Site Development Plan

Glacier Creek

Stream and Wetland Mitigation Bank

Douglas County, Nebraska

PREPARED FOR

Papio-Missouri River Natural Resources District

May 2013

Revision 1

Benesch Project No.: 75509104

benesch

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1.0 INTRODUCTION

The Papio-River Natural Resources District (PMRNRD) and the University of Nebraska at Omaha (UNO) have formed a partnership to expand Allwine Prairie and develop a stream and wetland bank within the floodplain of the Big Papio Creek. The site is located adjacent to and west of the Big Papio Creek, north of State Street in Douglas County, Nebraska. The land will be owned by UNO and the bank will be operated by the PMRNRD. The PMRNRD will allow the sale of wetland credits to private and government organizations located in the Big Papillion-Mosquito (10230006) HUC unit. The bank will be approximately 83 acres in size and provide stream and wetland credits for unavoidable wetland impacts in the east central portion of Nebraska. The Site Development Plan was created in accordance with the Amendment 2 of the PMRNRD Final Banking Instrument.

The following sections provide further detail about how the proposed project site will function under the existing wetland mitigation bank instrument (Section 2), existing site conditions (Section 3), conceptual design information and structure of the proposed wetlands and stream restoration (Section 4), how the site will be constructed (Section 5), post-construction aquatic resources (Section 6), and proposed monitoring and maintenance (Section 7 and 8).

2.0 PROJECT INFORMATION

2.1 Project Overview

The Papio-Missouri River Natural Resources District (PMRNRD) and the University of Nebraska at Omaha (UNO) are proposing an expansion of Allwine Prairie Preserve by restoring 83-acres of floodplain and uplands primarily used for agriculture into a lowland prairie ecosystem. Allwine Prairie is a 160-acre restored prairie used for education and research by UNO. As part of this expansion the PMRNRD will develop a stream and wetland bank to be incorporated under their existing wetland bank umbrella instrument. The site is located adjacent to and west of the Big Papio Creek, north of State Street in Douglas County Nebraska. See Figure 1 in Appendix A. The land will be owned by the University of Nebraska at Omaha and the bank will be operated by the Papio-Missouri River Natural Resources District. The PMRNRD will allow the sale of wetland credits to private and government organizations located in the Big Papillion-Mosquito (10230006 HUC unit). The bank will be approximately 83 acres in size and provide stream and wetland credits for unavoidable wetland impacts in the east central portion of Nebraska. A HUC map is presented as Figure 2 in Appendix A. The Site Development Plan was created in accordance with the Amendment 2 of the PMRNRD Final Banking Instrument.

2.2 Location of Proposed Bank

The site is located one-half mile north of the intersection of 144th and State Streets within the floodplain of the Big Papio Creek (Fig. 1). The site is adjacent to Allwine Prairie on the West, a small area of residential development to the Northwest, a wetland mitigation site and agricultural ground to the North, Big Papio Creek to the east and agriculture ground to the South.

The proposed wetland bank will be located in the NE ¼ of Section 23 and the West 1/2 of Section 24, Township 16 North, Range 11 East of the 6th P.M., Douglas County, Nebraska. Collectively the two parcels are adjacent and contain approximately 83 acres.

2.3 Goals and Objectives

- Expand Allwine Prairie Preserve, a restored prairie, to include 83 acres of the Big Papio Creek floodplain ecosystem.
- Restore the floodplain ecosystem, which is currently used for agriculture, with an emphasis on creating a dynamic lowland prairie ecosystem including amphibian habitat.
- Create a highly functional, self-sustaining stream and wetland mitigation bank that approximates the dynamic nature of historic geomorphological processes.
- Restore approximately 2,300 linear feet of Glacier Creek and an unnamed tributary to conditions approximating pre-European settlement.
- Create 14.77 acres of riverine channel and floodplain depressional, emergent, temporarily flooded, seasonally flooded and semi-permanently flooded wetlands.
- Preserve/Enhance 2.9 acres of existing seeps and slope wetlands.
- Utilize stream and wetland credits for current PMRNRD flood control projects.

2.4 Establishment and Operation

The proposed Glacier Creek Stream and Wetland Bank Site is slated for construction in the summer and fall of 2013 with the first monitoring report planned for 2014. (See schedule below).

Operation of the site will be conducted in accordance with the Papio-Missouri River Natural Resources District Final Banking Instrument (2000) and amendments.

2.5 Schedule and Milestones

Table 1. Glacier Creek Wetland Bank Construction and Monitoring Implementation Timetable

Spring 2013	Approval of SDP and Plans for Construction
Summer 2012	Request release of 5% pre-credits
Summer/Fall 2013	Construction
Fall 2013	Request release of additional 10% pre-credits (15% total)
Growing Season/Dormant Season 2013	Seeding
2014	First Year Monitoring
2015	Second Year Monitoring
2016	Third Year Monitoring/ If sites meets COE 1987 Manual Criteria request release of additional pre-credits (30% total)
2017	Fourth Year Monitoring
2018	Final year monitoring/If site meets success criteria request site certification and remaining credit release.

2.6 Financial Assurances

The PMRNRD, as the Bank sponsor, will be responsible for the construction, management, and short and long term maintenance of the Bank site. Short term maintenance is the period of time between construction completion and attainment of success criteria. Long term maintenance is defined as the period after short term maintenance into perpetuity. The PMRNRD will be responsible for securing adequate funds for construction, operation and maintenance of the Bank during its operation life, as well as for long-term management of the Bank as necessary. The PMRNRD has taxing authority to secure funds for the above mentioned financial liabilities. The Bank Instrument provides additional detail about Financial Assurance.

2.7 Real Estate Provisions

The PMRNRD will make appropriate real estate provisions as necessary to preserve this Site into perpetuity. The PMRNRD will submit a Corps approved deed restriction with legal description of boundary to the Douglas County Register of Deeds and provide a copy to the US Army Corps of Engineers. See attached easement language in Appendix H.

2.8 Authorities

Bank Sponsor and Responsible Parties

Bank Sponsor –
Papio-Missouri River Natural Resources District
Attention: Amanda Grint, P.E.
8901 S. 154th Street
Omaha, Nebraska 68138-3621
402-444-6222

Responsible Parties– The PMRNRD will have the primary responsibility of construction, wetland monitoring, and maintenance of the proposed wetland bank. UNO will provide short and long term management. Accounting of wetland bank credits will be completed by the PMRNRD.

University of Nebraska at Omaha
Attention: Tom Bragg, Ph.D.
Allwine Hall 114
6001 Dodge Street
Omaha, NE 68182-0040
402-554-3378

3.0 PRE-CONSTRUCTION DESCRIPTION OF MITIGATION SITE

3.1 Current Land Use

The site is currently used for agriculture purposes, primarily row crops and pasture. Two drainage ways, Glacier Creek, which is forested, and an unnamed tributary, which is covered with herbaceous vegetation, dissect the agricultural land. The site also has several forested areas along the transition between the floodplain and loess uplands. The transition area consists of upland grassland, forest and sloped wetlands. The Site Map (Fig. 3) shows these features on an aerial image. Surrounding land use consists of agriculture land, natural areas and single family residential. See the Land Use Plan for additional detail about surrounding land use (Fig 4a).

3.2 Hydrology

The proposed bank site is located in the south central portion of the Big Papillion-Mosquito (10230006) HUC unit (Fig. 2). Hydrology at the proposed wetland bank will be influenced by both surface water and ground water. The watershed draining to the site is approximately 390 acres with approximately 196 acres of cropland, 164 acres of natural area and 31 acres residential development. See Figure 4a for land use map and Figure 4b for drainage area map. Watershed runoff information is provided in Appendix B. In 2010 groundwater in this area fluctuated from 2-17 feet below the soil surface depending on the time of year. The average groundwater depth below the ground surface on the south half of site was 4.5 feet in May, 2.0 feet in June, and 6.5 feet in October. It should be noted that groundwater dropped to 17.0 feet below ground surface within 300 feet of the Big Papio as groundwater naturally drops to meet the water elevation of Big Papio Creek. Appendix B contains groundwater data from preliminary geotechnical investigations performed in May and June, 2010 and a final geotechnical investigation in October, 2010. A Boring Location Plan and summary of groundwater depths (Table 2) is presented in the Geotechnical Investigation Report (App. B).

3.3 Soils

The Site lies in the Dissected Till Plains section of Nebraska, a part of the Central Lowland province of the Interior Plains physiographic division (Lobeck 1948). The project site is located primarily on alluvial bottom lands adjacent to the Big Papio Creek. The NRCS soil survey classified soils at the site as Kennebec, Contrary, Judson, and Kenridge map units. All of the map units in the stream and wetland development area are partially to moderately well-drained to somewhat poorly drained. Benesch advanced seven soil borings in May 2011 to characterize soils at the site. Soils consisted of lean and fat clays. The Benesch geotechnical investigation report is provided in Appendix B.

3.4 Vegetation

Natural vegetation within a majority of the site has been removed and converted to agriculture, row crops and pasture. Natural vegetation is associated with Glacier Creek, the unnamed tributary and hill slope (transition area) along west side of property. This area consisted of upland wooded areas, sloped forested wetlands, upland pasture and sloped herbaceous wetlands. These areas are identified on the Site Map (Fig. 3). Vegetation within Glacier Creek and unnamed tributary drainage was comprised of eastern riparian forests (Steinauer & Rolfsmeier 2003) consisting of 30-75 feet tall *Populus deltoides*, *Celtis occidentalis*, *Morus alba* and *Ulmus americana*. *P. deltoides* was only observed on the eastern third of Glacier Creek. The

herbaceous understory in these areas consisted of *Bromus inermis*, *Elymus virginicus*, *Urtica dioica*, and *Muhlenbergia* sp. Vegetation along hillslope varied depending on the community type. Forested, sloped wetlands consisted of *Salix amygdaloides*, *Ulmus americana* and *M. alba*. Emergent sloped wetlands consisted of *Equisetum arvense*, *Scirpus* spp., *Typha* sp., *Phalaris arundinacea*, and *Solidago gigantea*. The upland pasture consisted of *B. inermis* and the upland forest of *Ulmus* sp.

3.5 Existing Wetlands

Two types of wetlands are present within the 83-acre proposed wetland bank site, sloped wetlands are present along the topographic transition area of the Big Papio Creek floodplain and adjacent Loess uplands (west side of site) and riparian wetlands are present along the unnamed tributary. Wetland locations are depicted on the Wetland Delineation Map (Fig. 5). Hayes Environmental identified wetlands in 2007 on a portion of the site associated with the Heritage Development which was proposed to be west/northwest of the proposed bank site. Benesch verified the presence of existing wetlands identified by Hayes and conducted a separate investigation of Glacier Creek, the unnamed tributary on the north end of site, and farmed areas in the fall of 2010. The Benesch wetland verification report is provided in Appendix C. Wetlands identified on the proposed bank site are further discussed below.

Sloped Wetlands – Sloped wetlands were identified in two locations along the west side of the Site. The wetlands were located along hillsides with slopes ranging from 10-25%. The source of hydrology for these wetlands appears to be a series of seeps dispersing from the face of the slope. The seeps possibly occur where the permeability of the soils change. Vegetation consisted of *Salix amygdaloides*, *Ulmus americana*, *M. alba*, *Equisetum arvense*, *Scirpus* spp., *Typha* sp., *Phalaris arundinacea*, and *Solidago gigantea*. The soils at one sampling location were saturated to surface with a color of 10YR 2/1 and emitted a hydrogen sulfur smell which meets the hydric soil indicator (A4) Hydrogen Sulfide.

Riparian wetlands – Despite mapped National Wetland Inventory (1988) Palustrine Forested Temporarily Flooded (PFOA) wetlands along Glacier Creek actual wetlands were not observed in the field. Wetlands were not present within Glacier Creek due to the steep, incised banks located above the channel. The primary terrace above the stream did not exhibit wetlands either. The NWI map did not depict any other wetlands at the site. Palustrine Emergent Seasonally Flooded (PEMC) wetlands were observed in channel bottom of the unnamed tributary located on the north end of the Site.

Farmed areas – A review of historic aerial photos for wetland signatures in accordance with Chapter 5 of the U.S. Corps of Engineers Midwest Regional Supplement (2010) did not reveal presence of wetlands in farmed areas.

Surrounding Properties – Wetlands are also present adjacent to the Site along Big Papio Creek, within Glacier Creek upstream of the proposed Bank Site on Allwine Prairie, and near the north end of Site in a natural seep wetland (PEMC/PSSA) located along a terrace of the unnamed tributary. Floodplain depressional wetlands are present north of the Site in a wetland mitigation area.

Wetland Impacts – Wetland impacts will occur as a result of the Bank development. Impacts to regulated wetlands within the Unnamed Tributary will occur as a result of the stream restoration project. Impacts will be accounted for during the calculation of wetland credits at the site. The 0.4 acres of wetlands will be deducted from the wetlands restored in this area.

3.6 Existing Streams

3.6.1 Glacier Creek

Glacier Creek is considered a perennial stream. Aerial photographs dating to 1940 show the alignment in a similar location as today. It is unknown whether the segment at the Site was channelized; however, the present configuration is straight with no meanders. The channel has been severely degraded over time due to head cutting that has propagated upstream from the confluence with the Big Papio Creek. A twin corrugated culvert located 1,400 feet upstream of the confluence has prevented head cutting any further up gradient. The purpose of the culvert is to allow access across Glacier Creek. Glacier Creek has perennial water flow within 3-5 feet wide, 6-inch deep channel during base flow conditions. The substrate consisted of hard, loamy clay. See Exhibit 1 below for a typical view of this stream. Banks were 7-15 feet tall and typically steep to vertical. No riparian wetlands were observed. In-stream habitat was present in the form of pools, overhanging branches, tree roots,

Exhibit 1. View of Glacier Creek near upstream end facing west.

3.6.2 Unnamed Tributary

The unnamed tributary is considered a perennial stream. Aerial photographs dating back to 1940 show the alignment in a similar location as today. It is unknown whether the segment on the site property was channelized; however, the present configuration appears to have been channelized. The substrate consisted of a soft loam/clay. (See Exhibit 2 for a typical view of this stream). Banks were 4-6 feet tall and typically steep to vertical. Wetlands were observed within the stream channel. Little in-stream habitat was present in the form of pools, overhanging branches or tree roots.

Exhibit 2. View of Unnamed Tributary facing north.

Glacier Creek and the unnamed tributary are both regulated waterways of the United States. Both waterways had a defined bed and bank, an Ordinary High Water Mark (OHWM) and are considered Relatively Permanent Waters (RPW), which are regulated by the Corps of Engineers.

Stream Impacts – Waterway impacts will occur as a result of the Bank development. Impacts to regulated waterways, at Glacier Creek and at the unnamed tributary will occur as a result of the stream restoration project. Impacts will be accounted for during the calculation of stream credits for the proposed bank site. Stream channel impacts will be temporary as the original channel will be restored. The existing length of regulated channel is accounted for in the stream assessment and therefore not allowed to be sold for credits. Section 5.0 describes the stream assessment that was completed for each stream.

3.7 Stream Assessment

A stream assessment was completed for both tributaries according to the Nebraska Stream Assessment Protocol (COE 2010). The primary purpose of this assessment was to document stream conditions prior to the restoration and again afterwards to determine the functional improvement from restoration. The net gain identifies the amount of functional credits that are available to be sold at the bank. Appendix D contains the calculation sheet and stream assessment protocol. Comments from the Corps of Engineers IRT chairman have been incorporated into this assessment. Table 3 summarizes the results of the stream assessment for Glacier Creek and the unnamed tributary.

Table 2. Nebraska Stream Assessment summary of Glacier Creek and Unnamed Tributary prior to restoration and post-restoration.

Nebraska Stream Assessment Protocol		
Existing Conditions		
	Condition Index Rating	
Variables	**Glacier Creek**	**North Channel**
Hydraulic Conveyance and Sediment Dynamics	0.1	0.1
In stream and Overbank Habitat Diversity	0.18	0.5
Floodplain Interaction-Connectivity	0.25	0.25
Vegetation Composition	0.25	0.1
Buffer Continuity and Width	0.5	0.25
Land Use	0.75	0.5
Stream Condition Index Total	**37,625.25**	**15,277.70**
Proposed Conditions		
	Condition Index Rating	
Variables	**Glacier Creek**	**North Channel**
Hydraulic Conveyance and Sediment Dynamics	0.75	1
In stream and Overbank Habitat Diversity	0.75	1
Floodplain Interaction-Connectivity	0.75	0.75
Vegetation Composition	1	0.75
Buffer Continuity and Width	1	1
Land Use	1	1
Stream Condition Index Total	**145,656.88**	**211,997.50**
Net Increase (Functional Lift)	**108,031.63**	**196,719.80**
Mitigation Units (Credits)	**108,031.63**	**196,719.80**

4.0 MITIGATION SITE PLAN

4.1 Concept Design

4.1.1 Wetlands

The proposed wetland bank project will create approximately 14.77 acres of emergent, floodplain depressional and riverine channel (HGM), temporarily flooded, seasonally flooded and semi-permanently flooded wetlands. Existing forested and emergent sloped wetlands totaling 2.9 acres are proposed to be enhanced. A conceptual design plan is provided in Figure 6 of Appendix A. Proposed wetland areas were assigned a naming convention for discussion purposes (Wetland A, B, C, etc.). Proposed wetlands with this naming convention are shown on Figure 6. Each wetland is discussed in more detail below.

Wetland A and B – Two, 1-acre in size, floodplain depressional, seasonally flooded, emergent wetlands will be created immediately adjacent to Glacier Creek with the goal of receiving out of bank flooding from Glacier Creek on a regular basis. Wetland A will be 4-8 feet deep and will

seasonally intercept the groundwater table. This area is expected to be flooded for longer durations and could have a semi-permanently flooded water regime (PEMF). Wetland B will be 2-4 feet deep and will rely on surface water alone for a water source. This area is expected to be flooded seasonally and will have a temporarily flooded water regime (PEMA/C). A clay liner will be installed in the bottom and sides to retain surface water for a longer period. See the water budget for these areas provided in Appendix B. It should be noted that the water budget for Wetland B was calculated without the clay liner. Benesch expects this wetland to be wetter during the growing season than shown. The side slopes of these depressions will be at a relatively flat slope of 15 horizontal feet for every one foot of vertical rise (15:1).

Vegetation will exist around the perimeter and bottom at Wetlands A & B within zones along a moisture gradient. These areas will contain a variety of species ranging from shallow and deep marsh species, such as, bulrush (*Scirpus* sp.), cattail (*Typha* spp.), arrowhead (*Sagittaria* sp.) and smartweed (*Polygonum* sp.) along bottom and lower zones and wet meadow species, such as, grasses, rushes (*Juncus* spp., sedges (*Carex* spp.) along the middle zone to upper zone that will transition to a lowland prairie.

Wetlands C, D/E are all floodplain depressional wetlands that will vary in size from 1.0 – 1.7 acres and have a temporarily to seasonally flooded water regime (PEMA/C). These areas will vary in shape from circular to irregular shaped, approximately 70-170 feet in diameter, and 1-3 foot deep. These wetlands are expected to pond water for various durations during the growing season as a result of different soil types (natural vs. clay) and compaction rates. Variable water regimes are desirable for attracting amphibians which need a diversity of water regimes, such as, temporarily flooded, seasonally flooded and permanently flooded for life cycle requirements (PARC 2010). A hydrograph for these wetlands calculated without compaction and or clay liners is provided in Appendix B. The hydrograph for Wetlands C shows that water will be 1-4 inches deep from early spring though May and then a dry down will occur from June to September. The Hydrograph for Wetland D/E shows water up to 20 inches deep from March thru August and then dry for the remaining part of year.

Vegetation will be limited primarily to the fringe in these areas and consists primarily of early colonizing species that tolerate wet dry cycles. Examples of species that may exist in this environment are barnyard grass (*Echinochloa crusgalli*), smartweed (*Polygonum* sp.), beggarstick (*Bidens* sp.) and seed box (*Ammannia coccinea*). Vegetation may colonize the wetland bottom after the water recedes in summer.

Wetland G and H are approximately 70 feet in diameter, and 2 foot deep depressional areas located within the riparian area of the unnamed tributary. These wetlands will have a seasonally flooded to semi permanently flooded (PEMC/F) water regime consisting of water up to a foot deep from March to September. A water budget is presented in Appendix B. These areas will contain a variety of wetland meadow to shallow marsh species varying from smartweed (*Polygonum* spp.), barnyard grass (*Echinochloa crusgalli*), bulrush (*Scirpus* sp.) and cattail.

Wetlands I and J are proposed wetland areas along the restored Glacier Creek and the unnamed tributary within the immediate floodplain or terrace of these streams. These areas will be relatively flat and then transition up a 4:1 slope onto the Big Papio floodplain. The adjacent

stream will only be two foot deeper than the wetland terrace. According to the results from the preliminary hydraulic analysis, these areas will receive regular out of bank flooding from the streams and potentially be influenced by groundwater creating a temporarily flooded to seasonally flooded riparian wetland (PEMA/C). A water budget for this area is provided in Attachment B and a grading plan and cross sections provided in Appendix E.

Vegetation expected in this area will vary from grasses such as (*Muhlenbergia* sp.), big bluestem (*Andropogon gerardii*), (*Panicum* spp.), and prairie cordgrass (*Spartina pectinata),* sedges (*Carex* spp.), rushes (*Juncus* spp.) *Echinochloa crusgalli*) to grass like plants, such as, spike rush (*Eleocharis* sp.), sedges (*Carex* sp.), and forbs, such as, ragweed (*Ambrosia* sp.) and tickseed (*Coreopsis* sp.).

Wetland Enhancement Areas – Sloped wetlands on the north end of the site have been severely modified by a man-made berm located near the transition of the floodplain and upland. The proposed plan for restoration/enhancement is to remove the berm, re-grade and re-seed the area. Additional wetland area is expected to develop along the floodplain as a result. The south slope wetland has had hydraulic modifications to the natural flow of the seeps in addition to an equipment road through the middle. In addition, this area has undesirable vegetation consisting of *Phalaris arundinacea*. This area is proposed to be enhanced by removing the trail and water diversion, removing undesirable vegetation and reseeding.

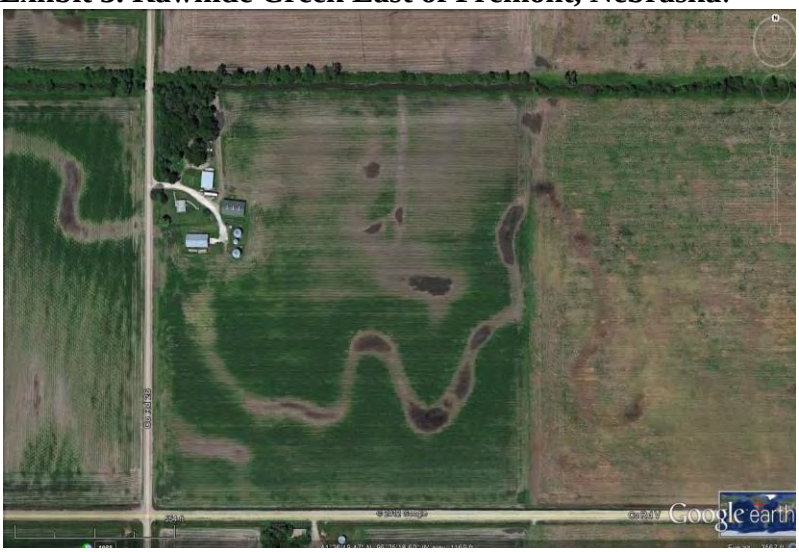
For all wetland areas a preliminary grading plan and cross sections are provided in Appendix E. A vegetation planting plan is provided as Figure 7 and proposed seed mixes are presented in Appendix G.

4.1.2 Stream Restoration

Glacier Creek and the unnamed tributary will be restored to a stream condition noted in the 1856 survey of this area, which stated that Glacier Creek in this area could be stepped across and had only a few trees along the entire segment. This description is consistent with pre-settlement descriptions of prairies with regular fire regimes (Packard & Mutel 1997, pers comm. with Tom Bragg). Even though the historic land survey and historic maps (1940 aerial, 1893 topographic map) and the historic soil survey did not indicate if the channel meandered, the proposed plan will add meanders back to the streams, which is consistent with most natural streams that have not been impacted by anthropogenic causes (Leopold et al. 1992, Riley 1998). In addition, the incised channel beds of these streams will be elevated to just a few feet below the floodplain terrace.

Rawhide Creek in Dodge County and Salt Creek in Lancaster County are two examples of natural streams with meanders. (See Exhibit 3 and 4 below).

Exhbit 3. Rawhide Creek East of Fremont, Nebraska.



Restoration of the stream bed to a vertical elevation just a few feet below the floodplain surface will require a single water control structure at the downstream end near the confluence with the Big Papio. This will allow the channel upstream of the structure to be backfilled and raised approximately 13 feet at Glacier Creek and 10 feet at the unnamed tributary. Exhibit 5 provided on the next page shows a cross section of the proposed channel at Glacier Creek and structure with the existing channel for comparison.

Exhibit 4. Salt Creek southeast of Lincoln, Nebraska

Raising the stream bed elevation near the floodplain surface elevation will theoretically raise the local groundwater table that currently drains to the existing stream channel (which is at an elevation of 10-13 feet below the flood plain surface elevation). Restoring the stream channels and associated groundwater table will allow the development of a lowland prairie ecosystem which is typical of floodplains with a high groundwater table. The higher groundwater table will allow the development of a lowland prairie vegetation community.

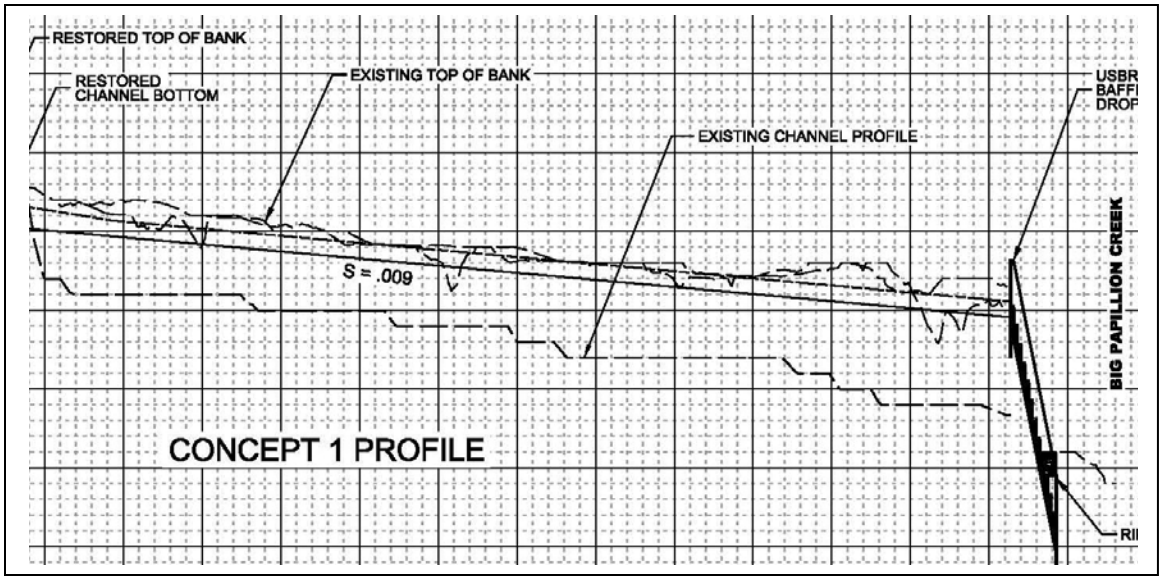


Exhibit 5. Cross section view showing proposed stream bed, structure and existing stream.

Design Components – The site concept plan (Fig. 6) shows the proposed meander pattern of the new streams. The proposed stream dimension will be approximately 6 feet wide by 2 feet deep. The preliminary grading plan and cross section maps in Appendix E show additional detail of the stream dimension. To protect the stream from erosion on the channel bottom and along outside bends (primary concern is during flood events) a series of soft and hard armoring techniques will be implemented. The proposed stream restoration plan detail is provided in Appendix F. Generally, the outside bank of the channels will be protected using soft armoring techniques such as tree branches/logs, brush mattresses, live fascines and live stakes. Further downstream the level of protection will be higher in order to prevent the channel from migrating outside the down gradient control structure. The second to last bend has a log, root wad, and boulder revetments along the outer toe of bank and the last bend has a vegetated geogrid on the outer bank. Each of these treatments is further described in Stream Restoration Concept Plan (App. F).

Rock riffle pool structures are proposed at two locations on each stream. These structures allow for grade changes and grade stabilization.

4.1.3 Upland Buffer

A major component of the Glacier Creek Wetland Bank will be the reconstruction of approximately 63.3 acres of lowland and upland prairie. Figure 6 shows the proposed reconstructed prairie areas. The proposed development plan for the prairie reconstructions follows a successful prairie reconstruction at Northwest Prairie Park (NWPP). NWPP consists of a 40 acre native Prairie that was expanded to 160 acres. 120 acres of agriculture row crops were left with corn stubble. Harvested and hand collected grasses and forbs were collected from native prairies within a 100-mile radius. The same procedure is proposed for this site. George Cunningham of EcoCentrics, who coordinated the prairie reconstruction at NWPP will be responsible for the reconstruction of the project site.

The 10 acres of existing upland pasture, which is dominated by smooth brome (*Bromus inermis*), is planned to be burned by UNO. Once the brome greens up after the burn, the PMRNRD will

spray with Roundup followed by a second application later in the growing season. Finally, this area will be reseeded with an upland prairie seed mix during the dormant season. A vegetation planting plan is provided in Figure 7 of Appendix A. The proposed seed mix for each area at the project site is provided in Appendix G.

4.2 Hydrologic Alteration

Hydrologic alterations will take place primarily at the two stream restoration areas of Glacier Creek and the unnamed tributary. At the confluence of each stream with the Big Papio Creek a USBR Type IX Baffled Chute Drop Structure will be installed. The structure is constructed of reinforced concrete and has dimensions of 28 feet high by 20 feet wide by 12 inches thick. The conceptual design (Figure 6, Appendix A) shows the location of each structure. A detail of each structure is presented in Appendix E. Once installed the upgradient side will be backfilled with on-site soil to create the designed elevation of the stream. The spillway elevation of each will be set to an elevation that will maintain a 0.5-2% slope throughout the restored stream channel. The down-gradient side of structure will have a drop of approximately 25 feet. Water will be let down through baffles to minimize velocity and the base will be protected by riprap.

Glacier Creek will also have a modification at the upstream end along the west property boundary. At this location an existing structure will be removed and replaced with a low water crossing and a stream gauge station. (See Access Road Plan & Profile Sheet in Appendix E.) The gauging station will be used for research purposes by UNO. The current structure drains water from the restored portion of Glacier Creek upgradient of the Site and drops it 15 feet, discharging water back into Glacier Creek via two outlet pipes. Elimination of this structure and the replacement with a low water crossing, which will also double as grade control structure, will allow the continuation of the restored Glacier Creek channel at the same elevation of approximately 1,087 feet. The channel will then drop towards the Big Papio Creek at a varied slope of 0.5% to 2% until reaching the previously discussed downstream structure at the east end of the site near the Big Papio Creek.

Several bank stabilization features will be placed at the outer edge of the newly restored stream channels of Glacier Creek and the unnamed tributary to protect the bank from erosion and failure. In addition, two rock riffle pool structures will be installed along the channel bed to systematically allow for channel drops. These features will also allow for natural rock riffle pool features found in natural streams. The stream restoration plan in Appendix F shows the proposed location of these features.

4.3 Access Road and Fencing

Site access will remain as it is today along the west property boundary extending from the south boundary north approximately 1/4 mile to the approximate middle of the Site. The access road consists of dirt and gravel. Access to the north half of the property will consist of a low impact trail to be constructed.

4.4 Adjacent Land Use

Adjacent land use is not expected to change. The NRD and UNO may acquire additional land west of the Site and north and west of Allwine Prairie.

5.0 SITE CONSTRUCTION ACTIVITIES

5.1 Wetlands

Site construction will consist of standard grading methods consistent with land and pond development. Initial excavation of wetland depressions will be conducted using standard excavation equipment with the soil to be stockpiled adjacent to streams for later use in the channel restoration. Each depression will be excavated to the planned elevation and then finish graded. A rough surface consisting of tire tracks and clods will be specified to create micro topographic diversity. Wetlands A and F will have specifications to minimize compaction during construction as these wetlands are planned to interact with the groundwater table. Soil borings revealed that the groundwater table at this location is high, approximately 4-6 feet below the surface. (See Geotechnical Investigation Report in Appendix B). Wetlands B, C, D/E, G, H, I and J will be graded to planned elevation and then either over excavated to allow placement of clay liner or compacted, both for the purpose of minimizing water loss through infiltration.

Once grading is complete each area will be seeded with a nurse crop consisting of seed oats followed by an appropriate native seed mix according to the water regime during the dormant season. A vegetation planting plan is provided in Appendix G. Seed will be collected as close to the Site as possible but at the very least will be non-invasive and native to Nebraska. Native seed will be applied in the dormant season of 2013.

5.2 Stream Restoration

Initially trees will be removed from along Glacier Creek followed by the diversion of water flow at the upstream end of Glacier Creek into some type of culvert or tube to allow the construction of the restored channel. Once the channel is diverted, the low water crossing will be constructed and the existing channel filled with soil and compacted to 95% of Standard Proctor. Once the base elevation is established, the new channel will be constructed. Stream bank protection measures and rock riffle pool structures will be installed along the channel. After this stage is complete, the downstream structure will be installed. The unnamed tributary will be constructed in a similar fashion except there will be no low water crossing at the upstream end. A Site Grading Plan is provided in Appendix E.

Erosion and Sediment control measures will be implemented to minimize sediment migration of exposed soil during construction activities and after Site grading. A Sediment and Erosion Control Plan and Storm Water Pollution Prevention Plan (SWPPP) will be prepared and implemented according to the Papillion Creek Watershed Partnership and Nebraska Department of Environmental Quality standards.

5.3 Erosion Control Measures

Erosion and sediment control measures will be implemented to minimize sediment migration of exposed soil during construction activities and after Site grading. A Sediment and Erosion Control Plan and Storm Water Pollution Prevention Plan (SWPPP) will be prepared and implemented according to the Papillion Creek Watershed Partnership and Nebraska Department of Environmental Quality standards.

5.4 Construction Schedule

Table 3. Glacier Creek Wetland Bank Construction and Monitoring Construction Schedule.

May 15, 2013	Solicit bids for construction
July 1, 2013	Select contractor/initiate contracting
August1, 2013	Start construction
Nov. 1, 2013	Complete construction
Sept 1, 2013	Plant nurse crop in disturbed areas/install erosion control measures
Nov 15, 2013-March 2014	Dormant seed entire site

6.0 POST CONSTRUCTION AQUATIC RESOURCES & CREDITING

Post construction aquatic resources are expected to develop as a result of the stream restoration, creation of wetland depressions throughout the floodplain and enhancement of existing sloped wetlands. The proposed bank is anticipated to have approximately 9.0 acres of Riverine Channel, Palustrine Emergent, Temporarily to Seasonally Flooded wetlands (PEMA and PEMC) (HGM, Cowardin, 1979); 5.77 acres of Floodplain Depression, Palustrine Emergent, Temporarily Flooded, Seasonally Flooded and Semi-permanently Flooded wetlands (PEMA, PEMC and PEMH); and 2.9 acres of enhanced slope wetlands, Palustrine Emergent/Forested, Seasonally Flooded/Saturated wetlands (PEMC/B and PFOA). In addition, the reconstruction of 63.4 acres of uplands to native prairie is proposed as part of this project; however, based on April 2013 guidance from the COE project manager only 50 feet around each wetland area at a reduced ratio of 4:1 will be counted toward wetland/buffer credits. Wetland enhancement and upland buffer have higher ratios for credits, for example, enhancing a wetland equals a 5:1 credit ratio and creation of buffer equals a 4:1 credit ratio. A total of 0.6 wetland credit is expected for enhancing 2.9 acres of wetlands (5:1 ratio) and 3.38 credits for the 13.52 acres of buffer around wetlands. Table 5 provides a summary of expected wetland types and areas.

Table 4. Expected wetland types and areas from stream restoration, wetland creation and wetland enhancement.

Development Type	HGM Classification	Cowardin Classification	Area (acres)/Credits
Stream Restoration	Riverine Channel	PEMA/C	9.0
Creation	Floodplain	PEMA, PEMC, PEMH	5.77
Enhancement	Sloped Wetlands	PEMC/PEMB	0.6 (2.9 ac.@ 5:1)
Buffer	NA	NA	3.38 (13.52@4:1)
Total			**18.75**

Stream credits are expected as a result of the restoration of Glacier Creek and unnamed tributary. Table 6 below summarizes the expected mitigation credits as a result.

Table 5. Expected stream credits at the Glacier Creek Wetland Bank.

Value	Glacier Creek	Unnamed Tributary
Net Increase (Functional Lift)	108,031.63	196,719.80
Mitigation Units (Credits)	108,031.63	196,719.80

Wetland and Stream credits will become available once the criteria are met as stated in Part IV. Section E of the PMRNRD Final Banking Instrument.

6.1 Pre-Construction and Post-Construction Crediting-

Wetland credits will be developed by the bank sponsor and become available for debiting based on the stage and success of project according to procedures specified in the PMRNRD Final Banking Instrument (Part IV Section F).

7.0 Monitoring Plan

7.1. Monitoring Provisions

The PMRNRD will monitor success of the Bank using criteria presented in this document. Wetland and stream monitoring will be initiated after the first full growing season for a period of at least five years. Monitoring will be conducted semi-annually, once in the early summer for hydrology and once mid-to-late summer for vegetation and hydrology. Once the bank is fully credited, formal monitoring will cease. However, periodic informal monitoring will continue to identify problem areas and to identify maintenance tasks.

7.2 Monitoring Reports

The PMRNRD will submit to the COE, for distribution to the other members of the IRT, an annual report describing success of each wetland phase and maintenance items completed or recommended. Reports will be submitted by the PMRNRD at the end of the calendar year and contain the following information:

1. U.S. Geological Survey topographical map showing Bank location,
2. Vegetation and hydrology summary data for each transect,
3. Base map showing survey results, permanent photo stations, transects and sample plots,
4. Photographs from fixed locations, and
5. Following three full growing seasons, the PMRNRD will update the area of each wetland type (PEMA, PEMC, PEMF and PEMH) that has successfully met the minimum success criteria. Successful wetland type areas will be shown as a percentage of the entire successful area.

A proposed wetland bank monitoring map is provided in Figure 8 of Appendix A. Proposed transects are depicted on this map were established according to Section E of the 1987 COE Wetland Delineation Manual. Sample plots will be sampled every 100 feet within wetland areas.

7.3 Success Criteria

The criteria described in the following sections and as stated in Final Bank Instrument and Amendments will be used to assess Bank success.

7.3.1 Wetlands

1. Wetlands meet the COE 1987 Wetlands Delineation Manual criteria for wetlands:
    a) Greater than 50% of dominant vegetation of each plot has a wetland indicator status of FAC, FACW or OBL (50/20 rule)
    b) Flooded or saturated conditions exist for at least 5% of growing season.
    c) Presence of hydric soils (hydric soils sometimes take many years to develop), so this criterion is preferable but not required.
2. Achieve 80% canopy cover for emergent plant species.
3. Not exceed 25% of total canopy cover with any given species.
4. Monitor emergent wetlands for a minimum of three growing seasons prior to submission for approval of full credit.
5. Monitor forested wetlands for a minimum of seven growing seasons prior to submission for approval of full credit
6. Achieve in-kind replacement of functions according to the wetland subclasses described in Exhibit E of Final Bank Instrument, Nebraska Wetland Subclasses.
7. Control state listed noxious weeds and pest species, as identified in individual site development plans, to less than 1% of total canopy cover.
8. Achieve 80 percent survival of woody species after three years.
9. Not exceed 10% of total canopy cover by the following species: reed canary grass (*Phalaris arundinacea*), common reed (*Phragmites australis*), or cattail (*Typha* spp.)

7.3.2 Stream

The success criteria for the streams as stated in Amendment 2 to the PMRNRD Final Banking Instrument will focus on stream stability and aquatic function compared to the goals and objectives of the Site. The following Nebraska Stream criteria will be evaluated:

1. Hydraulic conveyance dynamics
2. In-stream habitat
3. Floodplain interaction
4. Riparian vegetation
5. Buffer continuity and width
6. Land use adjacent to active floodplain zone

7.4 Assessment Methodology

7.4.1 Wetland

A COE-Level 1 Functional Assessment (Floristic Quality Assessment) will be completed at the end of the monitoring period. Procedures identified in "COE Guidance for Compensatory Mitigation and Mitigation Banking in the Omaha District" will be followed. Wetlands will be surveyed using a Trimble sub-foot accurate GPS unit and plotted on a site

base map each year. Each wetland type will be subdivided and shown with respective acreage area.

7.4.2 Stream

Nebraska Stream Assessment Protocol success criteria are based off a Condition Index Rating which will be assigned for each of the six stream thematic variables (hydraulic conveyance dynamics, in-stream habitat, floodplain interaction, riparian vegetation, buffer, and land use). Each stream will be sampled at three different locations. Success will be measured against the baseline evaluation score for each variable which was completed during the site pre-assessment (see Table 3 in Section 3.7). To be successful a higher score for each Condition Index Rating will be required.

8.0 MANAGEMENT

8.1 Maintenance Provisions

The PMRNRD agrees to perform all necessary work to maintain the Bank consistent with the success criteria established in Section 7 of this Site Development Plan. The PMRNRD shall carry out maintenance activities until closure of the Bank. Upon closure of the Bank, the Partnership shall implement the management requirements established in this section.

8.2 Contingency/Remedial Actions

In the event the Bank or certain phases of the Bank fail to achieve the success criteria, the PMRNRD shall develop necessary contingency plans and implement appropriate remedial actions for the Bank in coordination with the IRT.

In the event the PMRNRD fails to implement necessary remedial actions within 30 calendar days after notification by the COE of necessary remedial action to address any failure in meeting the success criteria, the IRT (acting through the Chair) will notify the PMRNRD and the appropriate authorizing agency(ies) to recommend appropriate remedial.

At the request of the PMRNRD, the IRT will perform a final compliance visit to determine whether all success criteria have been satisfied. Upon meeting the success criteria, any remaining contingency funds will be released to the PMRNRD.

8.3 Short-Term Management

The principles of adaptive management, or more advanced management protocols that may be developed, will be used to determine short-term actions appropriate to manage the Bank. Management may include, but is not limited to, prescribed fire, herbicide application, mowing and grazing. The following management strategies will be implemented at the Bank site as needed. It should be noted that the following management activities for common issues in wetland and prairie restorations are not inclusive but an example of a typical approach.

1. Woody Species – Large colonization of woody species such as *Populus deltoides* or *Salix* spp. will be controlled.
2. Invasive Species – Invasive species such as *Lythrum salicaria*, *Phalaris arundinacea* and *Phragmites australis* ssp. *australis* will be controlled by

chemical application. An appropriate aquatic herbicide would be used in these situations.

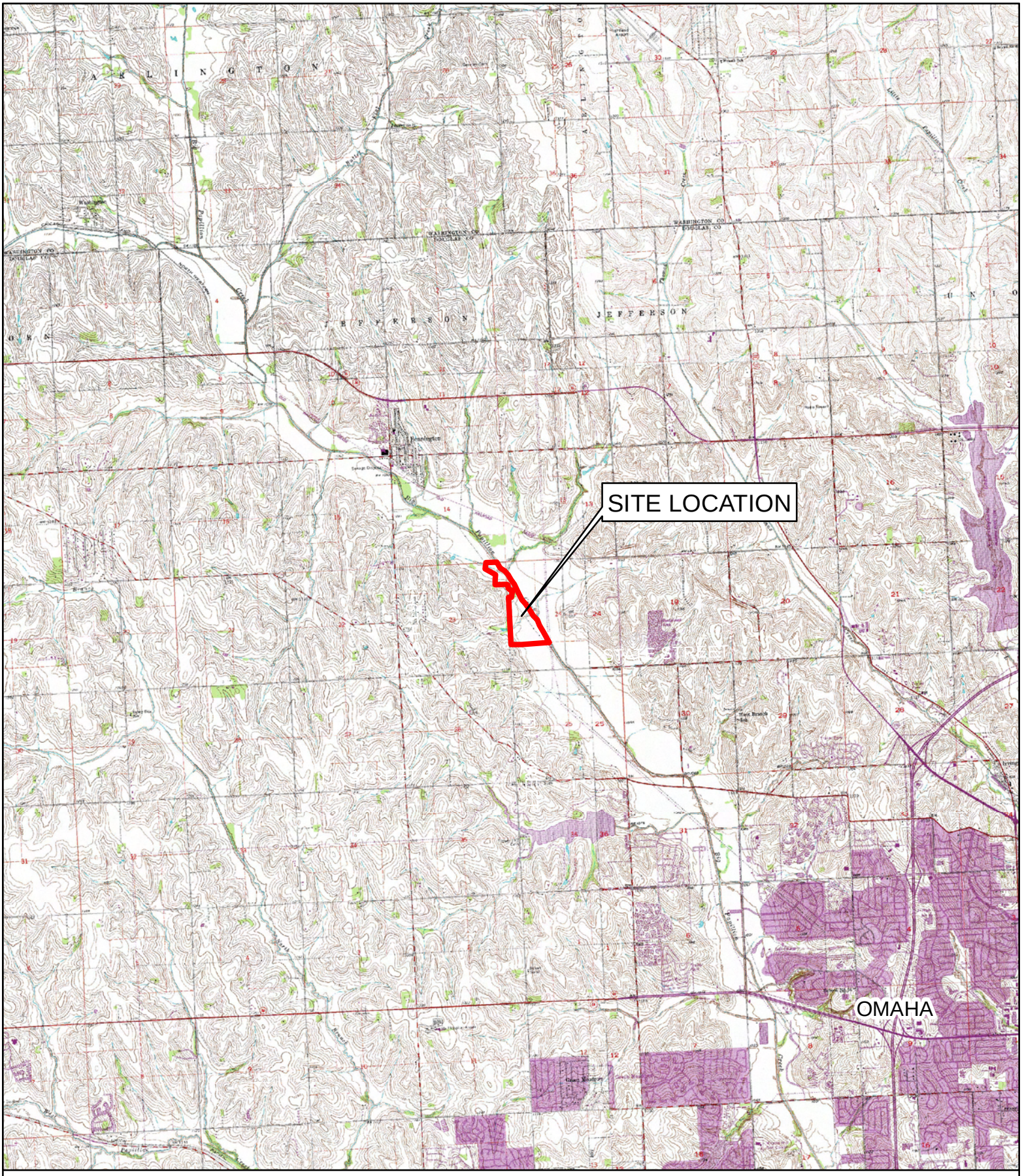
3. Prescribed burning will be used to manage the Bank where it is appropriate to meet overall management goals. The general objective will be to burn portions of the Bank so that the equivalent of the entire burnable portion of the Bank is treated with fire at least once every 3-5 years, as dictated by fuel, weather, and safe burning conditions, an approach consistent with the concept of adaptive management.

8.4 Long-Term Management

The Partnership will carry out long-term management of the Site. A long-term management plan will be developed by the end of the monitoring period for the purposes of maintaining the Bank's wetland viability and quality in perpetuity. Under this plan wetlands will be periodically examined to determine stability and trends. Monitoring will assess overall wetland conditions, (i.e., species composition, diversity, canopy cover, wetness coefficient, percent invasive species, functions and wildlife use). If an action is required to address an observed problem an appropriate management task will be carried out as previously discussed.

APPENDIX A

FIGURE 1 - SITE LOCATION MAP
FIGURE 2 - HYDROLOGIC UNIT CODE MAP
FIGURE 3 - PROPOSED WETLAND BANK SITE MAP
FIGURE 4 - AERIAL PHOTOGRAPH
FIGURE 5 - WETLAND DELINEATION MAP
FIGURE 6 - CONCEPTUAL PLAN
FIGURE 7 - VEGETATION PLANTING PLAN
FIGURE 8 – WETLAND MONITORING MAP



USGS Topographic Imagery

SITE LOCATION MAP - FIGURE - 01

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0 3,000 6,000 12,000 Feet

Glacier Creek Stream & Wetland Bank
Site Development Plan
Douglas County, NE
T. 16N, R. 11E, S. 24

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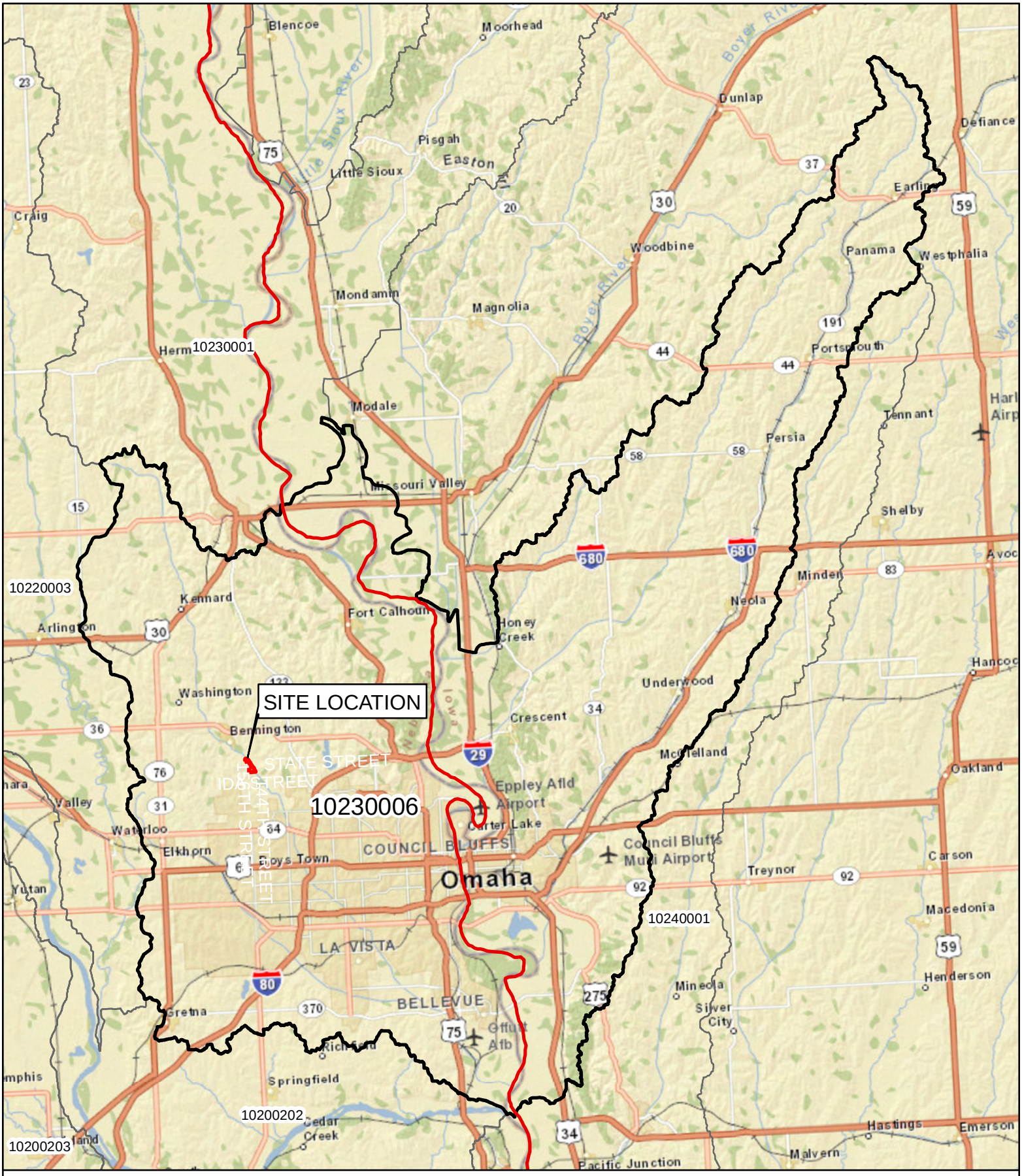

USGS Topographic Imagery

HUC - FIGURE - 02

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0 18,500 37,000 74,000 Feet

Glacier Creek Stream & Wetland Bank
Site Development Plan
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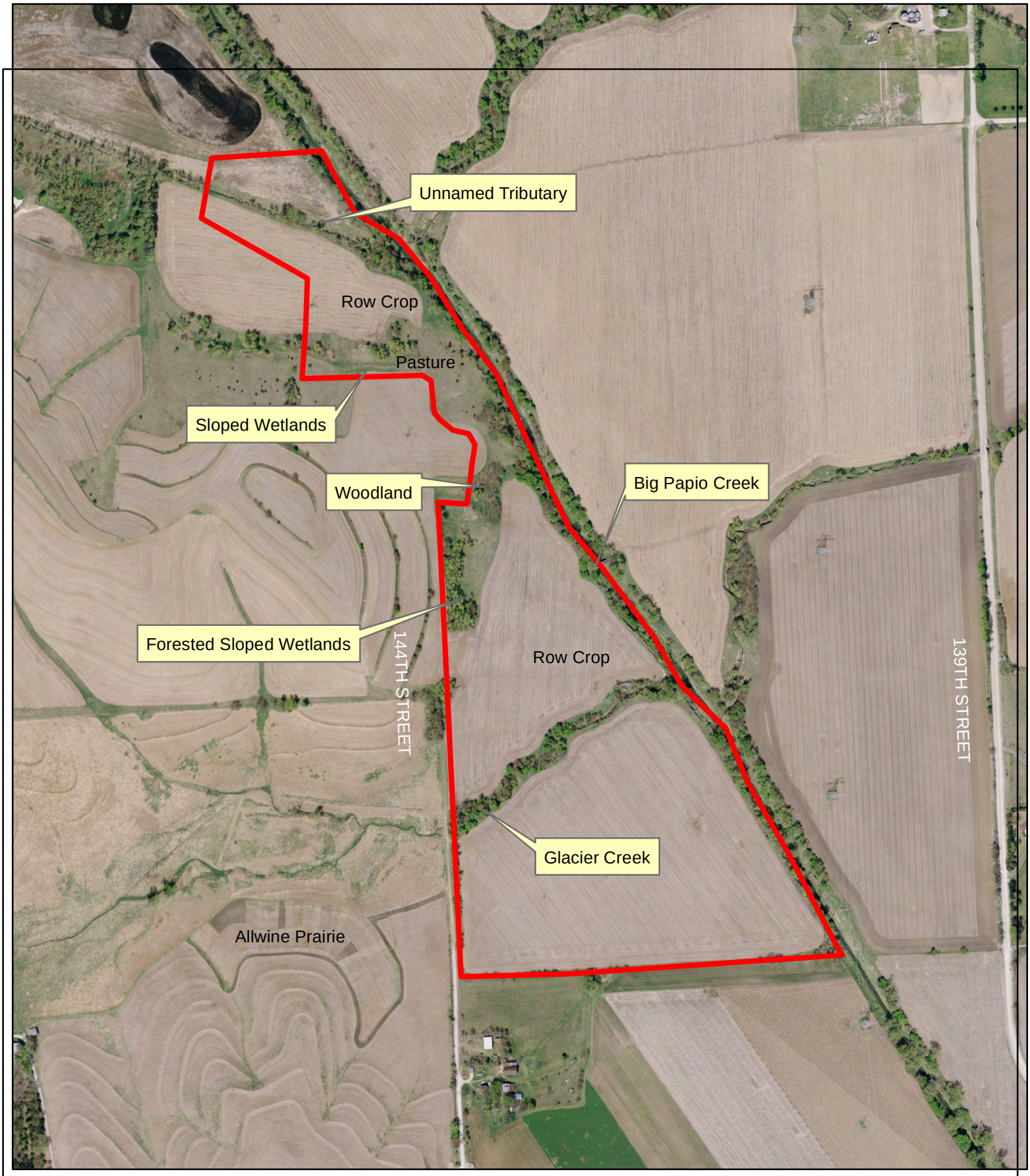

Douglas County 2007 Aerial Imagery

PROPOSED WETLAND BANK MAP - FIGURE 03

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0 300 600 1,200 Feet

Glacier Creek Stream & Wetland Bank
Site Development Plan
Douglas County, NE
T. 16N, R. 11E, S. 24

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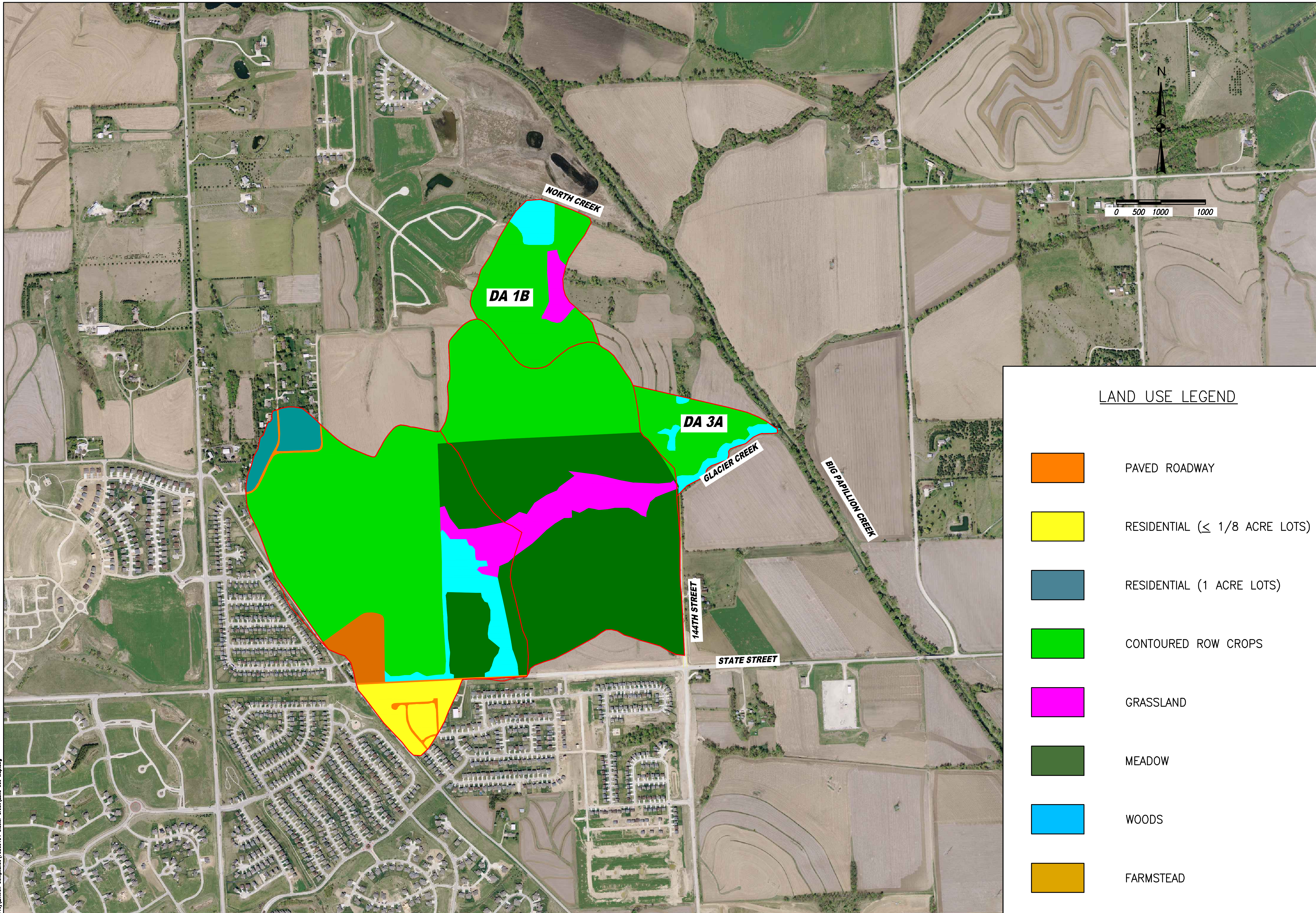

NO.	REVISIONS	DATE
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

FIGURE 4
GLACIER CREEK
LAN USE MAP

GLACIER CREEK
MITIGATION BANK

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PROJECT: GLACIER CREEK
DATE: 02-27-2012
JOB NO.: 75-50-9104

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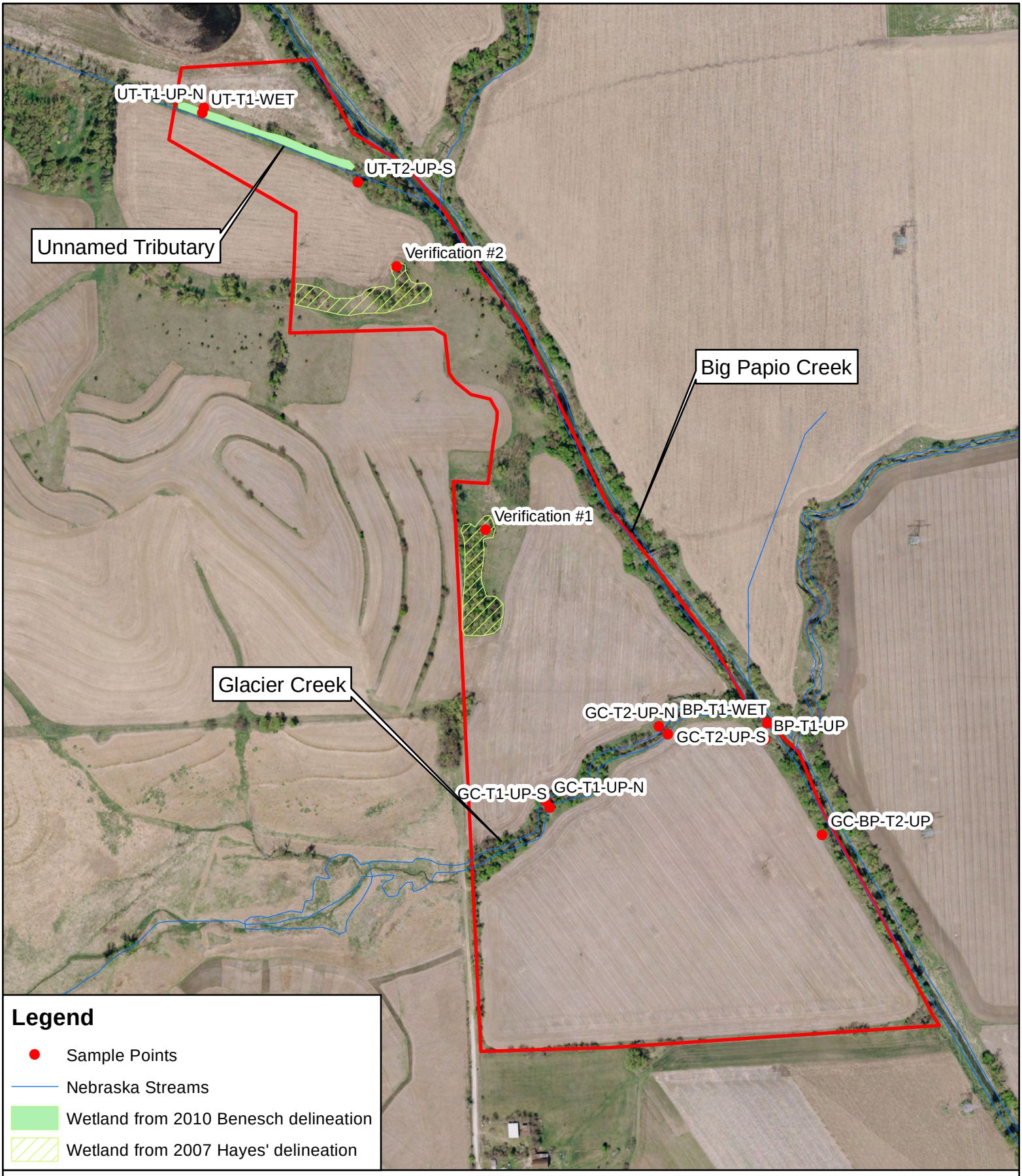

NIROC 2010 Douglas County Aerial Imagery

WETLANDS DELINEATION MAP - FIGURE 05

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0 250 500 1,000 Feet

Glacier Creek Stream & Wetland Bank
Site Development Plan
Douglas County, NE
T. 16N, R. 11E, S. 24

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EXISTING WETLAND MITIGATION SITE

UNNAMED TRIBUTARY

WATER CONTROL STRUCTURE

SPRING/WETLAND

EXISTING WETLANDS (PROPOSED ENHANCEMENT)

APPROXIMATE PROJECT BOUNDARY

PROPOSED HERITAGE DEVELOPMENT

WATER CONTROL STRUCTURE

BIG PAPILLION CREEK

LOW WATER CROSSING

GLACIER CREEK

Wetland

ALLWINE PRAIRIE PRESERVE

KOBS PROPERTY

STATE STREET

144TH STREET

I

D/E

A

J

F

B

C

1

2

3

4

5

6

7

LEGEND

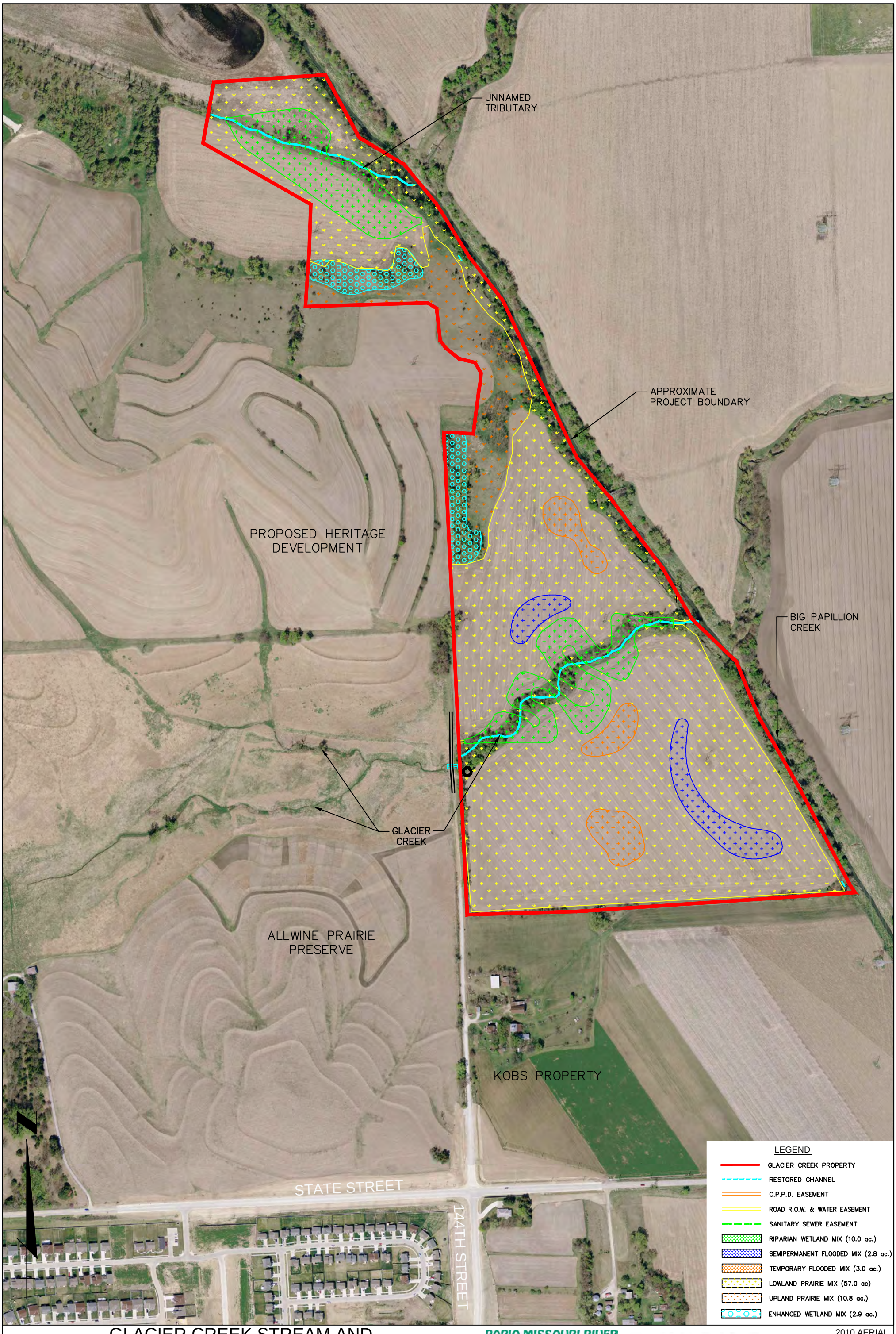
- GLACIER CREEK PROPERTY
- EXISTING CHANNEL
- RESTORED CHANNEL
- O.P.P.D. EASEMENT
- ROAD R.O.W. & WATER EASEMENT
- SANITARY SEWER EASEMENT
- CREATED WETLAND (14.77 AC.)
- WETLAND BUFFER (13.52 AC.)
- ENHANCED WETLAND (2.9 AC.)
- ENHANCED UPLAND
- RECONSTRUCTED PRAIRIE
- PIEZOMETER
- BORING

GLACIER CREEK STREAM AND WETLAND BANK CONCEPT
FIGURE 6

PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT

UNIVERSITY OF Nebraska Omaha

2010 AERIAL

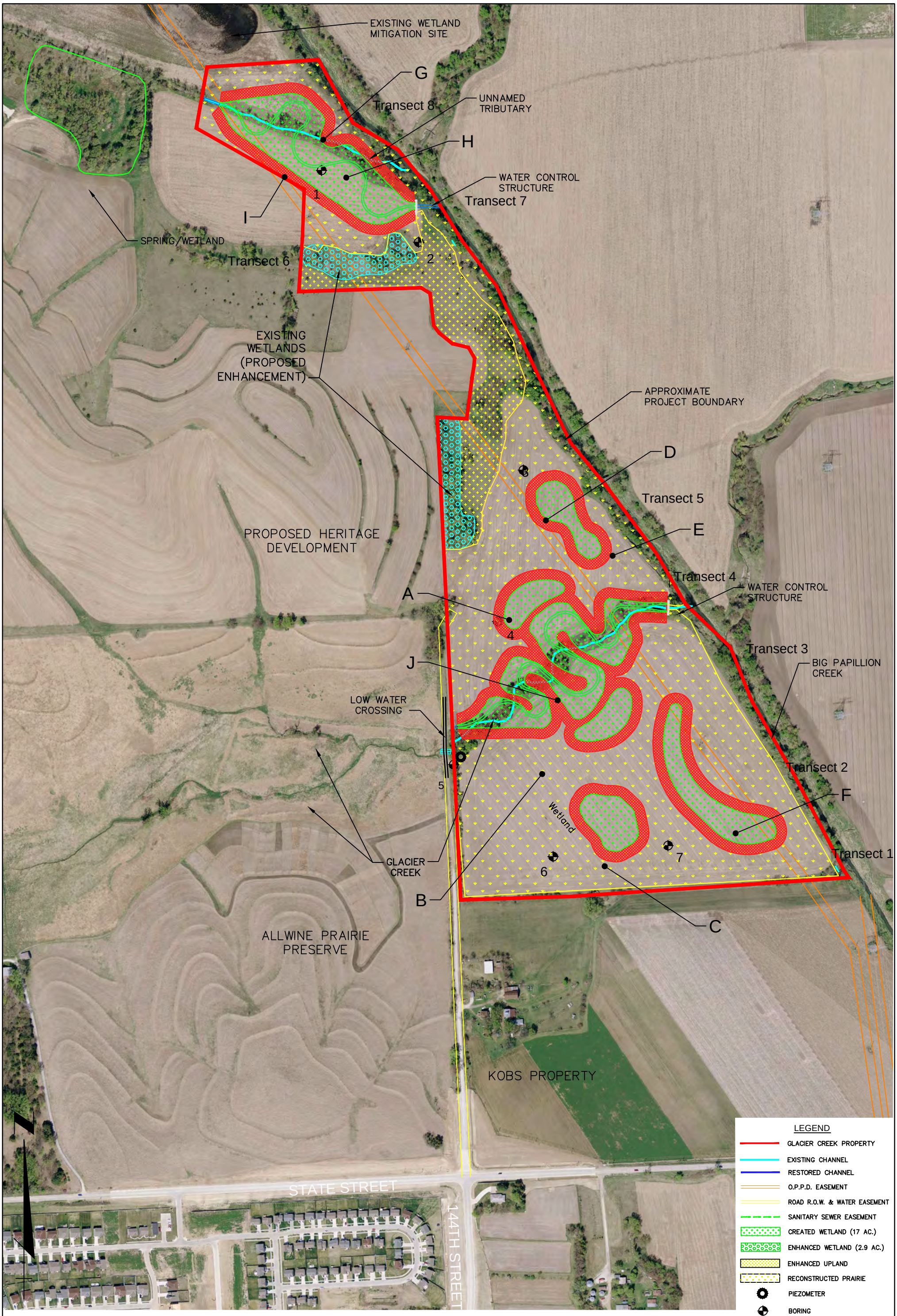


GLACIER CREEK STREAM AND WETLAND BANK CONCEPT VEGETATION PLANTING PLAN
FIGURE 7

PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT

UNIVERSITY OF Nebraska Omaha

2010 AERIAL



GLACIER CREEK STREAM AND WETLAND MONITORING PLAN
FIGURE 8

2010 AERIAL

PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT

UNIVERSITY OF Nebraska Omaha

GEOTECHNICAL DATA/HYDROLOGY DATA

PRELIMINARY GEOTECHNICAL ENGINEERING REPORT

Glacier Creek Stream & Wetland Bank Project

Omaha, Nebraska

PREPARED FOR

Papio-Missouri River Natural Resources District

8901 South 154th Street

Omaha, NE 68138

October 14, 2010

PREPARED BY

benesch

engineers · scientists · planners

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engineers · scientists · planners

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October 14, 2010

Amanda Grint, P.E.
Papio-Missouri River Natural Resources District
8901 South 154th Street
Omaha, NE 68138

REFERENCE: Preliminary Geotechnical Investigation for
Glacier Creek Stream and Wetland Bank Project
Omaha, Nebraska

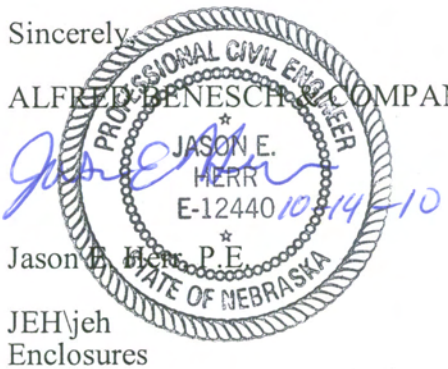
Dear Ms. Grint:

Alfred Benesch & Company (Benesch) is pleased to submit the enclosed report that summarizes the findings of a geotechnical engineering study and provides recommendations related to the referenced project.

If any questions arise concerning this report or if additional information is needed about soil conditions at this site, please contact Benesch for assistance.

Sincerely,

ALFRED BENESCH & COMPANY



10/14/10

Jason E. Herr, P.E.

JEH\jeh
Enclosures
75509104.00
glacier_prelim.doc
Orig. & 2 pc.: Papio-Missouri River NRD

GEOTECHNICAL ENGINEERING REPORT

Glacier Creek Stream & Wetland Bank Project
Omaha, Nebraska

Prepared
for

Papio-Missouri River Natural Resources District
8901 South 154th Street
Omaha, NE 68138

October 14, 2010

Prepared
by

ALFRED BENESCH & COMPANY
14748 West Center Road, Suite 200
Omaha, NE 68144

CONTENTS

I. INTRODUCTION

The Papio-Missouri River Natural Resources District (NRD) in conjunction with the University of Nebraska-Omaha (UNO) plans to construct a stream and wetland bank in the vicinity of the confluence of Glacier and Big Papillion Creeks. The proposed 78-acre site is located on the northwest side of Omaha, Nebraska, northeast of the intersection of 144th and State Streets. The project includes restoring degraded stream channels, and creating additional stream channels and wetlands.

Alfred Benesch & Company (Benesch) has prepared this preliminary report to present: (a) the findings of an exploration of the soils at the project site, (b) the results obtained from laboratory tests, and (c) preliminary recommendations concerning the stream and wetland bank project.

Field and laboratory work consisted of: (a) performing auger borings to determine the depth, thickness and composition of each soil formation encountered to the depths of the borings, (b) installing permanent groundwater monitoring wells, (c) performing a geologic study to determine the origin of the deposits underlying the site, and (d) performing standard tests to determine the engineering properties of the soil strata.

Recommendations are provided for preliminary design of stream and wetland features. Soil properties that affect permeability/infiltration of existing flood plain soil when flooded, and erosivity and dispersion of newly restored and created streams channels, have been provided.

II. SUBSURFACE EXPLORATION

A program of test borings and soil sampling was performed at the project site on May 19, 2010. Seven (7) exploratory borings were advanced to depths of 10.0 to 20.0 feet below the existing grade to establish the general subsurface conditions of the area under consideration.

The Dutch friction-cone sounding was performed with a mechanical penetrometer in accordance with ASTM D 3441-98, Standard Method for Deep, Quasi-Static, Cone, and Friction Cone Penetration Tests of Soil. The mechanical penetrometer operates incrementally, using a set of inner rods to operate a telescoping penetrometer tip and to transmit the components of penetration resistance (cone bearing and friction sleeve resistance) to the surface for measurement. The plot of the test data identifies the relative positions and thicknesses of hard and soft layers. The borings were made either by use of a hand auger or in accordance with ASTM D 1452-80 (Reapproved 2000), Standard Practice for Soil Investigation and Sampling by Auger Borings. The machine-driven borings used a continuous-flight auger having a diameter of 6 inches to advance the holes for split-barrel and thin-walled tube sampling. The bore holes were stable and casing was not required.

Seven (7) relatively undisturbed soil samples were recovered for visual observation and laboratory testing. This sampling was performed in accordance with ASTM D 1587, Standard Method for Thin-Walled Tube Sampling of Soil, utilizing an open-tube sampler having an outside diameter of 3.0 inches.

The vicinity map and the boring location plan are presented in Appendix A. The boring logs (see Appendix B) present the data obtained in the subsurface exploration. The logs include the surface elevations, the approximate depths and elevations of major changes in the character of the subsurface materials, visual descriptions of the materials in accordance with Appendix C, groundwater depth, and the locations of undisturbed samples of soil. The locations of the soundings and borings were determined by GPS. Relative elevations between the boring

locations were determined by survey. These relative elevations were cross-referenced with LiDAR 2.0-foot contour information, to determine the approximate actual elevations (NAVD 88) of the borings. Water level readings were made in the auger borings at times and under conditions stated on the boring logs.

III. LABORATORY ANALYSES

The undisturbed soil samples obtained during the subsurface exploration were examined in the laboratory by a member of Benesch's professional engineering staff to supplement the field identification. Standard tests were performed on selected samples to determine the engineering properties of the subsurface materials.

The moisture contents and dry unit weights of selected undisturbed soil samples were determined in the laboratory. These test results are presented in the boring logs opposite the respective sample locations. The moisture contents were determined in accordance with either ASTM D 4643-00, Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method, or ASTM D 2216-98, Standard Test Method for Determination of Water (Moisture) Content of Soil and Rock by Mass. The dry unit weights were determined in accordance with the Displacement Method of the Corps of Engineers, EM1110-2-1906, Appendix II, Unit Weights, Void Ratio, Porosity, and Degree of Saturation. These data correlate with the strength and compressibility of the soil. High moisture content and low density usually indicate low strength and high compressibility.

The unconfined compressive strengths of several undisturbed samples were estimated in the laboratory with a calibrated hand penetrometer. These strengths are presented on the boring logs and are estimates only. Actual values are generally lower than the estimated values indicated on the boring logs.

Seven (7) crumb tests were performed on remolded samples of subsurface materials at the site. The crumb tests were performed in accordance with ASTM D 6572, Standard Test Methods for Determining Dispersive Characteristics of Clayey Soils by the Crumb Test. The crumb test is an indicator test used in the identification of dispersive soils. A summary of the test results are presented in Table 1.

TABLE 1
Dispersion Test Data

Boring No.	Depth, ft	Moisture Content, %	Crumb-Test Grade[a]		
			2 min.	1 hr.	6 hrs.
B-1	2.7 – 3.4	33.8	1	1	1
B-2	4.5 – 5.2	26.0	1	1	1
B-3	3.9 – 4.4	34.8	1	1	1
B-4	4.4 – 5.1	26.2	1	1	1
B-5	4.3 – 5.0	20.9	1	1	1
B-6	3.4 – 4.2	26.0	1	1	1
B-7	5.4 – 6.1	38.8	1	1	1

[a]Crumb-Test Grades:
1 - Nondispersive; 2 - Intermediate; 3 - Dispersive; 4 – Highly Dispersive

IV. GEOLOGY AND SITE CONDITIONS

The project site lies in the Dissected Till Plains section of Nebraska, a part of the Central Lowland province of the Interior Plains physiographic division[1]. The project site is located primarily on alluvial bottomlands adjacent to Glacier and Big Papillion Creeks. Currently, the majority of the project site consists of cultivated fields.

The subsurface materials encountered at the boring locations are briefly described below in descending order of occurrence. Detailed descriptions are provided in the boring logs, which are presented in Appendix C.

Soil Zone	Description
Fill	Lean clay; medium plasticity; wet; medium stiff to stiff; encountered at borings B-4 and B-5.
Topsoil	Lean clay; medium plasticity; wet; medium stiff to stiff; encountered at all borings.
Subsoil	Lean clay; medium plasticity; wet; stiff to very stiff; encountered at boring B-4.
Recent Alluvium	Lean clay, organic clay, fat clay; medium to high plasticity; wet to saturated; soft to very stiff; encountered at all borings except B-2 and B-4.
Bignell Alluvium	Lean clay; medium plasticity; wet to saturated; stiff to very stiff; encountered at borings B-2 and B-5.
Peoria Alluvium	Lean clay, fat clay; medium to high plasticity; saturated; medium stiff to very stiff; encountered at borings B-1, B-5, B-6 and B-7.
Peoria Loess	Lean clay, silty clay; low to medium plasticity; wet to saturated; soft to very stiff; encountered at borings B-2, B-3 and B-4.
Glacial Till	Lean to fat clay; medium to high plasticity; saturated; very stiff; encountered in boring B-2.

[1] Physiographic Provinces of North America, Map by A. K. Lobeck, 1948; The Geographical Press; Columbia University, New York

Groundwater was encountered at depths of 4.4 to 11.0 feet below grade (elevations of 1069.1 to 1080.0 feet). The water levels at each boring during the subsurface exploration (May 27 and 28, 2010) are shown in Table 2. Additionally, the water levels measured at the three piezometers on June 27, 2010 is also shown in Table 2. The water table could be expected to fluctuate several feet depending on surface drainage, rainfall, irrigation, vegetation, temperature and other factors.

TABLE 2
Summary of Groundwater Levels

Boring Location	Surface Elevation, ft	May 27 & 28, 2010		June 17, 2010
		Groundwater Elevation, ft	Groundwater Depth, ft	Groundwater Elevation (Depth), ft
B-1	1080.5	1075.1	5.4	1078.2 (2.3)
B-2	1086.0	1075.0	11.0	-
B-3	1076.5	1071.7	4.8	-
B-4	1080.5	1071.5	9.0	-
B-5	1090.0	1080.0	10.0	1081.3 (8.7)
B-6	1078.5	1073.7	4.8	-
B-7	1073.5	1069.1	4.4	1071.5 (2.0)

Various soil properties are available from the Natural Resource Conservation Service (NRCS) soil survey. A summary of the soil information available for the soil groups in the vicinity of each boring are shown in Table 3 and map showing the extent of each soil group is included in Appendix A.

TABLE 3
Summary of NRCS Soil Survey

Boring	Soil No.	Map Unit	Landform	Parent Material	Presence of Hydric Soils	Average Saturated Permeability, cm/sec	Range of Saturated Permeabilities, cm/sec	Drainage Class	Hydrologic Soil Group	Average Depth to Water Table, in.
B-1	7234	Kennebec	Flood Plains	Alluvium	Partially	2.8E-04	1.4E-03 to 4.2E-04	Well Drained	C	> 80
B-2	8153	Contrary	Loess Hills	Colluvium	None	3.3E-04	1.4E-03 to 1.4E-04	Well Drained	B	> 80
B-3	7050	Kennebec	Flood Plains	Alluvium	Partially	9.2E-04	1.4E-03 to 4.2E-04	Moderately Well Drained	B	54
B-4	7234	Judson	Hill Slopes	Loess	Partially	2.8E-04	4.2E-04 to 1.4E-04	Well Drained	C	> 80
B-5	7812	Kenridge	Flood Plains	Alluvium	Partially	2.3E-04	4.2E-04 to 1.4E-04	Somewhat Poorly Drained	C	54
B-6	7812	Kenridge	Flood Plains	Alluvium	Partially	2.3E-04	4.2E-04 to 1.4E-04	Somewhat Poorly Drained	C	54
B-7	7050	Kennebec	Flood Plains	Alluvium	Partially	9.2E-04	1.4E-03 to 1.4E-04	Moderately Well Drained	B	54

V. DISCUSSION AND RECOMMENDATIONS

As discussed in the Introduction section of this report, the Papio-Missouri River NRD and UNO plan to restore stream channels and construct a stream and wetland bank in the vicinity of the confluence of Glacier and Big Papillion Creeks. The following recommendations are based upon site conditions, the engineering properties of the subsurface materials and the requirements of the project.

1. **Dispersive Soils.** Dispersive soils have the potential to erode along paths of groundwater flow creating pipes and jugs that can eventually undermine stream banks and berms. The laboratory crumb tests indicate the tested soils as being non-dispersive. It is Benesch's opinion that the natural soils encountered at the project site will likely be non-dispersive.

2. **Soil Erosivity.** In order to estimate the approximate erosivity of the onsite soils that will likely be encountered in the sides of the proposed stream channel, the soil properties below would predominately prevail, based on soils encountered at borings B-6 and B-7 in the upper 5 to 10 feet.

- USCS Soil Type = Lean Clay (CL)
- Plasticity Index = 15 to 20
- Void Ratio = 1.11

3. **Permeability and Infiltration.** The hydraulic conductivity (coefficient of permeability) for cohesive alluvium that was encountered at the project site can vary greatly both laterally and with depth due to interbedded seams of sands and silts that are typically present in the alluvium. In addition, vertical joints are often present in these soils due to desiccation during and after deposition of the soils, which can result in higher hydraulic conductivities. The permeability of various soil groups, as classified by the Unified Soil

Classification System (see Appendix C), encountered at the project site would generally decrease in the following order: CL/ML, OL, CL, OH, CH.

Based on the type and variability of soils encountered at the boring locations, it is Benesch's opinion that groundwater flow would likely not be significantly impeded in any direction. A stream or pond with a flow line elevation above the groundwater table will lose water through infiltration. As a result, the depth to the groundwater table will likely significantly affect the duration of surface water remaining in the stream or pond, if a liner is not constructed. The hydraulic conductivities provided in Table 3 should be used for preliminary design. Further monitoring of the water table levels and the permeability testing of the soils at the project site should be performed in order to more accurately determine the approximate macro permeability of the soils near the surface.

4. Applicability of Recommendations. The recommendations presented in this report are based in part upon Benesch/s analyses of the data from the soil borings. The boring logs and related information depict subsurface conditions only at the specific boring locations and at the time of the subsurface exploration. Soil conditions may differ between the exploratory borings and might change with the passage of time. The nature and extent of any variations between the boring locations or of any changes in soil conditions (e.g., drying of soil) might not become evident until grading operations have begun. If variations and changes in the soil conditions then appear, it will be necessary to re-evaluate the recommendations stated in this report.

VI. CONCLUSIONS

This report has been prepared in accordance with generally accepted soil engineering practices for exclusive use by the Papio-Missouri River NRD for specific application to the Glacier Creek stream and wetland bank project. The recommendations of this report are not valid for any other purpose.

Benesch should be contacted if any questions arise concerning this report or if changes in the nature or design of the project are planned. If any such changes are made, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed by Benesch and the conclusions of this report are modified or verified in writing. This report shall not be reproduced, except in full, without the written approval of Alfred Benesch & Company.

Submitted By

ALFRED BENESCH & COMPANY

10/14/10

Jason E. Herr, P.E.

APPENDIX A. VICINITY MAP, BORING LOCATION PLAN AND SOILS MAP

Douglas County 2007 Aerial Imagery

VICINITY MAP

HWS
Solutions through Service

N
W E
S

0 1,250 2,500 5,000
Feet

Glacier Creek
Stream & Wetland Bank Concept
Douglas County, NE
T. 16N, R. 11E, S. 24

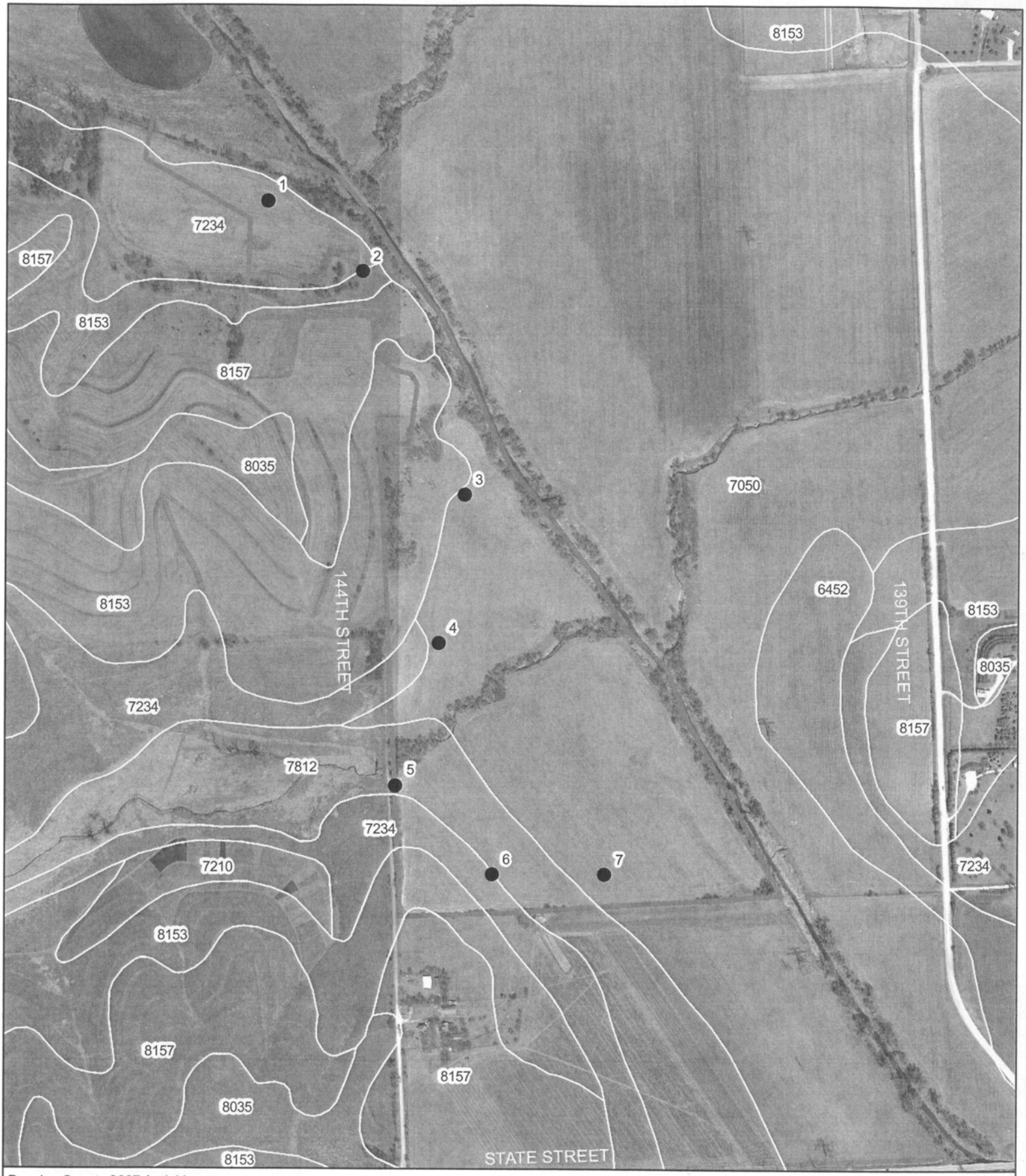
GLACIER CREEK STREAM AND WETLAND BANK CONCEPT

2007 AERIAL

PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT

UNIVERSITY OF Nebraska Omaha

HWS



Douglas County 2007 Aerial Imagery

N
W E
S

0 300 600 1,200
Feet

HWS
Solutions Through Service

SOILS MAP

Glacier Creek
Stream & Wetland Bank Concept
Douglas County, NE
T. 16N, R. 11E, S. 24

APPENDIX B. BORING LOGS

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PROJECT: Glacier Creek Wetlands
144th & State Streets - Omaha, NE

LOCATION: -96.140713, 41.348709

JOB NO.: 52-80-3897
RIG / METHOD: B-53 / Straight Auger
CREW: GBW & PN

BORING LOG

BORING No.: B-1
SHEET 1 of 2
DATE: 5-19-2010

WATER LEVELS ▼ 5.8 IAD ▼ 5.4 on 5-27-2010

ELEV (USGS)	DEPTH (feet)	LOG	LITHOLOGY DESCRIPTION	SAMPLE	qu (tsf)	DRY DENSITY (pcf)	MOISTURE (%)	DEPTH (feet)
1080.5	0.0		CL - LEAN CLAY; medium plasticity; very dark grayish brown; wet; medium stiff to stiff. (Topsoil)					0.0
1079.2	1.3		CL - LEAN CLAY; medium plasticity; very dark grayish brown with very dark gray; wet; stiff to very stiff. (Recent Alluvium)					
1078.5	2.0		OL - ORGANIC CLAY; medium plasticity; black; wet; stiff; friable. (Recent Alluvium)		1.3*			2.5
1077.7	2.8		OH - ORGANIC CLAY; high plasticity; very dark gray; wet; stiff; with very small shells. (Recent Alluvium)	1	1.7*	83.8	33.75	
					1.7*			
					1.5*			
1076.0	4.5		CH - FAT CLAY; high plasticity; very dark gray; saturated; stiff. (Recent Alluvium)					5.0
1074.0	6.5		CL - LEAN CLAY; medium plasticity; dark grayish brown slightly mottled with dark yellowish red and very dark gray; saturated; medium stiff to stiff. (Recent Alluvium)					7.5
1072.5	8.0		CH - FAT CLAY; high plasticity; very dark gray; saturated; medium stiff. (Recent Alluvium)					
1071.5	9.0		OH - ORGANIC CLAY; high plasticity; very dark gray; saturated; very stiff; with very small shells. (Recent Alluvium)					10.0
1069.0	11.5		CL - LEAN CLAY; medium plasticity; very dark gray; saturated; medium stiff. (Recent Alluvium)					
1068.5	12.0		CH - FAT CLAY; high plasticity; dark gray slightly mottled with white; saturated; very stiff. (Peoria Alluvium)					12.5
1066.5	14.0		CL - LEAN CLAY; medium plasticity; dark greenish gray slightly mottled with white; saturated; stiff to very stiff. (Peoria Alluvium)					
1065.5	15.0							15.0

BORING LOG GLACIERLOGS.GPJ HWS.GDT 10/01/10

* Unconfined compressive strength was estimated using a calibrated hand penetrometer.

Figure B - 1a

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RIG / METHOD: B-53 / Straight Auger
CREW: GBW & PN

BORING LOG

BORING No.: B-1

SHEET 2 of 2

DATE: 5-19-2010

WATER LEVELS ▼ 5.8 IAD ▼ 5.4 on 5-27-2010

ELEV (USGS)	DEPTH (feet)	LOG	LITHOLOGY DESCRIPTION	SAMPLE	qu (tsf)	DRY DENSITY (pcf)	MOISTURE (%)	DEPTH (feet)
			CL - Same as above. (Peoria Alluvial Clay)					15.0
								17.5
1060.5	20.0		Boring Terminated at: 20.0ft					20.0
								22.5
								25.0
								27.5
								30.0

BORING LOG GLACIERLOGS.GPJ HWS.GDT 10/01/10

* Unconfined compressive strength was estimated using a calibrated hand penetrometer.

Figure B - 1b

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LOCATION: -96.139106, 41.347726

JOB NO.: 52-80-3897
RIG / METHOD: B-53 / Straight Auger
CREW: GBW & PN

BORING LOG

BORING No.: B-2
SHEET 1 of 2
DATE: 5-19-2010

WATER LEVELS ▼ 19.8 IAD ▼ 11.0 on 5-28-2010

ELEV (USGS)	DEPTH (feet)	LOG	LITHOLOGY DESCRIPTION	SAMPLE	qu (tsf)	DRY DENSITY (pcf)	MOISTURE (%)	DEPTH (feet)
1086.0	0.0		CL - LEAN CLAY; medium plasticity; brown; wet; stiff. (Modern Colluvium)					0.0
1085.0	1.0		CL - LEAN CLAY; medium plasticity; black; wet; stiff; friable. (Topsoil)					
1084.2	1.8		CL - LEAN CLAY; medium plasticity; very dark grayish brown; wet; stiff. (Bignell Alluvium)					2.5
1081.5	4.5		CL - LEAN CLAY; medium plasticity; very dark brown; wet; stiff. (Bignell Alluvium)		1.9*	85.7	26.01	
1080.8	5.2		CL - LEAN CLAY; medium plasticity; dark brown slightly mottled with light olive brown; wet; very stiff. (Bignell Alluvium)	2	1.9*			5.0
1079.5	6.5		CL - LEAN CLAY; medium plasticity; olive brown; wet; stiff to very stiff. (Peoria)		2.3*			
1079.0	7.0		CL - LEAN CLAY; medium plasticity; light olive brown slightly mottled with yellowish red; wet; stiff. (Peoria)					7.5
								10.0
1073.5	12.5		CL - Same as above except soft to medium stiff. (Peoria)					12.5
1071.0	15.0							15.0

BORING LOG GLACIERLOGS.GPJ HWS.GDT 10/01/10

* Unconfined compressive strength was estimated using a calibrated hand penetrometer.

Figure B - 2a

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LOCATION: -96.139106, 41.347726

JOB NO.: 52-80-3897
RIG / METHOD: B-53 / Straight Auger
CREW: GBW & PN

BORING LOG

BORING No.: B-2
SHEET 2 of 2
DATE: 5-19-2010

WATER LEVELS ▼ 19.8 IAD ▼ 11.0 on 5-28-2010

ELEV (USGS)	DEPTH (feet)	LOG	LITHOLOGY DESCRIPTION	SAMPLE	qu (tsf)	DRY DENSITY (pcf)	MOISTURE (%)	DEPTH (feet)
			CL - Same as above. (Peoria)					15.0
1070.0	16.0		CL - LEAN CLAY; medium plasticity; light yellowish brown with yellowish brown mottled with yellowish red; saturated; soft to medium stiff; with silt seams and silty sand seams. (Peoria)					
1069.0	17.0		CL/CH - LEAN TO FAT CLAY with Sand; medium to high plasticity; gray heavily mottled with grayish brown slightly mottled with yellowish red; saturated; very stiff. (Glacial Till)					17.5
1066.0	20.0		Boring Terminated at: 20.0ft					20.0
								22.5
								25.0
								27.5
								30.0

BORING LOG GLACIERLOGS.GPJ HWS.GDT 10/01/10

* Unconfined compressive strength was estimated using a calibrated hand penetrometer.

Figure B - 2b

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PROJECT: Glacier Creek Wetlands
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LOCATION: -96.137490, 41.344730

JOB NO.: 52-80-3897
RIG / METHOD: B-53 / Straight Auger
CREW: GBW & PN

BORING LOG

BORING No.: B-3
SHEET 1 of 1
DATE: 5-19-2010

WATER LEVELS ▼ 4.5 IAD ▼ 4.8 on 5-28-2010

ELEV (USGS)	DEPTH (feet)	LOG	LITHOLOGY DESCRIPTION	SAMPLE	qu (tsf)	DRY DENSITY (pcf)	MOISTURE (%)	DEPTH (feet)
1076.5	0.0		CL - LEAN CLAY; medium plasticity; very dark grayish brown; wet; medium stiff to stiff. (Topsoil)					0.0
1075.5	1.0		CL - LEAN CLAY; medium plasticity; black slightly mottled with dark grayish brown; wet; medium stiff; friable. (Recent Alluvium)					
					0.7*			2.5
				3	0.8*	79.6	34.83	
1072.1	4.4		CL - Same as above except medium stiff to stiff; saturated. (Recent Alluvium)		0.8*			
1071.5	5.0		CL - LEAN CLAY; medium plasticity; very dark gray; saturated; soft to medium stiff. (Recent Alluvium)		0.5*			5.0
1070.5	6.0		CL - LEAN CLAY; medium plasticity; very dark grayish brown with olive brown; saturated; soft. (Recent Alluvium)					
1069.5	7.0		CL - LEAN CLAY; medium plasticity; light olive brown mottled with grayish brown and yellowish red; saturated; medium stiff. (Peoria)					7.5
1066.5	10.0		Boring Terminated at: 10.0ft					10.0
								12.5
								15.0

BORING LOG GLACIERLOGS.GPJ HWS.GDT 10/01/10

* Unconfined compressive strength was estimated using a calibrated hand penetrometer.

Figure B - 3

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LOCATION: -96.138054, 41.342782

JOB NO.: 52-80-3897
RIG / METHOD: B-53 / Straight Auger
CREW: GBW & PN

BORING LOG

BORING No.: B-4
SHEET 1 of 1
DATE: 5-19-2010

WATER LEVELS ▼ 14.6 IAD ▼ 9.0 on 5-28-2010

ELEV (USGS)	DEPTH (feet)	LOG	LITHOLOGY DESCRIPTION	SAMPLE	qu (tsf)	DRY DENSITY (pcf)	MOISTURE (%)	DEPTH (feet)
1080.5	0.0		CL - LEAN CLAY; 0-5% fine sand; medium plasticity; very dark grayish brown; wet; medium stiff. (Fill)					0.0
1080.0	0.5		CL - LEAN CLAY; medium plasticity; olive brown with very dark grayish brown; wet; stiff. (Fill)					
1079.3	1.2		CL - LEAN CLAY; medium plasticity; black; wet; stiff; friable. (Topsoil)					
1077.7	2.8		CL - LEAN CLAY; medium plasticity; dark grayish brown slightly mottled with dark gray and yellowish red; wet; stiff to very stiff. (Subsoil)		1.7*			2.5
1076.8	3.7		CL - LEAN CLAY; medium plasticity; olive brown mottled with yellowish red slightly mottled with black; wet; stiff. (Peoria)	4	2.1*			
					1.5*	89.8	26.15	5.0
					1.5*			
1074.0	6.5		CL - Same as above except medium stiff. (Peoria)					7.5
1070.0	10.5		CL - LEAN CLAY; 0-5% fine gravel; 5-15% fine to coarse sand; medium plasticity; olive brown slightly mottled with black and light gray; wet to saturated; soft. (Peoria)					10.0
1069.0	11.5		CL - LEAN CLAY; medium plasticity; light olive brown slightly mottled with yellowish red; saturated; soft. (Peoria)					
1068.0	12.5		CL/ML - SILTY CLAY; low to medium plasticity; light olive brown slightly mottled with yellowish red; saturated; soft. (Peoria)					12.5
1065.5	15.0		Boring Terminated at: 15.0ft					15.0

BORING LOG GLACIERLOGS.GPJ HWS.GDT 10/01/10

* Unconfined compressive strength was estimated using a calibrated hand penetrometer.

Figure B - 4

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PROJECT: Glacier Creek Wetlands
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LOCATION: -96.13387, 41.34095

JOB NO.: 52-80-3897
RIG / METHOD: B-53 / Straight Auger
CREW: GBW & PN

BORING LOG

BORING No.: B-5
SHEET 1 of 2
DATE: 5-19-2010

WATER LEVELS ▼ 9.8 IAD ▼ 10.0 on 5-27-2010

ELEV (USGS)	DEPTH (feet)	LOG	LITHOLOGY DESCRIPTION	SAMPLE	qu (tsf)	DRY DENSITY (pcf)	MOISTURE (%)	DEPTH (feet)
1090.0	0.0		CL - LEAN CLAY; medium plasticity; very dark grayish brown with brown; wet; stiff. (Fill)					0.0
1088.3	1.7		CL - LEAN CLAY; medium plasticity; black; wet; medium stiff to stiff; friable. (Topsoil)					2.5
1086.5	3.5		CL - LEAN CLAY; medium plasticity; very dark grayish brown; moist to wet; very stiff; moderately porous. (Recent Alluvium)		3.5*			
1085.5	4.5		CL - LEAN CLAY; medium plasticity; very dark grayish brown; wet; very stiff. (Recent Alluvium)	5	4.0*	79.1	20.91	5.0
1084.0	6.0		CL - LEAN CLAY; medium plasticity; very dark grayish brown mottled with dark yellowish red; wet; stiff. (Bignell Alluvium)		4.2*			7.5
1081.0	9.0		CL - LEAN CLAY; medium plasticity; dark gray mottled with dark yellowish red; saturated; stiff. (Bignell Alluvium)					10.0
1077.5	12.5		CL - LEAN CLAY; medium plasticity; brown mottled with dark yellowish red; saturated; stiff. (Bignell Alluvium)					12.5
1076.5	13.5		CL - LEAN CLAY; medium plasticity; very dark gray; saturated; stiff. (Peoria Alluvium)					
1075.0	15.0							15.0

BORING LOG GLACIERLOGS.GPJ HWS.GDT 10/01/10

* Unconfined compressive strength was estimated using a calibrated hand penetrometer.

Figure B - 5a

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LOCATION: -96.13387, 41.34095

JOB NO.: 52-80-3897
RIG / METHOD: B-53 / Straight Auger
CREW: GBW & PN

BORING LOG

BORING No.: B-5

SHEET 2 of 2

DATE: 5-19-2010

WATER LEVELS ▼ 9.8 IAD ▼ 10.0 on 5-27-2010

ELEV (USGS)	DEPTH (feet)	LOG	LITHOLOGY DESCRIPTION	SAMPLE	qu (tsf)	DRY DENSITY (pcf)	MOISTURE (%)	DEPTH (feet)
			CL - LEAN CLAY; medium plasticity; dark greenish gray; saturated; medium stiff. (Peoria Alluvium)					15.0
								17.5
1070.0	20.0		Boring Terminated at: 15.0ft					20.0
								22.5
								25.0
								27.5
								30.0

BORING LOG GLACIERLOGS.GPJ HWS.GDT 10/01/10

* Unconfined compressive strength was estimated using a calibrated hand penetrometer.

Figure B - 5b

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LOCATION: -96.137273, 41.339713

JOB NO.: 52-80-3897
RIG / METHOD: B-53 / Straight Auger
CREW: GBW & PN

BORING LOG

BORING No.: B-6
SHEET 1 of 1
DATE: 5-19-2010

WATER LEVELS ▼ 4.6 IAD ▼ 4.8 on 5-28-2010

ELEV (USGS)	DEPTH (feet)	LOG	LITHOLOGY DESCRIPTION	SAMPLE	qu (tsf)	DRY DENSITY (pcf)	MOISTURE (%)	DEPTH (feet)
1078.5	0.0		CL - LEAN CLAY; medium plasticity; very dark grayish brown; wet; stiff; friable. (Topsoil)					0.0
1076.5	2.0		OH - ORGANIC CLAY; high plasticity; very dark gray with black; wet; stiff. (Recent Alluvium)	6	1.3*			2.5
1075.2	3.3		CL - LEAN CLAY; medium plasticity; very dark grayish brown mottled with very dark gray; wet; stiff. (Recent Alluvium)		1.7*	95.3	26.01	
1074.0	4.5		CL - LEAN CLAY; medium plasticity; dark grayish brown slightly mottled with yellowish red; saturated; stiff. (Recent Alluvium)		1.4*			
1073.5	5.0		CL - LEAN CLAY; medium plasticity; very dark grayish brown mottled with dark yellowish red; saturated; medium stiff. (Recent Alluvium)					5.0
1072.0	6.5		CL - LEAN CLAY; medium plasticity; dark gray; saturated; medium stiff. (Peoria Alluvium)					7.5
1068.5	10.0		Boring Terminated at: 10.0ft					10.0
								12.5
								15.0

BORING LOG GLACIERLOGS.GPJ HWS.GDT 10/01/10

* Unconfined compressive strength was estimated using a calibrated hand penetrometer.

Figure B - 6

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LOCATION: -96.135299, 41.339648

JOB NO.: 52-80-3897
RIG / METHOD: B-53 / Straight Auger
CREW: GBW & PN

BORING LOG

BORING No.: B-7
SHEET 1 of 2
DATE: 5-19-2010

WATER LEVELS ▼ 4.4 IAD ▼ 4.4 on 5-27-2010

ELEV (USGS)	DEPTH (feet)	LOG	LITHOLOGY DESCRIPTION	SAMPLE	qu (tsf)	DRY DENSITY (pcf)	MOISTURE (%)	DEPTH (feet)
1073.5	0.0		CL - LEAN CLAY; medium plasticity; black; wet; stiff. (Topsoil)					0.0
1071.5	2.0		CL - LEAN CLAY; medium plasticity; very dark grayish brown with dark gray; wet; stiff to very stiff. (Recent Alluvium)					2.5
1070.5	3.0		CL - LEAN CLAY; medium plasticity; dark grayish brown; wet; stiff. (Recent Alluvium)					
1068.5	5.0		CL - LEAN CLAY; medium plasticity; very dark gray heavily mottled with black; saturated; medium stiff; very porous. (Recent Alluvium)		0.7*			5.0
1068.0	5.5		CL - Same as above except soft. (Recent Alluvium)	7	0.3*	80.3	38.78	
					0.3*			
					0.3*			
1066.0	7.5		CL - LEAN CLAY; medium plasticity; dark gray; saturated; stiff to very stiff. (Peoria Alluvium)					7.5
1063.5	10.0		CL - LEAN CLAY; medium plasticity; dark gray slightly mottled with white; saturated; stiff to very stiff; with small lime concretions. (Peoria Alluvium)					10.0
1060.5	13.0		CH - FAT CLAY; high plasticity; very dark gray with dark gray slightly mottled with white; saturated; very stiff. (Peoria Alluvium)					12.5
1059.5	14.0		CL - LEAN CLAY; medium plasticity; dark gray slightly mottled with white; saturated; stiff; with small lime concretions. (Peoria Alluvium)					
1058.5	15.0							15.0

BORING LOG GLACIERLOGS.GPJ HWS.GDT 10/01/10

* Unconfined compressive strength was estimated using a calibrated hand penetrometer.

Figure B - 7a

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LOCATION: -96.135299, 41.339648

JOB NO.: 52-80-3897
RIG / METHOD: B-53 / Straight Auger
CREW: GBW & PN

BORING LOG

BORING No.: B-7

SHEET 2 of 2

DATE: 5-19-2010

WATER LEVELS ▼ 4.4 IAD ▼ 4.4 on 5-27-2010

ELEV (USGS)	DEPTH (feet)	LOG	LITHOLOGY DESCRIPTION	SAMPLE	qu (tsf)	DRY DENSITY (pcf)	MOISTURE (%)	DEPTH (feet)
			CL - Same as above. (Peoria Alluvium)					15.0
1056.0	17.5		CL/CH - LEAN TO FAT CLAY; medium to high plasticity; very dark gray; saturated; very stiff. (Peoria Alluvium)					17.5
1055.0	18.5		CL - LEAN CLAY; medium plasticity; dark gray; saturated; soft to medium stiff. (Peoria Alluvium)					
1053.5	20.0		Boring Terminated at: 20.0ft					20.0
								22.5
								25.0
								27.5
								30.0

BORING LOG GLACIERLOGS.GPJ HWS.GDT 10/01/10

* Unconfined compressive strength was estimated using a calibrated hand penetrometer.

Figure B - 7b

APPENDIX C.
CRITERIA USED FOR VISUAL SOIL CLASSIFICATION

TABLE C-1

Soil Classification Chart

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]			Group	Soil Classification	
				Group Symbol	Group Name[B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	Cu≥4 and 1≤Cc≤3[E]	GW	Well-graded gravel[F]
			Cu<4 and/or 1 >Cc>3[E]	GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	Cu≥6 and 1≤Cc≤3[E]	SW	Well-graded sand[1]
			Cu<6 and/or 1≥Cc≥3[E]	SP	Poorly graded sand[1]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,I]
			Fines classify as CL or CH	SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI>7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI<4 or plots below "A" line[J]	ML	Silt[K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried <0.75	OL	Organic clay[K,L,M] Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried <0.75	OH	Organic clay[K,L,M,P] Organic silt[K,L,M,Q]
Highly organic soils	Primarily organic matter, dark in color, and organic odor		PT	Peat	

[A] Based on the material passing the 3-in. (77-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded with silt
GP-GC poorly graded gravel with clay

[D] Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.

[H] If fines are organic, add "with organic fines' to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel", whichever is predominant.

[L] If soil contains ≥30% plus No. 200, predominantly sand, add "sandy" to group name.

[M] If soil contains ≥30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥4 and plots on or above "A" line.

[O] PI <4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

TABLE C-2

CRITERIA FOR DESCRIBING MOISTURE CONDITION OF CLAY SOIL	
Description	**Criteria**
Dry	Absence of moisture, dusty, dry to the touch.
Moist	Damp, slightly wet, moisture content below plastic limit.
Wet	Moisture content above the plastic limit.
Saturated	Very wet. Usually soil is below water table.

TABLE C-3

CRITERIA FOR DESCRIBING MOISTURE CONDITION OF GRANULAR SOIL	
Description	**Criteria**
Dry	Absence of moisture, dry to the touch.
Moist	Damp but no visible free water.
Wet	Visible free water.
Saturated	Usually soil is below water table.

TABLE C-4

CRITERIA FOR DESCRIBING CONSISTENCY OF CLAY SOIL	
Density	**Penetration Resistance, N Blows per 12 in.**
Very Soft	Less Than 2
Soft	2-4
Medium	4-8
Stiff	8-15
Very Stiff	15-30
Hard	Greater Than 30

TABLE C-5

CRITERIA FOR DESCRIBING DENSITY OF COARSE-GRAINED SOIL

Density	Penetration Resistance, N Blows per 12 in.
Loose	Less Than 10
Medium	10-30
Dense	30-50
Very Dense	Greater Than 50

TABLE C-6

CRITERIA FOR DESCRIBING STRENGTH OF ROCK

Description	Criteria
Very soft	Permits denting by moderate pressure of the fingers.
Soft	Resists denting by the fingers, but can be abraded and pierced to a shallow depth by a pencil point.
Moderately soft	Resists a pencil point, but can be scratched and cut with a knife blade.
Moderately hard	Resistant to abrasion or cutting by a knife blade, but can be easily dented or broken by light blows of a hammer.
Hard	Can be deformed or broken by repeated moderate hammer blows.
Very hard	Can be broken only by heavy, and in some rocks, repeated hammer blows.

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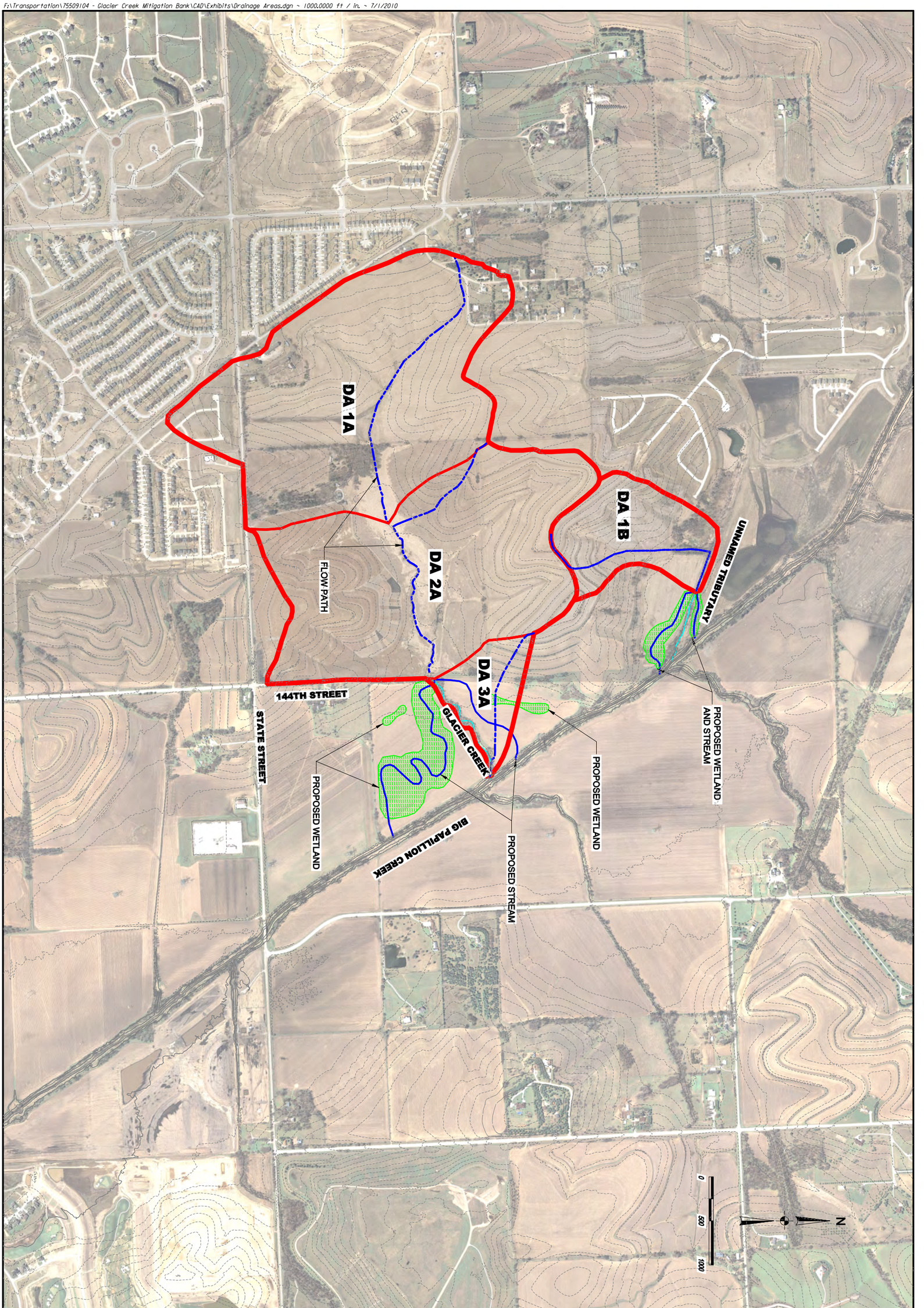


EXHIBIT NO.

JOB NO. 75-509104

DATE XXXX 2010

PROJECT GLACIER CREEK

HWS

LINCOLN OFFICE
825 J St., Box 80358
Lincoln, NE 68501
(402) 479-2200
www.hws.com

GLACIER CREEK MITIGATION BANK

GLACIER CREEK DRAINAGE AREAS

DRAFT

NO.	REVISIONS	DATE
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

Curve Number Calculations

HEC-HMS Model:

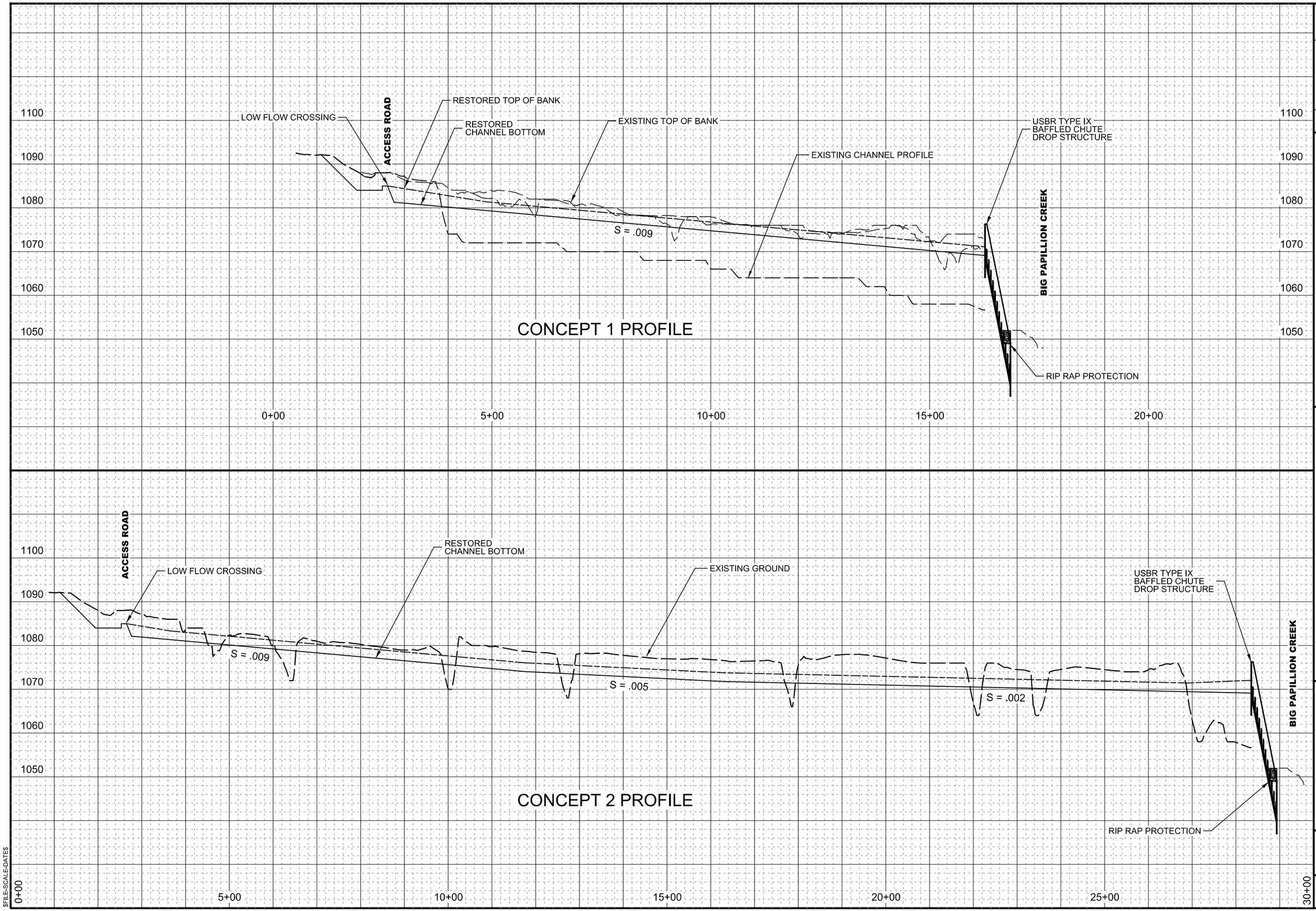
Drainage Area 1A		Area (Acres)		Curve Numbers	
Land Use	Total Area	HSG B	HSG C	HSG B	HSG C
Total Area	**173.2**	92.6	80.6		
Contoured Cropland	98.88	54.56	44.32	74	81
Residential (< 1/8 acre)	12.06	5.95	6.11	85	90
Residential (acre)	7.6	2.44	5.16	68	79
Farmstead	8.08	0.63	7.45	74	82
Grassland, Fair	6.84	0.82	6.02	69	79
Meadow	22.76	17.96	4.8	58	71
Woods, Fair	13.67	8.61	5.06	60	73
Paved Road, ROW excluded	3.34	1.67	1.67	98	98
Weighted CN Value:	**75.3**				

Drainage Area 2A		Area (Acres)		Curve Numbers	
Land Use	Total Area	HSG B	HSG C	HSG B	HSG C
Total Area	**156.4**	90.7	65.7		
Contoured Cropland	48.41	30.18	18.23	74	81
Residential (< 1/8 acre)	0	0	0	85	90
Residential (acre)	0	0	0	68	79
Farmstead	0	0	0	74	82
Grassland, Fair	14.23	0	14.23	69	79
Meadow	93.8	60.52	33.28	58	71
Woods, Fair	0	0	0	60	73
Paved Road, ROW excluded	0	0	0	98	98
Weighted CN Value:	**68.4**				

Drainage Area 3A		Area (Acres)		Curve Numbers	
Land Use	Total Area	HSG B	HSG C	HSG B	HSG C
Total Area	**21.4**	18.6	2.7		
Contoured Cropland	17.62	15.64	1.98	74	81
Residential (< 1/8 acre)	0	0	0	85	90
Residential (acre)	0	0	0	68	79
Farmstead	0	0	0	74	82
Grassland, Fair	0	0	0	69	79
Meadow	0	0	0	58	71
Woods, Fair	3.74	3	0.74	60	73
Paved Road, ROW excluded	0	0	0	98	98
Weighted CN Value:	**72.6**				

TR-55 Model:

Drainage Area 1B		**Area (Acres)**		**Curve Numbers**	
Land Use	**Total Area**	**HSG B**	**HSG C**	**HSG B**	**HSG C**
Total Area	**39.1**	29.1	10.0		
Contoured Cropland	30.64	24.62	6.02	74	81
Residential (< 1/8 acre)	0	0	0	85	90
Residential (acre)	0	0	0	68	79
Farmstead	0	0	0	74	82
Grassland, Fair	3.77	2.92	0.85	69	79
Meadow	0	0	0	58	71
Woods, Fair	4.64	1.54	3.1	60	73
Paved Road, ROW excluded	0	0	0	98	98
Weighted CN Value:	**74.2**				



NO. | REVISIONS | DATE

GLACIER CREEK
RESTORATION PROFILE

GLACIER CREEK
STREAM & WETLAND BANK

benesch
engineers - scientists - planners
Alfred Benesch & Company
825 J Street
Lincoln, Nebraska 68508
402-479-2200
Job No. -

PROJECT
$$-TB PROJECT-$$

DATE
Thursday, February 17, 201

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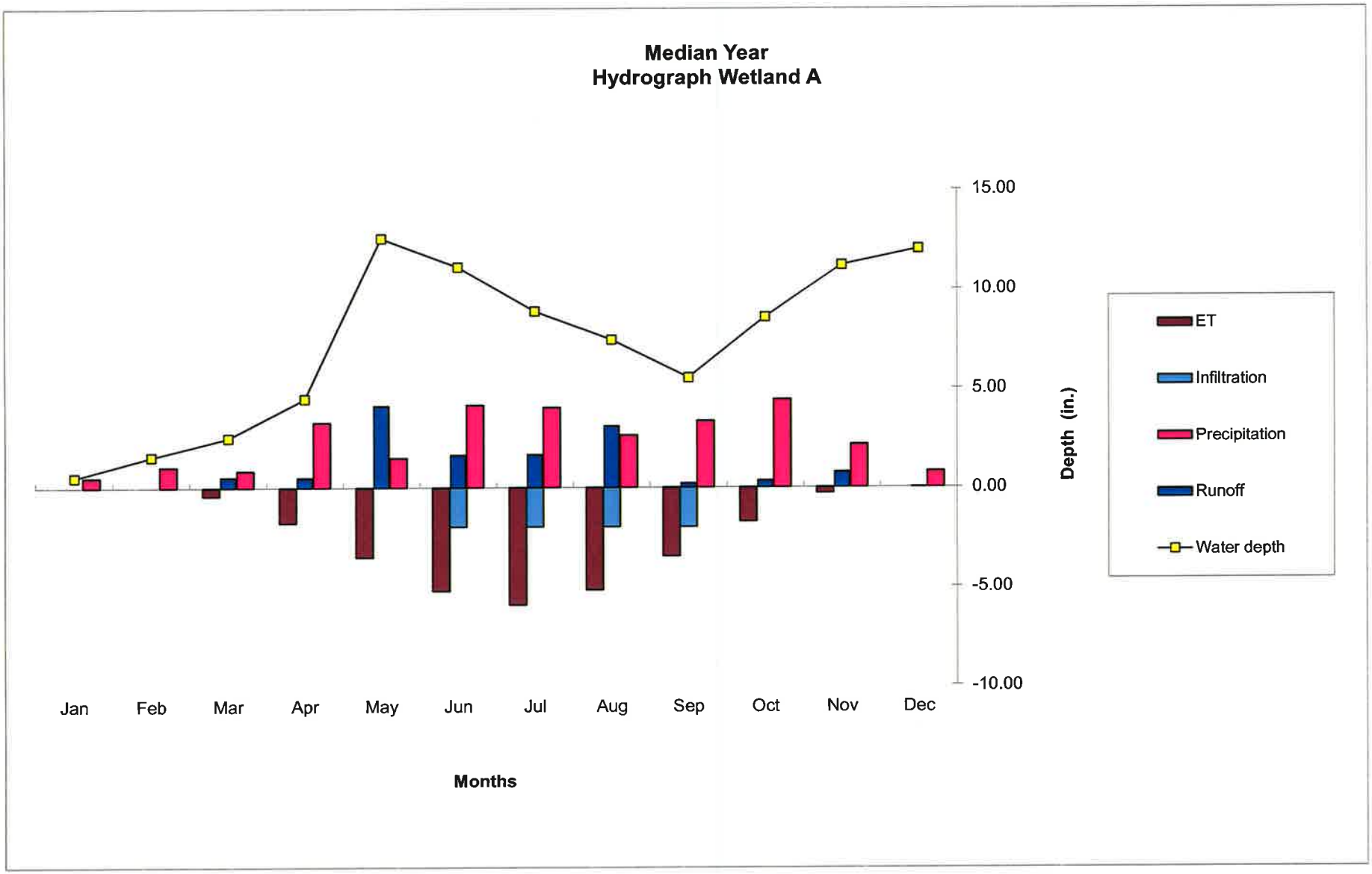
GLACIER CREEK
CONCEPT PLAN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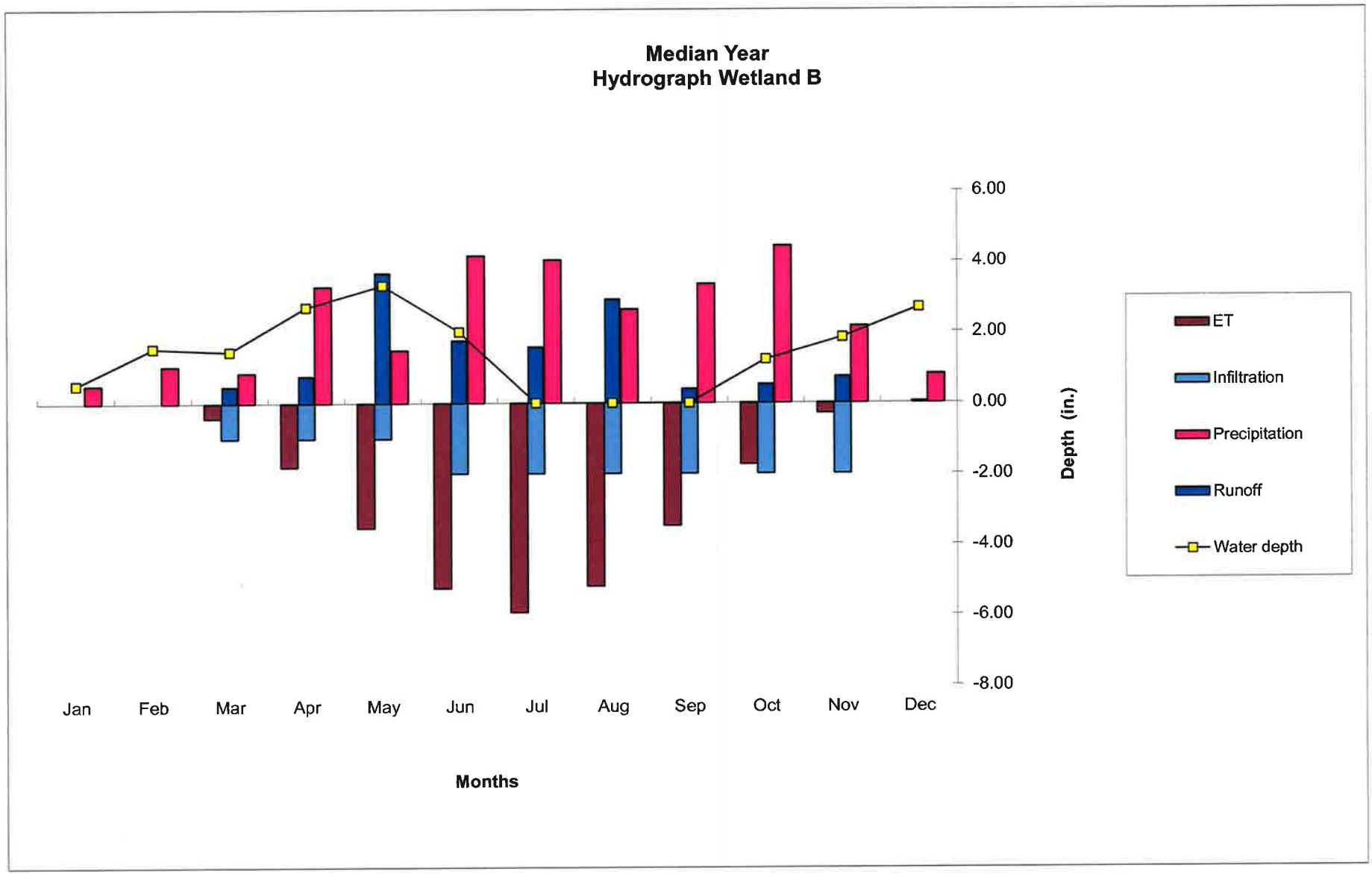
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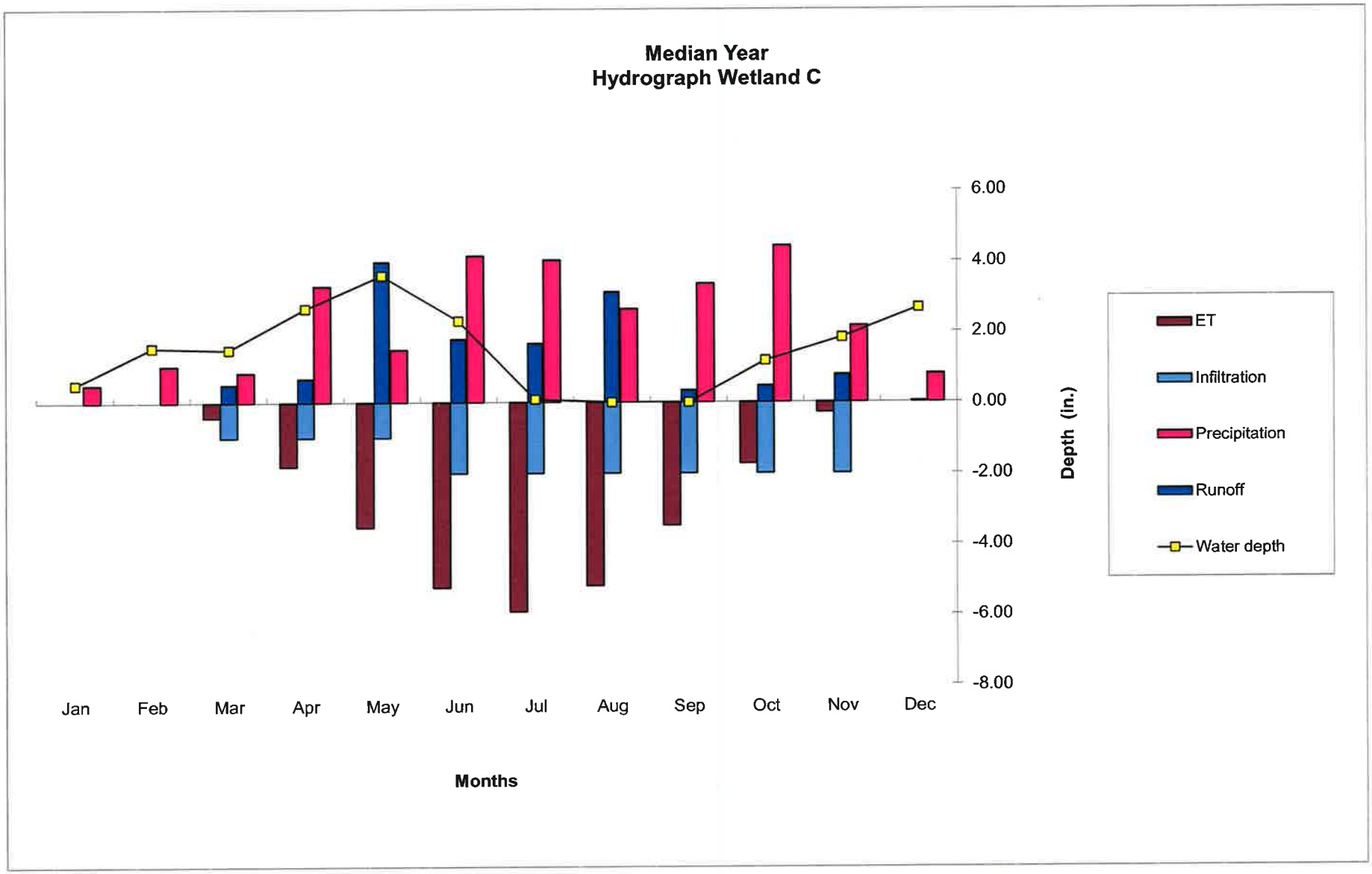
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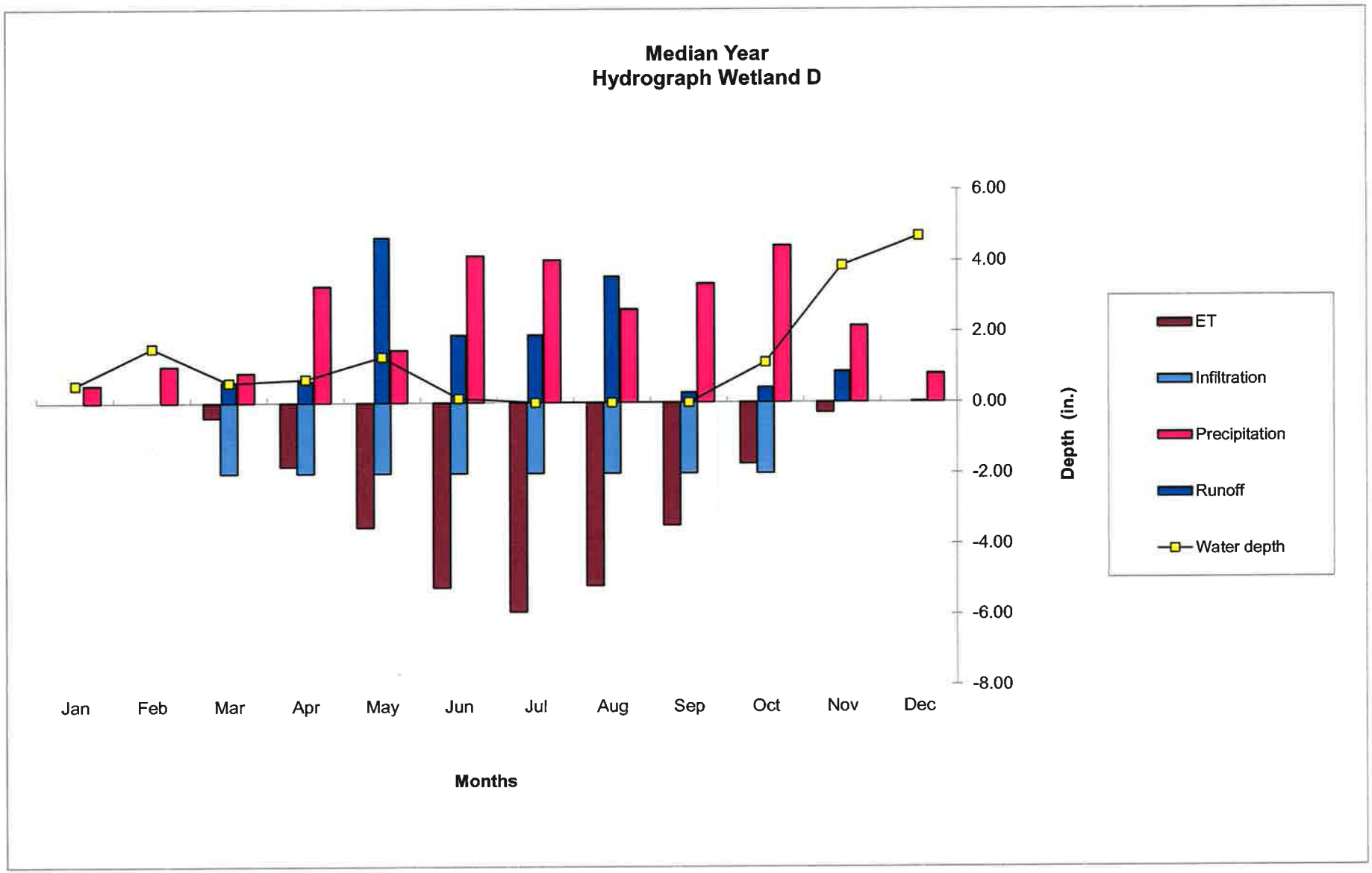
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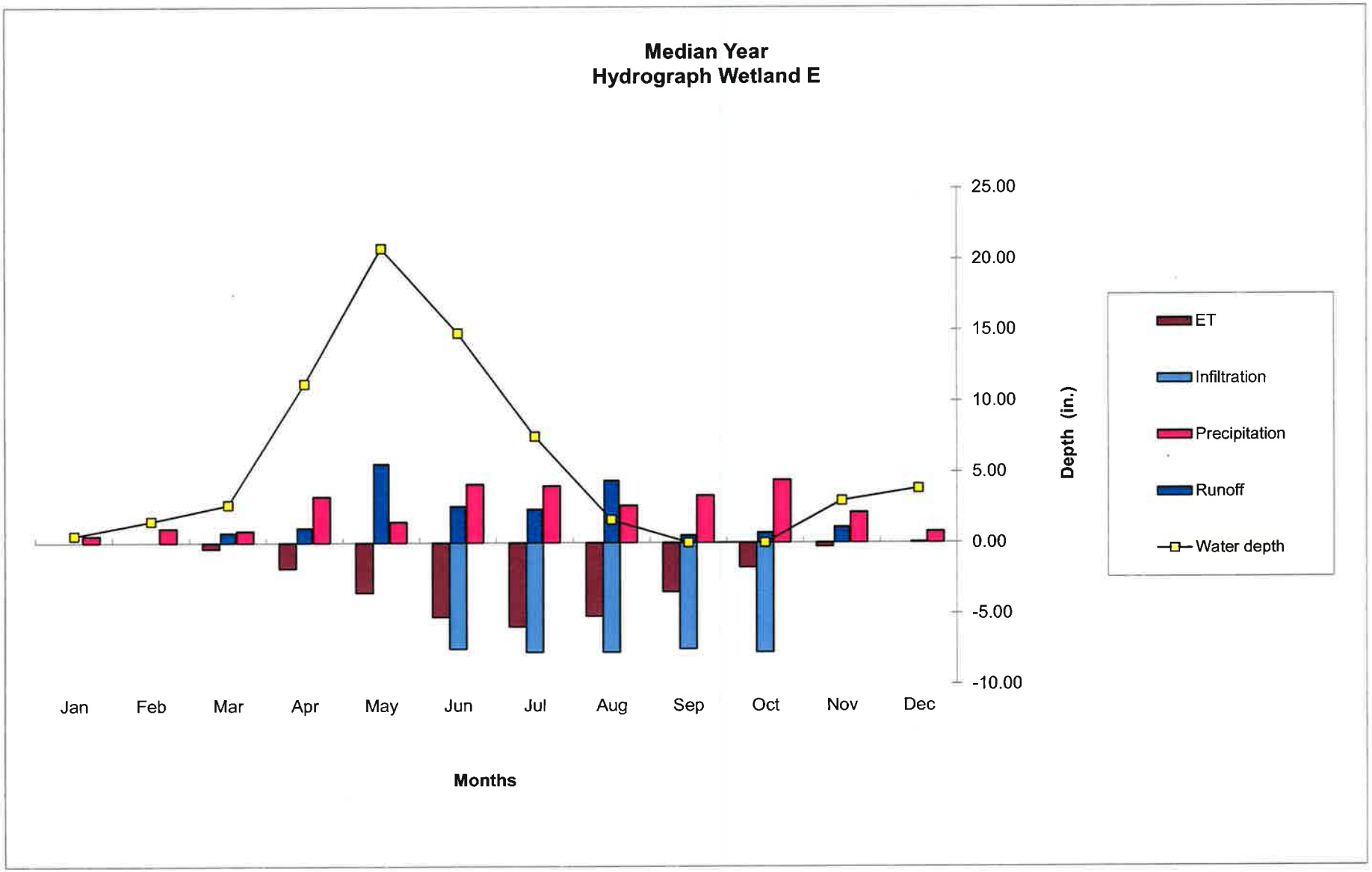
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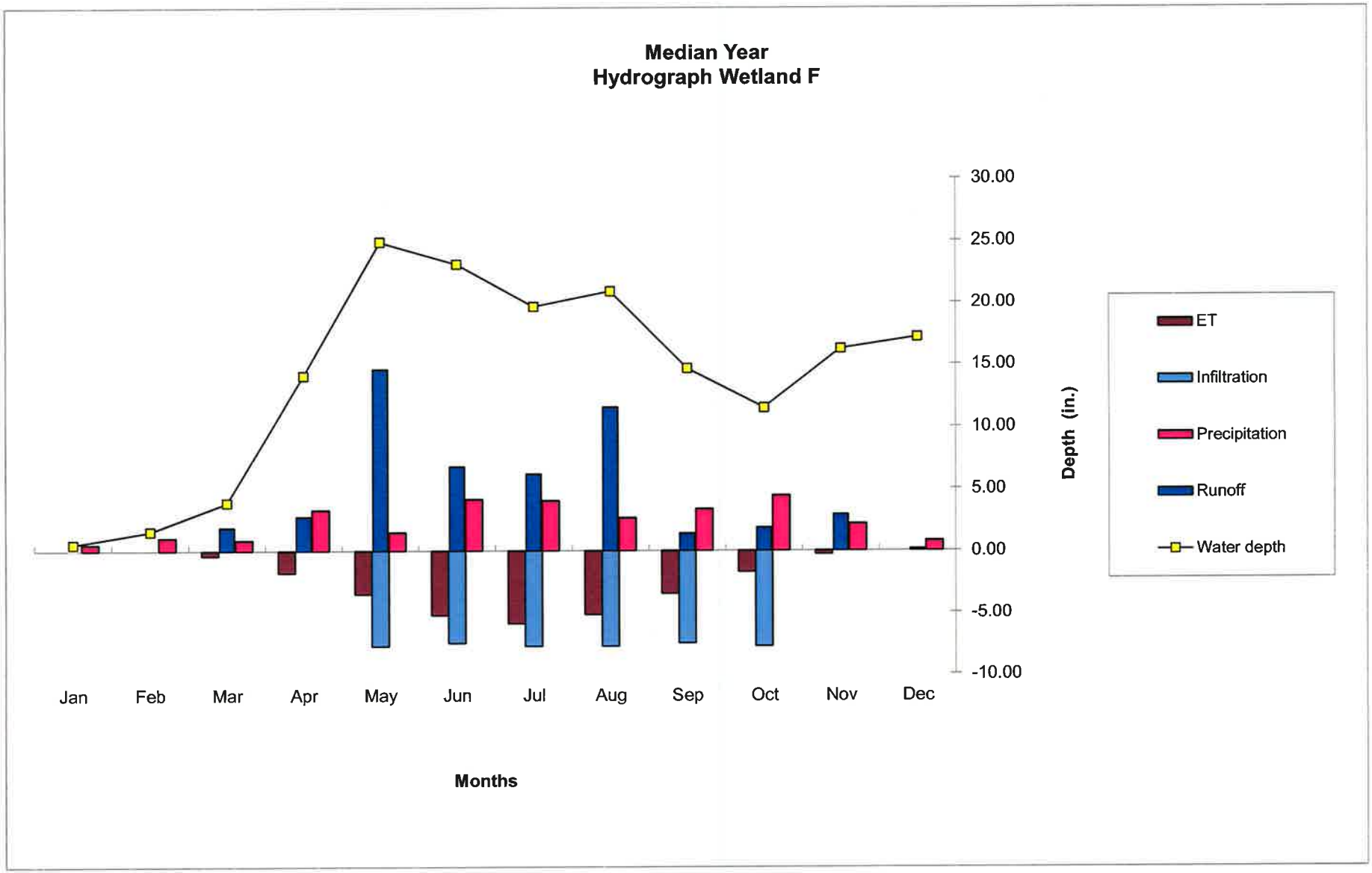
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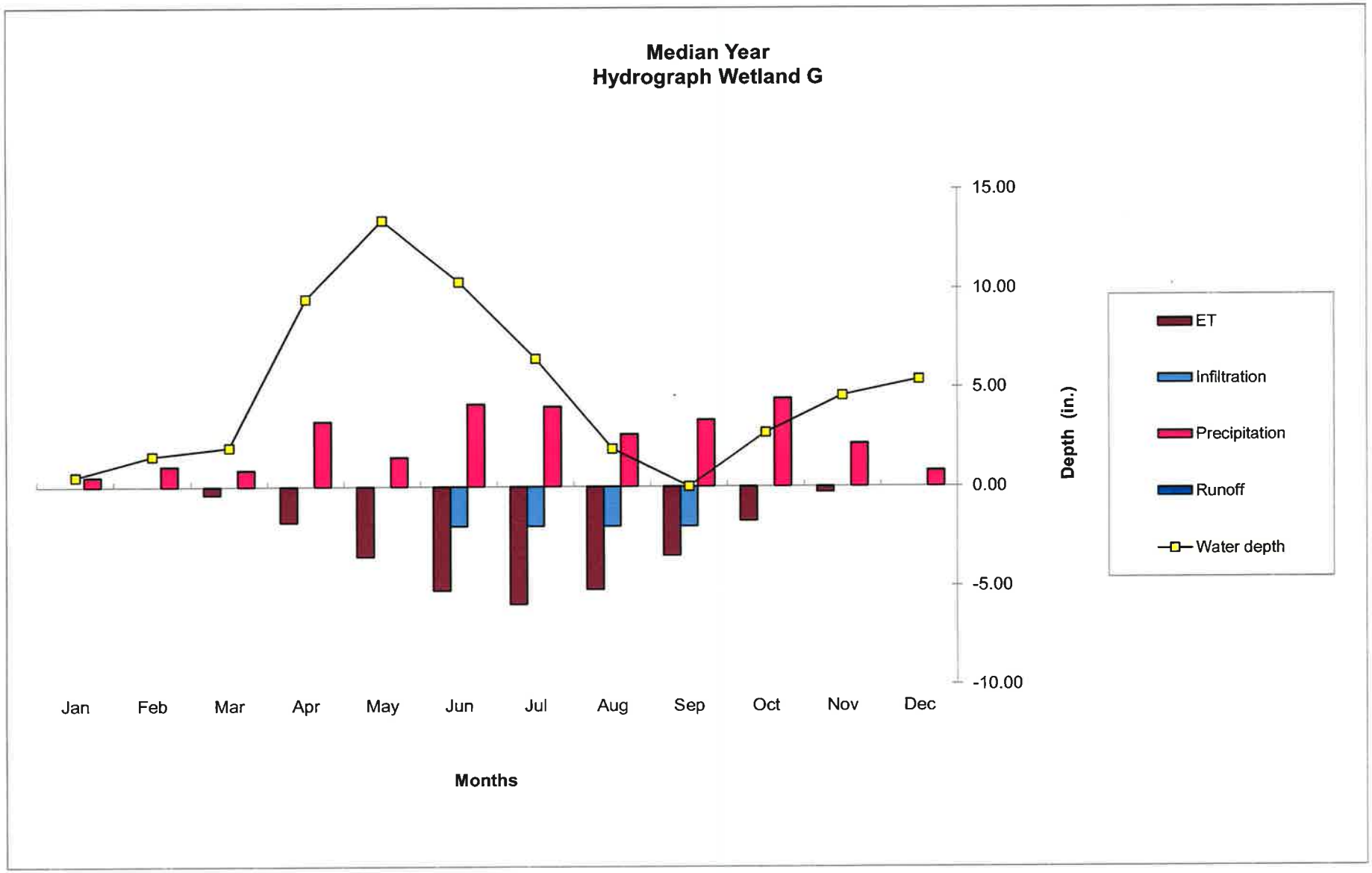
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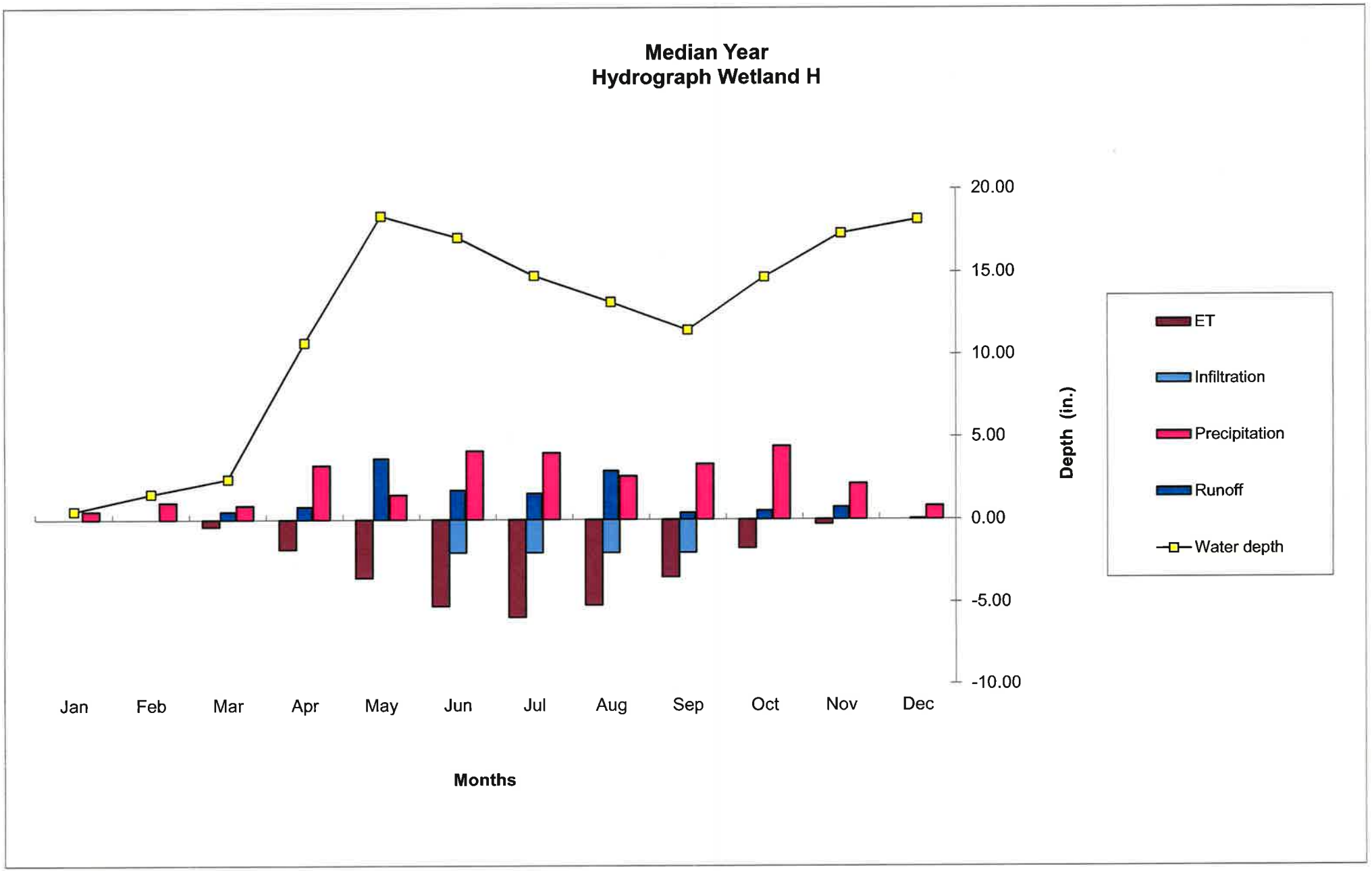
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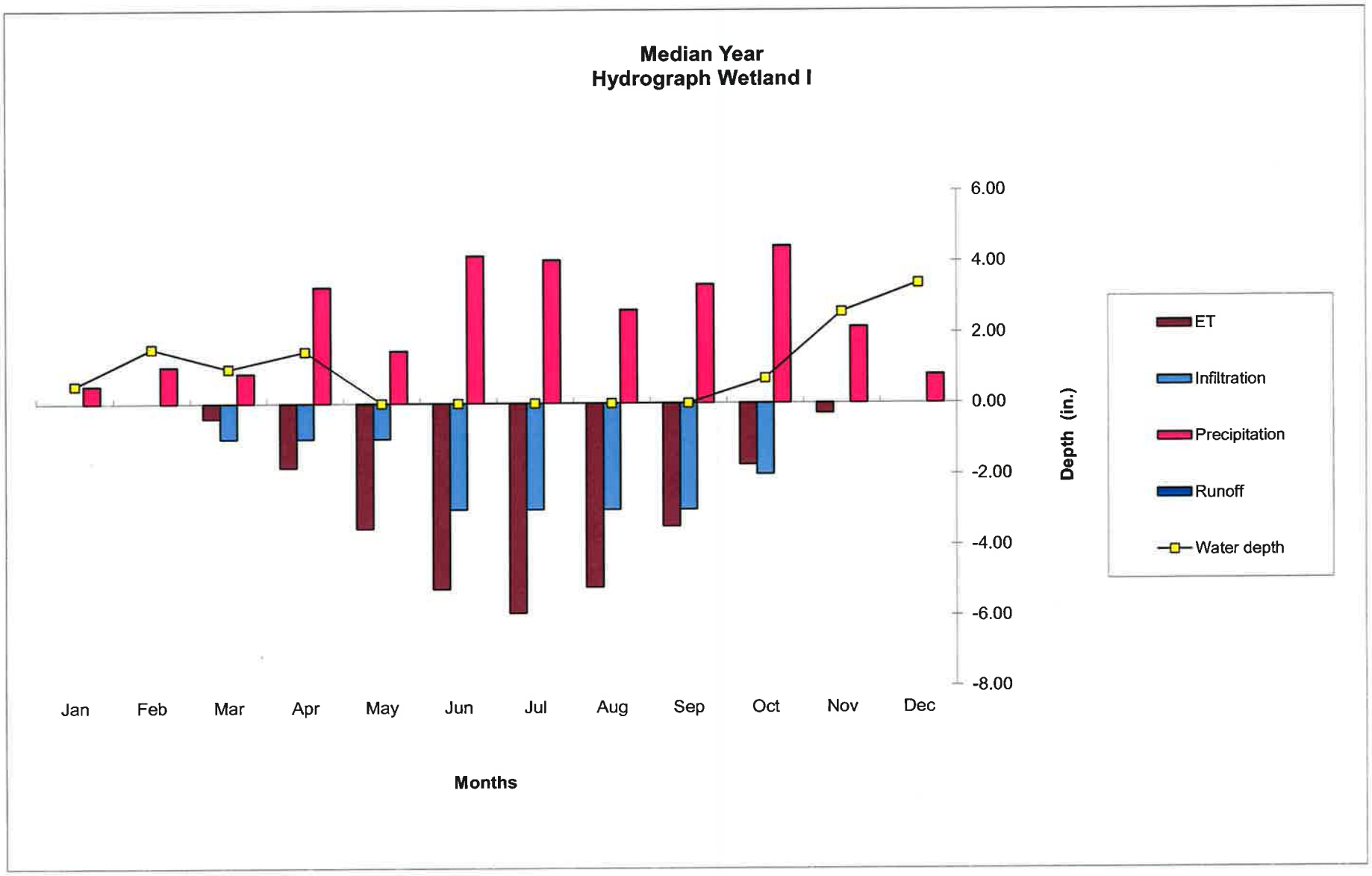
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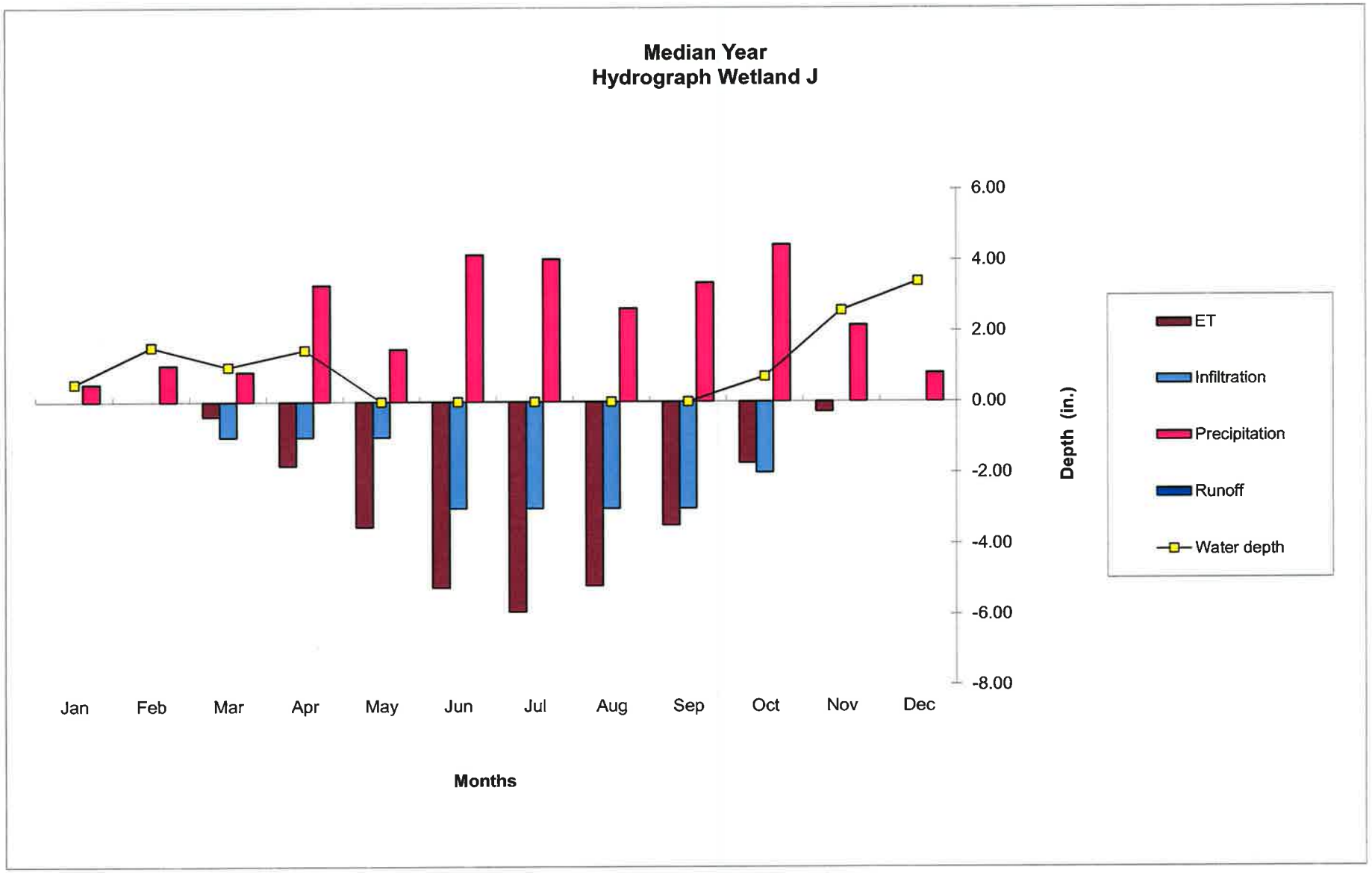
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Water depth
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Nov
Dec
Months

WETLAND VERIFICATION REPORT

Waters Of the U.S. Investigation

Glacier Creek

144th and State St.
Bennington, NE 68007

PREPARED FOR

Papio-Missouri River Natural Resource District

8901 S 154th St

Omaha, NE 68138

February 2012

benesch
engineers · scientists · planners

TABLE OF CONTENTS

1.0 INTRODUCTION

Benesch was retained by the Papio-Missouri River NRD to verify existing wetlands and identify any other wetland areas. The investigation was completed in accordance with the U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual, Technical report Y-87-1 (1987) and the 2010 Midwest Regional Supplement to the Corps of Engineers Wetland Delineation Manual. The field verification was intended to determine if the investigation areas contained all three jurisdictional wetland parameters which includes hydrophytic vegetation, hydric soils, and wetland hydrology, in similar size and shape to those previously identified.

A hand-held sub-meter global positioning system (GPS) recorder was utilized to record the locations of all new wetland determination points. The areas of Verification #1 and Verification #2 are based on Hayes Environmental L.L.C. 2007 wetland delineation map and 2010 aerial imagery. The wetland area near the Unnamed Tributary is based on site reconnaissance and 2010 aerial imagery. These details are shown on Figure 1.

The previous Waters of the U.S. Delineation performed at Glacier Creek was conducted by Hayes Environmental, L.L.C. of Elkhorn, NE in 2007. Each wetland described in the Hayes Environmental, L.L.C. 2007 report was reevaluated during this current investigation by Benesch personnel on October 1, 2010. The Hayes Environmental L.L.C. 2007 report stated that two wetlands were identified at Glacier Creek as being jurisdictional. The comparisons of the previous investigation with the current data are presented as follows:

2.0 WATERS OF THE U.S. DELINEATION VERIFICATION

2.1 Verification Wetland 1 (non-jurisdictional)

A wetland was previously identified by Hayes Environmental L.L.C. in the W ½, SW1/4, NW1/4, Section 24, Township 16 North, Range 11 East, Douglas County, NE.

During the verification of the wetlands in this area, a test pit was excavated and the three wetland parameters were described. Verification Wetland 1 is located on the east-facing slope of the hillside with a slope of approximately 25%. The source of the water in this area appears to be a series of seeps emanating from the face of the slope. These seeps probably occur where the permeability of the soils changes.

There is no jurisdictional waterway adjacent to Verification Wetland 1, therefore it is an isolated wetland and is not regulated. Benesch has classified this wetland as a Palustrine Forested, Saturated (PFOB) wetland (Photographs 1).

The area near Verification Wetland 1 is partially shaded by the nearby trees; peach-leaf willow (*Salix amygdaloides*) and green ash (*Fraxinus pennsylvanica*). Dominant herbs include reed canary grass (*Phalaris arundinacea*), giant goldenrod (*Solidago gigantea*), and aster sp. The soil was a silty clay with the color 10YR 2/1 from the surface to 16 inches of depth and there was a strong sulfur odor – indicating

the presence of hydric soils. The soil was saturated to the surface. Hydrophytic vegetation, hydrology, and hydric soils were all present in this wetland.

2.2 Verification Wetland 2 (non-jurisdictional)

A wetland was previously identified by Hayes Environmental L.L.C. in the SE ¼, NE1/4, NE1/4, Section 23, Township 16 North, Range 11 East, Douglas County, NE.

During the verification of the wetlands in this area, a test pit was excavated and the three wetland parameters were described. Verification Wetland 2 is located on the northeast-facing slope of the hillside with a slope of approximately 10%. The source of the water in this area appears to be a series of seeps emanating from the face of the slope. These seeps probably occur where the permeability of the soils changes.

There is no jurisdictional waterway adjacent to Verification Wetland 2, therefore it is an isolated wetland and is not regulated. Benesch has classified this wetland as a Palustrine Emergent, Saturated (PEMB) wetland.

The area near Verification Wetland 2 is very sparsely shaded by nearby trees; white mulberry (*Morus alba*). Nearby shrubs included dogwood (*Cornus sp.*) and elderberry (*Sambucus canadensis*). The dominant herb was reed canary grass (*Phalaris arundinacea*). The soil was a silty clay with the color 10YR 2/1 from the surface to 16 inches of depth. The soil was saturated at a depth of approximately four inches below the ground surface. These soils may contain hydrogen sulfur, but the gas can tend to dissipate rapidly before it can be smelled. These soils are very similar to verification 1 with hydrology, vegetation and soil color and position so they are assumed to by hydric. Hydrophytic vegetation, hydrology, and hydric soils were all present in this wetland.

3.0 WATERS OF THE U.S. DELINEATION

3.1 Glacier Creek

Two upland transects were completed along Glacier Creek on October 1, 2010. The locations of these transects, and the locations of the upland test pits, are shown on Figure 1.

Upland test pits GC-T1-UP-S, and GC-T1-UP-N, were located on the upland terrace adjacent to Glacier Creek in the NW ¼, NW ¼, SW ¼, Section 24, Township 16 North, Range 11 East, Douglas County, NE. Test pits GC-T1-UP-S and GC-T1-UP-N were located on the south and north side of Glacier Creek, respectively. The vegetation at both of these points was dominated by smooth brome (*Bromus hordeaceus*). Nearby trees included white mulberry (*Morus alba*) and green ash (*Fraxinus pennsylvanica*). The soil at both locations was silty clay. There was no indication of the requisite hydrology at either sample point.

Upland test pits GC-T2-UP-S and GC-T2-UP-N were located on the upland terrace adjacent to Glacier Creek in the NE ¼, NW ¼, SW ¼, Section 24, Township 16 North, Range 11 East, Douglas County, NE. Test pits GC-T2-UP-S, and GC-T2-UP-N, were located on the south and north side of Glacier Creek,

respectively. The vegetation at both of these points was dominated by smooth brome (*Bromus hordeaceus*). River grape (*Vitus* riparia) was present on the terrace on the south side of Glacier Creek (Photograph 2). The soil at both locations was silty clay. There was no indication of the requisite hydrology at either sample point.

There are no wetlands adjacent to Glacier Creek within the project area. Glacier Creek is a perennial stream with an approximate depth of 0 to 1 foot and a width of 3 to 5 feet with very steep to vertical banks. In-stream habitat along the creek includes pools, overhanging branches and tree roots (Photograph 3).

3.2 Big Papillion Creek

One wetland and two upland sample locations were investigated adjacent to Big Papillion Creek.

The wetland test pit, BP-T1-Wet, is located in the NE ¼, NW ¼, SW ¼, Section 24, Township 16 North, Range 11 East, Douglas County, NE. This sample point was on the east-facing slope of Big Papillion Creek approximately five to ten feet above the water level of the creek (Photograph 4). The dominant vegetation was reed canary grass (*Phalaris arundinacea*). The soil was silty clay with the color 10YR 4/2 from the surface to six inches of depth, and a color of Gley 1 2.5/N from six inches to 16 inches of depth. The soil was saturated at a depth of approximately six inches below the ground surface. No hydric soil indicators were observed. Hydrophytic vegetation, and hydrology were all present in this wetland. This is a jurisdictional wetland as it is adjacent to a jurisdictional waterway – Big Papillion Creek. Benesch has classified this wetland as a Palustrine Emergent, Seasonally Flooded/Saturated (PEMC) wetland.

Upland test pit BP-T1-UP was located on the upland terrace adjacent to Big Papillion Creek in the NE ¼, NW ¼, SW ¼, Section 24, Township 16 North, Range 11 East, Douglas County, NE. The vegetation at this point was dominated by smooth brome (*Bromus hordeaceus*). The soil at this location was silty clay. There was no indication of the requisite hydrology at this sample point.

Upland test pit BP-T2-UP was located on the upland terrace adjacent to Big Papillion Creek in the NW ¼, NE ¼, SW ¼, Section 24, Township 16 North, Range 11 East, Douglas County, NE. The vegetation at this point was dominated by smooth brome (*Bromus hordeaceus*). The trees growing near this location white mulberry (*Morus alba*) and green ash (*Fraxinus pennsylvanica*) were primarily growing on the steep bank of Big Papillion Creek (Photograph 5). The soil at this location was silty clay. There was no indication of the requisite hydrology at this sample point.

3.3 Unnamed Tributary to Big Papillion Creek

One wetland and four upland sample locations were investigated adjacent to the Unnamed Tributary to Big Papillion Creek.

The wetland test pit, UT-T1-Wetland, is located in the NW ¼, NEW ¼, NE ¼, Section 23, Township 16 North, Range 11 East, Douglas County, NE. This sample point was on a very narrow terrace approximately one foot above the water level of the Unnamed Tributary (Photograph 6). The dominant vegetation was reed canary grass (*Phalaris arundinacea*). The soil was silty clay with the color 10YR 2/1

from the surface to four inches of depth, and a color of Gley 1 2.5/N from four inches to 16 inches of depth. The soil was saturated at a depth of approximately two inches below the ground surface. The soils in this area have been disturbed due to channelization of the unnamed tributary and do not meet any hydric soil indicators. Hydrophytic vegetation and hydrology were all present in this wetland. This is a jurisdictional wetland as it is a direct tributary to a jurisdictional waterway – Big Papillion Creek. Benesch has classified this wetland as a Palustrine Emergent, Seasonally Flooded/Saturated (PEMC) wetland.

Upland test pit UT-T1-S-UP was located on the upland terrace adjacent to the south side of the Unnamed Tributary in the NW ¼, NE ¼, NE ¼, Section 23, Township 16 North, Range 11 East, Douglas County, NE. The vegetation at this point was dominated by smooth brome (*Bromus hordeaceus*) and wild plum (*Prunus americana*). The soil at this location was silty clay. There was no indication of the requisite hydrology at this sample point.

Upland test pit UT-T1-N-UP was located on the upland terrace adjacent to the north side of the Unnamed Tributary in the NW ¼, NE ¼, NE ¼, Section 23, Township 16 North, Range 11 East, Douglas County, NE. The vegetation at this point was dominated by smooth brome (*Bromus hordeaceus*) (Photograph 7). The soil at this location was silty clay that does show indications of being hydric. There was no indication of the requisite hydrology at this sample point.

Upland test pit UT-T2-S-UP was located on the upland terrace adjacent to the south side of the Unnamed Tributary in the NE ¼, NE ¼, NE ¼, Section 23, Township 16 North, Range 11 East, Douglas County, NE. The vegetation at this point was dominated by smooth brome (*Bromus hordeaceus*), elm (*Ulmus* sp., white mulberry (*Morus alba*) and green ash (*Fraxinus pennsylvanica*) (Photograph 8). The soil at this location was silty clay. There was no indication of the requisite hydrology at this sample point.

Upland test pit UT-T2-N- UP was located on the upland terrace adjacent to the north side of the Unnamed Tributary in the NE ¼, NE ¼, NE ¼, Section 23, Township 16 North, Range 11 East, Douglas County, NE. The vegetation at this point was dominated by smooth brome (*Bromus hordeaceus*), elm (*Ulmus* sp., white mulberry (*Morus alba*) and green ash (*Fraxinus pennsylvanica*) (Photograph 9). The soil at this location was silty clay. There was no indication of the requisite hydrology at this sample point.

4.0 CONCLUSION

Benesch investigated all potential wetland and waterways within the investigation area and identified three streams, one wetland area and verified two wetland areas. The wetland adjacent to the Big Papio Creek is not within the investigation area. The two verified wetlands are considered isolated and not jurisdictional. The three streams identified; Big Papio Creek, Glacier Creek, and Unnamed Tributary and the adjacent wetland to the unnamed tributary are all jurisdictional and regulated by the Corps.

The above text regarding the jurisdictional status of these features is the opinion of Benesch. The U.S. Army Corps of Engineers would need to concur before this opinion could be considered valid. This can

be accomplished by submitting this report along with a request to concur with these findings or request a Jurisdictional Determination (JD).

Report prepared by:	Reviewed by:
Steve Jorgenson Project Scientist	Andy Miller Project Manager

Alfred Benesch & Company
14748 West Center Road
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Facsimile 402.333.2428

APPENDIX A

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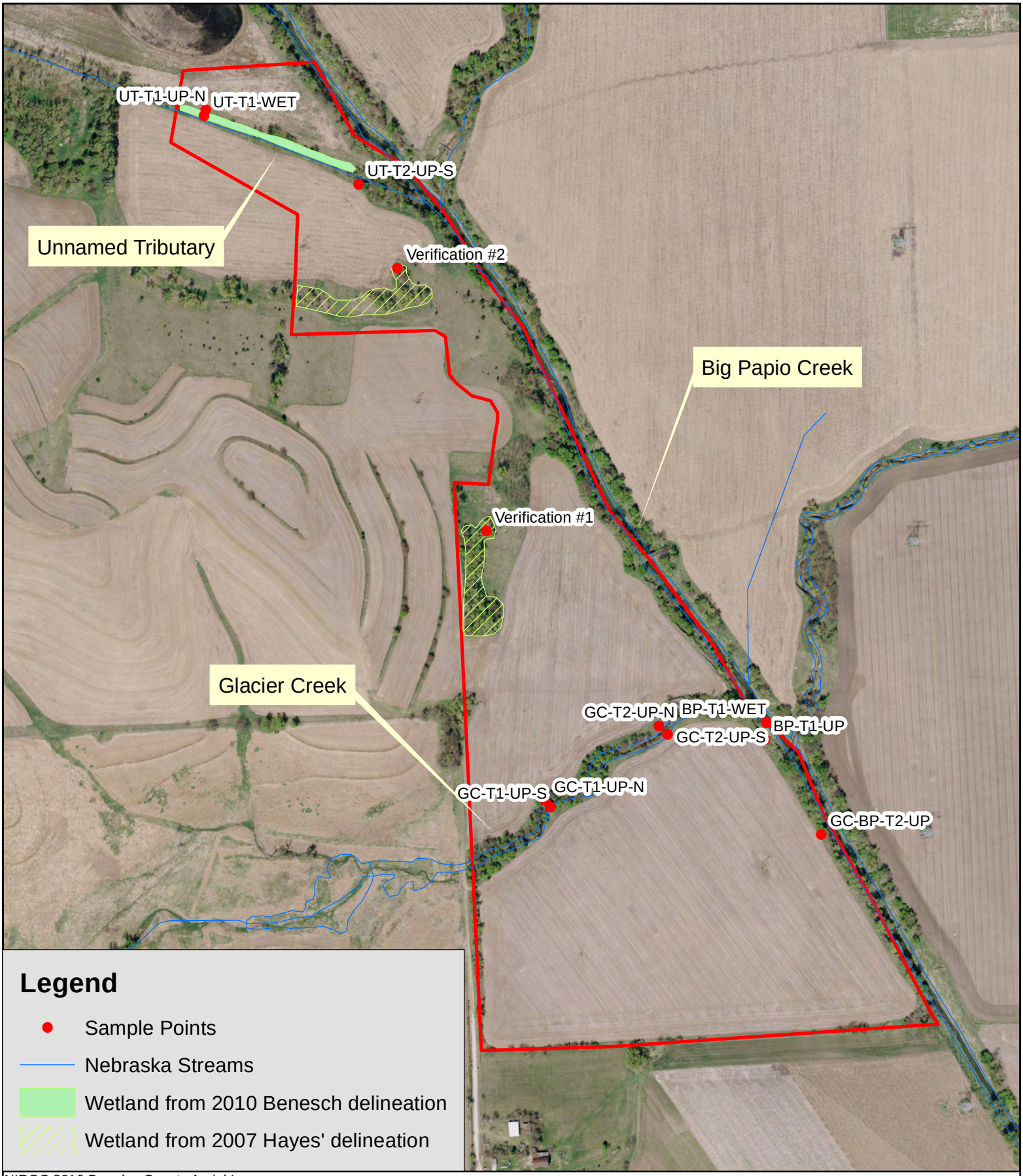
APPENDIX B



NIROC 2010 Douglas County Aerial Imagery

WETLANDS DELINEATION MAP - FIGURE 01

N
W E
S

0 280 560 1,120
Feet

benesch
engineers · scientists · planners

Glacier Creek
Stream & Wetland Bank Concept
Douglas County, NE
T. 16N, R. 11E, S. 24

APPENDIX C

Site Reconnaissance of Glacier Creek on October 1, 2010

Photograph 1 – View east of Wetland Verification Area One.

Photograph 2 – View north at Transect 2 from the south side of Glacier Creek.

Photograph 3 - View of Glacier Creek

Photograph 4 – View south of wetland on west bank of Big Papillion Creek.

Photograph 5 – View east of Big Papillion Creek from Upland test pit BP-T2-UP.

Photograph 6 – View of test pit UT-T1-Wetland.

Photograph 7 – View south of test pit UT-T1-N-UP.

Photograph 8 – View north of test pit UT-T2-S-UP.

Photograph 9 – View south of test pit test pit UT-T2-N-UP

APPENDIX D

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Glacier Creek City/County: Douglas County Sampling Date: 10-1-10

Applicant/Owner: Papio-Missouri River NRD State: NE Sampling Point: Verification 1

Investigator(s): Steven Jorgensen Section, Township, Range: Section 24, Township 16N, Range 11E

Landform (hillslope, terrace, etc.): hill slope Local relief (concave, convex, none): convex

Slope (%): 25 Lat: Long: Datum:

Soil Map Unit Name: NWI or WWI classification: PEMA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X No	
Wetland Hydrology Present?	Yes X No	

Remarks:

PEMA Wetland

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix Amygdaloides*	50	X	FACW
2. *Fraxinus Pennsylvanica*	5		FACW
3.			
4.			
5.			
	55	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size:)			
1. *Phalaris arundinacea*	60	X	FACW
2. *Solidago Gigantea*	25	X	FACW
3. *Aster Puniceus*	15		OB
4. *Asclepias incarnata*	<5		OB
5. *Scirpus Torreyi*	<5		OB
6.			
7.			
8.			
9.			
10.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 = 0
FACW species	x 2 = 0
FAC species	x 3 = 0
FACU species	x 4 = 0
UPL species	x 5 = 0
Column Totals: (A)	0 (B)

Prevalence Index = B/A = 0

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Verification 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10 YR 2/1	100					Silty Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

Strong surface odor of hydrogen sulfide.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ____ Depth (inches): 0

Water Table Present? Yes X No ____ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 0

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Glacier Creek City/County: Douglas County Sampling Date: 10-1-10

Applicant/Owner: Papio-Missouri River NRD State: NE Sampling Point: Verification 2

Investigator(s): Steven Jorgensen Section, Township, Range: Section 24, Township 16 N, Range 11E

Landform (hillslope, terrace, etc.): hill slope Local relief (concave, convex, none): convex

Slope (%): 10 Lat: Long: Datum:

Soil Map Unit Name. NWI or WWI classification: PEMA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes No X	
Welland Hydrology Present?	Yes X No	

Remarks:

PEMA Welland

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Morus rubra*	10	X	FACU
2.			
3.			
4.			
5.			
	10 = Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. *Sambucus canadensis*	5	X	FAC
2. *Cornus drummondii*	15	X	FAC
3.			
4.			
5.			
	20 = Total Cover		
Herb Stratum (Plot size:)			
1. *Phalaris arundinacea*	95	X	FACW
2. *Urtica Dioica*	5		FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1. *Vitis Riparia*	10	X	FAC
2.			
	10 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 = 0
FACW species	x 2 = 0
FAC species	x 3 = 0
FACU species	x 4 = 0
UPL species	x 5 = 0
Column Totals: (A)	0 (B)

Prevalence Index = B/A = 0

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheel)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Verification 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10 YR 2/1	100	10 yr 3/4	2	C	M	Silty Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes X No _____ Depth (inches): 12

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 4

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Glacier Creek City/County: Douglas County Sampling Date: 10-1-10

Applicant/Owner: Papio-Missouri River NRD State: NE Sampling Point: UT-T1-N-UP

Investigator(s): Steven Jorgensen Section, Township, Range: Section 24, Township 16 N, Range 11E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none

Slope (%): 0-1 Lat: Long: Datum:

Soil Map Unit Name: NWI or WWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No X	**Is the Sampled Area within a Wetland?** Yes No X
Hydric Soil Present?	Yes	No X	
Wetland Hydrology Present?	Yes	No X	

Remarks:

Not a wetland

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. *Bromus inermis*	100	X	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	(A)		0 (B)

Prevalence Index = B/A = 0

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: UT-T1-N-UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of Indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10 YR 2/1	100					Silty Clay	
12-16	10 YR 2/1	70	10YR 4/4	30	RM	M	Silty Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Glacier Creek City/County: Douglas County Sampling Date: 10-1-10

Applicant/Owner: Papio-Missouri River NRD State: NE Sampling Point: UT-T2-N-UP

Investigator(s): Steven Jorgensen Section, Township, Range: Section 24, Township 16 N, Range 11E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none

Slope (%): 0-1 Lat: Long: Datum:

Soil Map Unit Name: NWI or WWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No X	**Is the Sampled Area within a Wetland?** Yes No X
Hydric Soil Present?	Yes	No X	
Wetland Hydrology Present?	Yes	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. *Bromus inermis*	100	X	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	(A)		0 (B)

Prevalence Index = B/A = 0

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: UT-T2-N-UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10 YR 2/1	100					Silty Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Glacier Creek City/County: Douglas County Sampling Date: 10-1-10

Applicant/Owner: Papio-Missouri River NRD State: NE Sampling Point: UT-T1-S-UP

Investigator(s): Steven Jorgensen Section, Township, Range: Section 24, Township 16 N, Range 11E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none

Slope (%): 0-1 Lat: Long: Datum:

Soil Map Unit Name: NWI or WWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No X	**Is the Sampled Area within a Wetland?** Yes No X
Hydric Soil Present?	Yes	No X	
Wetland Hydrology Present?	Yes	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. *Prunus americana*	30	X	UPL
2.			
3.			
4.			
5.			
	30 = Total Cover		
Herb Stratum (Plot size:)			
1. *Bromus inermis*	100	X	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1. *Vitis Riparia*	5	X	FAC
2.			
	5 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 = 0
FACW species	x 2 = 0
FAC species	x 3 = 0
FACU species	x 4 = 0
UPL species	x 5 = 0
Column Totals: (A)	0 (B)

Prevalence Index = B/A = 0

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: UT-T1-S-UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-12	10 YR 2/1	100					Silty Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Glacier Creek City/County: Douglas County Sampling Date: 10-1-10

Applicant/Owner: Papio-Missouri River NRD State: NE Sampling Point: UT-T2-S-UP

Investigator(s): Steven Jorgensen Section, Township, Range: Section 24, Township 16 N, Range 11E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none

Slope (%): 0-1 Lat: Long: Datum:

Soil Map Unit Name: NWI or WWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Ulmus americana*	10	X	FAC
2. *Fraxinus pennsylvanica*	5	X	FACW
3. *Morus rubra*	5	X	FACU
4.			
5.			
	20 = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. *Bromus inermis*	100	X	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
	____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	5	x 2 =	10
FAC species	10	x 3 =	30
FACU species	5	x 4 =	20
UPL species	100	x 5 =	500
Column Totals:	120 (A)		560 (B)

Prevalence Index = B/A = 4.67

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: UT-T2-S-UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10 YR 3/1	100					Silty Clay	
8-16	10 YR 3/2	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Glacier Creek City/County: Douglas County Sampling Date: 10-1-10

Applicant/Owner: Papio-Missouri River NRD State: NE Sampling Point: BP-T1-Wet

Investigator(s): Steven Jorgensen Section, Township, Range: Section 24, Township 16 N, Range 11E

Landform (hillslope, terrace, etc.): hill slope to stream Local relief (concave, convex, none): Concave

Slope (%): 30% Lat: Long: Datum: PEMA

Soil Map Unit Name: NWI or WWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes No X	
Wetland Hydrology Present?	Yes X No	

Remarks:

Wetland on slope of Big Papio Creek. Slumped area

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. *Phalaris arundinacea*	100	X	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 = 0
FACW species	x 2 = 0
FAC species	x 3 = 0
FACU species	x 4 = 0
UPL species	x 5 = 0
Column Totals: 0 (A)	0 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BP-T1-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 4/2	100					Silty Clay	
6-16	Gley1 2.5/N	100	10 YR 3/4	10	C	M	Silty Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes X No _____ Depth (inches): 14

Saturation Present? (Includes capillary fringe) Yes X No _____ Depth (inches): 6

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Glacier Creek City/County: Douglas County Sampling Date: 10-1-10

Applicant/Owner: Papio-Missouri River NRD State: NE Sampling Point: BP-T1-UP

Investigator(s): Steven Jorgensen Section, Township, Range: Section 24, Township 16 N, Range 11E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): none

Slope (%): 0-1% Lat: Long: Datum:

Soil Map Unit Name: NWI or WWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. *Bromus inermis*	100	X	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
	____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = 0
FACW species ____	x 2 = 0
FAC species ____	x 3 = 0
FACU species ____	x 4 = 0
UPL species ____	x 5 = 0
Column Totals: 0 (A)	0 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separale sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BP-T1-UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10 YR 3/3	100					Silty Clay	
5-16	10 YR 3/1	100					Silty Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Glacier Creek City/County: Douglas County Sampling Date: 10-1-10

Applicant/Owner: Papio-Missouri River NRD State: NE Sampling Point: BP-T2-UP

Investigator(s): Steven Jorgensen Section, Township, Range: Section 24, Township 16 N, Range 11E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none

Slope (%): 0-1% Lat: Long: Datum:

Soil Map Unit Name: NWI or WWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. *Bromus inermis*	100	X	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
	____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	____	x 1 =	0
FACW species	____	x 2 =	0
FAC species	____	x 3 =	0
FACU species	____	x 4 =	0
UPL species	____	x 5 =	0
Column Totals:	0 (A)		0 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: BP-T2-UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10 YR 3/2	100					Silty Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Glacier Creek City/County: Douglas County Sampling Date: 10-1-10

Applicant/Owner: Papio-Missouri River NRD State: NE Sampling Point: GC-T1-N-UP

Investigator(s): Steven Jorgensen Section, Township, Range: Section 24, Township 16 N, Range 11E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none

Slope (%): 0-1 Lat: Long: Datum:

Soil Map Unit Name: NWI or WWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No X	**Is the Sampled Area within a Wetland?** Yes No X
Hydric Soil Present?	Yes	No X	
Wetland Hydrology Present?	Yes	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fraxinus pennsylvanica*	40	X	FACW
2.			
3.			
4.			
5.			
	40 = Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. *Bromus inermis*	60	X	UPL
2. *Setaria faberi*	40	X	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	(A)		0 (B)

Prevalence Index = B/A = 0

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: GC-T1-N-UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10 YR 2/1	100					Silty Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Glacier Creek City/County: Douglas County Sampling Date: 10-1-10

Applicant/Owner: Papio-Missouri River NRD State: NE Sampling Point: GC-T2-N-UP

Investigator(s): Steven Jorgensen Section, Township, Range: Section 24, Township 16 N, Range 11E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none

Slope (%): 2-5 Lat: Long: Datum:

Soil Map Unit Name: NWI or WWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No X	**Is the Sampled Area within a Wetland?** Yes No X
Hydric Soil Present?	Yes	No X	
Wetland Hydrology Present?	Yes	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. *Bromus inermis*	100	X	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	(A)		0 (B)

Prevalence Index = B/A = 0

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: GC-T2-N-UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 3/2	100					Silty Clay	
6-16	10 YR 3/3	100					Silty Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Glacier Creek City/County: Douglas County Sampling Date: 10-1-10

Applicant/Owner: Papio-Missouri River NRD State: NE Sampling Point: GC-T1-S-UP

Investigator(s): Steven Jorgensen Section, Township, Range: Section 24, Township 16 N, Range 11E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none

Slope (%): 2-5 Lat: Long: Datum:

Soil Map Unit Name: NWI or WWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No X	**Is the Sampled Area within a Wetland?** Yes No X
Hydric Soil Present?	Yes	No X	
Wetland Hydrology Present?	Yes	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Morus rubra*	50	X	FAC
2. *Fraxinus pennsylvanica*	20	X	FACW
3.			
4.			
5.			
	70	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size:)			
1. *Bromus inermis*	100	X	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	(A)		0 (B)

Prevalence Index = B/A = 0

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: GC-T1-S-UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10 YR 2/1	100					Silty Clay	
12-16	10 YR 3/3	100					Silty Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Glacier Creek City/County: Douglas County Sampling Date: 10-1-10

Applicant/Owner: Papio-Missouri River NRD State: NE Sampling Point: GC-T2-S-UP

Investigator(s): Steven Jorgensen Section, Township, Range: Section 24, Township 16 N, Range 11E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none

Slope (%): 2-5 Lat: Long: Datum:

Soil Map Unit Name: NWI or WWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No X	**Is the Sampled Area within a Wetland?** Yes No X
Hydric Soil Present?	Yes	No X	
Wetland Hydrology Present?	Yes	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. *Bromus inermis*	100	X	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1. *Vitis Riparia*	20	X	FAC
2.			
	20 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	20	x 3 =	60
FACU species		x 4 =	0
UPL species	100	x 5 =	500
Column Totals:	120 (A)		560 (B)

Prevalence Index = B/A = 4.67

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: GC-T2-S-UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10 YR 3/2	100					Silty Clay	
12-16	10 YR 3/3	100					Silty Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

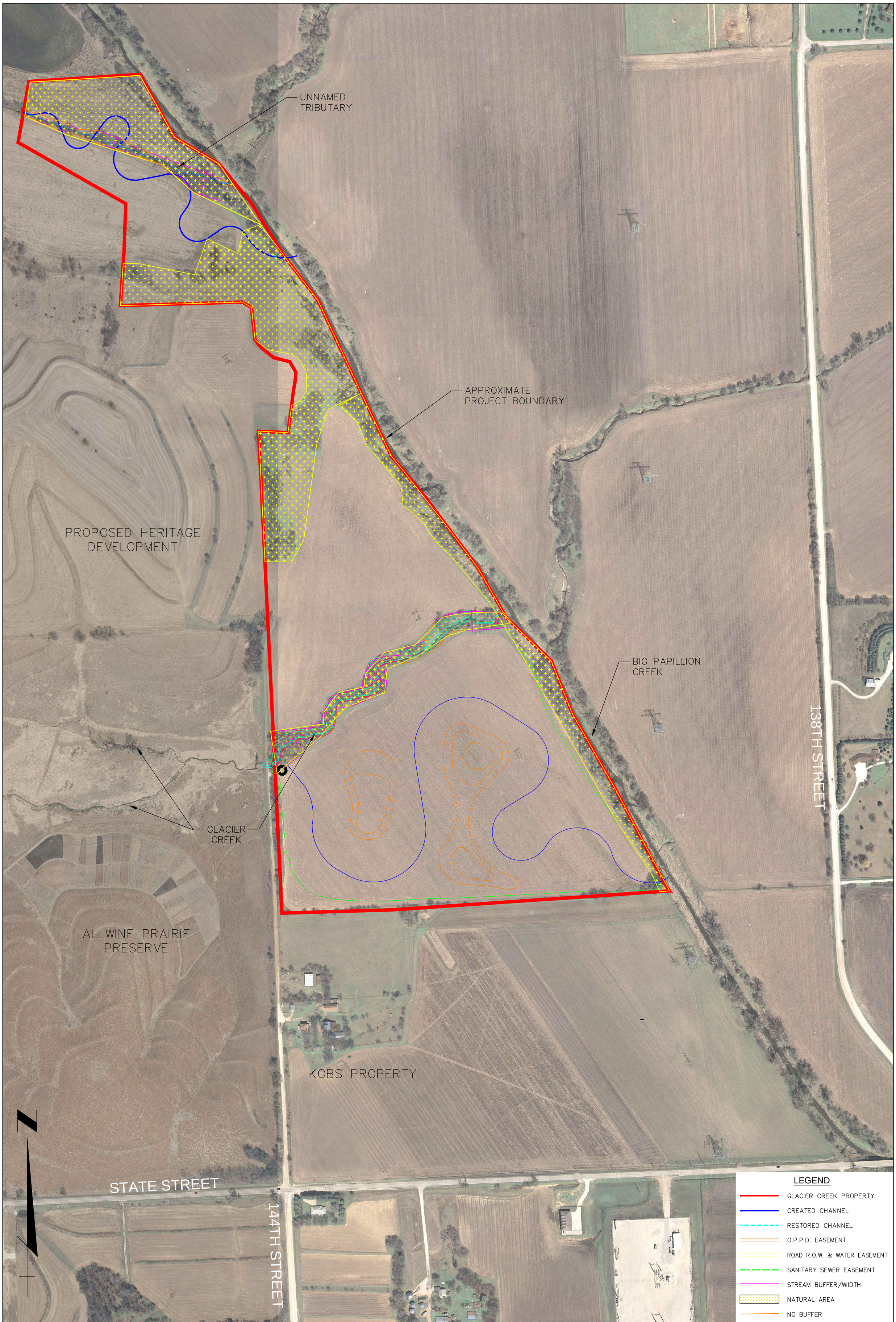
Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX D

STREAM ASSESSMENT



GLACIER CREEK STREAM AND WETLAND BANK STREAM ASSESSMENT

2007 AERIAL

PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT

UNIVERSITY OF Nebraska Omaha

RR_m= Impact reach

	Baseline (Pre project)	RR_m1	RR_m2	RR_m3	RR_m4	RR_m5	RR_m6	RR_m7	RR_m8	RR_m9	RR_m10	RR_m11	RR_m12	RR_m13
1	Hydraulic Conveyance and Sedimenet Dynamics	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	In-stream Habitat/Available Cover	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Floodplain Interaction-Connectivity	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Riparian Vegetation Composition	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Buffer continuity & Width	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Landuse adjacent to Active Flood plain zone	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Stream Condition Index	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Left desending bank -Length (ft)	1,362.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Right desending bank -Length (ft)	1,349.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	width (ft)	85.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Area	115,770.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Stream condition Index * area	37,625.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Post Project (PROPOSED)	RR_m1	RR_m2	RR_m3	RR_m4	RR_m5	RR_m6	RR_m7	RR_m8	RR_m9	RR_m10	RR_m11	RR_m12	RR_m13
1	Hydraulic Conveyance and Sedimenet Dynamics	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	In-stream Habitat/Available Cover	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Floodplain Interaction-Connectivity	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Riparian Vegetation Composition	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Buffer continuity & Width	1.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Landuse adjacent to Active Flood plain zone	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Stream Condition Index	0.88	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Left desending bank -Length (ft)	2561.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Right desending bank -Length (ft)	2561.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	width (ft)	65.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Area	166,465.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Stream condition Index * area	145,656.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Change from baseline to post project	RR_i1	RR_i2	RR_i3	RR_i4	RR_i5	RR_i6	RR_i7	RR_i8	RR_i9	RR_i10	RR_i11	RR_i12	RR_i13
1	Hydraulic Conveyance and Sedimenet Dynamics	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	In-stream Habitat/Available Cover	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Floodpalin Interaction-Connectivity	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Riparian Vegetation Composition	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Riparian Buffer	0.25	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Landuse adjacent to Active Flood plain zone	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

PROPOSED - BASELINE	108,031.63
Multiplier	0.53

MITIGATION UNITS	57,179.57

RR_m= Impact reach

	Baseline (Pre project)	RR_m1	RR_m2	RR_m3	RR_m4	RR_m5	RR_m6	RR_m7	RR_m8	RR_m9	RR_m10	RR_m11	RR_m12	RR_m13
1	Hydraulic Conveyance and Sedimenet Dynamics	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	In-stream Habitat/Available Cover	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Floodplain Interaction-Connectivity	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Riparian Vegetation Composition	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Buffer continuity & Width	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Landuse adjacent to Active Flood plain zone	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Stream Condition Index	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Left desending bank -Length (ft)	1,031.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Right desending bank -Length (ft)	1,031.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	width (ft)	52.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Area	53,921.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Stream condition Index * area	13,030.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Post Project (PROPOSED)	RR_m1	RR_m2	RR_m3	RR_m4	RR_m5	RR_m6	RR_m7	RR_m8	RR_m9	RR_m10	RR_m11	RR_m12	RR_m13
1	Hydraulic Conveyance and Sedimenet Dynamics	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	In-stream Habitat/Available Cover	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Floodplain Interaction-Connectivity	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Riparian Vegetation Composition	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Buffer continuity & Width	1.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Landuse adjacent to Active Flood plain zone	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Stream Condition Index	0.88	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Left desending bank -Length (ft)	1779.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Right desending bank -Length (ft)	1779.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	width (ft)	130.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Area	231,270.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Stream condition Index * area	202,361.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Change from baseline to post project	RR_i1	RR_i2	RR_i3	RR_i4	RR_i5	RR_i6	RR_i7	RR_i8	RR_i9	RR_i10	RR_i11	RR_i12	RR_i13
1	Hydraulic Conveyance and Sedimenet Dynamics	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	In-stream Habitat/Available Cover	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Floodpalin Interaction-Connectivity	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Riparian Vegetation Composition	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Riparian Buffer	0.75	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Landuse adjacent to Active Flood plain zone	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

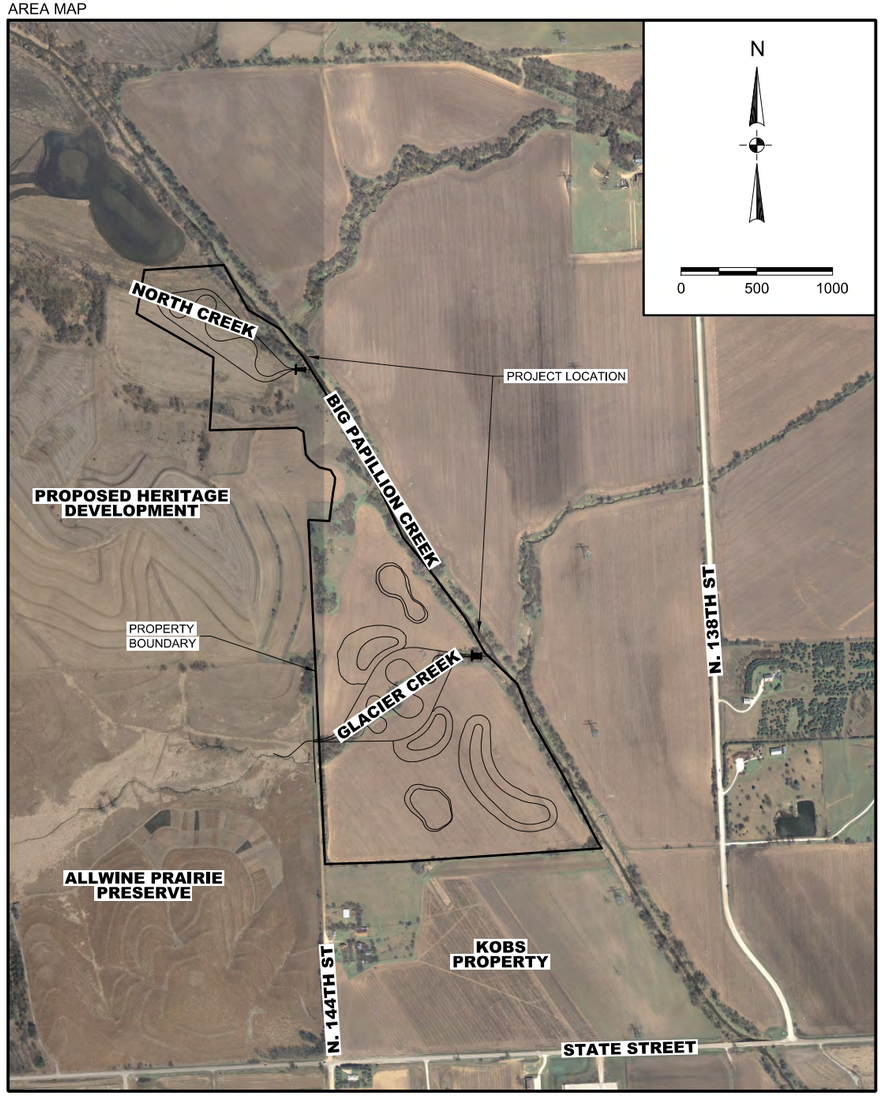
PROPOSED - BASELINE	189,330.27
Multiplier	0.58

MITIGATION UNITS	109,724.29

DESIGN PLANS

GLACIER CREEK
STREAM & WETLAND BANK
PAPIO-MISSOURI NATURAL RESOURCES DISTRICT

AREA MAP



DIGGERS HOTLINE OF NEBRASKA

CALL BEFORE YOU DIG... IT'S THE LAW
STATEWIDE (800) 331-5666

PRIOR TO CONSTRUCTION:

CALL: 1-800-331-5666 FOR LOCATION OF UNDERGROUND TELEPHONE, ELECTRIC, GAS MAINS, CABLE TELEVISION, WATER, SEWER OR ANY OTHER UTILITIES.

NOTE: EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND DRAINAGE STRUCTURES HAVE BEEN PLOTTED FROM AVAILABLE INFORMATION AND THEREFORE, THEIR LOCATIONS MUST BE CONSIDERED APPROXIMATE ONLY. IT IS THE RESPONSIBILITY OF THE INDIVIDUAL CONTRACTORS TO EXACTLY LOCATE AND PROTECT EACH EXISTING UTILITY BEFORE AND DURING ACTUAL CONSTRUCTION.

SCHEDULE OF APPROXIMATE QUANTITIES

ITEM DESCRIPTION	UNIT	QUANTITY
MOBILIZATION	LS	1
CLEARING AND GRUBBING	LS	1
EARTHWORK (EXCAVATION)	CY	143,030
EARTHWORK (SPOIL ON SITE)	CY	47,677
EARTHWORK (HAUL-OFF)	CY	95,353
STRIP, STOCKPILE, & RESPREAD TOPSOIL	CY	16,600
REMOVE BROKEN CONCRETE RIP RAP	LS	1
REMOVE INLET RISER	EA	2
ABANDON EXISTING CMP PIPE	LF	95
AGGREGATE SURFACE COURSE, 4"	SY	440
REINFORCED CONCRETE LOW WATER CROSSING	LS	1
REINF. CONC. DROP STRUCTURE (GLACIER CR.)	LS	1
REINF. CONC. DROP STRUCTURE (NORTH CR.)	LS	1
TEMPORARY CHANNEL DIVERSION	LS	1
RIP RAP, TYPE C	TONS	3,468
GEOTEXTILE FILTER FABRIC	SY	3,083
ROCK VORTEX WEIR	EACH	4
LIVE FASCINE	LF	760
LIVE STAKING	EA	991
LOG SILL	EACH	6
SHEET PILING	SF	1,200
COIR LOG	LF	8,923
SILT FENCE	LF	13,573
TEMPORARY SEEDING	ACRES	30.9
HAY OR STRAW MULCH	ACRES	29.5
ROLLED EROSION CONTROL, TEMPORARY	SY	3,875
TURF REINFORCEMENT MAT	SY	2,744
BUR OAK, 1-INCH MINIMUM CALIPER	EA	25
HERBICIDE APPLICATION	LS	1

SHEET INDEX

PROFESSIONAL CIVIL ENGINEER
STEPHANIE L. RATHBURN
E-11928
STATE OF NEBRASKA

NO.	REVISIONS	DATE

COVER SHEET

GLACIER CREEK MITIGATION BANK

benesch
engineers · scientists · planners
Alfred Benesch & Company
825 J Street
Lincoln, Nebraska 68508
402-479-2200

PROJECT 75509104
DATE 6/11/2012
SHEET 1 OF 72

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LEGEND

N

0 150 300

PROPOSED WETLAND AREA

PROPERTY BOUNDARY

PROPOSED CHANNEL ALIGNMENT

PROPOSED PROJECT AREA

STOCK PILE / EARTH SPOIL AREA

APPROXIMATE HAUL ROUTE LOCATION

CONSTRUCT DROP STRUCTURE

HISTORIC BRIDGE

PROPERTY BOUNDARY

BIG PAPILLION CREEK

GLACIER CREEK

WETLAND AREA GRADING

TEMPORARY STOCK PILE / PERMANENT EARTH SPOIL AREA

GLACIER CREEK RESTORATION

ACCESS ROAD

ACCESS SITE VIA 144TH STREET AT THIS APPROXIMATE LOCATION

REMOVE AND DISPOSE OF EXISTING BROKEN CONCRETE RIP RAP

ACCESS ROAD RECONSTRUCTION

FILL EXISTING CMP CULVERTS WITH SOIL AND ABANDON IN PLACE

CONSTRUCT LOW WATER CROSSING

REMOVE EXISTING INLET RISERS

REALIGN GLACIER CREEK CHANNEL

WETLAND AREA ENHANCEMENTS

WETLAND AREA GRADING

NORTH CREEK

NORTH CREEK RESTORATION

PROFESSIONAL CIVIL ENGINEER
STEPHANIE L. RATHBURN
E-11928
STATE OF NEBRASKA

NO.	REVISIONS	DATE

PROJECT OVERVIEW

GLACIER CREEK MITIGATION BANK

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402-479-2200

PROJECT 75509104

DATE 6/11/2012

SHEET 2 OF 72

F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\PROJECT OVERVIEW_GC.dgn - 300.0000 ft / in. - 6/13/2012

GENERAL NOTES:

1. THE TIME LIMIT TO COMPLETE THE WORK SHALL BE AS FOLLOWS:
   1) COMPLETE BED AND BANK STABILIZATION, STORM SEWER (INCLUDING OUTLET STRUCTURE), REINFORCED EARTH WORK, SHEET PILE WORK, AND CHANNEL SEEDING AND MATTING BY SEPTEMBER 15TH.
   2) COMPLETE ALL REMAINING WORK, INCLUDING BIOENGINEERING PLANTINGS, TREE PLANTINGS, AND FINAL STABILIZATION BY DECEMBER 1ST.

   NOTICE TO PROCEED SHALL NOT BE GIVEN UNTIL THE SECTION 404 PERMIT HAS BEEN ISSUED. THE ANTICIPATED START DATE IS AUGUST 1ST.

2. EXCEPT AS INDICATED BY CONTRACT DOCUMENTS, ALL SITE WORK SHALL BE IN ACCORDANCE WITH "DOUGLAS COUNTY STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, CURRENT EDITION" AND THE "CITY OF OMAHA STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, CURRENT EDITIION" AND ANY REVISIONS OR AMENDMENTS THERETO SHALL APPLY TO THIS PROJECT. THE ENGINEER SHALL RESOLVE ALL CONFLICTS.

3. THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES 48 HOURS BEFORE WORK IS STARTED TO VERIFY UTILITY LOCATIONS (ONE CALL 344-3565).

4. THE CONTRACTOR IS REFERRED TO THE SPECIAL CONDITIONS OF THE SPECIFICATIONS FOR FURTHER INFORMATION.

5. UNLESS INDICATED IN THE PLANS, NO TREES SHALL BE REMOVED WITHOUT APPROVAL OF THE ENGINEER.

6. THESE PLANS HAVE BEEN PREPARED IN COMPLIANCE WITH THE REQUIREMENTS CONTAINED IN THE PAPIO CREEK WATERSHED PARTNERSHIP GRADING PERMIT NO. OMA20110412-1184-1.

7. THE LOCATIONS OF ALL AERIAL AND UNDERGROUND UTILITY FACILITIES MAY NOT BE INDICATED IN THESE PLANS. EXISITNG UTILITIES ARE SHOWN AS A CONVENIENCE FOR THE CONTRACTOR. UNDERGROUND UTILITIES, WHETHER INDICATED OR NOT, WILL BE LOCATED AND FLAGGED BY THE UTILITY COMPANIES AT THE CONTRACTOR'S REQUEST. THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES 48 HOURS BEFORE WORK IS STARTED TO VERIFY UTILITY LOCATIONS(ONE CALL 344-3565). NO EXCAVATION WILL BE PERMITTED IN THE AREA OF THE UNDERGROUND UTILITIES UNTIL ALL FACILITIES HAVE BEEN LOCATED AND IDENTIFIED TO THE SATISFACTION OF ALL PARTIES AND THEN ONLY WITH EXTREME CARE TO AVOID ANY POSSIBILITY OF DAMAGES TO FACILITIES. SECTION 4.04 OF THE GENERAL CONDITIONS FOR FURTHER INFORMATION.

8. ELEVATIONS ARE REFERENCED TO N.A.V.D. 1988.

9. FINISHED GRADE IN WETLAND AREAS SHALL BE FREE OF CLODS BUT UNDULATED TO CREATE MICROTOPOGRAPHIC DIFFERENCES (± 6").

10. THE CONTRACTOR IS RESPONSIBLE FOR ESTABLISHING AND MAINTAINING A HAUL ROUTE WITHIN THE PROPERTY BOUNDARY AND WITHIN OR ADJACENT TO THE LIMITS OF CONSTRUCTION ACCESSIBLE VIA THE 144TH STREET ACCESS IDENTIFIED IN THE CONTRACT DOCUMENTS. NO ACTIVE FARMLAND OR VEGETATED AREA SHALL BE DISTURBED BY THE SELECTED ROUTE WITHOUT APPROVAL BY THE ENGINEER. THE PROJECT SITE CONTAINS SEVERAL ENVIRONMENTALLY, CULTURALLY, AND/OR ARCHEOLOGICALLY SENSITIVE LOCATIONS IN THE VICINITY OF THE INDIVIDUAL WORK AREAS THAT SHALL NOT BE DISTURBED. THE ENGINEER SHALL IDENTIFY THESE AREAS PRIOR TO THE START OF CONSTRUCTION.

GEOTECHNICAL NOTES:

1. IN AREAS TO RECEIVE FILL, ALL VEGETATION AND THE UPPER 0.5 FEET OF EXISTING SOILS SHALL BE REMOVED FROM THE AREA TO BE FILLED. FOR STREAM CHANNELS, RETENTION BASINS AND SWALES, UNLESS OTHERWISE NOTED, ALL SANDY/SILTY SOILS ENCOUNTERED DURING GRADING OPERATIONS SHALL BE REMOVED AND REPLACED OR CAPPED WITH AT LEAST 2.0 FEET OF COHESIVE CONTROLLED EARTH FILL COMPRISED OF ONSITE SOILS CONFORMING TO THE MOISTURE CONTENT AND COMPACTION REQUIREMENTS PRESENTED IN TABLE 1.

2. LOW-PERMEABILITY SOIL LINERS SHALL CONSIST OF MIXING EITHER SODIUM BENTONITE OR SODA ASH INTO ONSITE CLAYEY SOILS. THE BENTONITE OR SODA ASH SHALL BE MIXED INTO A 6-INCH-THICK LAYER OF ONSITE SOILS AT THE RATE OF EITHER 2.0 LBS OR 0.2 LBS, RESPECTIVELY, PER SQ. FT. OF LINER AND COMPACTED TO THE MOISTURE CONTENT AND COMPACTION REQUIREMENTS PRESENTED IN TABLE 1. ONSITE TOPSOIL AND SANDY SOILS SHOULD NOT BE USED FOR THE SOIL LINERS. THE SOIL LINERS SHALL BE COVERED WITH AT LEAST 12 INCHES OF COHESIVE COVER SOIL TO HELP PROTECT THE LINER FROM BECOMING DISTURBED AND/OR DESICCATED AFTER CONSTRUCTION.

3. IN SWALES THAT ARE TO REMAIN PERMEABLE, ONCE THE SWALE HAS BEEN CONSTRUCTED TO THE GRADES SHOWN IN THE PLANS, THE FLOOR AND WALLS OF THE SWALE SHALL BE SCARIFIED A MINIMUM DEPTH OF 12 INCHES.

4. THE PROPOSED CUT DEPTHS FOR THIS PROJECT WILL LIKELY EXTEND INTO SOFT TO MEDIUM STIFF, SATURATED LEAN CLAYS. THESE SOILS MIGHT BECOME DISTURBED BY REPEATED PASSES OF CONSTRUCTION EQUIPMENT DURING EXCAVATING OPERATIONS IF GROUNDWATER CONDITIONS AT THE TIME OF GRADING ARE THE SAME AS AT THE TIME OF THE SUBSURFACE EXPLORATION. IF POSSIBLE, EXCAVATION OPERATIONS SHOULD TAKE PLACE DURING A DRY PERIOD, SUCH AS JULY OR AUGUST. TO PREVENT EXCESSIVE DISTURBANCE, THE FINAL ONE TO TWO FEET OF MATERIALS IN THE PROPOSED CUTS MIGHT NEED TO BE REMOVED WITH TRACK-TYPE EQUIPMENT AND POSSIBLY A BACKHOE INSTEAD OF RUBBER-TIRE EQUIPMENT.

5. THE GEOTECHNICAL ENGINEER SHOULD OBSERVE THE AREAS TO BE GRADED TO VERIFY THAT ALL UNSUITABLE SOILS HAVE BEEN REMOVED AND REPLACED. IN AREAS TO BE FILLED, UPON APPROVAL OF THE SITE BY THE GEOTECHNICAL ENGINEER, ANY EXPOSED GROUND SURFACE THAT HAS NOT BEEN PREVIOUSLY REWORKED SHOULD BE SCARIFIED TO A MINIMUM DEPTH OF 6 INCHES AND REWORKED TO CONFORM TO THE MOISTURE CONTENT AND COMPACTION RECOMMENDATIONS PRESENTED IN TABLE 3. AREAS TO BE FILLED SHOULD THEN BE RAISED TO THE DESIRED ELEVATION WITH CONTROLLED EARTH FILL.

6. CONTROLLED EARTH FILL PLACED IN STREAM CHANNELS, RETENTION BASINS, SWALES, BERMS, AND ONSITE SOILS TO BE MIXED WITH SODIUM BENTONITE, SHALL BE CONSIST OF INORGANIC CL[1] OR CH[2] MATERIALS. THE PEORIA AND COHESIVE ALLUVIUM SOILS ENCOUNTERED AT THE PROJECT SITE ARE CONSIDERED SUITABLE FOR USE AS FILL. SOME OF THE SUBSURFACE MATERIALS ARE HIGH IN MOISTURE CONTENT AND MIGHT REQUIRE MANIPULATION (DRYING) TO ACHIEVE THE MOISTURE CONTENT NECESSARY FOR PROPER COMPACTION. PROPOSED FILL AND BACKFILL MATERIALS SHALL BE SUBJECT TO APPROVAL BY THE GEOTECHNICAL ENGINEER. REPRESENTATIVE SAMPLES OF THE PROPOSED FILL AND BACKFILL MATERIALS SHALL BE SUBMITTED TO THE GEOTECHNICAL ENGINEER AT LEAST THREE DAYS PRIOR TO PLACEMENT SO THE NECESSARY LABORATORY TESTS CAN BE PERFORMED.

[1] CL: LEAN CLAY, LEAN CLAY WITH SAND, AND SANDY LEAN CLAY.
[2] CH: FAT CLAY, FAT CLAY WITH SAND, AND SANDY FAT CLAY.

TABLE 1. COMPACTION RECOMMENDATIONS OF CONTROLLED EARTH FILL AND BACKFILL

LOCATION	SOIL TYPE	MINIMUM MOISTURE CONTENT	MINIMUM COMPACTION
LOW PERMEABILITY SOIL LINERS. (WETLAND AREAS: C, G)	LEAN AND FAT CLAYS MIXED WITH SODIUM BENTONITE OR SODA ASH	OPTIMUM	95%
ONSITE CLAYS IN STREAM CHANNELS, RETENTION BASINS, SWALES AND BERMS; AND COVER FOR SOIL LINERS. (WETLAND AREAS: B, D, F)	LEAN AND FAT CLAYS	OPTIMUM	95%
GENERAL GRADING FOR AREAS THAT WILL NOT BE REQUIRED TO RETAIN WATER. (WETLAND AREAS: A, E)	LEAN AND FAT CLAYS	2% BELOW OPTIMUM	92%

* PERCENT OF MAXIMUM DRY DENSITY (ASTM D 698, PROCEDURE A)

VEGETATION SEEDING NOTES:

1. PRE-FIELD WORK: SUBMIT TO BENESCH A SUBMITTAL OF VEGETATION MATERIALS TO BE USED WITH DOCUMENTATION OF SOURCE AND QUALITY REQUIREMENTS PRIOR TO INSTALLATION. SUBMITTAL SHALL VERIFY SEEDING AND PLANTING INSTRUCTIONS AND ANY VARIANCES REQUESTS TO THESE REQUIREMENTS.

2. TEMPORARY SEEDING PLANTING: OPTIMUM SEEDING TIME APRIL 15 TO SEPTEMBER 15.

   A. TEMPORARY SEEDING MIX SHALL CONSIST OF A SEED MIX CONSISTENT WITH THE OMAHA REGIONAL STORM WATER DESIGN MANUAL FOR THE DATES SEEDING IS APPLIED.
   B. PLANTING AREA- PLANT IN ALL DISTURBED AREAS ONCE CONSTRUCTION IS COMPLETE. SEE SWPPP FOR SEEDING AREA. ALSO APPLIES TO HAUL ROADS, SPOIL STOCK PILE, BURN AREAS, ETC.
   C. SEED BED PREPARATION - TILL THE SEEDBED TO A DEPTH OF 2" TO 4". IF THE GROUND IS WET, DELAY TILLING UNTIL SOIL DRIES ENOUGH TO BREAK APART WHEN TILLED. LIGHTLY COMPACT THE TILLED SOIL WITH A ROLLER, CULTIPACKER, OR A SIMILAR IMPLEMENT. SURFACE SOIL SHOULD BE FIRM.
   D. SEED WITH SEED DRILL, BY HAND OR WITH A BROADCASTER, OR HYDROMULCHER AND PRESS INTO THE SOIL WITH A ROLLER, CULTIPACKER, OR SIMILAR IMPLEMENT. DO NOT COVER SEED MORE THAN 1/4" DEEP.
   E. A LIGHT MULCH OF 1" OF STRAW SHALL BE PLACED AFTER SEEDING IS COMPLETE. MULCH CAN BE CRIMPED INTO SOIL USING CRIMPING DEVICE OR TACTIFIER.
   F. TEMPORARY SEEDING SHALL BE PERFORMED WITHIN 10 DAYS OF THE COMPLETION OF GRADING ACTIVITIES FOR EACH AREA. EXCEPT FOR CHANNEL REALIGNMENT AREAS, NO INDIVIDUAL WORK AREA SHALL BE DISTURBED AND REMAIN UNSEEDED FOR LONGER THAN 30 DAYS WITHOUT APPROVAL BY THE ENGINEER.

3. BUFFER AND WETLAND SEEDING

   A. BUFFER AND WETLAND SEEDING TO BE PROVIDED BY OTHERS AFTER CONSTRUCTION SEASON.

4. TREE PLANTING
   A. PLANTING AREA- PLANT AREA CALLED OUT ON WETLAND AND VEGETATION PLAN SHEET.
   B. GROUND PREPARATION- MOW EXISTING VEGETATION, IF NECESSARY
   C. INSTALL ACCORDING TO NURSERY SPECIFICATIONS.
   D. TREES SHOULD GENERALLY BE PLANTED ON 30-FOOT CENTERS. PLANTING SHOULD BE COORDINATED WITH BENESCH.
   E. TREE SIZE SHALL BE APPROXIMATELY 1"CALIPER, NO BARE ROOT.
   F. TREES SHOULD BE WATERED AFTER PLANTING. CONTRACTOR IS RESPONSIBLE FOR PROTECTING TREES AS NECESSARY TO PROTECT FROM ANIMALS.

PROFESSIONAL CIVIL ENGINEER
STEPHANIE L. RATHBURN
E-11928
STATE OF NEBRASKA

NO. | REVISIONS | DATE

GENERAL NOTES

GLACIER CREEK MITIGATION BANK

benesch
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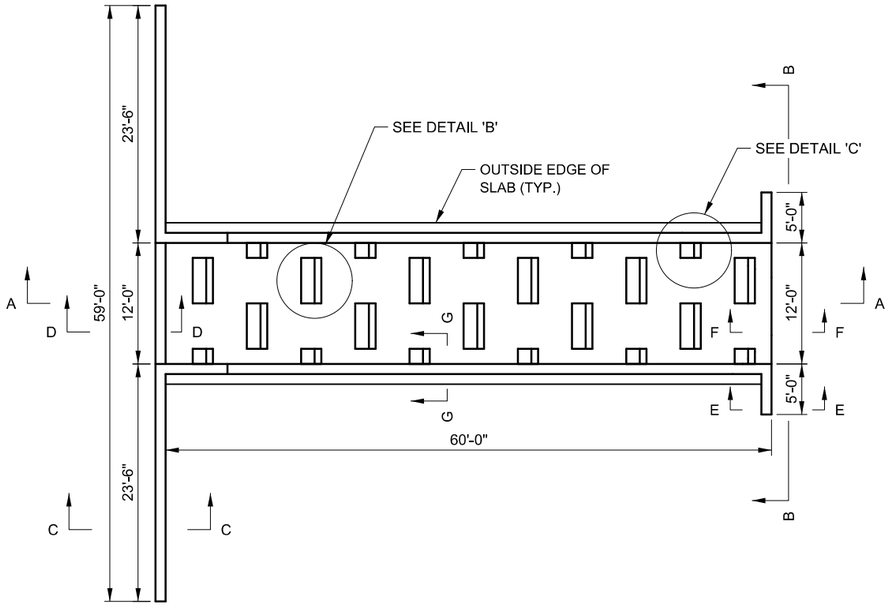
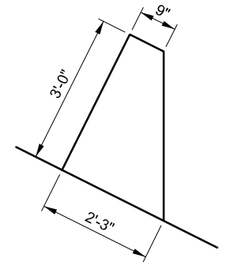
Alfred Benesch & Company
825 J Street
Lincoln, Nebraska 68508
402-479-2200

PROJECT 75509104
DATE 6/11/2012
SHEET 3 OF 72

NOTE:
RIPRAP NOT SHOWN FOR CLARITY. SEE STREAM STABILITY PLANS FOR RIPRAP LAYOUT AND DETAILS.



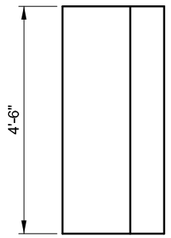
PLAN VIEW



DETAIL 'A'
BAFFLE CROSS SECTION

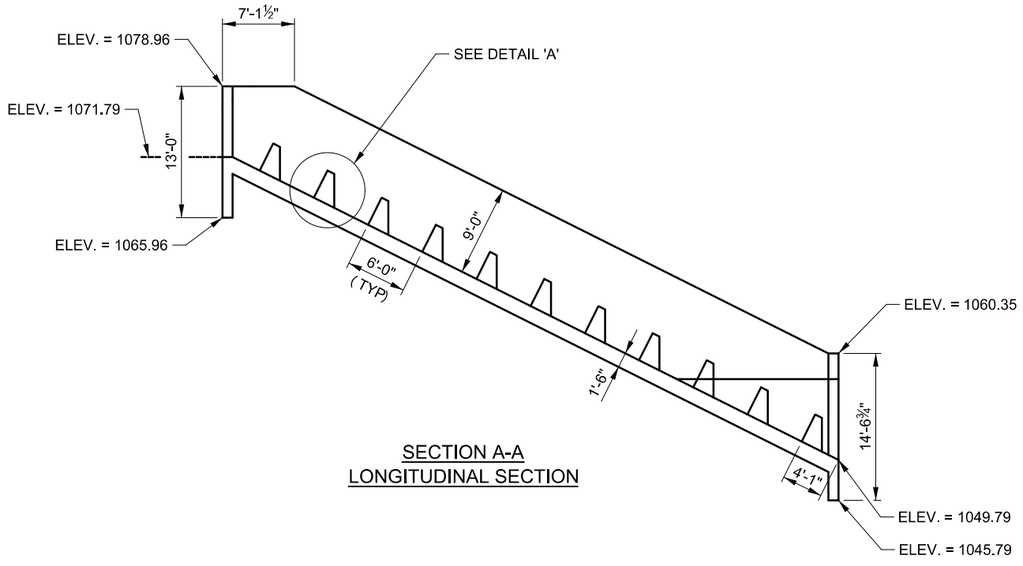
APPROXIMATE QUANTITIES
(FOR INFORMATION ONLY)

CLASS 47B-3000 CONCRETE	159.3 CY
REINFORCING STEEL	12,900 LBS

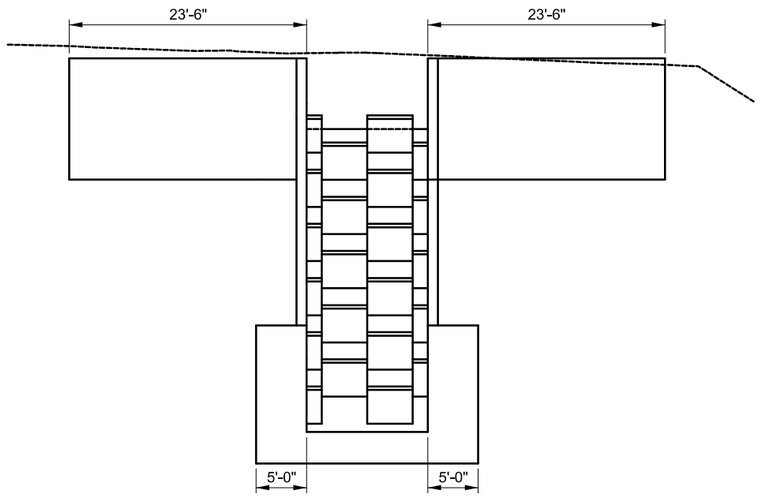


DETAIL 'B'
BAFFLE
PLAN VIEW

DETAIL 'C'
PARTIAL BAFFLE
PLAN VIEW



SECTION A-A
LONGITUDINAL SECTION



SECTION B-B
FRONT VIEW

NO.	REVISIONS	DATE

NORTH CREEK
USBR TYPE IX BAFFLE CHUTE
DROP STRUCTURE DETAILS

GLACIER CREEK
MITIGATION BANK

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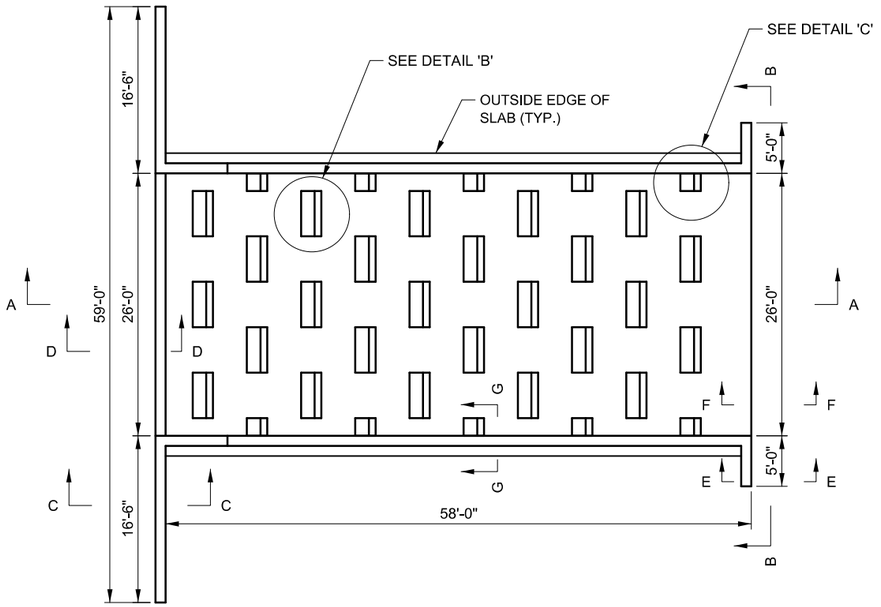
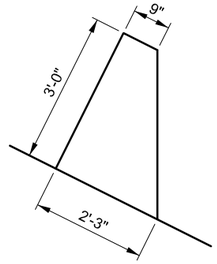
PROJECT 75509104
DATE 6/11/2012
SHEET 4 OF 72

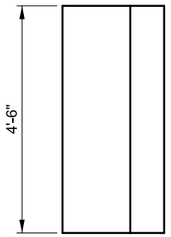
NOTE:
RIPRAP NOT SHOWN FOR CLARITY. SEE STREAM STABILITY PLANS FOR RIPRAP LAYOUT AND DETAILS.



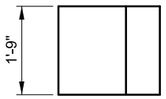
PLAN VIEW



DETAIL 'A'
BAFFLE CROSS SECTION



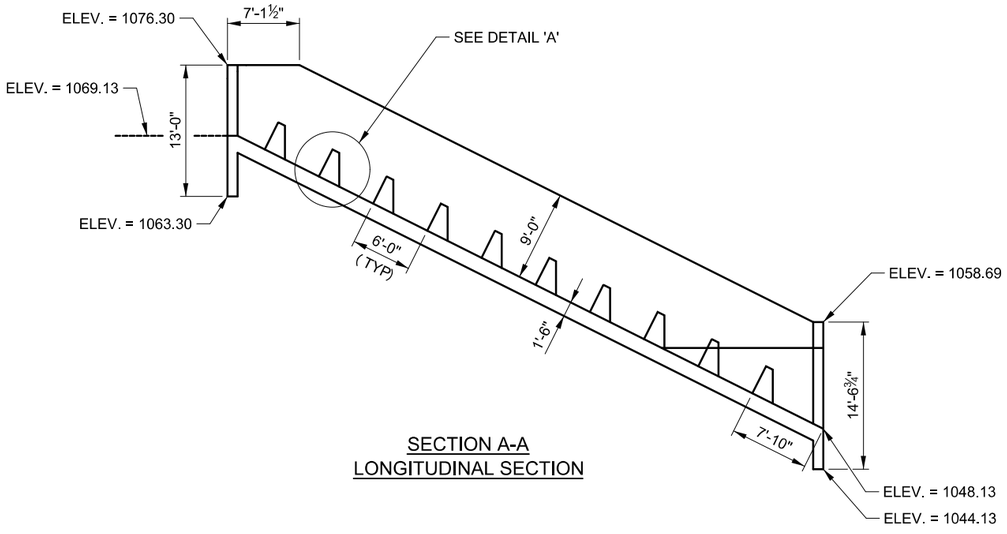
DETAIL 'B'
BAFFLE
PLAN VIEW



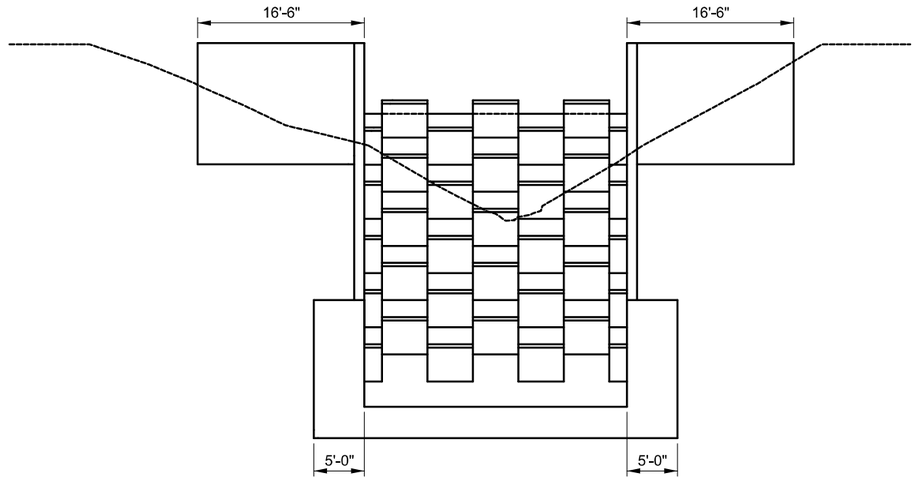
DETAIL 'C'
PARTIAL BAFFLE
PLAN VIEW

APPROXIMATE QUANTITIES
(FOR INFORMATION ONLY)

CLASS 47B-3000 CONCRETE	212.8 CY
REINFORCING STEEL	15,600 LBS



SECTION A-A
LONGITUDINAL SECTION



SECTION B-B
FRONT VIEW

NO.	REVISIONS	DATE

GLACIER CREEK
USBR TYPE IX BAFFLE CHUTE
DROP STRUCTURE DETAILS

GLACIER CREEK
MITIGATION BANK

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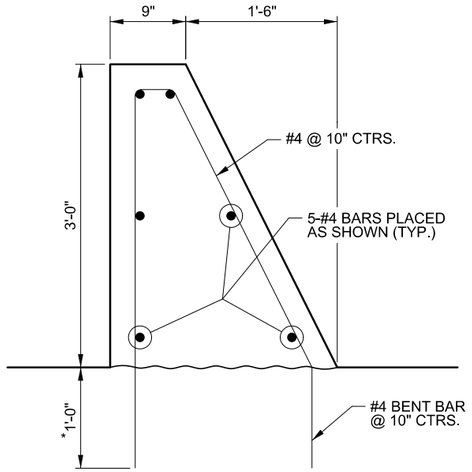
PROJECT 75509104
DATE 6/11/2012
SHEET 5 OF 72

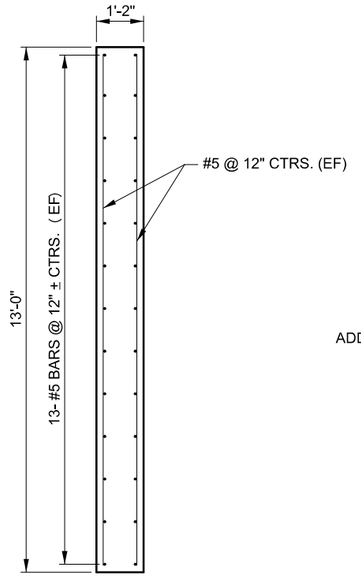
CAST-IN-PLACE CONCRETE NOTES:

1. ALL CAST-IN-PLACE CONCRETE SHALL BE CLASS "47B" CONCRETE, WITH A 28-DAY STRENGTH OF 3,000 PSI.
2. ALL REINFORCING STEEL SHALL BE BLACK, UNCOATED, AND SHALL CONFORM TO THE REQUIREMENTS OF ASTM A615/A516M, GRADE 60 STEEL.
3. THE MINIMUM CLEARANCE, MEASURED FROM THE FACE OF THE CONCRETE TO THE FACE OF ANY REINFORCING BAR, SHALL BE 3".
4. THE CONTRACTOR SHALL PROVIDE SPACERS, CHAIRS, BOLSTERS, ETC. NECESSARY TO SUPPORT REINFORCING STEEL. CONCRETE BRICKS, ROCKS OR OTHER SIMILAR MATERIALS ARE NOT ACCEPTABLE MEANS OF SUPPORT.
5. THE MINIMUM LAP LENGTH FOR REINFORCING BARS SHALL BE 40 BAR DIAMETERS.

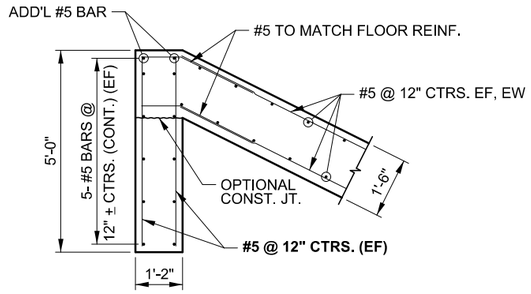


* AS AN ALTERNATE, DRILL 4" INTO EXISTING WORK AND SET BARS IN EPOXY COMPOUND

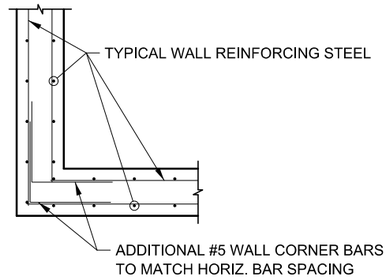
BAFFLE DETAIL



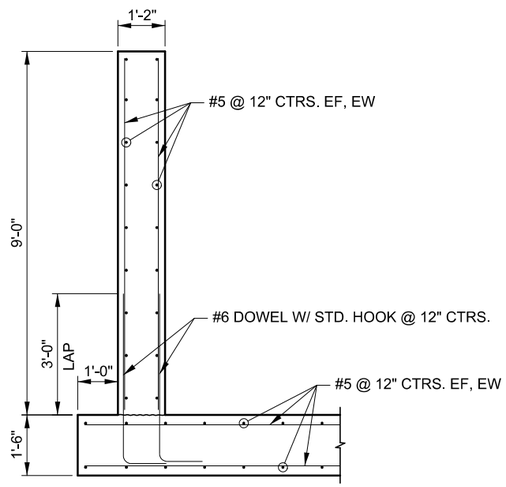
SECTION C-C



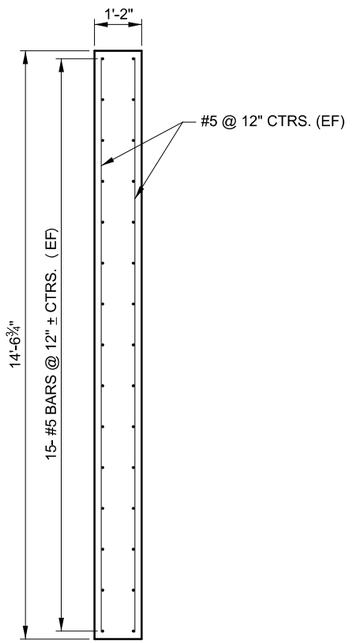
SECTION D-D



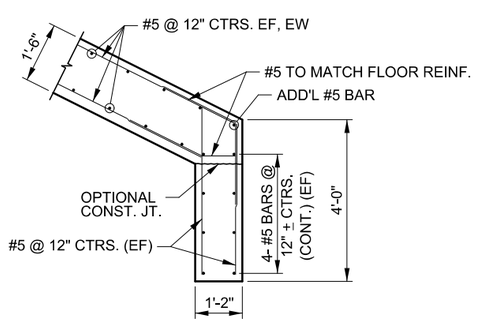
TYPICAL CORNER REINFORCING



SECTION G-G



SECTION E-E



SECTION F-F

NO.	REVISIONS	DATE

DROP STRUCTURE SECTIONS

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ACCESS ROAD HORIZONTAL ALIGNMENT

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(1) P.O.T. STA. 0+00.00
N = 573228.21
E = 2699939.52

(2) P.I. STA. 0+85.34
N = 573142.90
E = 2699941.73

(3) P.I. STA. 2+61.06
N = 572967.19
E = 2699943.98

(4) P.I. STA. 4+28.56
N = 572799.87
E = 2699951.62

(5) P.O.T. STA. 5+00.00
N = 572728.56
E = 2699956.04

(•) CONTROL POINT
POINT NO: 1
5/8" X 30" REBAR
N: 573072.259
E: 2699930.217
ELEV: 1088.37'

NOTES:

- HORIZONTAL DATUM IS NAD83 (CORS 96) (EPOCH: 2002.0000), NEBRASKA STATE PLANE COORDINATES, ZONE 2600.
- VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)
- SURVEY CONTROL WAS ESTABLISHED USING NATIONAL GEODETIC SURVEY (NGS) ONLINE POSITIONING USER SERVICE (OPUS).

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DATE 6/11/2012

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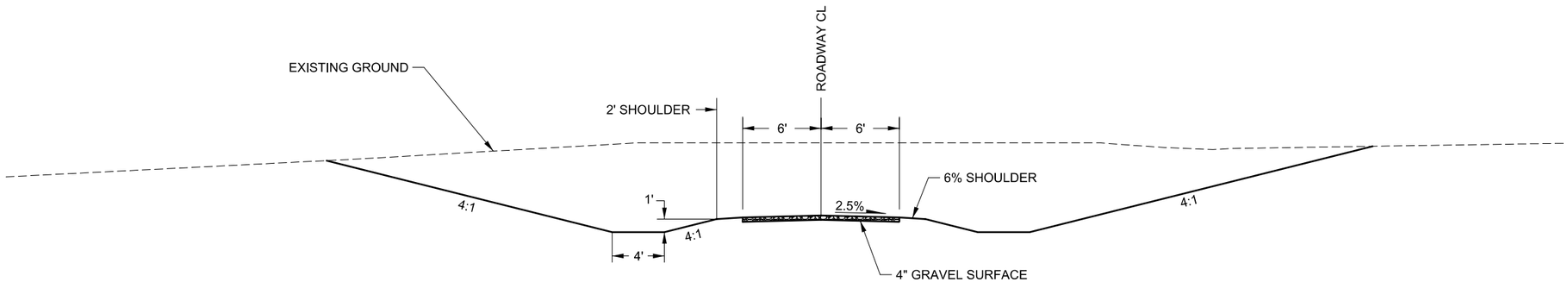
F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\HORIZ ALIGNMENT_ACCESS ROAD.dgn - 40.0000 ft / in. - 6/11/2012



ACCESS ROAD
STA 0+67.39 - 4+00.54

NO.	REVISIONS	DATE

ACCESS ROAD TYPICAL SECTION

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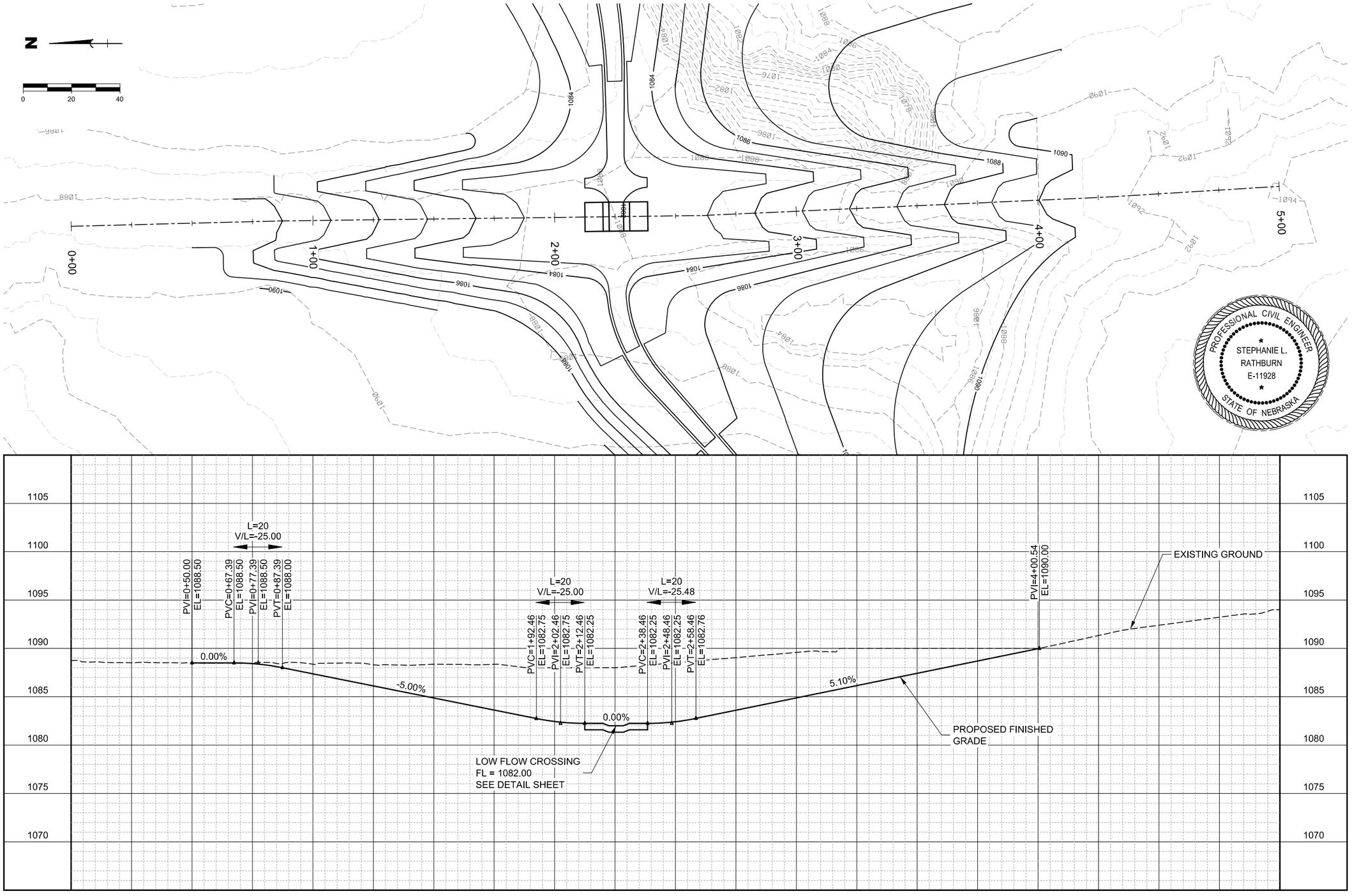

NO. | REVISIONS | DATE

ACCESS ROAD
PLAN AND PROFILE

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PROJECT 75509104

DATE 6/11/2012

SHEET
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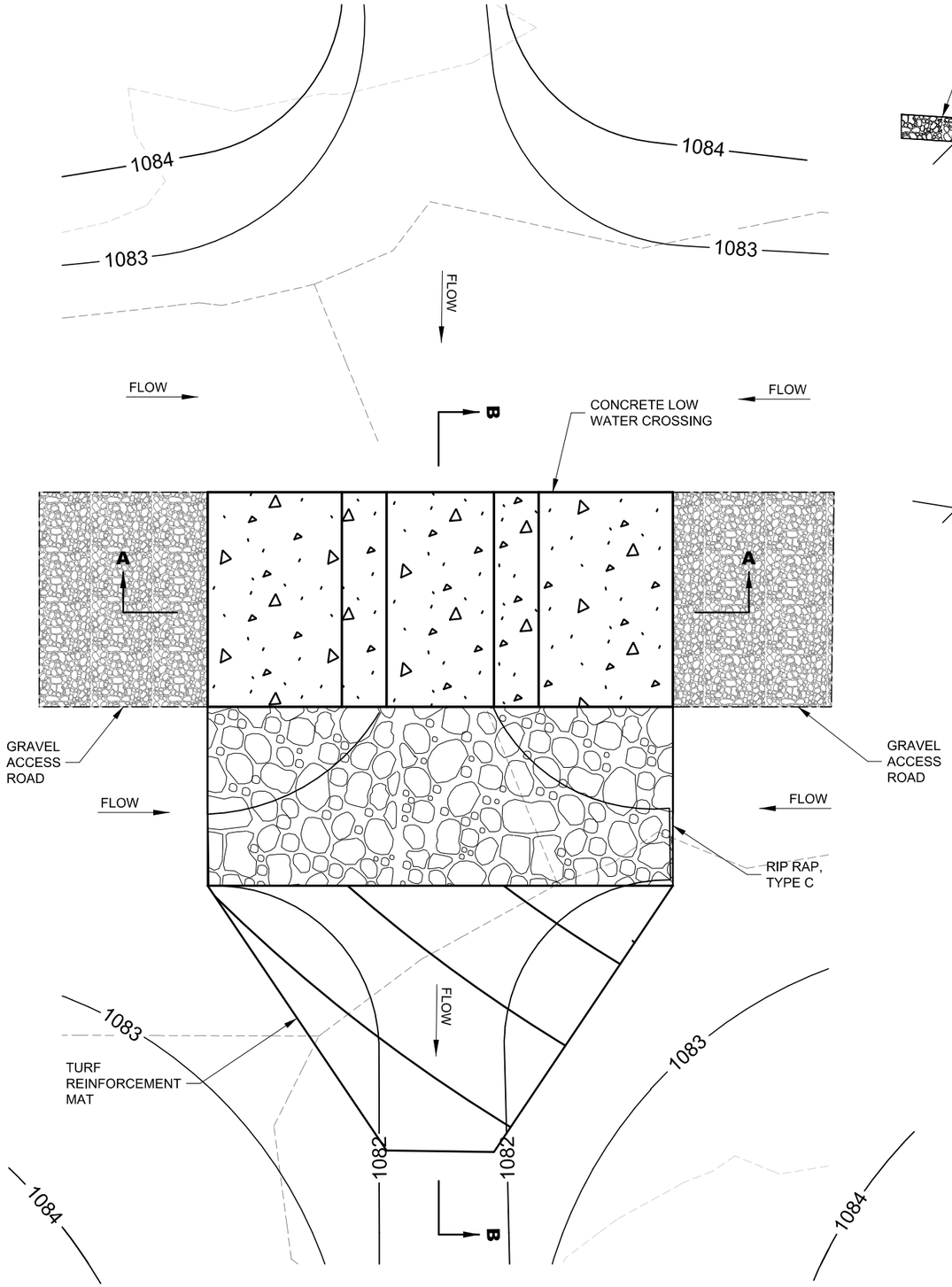
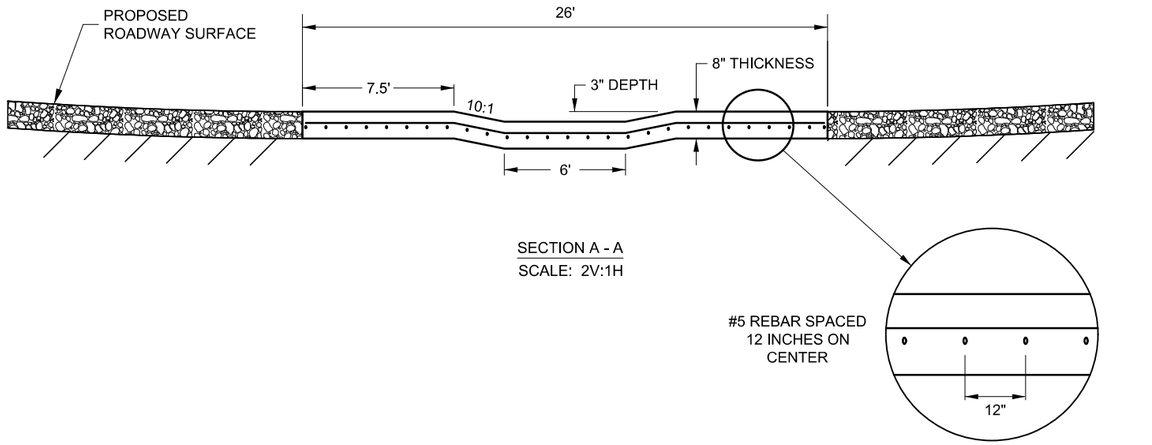
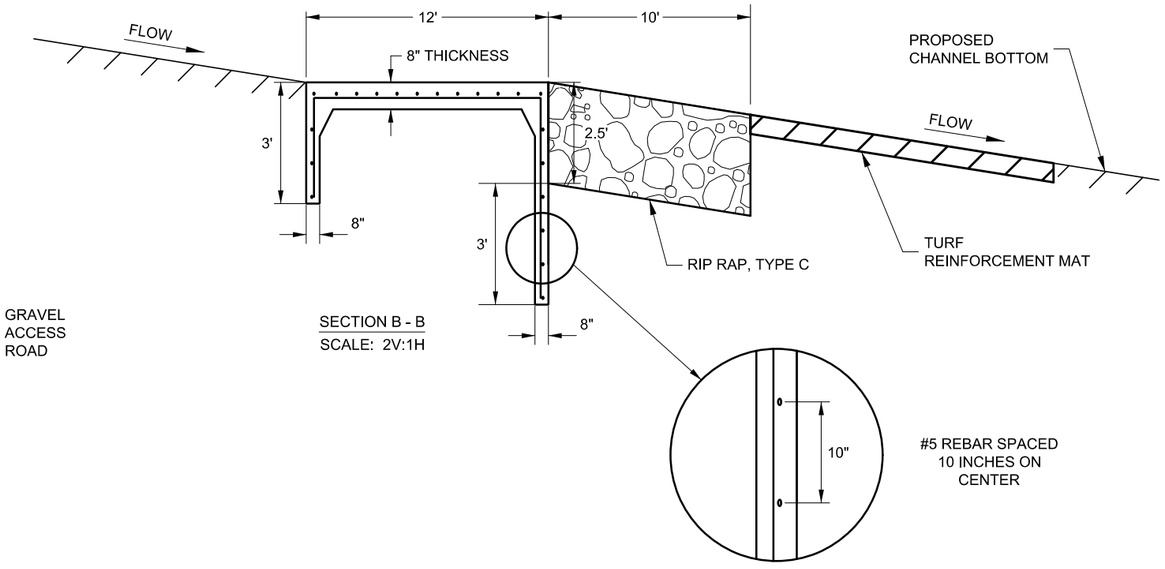




SECTION A - A
SCALE: 2V:1H



SECTION B - B
SCALE: 2V:1H

#5 REBAR SPACED
10 INCHES ON
CENTER

CAST-IN-PLACE CONCRETE NOTES:

1. ALL CAST-IN-PLACE CONCRETE SHALL BE CLASS "47B" CONCRETE, WITH A 28-DAY STRENGTH OF 3,000 PSI.
2. ALL REINFORCING STEEL SHALL BE BLACK, UNCOATED, AND SHALL CONFORM TO THE REQUIREMENTS OF ASTM A615/A516M, GRADE 60 STEEL.
3. THE MINIMUM CLEARANCE, MEASURED FROM THE FACE OF THE CONCRETE TO THE FACE OF ANY REINFORCING BAR, SHALL BE 3".
4. THE CONTRACTOR SHALL PROVIDE SPACERS, CHAIRS, BOLSTERS, ETC. NECESSARY TO SUPPORT REINFORCING STEEL. CONCRETE BRICKS, ROCKS OR OTHER SIMILAR MATERIALS ARE NOT ACCEPTABLE MEANS OF SUPPORT.

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LOW WATER CROSSING DETAILS

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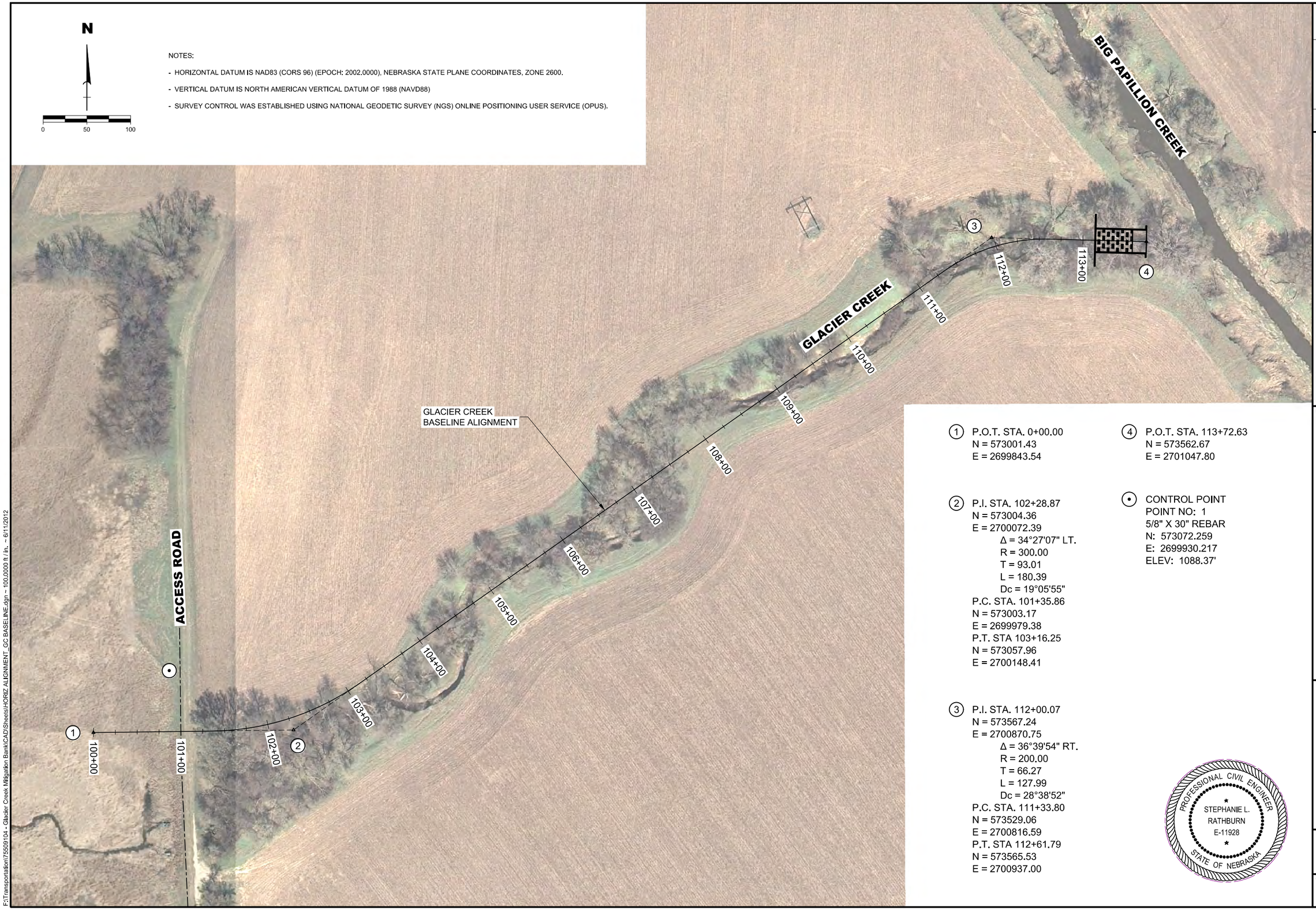
N

0 50 100

NOTES:

- HORIZONTAL DATUM IS NAD83 (CORS 96) (EPOCH: 2002.0000), NEBRASKA STATE PLANE COORDINATES, ZONE 2600.
- VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)
- SURVEY CONTROL WAS ESTABLISHED USING NATIONAL GEODETIC SURVEY (NGS) ONLINE POSITIONING USER SERVICE (OPUS).



1 P.O.T. STA. 0+00.00
N = 573001.43
E = 2699843.54

2 P.I. STA. 102+28.87
N = 573004.36
E = 2700072.39
Δ = 34°27'07" LT.
R = 300.00
T = 93.01
L = 180.39
Dc = 19°05'55"
P.C. STA. 101+35.86
N = 573003.17
E = 2699979.38
P.T. STA 103+16.25
N = 573057.96
E = 2700148.41

3 P.I. STA. 112+00.07
N = 573567.24
E = 2700870.75
Δ = 36°39'54" RT.
R = 200.00
T = 66.27
L = 127.99
Dc = 28°38'52"
P.C. STA. 111+33.80
N = 573529.06
E = 2700816.59
P.T. STA 112+61.79
N = 573565.53
E = 2700937.00

4 P.O.T. STA. 113+72.63
N = 573562.67
E = 2701047.80

⊙ CONTROL POINT
POINT NO: 1
5/8" X 30" REBAR
N: 573072.259
E: 2699930.217
ELEV: 1088.37'

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GLACIER CREEK BASELINE HORIZONTAL ALIGNMENT

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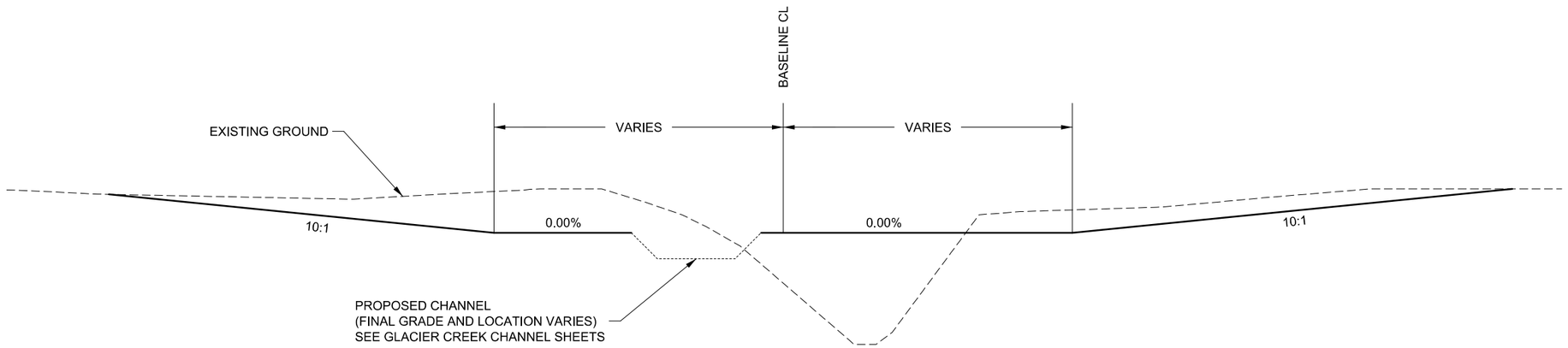

GLACIER CREEK
STA 101+06 - 113+13.63

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GLACIER CREEK BASELINE TYPICAL SECTION

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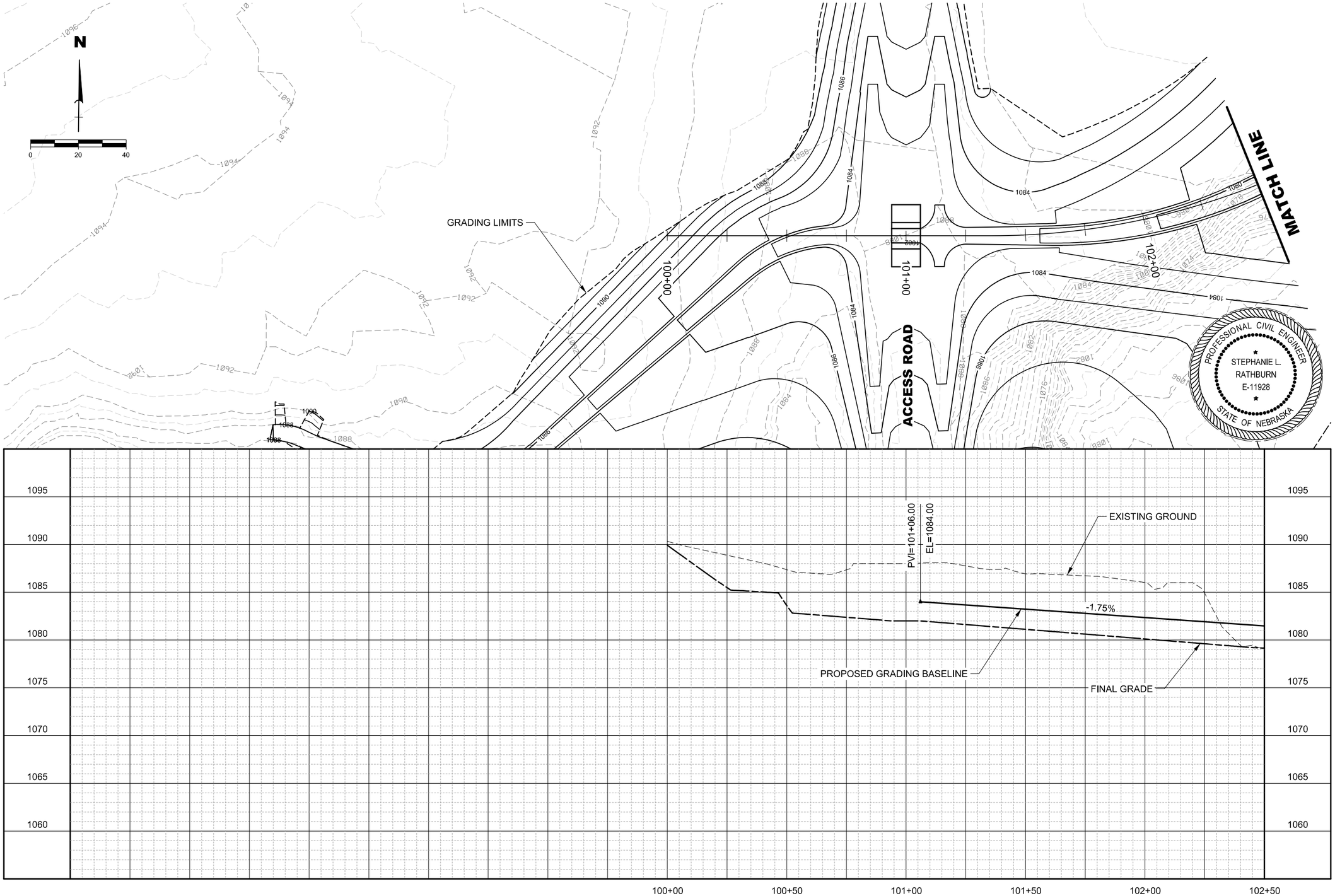
F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\TYPICAL SECTIONS.dgn ~ 10.0000 ft / in. ~ 6/11/2012



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GLACIER CREEK BASELINE PLAN AND PROFILE

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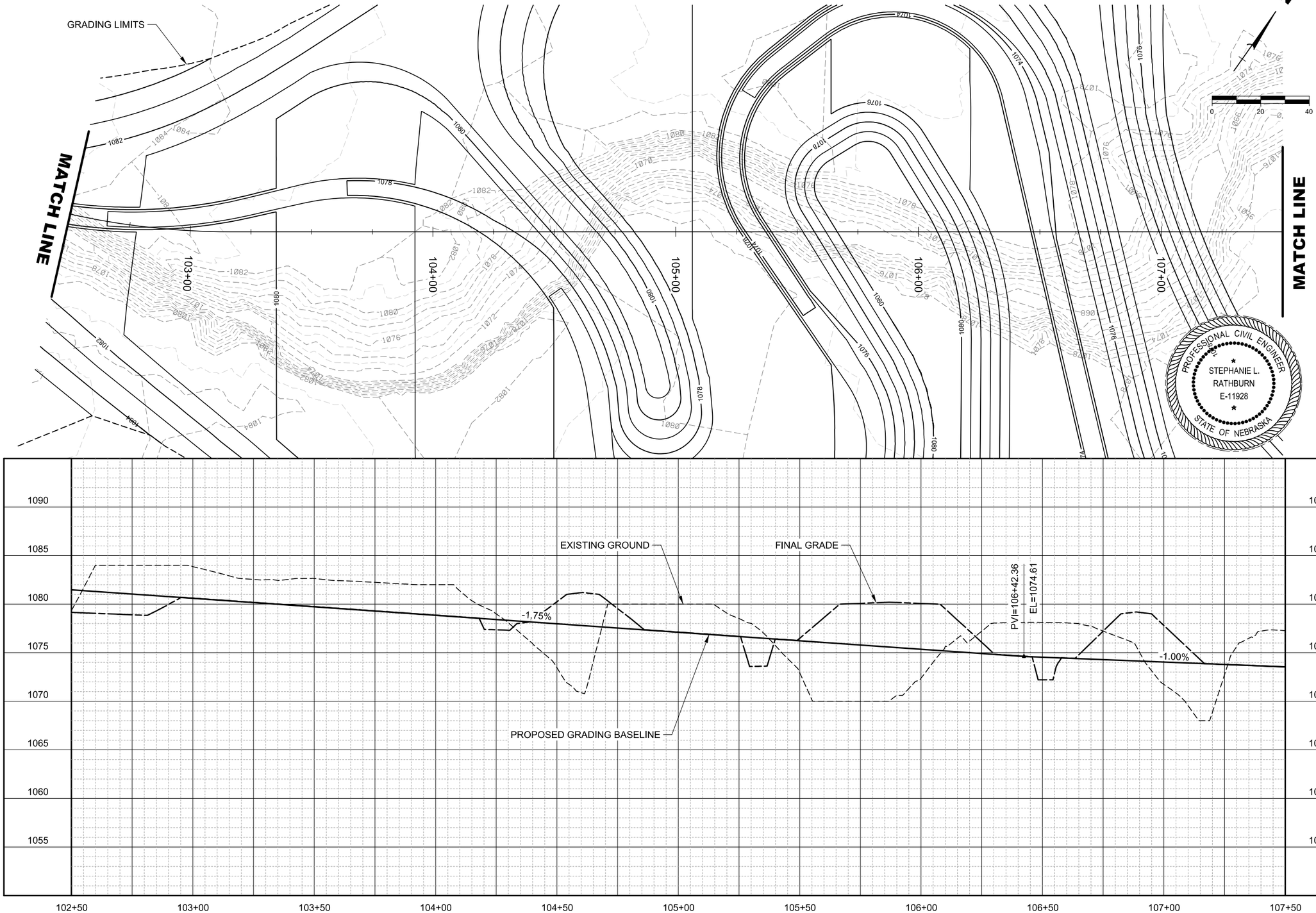

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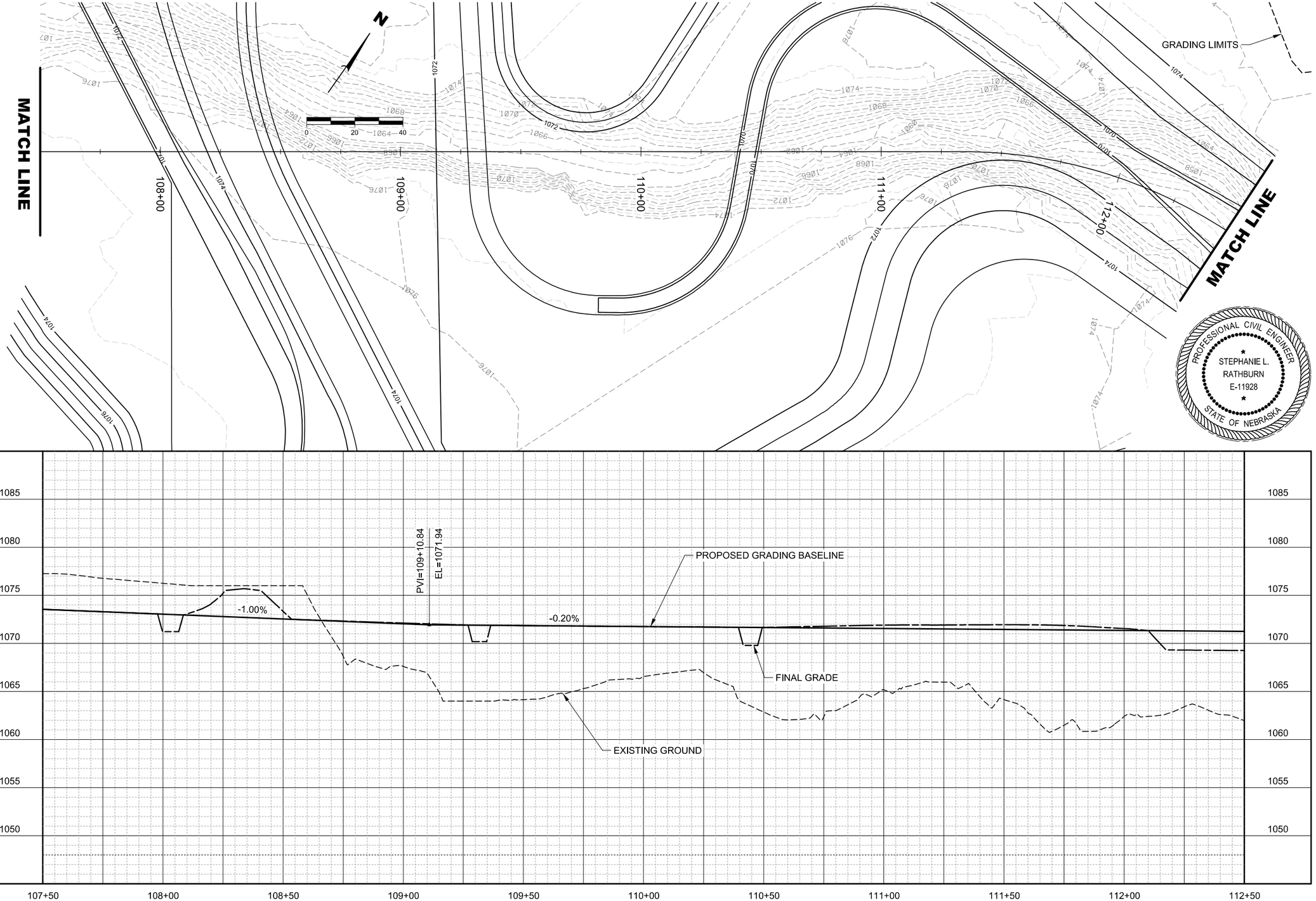
F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\P&P_GC BASELINE 2.dgn - 40.0000 ft / in. - 6/11/2012



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15 OF 72

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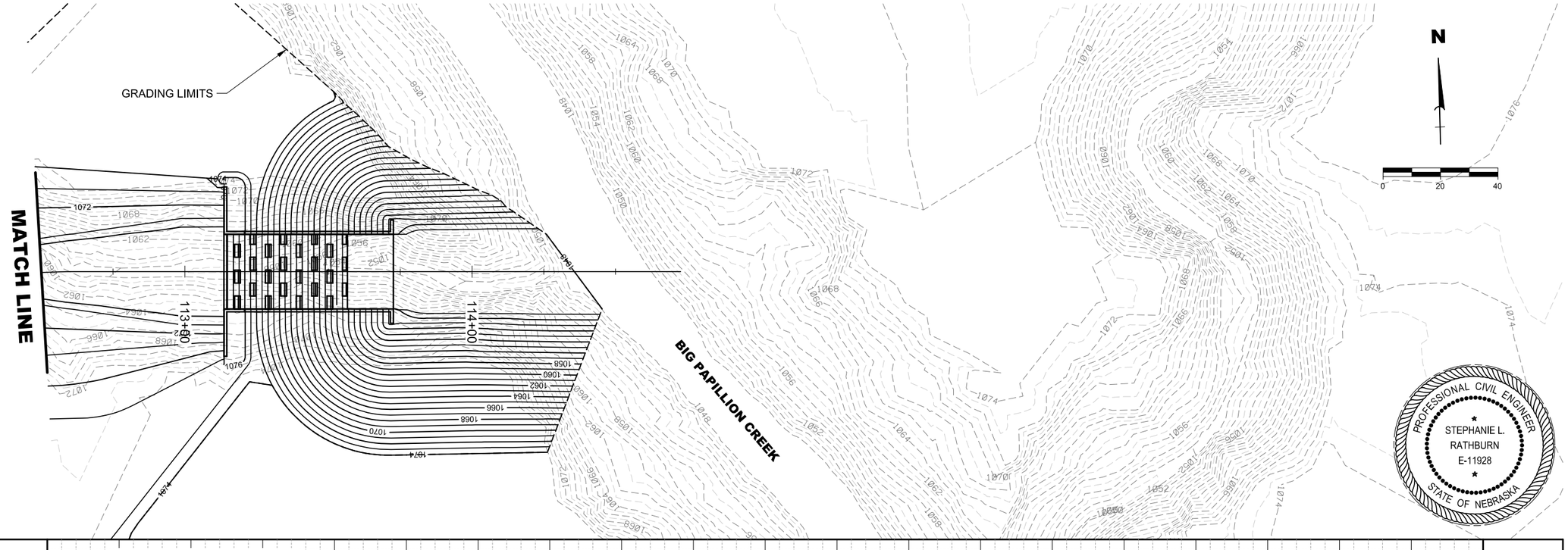

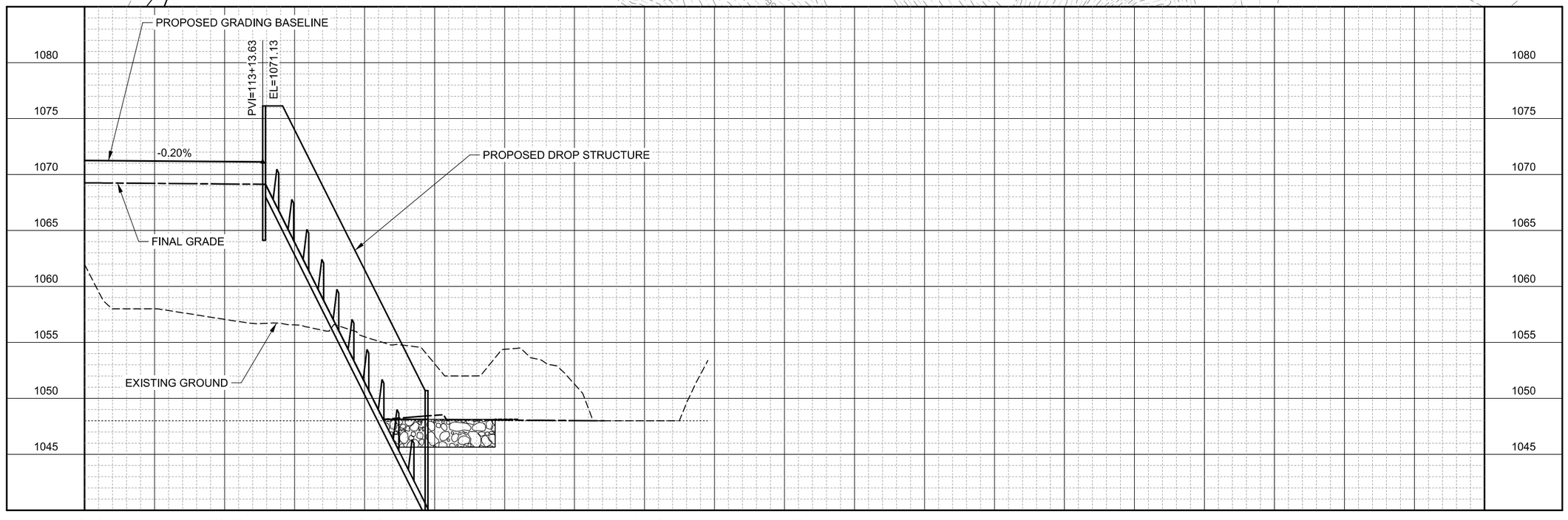

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GLACIER CREEK BASELINE PLAN AND PROFILE

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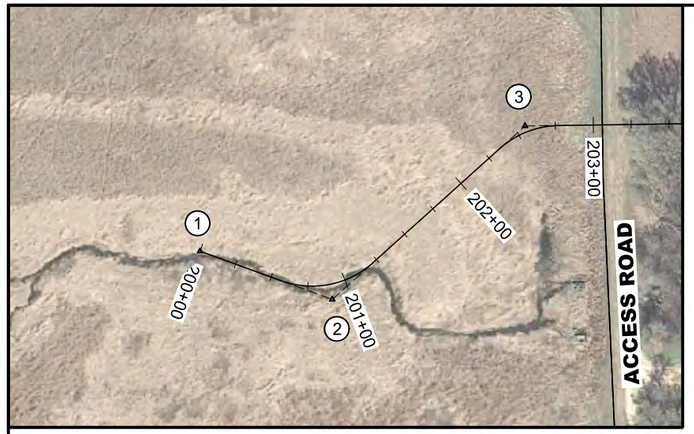
F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\P&P_GC BASELINE 4.dgn – 40.0000 ft / in. – 6/11/2012



(1) P.O.T. STA. 200+00.00
N = 572919.32
E = 2699677.95

(2) P.I. STA. 200+92.92
N = 572887.52
E = 2699765.26
Δ = 62°00'30" LT.
R = 60.00
T = 36.06
L = 64.93
Dc = 95°29'35"
P.C. STA. 200+56.86
N = 572899.86
E = 2699731.38
P.T. STA 201+21.80
N = 572911.64
E = 2699792.06

(3) P.I. STA. 202+56.94
N = 573002.06
E = 2699892.50
Δ = 41°15'37" RT.
R = 60.00
T = 22.59
L = 43.21
Dc = 95°29'35"
P.C. STA. 202+34.35
N = 572986.95
E = 2699875.71
P.T. STA 202+77.56
N = 573002.35
E = 2699915.09

(4) P.I. STA. 204+52.44
N = 573004.59
E = 2700089.96
Δ = 47°41'51" LT.
R = 200.00
T = 88.41
L = 166.50
Dc = 28°38'52"
P.C. STA. 203+64.03
N = 573003.46
E = 2700001.55
P.T. STA 205+30.52
N = 573070.74
E = 2700148.62

(5) P.I. STA. 206+61.82
N = 573168.97
E = 2700235.74
Δ = 95°01'19" RT.
R = 100.00
T = 109.17
L = 165.84
Dc = 57°17'45"
P.C. STA. 205+52.64
N = 573087.29
E = 2700163.30
P.T. STA 207+18.49
N = 573089.66
E = 2700310.76

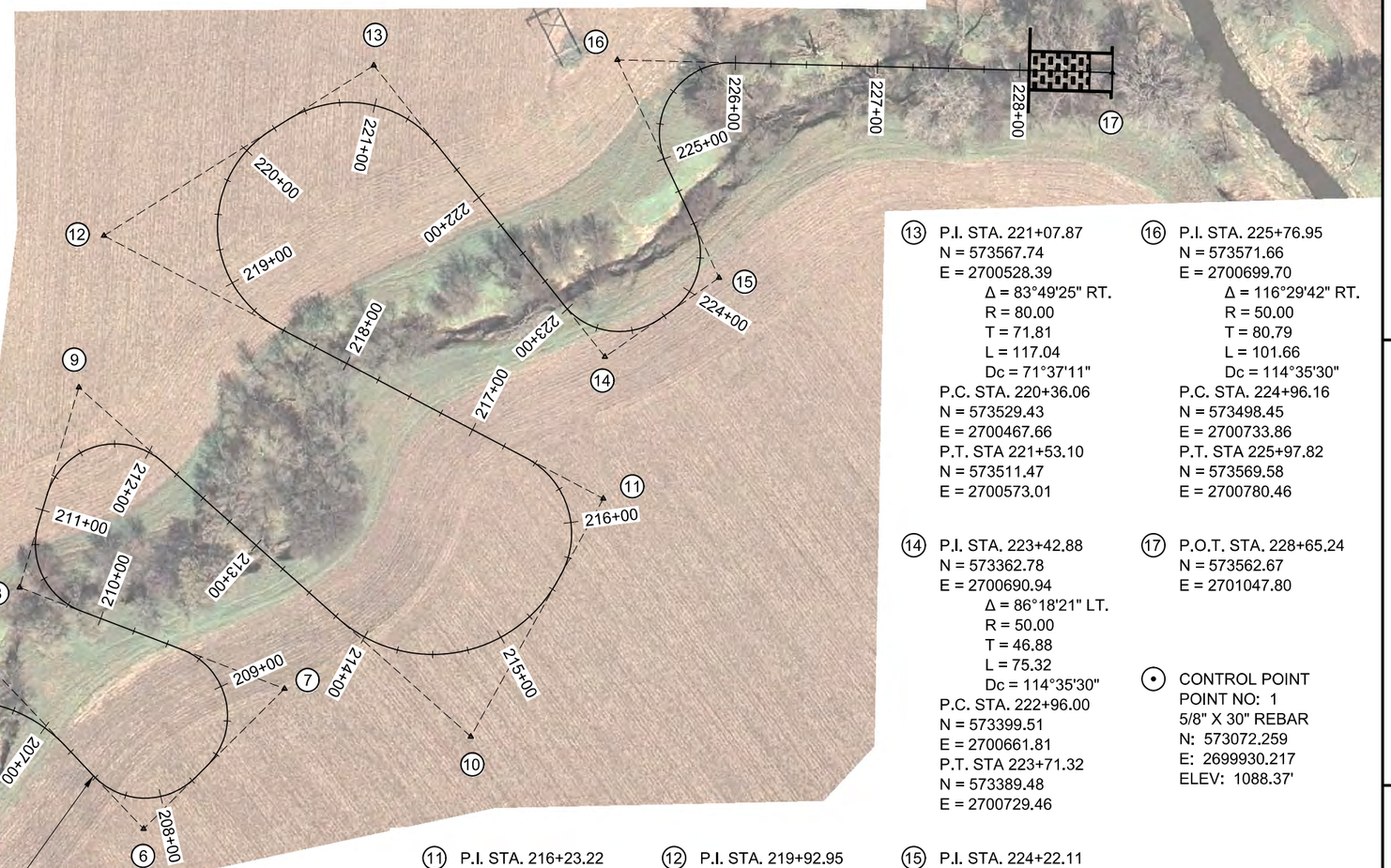
(6) P.I. STA. 207+99.57
N = 573030.75
E = 2700366.48
Δ = 91°26'54" LT.
R = 50.00
T = 51.28
L = 79.80
Dc = 114°35'30"
P.C. STA. 207+48.29
N = 573068.00
E = 2700331.24
P.T. STA 208+28.10
N = 573066.92
E = 2700402.83

(7) P.I. STA. 209+16.56
N = 573129.32
E = 2700465.54
Δ = 114°13'13" LT.
R = 50.00
T = 77.32
L = 99.68
Dc = 114°35'30"
P.C. STA. 208+39.24
N = 573074.78
E = 2700410.73
P.T. STA 209+38.91
N = 573156.93
E = 2700393.32

(8) P.I. STA. 210+61.08
N = 573200.55
E = 2700279.21
Δ = 85°33'43" RT.
R = 50.00
T = 46.27
L = 74.67
Dc = 114°35'30"
P.C. STA. 210+14.81
N = 573184.03
E = 2700322.42
P.T. STA 210+89.48
N = 573244.92
E = 2700292.33

(9) P.I. STA. 211+90.00
N = 573341.31
E = 2700320.86
Δ = 115°12'39" RT.
R = 50.00
T = 78.80
L = 100.54
Dc = 114°35'30"
P.C. STA. 211+11.20
N = 573265.74
E = 2700298.50
P.T. STA 212+11.74
N = 573288.89
E = 2700379.70

(10) P.I. STA. 215+02.21
N = 573095.67
E = 2700596.60
Δ = 102°36'37" LT.
R = 100.00
T = 124.84
L = 179.09
Dc = 57°17'45"
P.C. STA. 213+77.37
N = 573178.72
E = 2700503.38
P.T. STA 215+56.46
N = 573204.77
E = 2700657.29



(11) P.I. STA. 216+23.22
N = 573263.11
E = 2700689.74
Δ = 91°19'30" LT.
R = 60.00
T = 61.40
L = 95.64
Dc = 95°29'35"
P.C. STA. 215+61.81
N = 573209.45
E = 2700659.89
P.T. STA 216+57.45
N = 573291.71
E = 2700635.40

(12) P.I. STA. 219+92.95
N = 573447.98
E = 2700338.51
Δ = 120°00'03" RT.
R = 80.00
T = 138.57
L = 167.55
Dc = 71°37'11"
P.C. STA. 218+54.39
N = 573383.44
E = 2700461.13
P.T. STA 220+21.94
N = 573521.90
E = 2700455.71

(13) P.I. STA. 221+07.87
N = 573567.74
E = 2700528.39
Δ = 83°49'25" RT.
R = 80.00
T = 71.81
L = 117.04
Dc = 71°37'11"
P.C. STA. 220+36.06
N = 573529.43
E = 2700467.66
P.T. STA 221+53.10
N = 573511.47
E = 2700573.01

(14) P.I. STA. 223+42.88
N = 573362.78
E = 2700690.94
Δ = 86°18'21" LT.
R = 50.00
T = 46.88
L = 75.32
Dc = 114°35'30"
P.C. STA. 222+96.00
N = 573399.51
E = 2700661.81
P.T. STA 223+71.32
N = 573389.48
E = 2700729.46

(15) P.I. STA. 224+22.11
N = 573418.41
E = 2700771.21
Δ = 80°17'37" LT.
R = 50.00
T = 42.17
L = 70.07
Dc = 114°35'30"
P.C. STA. 223+79.93
N = 573394.39
E = 2700736.55
P.T. STA 224+50.00
N = 573456.63
E = 2700753.38

(16) P.I. STA. 225+76.95
N = 573571.66
E = 2700699.70
Δ = 116°29'42" RT.
R = 50.00
T = 80.79
L = 101.66
Dc = 114°35'30"
P.C. STA. 224+96.16
N = 573498.45
E = 2700733.86
P.T. STA 225+97.82
N = 573569.58
E = 2700780.46

(17) P.O.T. STA. 228+65.24
N = 573562.67
E = 2701047.80

⊙ CONTROL POINT
POINT NO: 1
5/8" X 30" REBAR
N: 573072.259
E: 2699930.217
ELEV: 1088.37'

NOTES:

- HORIZONTAL DATUM IS NAD83 (CORS 96) (EPOCH: 2002.0000), NEBRASKA STATE PLANE COORDINATES, ZONE 2600.

- VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

- SURVEY CONTROL WAS ESTABLISHED USING NATIONAL GEODETIC SURVEY (NGS) ONLINE POSITIONING USER SERVICE (OPUS).

- GRADING PLAN SHEETS HAVE BEEN DIVIDED ON A GRID, WITH BOUNDARIES CORRESPONDING TO THE NORTHING AND EASTING COORDINATES SHOWN ON THIS SHEET.

PROFESSIONAL CIVIL ENGINEER
STEPHANIE L. RATHBURN
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STATE OF NEBRASKA

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GLACIER CREEK CHANNEL HORIZONTAL ALIGNMENT

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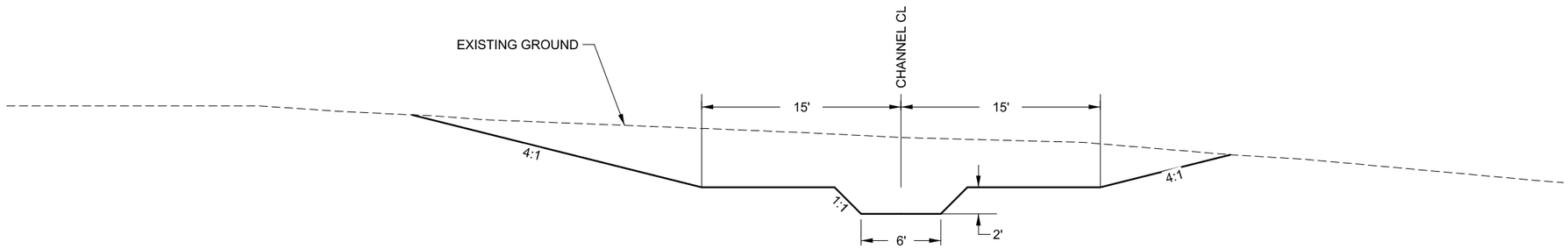
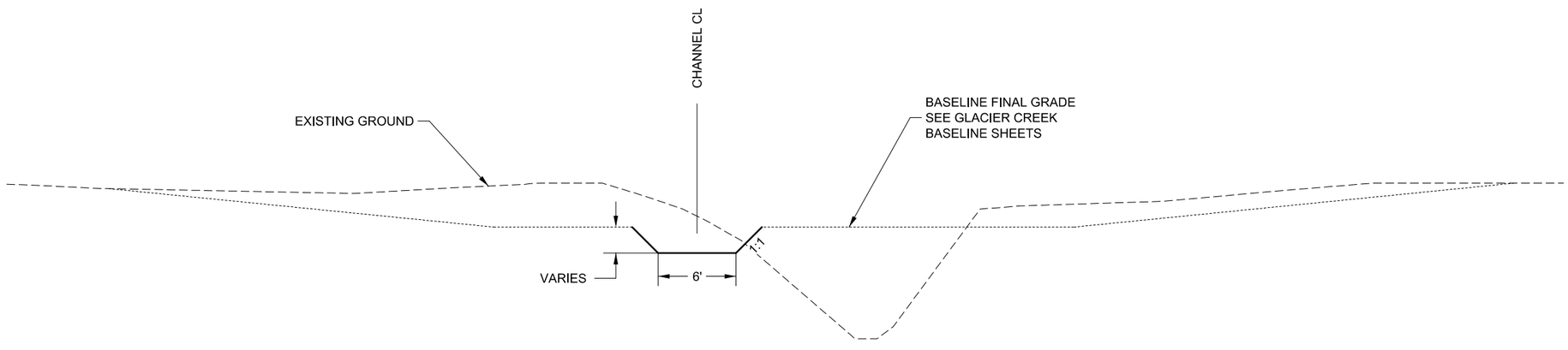


GLACIER CREEK
STA 200+00 - 203+00



GLACIER CREEK
STA 203+12 - 228+06.24

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STATE OF NEBRASKA

NO.	REVISIONS	DATE

GLACIER CREEK CHANNEL TYPICAL SECTIONS

GLACIER CREEK MITIGATION BANK

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PROJECT 75509104
DATE 6/11/2012
SHEET **18 OF 72**

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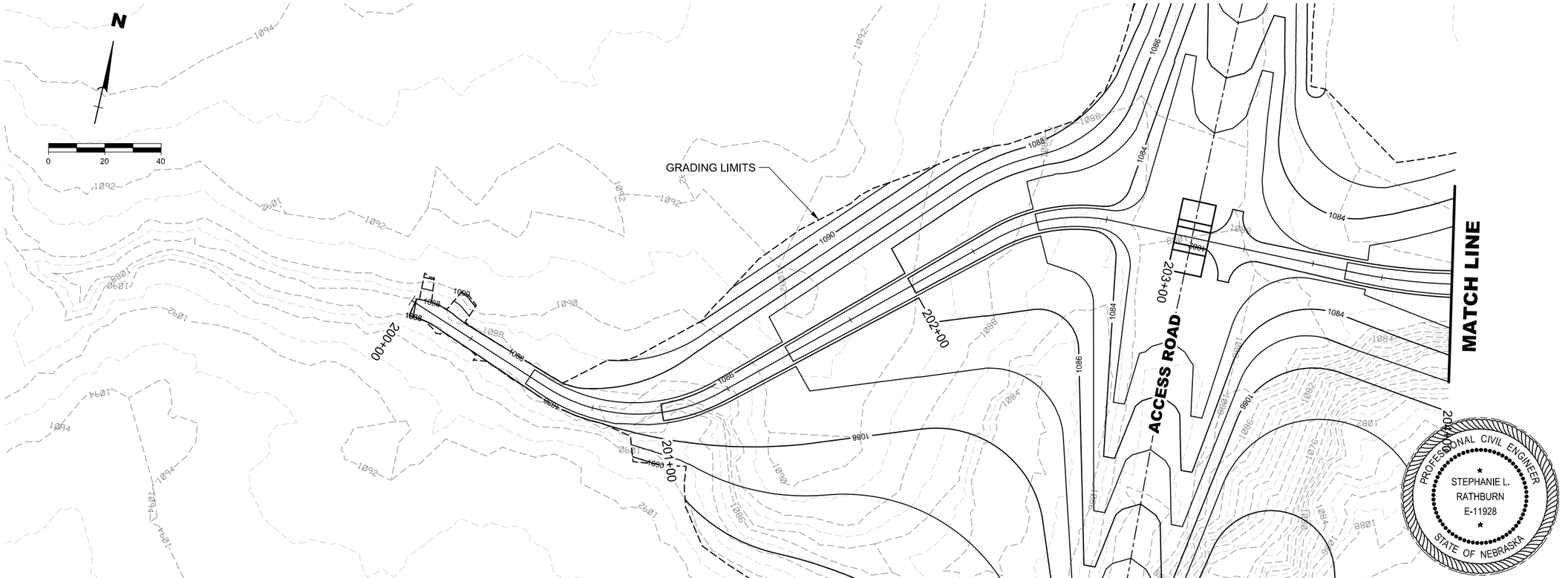

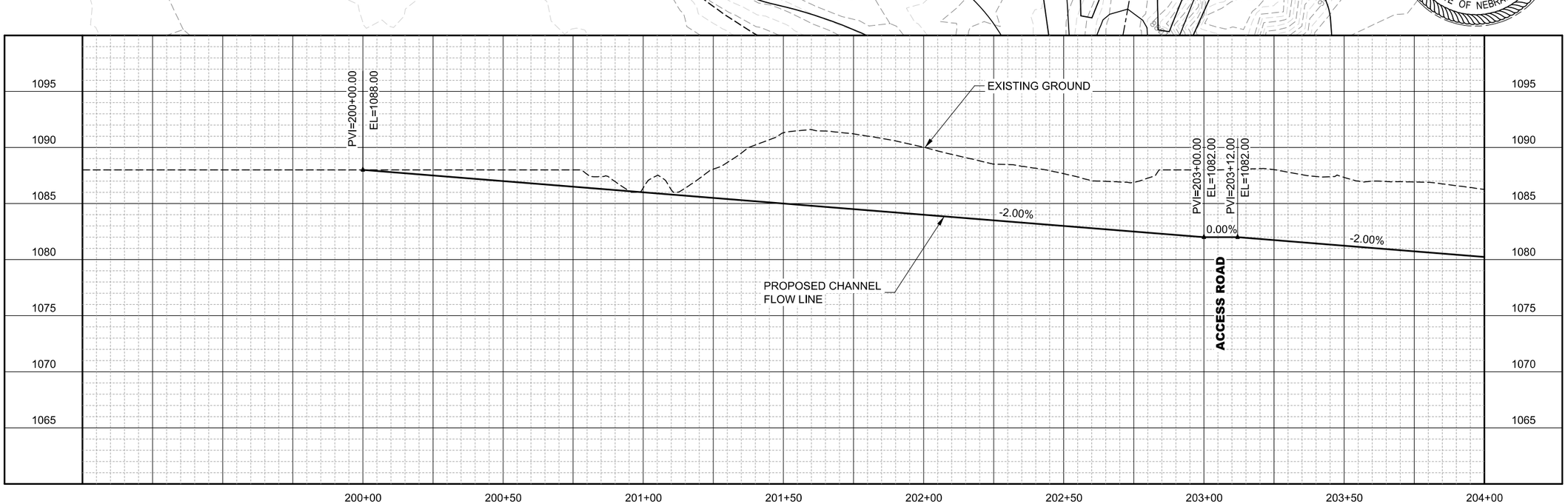

NO.	REVISIONS	DATE

GLACIER CREEK CHANNEL
PLAN AND PROFILE

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STEPHANIE L. RATHBURN
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SHEET
19 OF 72

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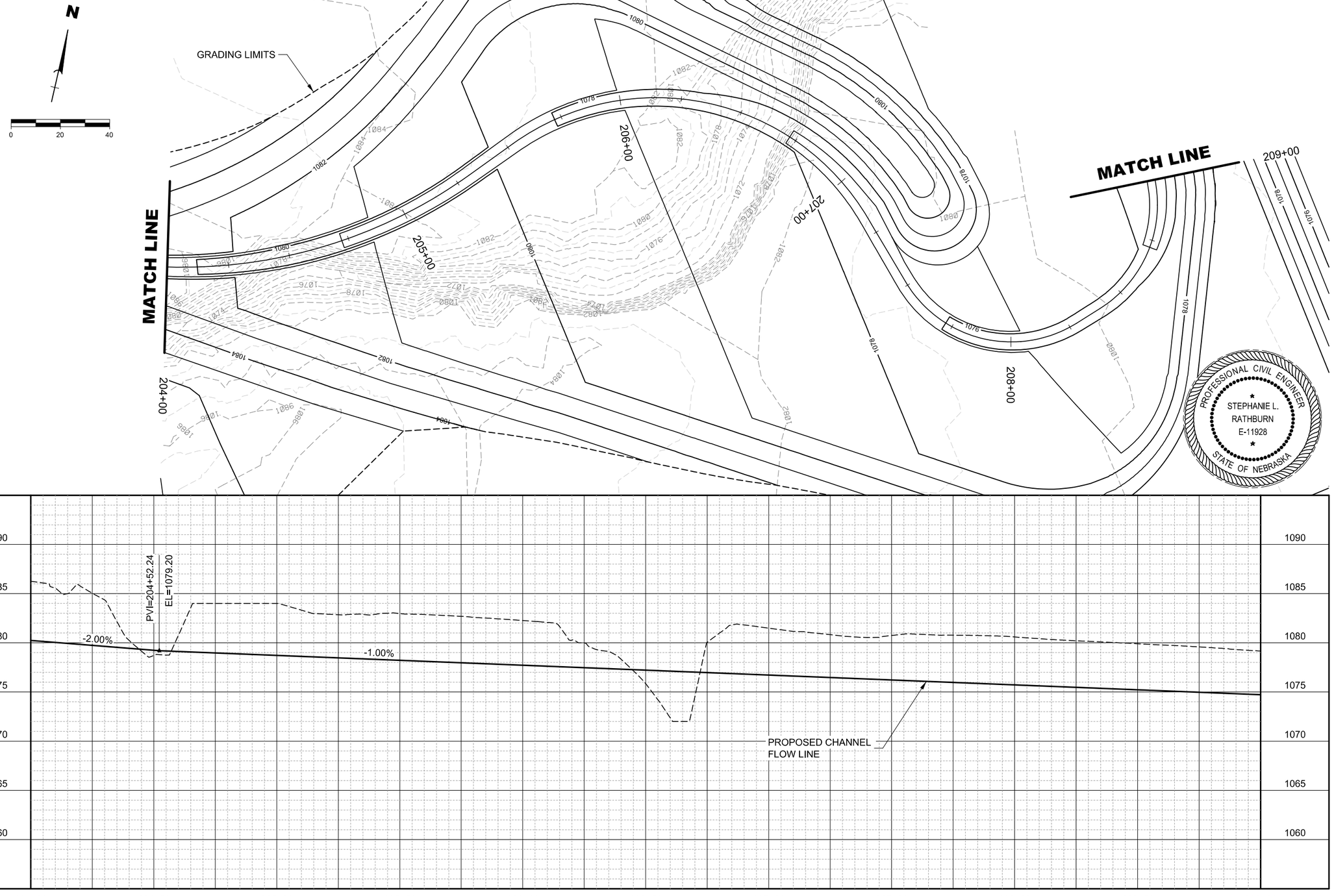

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GLACIER CREEK CHANNEL PLAN AND PROFILE

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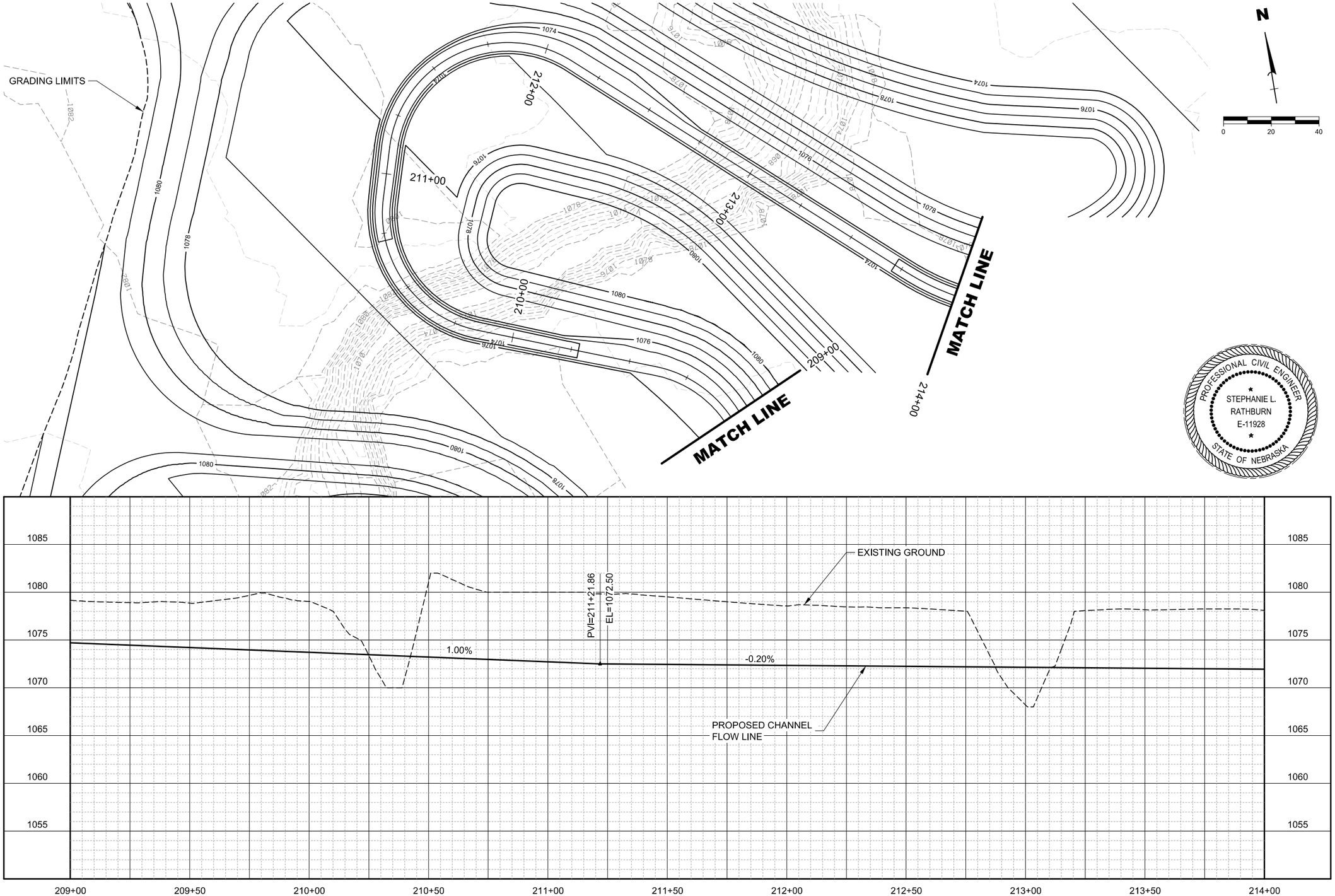

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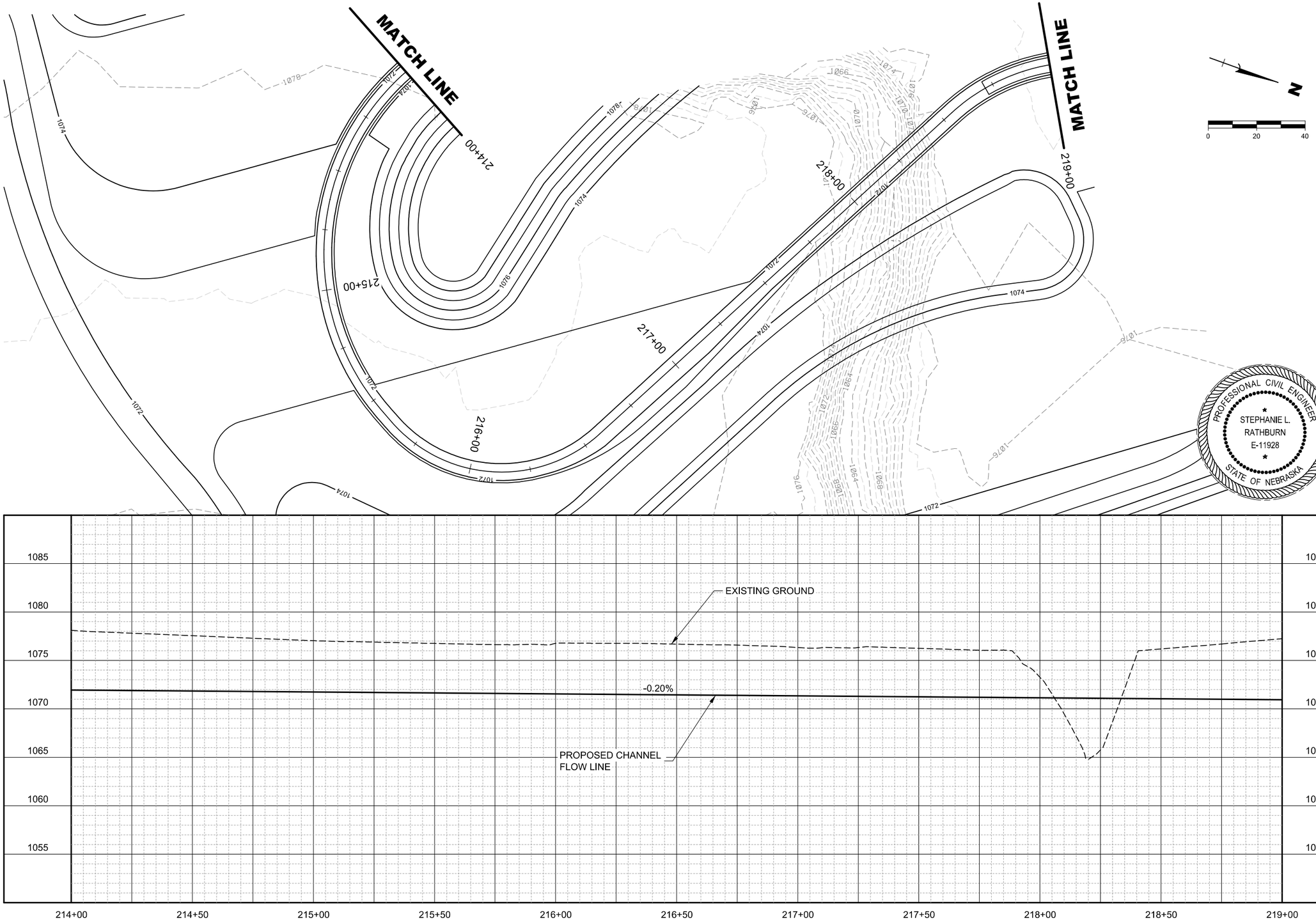

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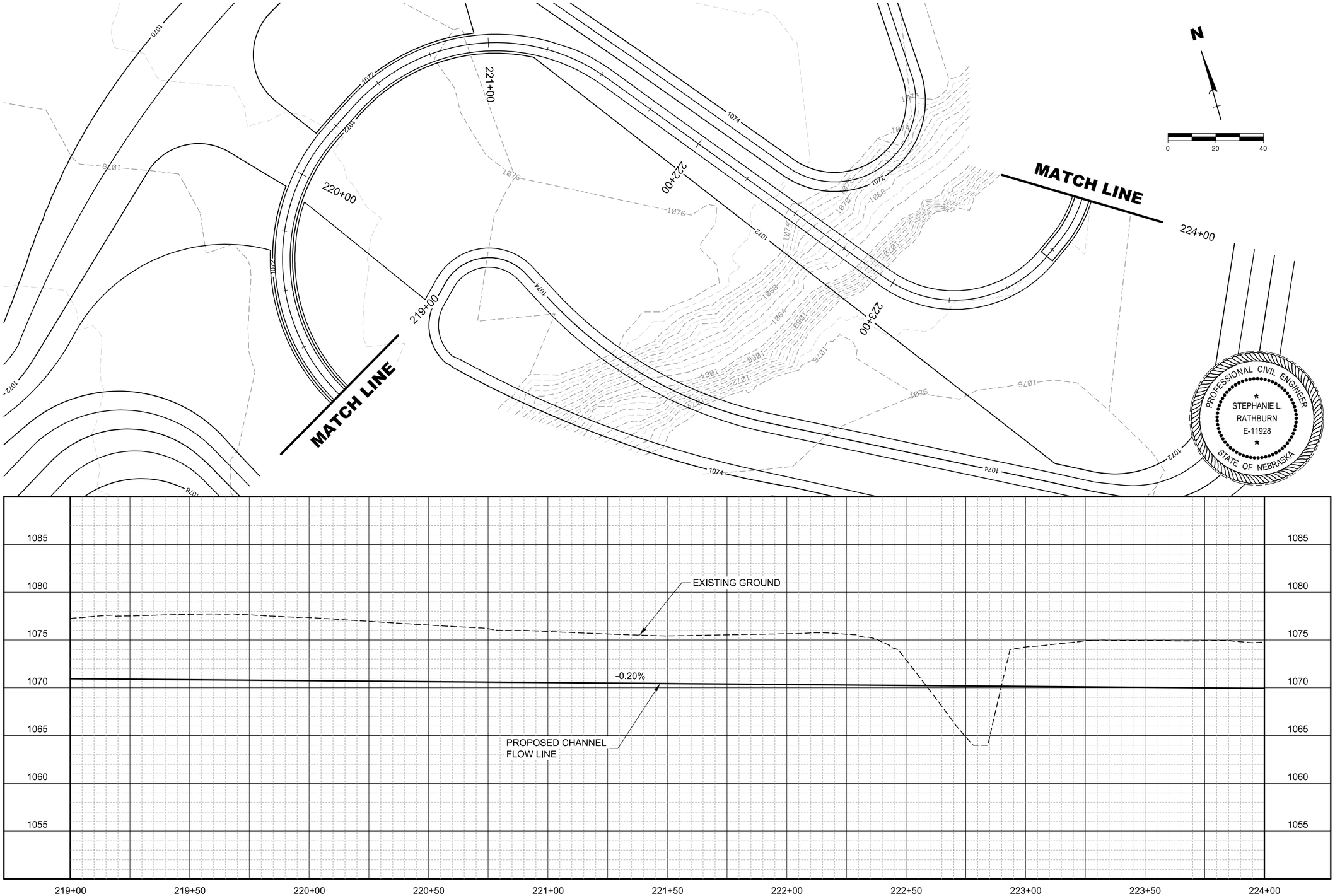

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23 OF 72

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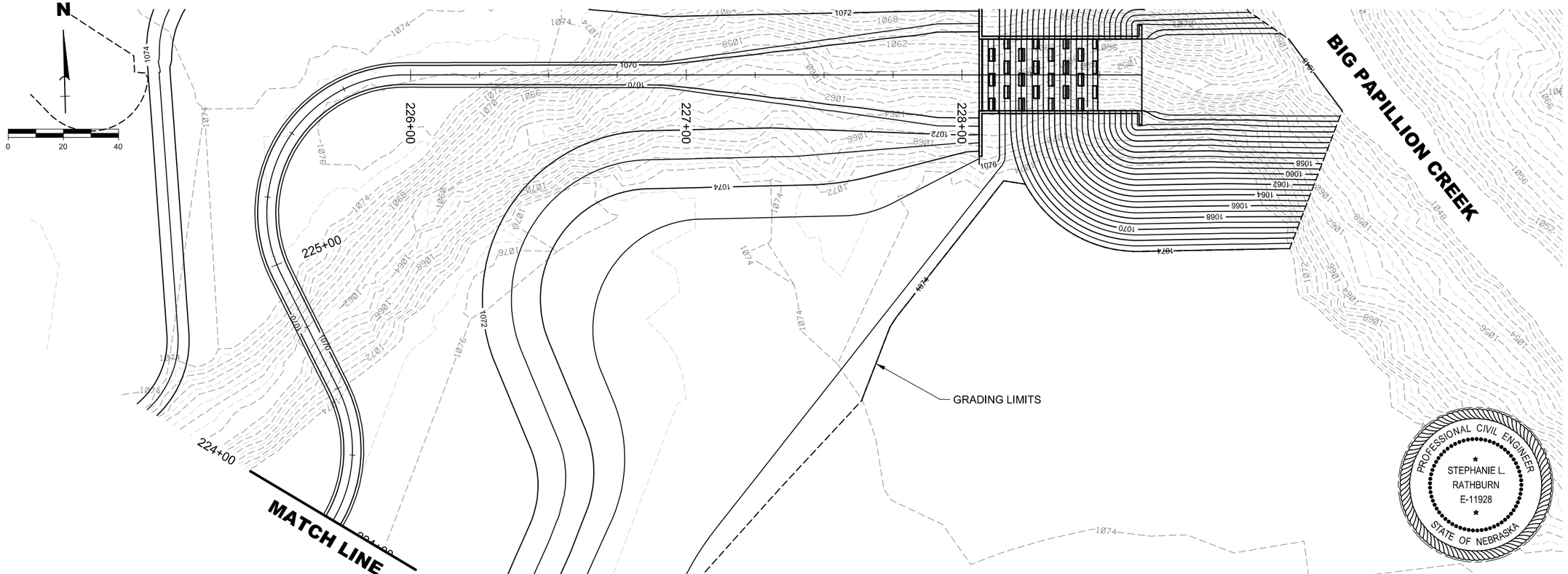

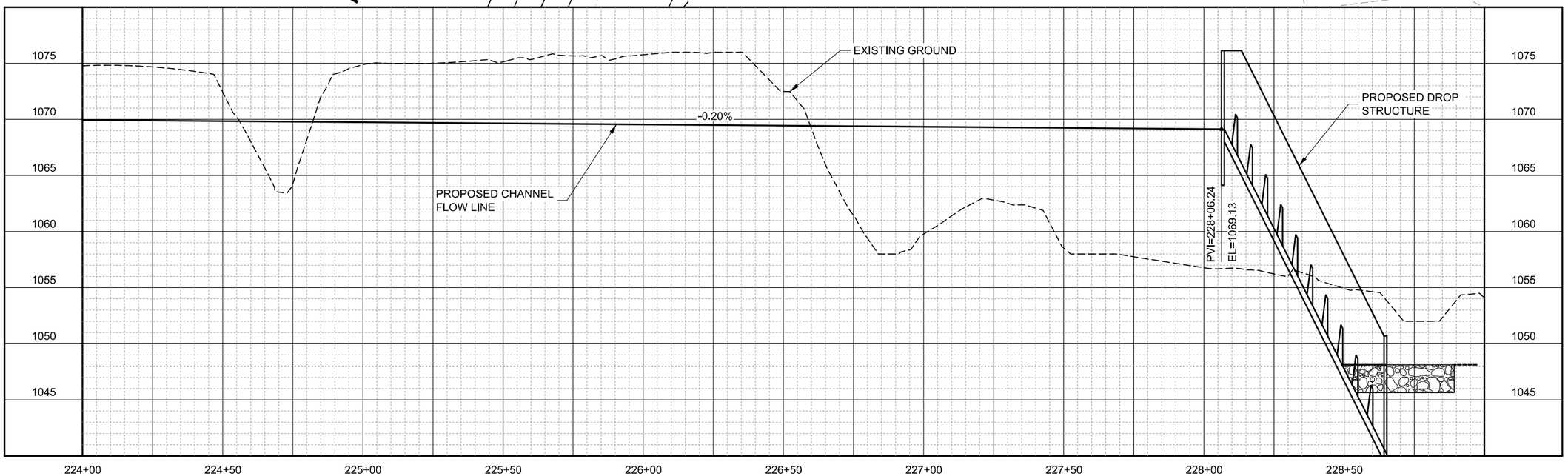

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N

0 50 100

NOTES:

- HORIZONTAL DATUM IS NAD83 (CORS 96) (EPOCH: 2002.0000), NEBRASKA STATE PLANE COORDINATES, ZONE 2600.
- VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)
- SURVEY CONTROL WAS ESTABLISHED USING NATIONAL GEODETIC SURVEY (NGS) ONLINE POSITIONING USER SERVICE (OPUS).

(1) P.O.T. STA. 300+00.00
N = 575951.42
E = 2698839.03

(2) P.I. STA. 304+28.36
N = 575807.51
E = 2699242.49
Δ = 22°26'07" RT.
R = 300.00
T = 59.50
L = 117.47
Dc = 19°05'55"
P.C. STA. 303+68.86
N = 575827.50
E = 2699186.46
P.T. STA 304+86.33
N = 575767.64
E = 2699286.66

(3) P.I. STA. 309+47.10
N = 575458.93
E = 2699628.72
Δ = 40°49'38" LT.
R = 100.00
T = 37.22
L = 71.26
Dc = 57°17'44"
P.C. STA. 309+09.89
N = 575483.87
E = 2699601.09
P.T. STA 309+81.14
N = 575458.13
E = 2699665.93

(4) P.O.T. STA. 312+02.36
N = 575453.34
E = 2699887.09

NORTH CREEK
BASELINE ALIGNMENT

BIG PAPILLION CREEK

NORTH CREEK

PROPERTY BOUNDARY

300+00 301+00 302+00 303+00 304+00 305+00 306+00 307+00 308+00 309+00 310+00 311+00 312+00

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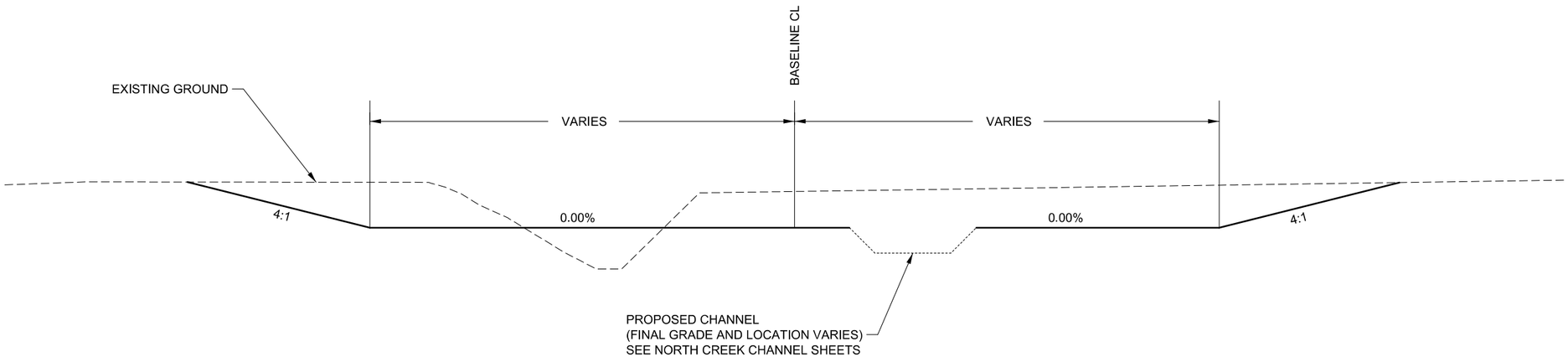

NORTH CREEK
STA 300+00 - 311+41.36

NO.	REVISIONS	DATE

NORTH CREEK BASELINE TYPICAL SECTION

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26 OF 72

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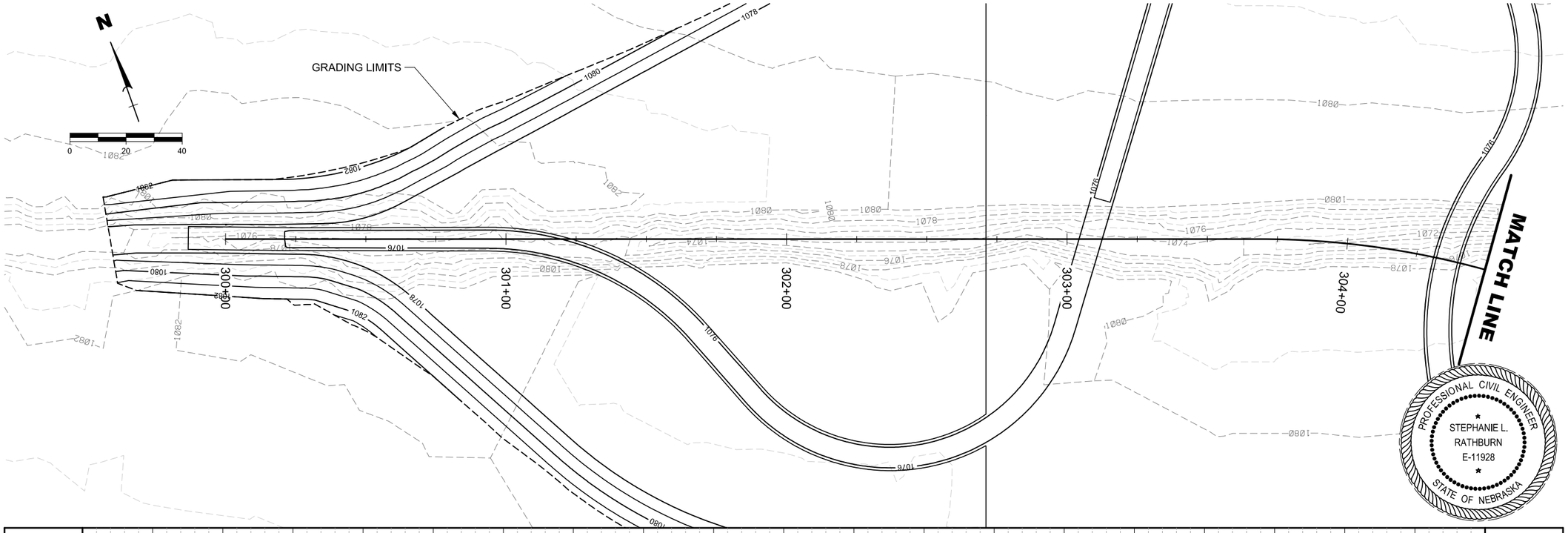

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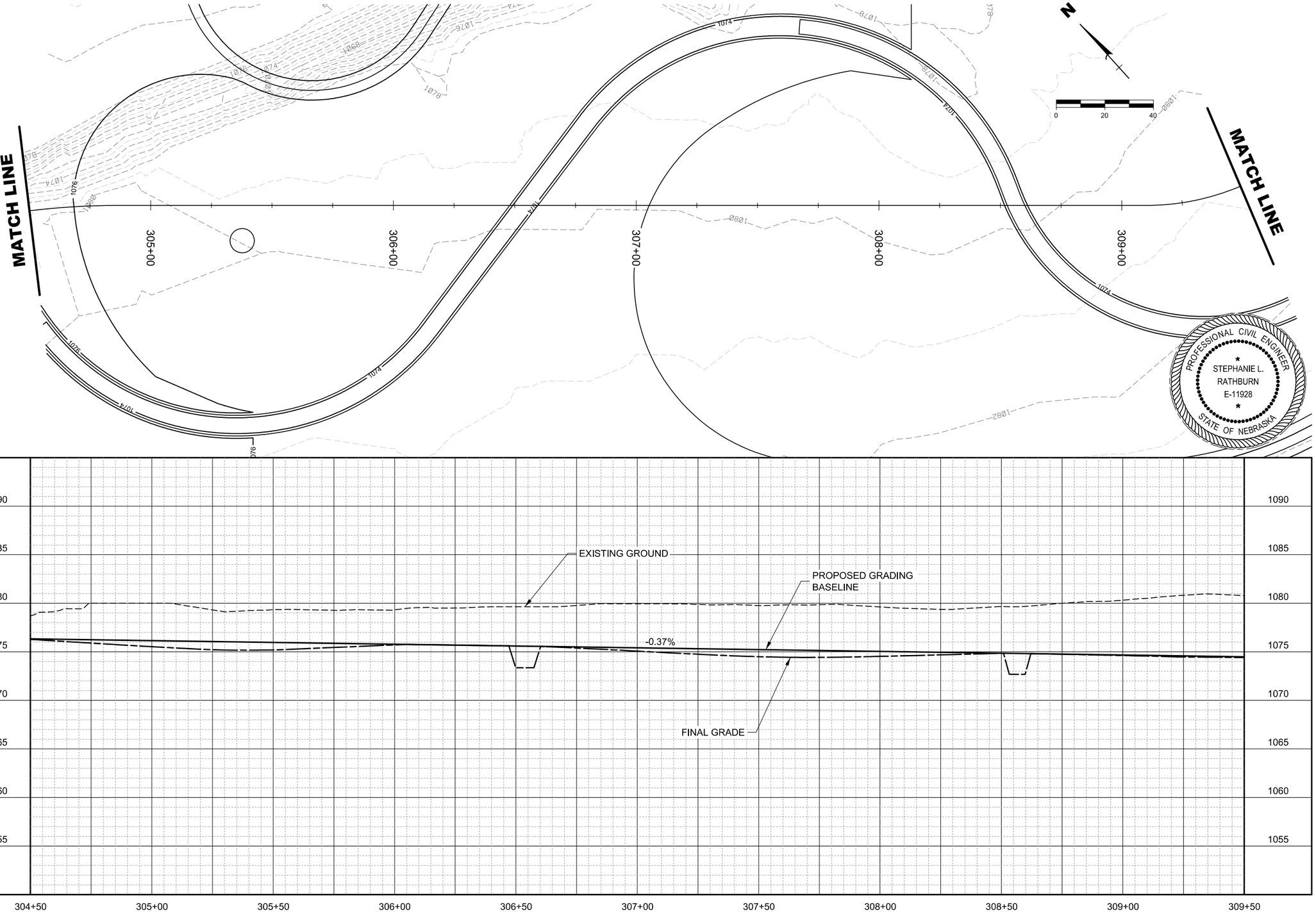
27 OF 72



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28 OF 72

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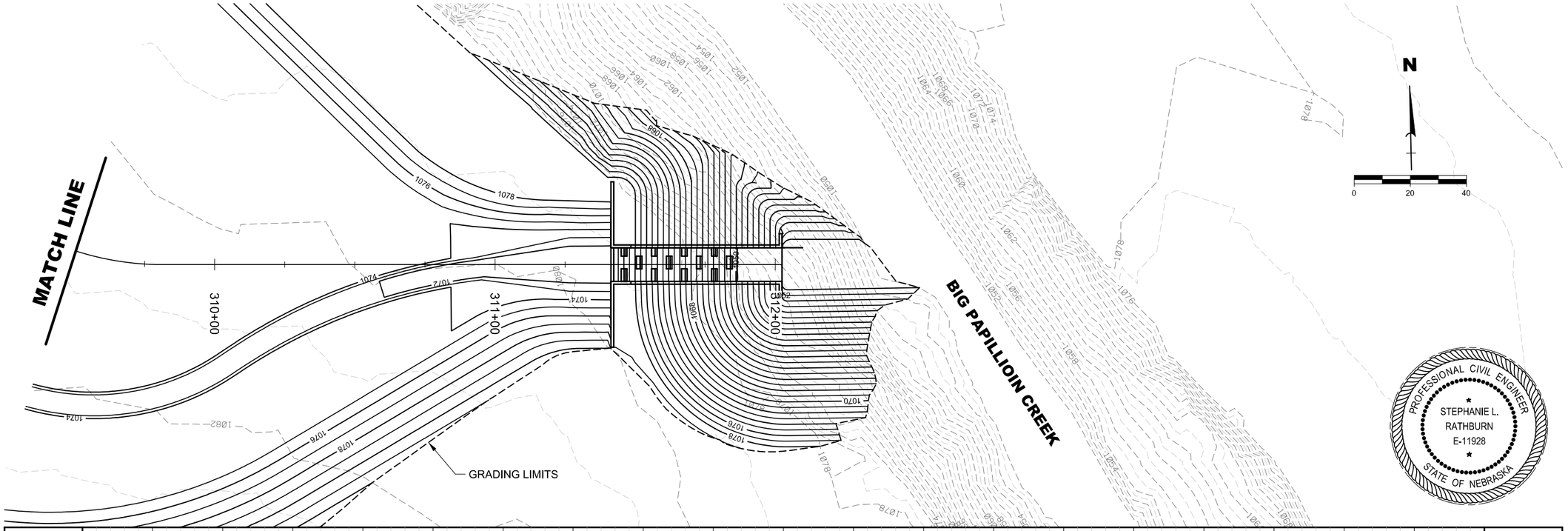

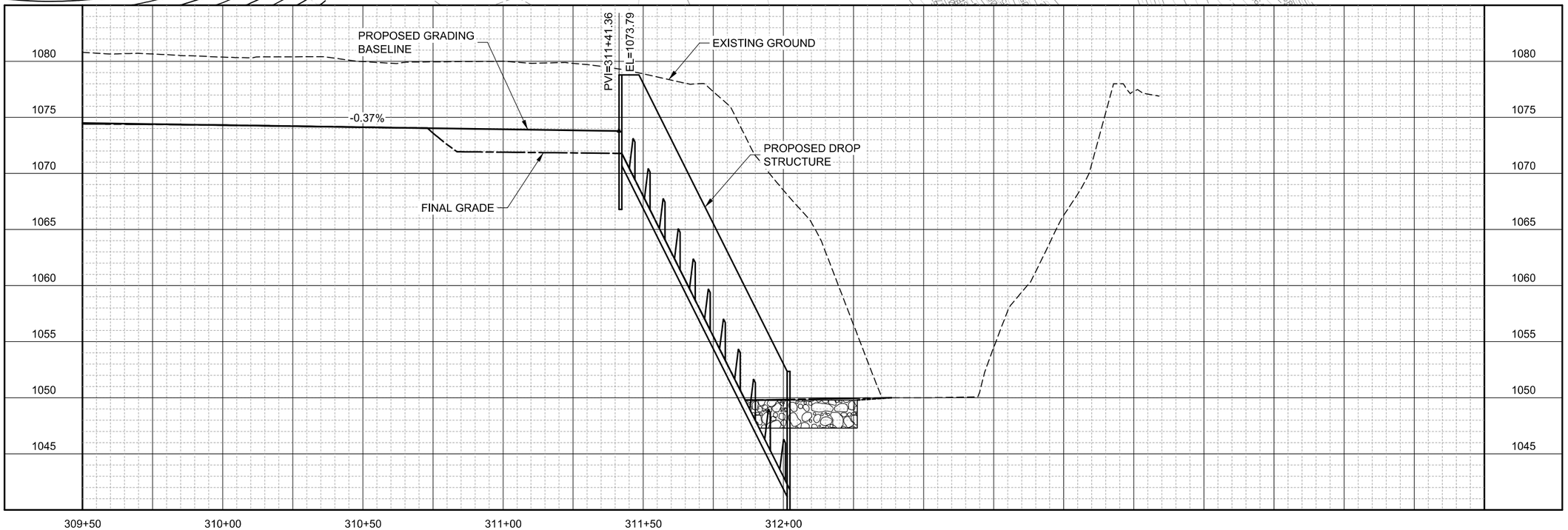

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29 OF 72

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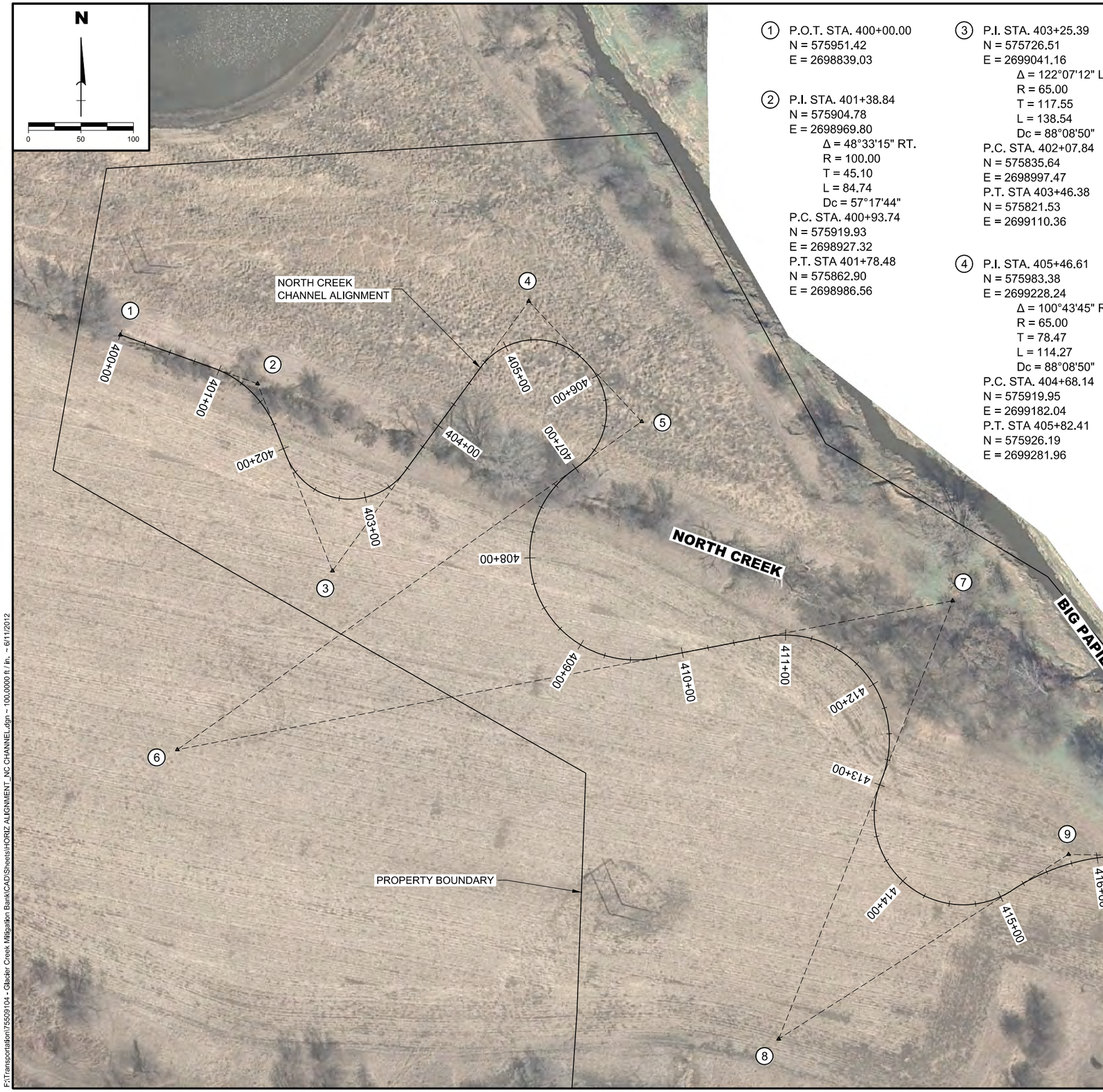

(1) P.O.T. STA. 400+00.00
N = 575951.42
E = 2698839.03

(2) P.I. STA. 401+38.84
N = 575904.78
E = 2698969.80
Δ = 48°33'15" RT.
R = 100.00
T = 45.10
L = 84.74
Dc = 57°17'44"
P.C. STA. 400+93.74
N = 575919.93
E = 2698927.32
P.T. STA 401+78.48
N = 575862.90
E = 2698986.56

(3) P.I. STA. 403+25.39
N = 575726.51
E = 2699041.16
Δ = 122°07'12" LT.
R = 65.00
T = 117.55
L = 138.54
Dc = 88°08'50"
P.C. STA. 402+07.84
N = 575835.64
E = 2698997.47
P.T. STA 403+46.38
N = 575821.53
E = 2699110.36

(4) P.I. STA. 405+46.61
N = 575983.38
E = 2699228.24
Δ = 100°43'45" RT.
R = 65.00
T = 78.47
L = 114.27
Dc = 88°08'50"
P.C. STA. 404+68.14
N = 575919.95
E = 2699182.04
P.T. STA 405+82.41
N = 575926.19
E = 2699281.96

(5) P.I. STA. 406+61.14
N = 575868.80
E = 2699335.86
Δ = 97°57'49" RT.
R = 65.00
T = 74.73
L = 111.14
Dc = 88°08'50"
P.C. STA. 405+86.41
N = 575923.27
E = 2699284.70
P.T. STA. 406+97.55
N = 575825.68
E = 2699274.83

(6) P.I. STA. 411+64.51
N = 575556.23
E = 2698893.45
Δ = 155°37'22" LT.
R = 100.00
T = 462.97
L = 271.61
Dc = 57°17'44"
P.C. STA. 407+01.55
N = 575823.38
E = 2699271.56
P.T. STA 409+73.16
N = 575643.50
E = 2699348.11

(7) P.I. STA. 412+62.29
N = 575697.99
E = 2699632.06
Δ = 122°31'12" RT.
R = 100.00
T = 182.35
L = 213.84
Dc = 57°17'44"
P.C. STA. 410+79.94
N = 575663.62
E = 2699452.98
P.T. STA 412+93.77
N = 575528.51
E = 2699564.77

(8) P.I. STA. 415+60.57
N = 575280.54
E = 2699466.31
Δ = 144°09'12" LT.
R = 85.00
T = 262.80
L = 213.86
Dc = 67°24'24"
P.C. STA. 412+97.77
N = 575524.79
E = 2699563.29
P.T. STA 415+11.63
N = 575421.74
E = 2699687.96

(9) P.I. STA. 415+76.28
N = 575456.47
E = 2699742.48
Δ = 33°44'15" RT.
R = 200.00
T = 60.65
L = 117.77
Dc = 28°38'52"
P.C. STA. 415+15.63
N = 575423.89
E = 2699691.33
P.T. STA 416+33.40
N = 575455.16
E = 2699803.11

(10) P.O.T. STA. 417+17.40
N = 575453.34
E = 2699887.09

NOTES:

- HORIZONTAL DATUM IS NAD83 (CORS 96) (EPOCH: 2002.0000), NEBRASKA STATE PLANE COORDINATES, ZONE 2600.

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NO.	REVISIONS	DATE

NORTH CREEK CHANNEL HORIZONTAL ALIGNMENT

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30 OF 72

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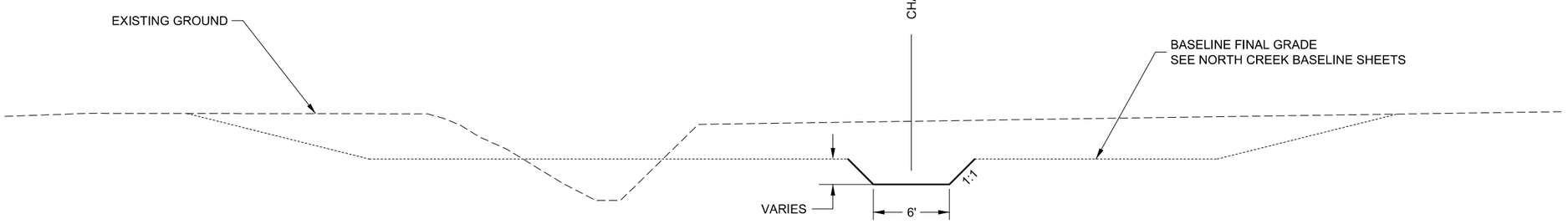

NORTH CREEK
STA 400+00 - 416+56.40

NORTH CREEK CHANNEL TYPICAL SECTION

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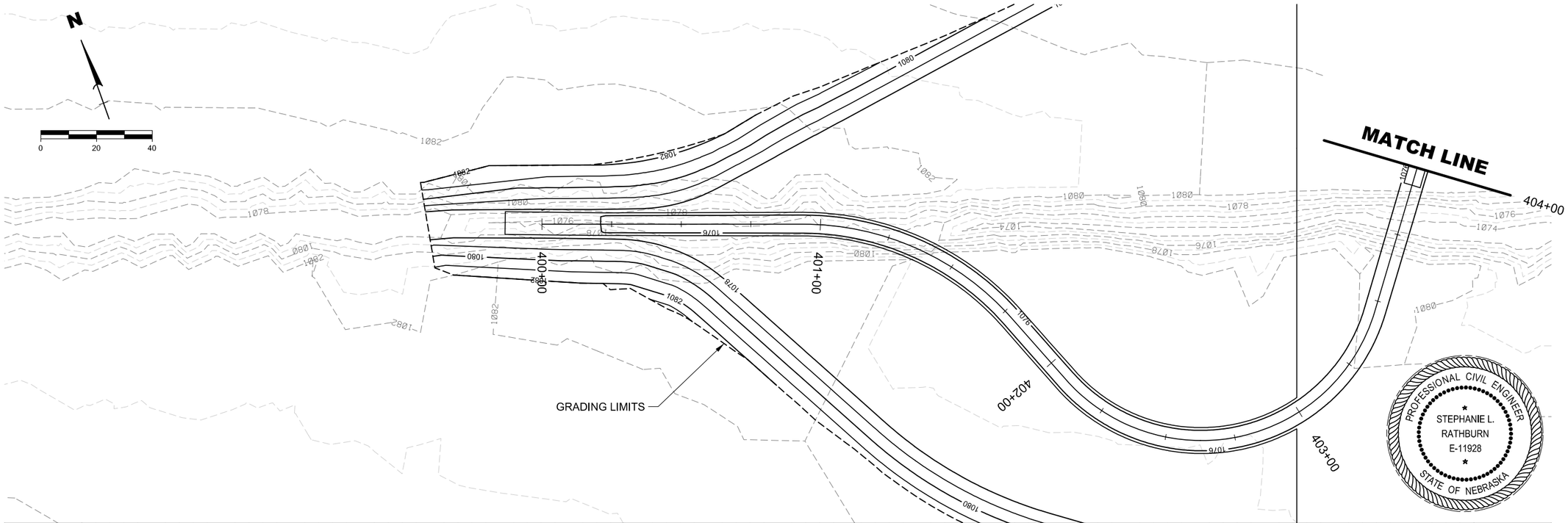

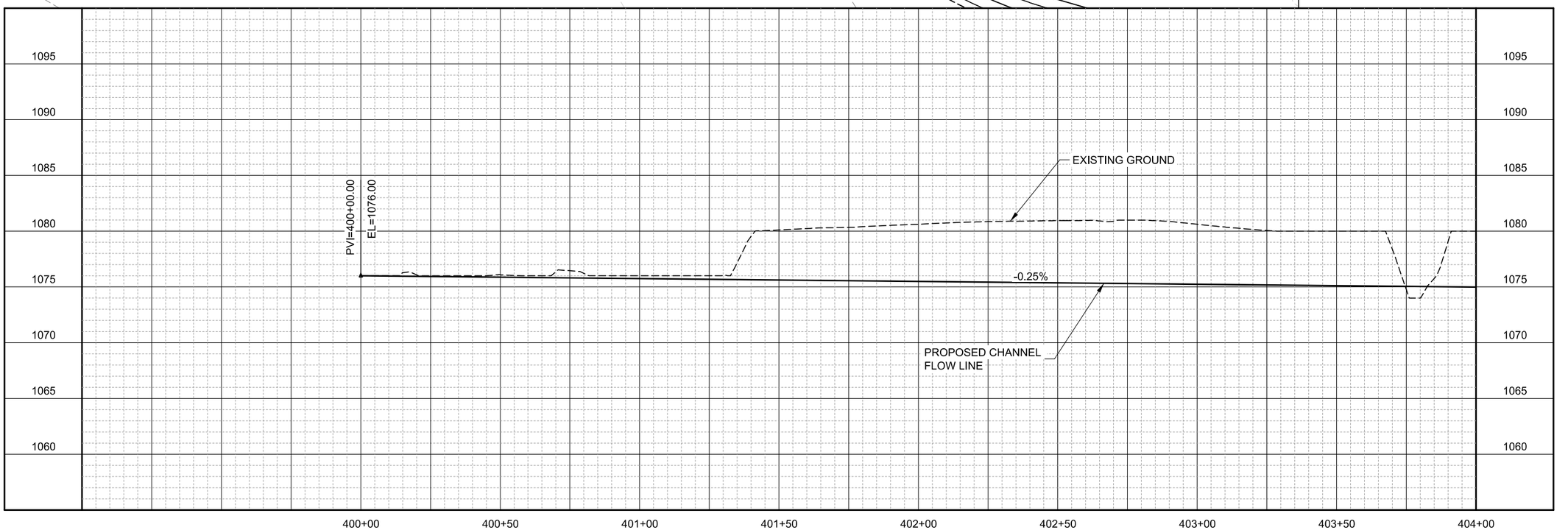

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NORTH CREEK CHANNEL PLAN AND PROFILE

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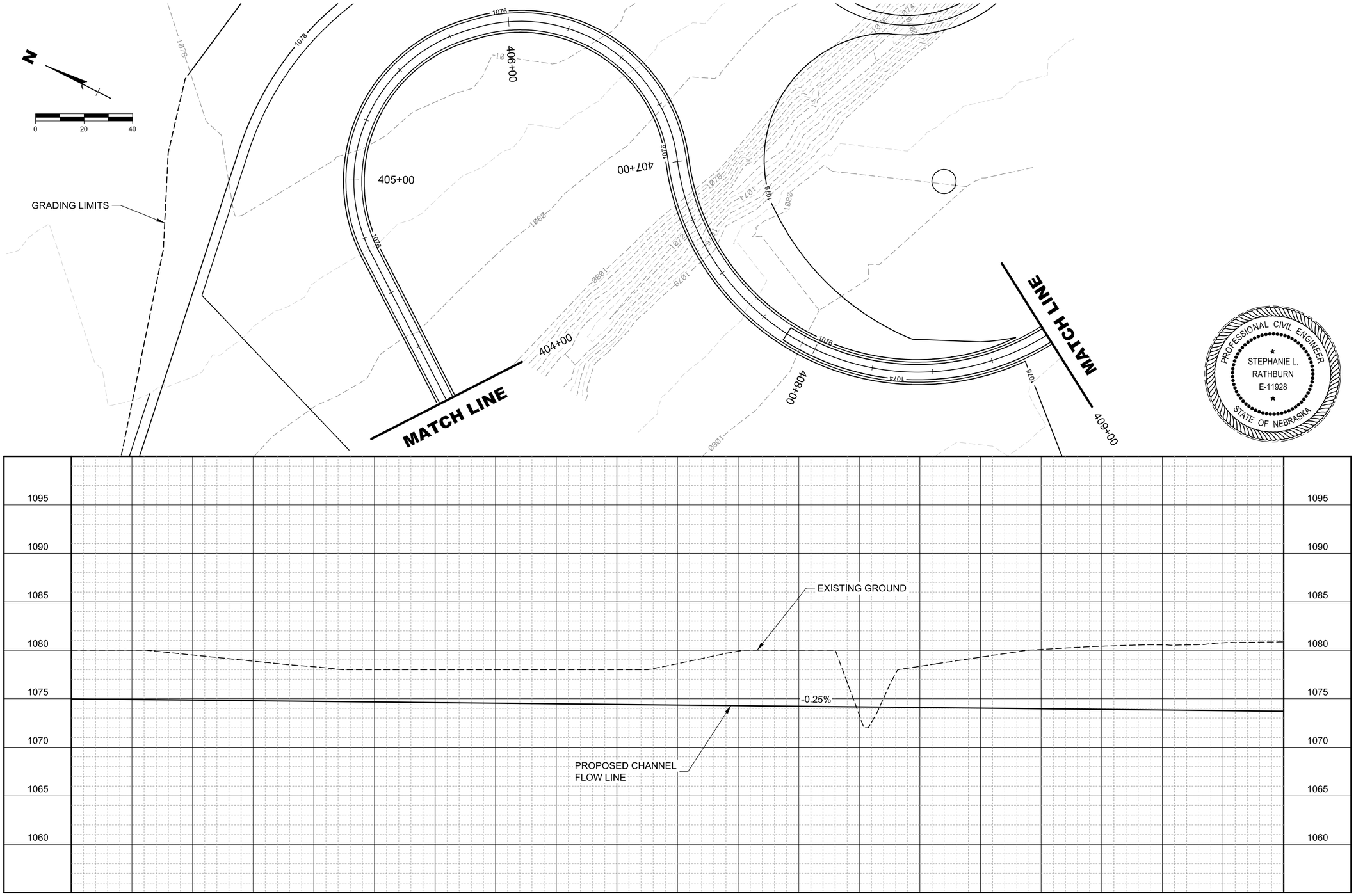

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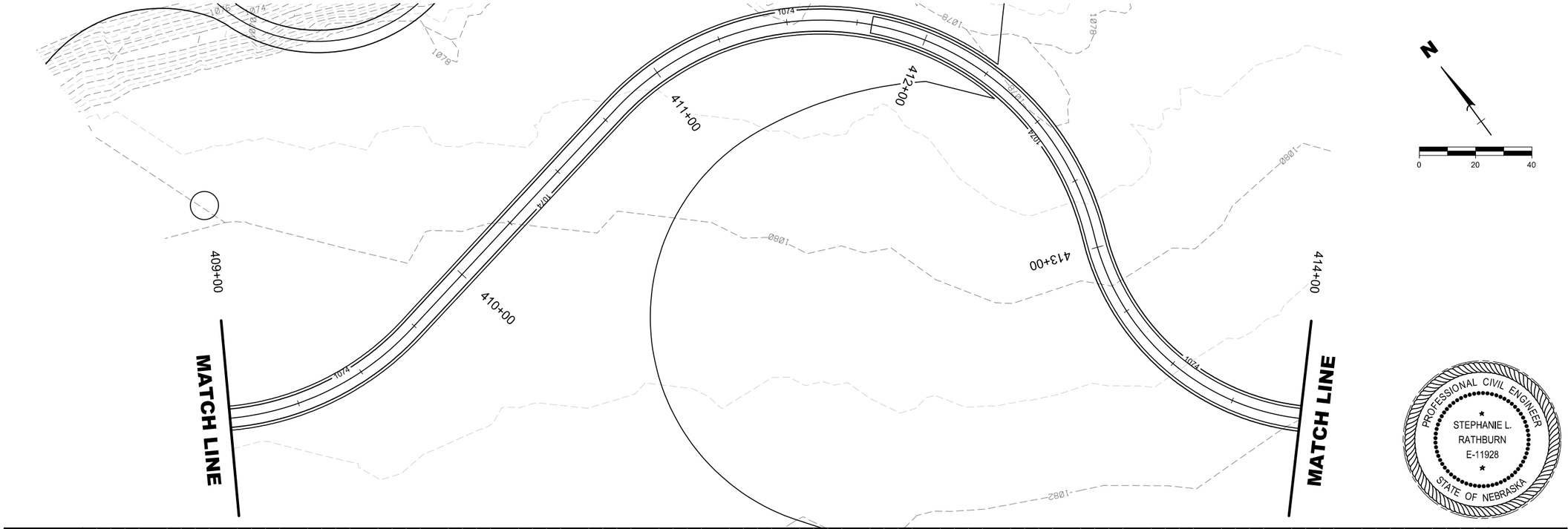

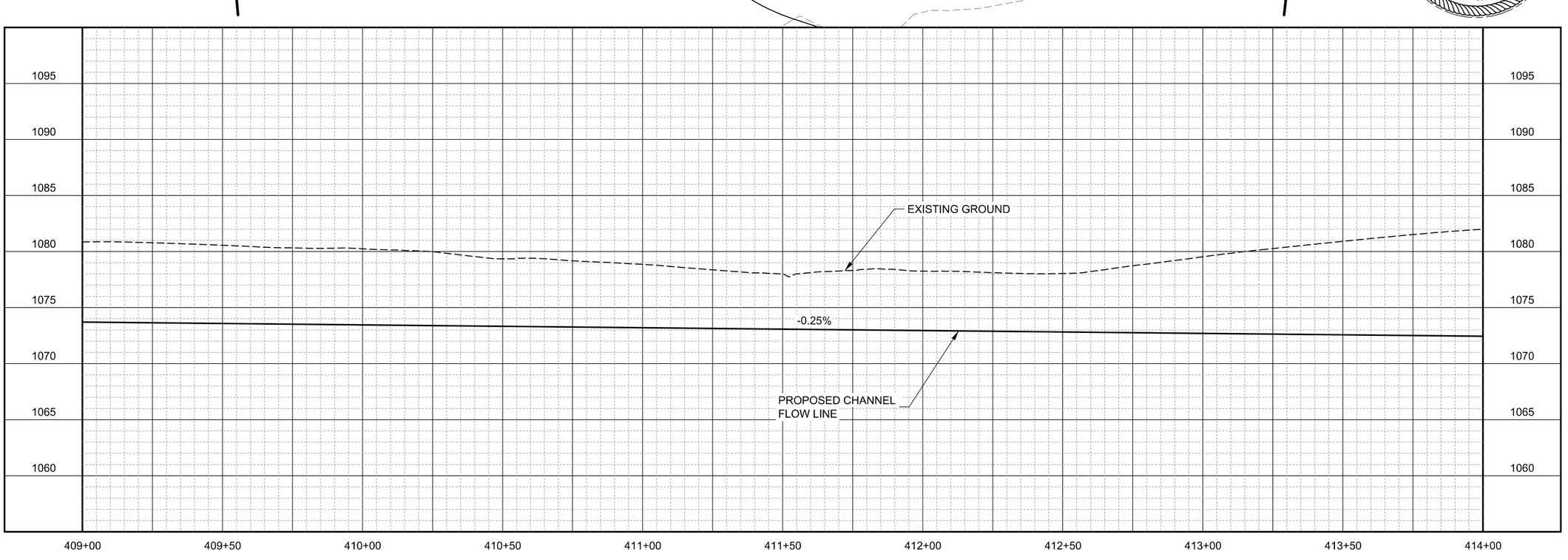

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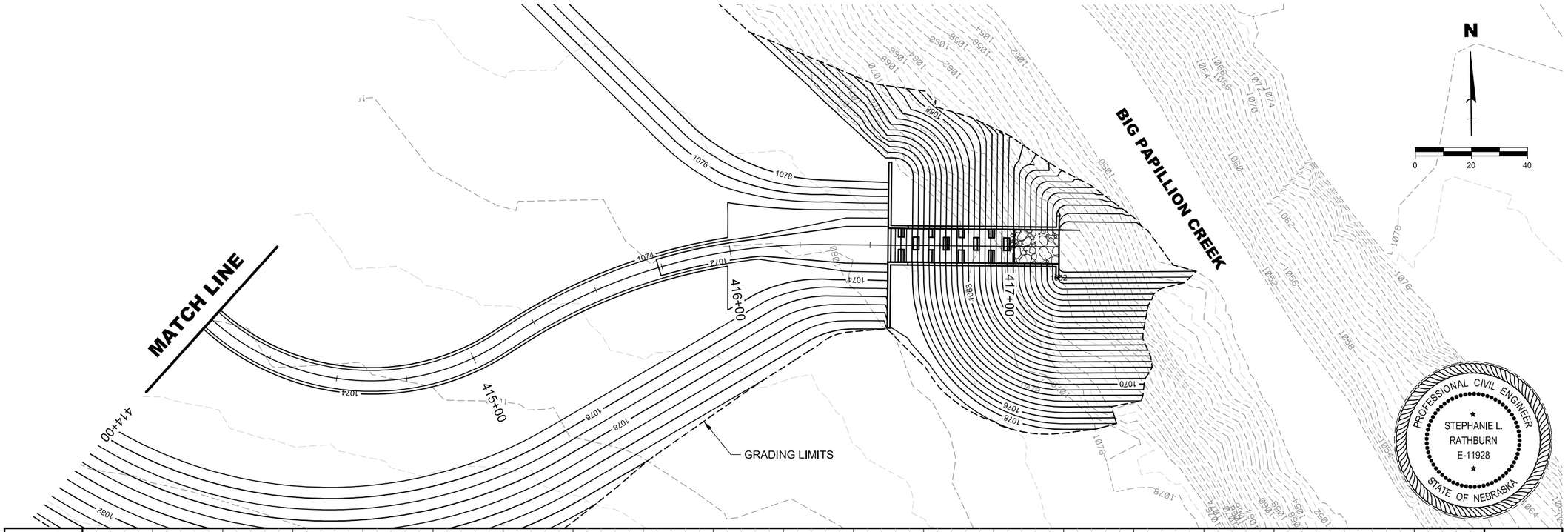

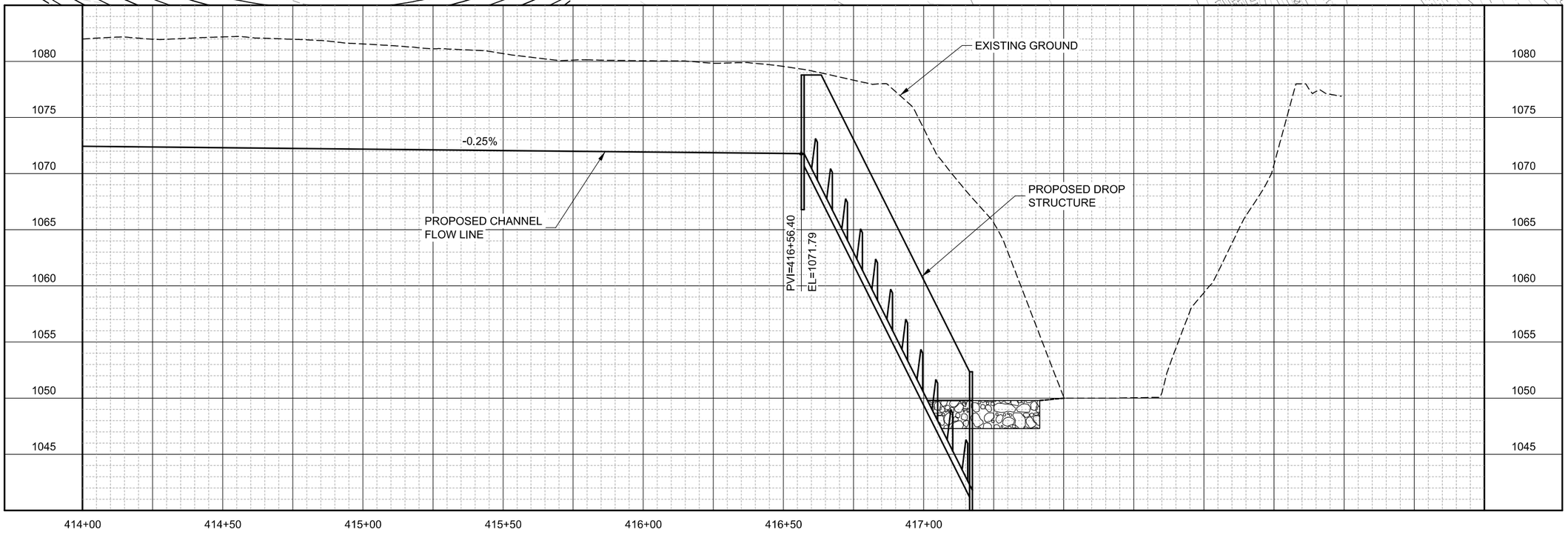

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NORTH CREEK CHANNEL
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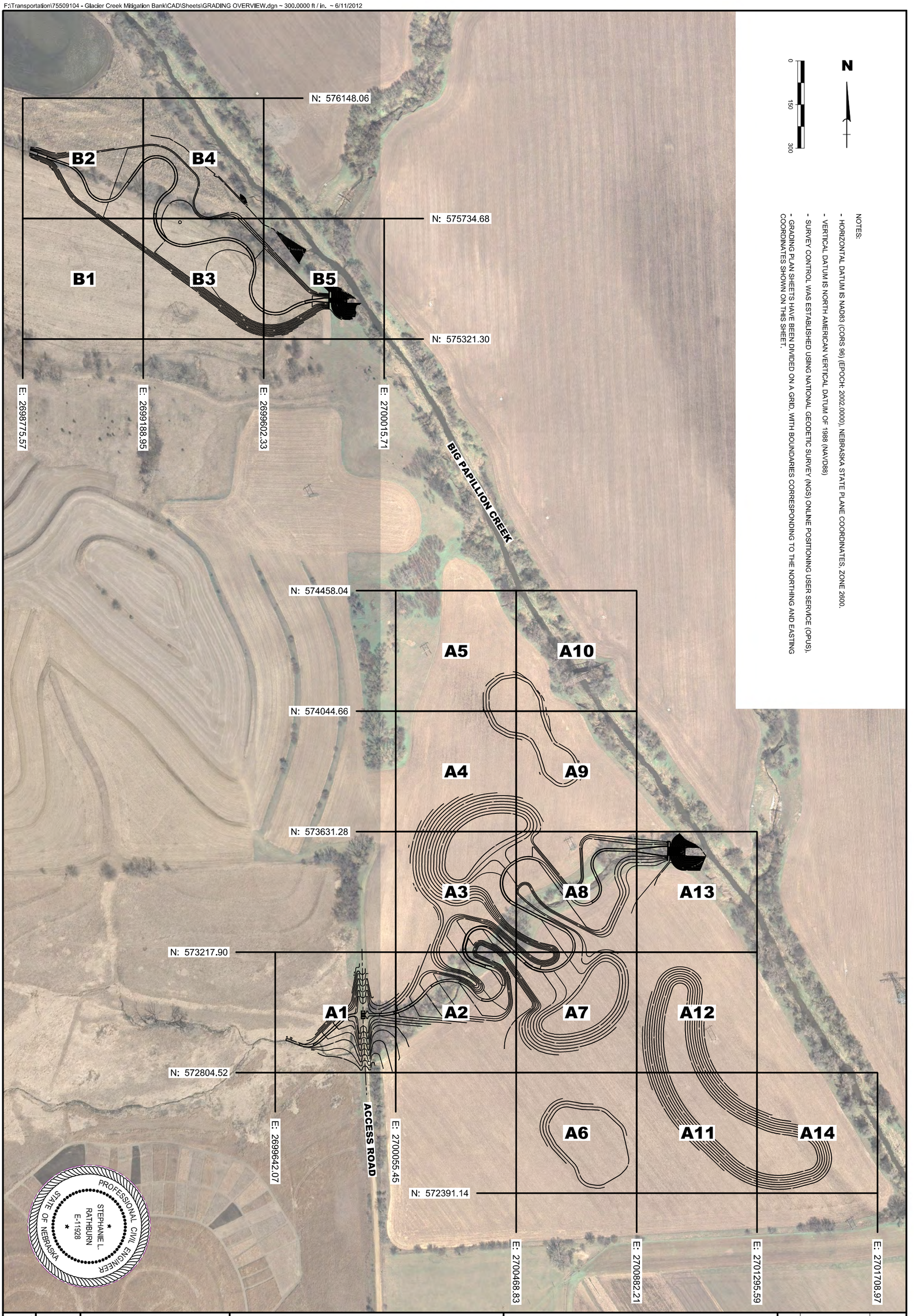
SHEET
35 OF 72

F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\GRADING OVERVIEW.dgn ~ 300.0000 ft / in. ~ 6/11/2012



NOTES:

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- SURVEY CONTROL WAS ESTABLISHED USING NATIONAL GEODETIC SURVEY (NGS) ONLINE POSITIONING USER SERVICE (OPUS).
- GRADING PLAN SHEETS HAVE BEEN DIVIDED ON A GRID, WITH BOUNDARIES CORRESPONDING TO THE NORTHING AND EASTING COORDINATES SHOWN ON THIS SHEET.

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GRADING PLAN OVERVIEW

NO.	REVISIONS	DATE

N: 573217.90

E: 2699642.07

E: 2700055.45

N: 572804.52

GRADING LIMITS

CONSTRUCT
CONCRETE
LOW-FLOW CROSSING
(SEE DETAIL SHEET)

4:1 (TYP.)

10:1 (TYP.)

ACCESS ROAD

1100 1098 1096 1094 1092 1090 1088 1086 1084 1082 1080 1078 1076

N

0 20 40

A5 A10
A4 A9
A3 A8 A13
A1 A2 A7 A12
A6 A11 A14

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GRADING PLAN A1

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SHEET 37 OF 72

F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\GRADING PLAN A1.dgn ~ 40.0000 ft / in. ~ 6/11/2012

N: 573217.90

E: 2700055.45

TOP OF BERM
ELEV = 1080.00

TOP OF BERM
ELEV = 1081.00

(TYP.) 10:1

(TYP.) 4:1

4:1 (TYP.)

GRADING LIMITS

E: 2700468.83

N: 572804.52

F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CADD\Sheets\GRADING PLAN A2.dgn ~ 40.0000 ft / in. ~ 6/11/2012

N

0 20 40

A5 A10 A4 A9 A3 A8 A13 A1 A2 A7 A12 A6 A11 A14

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SHEET 38 OF 72

N: 573631.28

E: 2700055.45

E: 2700468.83

N: 573217.90

BOTTOM OF WETLAND
ELEV = 1069.50

TOP OF BERM
ELEV = 1079.00

10:1 (TYP.)

4:1 (TYP.)

GRADING LIMITS

N

0 20 40

A5 A10 A4 A9 A3 A8 A13 A1 A2 A7 A12 A6 A11 A14

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GRADING PLAN A3

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SHEET 39 OF 72

F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\GRADING PLAN A3.dgn - 40.0000 ft / in. - 6/11/2012

N: 574044.66

E: 2700055.45

E: 2700468.83

N: 573631.28

BOTTOM OF WETLAND
ELEV = 1074.00

BOTTOM OF WETLAND
ELEV = 1069.50

10:1 (TYP.)

GRADING LIMITS

1088 1086 1084 1082 1080 1078 1076 1074 1072 1070

N

0 20 40

A5 A10 A4 A9 A3 A8 A13 A1 A2 A7 A12 A6 A11 A14

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GRADING PLAN A4

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SHEET 40 OF 72

F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\GRADING PLAN A4.dgn ~ 40.0000 ft / in. ~ 6/11/2012

N: 574458.04

E: 2700055.45

E: 2700468.83

N: 574044.66

GRADING LIMITS

10:1 (TYP.)

BOTTOM OF WETLAND
ELEV = 1074.00

N

0 20 40

A5 A10 A4 A9 A3 A8 A13 A1 A2 A7 A12 A6 A11 A14

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GRADING PLAN A5

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F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\GRADING PLAN A5.dgn - 40.0000 ft / in. - 6/11/2012

N: 572804.52

E: 2700468.83

E: 2700882.21

N: 572391.14

1078
1076
1074

10:1 (TYP.)

BOTTOM OF WETLAND
ELEV = 1074.00

GRADING LIMITS

N

0 20 40

A5 A10
A4 A9
A3 A8 A13
A1 A2 A7 A12
A6 A11 A14

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GRADING PLAN A6

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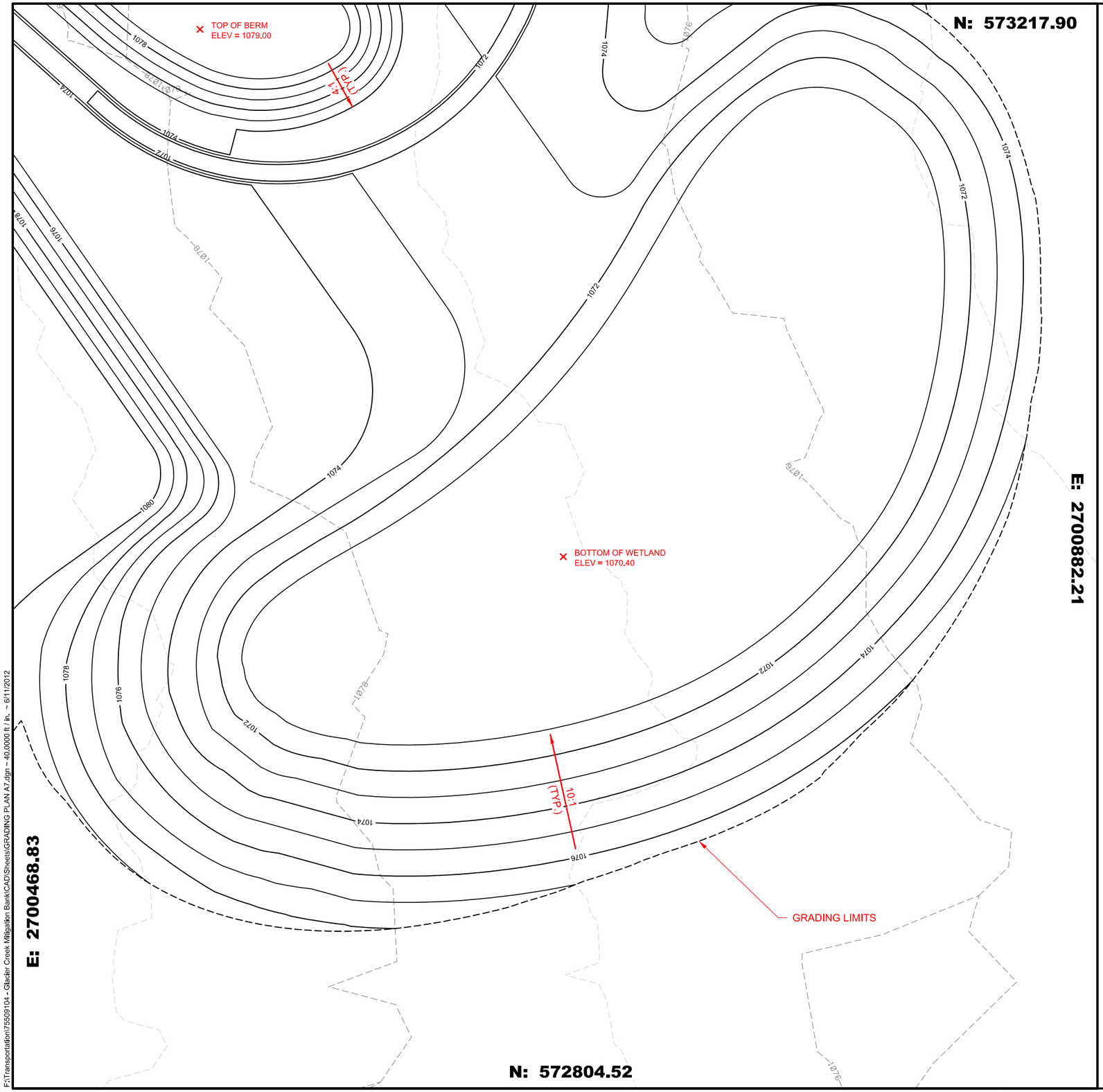
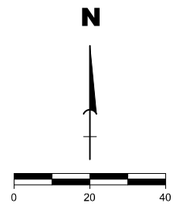
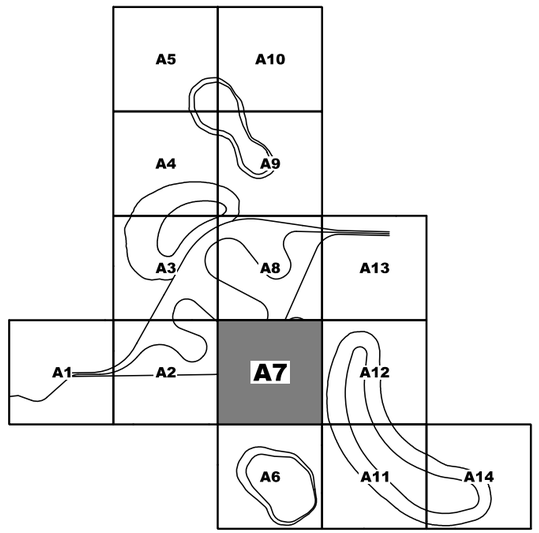
SHEET 42 OF 72

F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\GRADING PLAN A6.dgn – 40.0000 ft / in. – 6/11/2012







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GRADING PLAN A7

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SHEET 43 OF 72

N: 573631.28

E: 2700468.83

4:1 (TYP.)

TOP OF BERM
ELEV = 1074.00

TOP OF BERM
ELEV = 1075.50

10.5:1 (TYP.)

8.5:1 (TYP.)

GRADING LIMITS

E: 2700882.21

N: 573217.90

N

0 20 40

A5 A10 A4 A9 A3 A8 A13 A1 A2 A7 A12 A6 A11 A14

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GRADING PLAN A8

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SHEET 44 OF 72

F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\GRADING PLAN A8.dgn ~ 40.0000 ft / in. ~ 6/11/2012

N: 574044.66

E: 2700468.83

E: 2700882.21

N: 573631.28

BIG PAPILLION CREEK

BOTTOM OF WETLAND
ELEV = 1074.00

BOTTOM OF WETLAND
ELEV = 1069.50

10:1 (TYP.)

10:1 (TYP.)

GRADING LIMITS

N

0 20 40

A5 A10
A4 A9
A3 A8 A13
A1 A2 A7 A12
A6 A11 A14

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GRADING PLAN A9

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SHEET 45 OF 72

F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CADSheets\GRADING PLAN A9.dgn – 40.0000 ft / in. – 6/11/2012

N: 574458.04

E: 2700468.83

E: 2700882.21

N: 574044.66

BIG PAPILLION CREEK

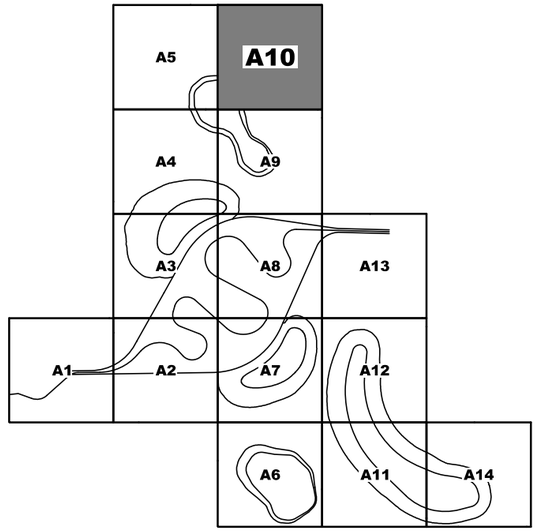
GRADING LIMITS

BOTTOM OF WETLAND
ELEV = 1074.00

10:1
(TYP.)

N

0 20 40



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GRADING PLAN A10

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SHEET 46 OF 72

F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\GRADING PLAN A10.dgn – 40.0000 ft / in. – 6/11/2012

N: 572804.52

E: 2700882.21

E: 2701295.59

N: 572391.14

8:1 (TYP.)

8:1 (TYP.)

8:1 (TYP.)

BOTTOM OF WETLAND
ELEV = 1066.00

GRADING LIMITS

1066 1068 1070 1072 1074

N

0 20 40

A5 A10 A4 A9 A3 A8 A13 A1 A2 A7 A12 A6 A11 A14

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GRADING PLAN A11

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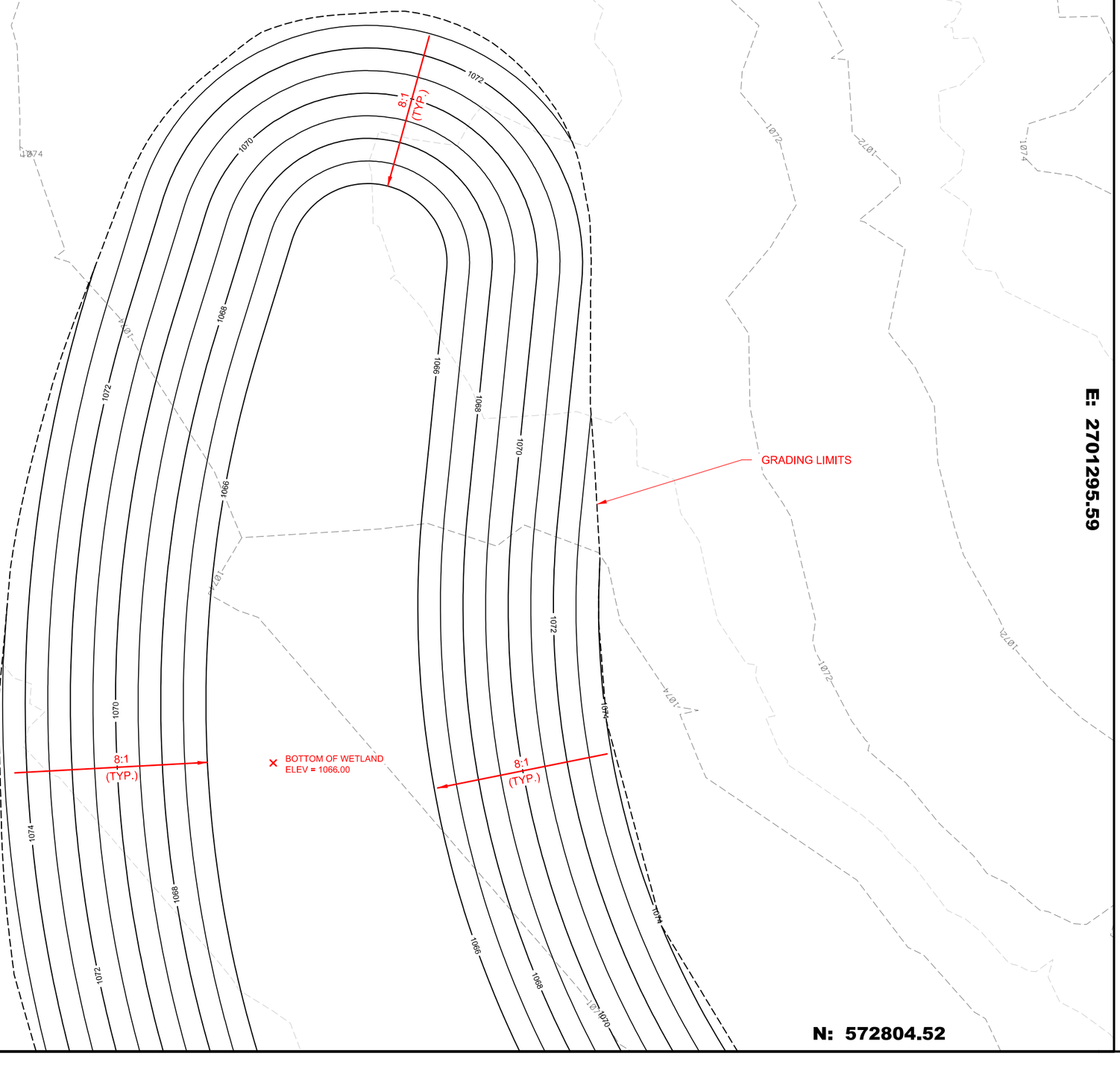
F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CADISheets\GRADING PLAN A11.dgn ~ 40.0000 ft / in. ~ 6/11/2012

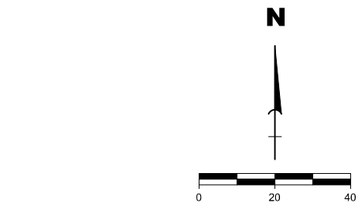
N: 573217.90

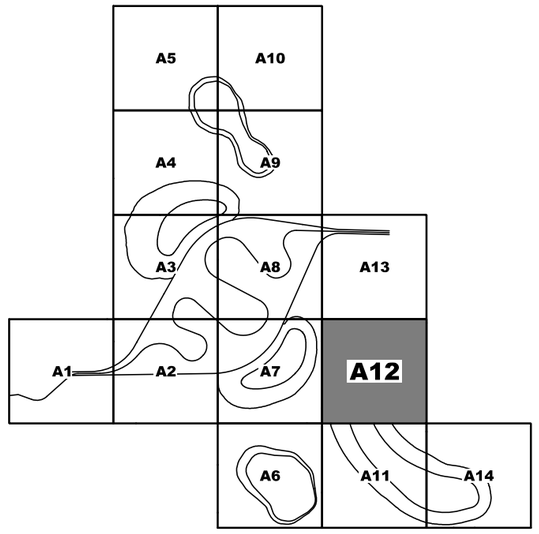
E: 2700882.21

E: 2701295.59

N: 572804.52







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GRADING PLAN A12

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DATE 6/11/2012

SHEET

48 OF 72

N: 573631.28

DROP STRUCTURE
FL = 1069.13

DROP STRUCTURE
FL = 1048.13

3:1 (TYP.)

2:1 (TYP.)

BIG PAPILLION CREEK

GRADING LIMITS

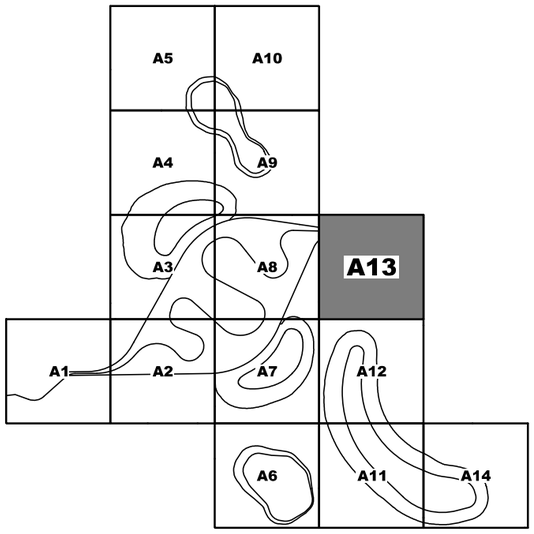
E: 2700882.21

E: 2701295.59

N: 573217.90

N

0 20 40



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GRADING PLAN A13

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SHEET 49 OF 72

F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\GRADING PLAN A13.dgn – 40.0000 ft / in. – 6/11/2012

N: 572804.52

E: 2701708.97

E: 2701295.59

N: 572391.14

GRADING LIMITS

BOTTOM OF WETLAND
ELEV = 1066.00

8:1 (TYP.)

BIG PAPILLION CREEK

N

0 20 40

A5 A10 A4 A9 A3 A8 A13 A1 A2 A7 A12 A6 A11 A14

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GRADING PLAN A14

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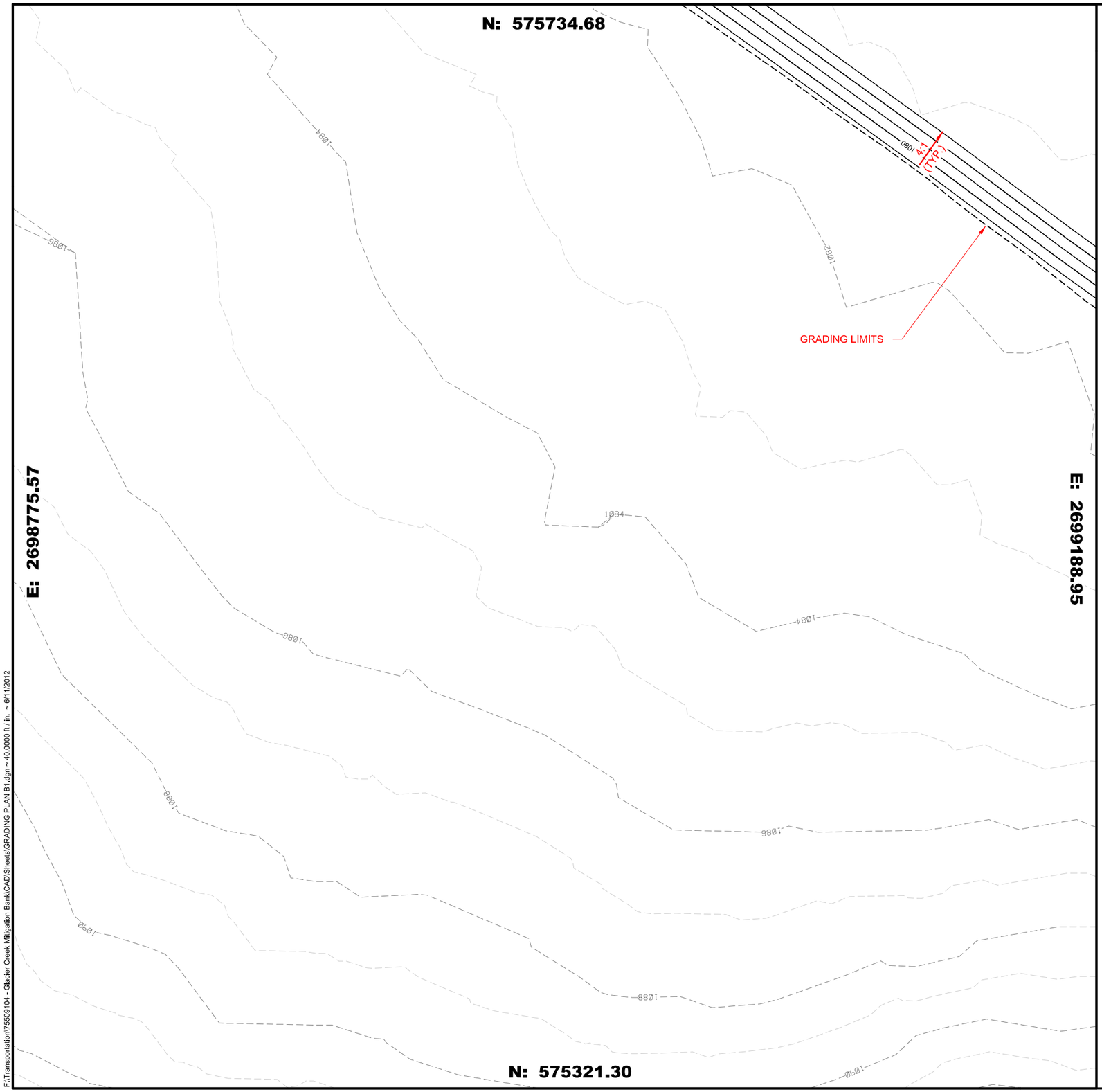
F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\GRADING PLAN A14.dgn - 40.0000 ft / in. - 6/11/2012

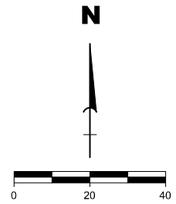
N: 575734.68

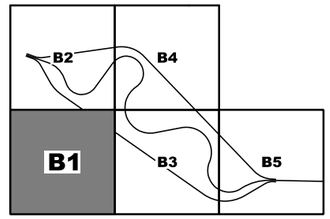
E: 2698775.57

E: 2699188.95

N: 575321.30







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GRADING PLAN B1

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F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\GRADING PLAN B1.dgn ~ 40.0000 ft / in. ~ 6/11/2012

N: 576148.06

E: 2699188.95

GRADING LIMITS

4:1 (TYP.)

E: 2698775.57

N: 575734.68

N

0 20 40

B2 B4 B1 B3 B5

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GRADING PLAN B2

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F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\GRADING PLAN B2.dgn ~ 40.0000 ft / in. ~ 6/11/2012

N: 575734.68

E: 2699188.95

E: 2699602.33

N: 575321.30

LOW POINT
ELEV = 1074.50

LOW POINT
ELEV = 1073.70

GRADING LIMITS

4:1 (TYP.)

N

0 20 40

B2 B4 B1 B3 B5

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GRADING PLAN B3

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SHEET 53 OF 72

F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\GRADING PLAN B3.dgn – 40.0000 ft / in. – 6/13/2012

N: 576148.06

E: 2699188.95

E: 2699602.33

N: 575734.68

GRADING LIMITS

BIG PAPILLION CREEK

4:1 (TYP.)

4:1 (TYP.)

TOP OF BERM
ELEV = 1078.00

N

0 20 40

B2 B4 B1 B3 B5

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GRADING PLAN B4

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F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\GRADING PLAN B4.dgn - 40.0000 ft / in. - 6/11/2012

N: 575734.68

E: 2699602.33

E: 2700015.71

N: 575321.30

TOP OF BERM
ELEV = 1078.00

DROP STRUCTURE
FL = 1071.79

DROP STRUCTURE
FL = 1049.79

GRADING LIMITS

4:1 (TYP.)

3:1 (TYP.)

2:1 (TYP.)

N

0 20 40

B1 B2 B3 B4 **B5**

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GRADING PLAN B5

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SHEET **55 OF 72**

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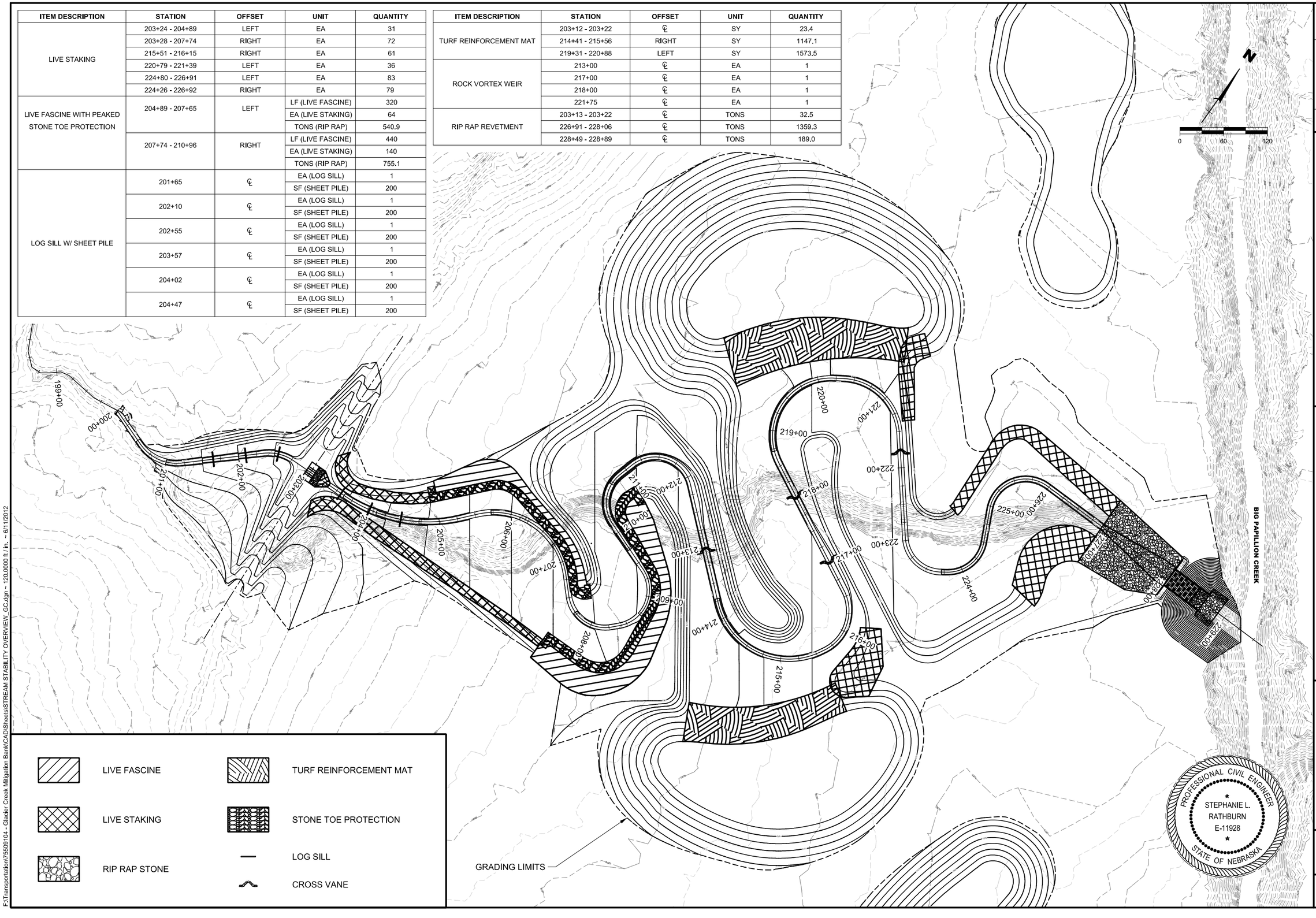
ITEM DESCRIPTION	STATION	OFFSET	UNIT	QUANTITY
LIVE STAKING	203+24 - 204+89	LEFT	EA	31
	203+28 - 207+74	RIGHT	EA	72
	215+51 - 216+15	RIGHT	EA	61
	220+79 - 221+39	LEFT	EA	36
	224+80 - 226+91	LEFT	EA	83
	224+26 - 226+92	RIGHT	EA	79
LIVE FASCINE WITH PEAKED STONE TOE PROTECTION	204+89 - 207+65	LEFT	LF (LIVE FASCINE)	320
			EA (LIVE STAKING)	64
			TONS (RIP RAP)	540.9
	207+74 - 210+96	RIGHT	LF (LIVE FASCINE)	440
			EA (LIVE STAKING)	140
			TONS (RIP RAP)	755.1
LOG SILL W/ SHEET PILE	201+65	℄	EA (LOG SILL)	1
			SF (SHEET PILE)	200
	202+10	℄	EA (LOG SILL)	1
			SF (SHEET PILE)	200
	202+55	℄	EA (LOG SILL)	1
			SF (SHEET PILE)	200
	203+57	℄	EA (LOG SILL)	1
			SF (SHEET PILE)	200
	204+02	℄	EA (LOG SILL)	1
			SF (SHEET PILE)	200
	204+47	℄	EA (LOG SILL)	1
			SF (SHEET PILE)	200

ITEM DESCRIPTION	STATION	OFFSET	UNIT	QUANTITY
TURF REINFORCEMENT MAT	203+12 - 203+22	℄	SY	23.4
	214+41 - 215+56	RIGHT	SY	1147.1
	219+31 - 220+88	LEFT	SY	1573.5
ROCK VORTEX WEIR	213+00	℄	EA	1
	217+00	℄	EA	1
	218+00	℄	EA	1
	221+75	℄	EA	1
RIP RAP REVETMENT	203+13 - 203+22	℄	TONS	32.5
	226+91 - 228+06	℄	TONS	1359.3
	228+49 - 228+89	℄	TONS	189.0



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GLACIER CREEK STREAM STABILITY PLAN OVERVIEW

GLACIER CREEK MITIGATION BANK

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SHEET **56 OF 72**

F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\STREAM STABILITY OVERVIEW_GC.dgn ~ 120.0000 ft / in. ~ 6/11/2012

N

0 25 50

199+00

200+00

GLACIER CREEK

201+00

202+00

203+00

204+00

205+00

ACCESS ROAD

LIVE FASCINE

LIVE STAKING

RIP RAP STONE

TURF REINFORCEMENT MAT

STONE TOE PROTECTION

LOG SILL

CROSS VANE

NO.	REVISIONS	DATE

STREAM STABILITY PLAN
GLACIER CREEK

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SHEET
57 OF 72

F:\Transportation\75509104 - Glacier Creek Mitigation Bank\CAD\Sheets\STREAM STABILITY PLAN 1.dgn – 50.0000 ft / in. – 6/11/2012

STREAM STABILITY PLAN
GLACIER CREEK

GLACIER CREEK MITIGATION BANK

NO.	REVISIONS	DATE

N

0 25 50

206+00
207+00
208+00
209+00
210+00
211+00
212+00
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- LIVE FASCINE
- LIVE STAKING
- RIP RAP STONE
- TURF REINFORCEMENT MAT
- STONE TOE PROTECTION
- LOG SILL
- CROSS VANE

PROFESSIONAL CIVIL ENGINEER
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STATE OF NEBRASKA

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SHEET 58 OF 72

N

0 25 50

LIVE FASCINE

LIVE STAKING

RIP RAP STONE

TURF REINFORCEMENT MAT

STONE TOE PROTECTION

LOG SILL

CROSS VANE

220+00

221+00

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STREAM STABILITY PLAN
GLACIER CREEK
GLACIER CREEK MITIGATION BANK

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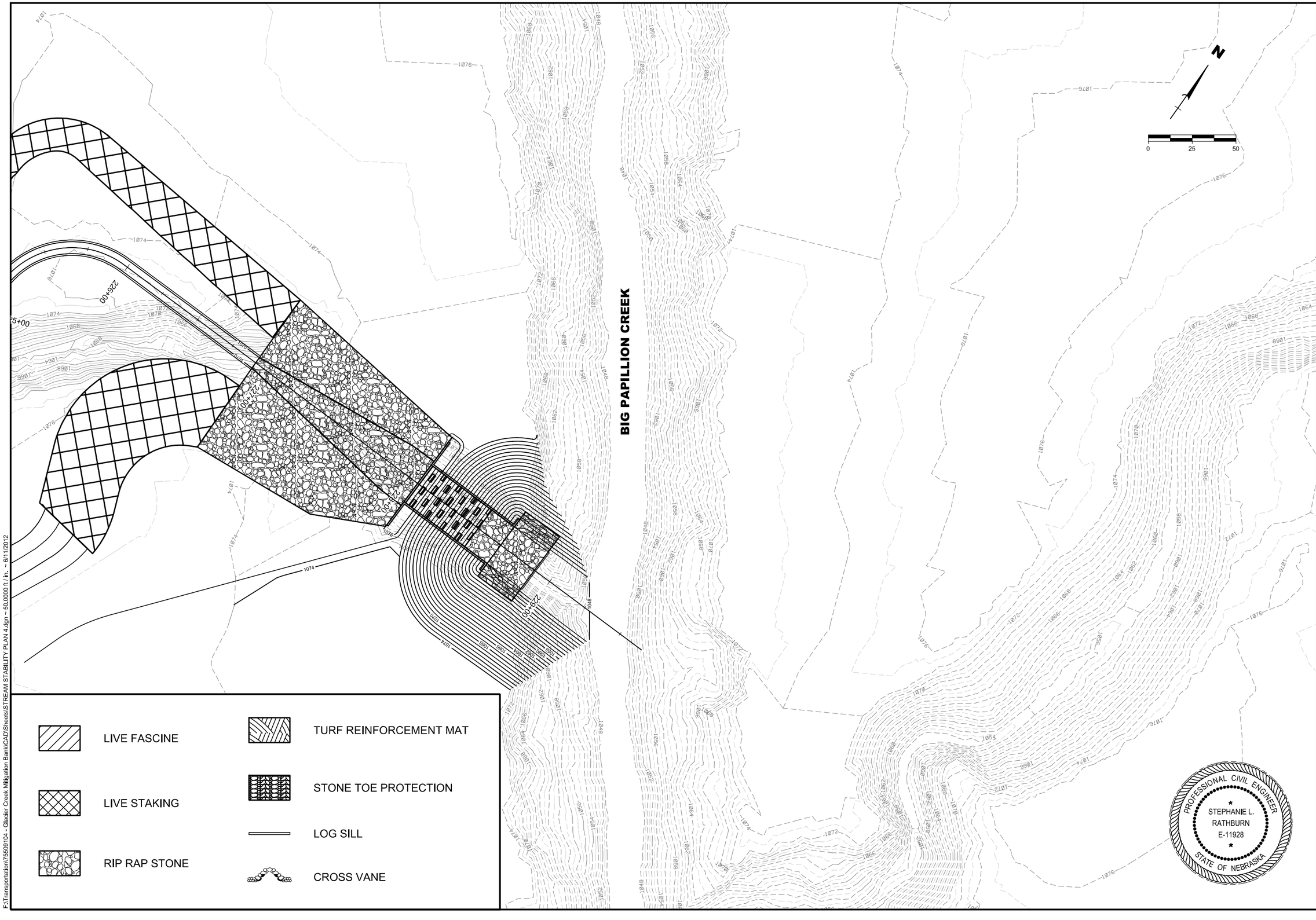

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ITEM DESCRIPTION	STATION	OFFSET	UNIT	QUANTITY
LIVE STAKING	404+80 - 416+56	LEFT	EA	226
	413+47 - 416+56	RIGHT	EA	199
RIP RAP REVETMENT	416+00 - 416+56	℄	TONS	477.1
	417+01 - 417+41	℄	TONS	114.1

N

0 60 120

BIG PAPILLION CREEK

401+00 402+00 403+00 404+00 405+00 406+00 407+00 408+00 409+00 410+00 411+00 412+00 413+00 414+00 415+00 416+00 417+00 418+00 490+00

LIVE FASCINE

LIVE STAKING

RIP RAP STONE

TURF REINFORCEMENT MAT

STONE TOE PROTECTION

LOG SILL

CROSS VANE

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STREAM STABILITY PLAN
NORTH CREEK OVERVIEW

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LIVE FASCINE

LIVE STAKING

RIP RAP STONE

TURF REINFORCEMENT MAT

STONE TOE PROTECTION

LOG SILL

CROSS VANE

400+00 401+00 402+00 403+00 404+00 405+00 406+00 407+00 408+00 409+00 410+00 411+00

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STREAM STABILITY PLAN
NORTH CREEK

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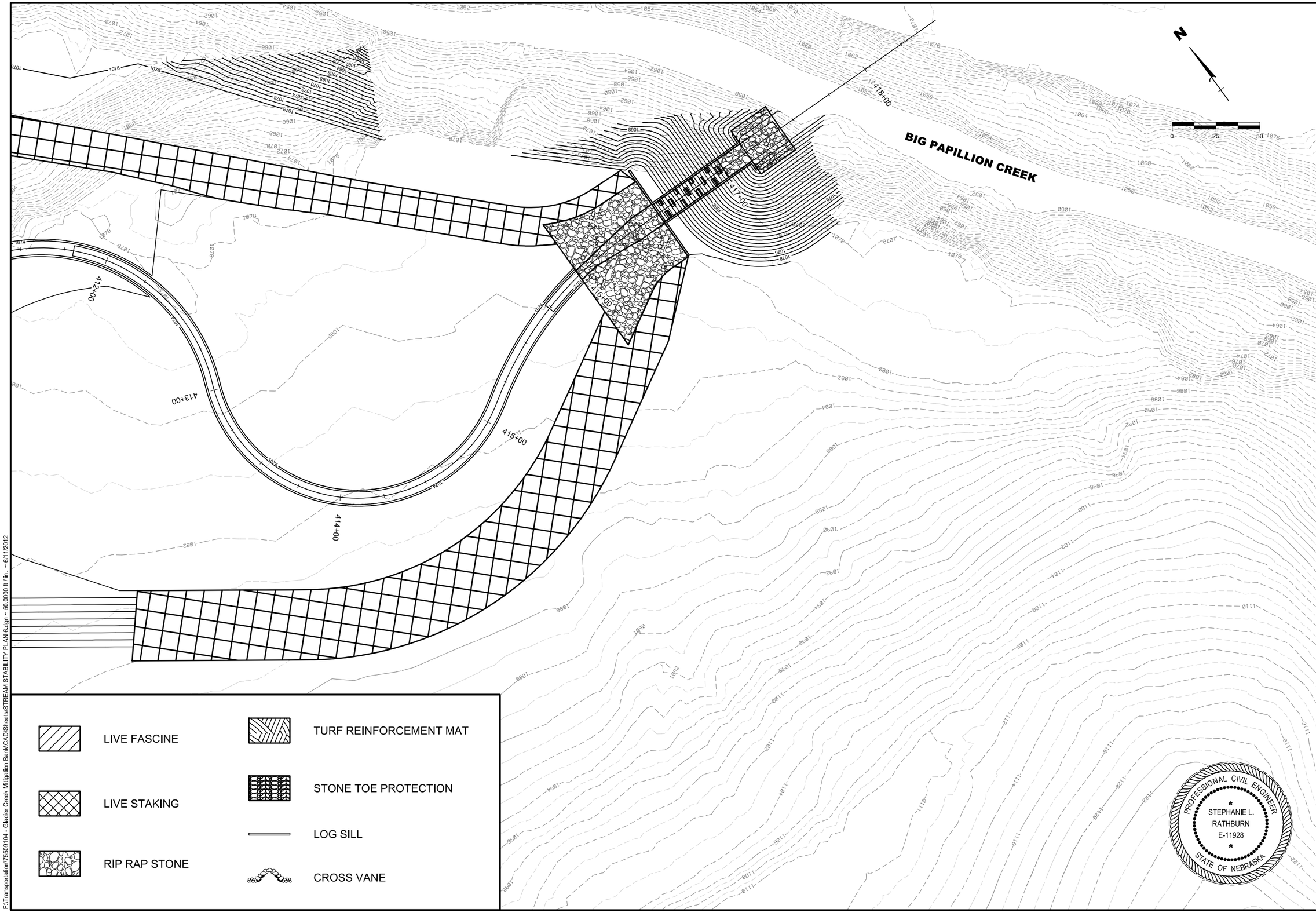

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STREAM STABILITY PLAN
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SHEET
63 OF 72

GENERAL BIO-ENGINEERING NOTES:

1. The collections and installation of live cuttings for use in fascines and for live stakes shall be during the dormant season (approximately November 1 until April 1). Plant materials harvested for use shall not be "in leaf" or have leaf buds which have broken as part of the spring leaf development process. Fall harvested cuttings shall have lost all leaves from previous growing season and be fully hardened for winter.

2. Plant material used for live cuttings shall be harvested from at least two different approved sites and intermixed during installation.

3. The CONTRACTOR will be responsible for locating and harvesting live cuttings from local sources. The CONTRACTOR shall contact the ENGINEER and the Natural Resources District to receive approval for the source of live stake cutting prior to harvesting.

4. Immediately following harvesting, live cuttings shall be soaked for a period of 10-12 days prior to installation to fully hydrate the plant tissues. Soak cuttings in fresh water such as an existing pond, backwater zone of a river, small plastic-lined pond or holding tank large enough to allow dormant cuttings to be fully submerged. To avoid bacterial growth and rotting, do not soak cuttings in stagnant water. Ensure cuttings are removed from the water and installed before the emergence of roots.

5. Live cuttings shall be harvested by making a clean square cut between 8 to 10 inches above the ground. Care shall be taken during harvesting and subsequent handling to avoid damaging or stripping the bark from the cutting. Cuttings shall be placed in an orderly manner on the transport vehicle so that all the growing tips are pointed forward. A tarp or other covering shall be used during transport to minimize desiccation. Cuttings shall be removed from the truck within four hours of harvest and either installed or stored in compliance with these notes.

6. Approved species of live cuttings for live stakes and live fascines include all willows (Salix species) native to the Omaha area, Redosier Dogwood (Cornus sericea), Common Elderberry (Sambucus canadesis) and other wetland woody species approved by the ENGINEER. Only woody species native to local wetlands will be considered for approval.

7. Twine used to tie live fascine bundles shall be a natural sisal twine that is un-dyed. The twine shall have a minimum tensile strength of 75 pounds. The twine shall contain no plastic or other synthetic materials.

8. For live cuttings to root down properly it is important that continuous contact exist between the stems of the live cuttings and the adjacent soils. Contractor shall take care when backfilling around all types of live cuttings to ensure that all void areas are filled with soil. Contractor shall avoid backfilling with exremely wet soils, dry soils with large clods or clumps and shall apply water as needed to wash soil into voids between stems and other materials.

LIVE FASCINES:

1. This work shall consist of furnishing all live cuttings, labor, materials and equipment, and performing all work necessary and incidental to the installation of live fascines in accordance witht hese specifications while conforming to the lines, grades and dimensions shown on the Drawings.

2. Live cuttings for fascines shall have diameters between 3/4 and 1 1/2 inch diameters with a length between 5 to 12 feet long. Side branches shall be left intact. Willows shall make up at least 90% of the live cuttings used in the fascine.

3. Fascines shall be constructed by tying live cuttings tied together with twine every 2 feet to form a 6 to 8 inch diameter cylindrical structure. All the growing tips shall be oriented in the same direction in the fascine. Stagger the live cuttings so the growing tips are evenly distriubted in the fascine. Trim the length of individual live cuttings at each end of a fascine to achieve the staggered pattern of growing tips. The length of fascines can be constructed as needed, but generally shall be between 8 to 12 feet long. The installed length of each fascine shall be as indicated on the Drawings.

4. Dig a trench 4 to 6 inches deep and 8 to 10 inches wide within the areas indicated on the Drawings. The trench shall be dug at an angle to the contour of the side slope. The material dug from the trench shall be used for back fill.

5. Set live fascine in the trench with the growing tips pointing uphill. Dead stout stakes shall be driven through the center of the fascine 3 feet on center. Orient stakes with 4 inch width perpendicular to stream. Drive stake so tops protrude 2 inches above bundle. Live stout stakes shall then be driven at an angle on the down slope side of the fascine just below dead stakes, and at mid-points between adjacent dead stout stakes.

6. Cover fascine with remainder of excavated soil. Ensure good soil to stem contact by working soil into voids between live cuttings and using water to wash soil into spaces between inner cuttings. Provide additional soil as needed to complete the backfill operation. Do not fully bury fascine but leave portion of upper surface exposed to sunlight to promote sprouting.

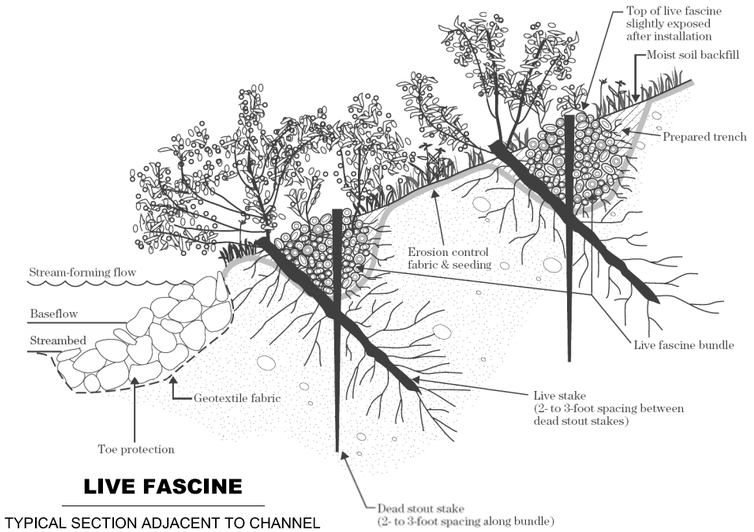
LIVE STAKING:

1. Live stakes used on unarmored slopes shall consist of live cuttings between 3/4 to 3 inches in diameter and approximately 3 feet long. Side branches shall be removed with the bark intact to form a single stem. Cut the basal (bottom) end to a 45-degree angle or sharpen to a pointed end to facilitate driving. The top end should be cut flat.

2. Live stakes shall be installed using punch bar, hand auger or waterjet stinger.

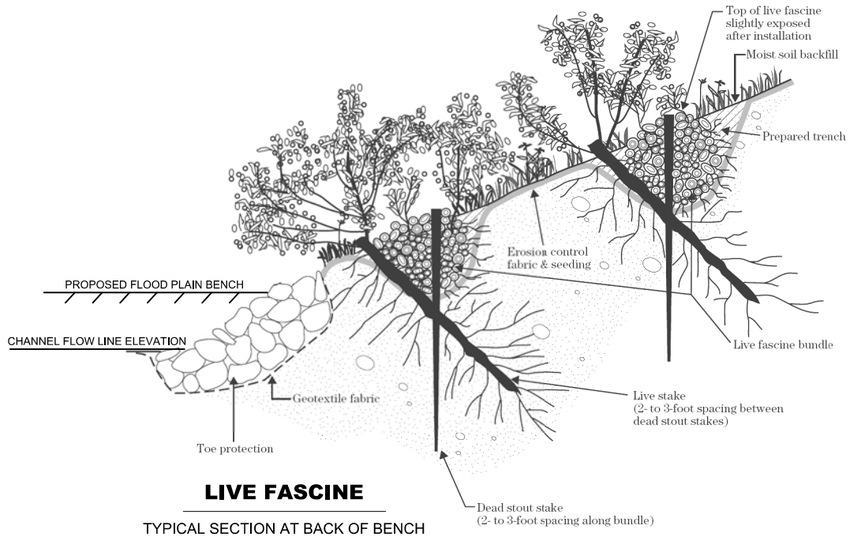
3. Holes for live stakes shall be 2/3 to 3/4 the length of the live cutting. Make hole diameter as close to the live cutting's diameter as possible. Do not allow significant amounts of sediment to bubble up out of hole while drilling.

4. Once the hole has been created, immediately push the live stake into the hole to the indicated depth. Replace any soil that may have bubbled out and created a depression around the stake. Replace with a mud slurry to prevent all pockets around the stake and in the soil.



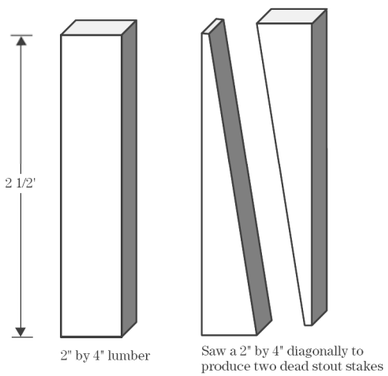
LIVE FASCINE

TYPICAL SECTION ADJACENT TO CHANNEL

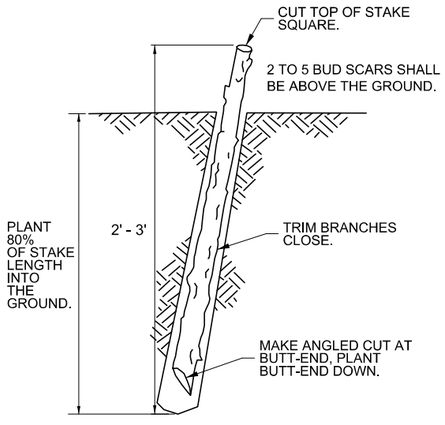


LIVE FASCINE

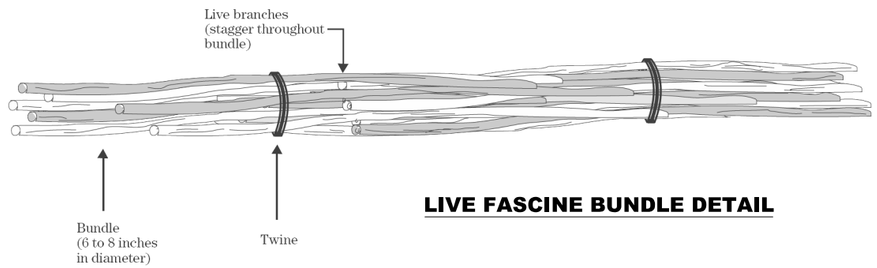
TYPICAL SECTION AT BACK OF BENCH



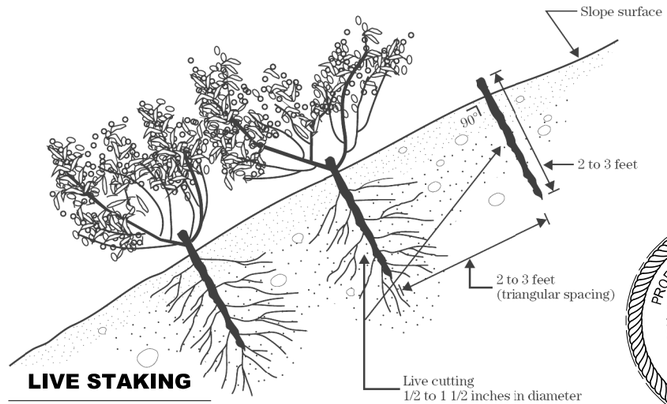
LIVE FASCINE DEAD STAKE DETAIL



LIVE STAKE DETAIL



LIVE FASCINE BUNDLE DETAIL



LIVE STAKING

TYPICAL SECTION

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DETAILS LIVE STAKING & LIVE FASCINE

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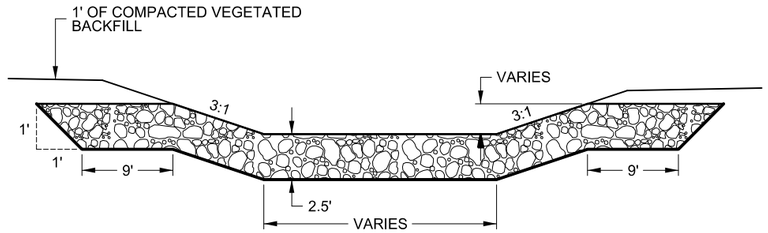


RIP RAP TYPICAL CROSS SECTION

RIP RAP UPSTREAM REVETMENT EDGE

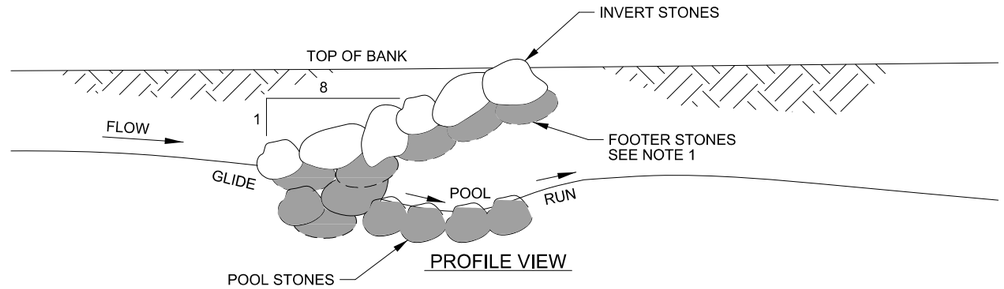
RIP RAP DOWNSTREAM REVETMENT EDGE

NOTES:

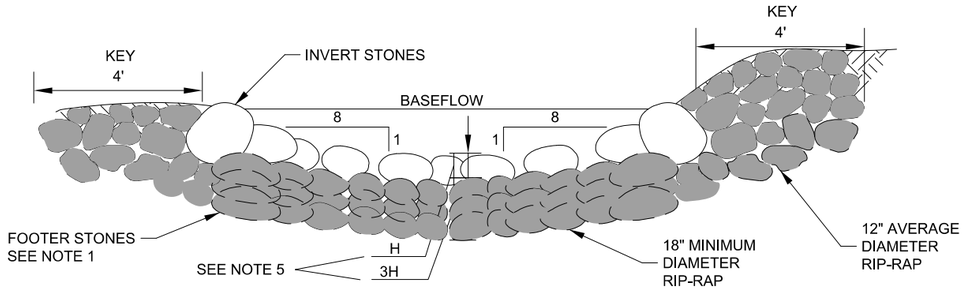
1. ALL ROCK RIP RAP STABILIZATION SHALL BE COVERED WITH 6" SOIL TAMPERED OR LIGHLTLY COMPACTED IN PLACE.
2. ROCK RIP RAP FOR BANK STABILIZATION SHALL BE NDOR TYPE "C" RIP RAP.

RIP RAP REVETMENT

NOT TO SCALE



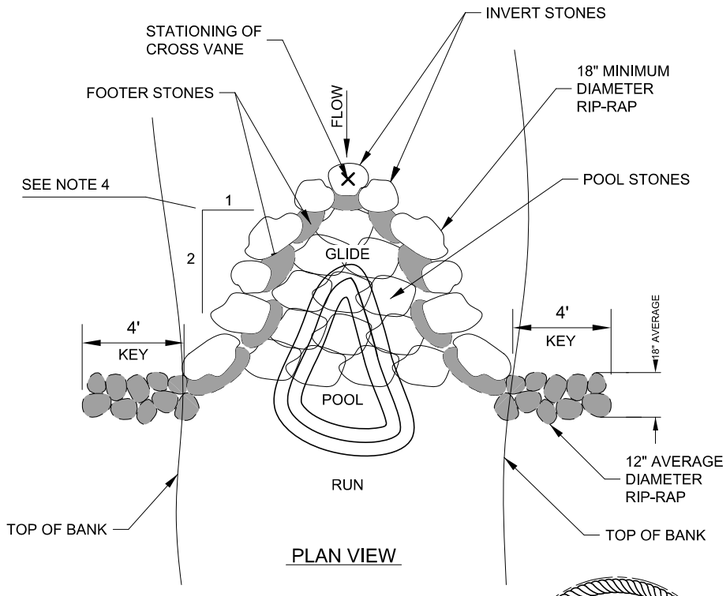
PROFILE VIEW



CROSS-SECTION VIEW

NOTES:

1. ALL STONES SHALL BE PLACED SUCH THAT INVERT STONES ARE SLIGHTLY UPSTREAM OF FOOTER STONES AS SHOWN IN DETAIL. STREAM FLOW SHOULD CAUSE THE INVERT STONES TO BEAR INTO FOOTER STONES PUTTING THEM IN COMPRESSION SO AS TO MAINTAIN STRUCTURE INTEGRITY.
2. 18" MINIMUM DIAMETER RIP-RAP SHALL BE USED FOR CONSTRUCTION OF FOOTER ROCK, INVERT ROCK, AND POOL ROCK IN VANES. 12" AVERAGE DIAMETER RIP-RAP SHALL BE USED FOR CONSTRUCTION OF KEYS.
3. ALL STRUCTURES SHALL BE KEYED INTO BANKS. KEYS SHALL BE AS DEEP AS THE STRUCTURE AND SHALL BE A LENGTH OF 4' AND ALIGNED PERPENDICULAR TO BANK. ROCK SHALL MATCH EXISTING OR PROPOSED GRADE, BACK FILL AND COMPACT TO 90%.
4. VANES SHALL BE ANGLED AWAY FROM TOP OF LOW FLOW CHANNEL BANK AT A 2:1 SLOPE AND ANGLED DOWN AT A 8:1 SLOPE.
5. FOOTER STONE DEPTH SHALL BE 3 TIMES THE EXPOSED HEIGHT OF THE DEEPEST (INVERT) ROCK.
6. GAPS BETWEEN INVERT STONES SHALL BE NO GREATER THAN 2".



PLAN VIEW

ROCK VORTEX WEIR

NOT TO SCALE

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STATE OF NEBRASKA

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DETAILS ROCK VORTEX WEIR & RIP RAP REVETMENT

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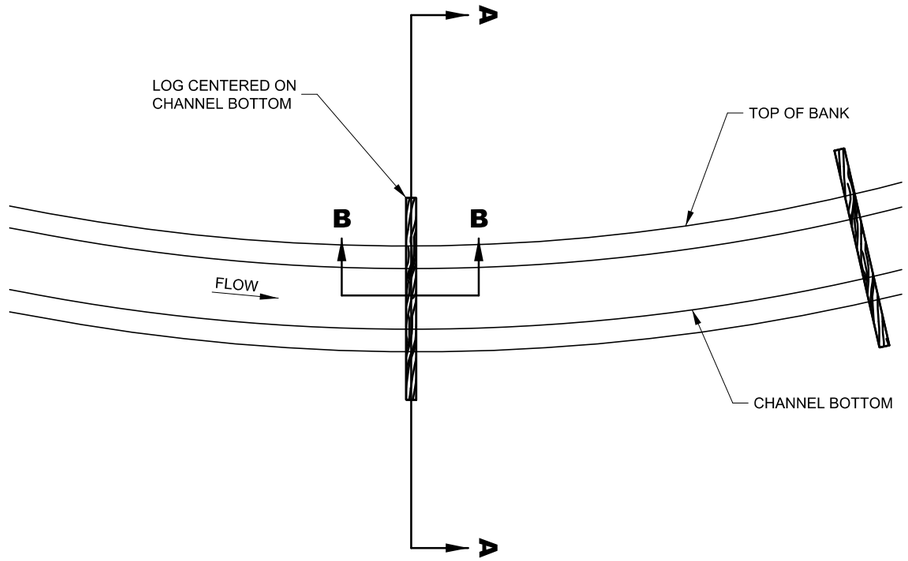
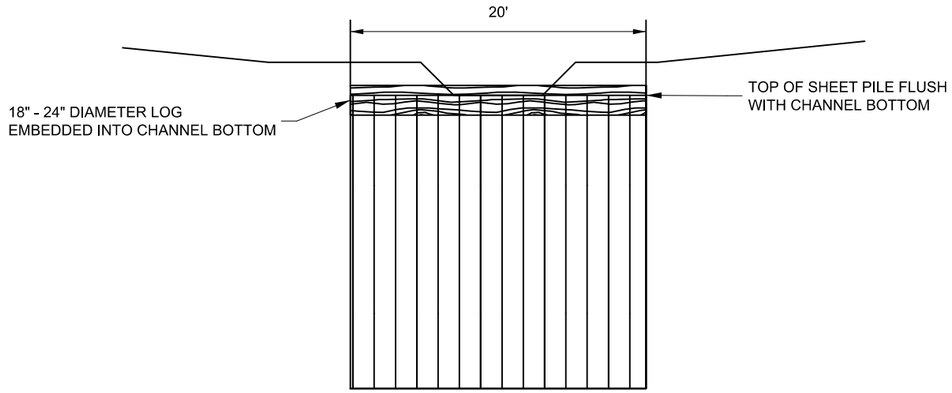
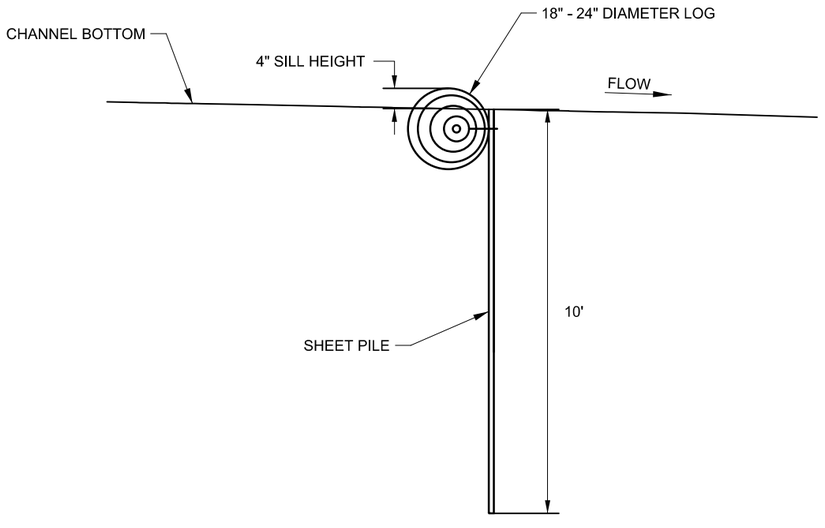




SECTION A - A



SECTION B - B

LOG SILL

NOT TO SCALE

NOTES:

1. LOGS SHALL BE SALVAGED FROM EXISTING TREES TO BE REMOVED DURING CLEARING AND GRUBBING ACTIVITIES. THE ENGINEER SHALL APPROVE THE USE OF ANY TREE PRIOR TO INSTALLATION AS A LOG SILL.

2. ALL SHEET PILING SHALL CONFORM TO ASTM A328/A328M STEEL AND SHALL MEET THE FOLLOWING MINIMUM REQUIREMENTS:

MIN. SECTION LENGTH (BELOW TOP OF SLAB)	8.0 FT.
MAX. SECTION DEPTH.....	10.00 IN.
MIN. SECTION THICKNESS.....	0.25 IN.
MIN. SECTION MODULUS.....	13.0 CUBIC IN./FT.

3. USED OR SALVAGED SHEET PILES MAY BE USED SUBJECT TO THE REVIEW AND ACCEPTABLE INSPECTION BY THE ENGINEER. USED OR SALVAGED SHEET PILE SHALL NOT CONTAIN HOLES OR TEARS.

4. LOG SILL SHALL BE MEASURED FOR PAYMENT BY EACH SILL LOCATION. THE WORK SHALL INCLUDE PREPARING LOGS SALVAGED DURING TREE REMOVAL, EXCAVATION, PLACING LOGS, BACKFILLING, GRADING AND SHAPING OF THE SILL, AND OTHER WORK INCIDENTAL TO COMPLETING THE LOG SILL AS PER THE DETAILS.

SHEET PILING WILL BE MEASURED FOR PAYMENT BY THE SQUARE FOOT. THE AREA IS OBTAINED BY MULTIPLYING THE LENGTH OF THE SHEETS DRIVEN BY THE MANUFACTURER'S NOMINAL DRIVING WIDTH OF EACH SHEET. THE PAY QUANTITY WILL BE BASED ON THE SHEET PILE WALL DIMENSIONS SHOWN. THE CONSTRUCTED WALL LENGTH SHALL BE WITHIN ±16" OF THE SHEET PILE WALL DIMENION SHOWN. PAYMENT AT THE CONTRACT UNIT PRICE "SHEET PILING" SHALL BE FULL COMPENSATION FOR ALL LABOR, MATERIALS AND EQUIPMENT, INCLUDING THE MANUFACTURE, DELIVERY AND ERECTION OF THE SHEET PILING AND PILE DRIVING, BACKFILLING, GRADING AND SHAPING FOR THE WEIR, AND OTHER INCIDENTALS NECESSARY TO COMPLETE THE SHEET PILE WALL AS SHOWN IN THE DETAILS.

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LOG SILL DETAILS

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SHEET
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N

0 150 300

LEGEND

CREATED WETLAND

EXISTING WETLAND

PROPERTY BOUNDARY

BIG PAPILLION CREEK

GLACIER CREEK

NORTH CREEK

ACCESS ROAD

A

B

C

D

E

F

G

STRIP AND REMOVE SMOOTH BROME (BROMUS INERMIS) AND RE-SEED WITH SEED OATS (AREA = 1.3 ACRES). PLANT TWENTY FIVE (25) BUR OAK (QUERCUS MACROCARPA) (1" MINIMUM CALIPER) EVENLY THROUGH AREA. SEE ENGINEER FOR TREE PLANTING LOCATIONS.

REMOVE TREES (APPROXIMATELY 20 FEET TALL) IN 0.85 ACRE AREA. PLANT NURSE CROP OF SEED OATS. PERMANENT SEEDING PROVIDED BY OTHERS.

APPLY HERBICIDE TO CANADA THISTLE (CIRSIUM ARVENSE) AS INSTRUCTED BY ENGINEER IN FIELD. AREA OF APPLICATION: 100 SQ. FT.

REMOVE THREE (3) MATURE MULBERRY (MORUS ALBA) TREES.

APPLY HERBICIDE TO REED CANARY GRASS (PHALARIS ARUNDINACEA) AS INSTRUCTED IN FIELD BY ENGINEER. AREA OF APPLICATION: 500 SQ. FT.

APPLY HERBICIDE TO REED CANARYGRASS (PHALARIS ARUNDINACEA) AS INSTRUCTED IN FIELD BY ENGINEER. AREA OF APPLICATION: 500 SQ. FT.

REMOVE MAN-MADE STOCK PILE OF SOIL ALONG DRAINAGE. APPROXIMATELY 250 CY.

STRIP HERBACEOUS VEGETATION SMOOTH BROME (BROMUS INERMIS) AND 2 INCHES OF TOPSOIL. DO NOT MIX WITH NEW SURFACE SOIL.

REMOVE TREES. SET ASIDE TEN (10) 10-20 FOOT TALL TRUNKS TO BE USED FOR CONSTRUCTING LOG SILLS AND FOR USE AS HABITAT FEATURES IN WETLANDS. SEE ENGINEER FOR PLACEMENT OF HABITAT FEATURES. SEE STREAM STABILITY PLAN AND DETAIL SHEETS FOR LOCATIONS AND PLACEMENT OF LOG SILLS.

NOTES:

1. BROME REMOVAL - DISPOSE IN AREAS OF FILL AS DIRECTED BY ENGINEER. MAY NOT BE PLACED IN TOP 3 FEET OF EMBANKMENT OR WITHIN 20 FEET OF DROP STRUCTURES.

2. SEE GEOTECHNICAL NOTES FOR RECOMMENDED SOIL COMPACTION TABLE.

SINGLE TREE PLANTING

BOTANICAL NAME	COMMON NAME	SIZE	UNIT	QUANTITY
Quercus macrocarpa	bur oak	1-inch Min. Caliper	EA	25

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WETLAND AND VEGETATION PLAN

GLACIER CREEK MITIGATION BANK

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LEGEND

N

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CONTOUR

GRADING LIMITS

PROPERTY BOUNDARY

POTENTIAL HAUL ROUTE

PROPOSED CHANNEL ALIGNMENT

STOCK PILE / EARTH SPOIL AREA

NOTE:

PROJECT AREA WILL HAVE CROPS. MINIMIZE DAMAGE TO GRADING AREAS, HAUL ROADS, SOIL AND STOCK PILE AREAS.

HISTORIC BRIDGE

PROPERTY BOUNDARY

BIG PAPILLION CREEK

GLACIER CREEK

TEMPORARY STOCK PILE / PERMANENT EARTH SPOIL AREA

ACCESS ROAD

CONTRACTOR ACCESS TO THE SITE

NORTH CREEK

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STORM WATER POLLUTION PREVENTION PLAN

SITE ACCESS

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GRADING PLAN GENERAL NOTES

1. All project procedures and materials shall conform to the following publication and any additions thereto: Omaha Regional Stormwater Design Manual and the Supplemental BMP Guide. The aforementioned publications can be found at http://www.PCWPErosionControl.org.

2. All OPERATORS/CONTRACTORS must comply with all noise and dust control ordinances of applicable government agencies.

3. All OPERATORS/CONTRACTORS must locate all existing utilities prior ot he start of work (One Call 344-3565).

4. All OPERATORS/CONTRACTORS shall be responsible to comply with OSHA regulations.

5. All OPERATORS/CONTRACTORS must confirm with the APPLICANT that any and all applicable governmental approvals have been received prior to the start of work.

6. The APPLICANT and INSPECTOR must comply with all government regulators in regards to the construction activities so as to minimize the potential for erosion.

7. All OPERATORS/CONTRACTORS must comply with the APPLICANT/INSPECTOR and all government regulators in regards to the construction activities so as to minimize the potential for erosion and pollution.

8. Each OPERATOR/CONTRACTOR must monitor Silt Fencing, within their areas of responsibility, and install additional silt fencing if necessary and as directed by the INSPECTOR.

9. Each OPERATOR/CONTRACTOR shall periodically remove accumulated sediment from Temporary Sediment Traps, Temporary Sediment Basins, behind Silt Fences, and all other erosion control measures that store sediment, within their areas of responsibility, if necessary and as directed by the INSPECTOR.

10. Each OPERATOR/CONTRACTOR must build stabilized Construction Entrances, within their areas of responsibility and as defined within the SWPPP. Each OPERATOR/CONTRACTOR must monitor all stabilized Construction Entrances, within their areas of responsibility, and maintain the entrances as needed and directed by the INSPECTOR. OPERATORS/CONTRACTORS shall not use any other acess to the site or allow others to use alternate access points.

11. Each OPERATOR/CONTRACTOR must perform preventative maintenance on each Best Management Practice (BMP), within their areas of responsibility, to ensure proper function. The INSPECTOR must ensure preventative maintenance is being performed.

12. All BMPs must be kept in working order. Each OPERATOR/CONTRACTOR must repair all damages caused by pollutant discharge and construction activities, within their areas of responsibility, at or before the end of each working day and as directed by the INSPECTOR.

13. BMPs may not be removed without INSPECTOR and applicable government approval.

14. Each OPERATOR/CONTRACTOR shall be responsible for adhering to all BMPs, within their areas of responsibility.

15. In the event of a release of oil or hazardous substance, all OPERATORS/CONTRACTORS shall comply with the requirements of the Nebraska Department of Environmental Quality for notification, containment, investigation, remedial action and disposal.

16. The APPLICANT, INSPECTOR, and CONTRACTOR/OPERATORS must ensure Temporary Diversion Dike and Temporary Fill Diversion are constructed as shown within the SWPPP and as necessary to properly control pollutant discharge. Temporary Diversion Dike and Temporary Fill Diversion shall be isntalled at the end of each working day, prior to all rain events, and as directed by the INSPECTOR.

17. The APPLICANT, INSPECTOR, and/or OPERATORS/CONTRACTORS shall allow all government regulators access to the site for inspections at any time, at the implementing agency's discretion.

18. The APPLICANT, INSPECTOR, and CONTRACTORS/OPERATORS must initiate stabilization measures, such as Temporary Seeding, Permanent Seeding, and/or Mulching, as soon as possible in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction in that portion of the site have temporarily or permanently ceased. The Temporary Seeding (9.5.20), Permanent Seeding (9.5.21), and Mulching (9.5.23) BMPs presented within the Omaha Regional Stormwater Design Manual must be adhered to at all times. The aforementioned publications can be found at http://www.PCWPErosionControl.org.

19. For Dust Control, the APPLICANT, INSPECTOR, and CONSTRUCTOR/OPERATORS must use any of the following measures or a combination if necessary: establishing Temporary Seeding, Permanent Seeding, and/or Mulch in areas subject to little or no construction traffic; irrigating stripped areas and/or haul roads; reducing vehicular speed on haul roads; and as directed by the INSPECTOR. Furthermore, the Dust Control (9.5.17) BMP presented within the Omaha Regional Stormwater Design Manual must be adhered to at all times. The aforementioned publications can be found at http://www.PCWPErosionControl.org.

20. The APPLICANT, INSPECTOR, and CONTRACTORS/OPERATORS must ensure sediment that has been accidentally transported onto public streets is removed as needed, at the end of each working day, and prior to all rain events. Sediment shall be shoveled and/or swept from the street and disposed of in a manner that prevents stormwater contamination. Furthermore, the Street Cleaning / Sweeping (SM-4) BMP presented within the Supplemental BMP Guide must be adhered to at all times. The aforementioned publications can be found at http://www.PCWPErosionControl.org.

21. The APPLICANT, INSPECTOR, and CONTRACTORS/OPERATORS must adhere to all Good Housekeeping BMPs presented within the Supplemental BMP Guide. Good Housekeeping BMPs focus on keeping the work site clean and orderly while handling materials and waste in a manner that eliminates the potential for pollutant runoff. Good Housekeeping BMPs such as Sanitary Waste Management (SM-1), Solid Waste Management (SM-2), Material Delivery & Storage (SM-3), Street Cleaning / Sweeping (SM-4), and Vehicle & Equipment Fueling (SM-5) must be addressed when applicable. The aforementioned publications can be found at http://www.PCWPErosionControl.org.

22. To better inform all concerned parties about the existence of the SWPPP, the APPLICANT, INSPECTOR, and CONTRACTORS/OPERATORS must ensure an easily visible and legible sign be prominently posted at conspicuous locations near all site entry points. All signs must be in conformance with the SWPPP Notification Sign (SM-6) presented within the Supplemental BMP Guide. The aforementioned publications can be found at http://www.PCWPErosionControl.org.

23. The SWPPP documents (e.g. NDEQ-NPDES, SWPPP-SM, SWPPP-N, etc.) are essential and a requirement in one part is as binding as though occurring in all. The SWPPP documents are complementary. The documents describe and provide the complete SWPPP. The APPLICANT, INSPECTOR, and/or CONTRACTORS/OPERATORS may not take advantage of any apparent SWPPP errors or omissions. The INSPECTOR shall notify the APPLICANT, DESIGNER, and CONTRACTOR/OPERATOR promptly of any ommisions or errors. The APPLICANT shall instruct the DESIGNER to make any corrections necessary to fulfill the overall intent of the SWPPP Documents (e.g. Grading Permit Modification Form). In the case of a discrepancy between parts of the SWPPP documents, the most stringent requirement shall rule.

24. In construction of controlled fills, all soils shall be compacted as specified in the Compaction Requirements Table (See Sheet 3).

25. No trees shall be removed without approval of the ENGINEER.

26. Do not distrub existing vegetation outside limits of grading.

27. Maintain drainage in existing road ditches at all entrances and from all culverts draining onto the site.

28. Topsoil shall be stripped to a minimum depth of 4 inches and stockpiled within the limits of grading. Do not strip more area than is required for working space. Stockpiled topsoil shall be evenly respread across disturbed areas not being paved.

BMPs MAINTENANCE SCHEDULE

The following Maintenance Schedule has been provided. The INSPECTOR must perform the inspections. The OPERATOR/CONTRACTOR must perform all needed maintenace. Furthermore, all erosion control features requiring maintenance may not be listed below. The OPERATOR/CONTRACTOR and INSPECTOR must perform their respective duties on all BMPs that are not listed below as well.

1. Construction Entrance - The entrance shall be maintained in a condition which will prevent tracking or flow of sediment onto public rights-of-way. This may require periodic top dressing with additional stone or the washing and reworking of existing stone as conditions demand and repair and/or cleanout of any structures used to trap sediment. All materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains must be removed immediately. The use of water trucks to remove materials dropped, washed, or tracked onto roadways will not be permitted under any circumstance.

2. Silt Fence - The maintenance measures are as follows: (3.1) silt fences shall be inspected after each rainfall and at least daily during prolonged rainfall, any required repairs shall be made immediately; (3.2) close attentiion shall be paid to the repair of damaged silt fence resulting from end runs and undercutting; (3.3) should the fabric on a silt fence decompose or become inefective prior to the end of the expected usable life and the barrier is still necessary, the fabric shall be replaced promptly; (3.4) sediment deposits must be removed when the level of deposition reaches approximately one-half the height of the barrier; and (3.5) any sediment deposits remaining in place after the silt fence is no longer required shall be dressed to conform to the existing grade, prepared and seeded.

3. Temporary Seeding - Areas which fail to establish vegetative cover adequate to prevent rill erosion will be re-seeded as soon as such areas are identified. Control weeds by mowing.

4. Mulching - All mulches and soil coverings should be inspected periodically (particularly after rainstorms) to check for erosion. Where erosion is observed in mulched areas, additional mulch should be applied. Nets and mats should be inspected after rainstorms for dislocation or failure. If washouts or breakage occur, reinstall netting or matting as necessary after repairing damage to the slope or ditch. Inspections should take place until grasses are firmly established. Where mulch is used in conjunction with ornamental plantings, inspect periodically throughout the year to determine if mulch is maintaining coverage of the soil surface; repair as needed.

5. Soil Stabilization Blankets & Matting - All soil stabilization blankets and matting should be inspected periodically following installation, particularly after rainstorms to check for erosion and undermining. Any dislocation or failure should be repaired immediately. If washouts or breakage occurs, reinstall the material after repairing damage to the slope or ditch. Continue to monitor these areas until which time they become permanently stabilized; at that time an annual inspection should be adequate.

PROFESSIONAL CIVIL ENGINEER
STEPHANIE L. RATHBURN
E-11928
STATE OF NEBRASKA

NO.	REVISIONS	DATE

SWPPP NOTES

GLACIER CREEK MITIGATION BANK

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402-479-2200

PROJECT 75509104
DATE 6/11/2012
SHEET
69 OF 72

PROJECT DESCRIPTION

THIS PROJECT CONSISTS OF STREAM GRADING, CONSTRUCTION OF TWO (2) REINFORCED CONCRETE DROP STRUCTURES AND A LOW WATER CROSSING, AND WETLAND CREATION AND ENHANCEMENT. EROSION CONTROL MEASURES ARE INCLUDED IN THE SIGNED AND SEALED PLAN SET. HOWEVER, IF IT IS DETERMINED THAT ADDITIONAL EROSION PROTECTION MEASURES ARE NEEDED, THEN THE EROSION PREVENTION MEASURES WILL BE MODIFIED. THE STORM WATER POLLUTION PREVENTION PLAN WILL BE UPDATED TO REFLECT ANY CHANGES.

THE CONTRACTOR WILL BE RESPONSIBLE FOR CONSTRUCTION, MAINTENANCE, REPAIR AND REMOVAL OF ALL BMPS CONSTRUCTED IN ASSOCIATION WITH THIS PROJECT. THE PROJECT SITE SHALL BE REVIEWED BY BOTH THE CONTRACTOR'S AND THE CITY'S REPRESENTATIVES ON A DAILY BASIS AND PRIOR TO ANY ANTICIPATED RAINFALL. IF, AFTER REVIEW, ADDITIONAL EROSION CONTROL MEASURES ARE WARRANTED, APPROPRIATE BMP'S SHALL BE CONSTRUCTED.

CONSTRUCTION ACTIVITIES & SCHEDULE

ACTIVITY	SCHEDULE
Install all BMPs needed and associated with the Grading Phase such as stabilized construction entrances, sediment basins, riser pipes, outlet pipes, sediment traps, silt fence, diversions, terraces and etcetera.	Prior to any stripping of existing vegetation or grading.
Construct Access Road grading and Low Water Crossing.	Low Flow Crossing must be installed prior to diversion of stream flow.
Construct Glacier Creek stream diversion and grading west of access road.	Glacier Creek channel flow must utilize the diversion channel prior to initializing drop structure construction.
Construct Drop Structures on Glacier Creek and North Creek.	All vegetative material must be removed in the vicinity of the drop structures prior to initializing construction. Minimize disturbance of existing ground surface. Drop Structures must be completed prior to initiating channel grading.
Proceed with stripping of exisitng vegetation and grading in accordance witht he grading plan, while disturbing no more than necessary.	After installing all BMPs needed and associated with the Grading Phase. Furthermore, INSPECTOR approval must be obtained before the start of any stripping of existing vegetation or grading.
Implement the installation of Temporary Seeding, Permanent Seeding, and/or Mulching.	Stabilization measures must be initiated as soon as possible in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.

STANDARD DETAILS

NUMBER	NAME	PAGE #	LOCATION
9.5.2	CONSTRUCTION ENTRANCE	9-26	OMAHA REGIONAL STORMWATER DESIGN MANUAL
9.5.5	SILT FENCE	9-33	OMAHA REGIONAL STORMWATER DESIGN MANUAL
9.5.17	DUST CONTROL	9-115	OMAHA REGIONAL STORMWATER DESIGN MANUAL
9.5.20	TEMPORARY SEEDING	9-128	OMAHA REGIONAL STORMWATER DESIGN MANUAL
9.5.23	MULCHING	9-140	OMAHA REGIONAL STORMWATER DESIGN MANUAL
9.5.24	SOIL STABILIZATION BLANKETS & MATTING	9-143	OMAHA REGIONAL STORMWATER DESIGN MANUAL
SM-1	SANITARY WASTE MANAGEMENT	2	SUPPLEMENTAL BMP GUIDE
SM-2	SOLID WASTE MANAGEMENT	3	SUPPLEMENTAL BMP GUIDE
SM-3	MATERIAL DELIVERY AND STORAGE	4	SUPPLEMENTAL BMP GUIDE
SM-4	STREET CLEANING / SWEEPING	5	SUPPLEMENTAL BMP GUIDE
SM-5	VEHICLE AND EQUIPMENT FUELING	6	SUPPLEMENTAL BMP GUIDE
SM-6	SWPPP NOTIFICATION SIGN	7	SUPPLEMENTAL BMP GUIDE

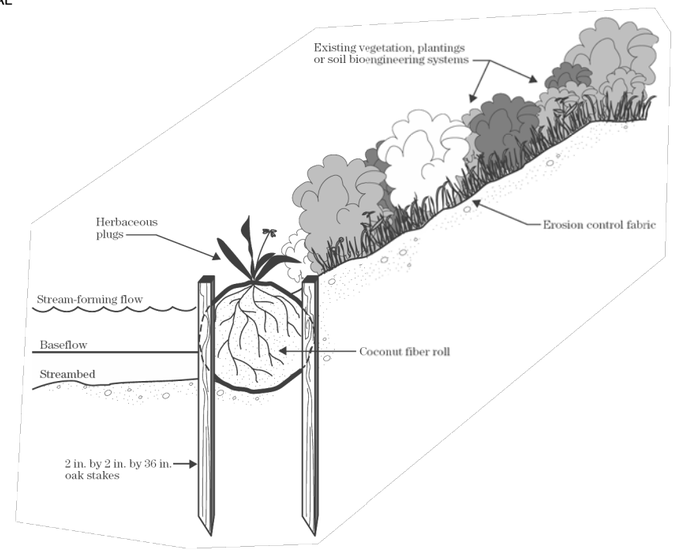
THE OMAHA REGIONAL STORMWATER DESIGN MANUAL AND SUPPLEMENTAL BMP GUIDE CAN BE FOUND AT http://www.PCWPErosionControl.org

The Storm Water Pollution Prevention Plan For This Site Was Reviewed And Approved By The Designated Erosion And Sediment Control Inspector.

INSPECTOR'S Signature _____ *Date* _____

SITE INFORMATION

XX/XX/2012 *Estimated Start Date*	*PCWP Project Number*	NER *NDEQ NOI Number*	
GLACIER CREEK RESTORATION *Project Name*		XX *Address*	
Subdivision Name	*S&ID #*	OMAHA *City*	DOUGLAS *County*
XX *Latitude*	XX *Longitude*	NEBRASKA *State*	XXXXX *Zip Code*
Total Site Area (Acres)	XX	*Estimated Permit Duration*	XX
Disturbed Area (Acres)	XX	*Cut Volume (YD^3)*	XXXXX
Undisturbed Area (Acres)	XX	*Fill Volume (YD^3)*	XXXXX
Impervious Area Before Construction (%)	XX.X	*Runoff Coefficient Before Construction*	0.XX
Impervious Area After Construction (%)	XX.X	*Runoff Coefficient After Construction*	0.XX



COCONUT FIBER ROLL

NOT TO SCALE

NOTES:

1. EXCAVATE A SHALLOW TRENCH AT THE TOE OF THE SLOPE TO A DEPTH SLIGHTLY BELOW CHANNEL GRADE.

2. AFTER PLACING THE COCONUT FIBER ROLL IN THE TRENCH, DRIVE 2 INCH X 2 INCH X 36 INCH STAKES BETWEEN THE BINDING TWINE AND COCONUT FIBER. STAKES SHOULD BE PLACED ON BOTH SIDES OF THE ROLL ON 2 TO 4 FEET CENTERS DEPENDING UPON ANTICIPATED VELOCITIES. TOPS OF STAKES SHOULD NOT EXTEND ABOVE THE TOP OF THE FIBER ROLL.

3. BACKFILL SOIL BEHIND THE FIBER ROLL AND INSTALL APPROPRIATE VEGETATION OR STREAM STABILITY MEASURES UPSLOPE FROM FIBER ROLL.

BMP RESPONSIBILITY TABLE

MAJOR ACTIVITY	CONTROL MEASURES	TIMING	RESPONSIBLE PARTY
Grading	Silt Fence	Prior to stripping	General Contractor
	Restroom Facilities	Prior to stripping	General Contractor
	Fuel Containment	Prior to stripping	General Contractor
	Area cleanup of any tracked mud/dirt from adjacent streets	Daily	General Contractor
	Use of water truck to control windblown dust	As often as needed & recommended by the inspector	General Contractor

APPLICANT SWPPP CERTIFICATION

XX *Business Name*	XX *Representative's Email Address*	XX *Phone Number*
XX *Representative's Name*	XX *Address*	XX *Fax Number*
XX *Project # Assigned By APPLICANT*	XX *City* XX *State*	XX *Zip Code*

DESIGNER		INSPECTOR	
Alfred Benesch & Co *Business Name*	Stephanie Rathburn, PE *Representative's Name*	XX *Business Name*	XX *Representative's Name*
825 J Street *Address*	srathburn@benesch.com *Representative's Email Address*	XX *Address*	XX *Representative's Email Address*
Lincoln, NE 68508 *City, State, & Zip Code*	75509104 *Project # Assigned By DESIGNER*	XX *City, State, & Zip Code*	XX *Project # Assigned By INSPECTOR*
(402) 479-2200 *Phone Number*	(402) 479-2276 *Fax Number*	XX *Phone Number*	XX *Fax Number*

I hereby agree to act as APPLICANT in association with this SWPPP. Furthermore, I certify under penalty of law the following:(1) that, this document and all supporting information has been prepared under my direction or supervision in accordancewith a system designed to assure that qualified personnel properly gathered and evaluated the information submitted; (2)that, I understand and agree to abide by the terms and conditions contained within this Storm Water Pollution PreventionPlan - Site Map (SWPPP-SM), the associated Storm Water Pollution Prevention Plan - Narrative (SWPPP-N), and the PCWPGrading Permit Terms (http://www.PCWPErosionControl.org); (3) that, to the best of my knowledge and belief informationcontained in this SWPPP is true, complete, and accurate; (4) that, the SWPPP has been represented and warranted toconform to all applicable Standards, Criteria, Ordinances, Laws, Rules, and Regulations enacted by the -- [a] PCWP and itsMembers, [b] Douglas County, [c] Sarpy County, [d] State of Nebraska, and [e] United States Federal Government; (5) that,sound and established practices were used for the creation of this SWPPP; (6) that, I am obligated to ensure inspection, reporting, and maintenance requirements occur under the terms of this SWPPP; (7) that, this SWPPP will be implemented as the first element of construction; (8) that, I shall indemnify and save harmless the PCWP, its Members, Officers, Agents and Employees from all claims and demands of every nature and description growing out of the implementation of this SWPPP, including personal injuries received and all property damage sustained; (9) that, I will retain the services of the aforementioned DESIGNER and INSPECTOR, to perform all design and inspection duties associated with this SWPPP, though a contractual agreement for the life of the SWPPP; and (10) that, corrections of defects and deficiencies in design, construction, inspection, implementation, and testing shall be without expense to the PCWP and its Members, Officers, Agents and Employees and shall be my obligations while acting as APPLICANT.

APPLICANT'S Signature _____ *Date* _____

PROFESSIONAL CIVIL ENGINEER
STEPHANIE L. RATHBURN
E-11928
STATE OF NEBRASKA

DATE
REVISIONS
NO.

SWPPP NOTES AND DETAILS

GLACIER CREEK MITIGATION BANK

benesch
engineers · scientists · planners
Alfred Benesch & Company
825 J Street
Lincoln, Nebraska 68508
402-479-2200

PROJECT 75509104
DATE 6/11/2012
SHEET
70 OF 72

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NOTES:

1. PLACE TEMPORARY SEEDING IN ALL LOCATIONS OF STRAW MULCH AND EROSION CONTROL MATTING.

2. SEE STREAM STABILITY PLANS FOR PERMANENT EROSION CONTROL MEASURES.

INSTALL SILT FENCE

GRADING LIMITS

INSTALL EROSION CONTROL MATTING ALONG 2:1 BANK SLOPES

PROPERTY BOUNDARY

TEMPORARY CHANNEL DIVERSION

INSTALL COCONUT FIBER ROLL ALONG TOE OF CHANNEL EMBANKMENT

INSTALL SILT FENCE

INSTALL EROSION CONTROL MATTING ALONG 1:1 CHANNEL SLOPES

ACCESS ROAD

SPOIL AREA 8.5 ACRES

BIG PAPILLION CREEK

GRADING LIMITS

TEMPORARY CHANNEL DIVERSION

COCONUT FIBER ROLLS

SILT FENCE

EMBANKMENT SPOIL AREA

EROSION CONTROL MAT

STRAW MULCH

PROFESSIONAL CIVIL ENGINEER
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STATE OF NEBRASKA

NO.	REVISIONS	DATE

GLACIER CREEK SWPPP

GLACIER CREEK MITIGATION BANK

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PROJECT 75509104

DATE 6/11/2012

SHEET 71 OF 72

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NOTES:

1. PLACE TEMPORARY SEEDING IN ALL LOCATIONS OF STRAW MULCH AND EROSION CONTROL MATTING.

2. SEE STREAM STABILITY PLANS FOR PERMANENT EROSION CONTROL MEASURES.

GRADING LIMITS

INSTALL SILT FENCE

BIG PAPILLION CREEK

PROPERTY BOUNDARY

INSTALL EROSION CONTROL MATTING ALONG 1:1 CHANNEL SLOPES

INSTALL EROSION CONTROL MATTING ALONG 2:1 BANK SLOPES

INSTALL COCONUT FIBER ROLL ALONG TOE OF CHANNEL EMBANKMENT

TEMPORARY CHANNEL DIVERSION

COCONUT FIBER ROLLS

SILT FENCE

EMBANKMENT SPOIL AREA

EROSION CONTROL MAT

STRAW MULCH

PROFESSIONAL CIVIL ENGINEER
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STATE OF NEBRASKA

NO.	REVISIONS	DATE

NORTH CREEK SWPPP

GLACIER CREEK MITIGATION BANK

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PROJECT 75509104

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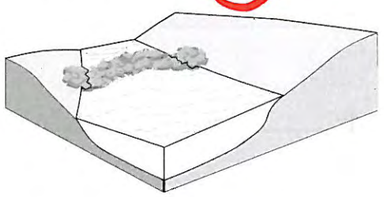
APPENDIX F

STREAM RESTORATION PLAN

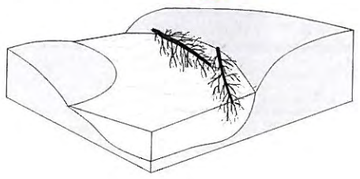
GLACIER CREEK
RESTORATION CONCEPT PLAN

Weirs or Sills (1)



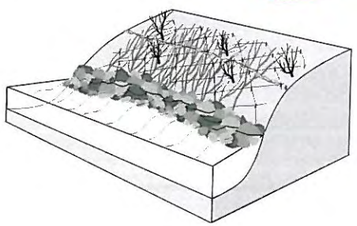
Log, boulder, or quarrystone structures placed across the channel and anchored to the streambank and/or bed to create pool habitat, control bed erosion, or collect and retain gravel.

Tree Cover (2)

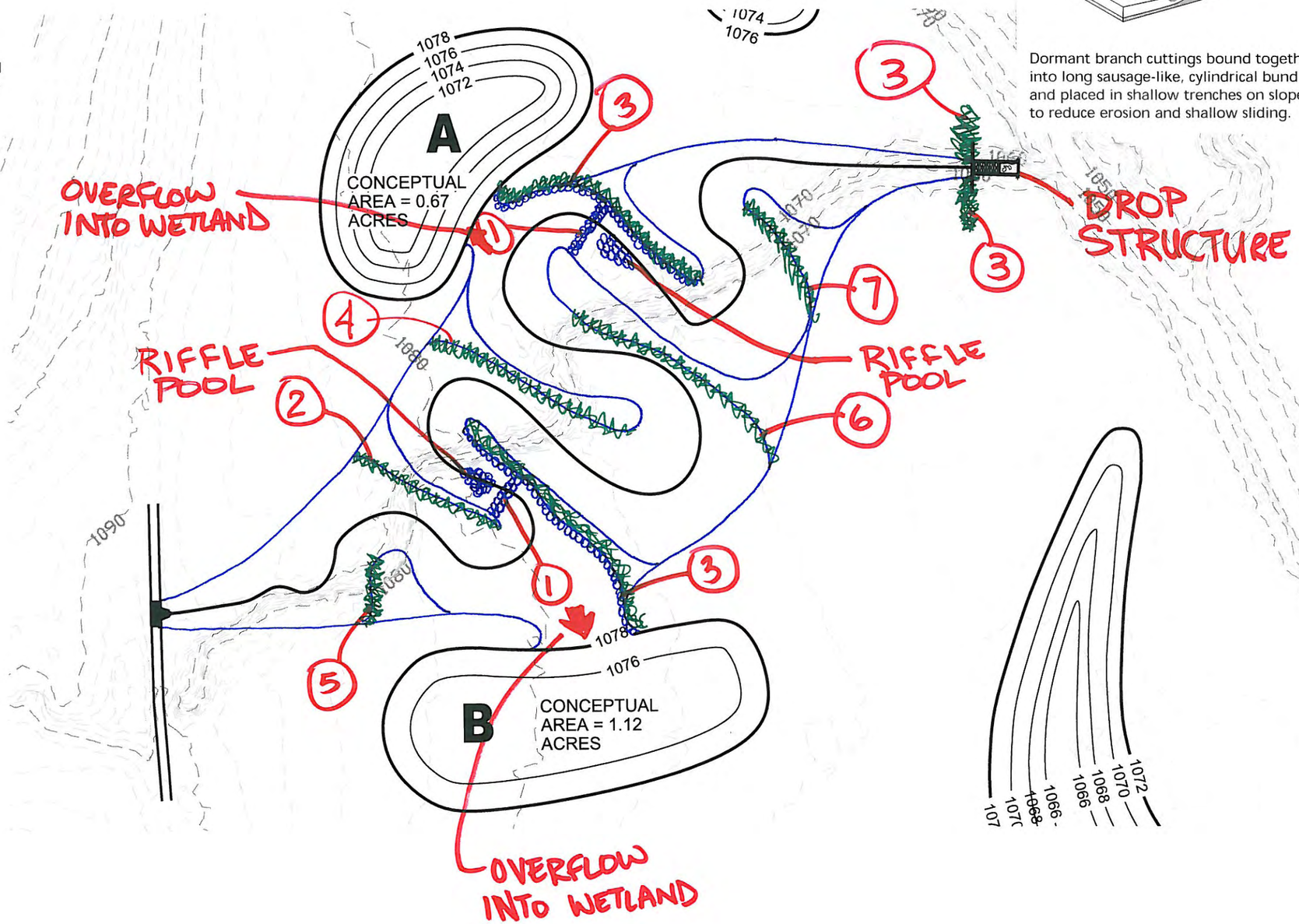


Felled trees placed along the streambank to provide overhead cover, aquatic organism substrate and habitat, stream current deflection, scouring, deposition, and drift catchment.

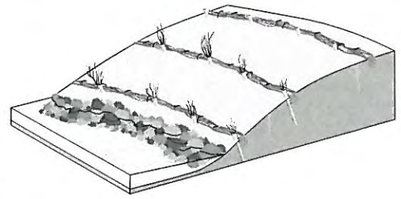
Brush Mattresses (3)



Combination of live stakes, live facines, and branch cuttings installed to cover and physically protect streambanks; eventually to sprout and establish numerous individual plants.

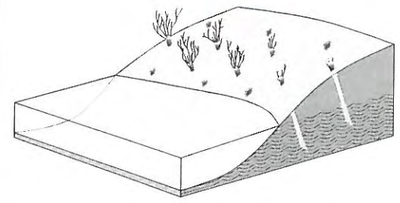


Live Fascines (4)



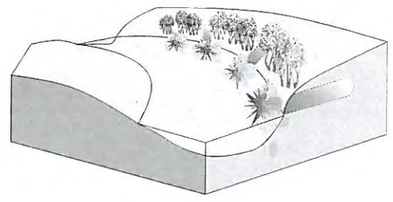
Dormant branch cuttings bound together into long sausage-like, cylindrical bundles and placed in shallow trenches on slopes to reduce erosion and shallow sliding.

Live Stakes (5)



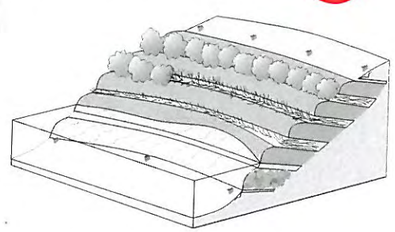
Live, woody cuttings which are tamped into the soil to root, grow and create a living root mat that stabilizes the soil by reinforcing and binding soil particles together, and by extracting excess soil moisture.

Log, Rootwad, and Boulder Revetments (6)



Boulders and logs with root masses attached placed in and on streambanks to provide streambank erosion, trap sediment, and improve habitat diversity.

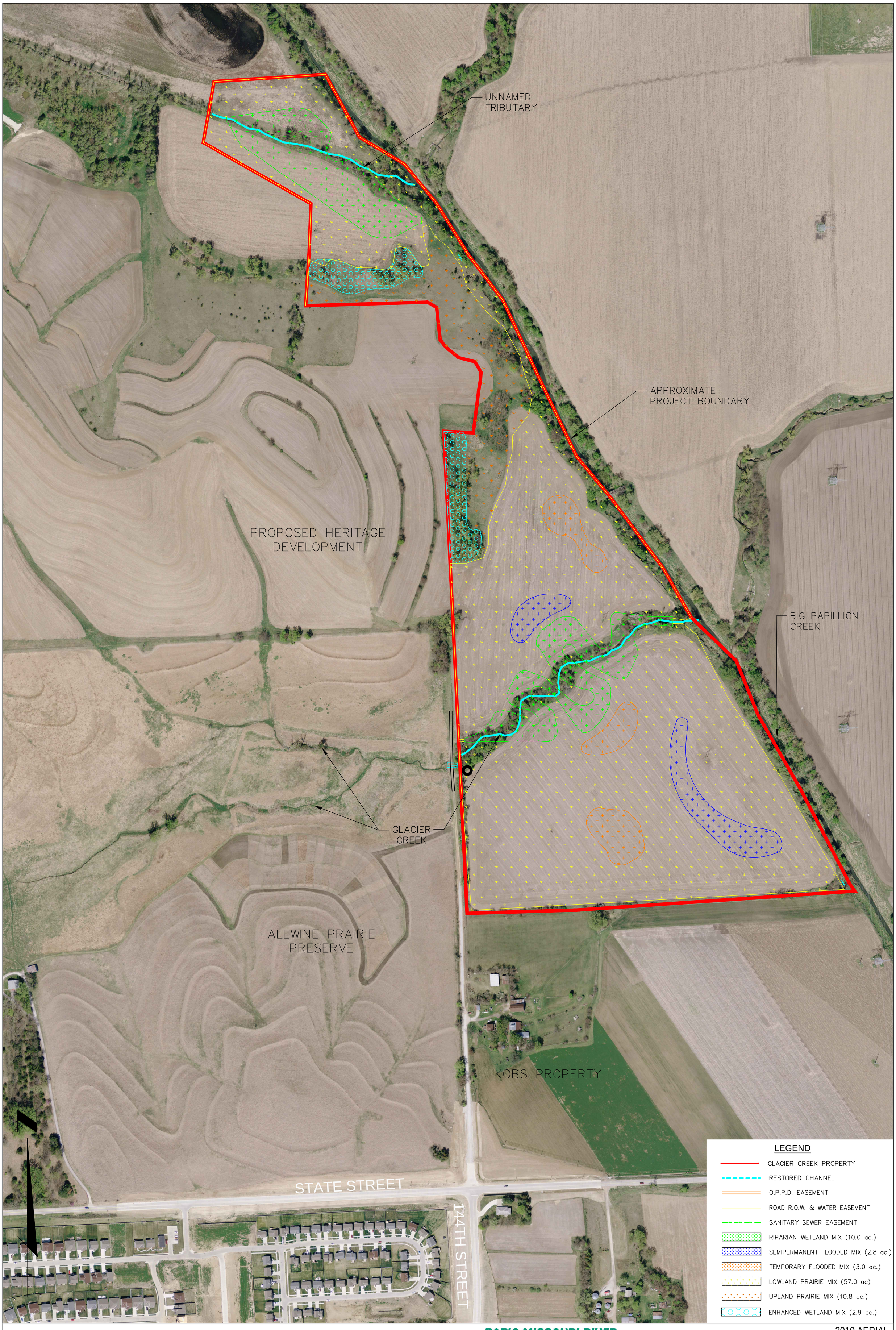
Vegetated Geogrids (7)



Alternating layers of live branch cuttings and compacted soil with natural or synthetic geotextile materials wrapped around each soil lift to rebuild and vegetate eroded streambanks.

APPENDIX G

VEGETATION PLANTING PLAN



GLACIER CREEK STREAM AND WETLAND BANK CONCEPT VEGETATION PLANTING PLAN

PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT

UNIVERSITY OF Nebraska Omaha

2010 AERIAL

Seed Mixes

			Wetness	Lowland Prairie (77)	Riparian/Temporary Flooded	Semi-Permanent Flooded
Grasses						
Calamagrostis	canadensis	Bluejoint	OBL	X	X	
Calamagrostis	stricta	Northern Reedgrass	FACW		X	
Elymus	canadensis	Canada Wildrye	FACU	X		
Elymus	trachycaulus	Slender Wheatgrass	FACU	X		
Elymus	virginicus	Virginia Wildrye	FAC	X	X	
Glyceria	grandis	Large Manna Grass	OBL		X	
Glyceria	striata	Manna grass	OBL		X	
Hordeum	jubatum	Foxtail Barley	FACW	X	X	
Leersia	oryzoides	Rice Cut Grass	OBL		X	
Muhlenbergia	racemosa	Marsh Muhly	FACW		X	
Spartina	pectinata	Prairie Cordgrass	FACW	X	X	
Sphenopholis	obtusata	Prairie Wedgegrass	FACW	X	X	
				7	**10**	**0**
Sedges/Rushes						
Carex	aurea	Orange Sedge	FACW		X	
Carex	brachyglossa	Yellowfruit Sedge	FAC	X	X	
Carex	brevior	Fescue Sedge	FAC		X	
Carex	crawei	Crawe's Sedge	FACW		X	
Carex	cristatella	Crested Sedge	FACW		X	
Carex	emoryi	Emory's Sedge	OBL		X	
Carex	gravida	Wetland Gravida	OBL	X	X	
Carex	hystericina	Bottlebrush Sedge	OBL		X	
Carex	laeviconica	Smooth Cone Sedge	OBL	X	X	
Carex	pellita	Wooly Sedge	OBL		X	
Carex	scoparia	Broom Sedge	FACW		X	
Carex	stipata	Saw-beak Sedge	OBL		X	
Carex	vulpinoidea	Fox Sedge	OBL	X	X	X
Eleocharis	acicularis	Needle Spikerush	OBL		X	X
Eleocharis	erythropoda	Bald Spikerush	OBL		X	X
Eleocharis	palustris	Common Spikerush	OBL		X	X
Fimbristylis	puberula	Hairy Fimbry	OBL	X	X	
Juncus	balticus	Baltic Rush	OBL	X	X	
Juncus	dudleyi	Dudley Rush	FACW		X	
Juncus	interior	Interior Rush	FAC		X	
Juncus	marginatus	Grassleaf Rush	FACW		X	
Juncus	torreyi	Torrey's Rush	FACW	X	X	X
Bolboschoenus	maritimus	Prairie Bulrush	OBL			X
Schoenoplectus	acutus	Hardstem Bulrush	OBL		X	
Schoenoplectus	pungens	Common Threesquare	OBL		X	
Scirpus	atrovirens	Dark Green Bulrush	OBL	X	X	X
Scirpus	pallidus	Pale Bulrush	OBL	X	X	X
Sparganium	eurycarpum	Burreed	OBL			X
				9	**26**	**9**
Legumes						
Cassia	chamaecrista	Partridge Pea	FACU	X		
Dalea	candidum	White Prairieclover	UPL	X		
Dalea	leporina	Foxtail Dalea	FACU	X		
Dalea	purpurea	Purple Prairieclover	UPL	X		
Desmanthus	illinoensis	Illinois Bundleflower	FACU	X	X	
Desmodium	canadense	Canada Tickclover	FAC	X		
Lespedeza	capitata	Roundhead Bushclover	UPL	X		
Lotus	purshianus	Deervetch	FAC	X		
				8	**1**	**0**
Composites						
Achillea	millefolium	Yarrow	FACU	X		
Arnoglossum	atriplicifolium	Pale Indian Plantain	UPL	X		
Artemisia	ludoviciana	Sagewort	FACU	X		
Aster	ericoides	Heath Aster	FAC	X		
Aster	novae-angliae	New England Aster	FACW	X	X	

Aster	prealtus	Willowleaf Aster	FACW	X		
Aster	simplex	Panicled Aster	FACW	X		
Bidens	cernua	Nodding Beggar-ticks	OBL		X	
Bidens	polylepis	Bur Marigold	FACW		X	
Boehmeria	cllindrica	False Nettle	OBL		X	
Boltonia	asteroides	False Aster	FACW	X	X	
Coreopsis	tinctoria	Plains Correopsis	FAC	X	X	
Crepis	runcinata	Yellow Hawk Beard	FAC		X	
Erigeron	strigosus	Daisy Fleabane	FAC	X		
Eupatorium	maculatum	Spotted Joe Pye Weed	OBL		X	
Eupatorium	perfoliatum	Boneset	OBL		X	
Euthamia	gymnospermoides	Grassleaf Goldenrod	FACW	X		
Helenium	autumnale	Sneezeweed	FACW		X	
Helianthus	grosseserratus	Sawtooth Sunflower	FACW	X	X	
Helianthus	tuberosus	Jerusalem Artichoke	FAC	X	X	
Iva	annua	Small Marsh Elder	FAC	X	X	
Lactuca	canadensis	Canada Lettuce	FACU	X		
Lactuca	ludoviciana	Wild Lettuce	FAC	X		
Liatris	lancifolia	Thickspike Gayfeather	FACW	X		
Liatris	pycnostachya	Prairie Blazing Star	FAC	X		
Ratibida	columnifera	Upright Prairie Coneflower	UPL	X		
Ratibida	pinnata	Grayhead Coneflower	FACW	X		
Rudbeckia	hirta	Black-eyed Susan	FACU	X		
Rudbeckia	laciniata	Golden Glow	FAC		X	
Senecio	plattensis	Prairie Ragwort	FACU	X		
Silphium	integrifolium	Entire-leaf Rosinweed	FACU	X		
Silphium	laciniatum	Compass Plant	UPL			
Silphium	perfoliatum	Cup Plant	FAC	X		
Vernonia	baldwinii	Weastern Ironweed	FACW	X		
Vernonia	fasciculata	Ironweed	FAC	X	X	
				26	**15**	**0**
Misc. Forbs						
Acorus	americanus	Sweet Flag	OBL			X
Agalinis	tenuifolia	Slender False Foxglove	FACW		X	
Alisma	trivale	American Water Plantain	OBL		X	X
Allium	canadense	Canada Garlic	FAC	X	X	
Ammania	coccinea	Tooth Cup	OBL		X	
Anemone	canadensis	Meadow Anemone	FACW	X		
Apocynum	cannabinum	Prairie Dogbane	FAC	X	X	
Asclepias	incarnata	Swamp Milkweed	OBL	X	X	
Asclepias	speciosa	Showy Milkweed	FAC	X		
Asclepias	sullivantii	Sullivant's Milkweed	FAC	X		
Asclepias	syriaca	Common Milkweed	FAC	X		
Asclepias	verticillata	Whorled Milkweed	FACU	X		
Calylophus	serrulatus	Serrate-leaf Primrose	UPL	X		
Cephalanthus	occidentalis	Buttonbush	OBL	X		
Cicuta	maculata	Water Hemlock	OBL		X	
Epilobium	coloratum	Cinnamon Willow Herb	OBL		X	
Geum	alleppicum	Wetland Yellow Geum	FACU		X	
Geum	vernum	Heartleaf Avens	FACU		X	
Impatiens	capensis	Spotted Touch-me-not	FACW		X	
Lobelia	cardinalis	Cardinal Flower	OBL		X	
Lobelia	siphilitica	Blue Cardinal Flower	OBL	X	X	
Lobelia	spicata	Palespike Lobelia	FAC	X		
Ludwigia	alternifolia	Bushy Seedbox	OBL		X	
Lycopus	americanus	American Bugleweed	OBL	X	X	
Lycopus	asper	Rough Bugleweed	OBL	X	X	
Lysimachia	ciliata	Fringed-loosestrife	FACW		X	
Lythrum	alatum	Winged Lythrum	OBL	X	X	
Mentha	arvensis	Field Mint	FACW		X	
Mimulus	ringens	Alleghany Monkey Flower	OBL		X	
Oenothera	villosa	Common Evening Primrose	FAC	X		

Penstemon	digitalis	Smooth Penstemon	FAC	X		
Penthorum	sedoides	Ditch Stonecrop	OBL		X	
Phyla	lanceolata	Fog Fruit	OBL		X	
Polygonum	coccineum	Swamp Smartweed	FACW		X	
Polygonum	lapathifolium	Pale Smartweed	OBL		X	
Polygonum	punctatum	Water Smartweed	OBL		X	
Polytaenia	nuttallii	Prairie Parsley	FACU	X		
Potentilla	arguta	Prairie Cinquefoil	FAC	X		
Potentilla	norvegica	Norwegian Cinquefoil	FAC		X	
Prunella	vulgaris	Self-heal	FACW	X	X	
Pycnanthemum	virginianum	Mountain Mint	FAC	X		
Ranunculus	cymbalaria	Shore Buttercup	OBL		X	
Sagittaria	brevirostra	Shortbeak Arrowhead	OBL		X	X
Sagittaria	calycina	Hooded Arrowhead	OBL		X	
Sagittaria	graminea	Grassy Arrowhead	OBL			X
Sagittaria	latifolia	Broadleaf Arrowhead	OBL			X
Scutellaria	galericulata	Marsh Skullcap	OBL		X	
Scutellaria	lateriflora	Blue Skullcap	OBL		X	
Smilacina	stellata	False Solomonseal	FAC	X		
Stachys	palustris	Marsh Nettle	FACW		X	
Teucrium	canadense	American Germander	FACW	X	X	
Thalictrum	dasycarpum	Purple Meadow Rue	FACW	X	X	
Tradescantia	bracteata	Bracted Spiderwort	FAC	X		
Verbena	hastata	Blue Vervain	FACW	X	X	
Verbena	urticifolia	Elm-leaf Verbena	UPL		X	
Zizia	aurea	Golden Alexander	FAC	X		
				27	**37**	**5**

OBL	Obligate Wetland	Occurs almost always (estimated probability 99%) under natural conditions in wetlands.
FACW	Facultative Wetland	Usually occurs in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
FAC	Facultative	Equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).
FACU	Facultative Upland	Usually occurs in non-wetlands (estimated probability 67%-99%), but occasionally found on wetlands (esti
UPL	Obligate Upland	Occurs in wetlands in another region, but occurs almost always (estimated probability 99%) under natural conditions in non-wetlands in the regions specified. If a species does not occur in wetlands in any region,

APPENDIX H

EASEMENT

COVENANT OF DEDICATION

Papio Missouri River Natural Resources District now stipulates to the following statements of fact, and further agrees to restrict the use and title of the realty described in **legal description attached** to this **document** (hereinafter referred to as the "Land") in accordance with the terms and conditions set forth herein.

STIPULATIONS OF FACT

1. That **Papio Missouri River Natural Resources District** is the **bank sponsor for wetland bank.**

2. That **Papio Missouri River Natural Resources District** is the owner in fee of the real estate described in **attachment**.

3. That Papio Missouri River Natural Resources District and the Omaha District of the U.S. Army Corps of Engineers have reached an agreement whereby Papio Missouri River Natural Resources District will be permitted to sell wetland credits in accordance with approved bank instrument and by dedicating the realty described for perpetual use as a conservancy area in accordance with the terms and conditions of this document.

4. That the above-mentioned dedication shall consist of the execution of this document by all parties necessary to restrict the use and title of the land; and that this document shall be recorded in the Office of the Register of Deeds for **Douglas County**, **Nebraska**.

5. That upon receipt of a certified copy of this document, as recorded in the Office of the County Register of Deeds for **Douglas County**, **Nebraska**, the District Engineer of the Omaha District of the U.S. Army Corps of Engineers will issue a validated permit, number (NUMBER) to (PERMITTEE); and that said permit shall be issued in consideration for the execution of this Covenant.

6. That upon execution of deed restriction the **Papio Missouri River Natural Resources District** will supply the Omaha District of the U.S. Army Corps of Engineers evidence of recordation for the files.

7. That the terms and conditions of this Covenant of Dedication shall, as of the date of execution of this document, bind **Papio Missouri River Natural Resources District** to the extent of his legal and/or equitable interest in the land; and that this Covenant shall run with the land and be binding on (PERMITTEE) and its successors and assigns forever.

8. That the terms and conditions of this Covenant shall be both implicitly and explicitly included in any transfer, conveyance, or encumbrance of the Land or any part thereof, and that any instrument of transfer, conveyance, or encumbrance affecting all or any part of the Land shall set forth the terms and conditions of this document either by reference to this document or set forth in full text. That in the event of conflict between the deed restriction and instrument, the instrument shall supersede the deed restriction.

DEED AND USE RESTRICTIONS

Papio Missouri River Natural Resources District hereby warrants that it is the owner in fee of the realty described in **Attachment**; and that the Land is hereby dedicated in perpetuity for use as a conservancy area.

Papio Missouri River Natural Resources District hereby agrees to restrict the use and title of the Land as follows:

1. There shall be no construction or placement of structures or mobile homes, fences, signs, billboards or other advertising material, or other structures, whether temporary or permanent, on the land.

2. There shall be no filling, draining, excavating, dredging, mining, drilling or removal of topsoil, loam, peat, sand, gravel, rock, minerals or other materials unless related to management activities.

3. There shall be no building of roads or paths for vehicular or pedestrian travel or any change in the topography of the land. Temporary roads are acceptable for maintenance and recreation activities participated in by **Papio Missouri River Natural Resources District.**

4. There shall be no removal, destruction, or cutting of trees or plants; spraying with biocides, insecticides, or pesticides; grazing of animals, farming, tilling of soil, or any other agricultural activity. Management activities **that incorporate these techniques** are acceptable **without** approval from the Corps.

5. There shall be no operation of all-terrain vehicles or any other type of motorized vehicle on the land except for construction and maintenance, management activities or handicap access.

6. This Covenant of Dedication may be changed, modified or revoked only upon written approval of the District Engineer of the Omaha District of the U.S. Army Corps of Engineers. To be effective, such approval must be witnessed, authenticated, and recorded pursuant to the law of the State of Nebraska**.**

This Covenant needs to be reviewed by the Corps of Engineers prior to signature to assure compliance with permit conditions.

COE representative's initial _____

7. This Covenant is made in perpetuity such that the present owner and its heirs and assigns forever shall be bound by the terms and conditions set forth herein.

By:

Papio Missouri River Natural Resources District

Executed before me this ____ day of _____, 2012, by **Papio Missouri River Natural Resources District** who is personally known to me.

_____ My commission expires_____

Notary Public