

Section 7

Capital Improvement Projects

7.1 Introduction

The results of the hydrologic, geomorphic, water quality and special areas evaluations discussed in the previous sections of this report formed the foundation for identifying problem areas in the Haines Branch Watershed Study Area. The Potential Capital Improvement Projects (CIP) addressing each problem area were evaluated based on design, economic feasibility, and overall efficiency of addressing systemic problems within the study area. Each CIP was then prioritized according to the City's Priority Ranking for Watershed Master Plan Projects.

The CIP identification and development process is detailed in the following subsections. The CIP Prioritization Worksheets are found in Appendix H, and the cost estimate worksheets for each project are found in Appendix I.

7.2 Problem Identification

The problem identification was based upon an evaluation of the Haines Branch main stem and tributaries to identify areas which pose a serious public safety concern with respect to drainage infrastructure and stream erosion and/or threaten water quality or natural resources.

The geomorphic evaluation discussed in Section 5 was used to identify stream stability problems in the watershed. The stream processes driving instability identified in Section 5 are systemic channel incision, widening, and plan form adjustment. Incision represents the main source of much of the erosion and mass wasting observed throughout the Haines Branch Watershed Study Area, with widening and plan form adjustment occurring in the natural progression of instability once the channel has incised to critical bank height.

Incision, widening and plan form adjustment all drive the widespread bank failures, mass wasting, and sediment generation identified in Section 5. Channel incision threatens bridges and culverts by eroding below the structure footing and removing the very soil on which these structures bear. Incision also threatens streamside utilities by day-lighting them and exposing the utility to channel shear forces. Bank failures and mass wasting resulting from incision, widening and plan form adjustment threaten streamside infrastructure and structures.

The water quality evaluation discussed in Section 4 identified elevated levels of E. coli, total suspended solids, phosphorus, total organic carbon and sodium. All of these conditions stem from systemic watershed characteristics, land use and watershed management practices rather than specific localized water quality problems or contamination sources. As a result, no water quality CIPs were developed. Instead, the identified water quality problems led to watershed best management practice recommendations which are discussed in the Implementation section of this report.

7.3 Evaluation Approach

7.3.1 Stream Erosion Evaluation

The major driver of instability in the Haines Branch Watershed Study Area is incision. The CIP's address channel incision by incorporating grade controls into the projects. The grade controls will prevent the channel from cutting deeper thereby protecting the channel upstream of the grade control. Bank stabilization is also included in the CIPs to address bank erosion and mass wasting in areas where infrastructure is threatened. The old truism regarding streambanks – *It is impossible to stabilize a streambank on an unstable stream* – is as applicable here as anywhere in the region. Therefore, grade controls are also included in the bank stabilization CIPs to prevent future incision at the bank stabilization location. These grade controls are not included at sites where an existing nearby downstream grade control exists.

Ten recommended CIP's are developed for the Haines Branch Watershed Study Area. These recommended projects are strategic in nature, focusing on protecting existing infrastructure and interrupting the cycle of degradation by arresting channel incision prior to its propagation into stable reaches. The CIP's do not address all of the stream erosion issues in the watershed study area, as a program to repair all of the problem sites would be cost prohibitive. However, each of the recommended improvements are designed to address both the local stability problem identified in addition to helping the entire stream system move closer to self-sustaining dynamic equilibrium.

7.3.2 Water Quality Considerations

Water quality impacts are included in the evaluation of potential CIP's. Project evaluation and development took into account the potential water quality impacts which may occur as a result of project construction. Consideration was also given to the benefit the project would provide in terms of reducing channel erosion and protecting stable reaches, therefore reducing sediment loading. For example, grade controls and bank stabilization projects designed to address stream erosion also assist in reducing sediment pollutants.

7.3.3 Special Areas Considerations

The process of evaluating the potential CIP's also included a consideration of the potential impacts each project may have on the Special Areas. Consideration was given to both avoiding potential negative impacts during project construction as well as the benefits each project provides in terms of protecting the local Special Areas from unmanaged system instability.

7.3.4 Capital Improvement Project Types

The recommended projects generally fall into one of three categories of projects:

1. **Grade Control Projects** - construct grade controls along the main stem and tributaries at select locations to stop incision at these locations. The grade controls will eliminate incision and limit the propagation and depth of incision upstream of each grade control project. Grade control projects also include any localized bank stabilization necessary to construct a stable grade control. The bank stabilization should incorporate the use of native riparian vegetation. The grade control should be placed at grade on the channel bottom and formed in a manner to mimic the elevation and stable slopes of the existing channel banks. Where stabilizing a knickpoint, a ramp slope of 20H: 1V maximum should be used. The grade control should extend to the top of each bank or the 25 year flow depth, whichever is greater. Consideration should be given to soil erodability, piping and shear stresses along the grade control and at the edges.

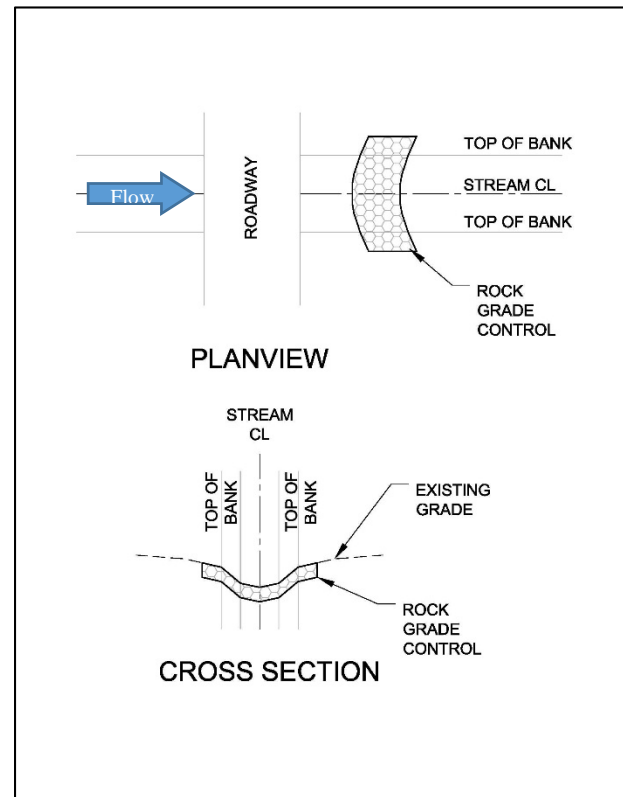


Figure 7-1: Rock Grade Control Structure Detail

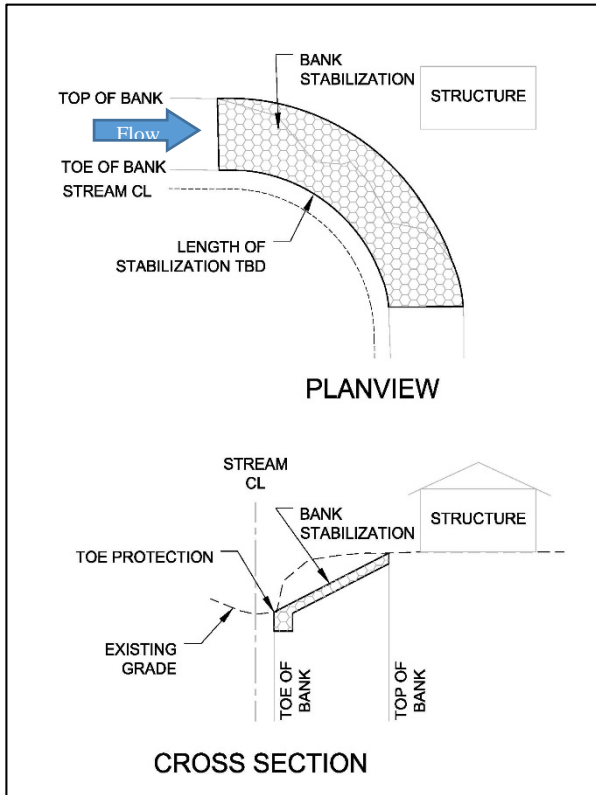


Figure 7-2: Bank Stabilization Structure Detail

3. **Outlet Stilling Basin and Scour Protection** – construct a stilling basin or scour protection at the pipe or culvert outfall to protect the pipe from erosion and undermining due to outfall scour. The limits of protection should extend to the top of each bank or the 25 year flow depth, whichever is greater. Consideration should be given to soil erodability, piping and shear stresses through the scour protection and at the edges. When using a stilling basin, consideration should be given to the depth of scour anticipated in the plunge pool for a variety of flow events. Due to tailwater influences, the greatest potential for scour may not occur at the largest flowrate.

2. **Bank Stabilization Projects** - construct engineered bank stabilization to protect identified infrastructure or structures from continuing bank erosion threatening the structure. The bank stabilization measures vary in size based on flow parameters, bank height, bank slope, site-conditions and other parameters. Bank stabilization should extend through the entire bend, beginning and ending at a riffle. To the greatest extent practical, bank stabilization shall be bio-engineered, incorporating the use of native riparian vegetation. Each bank stabilization project includes grade controls at the project limits to protect the stabilized bank from potential future incision and add to the systemic stability of the watershed study area.

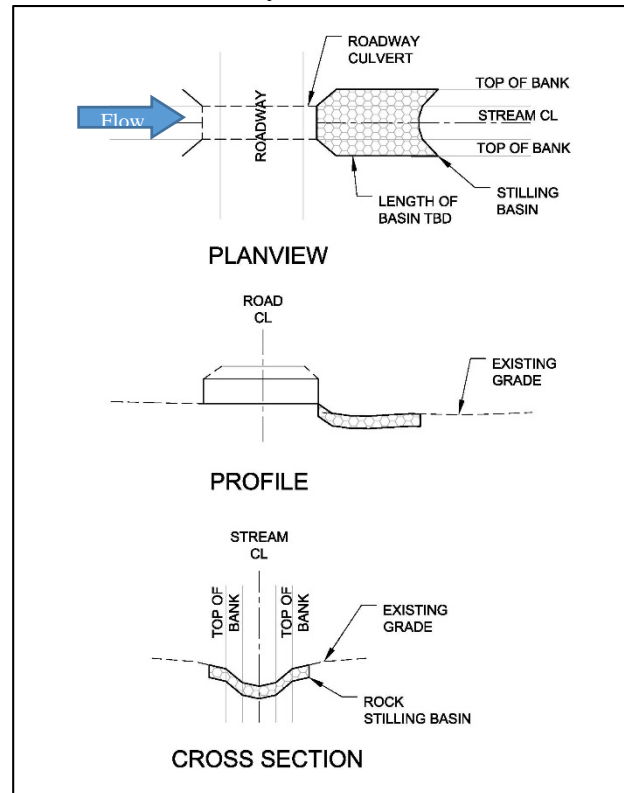





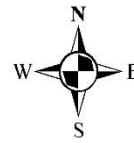
Figure 7-3: Stilling Basin Structure Detail

7.4 Capital Improvement Projects

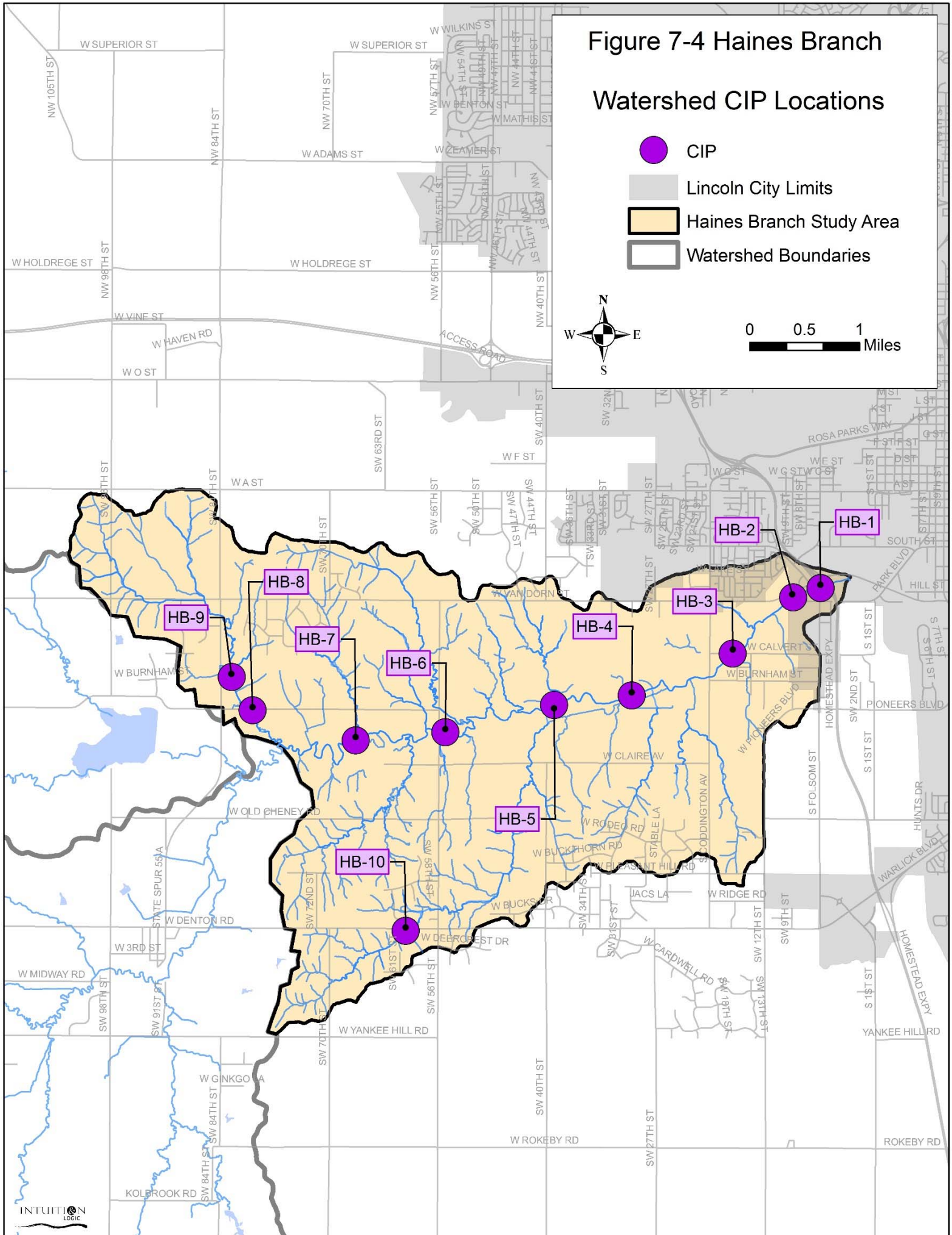
The potential CIP's are discussed in the following pages and their locations illustrated in Figure 7-4.

Figure 7-4 Haines Branch
Watershed CIP Locations

-  CIP
-  Lincoln City Limits
-  Haines Branch Study Area
-  Watershed Boundaries



0 0.5 1 Miles



7.4.1 Project HB-1: Grade Control Main Stem HBR005 at S Folsom St and Pipe Outfall Restoration along Bison Trail at Homestead

Problem description: Two knickpoints are located on the main stem HBR005 at the S Folsom St Bridge, one under the bridge, and one approximately 110 feet upstream of the bridge. Each knickpoint is creating approximately a 6 inch to 1 foot drop in the channel. Also, scour and erosion is occurring at multiple pipe outfall locations along Bison Trail at Homestead Expressway. Potentially affected parcels are public and within state right-of-way. Close coordination between the City of Lincoln (City), the Lower Platte South Natural Resources District (LPSNRD) and the Nebraska Department of Roads (NDOR) will be required for the completion of this project.

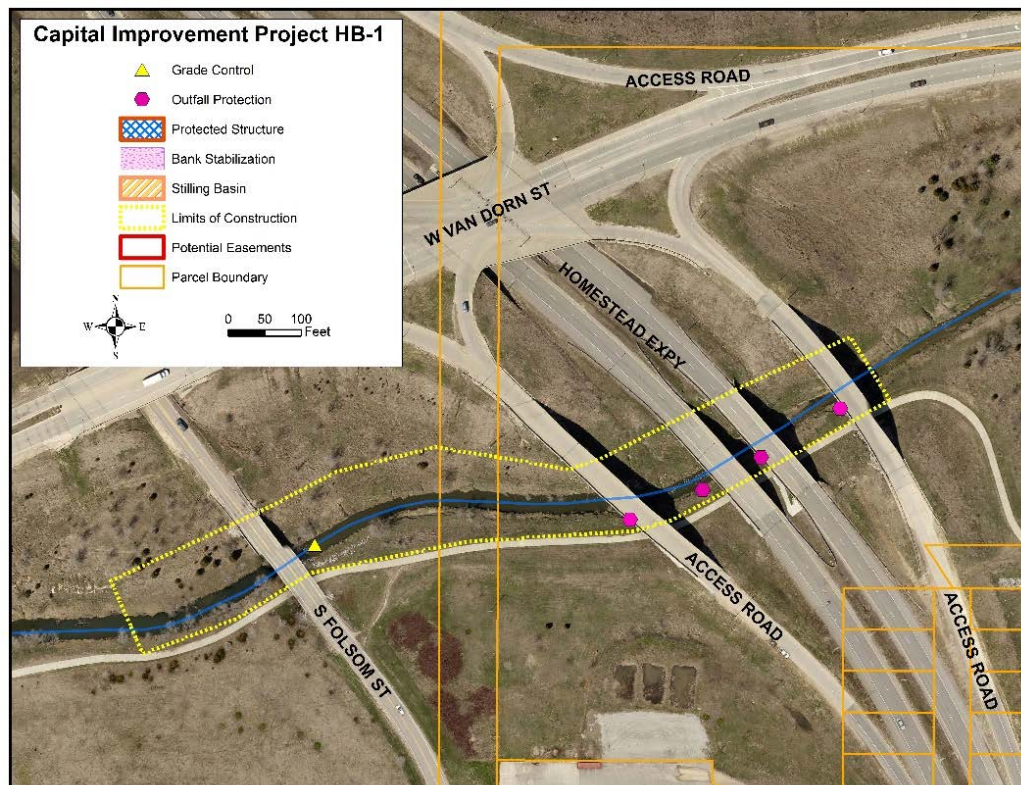


Figure 7-5: Debris jam knickpoint

Recommendation: Construct an engineered grade control immediately downstream of S Folsom St to halt the propagation of knickpoints upstream. Install scour protection at each pipe outfall to eliminate erosion and protect the pipe outfall and stream bank.

Impact to Special Areas and Water Quality: Project is located along Bison Trail within Salt Valley Greenway as well as the Prairie Corridor. The grade control and pipe outfall protection will help protect these special areas. Consideration during design and construction should be provided to minimize disturbance to these special areas and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$195,000



7.4.2 Project HB-2: Bank Stabilization and Grade Control Main Stem HBR005 at W Van Dorn St

Problem description: Bank erosion along main stem HBR005 is threatening W Van Dorn St about 1,050 feet southwest of the intersection of W Van Dorn St and S Folsom St. Potentially affected parcels are public and within the State right-of-way. Close coordination between the City, LPSNRD and NDOR will be required for the completion of this project.

Recommendation: Constructing bank stabilization along the left descending bank with associated grade controls as needed to protect W Van Dorn St.



Figure 7-7: High Bank from erosion

Impact to Special Areas and Water Quality: Project is located in the Prairie Corridor. Bank stabilization and grade controls will help protect this special area. Consideration during design and construction should be provided to minimize disturbance to special areas and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$480,000

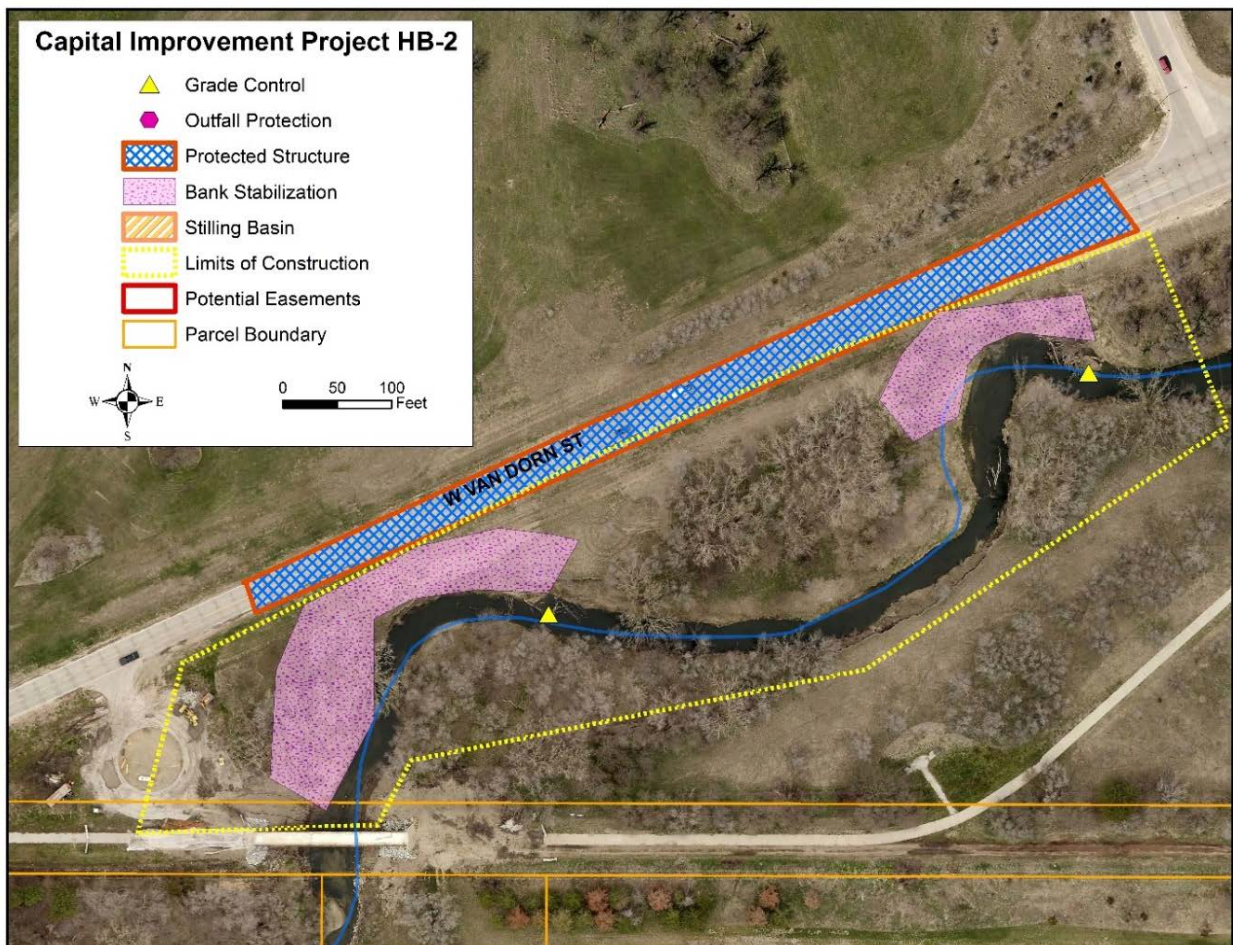


Figure 7-8: Conceptual Lavout of HB-2

7.4.3 Project HB-3: Grade Control Knickpoint on Tributary HB015R005 at Confluence

Problem description: There is a tall knickpoint in tributary HB015R005 at the confluence with the main stem. The main stem flowline is several feet below the tributary on the right descending bank west of W Calvert St and SW 16th St. Upstream of the knickpoint, the tributary is showing early signs of incision. Potentially affected parcels are public. Close coordination between the City, County, LPSNRD and NDOR will be required for the completion of this project.

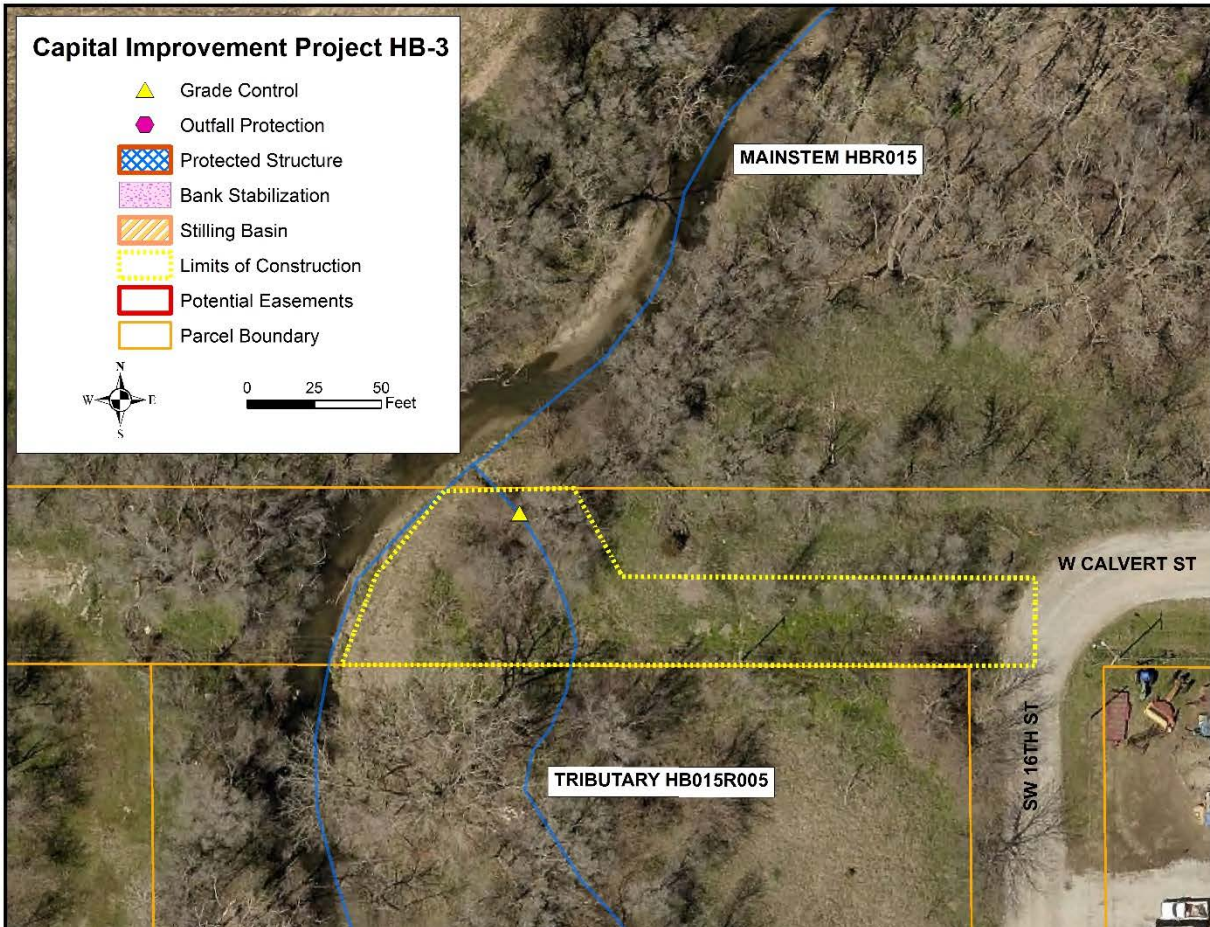


Figure 7-9– Knickpoint at tributary

Recommendation: Construct grade control at tributary confluence to halt incision and protect the upstream reach. This project could be combined with a bridge or culvert at W Calvert St.

Impact to Special Areas and Water Quality: Portion of project is located in the Prairie Corridor and grade controls will help protect this special area. Consideration during design and construction should be provided to minimize disturbance to special areas and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$124,000



7.4.4 Project HB-4: Grade Control Knickpoint at Confluence on Tributary HB040R005 in Pioneers Park

Problem description: At this location there is an existing knickpoint in tributary HB0040R005 at the confluence with the main stem within Pioneers Park. The knickpoint is stabilized by an existing rubble grade control that is actively failing. This project will protect the pedestrian trail from channel erosion. When entering South Pioneers Park from S Coddington Ave, take the left at the first “Y” in the road. The access will be located directly before the next “Y” in the road. Project will be located on the left side of the road near the RR tracks. Potentially affected parcels are public property.



Figure 7-11: Knickpoint

Recommendation: Remove existing failing grade control and construct one or more new grade controls to stop incision and protect the tributary and park.

Impact to Special Areas and Water Quality: Project is located in Pioneers Park, within the Prairie Corridor, and within designated treemass areas. Grade controlling this tributary will help protect these special areas. Consideration during design and construction should be provided to minimize disturbance to special areas and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$167,000

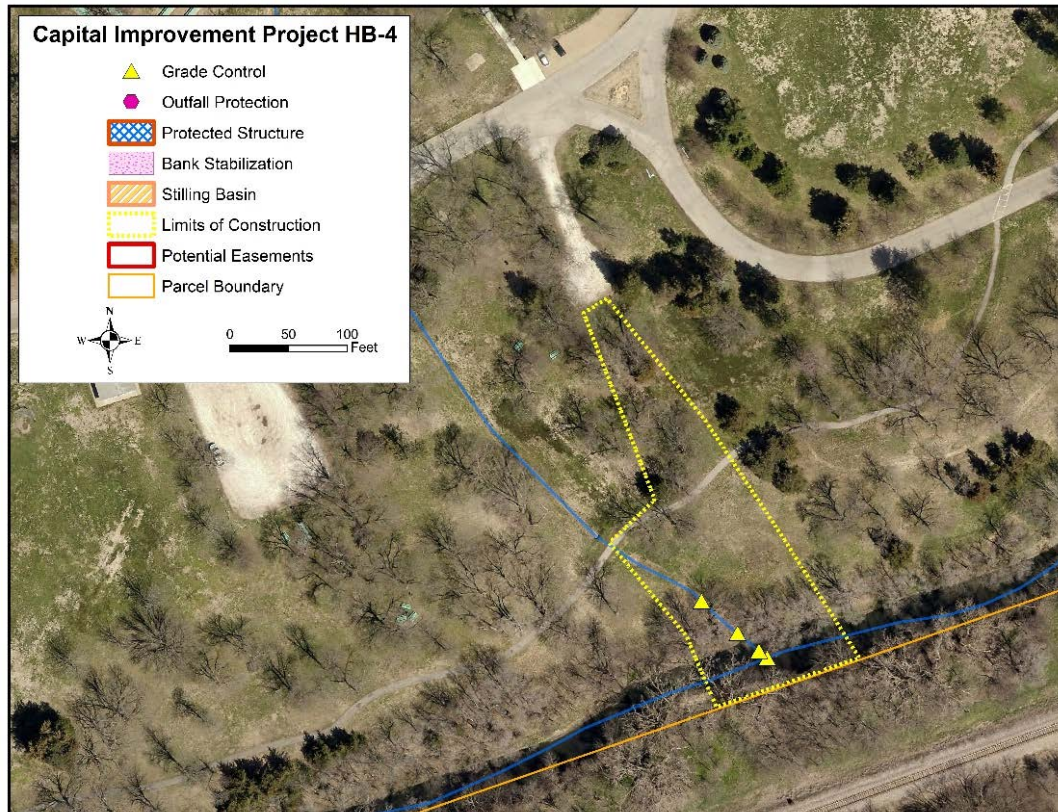


Figure 7-12: Conceptual Layout of HB-4

7.4.5 Project HB-5: Grade Control Knickpoint at Confluence on Tributary HB045R005 in Pioneers Park Nature Center

Problem description: Knickpoints and erosion in tributary HB045R005 from the main stem to the outfall at the fence line on the southwest side of the Nature Center is potentially threatening the outfall. Access for this project is through the Nature Center from the southwest corner of the Pioneer Park Golf Course. Potentially affected parcels are public property.

Recommendation: Construct multiple grade controls and associated bank stabilizations to stabilize the tributary and stop incision.



Figure 7-13: Knickpoint

Impact to Special Areas and Water Quality: Project is located within a Prairie Corridor, woodland, and Pioneers Park. The proposed access to the location runs near, but not through a designated wetland. Consideration during design and construction should be provided to minimize disturbance to special areas and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$186,000

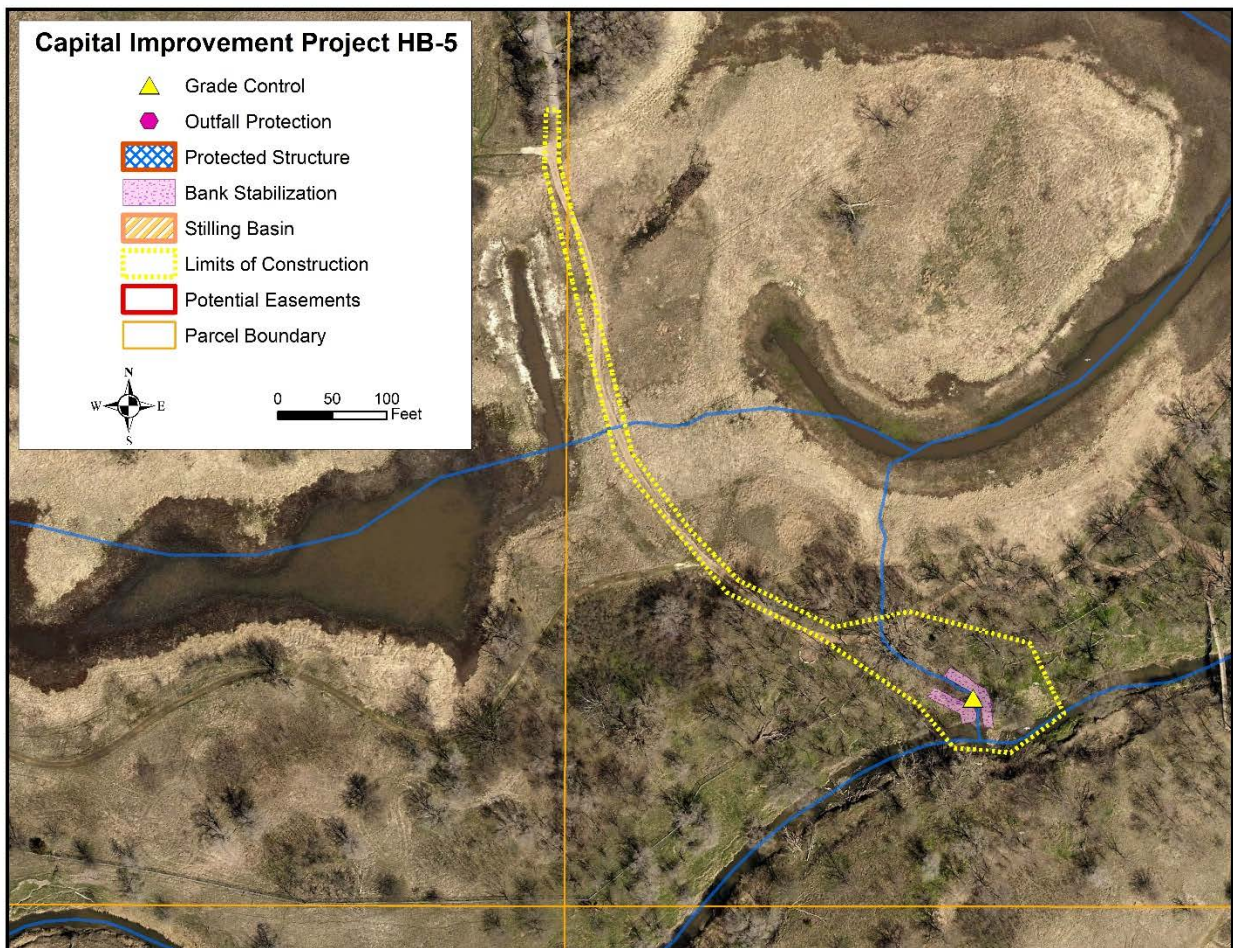


Figure 7-14: Conceptual Layout of HB-5

7.4.6 Project HB-6: Grade Control Knickpoint on Tributary HB055R005 at Confluence

Problem description: Knickpoint in the tributary HB055R005 near its confluence with Haines approximately 400 feet downstream of SW 56th St. The access is approximately 0.2 miles north of the SW 56th St and W Claire Ave intersection. Potentially affected parcels are private property.

Recommendation: Construct grade controls to stabilize tributary and stop incision.



Figure 7-15: Knickpoint

Impact to Special Areas and Water Quality: Project is located within a wetland, as well as the planned Prairie Corridor. West of the proposed access across SW 56th St is another wetland with proposed critical habitat. Consideration during design and construction should be provided to minimize disturbance to special areas and reduce impacts to water quality and proposed critical habitat to the greatest extent practical.

Estimated Project Cost: \$150,000

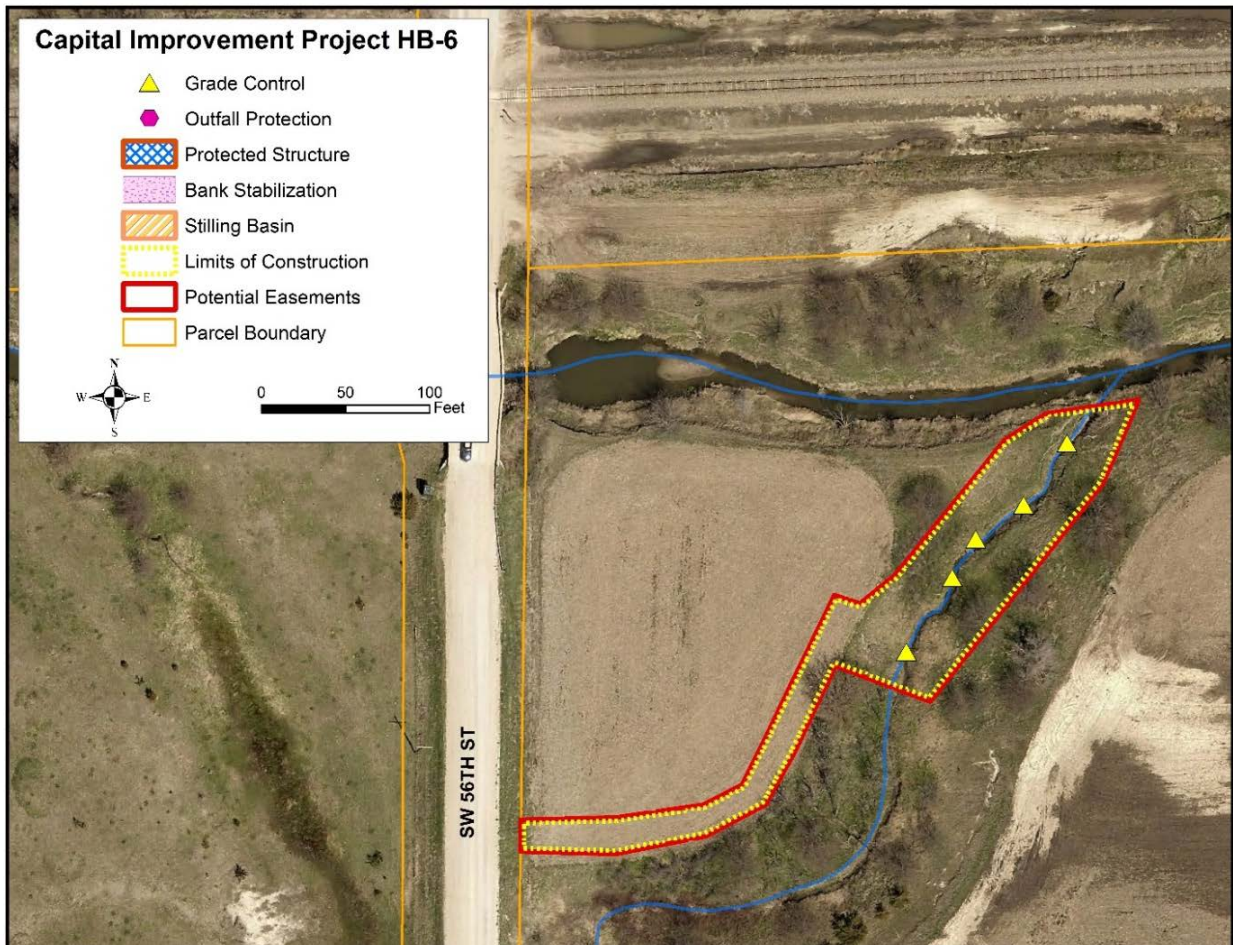


Figure 7-16: Conceptual Layout of HB-6

7.4.7 Project HB-7: Grade Control Knickpoint on Tributary HB070R005 at Confluence

Problem description: A large woody debris jam is holding up a greater than five foot tall knickpoint at the tributary HB070R005 confluence located approximately 1,500 feet south of W Pioneers Blvd. Potentially affected parcels are private property. Potential access may follow along an existing driveway and will cross two railroad lines.

Recommendation: Remove debris jam and replace with grade control and associated bank stabilization to stop incision.



Figure 7-17: Knickpoint

Impact to Special Areas and Water Quality: Project is located in the planned Prairie Corridor and a woodland. Consideration during design and construction should be provided to minimize disturbance to special areas and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$224,000

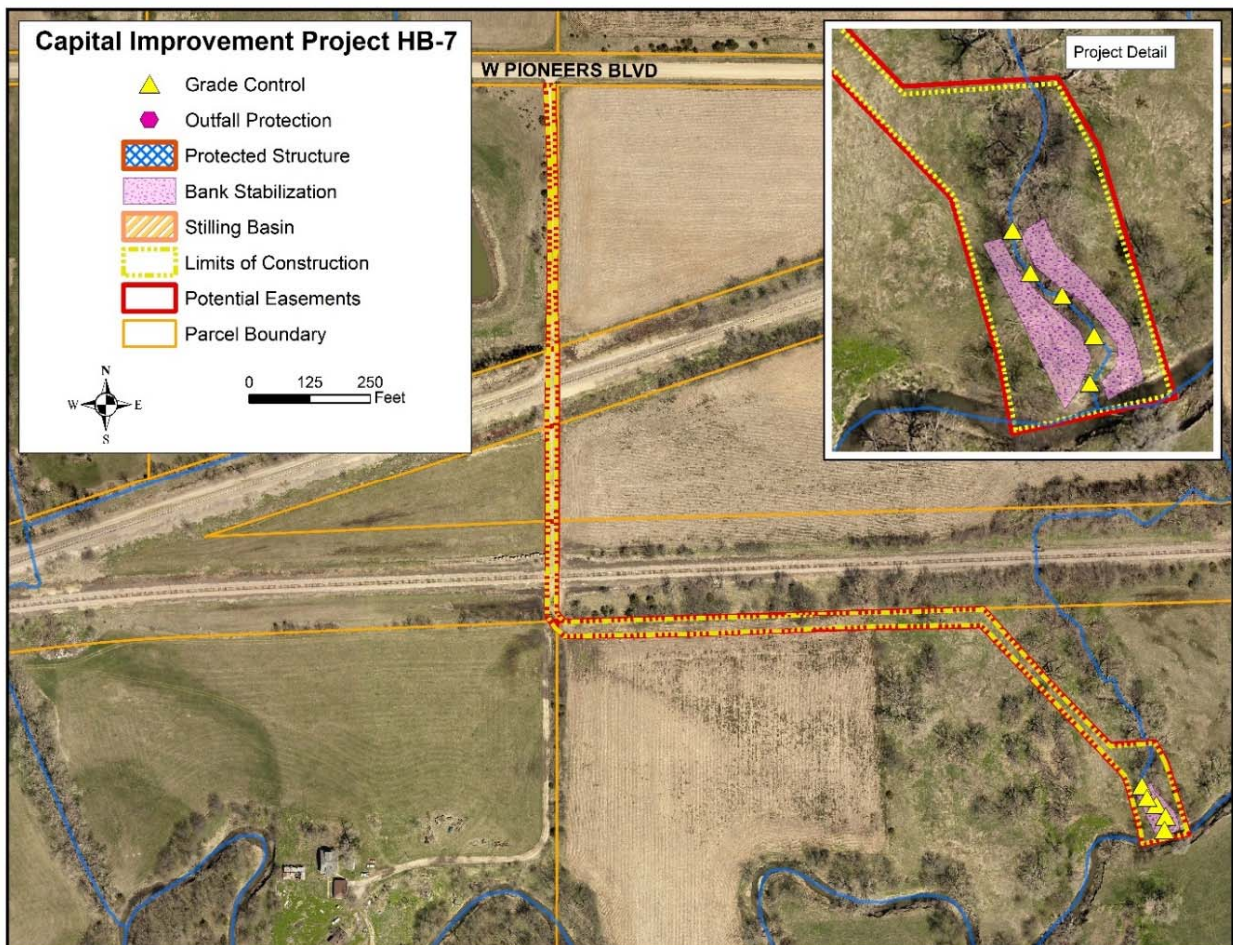


Figure 7-18: Conceptual Layout of HB-7

7.4.8 Project HB- 8: Bank Stabilization at W Pioneers Blvd on Tributary HB080R005

Problem description: Bank erosion on tributary HB080R005 is threatening W Pioneers Blvd located approximately 1,520 feet east of SW 84th St and W Pioneers Blvd. Potentially affected parcels are both public and private property.

Recommendation: Construct bank stabilization with associated grade controls to stop erosion and protect the road. Include culvert outfall protection for the storm outfall on the right descending bank.



Figure 7-19: Knickpoint

Impact to Special Areas and Water Quality: Project is located in an area dominated by woodland. Consideration during design and construction should be provided to minimize disturbance to special areas and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$145,000

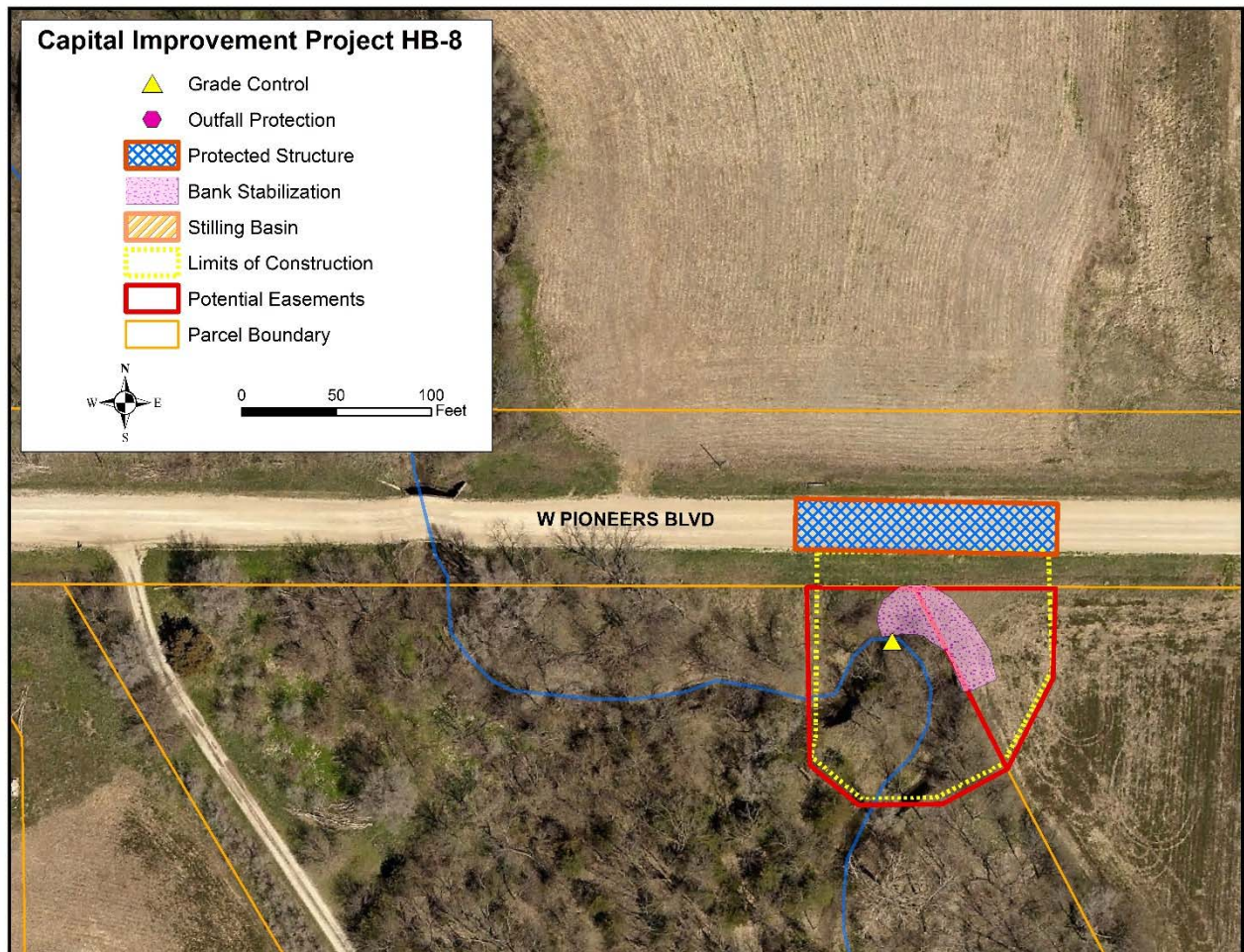


Figure 7-20: Conceptual Layout of HB-8

7.4.9 Project HB-9: Grade Control Incising Reach on Tributary HB080R010

Problem description: Multiple knickzones and active incision exists along a 1,700 foot section of tributary HB080R010 located east of SW 84th St and north of W Pioneers Blvd. Potentially affected parcels are private property.

Recommendation: Construct multiple grade controls along this reach to stop incision. There is approximately 14 feet of vertical drop in the profile elevation from the upstream to the downstream limit of this reach.



Figure 7-21: Incising Channel

Impact to Special Areas and Water Quality: No special area impacts are anticipated. Consideration during design and construction should be provided to minimize disturbance to special areas and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$276,000

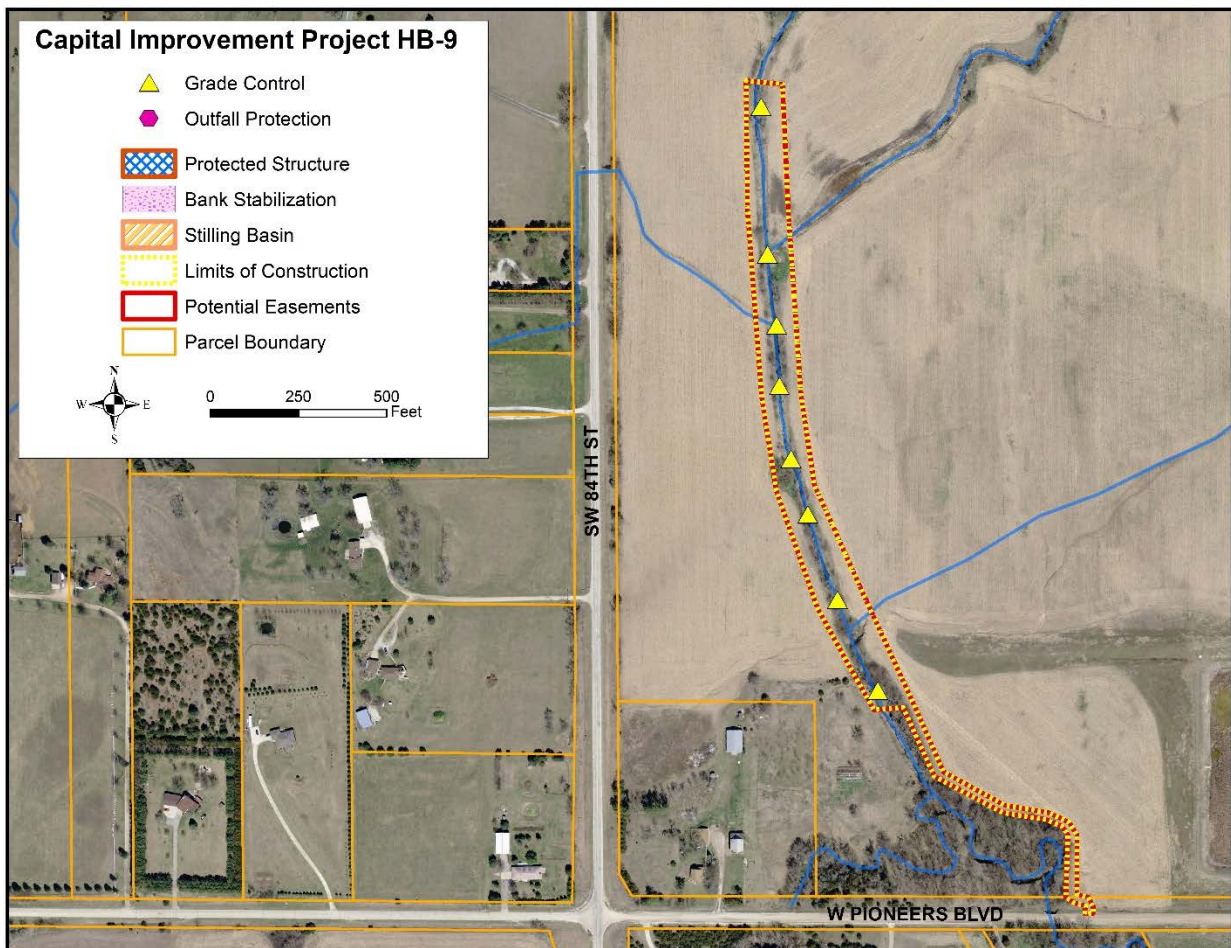


Figure 7-22: Conceptual Layout of HB-9

7.4.10 Project HB-10: Grade Control Knickzone on Tributary HB035R040

Problem description: 4 foot knickzone on the tributary HB035R040 immediately upstream of the W Denton Rd culvert (County Structure N-129) located 250 feet east of SW 60th St. potentially affected parcels are private property.

Recommendation: Construct a series of grade controls and associated bank stabilization to stop incision.

Impact to Special Areas and Water Quality: Project is located in a woodland. Consideration during design and construction should be provided to minimize disturbance to special areas and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$173,000



Figure 7-23: 4 Foot Knickzone

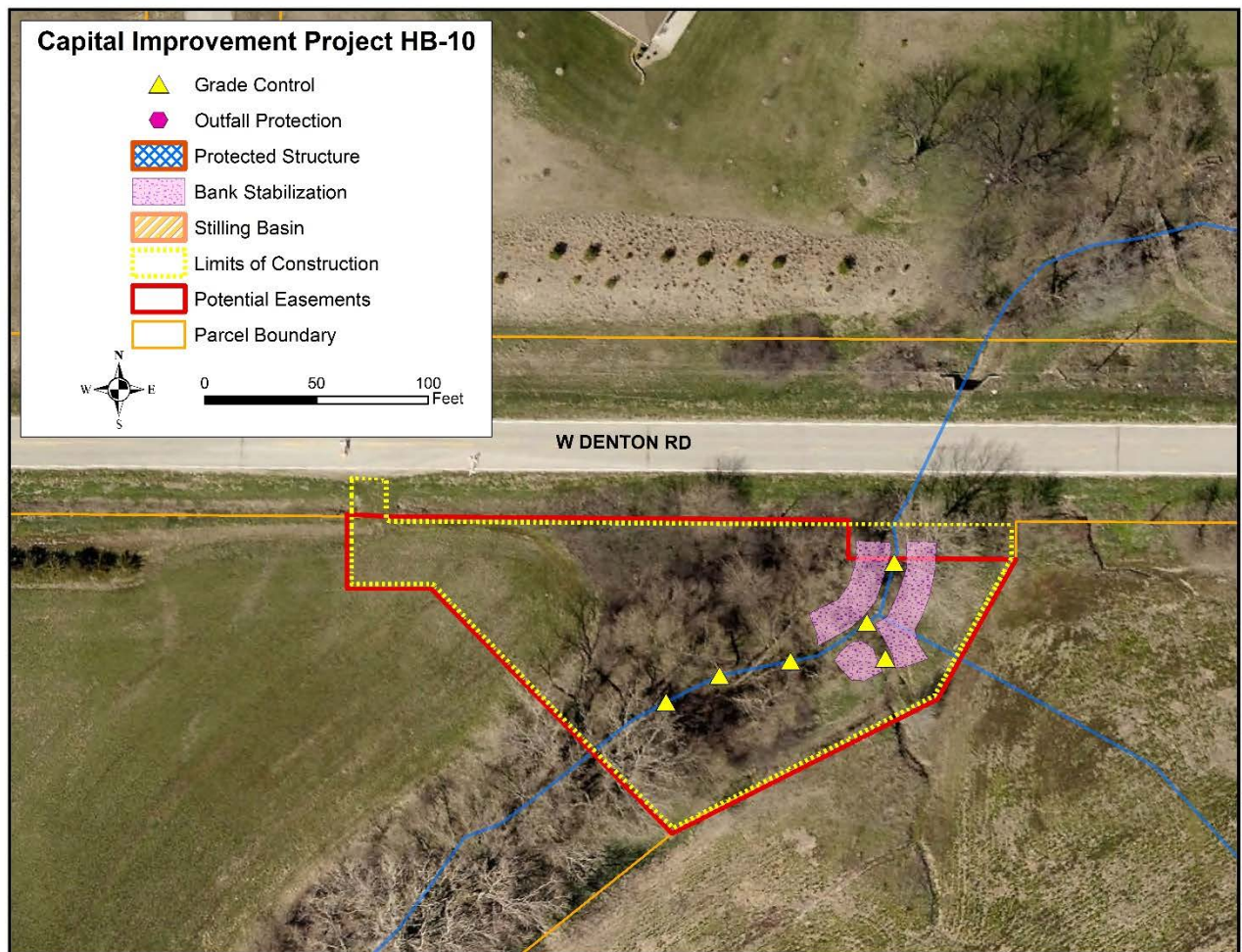


Figure 7-24: Conceptual Layout of HB-10

7.5 Prioritization

The recommended CIP's were classified using the prioritization categories from the Prioritization Methodology Report for Watershed Master Planning Projects, City of Lincoln, Nebraska, 2006. The prioritization methodology was developed for the City of Lincoln to set priorities and implement Capital Improvement Programs for watershed master planning each year. A Flood Impacts Analysis was not included in this Watershed Master Plan, therefore, Flood Impact projects are not included in the CIP. The following prioritization categories were used for project ranking:

- **Flooding Impacts:** This category identifies the impact of floodwater encroachment on structures, public or private property, parking lots, public utilities or other infrastructure. The flooding potential can be identified through hydrologic and hydraulic analysis, study of topographic maps, field investigation and recorded historic problems. This category is further divided according to the frequency of the flooding, flooding that occurs at a more or less frequent rate than the ten-year storm event. Projects primarily intended to address structural or non-structural flooding will usually incorporate a high or low risk safety factor and may, if applicable, incorporate stream stability or water quality benefits.
- **Stream Stability:** This category identifies the impacts of channel erosion, the transport and undermining of soil by stream flow or overland flow. Channel erosion can threaten structures, public property, parking lots, public utilities or other public infrastructure. Channel erosion can also endanger streams, wetlands, lakes, conservation easements, buffer zones or other natural resources. The stream stability and erosion threat may be identified through visual observation, not strictly fluvial geomorphic assessment. This category is further divided according to the nature of the erosion, aggressive channel downcutting as compared to gradual channel widening. Projects primarily intended for stream stability typically will not incorporate flooding impact benefits, though will incorporate water quality benefits.
- **Water Quality:** This category identifies the impacts of water quality. A number of geomorphic mechanisms can adversely affect water quality through increased pollutant loading. The water quality benefits broken down in this category reflect the types of projects developed during watershed master planning efforts. This category is further divided according to the perceived scope of the project benefits, with greater emphasis placed upon projects with broad-based impacts. Projects primarily intended for water quality typically will not incorporate flooding impact benefits, though may incorporate stream stability benefits.
- **Safety Factor:** This category identifies benefits to the potential threat to public health and safety. The potential for loss of life or bodily injury may include individuals trapped in structures during flooding or vehicles being swept away by floodwater. A safety factor is generally associated with projects addressing structural or non-structural flooding, though may be associated with stream stability or water quality projects.
- **Miscellaneous Factors:** This category identifies various other miscellaneous factors and additional considerations that have not been addressed in the previous four categories. Examples of other factors include but are not limited to: project location, development status, adjacent projects, complaints and outside funding opportunities.

This ranking system was specifically developed for Capital Improvement Projects proposed as part of the on-going watershed master planning efforts. Ranking worksheets were used to add points under each category, with the goal of developing an overall score. The projects with the highest point score are considered a higher priority. Appendix H provides a copy of each ranking worksheet.

Table 7.1 lists the priority score, ranking and cost by project for the capital improvement projects within the Haines Branch Watershed Study Area. For projects with the same overall score, engineering judgment was used to finalize the ranking. The engineering judgment favored projects that provided broader based benefits over those projects that focused benefits to one area. The project costs are based on 2014 material and construction costs.

Table 7.1 Project Priority, Rank and Cost

Project Name	Project Description	Priority Score	Project Ranking	Project Cost
HB 1	Grade Control Main Stem HBR005 at S Folsom St and Pipe Outfall Restoration along Bison Trail at Homestead	230	2	\$ 195,000
HB 2	Bank Stabilization and Grade Control Main Stem HBR005 at W Van Dorn St	235	1	\$ 480,000
HB 3	Grade Control Knickpoint on Tributary HB015R005 at Confluence	215	5	\$ 124,000
HB 4	Grade Control Knickpoint at Confluence on Tributary HB040R005 in Pioneers Park	215	4	\$ 167,000
HB 5	Grade Control Knickpoint at Confluence on Tributary HB045R005 in Pioneers Park Nature Center	215	6	\$ 186,000
HB 6	Grade Control Knickpoint on Tributary HB055R005 at Confluence	190	8	\$ 150,000
HB 7	Grade Control Knickpoint on Tributary HB070R005 at Confluence	190	9	\$ 224,000
HB 8	Bank Stabilization at W Pioneers Blvd on Tributary HB080R005	200	7	\$ 145,000
HB 9	Grade Control Incising Reach on Tributary HB080R010	225	3	\$ 276,000
HB 10	Grade Control Knickzone on Tributary HB035R040	190	10	\$ 173,000
Total				\$ 2,340,000

7.6 Other Improvement Recommendations

While the process for identifying problem areas in the Haines Branch Watershed Study Area was primarily focused on identifying and evaluating potential CIP's, it inevitably identified other projects which are not eligible for consideration as a CIP given the detailed criteria used in this evaluation.

Generally these problem areas were classified into one of two potential categories.

1. Other Projects – generally consisted of projects addressing problems identified to have measureable benefits, but do not qualify as Capital Improvement Projects or projects

recommending monitoring of potential problem areas during future CIP planning. These projects and recommendations are included in this Master Plan as Other Improvement Recommendations for use with other programs.

2. Private Projects – generally consisted of problems identified in relation to privately owned structures and/or privately owned and operated utility pipelines and infrastructure either exposed in the channel bed or otherwise threatened by channel erosion. Private projects have little to no measureable benefits to the public, while also not providing substantial flood reduction, stream stability, and water quality benefits. These project locations were provided to the City of Lincoln officials for their use in notifying the private owner of the threatened infrastructure. Some of the pipelines appear abandoned or are no longer in service, so this should be evaluated further prior to proceeding with the project.

The projects categorized as Other and Private are discussed in the following pages.

Figure 7-25 Haines Branch

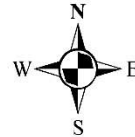
Other & Private Projects

● Private

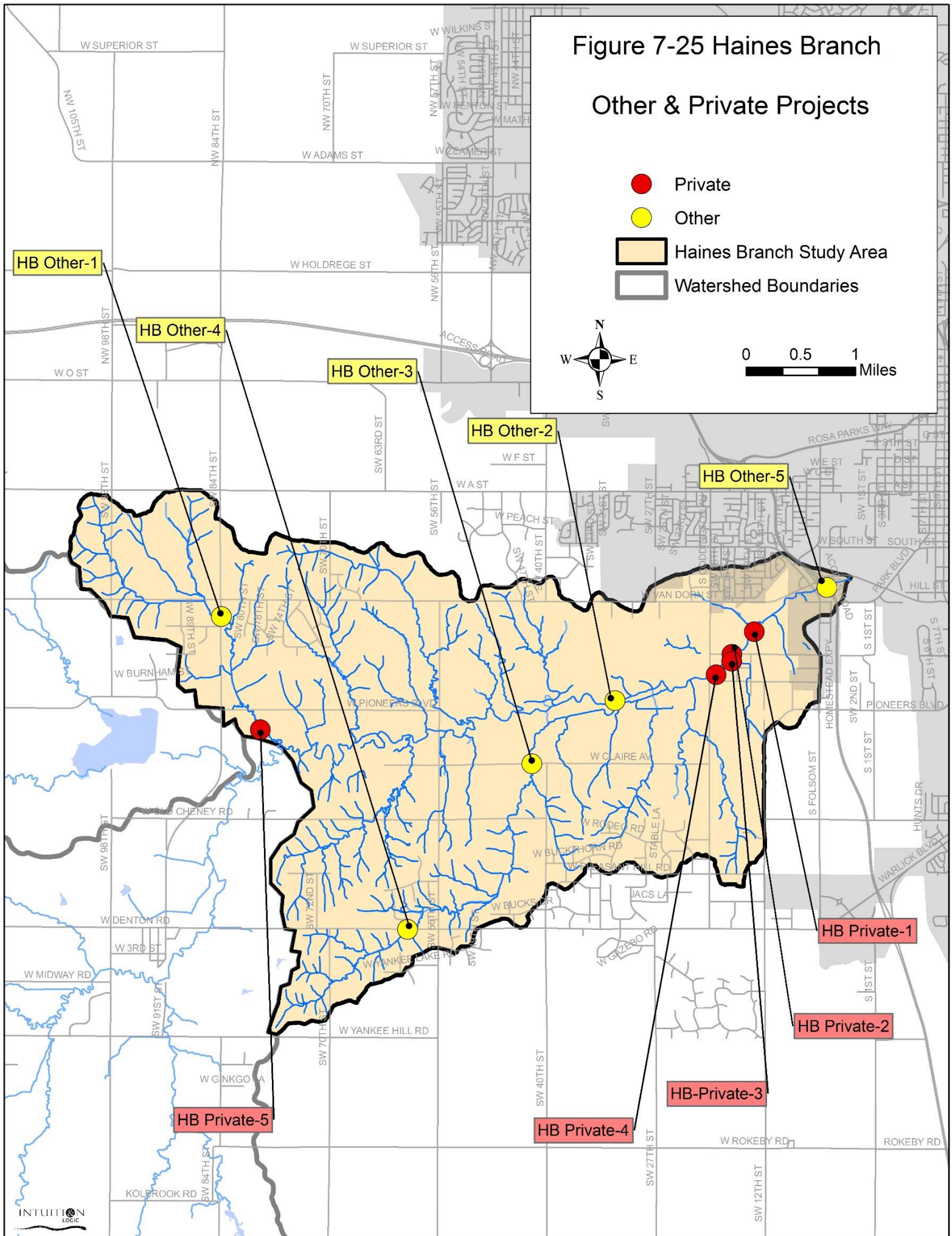
● Other

■ Haines Branch Study Area

□ Watershed Boundaries



0 0.5 1 Miles



7.6.1 Project HB Other-1: Monitor Channel along Tributary HB080R010, Downstream of SW 84th Street

Problem description: Accumulation of sediment and narrowing of the channel on tributary HB080R010 immediately downstream of the SW 84th St culvert indicates irregularities in sediment transport that may become a problem in the future.

Recommendation: Monitor this location for potential problems to include in future CIP planning.

Impact to Special Areas and Water Quality: There are no special areas directly impacted by this project. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.



Figure 7-26: SW 84th St Bridge over Channel

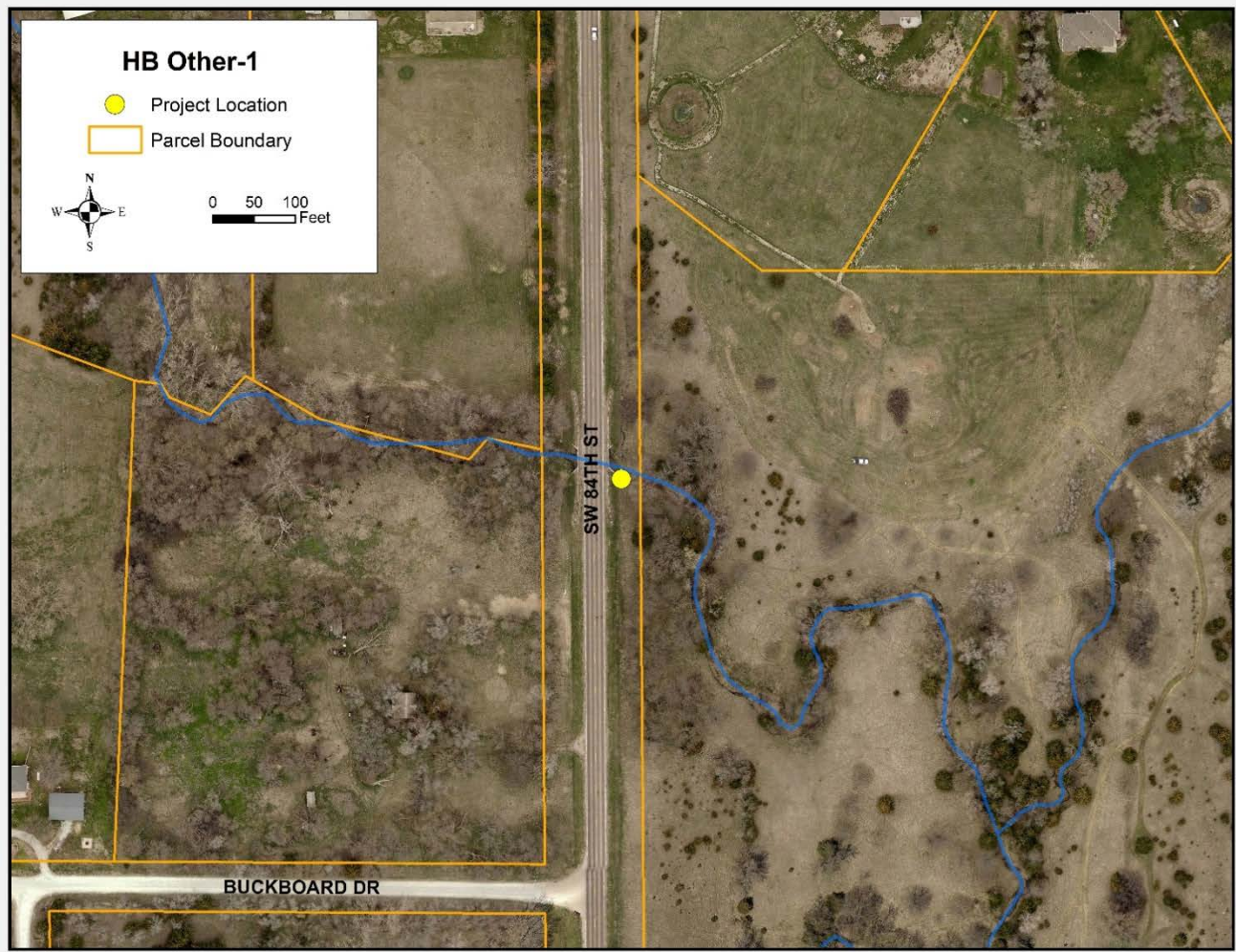


Figure 7-27: HB Other-1 Project Location

7.6.2 Project HB Other-2: Relocate Pioneers Park Trail Away From Eroding Bank of Reach HBR035

Problem description: An existing park trail is located near the top of the left descending bank of the Haines Branch main stem HBR035. Bank erosion is evident in this area and could potentially threaten the trail.

Recommendation: Monitor the progression of bank erosion at this location and plan to potentially relocate this section of trail in response to erosion.

Impact to Special Areas and Water Quality:
Project is located within the Prairie Corridor, woodland, and Pioneers Park.



Figure 7-28: Trail by Bank



Figure 7-29: HB Other-2 Project Location

7.6.3 Project HB Other-3: W Claire Ave Culvert at Reach HB035R015

Problem description: Hydraulic analysis based on available hydrologic and as-built data, indicates that roadway overtopping will occur at the W Claire Ave culvert (O125) on reach HB035R015 during a 100-year flow event. Roadway overtopping at this location could be eliminated if the culvert capacity is increased. The channel capacity at this location is sufficient to convey flood flow without overtopping the roadway.



Figure 7-30: W Claire Ave Culvert (O125)

Recommendation: Conduct further evaluation of the culvert crossing to augment prioritization for culvert replacement. Include consideration of designing a two stage culvert at this location to accommodate the channel dominant discharge as well as flood flows.

Impact to Special Areas and Water Quality: There are no special areas directly impacted by this project. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

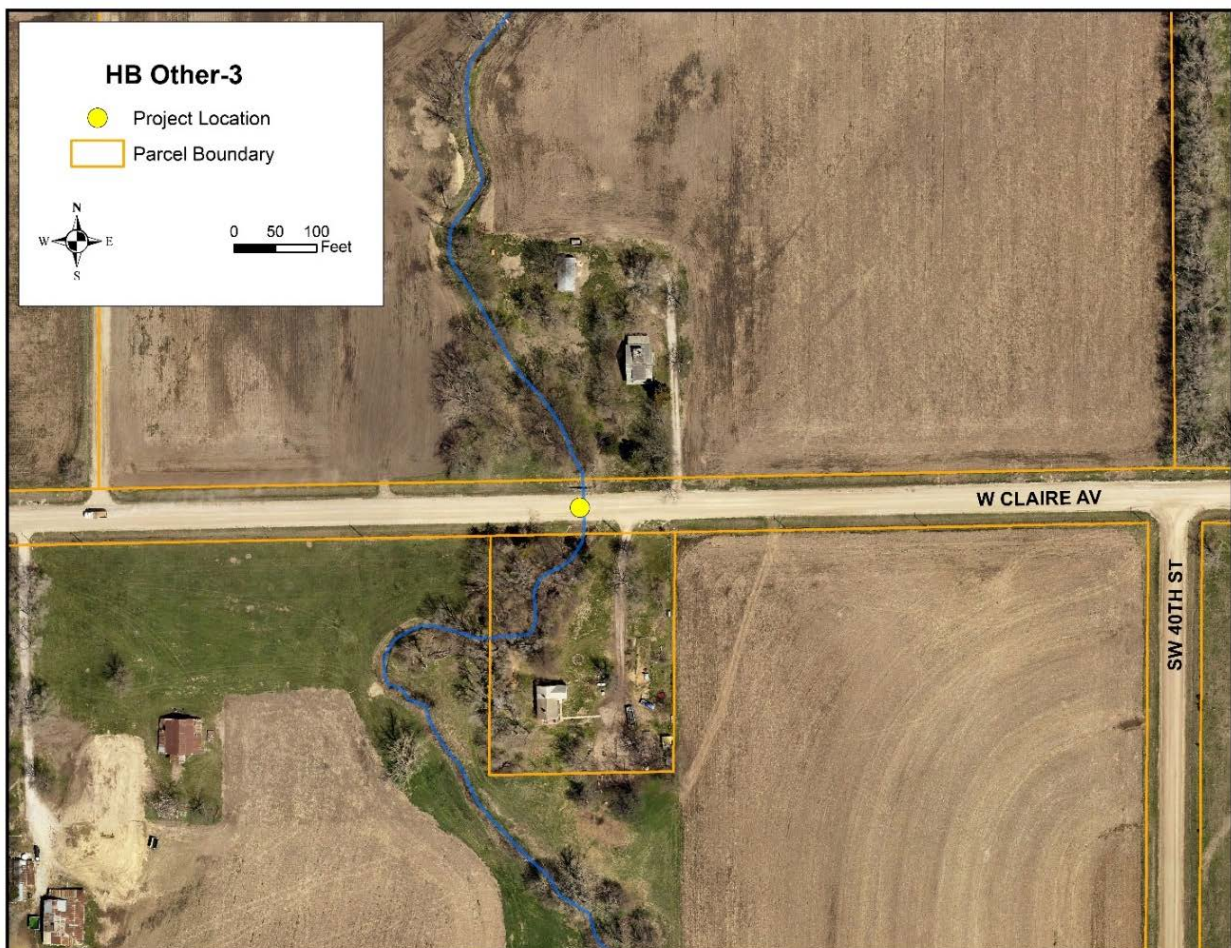


Figure 7-31: HB Other-3 Project Location

7.6.4 Project HB Other-4: W Denton Rd Culvert at Reach HB035R035

Problem description: Hydraulic analysis based on available hydrologic and as-built data, indicates that roadway overtopping will occur at the W Denton Rd culvert (N129) on reach HB035R035 during a 100-year flow event. Roadway overtopping at this location could be eliminated if the culvert capacity is increased. The channel capacity at this location is sufficient to convey flood flow without overtopping the roadway.



Figure 7-32: W Denton Rd Culvert (N129)

Recommendation: Conduct further evaluation of the culvert crossing to augment prioritization for culvert replacement.

Impact to Special Areas and Water Quality: There are no special areas directly impacted by this project. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.



Figure 7-33: HB Other-4 Project Location

7.6.5 Project HB Other-5: Monitor Knickpoints on Main Stem HBR005 at Homestead Expressway

Problem description: Two knickpoints are located on the main stem HBR005 at Homestead Expressway. Each knickpoint is creating approximately 1 foot drop in the channel.

Recommendation: Monitor the knickpoints for potential progression upstream.

Impact to Special Areas and Water Quality: Project is located within Salt Valley Greenway as well as the Prairie Corridor. Consideration during design and construction should be provided to minimize disturbance to these special areas and reduce impacts to water quality to the greatest extent practical.

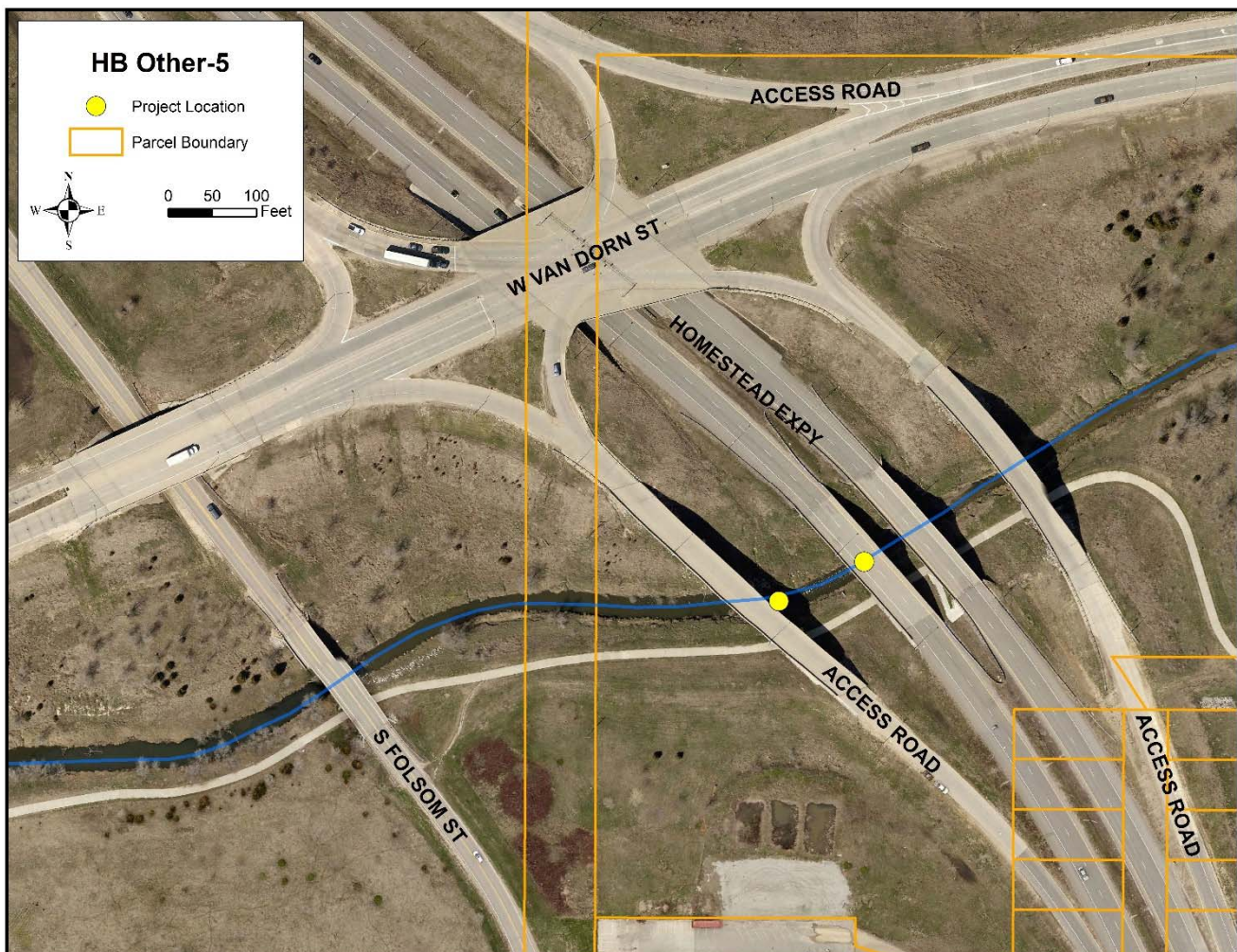


Figure 7-34: HB Other-5 Project Location

7.6.6 Project HB Private-1: Knick Point on Reach HBR015 with Pipe exposed in Channel North of W Calvert St

Problem description: A pipe is exposed in the Haines Branch main stem HBR015 located 1,100 feet north of W Calvert St and SW 15th St. The exposed pipe is currently holding a knick point in the channel. The pipe owner is not known. The project is located in a public parcel.

Recommendation: Notify the owner of the exposed pipe.

Impact to Special Areas and Water Quality: Project is located in a Prairie Corridor.



Figure 7-35: Pipe in channel

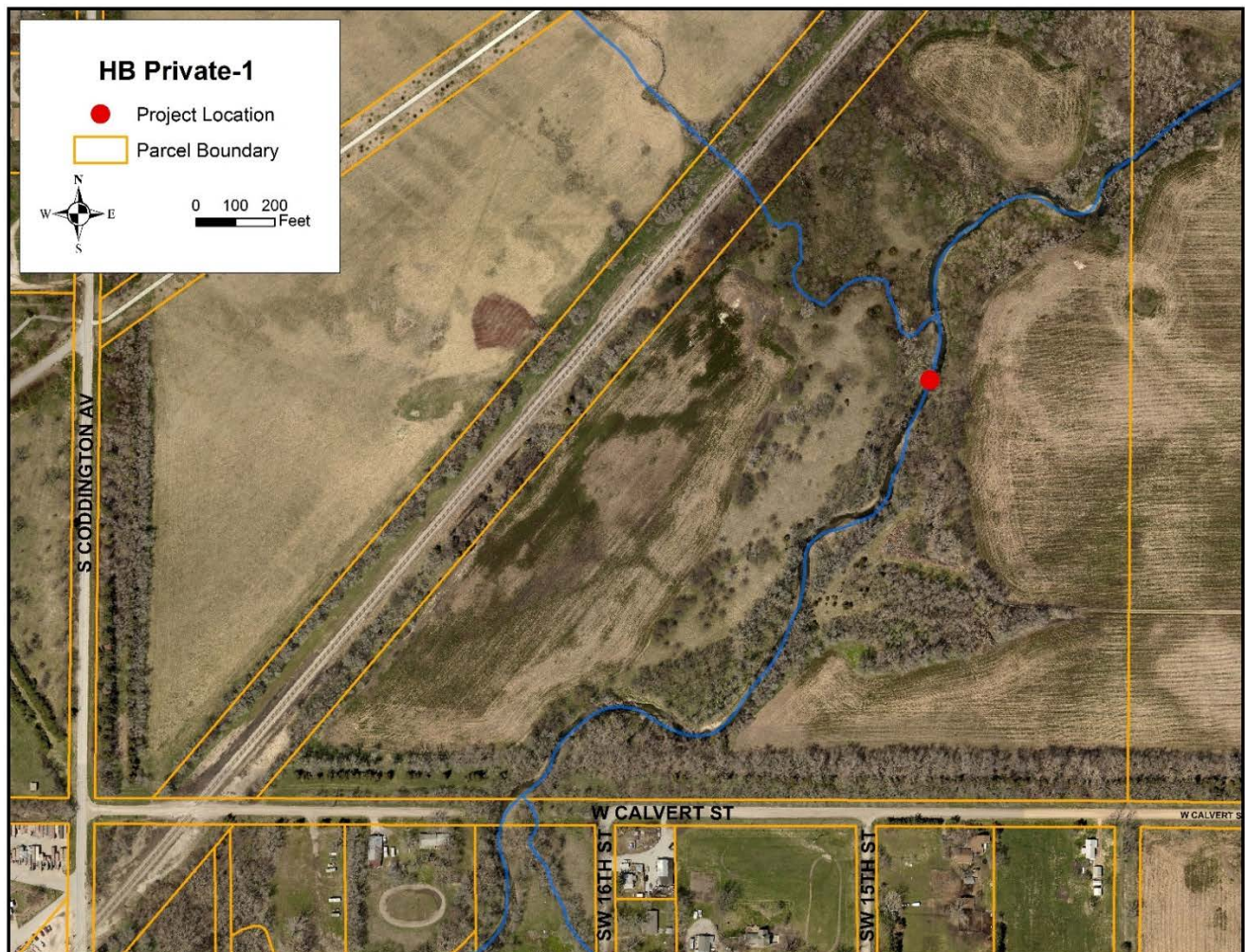


Figure 7-36: HB Private-1 Project Location

7.6.7 Project HB Private-2: Bank Erosion on Reach HBR020 near Utility Pole at W Calvert St

Problem description: Bank erosion is threatening an electric utility pole located at the top of the left descending bank of Haines Branch main stem HBR020, 260 feet west of SW 16th St on W Calvert St. The project is located in a public parcel.

Recommendation: Notify the owner of the threat of bank erosion to the utility pole.

Impact to Special Areas and Water Quality:

While the project is not located in a special area, it is in close proximity to a Prairie Corridor.



Figure 7-37: Utility Pole

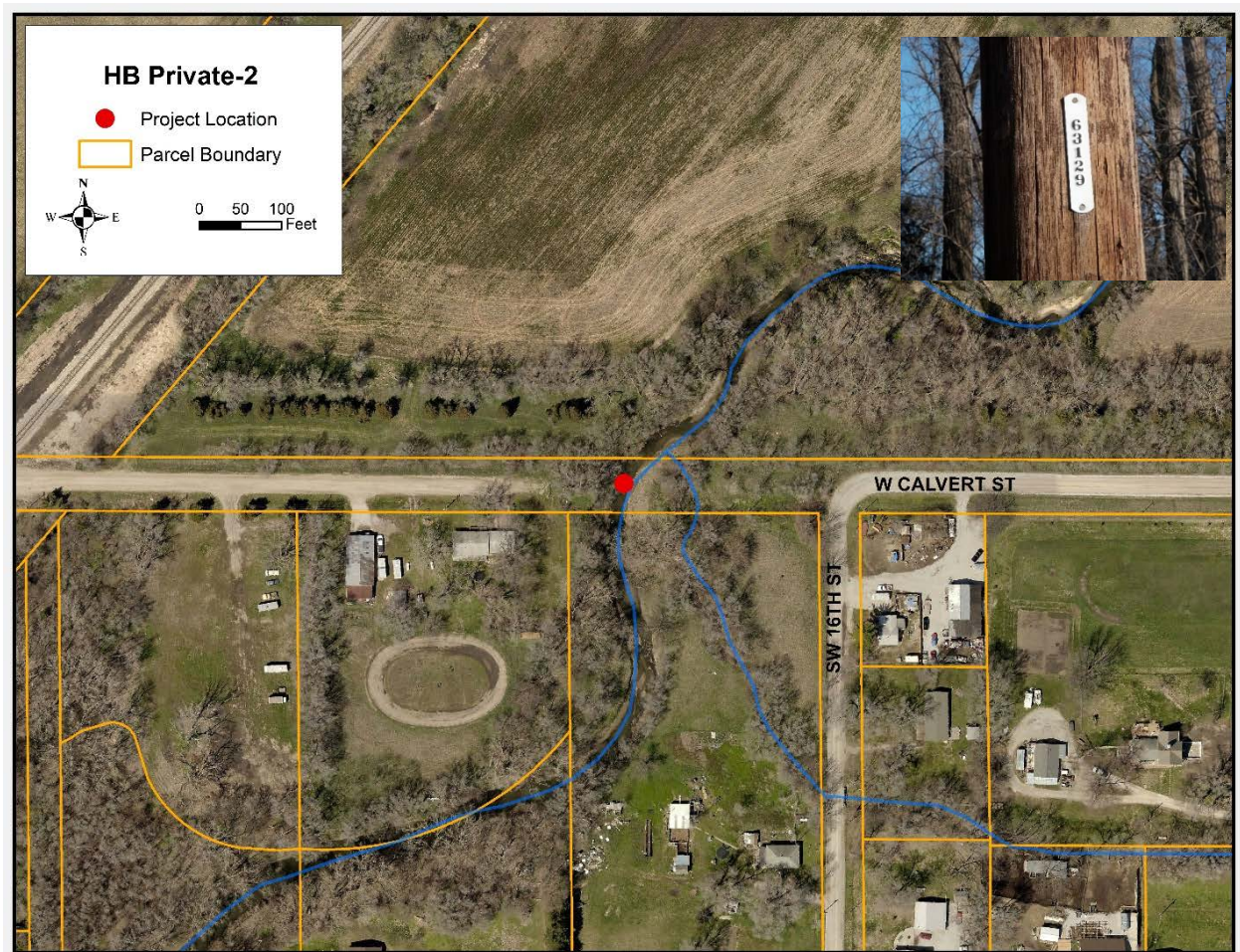


Figure 7-38: HB Private-2 Project Location

7.6.8 Project HB Private-3: Bank Erosion on Reach HBR020 Threatening Structure

Problem description: Eroding high bank on Haines Branch main stem HBR020 is threatening private outbuilding structure at the top of bank located 400 feet northwest of SW 16th St and W Stockwell St.

Recommendation: Notify the owner of the threat of bank erosion to the structure.

Impact to Special Areas and Water Quality: There are no special areas directly impacted by this project. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.



Figure 7-39: Structure on top of bank

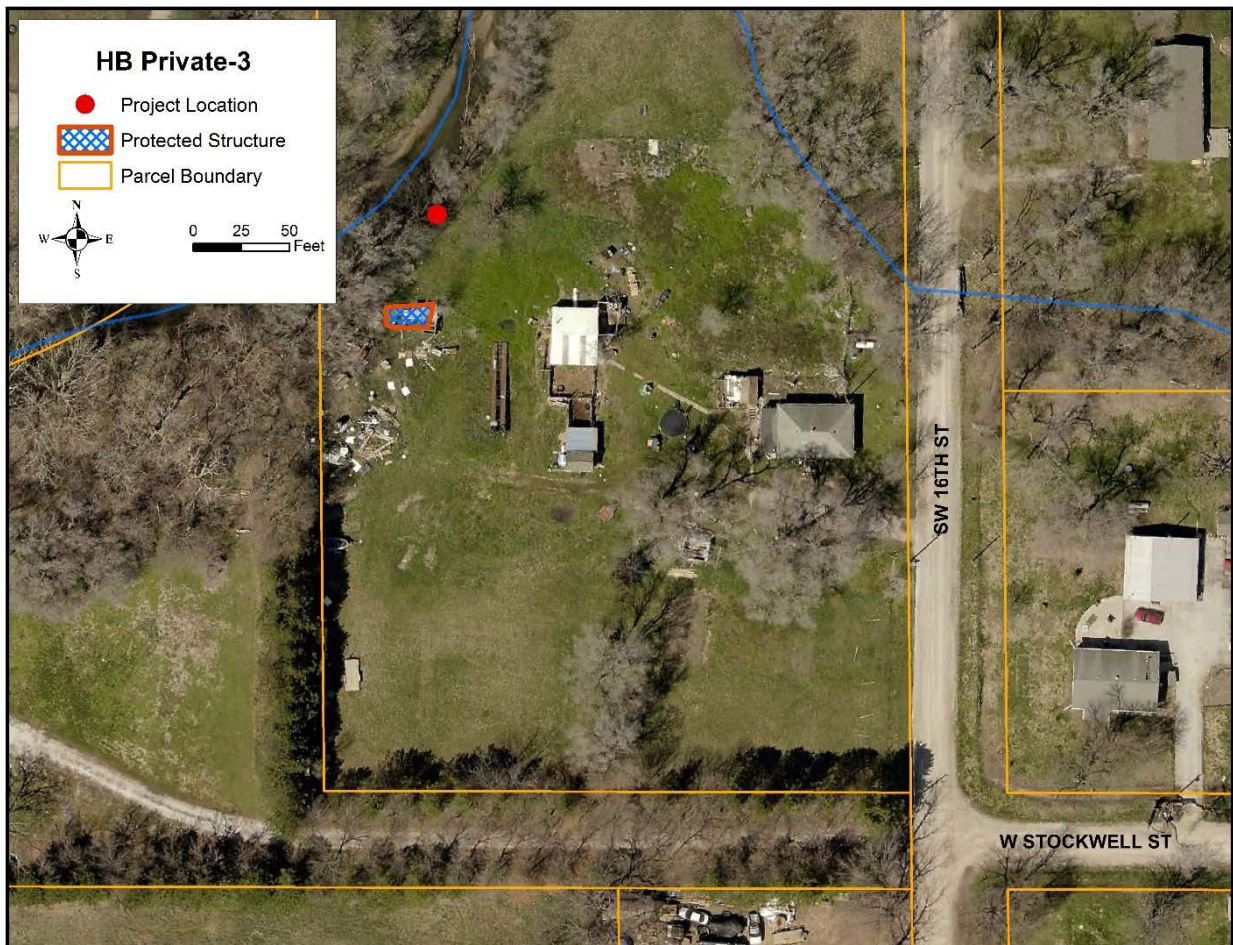


Figure 7-40: HB Private-3 Project Location

7.6.9 Project HB Private-4: Bank Erosion on Reach HBR020 Threatening Structure

Problem description: Eroding high bank on Haines Branch main stem HBR020 is threatening private outbuilding structure at the top of bank located 440 feet northeast of the intersection of S Coddington Ave and W Burnham St.

Recommendation: Notify the owner of the threat of bank erosion to the structure.

Impact to Special Areas and Water Quality: There are no special areas directly impacted by this project. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.



Figure 7-41: Structure on top of bank



Figure 7-42: HB Private-4 Project Location

7.6.10 Project HB Private-5: Bank Erosion on Reach HB080R005 Threatening Utility Pole South of W Pioneers Blvd

Problem description: Bank erosion is threatening an electric utility pole at the top of the left descending bank on the Haines Branch tributary HB080R005. Project is located approximately 950 feet south of W Pioneers Blvd.

Recommendation: Notify the owner of the threat of bank erosion to the utility pole.

Impact to Special Areas and Water Quality: NONE



Figure 7-43: Utility Pole

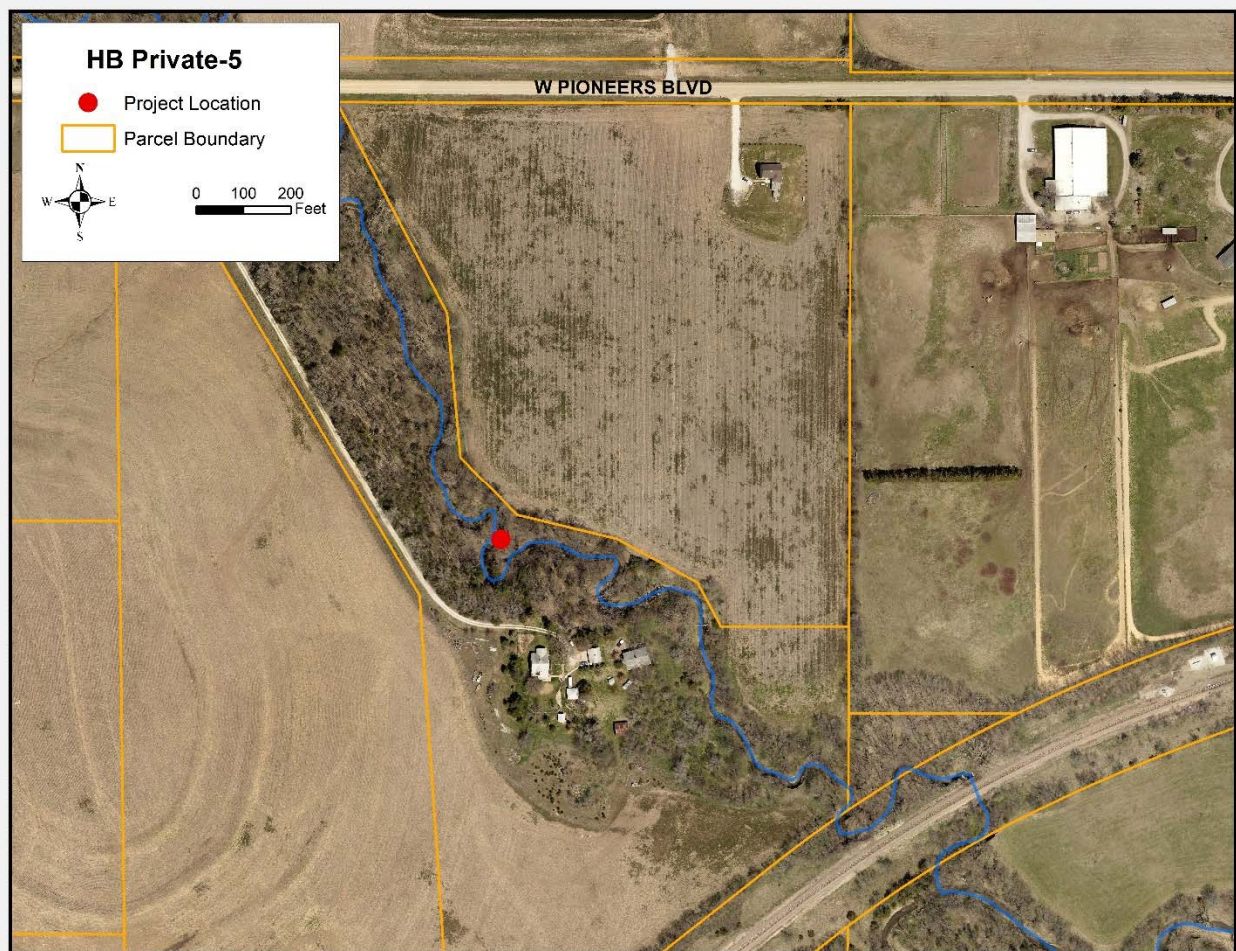


Figure 7-44: HB Private-5 Project Location

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