

Technical Memorandum

To: Jeff Oliver, City Engineer and Eric Eckman, Environmental Resources Supervisor, City of Golden Valley
From: Jennifer Koehler, PE, Senior Water Resources Engineer; Kurt Leuthold, PE, LEED AP, Senior Civil Engineer; and Katie Turpin-Nagel, Water Resources Engineer
Subject: DeCola Ponds E & F Flood Mitigation Planning Study: SEA School/Wildwood Park and Isaacson Park/Sandburg Industrial Area
Date: 11/10/2020
Project: 23/27-1785
c: Laura Jester, BCWMC Administrator

EXECUTIVE SUMMARY

The City of Golden Valley has been working in partnership with other cities, agencies, and stakeholders to implement the Medicine Lake Road and Winnetka Avenue Area Long-Term Flood Mitigation Plan to reduce flooding on the DeCola Ponds system.

The City is currently looking at incorporating flood mitigation projects at additional locations within the City that would specifically help reduce surface flooding in DeCola Ponds D, E, and F. This planning study is evaluating two flood mitigation projects located at the SEA School/Wildwood Park and in the Isaacson Park/Sandburg Industrial area. Table EX-1 provides a summary of the planning level evaluation for the two project areas.

For the SEA School/Wildwood Park flood mitigation project, three planning level concepts were developed based on input from project stakeholders and the public. These three concepts preserve important features in the park/school properties as identified through the input process while developing the optimized flood storage volume of 9.0-11.0 acre-ft of storage in this area for diversion of flows away from DeCola Ponds E and F. These concepts use above ground storage, below ground, or a combination of above and below ground storage. Also included in these concepts is the upsizing of the outlet from DeCola Pond D. Figure 3 through Figure 5 show the planning level concepts. Feedback from the public will be used to modify concepts that will be further evaluated in the Bassett Creek Watershed Management Commission (BCWMC) engineering feasibility study that is currently underway.

Additionally, in the Isaacson Park/Sandburg industrial area, the city is looking at opportunities for the incorporation approximately 20-25 acre-ft of flood storage in the watershed to the east of the Canadian Pacific Railroad and provide for diversion of flows away from DeCola Pond F. This project will require acquisition of parcels to develop the flood storage needed for the diversion of flows away from the DeCola Ponds. This planning level analysis was intended to help the city identify the most promising and feasible locations for flood storage in this area and help the city capitalize on opportunities for parcel acquisitions (if/as they arise) in preparation for a future project. The parcel evaluation resulted in seven

"project area" groupings that we identified as having the highest potential to facilitate the installation of considerable flood storage volumes, including review of existing topography and storm sewer infrastructure elevations. Figure 6 and Figure 7 summarize the Isaacson Park/Sandburg industrial area parcels and those considered for flood mitigation volume.

Assuming we can achieve the project targets outlined above, the estimated combined impact of the two flood mitigation projects will reduce the number of at-risk homes around DeCola Ponds D, E, and F by approximately by nine (9) structures during the 10-year event and 15 to 21 structures during the 100-year event.

Table EX-1 Planning Level Flood Mitigation Project Summary

Concept	Concept Name	Estimated Flood Storage Developed (acre-ft)	Planning Level Opinion of Probable Cost Range (-30% to +50%) ¹	Potential Reduction in Number of At-Risk Homes
SEA School/Wildwood Park & DeCola Pond D Outlet				
Concept 1	Dry Surface Storage	9.4	\$2.3 - \$5.0 million	6-7
Concept 2	Wet Pond and Underground Storage	10.0	\$4.1 - \$8.7 million	
Concept 3	Underground Storage	9.9	\$7.4 - \$15.9 million	
Isaacson Park/Sandburg Industrial Area Flood Mitigation²				
Area 2	2291/2301 Nevada Ave N	22.4	\$5.3 - \$11.4 million	1-8
Area 5	2305, 2325, and 2355 Louisiana Ave N	17.7	\$5.7 - \$12.2 million	
Area 7	7125 Sandburg Road	20.6	\$9.8 - \$21.1 million	
Area 8	7145/7147 Sandburg Road	19.8	\$4.8 - \$10.2 million	
Combined Project Evaluation (SEA School/Wildwood Park, DeCola Pond D Outlet, & Isaacson Park/Sandburg Industrial Area Flood Mitigation)³				
	Combined Project Evaluation	10.0 (SEA School)/22.4 (Area 2)	\$7.6 - \$20.1 million	15-21

¹ Opinion of Cost includes planning, engineering/design, and construction

² Opinion of probable cost includes parcel acquisition, relocation, and demolition costs (taxable market value multiplied by a factor of 1.5, as recommended by City of Golden Valley staff during the long term flood mitigation plan) along with planning, engineering/design, and construction costs of the flood storage and storm sewer diversion

³The combined evaluation run assumes that the proposed projects will be able to divert the majority of flows away from DeCola Ponds E and F and that the project will be able to provide the water quality mitigation volume needed.

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INTRODUCTION

Chronic flooding has occurred around the DeCola Ponds and on Medicine Lake Road, Winnetka Avenue, and other streets near the ponds since the 1970s. In 2011 and 2012, the City of Golden Valley completed the *DeCola Ponds Area Flood Mitigation Study* (2012 *DeCola Ponds Study*) to understand causes of and opportunities to address flooding at the low point on Medicine Lake Road east of Winnetka Avenue and around the downstream DeCola Ponds. As part of the study, Barr developed an XP-SWMM model for the project area within Golden Valley, and incorporated an existing model originally developed for the City of New Hope for the area upstream of Medicine Lake Road. The XP-SWMM model was used to evaluate engineering alternatives to reduce flooding at Medicine Lake Road and in the DeCola Ponds system. Although several of the evaluated flood mitigation alternatives were expected to reduce flooding at Medicine Lake Road and around the DeCola Ponds, no alternative fully-resolved the flooding issues (some structures would remain at-risk of flooding even with implementation of the project). Additionally, the most promising flood mitigation projects came with a significant cost.

Because approximately half of the watershed contributing to the flood areas was from areas outside of Golden Valley and because of the significant capital costs of a flood mitigation project that would only partially resolve the flooding issue, one of the 2012 *DeCola Ponds Study* recommendations was for the Cities of Golden Valley, New Hope, and Crystal to develop a long-term flood mitigation plan for the project area. Based on that recommendation, the three Cities agreed to participate in the development of a long-term flood mitigation plan, which was completed in May 2016 (*Medicine Lake Road and Winnetka Avenue Area Long-Term Flood Mitigation Plan*). This plan helped to outline critical flood mitigation project locations and planning-level costs that could be used to direct future efforts. Eight (8) flood storage mitigation projects were assessed in this study including locations in Yunker Park (Crystal), Roslyn Court (New Hope), and the Liberty Crossing Development, Pennsylvania Woods/DeCola Ponds B and C, Isaacson Park/Sandburg Industrial Parcels, and the School of Engineering and Arts (from here forward referred to as the SEA School) (Golden Valley). These specific areas were analyzed as they are expected to have the most significant impact on flood elevation reductions.

The City of Golden Valley worked in partnership with a private developer for the construction of the first flood mitigation alternatives at the Liberty Crossing Development. Construction was completed in 2017. Additionally, the city has worked in partnership with Minnesota Department of Natural Resources (MnDNR) and the Bassett Creek Watershed Management Commission (BCWMC) on the implementation of the second project, the DeCola Ponds B and C improvement project, that expanded flood storage around DeCola Ponds B & C and established the connection to the storage developed as part of the Liberty Crossing development project. Project construction and restoration was completed in 2020. In 2016, the City of Crystal also developed additional flood storage in Yunker Park.

These three projects were intended to lower peak water surface elevations along the low point on Medicine Lake Road and DeCola Ponds A, B, and C. However, high water levels are also a concern for

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residents surrounding DeCola Ponds D, E, and F, and other flood mitigation projects are needed to lower peak flood elevations on these ponds.

The City is looking to incorporate flood mitigation projects at additional locations within the City that would specifically reduce surface flooding in DeCola Ponds D, E, and F. In March 2020, the Golden Valley City Council authorized the DeCola Ponds E and F Flood Mitigation Study, a planning study to explore the next phases of the Medicine Lake Rd and Winnetka Ave Area Long-Term Flood Mitigation Plan. This memorandum summarizes the additional planning study and public input conducted for the flood mitigation projects identified at the SEA School/Wildwood Park area. This also includes further evaluation of flood storage opportunities in the Isaacson Park/Sandburg Industrial area.

HYDROLOGIC AND HYDRAULIC MODELING

Existing Conditions Field Investigations and Model Updates

Early in the concept evaluation process for the Isaacson Park/Sandburg Industrial area, a field investigation took place to assess the existing conditions of the ditch/channel east of the Canadian Pacific railroad that runs along the east side of DeCola Pond C. The channel was inspected due to the channel's hydraulic significance in relation to the planning level concepts evaluated for the Isaacson Park/Sandburg Industrial area. At the time when the initial XP-SWMM model was developed for the DeCola Ponds, 2008 topographic information was used for this channel. This was the best available topographic data at that time. The 2008 topographic data showed a high point in the ditch along the east side of the railroad that was higher than the 100-year peak flood elevation for DeCola Pond C. This meant there would be no flow in this ditch from Pond C to Pond F. However, review of topographic information from the 2011 LiDAR data showed that this high point was lower than the 2008 elevation and there may in fact be flow from Pond C to Pond F. A field investigation was performed and it confirmed that the high point in the channel was lower than the 2008 elevation in the model. When water levels in Pond C are above the channel high point of 898.00 ft MSL (as estimated from 2011 LiDAR data), water flows to a storm sewer east to the intersection of Nevada Avenue and Sandburg Avenue and south to the pipe crossing into DeCola Pond F.

The existing conditions XP-SWMM model was updated to reflect the 2011 LiDAR channel topographic data at this overflow point. Both existing conditions models reflect the implementation of the Liberty Crossing and DeCola Ponds B & C improvement projects. Figure 1 shows the existing conditions subwatersheds, storm sewer, and key flood areas for the general planning study area. Table 1 shows a comparison of the 10- and 100-year Atlas-14 flood elevations for the key flood locations based on the updated 2011 ditch/channel overflow elevation.

Table 1 Key Flood Area Maximum Water Surface Elevations based on Existing Conditions XP-SWMM Model Updates (Changes shown in blue)

Flood Area	Flood Area Description	Flood Elevation (ft-NAVD88)			
		Existing Conditions (Original Model) ¹		Existing Conditions (Updated Model) ²	
		10-yr	100-yr	10-yr	100-yr
1	Terra Linda Low Point	906.5	907.3	906.5	907.3
2	Medicine Lake Road Low Point/Rosalyn Court	901.5	902.3	901.5	902.2
3	Rhode Island Ave Low Point	898.9	901.8	898.9	901.7
4	Dover Hill Apartments	900.9	901.8	900.9	901.7
5	DeCola Pond A	898.6	901.8	898.5	901.7
6	DeCola Pond B	898.6	901.8	898.5	901.7
7	DeCola Pond C	898.6	901.8	898.5	901.7
8	DeCola Pond D	893.7	901.8	893.7	899.7
9	DeCola Pond E	893.3	896.0	893.1	895.9
10	DeCola Pond F	893.2	896.0	893.1	895.8
11	Medicine Lake Road East of Railroad	911.5	912.3	911.6	912.3
12	East of Railroad to DeCola Pond C	899.5	901.8	900.1	901.6
13	East of Railroad at Low Point on Nevada	903.0	903.8	903.0	903.8
14	East of Railroad at Low Point on Sandburg	902.5	903.8	902.3	903.8
15	East of Railroad to DeCola Pond F	899.0	901.5	898.6	901.2
16	Honeywell Pond	883.4	886.3	883.4	886.4

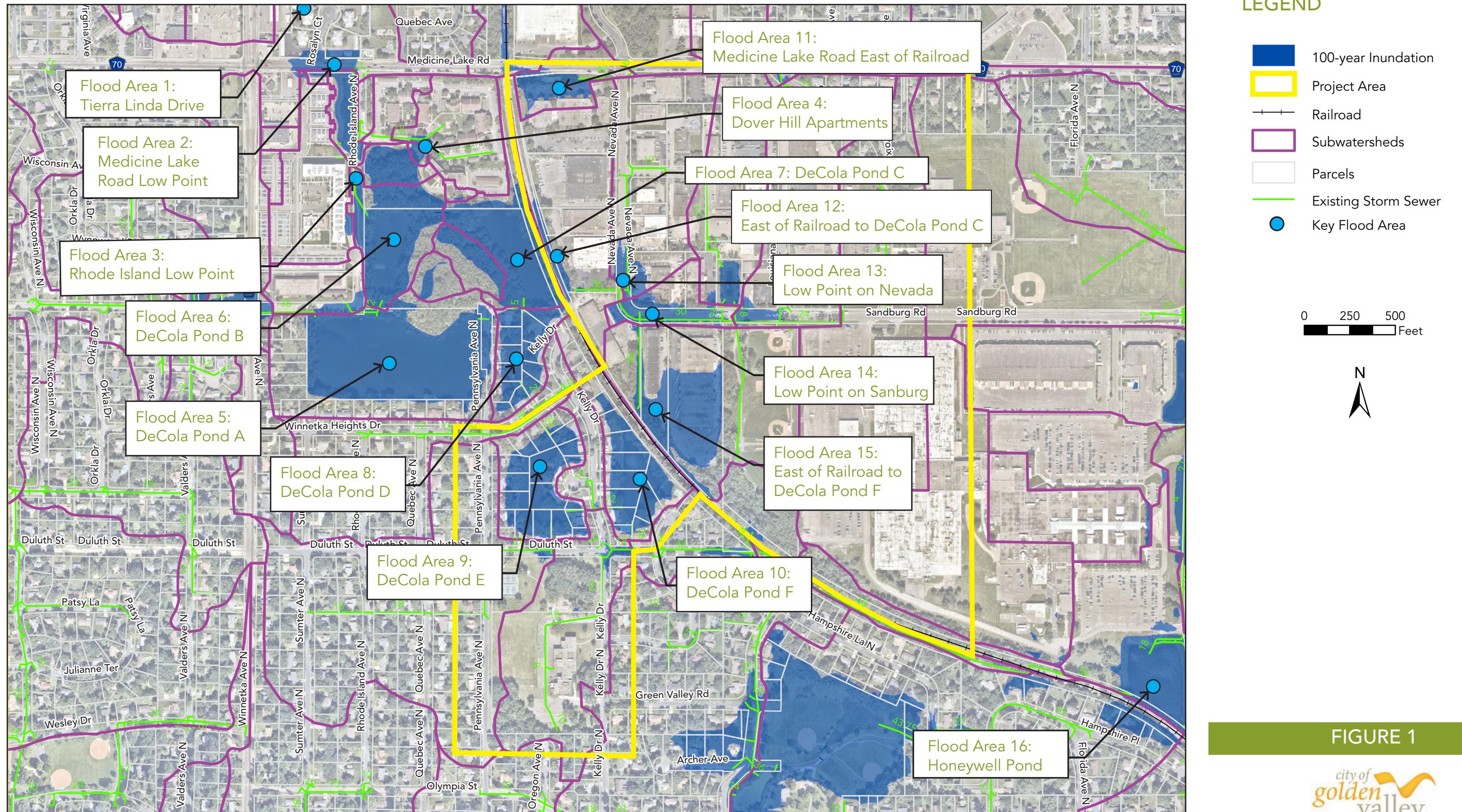
¹ Existing conditions flood elevations include the Liberty Crossing and DeCola Ponds B/C flood mitigation projects

² Existing conditions flood elevations include the Liberty Crossing and DeCola Ponds B/C flood mitigation projects and updates to the channel east of the railroad and DeCola C based on field investigations and the 2011 LiDAR dataset.

The most notable difference between the two model versions is the estimated 100-year maximum water surface elevation for DeCola Pond D. The lower channel overflow allows for additional runoff to bypass DeCola Pond C and flow directly to DeCola Pond F. This lowers the 100-year flood elevation in DeCola Ponds A, B & C from 901.8 to 901.7 and reduces the amount of water overtopping the berm between DeCola Ponds C and D. The 100-year flood elevations on DeCola Ponds C and D no longer equilibrates, resulting in a lower maximum flood elevation on DeCola Pond D from 901.8 to 899.7.

Other key flood areas showed slight reductions to the maximum water surface elevations, although to a smaller extent (0.1 to 0.6 feet). The reductions to the maximum water surface elevations in many of the surrounding areas due to the lower channel overflow elevation shows the interconnection of the system's hydraulics and timing of peaks. When proposing different projects to mitigate flood elevations, understanding the combined impact will be an important step.

Project Area Subwatersheds and Storm Sewer



DeCola Ponds E & F Flood Mitigation Planning Study

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Evaluation of Proposed Alternatives

The current (updated) XP-SWMM hydrologic and hydraulic model as discussed above, was used to evaluate the planning level concepts and estimate the expected impacts on peak flood elevations for projects in the SEA School/Wildwood Park area as well as the Isaacson Park/ Sandburg Avenue Industrial area. The evaluation included various storage volumes and routing options to determine optimized flood storage (i.e. flood storage volume developed versus the expected impact on the peak flood elevations on DeCola Ponds E & F). These are high-level planning analyses to understand the potential project improvements. A summary of the 10-year and 100-year peak flood elevations and summary of potentially impacted homes are summarized in Table 5 below. Further evaluation and refinement of these planning level concepts will continue during future engineering feasibility studies.

SUMMARY OF SEA SCHOOL/WILDWOOD PARK ALTERNATIVES

The SEA School and adjacent Wildwood Park was a site originally analyzed in the *Medicine Lake Road and Winnetka Avenue Area Long-Term Flood Mitigation Plan* (2016) to study the flood reduction impacts to DeCola Ponds E and F. The SEA School/Wildwood Park area was originally selected as a potential flood mitigation site due to the area being publicly-owned, the availability of open green space for the development of additional flood storage, and the opportunities to incorporate water quality treatment, develop habitat, and provide educational opportunities for the SEA School students, families, and park users.

Figure 2 shows the existing conditions in the SEA School and Wildwood Park project area.

Existing Conditions



LEGEND

- Project Area
- Railroad
- Existing Trails
- Existing Footpaths
- Existing Storm Sewer
- Parcels

Contours

- 2-foot contour
- 10-foot contour



0 100 200
Feet

FIGURE 2



DeCola Ponds E & F Flood Mitigation Planning Study: SEA School/Wildwood Park

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Stakeholder and Public Input

Because the flood mitigation concepts will impact Wildwood Park and potentially the northern portion of the SEA school property, input from city staff, Robbinsdale Area Schools, and the public were compiled and considered before developing the flood mitigation concepts.

Coordination with City of Golden Valley Representatives

A virtual meeting with representatives of the various city departments including engineering, public works and utilities, planning, and parks was held on April 9, 2020. The goal of this meeting was to review the conceptual project for the Wildwood Park/SEA School area and hear about known issues and future plans and projects that should be considered when developing the flood mitigation concepts.

Coordination with Robbinsdale Area School/SEA School Representatives

Because the flood mitigation concepts will impact Wildwood Park and potentially the northern portion of the SEA school property, both of which are used by the school for education and play, the City held a virtual meeting with representatives of the Robbinsdale Area School District and SEA school to find out how the school utilizes these areas, what school and grounds improvements are anticipated in the future, and if there are any known issues in these areas based on their use. This meeting was held on April 23, 2020.

Public Virtual Input – Park Use

As a result of the ongoing Covid-19 pandemic, an in-person public open house was not an option to discuss the flood mitigation project on the SEA School and Wildwood Park properties due to public safety concerns. Instead, an online survey and interactive map was made available from June 11 through June 26, 2020. A letter was mailed to residents informing them of the online survey. Web links were also made available on the SEA School Project webpage, the City website news feed, social media, and in an update in the weekly DeCola Ponds project news posting to promote participation in the survey.

A summary of the results of the public input survey is compiled here:

<https://www.goldenvalleymn.gov/stormwater/pdf/SEA-School-Input-Report.pdf>

This input was used to inform the development of the planning level concepts.

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Public Virtual Input – Response to Planning Level Concepts

As a result of the ongoing Covid-19 pandemic, an in-person public open house was not an option to present the three planning level concepts (discussed further below) for the flood mitigation project on the SEA School and Wildwood Park properties due to public safety concerns. The planning level concepts for flood storage on the SEA School and Wildwood Park properties were presented in a pre-recorded presentation that was posted online. A letter was mailed to residents informing them of the online presentation. Web links were made available on the SEA School Project webpage, the City website news feed, social media, and in an update in the weekly DeCola Ponds project news posting to promote review and feedback of the concepts. A *CityNews* story was also developed. Public input forms on the planning level concepts could be submitted to the city from September 17, 2020 through October 5, 2020. City staff were also able to follow-up with individuals who provided input and wanted further discussion to clarify comments and answer questions.

A summary of the results of the public input on the planning level concepts is compiled here:
<https://www.goldenvalleymn.gov/stormwater/pdf/SEA-School-Input-Report.pdf>

Concept Designs

Using the current (updated) XP-SWMM hydrologic and hydraulic model, the optimized flood storage volume for the SEA School/Wildwood Park project was estimated to be between 9.0 and 11.0 acre-ft. This volume was used to inform the sizing of the concept designs presented below. In all cases, flows from the direct watershed to DeCola Pond E would be routed into the proposed flood mitigation storage area. Depending on the amount of extended detention and proposed routing of flows (including allowing some flows to bypass DeCola Ponds E and F), the expected 100-year flood elevations on DeCola Ponds E & F are expected to range from 895.3 to 895.4 ft MSL, which is a reduction in flood elevation from existing conditions of approximately 0.5 to 0.6 feet. This reduction in flood elevations for the 100-year event could remove one (1) at-risk home from the floodplain. Eighteen (18) at-risk homes would still remain in the floodplain around DeCola Ponds E and F.

Additionally, as part of this evaluation, we considered the opportunity to upsize the outlet from DeCola Pond D to further reduce peak flood elevations on DeCola Pond D. The analysis estimated the impact on peak flood elevations on DeCola Pond D as well as any negative impacts to DeCola Ponds E & F. Ultimately, upsizing the outlet from DeCola Pond D to a 48" RCP from DeCola Pond D to DeCola Pond E can lower the flood elevation to 897.0 ft MSL without significant negative consequences to flood elevations in DeCola Ponds E & F (increase in 0.03 ft), which could reduce the flood risk for six (6) at-risk homes from the 100-year floodplain surrounding DeCola Pond D. Four (4) at-risk homes would remain in the floodplain around DeCola Pond D. The estimated 0.03 foot increase in the estimated flood elevations

on DeCola Ponds E & F would be mitigated by the additional flood storage proposed at SEA School/Wildwood Park.

Based on the input heard from City staff, Robbinsdale Area Schools/SEA School representatives, the general public input from June 2020, and the initial hydrologic and hydraulics modeling, three conceptual flood mitigation designs were developed and are described below. In general, the stakeholder input process identified key features valued by park users, including the pickleball courts, playground, sledding hill, and the woods located in the northeast corner of the parcel. In all concepts, these important park features were preserved. Adding additional park amenities (e.g., shade areas, benches, noise barriers) will also be possible with all concepts. Additionally, all concepts create an expanded, looped walking trail around the park and preserve the existing trails through the wooded knoll. Furthermore, in all three concepts, the existing SEA School driveway is proposed to be re-aligned to provide additional storage area and provide enhanced pedestrian and traffic safety by aligning the school exit with Maryland Avenue.

The three concepts were shared for additional public input in September 2020 and the comments received through this second public outreach will help to inform the concepts that will be further evaluated in the next phase of engineering feasibility that will occur through the BCWMC's Capital Improvement Project (CIP) process beginning fall 2020. Table 2 summarizes each concept and the planning-level opinions of probable cost ranges. Specific details on each concept are provided in the subsequent sections.

Table 2 SEA School/Wildwood Park Flood Mitigation Concept Design Summary

Concept	Concept Name	Planning Level Opinion of Probable Cost Range (-30% to +50%)¹
Concept 1	Dry Surface Storage	\$2.3 - \$5.0 million
Concept 2	Wet Pond and Underground Storage	\$4.1 - \$8.7 million
Concept 3	Underground Storage	\$7.4 - \$15.9 million

¹ Opinion of Cost includes planning, engineering/design, and construction

Concept 1: Dry Surface Storage

Concept 1 aligns most closely with the preliminary project identified in the long-term flood mitigation plan completed in 2016. Concept 1 provides approximately 9.4 acre-feet of live flood storage in Wildwood Park relying on above ground storage as shown in Figure 3. This alternative will have the most significant impact on the topography within the park, lowering many of the existing open spaces. To maximize storage area within the park, the widths of Duluth Street and Kelly Drive that run alongside Wildwood Park were reduced by 6 feet and trails were added next to the streets to provide a space place for

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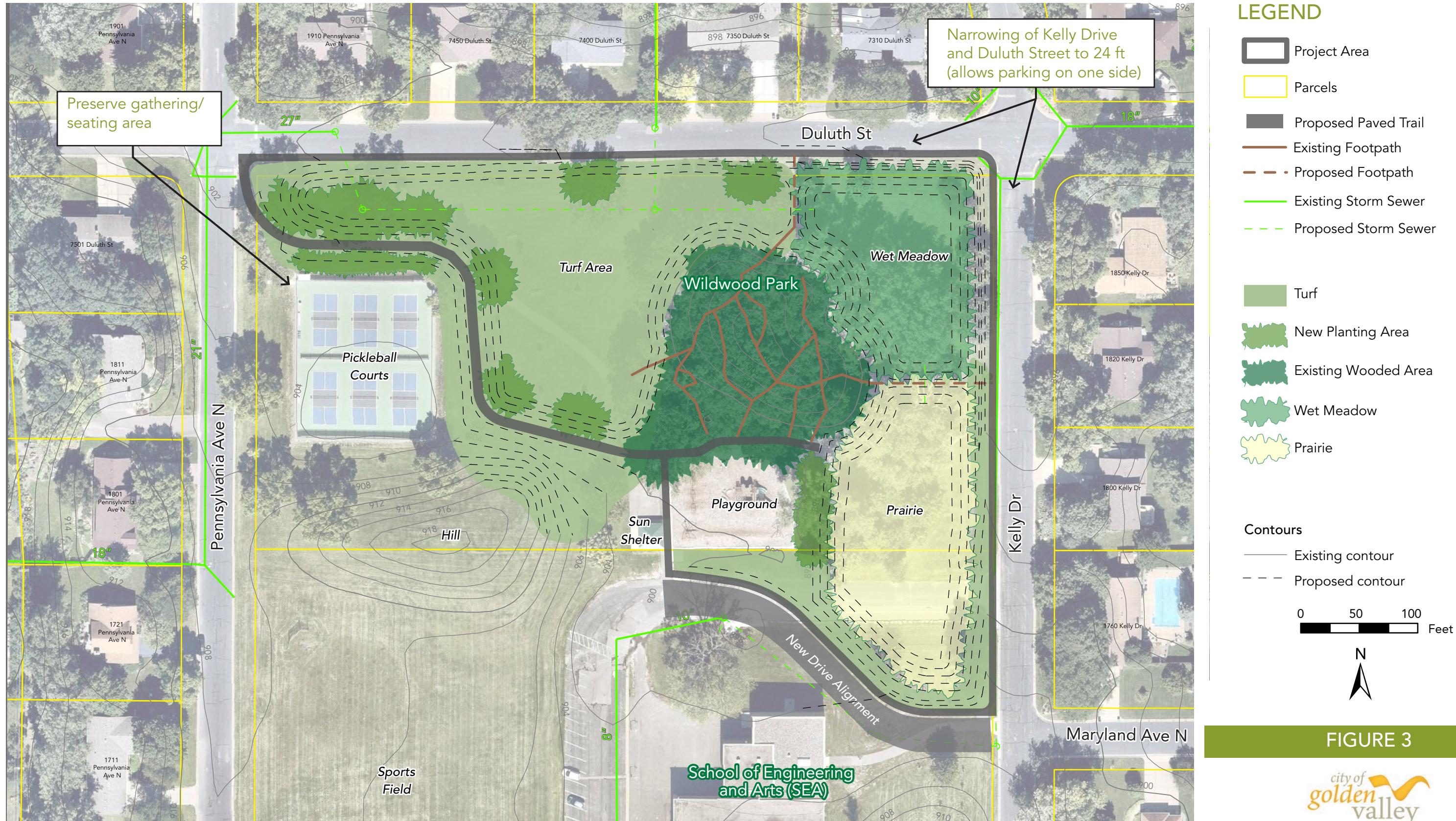
pedestrians and bicyclists. This is not intended to have any impact on traffic flow, but will reduce street parking to one side of the road.

The flood mitigation storage in Concept 1 relies on the creation of three different low areas that will provide flood storage during different size/frequency storm events and can provide opportunities to restore more varied habitat within the park based on the anticipated frequency of flooding. The basin in the northeast portion of the park will be the wettest area of the park, temporarily storing water during the more frequent, smaller storm events and can be expected to act as a wet meadow. The proposed basins in the southeast portion of the site will be drier and can be restored as upland prairie habitat (e.g., incorporating native grasses, wildflowers, shrubs and shrub-like trees), only storing water during larger storm events that can overtop the proposed trail connection. Similarly, the turf area in the western portion of the park will be lowered to provide storage during larger storm events; however, this area can be expected to be dry most of the year and used for informal play and gathering by park users.

Planning level design opinions of probable cost were developed for the three flood mitigation concepts and generally correspond to standards established by the Association for the Advancement of Cost Engineering (AACE). Class 5 concept design-level opinions of costs were used based on the limited project definition (less than 15% design), wide-scale use of parametric models to calculate estimated costs (i.e., making extensive use of order-of-magnitude costs from similar projects), and uncertainty, with an acceptable range of between -30% and +50% of the estimated project cost.

It is estimated that Concept 1 will cost between \$2.3 million and \$5.0 million to design and construct.

Concept 1: Dry Surface Storage (9.4 acre-ft)



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Concept 2: Wet Pond and Underground Storage

Concept 2 provides approximately 10.0 acre-feet of live flood storage in Wildwood Park using a combination of above-ground and underground storage features as shown in Figure 4. The surface feature in the eastern portion of the park consists of a wet retention pond that will have a maximum depth of four feet and a normal water level (NWL) of 890. The open water area will not only provide a new habitat type that will invite new species to the area, but it will also serve as a water quality feature by removing particulate pollutants from runoff. Similar to Concept 1, to maximize storage area within the park, the widths of Duluth Street and Kelly Drive that run alongside Wildwood Park were reduced to provide more space for storage.

Approximately 40% of the proposed flood storage will be attained by the underground storage feature. The subsurface system will ensure that the existing turf area in the central and western portion of the park would be dry at all times and available for use for informal play and gathering by park users. Both the wet retention pond and underground storage area will be utilized for small and large storm events.

The planning level design opinion of cost to design and construct Concept 2 ranges from \$4.1 million and \$8.7 million.

Concept 2: Wet Pond and Underground Storage (10.0 acre-ft)

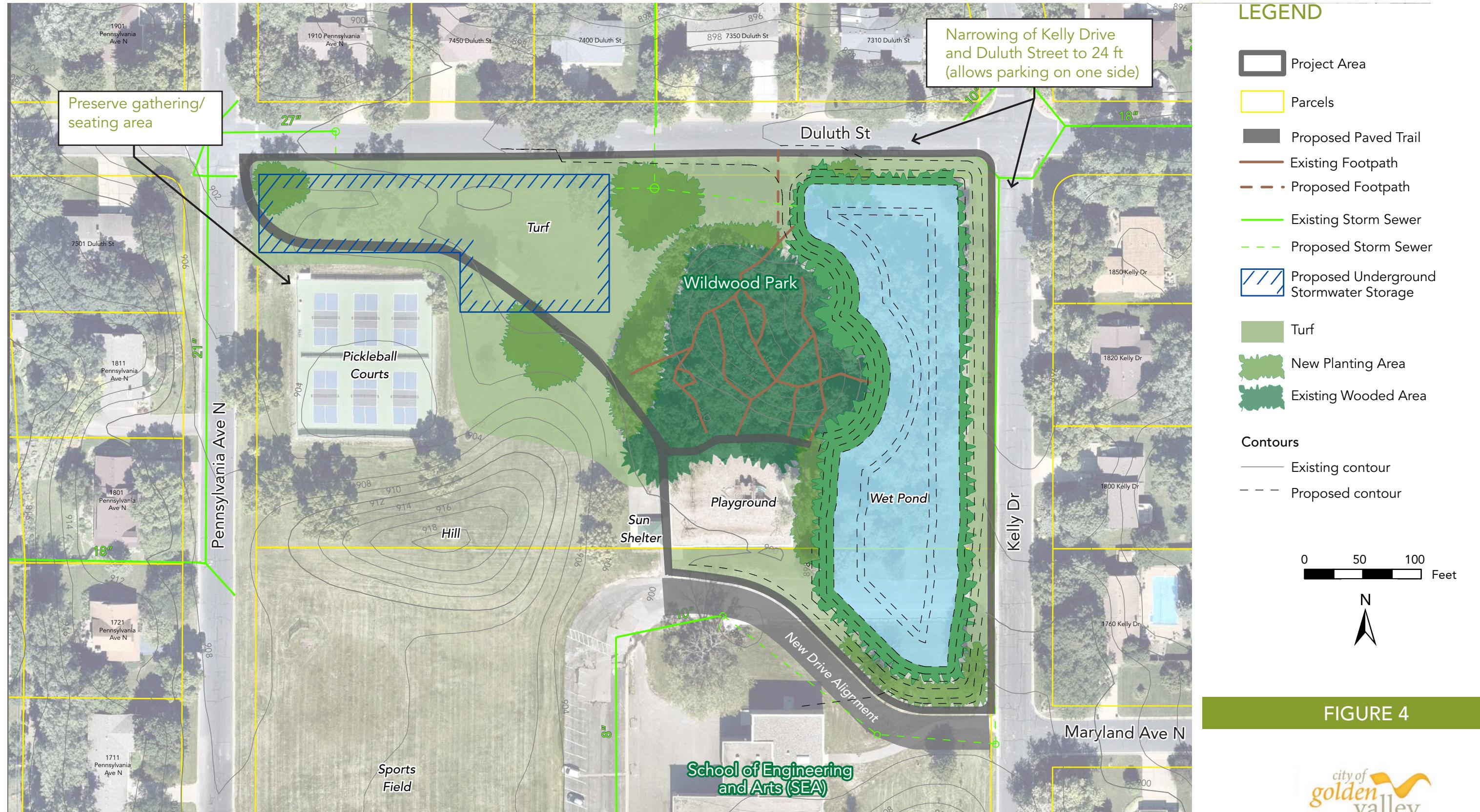


FIGURE 4



DeCola Ponds E & F Flood Mitigation Planning Study: *SEA School/Wildwood Park*

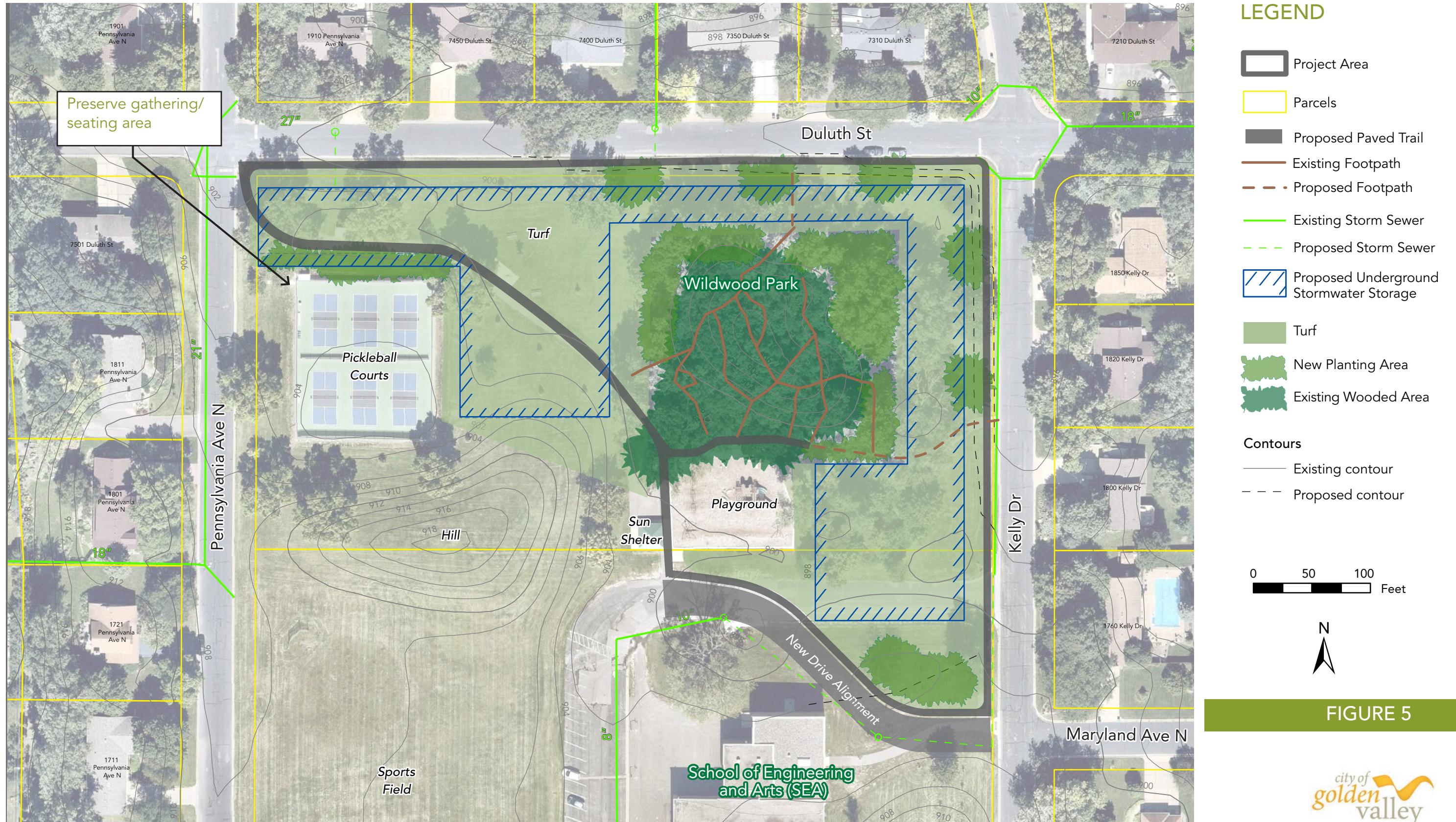
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Concept 3: Underground Storage

Concept 3 provides approximately 9.9 acre-feet of live flood storage in Wildwood Park using only underground storage as shown in Figure 5. The underground system will ensure that the existing turf area in the park would be dry at all times and available for use for informal play and gathering by park users (e.g., being utilized for small and large storm events). This alternative will result in the least amount of visual change to the existing park area after restoration. Although the concept shows the area restored as turf, similar to existing conditions, there may be opportunities to incorporate areas of native prairie grasses, wildflowers, shrubs, and shrub-like trees in various locations.. No changes to the widths of Duluth Street and Kelly Drive that run alongside Wildwood Park are proposed in this concept.

The planning level design opinion of cost to design and construct Concept 3 ranges from \$7.4 million and \$15.9 million.

Concept 3: Underground Storage (9.9 acre-ft)



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SUMMARY OF ISAACSON PARK/SANDBURG INDUSTRIAL AREA ALTERNATIVES

The Isaacson Park and Sandburg Industrial areas were originally analyzed in the *Medicine Lake Road and Winnetka Avenue Area Long-Term Flood Mitigation Plan* (2016) to study the flood reduction impacts to DeCola Ponds E and F. The Isaacson Park/Sandburg Industrial area was originally selected as potential flood mitigation site due to the contribution of runoff volume to DeCola Pond F, the location of existing stormwater infrastructure and proximity to DeCola Pond F, and Isaacson Park is located on city-owned property. The difficulty with including flood storage in the Sandburg Industrial area is that an industrial parcel will need to be purchased in order to provide the required space for flood storage, which adds significant cost to the total overall project cost.

The Sandburg Industrial site originally selected in the *Medicine Lake Road and Winnetka Avenue Area Long-Term Flood Mitigation Plan* (2016) was at 7145 Sandburg Road. The original project proposed to develop 19.8 acre-ft of additional flood storage (and 4.0 acre-ft of water quality volume) on a 2.16-acre industrial parcel just north of the railroad and 0.7 acre-ft of flood storage on the south end of Isaacson Park adjacent to the railroad. The majority of flows from this area were routed away from DeCola Pond F, discharging to the storm sewer system downstream of DeCola Pond F.

However, the City requested that Barr look at other parcels or combination of parcels in the industrial area to better understand all of the potential locations that may be able to provide similar flood storage/detention and water quality treatment as the 7145 Sandburg Road parcel so that the city is able to better plan for and respond to opportunities as they arise in preparation for project implementation.. This section summarizes the Sandburg industrial area parcels investigated and outlines potential opportunities the City may consider for acquisition to achieve the needed flood storage to reduce flooding on DeCola Ponds E & F.

Figure 6 shows the existing conditions in the Isaacson Park/Sandburg Industrial project area.

Existing Conditions

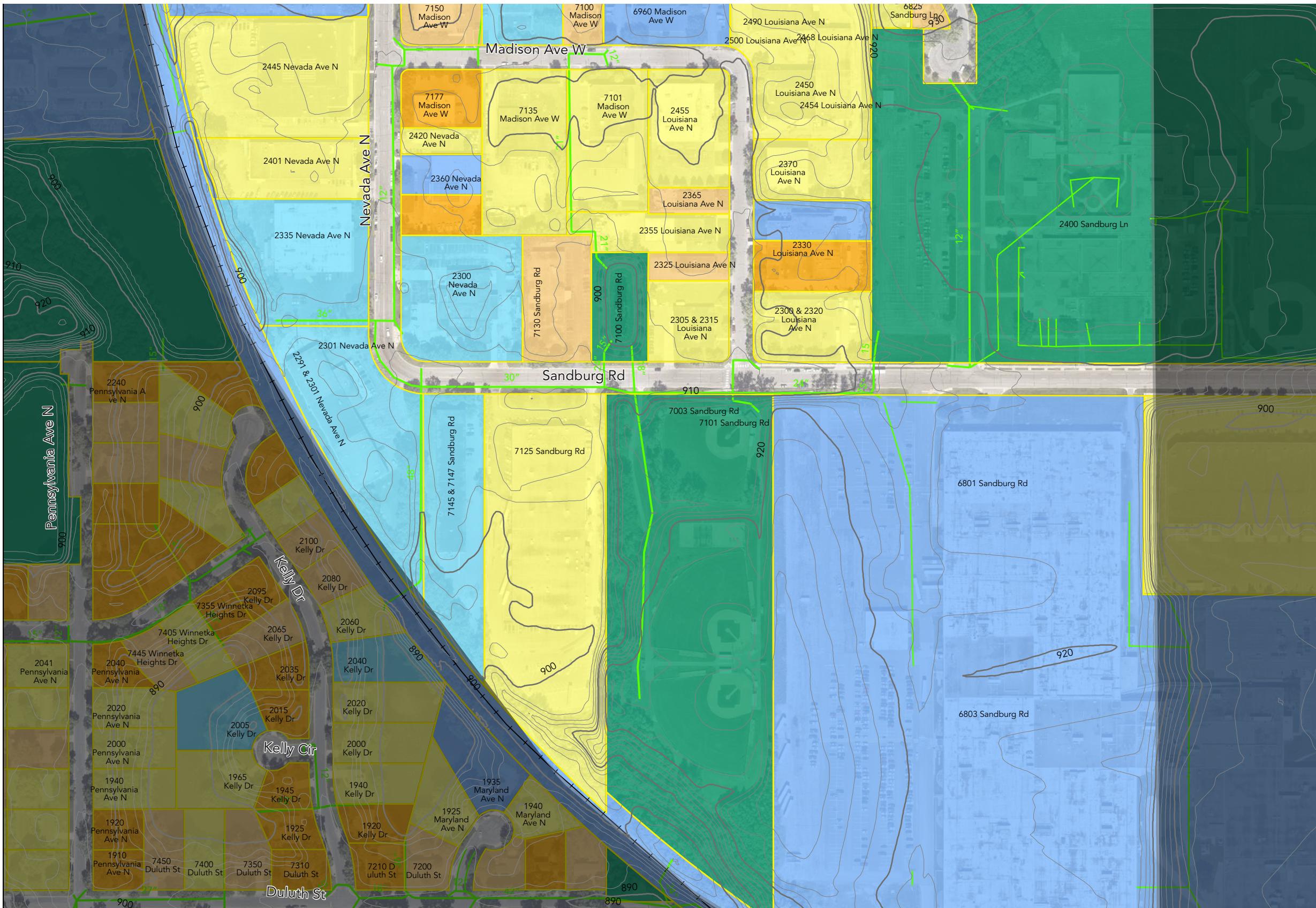


FIGURE 6



DeCola Ponds E & F Flood Mitigation Planning Study: *Isaacson Park/Sandburg Industrial Areas*

Concept Designs

Several of the parcels in the Isaacson Park/Sandburg industrial area were reviewed for the incorporation of flood storage to reduce flood elevations on DeCola Ponds E & F. Considerations included parcel area, elevation, proximity to existing storm sewer and stormwater infrastructure, potential for stormwater storage development, and parcel cost.

The parcel evaluation resulted in eight "project area" groupings that we identified as having the highest potential to facilitate the installation of considerable flood storage volume to help meet the objective of flood reduction on DeCola Ponds E & F. Figure 7 shows the locations of all the parcels considered and the "project areas". Table 3 summarizes the respective project areas, parcel areas, parcel acquisition cost per square foot, and total estimated parcel acquisition cost if one or more parcels were to be purchased for flood mitigation purposes. Table 3 also summarizes the anticipated flood storage volume that could be constructed on each area. Based on the potential total volume of flood storage in each project area and planning level acquisition costs, the project areas with the best potential flood mitigation appear to be Areas 2, 5, 7, and 8.

Area 2 would require purchasing one industrial parcel (2291/2301 Nevada Ave N) at the intersection of Nevada Ave and Sandburg Road. This 3.1-acre parcel could facilitate the addition of approximately 22.4 acre-feet of flood storage. This area is one of the most cost-effective parcels as a cost per square foot in this area. The parcel is also located at the most down-gradient location of the watershed, which will allow for the highest percentage of stormwater runoff capture from the watershed east of the railroad. The parcel is also directly adjacent to existing storm infrastructure, which should allow for minimal impacts to existing infrastructure to tie-in the flood mitigation feature(s).

Area 5 would require purchasing three industrial parcels (2305, 2325, and 2355 Louisiana Ave N) to the east of the existing storm water basin (Madison Pond) to facilitate the addition of approximately 17.7 acre-feet of live storage (includes merging with the existing stormwater pond). Since these parcels are located at a higher elevation in the watershed than for Area 2, storm sewer re-routing along Nevada Ave and Sandburg Ave should be considered in order to capture the highest percentage of stormwater runoff from this area. Although it would require a fairly flat slope, a new storm sewer line could be installed along Nevada Avenue and Sandburg Road to allow for the capture and detention of more stormwater runoff from the tributary watershed. The existing storm sewer line downstream of Madison Pond to the Nevada Ave/Sandburg Road intersection would also need to be lowered to accommodate the storm re-routing. Future design phases would need to investigate possible utility impacts in the right of way.

Area 7 would require purchasing one industrial parcel (7125 Sandburg Road) located on the south side of the Sandburg Road. This is a large 6.08-acre parcel and could provide more flood mitigation volume than may be needed. Additionally, acquisition of this parcel would require a more significant investment than for Areas 2 and 5; however, our analysis assumed that the southern half (~3.0 acres) could be utilized for

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flood storage and the northern portion of the site could potentially be sold and redeveloped. The southern portion of the site could facilitate the addition of approximately 20.5 acre-feet of flood storage. The southern portion of the parcel is located at the most down-gradient location of the watershed, which will allow for the highest percentage of stormwater runoff capture from the watershed east of the railroad. This parcel is also located along the proposed diversion alignment away from DeCola Pond F allowing less cost associated with the storm sewer diversion infrastructure and should allow for minimal impacts to existing infrastructure to tie-in the flood mitigation feature(s). Also, this parcel is immediately west of Isaacson Park so there may be additional opportunities to expand or improve recreation in this area.

Area 8 would require purchasing one industrial parcel (7145/7147 Sandburg Road) located on the south side of Sandburg Road. Based on the evaluation from the long-term flood mitigation plan, this 2.16-acre parcel could facilitate the addition of approximately 19.8 acre-feet of flood storage. This area is one of the most cost-effective parcels as a cost per square foot in this area. The parcel is also located at the most down-gradient location of the watershed, which will allow for the highest percentage of stormwater runoff capture from the watershed east of the railroad. The parcel is also directly adjacent to existing storm infrastructure, which should allow for minimal impacts to existing infrastructure to tie-into the flood mitigation feature(s). Storage on this parcel could be further expanded if the city could also secure an easement over the green space located on the south/southeast side of the parcel at 2291/2301 Nevada Ave N.

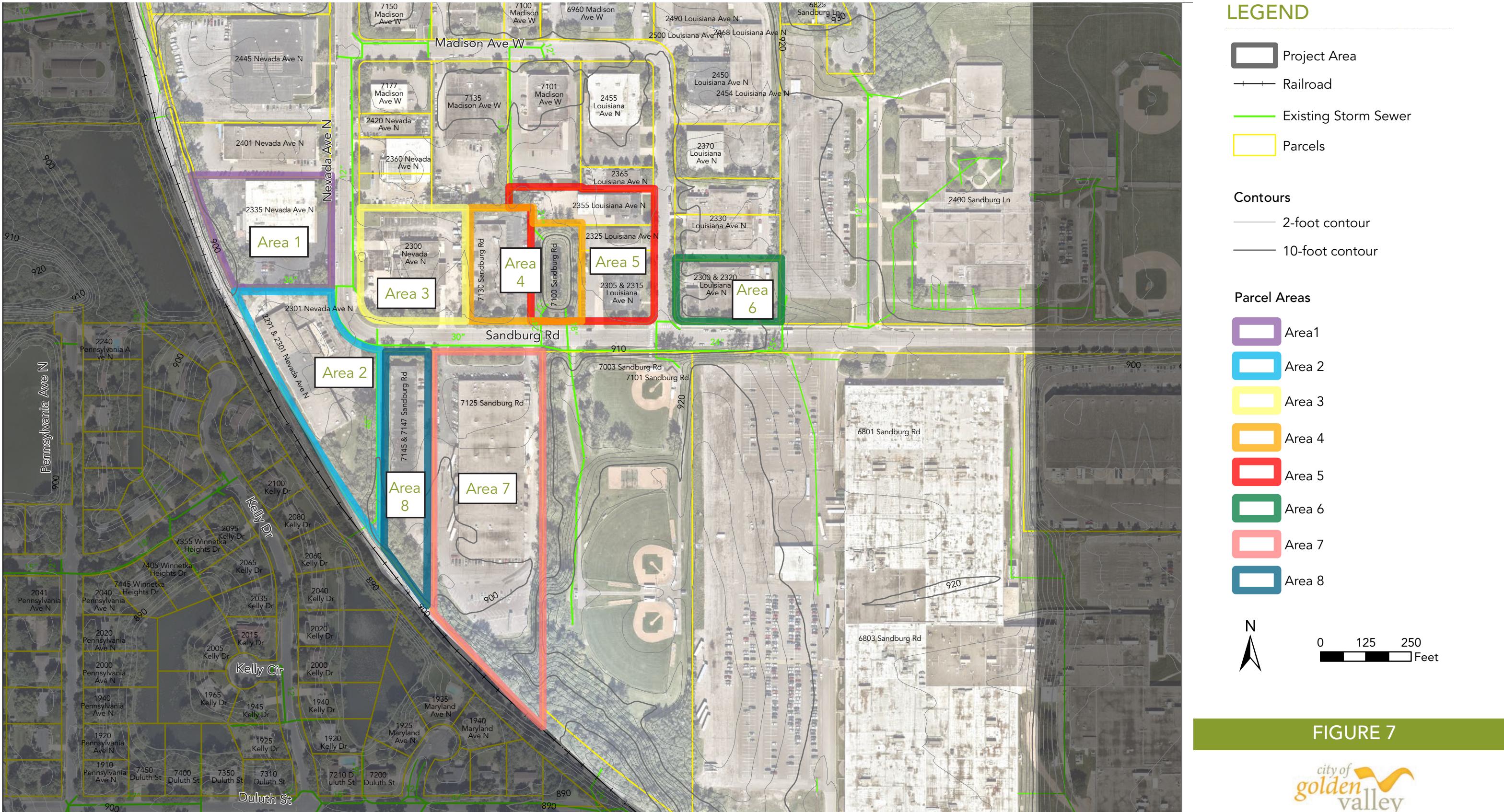
Table 3 Isaacson Park/Sandburg Industrial Parcel Storage Area Options

Area	Parcel Summary					Flood Storage Summary		
	Parcel Address	Parcel Area (acres)	Parcel Cost per Square Foot ¹	Estimated Total Parcel Acquisition Cost ¹	Estimated Total Project Area Parcel Acquisition Cost	Flood Storage Approximate Top Area (ac)	Flood Storage Approximate Bottom Area (ac)	Approximate Flood Storage (ac-ft)
1	2335 Nevada Ave N	2.36	\$12.91	\$1,331,000	\$1,331,000	2.1	1.7	10.1
2	2291/2301 Nevada Ave N	3.07	\$12.34	\$1,653,000	\$1,653,000	2.5	1.6	22.4
3	2300 Nevada Ave N	2.13	\$12.94	\$1,199,633	\$1,199,633	1.6	1.2	7.9
4	7100 Sandburg Rd	0.87	\$0.00	\$0	\$1,200,000	1.6	1.1	9.8
	7130 Sandburg Rd	1.22	\$20.66	\$1,200,000				
5	7100 Sandburg Rd	0.87	\$0.00	\$0	\$1,732,000	2.2	1.4	17.7
	2355 Louisiana Ave N	0.84	\$17.72	\$645,000				
	2325 Louisiana Ave N	0.32	\$22.50	\$315,000				
	2305/2315 Louisiana Ave N	0.92	\$19.34	\$772,000				
6	2300/2320 Louisiana Ave N	1.16	\$17.88	\$906,000	\$906,000	0.8	0.4	5.9
7	7125 Sandburg Road ²	6.08	\$16.42	\$4,350,000	\$4,350,000	2.5	0.9	20.6
8	7145/7147 Sandburg Road	2.16	\$14.96	\$1,408,000	\$1,408,000	1.6	0.8	19.8

¹ Parcel cost value is based on the 2019 Hennepin County taxable market values; the cost per square foot divides the taxable market value by the parcel area

² Assumes that approximately half the parcel area (southern half) would be used for flood storage and the northern half could be redeveloped as an industrial parcel

Isaacson Park/Sandburg Industrial Area Potential Flood Mitigation Parcels



DeCola Ponds E & F Flood Mitigation Planning Study: *Isaacson Park/Sandburg Industrial Areas*

Hydrologic and Hydraulic Modeling

Based on the current (updated) XP-SWMM hydrologic and hydraulic model that reflects the current conditions in the watershed, the impact of various detention and diversion options were evaluated for Sandburg Industrial Areas 2 and 5. Because the estimated volume developed for Area 7 was between that estimated for Areas 2 and 5, it can be assumed that the flood reduction performance would fall between these two areas.

The detention models assumed that stormwater runoff would be directed to the proposed flood storage areas and released slowly via extended detention to DeCola Pond F, but no flows would bypass DeCola Pond F. The diversion models assumed that stormwater runoff would be directed to the proposed storage areas, but released slowly via extended detention through a storm sewer diversion system discharging downstream of DeCola Pond F. For this diversion, storm sewer would be installed east of the existing railroad and flow southeast to an existing storm sewer located at the south of Isaacson Park and the railroad. The diversion scenario most closely aligns with the alternative originally outlined in the *Medicine Lake Road and Winnetka Avenue Area Long-Term Flood Mitigation Plan*.

Depending on the amount of extended detention in the Isaacson area, proposed routing of flows (e.g., diversion downstream of DeCola Pond F), the expected 100-year flood elevations on DeCola Ponds E & F are expected to range from 892.7 to 895.0, which is a reduction in flood elevation from existing conditions of approximately 0.8 to 3.1 feet. This reduction in flood elevation for the 100-year event could reduce the flood risk for one (1) to eight (8) at-risk homes from the floodplain around DeCola Ponds E and F. Eleven (11) to eighteen (18) homes would remain at-risk around DeCola Ponds E and F.

The concept that reduces flood elevations the most is the one that provides extended detention in Project Area 2 (22.4 acre-feet of flood storage) and diverts the majority of flows from Project Area 2 away from DeCola Ponds E and F. However, while this scenario provides the most significant Ponds E and F flood reductions, future design will need to consider providing additional water quality treatment to mitigate the treatment lost by diverting flows away from DeCola Pond F. Additionally, due to the channel connection between the Isaacson Park/Sandburg Industrial project areas with DeCola Pond C, holding additional water in the industrial project area does impact the hydraulics on DeCola Ponds A, B, C, & D. Detaining water in the Sandburg industrial project area creates slightly higher elevations in DeCola Pond C (+0.1') during the 100-year event. This causes prolonged overtopping of the DeCola Pond C/D berm allowing DeCola D to come to equilibrium with DeCola C. Therefore, the flood elevation on DeCola D for the 100-year event with the Isaacson storage area becomes 901.8, which is 2.1 feet higher than estimated in the updated existing conditions model.

As discussed previously, the system's hydraulics is interconnected and changes to one area impact other areas. Since multiple flood mitigation projects are being proposed, understanding how they work together is important. The section below discusses XP-SWMM model runs that includes combining the

flood mitigation projects at the SEA School/Wildwood Park area, modification to the DeCola D outlet, and the incorporation of storage in the Sandburg Industrial area, to help to begin understanding the impact of these projects when functioning together.

Cost Estimates

Planning-level opinions of probable cost were developed for the Isaacson Park/Sandburg Industrial Areas and generally correspond to standards established by the Association for the Advancement of Cost Engineering (AACE). Class 5 concept design-level opinions of costs were used for the Sandburg Industrial Areas based on the limited project definition, wide-scale use of parametric models to calculate estimated costs (i.e., making extensive use of order-of-magnitude costs from similar projects), and uncertainty, with an acceptable range of between -30% and +50% of the estimated project cost. The planning-level costs for Areas 2, 5, 7, and 8 are summarized in Table 4. Table 4 also includes an opinion of cost for the diversion of flows away from DeCola Pond F to the south end of Isaacson Park.

Table 4 Isaacson Park/Sandburg Industrial Areas Opinion of Probable Cost

Project Area	Estimated Total Parcel Area Acquisition Cost ¹	Opinion of Probable Cost Range (-30% to +50%) ²
Area 2	\$1,653,000	\$5.3 - \$11.4 million
Area 5	\$1,732,000	\$5.7 - \$12.2 million
Area 7	\$4,350,000	\$9.8 - \$21.1 million
Area 8	\$1,408,000	\$4.8 - \$10.2 million

¹ Parcel acquisition, assuming current Hennepin County assessed taxable market value

² Opinion of probable cost includes parcel acquisition, relocation, and demolition costs (taxable market value multiplied by a factor of 1.5, as recommended by City of Golden Valley staff during the long term flood mitigation plan) along with planning, engineering/design, and construction costs of the flood storage and storm sewer diversion

HYDROLOGIC AND HYDRAULIC MODELING – COMBINED FLOOD MITIGATION PROJECTS

In order to better understand how the proposed flood mitigation projects at the SEA School/Wildwood Park area, DeCola Pond D outlet, and the Isaacson Park/Sandburg Industrial area work together to impact flood elevations on DeCola Ponds D, E, and F, an XPSWMM model containing all three projects was developed.

The first combined run (Combined Run 1), represents a best-case scenario with the estimated maximum storage volumes and the bypass of flows around DeCola Ponds E and F. Combined Run 1 includes the following assumptions in the model:

- 10.0 acre-feet of surface storage in the SEA School/Wildwood Park. Flows are routed into the proposed storage area and outflows bypass DeCola Ponds E and F through storm sewer re-routing.

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- DeCola Pond D outlet is reconstructed to include 48-inch diameter RCP storm sewer from DeCola Pond D to DeCola Pond E.
- 22.4 acre-feet of storage is installed in Area 2 of the Sandburg Industrial area. Any stormwater detained in the feature bypasses DeCola Ponds E and F through storm sewer re-routing.

The second combined run (Combined Run 2), includes the assumptions from Combined Run 1, but also includes modifications to the channel east of the railroad, including:

- Raising the overflow along the channel/ditch along the east side of the railroad tracks to above the 100-year flood elevation to hydraulically disconnect DeCola Ponds A, B & C from the Isaacson Park/Sandburg Industrial area and DeCola Pond F.

As previously mentioned, sufficient water quality treatment may need to be provided to mitigate the treatment lost by diverting flows away from DeCola Ponds E and F. This water quality mitigation volume has not been further evaluated at this time but will need to be evaluated in future planning and feasibility studies.

Table 5 shows a summary of homes and structures that may have reduced risk of surface flooding during the 10- and 100-year storm events for the planning level concepts evaluated as part of this study. This table summarizes the impact of the individual projects (i.e., SEA School/Wildwood Park and DeCola Pond D Outlet Upsizing, Isaacson/Sandburg Industrial Parcel Storage area) as well as the two combined model runs outlined above.

Based on the combined model runs, hydraulically disconnecting DeCola Ponds A, B & C from the Isaacson Park/Sandburg Industrial area by raising the overflow in the channel east of the railroad does have a positive impact on reducing the number of at-risk homes around DeCola Ponds D, E, & F. This channel modification should be further evaluated as part of the future planning and feasibility phases of the Isaacson Park/Sandburg Industrial area project development.

Assuming we can achieve the project targets outlined above, the estimated impact of the two flood mitigation projects will reduce the number of at-risk homes around DeCola Ponds D, E, and F by nine (9) structures during the 10-year event and 15 to 21 structures during the 100-year event.

Table 5 Key Flood Area Maximum Water Surface Elevations and Number of At-Risk Structures

Flood Area	Flood Area Description	Flood Elevation (ft-NAVD88)																			
		Existing Conditions (Updated Clipped Model) ¹				SEA School/Wildwood Park and DeCola D Outlet Uppsize				Isaacson/Sandburg Industrial Area				Combined Run 1 - SEA School/Wildwood Park, DeCola D Outlet Uppsize, and Isaacson/Sandburg Industrial Area, No Modifications to Channel East of Railroad				Combined Run 2 - SEA School/Wildwood Park, DeCola D Outlet Uppsize, and Isaacson/Sandburg Industrial Area, Overflow Raised in Channel East of Railroad			
		Storm Event		Number At-Risk Structures		Storm Event		Number At-Risk Structures		Storm Event		Number At-Risk Structures		Storm Event		Number At-Risk Structures		Storm Event		Number At-Risk Structures	
		10-yr	100-yr	10-yr	100-yr	10-yr	100-yr	10-yr	100-yr	10-yr	100-yr	10-yr	100-yr	10-yr	100-yr	10-yr	100-yr	10-yr	100-yr	10-yr	100-yr
1	Terra Linda Low Point	906.5	907.3	1	1	906.5	907.3	1	1	906.5	907.3	1	1	906.5	907.3	1	1	906.5	907.3	1	1
2	Medicine Lake Road Low Point/Rosalyn Court	901.5	902.2	0	0	901.5	902.3	0	0	901.5	902.2	0	0	901.5	902.2	0	0	901.5	902.2	0	0
3	Rhode Island Ave Low Point	898.9	901.7	0	0	898.9	901.8	0	0	898.9	901.9	0	0	898.9	901.8	0	0	898.9	901.8	0	0
4	Dover Hill Apartments	900.9	901.7	0	0	900.9	901.7	0	0	900.9	901.8	0	0	900.9	901.8	0	0	900.9	901.7	0	0
5	DeCola Pond A	898.5	901.7	0	1	898.6	901.7	0	1	898.7	901.8	0	1	898.7	901.8	0	1	898.6	901.7	0	1
6	DeCola Pond B	898.5	901.7	0	0	898.6	901.7	0	0	898.7	901.8	0	0	898.7	901.8	0	0	898.6	901.7	0	0
7	DeCola Pond C	898.5	901.7	0	0	898.6	901.7	0	0	898.7	901.8	0	0	898.7	901.8	0	0	898.6	901.7	0	0
8	DeCola Pond D	893.7	899.7	0	10	893.1	898.3	0	4	893.7	901.8	0	12	893.1	897.1	0	1	893.1	896.7	0	0
9	DeCola Pond E	893.1	895.9	6	11	892.1	895.8	3	11	890.5	892.8	0	6	889.4	894.0	0	9	889.4	893.2	0	6
10	DeCola Pond F	893.1	895.8	3	8	892.1	895.5	1	7	890.4	892.6	0	2	889.4	893.8	0	5	889.4	893.0	0	3
11	Medicine Lake Road East of Railroad	911.6	912.3	0	0	911.5	912.3	0	0	911.5	912.3	0	0	911.5	912.3	0	0	911.5	912.3	0	0
12	East of Railroad to DeCola Pond C	900.1	901.6	0	0	899.5	901.7	0	0	899.7	901.9	0	0	899.7	901.8	0	0	899.5	901.7	0	0
13	East of Railroad at Low Point on Nevada	903.0	903.8	0	0	903.0	903.8	0	0	903.0	903.8	0	0	903.0	903.8	0	0	903.0	904.1	0	0
14	East of Railroad at Low Point on Sandburg	902.3	903.8	0	0	902.5	903.8	0	0	901.3	903.8	0	0	901.3	903.8	0	0	901.8	904.0	0	0
15	East of Railroad to DeCola Pond F	898.6	901.2	0	1	899.0	901.5	0	1	891.5	898.5	0	0	891.5	898.5	0	0	891.5	898.8	0	0
16	Honeywell Pond	883.4	886.4	0	0	883.3	886.3	0	0	882.7	886.3	0	0	882.2	886.3	0	0	882.2	886.3	0	0
<i>Total At-Risk Structures Remaining</i>		-	-	10	32	-	-	5	25	-	-	1	22	-	-	1	17	-	-	1	11

¹ Existing conditions flood elevations reflect implementation of the Liberty Crossing and DeCola Ponds B/C flood mitigation projects and updates to natural channel overflow elevation east of the railroad and DeCola C based on field investigations