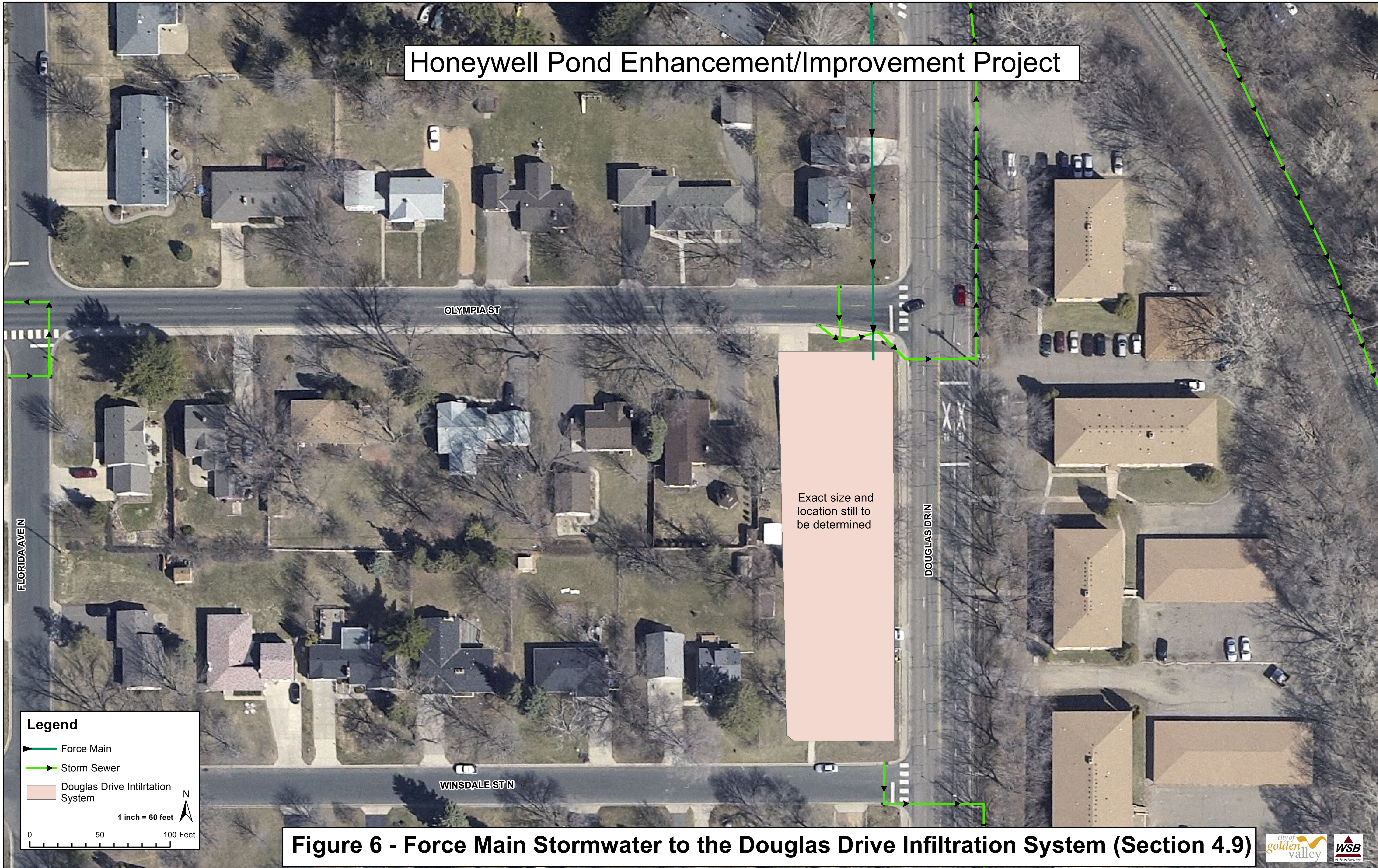
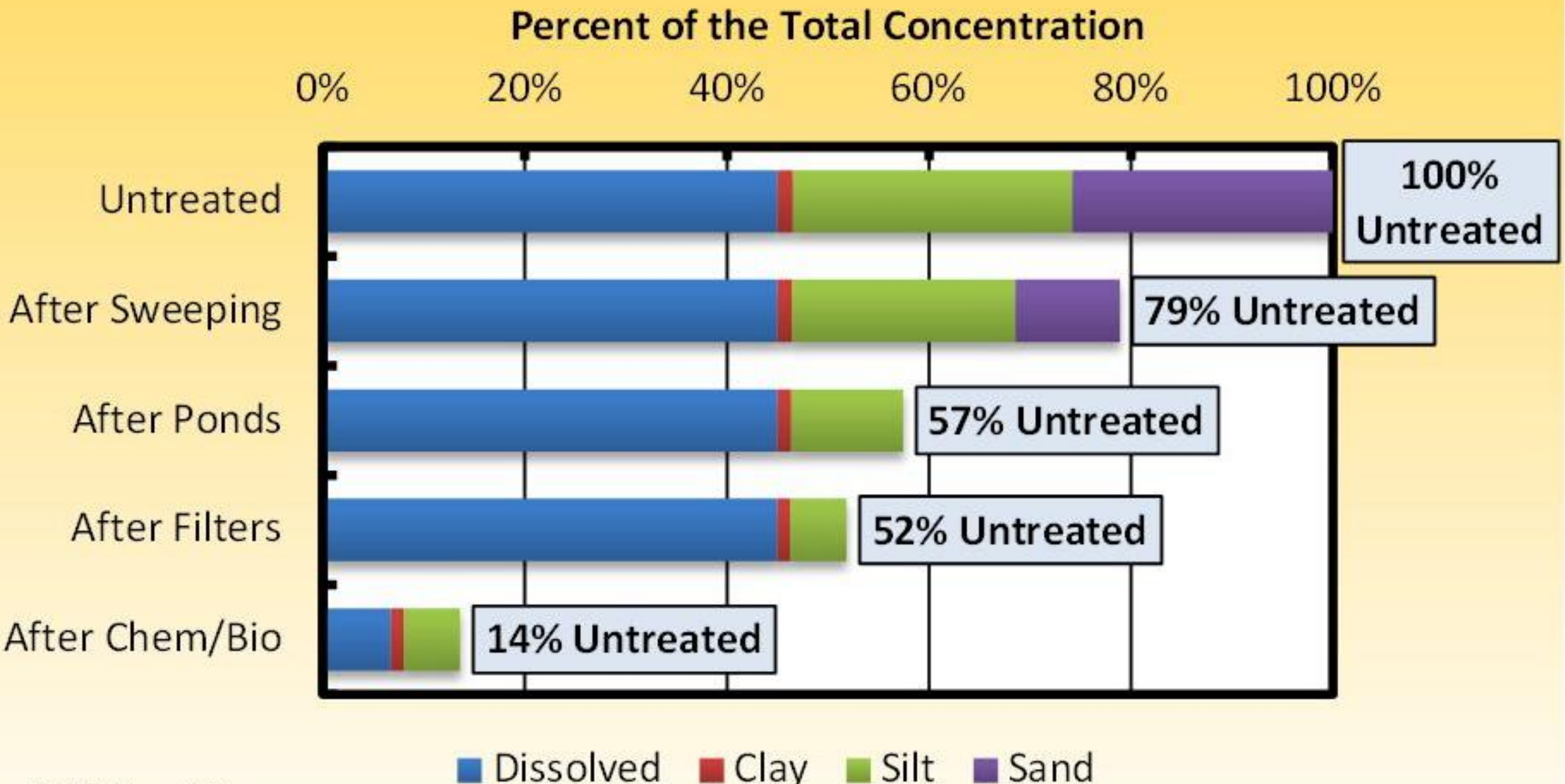


Figure 6 - Force Main Stormwater to the Douglas Drive Infiltration System (Section 4.9)

Appendix B
Predicted Phosphorus Removal for Various BMPs
Based on Study by St. Anthony Falls Laboratory – U of M

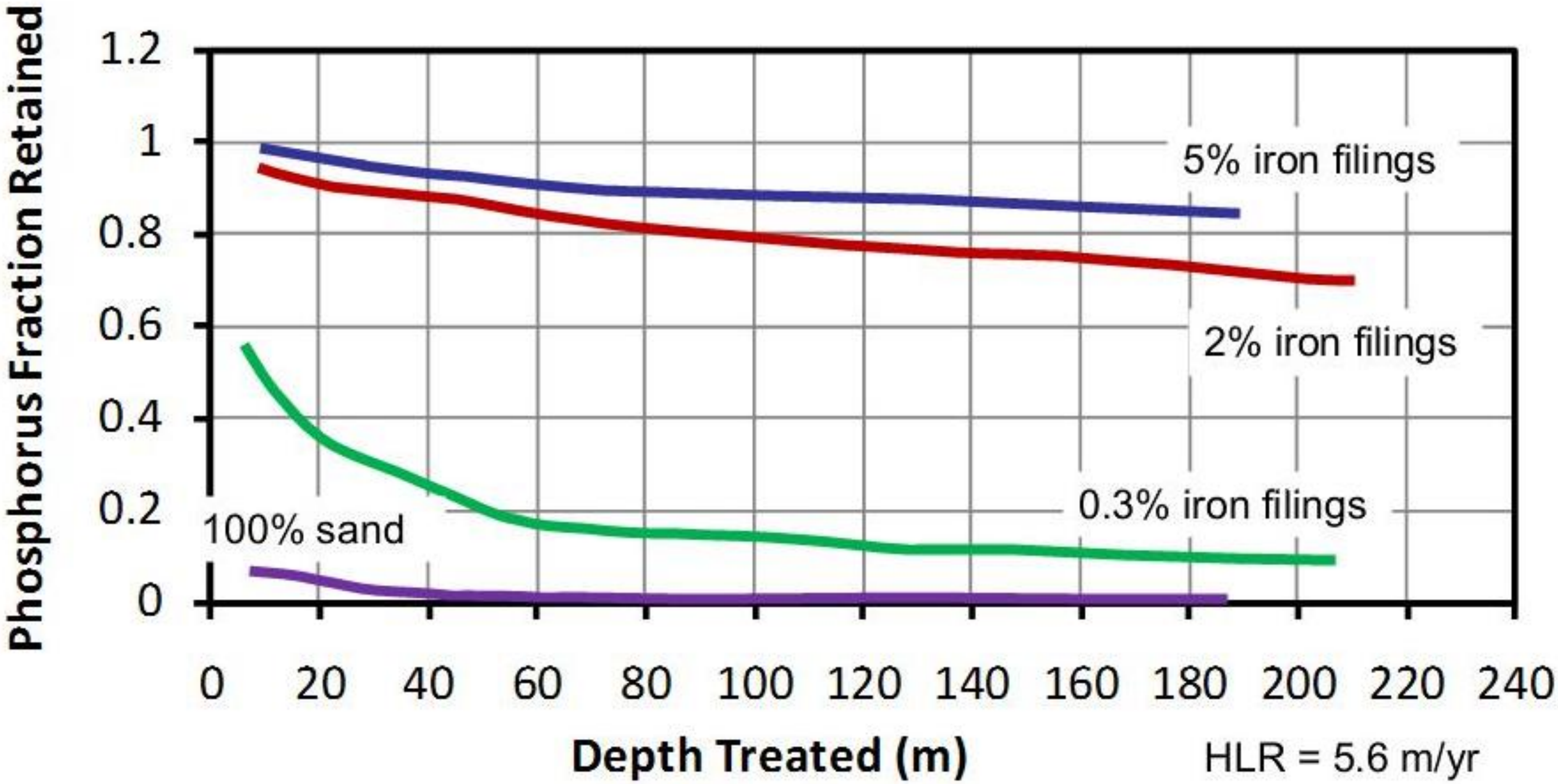
Dissolved Phosphorus Retention:
Treatment Train



NOTE: Estimated Values.

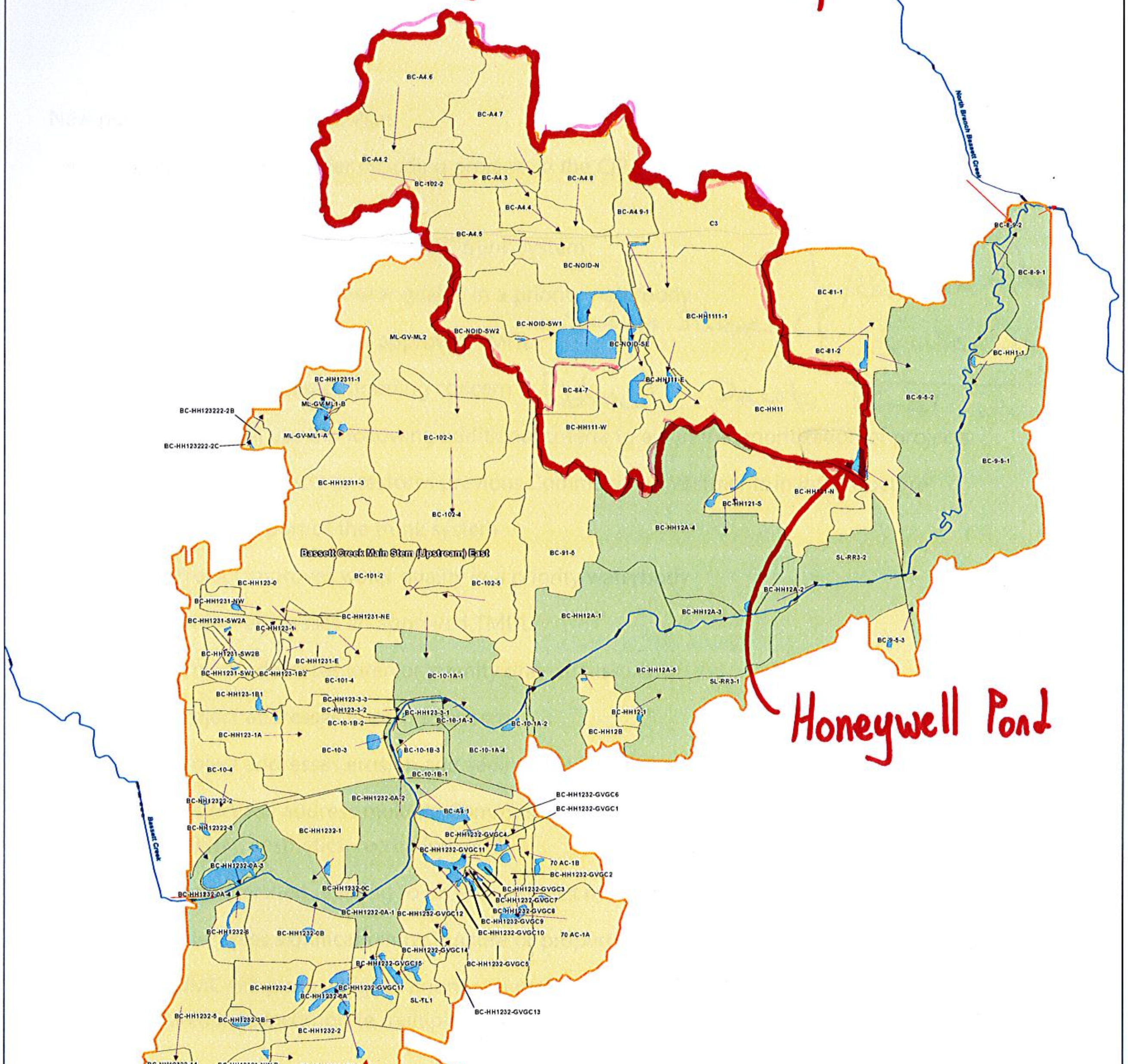
Experiments and Model:

Summary Experimental Results



Appendix C
Drainage Area Map

Drainage Area Map



Watershed	Device	Watershed	Device	Watershed	Device	Watershed	Device
70 AC-1A	BC-HH1232-GVGC5	BC-A4.4	Decola Ponds B_C	BC-HH1232-0A-3	BC-HH1232-0A	BC-HH1232-GVGC6	BC-HH1232GVGC6
70 AC-1B	MS-70AC1	BC-A4.5	Decola Ponds B_C	BC-HH1232-0A-4	BassettCreek	BC-HH1232-GVGC7	BC-HH1232-GVGC7
BC-101-2	BassettCreek	BC-A4.6	Decola Ponds B_C	BC-HH1232-0B	BC-HH1232-0B	BC-HH1232-GVGC8	GVGC8
BC-101-4	BassettCreek	BC-A4.7	Decola Ponds B_C	BC-HH1232-0C	BC-HH1232-0C	BC-HH1232-GVGC9	BC-HH1232GVGC9
BC-10-1A-1	BassettCreek	BC-A4.8	Madison Pond	BC-HH1232-1	HH 1232-1	BC-HH123-3-1	BassettCreek
BC-10-1A-2	BassettCreek	BC-A4.9-1	Madison Pond	BC-HH12321-NW-A	Loop F Pond	BC-HH123-3-2	BC-HH123-3
BC-10-1A-3	BassettCreek	BC-HH11	Honeywell Pond	BC-HH12321-NW-B	NW-B	BC-HH123-3-3	BassettCreek
BC-10-1A-4	BC10-1A	BC-HH1-1	BC-HH1-1	BC-HH1232-2	BC-HH1232-2	BC-HH12A-1	BassettCreek
BC-10-1B-1	BassettCreek	BC-HH1111-1	Madison Pond	BC-HH12322-14	Loop F Pond	BC-HH12A-2	BassettCreek
BC-10-1B-2	BassettCreek	BC-HH111-E	Decola Pond F	BC-HH12322-2	BC-HH12322-2	BC-HH12A-3	BassettCreek
BC-10-1B-3	BC10-1B	BC-HH111-W	Decola Pond E	BC-HH123222-2B	BC-HH123222-2A	BC-HH12A-4	BC-HH12
BC-102-2	Decola Ponds B_C	BC-HH12-1	BC-HH12-1	BC-HH12322-3	BC-HH12322-3B	BC-HH12A-5	BassettCreek
BC-102-3	BassettCreek	BC-HH121-N	Hampshire Pond	BC-HH1232-3A	Boone Ave Pond	BC-HH12B	BC-HH12
BC-102-4	BassettCreek	BC-HH121-S	BC-HH121-S	BC-HH1232-3B	BC-HH1232-5	BC-NOID-N	Decola Ponds B_C
BC-102-5	BassettCreek	BC-HH123-0	BC-HH1231-E	BC-HH1232-4	BC-HH1232-4	BC-NOID-SE	Decola Pond D
BC-10-3	BC-10-3	BC-HH123-1	BC-HH1231-E	BC-HH1232-5	Loop F Pond	BC-NOID-SW1	Decola Pond A
BC-10-4	BC-P-10-4	BC-HH12311-1	BC-HH12311-1	BC-HH1232-6	BC-HH1232-6A	BC-NOID-SW2	BC-NOID-SW2
BC-81-1	BassettCreek	BC-HH12311-3	BC-HH12311-3	BC-HH1232-GVGC1	Pond C	C3	BC-HH1111-1B
BC-81-2	BC81-2	BC-HH123-1A	BC-HH123-1	BC-HH1232-GVGC10	BC-HH1232-GVGC10	ML-GV-ML1-A	BC-HH12311-4A
BC-84-7	Decola Pond E	BC-HH123-1B1	BC-HH123	BC-HH1232-GVGC11	BC-HH1232GVGC11	ML-GV-ML1-B	BC-HH12311-2
BC-8-9-1	BassettCreek	BC-HH123-1B2	BC-HH1231-E	BC-HH1232-GVGC12	BC-HH1232-GVGC12	ML-GV-ML2	BassettCreek
BC-8-9-2	BassettCreek	BC-HH1231-E	BC-HH1231-E	BC-HH1232-GVGC13	BC-HH1232-GVGC13	SL-RR3-1	BassettCreek
BC-91-5	BassettCreek	BC-HH1231-NE	BC-HH1231-E	BC-HH1232-GVGC14	BC-HH1232-GVGC14	SL-RR3-2	BassettCreek
BC-9-5-1	BassettCreek	BC-HH1231-NW	BC-HH1231-NW	BC-HH1232-GVGC15	BC-HH1232-GVGC15	SL-TL1	BC-HH1232-GVGC16
BC-9-5-2	BassettCreek	BC-HH1231-SW1	BC-HH1231-SW1	BC-HH1232-GVGC17	BC-HH1232-GVGC17	WL-1	WL1 (Kilmer Pond)
BC-9-5-3	BC-9-5	BC-HH1231-SW2A	BC-HH1232-W	BC-HH1232-GVGC2	Pond B	WL-2	WL8 Westwood Lake
BC-A4.1	BC-HH1232-GVGC5	BC-HH1231-SW2B	BC-HH1231-SW2	BC-HH1232-GVGC3	BC_HH1232-GVGC3	WL-3	WL8 Westwood Lake
BC-A4.2	Decola Ponds B_C	BC-HH1232-0A-1	BassettCreek	BC-HH1232-GVGC4	BC-HH1232-GVGC4	WL-4	WL4
BC-A4.3	Decola Ponds B_C	BC-HH1232-0A-2	BassettCreek	BC-HH1232-GVGC5	BC-HH1232-GVGC5	WL-5	WL5
BC-HH123222-2C	BC-HH123222-2B	WL-9	WL9	WL-8	WL8 Westwood Lake	WL-6	WL8 Westwood Lake
WL-7	WL8 Westwood Lake						

Watershed
Landlocked Watershed
Watershed Intersected by Stream
Ponds

Feet
0 750 1,500 2,250 3,000

WESTWOOD-UPSTREAM EAST
Water Modeling Updates
Bassett Creek Watershed Management Commission