

Adopted by City Council 1/7/13



**Stormwater Management Standards and Design Manual  
January 2013**

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# I. Introduction

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The City of Grand Forks Stormwater Management Ordinance requires the development of Stormwater Management Plans for most development and land disturbing activities within the City and its extraterritorial jurisdiction. Grand Forks has three stormwater compliance standards that must be met and form the basis of the City's regulatory and review criteria, they are:

- The First compliance standard that must be met is the requirements of the North Dakota Pollutant Discharge Elimination System Permit. The focus of this document is primarily on the quality of stormwater runoff and is regulated by the state of North Dakota.
- The second compliance standard is the Letter of Map Revision (LOMR) issued by the Federal Emergency Management Agency (FEMA) and received by the City in August 2007. The Letter of Map Revision is based on the 2007 Flood Insurance Rate Study performed by the Corp of Engineers and primarily focuses on the quantity of stormwater runoff and water surface profiles of certain drainage conveyances. Development that potentially increases the quantity of stormwater runoff may raise water surface profiles, jeopardize the Letter of Map Revision and negatively impact the flood risk to the community.
- The third compliance standard is Chapter 15 of the Grand Forks City Code.

In addition to the above listed compliance standards, recommendations in the Grand Forks Perimeter Drainage Study will be used in the master planning and review of stormwater management plans, particularly in the undeveloped areas included in the study.

To provide guidance and assistance to those needing to comply with the Stormwater Management Ordinance, the City has prepared this Stormwater Management Standards and Design Manual. While the Stormwater Management Ordinance outlines approval and review procedures, approval standards, the application process, enforcement and penalties, the Manual provides guidance to implement the Stormwater Management Ordinance and aid in preparation of the Stormwater Management Plans. In developing this Stormwater Management Standards and Design Manual, it is intended to:

- Provide unified standards and provide detailed, specific standards and criteria.
- Simplify methods and procedures thereby reducing the effort to prepare and review Stormwater Management Plans.
- Provide standards that will prevent future stormwater problems and enhance the environment.

Provide guidance as to financial requirements of the developer and potential city involvement.

The field of stormwater management rules, technology, requirements and regulations change over time; therefore, this manual will be revised as needed to reflect these changes.

Within this document are a number of references to determinations to be made by the City Engineer or other City departments. This is needed due to the inability to describe all circumstances that may exist through the implementation process. The appeal process for these decisions and determinations may be made to the City Council upon written request with supporting information to the City Engineer.

If you have any questions, please contact the City of Grand Forks Engineering Department at (701) 746-2640.

## II. Hydrology

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Hydrology is generally defined as the science dealing with the relationship between water on and under the earth and in the atmosphere. In this manual, hydrology will deal with the estimating of flow rates and volumes from a precipitation event. For the design of stormwater conveyance or retention/detention facilities, this is usually considered in terms of peak runoff or discharge in cubic feet per second and hydrographs as discharge per time.

This section provides the generally accepted criteria for determining stormwater runoff peak design rates, durations and volumes to be used in preparation of Stormwater Management Plan Reports, drainage studies, plans and stormwater management facility design and review.

### **Storm Frequency**

Storm frequency refers to a storm or precipitation event that can be used in the design of a stormwater management plan. Grand Forks Design Storm Frequencies shall include 2, 5, 10, 25 and 100 year storm events.

### **Hydrologic Analysis**

The City accepts hydrologic analysis using either the rational method or programs based on the NRCS methodologies as may be appropriate. Other methods may be accepted but will need additional review time and justifications.

### **Regional Impervious Surface Design Limit Hydrology/Hydraulics**

The City has considered the inherent variability of large area planning documents as actually implemented over time. The City has also considered the cost advantages of limiting peak runoffs from highly impervious areas.

The policy implementation of these considerations is that regional collection and treatment systems are to be designed to convey and treat stormwater to a uniform level of 40% imperviousness. Stormwater flow and treatment above those levels will be attenuated on an individual site(s) basis.

## Rational Method (Regional)

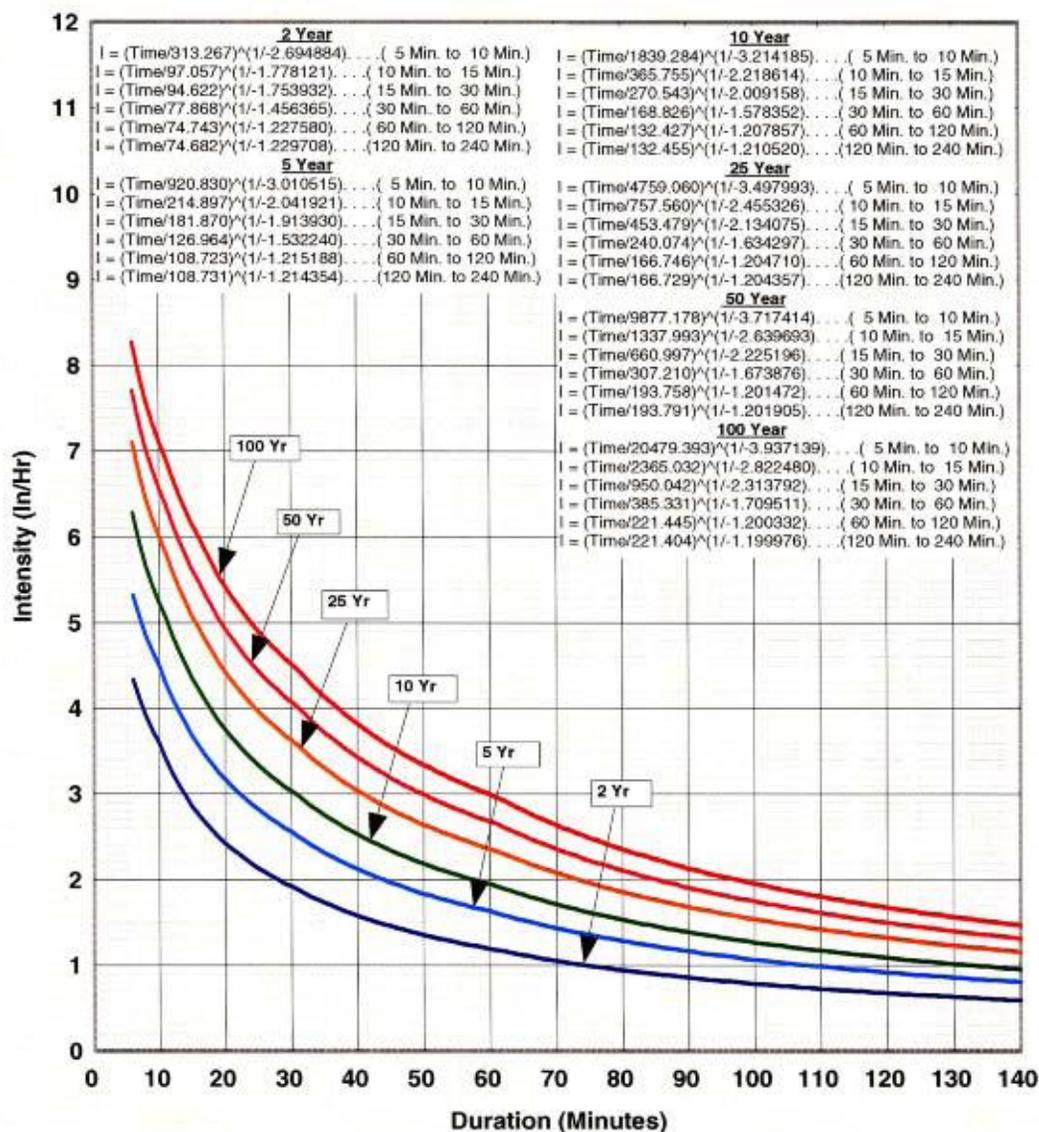
The Rational Method will use the IDF curves provided on figure 3-1.

The City accepts a base time of concentration of 15 minutes for first inlets in a typical subdivision situation. Use of longer time of concentration will require submittal of calculations and justifications.

The runoff coefficients shall be in accordance with land use zoning as shown in table 3-1.

**Figure 3-1**  
**IDF Curve for Grand Forks**

Latitude 47° 55' N Longitude 97° 04' W



Source: HYDRAIN - Version 6.1 - March 1999  
Integrated Drainage Design - Computer System  
Data Base Source:

- (1) National Weather Service (NWS) technical memorandum HYDRO-35
- (2) National Oceanic and Atmospheric Administration (NOAA) Atlas 2 doc.

**Table 3-1: Runoff Coefficients to be used with the Rational Method for Regional Systems**

<b>Land Use Classification</b>	<b>Description</b>	<b>Max. % Impervious Area</b>	<b>Runoff Coefficient I</b>
A-1	Limited Development	20%	0.30
A-2	Agricultural Reserve	20%	0.30
R-1	Single Family Residential	35%	0.42
R-2	One & Two Family Residential	40%	0.45
R-3	Multi-Family (Medium Density)	45%	0.47
R-4	Multi-Family (High Density)	55%	0.53
R-5	Mobil Home Residential	40%	0.45
RM	Manufactured Home Residential	40%	0.45
B-1	Limited Business	65%	0.58
B-2	Shopping Center	75%	0.64
B-3	General Business	85%	0.69
B-4	Central Business	100%	0.77
I-1	Light Industrial	80%	0.66
I-2	Heavy Industrial	85%	0.69
O-1	Office Park	65%	0.58
MU	Mixed Use	85%	0.69

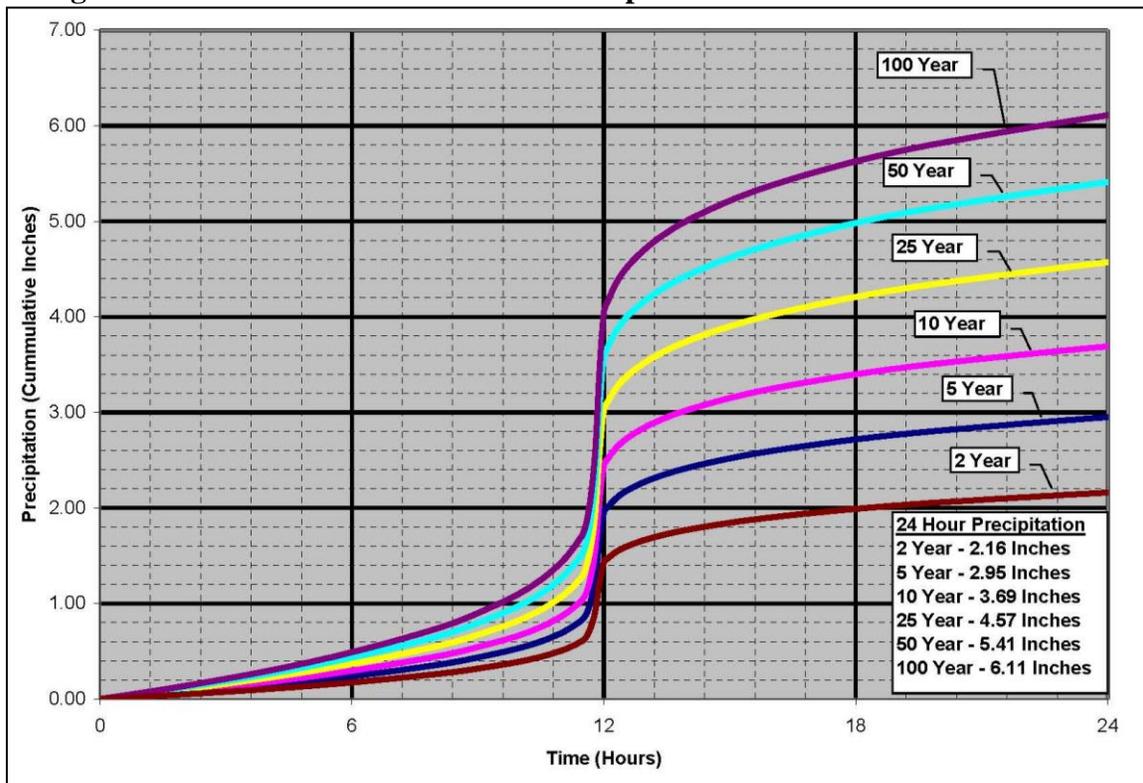
\*These runoff coefficients are only to be used on regional systems where the locations of streets and developments are only generally known. These runoff coefficients recognize that not all parcels within a regional area will be built to the full impervious potentially available. For locations where specific information is available, the runoff coefficient will be calculated based on the amount of impervious surface planned or available.

## NRCS Curve Number Method

The Natural Resources Conservation Service (NRCS), formerly known as the Soil Conservation Service, curve number method uses the same basic data as the rational method, but is a more sophisticated method as that it also considers the time distribution of the rainfall, the initial rainfall losses to interception and depression storage, and the infiltration rate that decreases during the course of the storm. Since this method utilizes more information than the rational method does, it is a more accurate method to estimate peak flow and storage from larger watersheds.

The Natural Resources Conservation Service developed four dimensionless 24-hour rainfall distributions using the Weather Bureau's Rainfall Frequency Atlas. Distributions are applied to a total hyetograph (graph showing rainfall intensity over time) to define an excess precipitation (runoff) hyetograph. In Grand Forks, the Natural Resources Conservation Service Type II storm is to be used. **Figure 3-2** is a graphical representation of the Natural Resources Conservation Service Type II storm showing accumulated precipitation over time in Grand Forks.

**Figure 3-2: Grand Forks Cumulative Precipitation over Time – NRCS Method**



The Natural Resources Conservation Service has established hydrologic curve numbers that can be used in determining the amount of stormwater runoff. These curve numbers are based on land use, soil permeability, ground cover, and development density. **Table 3-2** provides curve numbers to be used in Grand Forks that would correspond to a Type C soil.

**Table 3-2: NRCS Curve Numbers (Regional)**

<i>Land Use Classification</i>	<i>Description</i>	<i>Max. % Impervious Area</i>	<i>Curve Number</i>
A-1	Limited Development	20% *	80
A-2	Agricultural Reserve	20% *	80
R-1	Single Family Residential	35%	82
R-2	One & Two Family Residential	40%	83
R-3	Multi-Family (Medium Density)	45%	84
R-4	Multi-Family (High Density)	55%	86
R-5	Mobil Home Residential	40%	83
RM	Manufactured Home Residential	40%	83
B-1	Limited Business	65%	88
B-2	Shopping Center	75%	89
B-3	General Business	85%	91
B-4	Central Business	100%	94
I-1	Light Industrial	80%	90
I-2	Heavy Industrial	85%	91
O-1	Office Park	65%	88
MU	Mixed Use	85%	91

\* % Impervious Relates to Developed Lot and adjacent roadways

In situations where it is required to “not exceed pre-development conditions” the City accepts a curve number of **82** as the pre-development representative curve. This number generally reflects the amount of development runoff allowed in the Letter of Map Revision.

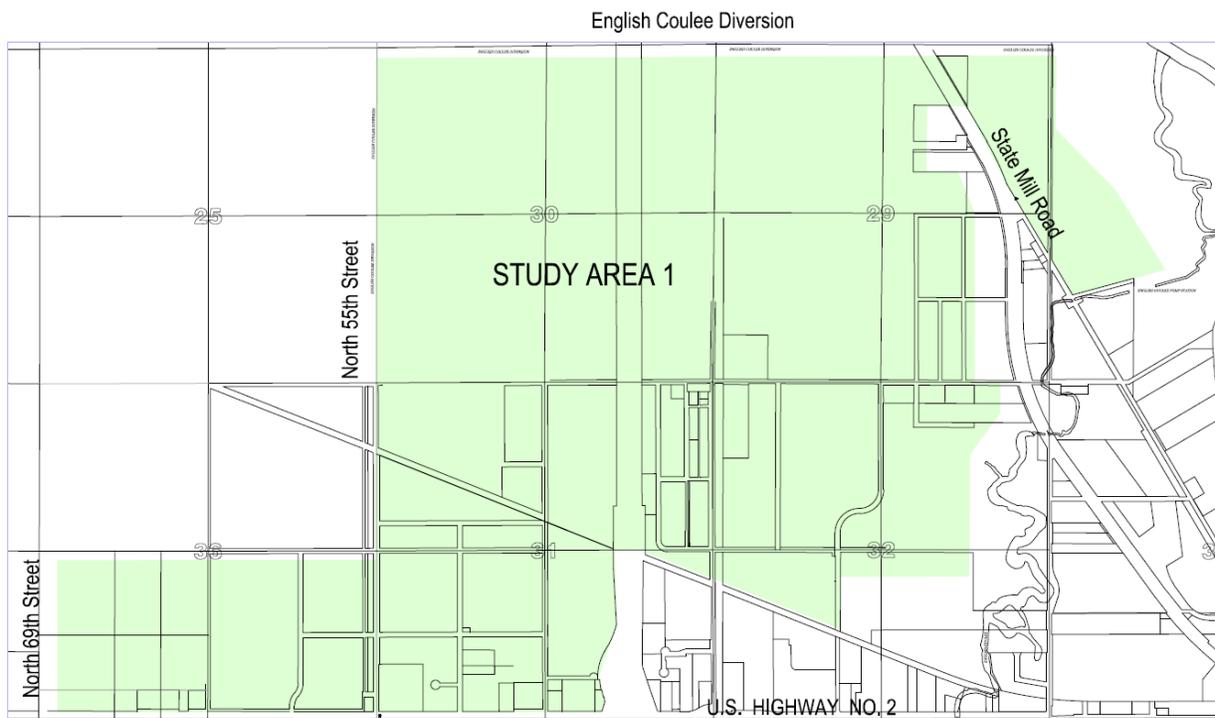
### III. Perimeter Drainage Study Area Map

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#### Perimeter Drainage Study

In 2008 the City adopted a report which outlined an overall plan to meet water quantity and quality challenges. The study identified four specific areas, or zones, with special characteristics. Listed in the following sections are thumbnail notes of special requirements for each area. Please refer to the fall study for details and appropriate applications.

#### Perimeter Drainage Area #1

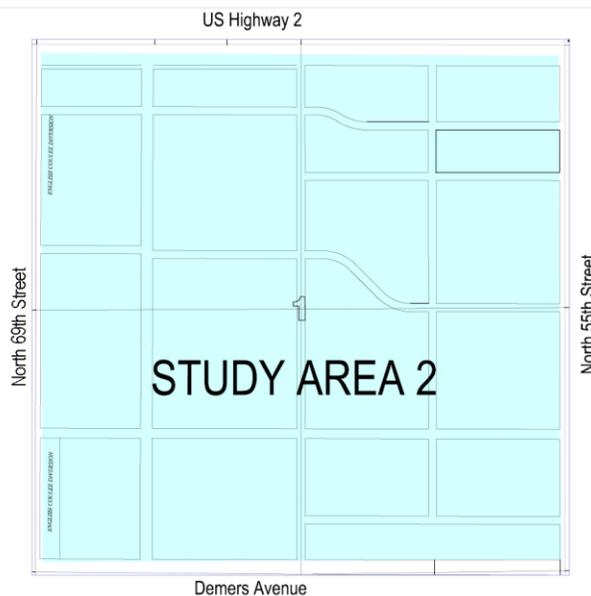


#### Special Considerations:

- Runoff from Area #1 must flow into either the English Coulee or English Coulee Diversion. See the perimeter drainage study document which delineates the area that drains into the English Coulee and the area that drains into the English Coulee Diversion.
- Corps of Engineers allows no discharge or pumping to the English Coulee Diversion when the flows and water surface elevation on the Red River or Diversion approach the 100 year event..

- Corps of Engineers requires additional storage capacity when discharge to English Coulee Diversion is restricted.
- ND Department of Transportation restricts discharges to highway ditches (I-29 & Highway 2).
- Stormwater runoff from the area north of Highway 2 and west of North 55<sup>th</sup> Street must discharge to the English Coulee Diversion upstream of the North 55<sup>th</sup> Street stormwater lift station discharge.
- Stormwater cannot be pumped into the English Coulee Diversion during 100-year flows of the Red River or English Coulee Diversion.
- Attenuate peak stormwater discharges using stormwater ponds or other appropriate methods; size facilities to hold stormwater during times of high water on the English Coulee Diversion and Red River of the North when or at the 100-year flow event. The 25-year design pond with 3 ft. of freeboard will be considered adequate to meet this requirement.

### **Perimeter Drainage Area #2**

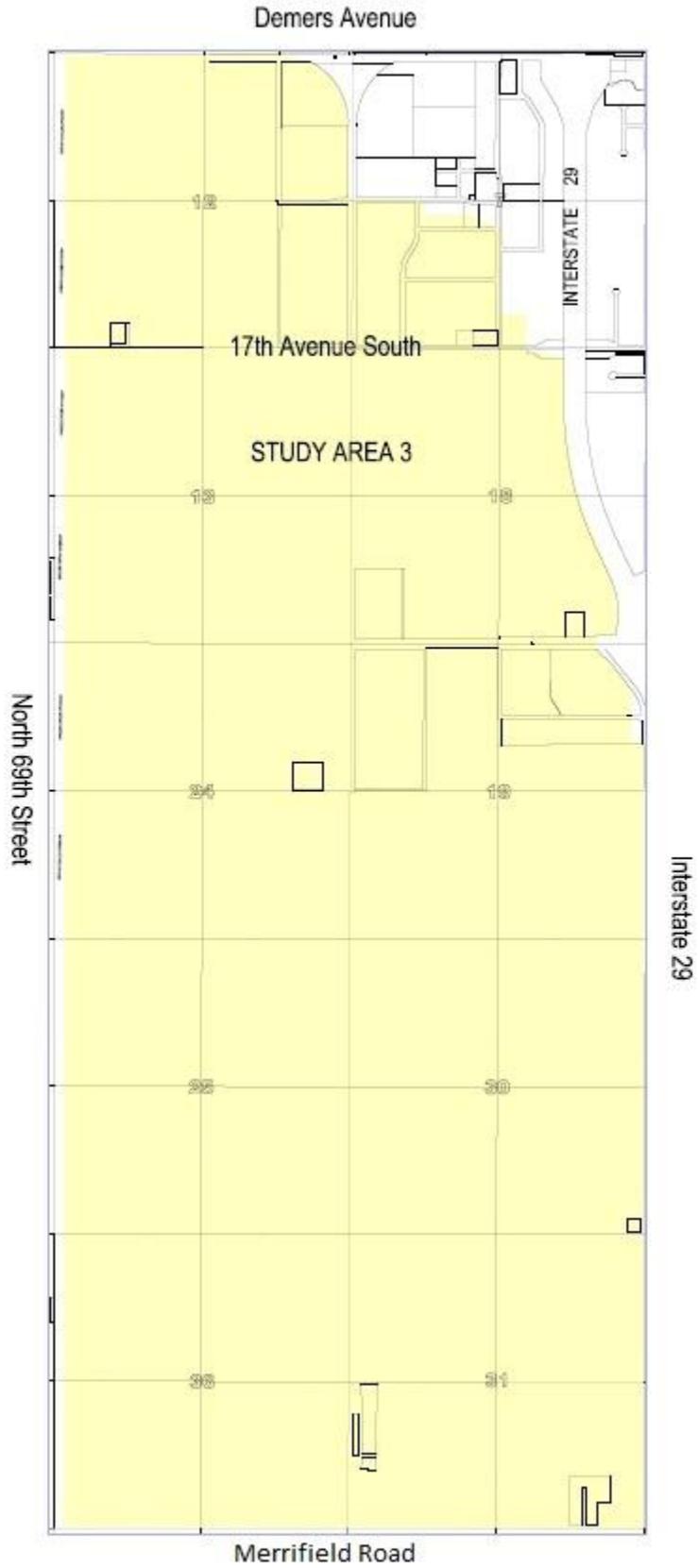


### **Special Considerations:**

- Area must discharge to existing lift station located at 55<sup>th</sup> Street and 6<sup>th</sup> Avenue North.
- Lift station discharges to English Coulee Diversion.
- Flows need to be attenuated by stormwater detention ponds.
- Corps of Engineers prohibits pumped discharge to English Coulee Diversion except at existing forcemain discharge point.

- Attenuate peak stormwater discharges using stormwater ponds or other appropriate methods; size facilities to hold stormwater during times of high water on the English Coulee Diversion and Red River of the North when or at the 100-year flow event. The 25-year design pond with 3 ft. of freeboard will be considered adequate to meet this requirement.

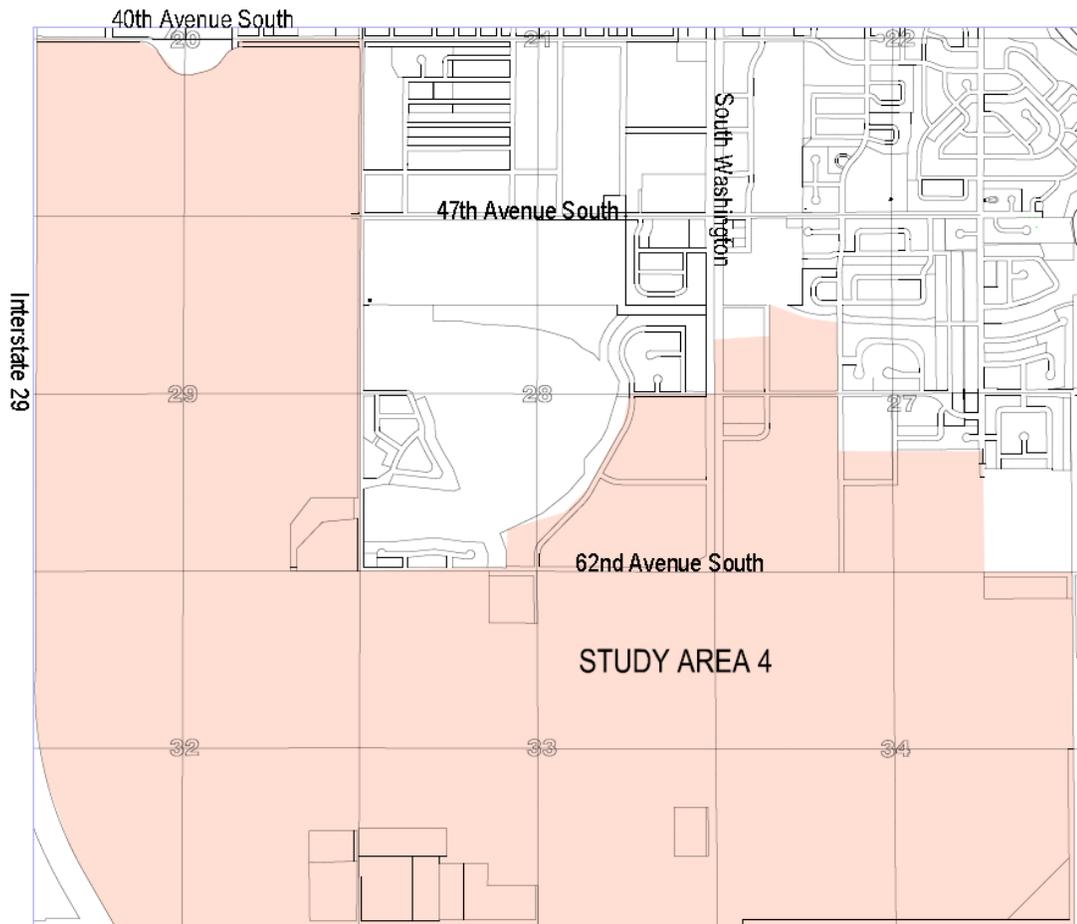
**Perimeter Drainage Area #3**



Special Considerations:

- Cannot discharge to English Coulee Diversion.
- ND Department of Transportation restricts discharge to I-29 ditch for nuisance storm events.
- Discharge to English Coulee limited to Corps Of Engineers Flood Insurance Study and FEMA Letter of Map Revision.
- Discharges are limited to approximately 0.1 cfs/acre of drainage for the 25 year storm event. The 100-year discharge is also limited to 0.1 cfs/acre. Storage needs greater than the 25-year pond design can be attributed to the 3 ft. pond freeboard area of the holding pond and street storage.
- Stormwater runoff from the area east of the English Coulee Diversion and North 69<sup>th</sup> Street shall not drain into the English Coulee Diversion and must drain east to the English Coulee.

**Perimeter Drainage Area #4**



Special Considerations:

- No increase in Water Surface Elevation of Southend Drainway, based on Corps of Engineers Flood Insurance Study and FEMA Letter of Map Revision.
- Corps of Engineers ponds provide attenuation for low density development. Minimum additional storage of 9 AF / 160 acres is required for section 32, 33, 34 and south ½ of Section 29. (In almost all cases, water quality criteria will meet this goal.)
- Areas draining to non Corps of Engineers ponds require a minimum storage volume of 27 ac-ft/160 acres of contributing drainage area.

**Property and Easements**

An applicant may need to acquire easements or property as a condition to the approval of a Stormwater Management Plan. If the plan involves directing some or all of the site's runoff to a drainage easement, the applicant shall obtain from the affected property owners any necessary easements or other property interests concerning the flowing of such water.

An applicant may need to dedicate or acquire land for the construction of stormwater management facilities including ponds, Best Management Practices, and piped or open drain systems.

## **IV. Regional Stormwater Management**

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All new subdivisions are required to have a Stormwater Management Plan that includes post development Best Management Practices that meet both runoff quality and quantity requirements.

A Stormwater Management Plan is a plan that delineates physical features that collect, store, convey, and treat stormwater runoff. These facilities normally include detention and retention facilities, streets, storm sewers, inlets, open channels, and special structures, such as inlets, manholes, and energy dissipaters.

It is required by the City of Grand Forks that every applicant for a subdivision or plat approval, or permit to allow site improvements must submit a Stormwater Management Plan to the City Engineer for approval. No subdivision approval or permit to allow site improvement activities will be issued until the Stormwater Management Plan is approved by the City Engineer or a waiver of approval requirements has been granted by City Council.

Stormwater Management Plans will typically include a Stormwater Management Plan Report (with an executive summary), Report Drawings, Maps, and conceptual utility layouts.

### **Approval Process**

#### ***Application***

The application and fees for the regional stormwater management plan (RSMP) are part of the subdivision/plat approval process. The City's Planning Department is in charge of the application process.

Two sets of legible copies of drawings, reports and required information, along with a receipt from the City indicating payment of required processing fees, are required for an application submittal. Plans shall be prepared to a scale appropriate to the site of the project, suitable for the review to be performed and shall contain all the information outlined in this manual.

## ***Approval***

Approvals for the regional stormwater management plan are part of the subdivision/plat approval process. Review and technical comments on the plan will be provided by the Office of the City Engineer during the platting process.

Should an Applicant request to change the Stormwater Management Plan prior to approval of the plat, the changes will be considered part of the original approved plan.

If the plan is very complex or has potential for significant controversy, the City Engineer may bring the plan before the City Council for consideration and public comment.

Prior to commencing construction, the applicant must also obtain a Stormwater Permit from the City and ND Department of Health.

## ***Approval Conditions***

Due to unique environmental and natural resources of individual watersheds, the City Engineer may specify special requirements or conditions for specific major or minor watersheds within the City and its extraterritorial jurisdiction.

## ***Duration***

The approval period will run for the life of the subdivision subject to any changes to the original concepts, new regulatory requirements, or corrections that may be discovered.

## **Documents**

### ***Stormwater Management Plan Report***

A Stormwater Management Plan Report is a document prepared and stamped by the design engineer that documents methodologies, assumptions and analysis used to arrive at a specific solution for stormwater management problems that may arise from a proposed development or site improvement.

The Stormwater Management Report shall be reviewed and approved by the City Engineer prior to final plat approval. Approval of the Stormwater Management Plan Report shall constitute conceptual approval and shall not be construed as final approval of any specific detailed plans. In addition, as applicable, besides the City of Grand Forks, Stormwater Management Plan Reports may have to be reviewed by other local, state or federal agencies such as ND Water Commission, ND Department of Health, US Army Corps of Engineers or the County Water Resource District. It is the Applicants responsibility to determine if review of their Stormwater Management Plan Report by other agencies is required.

While the content of the report will vary depending on the size and complexity of the proposed development, at a minimum the following should be included in the Stormwater Management Plan Report:

***Narrative***

At a minimum, the narrative shall include a description of: the existing site conditions including land use, land cover, drainage patterns and outfalls; a description of proposed site conditions with regards to site use, site cover, drainage patterns, drainage design, types and locations of Best Management Practices and proposed outfalls; the analysis of the downstream conditions to the point of study.

**Proposed Post-Development BMPs**

Identify and locate all proposed structural and non-structural Best Management Practices, identify each Best Management Practices, and provide pertinent information (Wqv, storage volumes, water surface elevations, location and type of access, etc) for each.

**Software used and underlying hydraulic methodology**

- Description of outfall structure
  - Impervious area/percentage and how it relates to zoning
  - Average Runoff Curve Number for each drainage area
  - Time of concentrations

- Summary tables of the following:
  - pre vs post runoff flow rates
  - minimum required vs proposed water quality volumes
  - minimum required vs proposed drawdown time
- Executive tabulation of operational parameters describing pond conditions and outlet structure elevations of the 2, 5, 10, 25 and 100 year events. For modeling purposes, it may be assumed that all of the 25-year event can make it to the pond. The 100-year event may need to identify the amount of storage needed on private or public property in order to prevent stormwater from breaking out from the regional stormwater management area if special circumstances are identified by the City Engineer.
- Provide a detail drawing of the proposed outlet structure. On the detail, mark the 2, 5, 10, 25 and 100 year event water levels. See Figure 3-3 on page 18 for example.

### ***Report Drawings and Maps***

At a minimum, drawings and maps for the Stormwater Management Report shall contain the following information:

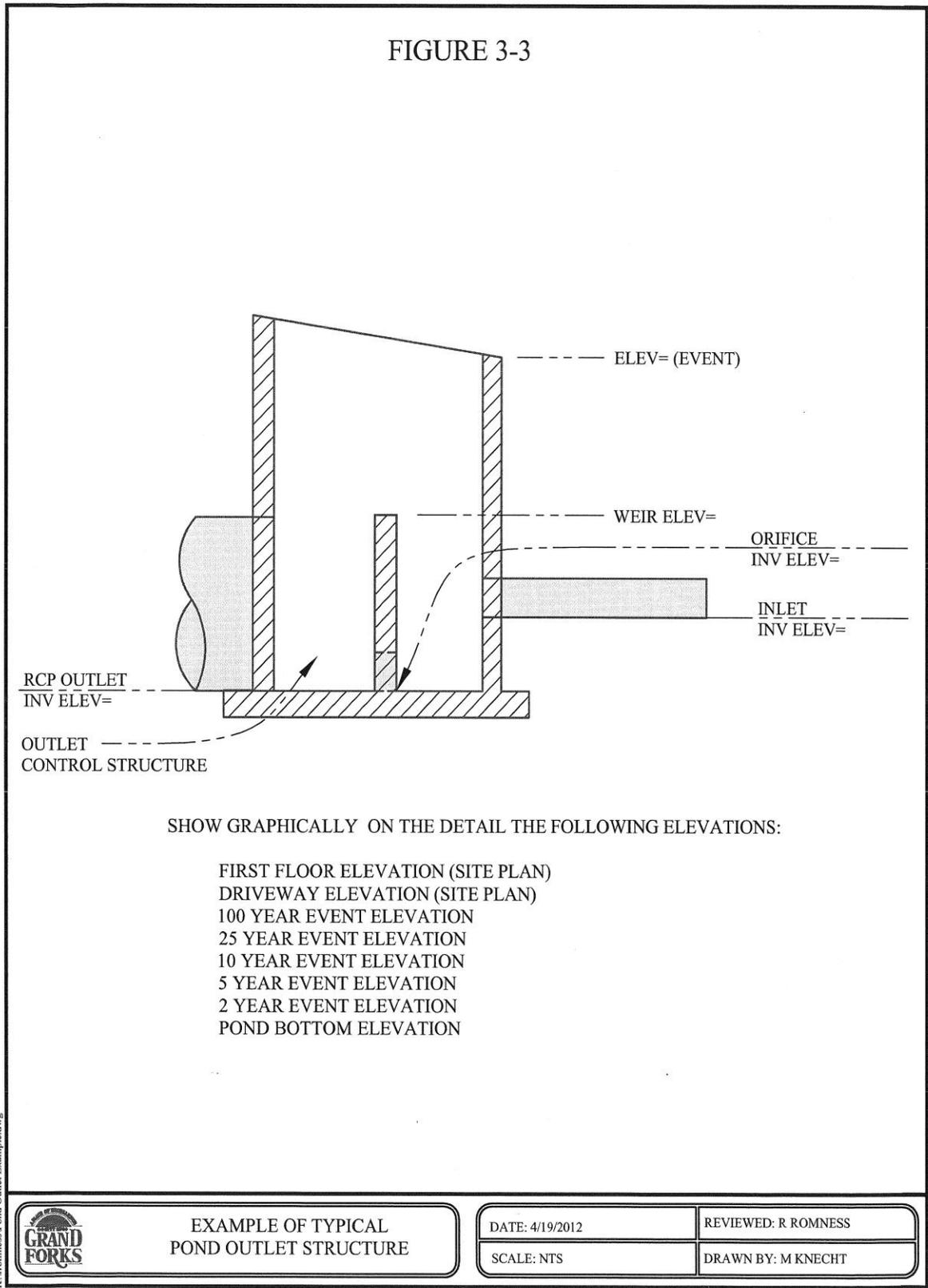
#### 1. Existing Site Conditions Map

The Existing Site Conditions Map shall show the site itself and a minimum of 100 feet of the immediate adjacent area beyond the property lines, and include:

- North Arrow, scale, number of sheets, township, section and range.
- Existing spot shot elevations and/or topography with contour intervals no greater than one foot.
- Show the current land use and improvements such as roads, buildings, parking lots, etc.
- 100-year flood plains, flood fringes and floodways.
- Any streams, rivers, public waters on site or immediately adjacent to the proposed site.
- Location and dimensions of existing stormwater drainage systems including piped systems, culverts, ditches, swales or channels either natural or manmade.

- Show the location and size of any on site or immediately adjacent detention/retention facilities or water quality features.
- Show the extent of existing vegetative cover and limit of proposed clearing.
- Provide a Soils Maps and delineate the soils type(s) and soil boundary(s) of each on site soil type (NRCS data is generally acceptable).

Figure 3-3



- Delineate drainage divides with flow arrows and time of concentration path(s) for each drainage area shown. In the event runoff from off-site, upstream area(s) flow to or through the proposed site, show limits of all contributing drainage areas.

## 2. Proposed Area Conditions Map

The proposed site conditions map will be at the same scale as the existing site conditions map showing the proposed changes including:

- Proposed grading with spot shots or contours at the same interval as the existing site conditions map.
- For site improvements, show proposed improvements such as buildings, roads, parking lots, landscape areas, etc.
- For pond design, the map would show the contributing drainage area(s) and note the 40% impervious design level criteria.
- For regional ponds that are assigned greater than minimum standards, the map would show anticipated land use by zoning allowed.
- A summary tabulation of existing and proposed impervious areas either on map or separate table in the report.
- A summary tabulation of existing and proposed flows at 2, 5, 10, 25 and 100 year events either on map or separate table in the report.
- Delineate drainage divides with flow arrows and time of concentration path(s) for each drainage area shown.
- The type and location of the trunk conveyance system proposed.
- The type, size and location of each water quality or detention/retention system proposed. On a site plan level, include information as to the private site improvements that attenuate quantity and quality of impervious areas greater than 40%.
- Other information particular to the project that the Applicant believes is necessary for the review of the project.

### 3. Offsite Drainage Map

The Offsite Drainage Map shall be prepared at an appropriate scale and, at a minimum, include the following information:

- Name of project, North Arrow, scale, number of sheets, township, section and range.
- Any streams, rivers, public waters or wetlands.
- Location and dimension of existing or proposed stormwater drainage systems including piped systems, culverts, ditches, swales or channels either natural or manmade.
- Show the location and size of any offsite detention/retention facilities, water quality features or other stormwater management facilities.
- Document that the detention and conveyance facilities were designed to accommodate the site.

### 4. Drawings

- Outlet structure detail
- Aesthetic features

### 5. Executive Summary

Summarize the operational parameters of the system. Include:

- Outlet detail (see figure 3-3 on page 18)
- Typical pond cross section
- Location map
- System typical section(s) if a pond is not used.

### ***Construction Plans and Specifications***

The plans submitted to the Engineering Department shall be consistent with the approved Stormwater Management Plan and shall include the following information:

- Geometric, dimensional, structural, foundation, bedding, landscaping, permanent and temporary erosion protection, details as needed to construct the stormwater facility.

Plans and specifications must be stamped by an engineer registered in the State of ND.

### ***Record Drawings***

After construction is complete, the engineer shall provide to the City Engineer electronic PDF files, paper drawings and as-built drawings showing any changes or material modifications. The drawings shall contain the final configuration for all the stormwater management structures constructed.

### **Requirements**

The City of Grand Forks has developed the following standards for Stormwater Management Plans.

### ***Water Quality***

In the design of stormwater management systems, the City of Grand Forks must comply with discharge permit requirements which encourages measures that will prevent introduction of pollutants into stormwater run-off, improve water quality and maintain water quality downstream from development and land disturbance activities. Preferred measures promote use of grass or other buffered area and “wet ponds” for enhancement of water quality.

Water quality measures shall be sized and meet the current requirements of the North Dakota Pollutant Elimination System Permit.

## V. Standard Regional Pond Design

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### Wet Regional Ponds

Ponds designed to serve a regional area (generally considered to be sites over 30 acres) are generally expected to be “wet ponds”.

General design requirements are listed below:

- Pond design shall be in conformance with the current NDPDES permit.
- Minimum pond design shall be to the 25-year storm event.
- Minimum of 3ft. water depth at the normal water level..
- Minimum 3 ft. of freeboard from original ground.
- Maximum side slopes of 4 horizontal to 1 vertical.
- Hard armoring of side slopes from 1 ft. vertical below the normal water depth to 3 ft. vertical above the normal water depth. For 2013, the City may allow up to 3 test ponds at 2 ft. vertical above the normal water depth.
- Aesthetic features such as shape, side slopes, vegetation that are proposed shall be identified on the plans and match the land area requirements identified in the master plan.
- A publicly owned pond will have sufficient ROW access for routine and special maintenance as determined by the City Engineer.
- Provide a minimum of 5 ft. of level ground past the backslope of the pond.
- Provide a minimum 2 ft. wide concrete strip around the perimeter of the pond property for drainage and horizontal control.
- Riprap shall meet City Standard Specifications Class A Material or equal as approved by the City Engineer. Crushed concrete, aggregate or manmade materials may be allowed contingent on engineering review and approval.
- Aeration devices may be required on a case by case basis.
- Unless a specific hydraulic model is available, the available downstream conveyance for the pond outlet may assumed to be free flowing.
- To evaluate the 25 yr. event, assume the entire contributing area can reach the pond.
- A regional pond not within study areas 1, 2, 3, or 4 of the perimeter drainage study will need to conform to the requirements of the nearest study area.
- The regional pond will be designed on a basis of 40% impervious surface over the entire contributing watershed for water quality and quantity calculations. Upon special request, a higher level of impervious design may be considered.
- The pond drawdown time shall be calculated from the peak pond elevation to the time it takes to reach an elevation three inches above the invert elevation of the discharge control device. Alternative elevations may be considered that meet the intent of this requirement.
- For the regional detention facilities the maximum hydraulic grade line for a 25-year storm event shall be no greater than 3 foot below the naturally occurring ground elevation in proximity of the pond.

- Ditches, swales and channels can be designed for a variety of capacities depending on the protection required. When ditches serve as a primary water surface collector in the upper part of a drainage basin, they shall be designed to convey the 10-year storm event without ponding in the roadway or adjacent private property.
- Bridges and box culverts shall meet the design criteria of the regulating authority.
- Features which, in the opinion of the City Engineer, will result in unusual and/or costly future operation and maintenance will not be allowed.
- A safety bench is required. Typically this would be a minimum 10 ft. wide bench with 10:1 side slopes. The bench will begin 0.5 ft. below the normal water level.
- Outlet structures shall be designed to prevent clogging and be easily accessible by maintenance personnel.
- Dry regional ponds may be considered on a case by case basis. Conditions and design features described for wet ponds that are applicable will be used for dry pond applications. Special changed conditions unique to dry ponds are:
  1. No safety bench will be required.
  2. No permanent shore armoring will be required.
  3. The pond bottom shall have slope and an underdrain system sufficient to maintain a “dry” state. Sufficiency of these requirements will be determined by the City Engineer.

## VI. Standard Site Development Stormwater Criteria

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### Site Development Stormwater Criteria

All new or rehabilitated sites over 20,000 ft<sup>2</sup> are required to have a stormwater management plan that includes post-development BMP's. Dry or wet ponds can be considered. For those sites that are contained within a regional system and meet the design conditions of that system, no additional measures are required. A report documenting conformance to the design conditions will be required.

If the proposed site lies within a larger drainage area, within the service area of a regional pond, the Applicant will submit an additional drainage map with the entire limits of the watershed(s) delineated.

Regional ponds designed after 2012 may be designed to serve a limit of 40% impervious surface of the contributing watershed for both water quality and water quantity. Therefore, individual sites which exceed 40% impervious area are required to mitigate the overage on site. This requirement applied to both water quality and quantity.

For sites not served by a regional facility, on site conformance to water quality and quantity criteria are required.

General design requirements are listed below:

- To account for proposed and future potential development, the site analysis and report will be based on the maximum impervious surface area allowed by code and include the entire area of the lot(s).
- Existing undeveloped sites will limit storm water quantity discharges to not exceed pre-development conditions under the 2, 5, 10 and 25 year events.
- The City will accept a pre-development curve number of 82 for Class C soils for programs using the NRCS method of calculating.
- The first floor of buildings must be set such that a site will spill into the street before first floor flooding can occur.

- The drainage design should preclude driveway overflows for the 2, 5, and 10 year events.
- Any new site over 20,000 square feet shall have an internal stormwater collection system which collects the entire site.
- Site discharge hydraulics will be evaluated on a case by case basis. Some site systems may discharge to a city system that has a computer model. In that case, the site model will use the discharge conditions contained within the model. Most areas will not have a model available. In those instances, the City will generally accept the pond discharge condition to be free discharge over the entire analysis period.
- The City will accept an initial Tc of 15 minutes to first inlets in a typical subdivision situation.
- For existing sites that have been altered by previous activities to be essentially flat, the City will accept an overland flow velocity of ¼ ft. per second as representing the original unaltered state of the site.
- Non-water quality ponding is allowed in parking lots. The depth of ponding allowed should consider potential water damage to parked vehicles.
- Small system ponds that require an orifice of 4 inches in diameter or less shall use a “protected” system to prevent clogging. The generally accepted method is to utilize an underground drain pipe system reaching under the dry pond.
- Provide an executive summary table of pre vs. post level flows at the 2, 5, 10, 25 and 100 year events.
- Provide a detail drawing of the outlet structure. On the detail, mark the 2, 5, 10, 25 and 100 year event water elevations. See Figure 3-3 on page 18 for example.
- Provide water quality calculations and executive summary of how it operates.
- In a dry pond situation, the City will generally accept a depth of 4 ft. from naturally occurring site elevations as not needing an underdrain. Ponds exceeding 4 ft. shall have an underdrain system to ensure the pond bottom can routinely be maintained using ordinary lawn equipment.
- Construction of “rain gardens” and other methods on site are encouraged and will be evaluated on a case by case basis.

## VII. Public Storm Water System Design Criteria

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### Storm Sewer Design Requirements

- All construction and design shall be in conformance with the City of Grand Forks Standard Construction Specifications
- Design Storm
  - 5 Year Recurrence Interval for local streets
  - 10 Year Recurrence Interval for classified streets
- Flow velocities should be between 3 and 5 feet per second
- Top of Curb Elevations at Curb Inlets
  - Residential Areas: Should not be higher than 0.5 feet below existing ground surface and not deeper than 2.0 feet below existing ground surface
  - Commercial Areas: Can be 0.5 feet higher than residential areas and not deeper than 1.5 ft. below existing ground surface
- Locate storm manholes and catch basins on extended lot lines. When unable to locate on lot lines then locate at extension of lot midpoint
- Curb inlets located at intersections will be 6 feet inside lot extensions to avoid sidewalk conflicts
- Curb inlets not located at intersections will be located at lot line extension or center of lot to avoid driveway conflicts
- Chimney seals required at curb inlets and manholes located in paved areas
- Manholes and inlets located in landscape areas shall have double wrap poly around chimney and casting
- Manhole and inlet adjustment: Plans designed for 2 adjusting rings, final installation shall have no more than 4 adjusting rings
- Catch basin barrel height: 5 feet minimum
- Storm sewers in unclassified streets shall convey the 5-year storm event and in classified street the 10-year storm event. The hydraulic grade line shall be a maximum of 2 ft. below the top of street inlet grates during the design event for pipes sized 24 inches or more. There shall be no ponding above inlet grates during the design event.

- Culverts shall pass the 10-year storm event with the headwater depth not exceeding the diameter of the culvert.
- Street inlets shall pass the design flow of the classification of street served, at a maximum depth of 4inches.
- Trench Backfill
  - Class AA at street crossings
  - Class C when located in right-of-way and paving to be constructed in same year
  - Class D when located in right-of-way and paving to be constructed after at least one freeze-thaw cycle
  - Class D allowed when located outside of right-of-way
  - Special circumstances may require a higher degree of compaction
- The minimum bury depth of any storm sewer pipe shall provide 3 feet of distance from the top of the pipe to the nearest ground or pavement surface.

## **Materials**

- Storm sewer pipe in right-of-way and public easements
  - Reinforced concrete pipe (RCP) Class III
  - Minimum diameter 12”
- Storm sewer pipe outside of right-of-way or public easements
  - Reinforced concrete pipe (RCP) Class III recommended
- Manholes and catch basins
  - Precast concrete
  - Minimum diameter: manholes 48”, catch basins 30”
  - Avoid flat top MH’s by using intermediate flat slabs & cone section as top section
- Castings
  - Manholes: Neenah Foundry R-1733-0067 or East Jordan Iron Works 1205; Letter Storm Sewer
  - Curb inlets: Neenah Foundry 3065 with type DR grate or East Jordan Iron Works 7010 with M5 diagonal bar grate
  - Area inlets: Neenah Foundry Casting Frame R-1733 with type C grate
  - Other castings as required

## **VIII. City Policy for Financial Participation in Regional Stormwater Treatment Systems**

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The City recognizes that a significant contributor to stormwater runoff involves the transportation network of streets and rights of ways. This transportation system is critical to the community as a whole. This policy would reflect the community responsibility to contribute financially to the stormwater treatment system that treats the public runoff.

The City desires to encourage and require a “regional” approach to stormwater management for efficiency of construction, operation and maintenance. Financial participation will reflect these desires.

### **Approval Process**

Any evaluations will be based off of information available during the time of initial platting. Consideration will be given to the stormwater management plan which is part of the platting process and other information available at the time. The evaluation will be conducted through the office of the City Engineer.

A public pond is required to be on property dedicated to the City of Grand Forks.

## **Rights-of-Way Contribution**

The City will consider participating in the proportional amount of right-of-way contributing drainage area to the total contributing drainage area of a public pond.

The City will participate to those features required by the City minimum design standards for public ponds. Any features above these minimums will be developers responsibility.

City participation will be for the contract design engineering, contract construction costs of pond, outlet structure and discharge piping.

The non-City portion of the pond, outlet structure, and discharge piping can be special assessed. The pond, outlet structure, and discharge piping will not have to be considered when calculating the developer's upfront participation requirements.

Phased construction of ponds greater than 6 acres in size will be considered if requested and if the request contains a proposed phasing plan.

In the case where participating items are special assessed, the City will typically pay their portion through annual equivalent special assessment payments.

In the case where the developer chooses to capitalize and construct a project, the City will reimburse those participating costs that can be documented to the satisfaction of the finance department. Only those costs attributable to the construction contractor and design/construction engineering consultant services will be considered eligible.

Land or easement acquisition costs are not considered to be eligible items.

Costs incurred prior to the date of adoption of this policy will not be considered eligible items.

The City may participate to either the calculated proportional area of rights-of-way to the total drainage area or the maximum participation level, whichever is smaller.

Table VIII-1

City Maximum Participation Levels

Acreage of Drainage Area	Maximum Contribution
Less than 20 Acres	0%
20 – 60 Acres	10%
60 – 180 Acres	15%
Over 180 Acres	20%

**Special Assessments to Pond Lots**

The City recognizes that the stormwater regulations are being imposed to the community as a whole. The City desires to emulate similar policies used on the flood protection project in which the City takes responsibility for the assessments that would otherwise be attributed to City property.

The City will participate in special assessments assigned to the City owned property in accordance with decisions made through the normal special assessment process.

In the case where the developer is constructing the public improvement, the City Engineer will provide an evaluation as to what proportion of costs would have been expected to be attributable to the City property. The City will determine a method of payment upon project completion for those direct construction payments and engineering fees that are determined by the City Engineer to have been the normal proportion expected if it had been special assessed. The payment to the developer may need to be done over time to meet cash flow restrictions within the utility fund.