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St. Paul District

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# **In-Town Levees Appendix B**

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Fargo Moorhead Metropolitan Area  
Flood Risk Management Project

EA Document

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# In-Town Levees

## Appendix B

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# In-Town Levees

## Appendix B

### 1 BACKGROUND

Following completion of the Final Feasibility Report and Environmental Impact Statement (FEIS) for the Fargo-Moorhead Metropolitan (FMM) Area Flood Risk Management Project (Project), a study was conducted to evaluate options for increasing the flow through the flood risk management area during flood events on the mainstem of the Red River of the North. Allowing river stages through the flood risk management area that would exceed the stage of 30.8 feet during the 1-percent chance flood event contemplated in the Locally Preferred Plan (LPP) in the FEIS could serve as environmental mitigation because the Project would operate less frequently, thereby reducing the impacts to fish passage and eliminating the need for constructed fish passage features at the Red and Wild Rice River control structures. The report from the study, “Final Technical Memorandum, AWD-00002 – Flows Through Flood Damage Reduction Area” dated July 16, 2012, is included as a reference. This study is also referred to as the “In-Town Levees” study.

#### 1.1 Level of Protection

The purpose of the Flows Through Flood Damage Reduction Area study was to evaluate options for increasing the flow and resultant residual Red River of the North flood stage through the flood risk management area, in order to determine the potential for providing an alternative to the proposed fish passages at the Red and Wild Rice River control structures. The study evaluated a range of potential target flood stages at the USGS Fargo stream gage ranging from 30 feet to 37 feet during the 1-percent chance event. A residual stage of 31 feet was used for the FRP for the 1-percent chance event. The study looked at a number of factors for each flood stage:

- Frequency of operation for each flood stage
- Residual flood stage impacts inside the flood risk management area
- Existing and emergency protection measures inside the flood risk management area
- Impacted private property (urban and rural) within the flood risk management area
- Impacted infrastructure and open spaces within the flood risk management area
- Effects on stage and frequency of flooding depth on upstream staging and storage areas
- Transportation mitigation measures

The following tables (Table 1 and Table 2) include the residual peak 1-percent chance event flood stage, discharge, approximate existing frequency for each river stage, and land impacts, as summarized in the July 16, 2012 report. The 35 foot stage would reduce the operation of the diversion channel to when

flows reach 17,000 cubic feet per second (cfs), which would occur less frequently than a 10-percent chance event. The in-town levees would eliminate the need for the proposed fish passages on the Red and Wild Rice River control structures by maintaining connectivity on the Red River and Wild Rice River during more frequent flood events. Historically, the discharge at the USGS gage in Fargo has only reached 17,000 cfs during spring snow-melt events. Therefore there have not been any historic flood events during the growing season in which the Project would have operated. This will minimize the probability of impacts to farming operations during the growing season. The tables also show the incremental increase in impacted acreage. These factors, combined with input from the cities of Fargo and Moorhead and Cass County on past experience with flood fighting were the primary factors in recommending a flood stage of 35 feet.

**Table 1 Residual Peak 1-Percent Chance Event (100-year) Flood Stage, Discharge, and Approximate Existing Frequency Conditions**

Residual 1-percent chance event Flood Stage	Residual 1-percent chance event Peak Discharge (cfs)	Approximate Existing Condition Frequency (yr)
30 feet	10,700	3.6
31 feet	11,900	4.8
32 feet	13,300	6.0
33 feet	14,600	7.1
34 feet	15,900	8.4
35 feet	17,500	10.2
36 feet	19,200	11.4
37 feet	21,000	12.9

**Table 2 Flood Risk Management Area Land Use Impacts**

Residual Flood Stage	Land Use Class (NLCD) (acres)			Total Acres Impacted
	Agricultural	Developed	Other (Water, Wetland, Forest, Grass, etc.)	
30 feet	14,764	2,229	5,483	22,476
31 feet	14,920	2,311	5,581	22,812
32 feet	15,266	2,409	5,681	23,356
33 feet	15,881	2,524	5,781	24,186
34 feet	16,722	2,656	5,894	25,272
35 feet	17,998	2,858	6,062	26,918
36 feet	19,658	3,191	6,222	29,071
37 feet	21,773	3,556	6,386	31,715

## 2 ALTERNATIVES CONSIDERED

Wherever practical, two conceptual options for each flood stage from 30 feet to 37 feet were evaluated. They were referred to as Option 1 and Option 2 in the Flows Through Flood Damage Reduction Area report referenced above. Generally, Option 1 was more focused on structural protection (e.g. levees and floodwalls) and Option 2 focused more on floodplain abandonment (e.g. acquisitions). However, the overall scope of the options varied considerably depending on the location and residual flood under consideration. Considerations that went into the evaluation included:

- Hydraulic impact – A hydraulic analysis was performed for each option and the impacts of each option were negligible.
- Geotechnical stability – For features that included levees and floodwalls, preliminary geotechnical analysis was performed to ensure they met FEMA and USACE stability requirements.
- Social impacts – Input from the non-Federal sponsors, the cities of Fargo and Moorhead, along with Cass County, was obtained on the social impacts. Efforts to minimize the impacts to residences and businesses were made in the development of the options.
- Cost – Construction cost estimates and Operation and Maintenance costs were developed for the options and were part of the decision process.
- Transportation – Transportation impacts were considered as part of the 2<sup>nd</sup> St. N. /Downtown flood control options. There was a desire to maintain traffic on 2<sup>nd</sup> St. N. during flood events.
- Residual floodplain—the residual floodplain through the flood risk management area was mapped to identify impacted areas which require additional flood risk management measures.

Within Option 1, geotechnical stability was the primary factor that influenced the decision between levees and floodwalls. Where practical from a geotechnical standpoint, levees were selected. This includes the El Zagal area, Mickelson Field Phase 2, and the 2<sup>nd</sup> St. South area. For areas where the geotechnical stability did not allow levees, floodwalls were considered, including the 2<sup>nd</sup> St. N/Downtown area. Preliminary screening of alternatives utilized preliminary geotechnical information developed by the cities of Fargo and Moorhead as part of previous flood protection planning efforts. Current design efforts are utilizing more detailed geotechnical evaluations that are ongoing. Other factors in developing levee and floodwall alternatives included transportation impacts and impacts to commercial and residential structures. These factors are discussed in more detail under the discussion of the 2<sup>nd</sup> St. N. flood protection (Options 1-5) below.

The features included in Options 1 and 2 are summarized in the following table (Table 3) along with the decision criteria. These measures include construction of levees and floodwalls, and acquisition and removal of structures, and are collectively referred to “In-Town Levees.” Most locations had identical features under both options, with the exception of the El Zagal Area and the 2<sup>nd</sup> St. N. Levee and Floodwall.

**Table 3 Features of Options 1 and 2**

<b>Location</b>	<b>Option 1</b>	<b>Option 2</b>	<b>Remarks</b>
Ridgewood/VA Levee (Fargo)	Certification of existing levee to FEMA	Certification of existing levee to FEMA	Same for both options
Project Area F1 (Moorhead)	Certification of existing levee to FEMA	Certification of existing levee to FEMA	Same for both options
El Zagal Area (Fargo)	Construction of levee	Acquisition	Option 1 – Desire to have facility remain (social)
Mickelson Field Phase 1 Levee (Fargo)	Certification of existing levee to FEMA	Certification of existing levee to FEMA	Same for both options
Mickelson Field Phase 2 Levee (Fargo)	Construction of levee	Construction of levee	Same for both options
2 <sup>nd</sup> St. N. Levee and Floodwall (Fargo)	Construction of floodwall between 1 <sup>st</sup> Ave. N. and BNSF Railway and relocation of 2 <sup>nd</sup> St. N.	Construction of floodwall between 1 <sup>st</sup> Ave. N. and BNSF Railway and along west side of 2 <sup>nd</sup> St. N.	See discussion below about additional features considered subsequent to initial study.
2 <sup>nd</sup> St. South Area (Fargo)	Acquisition	Acquisition	Same for both options. However, sponsors will likely construct a levee on this property as part of local flood protection efforts
Storm Sewer Lift Station LS FC2 Modification (Moorhead)	Flood-proof existing lift station	Flood-proof existing lift station	Same for both options
Isolated Urban Property (Moorhead)	Acquisition	Acquisition	Same for both options
Woodlawn Area Levee (Moorhead)	Certification of existing levee to FEMA	Certification of existing levee to FEMA	Same for both options
Belmont Area (Fargo)	Acquisition	Acquisition	Same for both options
Horn Park Area Levee (Moorhead)	Certification of existing levee to FEMA	Certification of existing levee to FEMA	Same for both options

In addition to Options 1 and 2 presented in the Flows Through Flood Damage Reduction Area report, three additional options (Options 3, 4, and 5) were identified for the 2<sup>nd</sup> St. N. area (north of Main

Avenue) in Fargo as more detailed design progressed. The following is a summary of the alternatives for 2<sup>nd</sup> St. N:

- Option 1 – This option includes the relocation of 2<sup>nd</sup> St. N. to the west and construction of a floodwall from 1<sup>st</sup> Avenue North to the BNSF Railroad grade. It includes full acquisition of the Park East Apartments, Northland Hospitality (Howard Johnson), Feder Realty, and Fargo Board of Education storage facility. 2<sup>nd</sup> St. N. would remain open during flood events.
- Option 2 – This option includes constructing a floodwall from 1<sup>st</sup> Avenue North to the BNSF Railroad grade along the west side of 2<sup>nd</sup> St. N. It includes full acquisition of the Park East Apartments and Fargo Board of Education storage facility. 2<sup>nd</sup> St. N. would stay on its current alignment and would be closed during flood events using structural emergency closures.
- Option 3 – This option includes the relocation of 2<sup>nd</sup> St. N. to the west and construction of a floodwall from 1<sup>st</sup> Avenue North to the BNSF Railroad grade. It includes full acquisition of the Park East Apartments, Feder Realty, and Fargo Board of Education storage facility and a partial acquisition of the Northland Hospitality (Howard Johnson) structure. 2<sup>nd</sup> St. N. would remain open during flood events.
- Option 4 – This option includes the relocation of 2<sup>nd</sup> St. N. to the west and construction of a floodwall from NP Avenue to the BNSF Railroad grade. It includes full acquisition of the Park East Apartments, Northland Hospitality (Howard Johnson), Feder Realty, and Fargo Board of Education storage facility. It also includes construction of a levee on the Park East Apartment property. 2<sup>nd</sup> St. N. would remain open during flood events.
- Option 5 - This option includes the relocation of 2<sup>nd</sup> St. N. to the west and construction of a floodwall from NP Avenue to the BNSF Railroad grade. It includes full acquisition of the Park East Apartments, Feder Realty, and Fargo Board of Education storage facility and partial acquisition of the Northland Hospitality (Howard Johnson) structure. It also includes construction of a levee on the Park East Apartment property. 2<sup>nd</sup> St. N. would remain open during flood events.

All five options provide a similar level of protection for the 2<sup>nd</sup> St. N./Downtown area. Option 5 is proposed for the 2<sup>nd</sup> St. N. area because it accomplishes all of the following goals of the city of Fargo:

- Desire to have the line of protection extend from NP Avenue to the BNSF Railroad Grade. Only Options 4 and 5 accomplish this.
- Desire to maintain traffic on 2<sup>nd</sup> St. N. (north of Main Avenue) during flood events. Options 1, 3, 4, and 5 accomplish this.
- The city of Fargo is considering the construction of a levee on the Park East Apartment property to provide additional flood protection for the community. This would be done as a betterment to the Federal project. Options 4 and 5 include this levee.
- The owner of the Northland Hospitality (Howard Johnson) structure has expressed a desire for a partial acquisition rather than a full acquisition. The final decision on whether the property is a full acquisition or a partial acquisition will be worked out during the land acquisition process. Options 2, 3, and 5 may allow for a partial acquisition.



In addition to Options 1-5, a tunnel concept was considered separately by the city of Fargo at the direction of the Fargo City Commission as part of planning efforts for the downtown area. The flood risk management portion of the tunnel alternative would have been similar to the 2<sup>nd</sup> St. N. flood wall concept. However, the tunnel concept was rejected due to the high cost associated with the concept and the lack of vehicular and pedestrian traffic benefits.

### 3 PROPOSED PLAN

The proposed plan for In-Town Levees is Option 1 for a river stage of 35 feet as recommended in the Flows Through Flood Damage Reduction Area report for all features with the exception of 2<sup>nd</sup> Street N., where the proposed plan is Option 5 as identified in more detailed design. The proposed plan includes the following features (Figure 1):

- Certification of the existing Ridgewood/VA levee.
- Certification of the existing project area F1 levee.
- Construction of the El Zagal Area levee
  - The El Zagal Area levee consists of an approximately 500-foot long levee near 3<sup>rd</sup> Street North between 14<sup>th</sup> Avenue North and 15<sup>th</sup> Avenue North. No structures would be removed for this feature.
- Mickelson Field levee
  - Phase 1 of the Mickelson Field Levee consists of certifying a levee that is being constructed by the city of Fargo in the Mickelson Field area of north Fargo. The planned levee is approximately 1500 feet long beginning near 11<sup>th</sup> Ave. North and extending to an existing levee near 8<sup>th</sup> Ave. North.
  - Phase 2 of the Mickelson Field levee consists of an approximately 150-foot long levee connecting the Phase 1 levee to high ground near the intersection of North Terrace and North River Road. Three structures would require removal for this feature.
- Construction of the 2<sup>nd</sup> Street North floodwall
  - The 2<sup>nd</sup> Street North floodwall includes realigning 2nd Street to the west to accommodate construction of a floodwall between the river and the roadway. However, the top elevation of the proposed floodwall is 39.5 feet +5.5 feet. The city of Fargo requested this floodwall elevation to provide the downtown area with interim flood protection to the preliminary FEMA 1-percent chance (100 year) event elevation of 39.5 feet plus freeboard until the diversion is completed and operational. It also helps provide flood protection for events larger than a 1-percent chance (100-year) event after the diversion is complete. This feature would include the acquisition of property north of 1st Avenue North including the Feder Realty Company building and the Fargo Board of Public Education building, and partial acquisition of the Northland Hospitality (Howard Johnson) structure. In order to provide minimum protection to 39.5 feet, this feature would extend protection through the Case Plaza parking lot using a permanent floodwall constructed throughout the parking lot. This option also

includes the acquisition of the Park East Apartments to remove that property from the floodplain at a river stage of 35 feet and higher and to allow for the construction of a levee across the property. An additional floodwall would then also be constructed to connect this levee to the north end of the existing 4th Street levee.

- Modification of the storm sewer lift station LS FC2 in Moorhead to flood proof the structure.
- Acquisition of the isolated urban property near Wood Lawn Park.
- Certification of the existing Woodlawn Area levee.
- Acquisition of two residential structures in the Belmont Area that are impacted at a flood stage of 35 feet. These properties are currently protected by a non-accredited levee; however certification of this levee to protect these structures is not feasible.
- Certification of the existing Horn Park Area levee.

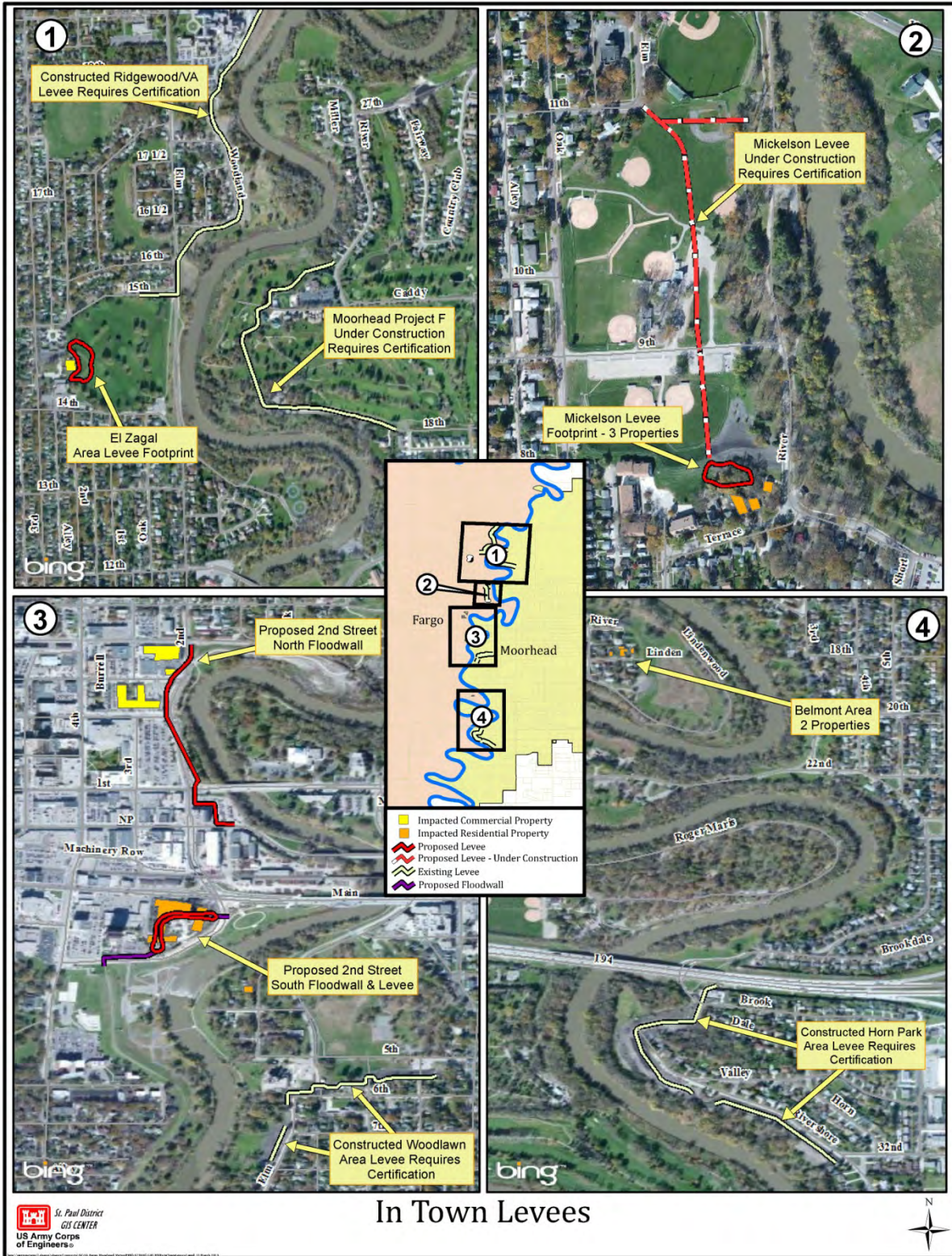


Figure 1 Proposed Alignment

