



Saint Paul
PORT AUTHORITY

INFRASTRUCTURE AND PLANNING ANALYSIS

HILLCREST GOLF COURSE SITE REDEVELOPMENT

RAMSEY COUNTY | ST. PAUL, MN

June 14, 2019

Prepared for:
St. Paul Port Authority
380 St. Peter Street, Suite 850
St. Paul, MN 55102

WSB PROJECT NO. R-013987-000





June 14, 2019

Mr. Monte Hilleman
Senior Vice President Real Estate Development
St. Paul Port Authority
380 St. Peter Street, Suite 850
St. Paul, MN 55102

Re: Infrastructure and Planning Analysis
Hillcrest Golf Course Site Redevelopment
WSB Project No. R-013987-000

Dear Mr. Hilleman:

We are pleased to present this Infrastructure and Planning Analysis Report for the redevelopment of the 112-acre Hillcrest Golf Course located at 2200 Larpenteur Avenue East, St. Paul, Minnesota.

The report outlines the infrastructure constraints, infrastructure needs, and risks for developing the site into a signature destination for St. Paul's east side.

Sincerely,

WSB

A handwritten signature in black ink, appearing to read "Bob Barth", with a stylized flourish at the end.

Bob Barth
Director Land Development
Principal

INFRASTRUCTURE AND PLANNING ANALYSIS

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For:

ST. PAUL PORT AUTHORITY

June 14, 2019

Prepared By:



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.



Greg Johnson, PE

License No. 26430



Heather Nelson, PE

License No. 45801



Sean Delmore, PE

License No. 40945

TABLE OF CONTENTS

COVER LETTER
TITLE SHEET
CERTIFICATION PAGE

1.	INTRODUCTION	1
2.	GEO TECHNICAL INVESTIGATION	2
3.	ENVIRONMENTAL INVESTIGATION	2
4.	EXISTING UTILITIES AND CAPACITY	2
5.	PLANNING AND ZONING	2
6.	MARKET STUDY	4
7.	LAND USE POTENTIAL	4
8.	PROPOSED INTERIOR ROADWAYS AND GRADING	4
9.	STORM WATER PLAN	5
10.	TRAFFIC IMPACTS	7
11.	WATER AND SANITARY SEWER.....	13
12.	INFRASTRUCTURE COSTS	17
13.	RISK ASSESSMENT	18

APPENDICES

Appendix A – Figures

Appendix B – Detailed Preliminary Cost Estimate

1. INTRODUCTION

The St. Paul Port Authority has entered into a purchase agreement with the St. Paul Pipefitters Local 455 to purchase the Hillcrest Golf Course. The Port Authority intends to redevelop the site into a mix of light industrial, commercial, and residential uses that will provide jobs for St. Paul's east side residents, passive open space for their enjoyment, and new housing options that meet current market trends.

Due diligence for the site included a Market Study, Geotechnical and Environmental Assessments, and an Infrastructure and Planning Analysis summarized by this report. The Infrastructure and Planning Analysis identifies preliminary development vision that provides the jobs, open space and new housing options and the infrastructure costs associated with this vision.

Figure 1 shows the boundary of the property. The site lies approximately 2-1/2 miles north of 3M's Maplewood campus and Interstate 94. It is within a 20-minute drive of Twin Cities International Airport, 10 minutes from downtown St. Paul and 20 minutes from downtown Minneapolis.

Table 1 – Property Summary

Parcel	Parcel Identification Number (PIN)	Size (Acres)
A	232922140002	72.54
B	232922410002	18.24
C	232922410001	18.24
D	232922120006	1.26
E	232922120004	0.70
F	232922120003	1.41
Total		112.4



Exhibit 1 – Parcel Reference

2. GEOTECHNICAL INVESTIGATION

See the Phase I Environmental Site Assessment dated June 10,2019 and the Phase II Environmental Site Assessment dated August 16,2019 prepared by Braun Intertec for a complete summary of the geotechnical investigation findings.

3. ENVIRONMENTAL INVESTIGATION

See the Phase I Environmental Site Assessment dated June 10,2019 and the Phase II Environmental Site Assessment dated August 16,2019 prepared by Braun Intertec for a complete summary of the environmental investigation findings.

4. EXISTING UTILITIES AND CAPACITY

Private utility providers within the area include gas and electric provider Xcel Energy and communication providers Comcast, CenturyLink, Sprint and Zayo. For public utilities, St. Paul Regional Water Services provides potable water, the City of St. Paul and Metropolitan Council provide sanitary sewer services, and the City of St. Paul and Ramsey County provide storm sewer conveyance.

Private utilities were contacted regarding availability and capacity of their respective utility to the site. Xcel Energy Electric has the capability to provide L-1 and L-3 services with multiple connection points along McKnight Road and Larpenteur Avenue. Xcel Energy Gas has the capability to provide gas services through a high pressure main along McKnight Road. The prospective energy consumption given by Xcel Energy was 6 KWH/sf per year electric and 0.25 Therms/sf per year gas for one 115,000 square foot industrial building and 0.75 KWH/sf per year electric and 0.03 Therms/sf per year gas for three additional 115,000 square feet industrial buildings. The lower industrial numbers represent a typical light industrial use while the higher industrial numbers represent food production or a heavier industrial use.

Fiber connections are possible through multiple communication providers at multiple locations around the perimeter of the site. None of the communications providers hesitated in asserting sufficient capacity for the industrial, commercial and residential uses shown in the concept plan.

Water and sanitary sewer connections are possible from multiple locations along the surrounding streets. Water and sanitary shall be discussed further in the Proposed Utility Plan section below.

5. PLANNING AND ZONING

The entirety of the proposed site is currently zoned R2, One-Family Residential. This zoning allows for single-family residential use with minimum lot sizes of 7,200 square feet and 60-foot minimum lot widths. The R2, One-Family Residential zoning district provides an environment of low-density, one-family dwellings intermixed with civic and institutional uses that serve residents. This zoning obviously does not accommodate the more intensive uses proposed in the Hillcrest Concept Plan, so the property would have to be rezoned.

St. Paul's draft 2040 Comprehensive Plan and 2040 Land Use Map guide the northern 20% of the property as "Mixed Use" and as a "Neighborhood Node" and guide the southern 80% as "Urban Neighborhood". St. Paul identifies Hillcrest as an "opportunity site" for development purposes. The following describe the guidance terminology:

- Mixed Use – areas primarily along thoroughfares well-served by transit. The main distinguishing characteristic is a balance of jobs and housing within walking distance of one another.

- Urban Neighborhood – areas primarily residential in nature with a range of housing types. Single-family homes and duplexes are most common, although multi-family housing predominates along arterial and collector streets, particularly those with transit. Multi-family housing, schools, neighborhood parks, religious institutions and cemeteries may also be scattered throughout Urban Neighborhoods. Limited neighborhoods serving commercial may also be present, typically at intersections of arterial and/or collector streets.
- Neighborhood Node – compact, mixed use areas that provide shops, services, neighborhood-scale civic and institutional uses, recreational facilities and employment close to residences. They may be neighborhood centers, transit station areas or urban villages, and have often developed adjacent to major intersections or at former street car stops. Neighborhood Nodes serve a neighborhood's daily needs, including access to food; reduce public infrastructure disparities; improve livability; and accommodate growth.

Many aspects of the Hillcrest Concept Plan, presented here, align with the guidance provided in the draft Comprehensive Plan and Land Use Map.

Density for each of the above Land Use designations are as follows:

Table 2 – Land Use Designation Density

Land Use Type	Base Range	At Neighborhood Node
Mixed Use	15-75 units/acre	20-200 units/acre
Urban Neighborhood	7-30 units/acre	15-55 units/acre

The potential land uses considered for the Hillcrest Concept Plan differ significantly from that allowed by the current zoning and differ from the Comprehensive Plan due to inclusion of light industrial. St. Paul Port Authority views this project as a means of creating jobs by providing light industrial square footage that augments the mixed use and urban neighborhood components called for in the 2040 draft Comprehensive Plan. **Figure 2** represents the potential uses for the site based on the following criteria:

- Job creation through light industrial space of at least 500,000 square feet.
- Residential buffers between light industrial space and existing residential neighborhoods.
- Multi-family and senior rentals mixed into the development.
- Commercial nodes at the intersections of new roads with Larpenteur Avenue and McKnight Avenue.

A Market Study guided the potential land uses shown in **Figure 2**. However, the uses deviate slightly from the Market Study due to the realities of creating development buffers, jobs and neighborhood scale commercial nodes in appropriate locations.

Land use, zoning findings and potential risks include:

- The Development Plan will require modifications to the City's Comprehensive Plan, specifically as it relates to the proposed light industrial uses.
- The Metropolitan Council is no longer accepting amendments to the 2030 Comprehensive Plans.
- The St. Paul Planning Commission recommended approval of the St. Paul's draft 2040 Comprehensive Plan on March 22, 2019. The St. Paul City Council held a public hearing on Wednesday, May 15, 2019 on the draft 2040 Comprehensive Plan.
- The full review process by the Metropolitan Council of the 2040 Comprehensive Plan will likely go through the remainder of 2019.

- The City of St. Paul's master planning process will continue well into 2020, so there is not opportunity to revise the 2040 Comprehensive Plan prior to Metropolitan Council approval.
- Based on the proposed development layout, the redevelopment will require a series of rezoning actions following the land use designation updates.

6. MARKET STUDY

See the Initial Market Assessment for Various Land Uses on the Hillcrest Golf Course Site in St. Paul, Minnesota dated April 23, 2019 prepared by Maxfield Research & Consulting for a complete summary of the market study findings.

7. LAND USE POTENTIAL

Figure 2 describes the land use potential for the Hillcrest Redevelopment. The Market Study defines the market potential for different land uses but the land use potential figure marries this market potential to realities on the ground:

- Need to buffer existing residential uses from future light industrial uses.
- Need to take advantage of key intersections and visibility for neighborhood-scale commercial
- Need to provide interconnected passive open space through the site.
- Need for public roadways connecting north, south, east and west.

8. PROPOSED INTERIOR ROADWAYS AND GRADING

Redevelopment of the Hillcrest Golf Course entails major public and private infrastructure investments. Grading represents the most significant component of this infrastructure investment.

Hillcrest Golf Course possesses rolling terrain that is difficult to develop without significant grading of the site to create flatter areas suitable for development. The site's high point lies at about 1,074 feet above sea level, while the low point near its southeast corner lies at 1,000 feet or lower.

Grading constraints within the project include the obvious:

- Need to connect to existing public roadways using accepted transportation design standards.
- Need to preserve wetlands identified within the site to the maximum extent practical.
- Need to blend grading into existing neighborhoods at project perimeter.

And the not so obvious:

- Need to preserve existing runoff discharge rates at numerous points around the site perimeter.
- Need to avoid steep slopes in transition areas from development to existing neighborhood.
- Need to create flat areas for development, particularly for the large light industrial areas.

Figure 2 shows potential public roadways including:

- North-south roadway from Larpenteur Avenue to Hawthorne Avenue in the south.
- Two through east-west roadways connecting McKnight Road to Hoyt Avenue and Cottage Avenue.

- A third east-west roadway from McKnight Road and Nebraska Avenue into the Hillcrest Development.

The public roadways shall be constructed in accordance with the City of St. Paul standards. Private roadways within the different commercial and residential areas will also be needed to provide access to individual homes and businesses. These are not shown in **Figure 2**.

The cost estimates prepared as part of the analysis include expenditures on public roadways and site grading. The cost estimates do not include private access roadways or drives, or any finish grading on individual sites, nor do they include parking lots, landscaping, or any other improvements for individual development sites; these expenditures being the responsibility of individual site developers and not the public.

9. STORM WATER PLAN

Existing Conditions

Existing site drainage patterns and areas with soils conducive to infiltration are shown on **Figure 3 – Existing Hydrology**. The site has very little impervious surface and its surficial soils are characterized as Hydrologic Soil Group (HSG) B and C. HSG B soils have moderate infiltration potential, while HSG C soils do not infiltrate well. There will be some challenges to meeting infiltration requirements given the soils on site and the mercury contamination found on the existing greens, fairways, and tee boxes.

There are several existing wetlands and ponds on the site. The wetlands were identified using the National Wetland Inventory. This is sufficient for development planning, but before any actual construction documents can be prepared, wetland delineations must be conducted on site.

There are several discharge points for the site:

- The northeast part of the site drains toward discharge point R1 of **Figure 3**.
- The northwest part of the site drains toward discharge points R7 and R8 of **Figure 3**.
- The west part of the site drains toward different storm sewers within the existing neighborhood.
- The south part of the site drains toward R2 of **Figure 3**.

The site's existing physical hydrology was used to calculate runoff from each of the site's subwatersheds. Parameters such as land cover, time of concentration, hydrograph routing etc., will be used to compare existing and proposed conditions to ensure compliance with Ramsey Washington Metro Watershed District's (RWMWD) rules.

Below is a summary table of the existing runoff rates for the 2-, 10- and 100-year rainfall events.

Table 3 – Existing Peak Flow

Discharge Point	2-Year (cfs)	10-Year (cfs)	100-Year (cfs)
R1	10.3	25	52.6
R2	14.9	31.8	51.6
R3	3.7	11.2	33.8
R4	1.5	12.4	9.1
R5	4.7	3.5	34.3
R6	0.8	2	4.9
R7	1.7	4	10.2
R8	9.3	22.6	59.2

Proposed Conditions Rate Control

Proposed Conditions Rate Control

City of St. Paul ordinance would allow a post-development discharge from the site based on 1.64 cfs per acre for the 6-inch, 24-hour, rainfall. This would allow 184 cfs discharge from the site. The City of St. Paul may change their allowable discharge rate standard to "Existing Conditions" in the next year. "Existing Conditions" would be a more restrictive criterion, so the stormwater analysis assumes this standard for the Hillcrest Concept Plan. To assume the current standard would introduce too much uncertainty to the project plan, or proforma, because there is a strong likelihood that existing system constraints adjacent to the site and downstream would not allow this level of discharge. Consequently, the potential development plan was developed based on reducing peak flow over existing conditions through large and widely dispersed stormwater rate control ponds.

Figure 4 – Stormwater Post-Development represents the site's post-development hydrology. Parameters such as land cover and percent impervious, combined with time of concentration determined by computing post-development urban flow paths allows calculations of routed runoff to the post-development site's stormwater ponds. The stormwater models created for the post-development condition route this runoff through the proposed ponds to determine the proposed peak flow rates at the various discharge points around the site.

The peak rate for runoff flowing offsite will not increase compared to existing conditions of the 2-, 10-, and 100-year events. Storm sewer from the site will be routed to one of the proposed ponds. As shown on **Figure 4**, the post-development site discharges to five locations. These discharge points have preliminarily been sized to meet the 100-year existing runoff rates. Rates for the 2-year and 10-year will be achieved through further analysis as site design progresses. Below is a summary of the runoff rate comparison.

Table 4 – Peak Flow Rate Comparison for 100-Year Rainfall

Discharge Point	Existing Peak Flow Rates (cfs)	Proposed Peak Flow Rates (cfs)
R1	52.6	31.8
R2	51.6	59.5
R3	33.8	50.7
R4	9.1	6.2
R5	34.3	15.7
R6	4.9	0
R7	10.2	0
R8	59.2	0

Proposed Conditions Water Quality and Annual Runoff Volume

RWMWD's rules required that runoff volume retained onsite will be equivalent to at least 1.1 inches over the new impervious surface.

Based on soil borings and the County soil survey, the northern portion of the site indicates C and D type soils which are less conducive to infiltration. The Watershed prohibits infiltration in D soils so runoff volume requirements for these subwatersheds will be met via filtration ponds. The Watershed requires that when filtration of the water quality volume is deemed necessary through watershed alternative compliance sequencing, the "required stormwater runoff volume" shall be multiplied by 1.82 and the filtration Best Management Practice (BMP) provide this storage volume below the invert of the low overflow outlet of the filtration BMP. Consequently, volumes normally expected were multiplied by 1.82 causing an overall increase in water quality BMP area due to the potential limitation on infiltration.

Ponds to the south have soils conducive to infiltration and were not required to include this filtration sizing factor. The table below shows proposed treatment volumes based on proposed land use and minimum BMP sizing for the four subwatersheds on site:

Table 5 – Water Quality Treatment Requirements Post-Development

Block	Total Area (ac)	Impervious Area (ac)	Treatment Volume Required (cf)	BMP Treatment Volume Required (cf)	Downstream BMP	Treatment Volume Available (cf)	BMP Area (ac)
A	5.07	4.31	31,330	149,810	Filtration Pond 1	106,720	1.0
B	2.81	2.39	17,370				
C	4.54	0.68	4,950				
E	10.46	7.53	54,760				
F	7.91	5.70	41,400				
D	3.63	0.54	3,960	122,400	Filtration Ponds 2 & 3	78,410	1.0
G	6.58	4.28	31,070				
H	3.21	0.48	3,500				
I	16.03	11.54	83,870				
J	11.84	7.70	55,950	145,470	Infiltration Pond 4	78,410	1.0
K	16.22	11.68	84,890				
L	4.25	0.64	4,630				
M	4.99	3.24	23,580	50,990	Infiltration Pond 5	196,020	2.5
N	6.05	2.42	17,590				
O	9.01	1.35	9,820				
Total			441,260			459,560	

Runoff discharging offsite must have a 90% reduction in Total Suspended Solids (TSS) during a 2.5-inch storm, shown via calculations, documentation or modeling.

This is proposed to be met by onsite infiltration, filtration and natural vegetation areas.

A wetland delineation has not been performed at the site. Wetlands identified on the site plan include NWI classified wetlands. Grading impacts for wetlands will be minimized to the greatest extent possible; however, it is anticipated that wetlands will be impacted by some grading activities. Onsite mitigation at a ratio of 2:1 is proposed. The anticipated impact and mitigation areas are shown on Figures 2 and 4..

10. TRAFFIC IMPACTS

This section summarizes traffic forecasts from the development and identifies traffic related risks to the expected improvements on public roadways to accommodate the new accesses and the increase in traffic.

The proposed development consists of residential, light industrial, office and retail sites which will have a total of eight proposed accesses to the site. The goal of this study is to determine the high-level impact of the proposed development on the surrounding roadway network.

Existing Transportation System

McKnight Road North is a four-lane undivided minor arterial roadway that has a 45-mph speed limit. Larpenteur Avenue East is a two-lane minor arterial roadway and has a 30-mph speed limit. Both Larpenteur and McKnight are County roads. Ivy Avenue East is a two-lane major collector roadway and has a 30-mph speed limit. The roadways surrounding the west side of the development are all

local roadways with a 30-mph speed limit. **Figure 5 - Current ADT** shows the existing (2016 or more recent) average daily traffic (ADT) volumes on the existing transportation system surrounding the development.

The following describes the existing geometry and traffic control at intersections that may be affected by the project.

- **Larpenteur Avenue East and Howard Street North** – This is a three-legged, minor approach stop-controlled intersection. All approaches provide one shared lane.
- **McKnight Road North and Larpenteur Avenue East** – This is a four-legged, signalized intersection. Larpenteur Avenue East provides an exclusive right turn lane and a shared through-left turn lane in each direction. McKnight Road North provides a shared through-left and shared through-right turn lane in each direction.
- **McKnight Road North and Montana Avenue** – This is a three-legged, minor approach stop-controlled intersection. McKnight Road North provides two through lanes per direction through the intersection and Montana Avenue provides one westbound lane. No turn lanes are currently provided.
- **McKnight Road North and Nebraska Avenue East** – This is a three-legged, minor approach stop-controlled intersection. McKnight Road North provides two through lanes per direction through the intersection and Nebraska Avenue East provides one westbound lane. No turn lanes are currently provided.
- **McKnight Road North and Arlington Avenue East** – This is a three-legged, minor approach stop-controlled intersection. McKnight Road North provides two through lanes per direction through the intersection and Arlington Avenue East provides one westbound lane. No turn lanes are currently provided.
- **Ivy Avenue North and Hawthorne Avenue East** – This is a three-legged, minor approach stop-controlled intersection. All approaches provide one shared lane.

Planned Roadway Improvements and Modifications

Ramsey County plans to resurface and restripe McKnight Road in 2020. The striping converts the current four-lane roadway to a three-lane roadway from Stillwater Avenue (south of the proposed development site) to 7th Avenue (north of the proposed development site). This project will provide two through lanes and a TWLTL (two-way left-turn lane), but no exclusive right turn lanes in either the north or south direction. The project also includes upgrading the signal at the McKnight Road and Larpenteur Avenue intersection.

Ramsey County has not programmed improvements for Larpenteur Avenue in the vicinity of the proposed development site.

Analysis Process

The purpose of this analysis is to estimate the trips generated by the proposed development, forecast the distribution onto the local roadway network, and identify expected improvements to the roadway/intersection geometry and traffic control at each access to the site.

Trip generation estimates for the proposed development were developed using the data presented in the Institute of Traffic Engineers' "Trip Generation, Tenth Edition, 2017". The trip generation results are shown in **Table 6**. It is assumed that 15% of the total trips are internal due to mixed-use development. The subtotal number of trips was used for the development access trip generation assignment. The total number of new trips include a reduction of 20% due to pass-by trips (vehicles

already travelling on McKnight Road or Larpenteur Avenue that alter their trip to include a stop at the proposed development).

Table 6 – Raw Trip Generation for Proposed Development

HILLCREST TRIP GENERATION											
Site	Future Use	# of Units	Unit Type	ITE Code/Description	AM Trips			PM Trips			Weekday Trips
					In	Out	Total	In	Out	Total	
North Site	Retail	20	KSF	820 - Shopping Center	12	7	19	37	40	77	755
	Office	20	KSF	710 - Office Building	20	3	23	4	20	24	195
	Apartments	770	Dwelling Units	221 - Multifamily Housing (Mid-Rise)	73	205	278	207	133	340	4,189
	Restaurant and Gas Station	5	KSF	950 - Truck Stop	67	66	133	61	54	115	2,278
	Fitness Center	40	KSF	492 - Health/Fitness Club	27	26	53	79	60	139	1,200
	Townhomes	40	Dwelling Units	220 - Multifamily Housing (Low-Rise)	5	14	19	15	9	24	293
	Office	5	KSF	710 - Office Building	5	1	6	1	5	6	49
	Industrial	250	KSF	110 - General Light Industrial	154	21	175	21	138	159	1,240
Internal Trip Reduction (15%)					(54)	(52)	(106)	(64)	(69)	(133)	(1,530)
SUBTOTAL NORTH SITE					309	292	600	361	390	751	8,668
South Site	Townhomes	80	Dwelling Units	220 - Multifamily Housing (Low-Rise)	9	28	37	29	17	46	586
	Industrial	250	KSF	110 - General Light Industrial	154	21	175	21	138	159	1,240
	Apartments	130	Dwelling Units	221 - Multifamily Housing (Mid-Rise)	13	35	48	35	23	58	707
Internal Trip Reduction (15%)					(26)	(13)	(39)	(13)	(27)	(39)	(380)
SUBTOTAL SOUTH SITE					150	71	221	72	151	224	2,153
SUBTOTAL					459	363	821	433	541	975	10,821
Pass-by Reduction (20%)					(92)	(73)	(164)	(87)	(108)	(195)	(2,164)
DEVELOPMENT TOTAL NEW TRIPS					367	290	657	346	433	780	8,657

The trips generated in **Table 6** were assigned to proposed intersections. The proposed development site shown in **Figure 2**, and for which the trip generation estimates were presented in **Table 6**, was divided into north and south halves to more accurately distribute trips to local roadways via the site accesses. Trip generation estimates for the proposed development were assigned to the eight accesses that connect to the local roadway network based on assumed trip distribution and proximity of the land use to the access. These access locations include:

- A. Larpenteur Avenue and retail access (new intersection)
- B. Larpenteur Avenue and Howard Street (existing 3-legged intersection – north leg stop controlled)
- C. McKnight Road and Montana Avenue (existing 3-legged intersection – east leg stop controlled)
- D. McKnight Road and Nebraska Avenue (existing 3-legged intersection – east leg stop controlled)
- E. McKnight Road and Arlington Avenue (existing 3-legged intersection – east leg stop controlled)
- F. Ivy Avenue and Hawthorne Avenue (existing 3-legged intersection – south leg stop controlled)
- G. Cottage Avenue and Townhome Access (extension of existing road)
- H. Hoyt Avenue/Winthrop Street and Apartment Access (currently a 90-degree turn – would become the third leg of this intersection)

The assigned peak hour development trips going in and out of each access are shown in **Figure 6 – Full Development Peak Hour Trip Generation**.

Access Management

Ramsey County follows MnDOT's access spacing standards for redeveloped areas. The recommended street spacing for an urban minor arterial roadway is shown in **Table 7**.

Table 7 – Recommended Street Spacing

Urban Minor Arterials		
Public Street Spacing		Signal Spacing
Primary Full-Movement Intersection	Secondary Intersection	
1/4 Mile	1/8 Mile	1/4 Mile

MnDOT's Vehicular Volume Warrants for turn lanes were used to identify potential turn lane locations based on trip generation volumes at each access. The warrants for left and right turn lanes are shown in **Tables 8 and 9**.

Table 8 – Warrants for Left Turn Lanes

2-Lane Highway AADT	4-Lane Highway AADT	Cross Street or Driveway ADT	Turn Lane Requirement
5,000 to 6,499	10,000 to 12,999	>800	Left turn lane warranted
≥6,500	≥13,000	101 to 400 ≥400	Left turn lane or bypass lane Left turn lane warranted

Table 9 – Warrants for Right Turn Lanes

2-Lane Highway AADT	4-Lane Highway AADT	Cross Street or Driveway ADT	Turn Lane Requirement
≥1,500	≥3,000	>100	Right turn lane warranted

Table 10 shows recommendations for the traffic control and intersection geometry (turn lanes) at each proposed access. The planned improvements on McKnight Road include a TWLTL, therefore left turn lanes are not shown as recommendations in the table.

Table 10 – Access Recommendations

Access		Recommended Traffic Control	Recommended Turn Lanes				Notes
			NB	SB	EB	WB	
A	Larpenteur Avenue & Retail Access	Through-Stop	LTL RTL	N/A	RTL		Potentially a right-in/right-out or $\frac{3}{4}$ intersection (out)
B	Larpenteur Avenue & Howard Street	Through-Stop	LTL RTL	None	RTL	LTL	
		Roundabout	N/A	N/A	N/A	N/A	Mini-roundabout that aligns the road to the south of the current centerline
C	McKnight Road & Hoyt Avenue	Through-Stop		RTL	LTL RTL	None	TWLTL provides left turn lanes for NB/SB
D	McKnight Road & Nebraska Avenue	Traffic Signal		RTL	LTL RTL	None	TWLTL provides left turn lanes for NB/SB
E	McKnight Road & Arlington Avenue	Through-Stop		RTL	LTL RTL	None	TWLTL provides left turn lanes for NB/SB
F	Ivy Avenue & Hawthorne Avenue	Through-Stop	None	None	None	None	
G	Cottage Avenue & Townhome Access	N/A (Extension of existing road)	N/A	N/A	N/A	N/A	
H	Hoyt Avenue /Winthrop & Apartment Access	Through-Stop	None	None	None	None	

To meet the signal spacing guidelines, a traffic signal is recommended at the intersection of McKnight Road and Nebraska Avenue. With the forecasted trip generation during peak hours, a signal is assumed to be warranted at full build out.

If more trips can be encouraged (by circulation, channelization, restriction, etc.) to use the Nebraska Avenue intersection, there is a greater chance that traffic signal warrants will be met, and the stop-controlled intersections will operate more efficiently. Additionally, once the intersections are in place, they tend to balance to equilibrium based on user experience.

The intersection of Larpenteur Avenue and Howard Street is recommended to operate with a mini-roundabout or under through-stop control with turn lanes provided. As there are single-approach lanes for roundabouts (no turn lanes needed), the roadway width would not need to be widened, but the circulatory roadway would likely require some additional right-of-way on the south side of the intersection.

All other intersections are recommended to operate with a through-stop control due to access spacing guidelines and forecasted trips.

Risk Factors

Potential risks are associated with the build out of the proposed development. These risks can be mitigated by planning and engagement with project stakeholders. These risks include:

- The addition of such a high volume of new trips onto the existing network that McKnight Road and/or Larpenteur Avenue become over capacity.
- The right-of-way acquisition that may be necessary to construct the recommended intersection and roadway improvements (the development may need to provide right-of way to Ramsey County).
- Not meeting the access spacing guidelines followed by Ramsey County.
- Nearby neighborhood roadway concerns with added vehicles and cut-through traffic.
- The need to construct development-related intersection improvements concurrent with the County improvement project in 2020. Design for the 2020 Ramsey County project will likely be completed during the first quarter of 2020, and any development related mitigation should be incorporated at that time.

The following summarizes the findings of the traffic analysis for the proposed Hillcrest Golf Course Redevelopment:

- The proposed development is expected to generate 10,821 daily trips, which includes a 15% internal trip reduction from mixed-use.
 - North Site – 600 trips during the a.m. peak hour, 751 trips during the p.m. peak hour and 8,668 daily trips.
 - South Site – 221 trips during the a.m. peak hour, 224 trips during the p.m. peak hour and 2,153 daily trips.
 - 20% of the development trips are assumed to be pass-by trips from vehicles already traveling on Larpenteur Avenue or McKnight Road, reducing the total number of new trips on the local network to 8,657 daily trips.
- The development is proposed to have eight access locations: two on Larpenteur Avenue, three on McKnight Road, one on the south side (Ivy Avenue), and two on the west side (connecting to Cottage Avenue and to Winthrop Street).
 - The MnDOT Access Management Guidelines were used for street spacing, as Ramsey County follows these recommendations.
 - A traffic signal is recommended at the intersection of McKnight Road and Nebraska Avenue, as this intersection meets the signal spacing guidelines and with the development trips, a signal is assumed to be warranted.
 - The access to Cottage Avenue will not require any traffic control modifications or improvements, as this will be an extension of an existing roadway with no cross-street.
 - The access at Larpenteur Avenue and Howard Street is recommended to be improved to a mini-roundabout.
 - The remaining five access locations are recommended to be constructed with through-stop control.
 - All access locations along Larpenteur Avenue or McKnight Road are expected to warrant left and right turn lanes into the development, based on forecasted trips and ADT volumes.

- A TWLTL is planned for the improvement and restriping of McKnight Road in 2020 and is not included in the construction costs for the recommended improvements.

11. WATER AND SANITARY SEWER

Water Supply

The Hillcrest Golf Course Development will receive water supply from Saint Paul Regional Water Services (SPRWS). The SPRWS system has existing 16-inch trunk water distribution mains in Larpenteur Avenue and McKnight Road, as well as smaller 6-inch and 8-inch mains on the western and southern boundaries of the development site. A preliminary water supply schematic is shown in **Figure 6 – Water Supply Schematic**. The watermain layout shown is general in nature and exact alignments may change during design. The estimated costs associated with the preliminary water supply schematic are attached.

The SPRWS storage facility associated with the pressure zone of the 16-inch trunk watermain is the Ferndale Tower, which has a storage volume of one million gallons and a high-water level (HWL) of 1,150 feet. The preliminary floor elevations within the development vary from 1,000 to 1,065 feet. Therefore, static pressures within the development will be approximately 37 to 65 psi. Ten States Standards for Drinking Water recommend a normal working pressure of 60 to 80 psi, and a minimum system pressure of 35 psi at all times. Communities often design for normal working pressures of 50 to 70 psi. The normal working pressures within the proposed development will be at the lower boundary of this range, but still above the required minimum. Buildings with multiple stories will have lower pressures on the upper levels, approximately 4 to 5 psi less per level, and will require internal booster pumps (especially those at higher elevations).

SPRWS staff conducted a hydrant flow test at hydrants on the 16-inch main in Larpenteur Avenue on May 8, 2019. The static pressure measured was 50 psi, which appears accurate based on the Ferndale Tower HWL. The test results indicated that a fire flow of 4,750 gpm is available at a residual pressure of 20 psi. The American Water Works Association (AWWA) recommends a minimum available fire flow of 3,500 gpm for non-residential development. SPRWS staff also modeled the proposed watermain shown in **Figure 6** using an InfoWater model. Their results are provided in **Table 11**; the nodes correspond to the water model junction labels on the water supply schematic. Note that the SPRWS InfoWater model is not fully calibrated, so the values in **Table 11** are approximate and are intended for planning purposes only.

Table 11 – Water Model Results

Node	Avg. Day Pressure	Max Day Pressure	Max Day Fire Flow @ 20 psi Residual
1	40 psi	40 psi	5,250 gpm
2	49 psi	48 psi	6,450 gpm
3	48 psi	48 psi	6,350 gpm
4	49 psi	49 psi	6,450 gpm
5	58 psi	57 psi	4,450 gpm

Below is an estimate of the water demands for the Hillcrest Golf Course Development. From 2010 to 2015, the SPRWS system delivered an average of 13,262 million gallons (MG) per year. Based on the projected annual demand of 136.4 MG below, this development will increase demand on the SPRWS system by 1.0%.

Table 12 – Water Demand Projections

Land Use	Acres	Units	Demand Assumption (gpd/acre; gpd/unit)	Average Demand (gpd)
Industrial	25.82	N/A	2,500	64,550
Office	5.70	N/A	1,500	8,550
Retail	9.57	N/A	1,875	17,944
Single Family	N/A	120	274*	32,880
Multifamily	N/A	900	274*	246,600
Open Space	24.68	N/A	125	3,085
ROW	8.22	N/A	0	0
Average Day Demand (gpd)				373,609
Annual Demand (MG)				136.4
Maximum Day Demand Factor**				2.0
Maximum Day Demand (gpd)				747,218
Maximum Day Demand (gpm)				519

*The average residential water demand for the SPRWS system from 2010-2015 was 44 gallons per capita per day, per the SPRWS Water Supply Plan. Conservative demand assumptions are used here.

**The maximum day demand factor for the SPRWS system from 2010-2015 was 1.74, per the SPRWS Water Supply Plan. A slightly more conservative value is used here.

Sanitary Sewer

The wastewater generated within the Hillcrest Golf Course development will discharge to the City of St. Paul sanitary sewer system and then to the Metropolitan Council Environmental Services (MCES) regional collection system. **Table 13** below provides an estimate of the wastewater flow from the proposed development. A preliminary sanitary sewer schematic is shown in **Figure 6 – Sanitary Sewer Schematic**. The sanitary sewer layout shown is general in nature and exact alignments may change during design. The estimated costs associated with the preliminary sanitary sewer schematic are attached.

Table 13 – Wastewater Flow Projections

Land Use	Acres	Units	Flow Assumption* (gpd/acre; gpd/unit)	Average Flow (gpd)
Industrial	25.82	N/A	2,000	51,640
Office	5.70	N/A	1,200	6,840
Retail	9.57	N/A	1,500	14,355
Single-Family	N/A	120	225	27,000
Multifamily	N/A	900	225	202,500
Open Space	24.68	N/A	100	2,468
ROW	8.22	N/A	0	0
Average Daily Flow (gpd)				304,803
Peak Hourly Flow Factor**				5.0
Peak Hourly Flow (gpd)				1,524,015
Peak Hourly Flow (gpm)				1,058

*Flow assumptions from West Side Flats sanitary sewer system analysis.

**Peak hourly flow factor from West Side Flats sanitary sewer system analysis.

MCES Interceptor 1-SP-214 will receive the flow generated within the Hillcrest Golf Course Development. The wastewater will then be conveyed south through the MCES regional collection system to the Metropolitan Wastewater Treatment Plant (Metro WWTP). The Metro WWTP has a capacity of 251 million gallons per day (MGD) and discharges treated effluent to the Mississippi River.

The capacity of the City of St. Paul sanitary sewer system in the immediate vicinity of the proposed development was reviewed to identify preferred discharge locations, based on flow projections in the Saint Paul Sanitary System Capacity Analysis (SPSSCA) dated May 8, 2013. The SPSSCA included flow projections during 1-year, 5-year, and 25-year rain events (since this was formerly a CSO system). The sanitary sewer capacities downstream of several discharge locations identified in **Figure 6 – Sanitary Sewer Schematic** are provided in **Table 14**. The projected flow during a 25-year rain event is included as a conservative check.

Table 14 – Sanitary Sewer Capacity Review

Location	Model ID	Pipe Diameter (in)	Full Flow Capacity (gpm)	25-yr Storm Flow (gpm)	25-yr Storm Residual Capacity (gpm)
Larpenteur Avenue	350800	10	676	1,721	-1,045
	350799	15	1,607	1,722	-114
	350798	15	1,584	1,725	-141
Nebraska Avenue	350654	12	3,252	33	3,220
	350653	12	3,249	49	3,200
	350692	21	5,377	66	5,311
	350691	21	6,052	83	5,970
Sherwood Avenue	349808	12	2,446	9	2,436
	349807	12	2,447	19	2,428
	349806	15	3,219	28	3,190
	349805	15	4,044	38	4,006
Ivy Avenue	350922	12	2,664	0	2,664
	350921	15	1,588	9	1,579
	350920	15	7,143	38	7,105
McKnight Road	349387	16	1,393	187	1,206
	349386	16	1,119	232	887
	349385	16	1,138	232	906
Hawthorne Avenue	349368	36	15,436	76	15,361
	349365	36	20,250	85	20,165
	349364	36	16,430	95	16,335
	349363	36	16,361	104	16,257
	349362	36	16,467	113	16,354
	349361	36	24,886	128	24,757
	350926	36	45,191	143	45,048
	350925	36	50,628	158	50,469
	350924	36	39,912	168	39,744
	349140	48	33,734	177	33,557
	350923	48	36,779	185	36,594
	349678	48	35,473	193	35,280
	349675	60	71,458	202	71,257
	349672	60	64,652	634	64,018
	349671	60	74,416	659	73,757
	367306	48	71,782	685	71,097
	352505	42	101,713	696	101,017
	351699	48	106,348	1,025	105,324
	351698	48	115,049	1,036	114,013
	351178	48	95,192	1,162	94,031
	349961	15	7,626	1,179	6,447

The one portion of existing sanitary sewer where the projected 25-year rain event flow exceeds the pipe capacity is located along Larpenteur Avenue, on the northern boundary of the proposed development.

The 36-inch trunk gravity sewer in Hawthorne Avenue on the southern boundary of the development has the greatest residual capacity; therefore, it is recommended that all wastewater from the site be routed to that location as shown in **Figure 8 – Sanitary Sewer**. The trunk gravity main in Hawthorne Avenue has sufficient capacity for the additional peak hourly flow from the proposed development. However, there is one 52-foot long segment of 15-inch VCP pipe in this trunk where it discharges to MCES Interceptor 1-SP-214 at the intersection of Maryland Avenue and Kennard Street. Although this 15-inch segment is projected to have sufficient capacity, it is a candidate for replacement given its size and material. The cost to upsize this segment is included in the attached cost estimate.

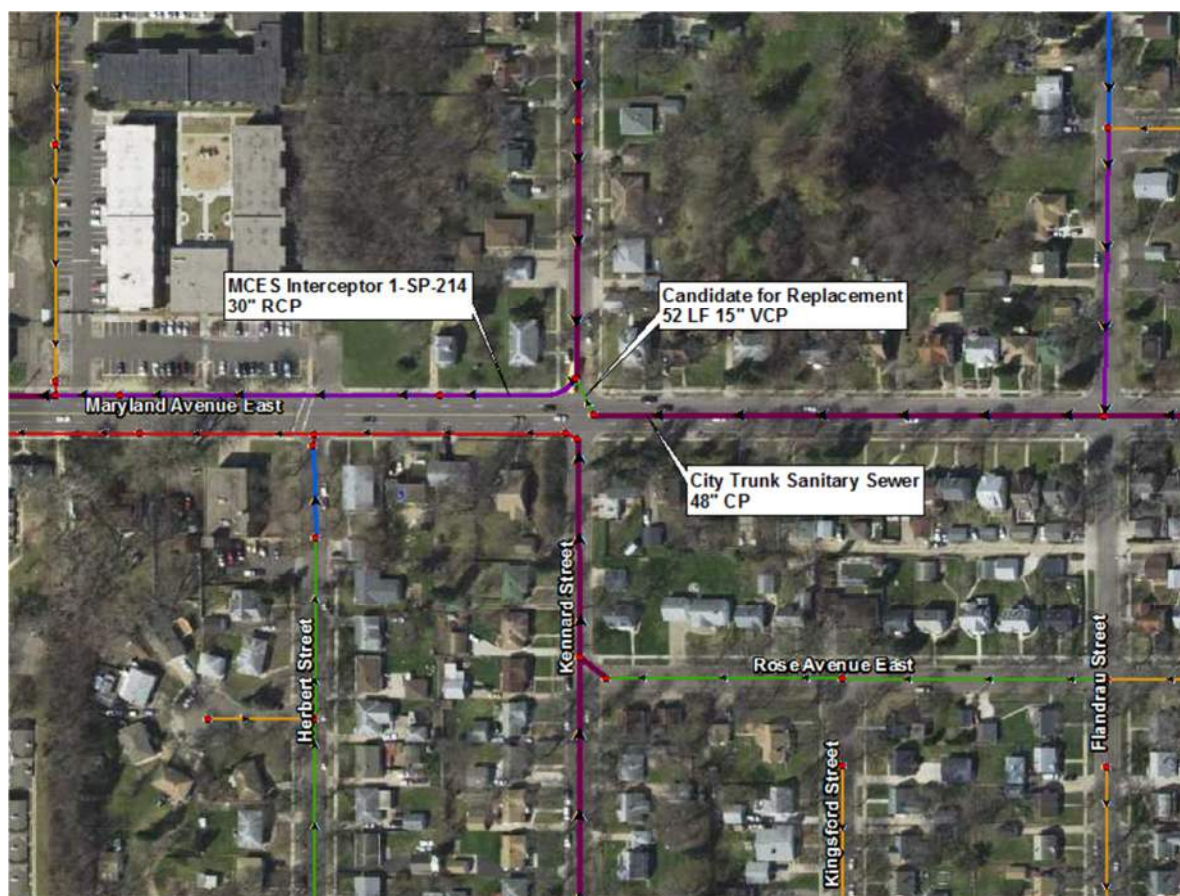


Exhibit 2 – Off-site Sanitary Sewer Improvement

12. INFRASTRUCTURE COSTS

One of the objectives of this analysis is to prepare a preliminary cost analysis of the projected costs of site grading, utilities, public or private streets and stormwater management facilities.

The estimated cost of site grading, utilities, public streets and pedestrian facilities have been completed without the benefit of engineering plans and specifications. For the purposes of this estimate the construction cost are based on the concept plan in a single-phase project.

Estimated costs are summarized below. The full preliminary cost estimate is presented in **Appendix B**.

Table 15 – Cost Summary

COST SUMMARY	
A. Surface Improvements	
Construction Total	\$ 16,212,106.28
Contingency (10%)	\$ 1,621,210.63
Subtotal	\$ 17,833,316.91
B. Watermain Improvements	
Construction Total	\$ 725,300.00
Contingency (10%)	\$ 72,530.00
Subtotal	\$ 797,830.00
C. Sanitary Sewer Improvements	
Construction Total	\$ 607,280.00
Contingency (10%)	\$ 60,728.00
Subtotal	\$ 668,008.00
D. Storm Sewer Improvements	
Construction Total	\$ 2,072,500.00
Contingency (10%)	\$ 207,250.00
Subtotal	\$ 2,279,750.00
E. Off Site Roadway Improvements	
Construction Total	\$ 735,000.00
Contingency (10%)	\$ 73,500.00
Subtotal	\$ 808,500.00
Grand Total	\$ 22,387,404.91

13. RISK ASSESSMENT

The analysis summarized in this report aims to identify known development constraints and costs associated with the redevelopment of Hillcrest Golf Course. Some unknowns remain, however, and these present risks that need to be acknowledged. These risks include:

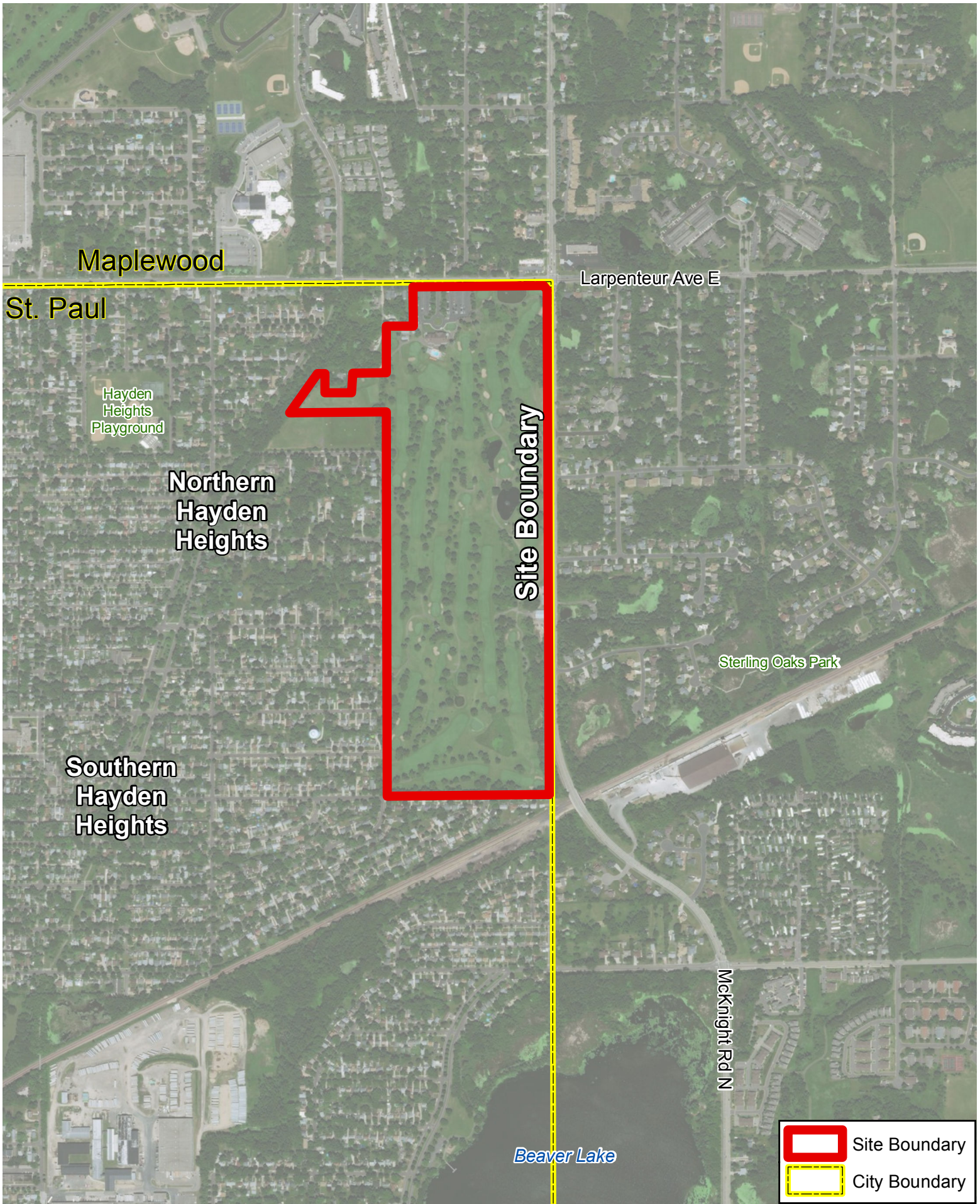
- The construction costs are based on current market conditions evident in bids for construction work in 2019. The City of St. Paul will conduct their Master Planning process in 2019 and 2020. It could be two years before some of the site work is bid. The risk of price inflation greater than recent trends is a risk to the project's financial proforma.
- Construction costs are based on a single-phase project, not an extended multi-year project.
- Ponds on the south part of the site are assumed to have an infiltration capacity because the soil borings confirm that existing sand layers support infiltration. If this cannot occur due to existing contamination, better soils information, or concerns about the impact of infiltration on existing downstream properties, then potentially more land will need to be dedicated to stormwater management on the south part of the site.
- The Metropolitan Council is no longer accepting amendments to the 2030 Comprehensive Plans.

- The full review process by the Metropolitan Council of the 2040 Comprehensive Plan will likely go through the remainder of 2019 prior to determination of land uses for Hillcrest so a Comprehensive Plan amendment will be necessary.
- Based on the proposed development layout, the redevelopment will require a series of rezoning actions following the land use designation updates.
- The ultimate configuration of land uses is likely to trigger mandatory EAW. However an EAW or the Alternative Urban Area Review can run concurrently with the City of St. Paul's Master Planning process..
- Roadway connections to existing neighborhoods to the west will raise resident concerns about cut through traffic. There must be early communication on mitigation measures early in the Master Planning process.

APPENDIX A

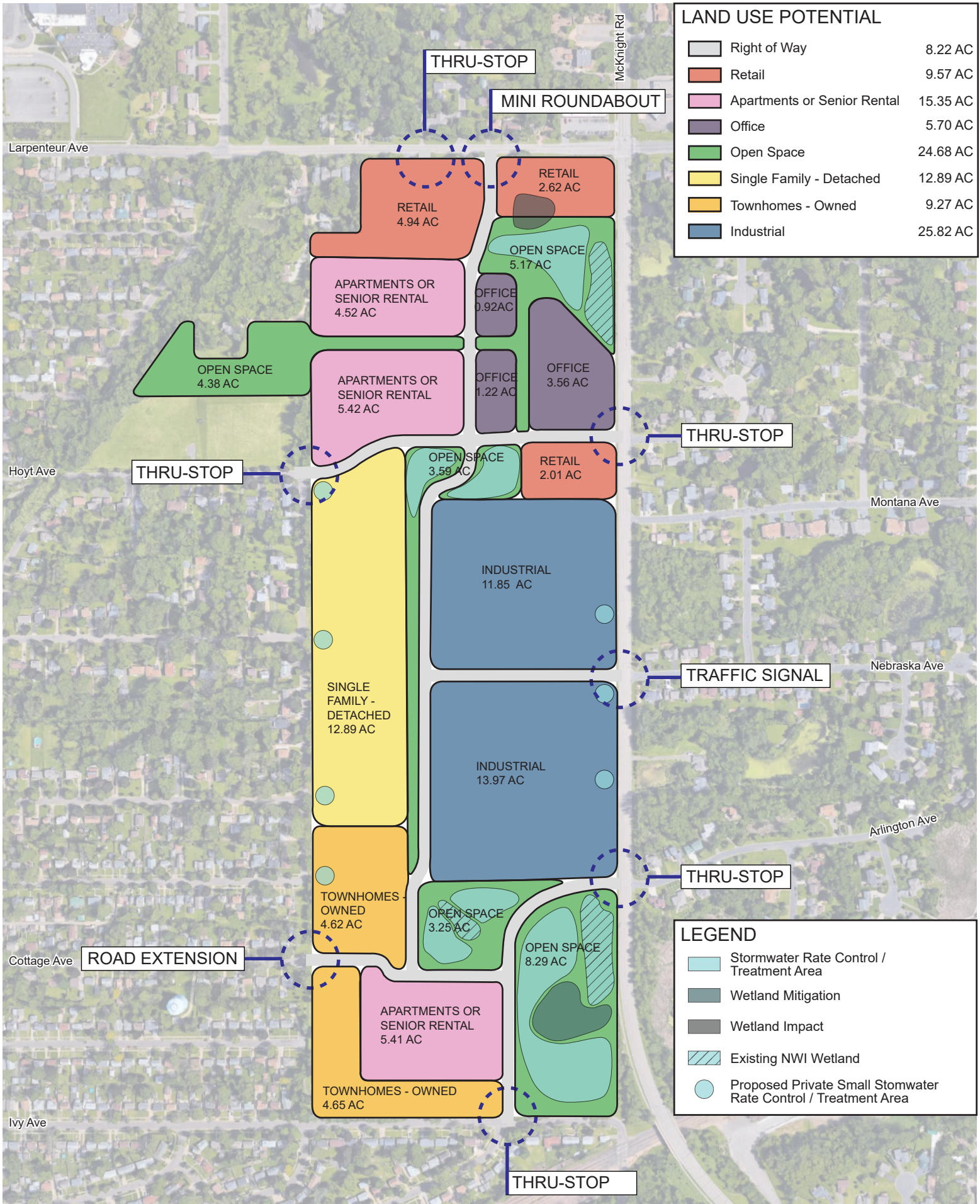
APPENDIX A

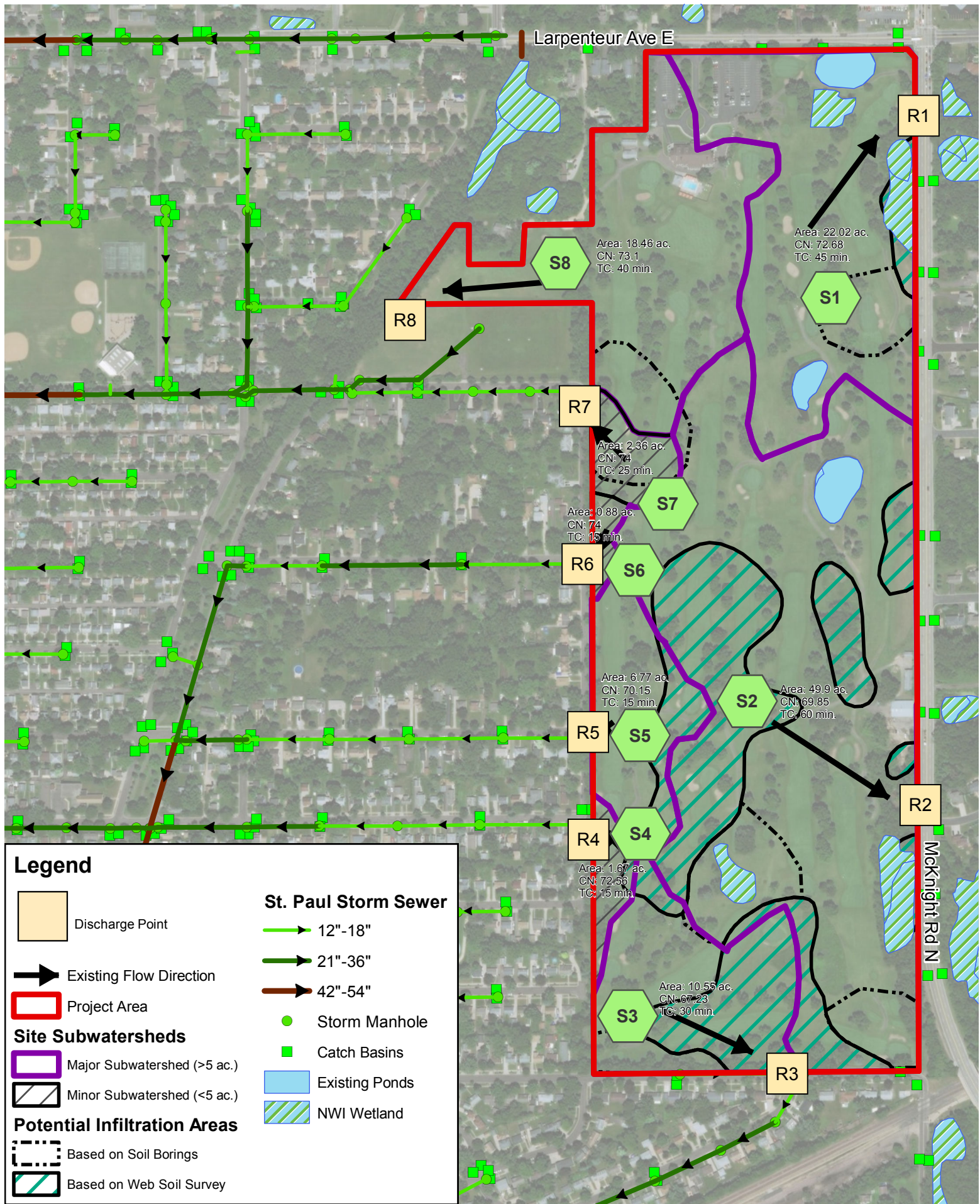
Figures

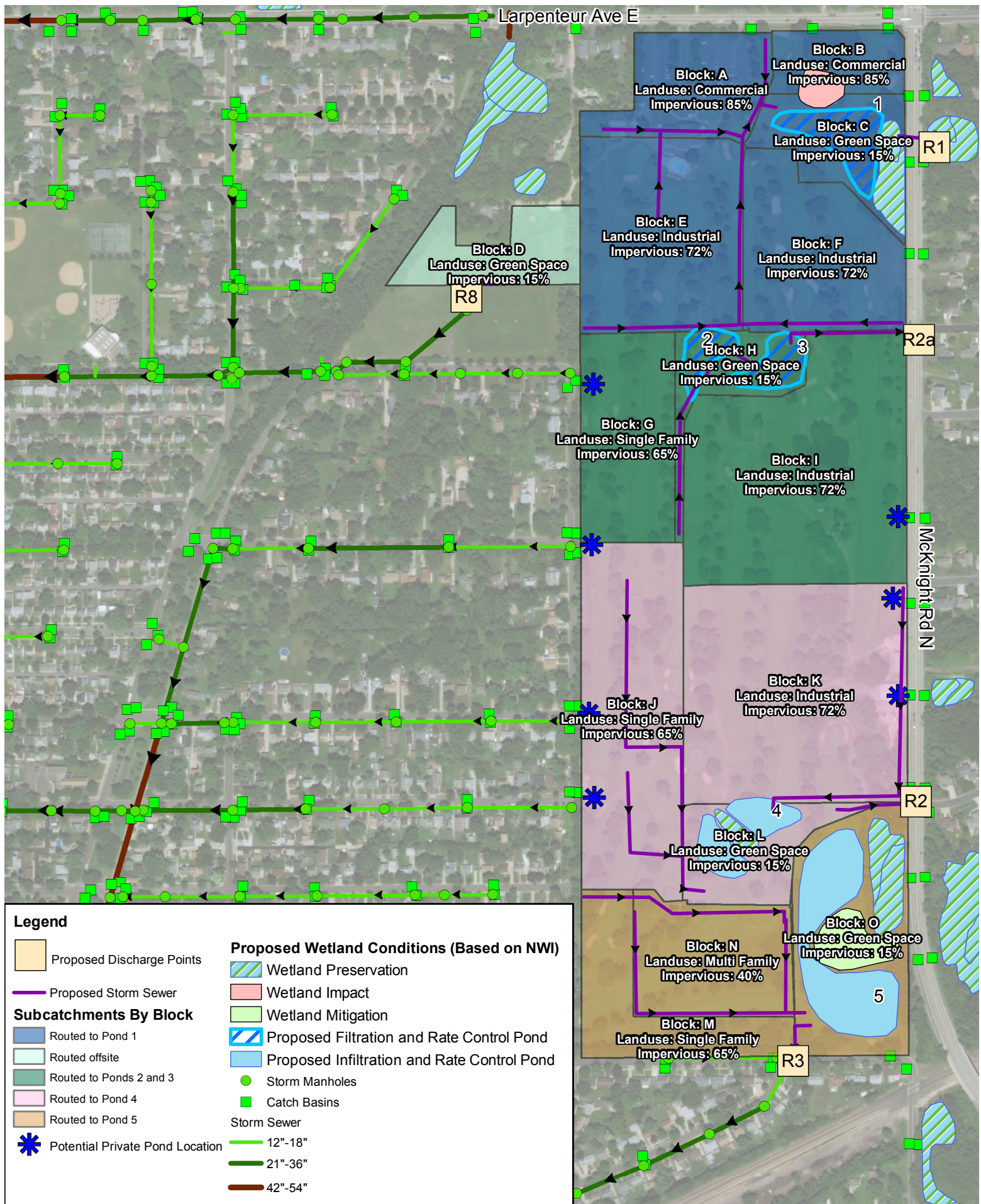


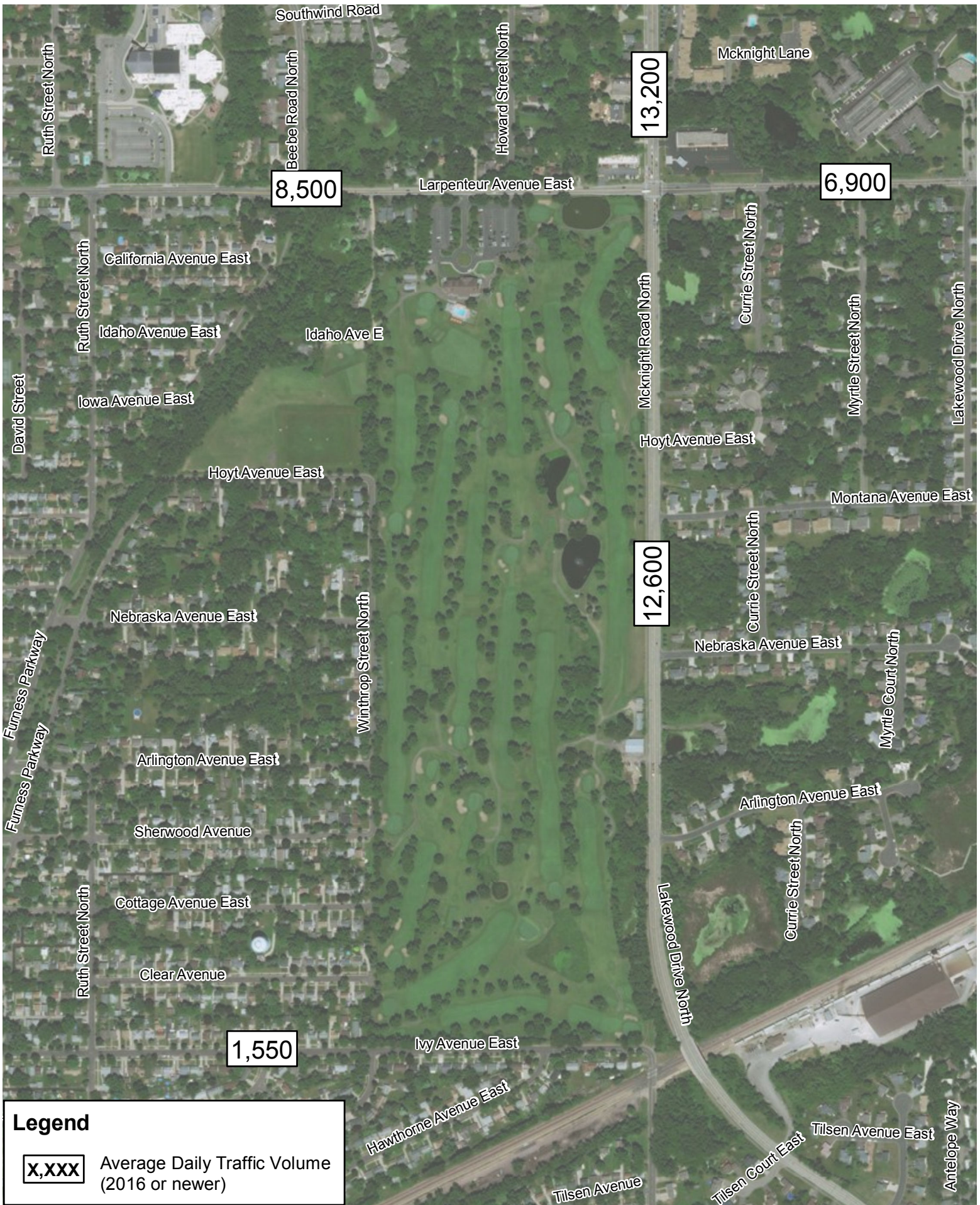
HILLCREST GOLF COURSE
REDEVELOPMENT
Figure 1 - Project Location











Legend

X,XXX

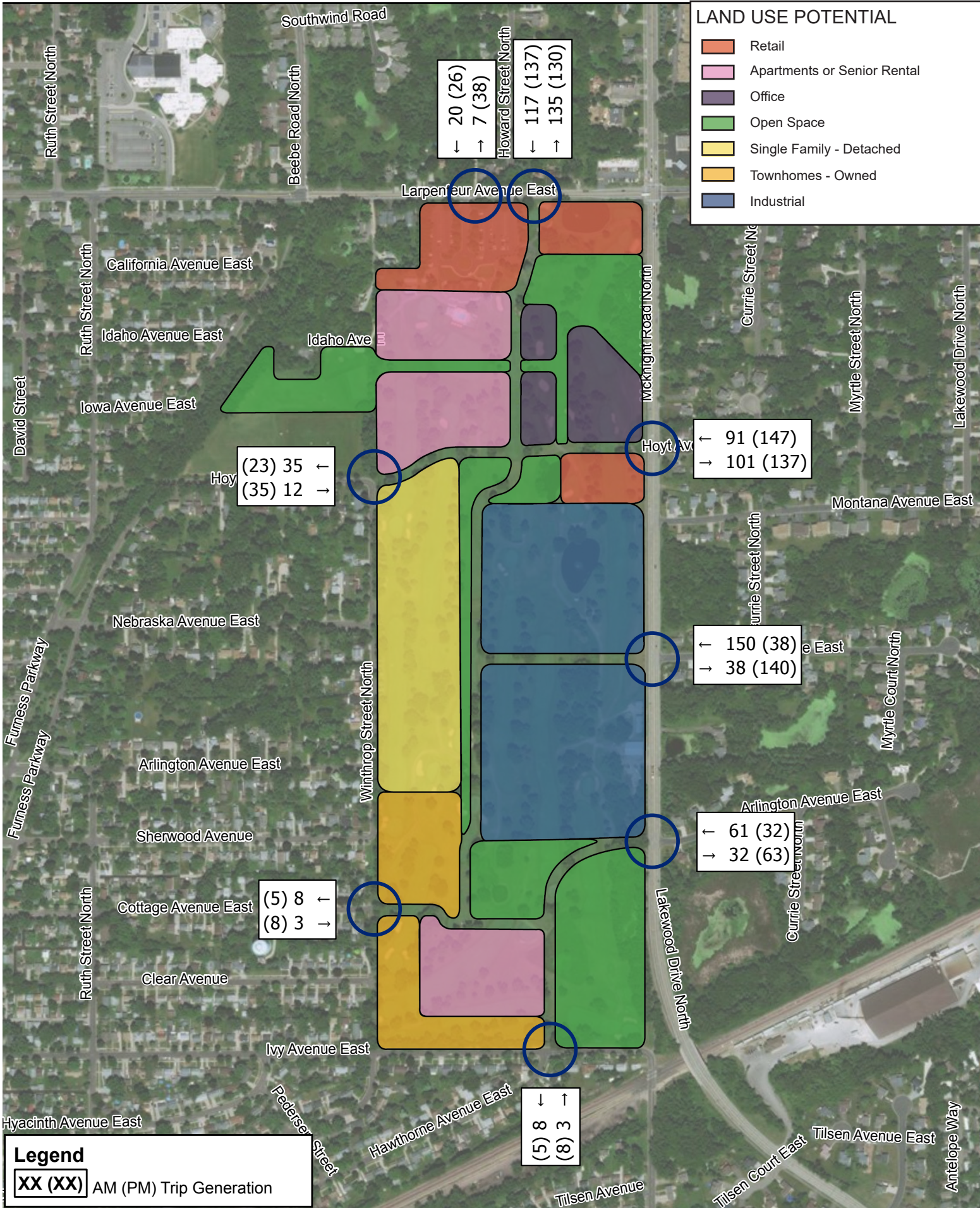
Average Daily Traffic Volume
(2016 or newer)

HILLCREST GOLF COURSE
REDEVELOPMENT
Figure 5 - Current ADT



0' 125' 250' 500'
Scale in Feet

wsb

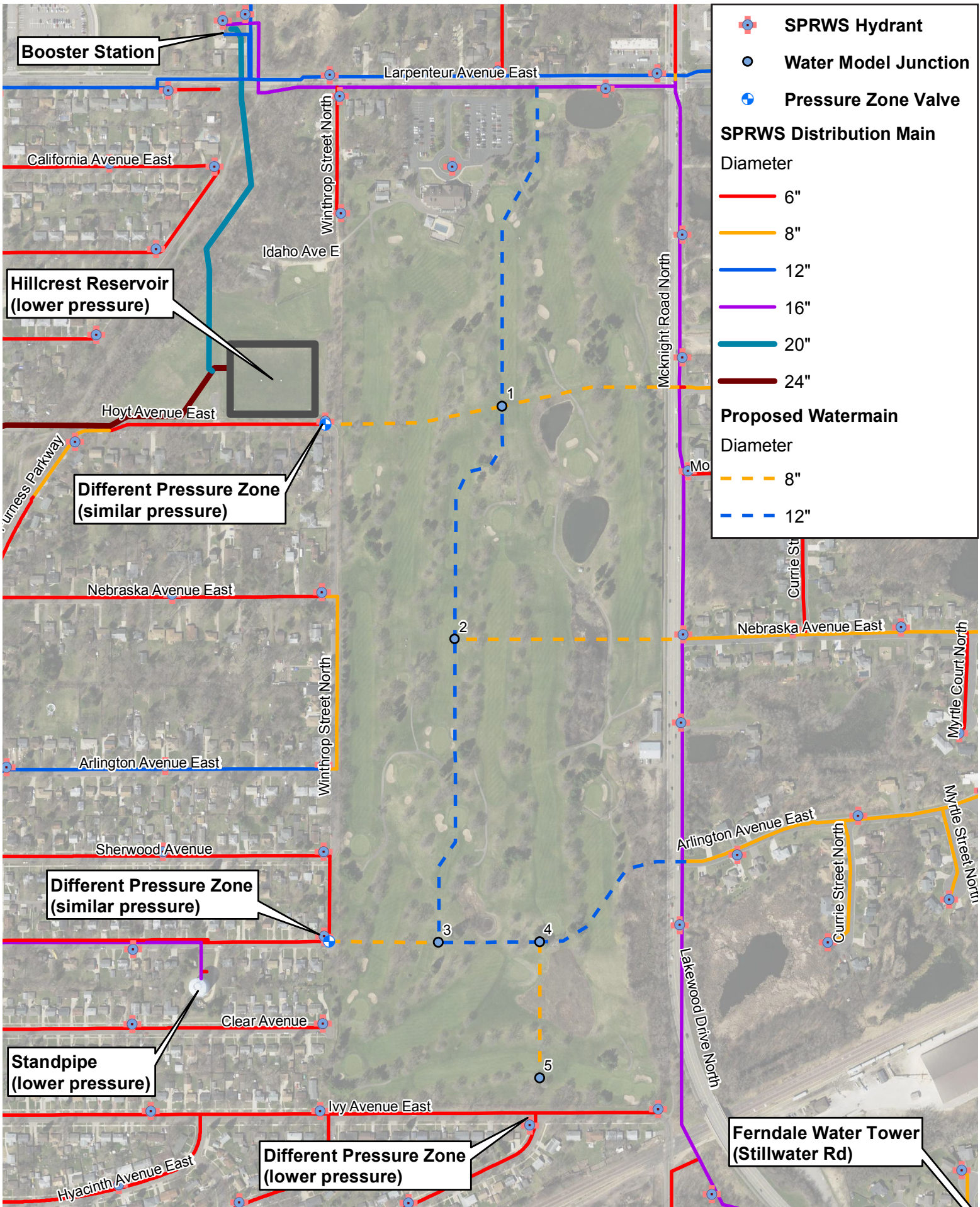


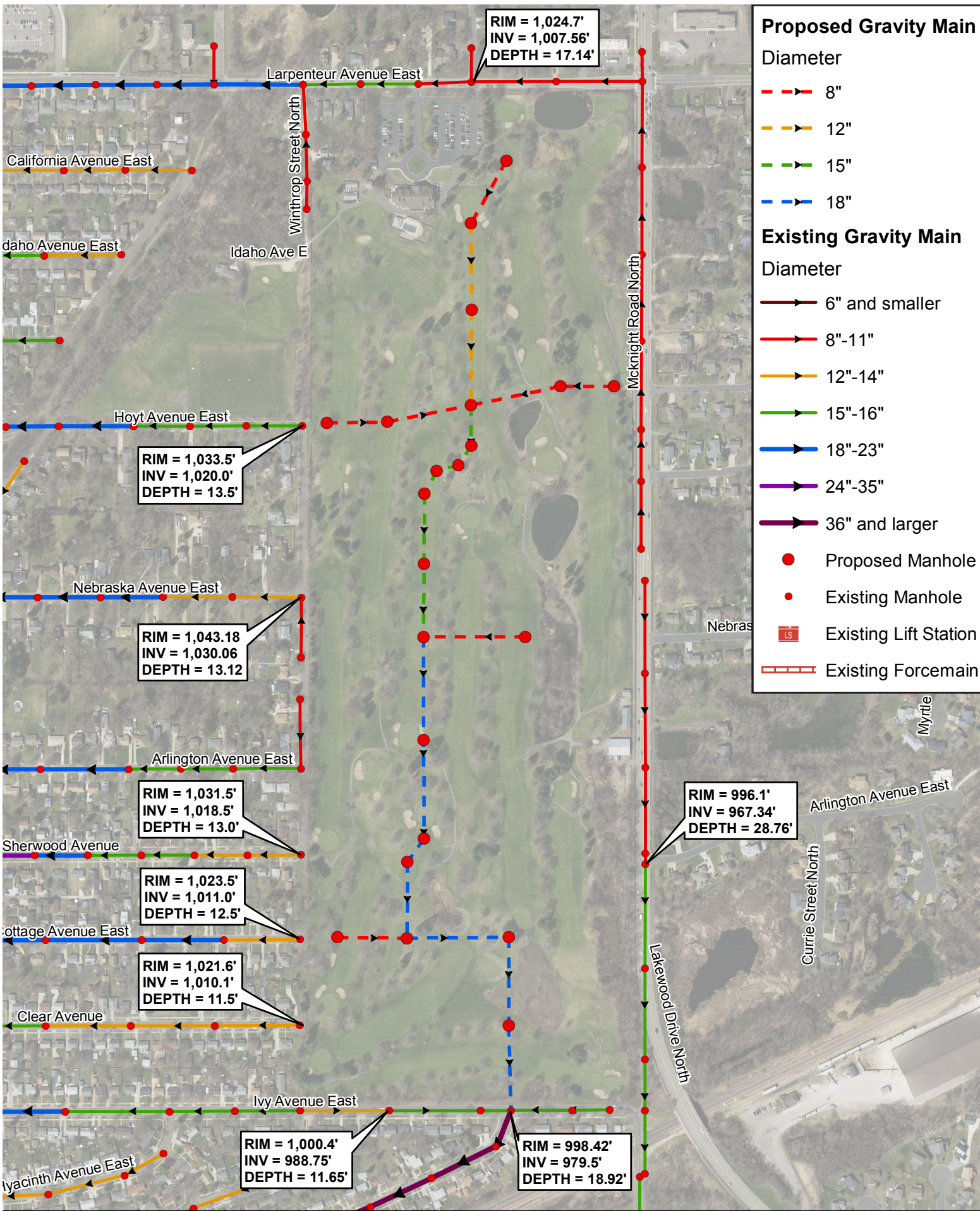
LAND USE POTENTIAL

- Retail
- Apartments or Senior Rental
- Office
- Open Space
- Single Family - Detached
- Townhomes - Owned
- Industrial

Legend

XX (XX) AM (PM) Trip Generation





APPENDIX B

APPENDIX B

Preliminary Cost Estimates

OPINION OF PROBABLE COST						
WSB Project: Hillcrest Golf Course Development Project Location: City of St. Paul, MN				Design By: BPM Checked By: EAB		
WSB Project No: 013987-000				Date: 6/13/2019		
Item No.	MN/DOT Specification No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
A. Surface Improvements						
1	2021.501	MOBILIZATION	LS	1	\$ 934,151.73	\$ 934,151.73
2	2101.505	CLEARING	ACRE	27	\$ 1,000.00	\$ 27,000.00
3	2101.505	GRUBBING	ACRE	27	\$ 1,000.00	\$ 27,000.00
4	2103.501	BUILDING REMOVAL	LS	1	\$ 150,000.00	\$ 150,000.00
5	2104.502	REMOVE LIGHT POLE	EACH	7	\$ 500.00	\$ 3,500.00
6	2104.502	REMOVE MARKER	EACH	1	\$ 1,000.00	\$ 1,000.00
7	2104.502	REMOVE SIGN	EACH	2	\$ 250.00	\$ 500.00
8	2104.503	REMOVE CURB & GUTTER	L F	1650	\$ 7.00	\$ 11,550.00
9	2104.503	REMOVE FENCE	L F	6250	\$ 5.00	\$ 31,250.00
10	2104.504	REMOVE CONCRETE PAVEMENT	S Y	1000	\$ 6.00	\$ 6,000.00
11	2104.504	REMOVE BITUMINOUS PAVEMENT	S Y	17500	\$ 4.00	\$ 70,000.00
12	2104.518	REMOVE BITUMINOUS WALK	S F	76550	\$ 0.50	\$ 38,275.00
13	2104.518	REMOVE CONCRETE WALK	S F	1800	\$ 2.00	\$ 3,600.00
14	2104.602	REMOVE MISCELLANEOUS STRUCTURES	EACH	18	\$ 250.00	\$ 4,500.00
15	2105.504	GEOTEXTILE FABRIC TYPE 5	S Y	26409	\$ 1.00	\$ 26,408.56
16	2105.601	SITE GRADING	LS	1	\$ 250,000.00	\$ 250,000.00
17	2106.507	EXCAVATION - COMMON	C Y	953540	\$ 6.50	\$ 6,198,010.00
18	2106.507	EXCAVATION - CHANNEL AND POND	C Y	61050	\$ 12.00	\$ 732,600.00
19	2106.507	SELECT GRANULAR EMBANKMENT (CV)	C Y	8480	\$ 24.00	\$ 203,520.00
20	2106.507	COMMON EMBANKMENT (CV)	C Y	721112	\$ 5.00	\$ 3,605,560.00
21	2112.519	SUBGRADE PREPARATION	RDST	84.8	\$ 200.00	\$ 16,960.00
22	2123.610	STREET SWEEPER (WITH PICKUP BROOM)	HOURL	100	\$ 150.00	\$ 15,000.00
23	2130.523	WATER	MGAL	200	\$ 45.00	\$ 9,000.00
24	2211.509	AGGREGATE BASE CLASS 5	TON	8187	\$ 18.00	\$ 147,366.00
25	2357.506	BITUMINOUS MATERIAL FOR TACK COAT	GAL	1140	\$ 3.00	\$ 3,420.00
26	2360.509	TYPE SP 12.5 WEARING COURSE MIX (2,C)	TON	2490	\$ 80.00	\$ 199,200.00
27	2360.509	TYPE SP 12.5 NON WEAR COURSE MIX (2,C)	TON	2490	\$ 80.00	\$ 199,200.00
28	2411.604	MODULAR BLOCK RETAINING WALL	SF	80000	\$ 25.00	\$ 2,000,000.00
29	2521.518	4" CONCRETE WALK	S F	50880	\$ 4.50	\$ 228,960.00
30	2521.518	6" CONCRETE WALK	S F	480	\$ 20.00	\$ 9,600.00
31	2531.503	CONCRETE CURB & GUTTER DESIGN B618	L F	16960	\$ 20.00	\$ 339,200.00
32	2545.501	LIGHTING SYSTEM	LS	1	\$ 500,000.00	\$ 500,000.00
33	2563.601	TRAFFIC CONTROL	LS	1	\$ 20,000.00	\$ 20,000.00
34	2564.518	SIGN PANELS TYPE C	S F	70	\$ 45.00	\$ 3,150.00
35	2564.518	SIGN PANELS TYPE SPECIAL	S F	30	\$ 60.00	\$ 1,800.00
36	2573.501	STABILIZED CONSTRUCTION EXIT	LS	1	\$ 5,000.00	\$ 5,000.00
37	2573.503	SILT FENCE, TYPE MS	L F	4240	\$ 2.00	\$ 8,480.00
38	2573.503	SEDIMENT CONTROL LOG TYPE WOOD FIBER	L F	4240	\$ 3.00	\$ 12,720.00
39	2574.508	FERTILIZER TYPE 3	LB	20000	\$ 0.25	\$ 5,000.00
40	2575.504	SODDING TYPE LAWN	S Y	5000	\$ 6.50	\$ 32,500.00
41	2575.504	EROSION CONTROL BLANKETS CATEGORY 3	S Y	5000	\$ 1.50	\$ 7,500.00
42	2575.505	SEEDING	ACRE	100	\$ 500.00	\$ 50,000.00
43	2575.508	SEED MIXTURE 25-131	LB	22000	\$ 1.00	\$ 22,000.00
44	2575.508	HYDRAULIC MULCH MATRIX	LB	7500	\$ 0.75	\$ 5,625.00
45	2575.523	RAPID STABILIZATION METHOD 3	MGAL	100	\$ 200.00	\$ 20,000.00
46	2582.503	4" SOLID LINE MULTI COMP	L F	16960	\$ 1.00	\$ 16,960.00
47	2582.503	4" BROKEN LINE MULTI COMP	L F	4240	\$ 1.00	\$ 4,240.00
48	2582.518	CROSSWALK MULTI COMP	S F	960	\$ 5.00	\$ 4,800.00
CONSTRUCTION TOTAL						\$ 16,212,106.28
CONTINGENCY TOTAL (10%)						\$ 1,621,210.63
SUBTOTAL						\$ 17,833,316.91
INDIRECT COST TOTAL (0%)						
TOTAL						\$ 17,833,316.91
B. Watermain Improvements						
49		CONNECT TO EXISTING WATERMAIN	EACH	6	\$ 1,800.00	\$ 10,800.00
50		8-INCH DIP WATERMAIN CL52	LIN FT	3200	\$ 55.00	\$ 176,000.00
51		12-INCH DIP WATERMAIN CL52	LIN FT	4600	\$ 65.00	\$ 299,000.00
52		DUCTILE IRON FITTINGS	POUND	3200	\$ 10.50	\$ 33,600.00
53		HYDRANT ASSEMBLY	EACH	26	\$ 5,000.00	\$ 130,000.00
54		8-INCH GATE VALVE AND BOX	EACH	5	\$ 2,300.00	\$ 11,500.00
55		12-INCH GATE VALVE AND BOX	EACH	14	\$ 4,600.00	\$ 64,400.00
56						\$ -
57						\$ -
58						\$ -
59						\$ -
60						\$ -

61						\$	-
62						\$	-
						CONSTRUCTION TOTAL	\$ 725,300.00
						CONTINGENCY TOTAL (10%)	\$ 72,530.00
						SUBTOTAL	\$ 797,830.00
						INDIRECT COST TOTAL (0%)	
						TOTAL	\$ 797,830.00
C. Sanitary Sewer Improvements							
63		CONNECT TO EXISTING SANITARY SEWER	EACH	1	\$	1,200.00	\$ 1,200.00
64		8-INCH PVC PIPE SEWER	LIN FT	2100	\$	41.00	\$ 86,100.00
65		12-INCH PVC PIPE SEWER	LIN FT	700	\$	55.00	\$ 38,500.00
66		15-INCH RC PIPE SEWER	LIN FT	1000	\$	75.00	\$ 75,000.00
67		18-INCH RC PIPE SEWER	LIN FT	2300	\$	85.00	\$ 195,500.00
67		REMOVE 15-INCH VCP AND INSTALL 48-INCH RCP PIPE SEW	LIN FT	52	\$	250.00	\$ 13,000.00
67		ADDITIONAL COST FOR SANITARY REPLACEMENT (REMOVA	LIN FT	52	\$	1,650.00	\$ 85,800.00
67		48-INCH DIAMETER SANITARY MANHOLE	EACH	22	\$	3,500.00	\$ 77,000.00
68		CASTING ASSEMBLY	EACH	22	\$	900.00	\$ 19,800.00
69		TELEWISE SANITARY SEWER	LIN FT	6152	\$	2.50	\$ 15,380.00
						CONSTRUCTION TOTAL	\$ 607,280.00
						CONTINGENCY TOTAL (10%)	\$ 60,728.00
						SUBTOTAL	\$ 668,008.00
						INDIRECT COST TOTAL (0%)	
						TOTAL	\$ 668,008.00
D. Storm Sewer Improvements							
70	2104.502	REMOVE PIPE APRON	EACH	8	\$	200.00	\$ 1,600.00
71	2104.503	REMOVE SEWER PIPE (STORM)	L F	120	\$	20.00	\$ 2,400.00
72	2501.502	15" RC PIPE APRON	EACH	2	\$	1,000.00	\$ 2,000.00
74	2501.502	24" RC PIPE APRON	EACH	6	\$	1,500.00	\$ 9,000.00
75	2501.502	30" RC PIPE APRON	EACH	4	\$	2,500.00	\$ 10,000.00
76	2501.602	TRASH GUARD FOR 15" PIPE APRON	EACH	2	\$	500.00	\$ 1,000.00
78	2501.602	TRASH GUARD FOR 24" PIPE APRON	EACH	6	\$	1,000.00	\$ 6,000.00
79	2501.602	TRASH GUARD FOR 30" PIPE APRON	EACH	4	\$	1,500.00	\$ 6,000.00
81	2503.503	15" RC PIPE SEWER DES 3006 CL V	L F	2300	\$	50.00	\$ 115,000.00
83	2503.503	24" RC PIPE SEWER DES 3006 CL III	L F	5750	\$	85.00	\$ 488,750.00
85	2503.503	30" RC PIPE SEWER DES 3006 CL III	L F	3450	\$	150.00	\$ 517,500.00
86	2506.502	CASTING ASSEMBLY	EACH	46	\$	750.00	\$ 34,500.00
87	2506.503	CONST DRAINAGE STRUCTURE DES 48-4020	L F	184	\$	500.00	\$ 92,000.00
88	2506.503	CONST DRAINAGE STRUCTURE DES 60-4020	L F	115	\$	750.00	\$ 86,250.00
89	2506.503	CONST DRAINAGE STRUCTURE DES 72-4020	L F	69	\$	1,000.00	\$ 69,000.00
		POND OUTLET CONTROL STRUCTURE	EACH	5	\$	3,500.00	\$ 17,500.00
		FILTRATION BASIN	ACRE	4	\$	145,000.00	\$ 580,000.00
90	2506.602	CONNECT INTO EXISTING DRAINAGE STRUCTURE	EACH	4	\$	1,000.00	\$ 4,000.00
91	2506.602	CONST DRAINAGE STRUCTURE DESIGN SPEC (2'X3')	EACH	12	\$	2,500.00	\$ 30,000.00
						CONSTRUCTION TOTAL	\$ 2,072,500.00
						CONTINGENCY TOTAL (10%)	\$ 207,250.00
						SUBTOTAL	\$ 2,279,750.00
						INDIRECT COST TOTAL (0%)	
						TOTAL	\$ 2,279,750.00
E. Off-Site Roadway Improvements							
92		TRAFFIC SIGNAL AT MCKNIGHT ROAD	L S	1	\$	300,000.00	\$ 300,000.00
93		ROUND-A-BOUT AT LARPENITEUR AVE	L S	1	\$	300,000.00	\$ 300,000.00
94		TURN LANE CONSTRUCTION	L F	900	\$	150.00	\$ 135,000.00
						CONSTRUCTION TOTAL	\$ 735,000.00
						CONTINGENCY TOTAL (10%)	\$ 73,500.00
						SUBTOTAL	\$ 808,500.00
						INDIRECT COST TOTAL (0%)	
						TOTAL	\$ 808,500.00

COST SUMMARY	
A. Surface Improvements	
Construction Total	\$ 16,212,106.28
Contingency (10%)	\$ 1,621,210.63
Subtotal	\$ 17,833,316.91
B. Watermain Improvements	
Construction Total	\$ 725,300.00
Contingency (10%)	\$ 72,530.00
Subtotal	\$ 797,830.00

C. Sanitary Sewer Improvements		
Construction Total	\$	607,280.00
Contingency (10%)	\$	60,728.00
Subtotal	\$	668,008.00
D. Storm Sewer Improvements		
Construction Total	\$	2,072,500.00
Contingency (10%)	\$	207,250.00
Subtotal	\$	2,279,750.00
E. Off Site Roadway Improvements		
Construction Total	\$	735,000.00
Contingency (10%)	\$	73,500.00
Subtotal	\$	808,500.00
GRAND TOTAL		\$ 22,387,404.91