FOX ISLAND FLOOD CONTROL FEASIBILITY ASSESSMENT

FEBRUARY 19, 2014

HoustonEngineering Inc.

CERTIFICATION

As a Registered Professional Engineer under the laws of the State of North Dakota, I hereby certify that the ***Fox Island Flood Control Feasibility Assessment*** was prepared by me or under my direct supervision.

Michael H. Gunsch, PE
North Dakota Registration Number 3052

Date: 2/19/2014

HoustonEngineering Inc.

ACKNOWLEDGMENTS

THE BURLEIGH COUNTY WATER RESOURCE DISTRICT WOULD LIKE TO ACKNOWLEDGE THE SUPPORT, ASSISTANCE AND INPUT PROVIDED BY THE FOLLOWING DURING COMPLETION OF THE FOX ISLAND FLOOD CONTROL FEASIBILITY ENGINEERING ASSESSMENT:

FOX ISLAND RESIDENTS AND STEERING COMMITTEE

FOX ISLAND HOMEOWNERS ASSOCIATION

RIVERWOOD WEST HOMEOWNERS ASSOCIATION

BURLEIGH COUNTY HIGHWAY DEPARTMENT

BURLEIGH COUNTY COMMISSION

CITY OF BISMARCK – MILLS AVENUE/RIVERWOOD DRIVE GRADE RAISE

NORTH DAKOTA STATE WATER COMMISSION – STUDY FUNDING ASSISTANCE

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FEBRUARY 19, 2014

PROBLEM DEFINITION

In March 2009, a major ice jam event occurred on the Missouri River south of the City of Bismarck just downstream from the Heart River confluence. This resulted in a rapid rise in water levels and flooding of properties within Fox Island and in South Bismarck (see summary in **Appendix A)**. During this event, many Fox Island residents were evacuated and significant damages occurred to their residences. This assessment focuses on identifying and evaluating potential flood hazard mitigation measures that could be implemented to reduce flood risks on Fox Island. It is also intended to provide the analysis required to initiate establishing a special assessment district to finance the preferred alternative in accordance with ND Century Code Chapter 61-16.1. This process requires a vote of the assessed or benefitted properties to approve a project before it proceeds to construction.

This evaluation was initiated through a petition filed with the Burleigh County Water Resource District (BCWRD) (see **Appendix B)**. The first step taken was to assess the level of damages incurred as a result of the 2009 flood event. Subsequently, the Fox Island residents were surveyed to obtain information regarding their lowest floor elevations, outbuildings, and monetary damages. A total of 183 questionnaires were distributed with 100 questionnaires returned, a response rate of approximately 55%. Of the questionnaires returned 59 respondents reported they had a flood insurance policy. The following damage amounts were reportedly incurred:

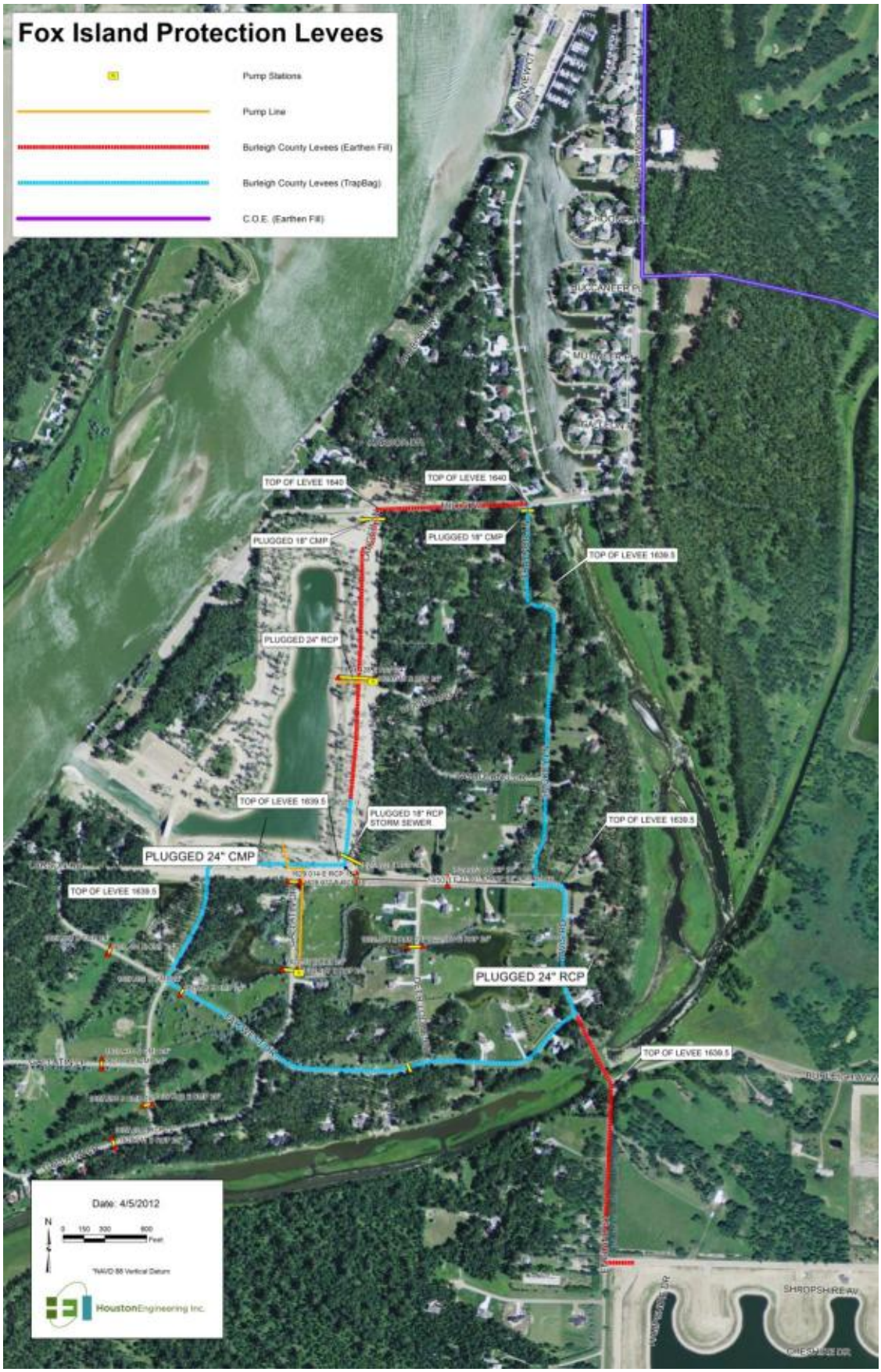
Primary Residential Damage	$ 766,961
Garage Damage	$ 110,753
Outbuilding Damage	$ 128,230
Total Damages	**$ 1,005,944**

In addition the following monies were reportedly received, either in the form of individual assistance or flood insurance reimbursements.

Individual Assistance	$ 13,050
Insurance Reimbursements	$ 395,249
Total Assistance	**$ 408,299**

While efforts were underway to evaluate various alternatives to provide flood protection to the level experienced during the March 2009 spring ice jam event, the 2011 summer flood occurred. During the 2011 event a temporary system of TrapBags© and clay levees were constructed along select roadways to protect a portion of the interior properties on Fox Island. This was accomplished in a few days requiring a monumental effort in terms of mobilizing equipment and materials, as well as coordination of construction activities. Residents outside the levee were left to construct individual private protection measures, which had varying degrees of success. The County installed temporary flood control measures, costing approximately $1.1 Million to construct and remove, are illustrated on **Figure 1**.

Figure 1 – 2011 Temporary Flood Control Measures



Following the 2011 event, a private Steering Committee was formed by some Fox Island residents south of Mills Avenue. They indicated their desire for the BCWRD to refocus its evaluation toward a levee that would provide protection for the entire island to the flood levels experienced during the 2011 event. In addition, residents north of Mills Avenue along Harbor Drive expressed interest, through the Riverwood West Homeowners Association, to be included in the evaluation. This area was already included in the Burleigh County Flood Mitigation Plan developed by the Burleigh County Highway Department. These factors necessitated expanding the original scope of study and revising the criteria used to evaluate the alternatives. The expanded evaluation was approved by the BCWRD in November 2011. A number of the Riverwood West Homeowners Association residents subsequently, requested to opt-out of the project due to the anticipated undesirable impacts to their properties located along the river.

A critical component in evaluating any flood hazard mitigation project is defining the known risks. The Fox Island area is subject to three floodwater sources. The two primary sources are associated with the Missouri River and include ice jams and open water flows. The third, related to local stormwater runoff from excessive rainfall, is addressed later in this report.

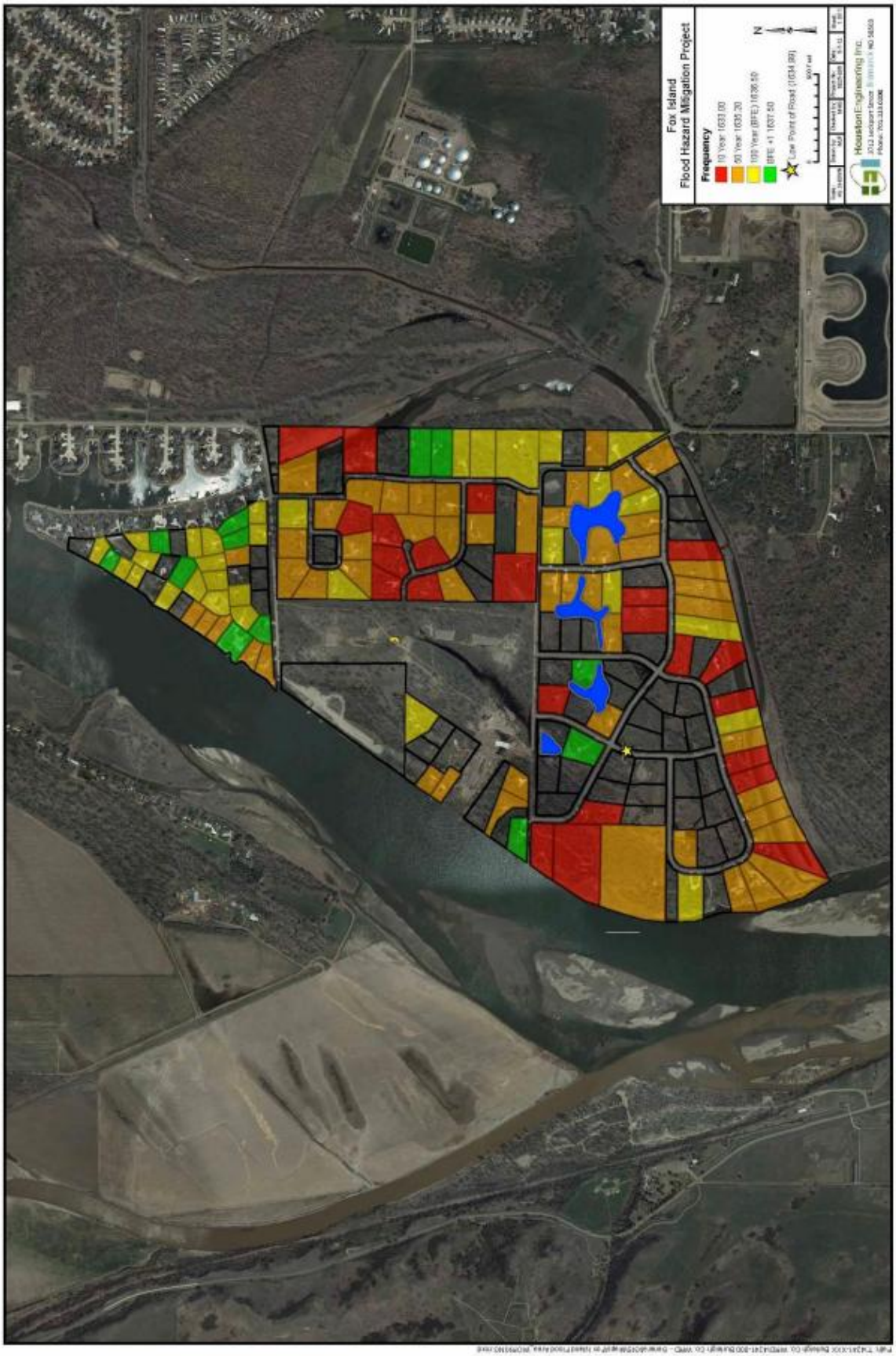
Ice jams are not an unusual occurrence on the Missouri River and are known to reoccur rather frequently along certain river segments. The principal areas of concern in Burleigh County are located downstream from Fox Island below the confluence of the Heart River and Apple Creek. Ice jams have been recorded on a number of occasions and were evaluated as part of the *2005 Flood Insurance Study (2005 FIS)*. The *June 2, 1999 Interim Report, Hydrology, Flood Insurance Restudy of the Missouri River,* prepared for the *2005 FIS* documents an evaluation of the historic ice jams since the closure of Garrison Dam. The highest previously recorded ice jam stage at the USGS Bismarck Gage was 14.8 feet occurring on January 13, 1983.

Based on available historic data, ice jams can be significant, however they do not represent the controlling Base Flood Elevation (BFE) or 100 year flood event used to map this reach of the Missouri. When the *Interim Report* was completed the data indicated ice jam events typically only affected projected flood elevations for frequencies below a 10-year open water event. Notable flood risks exist, however, even at these lower flood elevations. **Figure 2** illustrates a frequency based risk assessment for the residential lots within the study area. Based on measured flood elevations in the Fox Island Area, the 2009 ice jam event represented nearly a 50 year to a 100 year open water event. This is the largest recorded flood and ice jam event since closure of Garrison Dam. The maximum recorded stage at the USGS Bismarck Gage in 2009 was 16.1 feet, which reflected approximately a 17 foot stage at the north end and an 18 to 18.5 foot stage at the southern end of Fox Island. Given the 2009 ice jam and subsequent high waters related to recent ice jams; it appears prudent to reassess this risk with the next flood insurance study update.

ALTERNATIVE FLOOD HAZARD MITIGATION SOLUTIONS

Four alternatives were initially developed and evaluated to provide flood protection for the residents of Fox Island. **Alternative #1** includes raising Riverwood Drive and Mills Avenue and to construct flood control structures at Mills Avenue and at the Tavis Road Oxbow outfall to the Missouri River to isolate the Fox Island area during flood events. **Alternative #2** uses the existing roadways to cost effectively provide protection for those areas located within the interior of these roadways. **Alternative #3** is to construct an earthen levee and flood wall system, along the perimeter of the entire island. **Alternative #4** is to construct an earthen levee and floodwall system at a lower protection level, which would allow for the placement of temporary measures when required. **Alternative #5** was then developed based on input obtained during the initial public informational meeting and involves a perimeter levee and a roadway grade raise.

Figure 2
Flood Risk Frequency Assessment



In addition to structural project features, several non-project flood hazard mitigation alternatives were considered, including floodplain ordinance revisions and other measures described later.

ALTERNATIVE #1 – FLOOD CONTROL STRUCTURES/ROADWAY GRADE RAISE

This alternative includes raising Riverwood Drive and Mills Avenue, and installing control structures at Mills Avenue and the Tavis Road oxbow outlet. The purpose is to isolate this area from Missouri River floodwaters and backwaters. These features are illustrated on **Figure 3**. After reviewing the available topographic data, this would require reconstruction of the Mills Avenue crossing as it is not high enough to provide a significant level of flood protection. In addition, it was determined that portions of Mills Avenue, and Riverwood Drive north to Bismarck Expressway would have to be raised in order to provide adequate flood control. This alternative however does not provide the desired protection for areas located north of Mills Avenue or along the river bank, which were included in the revised project protection area.

One negative to this system is that any functional control structure would eliminate water access from the Tavis Road oxbow to the Missouri River. Such construction would also require an individual Section 404 and Section 10 permit from the US Army Corps of Engineers, as well as a Sovereign Lands permit from the North Dakota State Engineer. The minimum structure would be a double 7 foot by 5 foot box culvert similar to the one under Tavis Road. In addition, Mills Avenue and Riverwood Drive are city streets and outside the jurisdictional authority of the BCWRD, Burleigh County, and Lincoln Township. In addition, a means to provide an outlet for internal drainage accruing to the South Bismarck Storm Water Channel would need to be developed.

Due to these complicating factors and because this alternative alone does not provide the desired protection level, it was eliminated from further consideration. The need to coordinate flood control project features within the City of Bismarck is discussed later in this report.

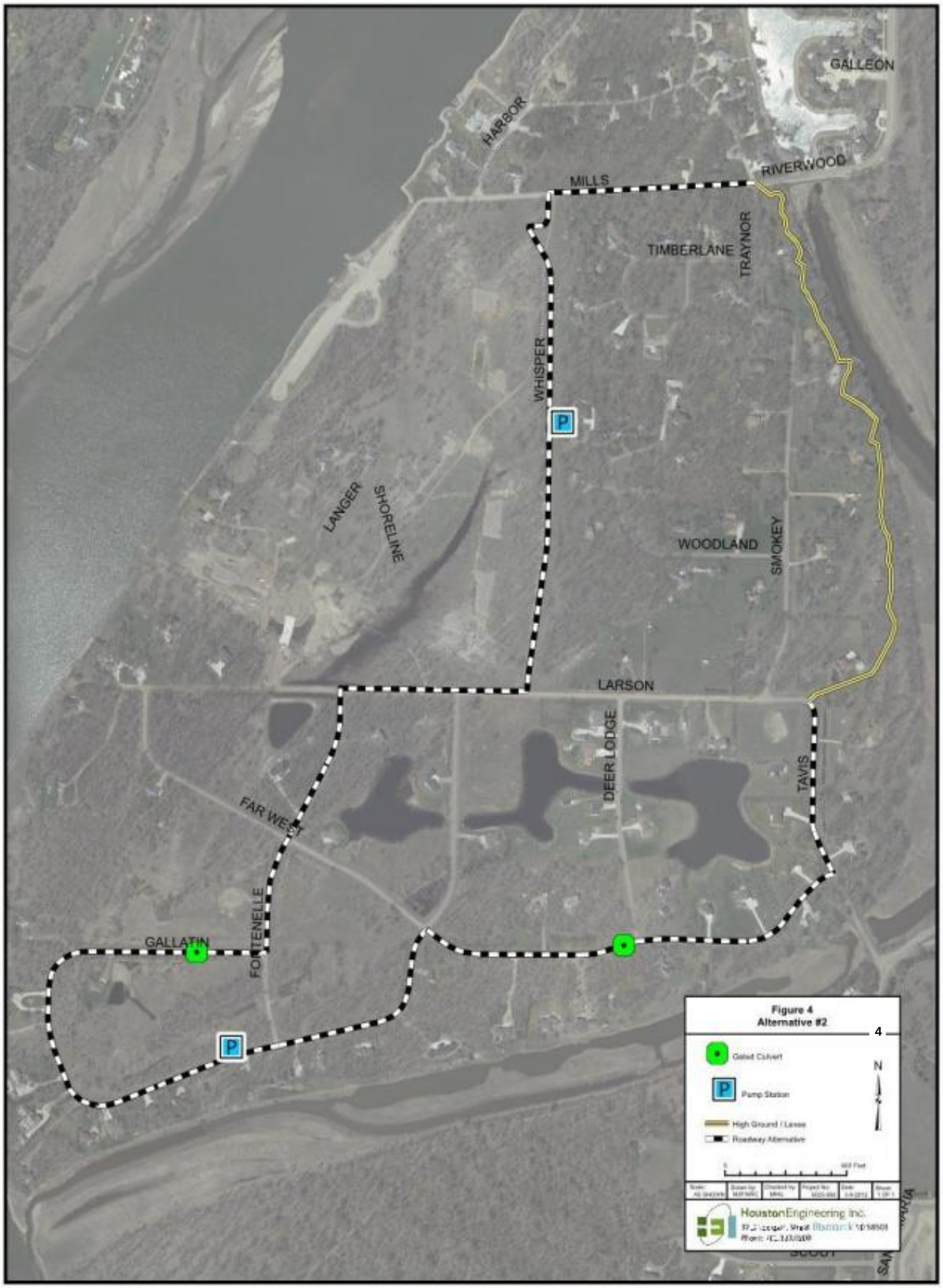
ALTERNATIVE #2 - INTERIOR ROADWAY

Alternative #2 is a cost effective means of providing flood hazard mitigation for a portion of Fox Island using the existing roadway system. These roadways would be raised and used to isolate and protect the interior portions of the development. Recent grade raises created the ability to protect the interior area with comparatively low cost control structures. The area that could be protected is bounded by Mills Avenue on the north; Traynor Lane, Smokey Lane and Tavis Road on the west; Far West and Gallatin Drives on the south; with Fontenelle Drive and Whisper Drive on the western boundary.

These improvements include an earthen levee along Mills Avenue, two gate/pump stations, and two other gated culverts as illustrated in **Figure 4**. These gates would isolate the interior area during a flood event and the pumps would be required to provide a means to evacuate internal stormwater runoff and excess groundwater during an extended flood event like 2011.

This alternative takes advantage of the existing roadway elevations which were recently increased in some areas to an average elevation around 1635.35 (NAVD 88). An earthen levee would also be required along Mills Avenue to achieve this same protection for the interior area. Natural high ground east of Traynor Lane and Smokey Lane provides containment along the eastern edge of the area. As a reference, the 2011 high water mark was approximately 1635.7 (NAVD 88) at Tavis Road, which was 0.35 feet above the average top of roadway.


BISMARCK
RIVERWOOD
CLIPPER
SCHOONER
BUCCANEER
MUTINEER
GALLEON
MILLS
TRAYNOR
WHISPER
LANGER
SMOKEY
LARSON
FAR WEST
GALLATIN
DEER LODGE
TAVIS
ENGLAND
Tavis Road
Oxbow Outlet
Figure 3
Alternative #1
Grade Raise
Proposed Structure
N
HoustonEngineering Inc.
3712 Lockport Street Bismarck ND 58503
Phone: 701.323.0200


GALLEON
HARBOR
MILLS
RIVERWOOD
TIMBERLANE
TRAYNOR
WHISPER
LANGER
SHORELINE
WOODLAND
SMOKEY
LARSON
DEER LODGE
TAVIS
FAR WEST
FONTENELLE
GALLATIN
Figure 4
Alternative #2
Gated Culvert
Pump Station
High Ground / Levee
Roadway Alternative
N
HoustonEngineering Inc.

The two pump stations, one located on Gallatin Loop and the other on Whisper Drive, would remove internal stormwater runoff and excess groundwater. Gates would be required on two additional culverts to prevent the introduction of backwaters from the Missouri River into the protected area. The first culvert is under Far West Drive, while the second is on Gallatin Loop.

In an attempt to quantify the potential benefits achieved under this alternative, a GIS analysis was completed using property evaluation data from Burleigh County and lowest adjacent grade information available from existing Letters of Map Change and 2009 LIDAR topographic data. The current effective Flood Insurance Study Missouri River HEC-RAS hydraulic model was used to project water surface elevations for events of varying recurrence intervals. Using this data, the monetary impact resulting from flooding on Fox Island was then calculated for various events under existing conditions and proposed conditions with **Alternative #2**. **Table 1** provides the projected flooding impacts for the entirety of Fox Island, including areas North of Mills Avenue. **Table 2** similarly provides the results for only those properties with the interior area. **Table 3** provides the revised flood risks for the interior area with the **Alternative #2** improvements in place.

TABLE 1
Flood Impacts for All of Fox Island
Existing Conditions

Event	River Elevation (NAVD 88)	# Affected Residences	% Affected	Market Value Affected [1]	# Affected Outbuildings	% Affected
10-year	1633.0	23	19%	$6,653,700	27	84%
50-year	1635.2	73	61%	$24,298,200	31	97%
March 2009	1635.3	74	62%	$24,711,200	31	97%
100-year	1636.5	105	88%	$36,102,300	32	100%
BFE + 1 Foot	1637.5	117	98%	$41,020,300	32	100%
BFE + 2 Foot	1638.5	120	100%	$42,616,800	32	100%
500-year	1639.9	120	100%	$42,616,800	32	100%

[1] Includes areas north of Mills Avenue and properties within the City of Bismarck
[2] Source of values = 2010 Burleigh County Tax Assessors

TABLE 2
Flood Impacts for Interior Area of Fox Island
Existing Conditions

Event	River Elevation (NAVD 88)	# Affected Residences	% Affected	Market Value Affected	# Affected Outbuildings	% Affected
10-year	1633.0	12	23%	$3,409,000	17	100%
50-year	1635.2	40	77%	$11,341,200	17	100%
March 2009	1635.3	43	83%	$12,415,000	17	100%
100-year	1636.5	49	94%	$14,484,300	17	100%
BFE + 1 Foot	1637.5	52	100%	$15,259,600	17	100%
BFE + 2 Foot	1638.5	52	100%	$15,259,600	17	100%
500-year	1639.9	52	100%	$15,259,600	17	100%

[1] Source of values = 2010 Burleigh County Tax Assessors

TABLE 3 Flood Benefits for Interior Area of Fox Island Proposed Conditions – Alternative #2						
Event	**River Elevation (NAVD 88)**	**# Affected Residences**	**% Affected**	**Market Value Affected**	**# Affected Outbuildings**	**% Affected**
10-year	1633.0	0	0%	$0	0	0%
50-year	1635.2	0	0%	$0	0	0%
March 2009	1635.3	0	0%	$0	0	0%
100-year	1636.5	49	94%	$14,484,300	17	100%
BFE + 1 Foot	1637.5	52	100%	$15,259,600	17	100%
BFE + 2 Foot	1638.5	52	100%	$15,259,600	17	100%
500-year	1639.9	52	100%	$15,259,600	17	100%
[1] Source of values = 2010 Burleigh County Tax Assessors						

As indicated in these tables, the proposed improvements provide protection up to a 50-year event including an ice jam event equal in magnitude to the 2009 event. This alternative would eliminate potential impacts to around $12,415,000 worth of property. During the 2009 ice jam a total of $303,764 in damages were reported on these same properties.

Due to the limited construction required and relatively low cost, this alternative was initially selected as the preferred alternative; however it does not provide protection for the entirety of Fox Island during a 2011 event including those areas north of Mills Avenue. Therefore, it no longer satisfied the expressed desire of the residents requesting a more comprehensive project.

ALTERNATIVE #3 - FOX ISLAND PERIMETER LEVEE

One method to protect the majority of residents on Fox Island from another 2011 event is to construct a levee encircling the entire development. Initially this alternative was eliminated from consideration largely due to the higher cost and the anticipated unacceptable aesthetic impacts such as tree removal and levees located within back yards that may in some instances obstruct the viewshed. Based on resident feedback during meetings following the 2011 event, this was, for some period of time, the preferred alternative as expressed by the Steering Committee. As such it was evaluated in more detail. When designing a flood control levee there are many factors to consider, including but not limited to, the following:

1. No material can be placed in the river without a COE Section 404/Section 10 permit.
2. No material can be placed below the Ordinary High Water Mark (OHWM) without obtaining a Sovereign Lands permit from the North Dakota State Engineer.
3. No material can be placed within the regulatory floodway without incorporating compensatory conveyance measures into the project and completion of an analysis that documents there will be no change in total conveyance.
4. Placement of material along the bankline cannot obstruct or restrict access to the existing COE bank stabilization projects as there are access easements that need to be adhered to.
5. Levee construction cannot affect any structure (including outbuildings, septic systems, etc…) without the impacts being mitigated, including the potential need to remove or relocate the structure. In these cases, consideration of a floodwall should be included during final design to limit impacts and costs.
6. Levee structural stability, seepage and geotechnical integrity.
7. FEMA Certification.
8. Consideration needs to be given to the design criteria on which to base the preliminary design and opinion of probable cost.
9. Landowner questions and expressed concerns – private systems (i.e., septic, electrical, irrigation system, etc…)

The approach taken with **Alternative #3** and **Alternative #5** is to comply with Item 1 through Item 3 to avoid needing permits, which can often require extensive technical and environmental reviews. A construction permit will be required by the North Dakota State Engineer, however as noted later. Item 4 is a given and compliance is in the resident's best interest in order to provide reasonable access to the river and riprap protection along the bankline. Item 5 is a design constraint that requires additional consideration during final design.

Item 6 requires a geotechnical evaluation on the property where the levee is located to assure the design is structurally stable and seepage is within acceptable limits. This evaluation is not completed until the design and final alignment have been determined.

FEMA certification noted in Item 7 is not possible in this instance as it would require a levee that has a minimum of three feet of freeboard. Construction of a levee to such a level is not acceptable due to space, aesthetic constraints, and cost.

Item 8 presents a more significant question related to what this system would look like. Subsequently, the following criteria were considered and project baseline determinations made. These are related to the selected protection levels and the levee design section:

- **Design Section**
  - Top Width — 10 feet (4 foot minimum)
  - Riverward Side Slope — 3:1 (OHWM and floodway avoidance)
  - Residence Side Slope — 4:1 (shaped to existing ground where reasonable)
  - Interior Drainage and Pumps — Gated culverts and pump structures
  - Residential Lot Drainage — Final Design Consideration

A number of considerations went into the proposed design section. First, the top width needed to provide reasonable access for maintenance, as well as to allow the placement of additional protective measures such as sandbags. The 10 foot top width would allow for the placement of 4 feet of properly constructed sandbags or various sizes TrapBags©. Four foot high TrapBags© requires a base footprint of around 6 feet. An additional clear width of 20 feet on the landward side of the levee is desirable for equipment access. Where this is not available, the TrapBags© can be filled from the ends; however the speed of installation is considerably slower. A four foot minimum top width is applicable in isolated areas to avoid the use of a higher cost structural floodwall. The selected side slopes are for embankment stability as well as ease in maintenance while limiting the overall foot print. An important final design issue is the geotechnical evaluation to ensure not only the stability of the levee, but the bankline on which it is placed. There will be considerable design challenges with the river sands underlying the alignment and bank stability. Specific landowner concerns will also be a significant factor when completing final design; however they cannot be addressed at this stage in project development.

Item 9 represents questions and concerns brought to our attention through cooperation with the Fox Island Steering Committee and Riverwood West Homeowners Association along with private systems. A summary of questions and general responses is provided in **Appendix F**.

The expressed directive from many residents was to develop a project that provides flood protection up to the water levels experienced in 2011. **Table 4** summarizes the pertinent elevations for various events at select locations along the river.

TABLE 4 HISTORIC FLOOD LEVELS			
Event	**Bismarck Gage**	**Mills Avenue**	**Tavis Road**
Base Flood Elevation (DFIRM Sept 2009)	1639.25 (19.62 Gage Height)	1636.53	1636.40
2009 Ice Jam	1635.72 (16.09 Gage Height)	1635.55 (est.)	1635.05 (est.)
2011 Flood Peak	1638.93 (19.30 Gage Height)	1637.15	1635.70
Elevation Datum = NGVD 1988			

Because peak water surface elevations decrease from upstream to downstream, the top of levee design elevation proposed will also slope from upstream to downstream. **Table 5** illustrates the results of the protective measures provided with **Alternative #3**. This table shows that all properties would be protected up through a 100 year event. The reasons for the six residences not protected during the 2011 event are documented in other sections of this report.

TABLE 5 Alternative #3 Flood Benefits for Fox Island Perimeter Levee/Floodwall						
Event[3]	**River Elevation (NAVD 88) [1]**	**# Affected Residences**	**% Affected**	**Market Value Affected [2]**	**# Affected Outbuildings**	**% Affected**
10-year	1633.0	0	0%	$0	0	0%
50-year	1635.2	0	0%	$0	0	0%
March 2009	1635.3	0	0%	$0	0	0%
100-year	1636.5	0	0%	$0	0	0%
2011 Event	**1637.15**	**6**	**4%**	**$2,985,700**	**2**	**6%**
500-year	1639.9	120	100%	$42,616,800	32	100%
[1] These elevations are based on the upstream end of the project area (Mills Avenue). [2] There are some residences not protected by the permanent levee and therefore are not included. [3] Flood Elevations are based on the 2005 FIS model, while the 2011 event represented a 500-year flow.						

Prior to the public informational meeting, **Alternative #3** had been identified as the preferred alternative. However, due to the opposition expressed by residents, those primarily living along the river oxbow, **Alternative #5**, as described below was developed.

ALTERNATIVE #4 - FOX ISLAND PERIMETER LEVEE/EASEMENT

There were a number of inquiries related to developing an alternative that would simply create a suitable easement area on which temporary flood protection measures could be placed prior to a major flood event. After reviewing this option, several fatal flaws were identified. Both involve the available reaction time to install the temporary measures. During an ice jam, waters rise very quickly, and temporary measures would have to be installed within a matter of hours. This quick reaction may not be possible or practical in all situations; therefore protection cannot be reasonably assured. The County would need to have the applicable materials on hand and the means to activate staff and/or contractors to install on extremely short notice. Given the inability to ensure protection to 2011 flood levels, especially if they occur as a result of an ice jam event, this alternative was eliminated from further consideration.

ALTERNATIVE #5 – PERIMETER LEVEE AND ROADWAY GRADE RAISES

During the public informational process, residents living on riverfront exterior lots presented petitions expressing their opposition to the placement of a levee between their homes and the river or, in the case of those residents along the backwater channel, between their homes and the channel. These petitions are included as **Appendix B,** and they clearly indicate these residents have chosen not to be protected by a public flood control project.

After the public informational meeting and the filing of the petition by the perimeter residents, the newly reactivated Fox Island Homeowners Association indicated their desire to continue exploring a project that would provide protection to the interior properties against another 2011 flood event. **Figure 5** illustrates this alternative which includes a perimeter levee along the Whispering Bay access channel extending south along the Missouri River, then across a County owned lot where it would tie into a roadway grade raise along Gallatin Loop. Roadway grade raises along Gallatin Loop, Gallatin Drive and Far West Drive would then tie into the previously completed grade raise on Tavis Road. This system, along with the City's planned grade raises on Mills Avenue and Riverwood Drive, would provide the desired protection to the interior lots south of Mills Avenue. Most of the exterior lots, owned primarily by those who signed the petitions, would not be protected. A few lots, whose owners had signed the petition, would still be protected as shown on **Figure 5**. It is understood that these owners would accept the project levee that is being proposed.

The residents along the river in the Harbor Drive area north of Mills Avenue also expressed their unwillingness to allow the construction of a levee between their residences and the river. The petitions that they submitted are included in **Appendix B**. The remaining residents in the Harbor Drive area privately examined alternatives for providing flood control protection for the interior area.

Because of the complications resulting from the opposition of the exterior residents and given the diverging goals of the Fox Island residents located south of Mills Avenue and residents of the Harbor Drive area, the BCWRD determined it necessary to consider any project developed for the area north of Mills Avenue in the Harbor Drive area as a separate project. Therefore, protecting property north of Mills Avenue was eliminated from the Fox Island Flood Control Project.

The two projects were in fact initiated by different mechanisms. The Fox Island Project was initiated through a formal petition process, while the Harbor Drive Project was initiated through the Burleigh County Flood Control Master Plan and interest expressed by the Riverwood West Homeowners Association. Subsequently, **Alternative #5** only provides flood protection for the interior of Fox Island residences south of Mills Avenue. **Table 6** illustrates the number and values of the structures protected by this alternative.

TABLE 6
Alternative #5 Flood Benefits for Fox Island
Perimeter Levee – Roadway Grade Raise

Event	River Elevation (NAVD 88) [1]	# Affected Residences	% Affected	Market Value Affected [2]	# Affected Outbuildings	% Affected
10-year	1633.0	16	25%	$4,455,700	22	96%
50-year	1635.2	48	75%	$14,193,300	23	100%
March 2009	1635.3	52	81%	$15,577,100	23	100%
100-year	1636.5	59	92%	$17,896,400	23	100%
2011 Event	**1637.15**	**64**	**100%**	**$19,799,900**	**23**	**100%**
500-year	1639.9	64	100%	$19,799,900	23	100%

[1] These elevations are based on the upstream end of the project area (Mills Avenue).
[2] There are some residences not protected by the permanent levee and therefore are not included.

SOVERIGN LAND
LINE (32,000 CFS)

FLOODWAY

LEVEE

GRADE RAISE

Larson Rd

Fontenelle Dr

Gallatin Loop

N

160 0 160 320
Scale Feet

This document is preliminary and not for construction or implementation purposes.

PRELIMINARY

No.	Revision	Date	By

Houston Engineering Inc.

Bismarck
P: 701.323.0200
F: 701.323.0300

Drawn by NRC/MJF | Date 1-7-13
Checked by MHG | Scale AS SHOWN

FOX ISLAND
SEGMENT D / ROAD RAISE
BISMARCK, ND

LEVEE
OVERVIEW
PROJECT NO. 6025-006

Figure 5

T:\6025-XXX Burleigh County Water Resource District\6025-006 Fox Island Flood Control\CAD\Segment D Fox Island\20.0 Stage Through Burleigh Lot and on Street\3 OVERVIEW - Optional Street Increase.dwg -22X34-1/7/2013 3:57 PM-(mcullen)

NON-PROJECT ALTERNATIVES

Since it is possible the proposed project measures may not be constructed it is prudent to review various other flood hazard mitigation alternatives that could be utilized by public agencies and/or individuals. These include, but are not limited to, floodplain ordinance revisions and structural modifications as discussed in the following sections.

FLOODPLAIN ORDINANCE

The most prudent action by any community to prevent flood damages or mitigate flood hazards is to implement and enforce a floodplain ordinance that protects against projected and documented flooding (i.e., 2011 event). A 1985 Corps of Engineers (COE) Report entitled *Oahe-Bismarck Area Studies, Analysis of Missouri River Flood Potential in the Bismarck, North Dakota Area*, contained the following statement related to mitigating flood risks on the Missouri River at Bismarck:

1985 – COE STUDY CONCLUSION

> *"The course of action to be followed by the Corps of Engineers is to continue to reduce releases from the Garrison Reservoir at critical high discharge periods at Bismarck – when flows from tributaries downstream from Garrison Dam could cause flooding at Bismarck and during winter ice-in (retain 13-foot target). Additional flood plain management measures should be considered by the City of Bismarck, Burleigh County, and those developing in the flood plain. These measures would limit future increases in flood damages and increase the safety of persons living in the flood plain. These measures include raising new development more than the required 1 foot above the potential existing-conditions 100-year flood elevation and raising the access roads to areas of extensive development. Also, those living or having businesses in the flood plain should continue to participate in the Federal Flood Insurance Program to minimize personal loss should flooding damage their property."*

It is interesting to note that these recommendations were not followed, and in some instances only after the 2009 and 2011 events were they given further consideration. It was not until mandated by the State of North Dakota in 2005 that the City and County adopted a one foot above the Base Flood Elevation (BFE) standard. After the 2009 ice jam event, the City revised its ordinance to require lowest floor elevations to be two feet above the BFE. The Burleigh County Commission recently approved revisions to their ordinance that reflect the extended recommendations provided below.

The current City and proposed County floodplain ordinance includes the following statements:

> *"1. Statement of purpose. It is the purpose of this ordinance article to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed:*
>
> *a. To protect human life and health;*
> *b. To minimize expenditure of public money for costly flood control projects; and*
> *c. To minimize the need for rescue and relief efforts associated with flooding, generally undertaken at the expense of the general public;"*

Based on the "*Statement of purpose*" included in the ordinance and documented flood impacts from the 2011 event, it is recommended that all new construction have a finished floor or crawl space elevation placed at least two feet above the BFE. In addition, any property removed from the Special Flood Hazard Area (SFHA) through a Letter of Map Revision (LOMR) or Letter of Map Amendment (LOMA) should remain subject to the provisions of the floodplain ordinance.

The objective is to prevent the placement of new basements or lowest floor elevations below the 2011 flood event, which measurably increases their risk for flooding and groundwater impacts. This is a very effective nonstructural mitigation measure to prevent new structures from being subjected to avoidable flood risks and damages. To protect new structures that could be adversely impacted by future events like the 2011 flood that are not within the FEMA regulatory floodplain (100-year), it is recommended the SFHA be defined as the 500 year floodplain. This provides additional jurisdictional authority to protect properties from groundwater impacts associated with extended duration flooding.

There is a notable concern related to the recommended floodplain ordinance revisions in that the BCWRD and Burleigh County have no jurisdictional authority within the subject study area. Fox Island is located within the City of Bismarck's extraterritorial jurisdiction and therefore theirs is the governing ordinance. After the 2009 ice jam event, the City of Bismarck adopted provisions that required all structures to be placed two feet above the BFE.

In recognition of the LOMR or LOMA issue, the City adopted a provision that structures removed from the floodplain be constructed using the guidelines outlined in *FEMA Technical Bulletin 10-01.* While a prudent step, it continues to allow floor elevations below the BFE and does not address the groundwater issues related to an extended duration flood event like that which occurred in 2011. It is also less effective at mitigating the risks for damages than adequately elevating the lowest floor elevations above a known flood event.

On a related topic, the BCWRD and Burleigh County have taken a position that the flood hazard mitigation levee and roadway grade raise projects under consideration will not be certified through the FEMA process. As such, while providing real and functional flood protection, they will not be used to change the Flood Insurance Rate Maps (FIRM) and FEMA's designated floodplain. Therefore, any revision to the floodplain ordinance will apply to all structures regardless if they are located behind a protective levee or not. As part of its flood mitigation master plan the County is raising access roadways to areas of extensive development to a centerline elevation that is 0.70 feet above the documented 2011 high water mark.

Another advantage in managing floodplains based on strict criteria is the opportunity to participate in *FEMA's Community Rating Service (CRS)*. This program could significantly lower the local cost for flood insurance premiums. It is recommended the City and County look into the CRS program to determine its value to the community.

In conclusion, the BCWRD is encouraged to request the City to consider the recommendations noted above. Should the City elect not to adopt these recommendations they would continue to allow developers, builders and residents to construct residences with lowest floor elevations below the BFE that are subject to unnecessary risks and *avoidable future private and public expenses*, which is contrary to the "*Statement of purpose*" in their floodplain ordinance.

STRUCTURAL MODIFICATIONS

Structural modifications as a flood hazard mitigation measure can take any number of forms. FEMA has any number of circulars and information available related to flood proofing of structures. These typically include the relocation or protection of utilities (e.g., electrical services, furnaces, hot water heaters…) to reduce flood damages, refer to www.fema.gov. Another effective method is to elevate the existing structure from its current level to two feet above the BFE, including the lowest floor elevation. This option has been discussed and considered by a number of residents for both their primary residence and outbuildings. The cost to remove a residence and reconstruct its foundation at a higher level varies significantly based on its size, shape, construction method and location so it is difficult to establish a single value.

In the instance where the City declines to modify their floodplain ordinances for new structures it is recommended that builders and buyers be notified of the risks associated with construction in the floodplain. This to include notification of the current City provision that structures constructed on lands removed from the floodplain must be constructed using the guidelines outlined in *FEMA Technical Bulletin 10-01.* The City and County are strongly encouraged to provide floodplain information to anyone applying for a building permit for a structure that is governed under the floodplain ordinance.

FLOOD INSURANCE RATE MAP REVISIONS

Another method to mitigate flood hazards is to adequately enforce existing floodplain ordinances based on the Flood Insurance Rate Maps (FIRM) published by FEMA as part of their Flood Insurance Study (FIS) and Risk Map Program. There is a significant future concern, however that needs to be documented and understood. The 2005 FIS resulted in nearly a one foot increase in the BFE in Bismarck and Burleigh County. This increase resulted from changing river conditions between the 1983 and 1998 data sets, including the growth in the downstream delta formation. Given the river scouring that occurred during the 2011 event, if a new FIS were completed today this increase may be reversed. If remapped based on these changes this action could result in a dangerous false sense of security and utilization of a lower BFE for floodplain development. It is recommended the BCWRD and County cautiously review any new FIRM's and modify their ordinances so as not to decrease the level of protection provided by the recommendations contained herein. It is important to recognize the use of stricter floodplain criteria does not affect the cost of federally subsidized flood insurance.

PREFERRED ALTERNATIVE

Alternative #5 – Perimeter Levee and Roadway Grade Raises is the preferred flood protection alternative, based on the petitions received during the public informational meeting, as well as the subsequent feedback from the reactivated Fox Island Homeowners Association. This system consists of an earthen levee along the south side of the Whispering Bay entrance channel then southward along the Missouri River and then east across a lot owned by Burleigh County where the levee ties into a grade raise on Gallatin Loop. This alternative also includes grade raises along Gallatin Loop, Gallatin, Drive and Far West Drive, tying in to Tavis/Larson Road, which is its eastern and southern terminus. This system will provide protection to the interior residents south of Mills Avenue while eliminating the placement of a levee on the lots owned by those who signed the petition of opposition to opt out. This system will not provide protection to a majority of the exterior lots, nor will it include the Harbor Drive area north of Mills Avenue.

The proposed design provides protection up to the high water levels experienced during 2011. The preliminary levee design is based on observed high water marks along this river reach, though this project does not necessarily protect against the designated Base Flood Elevation.

PRELIMINARY CONFIGURATION

The proposed system alignment is illustrated in **Figure 5** and has been divided into two segments for purposes of review and discussion, specifically the riverward earthen levee and the roadway grade raise. A preliminary plan set for each segment is included in **Appendix C**. A construction permit will be required from the North Dakota State Engineer, which would include an impact assessment on Missouri River flood elevations. This application would include all project components and identify the complementary City project features such as the Mills Avenue and Riverwood Drive grade raises. If the City grade raises are to be used as part of a flood control protective levee system, they also must be permitted.

SEGMENT A – RIVER LEVEE

The earthen levee runs along the south side of the Whispering Bay access channel and extends south along the Missouri River until it runs east to Gallatin Loop. The height of the levee averages 2.3 feet above natural ground with a maximum height of 7.6 feet. The length of river levee is 3,512 feet. The levee alignment was selected recognizing the need to stay outside the regulatory floodway as well as the sovereign lands boundary. There does not appear to be significant issues with this levee. The residents who objected to a levee being placed on their property are not directly impacted, with the exception of two residences where it is currently understood they agree with the levee proposal in this alternative. Accommodations will be made to fit the proposed levee into the natural topography of this area and around their residences. The river levee alignment is illustrated in **Figure 6**, and a typical cross section is illustrated in **Figure 7**.

SEGMENT B – ROADWAY GRADE RAISE

This segment involves a grade raise along Gallatin Loop, Gallatin Drive, and Far West Drive, for a total length of just over one mile. There are a number of issues to be resolved as part of the final design and construction such as right of way issues, potential roadway centerline changes and driveway approach grades. The alignment is illustrated in **Figures 8A and 8B**, and a typical section is illustrated **in Figure 9**. Initial indications are that the grade raise can be completed within the currently existing right-of-way, however considerable work and shaping will be required outside this area so temporary construction easements will be required.

OPINION OF PROBABLE COST

A preliminary Opinion of Probable Cost (OPC) was developed for this preferred alternative. **Appendix D** provides a more detailed unit cost breakdown of the anticipated project costs.

Table 7
Preferred Alternative (Alternative #5)
Opinion of Probable Cost

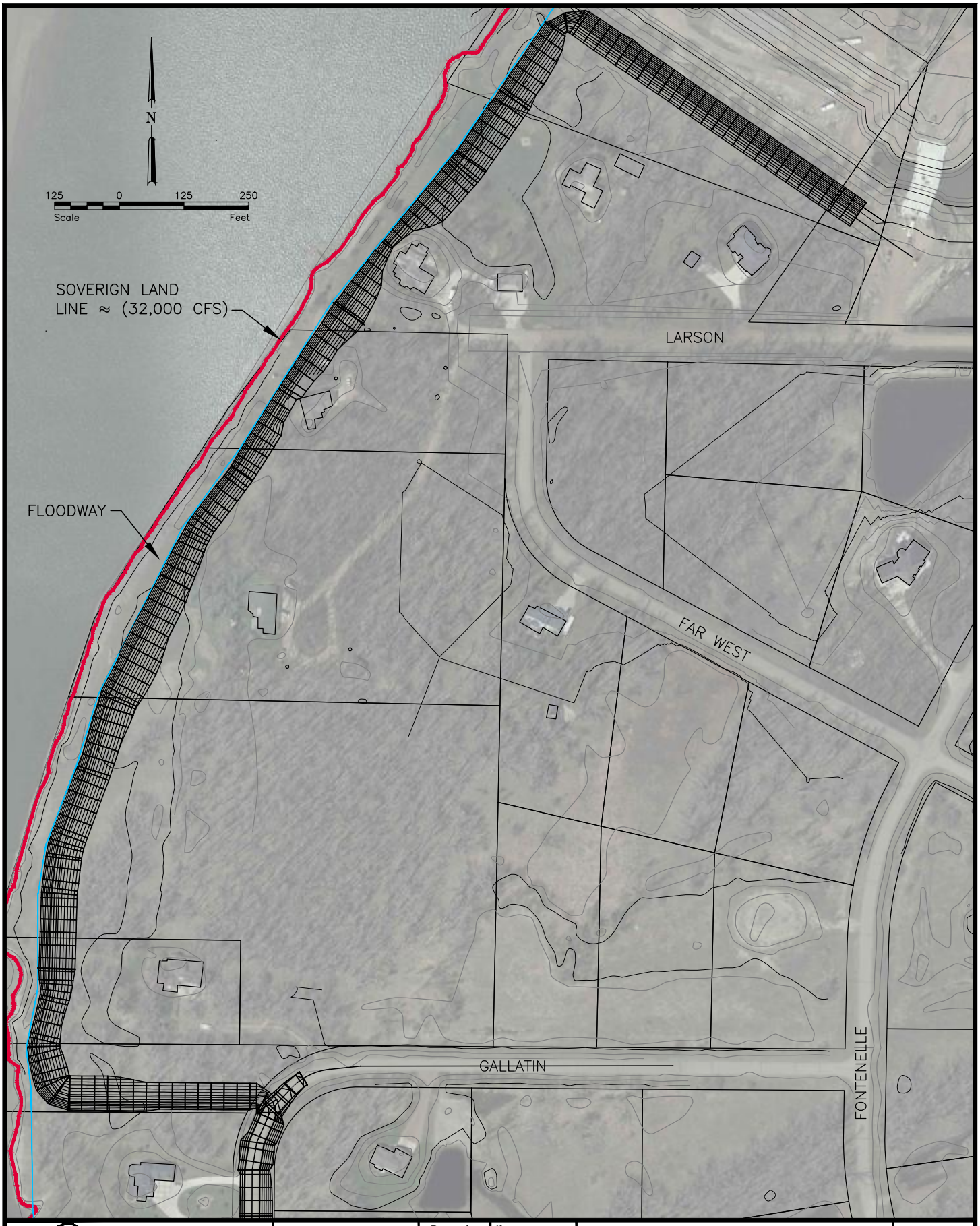
Construction	$2,375,028
Geotechnical	$10,000
Drainage Easement Documents	$12,000
Engineering	$427,504
Preliminary Engineering Study [1]	$130,000
Administration	$190,001
Total Cost	**$3,144,533**

[1] Less SWC cost share for preliminary engineering study

The distribution of the benefits and costs are discussed in more detail in the section entitled ***Assessment District Formation Process***.

PROJECT BENEFIT AREA

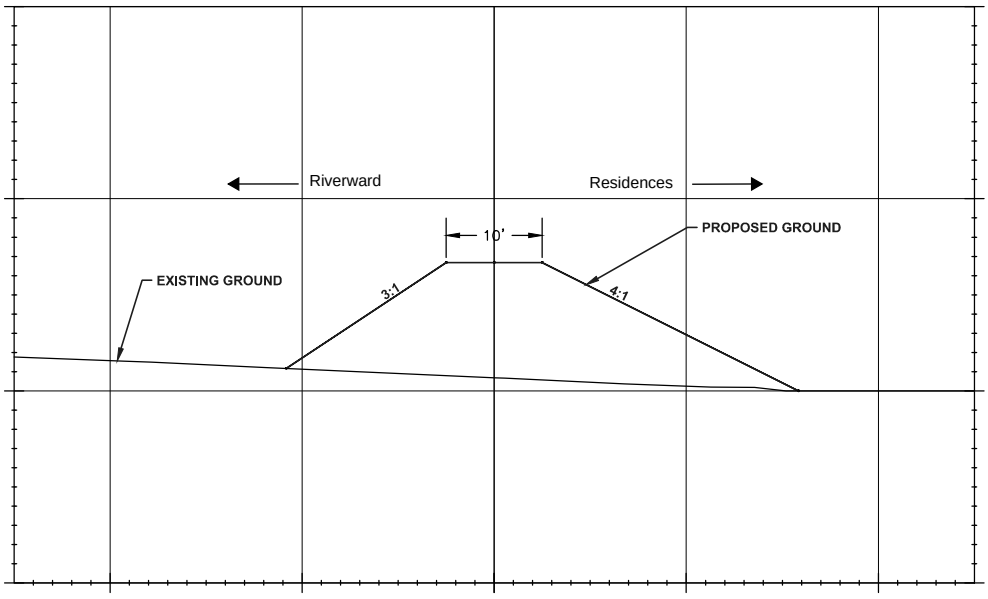
The benefited area for the Preferred Alternative is bound by the limits of the levee system. This includes the City of Bismarck's proposed grade raises on Mills Avenue and Riverwood Drive, and flood control gates and pump system on Tavis Road and Mills Avenue. **Figure 10** illustrates the unprotected property on Fox Island under existing conditions, while **Figure 11** illustrates the resulting protection provided by the preferred alternative. This inundation mapping is based on the 2011 high water surface elevation.



T:\6025-XXX Burleigh County Water Resource District\6025-006 Fox Island Flood Control\CAD\Segment D Fox Island\20.0 Stage Through Burleigh Lot and on Street\DESIGN & OVERVIEW - Optional Street Increase.dwg-FIGURE 6-12/30/2013 3:11 PM-(rcullen)

Houston Engineering Inc.	Bismarck P: 701.323.0200 F: 701.323.0300	Drawn by NRC/MJF	Date 11-29-12	RIVER LEVEE LAYOUT FOX ISLAND FLOOD CONTROL PROJECT BISMARCK , NORTH DAKOTA PROJECT NO. 6025-006	FIGURE 6
		Checked by MHG	Scale AS SHOWN		

80+00



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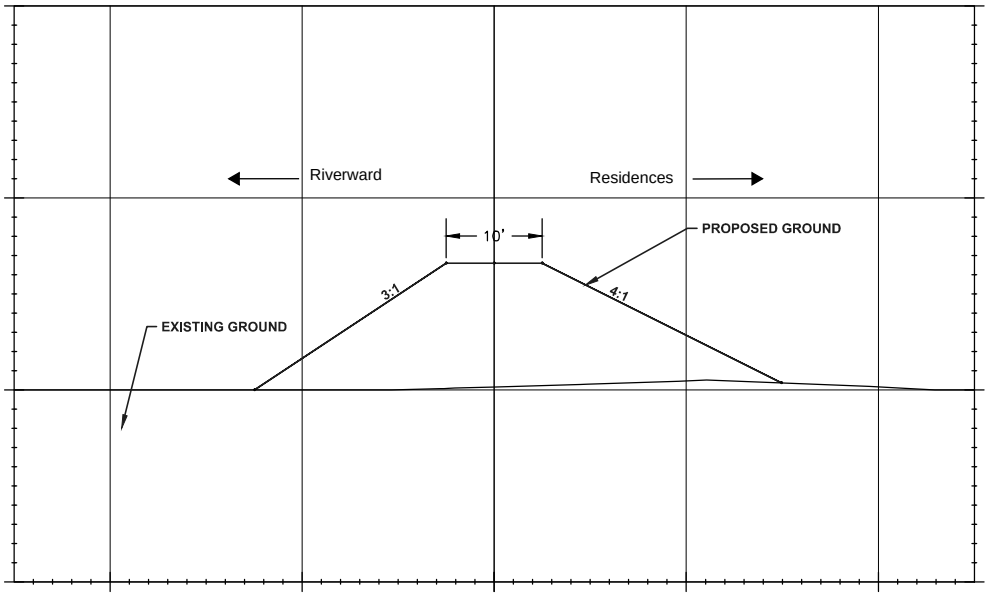


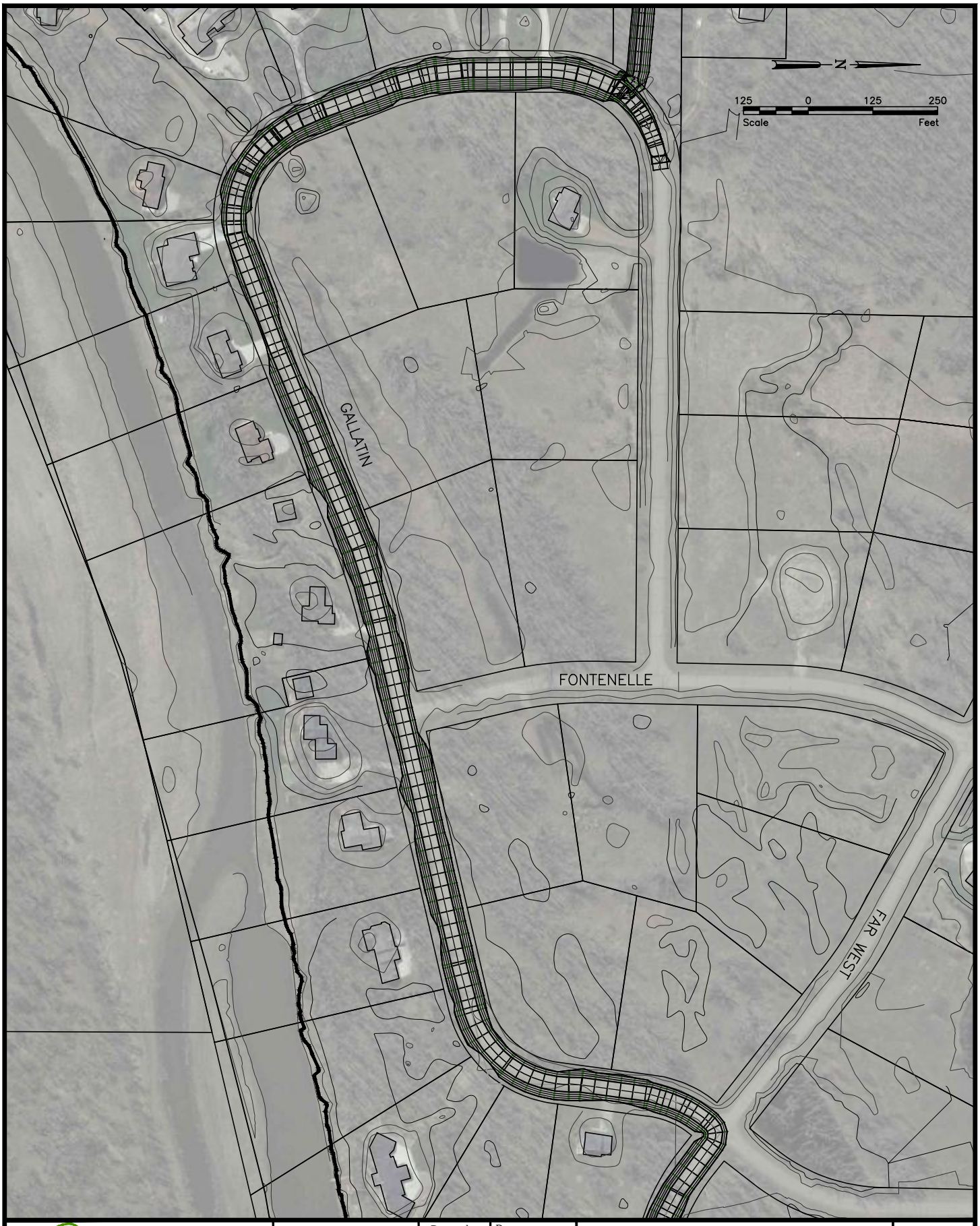
B/1 PROPOSED LEVEE CROSS SECTIONS

NOT TO SCALE

Houston Engineering Inc.
Bismarck
P: 701.323.0200
F: 701.323.0300

Drawn by	Date	
NRC/MJF	11-29-12	RIVER LEVEE TYPICAL SECTION FOX ISLAND FLOOD CONTROL PROJECT BISMARCK , NORTH DAKOTA
Checked by	Scale	PROJECT NO. 6025-006
MHG	AS SHOWN	

FIGURE 7



Houston Engineering Inc.	Bismarck P: 701.323.0200 F: 701.323.0300	Drawn by NRC/MJF	Date 11-29-12	GRADE RAISE LAYOUT FOX ISLAND FLOOD CONTROL PROJECT BISMARCK , NORTH DAKOTA PROJECT NO. 6025-006	FIGURE 8A
		Checked by MHG	Scale AS SHOWN		

T:\6025-XXX Burleigh County Water Resource District\6025-006 Fox Island Flood Control\CAD\Segment D Fox Island\20.0 Stage Through Burleigh Lot and on Street\3 OVERVIEW – Optional Street Increase.dwg-FIGURE 8A-1/7/2013 1:27 PM-(ncullen)

T:\6025-XXX Burleigh County Water Resource District\6025-006 Fox Island Flood Control\CAD\Segment D Fox Island\20.0 Stage Through Burleigh Lot and on Street\3 OVERVIEW - Optional Street Increase.dwg-FIGURE 8B-1/7/2013 3:44 PM-(ncullen)

Houston Engineering Inc.	Bismarck P: 701.323.0200 F: 701.323.0300	Drawn by NRC/MJF	Date 11-29-12	GRADE RAISE LAYOUT FOX ISLAND FLOOD CONTROL PROJECT BISMARCK , NORTH DAKOTA PROJECT NO. 6025-006	FIGURE 8B
		Checked by MHG	Scale AS SHOWN		

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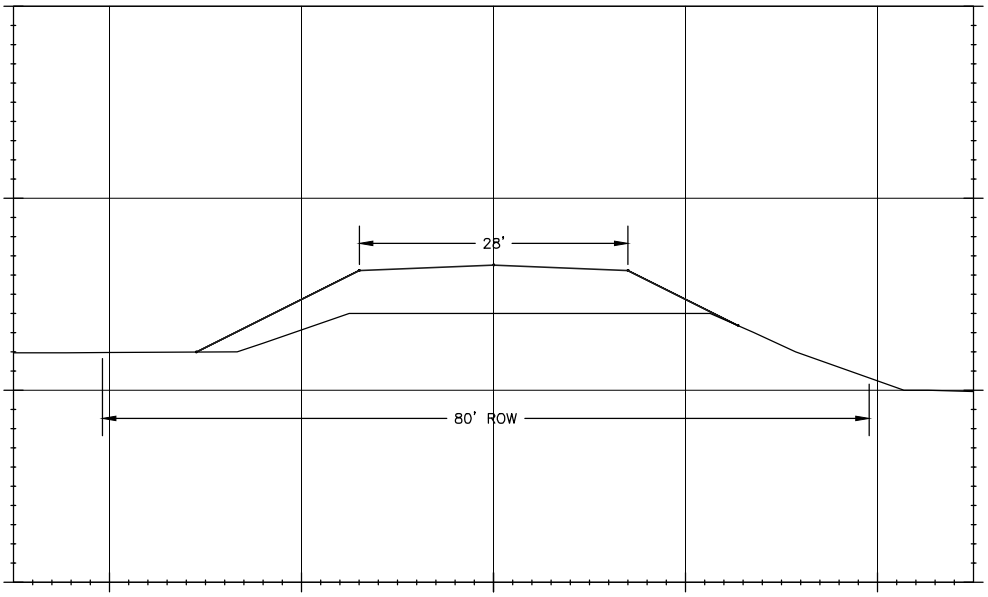

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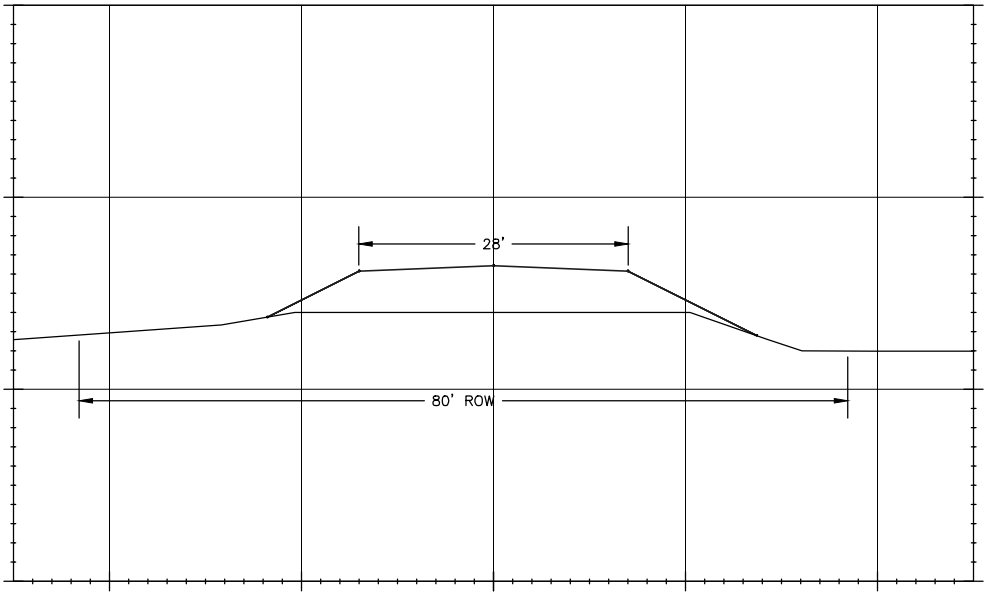

A/1 PROPOSED ROAD RAISE CROSS SECTIONS

NOT TO SCALE

Houston Engineering Inc.
Bismarck
P: 701.323.0200
F: 701.323.0300

Drawn by	Date	GRADE RAISE TYPICAL SECTION	FIGURE
NRC/MJF	11-29-12	FOX ISLAND FLOOD CONTROL PROJECT	
Checked by	Scale	BISMARCK , NORTH DAKOTA	9
MHG	AS SHOWN	PROJECT NO. 6025-006	

FIGURE 10
UNPROTECTED FLOOD LIMITS
EXISTING CONDITIONS

19.5 ft stage at the USGS Bismarck Gage

Scale:	Drawn By:	Checked By:	Project No.	Date:
AS SHOWN	MJF	MHG	6025-006	4/3/2012

Houston Engineering Inc.
Bismarck
P: 701.323.0200
F: 701.323.0300

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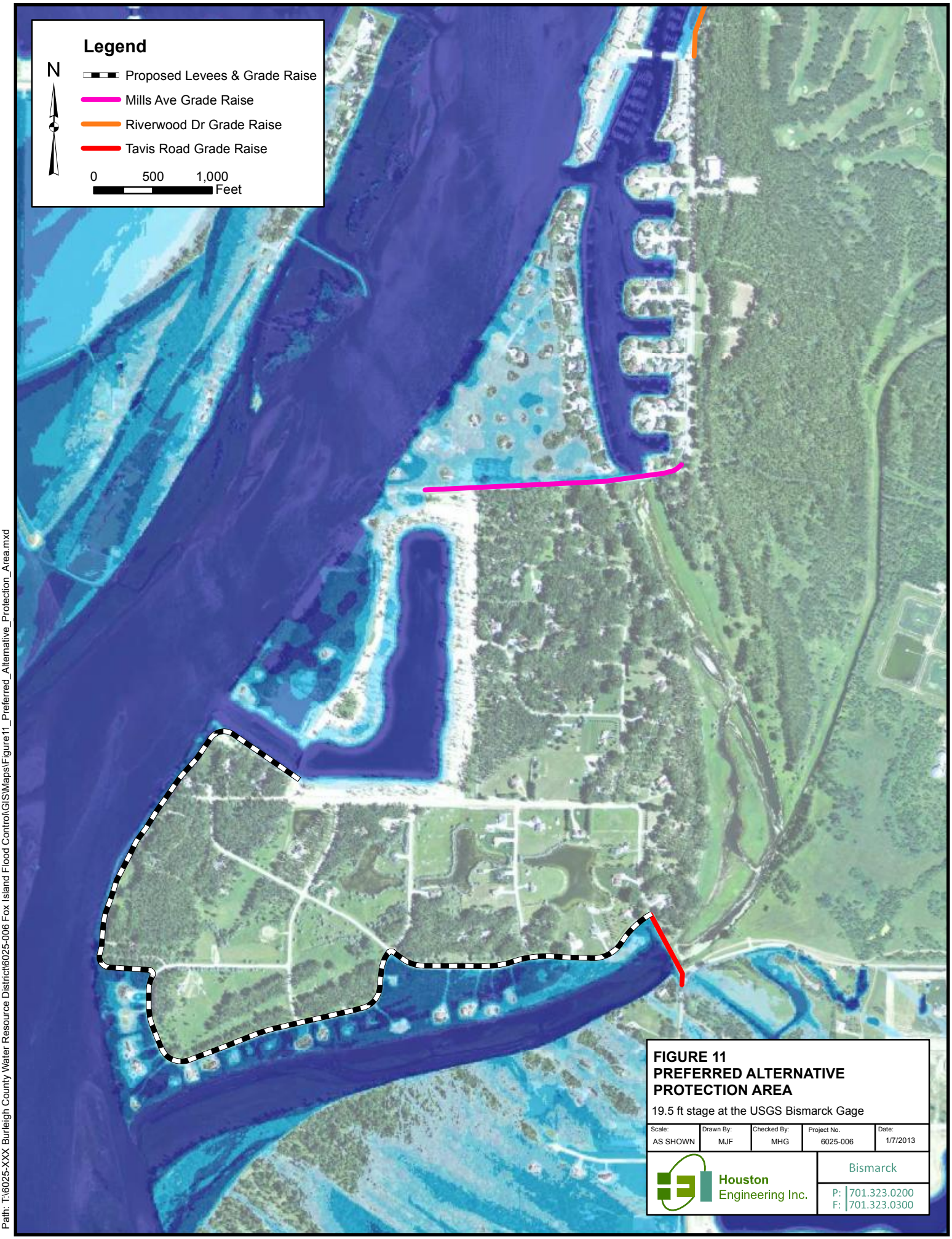


FIGURE 11
PREFERRED ALTERNATIVE PROTECTION AREA

19.5 ft stage at the USGS Bismarck Gage

Scale:	Drawn By:	Checked By:	Project No.	Date:
AS SHOWN	MJF	MHG	6025-006	1/7/2013

Houston Engineering Inc.
Bismarck
P: 701.323.0200
F: 701.323.0300

Path: T:\6025-XXX Burleigh County Water Resource District\6025-006 Fox Island Flood Control\GIS\Maps\Figure11_Preferred_Alternative_Protection_Area.mxd

INTERIOR DRAINAGE

STORMWATER MANAGEMENT

After the 2009 event, it was clearly evident that the internal drainage system within the Fox Island area is in serious need of improvement. Currently there are no defined stormwater easements within the existing plats. Therefore, every lot owner that places fill for construction of their residence or landscaping does so at the risk of obstructing a natural drainway, not being informed of the need to provide surface drainage through their properties.

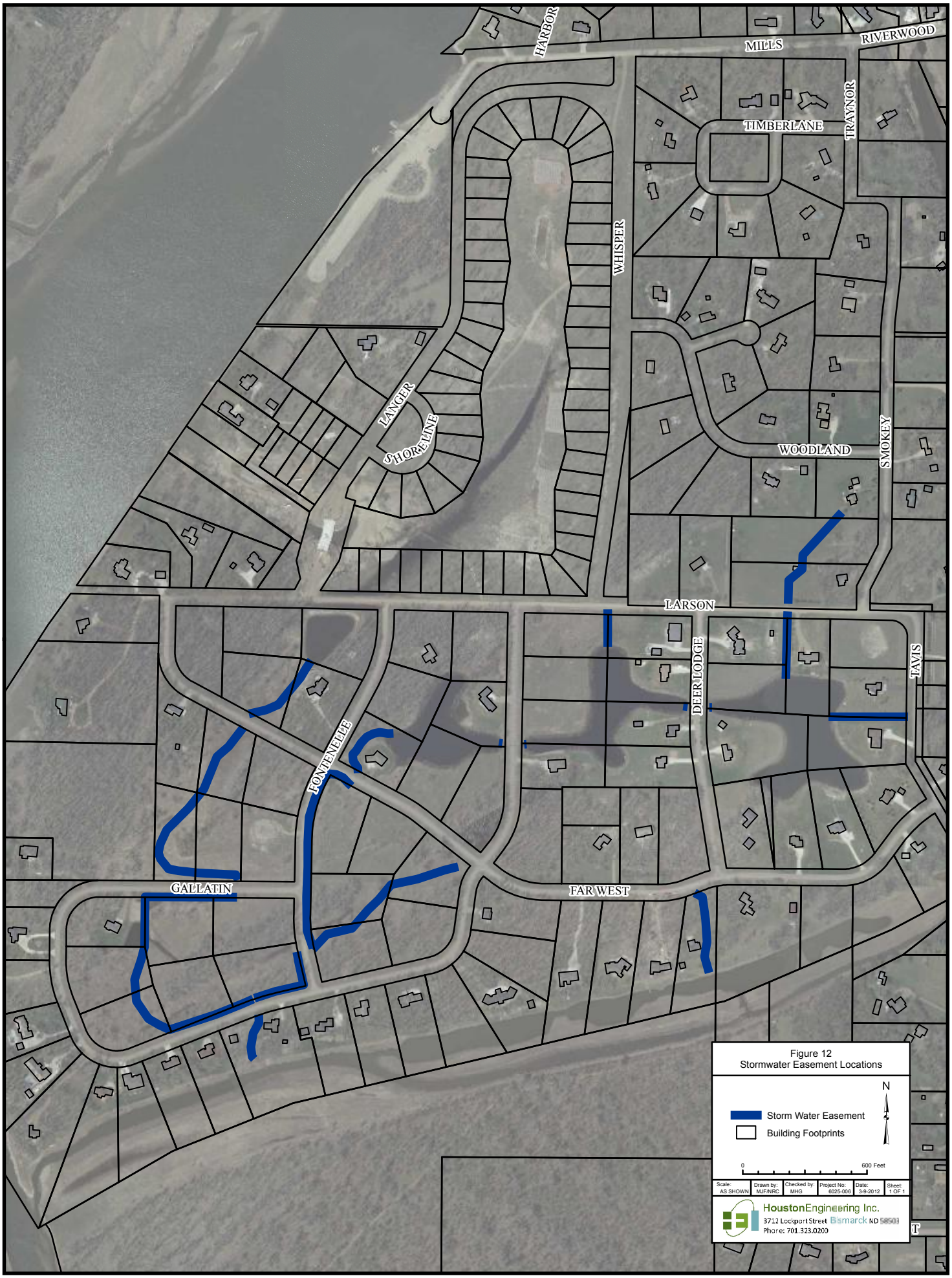
It is recommended that stormwater easements be created for surface drainage along the natural drainage within the development. These easements should be signed and recorded on the subject properties. Where existing obstructions exist, it is recommended the BCWRD notify the landowner to have them removed or provide an acceptable alternate path for surface waters to flow through the properties. If an alternative alignment is agreed upon, an easement should be acquired for that path and filed on the subject property. Where no agreement is reached, the BCWRD may consider enforcing the removal of the obstruction under their statutory authorities if the subject drainage meets the legal definition of a watercourse. The BCWRD should only proceed with this easement creation process if the assessment district is approved and the project proceeds. Otherwise this is an unfunded action and would be addressed on a case by case basis if written complaints are filed.

Figure 12 illustrates the projected location of the anticipate stormwater easements. The cost to complete the process of surveying and securing these easements is projected at around $16,000. The removal of materials and cleaning of these drainage paths to restore conveyance has a projected cost of approximately $85,000. In addition a gated control and pump station similar to the Whispering Bay Flood Control Structure is required south of Gallatin Drive or Far West Drive. These costs are included in the preferred alternative as detailed in **Table 6**.

While researching the Fox Island development history it was noted that a lake water freshening system was installed by the developer. It was determined this system has not been routinely used or maintained, and its current functional condition is unknown. While it was considered for utilization in floodwater removal, its size and capacity are limiting factors. In addition, since this a privately installed system, it is not recommended that its operation and maintenance be assumed or incorporated as part of a public project. The Fox Island Homeowners Association has been provided information on this system and may wish to consider assuming ownership and use of this system. Since this system is located within public right of way, approvals may be required for access and operation as it does not appear that easements were provided. It is unknown what authority or access was granted with the original installation, therefore, if this system is to be used, a formal agreement should be developed between the operator and Lincoln Township.

WHISPER DRIVE FLOOD CONTROL STRUCTURE

The Burleigh County Highway Department has completed the installation of the Whisper Drive flood control structure. This project includes a manhole structure and gate system with the ability to install a temporary pump when flood conditions require. The cost for this system was borne by Lincoln Township under the County's direction. The installation costs for this system are not recoverable under the proposed project assessment district. This system however, will need to be included in the project Emergency Response Plan.


HARBOR
MILLS
RIVERWOOD
TIMBERLANE
TRAYNOR
WHISPER
LANGER
SHORELINE
WOODLAND
SMOKEY
LARSON
DEER LODGE
TAVIS
FONTENELLE
GALLATIN
FAR WEST
Figure 12
Stormwater Easement Locations
N
Storm Water Easement
Building Footprints
0
600 Feet
Scale: AS SHOWN
Drawn by: MJF/NRC
Checked by: MHG
Project No: 6025-006
Date: 3-9-2012
Sheet: 1 OF 1
HoustonEngineering Inc.
3712 Lockport Street Bismarck ND 58503
Phone: 701.323.0200

ASSESSMENT DISTRICT FORMATION PROCESS

The Lincoln Township Cost Participation Memorandum included in **Appendix G** describes different alternatives for providing the required closure between Mills Avenue and Tavis Road. If no assessment project were approved by the Fox Island residents, then the Burleigh County Highway Department, acting as an agent for Lincoln Township, would ultimately provide closure by raising roadway grades in the shortest most direct route available. However, if the residents were to approve the Preferred Alternative, it is likely that the Burleigh County Highway Department/Lincoln Township would participate in the cost of that project up to the cost they would have incurred in providing the most direct closure.

However, the Burleigh County Engineer has indicated that Lincoln Township will not have adequate funding available for at least 3 to 4 years to provide the required closure, whether that is accomplished by raising the most direct route or by cost participating in the Preferred Alternative. As explained in **Appendix H**, the Fox Island Homeowners Association has agreed that they would like to pursue the Preferred Alternative, but they would like to wait until Lincoln Township has adequate funding to participate in the project. Therefore, they informally requested the Burleigh County Water Resource District to suspend further action on this project until that time.

How to most equitably assess the cost of the project to the benefitted residents was also considered by the Fox Island Homeowners Association. It was determined that the Preferred Alternative would primarily benefit those residents who would be protected by the Preferred Alternative but would not be protected if the most direct roadway grade raise closure were implemented by Lincoln Township via the Burleigh County Highway Department. It was their suggestion that the cost of the project be assessed accordingly to those additional properties that would be protected as a result of the Preferred Alternative. This would remove a significant number of residences from the proposed assessment district.

Therefore, this document summarizes the progress made to date toward development of a project in response to the original 2009 petition by the residents. This document will be submitted to the ND State Water Commission for cost share reimbursement, as they had agreed to provide cost share assistance in this initial feasibility assessment. Three to four years from now, when Lincoln Township has adequate funding available to participate in the project, this document will be supplemented with an up to date opinion of probable cost and assessment list and shall then serve as the Preliminary Engineering Report required by statute. A Public Informational Meeting to update the residents will be prudent at that time to be followed by the requisite Public Hearing and Assessment Vote.

Another important issue to consider will be the long term Operation and Maintenance of the Project. The ability to assess the benefitted properties for on-going operation and maintenance is somewhat limited statutorily. Therefore, the Burleigh County Water Resource District may wish to review the issues associated with creating an Operations and Maintenance Fund as part of the initial project assessment. Another option would be for the Fox Island Homeowners Association to raise funds through their dues structure and set them aside for project maintenance. The operation and maintenance of the township roadway would remain the responsibility of the township. Subsequently, only the levee segment would require maintenance by the BCWRD.

FUNDING OPPORTUNITIES (EXCLUDING PAVING COSTS)

It is likely this flood control project will be considered eligible for cost share funding through the North Dakota State Water Commission. Currently, they could provide 60% of eligible construction costs for flood control projects. Typically, they would not provide assistance for costs associated with the surfacing of the roadways to be raised. However, their cost share policies are currently being reviewed and some will change. The cost share policy and project eligibility will need to be reconsidered in a few years when the project is re-activated.

MISSOURI RIVER FLOODPLAIN IMPACTS

One question raised during the project evaluation process was the potential impacts on the Missouri River floodplain and flood elevations associated with project implementation. First, no project features will be constructed within the designated regulatory floodway. Therefore, this project is allowable under the adopted floodplain regulations in both Burleigh and Morton Counties. Secondly, during the 2011 event a similar concern was expressed regarding the placement of the temporary flood control levees. Prior to the peak releases, the impacts associated with the installation of these emergency protective measures were assessed. This assessment determined that impacts related to increased water surface elevations were not significant, (see **Appendix E**). These impacts are to be revisited as part of the final development and implementation of the Burleigh County Flood Hazard Mitigation Projects.

Another impact is the elimination of floodplain storage including storage volumes within the protected area of Fox Island, Tavis Road Oxbow and Riverwood Golf Course. This storage is not significant when considering the duration and volume of the 2011 event; however impacts during ice jam events was questioned. The potential impact was evaluated using the available LIDAR topography and a determination of the reduction in total storage north of the Tavis Road Oxbow. This assessment was originally completed for **Alternative #2**. The results indicated only a minimal change in flood storage and elevation would occur.

Upon consideration of the larger area being removed from floodplain storage, principally the Tavis Road Oxbow, Riverwood Golf Course and Fox Island area, it was determined approximately 4,100 acre feet of floodplain storage would be eliminated. This would occur largely due to the grade raises on Riverwood Drive, Mills Avenue, Tavis flood control structures and the Fox Island Perimeter Levee. When compared to the total available storage within the floodplain of 122,000 acre feet (to the extent of the available LIDAR data, the net effect would be a potential increase in water levels of 0.24 feet or 3.9 inches, based on static storage alone.

Subsequently, the impacts of the levee installations on floodplain encroachment and reduced floodplain storage are deemed reasonable and acceptable. It is anticipated that an overall review of the floodplain impacts associated with the County and City Flood Hazard Mitigation Projects will be completed independently from this project evaluation.

Burleigh County Water Resource District

Welcome
Fox Island Flood Control
Public Information Meeting
October 20, 2009

Government Access TV – Cable Channel 2
Recorded for replay and
Video on Demand

Fox Island Flood Control

Agenda

- Presentation 7 pm to ~ 8 pm
  - March 2009 Ice Jam Flood Event
  - Flood Response
  - Flood Hazard Mitigation
  - Flood Prevention and Action Items
  - BCWRD Project Option
- Question & Comment Session ~ 8 pm to 9 pm

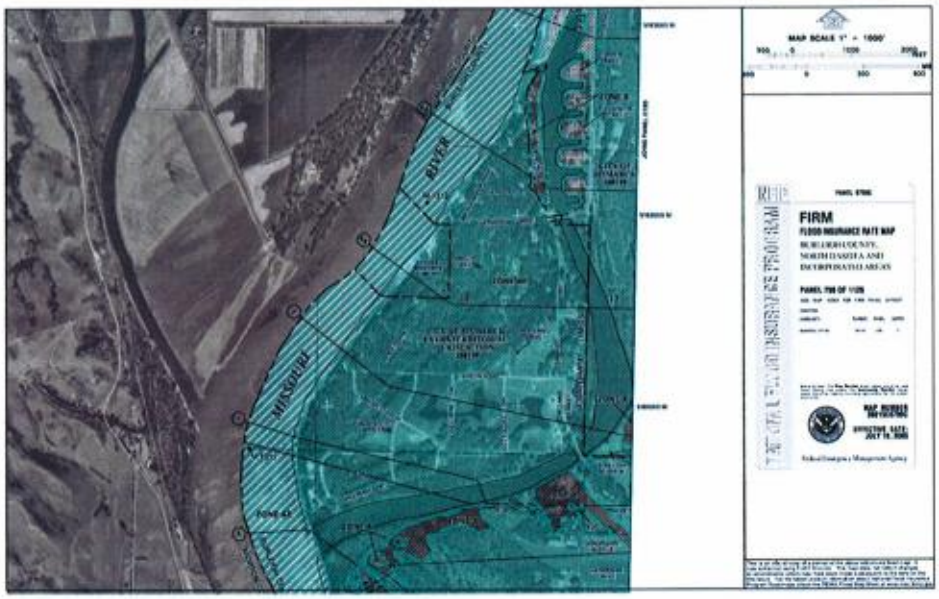
Special Flood Hazard Area

- **Missouri River Floodplain Management**
  - Floodplain Regulations (National Flood Insurance Program)
  - 2009 Ice Jam Flood Event Summary
  - Open Water Flood Event - FIRM
- **Fox Island Flood Hazards**
  - Missouri River Base Flood Elevations (BFE 1985 vs. 2005)
  - Emergency Access
  - Flood Prevention/Mitigation
  - Internal Drainage

Floodplain Regulations

- **City of Bismarck Floodplain Ordinance**
  - Chapter 14-04-19 (NFIP Compliant – Min. Standards)
- **Sept 18, 1985 Flood Insurance Rate Map** (FIRM)
  - Finished Floor Elevations (min. at or above BFE)
- **July 19, 2005 Digital FIRM** (DFIRM)
  - Ice Jam Assessment (June 2, 1999 Report)
  - Finished Floor Elevations (min. one foot above BFE)
  - NDCC 61-16.2-08
- **2009 Flood** (approx. 1 to 1.2 feet below the BFE)

2005 Missouri River DFIRM (1988 NGVD Datum)

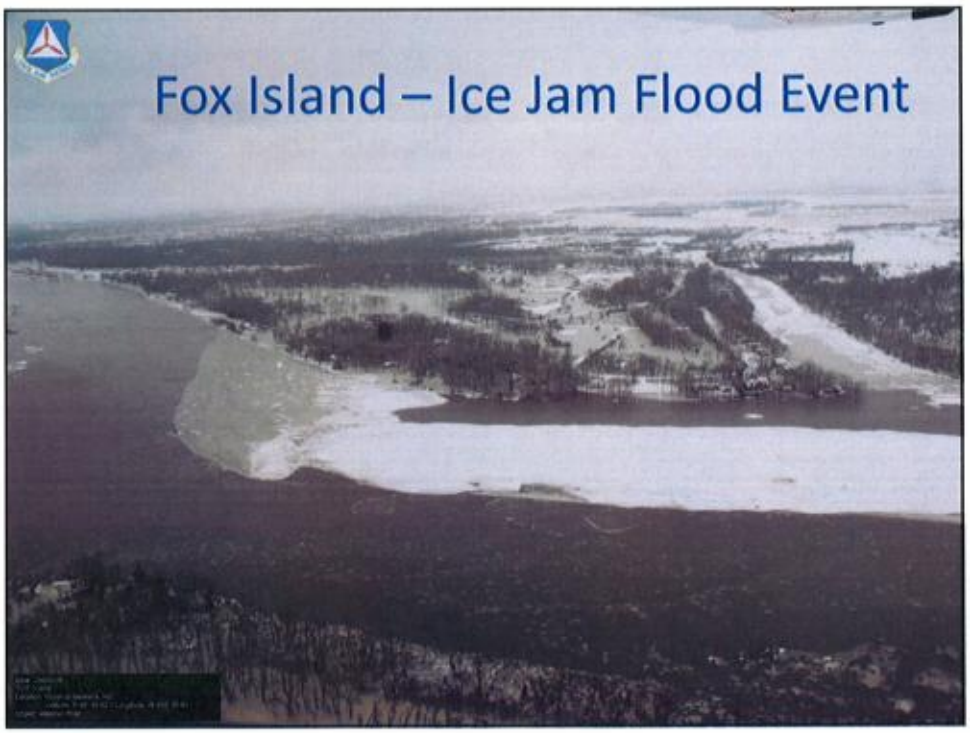


BFE Changes

Street Elevations and Base Flood Elevation Comparisons
Information obtained from Street Designs
All Elevations are NGVD 1929 Datum

Development	Min. Gutter Elevation	1985 BFE	As-Built Difference	2005 BFE	Current Difference
Marina Bay	1634.5	1635.10	- 0.6	1635.93	- 1.43
Lakewood	1636.0	1635.00	+ 0.5	1635.83	- 0.17
SouthPort	1635.0	1634.80	+ 0.2	1635.58	- 0.58
Larson Subdivision (Rural Residential)	1634.0	1634.20	- 0.2	1634.95	- 0.95
SouthBay	1635.5	1634.00	NA (2007)	1634.65	+ 0.85
Whispering Bay (Proposed)	1634.5	1634.30	NA (2008)	1635.07	- 0.57

2009 Flood Elevation Est. = 1633.7 at Tavis Road
Fox Island Internal Flood Elevation Est. = 1633.9
Oahe Delta Impact 1983 to 1998 (15 years) = + 0.8 feet



Flood Event Time Table

Peaks:

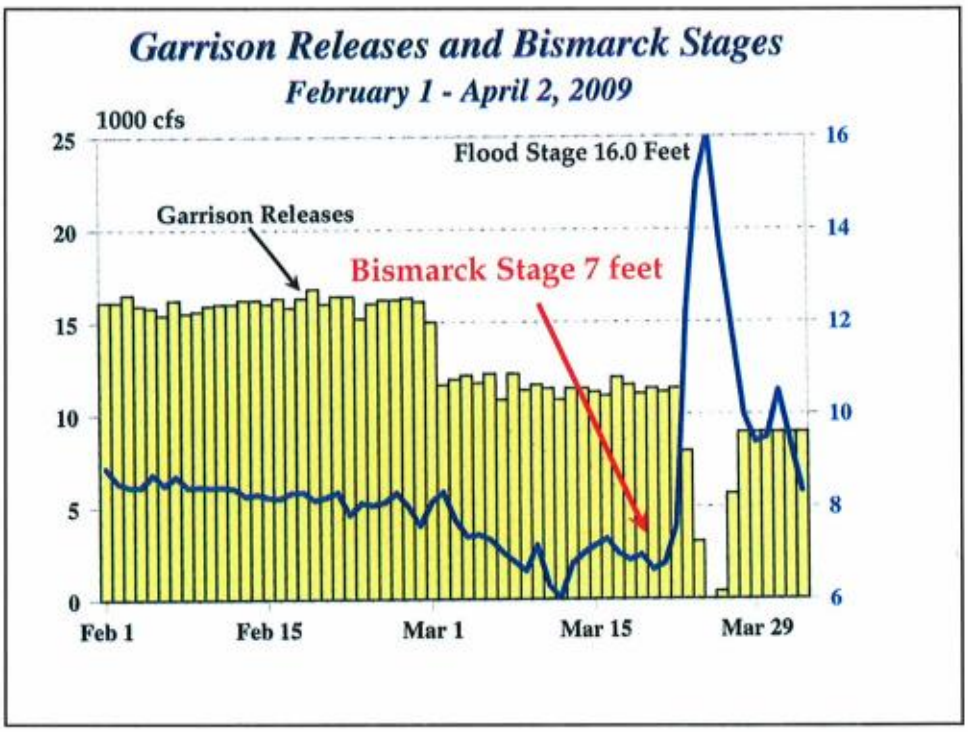
Near Stanton, ND ---------- 6:00 AM Tues March 24th
Near Washburn, ND ---------- 12:00 Noon Tues March 24th
Water Plant, Bis. ND ---------- 10:15 PM Tues March 24th - Max. Stage - 16.09 feet

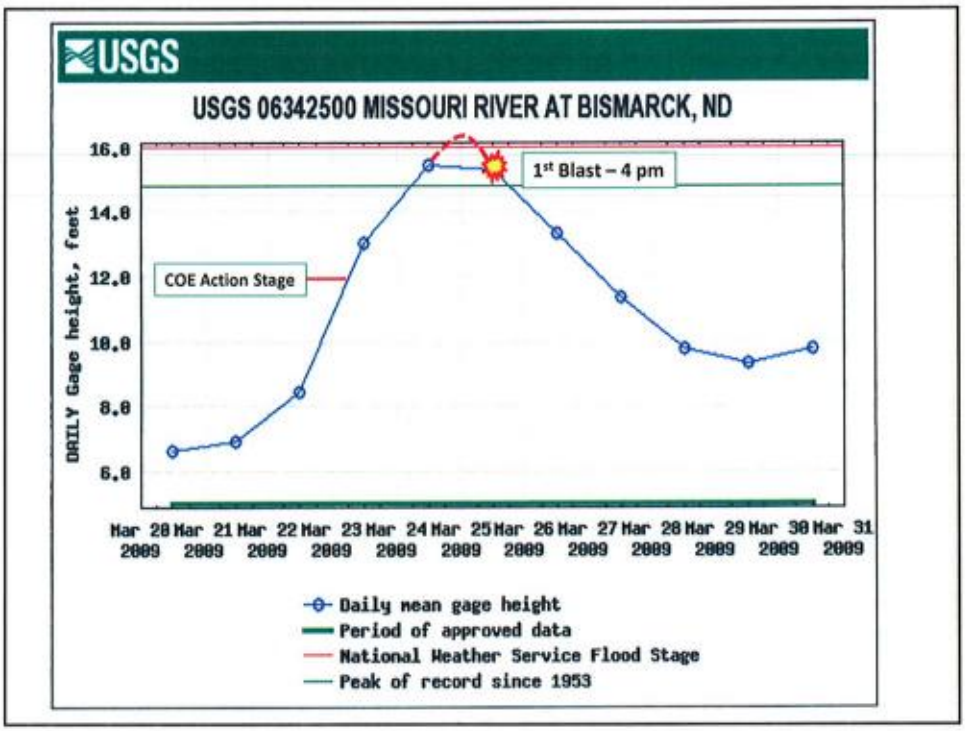
Other Times:

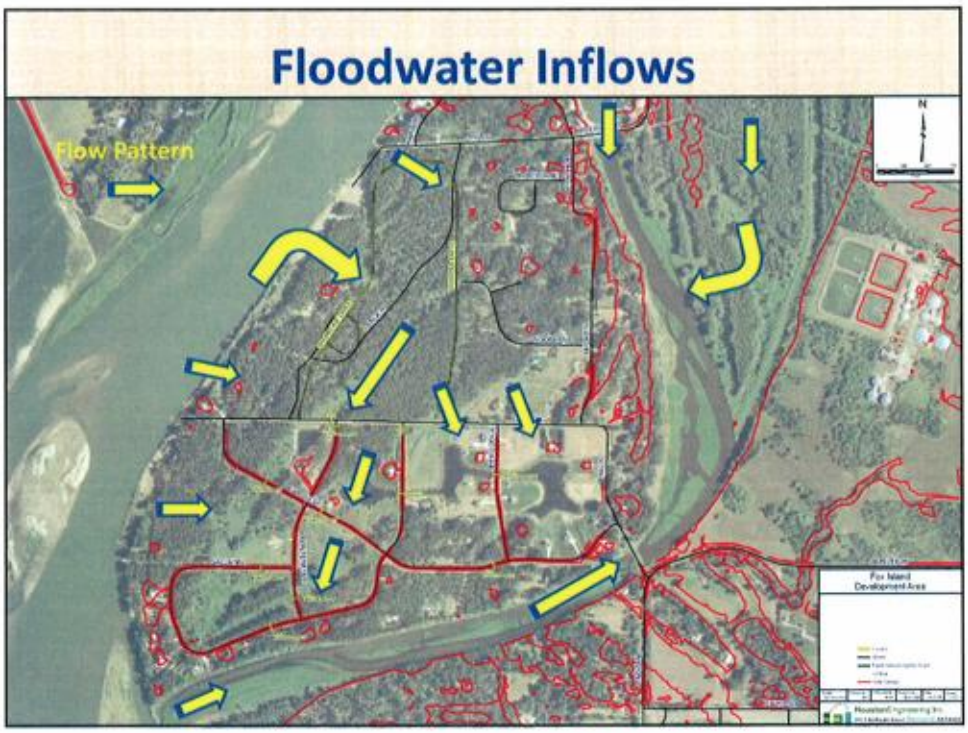
Water Plant, Bis. ND ---------- Noon Sun. March 22nd - Stage - 7.92 feet
Water Plant, Bis. ND ---------- 6:00 PM Sun. March 22nd - Stage - 8.91 feet
Water Plant, Bis. ND ---------- **8:00 AM Mon. March 23rd - Stage - 12.40 feet** (COE Trigger 12.0 ft)
Water Plant, Bis. ND ---------- 12:45 PM Mon. March 23rd - Stage - 13.02 feet (Action Stage 13 feet)
Water Plant, Bis. ND ---------- 8:00 AM Tues. March 24th - Stage - 15.02 feet (Flood Stage)

~ 2:00 PM – Tues. March 24th Mandatory Evacuation Notice (30 hrs)

Water Plant, Bis. ND ---------- **10:15 PM Tues. March 24th - Stage - 16.09 feet (Max. Stage)** (38 hrs)
Water Plant, Bis. ND ---------- 8:00 AM Wed. March 25th - Stage - 15.68 feet
Water Plant, Bis. ND ---------- Noon, Wed. March 25th - Stage - 15.42 feet
Water Plant, Bis. ND ---------- 4:00 PM, Wed. March 25th - Stage - 15.01 feet **(Time of 1st Blast)**
Water Plant, Bis. ND ---------- 8:00 AM Thurs March 26th - Stage - 13.59 feet
Water Plant, Bis. ND ---------- 8:00 AM Fri. March 27th - Stage - 11.71 feet




USGS
USGS 06342500 MISSOURI RIVER AT BISMARCK, ND
DAILY Gage height, feet
16.0
14.0
12.0
10.0
8.0
6.0
1st Blast – 4 pm
COE Action Stage
Mar 20 2009
Mar 21 2009
Mar 22 2009
Mar 23 2009
Mar 24 2009
Mar 25 2009
Mar 26 2009
Mar 27 2009
Mar 28 2009
Mar 29 2009
Mar 30 2009
Mar 31 2009
Daily mean gage height
Period of approved data
National Weather Service Flood Stage
Peak of record since 1953

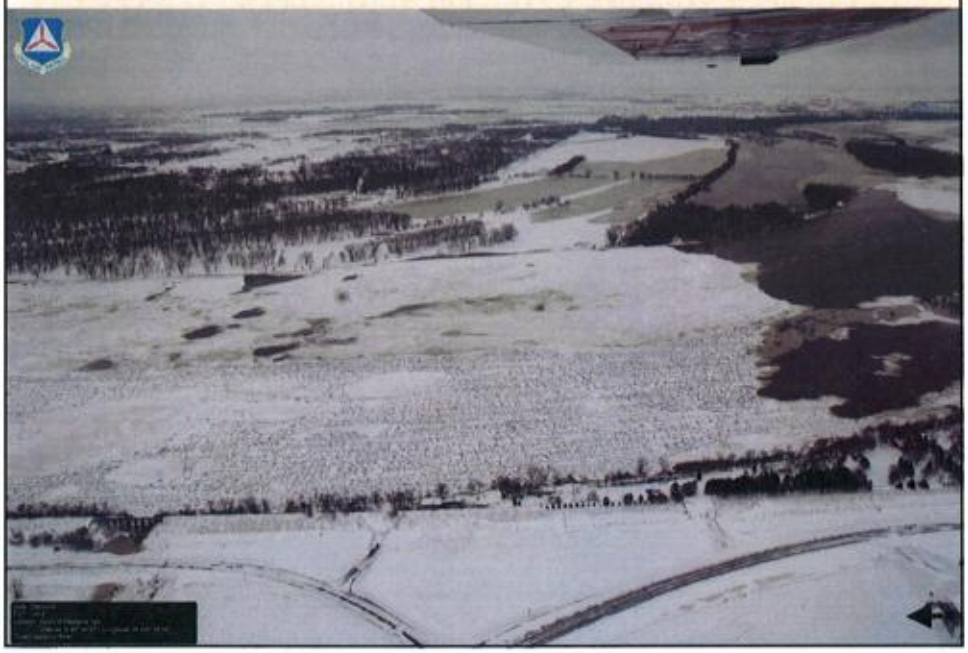

Floodwater Inflows
Flow Pattern
N

Tavis Road Oxbow

Heart River Confluence

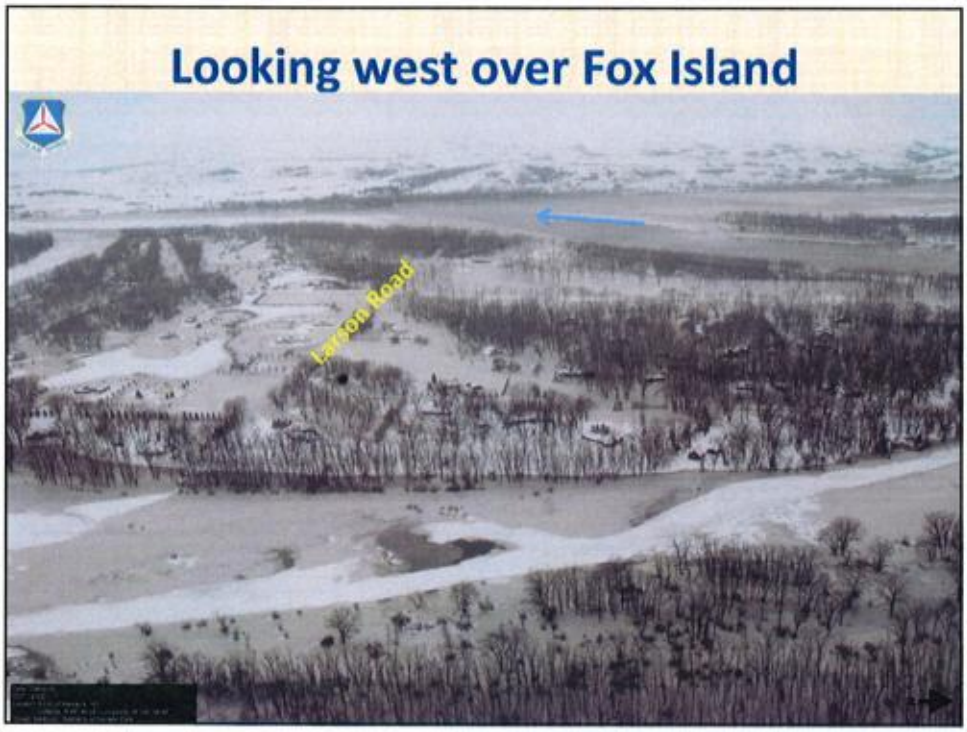
Upper End of Ice Jam

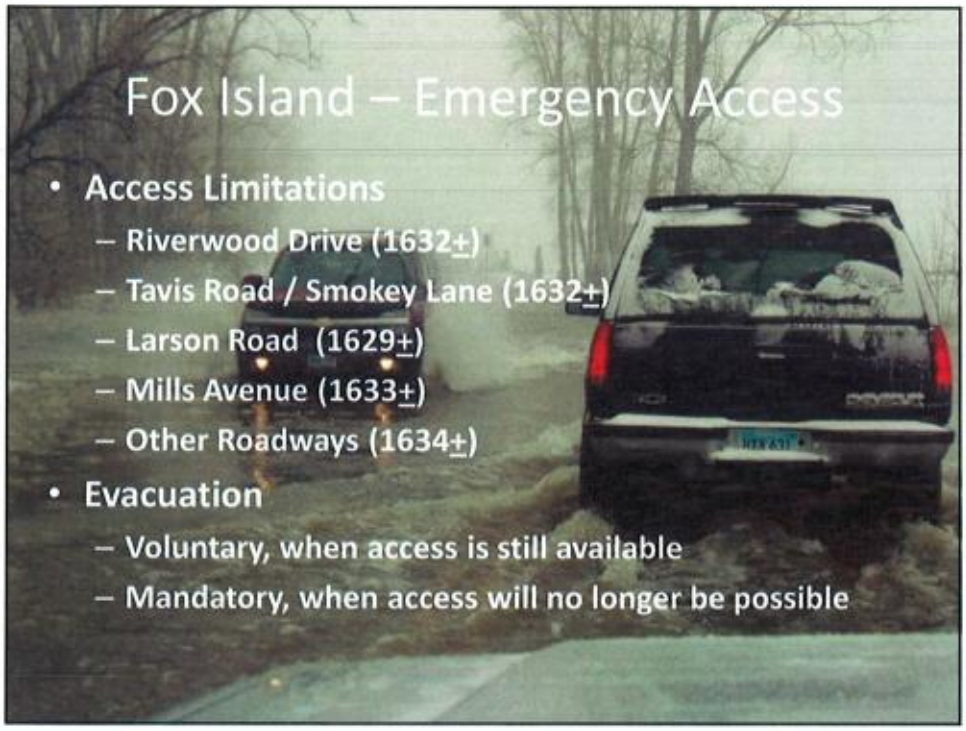
Lower End - State Penitentiary Lands



Southern View of Ice Jam

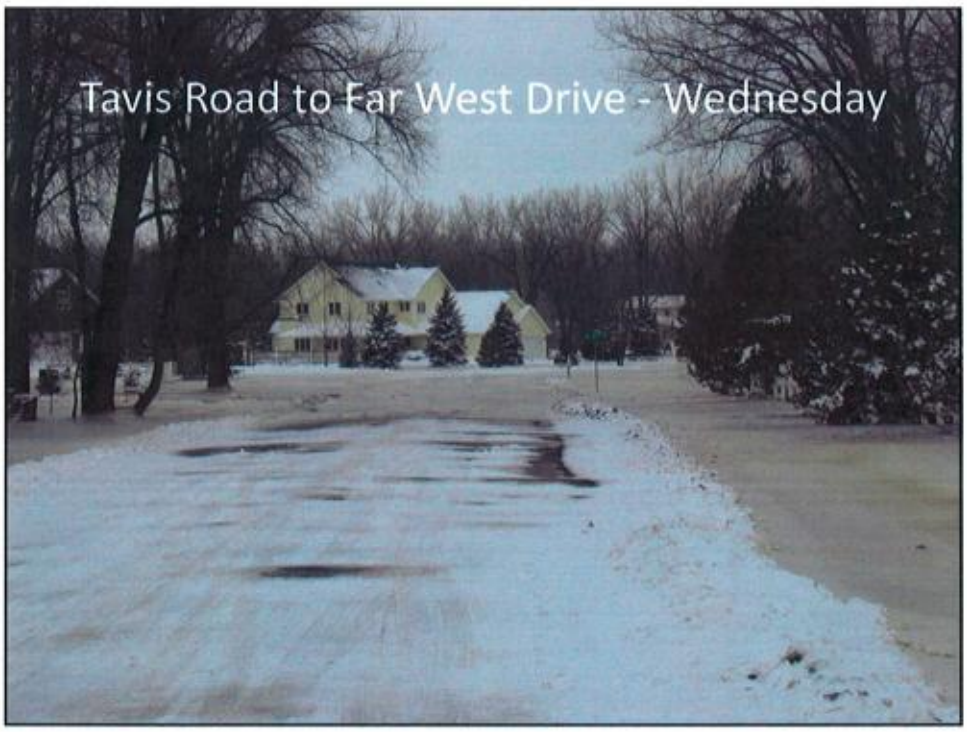
Looking west over Fox Island

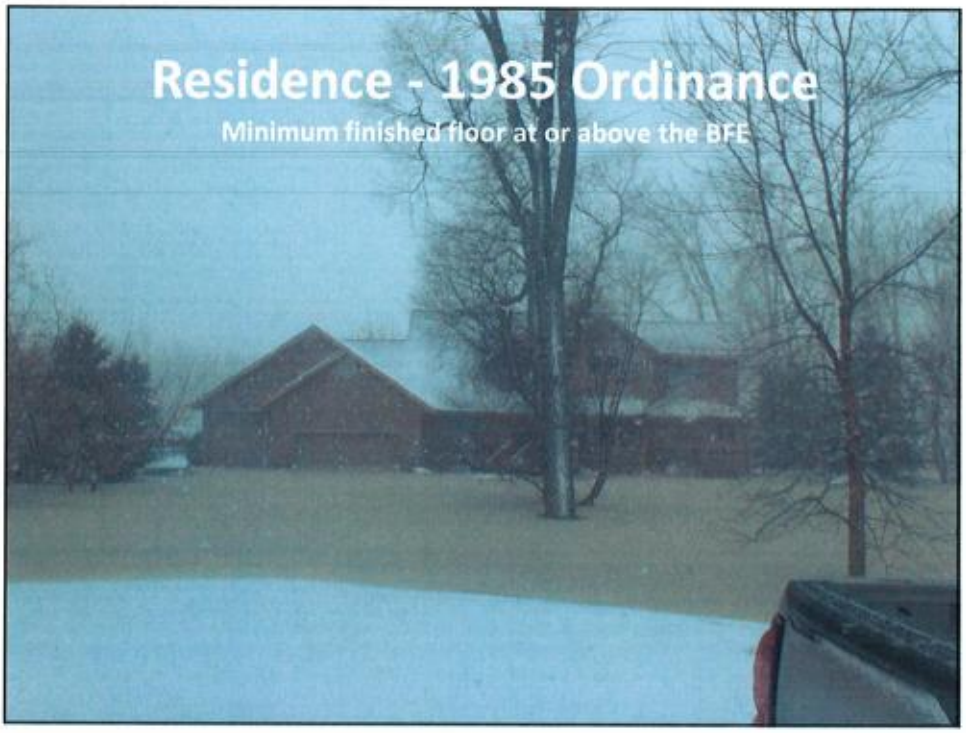


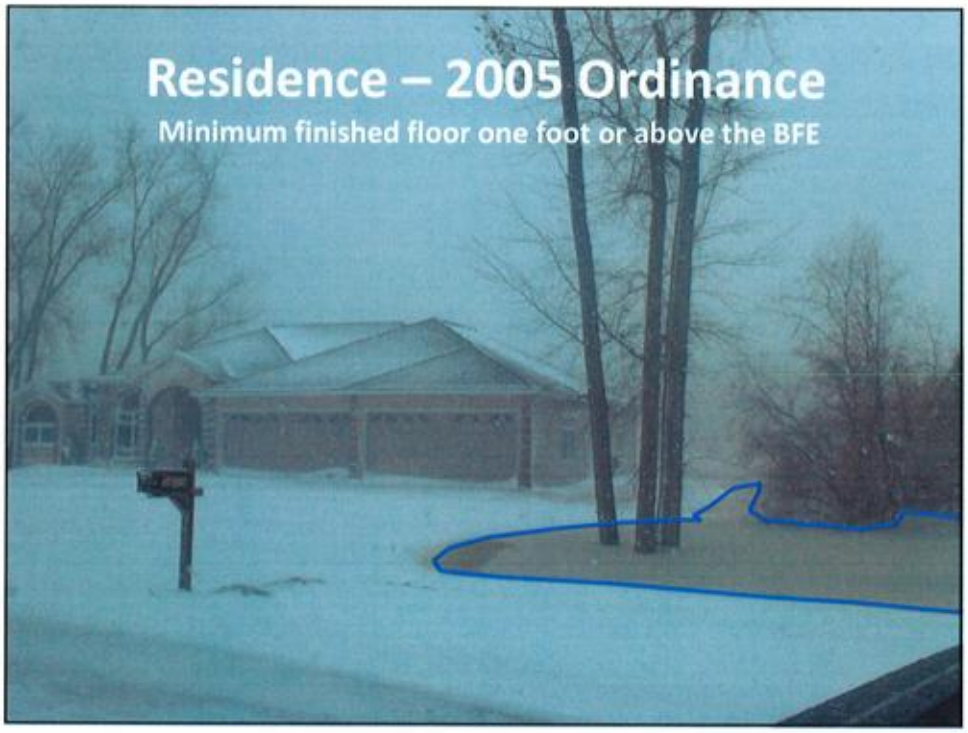

Fox Island – Emergency Access
• Access Limitations
– Riverwood Drive (1632±)
– Tavis Road / Smokey Lane (1632±)
– Larson Road (1629±)
– Mills Avenue (1633±)
– Other Roadways (1634±)
• Evacuation
– Voluntary, when access is still available
– Mandatory, when access will no longer be possible


Riverwood Drive

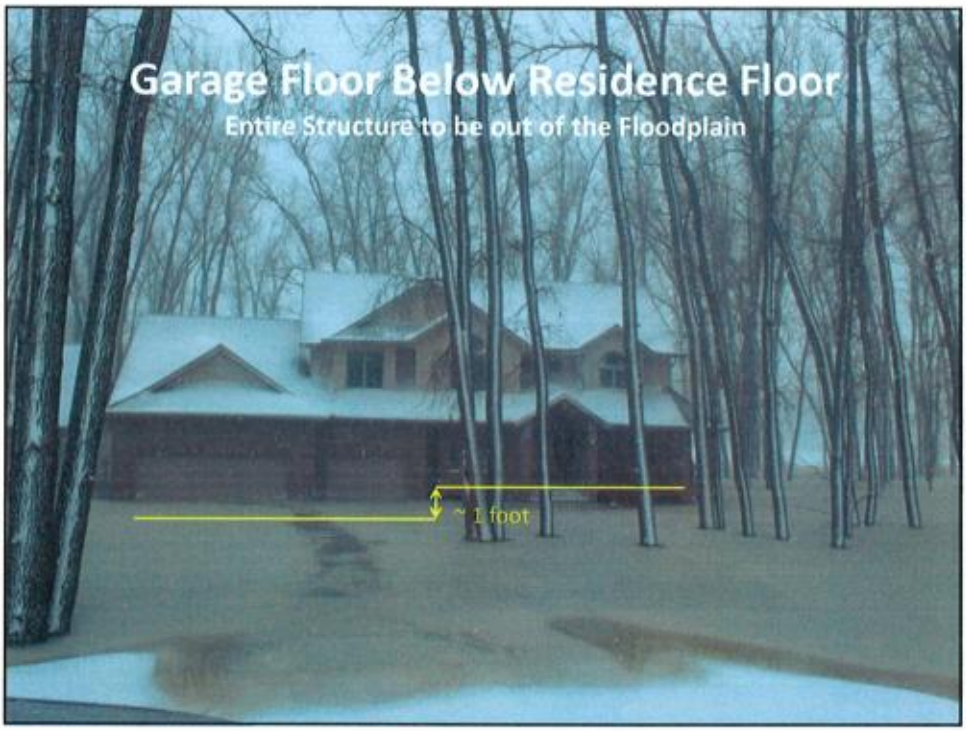

Smokey Lane – Tuesday Noon

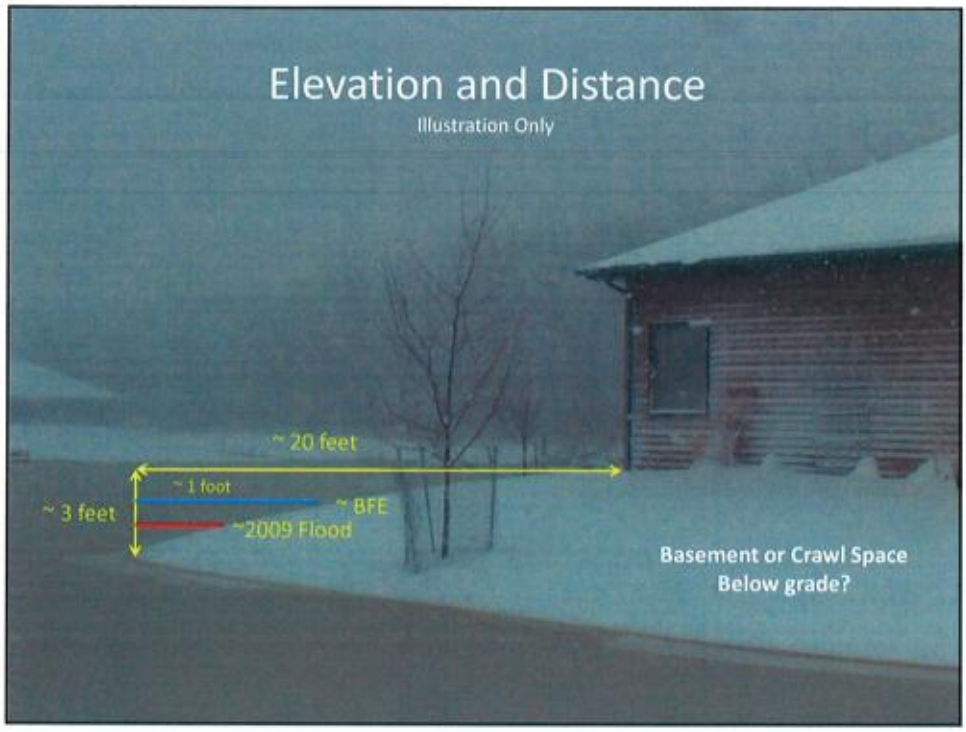

Tavis Road to Far West Drive - Wednesday

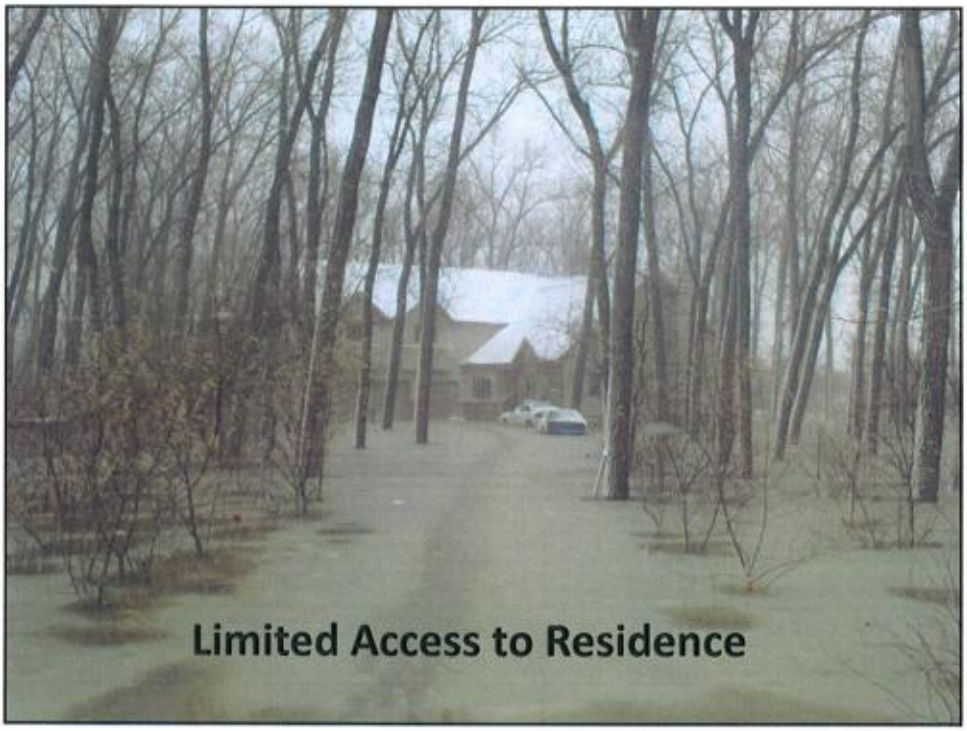

Residence - 1985 Ordinance
Minimum finished floor at or above the BFE

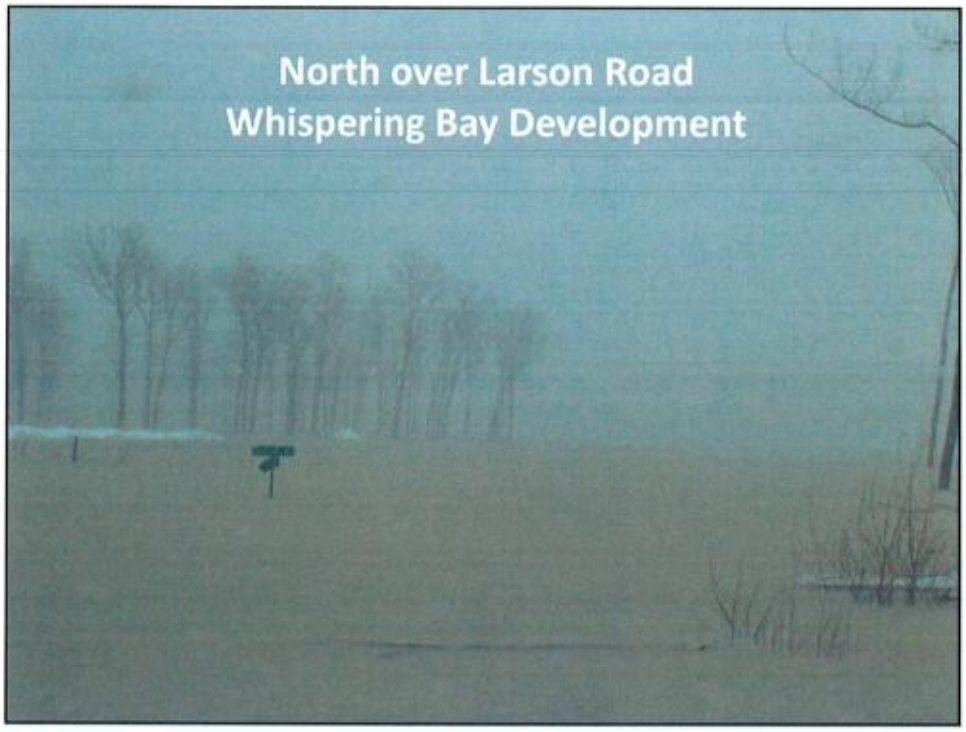

Residence – 2005 Ordinance
Minimum finished floor one foot or above the BFE

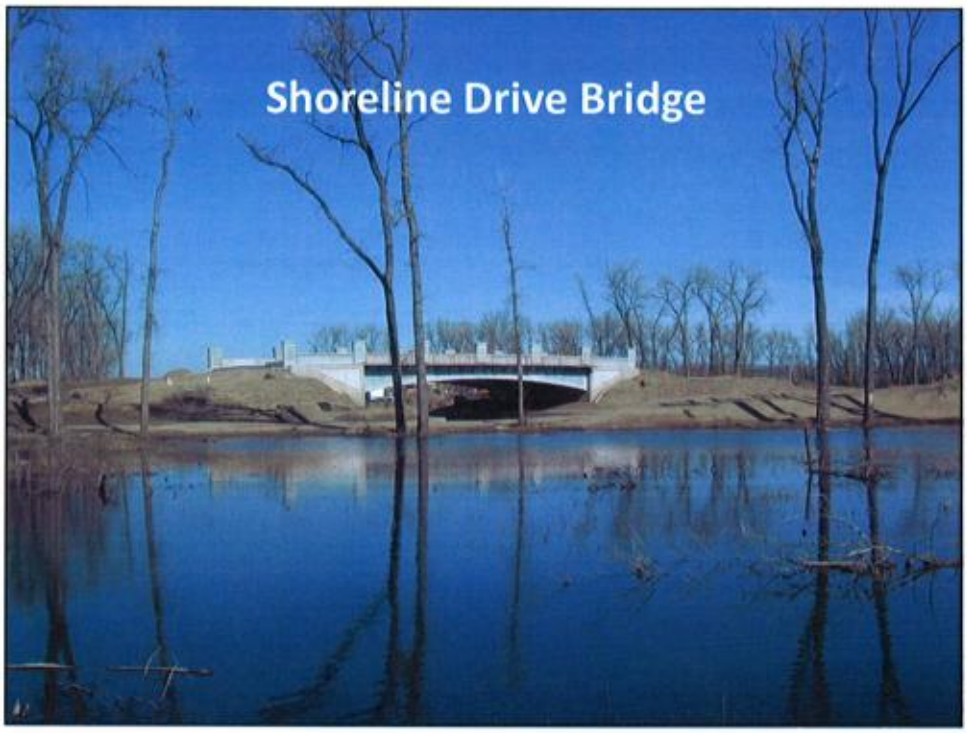

Garage Floor and Main Floor?


Garage Floor Below Residence Floor
Entire Structure to be out of the Floodplain
~ 1 foot

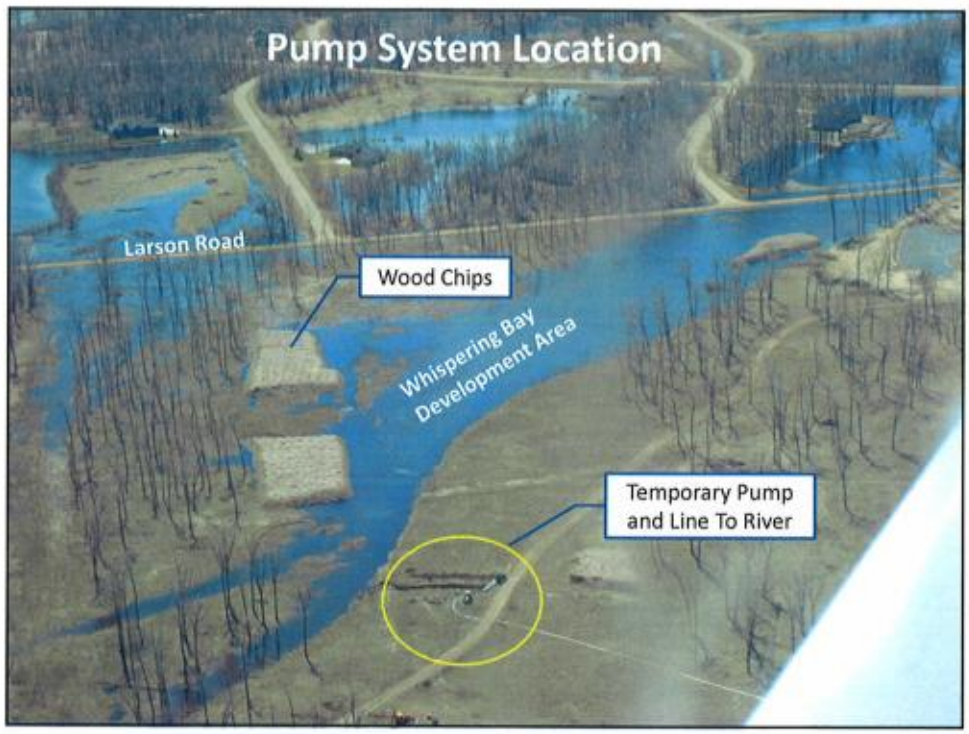

Elevation and Distance
Illustration Only
~ 20 feet
~ 1 foot
~ 3 feet
~ BFE
~2009 Flood
Basement or Crawl Space
Below grade?


Limited Access to Residence

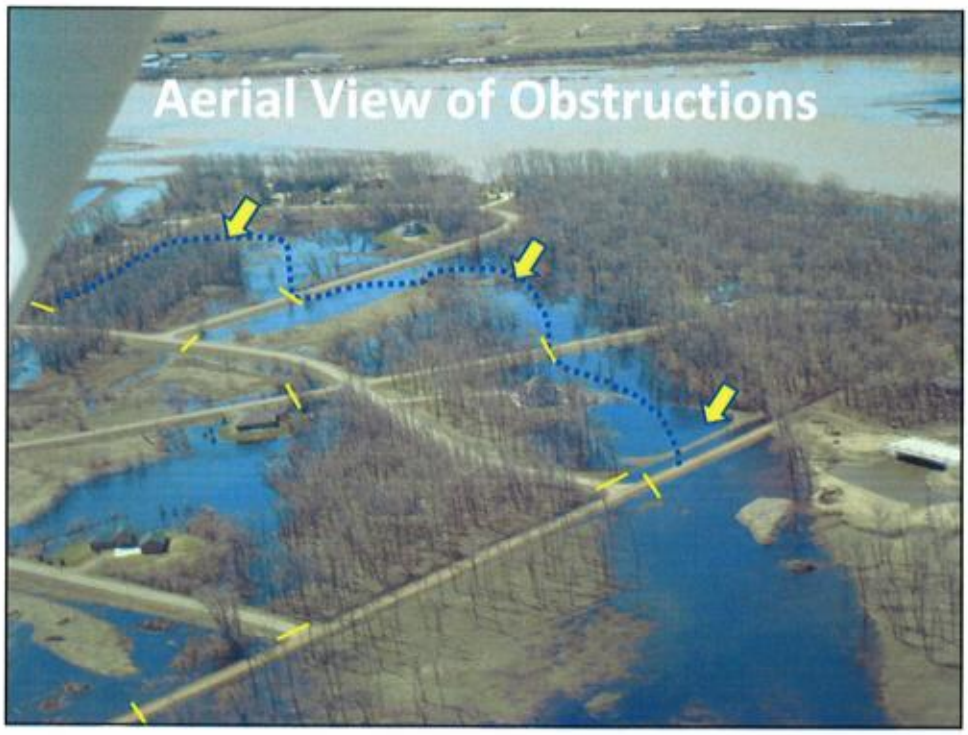

North over Larson Road
Whispering Bay Development


Shoreline Drive Bridge


Fox Island – Internal Drainage
• 2009 Pumping (~2+ weeks)
– County Expense
– Whispering Bay (reduces runoff to south)
– Culverts and Removal System (undefined)
• Drainage Obstructions
– Gallatin Drive Outfall (24" RCP - Blocked)
– Fill placement by lot owners
– No Stormwater Management Plan or Easements

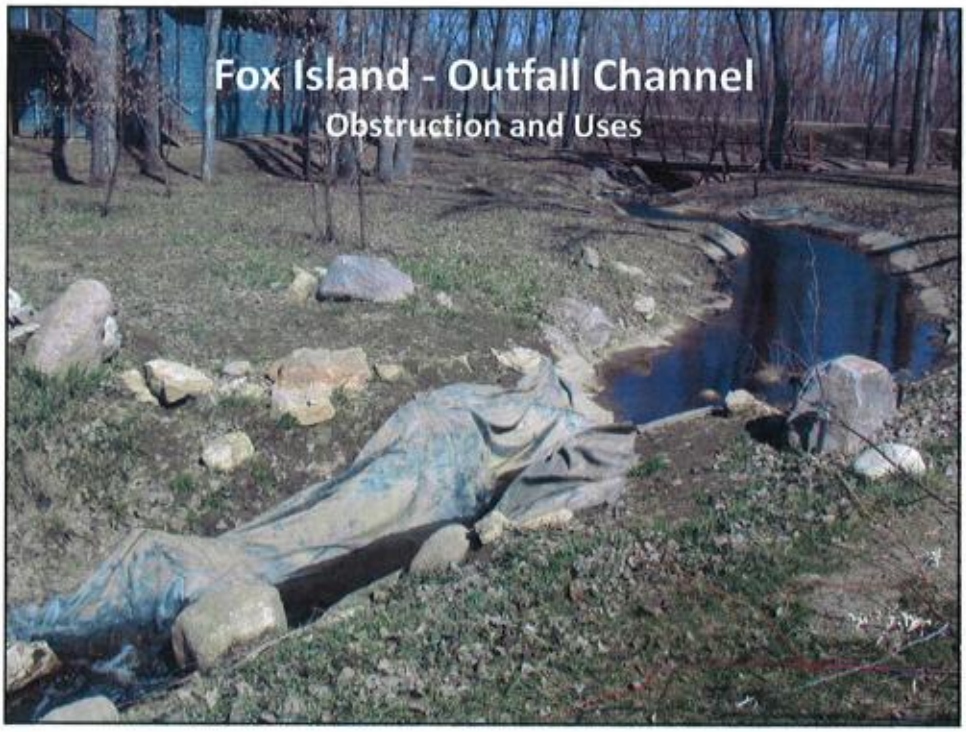

Pump System Location
Larson Road
Wood Chips
Whispering Bay Development Area
Temporary Pump and Line To River


washout due to high flows
Obstruction South of Larson Road


Aerial View of Obstructions

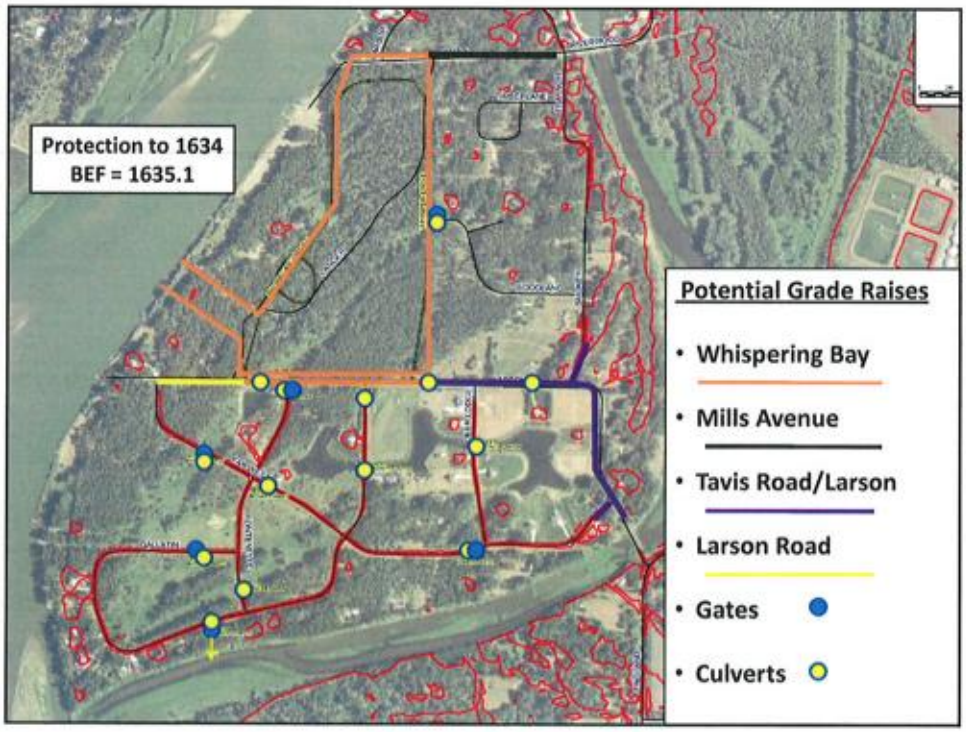

Drainage Obstruction

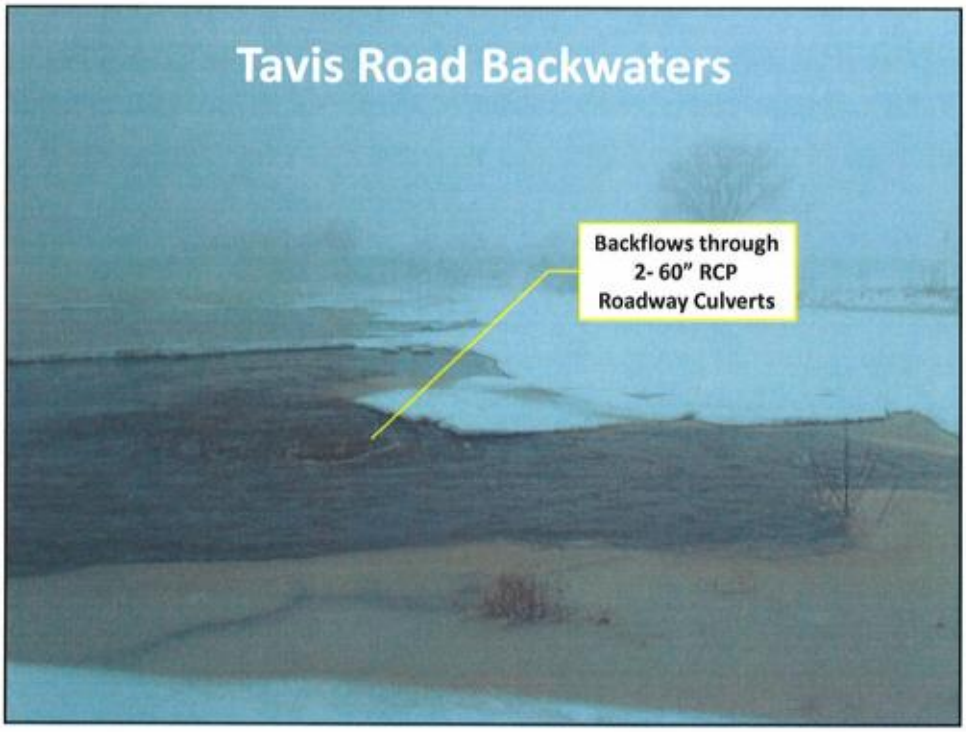

Blocked Outfall
24" RCP Culvert
Gallatin Drive



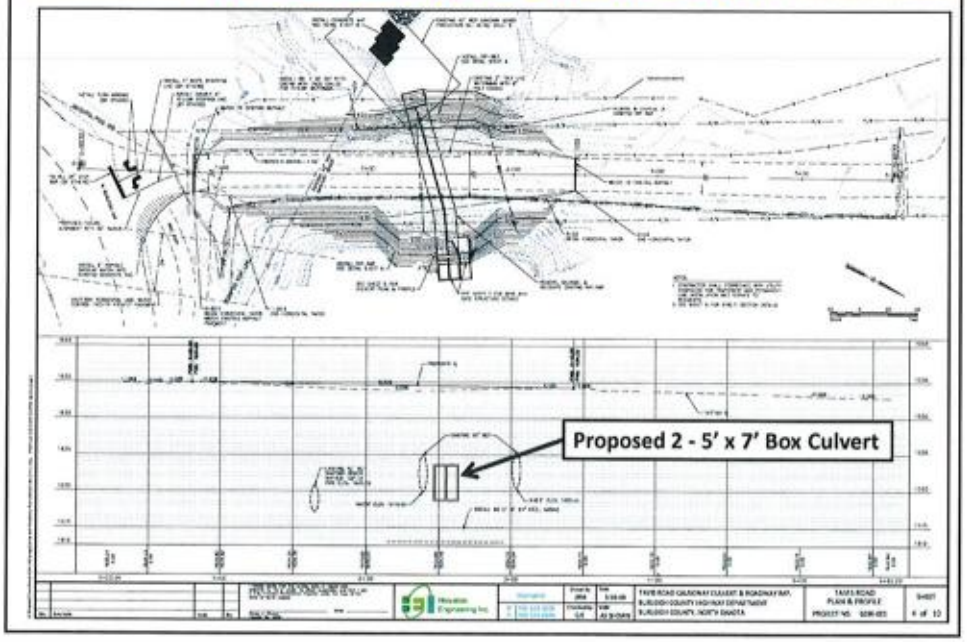
Flood Hazard Prevention

- **Whispering Bay Development**
  - Fill prevents direct inflows from the west
  - Larson Road (paving requirement)
  - Storm Sewer into Bay
    - River Backwater Concern
- **Proposed and Potential Grade Raises**
  - Larson Road (To be raised then paved – Lincoln Twp)
  - Larson Road (No raise planned west of the development)
  - Tavis Road/Smokey Lane (To be raised - Lincoln Twp)
  - Mills Avenue (City of Bismarck – no plans to raise)
- **Gated Culverts (Backwater Prevention)**
- **Drainage Plan/Project (Easements and Channelization)**

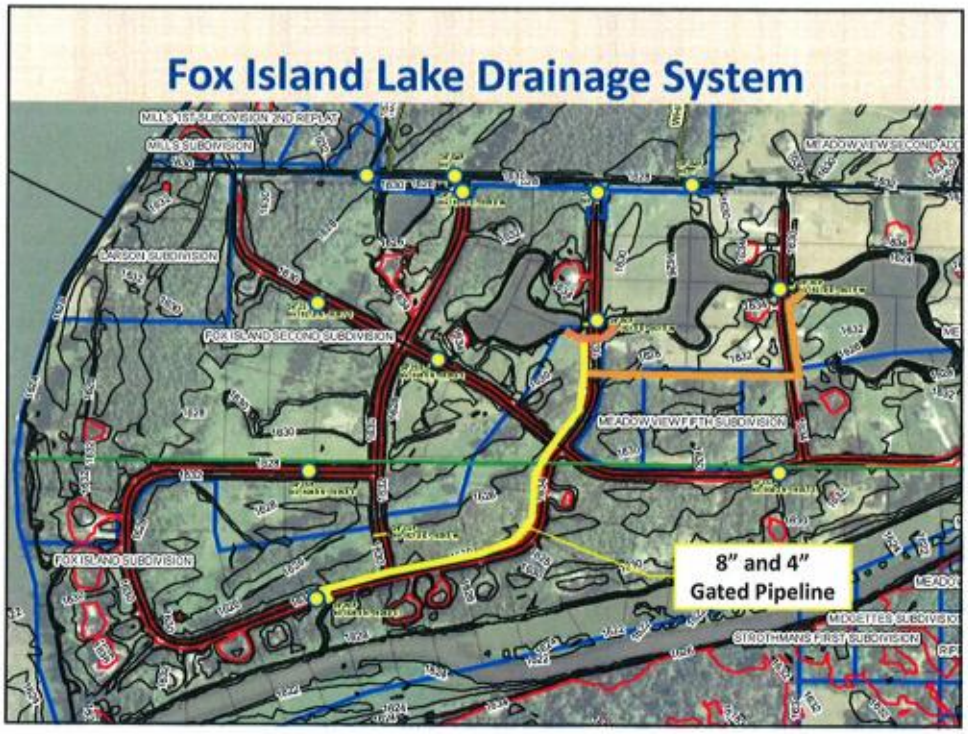

Protection to 1634
BEF = 1635.1
Potential Grade Raises
• Whispering Bay
• Mills Avenue
• Tavis Road/Larson
• Larson Road
• Gates
• Culverts


Tavis Road Backwaters
Backflows through
2- 60" RCP
Roadway Culverts

Tavis Road Improvements - 2010



Fox Island Lake Drainage System



Whispering Bay Development

- **COE Permits** - ***Approved***
- **Sovereign Land Permit** – ***Approved***
- **State Engineer Construction Permit** - ***Approved***
- **Stormwater Management Plan** – ***Approved***
- **Bank Stabilization Easements** - ***Approved***
- **Plat Ratification** – **Pending (Burleigh County)**
- **Final Plat** – ***Approved*** **(City of Bismarck)**
- **Floodplain Ordinance** **(Proposed Revision to 2 ft above BFE)**

Development Impacts

- **Floodplain Construction**
  - National Flood Insurance Program
    - Local Ordinance Enforcement
  - Floodplain Encroachment
    - Maximum one foot rise in BFE allowed
    - No encroachment into the floodway
  - Whispering Bay Development
    - Open water flow impact to BFE = 0.02 feet (0.25 inches)
    - Storage impact on March 2009 event = no effect
  - Fox Island Flood Control Gate System
    - Storage impact on March 2009 event = ~ 1+ inch

Missouri River Management

- **Corps of Engineers – Bismarck Gage**
  - Flood Response (Stage = 12 ft trigger)
  - Ice-In Stage is 10 to 13 feet (Action Stage is 13 feet)
- **ND State Engineer (Request to Review River Concerns)**
- **City/County Emergency Management (Action Plan)**
- **What will the future bring?**
  - Oahe Delta Formation (Increasing BFE's)
  - Ice Jam (event will reoccur – may not be a 100-yr event)
  - Flood Prevention Measures (grade raises, etc...)
  - Global Alternatives (river dredging, channelization, etc...)

Fox Island – Flood Response

- **Flood Prevention and Internal Drainage**
  - BCWRD/County Response
    - Informational Letter and **Public Information Meeting**
  - Landowner Petition for Project Option
    - Special Assessment District
  - SWMP Development/Project
    - Easements/Channels/Gates
- **Emergency Access**
  - Grade Raises by Roadway Authority

FEMA

What is my flood risk?

Question:
What is the "100-year flood"?

Answer:
The term "100-year flood" is misleading. It is not the flood that will occur once every 100 years. Rather, it is the flood elevation that has a 1- percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The 100-year flood, which is the standard used by most Federal and state agencies, is used by the NFIP as the standard for floodplain management and to determine the need for flood insurance. A structure located within a special flood hazard area shown on an NFIP map has a 26 percent chance of suffering flood damage during the term of a 30 year mortgage.

- 100 year Flood = "1% Chance Annual Flood"
- 26% chance (1 in 4) during a 30 year mortgage (~ 9% chance for a fire)
- 40% chance in 50 years
- 60% chance in 90 years

Flood Hazard Mitigation Measures

- Emergency Response
- Residential Protection
- Missouri River Issues
- Flood Prevention Measures

Flood Hazard Mitigation

- **Emergency Response**
  - **Emergency Action Plan (?)**
    - Warning and Notification
    - Flood response and evacuation plan
  - **Emergency Access**
    - Larson Road Grade Raise (Lincoln Twp)
    - Tavis Road Grade Raise (Burleigh County)
    - Mills Avenue (City of Bismarck – no plans)
    - Riverwood Drive (City of Bismarck – no plans)

Flood Hazard Mitigation

- **Residential Protection**
  - **Floodplain Ordinance**
    - 1985 Std (minimum at or above BFE)
    - 2005 Std (minimum one foot above BFE)
  - **Structural Modifications**
    - Elevate the residence or out buildings (Building Codes)
    - Flood Proofing (dikes, sump pumps, electrical, etc....)
    - Septic Systems (case by case consideration)

Floodplain Ordinance

"1) Residential Construction: Construction of any residential structure shall have the lowest finished floor elevation, including basement and crawl space, elevated to a minimum of one (1) foot above the base flood elevation, ..."

- BCWRD Recommendation is to increase this to two (2) feet
- Finished floor elevation
- Basement or crawl space elevations
- Garage and out building elevations
- Concern with removal of property from the floodplain via a Letter of Map Revision based on fill or LOMR(f) as then it is no longer subject to the ordinance.

Flood Hazard Mitigation Measures

- **Missouri River Flood Issues**
  - **Oahe Delta (Increasing Risks)**
    - Heart River Delta (March 2009)
    - Ice jam prevention
    - Additional Monitoring and River Evaluation
  - **Options and Opportunities**
    - Floodplain Ordinance Revisions
    - Local Mitigation Efforts
    - Dredging/Channelization/Levees
    - River Operations
    - Acquisition/Relocation

Action Items

- **Missouri River Flood Hazard Mitigation**
  - BCWRD, MCWRD, Lower Heart WRD
    - **Deadfall Tree Removal** (increased ice jam risk)
      - Flood Hazard Mitigation Grant Application
      - Denied – Considered Maintenance
    - **Scoping Document** (Risk Assessment and Alternatives)
      - **ND State Engineer supports**
  - COE's Sedimentation Study (ongoing)
  - Missouri River Annual Operations Plan
  - Other Missouri River Planning Efforts
- **Congressional Delegation Contacts**
- **COE and Agency Contacts** (future)

Flood Prevention Measures

- **Flood Control Gates** (not for the 100 year event)
  - Missouri River Backwater Prevention
  - Elevation 1634 – top of roadways (BEF ~ 1635.1)
  - Internal Drainage Storage/Removal System
  - Logistics of Gate Control (O&M)
- **Internal Drainage Improvements**
  - There is no Stormwater Management Plan
  - Existing Obstruction Removal
  - Easements and Channelization
  - Floodwater Removal
- **Special Assessment District Project – How?**

Burleigh County Water Resource District
Special Assessment District Projects

- Authorities - North Dakota Century Code

  NDCC 61-16.1 – Operation of Water Resource Districts

  - 61-16.1-09 Powers of water resource board (2 items)
    - Make rules and regulations concerning the management, control, regulation, and conservation of waters and prevent the pollution, contamination, or other misuse of the water resources, streams or bodies of water included within the district.
    - Plan, locate, relocate, construct, reconstruct, modify, extend, improve, operate, maintain, and repair sanitary and storm sewer systems, or combinations thereof, including sewage and water treatment plants, and regulate the quantity of sewage effluent discharged from municipal lagoons; and contract with the United States government, or any department or agency thereof, or any private or public corporation or limited liability company, the government of this state, or any department, agency, or political subdivision thereof, or any municipality or person with respect to such systems.

NDCC 61-16.1-15
Financing project through revenue bonds, general taxes, or special assessments – Apportionment of Benefits

- Project Initiation – Upon request (petition) or motion of the Board
- Project Revenue and Financing Sources
  - Improvement warrants
  - Special assessments
  - General taxes
  - Revenue Bonds
- Apportionment of Benefits
  - "..., such assessments shall be apportioned and spread upon lands or premises benefited by the project in proportion to and in accordance with benefits accruing thereto."
  - "In determining assessments the water resource board shall carry out to the maximum extent possible the water management policy of this chapter that the upstream landowners must share with the downstream landowners the responsibility to provide for the proper management of surface waters." (reference to NDCC 61-16.1-10)

Project Development and Assessment Provisions

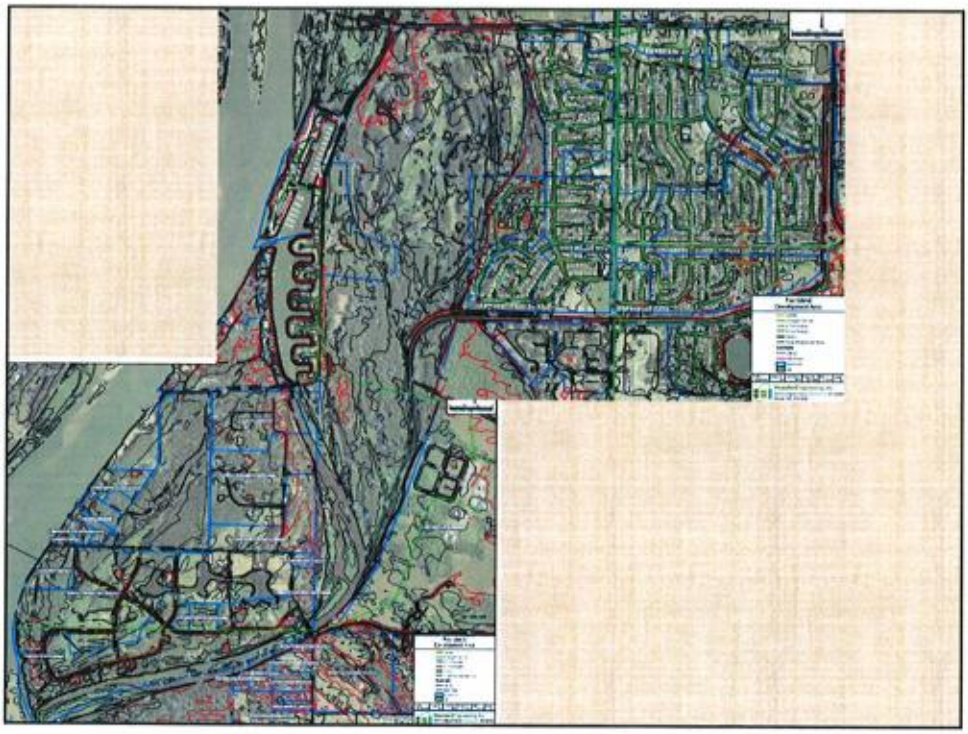
- **Adoption of Project Resolution** (NDCC 61-16.1-17)
  - Determination of necessity to construct and maintain
  - Engineering Report and Opinion of Probable Cost
- **Project Development Process**
  - **Public Hearing** - Project Information (purpose, costs, assessments, etc...) (NDCC 61-16.1-18)
  - **Voting Authority** - one vote for each $1 of assessment (NDCC 61-16.1-20)
    - Benefitted Properties
    - 0% to 100% Assessments – as defined by the Board (NDCC 61-16.1-21)
    - If > 50% of the "votes filed" favor the project it proceeds (NDCC 61-16.1-19)
  - **Special Assessment List**
    - Public Hearing – Assessment List Objections/Adjustments (NDCC 61-16.1-22)
    - Appeal to State Engineer (NDCC 61-16.1-23), Requires 25% of total assessment votes
  - **Construction**
    - No contract can be awarded which exceeds 20% the estimated cost as presented and approved by the affected landowners. (NDCC 61-16.1-24)

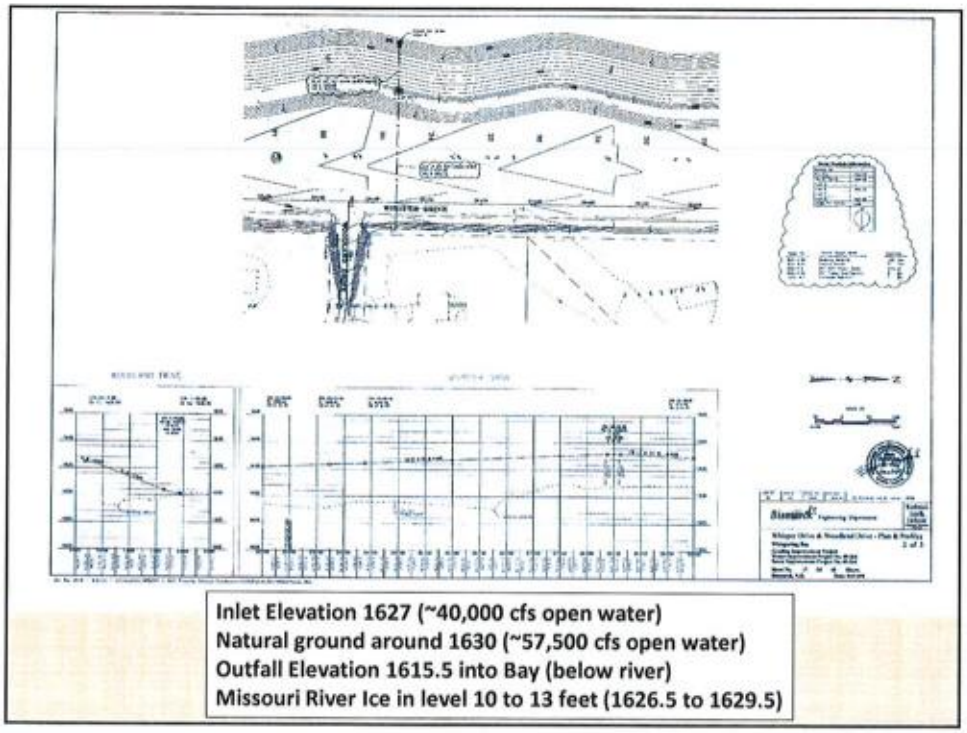
Fox Island Flood Control Project Petition

- Available at the back of the room for your consideration and signature
- There is no requirement for you to sign
- There is no obligation by signing as you will have the option to vote based on an assessment value for any proposed project.
- Project Schedule? – To be determined

Questions and Comments?

- Please complete evaluation questionnaire
- Please complete comment form
- Please approach podium and provide your name before asking your question or providing comment.
- No open comments from the audience as we want to answer directly without interruptions
- infobcwrd@nd.gov (e-mail address)





Inlet Elevation 1627 (~40,000 cfs open water)
Natural ground around 1630 (~57,500 cfs open water)
Outfall Elevation 1615.5 into Bay (below river)
Missouri River Ice in level 10 to 13 feet (1626.5 to 1629.5)

FOX ISLAND FLOOD CONTROL AND DRAINAGE IMPROVEMENTS
PETITION OF REQUEST FOR A PROJECT

We, the undersigned, hereby request the Burleigh County Water Resource District initiate a project in accordance with North Dakota Century Code Chapter 61-16.1 to evaluate measures to increase flood protection and to restore local surface drainage patterns on Fox Island. This process could result in the creation of a special improvement district to construct and implement flood prevention measures and to construct improvements for surface water drainage. We understand that the cost of any such improvements will need to be approved by a favorable vote of the benefitted landowners and their properties assessed accordingly.

Name	Address	Phone	E-mail
John Lies	2301 Riverwood dr	222-4435	
Danette McKenzie	1820 Larson Rd	255-4356	philmac@bis.midco.net
Philip McKenzie	1820 Larson Rd	255-4356	" "
Diane & Ron Davis	1807 Far West Dr	226-6754	ddavis.legacy@midconetwork.com
Sally A. Grenz	2850 Woodland D	751-1882	sallygrenz@hotmail.com
Everett Heringer	2505 Larson Rd	255-4401	everett@heringer.com
CARMEN GLASSER	3202 TAVIS ROAD	223-3870	rugs4u@bismidco.net
LARRY GLASSER	"	"	"
~~Tracy Doe~~	~~2462 Timberlane Pl~~	~~223-9415~~	~~doe52@bis.midco.net~~
BRIAN BJELLA	3465 GALLATIN DR.	202-8532	Kbjella@bis.midco.net
Rosemary Berger	2876 Woodland Pl	222-3571	rberger@bis.midco.net
DARYL WAHL	1531 MUTINEER PL	223-8162	cdwahl@bis.midco.net

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Name	Address	Phone	E-mail
Jan Warren	2882 Woodland Dr	258-0853	warren290@bis.midco.net
Chris & Byron Blowers	9360 Darin Drive	258 2694	bblowers@bis.midco.net.
Mark Cunningham	1680 Far West Dr	258-[illegible]	mcunning@nd.gov
Gerry & Barbara Koorbusch	2430 LARSON RD	223-6267	
Mike Egg|	1950 Far West	258-2797	meggl@bepc.com
Karen Bjella	3465 Gallatin Dr	258-8568	Kbjella@bis.midco.net
[illegible]	[illegible]	751-3003	[illegible]
Bob Rein	1707 Larson Rd	222-8868	breis@bis.midco.net
Arla Teske	2471 Timberlane Rd	255-5051	
Kaye Otteson	2525 Smokey Lane	258-6995	Kotte2@bis.midco.net
Katherine A. Hutchens	2424 Timberlane Pl.	2238010	kahutchens@bis.midco.net
Greg Berger	2876 Woodland Dr	222-3571	gberger@Bis.midco.net

BURLEIGH COUNTY Water Resource DISTRICT

Public Informational Meeting

Fox Island Flood Control

SIGN-IN FORM

October 20, 2009

NAME	ADDRESS	CITY	STATE	ZIP CODE	E-MAIL
Chris & Byron Blowers	9360 Davin DR	Bis.		58504	bblowers@bis.midco.net
Mark Cunningham	1680 Far West Dr			58504	Mcunningham@nd.gov
Kathleen Rowland	– USGS –	Bismarck, ND			krowland@usgs.gov

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Name	Address	Phone	E-mail
DeWayne Tennes	2520 Larson Rd.	258-7428	
Courtney Williams	2860 Woodland Pl	223-2480	courtneyw@bis.midco.net
Scott Kronberg	2875 Woodland Dr.	258-4529	kronberg2@bis.midco.net

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Name	Address	Phone	E-mail
Jim & Cathie VOLK	3397-GALLATIN DR.	255-4910	JAMES.VOLK@RAYMONDJAMES.COM
Ken Vellenga	2812 WOODLAND Dr	255-6321	KZMLK4@BIS.MIDCO.NET
Guy Otteson	2525 Smoky Lane	258-6995	Kotte2@bis.midco.net

Fox Island Flood Mitigation Steering Committee
Attn: Mike Eggl
1950 Far West Drive
Bismarck, ND 58504

August 2, 2011

Burleigh County Water Resources Board
Attn: Michael H. Gunsch, P.E.
3712 Lockport Street
Bismarck, ND 58503

Dear Mr. Gunsch,

As you are aware, the residents of Fox Island have formed a steering committee to address future flood hazard mitigation. The steering committee would appreciate the Water Resource District's review of the following thoughts on flood mitigation efforts and meet with the steering committee as to the best way to proceed. We would appreciate hearing from the District as to the best time for such a meeting.

The steering committee has agreed that the goal of future flood hazard mitigation should be a joint effort between the various communities along the river along with the county and city working in cooperation. Such coordination would save time and money. While very understandable, given the unprecedented nature of the event, the rapid response to the 2011 flood conditions suffered from a lack of coordination. Below are three options that we would like to discuss with you that we feel could aid in future coordination.

OPTION #1

The first option is to develop a dike/easement system along the perimeter of the Missouri River from Expressway Bridge south to an area near Apple Creek. In many ways, the area south of the Expressway Bridge on the east side of the river has been substantially protected by private development.

The residents of Southport have demonstrated that the outer perimeter of the development is significantly above the flood zone. Further, the residents themselves have demonstrated that the area can be protected through blocking the marina entrance and dewatering the interior area.

This same process could be easily accomplished at Whispering Bay, which is even higher than Southport.

South of Whispering Bay on Fox Island, the elevation has been raised in an inconsistent fashion. Some residents have built their individual lots to elevations well above the 100 year flood, while others remain significantly lower. The steering

committee has discussed this and there is a consensus that the residents on the river would be interested in developing an exterior dike or a system that would provide such protection.

This dike system could be continued across the exterior of the oxbow and across the state land and brought as close to Apple creek in order to protect the maximum area possible.

Advantages of this plan would include:

- Highest number of residences protected.
- Low distance of dikes vis-à-vis area protected.
- Would provide protection for the Southern Burleigh and South Bismarck.
- Would allow for dewatering further away from the city, alleviating the need to dewater on South Washington Street.
- Would eliminate the need for diking in several including the South Bismarck drainage ditch (both sides) south of Solheim school
- Would protect city infrastructure, including the sewage water treatment plant.

Concerns about this plan:

- Would require the development of a plan to block the Southport marina, the Whispering Bay Marina, and the river entrance of the oxbow. While the residents of Southport demonstrated the efficacy of this approach, it would need to be replicated and practical.
- Would require coordination between the City, County and State (as the perimeter of the state property south of Fox Island would be integral to the plan).

OPTION #2

The second option is to develop a dike/easement structure on the perimeter of Fox Island itself. Residents and the steering committee concur this is worth investigating this option. This has been considered in the past. This year's unprecedented flooding makes it all the more reasonable. Residents expended significant resources on an individual basis in protecting their homes. This effort would be better spent and more effective on group or neighborhood protection.

Advantages of this plan would include:

- This plan would be easier to coordinate than Option #1.
- This plan would provide protection and certainty for protection for a larger percentage of Fox Island residents.

Concerns about this plan include:

- Would require significantly more diking on Fox Island itself that Option #1.
- Would not provide protection to other areas such as the City of other sections of Fox Island. However, if the residents of Whispering Bay and

Southport concluded to undertake similar efforts, some level of protection could be coordinated between these areas.

OPTION #3

The third option is to develop only easements along the perimeter of Fox Island. Again, this plan could be coordinated with the Whispering Bay and Southport Island area if those areas demonstrated interest. The easements would be available to facilitate the more rapid installation of protective measures. This plan as well as the others above would also incorporate locking culverts and optimal drainage efforts as previously discussed by the District.

Advantages and concerns of this plan are similar to Option #2. An additional concern would be the active nature of the protection offered. The passive nature of dike would offer more security in a rapid moving emergency such as an ice jam. The timing of an ice jam would likely not allow installation of protective measures.

We appreciate the Water Resource Board's considering these plans and would appreciate meeting with Houston Engineering and the County Engineer to discuss these options in more detail and to develop next steps for protecting our residences. The members of the steering committee are listed below.

Sincerely

Mike Eggl
Evan Mandigo
Dan Privratsky
Brian Bjella
Tracy Doe
Robert Tanous
Everitt Heringer
Jim Volk
Don Wright
Duwayne Ternes
Bob Upgren

cc: Dr. John Warford, Mayor of Bismarck
Mr. Brian Bitner, Burleigh County Commission Chair
Mr. Todd Sando, State Engineer P.E., State Water Commission

#1

We, the undersigned residents of Fox Island, petition the Burleigh County Water Resource Board to **NOT PLACE A PERMANENT DIKE** on the west side (river side) of the homes along West Harbor and Harbor Drives. Our reasons for wishing to avoid a permanent dike include:

(1) Proven success in privately diking the riverbank during the unprecedented flood event of 2011 by over 80% of the riverside homes on Fox Island
(2) Universal concern about the stability of the riverbank and the possibility of damage due to the weight of permanent dike materials on untested soils
(3) A lack of assurance that a permanent dike would protect adjacent homes against the (much more likely) occurrence of an ice jam event, and in fact, may make the consequences of a large ice jam much worse for riverside homeowners than current naturally sloping back yards
(4) A loss of view, river access, and trees, all of which are vital to the aesthetic appreciation and enjoyment of our homes
(5) loss of the use of our back yards

(6) Concern over the problems associated with dike runoff during common normal rain events

(7) Permanent reduction in the market value of our homes

We believe a possible solution that may be satisfactory to interior home owners and to those living directly along the river would be to elevate Harbor and West Harbor Drives, allowing permanent access to Fox Island properties while providing a "dike" to homes to the east. Riverside homeowners with continual access to their properties would be able to prepare temporary emergency dikes in the unlikely occurrence of another significant flood the magnitude of the 2011 event.

	Name	Address	Phone No.
1.)	Tyler Leier	2250 Harbor Dr.	406-539-2200
2.)	Marilyn Bimonte	2260 Harbor DR	701-355-0960
3.)	Valerie Kinsey	2120 W Harbor Dr	701-951-2314
4.)	[illegible]	2130 W Harbor Dr	701-220-5743
5.)	Scott Stalock	2022 W HARbor Dr	701-471-0074
	Colleen Stalock	2022 W. Harbor Dr	701-471-0072
6.)	Shannon McQuade-Ely	1928 W. Harbor Dr	701-471-9440
7.)	Rick DETWILLER	1900 HARBOR DR	701-223-8782
8.)	Lynn D Stromberg	1918 HARBOR DR	701-258-4130

#2

We, the undersigned residents of Fox Island, petition the Burleigh County Water Resource Board to **NOT PLACE A PERMANENT DIKE** on the west side (river side) of the homes along West Harbor and Harbor Drives. Our reasons for wishing to avoid a permanent dike include:

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	Name	Address	Phone No.
9.)	[illegible]	2012 W. Harbor Dr, Bism.	258-7865
10.)	[illegible] William [illegible]	West Harbor Dr.	471-0018
11.)	[illegible]	2110 W. Harbor	471-6000
12.)	Robert D. [illegible]	2100 Harbor	220-0758
STEVE SCHWAN 13	[illegible]	2240 Harbor Dr	220 9898

#3

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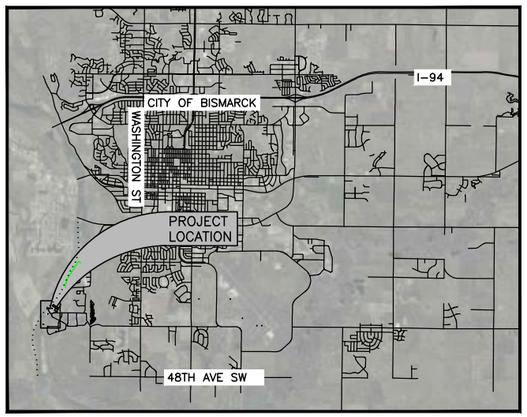
	Name	Address	Phone No.
2(B)	[signature]	2260 Harbor Dr. Bis	355-0960

SEGMENT D LEVEE
FOX ISLAND

BISMARCK, NORTH DAKOTA
MARCH, 2013



VICINITY MAP

SHEET INDEX

LOCATION MAP

RECORD DRAWING NOTES:

1. BENCHMARKS OR LOCATION COORDINATE POINTS ARE NOTED AS SHOWN, AND USE THE FOLLOWING DATUM AND COORDINATE SYSTEM: NAD83 NORTH DAKOTA STATE PLANE SOUTH INTERNATIONAL FOOT, GEOID 09, AND NAVD 88 VERTICAL DATUM.
2. LOCATION AND DIMENSIONS FOR COMPLETED REPAIRS ARE BASED ON AS CONSTRUCTED FIELD SURVEYS.
3. THE ACTUAL EXTENT OF WORK WAS DIRECTED BY COE FIELD PERSONNEL, AND ADJUSTED IN SOME LOCATIONS BASED ON SITE CONDITIONS ENCOUNTERED AT THE TIME WORK WAS COMPLETED.
4. SEVERAL REVETMENT STRUCTURES WERE NOT IN THE LOCATION DESIGNATED ON THE PLAN SET. SUBSEQUENTLY, THE WORK COMPLETED OCCURED ON THE ACTUAL STRUCTURE, AS IT PHYSICALLY EXISTS, WITH THE LOCATION NOTED ON THE RECORD DRAWING PLAN VIEW.

Houston Engineering Inc.

HEI PROJECT NO. 6025–006

This document is preliminary and not for construction or implementation purposes.

PRELIMINARY

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No.	Revision	Date	By

Houston Engineering Inc.
Bismarck
P: 701.323.0200
F: 701.323.0300

Drawn by	Date
ARV/NRC	3-25-13
Checked by	Scale
MHG	AS SHOWN

FOX ISLAND FLOOD CONTROL PROJECT
SEGMENT D / ROAD RAISE
BISMARCK, ND

OVERVIEW
PLAN VIEW
PROJECT NO. 6025-006

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FOX ISLAND FLOOD CONTROL PROJECT
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BISMARCK, ND

OVERVIEW
PLAN VIEW
PROJECT NO. 6025-006

SHEET
2 of 17

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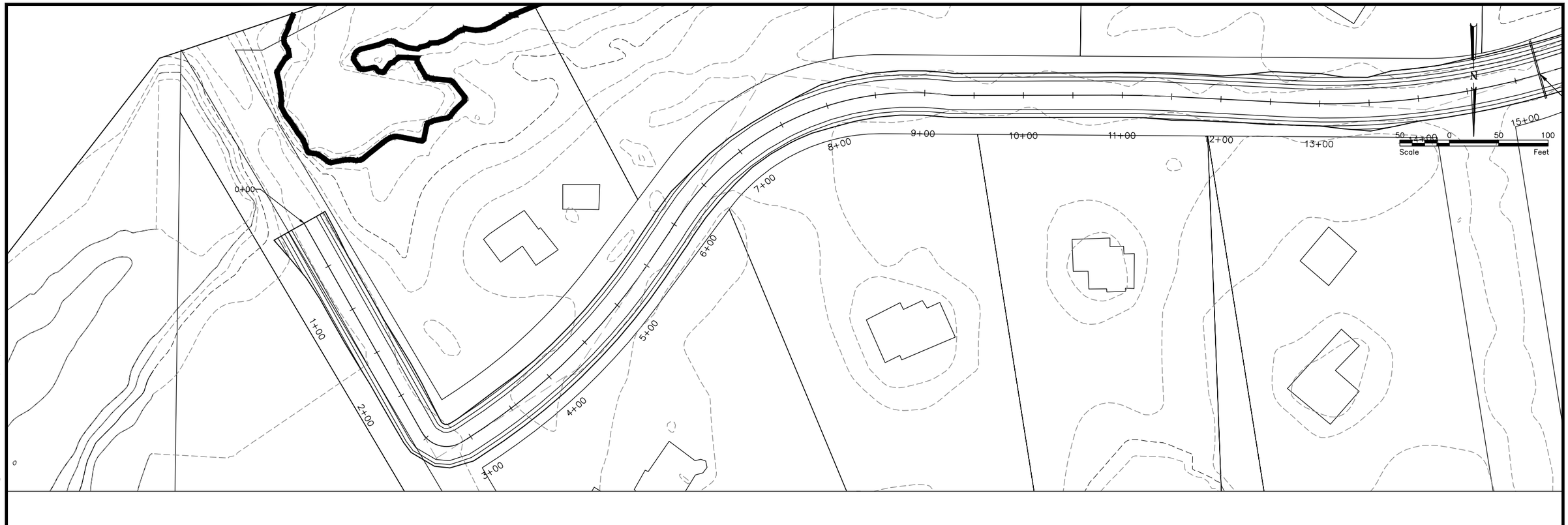

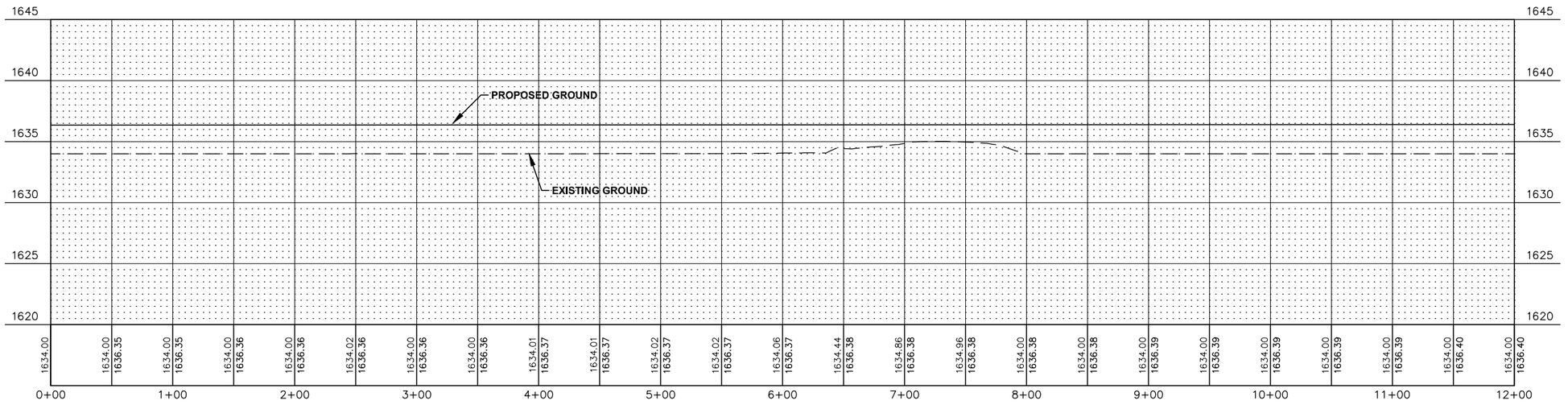

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Houston Engineering Inc.
Fargo
P: 701.237.5065
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Drawn by	Date
ARV/NRC	3-25-13
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FOX ISLAND FLOOD CONTROL PROJECT
SEGMENT D / ROAD RAISE
BISMARCK, ND

PLAN & PROFILE
STA. 0+00 - 12+00
PROJECT NO. 6025-006

SHEET
3 of 17

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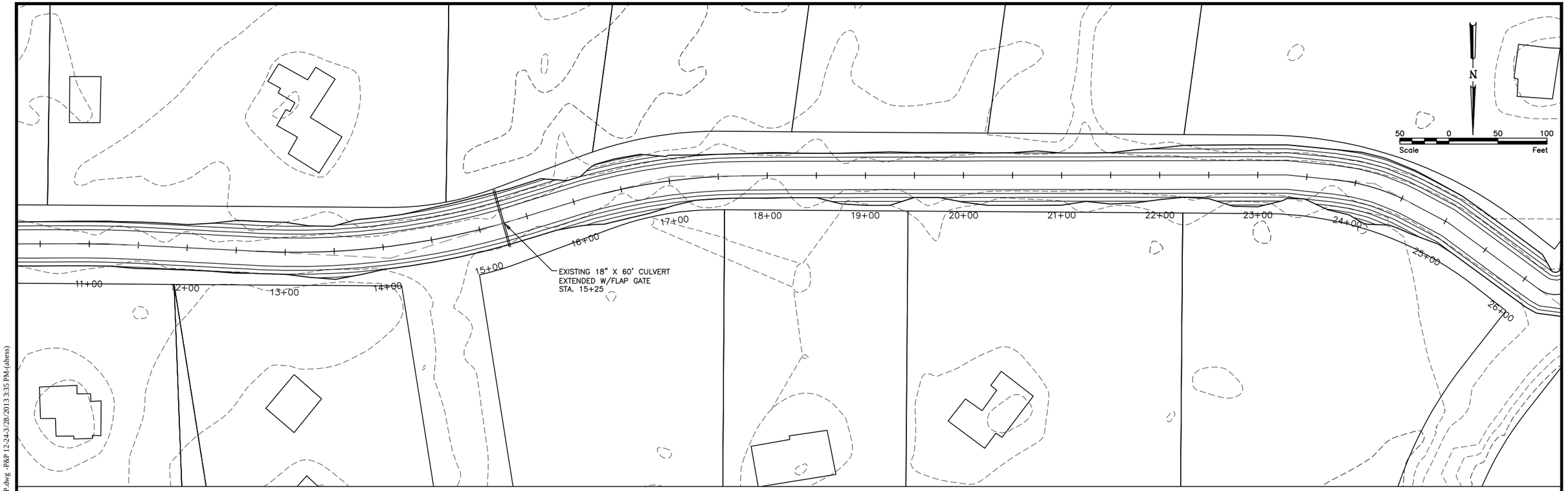

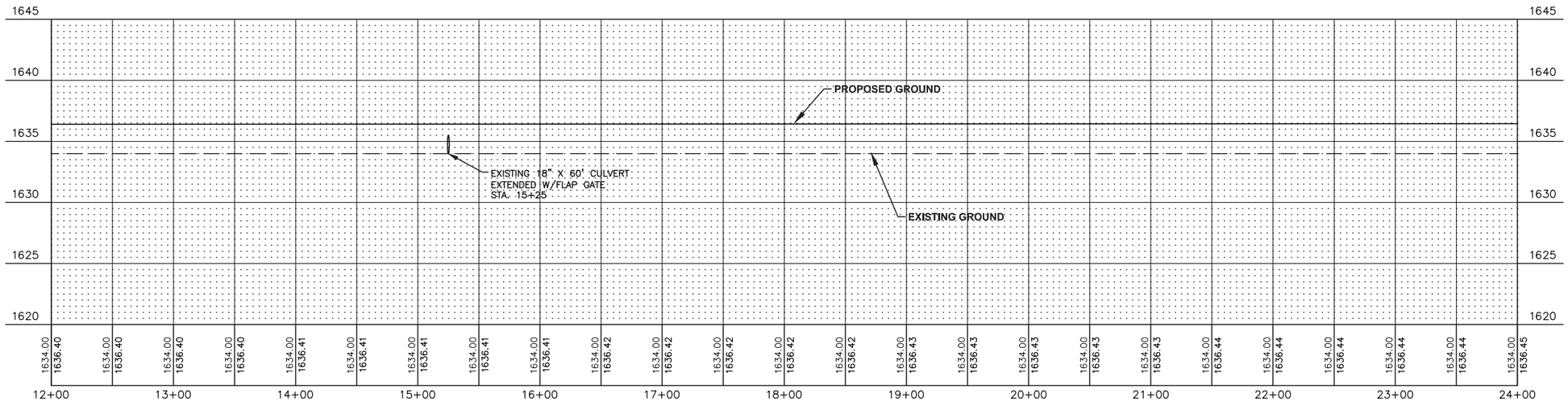

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BISMARCK, ND

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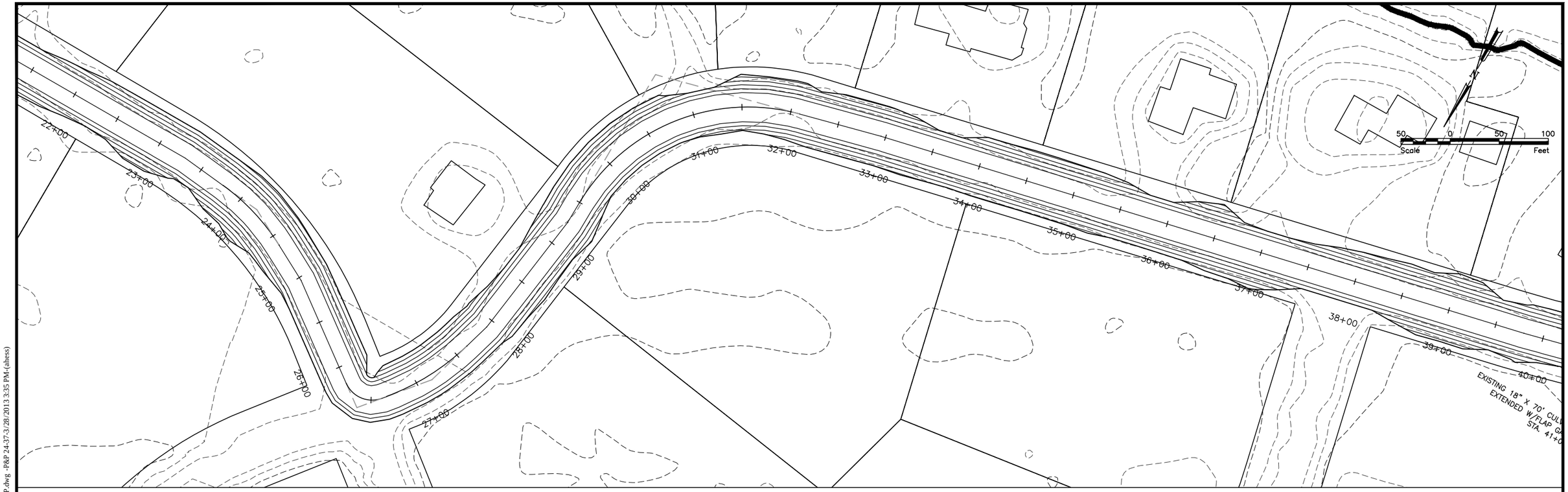

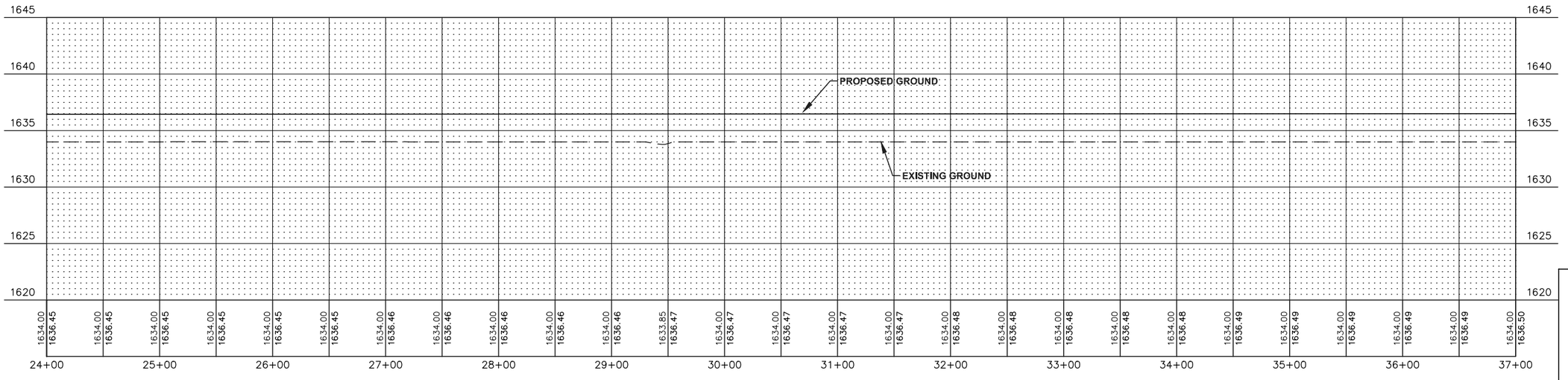

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FOX ISLAND FLOOD CONTROL PROJECT
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BISMARCK, ND

PLAN & PROFILE
STA. 24+00 - 37+00
PROJECT NO. 6025-006

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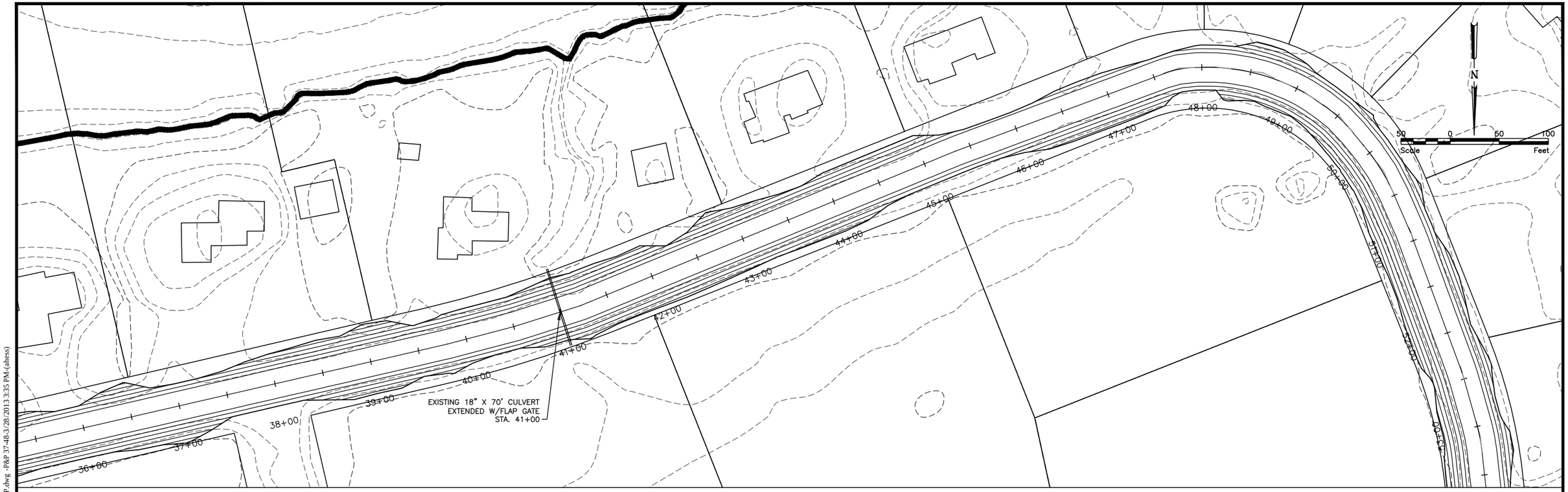

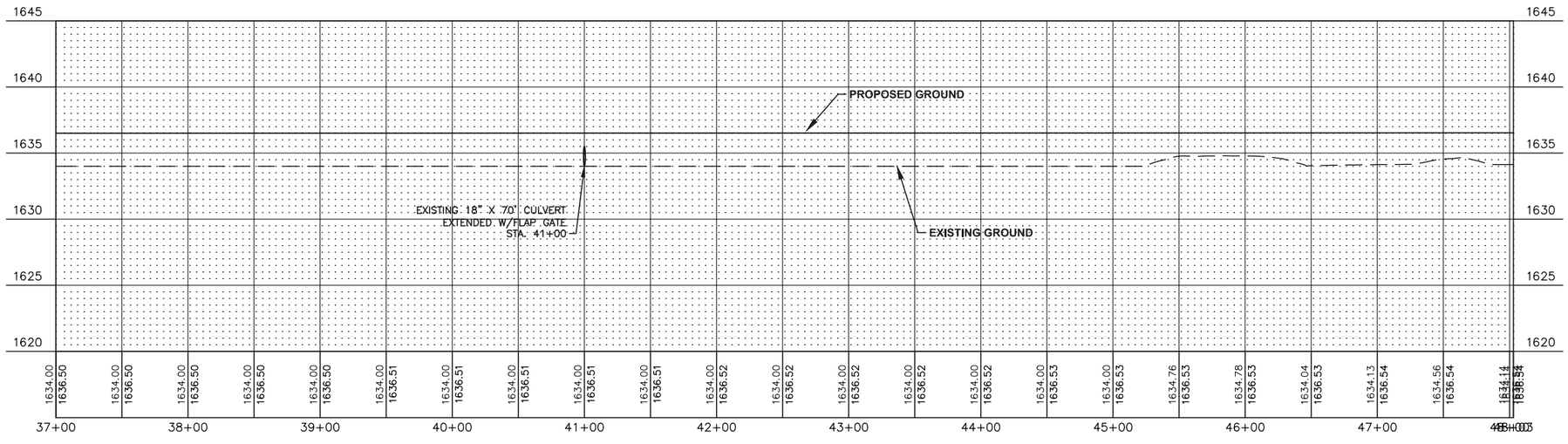

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BISMARCK, ND

PLAN & PROFILE
STA. 37+00 - 48+00
PROJECT NO. 6025-006

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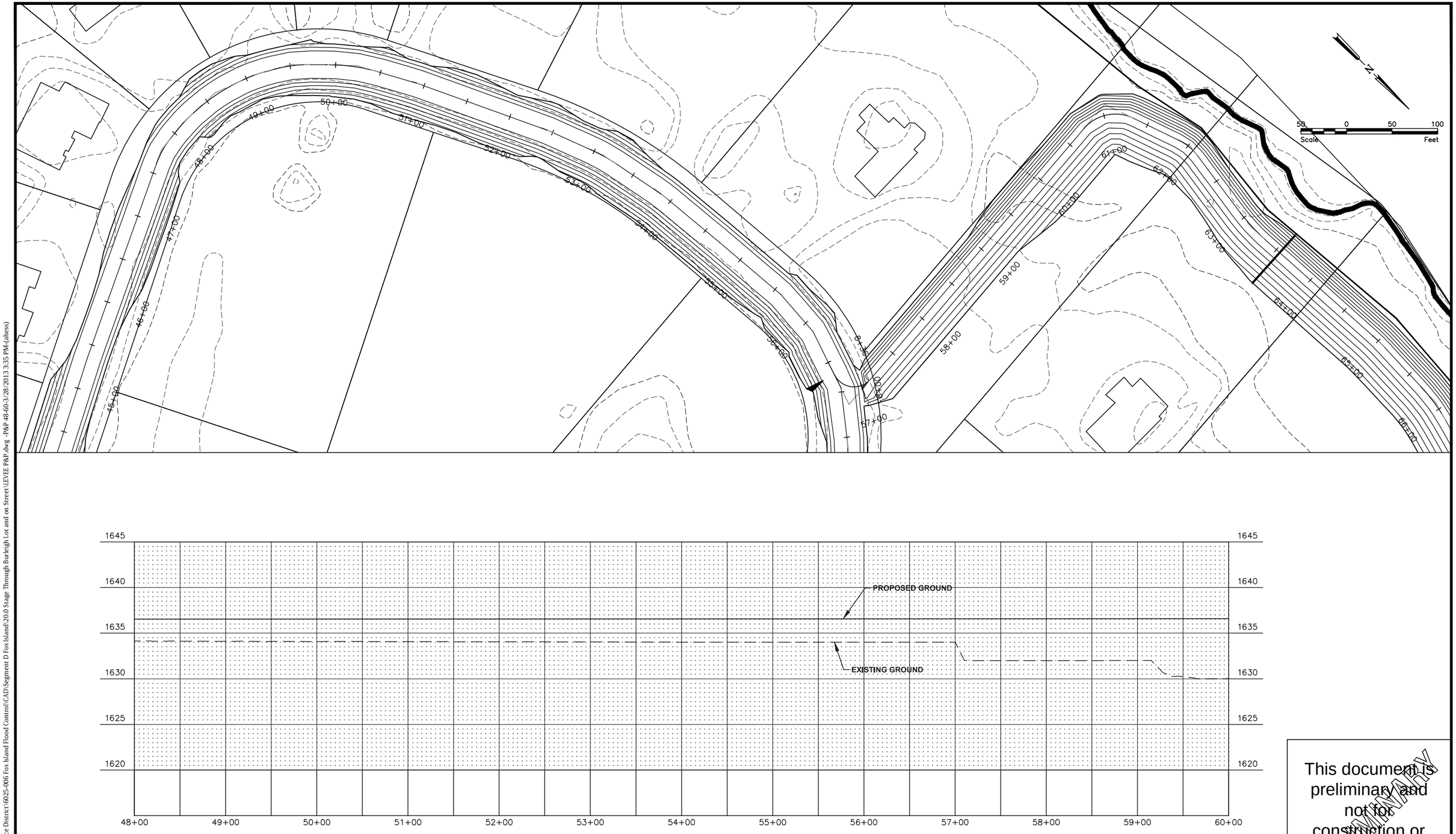

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FOX ISLAND FLOOD CONTROL PROJECT
SEGMENT D / ROAD RAISE
BISMARCK, ND

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PROJECT NO. 6025-006

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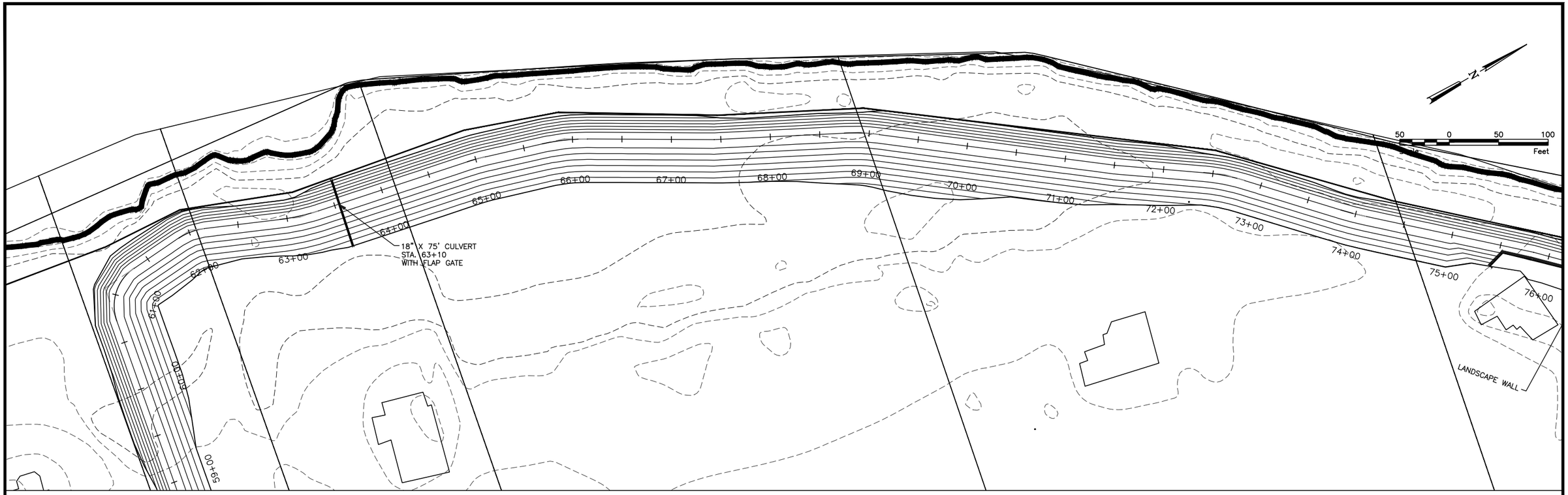

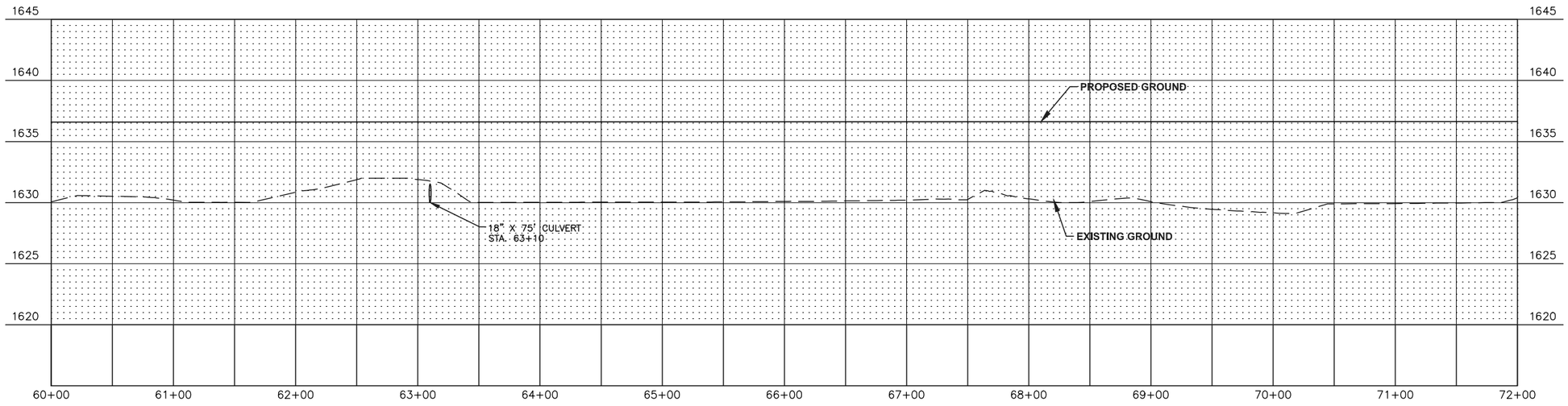

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FOX ISLAND FLOOD CONTROL PROJECT
SEGMENT D / ROAD RAISE
BISMARCK, ND

PLAN & PROFILE
STA. 60+00 - 72+00
PROJECT NO. 6025-006

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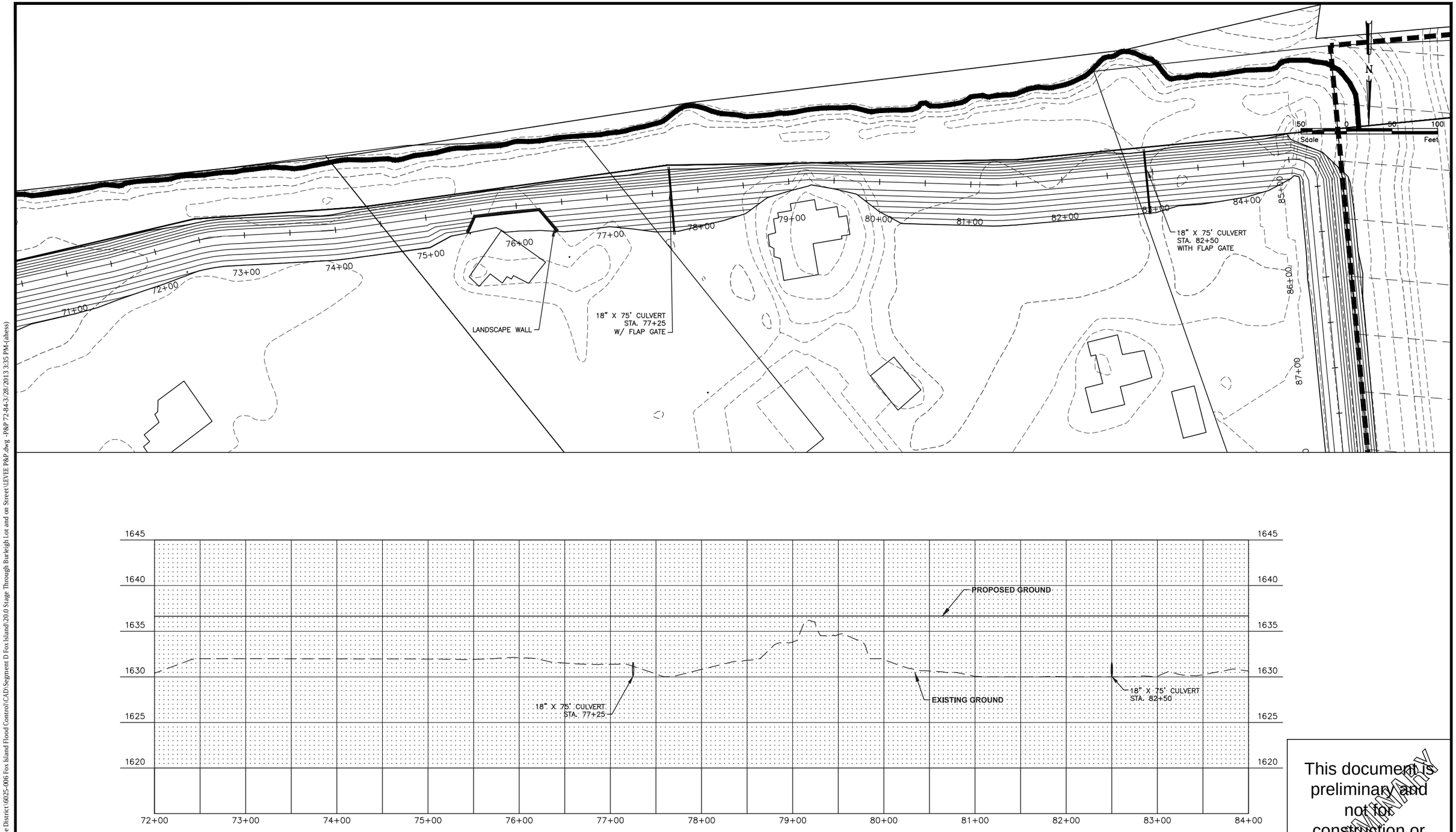

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FOX ISLAND FLOOD CONTROL PROJECT
SEGMENT D / ROAD RAISE
BISMARCK, ND

PLAN & PROFILE
STA. 72+00 - 84+00
PROJECT NO. 6025-006

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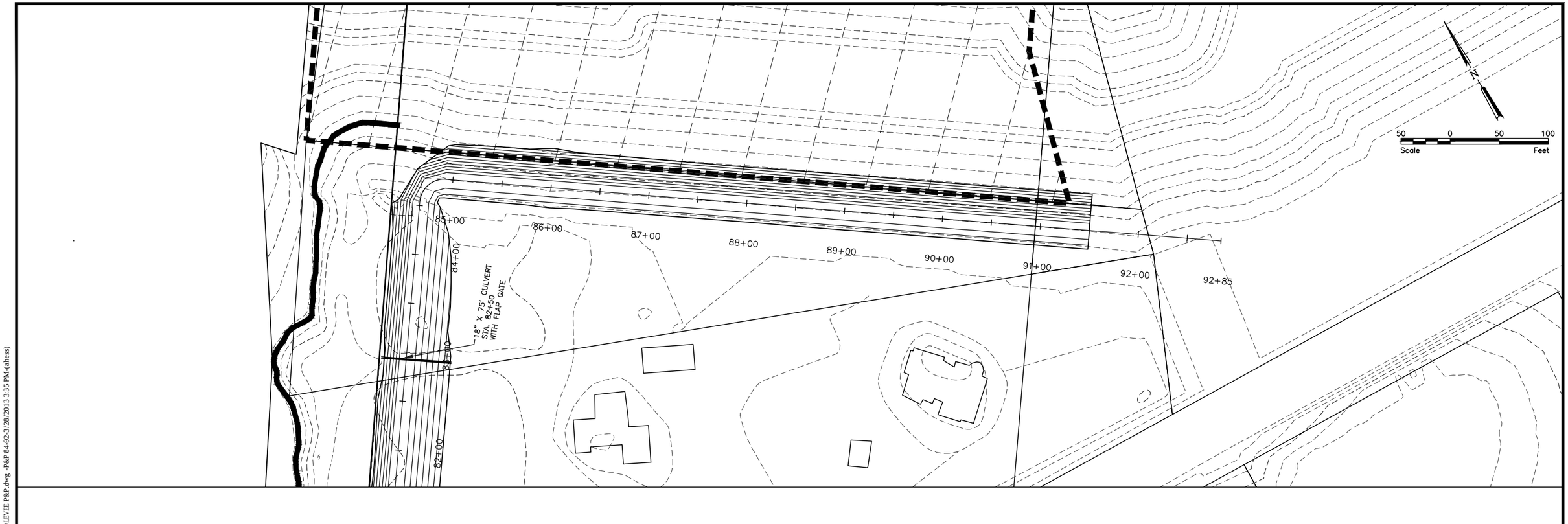

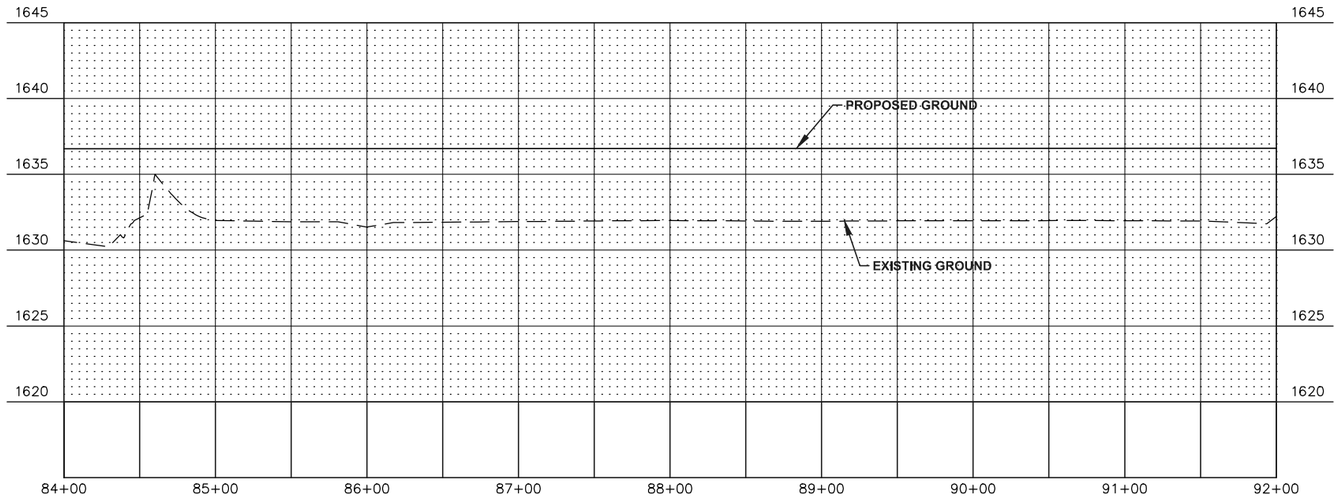

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FOX ISLAND FLOOD CONTROL PROJECT
SEGMENT D / ROAD RAISE
BISMARCK, ND

PLAN & PROFILE
STA. 84+00 - 92+00
PROJECT NO. 6025-006

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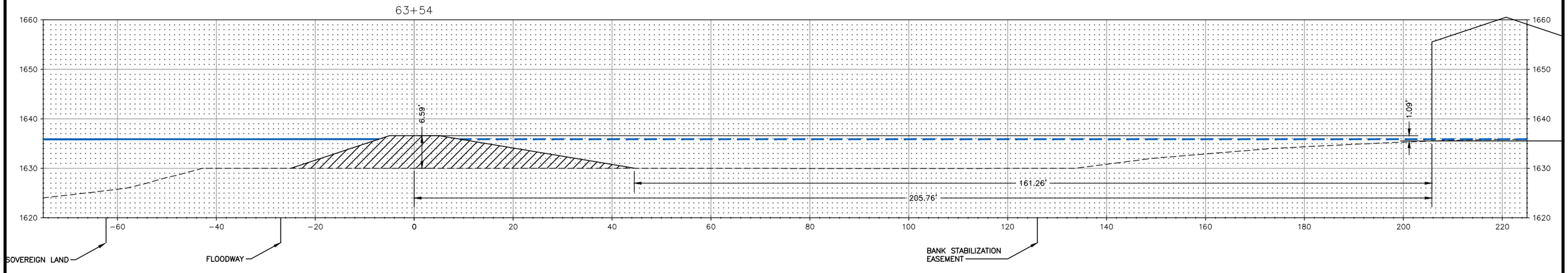
LEGEND

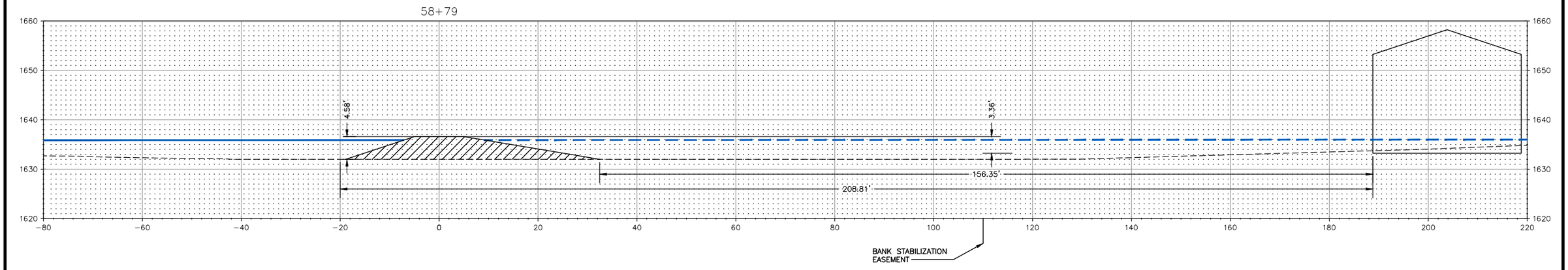
2011 FLOOD

2011 FLOOD INSIDE LEVEE

EXISTING GROUND

LEVEE





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Houston Engineering Inc.

Bismarck
P: 701.323.0200
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FOX ISLAND FLOOD CONTROL PROJECT
3456 GALLATIN DRIVE: GOVIG, PAUL & KRENZ, JULIE
BISMARCK, ND

CROSS SECTIONS
STA. 63+54 & 58+79
PROJECT NO. 6025-006

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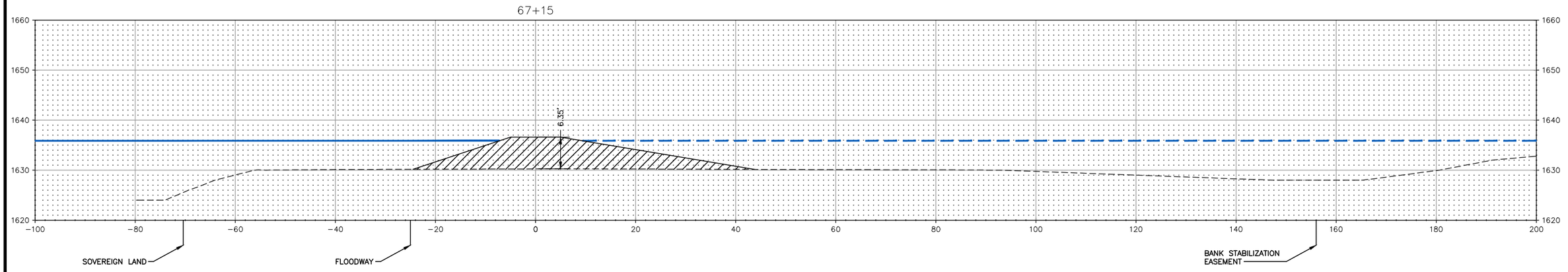
LEGEND

2011 FLOOD

2011 FLOOD INSIDE LEVEE

EXISTING GROUND

LEVEE



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FOX ISLAND FLOOD CONTROL PROJECT
3464 GALLATIN DRIVE: BOISE, TRAVIS
BISMARCK, ND

CROSS SECTIONS
STA. 67+15
PROJECT NO. 6025-006

SHEET
12 of 17

T:\6025-XXX Burleigh County Water Resource District\6025-006 Fox Island Flood Control\CAD\Segment D Fox Island\20.0 Stage Through Burleigh Lot and on Street\LEVEE XS.dwg - XS (2)-3/28/2013 3:36 PM-(ahess)

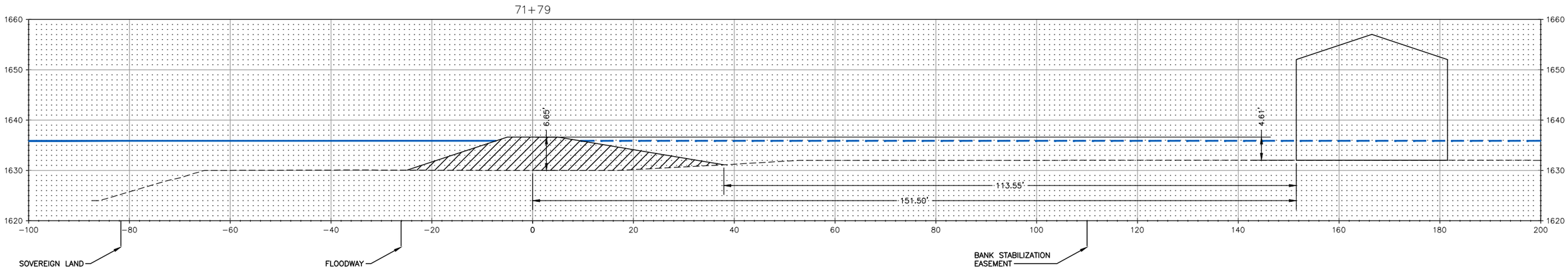
LEGEND

2011 FLOOD

2011 FLOOD INSIDE LEVEE

EXISTING GROUND

LEVEE



This document is preliminary and not for construction or implementation purposes.

PRELIMINARY

No.	Revision	Date	By

Houston Engineering Inc.

Bismarck

P: 701.323.0200
F: 701.323.0300

Drawn by	Date
ARV/NRC	3-25-13
Checked by	Scale
MHG	AS SHOWN

FOX ISLAND FLOOD CONTROL PROJECT
2505 LARSON ROAD: HERINGER, EVERETT & CAROL
BISMARCK, ND

CROSS SECTIONS
STA. 71+79
PROJECT NO. 6025-006

SHEET
13 of 17

T:\6025-XXX Burleigh County Water Resource District\6025-006 Fox Island Flood Control\CAD\Segment D Fox Island\20.0 Stage Through Burleigh Lot and on Street\LEVEE XS.dwg -XS (3)-3/28/2013 3:36 PM-(ahess)

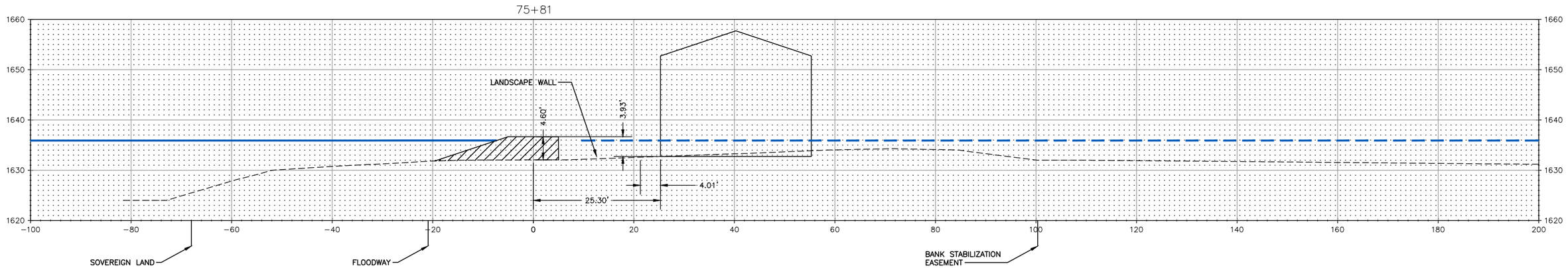
LEGEND

2011 FLOOD

2011 FLOOD INSIDE LEVEE

EXISTING GROUND

LEVEE



NOTE: SLOPE ADJUSTED DUE TO PROXIMITY OF HOUSE. THIS LOCATION MAY WARRANT THE INSTALLATION OF A FLOODWALL.

This document is preliminary and not for construction or implementation purposes.

PRELIMINARY

No.	Revision	Date	By

Houston Engineering Inc.

Bismarck

P: 701.323.0200
F: 701.323.0300

Drawn by: ARV/NRC

Checked by: MHG

Date: 3-25-13

Scale: AS SHOWN

FOX ISLAND FLOOD CONTROL PROJECT
2525 LARSON ROAD: LARSON, GREGORY & DIANE
BISMARCK, ND

CROSS SECTIONS
STA. 75+81
PROJECT NO. 6025-006

SHEET
14 of 17

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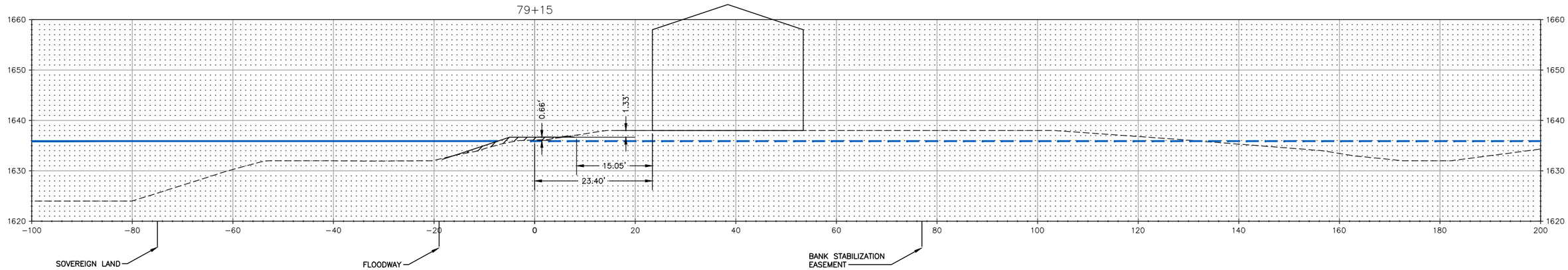
LEGEND

2011 FLOOD

2011 FLOOD INSIDE LEVEE

EXISTING GROUND

LEVEE



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PRELIMINARY

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No.	Revision	Date	By

Houston Engineering Inc.

Bismarck

P: 701.323.0200
F: 701.323.0300

Drawn by	Date
ARV/NRC	3-25-13
Checked by	Scale
MHG	AS SHOWN

FOX ISLAND FLOOD CONTROL PROJECT
2520 LARSON ROAD: TERNES, DUWAYNE & SHARON
BISMARCK, ND

CROSS SECTIONS
STA. 79+15
PROJECT NO. 6025-006

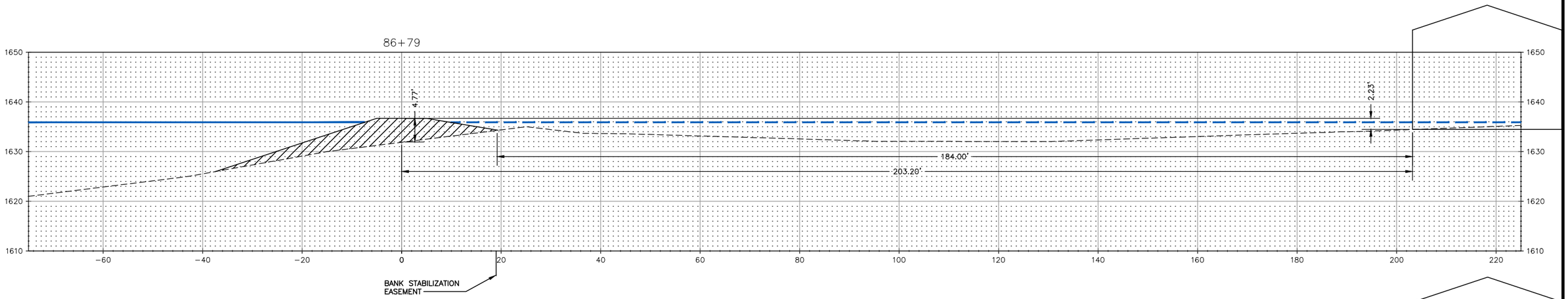
LEGEND

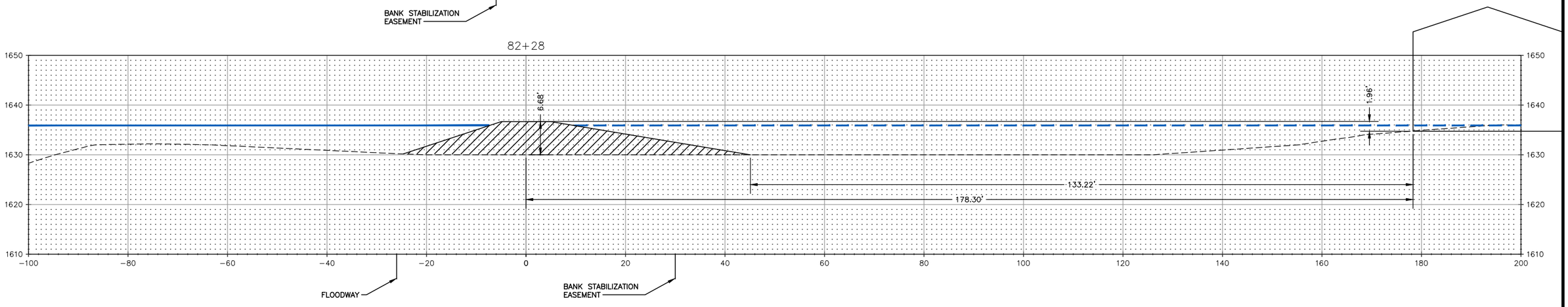
2011 FLOOD

2011 FLOOD INSIDE LEVEE

EXISTING GROUND

LEVEE





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PRELIMINARY

No.	Revision	Date	By

Houston Engineering Inc.

Bismarck

P: 701.323.0200

F: 701.323.0300

Drawn by	Date
ARV/NRC	3-25-13
Checked by	Scale
MHG	AS SHOWN

FOX ISLAND FLOOD CONTROL PROJECT
2450 LARSON ROAD: UPGREN, ROBERT & SHAUNNA
BISMARCK, ND

CROSS SECTIONS
STA. 86+79 & 82+28
PROJECT NO. 6025-006

SHEET
16 of 17

T:\6025-XXX Burleigh County Water Resource District\6025-006 Fox Island Flood Control\CAD\Segment D Fox Island\20.0 Stage Through Burleigh Lot and on Street\LEVEE XS.dwg -XS (6)-3/28/2013 3:36 PM-(ahess)

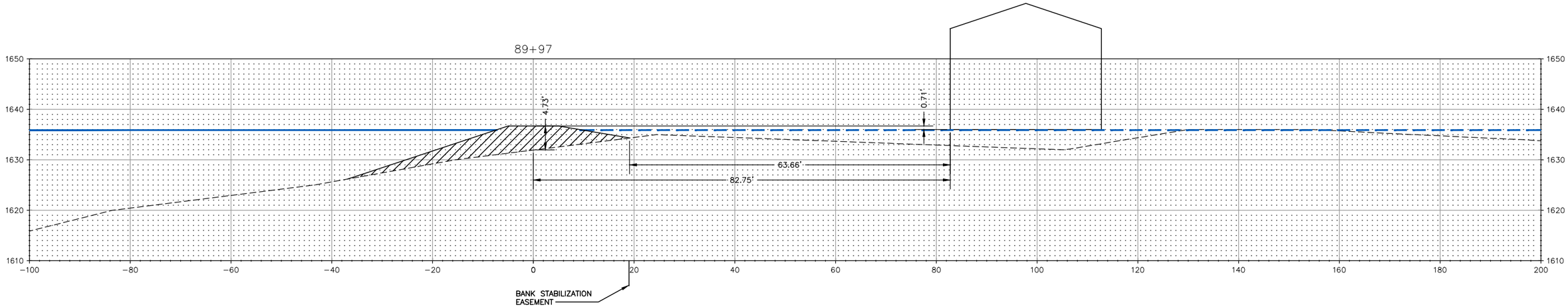
LEGEND

2011 FLOOD

2011 FLOOD INSIDE LEVEE

EXISTING GROUND

LEVEE



This document is preliminary and not for construction or implementation purposes.

PRELIMINARY

No.	Revision	Date	By

Houston Engineering Inc.

Bismarck

P: 701.323.0200
F: 701.323.0300

Drawn by: ARV/NRC
Date: 3-25-13
Checked by: MHG
Scale: AS SHOWN

FOX ISLAND FLOOD CONTROL PROJECT
2430 LARSON ROAD: HERINGER, JOSEPH & HEATHER
BISMARCK, ND

CROSS SECTIONS
STA. 89+97
PROJECT NO. 6025-006

SHEET
17 of 17

T:\6025-XXX Burleigh County Water Resource District\6025-006 Fox Island Flood Control\CAD\Segment D Fox Island\20.0 Stage Through Burleigh Lot and on Street\LEVEE XS.dwg -XS (7)-3/28/2013 3:36 PM-(ahess)

Segment A - Fox Island Flood Protection

Permanent Levee Construction

Opinion of Probable Cost

HEI# 6025-006

Monday, August 12, 2013

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 27,450.23	$ 27,450.23
2	Mobilization	1	L SUM	$ 54,900.46	$ 54,900.46
3	Pipe Conduit 18"	578	LF	$ 112.00	$ 64,770.16
4	Sluice Gate & Connection	12	EA	$ 6,500	$ 75,179.65
5	Remove, Stockpile, & Replace Topsoil	4.00	Acre	$ 2,800	$ 11,197.26
6	Saw Bituminous Surfacing	150	LF	$ 3.00	$ 450.00
7	Removal of Bituminous Surfacing	12566	SY	$ 5.75	$ 72,255.08
8	Excavation Waste	1094	CY	$ 11.00	$ 12,034.81
9	Levee Embankment - Fat Clay	14668	CY	$ 8.90	$ 130,546.13
10	Tree Removal	113	EA	$ 750.00	$ 84,821.18
11	Erosion Control Levee	13782	SY	$ 3.50	$ 48,237.38
12	Seeding & Hydromulch	5.70	Acre	$ 5,005	$ 28,503.91
13	Silt Fence	7640	LF	$ 2.75	$ 21,009.07
				Construction Cost =	**$ 631,355.31**

Engineering (Design and Const. Mgmt Services)	$ 113,643.96
Administration (ROW, Legal, Admin)	$ 50,508.42
Total Grade Raise Cost	**$ 795,507.69**
SWC Cost Share	**$ 378,813.18**
Grade Raise Cost w/SWC	**$ 416,694.50**

Township/County Paving Cost

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 17,383.09	$ 17,383.09
2	Mobilization	1	L SUM	$ 34,766.18	$ 34,766.18
3	Hot Bituminous Pavement CL 29	2792	TON	$ 45.00	$ 125,660.87
4	Asphlat Cement	168	TON	$ 600.00	$ 100,528.70
5	Aggregate Base Course CL 5	4189	TON	$ 29.00	$ 121,472.18
				Construction Cost =	**$ 399,811.01**

Engineering (Design and Const. Mgmt Services)	$ 71,965.98
Administration (ROW, Legal, Admin)	$ 31,984.88
Total Paving Cost	**$ 503,761.88**
Total Project Construction Cost	**$ 1,299,269.57**
Total Project Construction Cost w/SWC	**$ 920,456.38**

Segment B - Fox Island Flood Protection

Permanent Levee Construction

Opinion of Probable Cost

HEI# 6025-006

Monday, August 12, 2013

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 20,994.79	$ 20,994.79
2	Mobilization	1	L SUM	$ 41,989.58	$ 41,989.58
3	Pipe Conduit 18"	470	LF	$ 112.00	$ 52,651.20
4	Sluice Gate & Connection	9	EA	$ 6,500	$ 61,113.00
5	Remove, Stockpile, & Replace Topsoil	3.41	Acre	$ 2,800	$ 9,548.83
6	Saw Bituminous Surfacing	120	LF	$ 3.00	$ 360.00
7	Removal of Bituminous Surfacing	10402	SY	$ 5.75	$ 59,811.50
8	Levee Embankment - Fat Clay	9006	CY	$ 8.90	$ 80,155.09
9	Tree Removal	94	EA	$ 750.00	$ 70,213.50
10	Erosion Control Levee	12321	SY	$ 3.50	$ 43,122.73
11	Seeding & Hydromulch	5.09	Acre	$ 5,005	$ 25,481.61
12	Silt Fence	6341	LF	$ 2.75	$ 17,438.30
				Construction Cost =	**$ 482,880.12**

Engineering (Design and Const. Mgmt Services)	$ 86,918.42
Administration (ROW, Legal, Admin)	$ 38,630.41

Total Grade Raise Cost	**$ 608,428.95**
SWC Cost Share	**$ 289,728.07**
Grade Raise Cost w/SWC	**$ 318,700.88**

Township/County Paving Cost

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 14,389.42	$ 14,389.42
2	Mobilization	1	L SUM	$ 28,778.84	$ 28,778.84
3	Hot Bituminous Pavement CL 29	2312	TON	$ 45.00	$ 104,019.90
4	Asphlat Cement	139	TON	$ 600.00	$ 83,215.92
5	Aggregate Base Course CL 5	3467	TON	$ 29.00	$ 100,552.57
				Construction Cost =	**$ 330,956.64**

Engineering (Design and Const. Mgmt Services)	$ 59,572.19
Administration (ROW, Legal, Admin)	$ 26,476.53

Total Paving Cost	**$ 417,005.36**
Total Project Construction Cost	**$ 1,025,434.32**
Total Project Construction Cost w/SWC	**$ 735,706.24**

Segment B1 - Fox Island Flood Protection

Permanent Levee Construction

Opinion of Probable Cost

HEI# 6025-006

Monday, August 12, 2013

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 53,767.96	$ 53,767.96
2	Mobilization	1	L SUM	$ 107,535.93	$ 107,535.93
3	Pipe Conduit 18"	1,035	LF	$ 112.00	$ 115,920.00
4	Sluice Gate & Connection	21	EA	$ 6,500	$ 134,550.00
5	Remove, Stockpile, & Replace Topsoil	11.36	Acre	$ 2,800	$ 31,804.44
6	Saw Bituminous Surfacing	60	LF	$ 3.00	$ 180.00
7	Removal of Bituminous Surfacing	10200	SY	$ 5.75	$ 58,650.00
8	Excavation Waste	3580	CY	$ 11.00	$ 39,378.37
9	Levee Embankment - Fat Clay	40035	CY	$ 8.90	$ 356,311.16
10	Tree Removal	195	EA	$ 750.00	$ 146,475.00
11	Erosion Control Levee	28066	SY	$ 3.50	$ 98,231.39
12	Seeding & Hydromulch	11.54	Acre	$ 5,005	$ 57,778.90
13	Silt Fence	13120	LF	$ 2.75	$ 36,080.00
14	Drainage Easements and Improvements	1	LS	$ 65,000.00	$ 65,000.00
				Construction Cost =	**$ 1,236,663.15**

Geotechnical	$ 10,000.00
Drainage Easement Documents	$ 12,000.00
Engineering (Design and Const. Mgmt Services)	$ 222,599.37
Administration (ROW, Legal, Admin)	$ 98,933.05

Total Grade Raise Cost	**$ 1,580,195.57**
SWC Cost Share	**$ 741,997.89**
Grade Raise Cost w/SWC	**$ 838,197.68**

Township/County Paving Cost

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 14,109.99	$ 14,109.99
2	Mobilization	1	L SUM	$ 28,219.97	$ 28,219.97
3	Hot Bituminous Pavement CL 29	2267	TON	$ 45.00	$ 101,999.90
4	Asphlat Cement	136	TON	$ 600.00	$ 81,599.92
5	Aggregate Base Course CL 5	3400	TON	$ 29.00	$ 98,599.90
				Construction Cost =	**$ 324,529.68**

Engineering (Design and Const. Mgmt Services)	$ 58,415.34
Administration (ROW, Legal, Admin)	$ 25,962.37

Total Paving Cost	**$ 408,907.39**

Total Project Construction Cost	**$ 1,989,102.96**
Total Project Construction Cost w/SWC	**$ 1,247,105.07**

Segment B2 - Fox Island Flood Protection

Permanent Levee Construction

Opinion of Probable Cost

HEI# 6025-006

Monday, August 12, 2013

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 12,149.36	$ 12,149.36
2	Mobilization	1	L SUM	$ 24,298.73	$ 24,298.73
3	Pipe Conduit 18"	232	LF	$ 112.00	$ 25,942.75
4	Sluice Gate & Connection	5	EA	$ 6,500	$ 30,112.12
5	Remove, Stockpile, & Replace Topsoil	2.08	Acre	$ 2,800	$ 5,822.53
6	Saw Bituminous Surfacing	60	LF	$ 3.00	$ 180.00
7	Removal of Bituminous Surfacing	5633	SY	$ 5.75	$ 32,387.64
8	Excavation Waste	122	CY	$ 11.00	$ 1,346.07
9	Levee Embankment - Fat Clay	5935	CY	$ 8.90	$ 52,818.03
10	Tree Removal	51	EA	$ 750.00	$ 38,020.28
11	Erosion Control Levee	8403	SY	$ 3.50	$ 29,410.25
12	Seeding & Hydromulch	3.47	Acre	$ 5,005	$ 17,378.78
13	Silt Fence	3480	LF	$ 2.75	$ 9,568.85
				Construction Cost =	**$ 279,435.38**

Engineering (Design and Const. Mgmt Services)	$ 50,298.37
Administration (ROW, Legal, Admin)	$ 22,354.83
Total Grade Raise Cost	**$ 352,088.58**
SWC Cost Share	**$ 167,661.23**
Grade Raise Cost w/SWC	**$ 184,427.35**

Township/County Paving Cost

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 7,791.80	$ 7,791.80
2	Mobilization	1	L SUM	$ 15,583.60	$ 15,583.60
3	Hot Bituminous Pavement CL 29	1252	TON	$ 45.00	$ 56,326.28
4	Asphlat Cement	75	TON	$ 600.00	$ 45,061.02
5	Aggregate Base Course CL 5	1878	TON	$ 29.00	$ 54,448.73
				Construction Cost =	**$ 179,211.44**

Engineering (Design and Const. Mgmt Services)	$ 32,258.06
Administration (ROW, Legal, Admin)	$ 14,336.92
Total Paving Cost	**$ 225,806.41**
Total Project Construction Cost	**$ 577,894.99**
Total Project Construction Cost w/SWC	**$ 410,233.76**

Segment B3 - Fox Island Flood Protection

Permanent Levee Construction

Opinion of Probable Cost

HEI# 6025-006

Monday, August 12, 2013

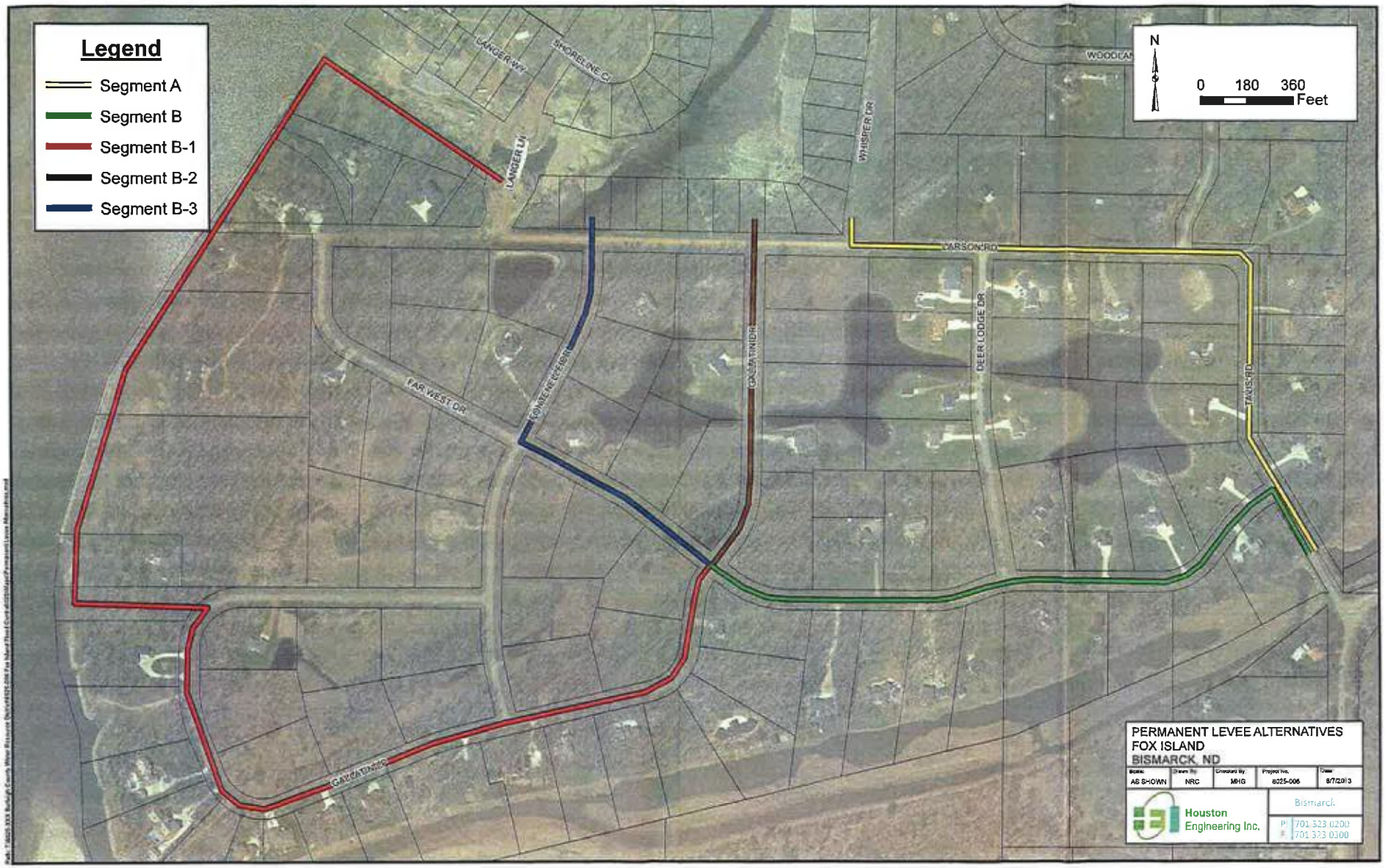
Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 16,074.71	$ 16,074.71
2	Mobilization	1	L SUM	$ 32,149.42	$ 32,149.42
3	Pipe Conduit 18"	341	LF	$ 112.00	$ 38,216.83
4	Sluice Gate & Connection	7	EA	$ 6,500	$ 44,358.82
5	Remove, Stockpile, & Replace Topsoil	2.72	Acre	$ 2,800	$ 7,613.69
6	Saw Bituminous Surfacing	120	LF	$ 3.00	$ 360.00
7	Removal of Bituminous Surfacing	7824	SY	$ 5.75	$ 44,990.49
8	Levee Embankment - Fat Clay	7241	CY	$ 8.90	$ 64,446.06
9	Tree Removal	70	EA	$ 750.00	$ 52,814.93
10	Erosion Control Levee	9969	SY	$ 3.50	$ 34,890.82
11	Seeding & Hydromulch	4.12	Acre	$ 5,005	$ 20,617.30
12	Silt Fence	4795	LF	$ 2.75	$ 13,185.32
				Construction Cost =	**$ 369,718.37**

Engineering (Design and Const. Mgmt Services)	$ 66,549.31
Administration (ROW, Legal, Admin)	$ 29,577.47
Total Grade Raise Cost	**$ 465,845.14**
SWC Cost Share	**$ 221,831.02**
Grade Raise Cost w/SWC	**$ 244,014.12**

Township/County Paving Cost

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 10,823.79	$ 10,823.79
2	Mobilization	1	L SUM	$ 21,647.58	$ 21,647.58
3	Hot Bituminous Pavement CL 29	1739	TON	$ 45.00	$ 78,244.26
4	Asphlat Cement	104	TON	$ 600.00	$ 62,595.40
5	Aggregate Base Course CL 5	2608	TON	$ 29.00	$ 75,636.11
				Construction Cost =	**$ 248,947.14**

Engineering (Design and Const. Mgmt Services)	$ 44,810.48
Administration (ROW, Legal, Admin)	$ 19,915.77
Total Paving Cost	**$ 313,673.39**
Total Project Construction Cost	**$ 779,518.54**
Total Project Construction Cost w/SWC	**$ 557,687.52**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Segment B-2
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CARSON RD
DEER LODGE DR
TAVIS RD
FAR WEST DR
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GALLATIN DR
PERMANENT LEVEE ALTERNATIVES
FOX ISLAND
BISMARCK, ND
AS SHOWN
NRC
MHG
6025-006
8/7/2013
Houston Engineering Inc.
Bismarck
P 701.323.0200
F 701.323.0300


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E Bismarck Expy
AD
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1636
© 2011 Google
Google
46°46'48.54" N 100°48'52.89" W elev 1635 ft
Eye alt 12941 ft

Missouri River 2011 Flood Event
City of Bismarck - Emergency Levee Installation
Encroachment Assessment

25-May-11

Location	Cross Section	Model XS	10 Year			50 Year			100 Year			500 Year		
			98' FIS	w/ 2011 Dikes	Δ (ft)	98' FIS	w/ 2011 Dikes	Δ (ft)	98' FIS	w/ 2011 Dikes	Δ (ft)	98' FIS	w/ 2011 Dikes	Δ (ft)
USGS Gage 16342500	AH	131464	1633.59	1633.62	0.03	1636.58	1636.63	0.05	1637.82	1637.88	0.06	1641.11	1641.43	0.32
~ Riverwood Drive	AD	131311	1633.00	1633.03	0.03	1635.98	1636.03	0.05	1637.20	1637.26	0.06	1640.32	1640.65	0.33
~ Southport	AC	131269	1632.80	1632.83	0.03	1635.75	1635.80	0.05	1636.95	1637.01	0.06	1640.10	1640.27	0.17
~ Mills Avenue	AB	131226	1632.37	1632.40	0.03	1635.32	1635.38	0.06	1636.55	1636.63	0.08	1639.83	1639.91	0.08
~ Center Fox Island	AA	131177	1632.23	1632.24	0.01	1635.19	1635.20	0.01	1636.42	1636.42	0.00	1639.61	1639.59	-0.02
~ Tavis Road	Z	131145	1632.11	1632.11	0.00	1635.09	1635.07	-0.02	1636.32	1636.29	-0.03	1639.49	1639.41	-0.08
~ Southend Fox Island	X	131109	1631.84	1631.84	0.00	1634.80	1634.80	0.00	1636.03	1636.03	0.00	1639.13	1639.13	0.00
~ Burleigh Avenue	Y	131072	1631.61	1631.61	0.00	1634.57	1634.57	0.00	1635.78	1635.78	0.00	1638.86	1638.86	0.00

*** All elevations in NAVD 88 Datum - Converted from Elevations Below**

Conversion to 88 datum 1.368 Feet

Location	Cross Section	Model XS	10 Year			50 Year			100 Year			500 Year		
			98' FIS	w/ 2011 Dikes	Δ (ft)	98' FIS	w/ 2011 Dikes	Δ (ft)	98' FIS	w/ 2011 Dikes	Δ (ft)	98' FIS	w/ 2011 Dikes	Δ (ft)
USGS Gage 16342500	AH	131464	1632.22	1632.25	0.03	1635.21	1635.26	0.05	1636.45	1636.51	0.06	1639.74	1640.06	0.32
~ Riverwood Drive	AD	131311	1631.63	1631.66	0.03	1634.61	1634.66	0.05	1635.83	1635.89	0.06	1638.95	1639.28	0.33
~ Southport	AC	131269	1631.43	1631.46	0.03	1634.38	1634.43	0.05	1635.58	1635.64	0.06	1638.73	1638.90	0.17
~ Mills Avenue	AB	131226	1631.00	1631.03	0.03	1633.95	1634.01	0.06	1635.18	1635.26	0.08	1638.46	1638.54	0.08
~ Center Fox Island	AA	131177	1630.86	1630.87	0.01	1633.82	1633.83	0.01	1635.05	1635.05	0.00	1638.24	1638.22	-0.02
~ Tavis Road	Z	131145	1630.74	1630.74	0.00	1633.72	1633.70	-0.02	1634.95	1634.92	-0.03	1638.12	1638.04	-0.08
~ Southend Fox Island	X	131109	1630.47	1630.47	0.00	1633.43	1633.43	0.00	1634.66	1634.66	0.00	1637.76	1637.76	0.00
~ Burleigh Avenue	Y	131072	1630.24	1630.24	0.00	1633.20	1633.20	0.00	1634.41	1634.41	0.00	1637.49	1637.49	0.00

*** All elevations in NGVD 29 Datum - Direct From HEC-RAS Model**

Appendix F

Fox Island Flood Control Project
Frequently Asked Questions

Based on public input to-date, we have assembled the following set of Frequently Asked Questions along with the best answers available at this stage of project development.

Aesthetics

Will I be able to landscape the levee?

The levee will be seeded to grass. Trees and shrubs will not be allowed on the levee embankment due to the fact that woody vegetation is known to adversely impact the integrity of levees. Similarly sprinkler systems may not be allowed within the embankment.

How tall will the embankment be?

This will vary depending on where you are located. In some locations, the levee will be 6 feet or greater, but in most places the levee is only a few feet high and can be integrated into the lot fairly well aesthetically. The heights measured at the riverward top of levee are provided in Appendix G of the report.

Will the public be allowed to use the levee as a walking trail?

No. An easement would be required to construct the levee on your property, and access would be required for purposes of maintenance, but the property remains privately owned, and the general public would have no right to access that property.

Where will the levee be located within the yards?

This will vary by location due to several considerations including the existing bank line, the location of the regulatory floodway, and elevation required. The ability to shape the levee to best fit in the yard would be considered further as part of the final design process.

Property Values

How will the District compensate me for my decreased property values resulting from having a levee located in my backyard?

The District will not be providing compensation for a perceived loss of property value. The project is being developed in response to a petition filed by area residents with the Burleigh County Water Resource District requesting a project be developed. The comments received at that time from the residents indicated that the proposed flood control project would mitigate the public perception that Fox Island is flood prone and would thereby increase property values.

Internal Drainage & Ground Water

How will local runoff be removed from the interior of the levee system?

The project includes drainage corridors and pumping systems to remove internal storm water runoff.

How will the project prevent the adverse impacts of increased ground water levels that occur during major flood events?

The project will not be designed to eliminate the threat of the inundation of basements and crawl spaces from high ground water levels. The storm water system installed to remove local internal runoff could be used to somewhat lower ground water levels in the southern end of Fox Island, but the system is not being designed for that purpose. The improved access resulting from the system will better allow home owners to manage the ground water threat individually during such events.

Maintenance

Who will be responsible for maintaining the project?

The District will be responsible to maintain the project on behalf of the benefitted residents. The District will have the authority to levee maintenance assessments for that purpose.

Height/Level of Protection

Will FEMA approve this project?

This project is not intended for accreditation under the National Flood Insurance Program. The County is not intending to provide the required three feet of freeboard or meet the other FEMA requirements for certification/accreditation. This project is not intended to remove properties from the regulatory floodplain. No approval is required from FEMA.

To what level is the project being designed?

The residents asked that we develop a project intended to provide protection for the Fox Island area up to a level of the 2011 flood event with freeboard. This would equate to a stage of 20 feet at the USGS Gaging Station, transferred downstream to allow for the river's gradient and an elevation of approximately 0.7 feet above the measured high water mark for the 2011 event. The actual top elevation of the levee thus decreases as you move downstream. The BCWRD has considered other alternatives including one that would construct a levee only to 18.5 feet north of Mills Avenue.

Will the levee provide protection from an ice jam event?

If constructed to 20.0 the levee system would be of sufficient height to provide protection during the 2009 ice jam event. A levee at 18.5 feet on the south end of Fox Island would not have any freeboard on the 2009 ice jam event as was therefore deemed to be an unacceptable alternative. The outside of the levee would be constructed using a turf reinforcement fabric under the grass to provide erosion protection.

Is the cost of the system worth constructing given the fact that the 2011 event was an extreme event and is unlikely to re-occur?

This is a decision that must be made by the residents. However, there is typically a public misconception regarding the likelihood of these more extreme events. What has historically been referred to as a '100-year' event is more accurately described as a 1% annual chance event. In other words there is a 1% chance of that event occurring in each and every year. The fact that one has just occurred has no impact on the likelihood of another similar event occurring next year or any other year. In fact, some experts believe these events often occur in clusters due to long term climatologic shifts. There is a 26% chance that a home located in the Special Flood Hazard Area (100-year floodplain) will be flooded during the life of a 30-year mortgage.

Voting/Assessment Costs

Will the project be voted on as one large project?

Consideration is being given to separating the project at Mills Avenue. The Fox Island area south of Mills Avenue would be voted on as one project, and the Harbor Drive area, north of Mills Avenue, would be voted on separately as another project. The area south of Mills Avenue was petitioned by the residents, while the Harbor Drive area was included in the Burleigh County Flood Control Master Plan and the Riverwood West Homeowner's Association requested consideration to be included in the study after the initial work had begun to develop a project.

What will be the cost to be assessed to each landowner?

Currently, our preliminary estimate is $17,268 if no cost share assistance is provided by the State Water Commission. If cost share assistance is provided for 60% of the construction costs, the cost per lot could be reduced to $8,892. These opinions of probable cost will continue to be refined as we formalize the preliminary engineering report and even throughout final design, if a positive vote is received.

When would construction occur?

Given the project's complexity and need to obtain easements from numerous parties, it is anticipated that the earliest any construction could begin would be during the 2013 construction season.

Fox Island Flood Control

HoustonEngineering Inc.

Alternative Review - Draft

To: Marcus Hall, P.E.
Burleigh County Highway Dept.

From: Craig Odenbach, P.E.
Michael Gunsch, P.E.

Date: October 26, 2013

Subject: Lincoln Township Cost Participation

As the BCWRD works toward a preferred alternative for the Fox Island Flood Control Project that can be taken to an assessment vote, the need to identify the most likely configuration of a township roadway grade raise and levee has become critical for residents who will be asked to approve or reject a special assessment against their property. This Memorandum is intended to identify the feasible alternatives, and to serve as a basis for further discussions with Lincoln Township regarding the selection of a mutually acceptable alternative.

The attached Figure illustrates five potential roadway/levee segments. The Burleigh County Highway Department has committed to provide a connecting closure between the Tavis Road control structure and Mills Avenue in order to protect South Bismarck. **Segment A** (color coded yellow) constitutes the shortest, most direct route for a grade raise that would provide the desired closure. However, this approach leaves a large area of Fox Island residences unprotected and does not achieve the objective of the petitioners for the Fox Island flood control project.

As an alternative, **Segment B** (color coded green) is another roadway grade raise of similar length and cost. However, the **Segment B** grade raise would require one of three alternative closures to complete the tie in to protect South Bismarck, each providing protection to larger portions of Fox Island. **Alternative Segment B-1** (color coded red) includes both a grade raise along Gallatin Loop, as well as a river levee running from the county owned lot northward to the entrance channel for Whispering Bay. This alternative maximizes the area being provided flood protection. **Alternative Segment B-2** (color coded brown) involves a grade raise along Gallatin Drive, and **Alternative Segment B-3** (color coded blue) involves a grade raise along Far West and Fontenelle Drives. Both **Alternative Segments B-2 and B-3** provide protection to a greater area of Fox Island than the construction of **Segment A** alone, but less than would be protected by the construction of **Segment B** and **Alternative Segment B-1**.

Preliminary Opinions of Probable Cost have been developed for these alternatives are provided in **Table One**.

Table One

Project Segment and OPC's

Segment	Length (ft)	Levee Cost	Paving Cost	Total Cost	Cost/Foot	Cost/Foot W/SWC Cost Share [1]
Segment A	3,770	$795,508	$503,762	$1,299,270	$344.63	$244.15
Segment B	3,121	$608,429	$417,005	$1,025,434	$328.56	$235.73
Alternative B-1	6,510	$1,580,196	$408,907	$1,989,103	$305.55	$191.57
Alternative B-2	1,690	$352,089	$225,806	$577,895	$341.95	$242.74
Alternative B-3	2,348	$465,845	$313,673	$779,519	$331.99	$237.52

[1] SWC cost share is based on 60% of eligible construction costs

If the special assessment project is not approved by Fox Island residents, the Burleigh County Highway Department (Lincoln Township) has three roadway options, and a roadway levee option to provide the required tie in to protect South Bismarck, each of which also provides varying degrees of flood protection within Fox Island. These options and their respective opinions of probable costs are listed in **Table Two** in ascending order of area or residences/lots protected.

Table Two
Project Configurations and OPC

Alternative	Lots Protected	Cost
Segment A (road)	48	$1,299,270
Segment B + B-2 (road)	73	$1,603,329
Segment B + B-3 (road)	80	$1,804,953
Segment B + B-1 (road/levee)	116	$3,014,537

If Segment A were constructed to provide the required closure, the SWC would likely provide 60% cost share assistance for the grade raise portion of the project. This would leave a total cost to Lincoln Township of $920,456. Thus, the Burleigh County Highway Department has provided a preliminary confirmation of their willingness, through Lincoln Township, to provide up to $920,456 to whichever alternative is ultimately selected, since this is the minimum cost required to provide the necessary closure. The following **Table Three** lists the potential project cost breakdown for each alternative and the cost per lot with and without State Water Commission cost share funding. It was assumed that only the cost of the levee construction, in the case of Segment B + B-1, and the cost of any associated roadway grade raises would possibly be eligible for State Water Commission cost share funding. None of the roadway surfacing costs (i.e., paving) would be eligible based on prior discussions with staff.

Table Three
Opinion of Probable Cost Per Residential Lot

Alternative	Total Cost	Lots Protected	Township Funds	Potential SWC Funds	Cost/Lot No SWC Funds	Cost/Lot w/SWC Funds
Segment A	$1,299,270	48	$920,456	$378,813	NA	NA
Segment B + B-2	$1,603,329	73	$920,456	$457,389	$9,354	$3,089
Segment B + B-3	$1,804,953	80	$920,456	$511,559	$11,056	$4,662
Segment B + B-1	$3,014,537	116	$920,456	$1,031,726	$18,052	$9,158

The values in these tables represent preliminary opinions of probable costs and assume State Water Commission cost participation in the amount of 60% of the eligible construction costs. The SWC does not provide conditional cost share approval prior to the assessment vote for anything other than drainage projects. Therefore it would be necessary to vote the entire assessment, or it may be possible to vote on the reduced cost conditioned on the SWC providing the cost share. In that case, if the cost share were not approved, a new vote would be required to advance the project, if desired.

In conclusion it is recommended the Burleigh County Water Resource District request Lincoln Township to consider participation in the Fox Island flood control project as described. Lincoln Township's need and/or desire to special assess the grade raise and paving costs remains to be determined. If they did assess those costs, the figures in **Table Three** would increase accordingly, however this would be a separate paving district.

The next step in project development is to obtain concurrence from Lincoln Township, after which the following steps would likely occur to further develop the project.

- ✓ Meeting with Fox Island Homeowner's Association to discuss project alternatives
- ✓ Update assessment district and establish final cost distribution
  - Consideration of river levee easements and assessment provisions
- ✓ Finalized Feasibility Study Report
- ✓ Request SWC cost share reimbursement for Feasibility Study
- ✓ Create project per NDCC – Board Action
- ✓ Complete Preliminary Engineering Report
- ✓ Public Informational Meeting – (if deemed necessary or proceed directly to the vote)
- ✓ Public Hearing and Vote
- ✓ Proceed to final design or abandon project

Segment A - Fox Island Flood Protection

Permanent Levee Construction

Opinion of Probable Cost

HEI# 6025-006

Monday, August 12, 2013

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 27,450.23	$ 27,450.23
2	Mobilization	1	L SUM	$ 54,900.46	$ 54,900.46
3	Pipe Conduit 18"	578	LF	$ 112.00	$ 64,770.16
4	Sluice Gate & Connection	12	EA	$ 6,500	$ 75,179.65
5	Remove, Stockpile, & Replace Topsoil	4.00	Acre	$ 2,800	$ 11,197.26
6	Saw Bituminous Surfacing	150	LF	$ 3.00	$ 450.00
7	Removal of Bituminous Surfacing	12566	SY	$ 5.75	$ 72,255.08
8	Excavation Waste	1094	CY	$ 11.00	$ 12,034.81
9	Levee Embankment - Fat Clay	14668	CY	$ 8.90	$ 130,546.13
10	Tree Removal	113	EA	$ 750.00	$ 84,821.18
11	Erosion Control Levee	13782	SY	$ 3.50	$ 48,237.38
12	Seeding & Hydromulch	5.70	Acre	$ 5,005	$ 28,503.91
13	Silt Fence	7640	LF	$ 2.75	$ 21,009.07
				Construction Cost =	**$ 631,355.31**

Engineering (Design and Const. Mgmt Services)	$ 113,643.96
Administration (ROW, Legal, Admin)	$ 50,508.42
Total Grade Raise Cost	**$ 795,507.69**
SWC Cost Share	**$ 378,813.18**
Grade Raise Cost w/SWC	**$ 416,694.50**

Township/County Paving Cost

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 17,383.09	$ 17,383.09
2	Mobilization	1	L SUM	$ 34,766.18	$ 34,766.18
3	Hot Bituminous Pavement CL 29	2792	TON	$ 45.00	$ 125,660.87
4	Asphlat Cement	168	TON	$ 600.00	$ 100,528.70
5	Aggregate Base Course CL 5	4189	TON	$ 29.00	$ 121,472.18
				Construction Cost =	**$ 399,811.01**

Engineering (Design and Const. Mgmt Services)	$ 71,965.98
Administration (ROW, Legal, Admin)	$ 31,984.88
Total Paving Cost	**$ 503,761.88**
Total Project Construction Cost	**$ 1,299,269.57**
Total Project Construction Cost w/SWC	**$ 920,456.38**

Segment B - Fox Island Flood Protection

Permanent Levee Construction

Opinion of Probable Cost

HEI# 6025-006

Monday, August 12, 2013

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 20,994.79	$ 20,994.79
2	Mobilization	1	L SUM	$ 41,989.58	$ 41,989.58
3	Pipe Conduit 18"	470	LF	$ 112.00	$ 52,651.20
4	Sluice Gate & Connection	9	EA	$ 6,500	$ 61,113.00
5	Remove, Stockpile, & Replace Topsoil	3.41	Acre	$ 2,800	$ 9,548.83
6	Saw Bituminous Surfacing	120	LF	$ 3.00	$ 360.00
7	Removal of Bituminous Surfacing	10402	SY	$ 5.75	$ 59,811.50
8	Levee Embankment - Fat Clay	9006	CY	$ 8.90	$ 80,155.09
9	Tree Removal	94	EA	$ 750.00	$ 70,213.50
10	Erosion Control Levee	12321	SY	$ 3.50	$ 43,122.73
11	Seeding & Hydromulch	5.09	Acre	$ 5,005	$ 25,481.61
12	Silt Fence	6341	LF	$ 2.75	$ 17,438.30
				Construction Cost =	**$ 482,880.12**

Engineering (Design and Const. Mgmt Services)	$ 86,918.42
Administration (ROW, Legal, Admin)	$ 38,630.41
Total Grade Raise Cost	**$ 608,428.95**
SWC Cost Share	**$ 289,728.07**
Grade Raise Cost w/SWC	**$ 318,700.88**

Township/County Paving Cost

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 14,389.42	$ 14,389.42
2	Mobilization	1	L SUM	$ 28,778.84	$ 28,778.84
3	Hot Bituminous Pavement CL 29	2312	TON	$ 45.00	$ 104,019.90
4	Asphlat Cement	139	TON	$ 600.00	$ 83,215.92
5	Aggregate Base Course CL 5	3467	TON	$ 29.00	$ 100,552.57
				Construction Cost =	**$ 330,956.64**

Engineering (Design and Const. Mgmt Services)	$ 59,572.19
Administration (ROW, Legal, Admin)	$ 26,476.53
Total Paving Cost	**$ 417,005.36**
Total Project Construction Cost	**$ 1,025,434.32**
Total Project Construction Cost w/SWC	**$ 735,706.24**

Segment B1 - Fox Island Flood Protection

Permanent Levee Construction

Opinion of Probable Cost

HEI# 6025-006

Monday, August 12, 2013

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 53,767.96	$ 53,767.96
2	Mobilization	1	L SUM	$ 107,535.93	$ 107,535.93
3	Pipe Conduit 18"	1,035	LF	$ 112.00	$ 115,920.00
4	Sluice Gate & Connection	21	EA	$ 6,500	$ 134,550.00
5	Remove, Stockpile, & Replace Topsoil	11.36	Acre	$ 2,800	$ 31,804.44
6	Saw Bituminous Surfacing	60	LF	$ 3.00	$ 180.00
7	Removal of Bituminous Surfacing	10200	SY	$ 5.75	$ 58,650.00
8	Excavation Waste	3580	CY	$ 11.00	$ 39,378.37
9	Levee Embankment - Fat Clay	40035	CY	$ 8.90	$ 356,311.16
10	Tree Removal	195	EA	$ 750.00	$ 146,475.00
11	Erosion Control Levee	28066	SY	$ 3.50	$ 98,231.39
12	Seeding & Hydromulch	11.54	Acre	$ 5,005	$ 57,778.90
13	Silt Fence	13120	LF	$ 2.75	$ 36,080.00
14	Drainage Easements and Improvements	1	LS	$ 65,000.00	$ 65,000.00
				Construction Cost =	**$ 1,236,663.15**

Geotechnical	$ 10,000.00
Drainage Easement Documents	$ 12,000.00
Engineering (Design and Const. Mgmt Services)	$ 222,599.37
Administration (ROW, Legal, Admin)	$ 98,933.05
Total Grade Raise Cost	**$ 1,580,195.57**
SWC Cost Share	**$ 741,997.89**
Grade Raise Cost w/SWC	**$ 838,197.68**

Township/County Paving Cost

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 14,109.99	$ 14,109.99
2	Mobilization	1	L SUM	$ 28,219.97	$ 28,219.97
3	Hot Bituminous Pavement CL 29	2267	TON	$ 45.00	$ 101,999.90
4	Asphlat Cement	136	TON	$ 600.00	$ 81,599.92
5	Aggregate Base Course CL 5	3400	TON	$ 29.00	$ 98,599.90
				Construction Cost =	**$ 324,529.68**

Engineering (Design and Const. Mgmt Services)	$ 58,415.34
Administration (ROW, Legal, Admin)	$ 25,962.37
Total Paving Cost	**$ 408,907.39**
Total Project Construction Cost	**$ 1,989,102.96**
Total Project Construction Cost w/SWC	**$ 1,247,105.07**

Segment B2 - Fox Island Flood Protection

Permanent Levee Construction

Opinion of Probable Cost

HEI# 6025-006

Monday, August 12, 2013

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 12,149.36	$ 12,149.36
2	Mobilization	1	L SUM	$ 24,298.73	$ 24,298.73
3	Pipe Conduit 18"	232	LF	$ 112.00	$ 25,942.75
4	Sluice Gate & Connection	5	EA	$ 6,500	$ 30,112.12
5	Remove, Stockpile, & Replace Topsoil	2.08	Acre	$ 2,800	$ 5,822.53
6	Saw Bituminous Surfacing	60	LF	$ 3.00	$ 180.00
7	Removal of Bituminous Surfacing	5633	SY	$ 5.75	$ 32,387.64
8	Excavation Waste	122	CY	$ 11.00	$ 1,346.07
9	Levee Embankment - Fat Clay	5935	CY	$ 8.90	$ 52,818.03
10	Tree Removal	51	EA	$ 750.00	$ 38,020.28
11	Erosion Control Levee	8403	SY	$ 3.50	$ 29,410.25
12	Seeding & Hydromulch	3.47	Acre	$ 5,005	$ 17,378.78
13	Silt Fence	3480	LF	$ 2.75	$ 9,568.85
				Construction Cost =	**$ 279,435.38**

Engineering (Design and Const. Mgmt Services)	$ 50,298.37
Administration (ROW, Legal, Admin)	$ 22,354.83
Total Grade Raise Cost	**$ 352,088.58**
SWC Cost Share	**$ 167,661.23**
Grade Raise Cost w/SWC	**$ 184,427.35**

Township/County Paving Cost

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 7,791.80	$ 7,791.80
2	Mobilization	1	L SUM	$ 15,583.60	$ 15,583.60
3	Hot Bituminous Pavement CL 29	1252	TON	$ 45.00	$ 56,326.28
4	Asphlat Cement	75	TON	$ 600.00	$ 45,061.02
5	Aggregate Base Course CL 5	1878	TON	$ 29.00	$ 54,448.73
				Construction Cost =	**$ 179,211.44**

Engineering (Design and Const. Mgmt Services)	$ 32,258.06
Administration (ROW, Legal, Admin)	$ 14,336.92
Total Paving Cost	**$ 225,806.41**
Total Project Construction Cost	**$ 577,894.99**
Total Project Construction Cost w/SWC	**$ 410,233.76**

Segment B3 - Fox Island Flood Protection

Permanent Levee Construction

Opinion of Probable Cost

HEI# 6025-006

Monday, August 12, 2013

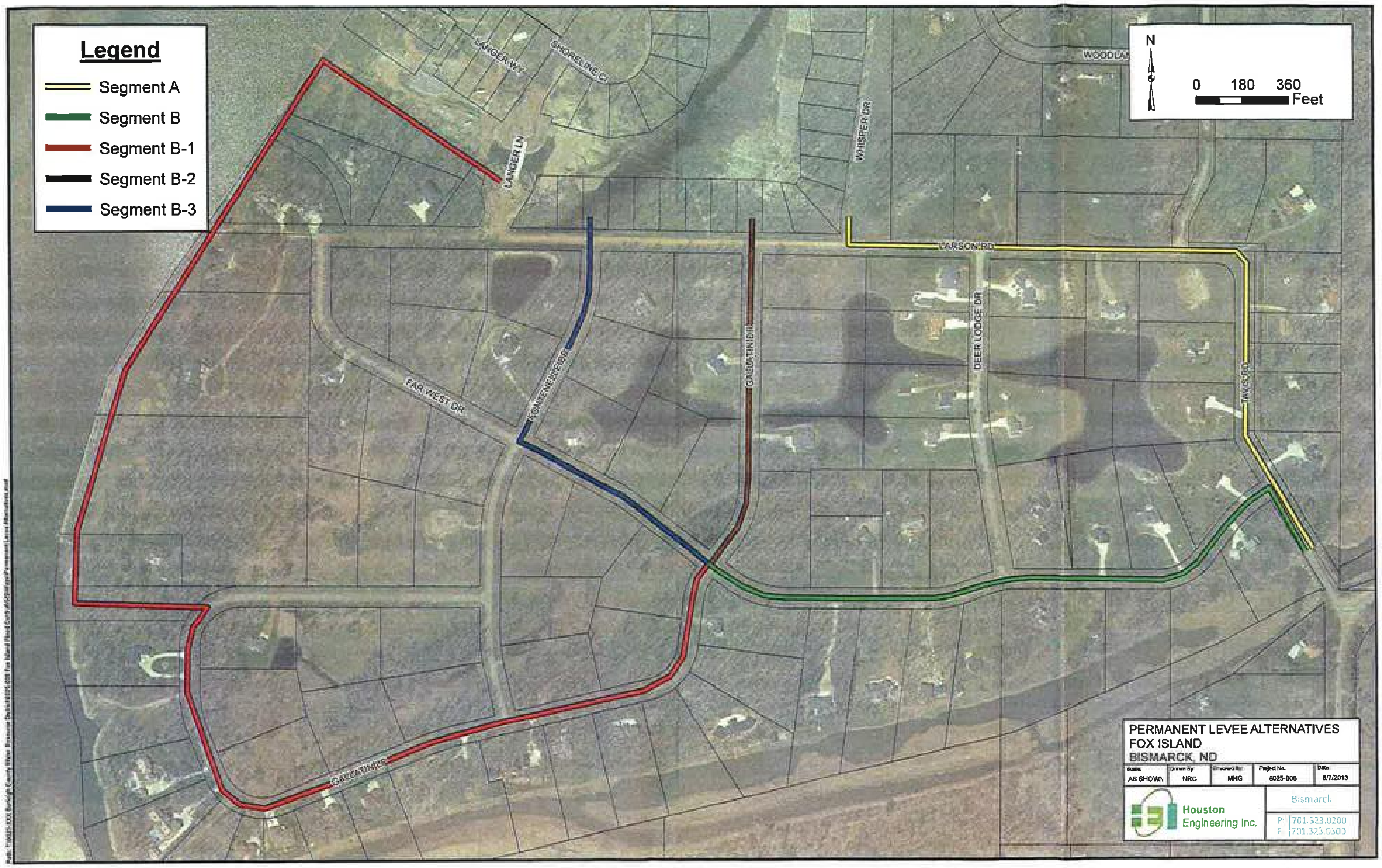
Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 16,074.71	$ 16,074.71
2	Mobilization	1	L SUM	$ 32,149.42	$ 32,149.42
3	Pipe Conduit 18"	341	LF	$ 112.00	$ 38,216.83
4	Sluice Gate & Connection	7	EA	$ 6,500	$ 44,358.82
5	Remove, Stockpile, & Replace Topsoil	2.72	Acre	$ 2,800	$ 7,613.69
6	Saw Bituminous Surfacing	120	LF	$ 3.00	$ 360.00
7	Removal of Bituminous Surfacing	7824	SY	$ 5.75	$ 44,990.49
8	Levee Embankment - Fat Clay	7241	CY	$ 8.90	$ 64,446.06
9	Tree Removal	70	EA	$ 750.00	$ 52,814.93
10	Erosion Control Levee	9969	SY	$ 3.50	$ 34,890.82
11	Seeding & Hydromulch	4.12	Acre	$ 5,005	$ 20,617.30
12	Silt Fence	4795	LF	$ 2.75	$ 13,185.32
				Construction Cost =	**$ 369,718.37**

Engineering (Design and Const. Mgmt Services)	$ 66,549.31
Administration (ROW, Legal, Admin)	$ 29,577.47
Total Grade Raise Cost	**$ 465,845.14**
SWC Cost Share	**$ 221,831.02**
Grade Raise Cost w/SWC	**$ 244,014.12**

Township/County Paving Cost

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Contract Bond	1	L SUM	$ 10,823.79	$ 10,823.79
2	Mobilization	1	L SUM	$ 21,647.58	$ 21,647.58
3	Hot Bituminous Pavement CL 29	1739	TON	$ 45.00	$ 78,244.26
4	Asphlat Cement	104	TON	$ 600.00	$ 62,595.40
5	Aggregate Base Course CL 5	2608	TON	$ 29.00	$ 75,636.11
				Construction Cost =	**$ 248,947.14**

Engineering (Design and Const. Mgmt Services)	$ 44,810.48
Administration (ROW, Legal, Admin)	$ 19,915.77
Total Paving Cost	**$ 313,673.39**
Total Project Construction Cost	**$ 779,518.54**
Total Project Construction Cost w/SWC	**$ 557,687.52**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6025-006
8/7/2013
Houston
Engineering Inc.
Bismarck
P: 701.323.0200
F: 701.323.0300

Fox Island Flood Control

HoustonEngineering Inc.

Homeowners Association Meeting

To:	**Terry Fleck, Chairman Burleigh County WRD**	**From:**	**Michael Gunsch, PE Senior Project Manager**
Date:	**November 30, 2013**	**Subject:**	**Memorandum/Alternative Selection**

The Fox Island Homeowners Association (FIHA) requested and scheduled this meeting on the Fox Island Flood Control Project with the Burleigh County Water Resource District (BCWRD). BCWRD members in attendance included Gordon Weixel, Kathleen Jones and Cary Backstrand. The members in attendance observed the discussion and there was no Board action taken during this meeting.

Don Roloff, FIHA introduced Michael Gunsch, Houston Engineering who provided a brief history of project development since the 2009 ice jam event through to the 2011 flood event, and since. The four alternatives contained in the most recent project memorandum were presented and discussed, including the cost projections and anticipated number of residences to be protected. The project memorandum is posted for viewing on the Board Web Site at www.bcwrd.org. Handouts at the meeting included the memorandum, and alternative layout sheet, cost summary tables and the recommendation of Marcus Hall to the Burleigh County Commission (aka, Lincoln Township). The meeting was then opened to questions from the members of the FIHA and other attendees.

A number of general questions were asked and responses provided as follows:

- ✓ The project will not change the floodplain insurance status for the benefited properties. That has not, nor has never been, a project objective, so compliance with the City's floodplain ordinance and floodplain ordinance requirements would remain unchanged. To design the project to eliminate the need for flood insurance would significantly increase costs and would require a notably higher grade raise than the proposed 1.2 feet.

- ✓ An explanation was provided as to the background for using the 20 foot stage at the Bismarck USGS stream gage as the design standard, which effectively is 0.7 feet above the 2011 event at each project location. This County standard was selected after consultation with the County Highway Department, County Commission and Bismarck City Engineering.

- ✓ It was noted that under existing conditions, with the Whispering Bay Development in place, and the grade raise under construction on Mills Avenue and Riverwood Drive, the majority of the area would be protected from a similar 2009 ice jam event.

- ✓ Each of the four alternatives was reviewed, including a notation of the number of residences or lots protect by each, along with the projected assessment costs.

- ✓ Marcus Hall was unable to attend the meeting; however the status of Lincoln Township's finances were presented to the Burleigh County Commission on November 18th. Marcus recommended, and the County Commission agreed, that participation in the Fox Island Flood Control Project be denied at this time, with reconsideration in three years (2017) when funds are projected to be available.

- ✓ Questions were raised regarding the assessment of costs. It was noted that those residences located outside the protection area would not be assessed, which includes no assessment for paving. These residents and properties are those that requested to be removed from the proposed protection area.

- ✓ The projected costs per lot with and without the township's contribution were presented and discussed. The two tables provided on the handout are attached to this memorandum.

- ✓ The benefits provided by the Mills Avenue and Riverwood Drive grade raised were discussed. Effectively this represents the City of Bismarck's contribution to protecting the Fox Island area, therefore it was determined that no properties within the City are to be included in any of the Fox Island Flood Control assessment districts.

- ✓ It was noted the North Dakota State Water Commission currently has a new draft cost share policy that would allow for the following changes, which may be implemented in 2014;
    - Engineering costs would now be eligible for cost participation (35%).
    - Projects may be allowed to request conditional cost share approval, so assessment votes could occur using the cost share contribution versus full project costs.

- ✓ Residents expressed concern over the fact that under Alternative A there are 48 residences that would not pay any assessment. This concern stemmed from the impression that if they were included in the assessment district, the vote may fail. This discussion led to a decision by the FIHA to request the BCWRD to consider not including these lots in the assessment district. It was also noted the membership of the FIHA does not extend to these lots as their membership is located entirely south of Larson Road.

- ✓ The projected assessments for each alternative, without the 48 lots included, were provided and are attached to this memorandum to complete the record.

- ✓ There were also questions about pumping water from the interior area and the need to have a system in place for the more frequent flood events to protect septic systems. This can be considered as part of the project or something completed by the FIHA using the existing 8" water quality line that can be used to remove waters from this area.

- ✓ It was requested that the assessment amounts be presented not only as a lump sum, but as an example monthly payment using a fixed percent interest, over a projected 15 year repayment period. These requested numbers are included on the updated table attached.

- ✓ A survey was distributed by the FIHA regarding selection of a preferred alternative, and the residents were requested to add two questions to their responses:

    - Do you want to delay the project vote three years, until such a time as Lincoln Township is able to participate?

    - Do you want the 48 lots located north of Larson Road, protected by Alternative A, to be removed from the assessment district?

Based on the survey results the following are the recommended next steps:

- Complete the preliminary engineering report with the **Alternative A: B-1** as the preferred alternative, which will protect 116 residential lots, and close out the project for future implementation in three years.

  The survey favored Alternative A: B-1 by 70%, and delaying the project was favored by 87%.

- The 48 lots north of Larson Road should be removed from the assessment district. The Board however, may wish to consider assessing a prorated portion of the engineering study costs to these properties given the benefits provided through the evaluation process both during and following the 2011 events. This includes the implementation of the other protective features including the Mills Avenue and Riverwood Drive grade raise.

  The survey favored the removal of these lots from the assessment district by 60%.

- Notify the North Dakota State Water Commission regarding the proposed delay in the project implementation, and request cost share reimbursement for the engineering feasibility study.

- It is recommendation a letter of notification be sent to all Fox Island residents regarding the project status and direction taken by the Board. The final report and related documents should be posted on the web site for public access.

Attachments:

Alternative Alignment Map

Table Three – Opinion of Probable Cost Per Residential Lot (handout)
Table Three – Opinion of Probable Cost Per Residential Lot – No Township Funds (handout)
Table Three – Opinion of Probable Cost Per Residential Lot – Lots north of Larson Road Removed (New)

Burleigh County Highway Department – Request for County Board Action (Lincoln Township Funding)

Fox Island Homeowners Association – Agenda and Survey Results

Fox Island Flood Control Memorandum – October 26, 2013 Alternative Review
On web site www.bcwrd.org

Table Three
Opinion of Probable Cost Per Residential Lot

Alternative	Total Cost	Lots Protected	Township Funds	Potential SWC Funds	Cost/Lot No SWC Funds	Cost/Lot w/SWC Funds
Segment A	$1,299,270	48	$920,456	$378,813	NA	NA
Segment B + B-2	$1,603,329	73	$920,456	$457,389	$9,354	$3,089
Segment B + B-3	$1,804,953	80	$920,456	$511,559	$11,056	$4,662
Segment B + B-1	$3,014,537	116	$920,456	$1,031,726	$18,052	$9,158

Table Three
Opinion of Probable Cost Per Residential Lot
No Township Funds

Alternative	Total Cost	Lots Protected	Township Funds	Potential SWC Funds	Cost/Lot No SWC Funds	Cost/Lot w/SWC Funds
Segment A	$1,299,270	48	$0	$378,813	$27,068	$19,176
Segment B + B-2	$1,603,329	73	$0	$457,389	$21,963	$15,698
Segment B + B-3	$1,804,953	80	$0	$511,559	$22,562	$16,167
Segment B + B-1	$3,014,537	116	$0	$1,031,726	$25,987	$17,093

Table Three

Projected Cost Per Lot

48 Lots North of Larson Road Removed

Alternative	Total Cost	Lots Protected	Lots Assessed	Township Funds	Local Cost	Cost/Lot No Cost Share	Cost/Lot SWC Cost Share	Projected Monthly Payment 4.5% / 15 years
Segment A	$1,299,270	48	0	$920,456	$0	$0	$0	$0
Segment B + B-2	$1,603,329	73	25	$920,456	$682,873	$27,314	$9,020	$69.00
Segment B + B-3	$1,804,953	80	32	$920,456	$884,497	$27,640	$11,655	$89.16
Segment B + B-1	$3,014,537	116	68	$920,456	2,094,081	$30,795	$15,622	$119.81

Segment B + B-1 is the Preferred Alternative by the Fox Island Homeowners Association

BURLEIGH COUNTY HIGHWAY DEPARTMENT

2000 NORTH 52ND STREET
BISMARCK, ND 58501-7900
701-221-6870
FAX 701-221-6872
www.burleighco.com

Request for County Board Action

DATE: **November 18, 2013**

TO: **Kevin Glatt**
County Auditor

FROM: **Marcus J. Hall**
County Engineer

RE: Direct County officials on how to proceed with the Burleigh County Water Resource District (BCWRD) request for funding of the Fox Island project.

Please include the following item in the November 18, 2013 Burleigh County Board packet.

ACTION REQUESTED:
Direct the proper County officials on how to answer the Burleigh County Water Resource District (BCWRD) request for funding of the Fox Island project.

BACKGROUND:
The summer flooding of 2011 exposed many residents of the Burleigh County area to extensive flood damage. In order to mitigate this damage in the future, Burleigh County staff and the BCWRD have developed a Master Plan for flood protection for the area. The Plan includes the construction of levees, the raising of road grades, and the installation of control structures to protect and provide access to area residents.

Flood protection project # 21 includes the construction of a levee around the south edge of Fox Island. In the time since the adoption of the Master Plan, the BCWRD has worked with the residents of the area in developing a plan that would work with the residents' needs. This plan has resulted in the attached BCWRD request to Lincoln Township. In summarizing the request, BCWRD is asking that Lincoln Township commit $920,456 to this project. The exact extent of this project will be up to a vote of the residents of the area; however, this request limits the Township expenditure to the minimum required to raise both Tavis and Larson Roads to 20'. It is important to note that on several occasions Burleigh County has committed to protecting the residents of south Bismarck and the Bismarck Waste Water Treatment Plant to 20 ft. To date a project still needs to be defined and planned to meet this commitment.

Nevertheless, the Township Board also needs to take into account their current township fiscal condition. Currently, the township has a usable balance of $455,000 but they are also already committed to over $760,000 in projects on the Tavis Road Pump station and the grade raise on 48th Avenue and Washington Street. With this in mind, the Township will be in the red by the end of next year. Under current cash flow projections we should be back in the black by sometime in 2015 and be able to start funding this project by 2017.

Therefore, it is the Highway Department's recommendation that we reject any financial commitment for this project until 2017. If residents wish to proceed with one of the prescribed options they may do so, but the funding would need to be done by a special assessment district and State Water Commission funding.

In order to meet our previous obligation to south Bismarck residents and the protection of the Waste Water Treatment Plant, the Highway Department will develop an action plan that will include the temporary raising of both Tavis and Larson Roads when needed.

RECOMMENDATION:
It is recommended the Board review the attached request and advise the Highway Department on how to proceed.

FOX ISLAND HOME OWNERS ASSOCIATION

BURLEIGH COUNTY WATER RESOURCE DISTRICT
INFORMATION MEETING

FOX ISLAND FLOOD CONTROL

11-19-14

RIVERWOOD GOLF COURSE CLUBHOUSE - 7:00 pm

AGENDA

1. Introduction of Guest Speakers and FIHOA Board
2. Proposals for Fox Island Flood Control Projects
   – Michael Gunsch, Project Manager, Houston Engineering
3. Project Implementation Information
   – Marcus Hall, Burleigh County Highway Department
4. Discussion of Proposals - Question and Answer
5. Burleigh County Water Resource District Fox Island Flood Control Project Survey
   – Administered by Fox Island Home Owners Association Board
6. Conclusion

FOX ISLAND HOME OWNERS ASSOCIATION

Fox Island Flood Control Project

11-19-13 Information Meeting

Fox Island Home Owners Association
Flood Protection Project Survey

Fox Island Home Owners Association Member_____TALLY SHEET_____
(Please Print)

Complete one survey per lot. Select one option from the listed Flood Control Construction Projects .

Flood Control Project	**Check Selection**
SEGMENT A	3
SEGMENT B + B-2	1
SEGMENT B + B-3	3
SEGMENT B + B-1	16

The survey will be tallied by the Fox Island Home Owners Association Board. The tally results will be provided to the Fox Island Home Owners Association membership, Burleigh County Water Resource District and Houston Engineering.

WRITE IN:

1. Funding for this current year has been removed for the Fox Island project. Funding can be reinstated in three years. Wait 3 years for funding. YES___20_____ NO____3_____

2. Remove 48 voters North of Larson from voting. They will be protected without the Fox Island flood control measures and may not be likely to support paying for any Fox Island improvements. YES_____14_____ NO_____8_____