



**US Army Corps  
of Engineers®**

St. Paul District

---

# **FM Diversion Plan B River Stage 37' Impacts Appendix I**

---

Fargo Moorhead Metropolitan Area  
Flood Risk Management Project

Supplemental Environmental  
Assessment Document

This page intentionally left blank

# FM Diversion Plan B- River Stage 37' Impacts

**To:** FM Diversion Task Order 27  
**From:** Houston-Moore Group  
**Subject:** FM Diversion Plan B River Stage 37' Impacts  
**Date:** July 13, 2018  
**Project:** 7438-0028

## INTRODUCTION

One of the major changes for Plan B versus the Pre-Task Force alignment included passing a flow through the Fargo-Moorhead urban area (Flow Through Town) that results in a river stage (RS) 37' at the USGS Fargo stream gage during the 1-percent annual chance (100-year) flood event. The Pre-Task Force project included passing a Flow Through Town that results in RS35' during the 100-year flood event. It should also be noted that the Plan B changes also utilize the full period of Record Hydrology (100-year discharge = 33,000 cfs) vs. the wet (EOE) period of record hydrology (100-year discharge = 34,700 cfs), which was utilized for the Pre-Task Force project. Table 1 summarizes the resultant 100-year peak discharge and corresponding existing conditions frequency of this peak discharge for both the Pre-Task Force and Plan B Projects.

Table 1 – Residual Peak 100-year Flood Stage, Discharge, and Approximate Existing Frequency

Residual 100-year Flood Stage	Residual 100-year Peak Discharge	Approximate Existing Conditions Frequency (POR Hydrology)
RS35' (Pre-Task Force)	17,000 cfs	10-year
RS37' (Plan B)	21,000 cfs	20-year

This document summarizes the additional impacts and measures that will need to be implemented within the flood damage reduction area to accommodate a Flow Through Town that produces RS37' during the 100-year flood event. The primary areas covered in the technical memorandum include:

- Changes to Residual Floodplain
- Impacts to Structures
- Required Flood Mitigation Measures
- Transportation Mitigation Measures

## ANALYSIS

### Changes to Residual Floodplain:

Increasing the Flow Through Town from RS35' to RS37' during the 100-year flood event increases the residual floodplain within the flood damage reduction area. Figures 1/1.1/1.2 show the residual floodplain for RS37' with

the project in operation based on the Plan B alignment for the dam/southern embankment. The residual floodplain acreage for RS37' for the 100-year flood event is summarized in Table 2.

Table 2 – Residual Floodplain Acreage for RS37'

Residual 100-year Flood Stage	Residual 100-year Floodplain within the Flood Damage Reduction Area (Acres)
RS37' (Plan B)	24,173

**Impacts to Structures:**

Increasing the Flow Through Town from RS35' to RS37' during the 100-year flood event increases the impacts (through a reduction in benefits) to residential and non-residential structures within the flood damage reduction area. Figures 1/1.1/1.2 show the residual floodplain and impacted residential and non-residential structures for RS37' with the project in operation based on the Plan B alignment for the dam/southern embankment. These structures see a benefit over existing conditions with Plan B and mitigation for the impacted residential and non-residential structures for RS37' is not planned, unless the structures fall within the Flood Mitigation Measures discussed below. The residential and non-residential structure impacts for the 100-year flood event are summarized in Table 3.

Table 3 – Residential and Non-Residential Structure Impacts for RS37'

Residual 100-year Flood Stage	Residential Structures Impacted	Non-Residential Structures Impacted
RS37' (Plan B)	27	196

A number of property acquisitions are required to implement the Flood Mitigation Measures described below based on a Flow Through Town of RS37'. All property acquisitions will follow the federal and/or state acquisition process. Table 4 summarizes the estimated property acquisition costs for RS37' and Figures 3.1/3.2 highlight the property acquisitions.

Table 4 – Property Acquisition Costs for RS37'

City of Fargo Property Acquisitions	Number of Properties	Estimated Cost (Acquisition, plus Demo)
<b>Total City of Fargo</b>	<b>42</b>	<b>\$ 26,900,000</b>
City of Moorhead Property Acquisitions	Number of Properties	Estimated Cost (Acquisition, plus Demo)
<b>Total City of Moorhead</b>	<b>69</b>	<b>\$ 25,800,000</b>

## **Required Flood Mitigation Measures:**

Several flood mitigation measures will be required to accommodate RS37'. These have been broken down into 2 categories as follows:

- Category 1 Measures – USACE Federal Project - These are flood protection measures that were required for RS35' and are part of the Federal Project for the FM Diversion. These measures have already been designed and constructed, with the exception of the 2<sup>nd</sup> Street South Closure and Pump Station being constructed under FM Diversion Authority Work Package 42E, and do not require modification to accommodate RS37' since they are designed to be certifiable to the current FEMA 100-year floodplain (RS39.3'). Funding for the design and construction of these measures has primarily been through state and local sources, with the exception of the Ridgewood/VA Levee and Floodwall and the 4<sup>th</sup> Street Levee, which also were constructed with federal funding.
- Category 2 Measures – Planned or Constructed Projects– These are flood protection measures that have been or are being designed and constructed by the Cities of Fargo and Moorhead using state and local funding. These flood protection measures address areas with ground elevations below the minimum freeboard height (RS37' plus 2.5 feet). The Category 2 measures have been divided into two subcategories. The Category 2a measures are those that have been completed. The Category 2a measures do not require modification to accommodate RS37' since they are designed to be certifiable to the current FEMA 100-year floodplain (RS39.3'). The Category 2b measures are measures that are planned or in progress. The schedule for completion of these measures is dependent on the availability of funding.

In addition to the flood mitigation projects consisting of levees and floodwalls, a number of stormwater lift stations in the cities of Fargo and Moorhead will require improvements to accommodate RS37'. Additional detail on the flood mitigation measures and the lift station improvements are discussed below.

### ***Category 1 Measures – USACE Federal Project:***

As noted above, these are flood protection measures that were required for RS35' and are part of the Federal Project for the FM Diversion. These measures have already been designed and constructed, with the exception of the 2<sup>nd</sup> Street South Closure and Pump Station being constructed under FM Diversion Authority Work Package 42E, which has not been constructed. The Category 1 measures do not require modification to accommodate RS37' since they are designed to be certifiable to the current FEMA 100-year floodplain (RS39.3'). The Category 1 measures include the following project areas that are highlighted in Figures 1/1.1/1.2.

- Ridgewood/VA Levee and Floodwall (City of Fargo)
- El Zagal Levee/Floodwall (City of Fargo)
- Mickelson Field Project (City of Fargo)
- 2<sup>nd</sup> Street/Downtown Levee/Floodwall Project (City of Fargo)
- 4<sup>th</sup> Street Levee and Floodwall (City of Fargo)
- Moorhead Country Club Project F1 Levee and Floodwall (City of Moorhead)
- Woodlawn Area Levee (City of Moorhead)

- Horn Park Area Levee and Floodwall (City of Moorhead)

Table 5 includes the remaining costs to implement the Category 1 Measures.

Table 5 – Category 1 Measures – USACE Federal Project

City of Fargo Category 1 Measures	Estimated Construction Costs
Work Package 42E – 2 <sup>nd</sup> Street South Closure and Pump Station	\$ 9,000,000

**Category 2 Measures – Planned or Constructed:**

As noted above, these are flood protection measures that have been or are being designed and constructed by the Cities of Fargo and Moorhead using state and local funding. These flood protection measures address areas with ground elevations below the minimum freeboard height (RS37’ plus 2.5 feet). The Category 2 measures have been divided into 2 subcategories. The Category 2a measures are those that have been completed. The Category 2a measures do not require modification to accommodate RS37’ since they are designed to be certifiable to the current FEMA 100-year floodplain (RS39.3’). The Category 2b measures are measures that are planned or in progress. The schedule for completion of these measures is dependent on the availability of funding.

The Category 2a Measures are highlighted in Figures 1/1.1/1.2 and are listed below. Since these measures are already complete, costs for them have not been included.

North Dakota/City of Fargo:

- North Oaks
- Fargo Country Club/Southwood
- Lemke Park
- Harwood, Hackberry, and River Drive
- University Drive South
- South Acres Addition
- River Vili
- Rose Creek
- Oakcreek
- Coulees Crossing
- Timberline
- Meadow Creek
- Drain 27 (40<sup>th</sup> Ave to I-29 areas)
- Drain 27 (I-29 to 42<sup>nd</sup> St. areas)
- Drain 27 (South of 52<sup>nd</sup> Ave. S.)
- Drain 53 (South of 52<sup>nd</sup> Ave. S.)
- Drain 53 (South of 64<sup>th</sup> Ave)

Minnesota/City of Moorhead:

- 27<sup>th</sup> Ave. N. Levee Phase 1 and 2
- River Haven Road
- Caddy/18<sup>th</sup> Ave N Area Levee
- Hjemkomst Area Levee
- Brookdale Levee
- I-94 Right-of-Way Floodwall and Levee
- Public Works Yard Levee
- The Saddle – Phase 1 and 2
- 2900 Block of Rivershore Drive Levee
- Davy Park Levee
- Public Housing High Rise – North, South, and Middle Levees
- 7<sup>th</sup> Street South Levee
- Bridgeview Levee – Phase 1
- 15<sup>th</sup> Ave North/St. Francis De Sales Levee and Road Raise
- Bluestem Levee
- Rivers Edge Levee
- Rivershore Drive Floodwall and Road Closure Structure
- River Oak Circle
- 43<sup>rd</sup> Ave N Road Raise
- Project A Levee
- Project B
- Project C
- 50<sup>th</sup> Ave S. Levee – South, NW, and NE Levees
- Tessa Terrace
- Project D and E
- Elm Street: 600 Block
- 2<sup>nd</sup> Ave S Flood Mitigation
- 7<sup>th</sup> St N Cul-De-Sac Road Raise
- Oakport Protection

The Category 2b Measures, which are those that are planned or in progress, are highlighted in Figures 4.1/4.2 and 5. Opinions of probable cost were prepared for the Category 2b Measures and are summarized in Table 6.

Table 6 – Category 2b Measures – Planned Non-USACE Costs

City of Fargo Category 2 Measures	Estimated Construction Cost
Drain 27 inlet culvert replacement	\$ 150,000
North Side Protection – Drain 10	\$ 9,830,000
Royal Oaks Levee	\$ 630,000
Elm Circle	\$ 160,000
Riverwood	\$ 90,000

Woodcrest	\$ 3,000,000
Oak Grove	\$ 440,000
I-29 Ditch	\$ 390,000
Oakcreek, Copperfield Court	\$ 1,820,000
Belmont	\$ 10,390,000
Harwood, Hackberry, River Drive gaps	\$ 500,000
64 <sup>th</sup> Ave Borrow Pit/Bison Meadows	\$ 1,200,000
Rosewood	\$ 4,000,000
<b>Total City of Fargo</b>	<b>\$ 32,600,000</b>
<b>City of Moorhead Category 2b Measures</b>	
<b>Estimated Construction Cost</b>	
North Moorhead	\$ 6,000,000
Moorhead Center Mall Sanitary Lift Station #2	\$ 1,000,000
1 <sup>st</sup> Avenue North Levee	\$ 1,020,000
Riverview Circle	\$ 650,000
<b>Total City of Moorhead</b>	<b>\$ 8,670,000</b>
<b>Total Category 2b Measures</b>	<b>\$ 41,270,000</b>

**Stormwater Lift Station Improvements:**

As noted above, a number of stormwater lift stations in the cities of Fargo and Moorhead will require improvements or replacement to accommodate RS37'. These stormwater lift stations are highlighted in Figures 6 and 7. Opinions of probable cost were prepared for the Stormwater Lift Station Improvements and are summarized in Table 7.

Table 7 – Stormwater Lift Station Improvements

City of Fargo Structure Replacement	Estimated Construction Cost
COF Lift Station 11	\$ 1,100,000
COF Lift Station 15	\$ 2,860,000
COF Lift Station 24	\$ 3,600,000
COF Lift Station 27	\$ 3,550,000
COF Lift Station 39	\$ 6,550,000
COF Lift Station 40	\$ 1,200,000
COF Lift Station 41	\$ 2,500,000
COF Lift Station 42	\$ 2,450,000
COF Lift Station 47	\$ 2,550,000
COF Lift Station 48	\$ 2,550,000
COF Lift Station 53	\$ 4,910,000
COF Lift Station 55	\$ 2,720,000
COF Lift Station 56	\$ 2,500,000



COF Lift Station 57	\$ 1,300,000
COF Lift Station 58	\$ 1,500,000
COF Lift Station 66	\$ 1,300,000
COF Lift Station 67	\$ 1,600,000
COF Lift Station 68	\$ 1,600,000
<b>Total City of Fargo</b>	<b>\$ 46,340,000</b>
<b>City of Moorhead Structure Modification</b>	<b>Estimated Construction Cost</b>
Moorhead Storm Structure FC 7	\$ 150,000
Moorhead Storm Structure FC 8	\$ 150,000
Moorhead Storm Structure FC 9	\$ 150,000
Moorhead Storm Structure FC 10	\$ 150,000
Moorhead Storm Structure FC 11	\$ 150,000
Moorhead Storm Structure FC 13	\$ 150,000
Moorhead Storm Structure FC 14	\$ 150,000
Moorhead Storm Structure FC 15	\$ 150,000
Moorhead Storm Structure FC 16	\$ 150,000
Moorhead Storm Structure GS24	\$ 200,000
Moorhead Storm Structure GS 47	\$ 150,000
<b>Total City of Moorhead</b>	<b>\$ 1,700,000</b>
<b>Total Stormwater Lift Station Improvements</b>	<b>\$ 48,040,000</b>

**Transportation Mitigation Measures:**

Increasing the Flow Through Town from RS35' to RS37' during the 100-year flood event increases the impacts to the transportation system within the flood damage reduction area. To quantify the impacts and required mitigation, the transportation impacts were reviewed for RS37' and areas for potential grade raises were identified to maintain access in key areas. Figure 2 shows required road raises for RS37' with the project in operation based on the Plan B alignment for the dam/southern embankment. The length of roadway that will require grade raises is summarized in Table 8.

Table 8 – Required Transportation Improvements for RS37'

Residual 100-year Flood Stage	Road Raises within the Flood Damage Reduction Area
RS37' (Plan B)	8.4 miles

When evaluating the road raises, areas where water inundated the driving lane (12' from centerline of roadway) were considered impacted and were raised to prevent future inundation when river levels through the FM area are at RS37'. The horizontal and vertical geometrics were designed to meet 55 mph unless existing site conditions dictated a lesser design speed. In North Dakota, sag vertical curves were evaluated based on

comfort criteria and crest vertical curves were designed to satisfy stopping sight distance. Minnesota vertical curvature meets requirements published by MnDOT for County State Aid Highways.

Approximately 4.4 miles of roadway were identified for improvement in North Dakota at RS37', with a maximum grade raise height of 1.5'. While in Minnesota, approximately 4.0 miles of roadway were identified to be impacted at RS37' with a maximum grade raise height of approximately 4'. For estimating purposes, a 6" hot mix asphalt pavement on 12" aggregate base was utilized on all existing paved sections. For the existing gravel roadways, a 6" aggregate section was utilized for estimating purposes. Table 9 includes a summary of costs for transportation improvements associated with RS37'.

Table 9 – Transportation Improvement Costs for RS37'

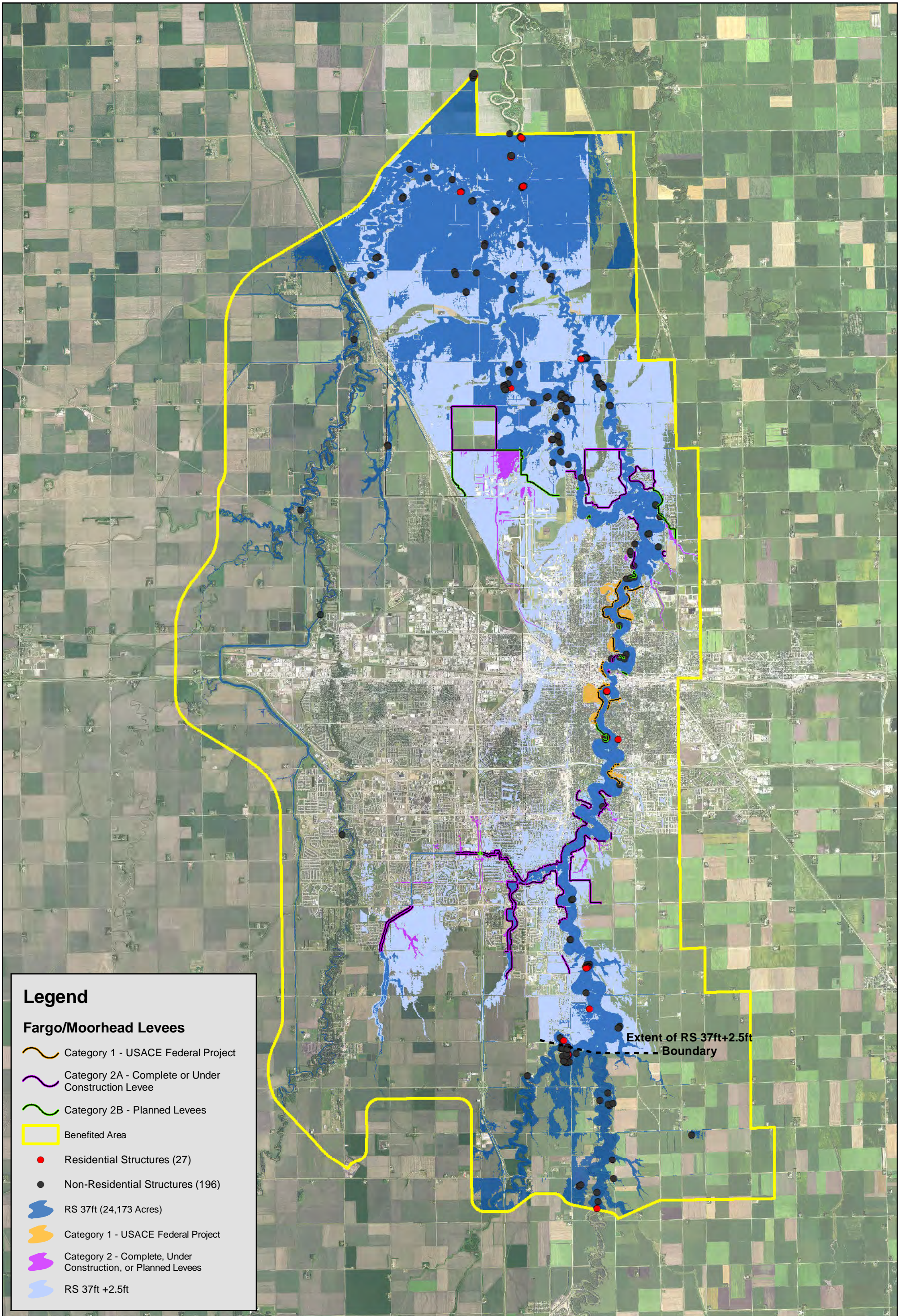
ND Roadway/Segment	RS37' Estimated Construction Cost
ND I-29 SB Exit Ramp (CR 16)	\$128,000
ND County Road 22	\$936,000
ND County Road 31, South Segment	\$258,000
ND County Road 31, South Center Segment	\$84,000
ND County Road 31, North Center Segment	\$363,000
ND County Road 31, North Segment	\$1,904,000
<b>Total ND Transportation Improvement Cost</b>	<b>\$3,673,000</b>
MN Roadway/Segment	RS 37' Estimated Construction Cost
MN Broadway	\$201,000
MN 10th St N	\$299,000
MN 100th Ave N	\$159,000
MN 110th Ave N	\$274,000
MN 120th Ave N	\$121,000
MN 130th Ave N	\$392,000
MN 140th Ave N	\$238,000
MN 15th St N, South Segment	\$344,000
MN 15th St N, Middle Segment	\$559,000
MN 15th St N, North Segment	\$512,000
<b>Total MN Transportation Improvement Cost</b>	<b>\$3,099,000</b>
<b>Total Transportation Improvement Cost</b>	<b>\$6,772,000</b>

**Summary:**

This Technical Memorandum summarizes the additional impacts and measures that will need to be implemented within the flood damage reduction area to accommodate a Flow Through Town that produces RS37' during the 100-year flood event. This includes costs for property acquisitions, flood mitigation measures and transportation improvements. The total costs broken down by State are summarized in Table 10.











Table 10 – RS37' Cost Summary

<b>North Dakota Mitigation Features</b>	<b>Estimated Construction Cost</b>
Property Acquisitions	\$ 26,900,000
Category 1 Flood Mitigation Measures	\$ 9,000,000
Category 2b Flood Mitigation Measures	\$ 32,600,000
Stormwater Lift Station Improvements	\$ 46,340,000
Transportation Improvements	\$ 3,673,000
Engineering and Administration (10%)	\$ 11,850,000
<b>Total North Dakota</b>	<b>\$ 130,363,000</b>
<b>Minnesota Mitigation Features</b>	
<b>Estimated Construction Cost</b>	
Property Acquisitions	\$ 25,800,000
Category 2b Flood Mitigation Measures	\$ 8,670,000
Stormwater Lift Station Improvements	\$ 1,700,000
Transportation Improvements	\$ 3,099,000
Engineering and Administration (10%)	\$ 3,970,000
<b>Total Minnesota</b>	<b>\$ 43,239,000</b>



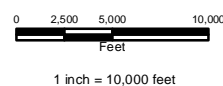
**Legend**

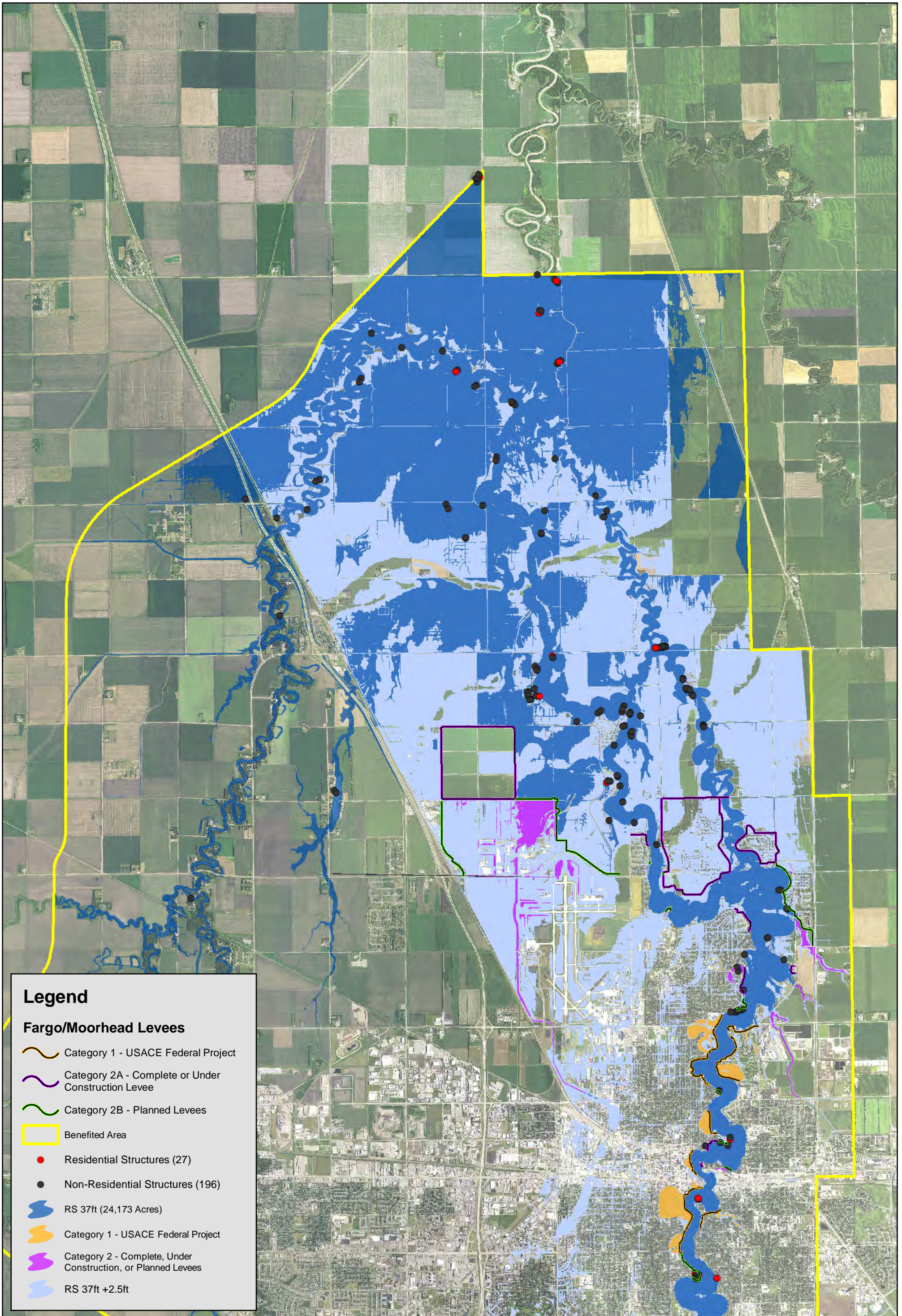
**Fargo/Moorhead Levels**

-  Category 1 - USACE Federal Project
-  Category 2A - Complete or Under Construction Levee
-  Category 2B - Planned Levees
-  Benefited Area
-  Residential Structures (27)
-  Non-Residential Structures (196)
-  RS 37ft (24,173 Acres)
-  Category 1 - USACE Federal Project
-  Category 2 - Complete, Under Construction, or Planned Levees
-  RS 37ft +2.5ft

Extent of RS 37ft+2.5ft Boundary











**Figure 1 - RS37ft Floodplain & Structure Impacts Plan B**  
**1 - Percent Chance Flood Event**



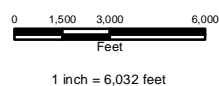


**Legend**

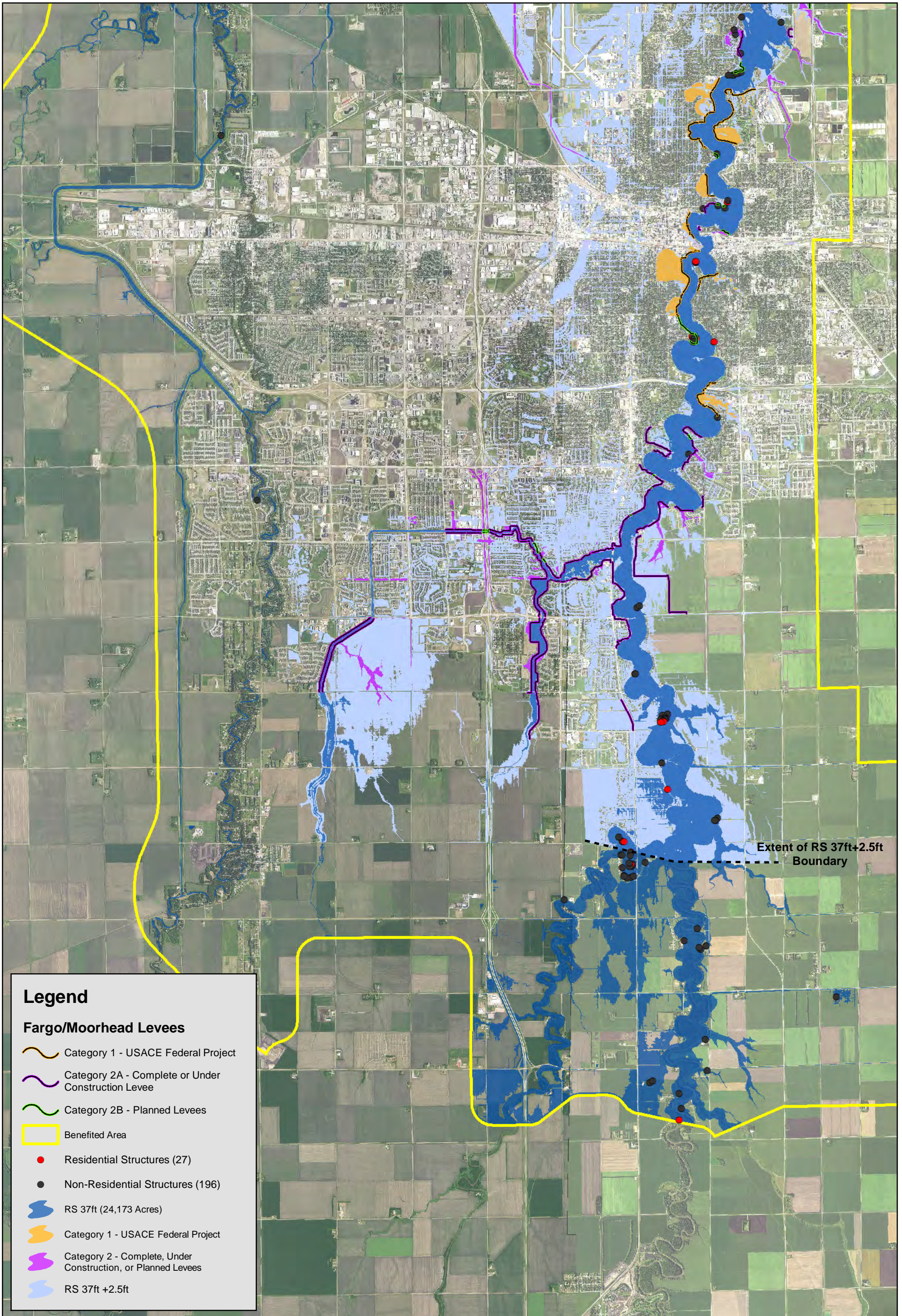
**Fargo/Moorhead Levels**

-  Category 1 - USACE Federal Project
-  Category 2A - Complete or Under Construction Levee
-  Category 2B - Planned Levees
-  Benefited Area
-  Residential Structures (27)
-  Non-Residential Structures (196)
-  RS 37ft (24,173 Acres)
-  Category 1 - USACE Federal Project
-  Category 2 - Complete, Under Construction, or Planned Levees
-  RS 37ft +2.5ft

**Figure 1.1 - RS37ft Floodplain & Structure Impacts  
Plan B  
1 - Percent Chance Flood Event**













Created By: enelson Date Created: 02/20/2017 Date Exported: 7/10/2018 Image: 2015 County NAIP  
Horizontal Datum: NAD 1983 StatePlane North Dakota South FIPS 3302 Feet Vertical Datum: North American 1983  
H:\Fargo\JBN\7400\7438\18\_7438\_0026\GIS\Maps\PA\_35vs37\_Impacts0702181.mxd

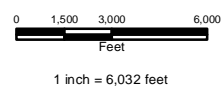


**Legend**

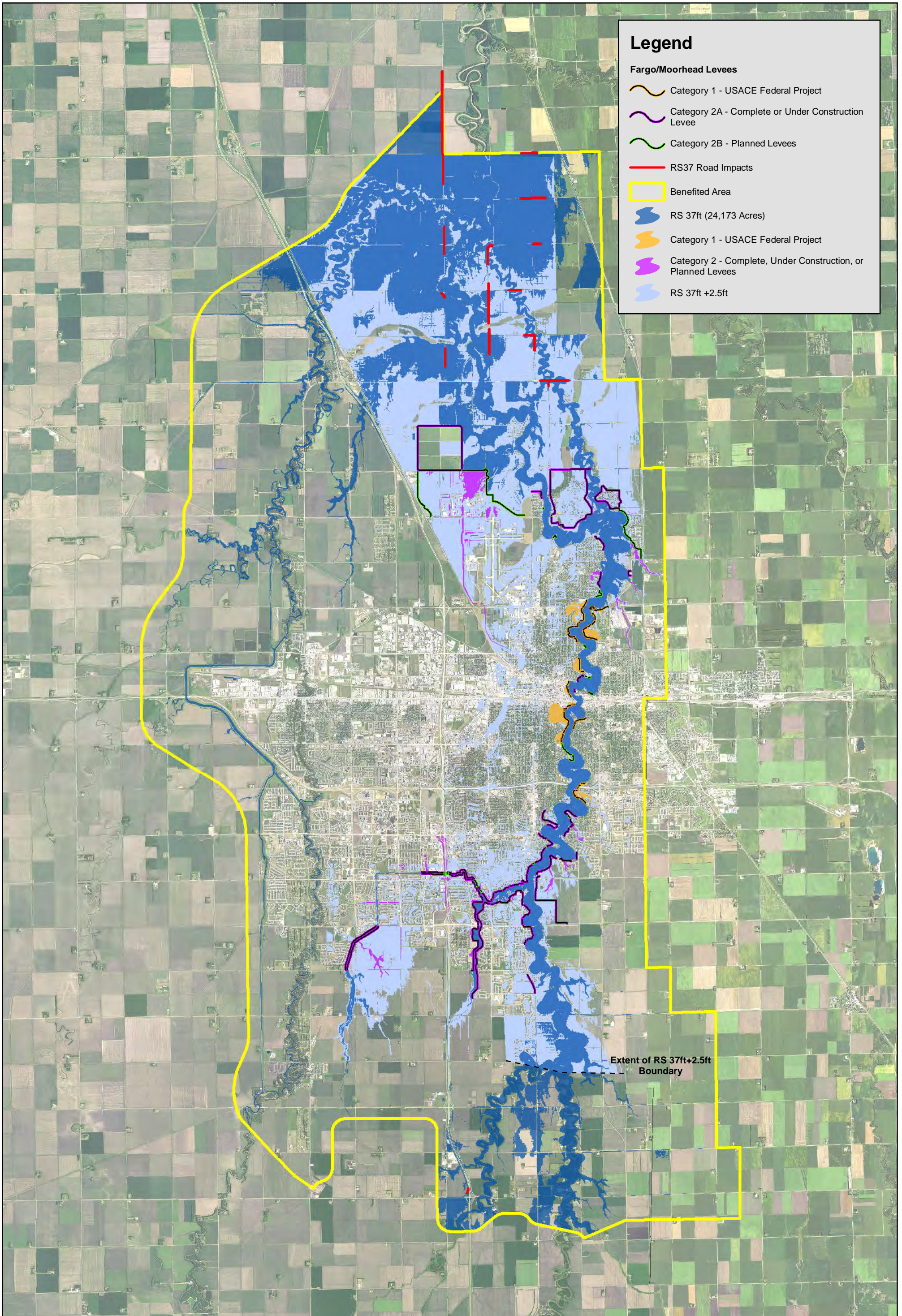
**Fargo/Moorhead Levels**

-  Category 1 - USACE Federal Project
-  Category 2A - Complete or Under Construction Levee
-  Category 2B - Planned Levees
-  Benefited Area
-  Residential Structures (27)
-  Non-Residential Structures (196)
-  RS 37ft (24,173 Acres)
-  Category 1 - USACE Federal Project
-  Category 2 - Complete, Under Construction, or Planned Levees
-  RS 37ft +2.5ft

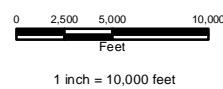
**Figure 1.2 - RS37ft Floodplain & Structure Impacts  
Plan B  
1 - Percent Chance Flood Event**



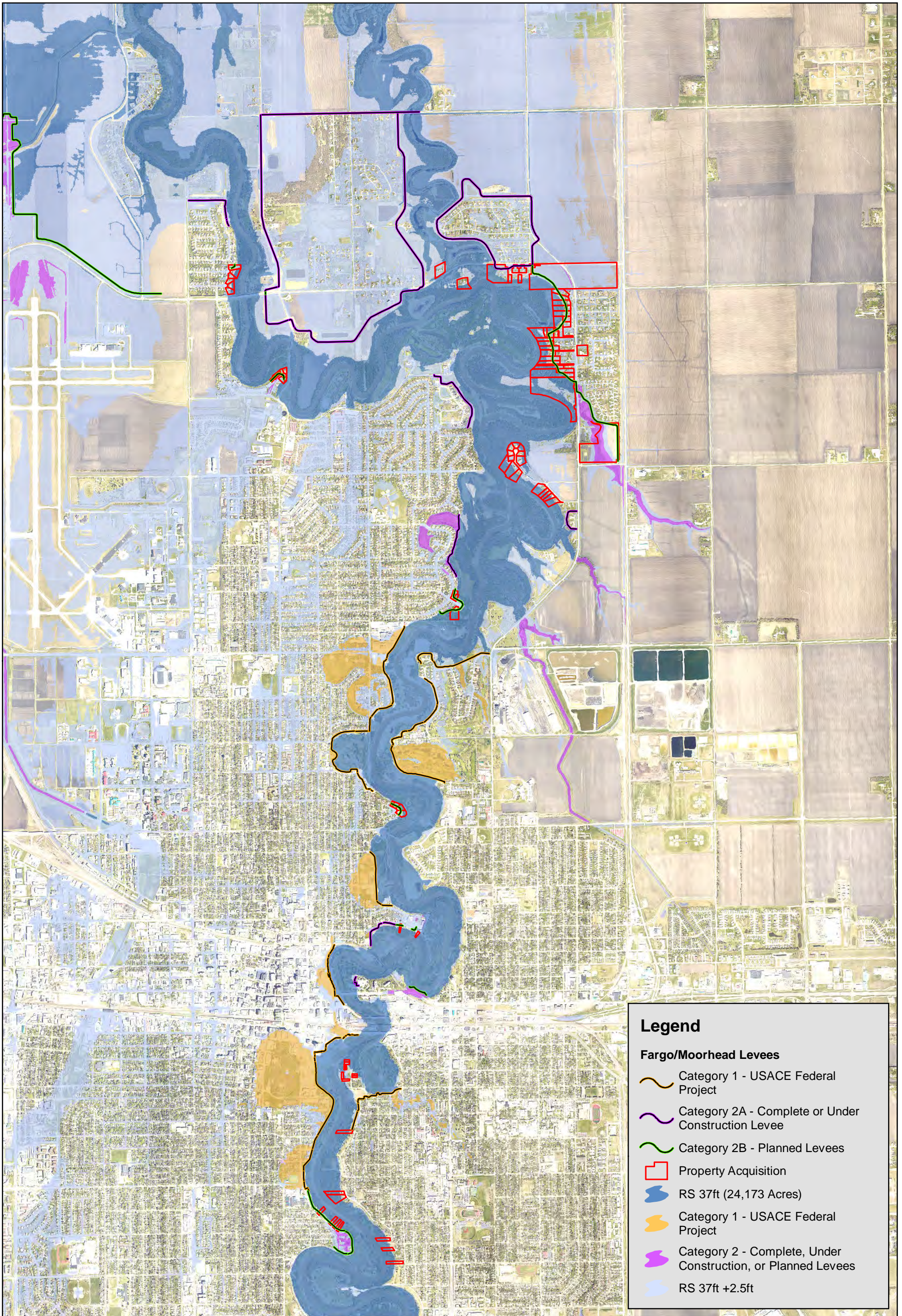
Created By: enelson Date Created: 02/20/2017 Date Exported: 7/11/2018 Image: 2015 County NAIP  
Horizontal Datum: NAD 1983 StatePlane North Dakota South FIPS 3302 Feet Vertical Datum: North American 1983  
H:\Fargo\JBN\7400\7438\18\_7438\_0026\GIS\Maps\PA\_35vs37\_Impacts0702181.mxd



**Figure 2 - RS37ft Roadway Impacts  
Plan B  
1 - Percent Chance Flood Event**











Created By: enelson Date Created: 02/20/2017 Date Exported: 7/11/2018 Image: 2015 County NAIP  
Horizontal Datum: NAD 1983 StatePlane North Dakota South FIPS 3302 Feet Vertical Datum: North American 1983  
H:\Fargo\JBN\7400\7438\18\_7438\_0028\GIS\Road Improvements\Adams Road Impacts.mxd

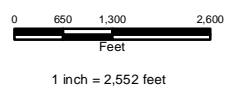


**Legend**

**Fargo/Moorhead Levees**

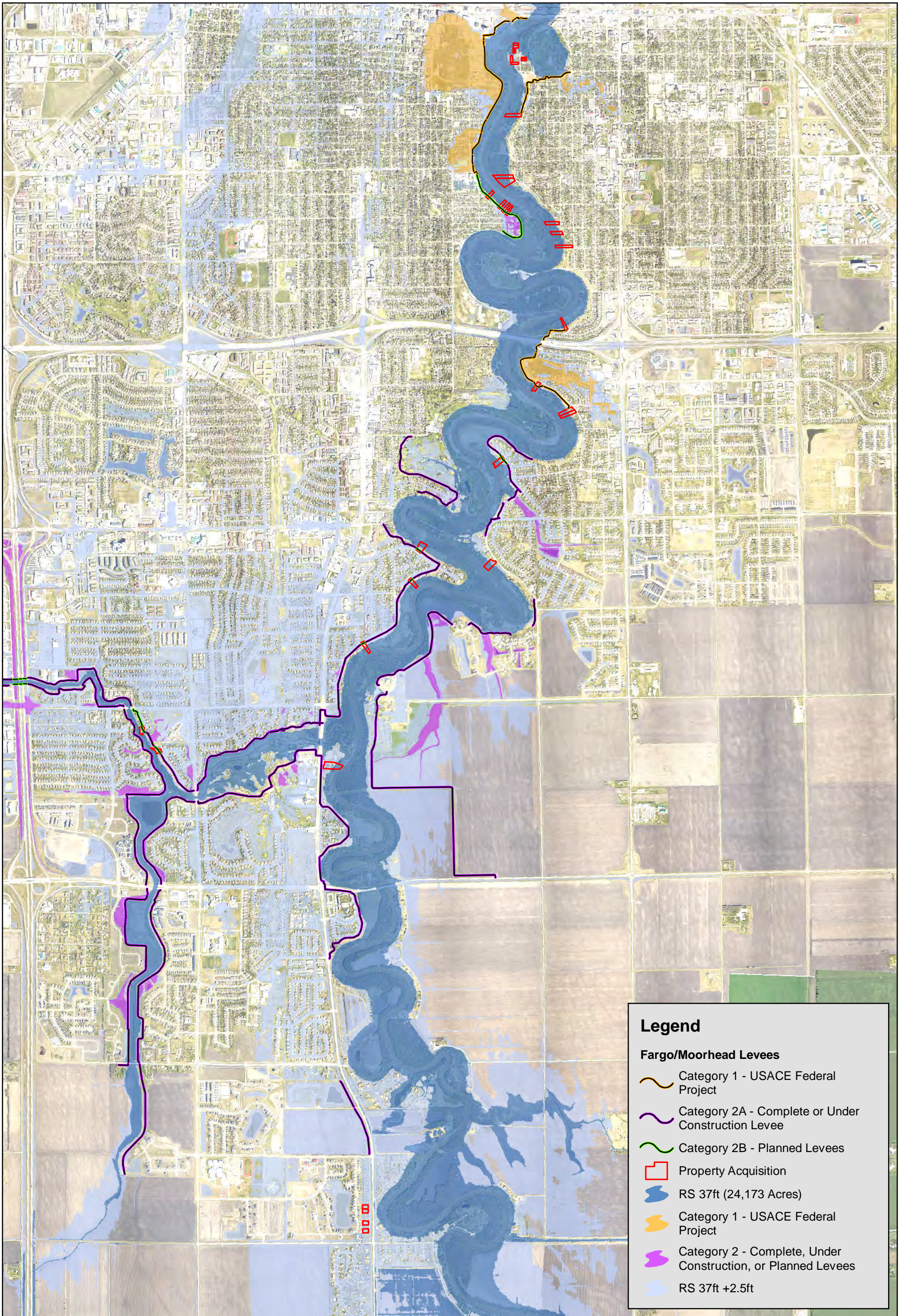
-  Category 1 - USACE Federal Project
-  Category 2A - Complete or Under Construction Levee
-  Category 2B - Planned Levees
-  Property Acquisition
-  RS 37ft (24,173 Acres)
-  Category 1 - USACE Federal Project
-  Category 2 - Complete, Under Construction, or Planned Levees
-  RS 37ft +2.5ft

**Figure 3.1 - RS37ft Property Acquisition  
Parcels - Plan B  
City of Fargo & Moorhead**











Created By: enelson Date Created: 02/20/2017 Date Exported: 7/11/2018 Image: 2015 County NAIP  
Horizontal Datum: NAD 1983 StatePlane North Dakota South FIPS 3302 Feet Vertical Datum: North American 1983  
H:\Fargo\JBN\7400\7438\18\_7438\_0028\GIS\Buyouts\Figure 5\_BuyoutMap.mxd



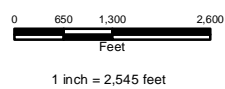


**Legend**

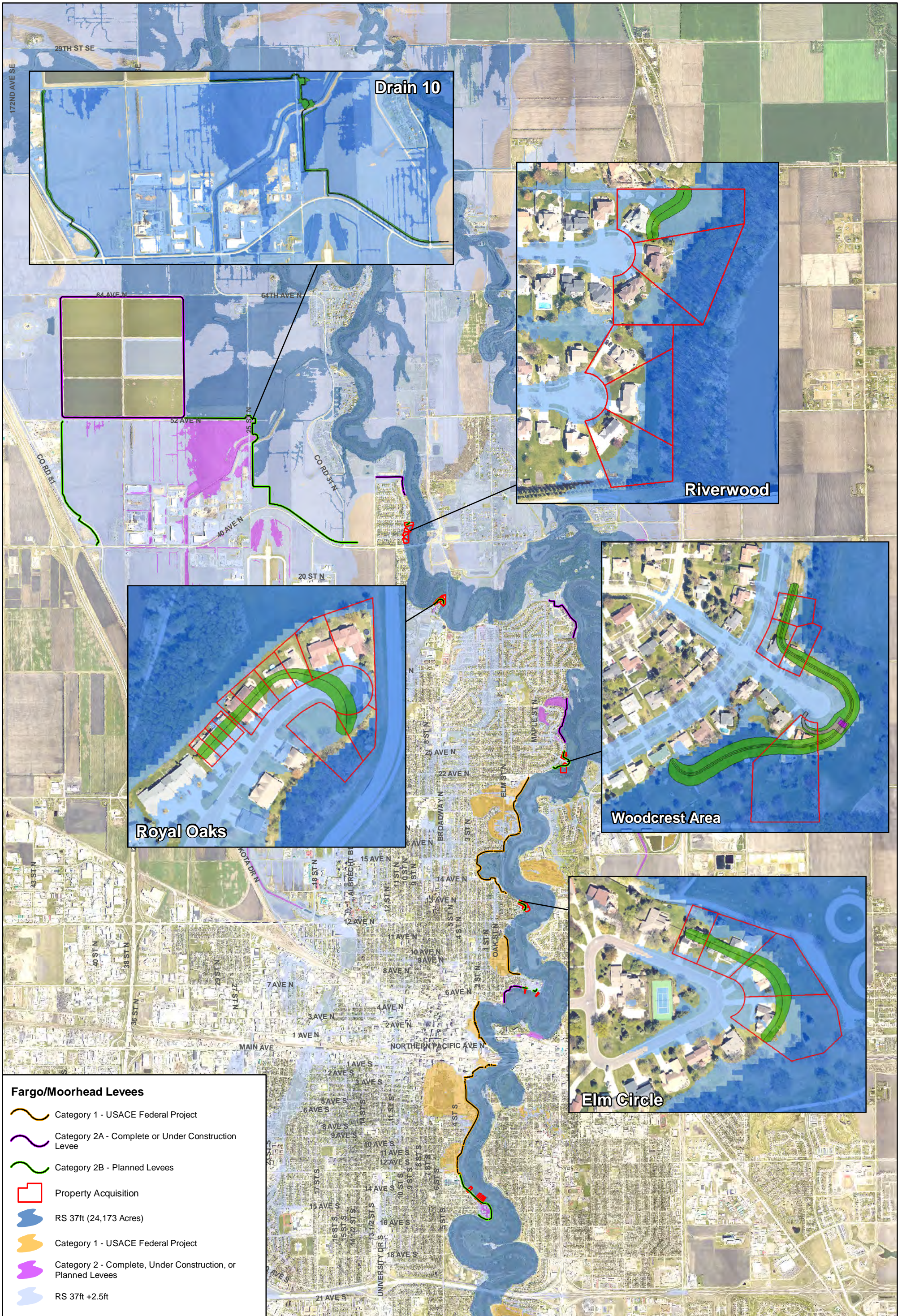
**Fargo/Moorhead Levees**

-  Category 1 - USACE Federal Project
-  Category 2A - Complete or Under Construction Levee
-  Category 2B - Planned Levees
-  Property Acquisition
-  RS 37ft (24,173 Acres)
-  Category 1 - USACE Federal Project
-  Category 2 - Complete, Under Construction, or Planned Levees
-  RS 37ft +2.5ft

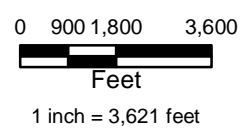
**Figure 3.2 - RS37ft Property Acquisition  
Parcels - Plan B  
City of Fargo & Moorhead**

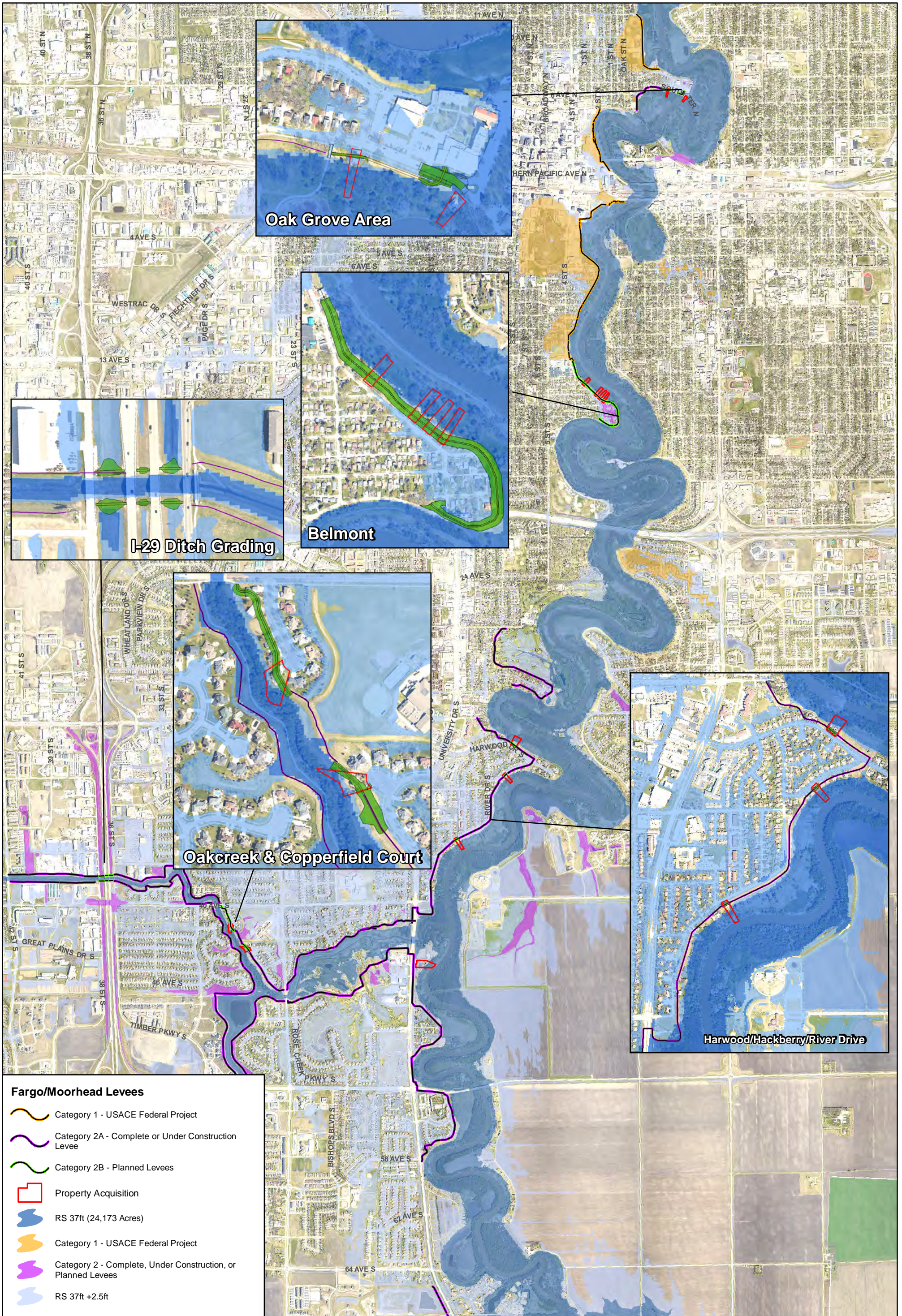


Created By: enelson Date Created: 02/20/2017 Date Exported: 7/11/2018 Image: 2015 County NAIP  
Horizontal Datum: NAD 1983 StatePlane North Dakota South FIPS 3302 Feet Vertical Datum: North American 1983  
H:\Fargo\JBN\7400\7438\18\_7438\_0028\GIS\Buyouts\Figure 5\_BuyoutMap.mxd



**Figure 4.1 - RS37ft Planned Flood Mitigation Projects  
City of Fargo**



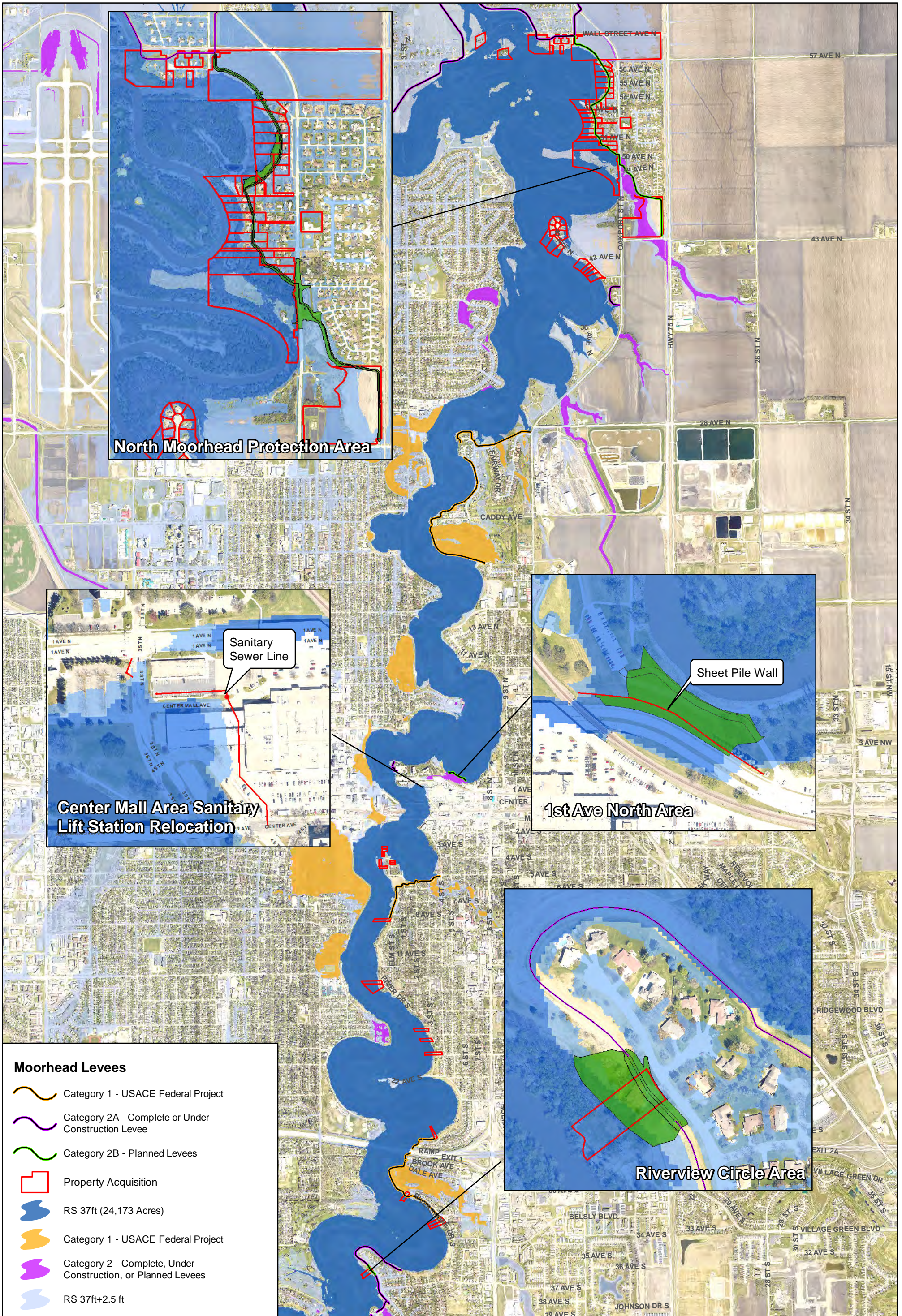


**Figure 4.2 - RS37ft Planned Flood Mitigation Projects  
City of Fargo**



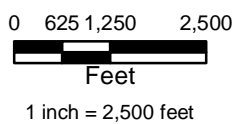
0 625 1,250 2,500  
Feet  
1 inch = 2,494 feet

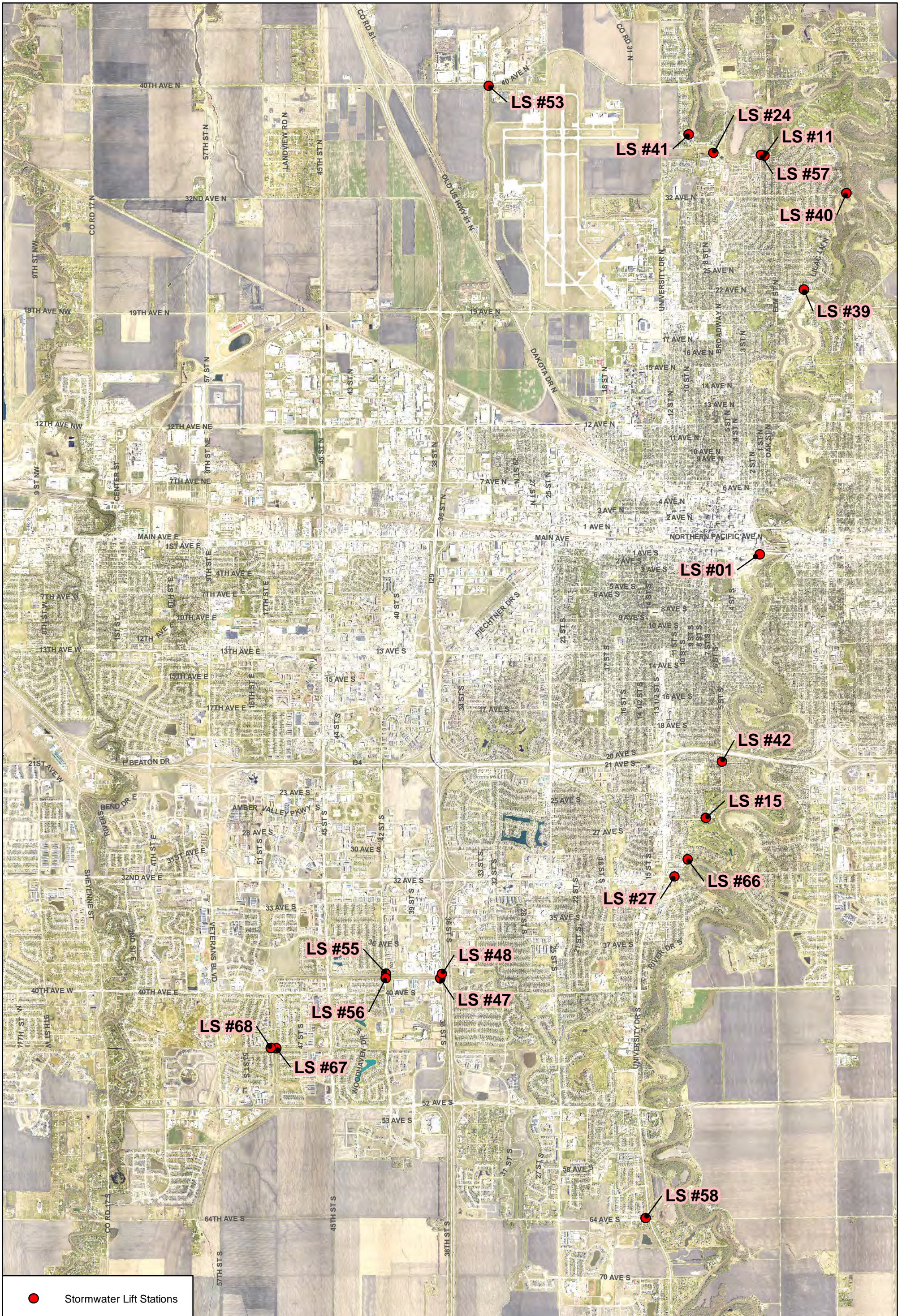




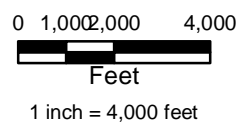
**Figure 5 - RS37ft Planned Flood Mitigation Projects City of Moorhead**

Created By: enelson Date Created: 6/7/2018 Date Exported: 7/11/2018 Image: FM2017 Elevation Data: NA  
 Horizontal Datum: Fargo Ground Coordinate System Vertical Datum: North American 1983  
 H:\Fargo\JBN\7400\7438\18\_7438\_0028\GIS\Protection Improvements\Mhd Work.mxd

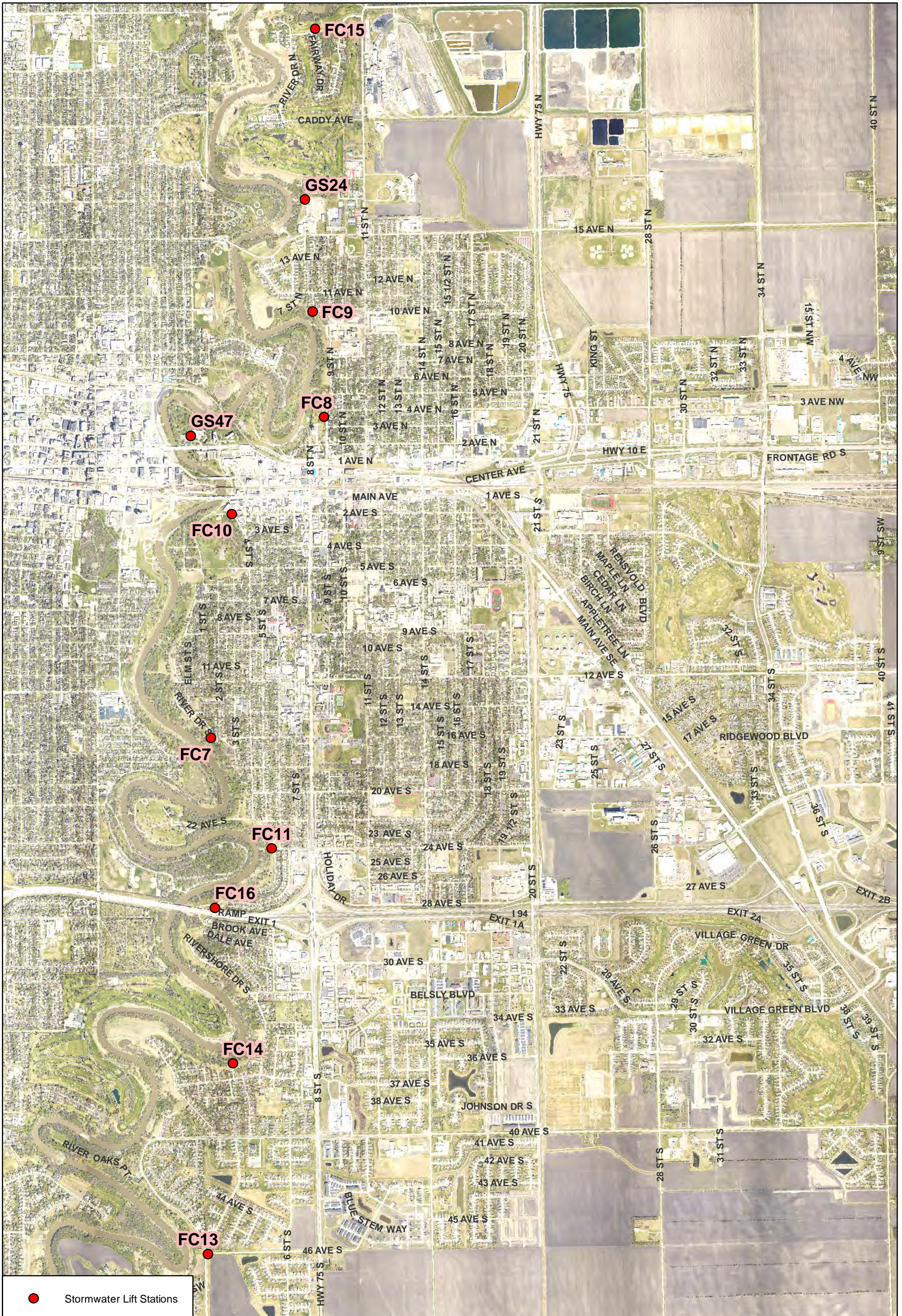




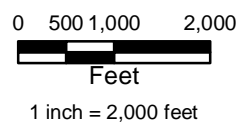
**Figure 6 - RS37ft Stormwater Lift Station Improvements  
City of Fargo**



Created By: enelson Date Created: 6/7/2018 Date Exported: 7/10/2018 Image: FM2017 Elevation Data: NA  
Horizontal Datum: Fargo Ground Coordinate System Vertical Datum: North American 1983  
H:\Fargo\JBN\7400\7438\18\_7438\_0028\GIS\LS Improvements\LS Improvements.mxd



**Figure 7 - RS37ft Stormwater Lift Station Improvements  
City of Moorhead**



Created By: enelson Date Created: 6/7/2018 Date Exported: 7/10/2018 Image: FM2017 Elevation Data: NA  
Horizontal Datum: Fargo Ground Coordinate System Vertical Datum: North American 1983  
H:\Fargo\JBN\7400\7438\18\_7438\_0028\GIS\LS Improvements\LS Improvements.mxd