



STORM WATER MANAGEMENT POLICY

REVISED Date: 9/6/2023

ENGINEERING DEPARTMENT
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Intent of Policy

- A. The purpose of this policy is to provide guidance when working with the City of Kindred to establish uniform standards that work within the framework of the City's storm water infrastructure with the intent of mitigating storm water runoff impacts to surrounding areas.

Storm Water Management Plan

- A. A Storm Water Management Plan (Plan) shall be created for all property greater than one-half acre with the intent of development. Examples of development include but not limited to the following:
1. Building and / or parking lot expansion
 2. Redevelopment
 3. New construction of agriculture or undeveloped land.
- B. The Plan shall be prepared by a Professional Engineer registered in the state of North Dakota indicating compliance with storm water requirements outlined within this policy. Submission and approval of the Plan is required prior to plat and building permits being issued. Plan and design requirements can be found in Appendix A and B.
- C. Approval of storm water management plan to be considered part of the plat or civil site review process.
- D. Additional storm water management provisions can be found in *Chapter 9-04 Storm Water Management* of the *Title IX Water and Sewers* ordinance.

Storm Water Discharge Requirement

- A. The maximum storm water discharge rate shall be limited to undeveloped vs. developed conditions for 2-year, 10-year and 100-year rainfall events.
- B. Storm water to be discharged directly to existing drainage infrastructure such as storm sewer, culverts, ditches, etc. within a public right-of-way. No water to be discharged onto adjacent properties without prior approval and / or easements.
- C. Core area storm water discharge to be managed and directed to as few discharge locations as able to reduce sheet flow from entering the City right-of-way. Storm water discharge not to exceed existing discharge rates onto adjacent properties. See Appendix A for additional information.

Water Quality Treatment

- A. The City of Kindred follows state requirements for water quality.

APPENDIX A: Storm Water Management Plan

Content Requirements

A. Core Area Redevelopment

1. The existing core area of Kindred will not require a Plan until storm sewer infrastructure is available in these areas to service runoff or unless recommended by City Engineer and approved by City Council.
2. A core area redevelopment map is in Appendix C showing the boundary for the core area and all parcels that are exempt from creating a Plan.

B. Site Development

1. All site designs greater than one-half acre require a Plan as indicated in the below “Storm Water Management Plan Content Requirements” table.
2. Requirements may be waived or deferred at the discretion of City Engineer.

C. Subdivision / Land Development

1. All new subdivision and land development require a Plan to be prepared as indicated in the below “Storm Water management Plan Content Requirements” Table.
2. Not required for simple lot splits
3. Requirements may be waived or deferred at the discretion of City Engineer.

Storm Water Management Plan Content Requirements					
Requirement	Core Area	Site Development (Private Infrastructure)			Land Development (Public Infrastructure)
		Under 1/2 Acre	1/2 to 10 Acres	Over 10 Acres	
Hydraulic Model	No	No	Yes	Yes	Yes
Summary Tables	No	No	Yes	-	-
Stormwater Report	No	No	No	Yes	Yes
Narrative	-	-	-	Yes	Yes
Summary Tables	-	-	-	Yes	Yes
Exhibits	-	-	-	Yes	Yes
Storm Sewer Design Calculations	-	-	-	-	Yes
Detention Pond Calculations	-	-	-	Yes	Yes
Inlet Design Calculations	-	-	-	-	Yes

Notes

1. Development located within a previously approved Plan, may have requirements waived by the City Engineer.
2. Summary tables to be included on Engineer Drawings when not part of full Storm Water Report.

Hydraulic Model

- A. Storm water to be modeled using storm water modeling software such as the following:
 - 1. SWMM
 - 2. Hydrocad (Small Detention Facilities Only)
 - 3. Autodesk Sanitary and Storm Analysis (SSA)
 - 4. FHWA Hydraulic Toolbox
 - 5. FHWA HY-8 Culvert Hydraulic Analysis
 - 6. Approved equal
- B. Computer outputs
 - 1. Drainage area hydrographs
 - 2. Detention pond stage / storage tables

Stormwater Report Requirements

- A. Narrative on upstream and downstream impacts of proposed project, assumptions, methodologies and analysis used in selecting the storm water management solutions for the Plan.
- B. Summary Tables
 - 1. Lot size
 - 2. Impervious and pervious areas: List each surface type in square-foot and acres per drainage basin
 - 3. Undeveloped peak runoff: 2, 5, 10, 100 Year Events
 - 4. Developed peak runoff: 2, 5, 10, 100 Year Events
 - 5. Detention pond water elevations, volume, and release rates: 2, 5, 10, 100 year events.
- C. Required Exhibits
 - 1. Location map
 - 2. FEMA flood map
 - 3. NRCS hydrologic soil group map
 - 4. Existing drainage patterns
 - 5. Proposed drainage patterns
 - 6. Storm water collection system
 - 7. Detention pond layout
 - 8. Flow pattern map of impacts when the storm water infrastructure is overwhelmed or plugged, and all drainage is overland.
- D. Other Data
 - 1. At the direction of the engineer, additional deliverables may be required or waived. Additional deliverables could include but not limited to the following:
 - a. Storm Sewer Design Calculations (Public Infrastructure Only)
 - b. Inlet Design Calculations (Public Infrastructure Only)

- c. Master plans
- d. GIS data
- e. Storm Water Models

Appendix B: Storm Sewer Infrastructure Design

Design Criteria

- A. Runoff calculations
 - 1. Peak Flow and Volume runoff calculations
 - 2. NOAA Atlas 14 Hydrology as published by the National Weather Service
 - 3. Design Events: 2, 5, 10, 100
 - 4. Hydrologic Soil Group as defined by the NRCS Web Soil Survey.
 - 5. Time of Concentration
 - a) Per TR-55
 - b) Maximum Sheet Flow Length: 100'
 - c) Minimum Time of Concentration: 10 minutes
 - d) Runoff curve number or runoff coefficient

Infrastructure Design

A. Storm Sewer Pipe:

- 1. Design Event:

Street Classification	Design Event
Local	2 Year
Collector	2 Year
Arterial	5 Year
County or State Highway	Per NDDOT

- 2. Allowable surcharging in pipes to 1.0' below grate elevation during design event.
- 3. Minimum self-cleansing velocity of 2.0 feet per second during design event

B. Inlets and Streets

- 1. Design Event (as indicated above)

Street Classification	Max Depth	Max Encroachment
Local	No Curb Overtopping	Flow may spread to the crown
Collector	No Curb Overtopping	12 feet from centerline
Arterial	No Curb Overtopping	7.5 feet from face of curb
State Highway	Per NDDOT Requirements	

- 2. 100 Year Event

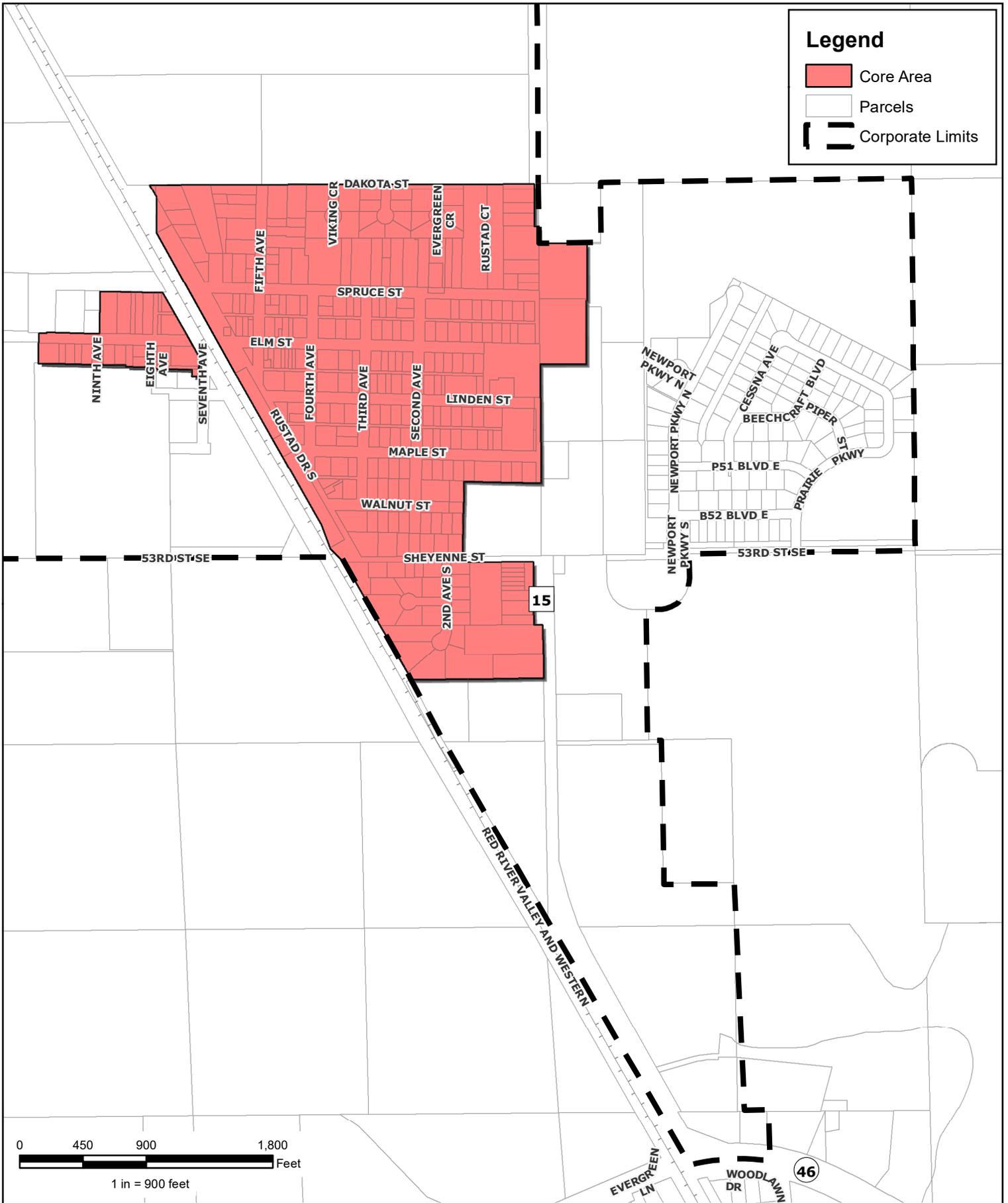
Street Classification	Max Depth	Max Encroachment
Local	6" at Crown	Street Right of Way or Stormwater Easements
Collector	6" at Crown	Street Right of Way or Stormwater Easements
Arterial	3" at Crown	Street Right of Way or Stormwater Easements
State Highway	Per NDDOT Requirements	Per NDDOT Requirements

3. Minimum Inlet/Manhole Grate Elevation in Relation to Detention Pond 100 Year Event
 - a) In Streets: 1.0 foot above freeboard elevation
 - b) In Greenspace: High water level
- C. Detention Facilities
 1. Operation
 - a) Detention facilities will empty or return to normal water level within approximately 24 hours or as accepted by City Engineer.
 - b) Storm water pumping stations to consist of 2 or more pumps of equal size.
 - c) Storm water ponds to not exceed freeboard with only one pump.
 2. Small Facilities: Under 7.5 Acre-Ft of Storage
 - a) 1.0' Freeboard Above 100 Year Event
 - b) Pre and Post Development meets 2, 100-year events.
 3. Regional Ponds: Over 7.5 Acre-Ft of storage
 - a) 2.0' Freeboard Above 100 Year Event
 - b) Pre and Post Development meets 2, 10, 100 Year Events
 4. Wet Ponds
 - a) Geotechnical slope analysis required
 - b) Min Depth 8.0' below pool elevation
 5. Dry Ponds
 - a) Bottom sloped to drain
 - b) Mowable
- D. Stream Crossings
 1. Per North Dakota Century Code 89-14.

**APPENDIX C:
Core Area Map**

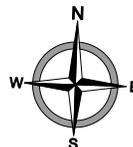
Legend

-  Core Area
-  Parcels
-  Corporate Limits



EXCLUDED STORM WATER POLICY AREAS KINDRED, NORTH DAKOTA

Created By: TJS Date Created: 02/07/23 Date Saved: 02/21/23 Date Plotted: 04/02/14 Date Exported: 02/21/23
Plotted By: Tanner Schmidt Parcel Date: 08/05/22 Aerial Image: 2022 County NAIP SIDS Elevation Data: Lidar
Horizontal Datum: NAD 1983 StatePlane North Dakota South FIPS 3302 Feet Vertical Datum: NAVD 1988
T:\BaseData\ND\City\Kindred\Kindred_StormWaterPolicy_Map_8pt5x11.mxd



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engineering, inc.