

Flood Mitigation Update

Revised In-Town Flood Mitigation Plan
(adopted August 13, 2018)

August 26, 2019

03/28/2009



Adopted Plan, Priorities & Status

| | Acquisitions & Projects | Total Costs ¹ | Expended & Committed ² |
|---|---|--------------------------|-----------------------------------|
| 1 | North Moorhead Project & Category A (26 25) | \$12.7M | \$6.708M |
| 2 | Riverview Circle Levee & 40 Ave S Road Raise & Category A (1) | \$3.5M | |
| 3 | Sanitary Lift Station #2 | \$2.0M | \$0.003M |
| | Category B Acquisitions (41 43) | \$15.8M | \$0.325M |
| 4 | 1 st Ave N Levee/Floodwall | \$2.0M | \$0.007M |
| | Stormwater Lift Stations | \$4.0M | |
| 5 | Category C Acquisitions (23) | \$11.5M | |
| Total Estimated Cost | | \$51.5M | \$7.043M |
| DNR FDR Grant Funds Under Contract | | | \$6.000M |
| <i>Pending DNR FDR Grant Amendment</i> | | | <i>\$1.043M</i> |
| Total Funding Available | | | \$7.043M |

¹Updated & revised

²As of November 2018 grant award including proposed bid award

Property Acquisition Priorities

- ***Category A: at or below 39.5 feet river stage***
 - Provides protection to public infrastructure
 - Exception: if the only at-risk public infrastructure is the sanitary sewer system & can be mitigated with a reverse clean-out & plug
 - Provides protection to public and/or private property off riverfront
 - Maintains vehicular access to public and/or private property off riverfront
- ***Category B: at or below 39.5 feet river stage***
 - Any riverfront property at risk of flooding not in Category A
- ***Category C: to 44 feet river stage***
 - Properties not in A or B but needed to complete the 44-foot line of protection

Property Acquisition

| Category | Eligible | Complete |
|----------|------------------|----------|
| A | 27 26 | 24 |
| B | 41 43 | 1 |
| C | 23 | 0 |
| Total | 91 92 | 25 |

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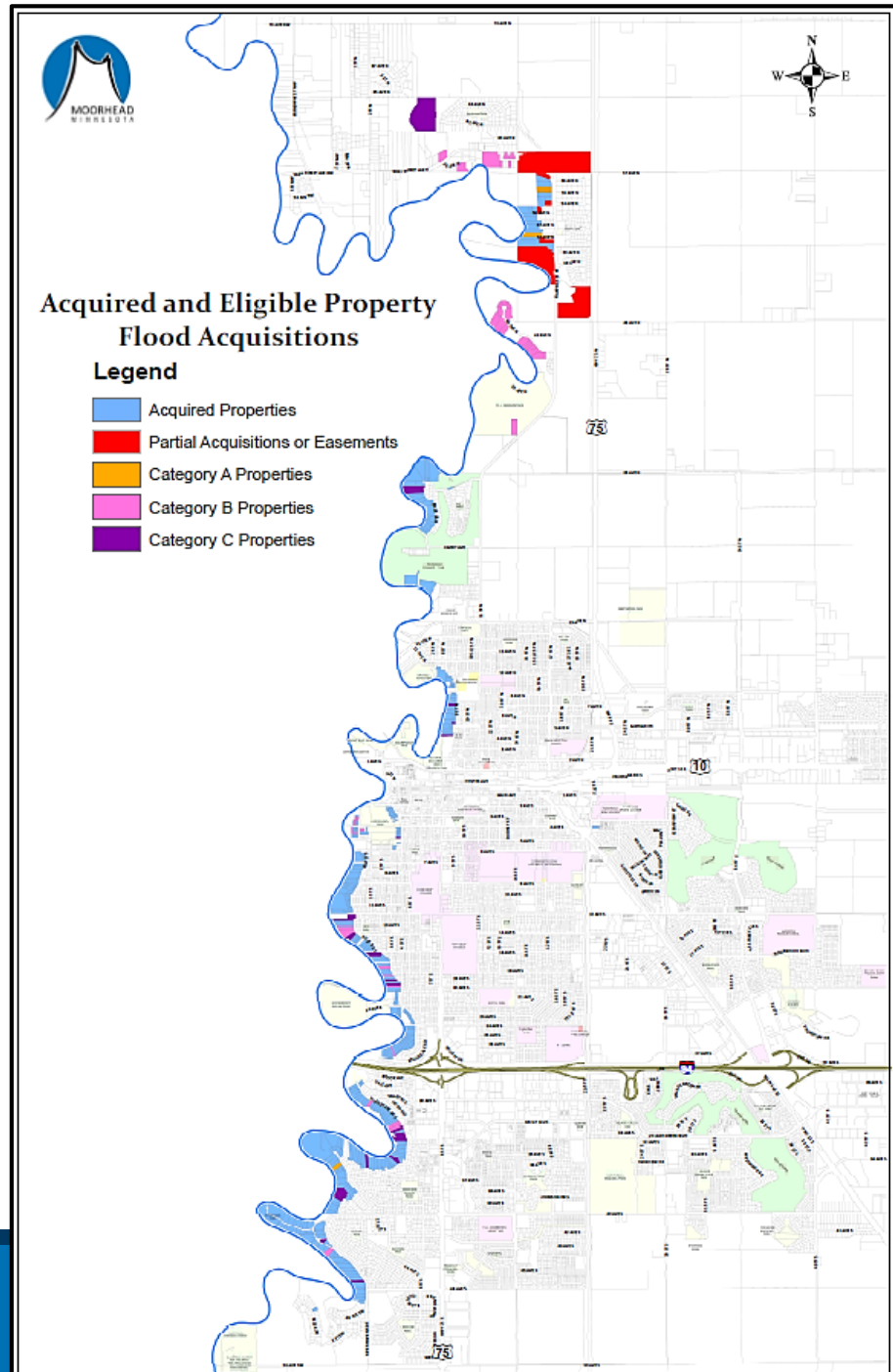
Search for “flood mitigation”



Acquired and Eligible Property Flood Acquisitions

Legend

- Acquired Properties
- Partial Acquisitions or Easements
- Category A Properties
- Category B Properties
- Category C Properties



Remaining Projects

North Moorhead Project

Riverview Circle Levee & 40 Ave S
Road Raise

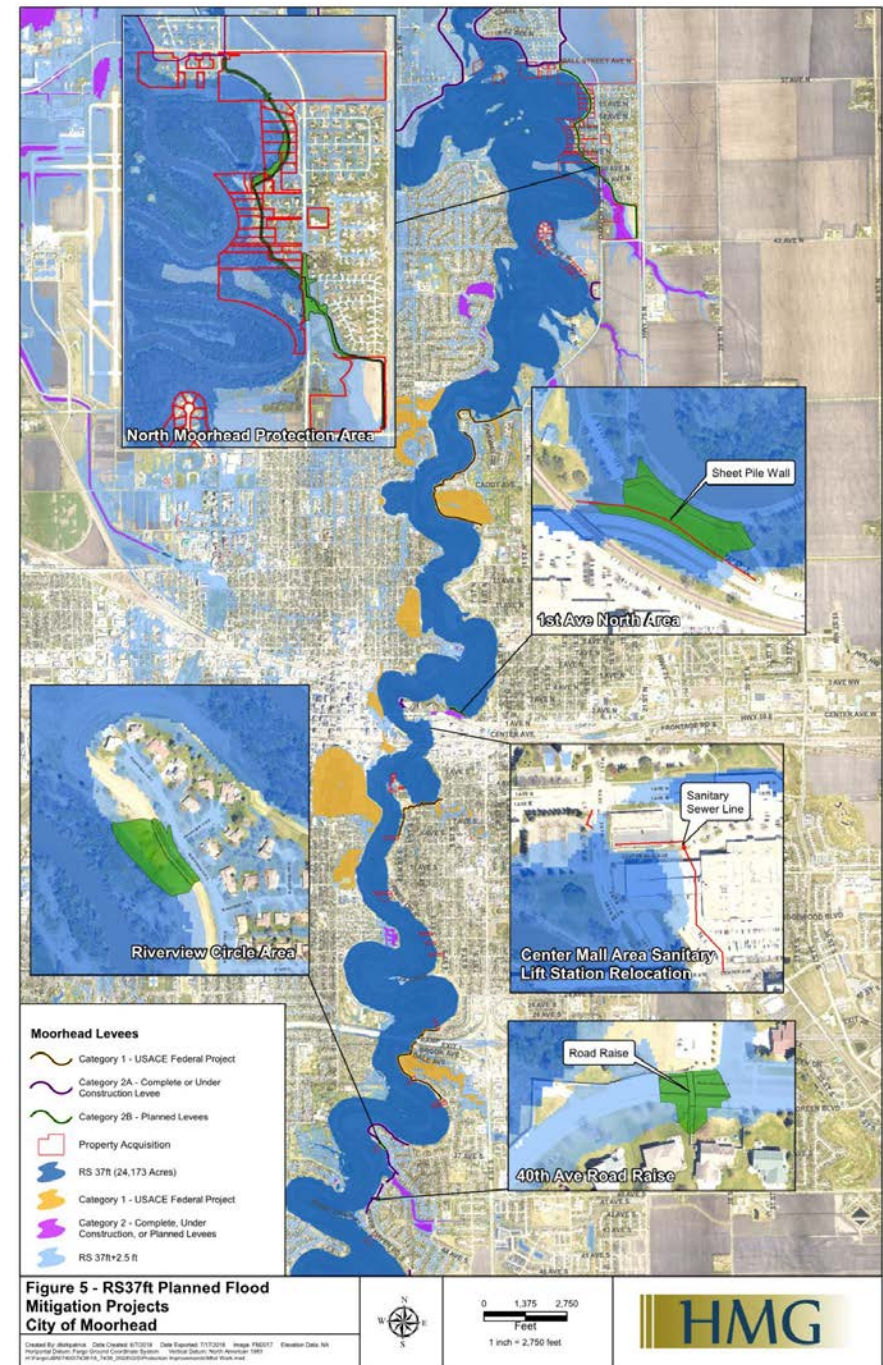
Sanitary Lift Station #2

1st Ave N Levee/Floodwall

Stormwater Lift Stations

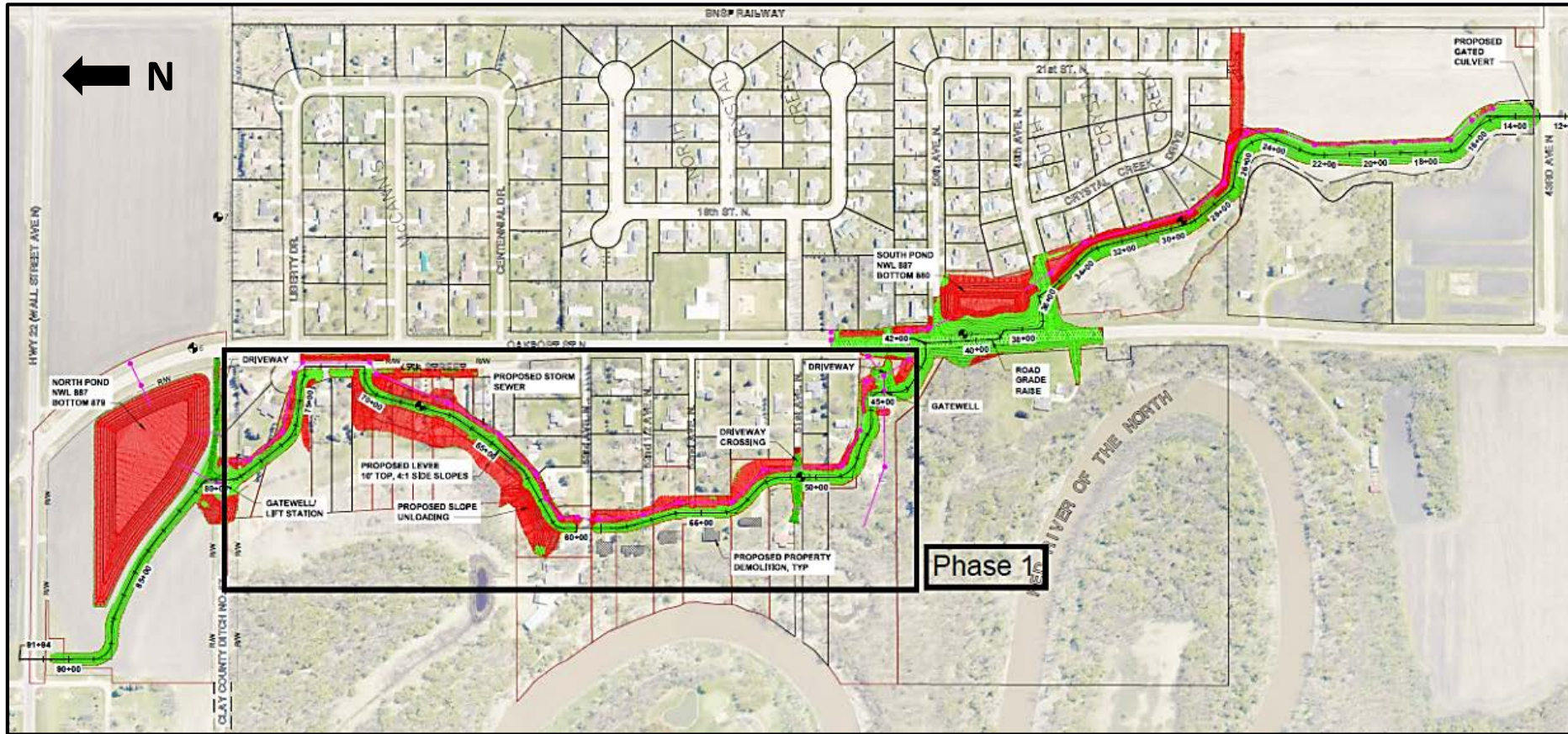
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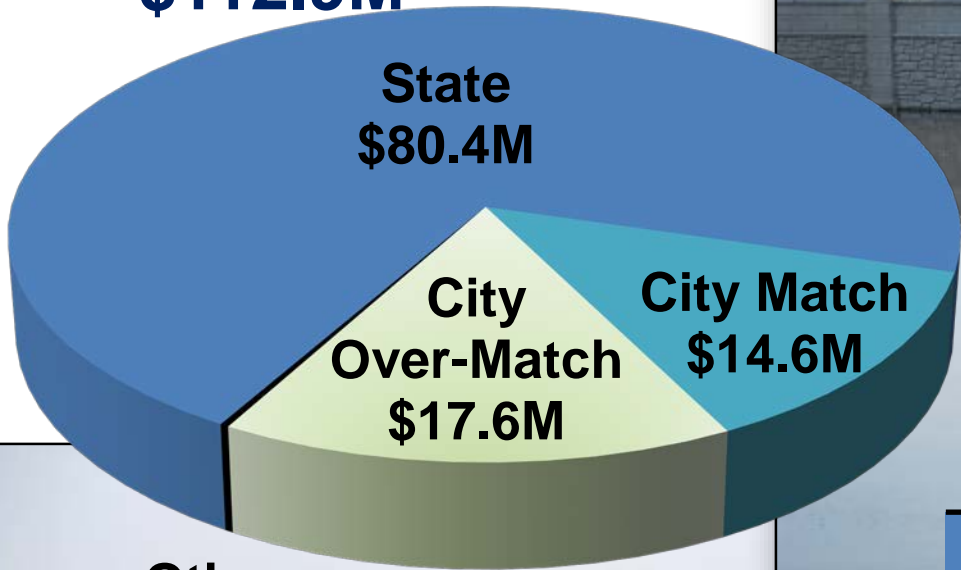


North Moorhead Project

Proposed Action: Award Phase 1 Bid



Post-2009 Total: \$112.9M



Floodwall top elevation:
45 feet



Levee top elevation:
44 feet

Post-2009 City Project Summary

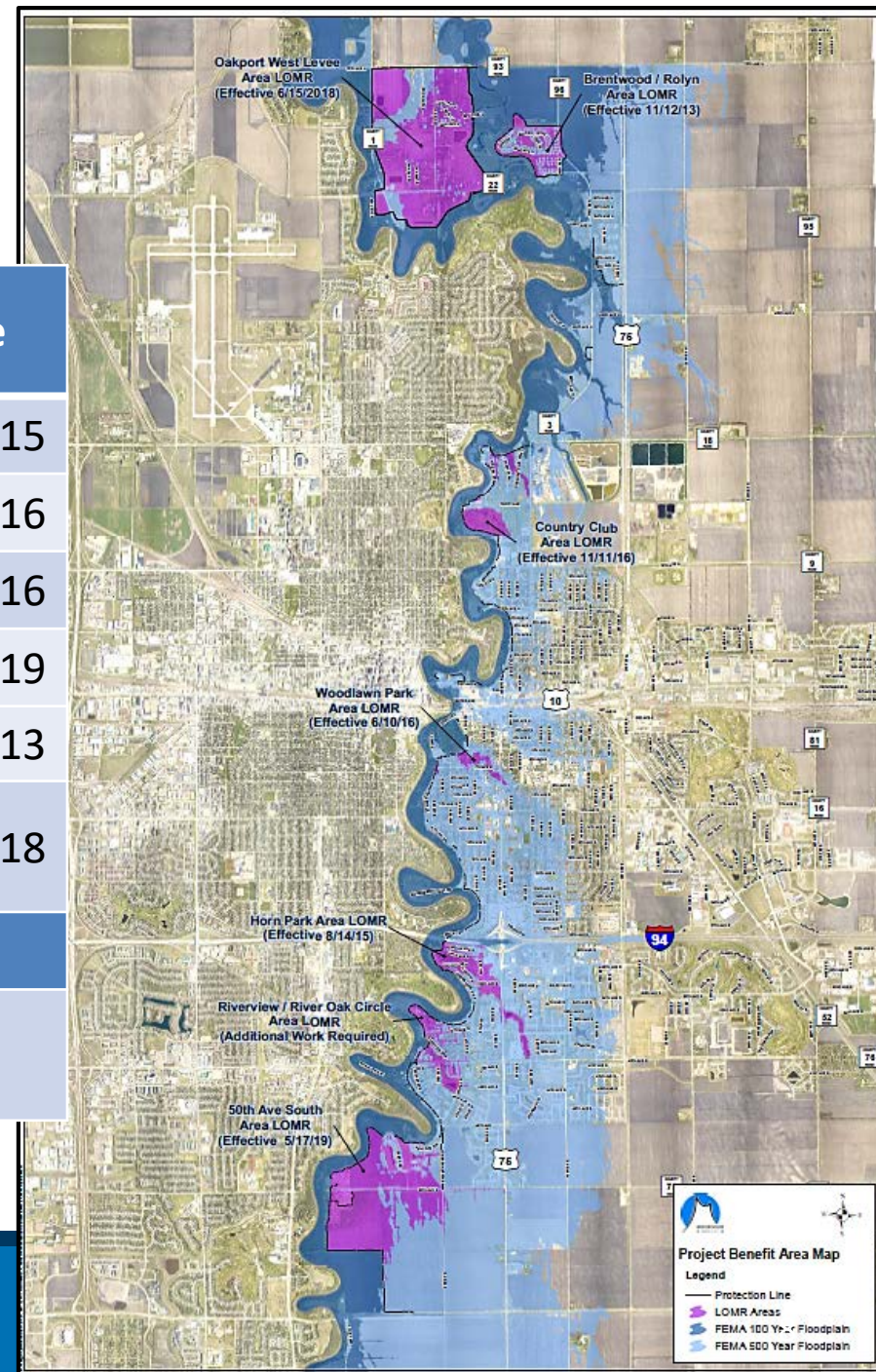
| | |
|--------------------------------|------|
| Voluntary acquisitions | 268 |
| Partial Acquisitions/Easements | 75 |
| Levees/floodwalls (miles) | 12.1 |
| Removable floodwall closures | 5 |
| Stormwater pump stations | 19 |
| Stormwater gates | 78 |
| Sanitary pump station upgrades | 5 |



FEMA Accreditation (2012 FEMA Floodplain)

| Area | # of Parcels | # of Structures | Date |
|---------------------------------|-----------------|--------------------|----------|
| Horn Park | 117 | 87 | 08-14-15 |
| Woodlawn Park | 37 | 35 | 06-10-16 |
| Country Club | 45 | 7 | 11-11-16 |
| 50 th Ave S | 55 | 0 | 05-17-19 |
| Brentwood | 102 | 36 | 11-12-13 |
| Oakport West Levee Area | 177 | 165 | 06-15-18 |
| Total | 533 | 330 | |
| Riverview/ River Oaks Circle | 176 | 17 | * |

*Additional acquisition & construction needed



| DNR Grant # | Amend # | Effective Date | Grant Amount | Required Local Match |
|-------------------|----------|-----------------|---------------------|----------------------|
| B30914/3000000599 | 0 | 07-21-09 | \$8,000,000 | \$8,124,146 |
| | 1 | 04-23-10 | \$15,000,000 | |
| | 2 | 11-15-10 | \$3,000,000 | |
| | 3 | 2-10-11 | \$3,000,000 | |
| | 4 | 11-02-11 | \$12,000,000 | \$4,292,298 |
| | 5 | 01-27-12 | \$4,500,000 | |
| | 6 | 08-16-12 | \$11,500,000 | |
| | 7 | 09-20-13 | \$7,000,000 | |
| | 8 | 10-03-14 | \$7,200,000 | |
| 56371/3000031263 | 0 | 12-17-12 | \$1,000,000 | \$1,000,000 |
| 63810/3000039375 | 0 | 06-25-13 | \$500,000 | \$500,000 |
| 30882/3000121702 | 0 | 09-05-17 | \$300,000 | \$300,000 |
| | 1 | 04-11-18 | \$383,000 | \$383,000 |
| 149304/3000142690 | 0 | 11-13-18 | \$4,000,000 | \$0 |
| | 1 | 04-12-19 | \$2,000,000 | |
| | 2 | Pending | \$1,043,000 | |
| Total | | | \$80,426,000 | \$14,599,444 |

Future Capacity (with funding available)

| Year | Acquisitions & Projects | Capacity | |
|------|---------------------------------------|--|----------------|
| 2020 | North Moorhead Project Phase 2 | \$6.0M | \$22.5M |
| | Category B Acquisitions | \$8.5M | |
| - | Sanitary Lift Station #2 | \$2.0M | |
| 2021 | 1 st Ave N Levee/Floodwall | \$2.0M | |
| | Stormwater Lift Stations | \$4.0M | |
| 2022 | Category B Acquisitions | \$7.0M | \$10.5M |
| | - | Riverview Circle Levee/40 Ave S Road Raise | |
| 2023 | & Category A Acquisition | \$3.5M | |
| 2024 | Category C Acquisitions | \$11.5M | \$11.5M |
| | | | |
| 2025 | | | |
| | | Total | \$44.5M |

Flood Risk

- 8 of top 10 flood events within the last 30 years
- Flood magnitudes & frequencies changing



Historical Crests

| Date | Crest (feet) |
|------------|--------------|
| 03-28-2009 | 40.84 |
| 04-18-1997 | 39.72 |
| 04-07-1897 | 39.10 |
| 04-09-2011 | 38.81 |
| 04-15-1969 | 37.34 |
| 04-05-2006 | 37.13 |
| 03-21-2010 | 36.99 |
| 04-14-2001 | 36.69 |
| 04-09-1989 | 35.39 |
| 04-08-2019 | 35.03 |

Historic Probabilistic Forecasts vs **Actual Crest**

| Flood Year | Final Probabilistic Forecast | | | | | | | | |
|------------|------------------------------|------|------|---------------|---------------|------|------|------------|---------------|
| | 90% | 80% | 70% | 60% | 50% | 40% | 30% | 20% | 10% |
| 2001 | 31.6 | 32.8 | 33.3 | 33.6 | 34.0 | 34.2 | 34.8 | 35.1 | 36.6 36.69 |
| 2006 | 32.1 | 32.4 | 32.6 | 32.9 | 33.1 | 33.6 | 34.7 | 35.5 | 36.8 37.13 |
| 2009 | 36.5 | 37.2 | 37.7 | 38.3 | 38.6 | 39.0 | 39.6 | 40.3 | 40.7 40.84 |
| 2010 | 33.8 | 34.6 | 35.9 | 36.9 36.99 | 38.0 | 39.4 | 39.9 | 1.3 | 42.7 |
| 2011 | 36.4 | 36.9 | 37.7 | 38.1 | 38.8 38.81 | 40.2 | 41.3 | | 1.0 |
| 2013 | 39.3 33.22 | 39.4 | 39.8 | | 40.3 | | 41.3 | 1.6 | 42.4 |
| 2019 | 34.9 35.03 | | 36.5 | | 37.9 | | 38.9 | | 40.3 |



Proposed Actions

- A. Resolution to Authorize Amendment #2 to Flood Damage Reduction Grant
- B. Award Bid: North Moorhead Project, Phase 1