Connection / Impact Fee Report

Bluemound Drive Ponds & Horizon Pond

Prepared For The

Grand Chute

TOWN OF GRAND CHUTE
OUTAGAMIE COUNTY, WISCONSIN

DECEMBER 14, 2016

McM. No. G0003-9-14-00271

AWS:car

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I. INTRODUCTION

The Town of Grand Chute constructed the Bluemound Drive North and South Pond in 2015 and Horizon Pond in 2015. The ponds were constructed to improve stormwater quality and assist with Municipal (MS4) Stormwater Permit compliance. The purpose of this report is to calculate an appropriate connection or impact fee for the ponds. Connection or impact fees are typically established as one-time charges to a developer (development or redevelopment site), property owner, or other MS4 permitted entity that desires to use a Town constructed pond to satisfy one or more stormwater management requirements. The connection or impact fee also provides the Town with a method to recover a part of a project's capital cost. The Bluemound Drive Ponds included a Urban Nonpoint Source Construction Grant from the Wisconsin Department of Natural Resources.

II. METHODOLOGY

For purposes of this report, the watershed area and impervious area methods were used to calculate the connection / impact fee for each pond.

The watershed area method calculates the impact fee by dividing the total project costs by the total watershed area within a pond's contributing watershed. The impervious area method calculates the impact fee by dividing the total project cost by the total impervious area within a pond's contributing watershed based on the future land use condition. The total impervious

area is calculated by multiplying the area of each land use within the contributing watershed by its average percent imperviousness. The average percent imperviousness for each land use is based on the standard land use files developed by the Wisconsin Department of Natural Resources (DNR). An engineer may be required to perform the impervious area calculations.

III. RESULTS

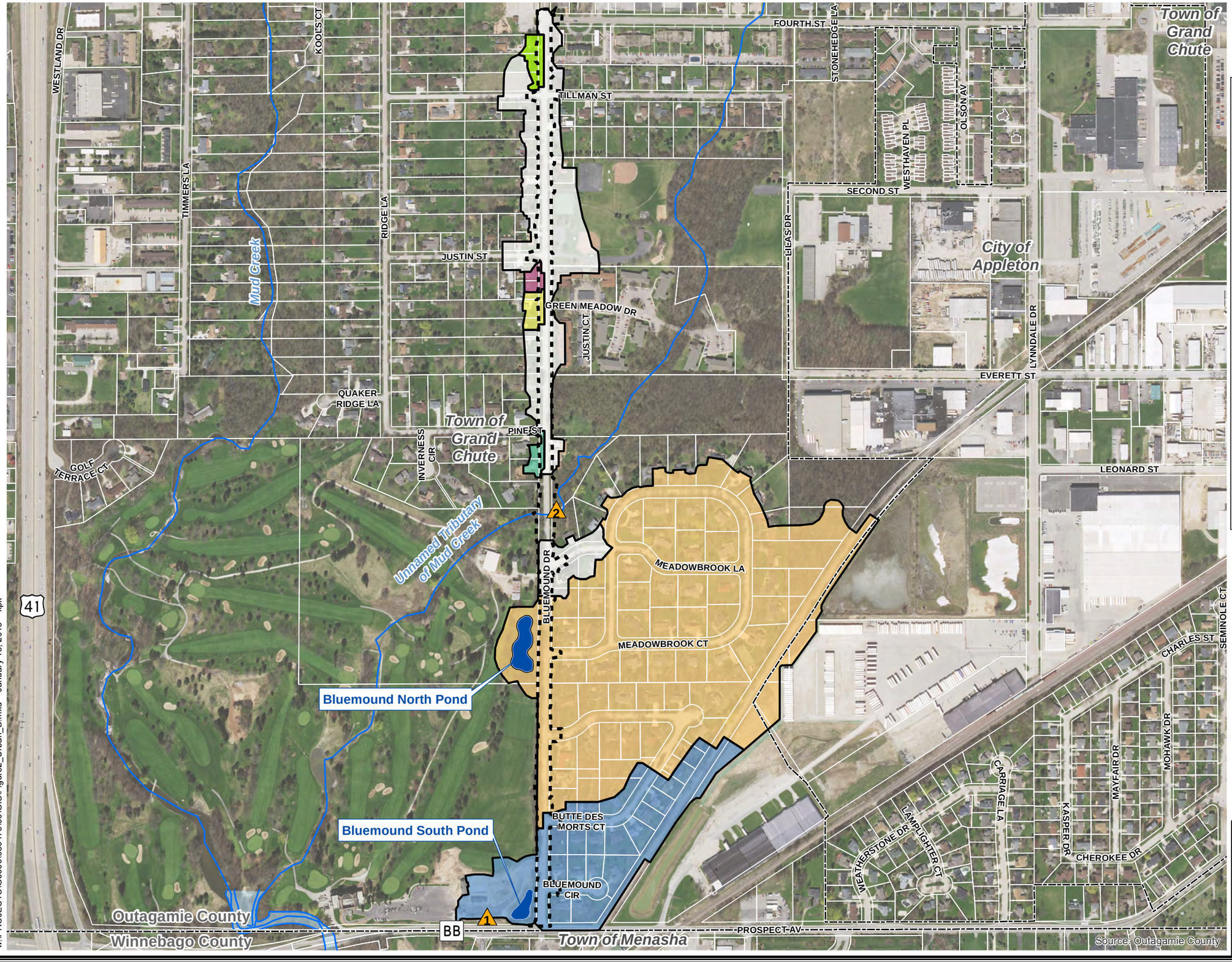
The contributing watersheds for the Bluemound Drive Ponds and Horizon Pond are shown on Figure 2 and Figure 3 taken from each Pond's stormwater management plan which is provided in Appendix A. The results of the connection / impact fee calculations for Bluemound Drive Ponds and Horizon Pond can be found in Appendix B. The calculations provide more detailed information including: total project cost, impervious area and watershed area. It is recommended that the Town adopt a resolution or ordinance identifying the impervious area methodology shall be used to establish connection / impact fees for the pond.

IV. SUMMARY

In summary, connection or impact fees are typically established as one-time charges to a developer (development or redevelopment site), property owner, or other MS4 permitted entity that desires to use Town constructed ponds to satisfy one or more stormwater management requirements. The connection / impact fees calculated in this report could be used by the Town to recover some of the initial capital cost for the associated pond project.

APPENDIX A

POND WATERSHED MAPS



GRAND CHUTE
la grande chute

Post-Development Drainage Areas

- Bioretention Device 1
- Bioretention Device 2
- Bioretention Device 3
- Bioretention Device 4
- Catch Basin Boundary
- Bluemound North
- Bluemound South

Other Mapped Features

- Study Area
- Outfall
- Municipal Boundary
- Parcel Line
- Stream
- Bluemound Stormwater Pond
- Surface Water

Source: Outagamie County, 2010-14; Winnebago County, 2014.

Disclaimer: The property lines, right-of-way lines, and other property information on this drawing were developed or obtained as part of the County Geographic Information System or through the County property tax mapping function. McMAHON does not guarantee this information to be correct, current, or complete. The property and right-of-way information are only intended for use as a general reference and are not intended or suitable for site-specific uses. Any use to the contrary of the above stated uses is the responsibility of the user and such use is at the user's own risk.

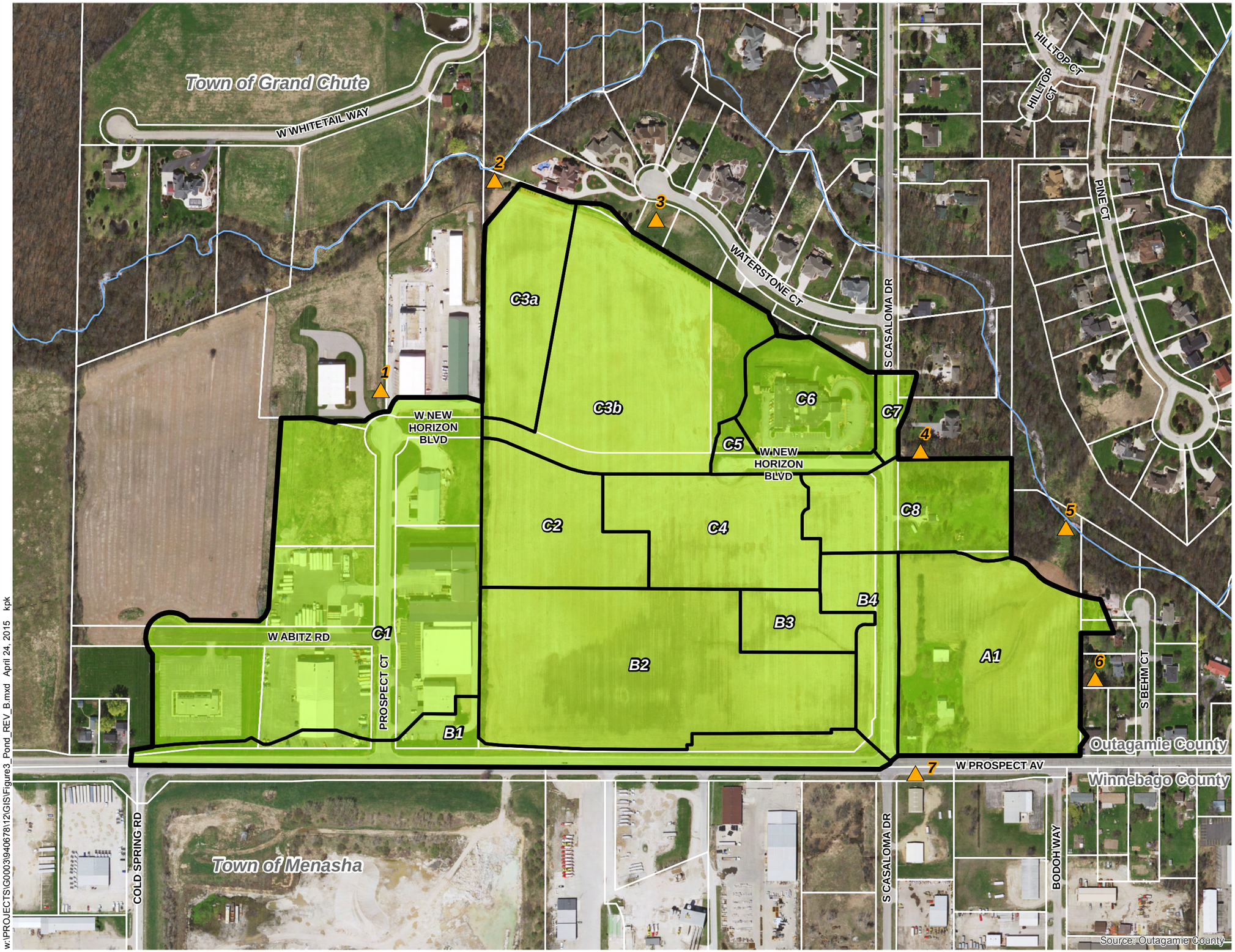
N

0 500 1,000 Feet

McMAHON ENGINEERS ARCHITECTS

FIGURE 2
POST-DEVELOPMENT DRAINAGE AREAS
BLUEMOUND DRIVE
URBANIZATION STORMWATER MANAGEMENT PLAN
TOWN OF GRAND CHUTE
OUTAGAMIE COUNTY, WISCONSIN

w:\PROJECTS\G0006\93047\00\GIS\Figure2_Urban_B.mxd January 13, 2015 kpk



GRAND CHUTE
la grande chute

Mapped Features

- A1 — Drainage Area and ID
- Study Area Boundary
- Stream
- Parcel Line
- 1 — Outfall and ID

Source: Outagamie County, 2014-15; Winnebago County, 2014.

Disclaimer: The property lines, right-of-way lines, and other property information on this drawing were developed or obtained as part of the County Geographic Information System or through the County property tax mapping function. McMAHON does not guarantee this information to be correct, current, or complete. The property and right-of-way information are only intended for use as a general reference and are not intended or suitable for site-specific uses. Any use to the contrary of the above stated uses is the responsibility of the user and such use is at the user's own risk.

N

0 300 600 Feet

McMAHON ENGINEERS ARCHITECTS

FIGURE 3
POST-DEVELOPMENT WATERSHED
HORIZON POND
TOWN OF GRAND CHUTE
OUTAGAMIE COUNTY, WISCONSIN

w:\PROJECTS\G0003\94067812\GIS\Figure3_Pond_REV_B.mxd April 24, 2015 kpk

APPENDIX B

CONNECTION / IMPACT FEE CALCULATION

McMAHON ENGINEERS ARCHITECTS

Town of Grand Chute
Pond Buy In Costs
G0003-9-14-00271.04
November, 2016

Grand Chute

Bluemound Drive Ponds "Buy In" Cost

Project Costs Include UNPS&SW Grant Funds Cost Reduction

Watershed Area:	63.61	acres
Maximum Impervious Surfaces in Watershed:	14.57	acres
Bluemound Drive Ponds Project Cost:	$299,385	

Buy In Costs:	Watershed Area Method:	$4,707	per acre of watershed
	Impervious Area Method:	$20,545	per acre of imperviousness

Notes:
1. The Pond Buy In Cost Rate is to be used for Development Site Post-Construction Stormwater Management requirements.
2. The Pond Buy In Cost is calculated by using the 'Buy in Cost' Parameter for the Development and multiply by the Buy In Cost Rate per acre.
3. The Pond Watershed Map, Figure 2 from the Bluemound Drive Ponds Stormwater Management Plan is

Horizon Pond "Buy In" Cost

Watershed Area:	83.25	acres
Maximum Impervious Surfaces in Watershed:	65.49	acres
Horizon Pond Project Cost:	$712,752	

Watershed Area Method:	$8,562	per acre of watershed
Impervious Area Method:	$10,884	per acre of imperviousness

Notes:
1. The Pond Buy In Cost Rate is to be used for Development Site Post-Construction Stormwater Management requirements.
2. The Pond Buy In Cost is calculated by using the 'Buy in Cost' Parameter for the Development and multiply by the Buy In Cost Rate per acre.
3. The Pond Watershed Map, Figure 3 from the Horizon Pond Stormwater Management Plan is attached.

Pond Project Overall "Buy In" Cost

Watershed Area:	146.86	acres
Maximum Impervious Surfaces in Watershed:	80.06	acres
Village of Ashwaubenon Pond Project Costs:	1,012,137	

Watershed Area Method:	$6,892	per acre of watershed
Impervious Area Method:	$12,642	per acre of imperviousness

Notes:
1. The Pond Buy In Cost Rate is to be used for Development Site Post-Construction Stormwater Management requirements.
2. The Pond Buy In Cost is calculated by using the 'Buy in Cost' Parameter for the Development and multiply by the Buy In Cost Rate per acre.
3. The Pond Watershed Maps are attached.

Cost Method Considerations

Impervious Area Method
* Method does not consider runoff volume, soil types, or poorly drained soils
* Concept is identical to the ERU method that is used for the Town's Stormwater Utility
* Fewer calculations are needed, easier for Town Staff to manage

Watershed Area Method
* Method does not consider land use, imperviousness, runoff volume, soil types, or poorly drained soils
* Residential will pay more and commercial will pay less than the amount of runoff generated by the site.
* Least accurate of the four methods used to develop a "buy-in" cost for the Cold Spring Pond.
* Fewest calculations are needed, easiest for Town Staff to manage

Ordinances

For The

CONSTRUCTION SITE EROSION CONTROL & POST-CONSTRUCTION STORMWATER MANAGEMENT PROGRAMS

Prepared For The

Grand Chute

TOWN OF GRAND CHUTE

OUTAGAMIE COUNTY, WISCONSIN

DECEMBER 13, 2016

McM No. G0003-9-14-00271

NAV:jlh

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TOWN OF GRAND CHUTE

OUTAGAMIE COUNTY, WISCONSIN

DECEMBER 13, 2016
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I. OVERVIEW

Several documents were updated or developed to assist the Town of Grand Chute with Municipal Stormwater Permit compliance and stormwater quality improvement. The documents are as follows:

- *Construction Site Erosion Control Program:* The Town's construction site erosion control ordinance and reference guide were updated to conform with recent modifications to Wisconsin Administrative Code NR 151. In addition, an educational brochure was developed to help landowners better understand which construction activities require ordinance compliance. These ordinance and educational activities are anticipated to reduce the amount of sediment, phosphorus and other stormwater pollutants discharging from construction sites. A copy of the educational brochure, construction site erosion control ordinance and reference guide are provided in Appendix A.

- *Post-Construction Stormwater Management Program:* The Town's post-construction stormwater management ordinance and reference guide were updated to conform with recent modifications to Wisconsin Administrative Code NR 151. In addition, an educational brochure was developed to help landowners better understand which post-construction activities require ordinance compliance. These ordinance and educational

activities are anticipated to reduce the amount of sediment, phosphorus and other stormwater pollutants discharging from post-construction sites. A copy of the educational brochure, post-construction stormwater management ordinance, and reference guide are provided in Appendix B.

APPENDIX A

CONSTRUCTION SITE EROSION CONTROL PROGRAM

Construction Site Erosion Control Permit

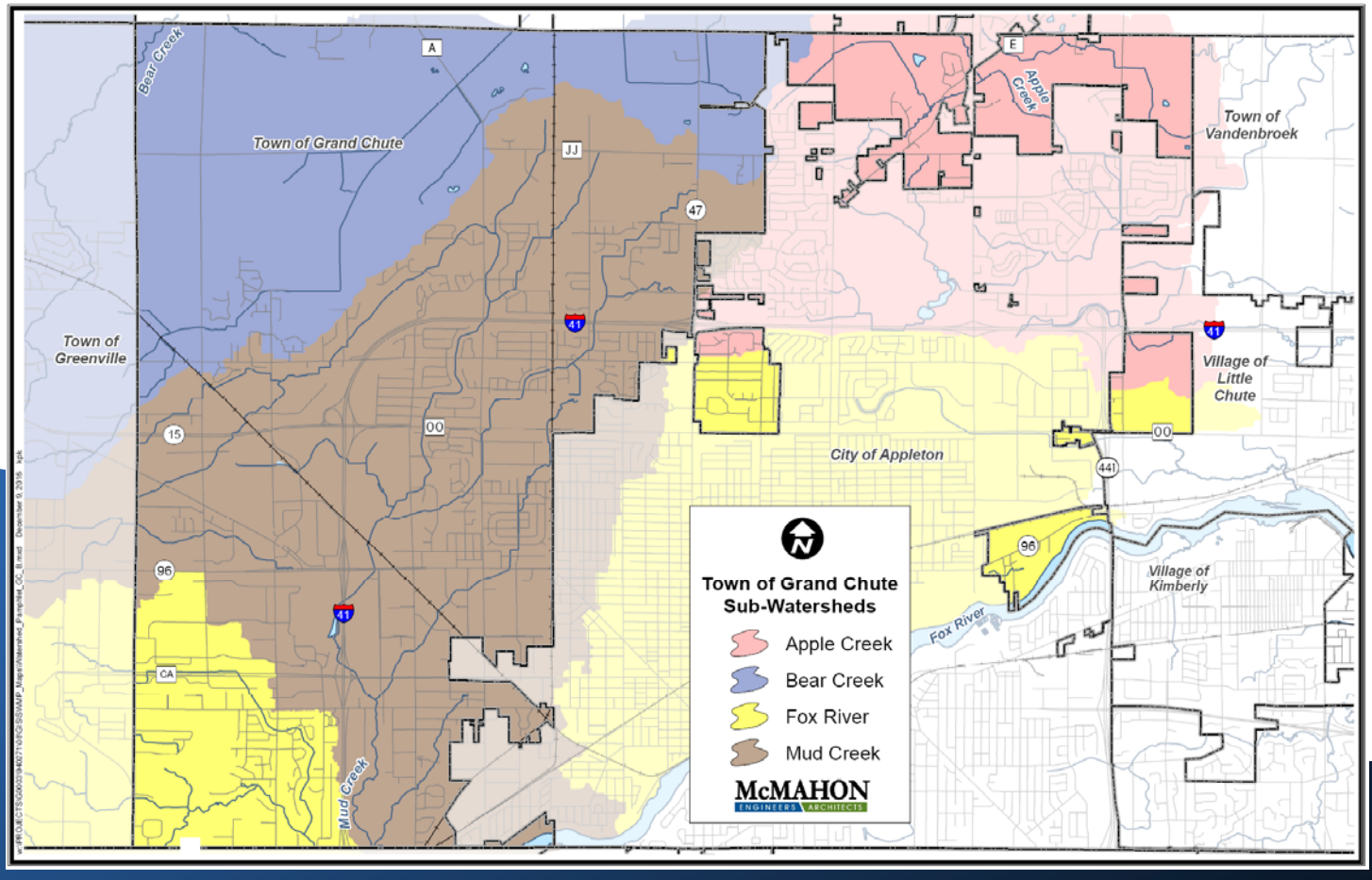
Protecting Our Lakes, Rivers & Streams

Fox River: Sediment & Poor Water Clarity

The Town of Grand Chute is required by the Wisconsin Department of Natural Resources to reduce the amount of stormwater pollutants discharging into Apple Creek, Bear Creek, Mud Creek, and the Fox River. Stormwater pollutants include sediment, phosphorus, bacteria, heavy metals, motor oil, toxins, solvents, pesticides, litter and other pollutants.

Decreasing the amount of sediment and phosphorus is anticipated to improve water clarity and reduce algae blooms in streams, rivers and lakes. Reduced algae will increase the amount of oxygen available for fish and aquatic species survival. Also, greater water clarity and decreased algae will improve recreational opportunities and scenic beauty.

The Town's drainage system is a network of swales, underground pipes and storm inlets that carry stormwater pollutants directly to Apple Creek, Bear Creek, Mud Creek, and the Fox River. As shown on the watershed map, the majority of the Town's developed urban area is located within the Mud Creek Sub-Watershed. The Town's Construction Site Erosion Control Ordinance requires the use of best management practices (BMPs) to reduce soil erosion and pollutant discharges from a construction site.



Frequently Asked Questions…

When is compliance required?

Ordinance compliance is required for all construction sites located within the Town.

Who is responsible for compliance?

Landowners, developers, builders, contractors, subcontractors, landscapers, utility companies and other persons involved with a construction site are responsible for ordinance compliance.

When is a Town permit required?

The Town's ordinance requires an erosion control permit for construction sites with 4,000 square feet or more of land disturbance. Although a permit is not typically required for construction sites with less than 4,000 square feet of land disturbance, ordinance compliance is still required.

What is required by the ordinance?

The Town's ordinance requires implementation and maintenance of best management practices (BMPs).

- **Non-Permitted Site** – Refer to the list of required BMPs for a non-permitted construction site.
- **Permitted Site** – In addition to the BMPs required for a non-permitted site, a written erosion and sediment control plan is required for a permitted site. If the site has 1 acre or more of land disturbance, the site also needs to comply with a maximum 5 ton per acre per year sediment performance standard.

BMPs Required for Non-Permitted Site:

- Do not track soil onto streets by vehicles.
- Do protect storm inlets from sediment.
- Do protect adjacent streams, rivers, lakes and wetlands from sediment.
- Do protect storm sewers, culverts and ditches that carry runoff off the site.
- Do not discharge sediment during site dewatering activities.
- Do protect soil stockpiles that exist for more than 7 days from erosion.
- Do not discharge chemicals, cement and other building materials into storm sewers, ditches, streams, rivers, lakes and wetlands.

FOR ADDITIONAL INFORMATION:

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1900 W. Grand Chute Boulevard
Grand Chute, WI 54913-9613
920-832-1573
www.grandchute.net

Grand Chute
experience better

McMAHON
ENGINEERS ARCHITECTS

The Town Board of the Town of Grand Chute does hereby ordain that Chapter 275 of the code of ordinances of the Town of Grand Chute is repealed and recreated to read as follows:

Chapter 275. Erosion and Sediment Control

Article I. General Requirements

§ 275-1. Authority.

A. This chapter is adopted by the Town of Grand Chute Board under the authority granted by § 60.627, Wis. Stats. This chapter supersedes all provisions of an ordinance previously enacted under § 60.62, Wis. Stats., that relate to construction site erosion control. Except as otherwise specified in § 60.627 Wis. Stats., § 60.62, Wis. Stats., applies to this chapter and to any amendments to this chapter.

B. The provisions of this chapter are deemed not to limit any other lawful regulatory powers of the same governing body.

C. The Town of Grand Chute Board hereby designates the Plan Commission and Community Development Department to administer and enforce the provisions of this chapter.

D. The requirements of this chapter do not pre-empt more stringent erosion and sediment control requirements that may be imposed by any of the following:

(1) Wisconsin Department of Natural Resources administrative rules, permits or approvals including those authorized under §§ 281.16 and 283.33, Wis. Stats.

(2) Targeted performance standards promulgated in rules by the Wisconsin Department of Natural Resources under § NR 151.004, Wis. Adm. Code.

§ 275-2. Findings of fact.

The Town of Grand Chute Board finds that runoff from land disturbing construction activity carries a significant amount of sediment and other pollutants to the waters of the state in the Town of Grand Chute.

§ 275-3. Purpose.

It is the purpose of this chapter to further the maintenance of safe and healthful conditions; prevent and control water pollution; prevent and control soil erosion; protect spawning grounds, fish and aquatic life; control building sites, placement of structures and land uses; preserve ground cover and scenic beauty; and promote sound economic growth, by minimizing the amount of sediment and other pollutants carried by runoff or discharged from land disturbing construction activity to waters of the state in the Town of Grand Chute.

§ 275-4. Applicability and jurisdiction.

A. Applicability.

(1) Where not otherwise limited by law, this chapter applies to all construction sites, unless the site is otherwise exempt under § 275-4A(2) or (3):

(a) A permit is required for a construction site with 4,000 square feet or greater of land disturbing construction activity. The responsible party shall comply with all applicable provisions of this chapter for a permitted site, including the § 275-7B performance standards, § 275-8 permit requirements, and § 275-9 plan requirements.

(b) A permit is not required for a construction site with less than 4,000 square feet of land disturbing construction activity. The responsible party shall comply with all applicable provisions of this chapter for a non-permitted site, including the § 275-7A performance standards.

(c) Notwithstanding the applicability requirements in § 275-4A(1)(a) and (b), a permit is required for a construction site with less than 4,000 square feet of land disturbing construction activity if the administering authority determines that permit coverage is needed in order to improve chapter compliance, meet targeted performance standards, or protect waters of the state. If a permit is required, the responsible party shall comply with all applicable provisions of this chapter for a permitted site, including the § 275-7B performance standards, § 275-8 permit requirements, and § 275-9 plan requirements.

(d) Utility work and other disturbances of a continuous distance of 100 feet of road ditch, nonagricultural grass waterway or other nonagricultural land area where drainage occurs in a watercourse.

(2) This chapter does not apply to the following:

(a) Nonpoint discharges from agricultural activity areas.

(b) Nonpoint discharges from silviculture activities.

(3) A construction site exempted by federal statutes or regulations from the requirement to have a national pollutant discharge elimination system permit issued under 40 CFR 122, for land disturbing construction activity, shall comply with § 275-7A performance standards if less than one acre of land disturbing construction activity. The § 275-7B performance standards, § 275-8 permit requirements, and § 275-9 plan requirements are not applicable.

B. Jurisdiction. This chapter applies to land disturbing construction activity on construction sites located within the boundaries and jurisdiction of the Town of Grand Chute.

C. Exclusions. This chapter is not applicable to activities conducted by a state agency, as defined under § 227.01 (1), Wis. Stats., but also including the office of district attorney, which is subject to the state plan promulgated or a memorandum of understanding entered into under § 281.33 (2), Wis. Stats.

§ 275-5. Definitions.

A. For the purpose of this chapter, the following shall apply as indicated throughout the chapter:

(1) The word "person" includes a firm, association, organization, partnership, trust, company or corporation as well as an individual.

(2) The present tense includes the future tense, and the singular includes the plural.

(3) The word "shall" is mandatory; the word "may" is permissive.

(4) The word "used" or "occupied" also means intended, designed or arranged to be used or occupied.

B. Definition of terms. For the purpose of this chapter, the following terms are defined:

ADMINISTERING AUTHORITY

A governmental employee or their designees empowered under s. 60.627, Wis. Stats., to administer this chapter. For the purpose of this chapter, it is the Town of Grand Chute Community Development Department under guidance from the Plan Commission.

AGRICULTURAL ACTIVITY AREA

The part of the farm where there is planting, growing, cultivating and harvesting of crops for human or livestock consumption and pasturing or outside yarding of livestock, including sod farms and silviculture. Practices in this area may include waterways, drainage ditches, diversions, terraces, farm lanes, excavation, filling and similar practices. The agricultural activity area does not include the agricultural production area.

AGRICULTURAL PRODUCTION AREA

The part of the farm where there is concentrated production activity or impervious surfaces. Agricultural production areas include buildings, driveways, parking areas, feed storage structures, manure storage structures, and other impervious surfaces. The agricultural production area does not include the agricultural activity area.

ATLAS 14

The National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Precipitation-Frequency Atlas of the United States, Volume 8 (Midwestern States), published in 2013.

BEST MANAGEMENT PRACTICE or BMP

Structural or non-structural measures, practices, techniques or devices employed to avoid or minimize soil, sediment or pollutants carried in runoff to waters of the state.

BUSINESS DAY

A day the office of the administering authority is routinely and customarily open for business.

CEASE AND DESIST ORDER

A court-issued order to halt land disturbing construction activity that is being conducted without the required permit.

COMMON PLAN OF DEVELOPMENT OR SALE

A development or sale where multiple separate and distinct land disturbing construction activities may be taking place at different times on different schedules but under one plan. A common plan of development or sale includes, but is not limited to, subdivision plats, certified survey maps, and other developments.

CONSTRUCTION SITE

An area upon which one or more land disturbing construction activities occur, including areas that are part of a larger common plan of development.

DESIGN STORM

A hypothetical discrete rainstorm characterized by a specific duration, temporal distribution, rainfall intensity, return frequency and total depth of rainfall. The TP-40, Type II, 24-hour design storms for Town of Grand Chute are: 1-year, 2.2 inches; 2-year, 2.5 inches; 5-year, 3.3 inches; 10-year, 3.8 inches; 25-year, 4.4 inches; 50-year, 4.9 inches; and 100-year, 5.3 inches. The Atlas 14, MSE4, 24-hour design storms for the Town of Grand Chute are: 1-year, 2.14 inches; 2-year, 2.45 inches; 5-year, 3.01 inches; 10-year, 3.51 inches; 25-year, 4.24 inches; 50-year, 4.85 inches; and 100-year, 5.50 inches.

DEVELOPMENT

Residential, commercial, industrial, institutional, or other land uses and associated roads.

DIVISION OF LAND

The creation from one or more parcels or building sites of additional parcels or building sites where such creation occurs at one time or through the successive partition within a 5 year period.

EROSION

The process by which the land's surface is worn away by the action of wind, water, ice or gravity.

EROSION AND SEDIMENT CONTROL PLAN

A comprehensive plan developed to address pollution caused by erosion and sedimentation of soil particles or rock fragments during construction.

EXTRATERRITORIAL

The unincorporated area within 3 miles of the corporate limits of a first, second, or third class city, or within 1.5 miles of a fourth class city or village.

FINAL STABILIZATION

Means that all land disturbing construction activities at the construction site have been completed and that a uniform perennial vegetative cover has been established, with a density of at least 70 percent of the cover, for the unpaved areas and areas not covered by permanent structures, or that employ equivalent permanent stabilization measures.

GOVERNING BODY

Town Board of Supervisors, county board of supervisors, city council, village board of trustees or village council.

LAND DISTURBING CONSTRUCTION ACTIVITY OR DISTURBANCE

Any man-made alteration of the land surface resulting in a change in the topography or existing vegetative or non-vegetative soil cover, that may result in runoff and lead to an increase in soil erosion and movement of pollutants into the municipal separate storm sewer or waters of the state. Land disturbing construction activity includes clearing and grubbing, demolition, excavating, pit trench dewatering, filling and grading activities, and soil stockpiling.

MEP or MAXIMUM EXTENT PRACTICABLE

The highest level of performance that is achievable but is not equivalent to a performance standard identified within this chapter. Maximum extent practicable applies when the permit applicant demonstrates to the administering authority's satisfaction that a performance standard is not achievable and that a lower level of performance is appropriate. In making the assertion that a performance standard is not achievable and that a level of performance different from the performance standard is the maximum extent practicable, the permit applicant shall take into account

the best available technology, cost effectiveness, geographic features, and other competing interests such as protection of public safety and welfare, protection of endangered and threatened resources, and preservation of historic properties.

MSE4 DISTRIBUTION

A specific precipitation distribution developed by the USDA, NRCS, using precipitation data from Atlas 14.

PERFORMANCE STANDARD

A narrative or measurable number specifying the minimum acceptable outcome for a facility or practice.

PERMIT

A written authorization made by the administering authority to the applicant to conduct land disturbing construction activity or to discharge post-construction runoff to waters of the state.

POLLUTANT

Has the meaning given in § 283.01 (13), Wis. Stats.

POLLUTION

Has the meaning given in § 281.01 (10), Wis. Stats.

PROTECTIVE AREA

Has the meaning given in § 463-19C(4) of Chapter 463, Stormwater Management.

RESPONSIBLE PARTY

Any entity holding fee title to the property or performing services to meet the performance standards of this chapter through a contract or other agreement.

RUNOFF

Stormwater or precipitation including rain, snow or ice melt or similar water that moves on the land surface via sheet or channelized flow.

SEDIMENT

Settleable solid material that is transported by runoff, suspended within runoff or deposited by runoff away from its original location.

SEPARATE STORM SEWER

A conveyance or system of conveyances including roads with drainage systems, streets, catch basins, curbs, gutters, ditches, constructed channels or storm drains, which meets all of the following criteria:

A. Is designed or used for collecting water or conveying runoff.

B. Is not part of a combined sewer system.

C. Is not part of a publicly owned wastewater treatment works that provides secondary or more stringent treatment.

D. Discharges directly or indirectly to waters of the state.

SILVICULTURE ACTIVITIES

Activities including tree nursery operations, tree harvesting operations, reforestation, tree thinning, prescribed burning, and pest and fire control. Clearing and grubbing of an area of a construction site is not a silviculture activity.

SITE

The entire area included in the legal description of the land on which the land disturbing construction activity is proposed in the permit application.

STOP WORK ORDER

An order issued by the administering authority which requires that all construction activity on the site be stopped.

TARGETED PERFORMANCE STANDARD

A performance standard that will apply in a specific area, where additional practices beyond those contained in this chapter, are necessary to meet water quality standards. A total maximum daily load is an example of a targeted performance standard.

TECHNICAL STANDARD

A document that specifies design, predicted performance and operation and maintenance specifications for a BMP, material, device or method.

TOTAL MAXIMUM DAILY LOAD or TMDL

The amount of pollutants specified as a function of one or more water quality parameters, that can be discharged per day into a water quality limited segment and still ensure attainment of the applicable water quality standard.

TP-40

The Technical Paper No. 40, Rainfall Frequency Atlas of the United States, published in 1961.

TR-55

The United States department of agriculture, natural resource conservation service (previously soil conservation service), Urban Hydrology for Small Watersheds, Second Edition, Technical Release 55, June 1986, which is incorporated by reference for this chapter.

TYPE II DISTRIBUTION

A rainfall type curve as established in the "United States Department of Agriculture, Soil Conservation Service, Technical Paper 149, published 1973", which is incorporated by reference for this chapter. The Type II curve is applicable to all of Wisconsin and represents the most intense storm pattern.

WATERS OF THE STATE

Has the meaning given in § 283.01 (20), Wis. Stats.

Article II. Technical Requirements

§ 275-6. Technical standards.

A. Design criteria, standards and specifications. All BMPs required to comply with this chapter shall meet the design criteria, standards and specifications based on any of the following:

(1) Design guidance and technical standards identified or developed by the Wisconsin Department of Natural Resources under Subchapter V of Chapter NR 151, Wis. Adm. Code.

(2) Technical standards and other guidance identified within the Town of Grand Chute Erosion and Sediment Control Reference Guide.

(3) Soil loss prediction tools such as the Revised Universal Soil Loss Equation 2 (RUSLE2) that estimate the sediment load leaving the site under varying land and management conditions may be used to show compliance with the sediment performance standards contained in § 275-7B.

(4) For this chapter, average annual basis is calculated using the appropriate annual rainfall or runoff factor, also referred to as the R factor, or an equivalent design storm using a Type II distribution, with consideration given to the geographic location of the site and the period of disturbance.

B. Other standards. Other technical standards not identified in § 275-6 may be used provided that the methods have been approved by the administering authority.

§ 275-7. Performance standards.

A. Non-permitted sites.

(1) Responsible party. The landowner of the construction site or other person contracted or obligated by other agreement with the landowner to implement and maintain construction site BMPs is a responsible party and shall comply with this chapter.

(2) Requirements. At each site where land disturbing construction activity is to occur, BMPs shall be used to prevent or reduce all of the following:

(a) The deposition of soil from being tracked onto streets by vehicles.

(b) The discharge of sediment from disturbed areas into stormwater inlets.

(c) The discharge of sediment from disturbed areas into adjacent waters of the state.

(d) The discharge of sediment from drainage ways that flow off the site.

(e) The discharge of sediment by dewatering activities.

(f) The discharge of sediment eroding from soil stockpiles existing for more than 7 days.

(g) The discharge of onsite chemicals, cement and other building compounds and materials into waters of the state or offsite separate storm sewers during the construction period. However, projects that require the placement of these materials in waters of the state, such as constructing bridge footings or BMP installations, are not prohibited by this chapter.

(3) Location. BMPs shall be located so that treatment occurs before runoff enters waters of the state and offsite separate storm sewers. However, projects that require BMP placement in waters of the state, such as a turbidity barrier, are not prohibited by this chapter.

(4) Implementation. The BMPs used to comply with this section shall be implemented as follows:

(a) Erosion and sediment control practices shall be constructed or installed before land disturbing construction activities begin.

(b) Erosion and sediment control practices shall be maintained until final stabilization.

(c) Final stabilization activity shall commence when land disturbing activities cease and final grade has been reached on any portion of the site.

(d) Temporary stabilization activity shall commence when land disturbing activities have temporarily ceased and will not resume for a period exceeding 14 calendar days.

(e) BMPs that are no longer necessary for erosion and sediment control shall be removed by the responsible party.

(5) Alternate requirements. The administering authority may establish erosion and sediment control requirements more stringent than those set forth in this chapter if the administering authority determines that an added level of protection is needed to protect resources.

B. Permitted sites.

(1) Responsible party. The landowner or other person performing services to meet the performance standards of this chapter, through a contract or other agreement with the landowner, is a responsible party and shall comply with this chapter.

(2) Plan. A written erosion and sediment control plan shall be developed and implemented by the responsible party in accordance with § 275-9. The erosion and sediment control plan shall meet all of the applicable requirements contained in this chapter.

(3) Requirements. The erosion and sediment control plan shall meet all of the following:

(a) The plan shall use BMPs to prevent or reduce all of the following:

[1] The deposition of soil from being tracked onto streets by vehicles.

[2] The discharge of sediment from disturbed areas into stormwater inlets.

[3] The discharge of sediment from disturbed areas into adjacent waters of the state.

[4] The discharge of sediment from drainage ways that flow off the site.

[5] The discharge of sediment by dewatering activities.

[6] The discharge of sediment eroding from soil stockpiles existing for more than 7 days.

[7] The discharge of sediment from erosive flows at outlets and in downstream channels.

[8] The discharge of onsite chemicals, cement and other building compounds and materials into waters of the state or offsite separate storm sewers during the construction period. However, projects that require the placement of these materials in waters of the state, such as constructing bridge footings or BMP installations, are not prohibited by this chapter.

[9] The discharge of untreated wash water from vehicle and wheel washing into waters of the state or offsite separate storm sewers.

(b) For sites with one acre or more of land disturbing construction activity, the plan shall meet the following sediment performance standards:

[1] BMP's that, by design, discharge no more than 5 tons per acre per year, or to the maximum extent practicable, of the sediment load carried in runoff from initial grading to final stabilization.

[2] Except as provided in § 275-7B(6), the administering authority may not require any person to employ more BMPs than are needed to meet the 5 tons per acre per year sediment performance standard in order to comply with maximum extent practicable. Erosion and sediment control BMPs may be combined to meet the sediment performance standard. The administering authority may give credit toward meeting the sediment performance standard for limiting the duration or area, or both, of land disturbing construction activity, or for other appropriate mechanisms.

[3] Notwithstanding § 275-7B(3)(b)[1] and [2], if BMPs cannot be designed and implemented to meet the 5 tons per acre per year sediment performance standard, the plan shall include a written, site-specific explanation of why the sediment performance standard cannot be met and how the sediment load will be reduced to the maximum extent practicable.

(c) The plan shall incorporate all of the following preventative measures:

[1] Maintenance of existing vegetation, especially adjacent to surface waters whenever possible.

[2] Minimization of soil compaction and preservation of topsoil.

[3] Minimization of land disturbing construction activity on slopes of 20% or more.

[4] Development of spill prevention and response procedures.

(4) Location. BMPs shall be located so that treatment occurs before runoff enters waters of the state and offsite separate storm sewers. However, projects that require BMP placement in waters of the state, such as a turbidity barrier, are not prohibited by this chapter.

(5) Implementation. The BMPs used to comply with this chapter shall be implemented as follows:

(a) In accordance with the plan developed pursuant to § 275-9, the erosion and sediment control practices shall be constructed or installed before land disturbing construction activities begin.

(b) Erosion and sediment control practices shall be maintained until final stabilization.

(c) Final stabilization activity shall commence when land disturbing activities cease and final grade has been reached on any portion of the site.

(d) Temporary stabilization activity shall commence when land disturbing activities have temporarily ceased and will not resume for a period exceeding 14 calendar days.

(e) BMPs that are no longer necessary for erosion and sediment control shall be removed by the responsible party.

(6) Targeted performance standards. The administering authority may establish numeric water quality requirements that are more stringent than those set forth in § 275-7B(3) in order to meet targeted performance standards, total maximum daily loads, and/or water quality standards for a specific water body or area. The numeric water quality requirements may be applicable to any permitted site, regardless of the size of land disturbing construction activity.

(7) Alternate requirements. The administering authority may establish erosion and sediment control requirements more stringent than those set forth in this section if the administering authority determines that an added level of protection is needed to protect resources. Also, the administering authority may establish erosion and sediment control requirements less stringent than those set forth in this section if the administering authority determines that less protection is needed to protect resources. However, the alternative requirements shall not be less stringent than those requirements promulgated in rules by Wisconsin Department of Natural Resources under NR 151 Wisconsin Administrative Code.

§ 275-8. Permitting requirements, procedures and fees.

A. Permit required. When a permit is required, no responsible party may commence a land disturbing construction activity subject to this chapter without receiving prior approval of an erosion and sediment control plan for the site and a permit from the administering authority.

B. Permit application and fees. When a permit is required, at least one responsible party desiring to undertake a land disturbing construction activity subject to this chapter shall submit an application for a permit and an erosion and sediment control plan that meets the requirements of § 275-9 and shall pay an application fee according to the fee schedule to the Town of Grand Chute. By submitting an application, the applicant is authorizing the administering authority to enter the site to obtain information required for the review of the erosion and sediment control plan.

C. Review and approval of permit application. The administering authority shall review any permit application that is submitted with an erosion and sediment control plan, and the required fee. The following approval procedure shall be used:

(1) Within 20 business days of the receipt of a complete permit application, as required by § 275-8B, the administering authority shall inform the applicant whether the application and plan are approved or disapproved based on the requirements of this chapter.

(2) If the permit application and plan are approved, the administering authority shall issue the permit.

(3) If the permit application or plan is disapproved, the administering authority shall state in writing the reasons for disapproval.

(4) The administering authority may request additional information from the applicant. If additional information is submitted, the administering authority shall have 20 business days from the date the additional information is received to inform the applicant that the plan is either approved or disapproved.

(5) Failure by the administering authority to inform the permit applicant of a decision within 20 business days of a required submittal shall be deemed to mean approval of the submittal and the applicant may proceed as if a permit had been issued.

D. Financial guarantee. As a condition of approval and issuance of the permit, the administering authority may require the applicant to deposit a surety bond, cash escrow, or irrevocable letter of credit to guarantee a good faith execution of the approved erosion and sediment control plan and any permit conditions. The financial guarantee shall be in an amount determined by the administering authority for the estimated construction and maintenance of the practices called for in the erosion and sediment control plan. The administering authority may require the site to be certified by a professional engineer. The financial guarantee shall give the administering authority the funds to complete the erosion and sediment control practices if the landowner defaults or does not properly implement the approved erosion and sediment control plan. Improper implementation of the plan shall be upon written notice by the administering authority that the requirements of this chapter have not been met.

(1) The administering authority shall release the portion of the financial guarantee established under this section, less any costs incurred by the administering authority to complete installation of practices, upon submission of “as built plans” by a licensed professional engineer. The administering authority may make provisions for a partial prorate release of the financial guarantee based on the completion of various development stages.

E. Permit requirements. All permits issued under this chapter shall be subject to the following conditions, and holders of permits issued under this chapter shall be deemed to have accepted these conditions. The administering authority may suspend or revoke a permit for violation of a permit condition, following written notification of the responsible party. An action by the administering authority to suspend or revoke this permit may be appealed in accordance with § 275-13.

(1) Notify the administering authority within 48 hours of commencing any land disturbing construction activity.

(2) Notify the administering authority of completion of any BMPs within 10 business days after their installation.

(3) Obtain permission in writing from the administering authority prior to any modification pursuant to § 275-9B of the erosion and sediment control plan.

(4) Install all BMPs as identified in the approved erosion and sediment control plan.

(5) Maintain all road drainage systems, stormwater drainage systems, BMPs and other facilities identified in the erosion and sediment control plan.

(6) Repair any siltation or erosion damage to adjoining surfaces and drainage ways resulting from land disturbing construction activities and document repairs in weekly inspection reports.

(7) Conduct construction site inspections at least once per week and within 24 hours after a precipitation event of 0.5 inches or greater. Repair or replace erosion and sediment control BMPs as necessary within 24 hours of an inspection or notification that repair or replacement is needed. Maintain, at the construction site, weekly written reports of all inspections. Weekly inspection reports shall include all of the following: date, time and location of the construction site inspection; the name of individual who performed the inspection; an assessment of the

condition of erosion and sediment controls; a description of any erosion and sediment control BMP implementation and maintenance performed; and a description of the present phase of land disturbing construction activity at the construction site.

(8) Allow the administering authority to enter the site for the purpose of inspecting compliance with the erosion and sediment control plan or for performing any work necessary to bring the site into compliance with the control plan. Keep a copy of the erosion and sediment control plan, stormwater management plan, amendments, weekly inspection reports, and permit at the construction site until permit coverage is terminated.

(9) The permit applicant shall post the "Certificate of Permit Coverage" in a conspicuous location at the construction site.

F. Permit conditions. Permits issued under this section may include conditions established by administering authority in addition to the requirements set forth in § 275-8E, where needed to assure compliance with the performance standards in § 275-7.

G. Permit duration. Permits issued under this section shall be valid for a period of 180 days, or the length of the building permit or other construction authorizations, whichever is longer, from the date of issuance. The administering authority may extend the period one or more times for up to an additional 180 days. The administering authority may require additional BMPs as a condition of the extension if they are necessary to meet the requirements of this chapter.

H. Maintenance. The responsible party throughout the duration of the construction activities shall maintain all BMPs necessary to meet the requirements of this chapter until the site has undergone final stabilization.

I. Alternate requirements. The administering authority may prescribe requirements less stringent for applicants seeking a permit for a construction site with less than one acre of land disturbing construction activity.

§ 275-9. Erosion and sediment control plan.

A. Plan requirements. The erosion and sediment control plan required under § 275-7B shall comply with the Town of Grand Chute Erosion and Sediment Control Reference Guide and contain at a minimum the following information:

(1) Name, address, and telephone number of the landowner and responsible parties.

(2) A legal description of the property proposed to be developed.

(3) A site map with property lines, disturbed limits, and drainage patterns.

(4) Total area of the site and total area of the construction site that is expected to be disturbed by construction activities.

(5) Performance standards applicable to site.

(6) Proposed best management practices.

(7) Erosion and sediment control plan narrative.

(8) Construction sequence and construction schedule.

(9) The erosion and sediment control plan shall include, at a minimum, the items specified in the Town of Grand Chute Erosion and Sediment Control Reference Guide and RUSLE2.

B. Amendments. The applicant shall amend the plan if any of the following occur:

(1) There is a change in design, construction, operation, maintenance or schedule at the site which has the reasonable potential for the discharge of pollutants to waters of the state or separate storm sewers, and which has not otherwise been addressed in the plan.

(2) The actions required by the plan fail to reduce the impacts of pollutants carried by construction site runoff.

(3) The administering authority notifies the applicant of changes needed in the plan.

C. Alternate requirements. The administering authority may prescribe requirements less stringent for applicants seeking a permit for a construction site with less than one acre of disturbance.

Article III. Administration

§ 275-10. Fee schedule.

The fees referred to in other sections of this chapter shall be established by the Town of Grand Chute Board and may from time to time be modified by resolution. A schedule of the fees established by the Town Board shall be available for review in the Town Hall.

§ 275-11. Inspection.

Whenever land disturbing construction activities are being carried out, the administering authority may enter the land pursuant to the provisions of §§ 66.0119(1), (2), and (3), Wis. Stats.

§ 275-12. Enforcement.

A. The administering authority may post a stop-work order if any of the following occurs:

(1) Any land disturbing construction activity is being undertaken without a permit and, pursuant to § 275-4A of this chapter, a permit is required for the construction site.

(2) The erosion and sediment control plan is not being implemented in a good faith manner.

(3) The conditions of the permit are not being met.

(4) Any land disturbing construction activity is in violation of the chapter.

B. If the responsible party does not cease activity as required in a stop-work order posted under this section or fails to comply with the erosion and sediment control plan or permit conditions, the administering authority may revoke the permit.

C. If the responsible party, where no permit has been issued, does not cease the activity after being notified by the administering authority, or if a responsible party violates a stop-work order posted under § 275-12A, the administering authority may request the town attorney to obtain a cease and desist order in any court with jurisdiction.

D. The administering authority may retract the stop-work order issued under § 275-12A or the permit revocation under § 275-12B.

E. After posting a stop-work order under § 275-12A, the administering authority may issue a notice of intent to the responsible party of its intent to perform work necessary to comply with this chapter. The administering authority may go on the land and commence the work after issuing the notice of intent. The costs of the work performed under this chapter by the administering authority, plus interest at the rate authorized by Town Board shall be billed to the responsible party or recovered from the surety bond, cash escrow, or irrevocable letter of credit. In the event a responsible party fails to pay the amount due, the clerk shall enter the amount due on the tax rolls and collect as a special assessment against the property pursuant to Subch. VII of Ch. 66, Wis. Stats.

F. Any person, firm, association, or corporation who or which does not comply with the provisions of this chapter shall be subject to a forfeiture as provided in the Uniform Forfeiture and Bond Schedules per offense, together with the costs of prosecution. Each day that the violation exists shall constitute a separate offense.

G. Compliance with the provisions of this chapter may also be enforced by injunction in any court with jurisdiction. It shall not be necessary to prosecute for forfeiture or a cease and desist order before resorting to injunctional proceedings.

§ 275-13. Appeals.

A. Appeals. The Town of Grand Chute Plan Commission, created pursuant to § 16-2 of this Code:

(1) Shall hear and decide appeals where it is alleged that there is error in any order, decision or determination made by the administering authority in administering this chapter except for cease and desist orders obtained under § 275-12C.

(2) Upon appeal, may authorize variances from the provisions of this chapter which are not contrary to the public interest and where owing to special conditions a literal enforcement of the provisions of the chapter will result in unnecessary hardship; and

(3) Shall use the rules, procedures, duties and powers authorized by statute in hearing and deciding appeals and authorizing variances.

B. Who may appeal. Appeals to the Plan Commission may be taken by any aggrieved person or by any office, department, board, or bureau of the Town of Grand Chute affected by any decision of the administering authority.

§ 275-14. Variances.

In any particular case where the landowner can show that, by reason of exceptional topography or other physical condition, strict compliance with any requirement of this chapter would cause unnecessary hardship, the Plan Commission may grant a variance provided such relief may be granted without detriment to the public good and without impairing the intent and purpose of this chapter or the desirable

general development of the Town. No variance shall be granted by the Commission which is contrary to provisions of the Wisconsin Administrative Code or the Wisconsin Statutes.

§ 275-15. Severability.

If a court of competent jurisdiction judges any section, clause, provision or portion of this chapter unconstitutional or invalid, the remainder of the chapter shall remain in force and not be affected by such judgment.

§ 275-16. Limitations on municipal responsibility.

Nothing in this chapter creates or imposes, nor shall be construed to create or impose, any greater obligation or responsibility on the municipality which has adopted this chapter than those minimum requirements specifically required by State of Wisconsin Statutes and Department of Natural Resources regulations.

§ 275-17. Effective date.

This chapter shall be in force and effect from and after its adoption and publication. The above and foregoing chapter was duly adopted by the Town Board of the Town of Grand Chute on the _____ day of February, 2017.

TOWN OF GRAND CHUTE

_____
David A. Schowalter, Town Chairman

_____
Karen L. Weinschrott, Town Clerk

TOWN OF GRAND CHUTE
EROSION & SEDIMENT CONTROL REFERENCE GUIDE

FOR THE:

EROSION & SEDIMENT CONTROL ORDINANCE

DATE:
December 30, 2016

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EXECUTIVE SUMMARY

The Town's Erosion & Sediment Control Reference Guide (Reference Guide) has been created to act as a companion to the Town's Erosion & Sediment Control Ordinance (Ordinance). The Ordinance cites the Reference Guide as the resource for details that were omitted from the Ordinance. Items in the Reference Guide can be changed without the public hearing process as the changes are typically administrative and/or technical and do not affect the Ordinance's intent and requirements. The Reference Guide is organized similar to the Erosion & Sediment Control Ordinance for ease of relating the Reference Guide to the appropriate sections in the Ordinance.

The Erosion & Sediment Control Ordinance (Ordinance) applies to all construction sites, regardless of the land disturbance size. The Ordinance requires a permit for a construction site with 4,000 square feet or greater of land disturbance. Please refer to 117-4A(1)(c) of the Ordinance and 117-4A of this Reference Guide for a description of other construction sites that may require a permit.

Construction Site Erosion Control Ordinance								
Site	**Requirements** [a]							
	Sediment (TSS)	**Vehicle Tracking**	**Protect Storm Inlets**	**Protect Waters of State**	**Protect Drainage Ways**	**Dewater Properly**	**Manage Soil Stockpile**	**Manage Building Materials**
Less than 1 Acre	No Numeric Standard [b]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 Acre or More	5 tons / acre / year	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[a] Summary of Section 117-7 Performance Standards of the Erosion & Sediment Control Ordinance. See Ordinance and this Reference Guide for specific requirements, exemptions and prohibitions.

[b] Construction sites regulated by the Wisconsin Department of Safety and Professional Services are required to comply with a numeric performance standard, regardless of the size of land disturbance. See SPS 360.20(3) and SPS 321.125(3) for specific requirements. The local municipality may also be acting as an agent of the Wisconsin Department of Safety and Professional Services.

117-1 AUTHORITY

117-2 FINDINGS OF FACT

117-3 PURPOSE

117-4 APPLICABILITY AND JURISDICTION

A. APPLICABILITY

Pursuant to 117-4A(1)(c), the administering authority may require a permit for construction sites with less than 4,000 square feet of land disturbance. Currently, the administering authority's policy is to require a permit for the following construction sites with less than 4,000 square feet of land disturbance:

- Installation, replacement, or maintenance of underground pipes, cables, fiber optics, or wires with 100 linear feet or greater of length.
- Routine ditch maintenance with 100 linear feet or greater of length.
- Land disturbing activities located in waters of the state, wetlands, or protective areas. Wetlands shall be delineated in accordance with s. NR 103.08(1m), Wis. Adm. Code.

B. JURISDICTION

C. EXCLUSIONS

The Wisconsin Department of Transportation (WisDOT) has entered into a memorandum of understanding with the Wisconsin Department of Natural Resources that satisfies s. 281.33 (2), Wis. Stats., such that activities directed and supervised by WisDOT are exempt from this Ordinance.

Activities directed and supervised by the local municipality are covered by this Ordinance.

117-5 DEFINITIONS

117-6 TECHNICAL STANDARDS

A. DESIGN CRITERIA, STANDARDS AND SPECIFICATIONS

Below is a list of Technical Standards and Guidance Documents that shall be used to satisfy Performance Standards contained in the ordinance. Technical Standards specify the minimum criteria for a best management practice (BMP). Guidance Documents contain recommendations and additional "how to" guidance. Performance Standards take precedence over Technical Standards and Technical Standards take precedence over Guidance Documents.

(a) **Technical Standards**: The following are applicable Wisconsin Department of Natural Resources (DNR) Conservation Practice Standards or Technical Standards. These standards may be found on the DNR website (http://dnr.wi.gov/topic/stormwater/standards/const_standards.html).

- 1050 Land Application of Additives for Erosion Control
- 1051 Water Application of Additives for Sediment Control
- 1052 Non-Channel Erosion Mat
- 1053 Channel Erosion Mat
- 1054 Vegetative Buffer for Construction Sites
- 1055 Sediment Bale Barrier (Non-Channel)
- 1056 Silt Fence
- 1057 Stone Tracking Pad and Tire Washing
- 1058 Mulching for Construction Sites
- 1059 Seeding for Construction Site Erosion Control
- 1060 Storm Drain Inlet Protection for Construction Sites
- 1061 De-watering
- 1062 Ditch Check (Channel)
- 1063 Sediment Trap
- 1064 Sediment Basin
- 1065 Rip-rap / Stabilized Outlet (pending completion)
- 1066 Construction Site Diversion
- 1067 Temporary Grading Practices for Erosion Control
- 1068 Dust Control on Construction Sites
- 1069 Turbidity Barrier
- 1070 Silt Curtain
- 1071 Interim Manufactured Perimeter Control & Slope Interruption Products

(b) **Local Modifications to Technical Standards:** The following are local requirements that are intended to supplement, clarify, or supersede DNR Technical Standards.

(c) **Guidance Documents**: The following are the applicable Guidance Documents. Many of these Guidance Documents can be found on the DNR website (http://dnr.wi.gov/topic/stormwater/standards/const_standards.html).

- Guidance for the Establishment of Protective Areas for Wetlands
- "Construction Site" Definition – "Common Plan of Development"
- Meeting New State Standards: Construction Erosion Control Workshops (http://dnr.wi.gov/topic/Stormwater/construction/practices.html)
- Estimating Residue Using the Line Transect Method (UW-Extension A3533).
- Wisconsin Department of Transportation - Erosion Control Product Acceptability Lists (PAL) for Multi-Modal Applications
- Wisconsin Department of Transportation - Facilities Development Manual
- Wisconsin DOT Standard Specifications for Highway and Structure Construction
- Other National Publications

B. OTHER STANDARDS

117-7 PERFORMANCE STANDARDS

A. NON-PERMITTED SITES

Construction sites with less than 4,000 square feet of land disturbance are required to satisfy a numeric performance standard if the construction site is regulated by the Wisconsin Department of Safety and Professional Services. Please refer to SPS 360.20(3) and SPS 321.125(3) for specific requirements.

Pursuant to 117-7A(5) of the Ordinance, the administering authority may establish more stringent erosion and sediment control requirements for non-permitted sites if the administering authority determines than an added level of protection is needed.

B. PERMITTED SITES

Construction sites with 1 acre or more of land disturbance are required to meet the ordinance's numeric performance standards.

Construction sites with less than 1 acre of land disturbance are required to satisfy a numeric performance standard if the construction site is regulated by the Wisconsin Department of Safety and Professional Services. Please refer to SPS 360.20(3) and SPS 321.125(3) for specific requirements.

Pursuant to 117-7B(6) or (7) of the Ordinance, the administering authority may establish more stringent erosion and sediment control requirements for permitted sites if the administering authority determines than an added level of protection is needed.

Computer Models:

The Wisconsin Department of Natural Resources (DNR) developed a USLE spreadsheet tool for construction site erosion control and determining compliance with the 5 tons/acre/year requirement. The USLE spreadsheet model can be found on the DNR website at http://dnr.wi.gov/topic/stormwater/standards/const_standards.html.

C. CLARIFICATIONS:

Erosion Control Practices - Erosion control practices are used to prevent sediment particles from becoming dislodged and suspended in runoff. Erosion control practices include land application of polyacrylamide, mulching, seeding, and erosion mats. Grading practices can be used to supplement these practices.

Sediment Control Practices - Sediment control practices are used to remove sediment particles that are suspended in runoff and being transported. Sediment control practices used for sheet flow conditions include vegetative buffers, sediment bale barriers (non-channel), silt fence, and perimeter control / slope interruption products. Sediment control practices used for concentrated flow conditions include storm drain inlet protection (< 1 acre), ditch checks (< 1 acre), sediment traps (< 5 acres), sediment basins (< 100 acres), and polymers. Sediment control practices used for lakes, rivers, and streams include turbidity barriers and silt curtains.

Construction Site Diversions - Construction site diversions are used to divert clear-water runoff away from disturbed areas. Construction site diversions are also designed to convey sediment-laden runoff from disturbed areas to sediment control practices such as ditch checks, sediment traps, and sediment basins.

Dust Control Practices - Dust control practices are used to prevent wind erosion.

Dewatering - Dewatering practices are used to remove sediment from ponding surface water or groundwater. A DNR permit is required for pumping 70 gpm or more (http://dnr.wi.gov/topic/wells/highcapacity.html). The discharge must be sampled in accordance with DNR requirements.

Non-Erosive Flows - Velocity dissipation devices shall be placed at outfall locations and

along the length of any channel, as necessary, to provide a non-erosive flow so that the natural, physical, and biological characteristics and functions are maintained and protected. Velocity dissipation devices could include erosion mat (channel), rip-rap, drop structures, stilling basins, and other energy dissipation devices.

Maximum Permissible Velocities for Channels			
Channel Cover	Slope Range %	Erosion-resistant soils	Easily eroded soils
Bare Soil	0-5	3-6 fps*	1.5-2 fps*
	Do not use on slopes steeper than 5%, except for side slopes in a combination channel.		
Bermuda Grass	0-5	8 fps	6 fps
	5-10	7 fps	5 fps
	>10	6 fps	4 fps
Buffalo grass, Kentucky bluegrass, Smooth brome, blue grama	0-5	7 fps	5 fps
	5-10	6 fps	4 fps
	>10	5 fps	3 fps
Grass mixture	0-5	5 fps	4 fps
	5-10	4 fps	3 fps
	Do not use on slopes steeper than 10%, except for side slopes in a combination channel.		
Lespedeza sericea, weeping love grass Ischaemum (yellow bluestem), kudzu, alfalfa, crabgrass	0-5	3.5 fps	2.5 fps
	Do not use on slopes steeper than 5%, except for side slopes in a combination channel.		
Annuals – used on mild slopes or as temporary protection until permanent covers are established, common lespedeza, Sudan grass	0-5	3.5 fps	2.5 fps
	Use on slopes steeper than 5% is not recommended		

* Maximum permissible velocities depend on specific soil properties and shear stress. Typically, the maximum velocity for sand = 1.5 fps, silt and loam = 1.7 to 2.5 fps, fine gravel = 2.5 fps, clay = 3.7 fps, coarse gravel = 4.0 fps, cobbles = 3.7 to 5.0 fps, and shale / hard pan = 6.0 fps.
Source – Chow Open Channel Hydraulics & Civil Engineering Reference Manual for the PE Exam, Ninth Edition

Materials - No sediment or solid materials, including building materials, may be discharged in violation of the following federal, state, and local regulations:

- Navigation, Dams, & Bridges (Chapter 30 and 31, Stats.)
- Wetland Water Quality Standards (NR 103)
- Wetlands (US Army Corps of Engineers Section 404 regulations)
- Shoreland Management (NR 115, NR 117, & local regulations)
- Floodplain Management (NR 116 & local regulations).

Wastewaters - Wastewaters, such as from concrete truck washout, need to be properly managed to limit the discharge of pollutants to the municipal separate storm sewer system or waters of the state. A separate permit may be needed form the DNR where a wastewater discharge has the potential to adversely impact waters of the state. The appropriate DNR wastewater specialist should be contacted to determine if wastewater permit coverage is needed where wastewater will be discharged to the municipal separate storm sewer system or waters of the state.

Wetland Delineations - Wetland delineations shall be performed by a professional soil scientist, professional hydrologist, or other qualified individual approved by the administering authority. The individual performing the delineation shall classify the wetland as a less susceptible wetland, highly susceptible wetland, exceptional resource water, or outstanding resource water.

Protective Areas - Protective areas may be disturbed as part of a construction project, if necessary. Disturbed areas must be stabilized from erosion and restored with an adequate sod or self-sustaining vegetative cover. Best Management Practices (ponds, swales, etc.) may be located in protective areas.

Type of Vegetation - It is recommended that seeding of non-invasive vegetative cover be used in the protective areas. Vegetation that is flood and drought tolerant and can provide long-term bank stability because of an extensive root system is preferable. Vegetative cover can be measured using the line transect method described in the University of Wisconsin Extension publication number A3533, titled “Estimating Residue Using the Line Transect Method”.

Adjacent Property Owners - If a stream or channel is permanently placed or relocated along a property line, an easement or letter of permission is required from any property owners impacted by the protective area’s new location. Also, if a stormwater facility or structure is proposed within an onsite stream or channel, 100-year flood elevations shall be evaluated to determine if offsite property owners are impacted by backwater or a flood elevation increase. An easement or letter of permission is required from any property owners impacted by backwater. Changes to a stream, wetland, or channel should be discussed during the pre-design meeting. Changes to a navigable stream, wetland or other waters of the state will require permits from the DNR, Army Corps of Engineers, and local municipality.

Agricultural Activity Areas - Agricultural Activity Areas (i.e. farm fields and other cropland areas) are exempt from the ordinance.

Agricultural Production Areas - Agricultural Production Areas (i.e. farm buildings, structures, and other impervious surfaces) are not exempt from the ordinance. The County Land Conservation Department (LCD) may be available to prepare Erosion & Sediment Control Plans for farm structures and disturbances in the Agricultural Production Areas. Construction of farm structures and disturbances in Agricultural Production Areas of one acre or greater must also be covered by an NR 216 permit.

Regional Wet Detention Ponds - A regional wet detention pond (post-construction site) may be used as a sediment basin (construction site) until final stabilization of the wet detention pond and expiration of the erosion control permit associated with construction of the regional wet detention pond. While regional stormwater management facilities are appropriate for control of post-construction pollutants, they should not be used for construction site sediment removal at other construction sites located within the wet detention pond’s watershed.

117-8 PERMITTING REQUIREMENTS, PROCEDURES AND FEES

A. PERMIT REQUIRED

B. PERMIT APPLICATION AND FEES

C. REVIEW AND APPROVAL OF PERMIT APPLICATION

Meetings between the permit applicant, designer, and plan reviewer are encouraged during the pre-design, design, and plan review process. The meetings are used to educate each other about regulatory requirements, environmentally sensitive areas, and design challenges. The number of meetings held is typically commensurate with the size and complexity of the project. Meetings can be face-to-face or via telephone.

A pre-construction conference is encouraged before the start of all construction projects. For sites with 1 acre or more of land disturbance, a pre-construction conference is required. The permit applicant, designer, plan reviewer, contractor, and inspector are encouraged to attend. The purpose of the meeting is to exchange contact information, review the Erosion & Sediment Control Plan, and identify individuals responsible for permit compliance, plan amendments, and weekly inspection reports.

D. FINANCIAL GUARANTEE

Construction sites with 1 acre or more of land disturbance are required to have a financial guarantee. The financial guarantee includes the cost associated with erosion and sediment control BMPs, site inspections, project administration, and contingencies.

Construction sites with less than 1 acre of land disturbance are not typically required to have a financial guarantee.

Portions of the financial guarantee may be released as the construction project progresses. The last portion of the financial guarantee is not released until the municipal inspector performs a final inspection and the permit applicant pays final inspection fees.

E. PERMIT REQUIREMENTS

The permit applicant is required to post the “Certificate of Permit Coverage” in a conspicuous place at the construction site.

F. PERMIT CONDITIONS

G. PERMIT DURATION

H. MAINTENANCE

I. ALTERNATE REQUIREMENTS

117-9 EROSION AND SEDIMENT CONTROL PLAN

A. PLAN REQUIREMENTS

Sites With Less Than 1 Acre of Land Disturbance:

The erosion and sediment control plan for construction sites with less than 1 acre of land disturbance shall contain, at a minimum, the following information unless other municipal ordinances or state regulations require more detailed information:

(a) The name, contact person, title, mailing address, e-mail address, telephone number, and fax number of the following individuals or organizations: permit applicant, landowner, consultant or plan preparer, and contractor (if known).
(b) Anticipated project start date and projected project end date.
(c) Total area of the construction site and the total area of the construction site that is expected to be disturbed by land disturbing activities.
(d) Sufficient detail so as to document ordinance compliance.
(e) Location of all BMPs to be employed.
(f) Pre-construction ground surface contour lines at intervals appropriate for conditions present within the proposed disturbed areas.
(g) Identify the initial downstream receiving water of the state.

Sites With 1 Acre or More of Land Disturbance:

The erosion and sediment control plan for construction sites with 1 acre or more of land disturbance shall contain, at a minimum, the following information:

(a) The name, contact person, title, mailing address, e-mail address, telephone number, and fax number of the following individuals or organizations: permit applicant, landowner, consultant or plan preparer, and contractor (if known).
(b) Anticipated project start date and projected project end date.
(c) Description of the construction site and the nature of the land disturbing construction activity, including representation of the limits of land disturbance on a USGS 7.5-minute series topographical map.
(d) Description of the intended sequence of major land disturbing construction activities for major portions of the construction site, including clearing; stripping topsoil; rough grading; installation of erosion and sediment controls; construction of utilities, streets, and buildings; finish grading; and permanent stabilization.
(e) Total area of the construction site and the total area of the construction site that is expected to be disturbed by land disturbing activities.
(f) Available data describing the surface soil as well as sub-soils, including representation of the limits of land disturbance on a NRCS soils map.
(g) Wherever permanent infiltration devices will be employed or were evaluated, the depth to the nearest seasonal high groundwater elevation or top of bedrock shall be identified.
(h) Name of the immediate named receiving water from the United States Geological Service 7.5 minute series topographic maps.
(i) Calculations demonstrating compliance with the 5 tons per acre per year sediment performance standard (calculations may not be feasible until RUSLE2 is completed).

The erosion and sediment control plan for construction sites with 1 acre or more of land disturbance shall include a site map. The site map shall include the following items and shall be at a scale not greater than 100 feet per inch and at a contour interval not to exceed two feet:

(a) Existing topography, vegetative cover, impervious surfaces, natural and engineered drainage systems, roads, surface waters, and 100-year floodplains. Identify slopes of 20% or more that are to be disturbed.
(b) Boundaries of the construction site.
(c) Drainage patterns and approximate slopes anticipated after grading activities. Identify drainage ways that flow off the site.
(d) Areas of soil disturbance, including soil stockpile locations.
(e) Location of major structural and non-structural controls identified in the erosion and sediment control plan, including standard detail drawings and specifications where appropriate.

(f) Location of areas where stabilization practices will be employed.
(g) Areas that will be vegetated following land disturbing construction activities.
(h) Area and location of wetland acreage on the construction site and locations where stormwater is discharged to a surface water or wetland within one-quarter mile downstream of the construction site.
(i) Areas used for infiltration of post-construction stormwater runoff.
(j) An alphanumeric or equivalent grid overlying the entire construction site.

The erosion and sediment control plan for construction sites with 1 acre or more of land disturbance shall include a description of appropriate erosion and sediment control best management practices that will be installed and maintained at the construction site to prevent pollutants from reaching waters of the state. The erosion and sediment control plan shall clearly describe the appropriate erosion and sediment control best management practices for each major land disturbing construction activity and the timing during the period of land disturbing construction activity that the erosion and sediment control best management practices will be implemented. The description of erosion controls shall include, when appropriate, the following minimum requirements:

(a) Description of any interim and permanent stabilization practices, including a schedule for implementing the practices. The erosion and sediment control plan shall ensure that existing vegetation is preserved where attainable and that disturbed portions of the construction site are stabilized.
(b) Description of any structural practices to divert flow away from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from the construction site. Unless otherwise specifically approved in writing by the local municipality, structural measures shall be installed on upland soils.
(c) Management of overland flow at all areas of the construction site, unless otherwise controlled by outfall controls.
(d) Trapping of sediment in channelized flow.
(e) Staging land disturbing activities to limit exposed soil areas subject to erosion. Soil stockpiles exposed for more than 7 days shall be stabilized.
(f) Protection of downslope drainage or storm water inlets where they occur.
(g) Minimization of tracking at all vehicle and equipment entry and exit locations of the construction site.
(h) Clean up of off-site sediment deposits by the end of each work day.
(i) Proper disposal and management of onsite chemicals, cement, and other building compounds and materials.
(j) Stabilization of drainage ways, including consideration of erosive flows at outlets and in downstream channels.
(k) Installation of permanent stabilization as soon as possible after final grading.
(l) Minimization of dust to the maximum extent practicable.
(m) Dewatering activities.
(n) Control of untreated wash water from vehicle and wheel washing into waters of the state or offsite separate storm sewers.
(o) Spill prevention and response procedures.
(p) Implementation of BMPs.

For construction sites with 1 acre or more of land disturbance, prepare a narrative describing the following: site location, total site area and disturbed area, purpose of project, drainage system and outfalls, drainage area for each outfall, stream and wetland locations, topsoil and subsoils, depth to groundwater and bedrock, erosion and sediment controls, sequence of construction, BMP inspection and maintenance responsibilities, weekly inspection reports, and plan amendments.

For construction sites with 1 acre or more of land disturbance, the erosion and sediment control plan shall include a statement or narrative which includes the following: (a)

erosion and sediment control practices shall be repaired or replaced within 24 hours of an inspection; and (b) when the failure of erosion or sediment control practices results in an immediate threat of sediment entering waters of the state or an offsite drainage system, procedures shall be implemented immediately to repair or replace the practices.

B. AMENDMENTS

C. ALTERNATE REQUIREMENTS

117-10 FEE SCHEDULE

117-11 INSPECTION

117-12 ENFORCEMENT

117-13 APPEALS

A. BOARD OF APPEALS

B. WHO MAY APPEAL

APPENDIX B

POST-CONSTRUCTION STORMWATER MANAGEMENT PROGRAM

Post-Construction Stormwater Permit

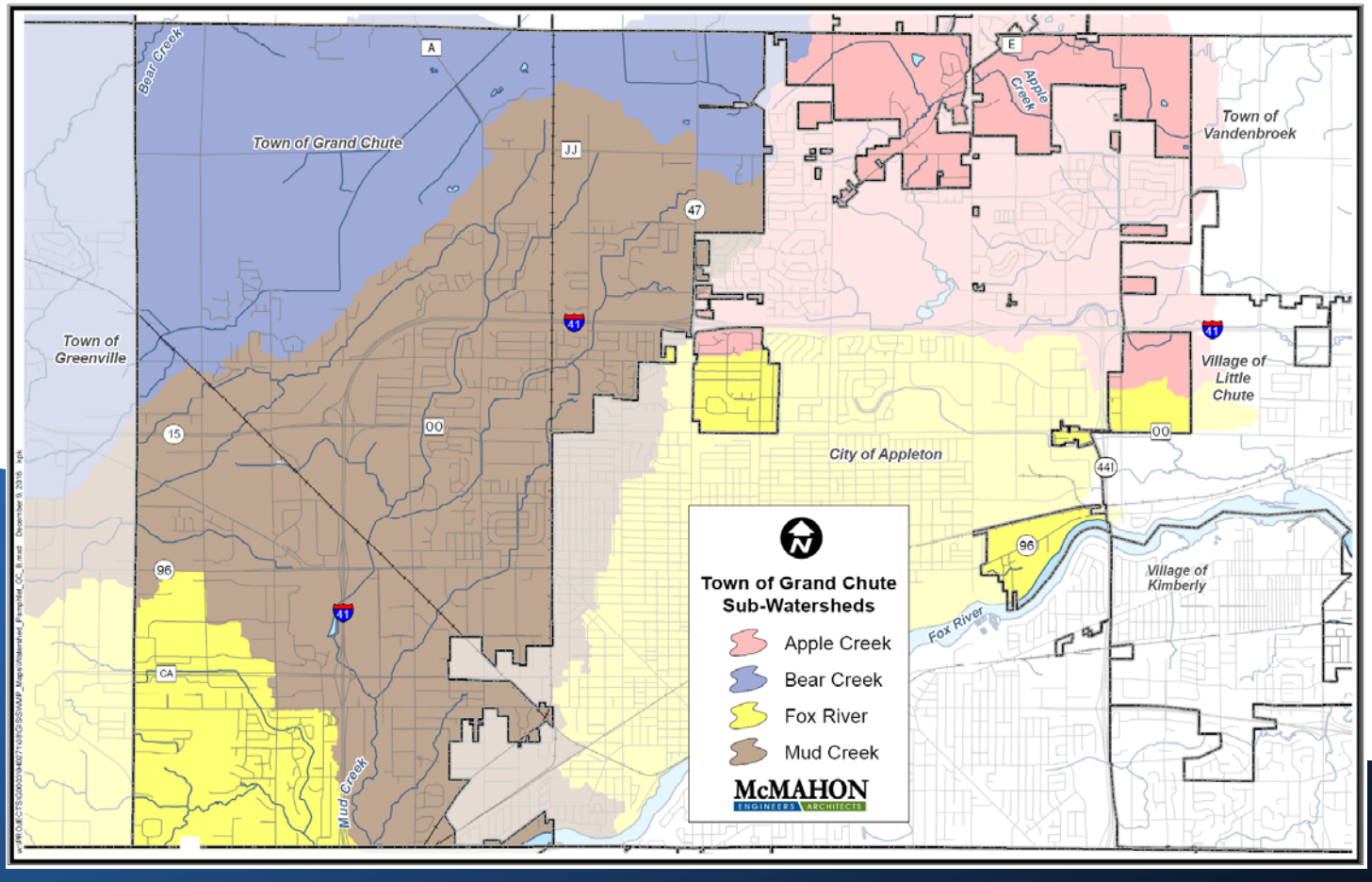
Protecting Our Lakes, Rivers & Streams

Fox River: Algae & Poor Water Clarity

The Town of Grand Chute is required by the Wisconsin Department of Natural Resources to reduce the amount of stormwater pollutants discharging into Apple Creek, Bear Creek, Mud Creek, and the Fox River. Stormwater pollutants include sediment, phosphorus, bacteria, heavy metals, motor oil, toxins, solvents, pesticides, litter and other pollutants.

Decreasing the amount of sediment and phosphorus is anticipated to improve water clarity and reduce algae blooms in streams, rivers and lakes. Reduced algae will increase the amount of oxygen available for fish and aquatic species survival. Also, greater water clarity and decreased algae will improve recreational opportunities and scenic beauty.

The Town's drainage system is a network of swales, underground pipes and storm inlets that carry stormwater pollutants directly to Apple Creek, Bear Creek, Mud Creek, and the Fox River. As shown on the watershed map, the majority of the Town's developed urban area is located within the Mud Creek Sub-Watershed. The Town's Stormwater Management Ordinance requires a different amount of pollutant reduction depending on which watershed the post-construction site is located within (see watershed map).



Frequently Asked Questions…

When is compliance required?

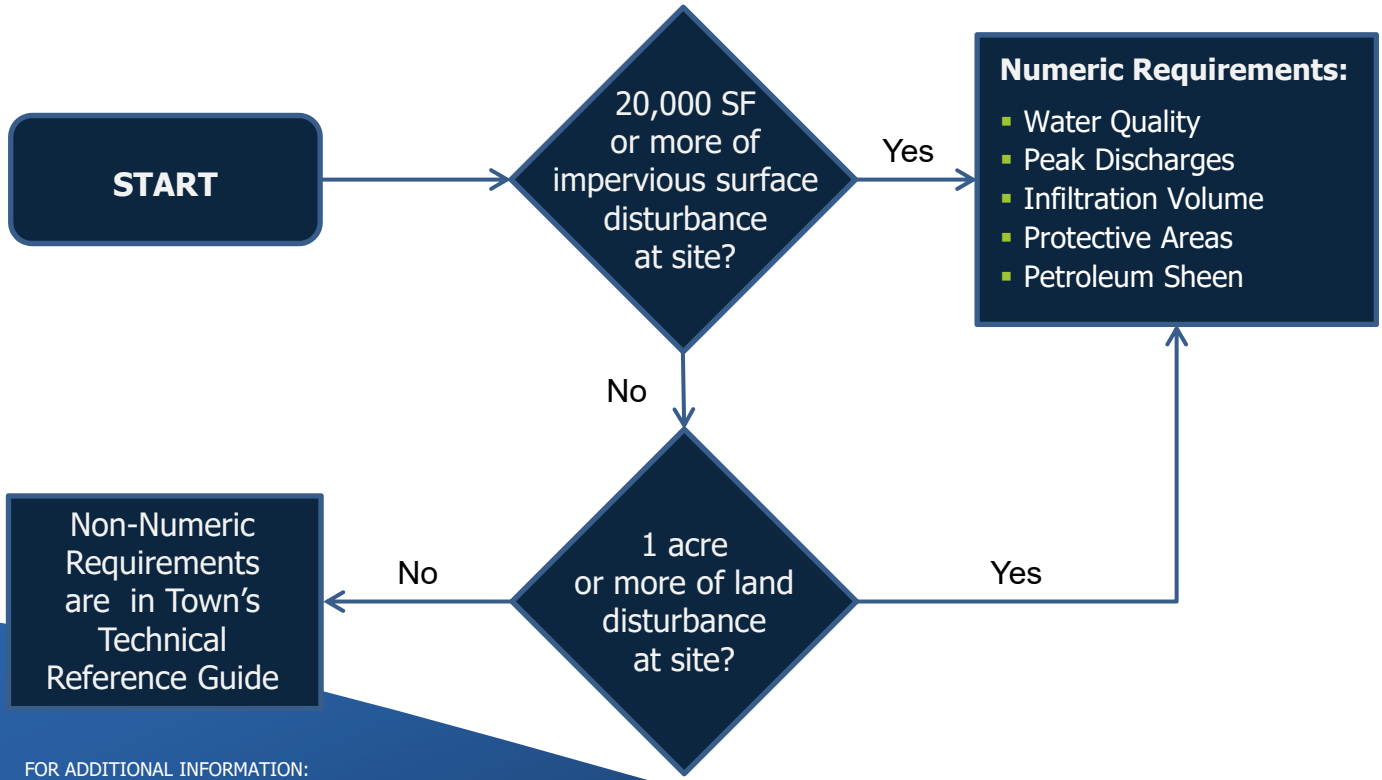
Ordinance compliance is required for all post-construction sites located within the Town.

Who is responsible for compliance?

Landowners, developers, builders, contractors, subcontractors, landscapers, utility companies and other persons involved with the post-construction site are responsible for ordinance compliance.

What is required by the ordinance?

The Town's Post-Construction Stormwater Management Ordinance requires design, installation and maintenance of best management practices (BMPs). The Town's permit application, ordinance and Technical Reference Guide can be downloaded from the website. Please refer to the ordinance for specific requirements and exemptions. Generally, the below flow chart describes when a permit applicant needs to satisfy the ordinance's numeric or non-numeric requirements.



FOR ADDITIONAL INFORMATION:

Town of Grand Chute
1900 W. Grand Chute Boulevard
Grand Chute, WI 54913-9613
920-832-1573
www.grandchute.net

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ENGINEERS ARCHITECTS

The Town Board of the Town of Grand Chute does hereby ordain that Article II of Chapter 463 of the code or ordinances of the Town Grand Chute is repealed and recreated to read as follows:

Chapter 463. Stormwater Management

Article II. Stormwater Management

§ 463-13. Authority.

A. This article is adopted by the Town of Grand Chute Board under the authority granted by § 60.627, Wis. Stats. This article supersedes all provisions of an ordinance previously enacted under § 60.62, Wis. Stats., that relate to post-construction stormwater management regulations. Except as otherwise specified in § 60.627, Wis. Stats., § 60.62, Wis. Stats., applies to this article and to any amendments to this article.

B. The provisions of this article are deemed not to limit any other lawful regulatory powers of the same governing body.

C. The Town of Grand Chute Board hereby designates the Plan Commission and Community Development Department to administer and enforce the provisions of this article.

D. The requirements of this article do not pre-empt more stringent stormwater management requirements that may be imposed by any of the following:

(1) Wisconsin Department of Natural Resources administrative rules, permits or approvals including those authorized under §§ 281.16 and 283.33, Wis. Stats.

(2) Targeted performance standards promulgated in rules by the Wisconsin Department of Natural Resources under § NR 151.004, Wis. Adm. Code.

§ 463-14. Findings of fact.

The Town of Grand Chute Board finds that uncontrolled, post-construction runoff has a significant impact upon water resources and the health, safety and general welfare of the community and diminishes the public enjoyment and use of natural resources. Specifically, uncontrolled post-construction runoff can:

A. Degrade physical stream habitat by increasing stream bank erosion, increasing streambed scour, diminishing groundwater recharge, diminishing stream base flows and increasing stream temperature.

B. Diminish the capacity of lakes and streams to support fish, aquatic life, recreational and water supply uses by increasing pollutant loading of sediment, suspended solids, nutrients, heavy metals, bacteria, pathogens and other urban pollutants.

C. Alter wetland communities by changing wetland hydrology and by increasing pollutant loads.

D. Reduce the quality of groundwater by increasing pollutant loading.

E. Threaten public health, safety, property and general welfare by overtaxing storm sewers, drainage ways, and other minor drainage facilities.

F. Threaten public health, safety, property and general welfare by increasing major flood peaks and volumes.

G. Undermine floodplain management efforts by increasing the incidence and levels of flooding.

§ 463-15. Purpose and intent.

A. Purpose. The general purpose of this article is to establish long-term, post-construction runoff management requirements that will diminish the threats to public health, safety, welfare and the aquatic environment. Specific purposes are to:

(1) Further the maintenance of safe and healthful conditions.

(2) Prevent and control the adverse effects of stormwater; prevent and control soil erosion; prevent and control water pollution; protect spawning grounds, fish and aquatic life; control building sites, placement of structures and land uses; preserve ground cover and scenic beauty; and promote sound economic growth.

(3) Control exceedance of the safe capacity of existing drainage facilities and receiving water bodies; prevent undue channel erosion; control increases in the scouring and transportation of particulate matter; and prevent conditions that endanger downstream property.

B. Intent. It is the intent of the Town of Grand Chute Board that this article regulates post-construction stormwater discharges to waters of the state. This article may be applied on a site-by-site basis. The Town Board recognizes, however, that the preferred method of achieving the stormwater performance standards set forth in this article is through the preparation and implementation of comprehensive, systems-level stormwater management plans that cover hydrologic units, such as watersheds, on a municipal and regional scale. Such plans may prescribe regional stormwater devices, practices or systems, any of which may be designed to treat runoff from more than one site prior to discharge to waters of the state. Where such plans are in conformance with the performance standards developed under § 281.16, Wis. Stats., for regional stormwater management measures and have been approved by the Town Board, it is the intent of this article that the approved plan be used to identify post-construction management measures acceptable for the community.

§ 463-16. Applicability and jurisdiction.

A. Applicability.

(1) Where not otherwise limited by law, this article applies to all post-construction sites, unless the site is otherwise exempt under Subsection A(2).

(2) A post-construction site that meets any of the following criteria is exempt from the requirements of this article.

(a) One- and two-family residential dwellings that are not part of a larger common plan of development or sale and that result in less than one acre of disturbance.

(b) Non-point discharges from agricultural activity areas.

(c) Non-point discharges from silviculture activities.

(d) Mill and crush operations.

(3) Notwithstanding the applicability requirements in Subsection A(1), this article applies to post-construction sites of any size that, in the opinion of the administering authority, is likely to result in runoff that exceeds the safe capacity of the existing drainage facilities or receiving body of water, that causes undue channel erosion, that increases water pollution by scouring or the transportation of particulate matter or that endangers property or public safety.

B. Jurisdiction. This article applies to post-construction sites within the boundaries and jurisdiction of the Town of Grand Chute.

C. Exclusions. This article is not applicable to activities conducted by a state agency, as defined under § 227.01 (1), Wis. Stats., but also including the office of district attorney, which is subject to the state plan promulgated or a memorandum of understanding entered into under § 281.33 (2), Wis. Stats.

§ 463-17. Definitions.

A. A. For the purpose of this article, the following shall apply as indicated throughout the article:

(1) The word "person" includes a firm, association, organization, partnership, trust, company or corporation as well as an individual.

(2) The present tense includes the future tense, and the singular includes plural.

(3) The word "shall" is mandatory; the word "may" is permissive.

(4) The word "used" or "occupied" also means intended, designed or arranged to be used or occupied.

B. Definition of terms. For the purpose of this article, the following terms are defined:

ADEQUATE SOD or SELF-SUSTAINING VEGETATIVE COVER

Maintenance of sufficient vegetation types and densities such that the physical integrity of the streambank or lakeshore is preserved. Self-sustaining vegetative cover includes grasses, forbs, sedges and duff layers of fallen leaves and woody debris.

ADMINISTERING AUTHORITY

A governmental employee or their designees empowered under s. 60.627, Wis. Stats., to administer this article. For the purpose of this article, it is the Town of Grand Chute Community Development Department under guidance from the Plan Commission.

AGRICULTURAL ACTIVITY AREA

The part of the farm where there is planting, growing, cultivating and harvesting of crops for human or livestock consumption and pasturing or outside yarding of livestock, including sod farms and silviculture. Practices in this area may include waterways, drainage ditches, diversions, terraces, farm lanes, excavation, filling and similar practices. The agricultural activity area does not include the agricultural production area.

AGRICULTURAL PRODUCTION AREA

The part of the farm where there is concentrated production activity or impervious surfaces. Agricultural production areas include buildings, driveways, parking areas, feed storage structures, manure storage structures, and other impervious surfaces. The agricultural production area does not include the agricultural activity area.

ATLAS 14

The National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Precipitation-Frequency Atlas of the United States, Volume 8 (Midwestern States), published in 2013.

AVERAGE ANNUAL RAINFALL

A typical calendar year of precipitation as determined by the Wisconsin DNR for users of models such as SLAMM, P8, or equivalent methodology. The average annual rainfall is chosen from a Wisconsin DNR publication for the location closest to the municipality.

BEST MANAGEMENT PRACTICES or BMP

Structural or non-structural measures, practices, techniques or devices employed to avoid or minimize soil, sediment or pollutants carried in runoff to waters of the state.

BUSINESS DAY

A day the office of the administering authority is routinely and customarily open for business.

CEASE AND DESIST ORDER

A court-issued order to halt land disturbing construction activity that is being conducted without the required permit.

COMBINED SEWER SYSTEM

A system for conveying both sanitary sewage and stormwater runoff.

COMMON PLAN OF DEVELOPMENT OR SALE

A development or sale where multiple separate and distinct land disturbing construction activities may be taking place at different times on different schedules but under one plan. A common plan of development or sale includes, but is not limited to, subdivision plats, certified survey maps, and other developments.

CONNECTED IMPERVIOUS

An impervious surface connected to the waters of the state via a separate storm sewer, an impervious flow path, or a minimally pervious flow path.

CONSTRUCTION SITE

An area upon which one or more land disturbing construction activities occur, including areas that are part of a larger common plan of development or sale.

DESIGN STORM

A hypothetical discrete rainstorm characterized by a specific duration, temporal distribution, rainfall intensity, return frequency, and total depth of rainfall. The TP-40, Type II, 24-hour design storms for Town of Grand Chute are: 1-year, 2.2 inches; 2-year, 2.5 inches; 5-year, 3.3 inches; 10-year, 3.8 inches; 25-year, 4.4 inches; 50-year, 4.9 inches; and 100-year, 5.3 inches. The Atlas 14, MSE4, 24-hour design storms for the Town of Grand Chute are: 1-year, 2.14 inches; 2-year, 2.45 inches; 5-year, 3.01 inches; 10-year, 3.51 inches; 25-year, 4.24 inches; 50-year, 4.85 inches; and 100-year, 5.50 inches.

DEVELOPMENT

Residential, commercial, industrial, institutional, or other land uses and associated roads.

DIRECT CONDUITS TO GROUNDWATER

Wells, sinkholes, swallets, fractured bedrock at the surface, mine shafts, nonmetallic mines, tile inlets discharging to groundwater, quarries, or depressional groundwater recharge areas over shallow fractured bedrock.

DIVISION OF LAND

The creation from one or more parcels or building sites of additional parcels or building sites where such creation occurs at one time or through the successive partition within a five year period.

EFFECTIVE INFILTRATION AREA

The area of the infiltration system that is used to infiltrate runoff and does not include the area used for site access, berms or pretreatment.

EROSION

The process by which the land's surface is worn away by the action of wind, water, ice or gravity.

EXCEPTIONAL RESOURCE WATERS

Waters listed in § NR 102.11, Wis. Adm. Code.

EXISTING DEVELOPMENT

Development in existence on October 1, 2004 or development for which a stormwater permit in accordance with Subch. III of Ch. NR 216, Wis. Adm. Code, was received on or before October 1, 2004.

EXTRATERRITORIAL

The unincorporated area within 3 miles of the corporate limits of a first, second, or third class city, or within 1.5 miles of a fourth class city or village.

FILTERING LAYER

Soil that has at least a 3-foot deep layer with at least 20 percent fines; or at least a 5-foot deep layer with at least 10 percent fines; or an engineered soil with an equivalent level of protection as determined by the administering authority for the site.

FINAL STABILIZATION

That all land disturbing construction activities at the construction site have been completed and that a uniform, perennial, vegetative cover has been established, with a density of at least 70% of the cover, for the unpaved areas and areas not covered by permanent structures, or that employ equivalent permanent stabilization measures.

FINANCIAL GUARANTEE

A performance bond, maintenance bond, surety bond, irrevocable letter of credit, or similar guarantees submitted to the administering authority by the responsible party to assure that requirements of the article are carried out in compliance with the stormwater management plan.

GOVERNING BODY

Town Board of Supervisors, county board of supervisors, city council, village board of trustees or village council.

GROUNDWATER

Waters of the state, as defined in § 281.01 (18), Wis. Stats., occurring in a saturated subsurface geological formation of rock or soil.

HIGH GROUNWATER LEVEL OR SUBSURFACE SATURATION

Higher of either the elevation to which the soil is saturated as observed as a free water surface in an unlined hole, or the elevation to which the soil has been seasonally or periodically saturated as indicated by soil color patterns throughout the soil profile, as defined in Technical Standard 1002, Site Evaluation for Stormwater Infiltration.

HIGHWAY

Has the meaning given in § 340.01 (22), Wis. Stats.

HIGHWAY RECONDITIONING

Has the meaning given in § 84.013 (1)(b), Wis. Stats.

HIGHWAY RECONSTRUCTION

Has the meaning given in § 84.013(1)(c), Wis. Stats.

HIGHWAY RESURFACING

Has the meaning given in § 84.013(1)(d), Wis. Stats.

IMPERVIOUS SURFACE

An area that releases as runoff all or a large portion of the precipitation that falls on it, except for frozen soil. Rooftops, sidewalks, driveways, parking lots and streets are examples of surfaces that typically are impervious. Gravel surfaces are considered impervious, unless specifically designed to encourage infiltration.

IMPERVIOUS SURFACE DISTURBANCE

Any land disturbing construction activity in which any new impervious surfaces are created or existing impervious surfaces are redeveloped.

IN-FILL

An undeveloped area of land or new development area located within an existing urban sewer service area, surrounded by development or development and natural or man-made features where development cannot occur. “In-fill” does not include any undeveloped area that was part of a larger new development for which a stormwater permit in accordance with Subch. III of Ch. NR 216, Wis. Adm. Code, was required to be submitted after October 1, 2004 to the Wisconsin Department of Natural Resources or Wisconsin Department of Safety and Professional Services (formerly Department of Commerce).

INFILTRATION

The entry and movement of precipitation or runoff into or through soil.

INFILTRATION SYSTEM

A device or practice such as a basin, trench, rain garden or swale designed specifically to encourage infiltration, but does not include natural infiltration in pervious surfaces such as lawns, redirecting of rooftop downspouts onto lawns or minimal infiltration from practices, such as swales or road side channels designed for conveyance and pollutant removal only.

LAND DISTURBING CONSTRUCTION ACTIVITY (OR DISTURBANCE)

Any man-made alteration of the land surface resulting in a change in the topography or existing vegetative or non-vegetative soil cover, that may result in runoff and lead to an increase in soil erosion and movement of pollutants into the municipal separate storm sewer or waters of the state. Land disturbing construction activity includes clearing and grubbing, demolition, excavating, pit trench dewatering, filling and grading activities, and soil stockpiling.

MAINTENANCE AGREEMENT

A legal document that provides for long-term maintenance of stormwater management and best management practices.

MEP or MAXIMUM EXTENT PRACTICABLE

The highest level of performance that is achievable but is not equivalent to a performance standard identified within this article. Maximum extent practicable applies when the permit applicant demonstrates to the administering authority's satisfaction that a performance standard is not achievable and that a lower level of performance is appropriate. In making the assertion that a performance standard is not achievable and that a level of performance different from the performance standard is the maximum extent practicable, the permit applicant shall take into account the best available technology, cost effectiveness, geographic features, and other competing interests such as protection of public safety and welfare, protection of endangered and threatened resources, and preservation of historic properties.

MINOR RECONSTRUCTION OF A HIGHWAY

Reconstruction of a highway that is limited to 1.5 miles in continuous or aggregate total length of realignment and that does not exceed 100 feet in width of roadbed widening, and that does not include replacement of a vegetated drainage system with a non-vegetated drainage system except where necessary to convey runoff under a highway or private road or driveway.

MSE4 DISTRIBUTION

A specific precipitation distribution developed by the USDA, NRCS, using precipitation data from Atlas 14.

NAVIGABLE WATERS AND NAVIGABLE WATERWAY

Has the meaning given in § 30.01(4m), Wis. Stats.

NEW DEVELOPMENT

That portion of a post-construction site where impervious surfaces are being created or expanded. Any disturbance where the amount of impervious area for the post-development condition is greater than the pre-development condition is classified as new development. For purposes of this article, a post-construction site is classified as new development, redevelopment, routine maintenance, or some combination of these three classifications as appropriate.

OFF-SITE

Located outside the property boundary described in the permit application.

ON-SITE

Located within the property boundary described in the permit application.

ORDINARY HIGH-WATER MARK

Has the meaning given in § NR 115.03(6), Wis. Adm. Code.

OUTSTANDING RESOURCE WATERS

Waters listed in § NR 102.10, Wis. Adm. Code.

PERCENT FINES

The percentage of a given sample of soil, which passes through a # 200 sieve.

PERFORMANCE STANDARD

A narrative or measurable number specifying the minimum acceptable outcome for a facility or practice.

PERMIT

A written authorization made by the administering authority to the applicant to conduct land disturbing construction activity or to discharge post-construction runoff to waters of the state.

PERMIT ADMINISTRATION FEE

A sum of money paid to the administering authority by the permit applicant for the purpose of recouping the expenses incurred by the authority in administering the permit.

PERVIOUS SURFACE

An area that releases as runoff a small portion of the precipitation that falls on it. Lawns, gardens, parks, forests or other similar vegetated areas are examples of surfaces that typically are pervious.

POLLUTANT

Has the meaning given in § 283.01(13), Wis. Stats.

POLLUTION

Has the meaning given in § 281.01(10), Wis. Stats.

POST-CONSTRUCTION SITE

A construction site following the completion of land disturbing construction activity and final site stabilization.

POST-DEVELOPMENT

The extent and distribution of land cover types present after the completion of land disturbing construction activity and final site stabilization.

PRE-DEVELOPMENT

The extent and distribution of land cover types present before the initiation of land disturbing construction activity, assuming that all land uses prior to development activity are managed in an environmentally sound manner.

PREVENTIVE ACTION LIMIT

The meaning given in § NR 140.05(17), Wis. Adm. Code.

REDEVELOPMENT

That portion of a post-construction site where impervious surfaces are being reconstructed, replaced, or reconfigured. Any disturbance where the amount of impervious area for the post-development condition is equal to or less than the pre-development condition is classified as redevelopment. For purposes of this article, a post-construction site is classified as new development, redevelopment, routine maintenance, or some combination of these three classifications as appropriate.

RESPONSIBLE PARTY

Any entity holding fee title to the property or other person contracted or obligated by other agreement to implement and maintain post-construction stormwater BMPs.

ROUTINE MAINTENANCE

That portion of a post-construction site where pre-development impervious surfaces are being maintained to preserve the original line and grade, hydraulic capacity, drainage pattern, configuration, or purpose of the facility. Remodeling of buildings and resurfacing of parking lots, streets, driveways, and sidewalks are examples of routine maintenance, provided the lower ½ of the impervious surface's granular base is not disturbed. The disturbance shall be classified as redevelopment if the lower ½ of the granular base associated with the pre-development impervious surface is disturbed or if the soil located beneath the impervious surface is exposed. For purposes of this article, a post-construction site is classified as new development, redevelopment, routine maintenance, or some combination of these three classifications as appropriate.

RUNOFF

Stormwater or precipitation including rain, snow or ice melt or similar water that moves on the land surface via sheet or channelized flow.

SEDIMENT

Settleable solid material that is transported by runoff, suspended within runoff or deposited by runoff away from its original location.

SEPARATE STORM SEWER

A conveyance or system of conveyances including roads with drainage systems, streets, catch basins, curbs, gutters, ditches, constructed channels or storm drains, which meets all of the following criteria:

A. Is designed or used for collecting water or conveying runoff.

B. Is not part of a combined sewer system.

C. Is not part of a publicly owned wastewater treatment works that provides secondary or more stringent treatment.

D. Discharges directly or indirectly to waters of the state.

SILVICULTURE ACTIVITIES

Activities including tree nursery operations, tree harvesting operations, reforestation, tree thinning, prescribed burning, and pest and fire control. Clearing and grubbing of an area of a construction site is not a silviculture activity.

SITE

The entire area included in the legal description of the land on which the land disturbing construction activity occurred.

STOP WORK ORDER

An order issued by the administering authority which requires that all construction activity on the site be stopped.

STORMWATER MANAGEMENT PLAN

A comprehensive plan designed to reduce the discharge of pollutants from stormwater after the site has under gone final stabilization following completion of the construction activity.

STORMWATER MANAGEMENT SYSTEM PLAN

Is a comprehensive plan designed to reduce the discharge of runoff and pollutants from hydrologic units on a regional or municipal scale.

TARGETED PERFORMANCE STANDARD

A performance standard that will apply in a specific area, where additional practices beyond those contained in this article, are necessary to meet water quality standards. A total maximum daily load is an example of a targeted performance standard.

TECHNICAL STANDARD

A document that specifies design, predicted performance and operation and maintenance specifications for a material, device or method.

TOP OF CHANNEL

An edge, or point on the landscape, landward from the ordinary high-water mark of a surface water of the state, where the slope of the land begins to be less than 12% continually for at least 50 feet. If the slope of the land is 12% or less continually for the initial 50 feet, landward from the ordinary high-water mark, the top of the channel is the ordinary high-water mark.

TOTAL MAXIMUM DAILY LOAD or TMDL

The amount of pollutants specified as a function of one or more water quality parameters, that can be discharged per day into a water quality limited segment and still ensure attainment of the applicable water quality standard.

TP-40

The Technical Paper No. 40, Rainfall Frequency Atlas of the United States, published in 1961.

TR-55

The United States Department of Agriculture, Natural Resources Conservation Service (previously Soil Conservation Service), Urban Hydrology for Small Watersheds, Second Edition, Technical Release 55, June 1986, which is incorporated by reference for this article.

TRANSPORTATION FACILITY

A public street, a public road, a public highway, a railroad, a public mass transit facility, a public-use airport, a public trail, or any other public work for transportation purposes such as harbor improvements under § 85.095(1)(b), Wis. Stats. “Transportation facility” does not include building sites for the construction of public buildings and buildings that are places of employment that are regulated by the Wisconsin Department of Natural Resources pursuant to § 281.33, Wis. Stats.

TYPE II DISTRIBUTION

A rainfall type curve as established in the “United States Department of Agriculture, Soil Conservation Service, Technical Paper 149, published 1973”, which is incorporated by reference for this article. The Type II curve is applicable to all of Wisconsin and represents the most intense storm pattern.

WATERS OF THE STATE

Has the meaning given in § 283.01 (20), Wis. Stats.

§ 463-18. Technical standards.

The following methods shall be used in designing and maintaining the water quality, peak discharge, infiltration, protective area, fueling / vehicle maintenance, and swale treatment components of stormwater practices needed to meet the water quality standards of this article:

A. Technical standards identified, developed or disseminated by the Wisconsin Department of Natural Resources under Subchapter V of Chapter NR 151, Wis. Adm. Code.

B. Technical standards and guidance identified within the Town of Grand Chute Stormwater Reference Guide.

C. Where technical standards have not been identified or developed by the Wisconsin Department of Natural Resources, other technical standards may be used provided that the methods have been approved by the administering authority.

D. In this article, the following year and location has been selected as average annual rainfall(s): Green Bay, 1969 (Mar. 29-Nov. 25).

E. Stormwater facilities located within an airport zoning district shall be designed, operated, and maintained in conformance with Chapter 10 of the Outagamie County Code of Ordinances.

F. Safety standards in addition to Ch. NR 151, Wis. Adm. Code. The purpose of this section is to enhance the safety of stormwater treatment facilities, including wet detention ponds. These standards shall apply to any wet pond on a parcel or site located in a residential zoning district or adjoining a residential zoning district, a school, a day-care facility or similar facility in the Town. These standards shall apply to stormwater facilities constructed after the effective date of this article.

(1) The Town encourages the use of a biofiltration system in meeting the stormwater quantity and quality standards on a site of two acres or less. The applicant shall identify its reasons for not installing a biofiltration system on a site of two acres or less.

(2) To achieve stormwater quality and quantity requirements, the applicant may use a wet pond design as a stormwater treatment facility. The wet pond specification shall meet the following safety specification:

(a) Side slope to wet pond of 4:1 or flatter.

(b) Underwater safety shelf measuring eight feet wide or more with an average water depth of less than 18 inches.

(c) Vegetation or plantings installed in the safety shelf and side slope.

(d) Grating covers for all structure inlets and outlets greater than six inches in size.

(3) The stormwater treatment facility maintenance plan shall identify the maintenance procedures for the vegetation so as to discourage access to the wet pond. Waterfalls, fountains, sculptures, and other improvements inside the side slope, not related to stormwater treatment facility operation, are prohibited.

(4) If the applicant cannot meet both the stormwater quantity and quality standards and the wet pond safety specifications in Subsection F(2) above, the applicant shall meet the quality and quantity standards. The applicant shall submit a wet pond safety report that identifies any variance from the safety specifications and identifies any supplemental safety features that are

incorporated into the design of the wet pond as a result. An applicant is not required to erect a fence around a wet pond; however, the applicant may include a fence in the safety features for the facility design. Fence height and fence location are regulated by § 535-53 of this Code and the County Shoreline Code.

(5) Ponds created for purposes other than stormwater management are exempt from this article.

§ 463-19. Performance standards.

A. Responsible party. The responsible party shall develop and implement a post-construction stormwater management plan that incorporates the requirements of this section.

B. Plan. A written stormwater management plan shall be developed and implemented by the responsible party in accordance with § 463-21. The stormwater management plan shall meet all of the applicable requirements contained in this article.

C. Requirements. The stormwater management plan shall meet the following minimum requirements to the maximum extent practicable:

(1) Water quality. BMPs shall be designed, installed and maintained to control pollutants carried in runoff from the post-construction site. The design shall be based on the average annual rainfall, as compared to no runoff management controls.

(a) For post-construction sites with one acre or more of land disturbance, the following is required:

[1] Except as provided in § 463-19C(1)(a)[2], a pollutant reduction is required as follows:

	Total Suspended Solids (TSS) & Total Phosphorus (TP) Reduction					
	New Development		Redevelopment		Routine Maintenance	
Watershed	TSS	TP	TSS	TP	TSS	TP
Bear Creek	80%	-	40%	-	40%	-
Fox River	80%	41%	72%	41%	72%	41%
Mud Creek	80%	48%	43%	48%	43%	48%
Rat River	80%	-	40%	-	40%	-
Wolf River	80%	-	40%	-	40%	-

[2] A pollutant reduction is not required for routine maintenance areas that are part of a post-construction site with less than five acres of disturbance.

(b) For post-construction sites with less than one acre of land disturbance, reduce the pollutant load using BMPs from the Town of Grand Chute Stormwater Reference Guide or other practices approved by the administering authority.

(c) Sites, including common plan of development sites, with a cumulative addition of 20,000 square feet or greater of impervious surfaces after October 1, 2004 are required to satisfy the performance standards within § 463-19C(1)(a)[1] and [2].

(d) The amount of pollutant control previously required for the site shall not be reduced as a result of the proposed development or disturbance.

(e) When designing BMPs, runoff draining to the BMP from offsite areas shall be taken into account in determining the treatment efficiency of the practice. Any impact on the BMP efficiency shall be compensated for by increasing the size of the BMP accordingly. The pollutant load reduction provided by the BMP for an offsite area shall not be used to satisfy the required onsite pollutant load reduction, unless otherwise approved by the administering authority in accordance with § 463-19E.

(f) If the design cannot meet the water quality performance standards of § 463-19C(1)(a) through (e), the stormwater management plan shall include a written, site specific explanation of why the water quality performance standard cannot be met and why the pollutant load will be reduced only to the maximum extent practicable. Except as provided in § 463-19F, the administering authority may not require any person to exceed the applicable water quality performance standard to meet the requirements of maximum extent practicable.

(2) Peak discharge. BMPs shall be designed, installed and maintained to control peak discharges from the post-construction site.

(a) The following is required for post-construction sites with one or more of the following: 20,000 square feet or more of impervious surface disturbance, or one acre or more of land disturbance.

[1] The peak post-development discharge rate shall not exceed the peak pre-development discharge rate for the 1-year, 2-year, 10-year, and 100-year, 24-hour design storms. These peak discharge requirements apply to new development and redevelopment areas. No peak discharge control is required for routine maintenance areas, unless runoff from the routine maintenance area discharges into a proposed peak flow control facility.

[2] Peak discharge calculations shall use TR-55 methodology. Atlas 14 rainfall depths and the MSE4 rainfall distribution shall be used unless the site is to be served by a previously constructed peak discharge facility. At the permittee's discretion, the TP-40 rainfall depths and the Type II rainfall distribution can be used for sites that are to be served by a previously constructed peak discharge facility. The meaning of "hydrologic soil group" and "runoff curve number" are as determined in TR-55. Unless the site is currently woodland, peak pre-development discharge rates shall be determined using the following runoff curve numbers for a "meadow" vegetative cover:

Maximum Pre-Development Runoff Curve Numbers				
	Hydrologic Soil Group			
Vegetative Cover	A	B	C	D
Meadow	30	58	71	78
Woodland	30	55	70	77

(b) For post-construction sites with less than 20,000 square feet of impervious surface disturbance, prepare a plan that shows how the peak post-development discharge rates are reduced using BMPs from the Town of Grand Chute Stormwater Reference Guide or other practices approved by the administering authority. If 90% of the proposed impervious surfaces discharge to BMPs, these sites are not required to satisfy a numeric performance standard.

(c) Sites with a cumulative addition of 20,000 square feet or greater of impervious surfaces after October 1, 2004 are required to satisfy the performance standards within § 463-19C(2)(a)[1] and [2].

(d) The amount of peak discharge control previously required for the site shall not be reduced as a result of the proposed development or disturbance.

(e) When designing BMPs, runoff draining to the BMP from offsite areas shall be taken into account in determining the performance of the practice. Any impact on the BMP performance shall be compensated for by increasing the size of the BMP accordingly. The peak discharge reduction provided by the BMP for an offsite area shall not be used to satisfy the required onsite peak discharge reduction, unless otherwise approved by the administering authority in accordance with § § 463-19E.

(f) An adequate outfall shall be provided for each point of concentrated discharge from the post-construction site and shall:

[1] Consist of non-erosive discharge velocities and reasonable downstream conveyance.

[2] Discharge to the municipal separate storm sewer system, waters of the state, or an appropriate drainage easement. If a site is not able to meet this requirement, the adequate outfall may be permitted if it diffuses the outfall within the site boundary in accordance with the Town of Grand Chute Stormwater Reference Guide.

(g) New buildings with basements shall be designed to provide a minimum one foot of vertical separation between the lowest floor surface and the estimated high groundwater level. If less than one foot of vertical separation is provided, groundwater flow shall be estimated for each basement during site or subdivision design. In addition, the onsite stormwater systems shall be designed to accommodate the additional water flow and volume from groundwater.

(h) New development sites that discharge to direct conduits to groundwater shall be designed in conformance with Chapter 38 of the Outagamie County Code of Ordinances.

(i) New development sites located near a closed depression and/or flood prone area shall be designed to provide a minimum one foot of vertical separation between the lowest ground surface elevation at the building's perimeter and the overland relief elevation for the flood prone area. The Town of Grand Chute maintains a Flood Prone Area map to assist with identifying higher risk areas. If less than one foot of vertical separation is provided, a detailed stormwater analysis shall be performed to identify and reasonably manage 100-year flooding risks for buildings or structures located within the flood prone area.

(j) Agricultural production areas shall meet the intent of this article by following the BMPs listed in the Town of Grand Chute Stormwater Reference Guide.

(k) *Exemptions.* The peak discharge performance standards do not apply to the following:

[1] A transportation facility where the discharge is directly into a lake over 5,000 acres or a stream or river segment draining more than 500 square miles.

[2] Except as provided under § 463-19C(2)(d) to (f), a highway reconstruction site.

[3] Except as provided under § 463-19C(2)(d) to (f), a transportation facility that is part of a redevelopment project.

(3) Infiltration. BMPs shall be designed, installed, and maintained to infiltrate runoff from the post-construction site, except as provided in § 463-19C(3)(i) through (m).

(a) The following is required for post-construction sites with one or more of the following: 20,000 square feet or more of impervious surface disturbance, or one acre or more of land disturbance.

[1] *Low Imperviousness.* For development up to 40 percent connected imperviousness, such as parks, cemeteries, and low density residential development, infiltrate sufficient runoff volume so that the post-development infiltration volume shall be at least 90 percent of the pre-development infiltration volume, based on an average annual rainfall. However, when designing appropriate infiltration systems to meet this requirement, no more than one percent of the post-construction site is required as an effective infiltration area.

[2] *Moderate imperviousness.* For development with more than 40 percent and up to 80 percent connected imperviousness, such as medium and high density residential, multi-family development, industrial and institutional development, and office parks, infiltrate sufficient runoff volume so that the post-development infiltration volume shall be at least 75 percent of the pre-development infiltration volume, based on an average annual rainfall. However, when designing appropriate infiltration systems to meet this requirement, no more than 2 percent of the post-construction site is required as an effective infiltration area.

[3] *High imperviousness.* For development with more than 80 percent connected imperviousness, such as commercial strip malls, shopping centers, and commercial downtowns, infiltrate sufficient runoff volume so that the post-development infiltration volume shall be at least 60 percent of the pre-development infiltration volume, based on an average annual rainfall. However, when designing appropriate infiltration systems to meet this requirement, no more than 2 percent of the post-construction site is required as an effective infiltration area.

(b) Pre-development condition shall assume “good hydrologic conditions” for appropriate land covers as identified in TR-55 or an equivalent methodology approved by the administering authority. The meaning of “hydrologic soil group” and “runoff curve number” are as determined in TR-55. The actual pre-development vegetative cover and the following pre-development runoff curve numbers shall be used:

Maximum Pre-Development Runoff Curve Numbers				
	Hydrologic Soil Group			
Vegetative Cover	A	B	C	D
Woodland	30	55	70	77
Grassland	39	61	71	78
Cropland	55	69	78	83

(c) For post-construction sites with less than 20,000 square feet of new impervious surfaces, infiltrate runoff volume using BMPs from the Town of Grand Chute Stormwater Reference

Guide or other practices approved by the administering authority. These sites are not required to satisfy a numeric performance standard.

(d) Sites with a cumulative addition of 20,000 square feet or greater of impervious surfaces after October 1, 2004 are required to satisfy the performance standards within § 463-19C(3)(a) and (b).

(e) The amount of infiltration previously required for the site shall not be reduced as a result of the proposed development or disturbance.

(f) Agricultural production areas shall infiltrate runoff volume using BMPs from the Town of Grand Chute Stormwater Reference Guide.

(g) When designing BMPs, runoff draining to the BMP from offsite areas shall be taken into account in determining the performance of the practice. Any impact on the BMP performance shall be compensated for by increasing the size of the BMP accordingly. The runoff volume reduction provided by the BMP for an offsite area shall not be used to satisfy the required onsite runoff volume reduction, unless otherwise approved by the administering authority in accordance with § 463-19E.

(h) *Pretreatment.* Before infiltrating runoff, pretreatment shall be required for parking lot runoff and for runoff from road construction in commercial, industrial and institutional areas that will enter an infiltration system. The pretreatment shall be designed to protect the infiltration system from clogging prior to scheduled maintenance and to protect groundwater quality in accordance with § 463-19C(3)(o). Pretreatment options may include, but are not limited to, oil/grease separation, sedimentation, biofiltration, filtration, swales or filter strips.

(i) *Source area prohibitions.* Runoff from the following areas may not be infiltrated and may not qualify as contributing to meeting the requirements of § 463-19C(3) unless demonstrated to meet the conditions of § 463-19C(3)(o).

[1] Areas associated with a tier 1 industrial facility identified in § NR 216.21(2)(a), Wis. Adm. Code, including storage, loading, and parking. Rooftops may be infiltrated with the concurrence of the administering authority.

[2] Storage and loading areas of a tier 2 industrial facility identified in § NR 216.21(2)(b), Wis. Adm. Code.

[3] Fueling and vehicle maintenance areas. Rooftops of fueling and vehicle maintenance areas may be infiltrated with the concurrence of the administering authority.

[4] Agricultural production areas that contain livestock, animal waste, or feed storage.

(j) *Source area exemptions.* Runoff from the following areas may be credited toward meeting the requirement when infiltrated, but the decision to infiltrate runoff from these sources is optional:

[1] Parking areas and access roads less than 5,000 square feet for commercial development.

[2] Parking areas and access roads less than 5,000 square feet for industrial development not subject to the prohibitions under § 463-19C(3)(i).

[3] Except as provided under § 463-19C(3)(e), redevelopment and routine maintenance areas.

[4] In-fill development areas less than five acres.

[5] Roads in commercial, industrial and institutional land uses, and arterial residential roads.

[6] Except as provided under § 463-19C(3)(e), transportation facility highway reconstruction and new highways.

(k) *Prohibitions.* Infiltration practices may not be located in the following areas:

[1] Areas within 1,000 feet upgradient or within 100 feet downgradient of direct conduits to groundwater.

[2] Areas within 400 feet of a community water system well as specified in § NR 811.16(4), Wis. Adm. Code, or within the separation distances listed in § NR 812.08, Wis. Adm. Code, for any private well or non-community well for runoff infiltrated from commercial, including multi-family residential, industrial, and institutional land uses or regional devices for one- and two-family residential development.

[3] Areas where contaminants of concern, as defined in § NR 720.03(2), Wis. Adm. Code, are present in the soil through which infiltration will occur.

(l) *Separation distances.* Infiltration practices shall be located so that the characteristics of the soil and the separation distance between the bottom of the infiltration system and the elevation of seasonal high groundwater or the top of bedrock are in accordance with the following:

Separation Distances and Soil Characteristics		
Source Area	Separation Distance	Soil Characteristics
Industrial, Commercial, Institutional Parking Lots and Roads	5 feet or more	Filtering Layer
Residential Arterial Roads	5 feet or more	Filtering Layer
Roofs Draining to Subsurface Infiltration Practices	1 foot or more	Native or Engineered Soil with Particles Finer than Coarse Sand
Roofs Draining to Surface Infiltration Practices	Not Applicable	
All Other Impervious Source Areas	3 feet or more	Filtering Layer

Notwithstanding § 463-19C(3)(l), applicable requirements for injection wells classified under Ch. NR 815, Wis. Adm. Code, shall be followed.

(m) *Infiltration rate exemptions.* Infiltration practices located in the following areas may be credited toward meeting the requirement under the following conditions, but the decision to infiltrate under these conditions is optional:

[1] Where the infiltration rate of the soil measured at the proposed bottom of the infiltration system is less than 0.6 inches per hour using a scientifically credible field test method.

[2] Where the least permeable soil horizon to five feet below the proposed bottom of the infiltration system using the U.S. Department of Agriculture method of soils analysis is one of the following: sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay.

(n) *Alternate uses.* Where alternate uses of runoff are employed, such as for toilet flushing, laundry or irrigation or storage on green roofs where an equivalent portion of the runoff is captured permanently by rooftop vegetation, such alternate use shall be given equal credit toward the infiltration volume required by § 463-19C(3).

(o) *Groundwater standards.*

[1] Infiltration systems designed in accordance with this § 463-19C(3) shall, to the extent technically and economically feasible, minimize the level of pollutants infiltrating to groundwater and shall maintain compliance with the preventive action limit at a point of standards application in accordance with Ch. NR 140, Wis. Adm. Code. However, if site specific information indicates that compliance with a preventive action limit is not achievable, the infiltration BMP may not be installed or shall be modified to prevent infiltration to the maximum extent practicable.

[2] Notwithstanding § 463-19C(3)(o)[1], the discharge from BMPs shall remain below the enforcement standard at the point of standards application.

(p) Where the conditions of § 463-19C(3)(i) through (m) limit or restrict the use of infiltration practices, the performance standard of § 463-19C(3) shall be met to the maximum extent practicable.

(4) Protective areas.

(a) "Protective area" means an area of land that commences at the top of the channel of lakes, streams and rivers, or at the delineated boundary of wetlands, and that is the greatest of the following widths, as measured horizontally from the top of the channel or delineated wetland boundary to the closest impervious surface. However, in § 463-19C(4), "protective area" does not include any area of land adjacent to any stream enclosed within a pipe or culvert, such that runoff cannot enter the enclosure at this location.

[1] For outstanding resource waters and exceptional resource waters, 75 feet.

[2] For perennial and intermittent streams identified on a United States geological survey 7.5-minute series topographic map, or a county soil survey map, whichever is more current, 50 feet.

[3] For lakes, 50 feet.

[4] For wetlands not subject to § 463-19C(4)(a)[5] or [6], 50 feet.

[5] For highly susceptible wetlands, 75 feet. Highly susceptible wetlands include the following types: calcareous fens, sedge meadows, open and coniferous bogs, low prairies, coniferous swamps, lowland hardwood swamps, and ephemeral ponds.

[6] For less susceptible wetlands, 10 percent of the average wetland width, but no less than 10 feet nor more than 30 feet. Less susceptible wetlands include: degraded wetlands dominated by invasive species such as reed canary grass; cultivated hydric soils; and any gravel pits, or dredged material or fill material disposal sites that take on the attributes of a wetland.

[7] In § 463-19C(4)(a)[4] to [6], determinations of the extent of the protective area adjacent to wetlands shall be made on the basis of the sensitivity and runoff susceptibility of the wetland in accordance with the standards and criteria in §. NR 103.03, Wis. Adm. Code.

[8] Wetlands shall be delineated. Wetland boundary delineations shall be made in accordance with § NR 103.08(1m), Wis. Adm. Code. § 463-19C(4) does not apply to wetlands that have been completely filled in compliance with all applicable state and federal regulations. The protective area for wetlands that have been partially filled in compliance with all applicable state and federal regulations shall be measured from the wetland boundary delineation after fill has been placed. Where there is a legally authorized wetland fill, the protective area standard need not be met in that location.

[9] For concentrated flow channels with drainage areas greater than 130 acres, 10 feet.

[10] Notwithstanding § 463-19C(4)(a)[1] to [9], the greatest protective area width shall apply where rivers, streams, lakes, and wetlands are contiguous.

(b) § 463-19C(4) applies to all post-construction sites located within a protective area, except those areas exempted pursuant to § 463-19C(4)(e).

(c) The following requirements shall be met:

[1] Impervious surfaces shall be kept out of the protective area entirely or to the maximum extent practicable. If there is no practical alternative to locating an impervious surface in the protective area, the stormwater management plan shall contain a written, site-specific explanation.

[2] Where land disturbing construction activity occurs within a protective area, adequate sod or self-sustaining vegetative cover of 70 percent or greater shall be established and maintained where no impervious surface is present. The adequate sod or self-sustaining vegetative cover shall be sufficient to provide for bank stability, maintenance of fish habitat, and filtering of pollutants from upslope overland flow areas under sheet flow conditions. Non-vegetative materials, such as rock riprap, may be employed on the bank as necessary to prevent erosion, such as on steep slopes or where high velocity flows occur.

[3] Best management practices such as filter strips, swales, or wet detention ponds, that are designed to control pollutants from non-point sources, may be located in the protective area.

(d) A protective area established or created after October 1, 2004 shall not be eliminated or reduced, except as allowed in § 463-19C(4)(e)[2], [3], or [4].

(e) *Exemptions.* The following areas are not required to meet the protective area requirements of § 463-19C(4):

[1] Redevelopment and routine maintenance areas provided the minimum requirements within § 463-19C(4)(d) are satisfied.

[2] Structures that cross or access surface waters such as boat landings, bridges and culverts.

[3] Structures constructed in accordance with § 59.692(1v), Wis. Stats.

[4] Areas of post-construction sites from which the runoff does not enter the surface water, including wetlands, without first being treated by a BMP to meet the requirements of § 463-19C(1) and (2), except to the extent that vegetative ground cover is necessary to maintain bank stability.

(5) Fueling and vehicle maintenance areas. Fueling and vehicle maintenance areas shall have BMPs designed, installed and maintained to reduce petroleum within runoff, so that the runoff that enters waters of the state contains no visible petroleum sheen, or to the maximum extent practicable.

(6) Swale treatment for transportation facilities. This § 463-19C(6) is not applicable to transportation facilities that are part of a larger common plan of development or sale.

(a) *Requirement.* Except as provided in § 463-19C(6)(b), transportation facilities that use swales for runoff conveyance and pollutant removal are exempt from the requirements of § 463-19C(1), (2), and (3), if the swales are designed to do all of the following or to the maximum extent practicable:

[1] Swales shall be vegetated. However, where appropriate, non-vegetative measures may be employed to prevent erosion or provide for runoff treatment, such as rock riprap stabilization or check dams.

[2] Swales shall comply with the Wisconsin Department of Natural Resources Technical Standard 1005, “Vegetated Infiltration Swale”, except as otherwise authorized in writing by the Wisconsin Department of Natural Resources.

(b) *Other Requirements.* Notwithstanding § 463-19C(6)(a), the administering authority may, consistent with water quality standards, require that other requirements, in addition to swale treatment, be met on a transportation facility with an average daily traffic rate greater than 2,500 and where the initial surface water of the state that the runoff directly enters is any of the following:

[1] An outstanding resource water.

[2] An exceptional resource water.

[3] Waters listed in section 303(d) of the federal clean water act that are identified as impaired in whole or in part, due to nonpoint source impacts.

[4] Waters where targeted performance standards are developed pursuant to § NR 151.004, Wis. Adm. Code.

(7) Exemptions. The following areas are not required to meet the performance standards within § 463-19C:

(a) Underground utility construction such as water, sewer, gas, electric, telephone, cable television, and fiber optic lines. This exemption does not apply to the construction of any above ground structures associated with utility construction.

(b) The following transportation facilities are exempt, provided the transportation facility is not part of a larger common plan of development or sale.

[1] A transportation facility post-construction site with less than 10 percent connected imperviousness, based on the area of land disturbance, provided the cumulative area of all impervious surfaces is less than one acre. Notwithstanding this exemption, the protective area requirements of § 463-19C(4) still apply.

[2] Reconditioning or resurfacing of a highway.

[3] Minor reconstruction of a highway. Notwithstanding this exemption, the protective area requirements of § 463-19C(4) apply to minor reconstruction of a highway.

[4] Routine maintenance for transportation facilities that have less than five acres of land disturbance if performed to maintain the original line and grade, hydraulic capacity or original purpose of the facility.

[5] Routine maintenance if performed for stormwater conveyance system cleaning.

D. General considerations for on-site and off-site stormwater management measures. The following considerations shall be observed in managing runoff:

(1) Natural topography and land cover features such as natural swales, natural depressions, native soil infiltrating capacity, and natural groundwater recharge areas shall be preserved and used, to the extent possible, to meet the requirements of this section.

(2) Emergency overland flow for all stormwater facilities shall be provided to prevent exceeding the safe capacity of downstream drainage facilities and prevent endangerment of downstream property or public safety.

E. BMP location and credit.

(1) General. To comply with § 463-19C performance standards, the BMPs may be located on-site or off-site as part of a regional stormwater device, practice or system.

(2) Offsite or regional BMP.

(a) The amount of credit that the administering authority may give an offsite or regional BMP for purposes of determining compliance with the performance standards of § 463-19C is limited to the treatment capability or performance of the BMP.

(b) The administering authority may authorize credit for an off-site or regional BMP provided all of the following conditions are satisfied:

[1] The BMP received all applicable permits.

[2] The BMP shall be installed and operational before the construction site has undergone final stabilization.

[3] The BMP shall be designed and adequately sized to provide a level of stormwater control equal to or greater than that which would be afforded by on-site BMPs meeting the § 463-19C performance standards.

[4] The owner of the BMP has entered into a § 463-22 maintenance agreement with the Town of Grand Chute, or another municipal entity, such that the BMP has a legally obligated entity responsible for its long-term operation and maintenance. Legal authority exists if a municipality owns, operates and maintains the BMP.

[5] The owner of the BMP has provided written authorization which indicates the permit applicant may use the BMP for § 463-19C performance standard compliance.

[6] Where an off-site or regional BMP option exists such that the administering authority exempts the applicant from all or part of the minimum on-site stormwater management requirements, the applicant shall be required to pay a fee in an amount determined in negotiation with the administering authority. In determining the fee for post-construction runoff, the administering authority shall consider an equitable distribution of the cost for land, engineering design, construction, and maintenance of the off-site or regional BMP.

(3) BMP in non-navigable waters. For purposes of determining compliance with the performance standards of § 463-19C, the administering authority may give credit for BMPs that function to provide treatment for runoff from existing development and post-construction runoff from new development, redevelopment, and routine maintenance areas and that are located within non-navigable waters.

(4) BMP in navigable waters.

(a) *New Development Runoff.* Except as allowed under § 463-19E(4)(b), BMPs designed to treat post-construction runoff from new development areas may not be located in navigable waters and, for purposes of determining compliance with the performance standards of § 463-19C, the administering authority may not give credit for such BMPs.

(b) *New Development Runoff Exemption.* BMPs to treat post-construction runoff from new development areas may be located within navigable waters and may be creditable by the administering authority under § 463-19C, if all the following are met:

[1] The BMP was constructed prior to October 1, 2002 and received all applicable permits.

[2] The BMP functions or will function to provide runoff treatment for the new development area.

(c) *Existing Development & Post-Construction Runoff From Redevelopment, Routine Maintenance, & Infill Development Areas.* Except as provided in § 463-19E(4)(d), BMPs designed to treat post-construction runoff for existing development and post-construction runoff from redevelopment, routine maintenance and infill development areas may not be located in navigable waters and, for purposes of determining compliance with the performance standards of § 463-19C, the administering authority may not give credit for such BMPs.

(d) *Existing Development & Post-Construction Runoff From Redevelopment, Routine Maintenance, & Infill Development Areas Exemption.* BMPs that function to provide treatment of runoff from existing development and post-construction runoff from redevelopment, routine maintenance and infill development areas may be located within navigable waters and, for purposes of determining compliance with the performance standards of § 463-19C, the administering authority may give credit for such BMPs, if any of the following are met:

[1] The BMP was constructed, contracts were signed or bids advertised and all applicable permits were received prior to January 1, 2011.

[2] The BMP is on an intermittent waterway and all applicable permits are received.

(5) Water quality trading. To comply with § 463-19C(1) performance standards, the administering authority may authorize credit for water quality trading provided all of the following conditions are satisfied:

(a) The treatment practices associated with a water quality trade shall be in place, effective and operational before credit can be authorized.

(b) The water quality trade shall comply with applicable trading ratios established by the Wisconsin Department of Natural Resources or the Town of Grand Chute.

(c) The water quality trade shall comply with applicable regulations, standards, and guidance developed by the Wisconsin Department of Natural Resources or the Town of Grand Chute.

(d) The responsible party shall furnish a copy of executed water quality trading agreements or other related information deemed necessary by the administering authority in order to authorize credit.

F. Targeted performance standards. The administering authority may establish numeric water quality requirements that are more stringent than those set forth in § 463-19C in order to meet targeted performance standards, total maximum daily loads, and/or water quality standards for a specific water body or area. The numeric water quality requirements may be applicable to any permitted site, regardless of the size of land disturbing construction activity.

G. Alternate requirements. The administering authority may establish stormwater management requirements more stringent than those set forth in this section if the administering authority determines that an added level of protection is needed to protect sensitive resources. Also, the

administering authority may establish stormwater management requirements less stringent than those set forth in this section if the administering authority determines that less protection is needed to protect sensitive resources and provide reasonable flood protection. However, the alternative requirements shall not be less stringent than those requirements promulgated in rules by Wisconsin Department of Natural Resources under NR 151 Wisconsin Administrative Code. The established additional requirements shall be provided to the applicant in writing.

§ 463-20. Permitting requirements, procedures and fees.

A. Permit required. No responsible party may undertake a land disturbing construction activity without receiving a post-construction runoff permit from the administering authority prior to commencing the proposed activity.

B. Permit application and fees. Unless specifically excluded by this article, any responsible party desiring a permit shall submit to the administering authority a permit application made on a form provided by the administering authority for that purpose.

(1) Unless otherwise excepted by this article, a permit application must be accompanied by a stormwater management plan, a maintenance agreement and a non-refundable permit administration fee.

(2) The stormwater management plan shall be prepared to meet the requirements of § 463-19 and § 463-21, the maintenance agreement shall be prepared to meet the requirements of § 463-22, the financial guarantee shall meet the requirements of § 463-23, and fees shall be those established by the Town of Grand Chute Board as set forth in § 463-24.

C. Review and approval of permit application. The administering authority shall review any permit application that is submitted with a stormwater management plan, maintenance agreement, and the required fee. The following approval procedure shall be used:

(1) Within 20 business days of the receipt of a complete permit application, including all items as required by § 463-20B, the administering authority shall inform the applicant whether the application, plan and maintenance agreement are approved or disapproved based on the requirements of this article.

(2) If the stormwater permit application, plan and maintenance agreement are approved, or if an agreed upon payment of fees in lieu of stormwater management practices is made pursuant to § 463-19E, the administering authority shall issue the permit.

(3) If the stormwater permit application, plan or maintenance agreement is disapproved, the administering authority shall detail in writing the reasons for disapproval.

(4) The administering authority may request additional information from the applicant. If additional information is submitted, the administering authority shall have 20 business days from the date the additional information is received to inform the applicant that the plan and maintenance agreement are either approved or disapproved.

(5) Failure by the administering authority to inform the permit applicant of a decision within 20 business days of a required submittal shall be deemed to mean approval of the submittal and the applicant may proceed as if a permit had been issued.

D. Permit requirements. All permits issued under this article shall be subject to the following conditions, and holders of permits issued under this article shall be deemed to have accepted these conditions. The administering authority may suspend or revoke a permit for violation of a permit condition, following written notification of the responsible party. An action by the administering authority to suspend or revoke this permit may be appealed in accordance with § 463-26.

(1) Compliance with this permit does not relieve the responsible party of the responsibility to comply with other applicable federal, state, and local laws and regulations.

(2) The responsible party shall design and install all structural and non-structural stormwater management measures in accordance with the approved stormwater management plan and this permit.

(3) The responsible party shall notify the administering authority at least 10 business days before commencing any work in conjunction with the stormwater management plan, and within 10 business days upon completion of the stormwater management practices. If required as a special condition under § 463-20E, the responsible party shall make additional notification according to a schedule set forth by the administering authority so that practice installations can be inspected during construction.

(4) Practice installations required as part of this article shall be certified "as built" by a licensed professional engineer. Completed stormwater management practices must pass a final inspection by the administering authority or its designee to determine if they are in accordance with the approved stormwater management plan and article. The administering authority or its designee shall notify the responsible party in writing of any changes required in such practices to bring them into compliance with the conditions of this permit.

(5) The responsible party shall notify the administering authority of any significant modifications it intends to make to an approved stormwater management plan. The administering authority may require that the proposed modifications be submitted to it for approval prior to incorporation into the stormwater management plan and execution by the responsible party.

(6) The responsible party shall inspect BMPs annually and after runoff events in accordance with the stormwater management plan and maintenance agreement. The responsible party shall have a licensed professional submit a stamped written inspection report to the administering authority for review and approval every five years. All written inspection reports prepared by the responsible party shall accompany the stamped report prepared by the licensed professional.

(7) The responsible party shall maintain all stormwater management practices in accordance with the stormwater management plan until the practices either become the responsibility of the Town of Grand Chute, or are transferred to subsequent private owners as specified in the approved maintenance agreement.

(8) The responsible party authorizes the administering authority to perform any work or operations necessary to bring stormwater management measures into conformance with the approved stormwater management plan, and consents to a special assessment or charge against the property as authorized under Subch. VII of Ch. 66, Wis. Stats., or to charging such costs against the financial guarantee posted under § 463-23.

(9) If so directed by the administering authority, the responsible party shall repair at the responsible party's own expense all damage to adjoining municipal facilities and drainage ways caused by

runoff, where such damage is caused by activities that are not in compliance with the approved stormwater management plan.

(10) The responsible party shall permit property access to the administering authority or its designee for the purpose of inspecting the property for compliance with the approved stormwater management plan and this permit.

(11) Where site development or redevelopment involves changes in direction, increases in peak rate and/or total volume of runoff from a site, the administering authority may require the responsible party to make appropriate legal arrangements with affected property owners concerning the prevention of endangerment to property or public safety.

(12) The responsible party is subject to the enforcement actions and penalties detailed in § 463-25, if the responsible party fails to comply with the terms of this permit.

(13) The permit applicant shall post the "Certificate of Permit Coverage" in a conspicuous location at the construction site.

E. Permit conditions. Permits issued under this subsection may include conditions established by administering authority in addition to the requirements needed to meet the performance standards in § 463-19 or a financial guarantee as provided for in § 463-23.

F. Permit duration. Permits issued under this section shall be valid from the date of issuance through the date the administering authority notifies the responsible party that all stormwater management practices have passed the final inspection required under § 463-20D(4).

G. Alternate requirements. The administering authority may prescribe alternative requirements for applicants seeking an exemption to on-site stormwater management performance standards under § 463-19E or for applicants seeking a permit for a post-construction site with less than 20,000 square feet of impervious surface disturbance.

§ 463-21. Stormwater management plan.

A. Plan requirements. The stormwater management plan required under § 463-19B and § 463-20B shall comply with the Town of Grand Chute Stormwater Reference Guide and contain at a minimum the following information:

(1) Name, address, and telephone number of the landowner and responsible parties.

(2) A legal description of the property proposed to be developed.

(3) Pre-development site map with property lines, disturbed limits, and drainage patterns.

(4) Post-development site map with property lines, disturbed limits, and drainage patterns.

(a) Total area of disturbed impervious surfaces within the site.

(b) Total area of new impervious surfaces within the site.

(c) Performance standards applicable to site.

(d) Proposed best management practices.

(e) Groundwater, bedrock, and soil limitations.

(f) Separation distances. Stormwater management practices shall be adequately separated from wells to prevent contamination of drinking water.

(5) Inspection and maintenance schedules for stormwater BMPs.

B. Alternate requirements. The administering authority may prescribe alternative submittal requirements for applicants seeking an exemption to on-site stormwater management performance standards under § 463-19E or for applicants seeking a permit for a post-construction site with less than 20,000 square feet of impervious surface disturbance.

§ 463-22. Maintenance agreement.

A. Maintenance agreement required. The maintenance agreement required under § 463-20B for stormwater management practices shall be an agreement between the Town of Grand Chute and the responsible party to provide for maintenance of stormwater practices beyond the duration period of this permit. The maintenance agreement shall be filed with the County Register of Deeds as a property deed restriction so that it is binding upon all subsequent owners of the land served by the stormwater management practices.

B. Agreement provisions. The maintenance agreement shall contain the following information and provisions and be consistent with the plan required by § 463-20B:

(1) Identification of the stormwater facilities and designation of the drainage area served by the facilities.

(2) A schedule for regular maintenance of each aspect of the stormwater management system consistent with the stormwater management plan required under § 463-20B.

(3) Identification of the responsible party(s), organization or city, county, town or village responsible for long term maintenance of the stormwater management practices identified in the stormwater management plan required under § 463-20B.

(4) Requirement that the responsible party(s), organization, or city, county, town or village shall maintain stormwater management practices in accordance with the schedule included in § 463-22B(2).

(5) Authorization for the administering authority to access the property to conduct inspections of stormwater management practices as necessary to ascertain that the practices are being maintained and operated in accordance with the agreement.

(6) A requirement on the administering authority to maintain public records of the results of the site inspections, to inform the responsible party responsible for maintenance of the inspection results, and to specifically indicate any corrective actions required to bring the stormwater management practice into proper working condition.

(7) Agreement that the party designated under § 463-22B(3), as responsible for long term maintenance of the stormwater management practices, shall be notified by the administering

authority of maintenance problems which require correction. The specified corrective actions shall be undertaken within a reasonable time frame as set by the administering authority.

(8) Authorization of the administering authority to perform the corrected actions identified in the inspection report if the responsible party designated under § 463-22B(3) does not make the required corrections in the specified time period. The administering authority shall enter the amount due on the tax rolls and collect the money as a special charge against the property pursuant to Subch. VII of Ch. 66, Wis. Stats.

C. Alternate requirements. The administering authority may prescribe alternative requirements for applicants seeking an exemption to on-site stormwater management performance standards under § 463-19E or for applicants seeking a permit for a post-construction site with less than 20,000 square feet of impervious surface disturbance.

§ 463-23. Financial guarantee.

A. Establishment of the guarantee. The administering authority may require the submittal of a financial guarantee, the form and type of which shall be acceptable to the administering authority. The financial guarantee shall be in an amount determined by the administering authority to be the estimated cost of construction and the estimated cost of maintenance of the stormwater management practices during the period which the designated party in the maintenance agreement has maintenance responsibility. The financial guarantee shall give the administering authority the authorization to use the funds to complete the stormwater management practices if the responsible party defaults or does not properly implement the approved stormwater management plan, upon written notice to the responsible party by the administering authority that the requirements of this article have not been met.

B. Conditions for release. Conditions for the release of the financial guarantee are as follows:

(1) The administering authority shall release the portion of the financial guarantee established under this section, less any costs incurred by the administering authority to complete installation of practices, upon submission of "as built plans" by a licensed professional engineer. The administering authority may make provisions for a partial pro-rata release of the financial guarantee based on the completion of various development stages.

(2) The administering authority shall release the portion of the financial guarantee established under this section to assure maintenance of stormwater practices, less any costs incurred by the administering authority, at such time that the responsibility for practice maintenance is passed on to another entity via an approved maintenance agreement.

C. Alternate requirements. The administering authority may prescribe alternative requirements for applicants seeking an exemption to on-site stormwater management performance standards under § 463-19E or for applicants seeking a permit for a post-construction site with less than 20,000 square feet of impervious surface disturbance.

§ 463-24. Fee schedule.

The fees referred to in other sections of this article shall be established by the Town of Grand Chute Board and may from time to time be modified by resolution. A schedule of the fees established by the Town Board shall be available for review in the Town Hall.

§ 463-25. Enforcement.

A. Any land disturbing construction activity or post-construction runoff initiated after the effective date of this article by any person, firm, association, or corporation subject to the article provisions shall be deemed a violation unless conducted in accordance with the requirements of this article.

B. The administering authority shall notify the responsible party by certified mail of any non-complying land disturbing construction activity or post-construction runoff. The notice shall describe the nature of the violation, remedial actions needed, a schedule for remedial action, and additional enforcement action which may be taken.

C. Upon receipt of written notification from the administering authority under Subsection B, the responsible party shall correct work that does not comply with the stormwater management plan or other provisions of this permit. The responsible party shall make corrections as necessary to meet the specifications and schedule set forth by the administering authority in the notice.

D. If the violations to a permit issued pursuant to this article are likely to result in damage to properties, public facilities, or waters of the state, the administering authority may enter the land and take emergency actions necessary to prevent such damage. The costs incurred by the administering authority plus interest and legal costs shall be billed to the responsible party.

E. The administering authority is authorized to post a stop work order on all land disturbing construction activity that is in violation of this article, or to request the Town Attorney to obtain a cease and desist order in any court with jurisdiction.

F. The administering authority may revoke a permit issued under this article for non-compliance with article provisions.

G. Any permit revocation, stop work order, or cease and desist order shall remain in effect unless retracted by the administering authority or by a court with jurisdiction.

H. The administering authority is authorized to refer any violation of this article, or of a stop work order or cease and desist order issued pursuant to this article, to the Town Attorney for the commencement of further legal proceedings in any court with jurisdiction.

I. Any person, firm, association, or corporation who does not comply with the provisions of this article shall be subject to a forfeiture as provided in the Uniform Forfeiture and Bond Schedules per offense, together with the costs of prosecution. Each day that the violation exists shall constitute a separate offense.

J. Compliance with the provisions of this article may also be enforced by injunction in any court with jurisdiction. It shall not be necessary to prosecute for forfeiture or a cease and desist order before resorting to injunctional proceedings.

K. When the administering authority determines that the holder of a permit issued pursuant to this article has failed to follow practices set forth in the stormwater management plan, or has failed to comply with schedules set forth in said stormwater management plan, the administering authority or a party designated by the administering authority may enter upon the land and perform the work or other operations necessary to bring the condition of said lands into conformance with requirements of the approved plan. The administering authority shall keep a detailed accounting of the costs and expenses of performing this work. These costs and expenses shall be deducted from any financial

security posted pursuant to § 463-23 of this article. Where such a security has not been established, or where such a security is insufficient to cover these costs, the costs and expenses shall be entered on the tax roll as a special charge against the property and collected with any other taxes levied thereon.

§ 463-26. Appeals.

A. Appeals. The Town of Grand Chute Plan Commission, created pursuant to § 16-2 of this Code, shall hear and decide appeals where it is alleged that there is error in any order, decision or determination made by the administering authority in administering this article. The Plan Commission shall also use the rules, procedures, duties, and powers authorized by statute in hearing and deciding appeals. Upon appeal, the Board may authorize variances from the provisions of this article that are not contrary to the public interest, and where owing to special conditions a literal enforcement of the article will result in unnecessary hardship.

B. Who may appeal. Appeals to the Plan Commission may be taken by any aggrieved person or by an officer, department, board, or bureau of the Town of Grand Chute affected by any decision of the administering authority.

§ 463-27 Variances.

In any particular case where the landowner can show that, by reason of exceptional topography or other physical condition, strict compliance with any requirement of this article would cause unnecessary hardship, the Town of Grand Chute Plan Commission may grant a variance provided such relief may be granted without detriment to the public good and without impairing the intent and purpose of this article or the desirable general development of the Town. No variance shall be granted by the Board which is contrary to provisions of the Wisconsin Administrative Code or the Wisconsin Statutes.

§ 463-28. Severability.

If any section, clause, provision or portion of this article is judged unconstitutional or invalid by a court of competent jurisdiction, the remainder of the article shall remain in force and not be affected by such judgment.

§ 463-29. Limitations on municipal responsibility.

Nothing in this article creates or imposes, nor shall be construed to create or impose, any greater obligation or responsibility on the municipality which has adopted this article than those minimum requirements specifically required by State of Wisconsin Statutes and Department of Natural Resources regulations.

§ 463-30. Effective date.

This article shall be in force and effect from and after its adoption and publication. The above and foregoing article was duly adopted by the Town Board of the Town of Grand Chute on the _____ day of February, 2017.

TOWN OF GRAND CHUTE

_____
David A. Schowalter, Town Chairman

_____
Karen L. Weinschrott, Town Clerk

TOWN OF GRAND CHUTE
STORMWATER REFERENCE GUIDE

FOR THE:

POST-CONSTRUCTION STORMWATER MANAGEMENT ORDINANCE

Grand Chute

DATE:
December 30, 2016

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EXECUTIVE SUMMARY

The Town's Stormwater Reference Guide (Reference Guide) has been created to act as a companion to the Town's Post-Construction Stormwater Management Ordinance (Ordinance). The Ordinance cites the Reference Guide as the resource for details that were omitted from the Ordinance. Items in the Reference Guide can be changed without the public hearing process as the changes are typically administrative and/or technical and do not affect the Ordinance's intent and requirements. The Reference Guide is organized similar to the Post-Construction Stormwater Management Ordinance for ease of relating the Reference Guide to the appropriate sections in the ordinance.

Post-Construction Stormwater Management Ordinance						
Site		**Requirements** [a]				
		Water Quality	**Peak Discharge**	**Infiltration**	**Protective Area**	**Fueling & Vehicle Maintenance Areas**
< 20,000 ft^2 Impervious Surface [b]		No Numeric Standard	No Numeric Standard	No Numeric Standard	Width Varies	No Visible Petroleum Sheen
> 20,000 ft^2 Impervious Surface	**New Development**	Numeric Standard Varies [d]	1, 2, 10 & 100-year	90% to 60% of pre-development infiltration volume	Width Varies	No Visible Petroleum Sheen
	Redevelopment	Numeric Standard Varies [d]	1, 2, 10 & 100-year	Exempt	Potentially Exempt	No Visible Petroleum Sheen
	Routine Maintenance Area	Numeric Standard Varies [d]	None, unless discharging into a BMP	Exempt	Potentially Exempt	No Visible Petroleum Sheen
Transportation Facilities [c]		- Grass swales comply with Technical Standard 1005 "Vegetated Infiltration Swale". - Other requirements may apply if discharging to ORW, ERW, 303(d) water body, etc.				

[a] Summary of Section 463-19 Performance Standards of the Post-Construction Stormwater Management Ordinance. See Ordinance and this Reference Guide for specific requirements, exemptions and prohibitions.

[b] The impervious surface areas created after the adoption date of the Ordinance are cumulative. For example, if a landowner first adds 18,000 ft^2 of parking and then adds a 2,001 ft^2 building the following year, the site is held to the >20,000 ft^2 performance standards at the time of the 2,001 ft^2 building addition.

[c] Provides alternative criteria for transportation facilities with grass swale drainage systems. The alternative criteria may be used by the applicant to satisfy the Water Quality, Peak Discharge, and Infiltration Performance Standards. The alternative criteria may not be used for transportation facilities that are part of a larger common plan of development.

[d] Please refer to the Post-Construction Storm Water Management Ordinance for the required water quality reductions. Water quality reductions and pollutants of concern may vary by watershed.

463-13 AUTHORITY

463-14 FINDINGS OF FACT

463-15 PURPOSE AND INTENT

A. PURPOSE

B. INTENT

463-16 APPLICABILITY AND JURISDICTION

A. APPLICABILITY

B. JURISDICTION

C. EXCLUSIONS

The Wisconsin Department of Transportation (WisDOT) has entered into a memorandum of understanding with the Wisconsin Department of Natural Resources that satisfies s. 281.33 (2), Wis. Stats., such that activities directed and supervised by WisDOT are exempt from this Ordinance.

Activities directed and supervised by the local municipality are covered by this Ordinance.

463-17 DEFINITIONS

"Biofiltration system" means a bioretention system which does not qualify for any infiltration credit pursuant to 463-19C(3) of the Post-Construction Stormwater Management Ordinance.

"Structural height" means the difference in elevation in feet between the point of lowest elevation of the top of the embankment before overtopping and the lowest elevation of the downstream toe of embankment.

463-18 TECHNICAL STANDARDS

Below is a list of Technical Standards and Guidance Documents that shall be used to satisfy Performance Standards contained in the ordinance. Technical Standards specify the minimum criteria for a best management practice (BMP). Guidance Documents contain recommendations and additional "how to" guidance. Performance Standards take precedence over Technical Standards and Technical Standards take precedence over Guidance Documents.

(a) **Technical Standards**: The following are applicable Wisconsin Department of Natural Resources (DNR) Conservation Practice Standards or Technical Standards. These standards may be found on the DNR website (http://dnr.wi.gov/topic/stormwater/standards/postconst_standards.html).

- 1001 Wet Detention Pond
- 1002 Site Evaluation for Stormwater Infiltration
- 1003 Infiltration Basin
- 1004 Bioretention For Infiltration
- 1005 Vegetated Swale
- 1006 Method for Predicting the Efficiency of Proprietary Storm Water Sedimentation Devices
- 1007 Infiltration Trench
- 1008 Permeable Pavement

- S100 Compost
- 1100 Interim Turf Nutrient Management

(b) **Local Modifications to Technical Standards:** The following are local requirements which are intended to supplement, clarify, or supersede DNR Technical Standards.

1001 - Wet Detention Pond

Dry Detention Pond-

- Dry detention ponds shall be designed to meet requirements in Technical Standard 1001, except criteria contained in Sections V.B.1.a. through g., V.B.2.c., and V.B.2.k.
- Dry detention ponds shall be designed to meet the local modifications provided below for Technical Standard 1001, except permanent pool and water quality criteria.
- Dry detention ponds shall not receive any water quality credit, unless written approval is obtained from the DNR. The approval letter must specifically indicate the amount of water quality credit provided by the dry pond.
- Dry detention pond shall have a minimum bottom slope to the principal outlet of 1%. The applicant may request a waiver from the administering authority if site characteristics create a hardship.
- As part of the Operation & Maintenance Plan, sediment accumulation in the dry pond shall be monitored. In lieu of criteria contained in Section VI.B. of Technical Standard 1001, accumulated sediment in a dry detention pond shall be removed when 5% to 10% of the storage volume is lost for the 2-year, 24-hour design storm. At a minimum, include details in the Operation & Maintenance Plan for inspecting sediment depths, frequency of accumulated sediment removal, and disposal locations for accumulated sediment.

Pond Watershed-

- Wet ponds are not recommended for small watersheds (< 15 acres in clay soil). A wet pond located in a small watershed may develop stagnation problems within the permanent pool and become a public nuisance. Public acceptance of stormwater BMPs is important to the success of a local stormwater program. Dry ponds, biofiltration, proprietary devices, and other BMPs are recommended for small watersheds.

100-Year Floodplain-

- Wet and dry detention ponds shall not be located in a 100-year floodway or 100-year flood storage area unless a hydrologic and hydraulic study is conducted in accordance with NR 116. Easements will be required if the flood study indicates the 100-year floodway or flood storage area is impacted by the pond or its embankment. Ponds shall not impede 100-year flood conveyance along navigable streams and non-navigable channels.

Permanent Pool-

- Pool Shape- A minimum length to width ratio of 3:1 is required between the principal inlet and principal outlet of the wet detention pond. The applicant may request a waiver if site characteristics create a hardship. Redevelopment and

pond retrofit projects may be eligible for a waiver. Typically, new development is not eligible for a waiver.

Water Quality-

- If the wet pond's pollutant removal is not determined with SLAMM or P8, the 1-year, 24-hour design storm shall be released from the wet pond using the criteria contained in Section V.B.1.a. and b. of Technical Standard 1001.

Peak Flow Control-

- Do not use Table 1 in Technical Standard 1001. Use the maximum pre-development runoff curve numbers contained in the Post-Construction Stormwater Management Ordinance.
- It is recommended that the developer and designer contact the local municipality to discuss peak discharge requirements for the site early in the design process. The local municipality may have adopted alternative peak discharge requirements for the site which are different than the Post-Construction Stormwater Management Ordinance. At a minimum, the peak discharge requirements contained in NR 151 shall be met.

Inflows-

- Pipe inlets shall be protected from soil washouts due to seepage along the pipe's granular bedding and backfill. Rip-rap or other protection shall be placed around the entire pipe perimeter.
- Other inflow points shall be protected from scour and erosion.

Principal Outlet-

- All flows shall pass through the principal outlet during the 1-year, 2-year and 10-year, 24-hour design storms. The principal outlet shall consist of one or more flow control structures and discharge pipes.
- Pipes- Generally concrete, PVC, or CMP are the preferred pipe materials. Corrugated PE will tend to jack-up due to frost heave and flotation. The minimum recommended pipe diameter is 12-inches.
- Orifices- Orifices smaller than 4 inches are not recommended due to the potential for clogging. Consider using a 6-inch perforated drain pipe and restrictor plate (refer to Section V.B.8 of Technical Standard 1004 for guidance). The total opening area of all perforation holes combined shall be sufficient to allow the drain pipe to discharge at full capacity, as would occur if there were no orifice restriction. Backfilling the drain pipe with 1-inch washed stone provides protection from clogging.
- Trash racks or other equivalent litter control devices are required for all outlet openings that control the 1-year and 2-year, 24-hour design storm. The maximum bar spacing shall be less than 2-inches and less than ½ the smallest opening dimension, whichever is more restrictive. The minimum surface area for the trash rack shall be 5 to 10 times the outlet's cross sectional area to prevent clogging. Trash racks keep litter and debris in the pond and prevent it from discharging into streams, rivers, and lakes.
- Trash racks are also required for other outlet openings that have a width, height, or diameter less than 12-inches. The maximum bar spacing shall be less than ½ the smallest opening dimension. The minimum surface area for the trash rack shall be at 5 to 10 times the outlet's cross sectional area to prevent clogging.

- Reverse-sloped pipes and other underwater outlets may impact a wet pond's pollutant removal efficiency. Outlets that draw water from below the permanent pool's surface elevation reduce the effective surface area and depth of the permanent pool. If reverse-sloped pipes and other underwater outlets are used, special consideration is required for SLAMM, DETPOND & P8 modeling to ensure accurate water quality results. Also, underwater outlets may freeze during winter.

Flap Gates-

- Flap gates are required if the 1-year, 2-year or 10-year, 24-hour design storm flows backward through the principal outlet. Backwater from a down slope conveyance system may impact a pond's water quality and/or flood control performance.
- Flap gates shall not impede flow in down slope pipes, channels or streams.
- Ice accumulation within the down slope conveyance system shall be considered during flap gate and principal outlet design.

Tailwater-

- Tailwater conditions shall be evaluated at the pond outlet.
- Tailwater conditions along lakes, rivers, and streams may be obtained from available 100-year floodplain studies.
- Tailwater conditions may require that 1, 2, 10, and/or 100-year, 24-hour runoff volumes be held in the pond, without release, until the down slope hydrograph allows the pond and flap gate to discharge flow.
- It is recommended that the designer contact the local municipality to discuss tailwater conditions early in the design process. The local municipality may have information available to assist with the tailwater evaluation.

Emergency Spillway-

- The routed 1-year, 2-year and 10-year, 24-hour design storm may not pass through the emergency spillway. The routed 100-year, 24-hour design storm may not pass through the emergency spillway if the pond is designed to have a:
    - Structural height > 6 feet and flood storage capacity > 50 acre-feet, or
    - Structural height > 25 feet and flood storage capacity > 15 acre-feet.
- Backwater from a down slope conveyance system may not pass through the emergency spillway during the 1-year, 2-year or 10-year, 24-hour design storm. Also, backwater may not pass through the emergency spillway during the 100-year, 24-hour design storm, unless a hydrologic and hydraulic evaluation indicates the site's peak discharge requirements are still satisfied, despite the backwater.
- When feasible, the emergency spillway should not be constructed on an embankment or over fill material. Spillways constructed on an embankment or over fill material are more prone to failure.
- The emergency spillway shall be constructed of permanent materials (i.e. poured concrete, riprap, articulated concrete block, etc.) if the spillway is constructed on an embankment. The permanent material shall extend from the top of embankment to the down slope toe of embankment. The permanent material shall be shaped to contain flows and reduce potential for erosion and embankment failure.

Topsoil & Seeding-

- Topsoil is required in the safety shelf to encourage wetland plant growth (12-inch minimum thickness).
- When feasible, install a wetland seed mix or mature plants in the safety shelf to improve pond safety, reduce wave erosion along the shoreline, improve pollutant removal, and discourage geese residence. Use non-invasive species.
- When feasible, maintain a high grass buffer around the permanent pool's perimeter. The high grass buffer will further improve pond safety and geese control. Also, the perimeter of the permanent pool is typically the most difficult area to mow due to saturated soil conditions.

Record Drawings-

- Surveyed record drawings certified by a Professional Engineer shall be submitted upon completion of construction of all wet and dry ponds. As part of the record drawings, the Professional Engineer may need to verify BMP performance using computer modeling. Refer to record drawing checklist for requirements.

1002 - Site Evaluation for Stormwater Infiltration

- A site layout should not be developed until Step B is complete. Information obtained from Step B is used to:
  - Identify soil textures within the site.
  - Identify infiltration exclusions and exemptions.
  - Develop a site layout and identify potential infiltration device locations.
- For Step B, the minimum number of initial test pits or soil borings required for a new development area are as follows:
  - Two for the initial 10 acres, plus one per 10 acres thereafter.
  - One per soil unit. Soil units are depicted on NRCS Soil Survey Maps.
  - Example calculations:
    - 4 acres with 1 soil unit = min. of 2 test pits or soil borings
    - 20 acres with 2 soil units = min. of 3 test pits or soil borings.
    - 20 acres with 5 soil units = min. of 5 test pits or soil borings.
    - 34 acres with 3 soil units = min. of 4 test pits or soil borings.
- Upon completion of Step B, it is recommended that the developer and designer meet with the municipality to discuss infiltration requirements for the development to avoid redesign during permit submittal.
- Information obtained from Step C is used to design each infiltration device. As part of Step C, a second set of test pits or soil borings are required. Refer to Table 1, Technical Standard 1002 for test pit or soil boring requirements.

1003 - Infiltration Basin

- SLAMM, P8 or an equivalent methodology shall be used if the designer desires pollutant reduction credit for the infiltration basin. Pursuant to Technical Standard 1003, pretreatment is required for an Infiltration Basin.
- *Record Drawings*- Surveyed record drawings certified by a Professional Engineer shall be submitted upon completion of construction of all infiltration basins. As part of the record drawings, the Professional Engineer may need to verify BMP performance using computer modeling. Refer to record drawing checklist for requirements.

1004 - Bioretention For Infiltration

- Biofiltration systems shall be designed to meet requirements in Technical Standard 1004, except for the storage layer and sand/native soil interface layer.
- Rain Gardens shall be designed to meet requirements in Technical Standard 1004, except for the engineered soil planting bed, storage layer, underdrain, and sand/native soil interface layer. Rain Gardens are typically used in residential areas. Rain Gardens are primarily intended for roof runoff, but may also be used for lawn, sidewalk and driveway runoff.
- SLAMM, P8 or an equivalent methodology shall be used to evaluate the pollutant reduction associated with a bioretention, biofiltration, or rain garden BMP.
- *Record Drawings*- Surveyed record drawings certified by a Professional Engineer shall be submitted upon completion of construction of all bioretention and biofiltration facilities. As part of the record drawings, the Professional Engineer may need to verify BMP performance using computer modeling. Also, as part of the record drawings, the contractor shall certify the bioretention or biofiltration device was constructed in accordance with the approved construction plans and that the installed engineered soil complies with the material specifications. Refer to record drawing checklist for requirements.

1005 – Vegetated Infiltration Swale

- Grass swales shall meet the following design criteria if the applicant plans to take credit for pollutant reductions calculated by SLAMM or P8.
    - The grass swale infiltration rate used in SLAMM or P8 shall be obtained from Table 2, Technical Standard 1002. The design infiltration rate shall be based on the least permeable soil horizon to 5 feet below the grass swale's bottom elevation.
    - Minimum longitudinal slope for a grass swale is 1%. The applicant may request a waiver if site characteristics create a hardship. If a longitudinal slope less than 1% is requested by the applicant, the stormwater management plan shall contain a written, site-specific explanation of how soil compaction, standing water, and poor soil drainage will be remedied by the responsible party or landowner such that water quality requirements are still satisfied. Drainage or standing water problems may develop along grass swales with a longitudinal slope less than 1%, particularly in sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay or clay soils. Concrete ditch liners and underdrain pipes installed between driveway culvert openings can remedy a standing water problem, but do not provide any water quality credit.
    - Grass swales shall be designed for a maximum 2-inch lawn height. If an alternative height is desired, it is recommended that the developer and designer contact the local municipality early in the design process to obtain approval. The local municipality may have ordinances or other design criteria which dictate the allowable mowing height.
    - Driveway culverts shall be considered when the swale length (density) is determined for purposes of SLAMM or P8 modeling. The maximum allowable culvert length for each lot shall be specified on the plans.
    - Minimize or mitigate soil compaction during grading activities.
    - Grassed swales shall be designed for the proper drainage area. Generally, it will be best to have one or two sizes to be used wherever needed throughout the development. The design shall be based on the largest drainage area served.

- Grassed swales shall be designed according to the planned vegetation type and maintenance that will be provided. Generally, grassed channels will be designed to have stable velocities when the vegetation is shortest and adequate capacity when the vegetation is longest.

1006 - Method for Predicting the Efficiency of Proprietary Storm Water Sedimentation Devices

- *Record Drawings*- Surveyed record drawings certified by a Professional Engineer shall be submitted upon completion of construction of all proprietary devices. As part of the record drawings, the Professional Engineer may need to verify BMP performance using computer modeling. Refer to record drawing checklist for requirements.

1007 - Infiltration Trench

- SLAMM, P8 or an equivalent methodology shall be used if the designer desires pollutant reduction credit for the infiltration trench. Pursuant to Technical Standard 1007, pretreatment is required for an Infiltration Trench.
- *Record Drawings*- Surveyed record drawings certified by a Professional Engineer shall be submitted upon completion of construction of all infiltration trenches. As part of the record drawings, the Professional Engineer may need to verify BMP performance using computer modeling. Refer to record drawing checklist for requirements.

(c) **Guidance Documents**: The following are the applicable Guidance Documents (http://dnr.wi.gov/topic/Stormwater/standards/postconst_standards.html):

- The Wisconsin Stormwater Manual
- S100 Compost
- Technical Note for Sizing Infiltration Basins and Bioretention Devices
- Rain Gardens: A How-To Manual for Homeowners (see above local modifications to Technical Standard 1004).
- Updates to Post-Construction Standards: Errata
- Errata to swale guidance
- Internally Drained Area Guidance
- Modeling Post-Construction Storm Water Management Treatment
- Storm Water Detention Ponds Site Safety Design
- Establishment of Protective Areas for Wetlands
- NR 528 Technical Guidance: Management of Accumulated Sediment from Storm Water Structures (http://dnr.wi.gov/topic/waste/nr528.html)
- Artificial recharge of groundwater: hydrogeology and engineering (http://dnr.wi.gov/topic/Stormwater/standards/gw_mounding.html)
- "Construction Site" Definition – "Common Plan of Development" (http://dnr.wi.gov/topic/stormwater/construction/overview.html)
- Technical Note for Sizing Infiltration Basins and Bioretention Devices
- Meeting New State Regulations: Post-Construction Stormwater Management Workshops (http://dnr.wi.gov/topic/Stormwater/construction/practices.html)
- Estimating Residue Using the Line Transect Method (UW-Extension A3533).
- Wisconsin Department of Transportation (DOT) - Facilities Development Manual
- Wisconsin DOT Standard Specifications for Highway and Structure Construction
- Other National Publications

(d) **Local Easement Requirements:**

- Easements are typically required for BMPs and conveyance systems that serve more than one property owner or lot. Conveyance systems include storm sewers, grass swales, channels, streams, and overland relief paths. Easement widths will vary.
- An ingress / egress easement or direct access to a public street is typically required for BMPs that serve more than one property owner or lot.
- It is recommended that the developer and designer contact the local municipality early in the design process to discuss easements and width requirements.

463-19 PERFORMANCE STANDARDS

A. RESPONSIBLE PARTY

B. PLAN

C. REQUIREMENTS

(1) WATER QUALITY

Post-construction sites with 20,000 sq.ft. or more of impervious surface disturbance and post-construction sites with 1 acre or more of land disturbance are required to meet the ordinance's numeric performance standards. All other post-construction sites are not required to meet a numeric performance standard. BMP design guidance is provided below in Section (h) for sites with less than 20,000 sq.ft. of impervious surface disturbance.

Computer Models:

Pollutant loading models such as SLAMM, DETPOND, P8 or an approved equivalent methodology may be used to evaluate the efficiency of the design in removing pollutants. Information on how to access SLAMM and P8 is available at http://dnr.wi.gov/topic/stormwater/standards/slamm.html or contact the stormwater coordinator in the runoff management section of the bureau of watershed management at (608) 267-7694.

Use the most recent version of SLAMM, DETPOND and P8. The applicant may request a waiver of this requirement.

Design Clarifications:

No Controls - "No Controls" is the baseline condition for each site. No water quality credit is provided for meeting the baseline condition. The baseline condition is defined as follows:

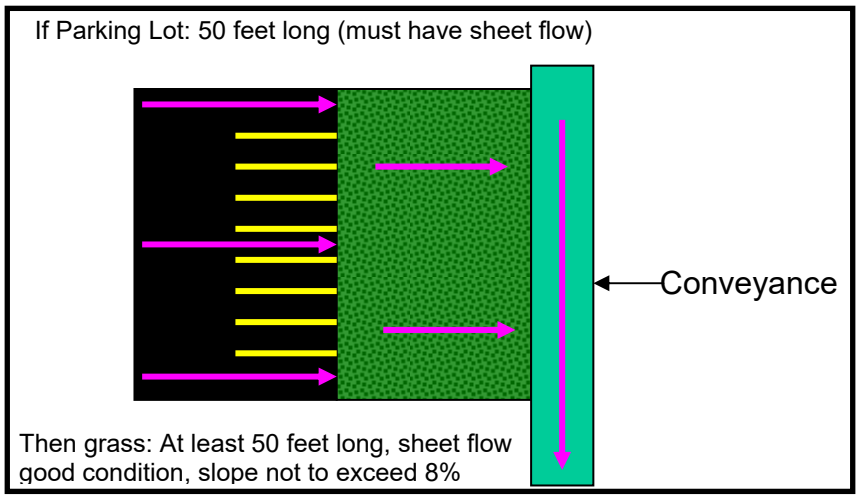
- Assume site is stabilized (no erosion).
- Assume proposed impervious surfaces are in place. Impervious surface reductions (e.g. reduced street width) cannot be used to claim water quality credit; however, impervious surface reductions will lower runoff volumes which will reduce the required size for stormwater management BMPs.
- Assume no stormwater management BMPs.
- Assume curb and gutter / storm sewer drainage system in fair condition.
- If the applicant intends to claim water quality credit for disconnecting an impervious surface, the "No Controls" condition shall be based on the "typical" percent connected impervious values established by the DNR:

LAND USE	% CONNECTED
Open space / undeveloped	5
Suburban Residential	7
Park	10
Cemetery	12

Low Density Residential	14
Medium Density Residential – With Alley	25
Medium Density Residential – No Alley	28
Schools - Institutional	39
High Density Residential – With Alley	42
High Density Residential – No Alley	42
Mobile Home Residential	47
Freeway	51
Multi-Family Residential	51
Miscellaneous Institutional	59
Medium Industrial	64
High Rise Residential	65
Light Industrial	71
Office Park – Commercial	74
Hospital – Institutional	76
Commercial Strip Mall	91
Shopping Center – Commercial	91
Commercial Downtown	96

Disconnection - Water quality credit is provided for runoff volume reductions associated with disconnecting impervious surfaces beyond the "typical" percent connected impervious values established by the DNR. In order to consider an impervious surface as "disconnected", the following criteria shall be met:

- Residential Roofs: Discharge runoff over a minimum 20-foot long pervious surface that is in good condition and graded for sheet flow.
- Other Impervious Surfaces:
  - Source area flow length may not exceed 75 feet.
  - Source area and pervious area must be graded for sheet flow.
  - Pervious area must be in good condition, have a slope less than 8%, and have a flow length at least as long as the contributing impervious area's length (but never less than 20 feet).



Source: DNR Post-Construction Stormwater Management Workshops

Street Sweeping & Catch Basin Cleaning - No water quality credit is provided for street sweeping, catch basin cleaning, or other management type BMPs in new development areas.

Infiltration Rate - The design infiltration rate for a BMP shall be based on the least permeable soil horizon to 5 feet below the BMP's bottom elevation. Infiltration rates shall be obtained from Table 2, Technical Standard 1002.

Grass Swale - The grass swale infiltration rate used in SLAMM or P8 shall be obtained from Table 2, Technical Standard 1002. For SLAMM, the typical swale geometry shall be entered in lieu of using the "Wetted Width" option. SLAMM will calculate the "Wetted Width" for each rain event based on the typical swale geometry.

Uncontrolled Areas - The performance standard for water quality is a site standard, not a BMP standard. Often, a site contains uncontrolled areas that do not flow through a BMP (e.g. wet pond, grass swale). Typically, it is necessary to increase the water quality reduction provided by other onsite BMPs in order to offset or over compensate for these uncontrolled areas.

Routine Maintenance Areas – No performance standard or water quality reduction is required for routine maintenance areas that are part of a post-construction site with less than 5 acres of disturbance. However, the applicant is responsible for proper performance of onsite BMPs. In order to ensure proper BMP performance, the applicant has two options:

- Divert the routine maintenance area around onsite BMPs, or
- Include runoff volumes from the routine maintenance area in onsite BMP calculations. However, no water quality credit is provided for the routine maintenance area unless it is reclassified as redevelopment.

Offsite Drainage Areas – The applicant is not responsible for satisfying water quality performance standards for offsite areas that drain into the project site. However, the applicant is responsible for proper performance of onsite BMPs. In order to ensure proper onsite BMP performance, the applicant has two options:

- Divert offsite runoff around onsite BMPs, or
- Include offsite runoff volumes in onsite BMP calculations. The amount of onsite water quality credit is determined by multiplying the BMP's percent pollutant reduction by the "no controls" baseline pollutant load for the onsite area.

Example Calculation #1:

The development site currently contains 30 acres of institutional land uses and 70 acres of agricultural land uses. The entire 100 acre site will be disturbed as part of the proposed project. Within the 100 acre site, the developer plans to:

- Redevelop 20 acres (existing institutional) into a new commercial area.
- Conduct routine maintenance on 10 acres of existing asphalt parking lot (existing institutional). Parking lot will be part of new commercial area.
- Develop 70 acres (existing agriculture) into a new residential area.

The "No Controls" or base TSS load is computed as follows:

- Onsite Commercial = (20 + 10) acres x 600 lbs/acre = 18,000 lbs
  (water quality reductions are required for routine maintenance areas that are part of a post-construction site with > 5 acres of disturbance)
- Onsite Residential = 70 acres x 400 lbs/acre = 28,000 lbs
- "No Controls" TSS Load = 18,000 + 28,000 = 46,000 lbs

The "TSS Reduction Required" is computed as follows:

- Onsite Commercial = 18,000 lbs x 40% (redevelopment) = 7,200 lbs
- Onsite Residential = 28,000 lbs x 80% (new development) = 22,400 lbs
- "TSS Reduction Required" = (7,200 + 22,400) / 46,000
  = 0.64 or 64%

A wet pond is proposed for the site. The pond achieves an 80% TSS reduction for its 130 acre watershed. The 130 acre watershed includes 20 acres of commercial area, 10 acres of commercial parking lot, 60 acres of residential area, and 40 acres of offsite residential area.

- Onsite Commercial (30 acres) = 18,000 lbs x 80% (wet pond) = 14,400 lbs
- Onsite Residential (60 acres) = 24,000 lbs x 80% (wet pond) = 19,200 lbs
- Offsite Residential (40 acres) = 16,000 lbs x 80% (wet pond) = 12,800 lbs
- Pond TSS Reduction = (14,400 + 19,200 + 12,800) / 58,000
  = 0.80 or 80%

The "TSS Reduction Provided" is computed as follows:

- Onsite Commercial = 18,000 lbs x 80% (wet pond) = 14,400 lbs
- Onsite Residential (60 acres) = 24,000 lbs x 80% (wet pond) = 19,200 lbs
- Onsite Residential (10 acres) = 4,000 lbs x 0% (uncontrolled) = 0 lbs
- "TSS Reduction Provided" = (14,400 + 19,200 + 0) / 46,000
  = 0.73 or 73%

73% > 64%, therefore the TSS requirement is satisfied.

In Example #1, the 40 acre offsite residential area could have been included in the "TSS Reduction Required" and "TSS Reduction Provided" calculations if it was a regional pond, as opposed to an onsite pond. A regional pond would have allowed the owner of the 40 acre offsite residential area to take credit for the TSS reduction provided by the wet pond.

Example Calculation #2:

The development site currently contains 1.5 acres of commercial land use and 3 acres of agricultural land use. The entire 4.5 acre site will be disturbed as part of the proposed project. Within the 4.5 acre site, the developer plans to:

- Develop 3 acres of existing agriculture into a new commercial area.
- Redevelop 1 acre of existing commercial into a new commercial area.
- Conduct routine maintenance on 0.5 acres of existing commercial parking lot. Existing parking lot will be part of new commercial area.

The "No Controls" or base TSS load is computed as follows:

- Onsite Commercial (new development) = 3 acre x 600 lbs/ac = 1,800 lbs
- Onsite Commercial (redevelopment) = 1 acre x 600 lbs/ac = 600 lbs
- Onsite Commercial (routine maintenance) = 0.5 acres x 0 lbs/ac = 0 lbs (water quality reductions are not required for a routine maintenance area if the post-construction site has < 5 acres of disturbance)
- "No Controls" TSS Load = 1,800 + 600 + 0 = 2,400 lbs

The "TSS Reduction Required" is computed as follows:

- Onsite Commercial (new development) = 1,800 lbs x 80% = 1,440 lbs
- Onsite Commercial (redevelopment) = 600 lbs x 40% = 240 lbs
- "TSS Reduction Required" = (1,440 + 240) / 2,400
  = 0.70 or 70%

Four biofilters and a dry detention pond are proposed for the site. The biofilters achieve a 72% TSS reduction for 4.9 acres. The 4.9 acres includes 4 acres of onsite commercial (new and redevelopment), 0.5 acres of onsite commercial parking lot (routine maintenance) and 0.4 acres of offsite commercial.

- Onsite Commercial (3 acres) = 1,800 lbs x 72% (biofilters) = 1,296 lbs
- Onsite Commercial (1 acre) = 600 lbs x 72% (biofilters) = 432 lbs
- Onsite Parking Lot (0.5 acres) = 300 lbs x 72% (biofilters) = 216 lbs
- Offsite Commercial (0.4 acres) = 240 lbs x 72% (biofilters) = 173 lbs
- Biofilter TSS Reduction = (1,296 + 432 + 216 + 173) / 2,940
  = 0.72 or 72%

The "TSS Reduction Provided" is computed as follows:

- Onsite Commercial (4 acres) = 2,400 lbs x 72% (biofilters) = 1,728 lbs
- "TSS Reduction Provided" = 1,728 / 2,400
  = 0.72 or 72%

72% > 70%, therefore the TSS requirement is satisfied.

In Example #2, the 0.5 acre onsite commercial parking lot could have been included in the "TSS Reduction Required" and "TSS Reduction Provided" calculations if it was reclassified as redevelopment, as opposed to routine maintenance. The reclassification would have allowed the applicant to plan for future reconstruction of the 0.5 acre onsite commercial parking lot.

In Example #2, the 0.4 acre offsite commercial area could have been included in the "TSS Reduction Required" and "TSS Reduction Provided" calculations if it was a regional BMP, as opposed to an onsite BMP. A regional BMP would have allowed the owner of the 0.4 acre offsite commercial area to take credit for the TSS reduction provided by the onsite BMP.

(2) PEAK DISCHARGE

Post-construction sites with 20,000 sq.ft. or more of impervious surface disturbance and post-construction sites with 1 acre or more of land disturbance are required to meet the ordinance's numeric performance standards. All other post-construction sites are not required to meet these numeric performance standards. BMP design guidance is provided below in Section (h) for sites with less than 20,000 sq.ft. of impervious surface disturbance.

Computer Models:

Peak discharge rates shall be evaluated using TR-55 methodology and a computer model. NRCS released a new Windows version of TR-55 referred to as WinTR-55. Unfortunately, WinTR-55 has some unacceptable restrictions in computing Tc and the computations for outlet structures are too approximate to be useable. Therefore, WinTR-55 is not acceptable software.

Other software packages are acceptable if they match the results and methodology of TR-55 (DOS version). There are multiple hydrology/pond routing computer programs available. They must be approved by the administering authority. Examples of common computer programs are HEC-HMS, XPSWMM, HydroCAD, HydraFlow, PondPack, etc.

Each pre-development watershed or site outfall shall be evaluated for peak discharge. It is not accurate or necessary to "link" all of the pre-development watersheds to determine the ultimate allowable discharge for the site. The allowable discharge for each outfall shall be determined based on the individual pre-development watershed as discussed below in "TR-55 Methodology Clarifications".

TR-55 Methodology Clarifications:

Time of Concentration (T_c) -

Pre-Development Requirements

- The T_c route shall be the route that takes the longest time to reach the outfall and not necessarily the furthest point in the watershed.
- The T_c route shall be shown to scale on the pre-development contours with each flow segment labeled.

- The pre-development T_c should typically be at least 30 minutes in NE Wisconsin. This may not apply to small sites.
- A Manning's "n" value of 0.24 shall be used for sheet flow "meadow" conditions. For redevelopment areas, assume impervious surfaces do not exist.
- The sheet flow length before development in NE Wisconsin is usually 250' to 300'. This may not apply to small sites.
- For shallow concentrated flow, "unpaved" or "paved" shall be used to represent vegetated swales and paved swales, respectively.

Post-Development Requirements

- The T_c route shall incorporate and represent the development. If the development is large, consider dividing the development into multiple watersheds.
- T_c will almost always be shorter after development.
- The T_c route shall be shown to scale on the post-development drainage plan with each flow segment labeled.
- The sheet flow length after development will seldom be greater than 50' to 100' due to the grading around homes and buildings. A sheet flow length of greater than 100 feet requires approval from the reviewing authority (except for large paved parking areas).
- A Manning's "n" value of 0.24 is appropriate for sheet flow "lawn" conditions.
- The minimum sheet flow slope shall be 2% for residential lawns.
- For shallow concentrated flow, "unpaved" or "paved" shall be used to represent vegetated swales and paved swales, respectively.
- The T_c flow path stops when it reaches the inflow of a wet or dry detention basin.
- The post-development T_c is important for determining the correct storage volume required. See the Storage Volume for Detention Basins section below.

Runoff Curve Numbers (CN) -

Pre-Development Requirements

- Unless the site is currently woodland, peak pre-development discharge rates shall be determined using the following runoff curve numbers for a "meadow" vegetative cover:

Maximum Pre-Development Runoff Curve Numbers				
Vegetative Cover	**Hydrologic Soil Group**			
	A	**B**	**C**	**D**
Meadow	**30**	**58**	**71**	**78**
Woodland	**30**	**55**	**70**	**77**

- Soil units can be found in the applicable County Soil Survey (or, if provided, on the Town's website.)
- The appropriate hydrologic soil groups are located at the following website: http://soildatamart.nrcs.usda.gov/County.aspx?State=WI

  To get an online soils report, do the following:
  1. Select the appropriate County.
  2. Select the "Generate Reports" button.
  3. Select the appropriate soils for the site (hold the ctrl key for multiple).

4. Select the report type (RUSLE2 Related Attributes or Water Features) below to get the Hydrologic Group(s) for the site.
5. Select the "Generate Report" button.

**Notice that a number of soils have different hydrologic soil groups than those shown in the original County USDA Soils book. The Internet groups are the ones to use.

Post-Development Requirements

- The Runoff Curve Number for lawns shall be used for developed areas that will be vegetated. Woods, wetland, or prairie areas preserved with a recorded document may be modeled as such.

Pre/Post-Development Curve Number Determination for Permeable Soils

- Refer to the Site Evaluation for Infiltration Report to verify that soils mapped in hydrologic groups A or B are well drained. If not well drained use the County USDA Soils Books hydrologic group explanation to determine the appropriate hydrologic group.
- If the existing site consists of multiple hydrologic groups, especially a combination of highly permeable and non-permeable, consideration shall be given to the proposed site balance cut/fill. See Appendix A of TR-55 for discussion on disturbed soil profiles as a result of urbanization.

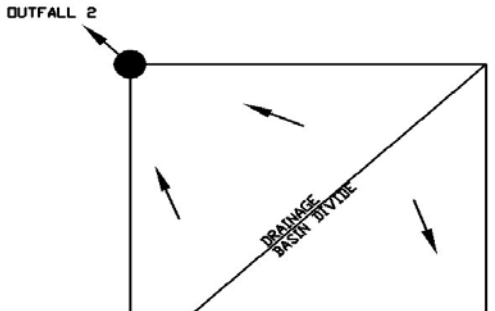
  Example: The site consists of 30% Hydrologic Group A soils and 70% Hydrologic Group C soils. The following scenarios shall be handled as noted:
  1. If the site earthwork does not balance within the respective Hydrologic Group and it is anticipated that the "C" soils will be filled on the "A" soils, the "C" soil RCN shall be used.
  2. If the site earthwork balances within each respective Hydrologic Group and it is anticipated that offsite fill will be required to achieve the desired dwelling elevations, the "C" soil RCN shall be used.
  3. If the site balances within each respective Hydrologic Group and no or minimal fill is anticipated on the "A" soils, compaction mitigation shall be provided.

Drainage Area -

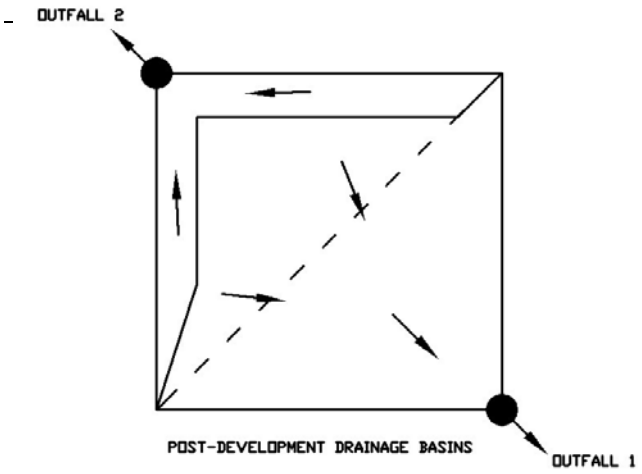
Pre-Development Requirements

- Determine the total contributing drainage area to the development, including offsite properties.
- If the pre-developed site consists of multiple drainage areas, each outfall shall be evaluated for peak discharge.

Example:
The pre-development site shown below is 40 acres and consists of 2 drainage areas, each 20 acres. Each outfall has a peak discharge of 2, 4, 8, and 12 cfs for the 1, 2, 10, and 100-year design storms, respectively.



The post-development site shown below is the same 40 acres; however, Outfall 1 now has 30 acres draining to it and Outfall 2, 10 acres.



The post-development discharges for Outfall 2 are 1, 3, 6, and 9 cfs for the 1, 2, 10, and 100-year design storms, respectively. Outfall 2 meets the peak discharge requirements of the Ordinance because the post-development peak discharges are below the pre-development discharges for Outfall 2.

The post-development discharges for Outfall 1 are 6, 12, 24, and 36 cfs for the 1, 2, 10, and 100-year design storms, respectively. Outfall 1 does not meet the peak discharge requirements of the Ordinance. As such, stormwater facilities are required to lower the post-development peak discharges to the pre-development discharges of 2, 4, 8, and 12 cfs for the 1, 2, 10, and 100-year design storms, respectively.

Below is an example of appropriate Stormwater Management Plan summary tables as required:

Pre-Development Peak Discharges				
Location	**1-year**	**2-year**	**10-year**	**100-year**
Outfall 1	2 cfs	4 cfs	8 cfs	12 cfs
Outfall 2	2 cfs	4 cfs	8 cfs	12 cfs

Post-Development Peak Discharges				
Location	**1-year**	**2-year**	**10-year**	**100-year**
Outfall 1 (undetained)	1.8 cfs (6 cfs)	3.6 cfs (12 cfs)	7.5 cfs (24 cfs)	10.9 cfs (36 cfs)
Outfall 2	1.5 cfs	3 cfs	6 cfs	9 cfs

Post-Development Requirements

- The design of stormwater runoff control facilities shall be based on the total contributing drainage area, not just the area being developed. Any off-site drainage area must be included in the plan facilities or safely diverted around the planned facilities.
- Off-site contributing areas that are not diverted must use the meadow condition runoff curve number for pre-development flow computations whether the off-site area is presently developed or not.
- Offsite contributing areas that are diverted shall use the highest anticipated runoff curve number for the offsite area for a safe design. Also, the diversion shall provide 0.3' of freeboard and assume 10% settlement for the 100-year flow. The conveyance shall be contained within an easement. The discharge location for the diversion shall be at the pre-developed outfall or at a stable location.
- If more than 30% of the drainage area will be impervious, it will often be necessary to divide the drainage area into a pervious sub-area and impervious sub-area for correct computation of peak flow.

Peak Discharge Method -

- For Wisconsin, use the Type II, 24-hour rainfall distribution for design storms.
- Natural depressions shall be evaluated or considered when determining peak discharge rates for the predevelopment condition.

Storage Volume for Detention Ponds (TR-55) -

- The approximate storage-routing curves should not be used if the adjustment for ponding (discussed above in the peak discharge section) is used.
- This manual method is good for determining quick estimates of the effects of temporary detention on peak discharges. Computer programs that utilize TR-20 provide more accurate methods of analysis and routing.
- The procedure should not be used to perform final design if an error in storage of 25 percent cannot be tolerated. Figure 6-1 may significantly overestimate the required storage capacity.
- When the peak outflow discharge is too close to post-development peak inflow discharge, parameters that affect the rate of rise of a hydrograph become especially significant.

Design Clarifications:

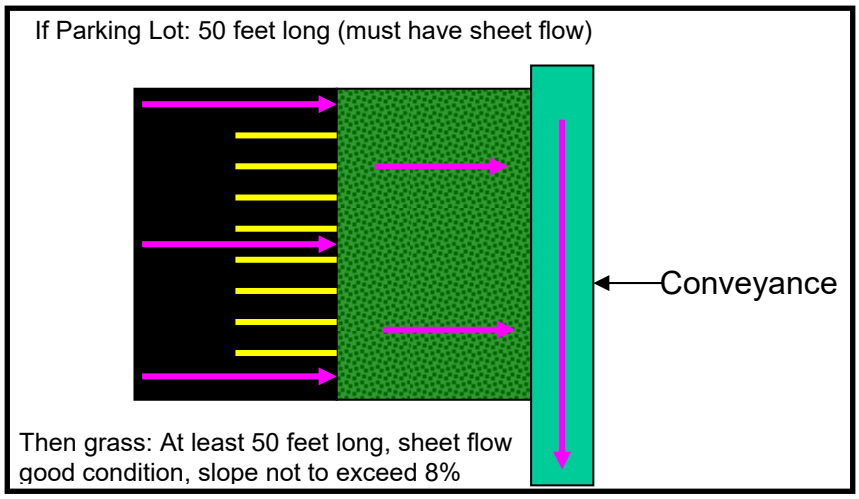
It is recommended that the developer and designer contact the local municipality to discuss peak discharge requirements for the site early in the design process. The local municipality may have adopted alternative peak discharge requirements for the site which are different than the Post-Construction Stormwater Management Ordinance. At a minimum, the peak discharge requirements contained in NR 151 shall be met.

Outfalls - Performance standards for peak discharge shall be satisfied at each outfall associated with the site. Written approval is required from down slope property owners if post-development peak discharge rates are not less than or equal to pre-development peak discharge rates at each outfall.

Disconnection - Disconnecting impervious surfaces can help achieve the peak discharge requirement. Disconnecting impervious surfaces not only reduces

runoff volumes, but also increases time of concentrations. In order to consider an impervious surface as "disconnected", the following criteria shall be met:

- Residential Roofs: Discharge runoff over a minimum 20 foot long pervious surface that is in good condition and graded for sheet flow.
- Other Impervious Surfaces:
  - Source area flow length may not exceed 75 feet.
  - Source area and pervious area must be graded for sheet flow.
  - Pervious area must be in good condition, have a slope less than 8%, and have a flow length at least as long as the contributing impervious area's length (but never less than 20 feet).



Source: DNR Post-Construction Stormwater Management Workshops

Uncontrolled Areas - The performance standard for peak discharge is an outfall standard. Often, a site contains an uncontrolled area for each outfall that does not flow through a BMP (e.g. wet pond). Typically, it is necessary to increase the peak discharge control provided by the onsite BMP in order to offset or over compensate for the uncontrolled area.

Routine Maintenance Areas – No performance standard or peak discharge reduction is required for routine maintenance areas. However, the applicant is responsible for proper performance of onsite BMPs. In order to ensure proper BMP performance, the applicant has two options:

- Divert the routine maintenance area around onsite BMPs, or
- Include runoff volumes from the routine maintenance area in onsite BMP calculations. For the predevelopment condition, routine maintenance areas shall be modeled as a meadow land use. For the post-development condition, routine maintenance areas shall be modeled using the post- construction conditions.

Offsite Drainage Areas – The applicant is not responsible for satisfying peak discharge performance standards for offsite areas that drain into the project site. However, the applicant is responsible for proper performance of onsite BMPs. In order to ensure proper onsite BMP performance, the applicant has two options:

- Divert offsite runoff around onsite BMPs, or
- Include offsite runoff volumes in onsite BMP calculations. Use a meadow vegetative cover for the off-site pre-development runoff curve number, regardless of whether the off-site area is currently developed or undeveloped. Use the current or future vegetative cover / impervious surface coverage for the off-site post-development runoff curve number.

(3) INFILTRATION

Post-construction sites with 20,000 sq.ft. or more of impervious surface disturbance and post-construction sites with 1 acre or more of land disturbance are required to meet the ordinance's numeric performance standards. All other post-construction sites are not required to meet these numeric performance standards. BMP design guidance is provided below in Section (h) for sites with less than 20,000 sq.ft. of impervious surface disturbance.

Computer Models:

A model that calculates runoff volume, such as RECARGA, SLAMM, P8, TR-55, or an approved equivalent methodology may be used to evaluate the efficiency of the infiltration design. Information on how to access RECARGA, SLAMM, or P8 is available at http://dnr.wi.gov/topic/stormwater/standards/slamm.htm or contact the stormwater coordinator in the runoff management section of the bureau of watershed management at (608) 267-7694.

Use the most recent version of RECARGA, SLAMM, and P8. The applicant may request a waiver of this requirement.

Depending on the type of infiltration device, groundwater mounding may need to be evaluated. Refer to Table 1, Technical Standard 1002 for groundwater mounding requirements. A model that calculates groundwater mounding is available at http://dnr.wi.gov/topic/stormwater/standards/gw_mounding.html or contact the stormwater coordinator in the runoff management section of the bureau of watershed management at (608) 267-7694.

Design Clarifications:

Maximum required Effective Infiltration Area (EIA) is calculated as follows:

- Prohibited and exempted areas located within the post-construction site are included in the EIA cap calculation.
- The maximum required EIA cap may be voluntarily exceeded.

Prohibitions - Runoff from prohibited areas does not have to be included in calculating the infiltration goal. However, if runoff from a prohibited area flows through an infiltration BMP, the following is required:

- Use caution. These source areas and locations are excluded from the ordinance's infiltration requirement due to groundwater contamination concerns. The municipality is not responsible for the applicant's decision to infiltrate this runoff. The applicant is solely responsible for NR 140 compliance and groundwater protection.
- The BMP design must take runoff from prohibited areas into account to assure the device can safely handle the additional flow and volume.

Exemptions - Infiltration from exempted areas is not required. Despite the ordinance, the applicant may choose to infiltrate exempted runoff. If exempted runoff is infiltrated, credit will be given toward achieving the infiltration requirement. Runoff from exempted areas does not have to be included in calculating the infiltration goal. However, if runoff from an exempted area flows through an infiltration BMP, the BMP design must take it into account to assure the device can safely handle the additional flow and volume.

Groundwater Protection - It is the applicant's sole responsibility to protect groundwater. Compliance with Preventative Action Limits (PAL) contained in NR 140 must be maintained. Also, infiltration system discharges must remain below Enforcement Standards (ES) contain in NR 140. DNR Technical Standards should meet these groundwater protection requirements.

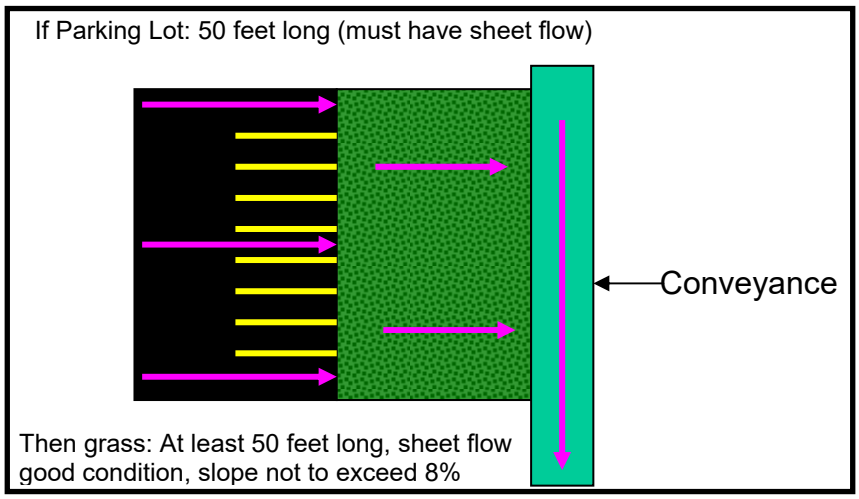
Maximum Extent Practicable (MEP):

- Definition takes into consideration best available technology, cost-effectiveness, natural resource protection, historic preservation, human safety & welfare, and site conditions (see ordinance).
- Topography- To achieve the infiltration requirement, maximum extent practicable should not be interpreted to require significant topography changes that create an excessive financial burden. Two feet or less of elevation change is considered reasonable and to the MEP.
- Pumping- To achieve the infiltration requirement, maximum extent practicable should not be interpreted to require stormwater pumping.

Roof Runoff - To minimize potential groundwater impacts, it is desirable to infiltrate the cleanest runoff. To achieve this, a design may propose greater infiltration of runoff from low pollutant sources such as roofs, and less from higher pollutant source areas such as parking lots.

Disconnection - Disconnection of impervious surfaces can be used to help achieve the infiltration requirement. However, disconnection is not considered to be part of an infiltration system. Therefore, disconnected areas do not count toward the maximum effective infiltration area calculation. In order to consider an impervious surface as "disconnected", the following criteria shall be met:

- Residential Roofs: Discharge runoff over a minimum 20 foot long pervious surface that is in good condition and graded for sheet flow.
- Other Impervious Surfaces:
  - Source area flow length may not exceed 75 feet.
  - Source area and pervious area must be graded for sheet flow.
  - Pervious area must be in good condition, have a slope less than 8%, and have a flow length at least as long as the contributing impervious area's length (but never less than 20 feet).



Source: DNR Post-Construction Stormwater Management Workshops

Routine Maintenance Areas – No performance standard or infiltration requirement is provided for routine maintenance areas. However, the applicant is responsible for proper performance of onsite BMPs. In order to ensure proper BMP performance, the applicant has two options:

- Divert the routine maintenance area around onsite BMPs, or
- Include runoff volumes from the routine maintenance area in onsite BMP calculations. The applicant will receive credit for infiltrating runoff from the routine maintenance area provided it is not a prohibited area.

Offsite Drainage Areas – The applicant is not responsible for satisfying infiltration performance standards for offsite areas that drain into the project site. However, the applicant is responsible for proper performance of onsite BMPs. In order to ensure proper onsite BMP performance, the applicant has two options:

- Divert offsite runoff around onsite BMPs, or
- Include offsite runoff volumes in the onsite BMP calculations. The amount of onsite credit is determined by prorating the infiltration volume. The applicant will not receive credit for infiltrating offsite runoff, unless the BMP is a regional facility.

Alternative Uses - The volume of runoff used for alternative uses will be credited towards the infiltration requirement. Alternative uses may include toilet flushing, laundry, and irrigation (e.g. cisterns, rain barrels, green roofs). In addition to the stormwater benefits, these alternative uses may also reduce municipal invoices for drinking water.

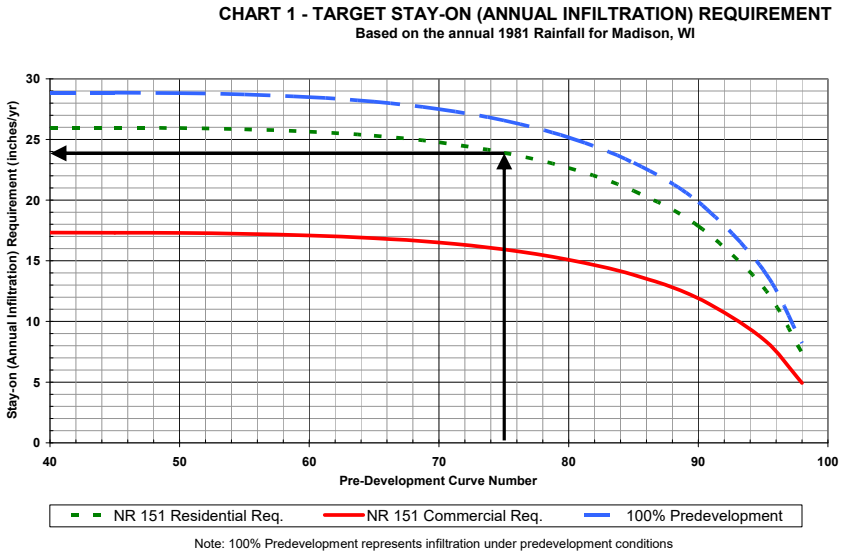
Example Calculations:

The site is currently 100 acres of cropland. Following development, the site will be 30 acres medium residential, 20 acres commercial, and 50 acres cropland. Native soils in the area to be developed are sandy loams, silt loams and silty clay loams. Hydrologic soil groups are B and C with an average pre-development curve number of 75. A site investigation using Step B of the DNR Technical Standard 1002, Site Evaluation for Stormwater Infiltration, determined that 10 of the acres to be developed into medium residential have an infiltration rate of 0.10 in/hr and are therefore exempt from the infiltration requirements. The site investigation also determined that 10 acres to be developed into commercial are excluded from the infiltration requirements. The post-development curve number for the pervious portions of the residential and commercial components will be 80, based on TR-55. The residential component will contain up to 40% connected imperviousness. The commercial component will contain more than80% connected imperviousness.

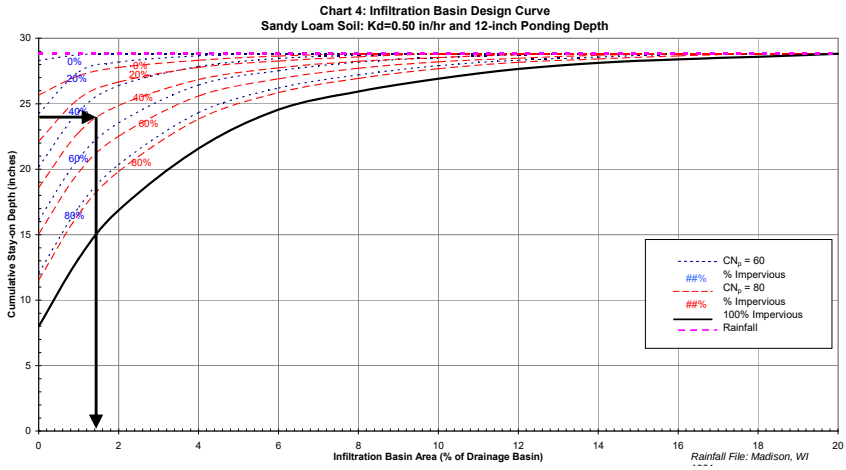
The residential and commercial components will meet the infiltration requirements using two infiltration basins. Upon completion of a preliminary site layout, two locations were chosen for investigation using Step C of Technical Standard 1002. The first location investigated was in the residential area that is not exempt from the infiltration requirements. The soil texture at the residential infiltration basin site is a sandy loam with a design infiltration rate of 0.5 in/hr. The second location investigated was in the commercial area that is not excluded from the infiltration requirements. The soil texture at the commercial infiltration basin site is a loamy sand with a design infiltration rate of 1.63 in/hr.

Step 1: Determine Infiltration Basin Size - Residential Component

Step 1A: Determine Target Stay-on Depth – Residential
Using Chart 1, the target stay-on depth is 24 inches/year.



Step 1B: Determine Preliminary Effective Infiltration Area – Residential
Using Chart 4, the preliminary effective infiltration area needed for the infiltration basin is 12,197 square feet (43,560 * 20 acres * 1.4%).



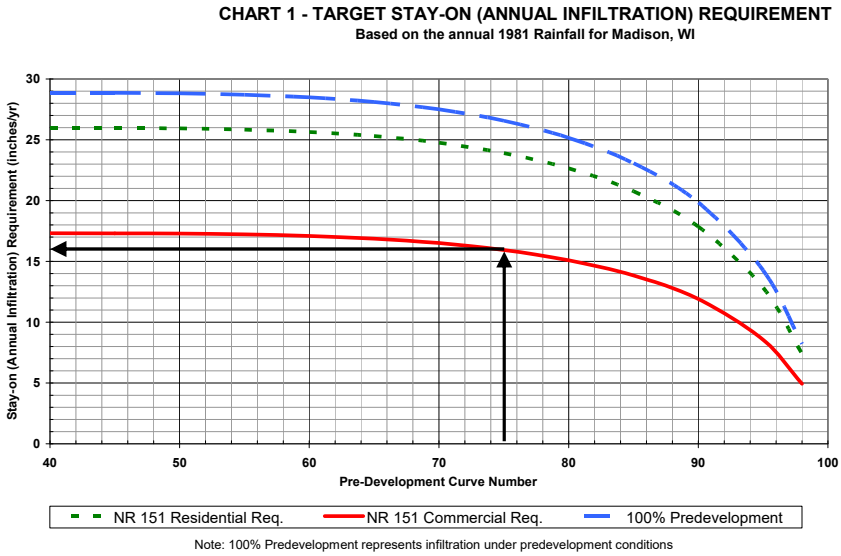
Step 1C: Maximum Required Effective Infiltration Area – Residential

- Residential Land Disturbance (30 acres total)
  - Building roof 5 acres
  - Driveway & sidewalk 2 acres
  - Street 5 acres
  - Lawn / landscaping 18 acres
- Maximum Required EIA = 13,068 sq.ft. (43,560 * 30 acres * 1%)

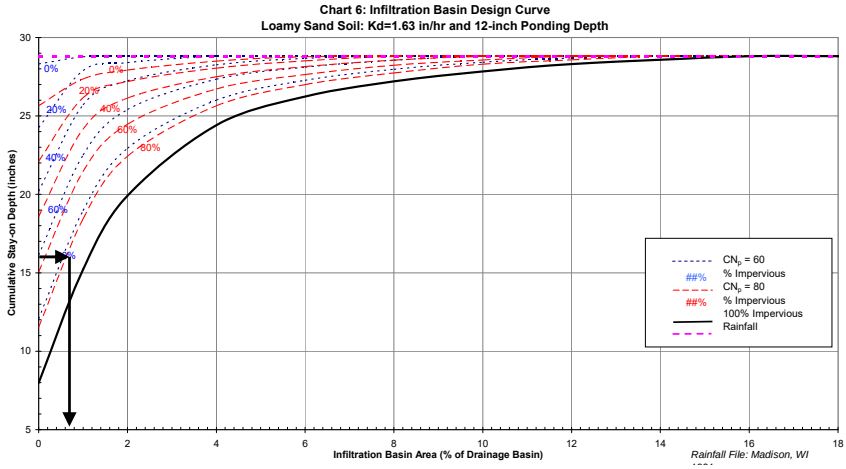
Step 1D: Determine Final Effective Infiltration Area – Residential
Using Technical Standard 1003, the preliminary effective infiltration area of 12,197 sq.ft. needs to be adjusted (depth, slope, cell configuration) to determine the final effective infiltration area. Groundwater mounding also needs to be checked. The maximum EIA cap does not appear to impact the infiltration basin's size (12,197 sq.ft. < 13,068 sq.ft.).

Step 2: Determine Infiltration Basin Size – Commercial Component

Step 2A: Determine Target Stay-on Depth – Commercial
Using Chart 1, the target stay-on depth is 16 inches/year.



Step 2B: Determine Preliminary Effective Infiltration Area – Commercial
Using Chart 6, the preliminary effective infiltration area needed for the infiltration basin is 2,614 square feet (43,560 * 10 acres * 0.6%).



Step 2C: Maximum Required Effective Infiltration Area – Commercial

- Commercial Land Disturbance (20 acres total)
  - Building roof 6 acres
  - Parking lot 7 acres
  - Street 3 acres
  - Lawn / landscaping 4 acre
- Maximum Required EIA = 17,424 sq.ft. (43,560 * 20 acres * 2%)

Step 2D: Determine Final Effective Infiltration Area – Commercial
Using Technical Standard 1003, the preliminary effective infiltration area of 2,614 sq.ft. needs to be adjusted (depth, slope, cell configuration) to determine the final effective infiltration area. Groundwater mounding also needs to be checked. The maximum EIA cap does not appear to impact the infiltration basin's size (2,614 sq.ft. < 17,424 sq.ft.).

(4) PROTECTIVE AREAS

All post-construction sites are required to meet the ordinance's protective area performance standards.

Design Clarifications:

Adjacent Property Owners - If a stream or channel is placed or relocated along a property line, an easement or letter of permission is required from any property owners impacted by the protective area's new location. Also, if a stormwater facility or structure is proposed within an onsite stream or channel, 100-year flood elevations shall be evaluated to determine if offsite property owners are impacted by backwater or a flood elevation increase. An easement or letter of permission is required from any property owners impacted by backwater.

Wetland Delineations - Wetland delineations shall be performed by a professional soil scientist, professional hydrologist, or other qualified individual approved by the administering authority. The individual performing the delineation shall classify the wetland as a less susceptible wetland, highly susceptible wetland, exceptional resource water, or outstanding resource water.

Disturbances - Protective areas may be disturbed as part of a project, if necessary. Disturbed areas must be stabilized from erosion and restored with a self-sustaining vegetation.

Type of Vegetation - It is recommended that seeding of non-invasive vegetative cover be used in the protective areas. Vegetation that is flood and drought tolerant and can provide long-term bank stability because of an extensive root system is preferable. Vegetative cover can be measured using the line transect method described in the University of Wisconsin Extension publication number A3533, titled "Estimating Residue Using the Line Transect Method".

Best Management Practices -

- BMPs may be located in protective areas (ponds, swales, etc.)
- Other state and local regulations may apply to BMPs located in protective areas and waters of the state, including the following:
  - Navigation, Dams, & Bridges (Chapter 30 and 31, Stats.)
  - Wetland Water Quality Standards (NR 103)
  - Wetlands (US Army Corps of Engineers Section 404 regulations)
  - Shoreland Management (NR 115, NR 117, & local regulations)
  - Floodplain Management (NR 116 & local regulations).
- For purposes of section 463-19C(4)(e)[4] of the ordinance, a vegetated protective area to filter runoff pollutants from post-construction sites is not necessary since runoff is not entering the surface water at that location. Other practices, necessary to meet the requirements of this section, such as a swale or pond, will need to be designed and implemented to reduce runoff pollutants before the runoff enters a surface water of the state.

(5) FUELING AND VEHICLE MAINTENANCE AREAS:

All post-construction sites are required to meet the ordinance's no visible petroleum sheen performance standard.

Design Clarifications:

The following BMPs are recommended to meet the performance standards contained within section 463-19C(5) of the ordinance:

- Enclose vehicle maintenance areas in a building or under a roof.
- Install a roof or canopy over fueling areas.
- Divert runoff away from fueling and vehicle maintenance areas.
- Keep adsorbent spill cleanup materials onsite at all times.
- Install an oil / water separator and/or biofiltration device.

- Post the spill response phone numbers in conspicuous onsite locations. The municipality's Illicit Discharge Ordinance requires reporting of hazardous spills. The local municipality's spill response phone number is 911 and the DNR's 24-hour spill response phone number is 1-800-943-0003.

(6) SWALE TREATMENT FOR TRANSPORTATION FACILITIES

Post-construction sites with 20,000 sq.ft. or more of impervious surface disturbance and post-construction sites with 1 acre or more of land disturbance are required to meet the ordinance's numeric performance standards. All other post-construction sites are not required to meet these numeric performance standards. BMP design guidance is provided below in Section (h) for sites with less than 20,000 sq.ft. of impervious surface disturbance.

Design Clarifications:

For purposes of section 463-19C(6)(a)[1] of the ordinance, it is preferred that tall and dense vegetation be maintained within the swale due to its greater effectiveness at enhancing runoff pollutant removal. However, the local municipality may have ordinances or other design criteria which dictate the allowable mowing height for grass swales.

For purposes of section 463-19C(6)(a)[2] of the ordinance, check dams may be included in the swale design to slow runoff flows and improve pollutant removal. Transportation facilities with continuous features such as curb and gutter, sidewalks or parking lanes do not comply with the design requirements of section 463-19C(6)(a)[2] of the ordinance. However, a limited amount of structural measures such as curb and gutter may be allowed as necessary to account for other concerns such as human safety or resource protection.

For purposes of section 463-19C(6)(b) of the ordinance, the Department of Natural Resource's regional stormwater staff can determine if additional BMPs, beyond a water quality swale, are needed.

(7) EXEMPTIONS FOR 463-19C PERFORMANCE STANDARDS

Projects that consist of only the construction of bicycle paths or pedestrian trails generally meet the exception found under section 463-19C(7)(b)[1] of the ordinance, as these facilities have minimal connected imperviousness.

(8) SITES WITH LESS THAN 20,000 SQ.FT. OF IMPERVIOUS SURFACE DISTURBANCE

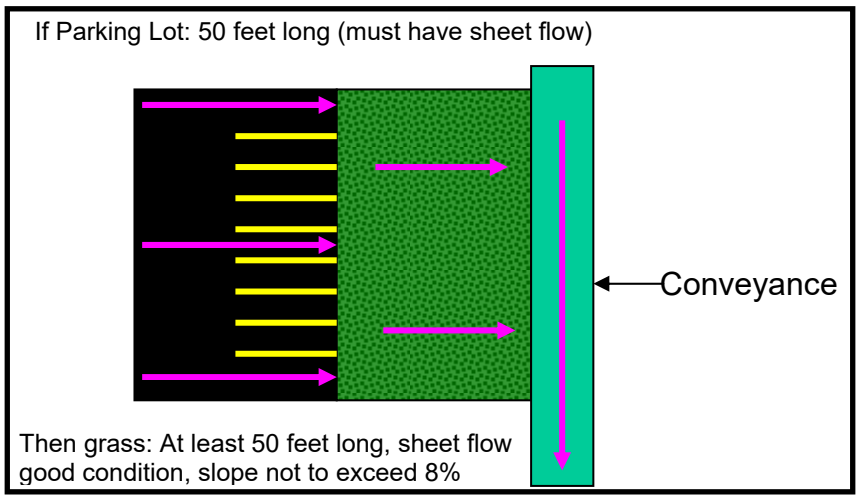
Pursuant to 463-19G of the ordinance, the municipality may establish stormwater management requirements more stringent than those set forth in this section if the municipality determines than an added level of protection is needed.

Design Clarifications:

For a post-construction site with less than 20,000 sq.ft. of impervious surface disturbance, the applicant shall comply with the protective area requirements in section 463-19C(4) of the ordinance, petroleum sheen requirements in section 463-19C(5) of the ordinance, and one of the two requirements provided below. It is recommended that the developer and designer contact the local municipality early in the design process to discuss which requirement must be complied with:

1. Disconnect impervious surfaces. 90% or more of disturbed impervious surfaces must be disconnected. In order to consider an impervious surface as "disconnected", the following criteria shall be met:

- Roofs: Discharge runoff over a minimum 20 foot long pervious surface that is in good condition and graded for sheet flow.
- Other Impervious Surfaces:
  - Source area flow length may not exceed 75 feet.
  - Source area and pervious area must be graded for sheet flow.
  - Pervious area must be in good condition, have a slope less than 8%, and have a flow length at least as long as the contributing impervious area's length (but never less than 20 feet).



Source: DNR Post-Construction Stormwater Management Workshops

2. Use the following best management practices and good housekeeping practices to improve water quality, reduce peak flow rates, and encourage infiltration:

   - Vehicle and equipment maintenance shall be performed inside buildings when feasible. Used fluids / batteries shall be stored and disposed of properly. Repair any vehicle leaks as soon as possible.
   - Outdoor trash bins are required for fast food restaurants, convenience stores, and gas stations. Litter shall be cleaned up daily and disposed of properly.
   - Fertilizers shall be used sparingly for lawn areas. Fertilizers shall be immediately swept off streets, parking lots, driveways, and sidewalks. Soil testing and compliance with Technical Standard 1100 (Turf Nutrient Management) is also encouraged.
   - Stream, shoreline, swale, and other erosion problems shall be repaired as part of the development project when feasible.
   - Roof downspouts, parking lots, driveways, and sidewalks shall discharge stormwater runoff to lawn or other pervious areas when feasible. Rain barrels are also encouraged at roof downspouts to store water for irrigation and watering landscaped areas (reduces municipal water invoice).
   - Create depressions in lawn areas and other landscape areas to temporarily store and treat stormwater runoff from roofs, parking lots, driveways and sidewalks when feasible. Grass swales, biofiltration devices, bioretention devices, and rain gardens are also encouraged when feasible.
   - Filter baskets shall be installed in parking lot catch basins when feasible.
   - Preserve wooded areas, trees, shrubs, and other native vegetation that are in good condition when feasible.

(9) OTHER DESIGN REQUIREMENTS

- Topographic surveys and plans shall be on municipality's vertical datum.
- Grass swales shall be designed with a minimum longitudinal slope of 1%.
- Storm sewers shall be designed for a 10-year design storm. A copy of storm sewer design calculations, time of concentration paths, tailwater conditions, and watershed maps shall be submitted.
- Culverts shall be designed for a 25, 50 or 100-year design storm, depending on location. Contact the municipality for more specific design guidance. A copy of culvert design calculations, time of concentration paths, tailwater conditions, and watershed maps shall be submitted.
- Overland flow paths shall be designed for a 100-year design storm. Flow paths shall be provided for street low points and other depressions. The location of overland flow paths shall be shown on the plans. The 100-year design storm shall be contained within the street right-of-way whenever feasible and ideally, the maximum depth of ponding at street low points shall be 6-inches. The 6-inch depth is measured at the street centerline.
- Minimum finished ground elevations shall be provided for buildings if deemed necessary to provide reasonable flood protection. The minimum finished ground elevation shall be > 1 foot above the 100-year flood elevation and extend at least 15 feet beyond the building. Minimum elevations may need to be specified for lakes, rivers, streams, ponds, and overland flow paths.
- A letter of permission may be required from down slope property owners if a post-development "point discharge" was "sheet flow" during the pre-development condition.
- The applicant may request a waiver or lesser design standard if site characteristics create a hardship.

Maximum Permissible Velocities for Channels			
Channel Cover	Slope Range %	Erosion-resistant soils	Easily eroded soils
Bermuda Grass	0-5	8 fps	6 fps
	5-10	7 fps	5 fps
	>10	6 fps	4 fps
Buffalo grass, Kentucky bluegrass, Smooth brome, blue grama	0-5	7 fps	5 fps
	5-10	6 fps	4 fps
	>10	5 fps	3 fps
Grass mixture	0-5	5 fps	4 fps
	5-10	4 fps	3 fps
	Do not use on slopes steeper than 10%, except for side slopes in a combination channel.		
Lespedeza sericea, weeping love grass Ischaemum (yellow bluestem), kudzu, alfalfa, crabgrass	0-5	3.5 fps	2.5 fps
	Do not use on slopes steeper than 5%, except for side slopes in a combination channel.		
Annuals – used on mild slopes or as temporary protection until permanent covers are established, common lespedeza, Sudan grass	0-5	3.5 fps	2.5 fps
	Use on slopes steeper than 5% is not recommended		

Source – Chow Open Channel Hydraulics

D. CONSIDERATIONS FOR ONSITE / OFFSITE STORMWATER MANAGEMENT MEASURES

All proposed land development activities should be planned, designed, and implemented:

1. In a manner that best fits the terrain of the site, avoiding steep slopes and other environmentally sensitive areas;

2. According to the unique resource conditions at, around, and downstream from a given site;

3. According to the principles of Low Impact Development**.** Use source controls rather than end-of-pipe treatment. Reduce, prevent and mitigate the adverse impacts of development by maintaining infiltration, reducing frequency and volume of discharges, reducing peak flows, and maintaining groundwater recharge. These goals can be accomplished by using:
   - Reduced impervious surfaces
   - Functional grading to slow runoff and thereby lengthen the time of concentration
   - Vegetated channels rather than paving or pipes
   - Disconnection of impervious surfaces; drain to vegetated areas
   - Bioretention (rain gardens) and filtration (buffer) landscape areas
   - Any other techniques that reduce the runoff curve number (RCN) or increase the time of concentration (Tc)
   - Use wet detention ponds after all source area practices and techniques have been employed

   Overall, the goal is to design the site as an integral, living part of the environment with careful use of principles and practices that are both low impact on runoff and simple for people to maintain and live with.

4. To maintain groundwater recharge areas and the infiltration capacity of native soils by avoiding the unnecessary filling of large natural depressions or compaction of upper soil horizons by construction equipment;

5. To maintain soil infiltration by keeping all topsoil on site;

6. To provide the protective area, shoreland, wetland, and environmentally sensitive area setback along all water courses; and

7. According to the sequence in the “Treatment Train”:
   a. First do source controls:
      - Reduce impervious areas to the maximum extent possible
      - Maintain undisturbed soil
      - Maintain existing trees, shrubs and vegetation
   b. Next do lot controls
      - Grade lots to create long areas of overland flow rather than channels
      - Minimize directly connected impervious areas by such practices as directing roof water to vegetated areas and draining driveways to grass rather than the street
      - Include “rain gardens” (undrained areas that will pond water)
   c. Then do site controls
      - Use grassed waterways and diversions rather than paved channels
      - Maintain wetlands
      - Use vegetated road ditches rather than curb and gutter
      - Use wet detention ponds. They can have pools 5 or more feet deep or may be designed as wetlands, but existing wetlands cannot be incorporated into stormwater facilities.

- Use off line detention basins

d. Finally, do Regional controls such as regional detention basins.

E. BMP LOCATION AND CREDIT

When using the regional treatment option, a letter is required from the owner of the regional facility. At a minimum, the letter shall state the following:

- Regional facility complies with ordinance requirements,
- Site can use regional facility for ordinance compliance, and
- Maintenance agreement for regional facility has been recorded at the County Register of Deeds.

F. TARGETED PERFORMANCE STANDARDS

G. ALTERNATE REQUIREMENTS

463-20 PERMITTING REQUIREMENTS, PROCEDURES AND FEES

A. PERMIT REQUIRED

B. PERMIT APPLICATION AND FEES

C. REVIEW AND APPROVAL OF PERMIT APPLICATION

D. PERMIT REQUIREMENTS

The permit applicant is required to post the permit in a conspicuous place at the construction site.

Record Drawings -

- Post-construction sites with 20,000 sq.ft. or more of impervious surface disturbance and post-construction sites with 1 acre or more of land disturbance are required to have record drawings. Record drawings shall be signed by a licensed Professional Engineer. Agricultural land uses, unless they are exceptionally large or special in some other way, are not required to have record drawings. Typically, agricultural land uses will not need anything more than review and acceptance by the administering authority.
- Post-construction sites with less than 20,000 sq.ft. of impervious surface disturbance are not typically required to have record drawings. Typically, sites with less than 20,000 sq.ft. of impervious surface disturbance will not need anything more than review and acceptance by the administering authority.

E. PERMIT CONDITIONS

F. PERMIT DURATION

G. ALTERNATE REQUIREMENTS

463-21 STORMWATER MANAGEMENT PLAN

A. PLAN REQUIREMENTS

Sites With Less Than 20,000 Square Feet of Impervious Surface Disturbance:

The stormwater management plan for post-construction sites with less than 20,000 square feet of impervious surface disturbance shall contain, at a minimum, the following

information unless other municipal ordinances or state regulations require more detailed information:

(a) Name, address, and telephone number for the following or their designees: landowner; developer; project engineer for practice design and certification; person(s) responsible for installation of stormwater management practices; and person(s) responsible for maintenance of stormwater management practices prior to the transfer, if any, of maintenance responsibility to another party.
(b) A description and installation schedule for the stormwater management practices needed to meet the performance standards in 463-19.
(c) Total area of impervious surface disturbance at the post-construction site. Total area of the post-construction site and the total area of the post-construction site that is expected to be disturbed by land disturbing activities.
(d) Sufficient detail so as to document ordinance compliance.
(e) Location of all BMPs to be employed.
(f) Pre-construction ground surface contour lines at intervals appropriate for conditions present within the proposed disturbed areas.
(g) Identify the initial downstream receiving water of the state.

Sites With 20,000 Square Feet or More of Impervious Surface Disturbance:

The stormwater management plan for post-construction sites with 20,000 sq.ft. or more of impervious surface disturbance and post-construction sites with 1 acre or more of land disturbance shall contain, at a minimum, the following information.

(a) Name, address, and telephone number for the following or their designees: landowner; developer; project engineer for practice design and certification; person(s) responsible for installation of stormwater management practices; and person(s) responsible for maintenance of stormwater management practices prior to the transfer, if any, of maintenance responsibility to another party.
(b) A proper legal description of the property proposed to be developed, referenced to the U.S. Public Land Survey system or to block and lot numbers within a recorded land subdivision plat.
(c) Total area of impervious surface disturbance at the post-construction site. Total area of the post-construction site and the total area of the post-construction site that is expected to be disturbed by land disturbing activities.
(d) Sufficient detail so as to document ordinance compliance.
(e) Location of all BMPs to be employed.
(f) Identify the initial downstream receiving water of the state.
(g) Pre-development site conditions, including:
    1. One or more site maps at a scale of not less than 1 inch equals 100 feet. The site maps shall show the following: site location and legal property description; predominant soil types and hydrologic soil groups; existing cover type and condition; one or two foot topographic contours of the site; topography and drainage network including enough of the contiguous properties to show runoff patterns onto, through, and from the site; watercourses that may affect or be affected by runoff from the site; flow path and direction for all stormwater conveyance sections; watershed boundaries used in hydrology determinations to show compliance with performance standards; lakes, streams, wetlands, channels, ditches, and other watercourses on and immediately adjacent to the site; limits of the 100 year floodplain; location of wells and wellhead protection areas covering the project area and delineated pursuant to s. NR 811.16, Wis. Adm. Code.
    2. Hydrology and pollutant loading computations as needed to show compliance with performance standards. All major assumptions used in developing input parameters shall be clearly stated. The geographic areas used in making the calculations shall be clearly cross-referenced to the required map(s).
(h) Post-development site conditions, including:

1. Explanation of the provisions to preserve and use natural topography and land cover features to minimize changes in peak flow runoff rates and volumes to surface waters and wetlands.
2. Explanation of any restrictions on stormwater management measures in the development area imposed by wellhead protection plans and ordinances.
    a. Stormwater infiltration systems and ponds shall be located at least 400 feet from a well serving a community water system unless the Wisconsin Department of Natural Resources and municipality concur that a lesser separation distance would provide adequate protection of a well from contamination.
    b. Stormwater management practices shall be located with a minimum separation distance from any well serving a non-community or private water system as listed within s. NR 812.08.
3. One or more site maps at a scale of not less than 1 inch equals 100 feet showing the following: post-construction pervious areas including vegetative cover type and condition; impervious surfaces including all buildings, structures, and pavement; post-construction one or two foot topographic contours of the site; post-construction drainage network including enough of the contiguous properties to show runoff patterns onto, through, and from the site; locations and dimensions of drainage easements; locations of maintenance easements specified in the maintenance agreement; flow path and direction for all stormwater conveyance sections; location and type of all stormwater management conveyance and treatment practices, including the onsite and offsite tributary drainage area; location and type of conveyance system that will carry runoff from the drainage and treatment practices to the nearest adequate outlet such as a curbed street, storm drain, or natural drainage way; watershed boundaries used in hydrology and pollutant loading calculations and any changes to lakes, streams, wetlands, channels, ditches, and other watercourses on and immediately adjacent to the site.
4. Hydrology and pollutant loading computations as needed to show compliance with performance standards. The computations shall be made for each discharge point in the development, and the geographic areas used in making the calculations shall be clearly cross-referenced to the required map(s).
5. Results of investigations of soils and groundwater required for the placement and design of stormwater management measures. When permanent infiltration systems are used, appropriate onsite testing shall be conducted to determine if seasonal groundwater elevation or top of bedrock is within 5 feet of the proposed infiltration system. Detailed drawings including cross-sections and profiles of all permanent stormwater conveyance and treatment practices.

(i) A description and installation schedule for the stormwater management practices needed to meet the performance standards in 463-19.

(j) A maintenance plan developed for the life of each stormwater management practice including the required maintenance activities and maintenance activity schedule.

(k) Cost estimates for the construction, operation, and maintenance of each stormwater management practice.

(l) Other information requested in writing by the administering authority to determine compliance of the proposed stormwater management measures with the provisions of this ordinance.

(m) All site investigations, plans, designs, computations, and drawings shall be certified by a licensed professional engineer to be prepared in accordance with accepted engineering practice and requirements of this ordinance.

B. ALTERNATE REQUIREMENTS

463-22 MAINTENANCE AGREEMENT

A. MAINTENANCE AGREEMENT REQUIRED

Post-construction sites with 20,000 sq.ft. or more of impervious surface disturbance and post-construction sites with 1 acre or more of land disturbance are required to have a maintenance agreement. The applicant shall use the municipality's standard forms for the maintenance agreement. The local municipality is responsible for recording the signed maintenance agreement at the County Register of Deeds.

Post-construction sites with less than 20,000 sq.ft. of impervious surface disturbance are not typically required to have a maintenance agreement.

Sites utilizing the regional treatment option are not typically required to have a maintenance agreement. However, a maintenance agreement is required for the regional facility.

B. AGREEMENT PROVISIONS

C. ALTERNATE REQUIREMENTS

463-23 FINANCIAL GUARANTEE

A. ESTABLISHMENT OF GUARANTEE

Post-construction sites with 20,000 sq.ft. or more of impervious surface disturbance and post-construction sites with 1 acre or more of land disturbance are required to have a financial guarantee. The financial guarantee includes the cost associated with stormwater BMPs, record drawings, project administration, and contingencies.

Post-construction sites with less than 20,000 sq.ft. of impervious surface disturbance are not typically required to have a financial guarantee.

Sites utilizing the regional treatment option are not typically required to have a financial guarantee.

B. CONDITIONS FOR RELEASE

The financial guarantee shall not be released until the applicant conducts a final inspection with a municipal representative, submits "record drawings" certified by a licensed Professional Engineer, completes punch list items, and pays fees.

C. ALTERNATE REQUIREMENTS

463-24 FEE SCHEDULE

463-25 ENFORCEMENT

463-26 APPEALS

A. APPEALS

B. WHO MAY APPEAL

Preliminary Stormwater Management Plan

Misty Pond

Prepared For The

Grand Chute

TOWN OF GRAND CHUTE
OUTAGAMIE COUNTY, WISCONSIN

DECEMBER 13, 2016

McM. No. G0003-9-14—271

AWS:car

McMAHON
ENGINEERS ARCHITECTS
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Preliminary Stormwater Management Plan

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TOWN OF GRAND CHUTE
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DECEMBER 13, 2016
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Misty Pond

Prepared For The

Grand Chute

TOWN OF GRAND CHUTE
OUTAGAMIE COUNTY, WISCONSIN

DECEMBER 13, 2016
McM. No. G0003-9-14-00271

I. INTRODUCTION

The Town of Grand Chute has elected to improve water quality within the Lower Fox River Mainstem Sub-Watershed. As such, the Town of Grand Chute desires to construct the Misty Pond, generally located west of an unnamed tributary to Mud Creek, north of Spencer Street, south of W. Lawrence Street and east of S. Misty Lane within the Town of Grand Chute, Outagamie County, Wisconsin (SW ¼ of SE ¼, Section 30, T21N, R17E). The Misty Pond is a regional wet detention pond that will assist the Town of Grand Chute in complying with the Lower Fox River (LFR) Basin Total Maximum Daily Load (TMDL) and NR 216 stormwater regulations. The Misty Pond project is exempt from NR 151.12 post-construction performance standards since it is considered a redevelopment post-construction site with no increase in exposed parking lots or roads. Specific goals for the Misty Pond and this Stormwater Management Plan include the following:

A. Reduce average annual Total Suspended Solids (TSS) by 40% to provide compliance with NR 151.122 (TSS Performance Standard) for any future redevelopment sites within the Misty Pond contributing watershed.

B. Reduce average annual TSS and Total Phosphorus (TP) loads in runoff to the Fox River, a 303(d) listed water body. The LFR TMDL identifies a 72.2% TSS load reduction and 40.5% TP load reduction for NR 216 Municipal Stormwater Dischargers located within the Lower Fox River Mainstem Sub-Watershed when adjusted to a "no controls condition". The adjustment is described in WDNR TMDL guidance documents.

II. STUDY AREA

The study area is depicted in Figure 1 and is the contributing watershed to the Misty Pond. The study area contains approximately 89.7 acres or 0.14 square miles of property within the Town of Grand Chute, Outagamie County, Wisconsin. Generally, the study area is bound to the south Spencer Street, to the north by Long Court, to the east by an unnamed tributary to the Fox River and to the west by County Highway 'CB'. The study area is substantially developed and consists primarily of residential land uses. Runoff from the study area is collected and conveyed via roadside ditches. As part of the Misty Pond project, stormwater will be diverted into the pond via storm sewer. The pond will discharge directly into the unnamed tributary to the Fox River.

III. HYDROLOGIC & HYDRAULIC ANALYSIS

A. Methodology

A hydrologic computer model was used to develop the rainfall / runoff relationship within the study area. The XP-SWMM (V15.0) computer model was used for this study. The SWMM computer model was used to generate surface runoff hydrographs for each sub-basin within the study area. The hydrographs include information such as peak flow rates, time of peak flow rates, and runoff volumes. The SWMM model was also used to combine, split, and route hydrographs within the study area.

The U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS or formerly SCS), Technical Release 55 methodology was also used to develop the rainfall / runoff relationship within the study area. The TR-55 methodology requires that various hydrologic parameters be input into the computer model. These hydrologic parameters generally include rainfall, sub-basin area, percent imperviousness, runoff curve number, and time of concentration.

B. Rainfall

Rainfall information was obtained from the U.S. Department of Commerce Technical Paper No. 40, *Rainfall Frequency Atlas of the United States*. The 24-hour rainfall depths are summarized below in Table #1. The SCS 24-hour, Type II rainfall distribution was used in this study.

Table #1

24-Hour Rainfall Depth

Rainfall Event	Depth (inches)
1-Year	2.2
2-Year	2.5
10-Year	3.8
100-Year	5.3

C. Drainage Area

The contributing watershed to the Misty Pond is 89.7 acres in size and is based upon a recent topographic survey of Spencer Street, Outagamie County 2 foot contour maps, and Town of Grand Chute drainage system maps. The Misty Pond (post-development) watershed is depicted in Figure 1.

D. Soil Types

Soil information was obtained from the U.S. Department of Agriculture *Soil Survey of Outagamie County, Wisconsin*. A copy of the NRCS / SCS Soil Map is provided in Figure 2. The predominant soil types within the study area are summarized below in Table #2. The Department of Agriculture has classified soil types into four hydrologic soil groups (HSG). The four hydrologic soil groups (i.e. A, B, C and D) are classified according to the minimum infiltration rate of the soil column. Group A soils have the highest permeability rate or lowest runoff potential, whereas Group D soils have the lowest permeability rate or highest runoff potential.

Table #2

Soil Information

Soil Name	Map Symbol	Soil Texture	Feet to Water Table	Inches to Bedrock	Permeability (in/hr)	HSG
Casco	CcB	Loam	6.6	16.9	40.0	B
Hebron	HeB	Loam	3.3	> 60	0.6	C
Hortonville	HrB	Silt Loam	6.6	> 60	1.2	C
Kolberg	KoB	Silt Loam	6.6	27.2	2.7	C
Mosel	MtA	Silt Loam	1.7	> 60	0.6	C/D
Poygan	Po	Silty Clay Loam	0.0	> 60	0.1	C/D
Symco	SzA	Silt Loam	0.8	> 60	18.5	B/D
Winneconne	WnA	Silty Clay	5.0	> 60	0.0	D
Winneconne	WnB	Silty Clay	5.8	> 60	0.0	D

E. Land Uses

The study area is primarily developed. Since the project is not required to satisfy NR 151.121, and has no peak flow requirements, existing (2004) land uses were used for the hydrologic analysis. However, for purposes of the water quality analysis, future land uses were used. The land uses within the watershed include low and medium density residential, suburban residential, strip commercial, office park, miscellaneous institutional, hospital, light industrial, grass and wetlands. A map of the existing (2015) and future land uses are depicted in Figures 3 and 4, respectively. Land uses are summarized in Table #3.

Table #3

Land Uses

Land Use	Existing Land Use		Future Land Use	
	Area (acres)	Percent (%)	Area (acres)	Percent (%)
Low Density Residential	49.2	54.8%	49.6	55.3%
Medium Density Residential	7.5	8.4%	8.8	9.8%
Suburban Residential	10.1	11.2%	22.6	25.1%
Strip Commercial	0.3	0.4%	0.3	0.4%
Office Park	0.0	0.0%	0.0	0.0%
Miscellaneous Institutional	1.7	1.9%	4.3	4.8%
Hospital	2.2	2.4%	2.2	2.4%
Light Industrial	0.9	1.0%	0.9	1.0%
Grass	16.8	18.7%	0.0	0.0%
Wetlands	1.0	1.2%	1.0	1.2%
Total	89.7	100.0%	89.7	100.0%

F. Runoff Curve Number

A composite runoff curve number was computed for each sub-basin and land use condition. Runoff curve number computations are based on land uses, vegetation, percent imperviousness, and hydrologic soil groups within each sub-basin. For this study, the following assumptions were used to compute each composite runoff curve number: average antecedent moisture condition, average runoff condition, good hydrologic condition for pervious areas, and directly connected impervious areas. Pre-development areas were assumed to have a runoff curve number of 71 (HSG C). Impervious areas were assumed to have a runoff curve number of 98 and pervious grass areas were assumed to have a runoff curve number of 74 (HSG C). See Table #4 for values.

G. Time of Concentration

Existing (2015) time of concentrations were computed for each sub-basin. Times of concentration calculations include sheet flow, shallow concentrated flow, and open channel flow. Time of concentration values can be found in Table #4.

H. Hydrologic Parameters

The existing land use condition refers to watershed conditions in 2015. The hydrologic parameters for each drainage area are summarized in Table #4.

Table #4

Hydrologic Parameters
Existing Land Use Condition

Drainage Area ID	Drainage Area (acres)	Impervious (%)	Curve Number	Tc (minutes)
F3k	3.14	6.3%	81.1	50
F3l1	5.03	22.7%	76.6	24
F3l2	41.08	17.7%	77.5	69
F3l3a	14.68	23.9%	81.9	70
F3l3b	1.59	9.6%	81.7	41
F3l3c	1.91	37.7%	86.8	24
F3l3d	0.10	100.0%	98.0	5
F3l3e	6.17	34.8%	84.4	41
F3l3f	1.86	63.6%	90.4	49
F3l3g	0.03	100.0%	98.0	5
F3l3h	0.10	100.0%	98.0	5
F3l3i	0.16	100.0%	98.0	5
F3m1	3.17	29.3%	78.1	30
F3m2a	8.63	15.1%	79.8	47
F3m2b	0.05	37.7%	86.8	5
F3m2c	0.35	37.7%	86.8	6
F3m2d	0.21	37.7%	86.8	5
F3m2e	0.28	37.7%	86.8	7
F3m2f	0.16	37.7%	86.8	5
F3m2g	0.65	37.7%	86.8	19
F3m2h	0.34	37.7%	86.8	10
Totals	89.7	22.0%	79.9	-

I. Hydrologic Results

The existing condition refers to hydraulic conditions before construction of the Misty Pond. Hydrologic and hydraulic results for the existing condition are summarized in Table #5.

Table #5

Peak Water Surface Elevations
Existing Condition

No.	Outfall (Node)	Location	Ground Elevation	Peak Water Surface Elevation			
				1-yr	2-yr	10-yr	100-yr
1	F3l1-l3a	Maple Hill Drive	780.25	779.31	780.12	780.56	780.68
2	F3l3d_3e	Misty Lane	775.42	775.47	775.61	775.82	775.94
3	F3m2c_2d	Wildrose Lane	777.1	776.20	776.78	777.34	777.44
4	F3m2e_2f	Golenrod Drive	774.82	774.90	774.95	775.08	775.15
5	F3k	Spencer Street	774.25	770.10	770.80	773.34	774.70

The post-pond construction condition refers to hydraulic conditions after construction of the Misty Pond. Hydrologic and hydraulic results for the post-pond construction condition are summarized in Table #6.

Table #6

Peak Water Surface Elevations
Post-Pond Construction Condition

No.	SWMM (Node)	Location	Ground Elevation	Peak Water Surface Elevation			
				1-yr	2-yr	10-yr	100-yr
1	F3l3a_m2a	Maple Hill Drive	779.58	775.21	775.98	777.53	779.76
2	F3l3e	Misty Lane	775.63	771.49	771.86	773.57	775.55
3	F3l3c_m2cd	Wildrose Lane	775.48	771.80	772.23	774.59	775.98
4	F3m2f	Golenrod Drive	774.33	771.50	771.87	773.59	774.65
5	Spen-us	Spencer Street	774.25	769.99	770.76	773.23	774.69
6	Pond_F3k	Misty Pond	-	771.49	771.85	773.50	774.77

A comparison of Tables #5 and #6 indicate that the peak water surface elevations for the post-pond construction condition are less than the ground surface elevation existing condition. Detailed hydrologic and hydraulic modeling information and results are provided in Appendix C.

The Misty Pond has a 89.7 acre watershed and a permanent pool surface area of 0.86 acres. Performance of the Misty Pond is summarized below in Table #7. Preliminary Plans for the Misty Pond are provided in Appendix B.

Table #7

Misty Pond Summary

Design Storm	SWMM (Node/Link)	Peak Outflow (cfs)	Storage Volume (ac-ft)	Normal Water Elevation (feet)	Peak Water Elevation (feet)
1-year	Pond_F3k / Pond-SS	9.2	2.84	768.50	771.49
2-year	Pond_F3k / Pond-SS	11.3	3.22	768.50	771.85
10-year	Pond_F3k / Pond-SS	37.2	5.06	768.50	773.50
100-year	Pond_F3k / Pond-SS & Pond-Ov	83.9	6.61	768.50	774.77

IV. WATER QUALITY ANALYSIS

A. Methodology

The water quality analysis for the study area was prepared using the Source Loading and Management Model (SLAMM) (v.10.2.1). SLAMM is an urban water quality model that predicts runoff volumes and non-point source pollution within a watershed. SLAMM calculates mass balances for both particulate and filterable pollutants. SLAMM also calculates the amount of pollutant removal provided by Best Management Practices (BMP), including wet detention ponds. No historical water quality information was available for the study area. As such, water quality within the study area was predicted using historical data collected during the National Urban Runoff Project (NURP).

B. Rainfall

SLAMM computes pollutant loads from one or more rainfall events. For this study, the series of small rainfall events that occurred between March 29, 1969 and November 25, 1969 in Green Bay, Wisconsin were used to compute pollutant loads. The 1969 historic rainfall series was determined to represent an average year of rainfall within northeast Wisconsin by the Wisconsin Department of Natural Resources (DNR).

C. Watershed

The 89.7 acre post-development watershed (study area) was used to prepare the SLAMM water quality model. The post-development watershed (study area) for the Misty Pond is depicted in Figure 1.

D. Soil Types

Soil information was obtained from the U.S. Department of Agriculture (USDA) *Soil Survey of Outagamie County, Wisconsin*. A copy of the NRCS Soil Map is provided in Figure 2. The USDA has classified soil types into four HSG. The four hydrologic soil

groups (i.e. A, B, C and D) are classified according to the minimum infiltration rate of the soil column. Group A soils have the highest permeability rate or lowest runoff potential, whereas Group D soils have the lowest permeability rate or highest runoff potential. As shown in Figure 2, the predominant soil types within the overall study area are Type C and Type D soils.

E. Land Use

As previously mentioned, the study area is substantially developed. Existing and future land uses are depicted in Figure 3 and Figure 4 and are shown in Table #8. The future land uses were used to prepare the SLAMM water quality model.

Table #8

Land Use

Land Use	Existing		Future	
		Percent (%)		Percent (%)
Low Density Residential	49.18	54.8%	49.64	55.3%
Medium Density Residential	7.54	8.4%	8.78	9.8%
Suburban Residential	10.06	11.2%	22.56	25.1%
Strip Commercial	0.33	0.4%	0.33	0.4%
Office Park	0.00	0.0%	0.01	0.0%
Miscellaneous Institutional	1.68	1.9%	4.26	4.8%
Hospital	2.18	2.4%	2.18	2.4%
Light Industrial	0.90	1.0%	0.90	1.0%
Grass	16.79	18.7%	0.00	0.0%
Wetlands	1.04	1.2%	1.04	1.2%
Total	89.70	100%	89.70	100%

F. Water Quality Results

The TSS reduction provided by the Misty Pond watershed is summarized below in Table #9. The removal rate provided by the Misty Pond is 81.5 percent or 12,211 pounds of TSS removed on an average annual basis.

Table #9

Total Suspended Solids (TSS)
Reduction Provided

BMP	Drainage Area (acres)	TSS Inflow (lbs.)	TSS Removed (lbs.)	TSS Outflow (lbs.)	TSS Removal (%)
Misty Pond	89.7	14,984	12,211	2,773	81.5%

In addition to TSS removal, the Misty Pond will also provide a reduction in TP. The removal rate provided by the Misty Pond is 57.3 percent or 34.4 pounds of TP removed on an average annual basis. The total phosphorous reduction provided is summarized below in Table #10.

Table #10

Total Phosphorus (TP)
Reduction Provided

BMP	Drainage Area (acres)	TP Inflow (lbs.)	TP Removed (lbs.)	TP Outflow (lbs.)	TP Removal (%)
Misty Pond	89.7	60.05	34.43	25.62	57.3%

No street sweeping, catch basin cleaning or other BMP are included in the SLAMM water quality model. The only Best Management Practices within the study area is the Misty Pond. For reference, the results of the SLAMM water quality analysis are provided in Appendix A. Preliminary plans for the Misty Pond project are provided in Appendix B.

It is of note that the Misty Pond achieves greater than 40% TSS removal for the pond's contributing watershed. Therefore, the Misty Pond will satisfy the TSS performance standard for any future redevelopment sites within the study area.

In addition the Misty Pond achieves greater than 72.2% TSS removal and 40.5% TP removal for the pond's contributing watershed to assist the Town in satisfying the TSS and TP load allocations / reductions required by the LFR Basin TMDL.

V. INFILTRATION

NR 151 stormwater regulations require that developments with moderate imperviousness (more than 40% and up to 80% connected imperviousness), such as medium density residential, infiltrate sufficient runoff volume so that the post-development infiltration volume be at least 75% of the pre-development infiltration volume, based on an average annual rainfall. However,

when designing appropriate infiltration systems to meet this requirement, no more than 2% of the post-construction site is required as an effective infiltration area.

The Misty Pond project is exempt from the infiltration performance standards within NR 151 and the Town Stormwater Management Ordinance since it is considered a redevelopment post-construction site with no increase in exposed parking lots or roads. It should also be noted that the study area is substantially developed so any redevelopment within the study area would also be exempt from the infiltration performance standards within NR 151 and the Town Stormwater Management Ordinance.

VI. PROTECTIVE AREAS

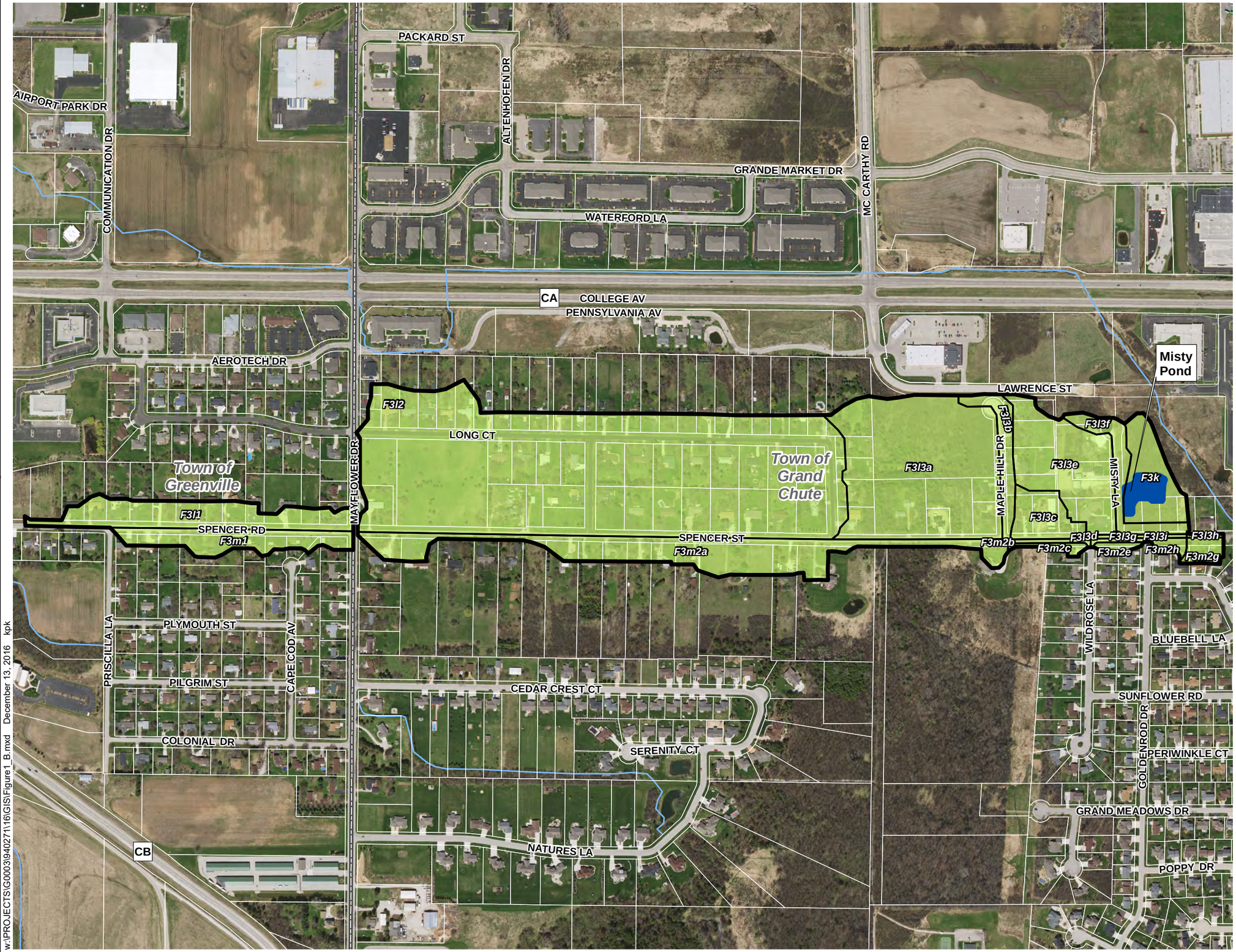
The Misty Pond project is exempt from the protective areas performance standards within NR 151 and the Town Stormwater Management Ordinance since it is considered a redevelopment post-construction site with no increase in exposed parking lots or roads. It should also be noted that the study area is fully developed so any redevelopment within the study area would also be exempt from the protective areas performance standards within NR 151 and the Town Stormwater Management Ordinance.

VII. FUELING & VEHICLE MAINTENANCE

The Misty Pond does not satisfy NR 151 petroleum sheen requirements for fueling and vehicle maintenance areas located within the study area. As such, each property owner will need to satisfy petroleum sheen requirements for their site at the time of redevelopment.

VIII. SUMMARY

In summary, the Misty Pond project satisfies the goals set forth in this Stormwater Management Plan. The intent of this Stormwater Management Plan is not to provide erosion and sediment control for construction sites located within the overall study area. Each site within the overall study area shall provide appropriate erosion and sediment controls for construction sites at the time of redevelopment.



Grand Chute

Study Area/
Pond Watershed

Other Mapped Features

F3k Drainage Area and ID

Misty Pond

Municipal Boundary

Parcel Line

Stream

Preliminary

Source: Outagamie County, 2014-15.

Disclaimer: The property lines, right-of-way lines, and other property information on this drawing were developed or obtained as part of the County Geographic Information System or through the County property tax mapping function. McMAHON does not guarantee this information to be correct, current, or complete. The property and right-of-way information are only intended for use as a general reference and are not intended or suitable for site-specific uses. Any use to the contrary of the above stated uses is the responsibility of the user and such use is at the user's own risk.

N

0 500 1,000 Feet

McMAHON ENGINEERS ARCHITECTS

FIGURE 1
STUDY AREA
MISTY POND
STORMWATER
MANAGEMENT PLAN
TOWN OF GRAND CHUTE
OUTAGAMIE COUNTY, WISCONSIN

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PACKARD ST
ALTENHOFEN DR
MC CARTHY RD
COMMUNICATION DR
GRANDE MARKET DR
WATERFORD LA
COLLEGE AV
PENNSYLVANIA AV
CA
Town of Grand Chute
AEROTECH DR
LONG CT
LAWRENCE ST
MAPLE HILL DR
MISTY LA
Town of Greenville
SPENCER RD
SPENCER ST
WILDROSE LA
BLUEBELL LA
PRISCILLA LA
PLYMOUTH ST
CAPE COD AV
PILGRIM ST
CEDAR CREST CT
SUNFLOWER RD
COLONIAL DR
SERENITY CT
PERIWINKLE CT
MAYFLOWER DR
NATURES LA
POPPY DR
CB

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Grand Chute

Hydrologic Soil Group (HSG)

- HSG A
- HSG B
- HSG C
- HSG D

Other Mapped Features

- Study Area Boundary
- Municipal Boundary
- Parcel Line
- Stream

Preliminary

Source: Outagamie County, 2014-15, USDA, 2014.

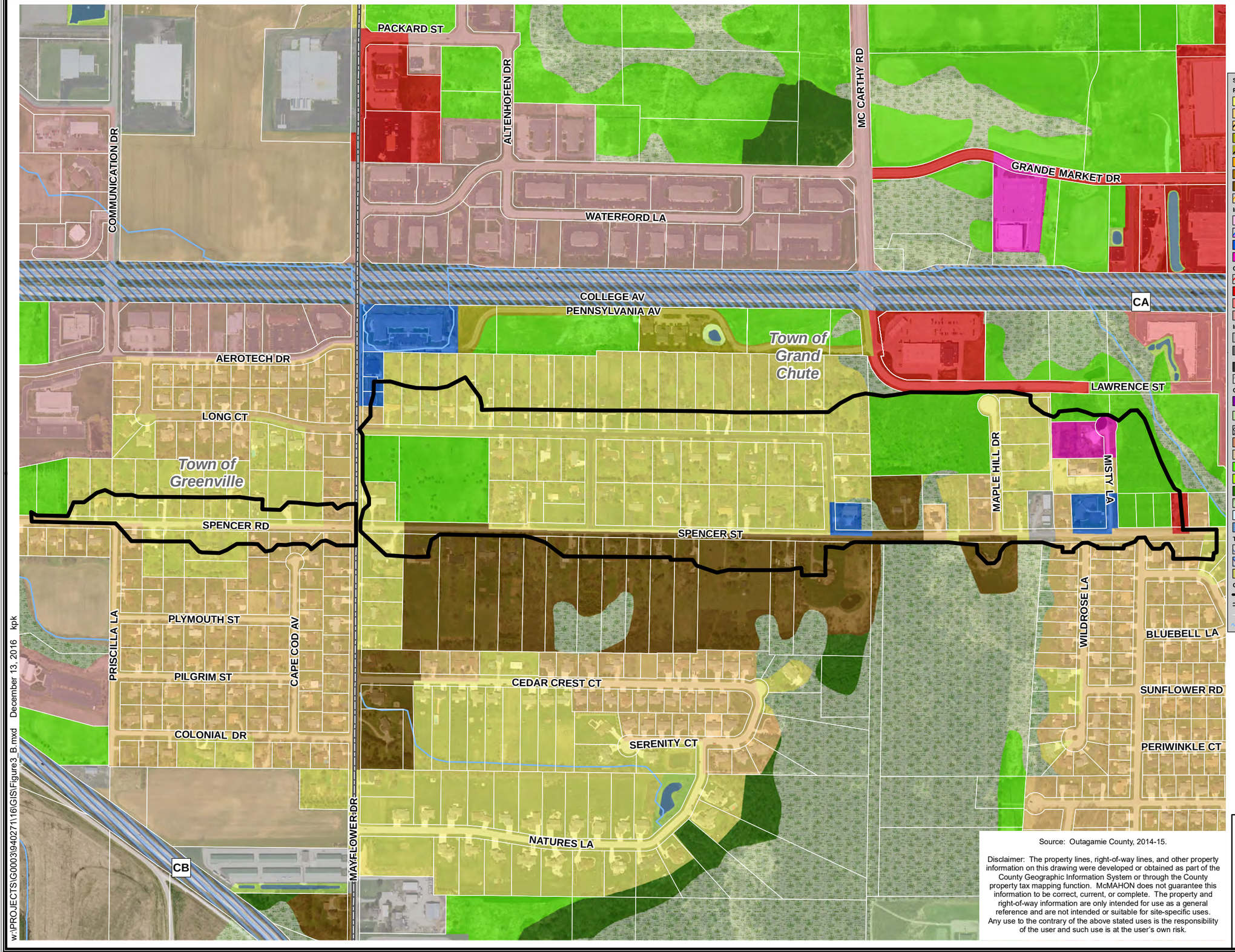
Disclaimer: The property lines, right-of-way lines, and other property information on this drawing were developed or obtained as part of the County Geographic Information System or through the County property tax mapping function. McMAHON does not guarantee this information to be correct, current, or complete. The property and right-of-way information are only intended for use as a general reference and are not intended or suitable for site-specific uses. Any use to the contrary of the above stated uses is the responsibility of the user and such use is at the user's own risk.

N

0 500 1,000 Feet

McMAHON ENGINEERS ARCHITECTS

FIGURE 2
SOILS
MISTY POND
STORMWATER
MANAGEMENT PLAN
TOWN OF GRAND CHUTE
OUTAGAMIE COUNTY, WISCONSIN



Grand Chute

SLAMM Standard Land Uses

Residential
- LDR - Low Density Single Family Residential (0.5 acre to 1.5 acre lots)
- MDR - Medium Density Single Family Residential (0.25 acre to 0.5 acre lots)
- MDRA - Medium Density Single Family Residential w/Alleys (0.25 acre to 0.5 acre lots)
- HDR - High Density Single Family Residential (0.125 acre lots or smaller)
- HDRA - High Density Single Family Residential w/Alleys (0.125 acre lots or smaller)
- MFR - Multi-Family Residential (3 or more families, 1-3 story height)
- HRR - High Rise Residential (1.5 acre to 5 acre lots, > 3 story)
- SUBR - Suburban Residential (1.5 acre to 5 acre lots)
- MOBR - Mobile Home or Trailer Park Residential

Institutional
- SCHOOL - Public or Private School
- UNIV - University, College, Technical School, etc.
- HOSP - Medical Facilities including Nursing Homes, Hospitals, etc.
- MISC - Miscellaneous Facilities (Churches, Institutional Property)

Commercial
- CDNTN - Downtown Commercial and Institutional Areas
- CSTRIP - Strip Commercial Areas (Courthouses, Police Stations, etc.)
- SHCNTR - Shopping Centers (parking lot is 2.5 times building area)
- OFFPRK - Office Parks (non-retail, multi-story, insurance, government)

Industrial
- LIGHTI - Light Industrial Areas (storage and distribution of goods for retail or sale)
- MEDI - Medium Industrial Areas (lumber, junk, or auto salvage yard, ag., co-op, oil tank farm, coal and salt storage, slaughter house)
- QUARRY - Aggregate Extraction and Excavation
- AIRPRT - Airport Facilities

Open Space
- CEM - Cemeteries, including grounds, roads, and buildings)
- PARK - Outdoor Recreational Areas (golf course, arboretums, botanical gardens, municipal playgrounds, and natural areas)
- RAIL - Railroad ROW (Excludes road ROW, storage yards)
- FRMSTD - Farmsteads, including limited houses, buildings, driveways and parking areas
- AGRIC - Agriculture fields
- GRASS - Undeveloped land that is vegetated (Excludes road ROW)
- GRASS_SWPOND - Vegetated land around a stormwater pond (Excludes road ROW)
- WOODS - Forested or Wooded Areas with Leaf Litter
- WETLND - DNR Wetland Inventory Map
- WATER - Waters of the State and Other Open Waters
- WATER_SWPOND - Open water associated with stormwater pond

Transportation
- FREE - Limited Access Highways and Interchanges, including vegetated ROW
- HWY - State or County Highway
- RURALRD - Rural Road

Other Mapped Features
- Study Area Boundary
- Municipal Boundary
- Parcel Line
- Streams

Preliminary

0 500 1,000 Feet

McMAHON ENGINEERS ARCHITECTS

Source: Outagamie County, 2014-15.

Disclaimer: The property lines, right-of-way lines, and other property information on this drawing were developed or obtained as part of the County Geographic Information System or through the County property tax mapping function. McMAHON does not guarantee this information to be correct, current, or complete. The property and right-of-way information are only intended for use as a general reference and are not intended or suitable for site-specific uses. Any use to the contrary of the above stated uses is the responsibility of the user and such use is at the user's own risk.

FIGURE 3
EXISTING (2015) LAND USE
MISTY POND
STORMWATER
MANAGEMENT PLAN
TOWN OF GRAND CHUTE
OUTAGAMIE COUNTY, WISCONSIN

w:\PROJECTS\G0003\940271\16\GIS\Figure3_B.mxd December 13, 2016 kpk

PACKARD ST
ALTENHOFEN DR
MC CARTHY RD
GRANDE MARKET DR
WATERFORD LA
COMMUNICATION DR
COLLEGE AV
PENNSYLVANIA AV
CA
Town of Grand Chute
AEROTECH DR
LONG CT
LAWRENCE ST
MAPLE HILL DR
MISTY LA
Town of Greenville
SPENCER RD
SPENCER ST
PRISCILLA LA
PLYMOUTH ST
CAPE COD AV
PILGRIM ST
COLONIAL DR
CEDAR CREST CT
SERENITY CT
WILDROSE LA
BLUEBELL LA
SUNFLOWER RD
PERIWINKLE CT
MAYFLOWER DR
NATURES LA
CB

Grand Chute

SLAMM Standard Land Uses

Residential
- LDR - Low Density Single Family Residential (0.5 acre to 1.5 acre lots)
- MDR - Medium Density Single Family Residential (0.25 acre to 0.5 acre lots)
- MDRA - Medium Density Single Family Residential w/Alleys (0.25 acre to 0.5 acre lots)
- HDR - High Density Single Family Residential (0.125 acre lots or smaller)
- HDRA - High Density Single Family Residential w/Alleys (0.125 acre lots or smaller)
- MFR - Multi-Family Residential (3 or more families, 1-3 story height)
- HRR - High Rise Residential (1.5 acre to 5 acre lots, > 3 story)
- SUBR - Suburban Residential (1.5 acre to 5 acre lots)
- MOBR - Mobile Home or Trailer Park Residential

Institutional
- SCHOOL - Public or Private School
- UNIV - University, College, Technical School, etc.
- HOSP - Medical Facilities including Nursing Homes, Hospitals, etc.
- MISC - Miscellaneous Facilities (Churches, Institutional Property)

Commercial
- CDNTN - Downtown Commercial and Institutional Areas
- CSTRIP - Strip Commercial Areas (Courthouses, Police Stations, etc.)
- SHCNTR - Shopping Centers (parking lot is 2.5 times building area)
- OFFPRK - Office Parks (non-retail, multi-story, insurance, government)

Industrial
- LIGHTI - Light Industrial Areas (storage and distribution of goods for retail or sale)
- MEDI - Medium Industrial Areas (lumber, junk, or auto salvage yard, ag., co-op, oil tank farm, coal and salt storage, slaughter house)
- QUARRY - Aggregate Extraction and Excavation
- AIRPRT - Airport Facilities

Open Space
- CEM - Cemeteries, including grounds, roads, and buildings)
- PARK - Outdoor Recreational Areas (golf course, arboretums, botanical gardens, municipal playgrounds, and natural areas)
- RAIL - Railroad ROW (Excludes road ROW, storage yards)
- FRMSTD - Farmsteads, including limited houses, buildings, driveways and parking areas
- AGRIC - Agriculture fields
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- GRASS_SWPOND - Vegetated land around a stormwater pond (Excludes road ROW)
- WOODS - Forested or Wooded Areas with Leaf Litter
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Transportation
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- HWY - State or County Highway
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Other Mapped Features
- Study Area Boundary
- Municipal Boundary
- Parcel Line
- Streams

Preliminary

0 500 1,000 Feet

McMAHON ENGINEERS ARCHITECTS

Source: Outagamie County, 2014-15.

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FIGURE 4
FUTURE LAND USE
MISTY POND
STORMWATER
MANAGEMENT PLAN
TOWN OF GRAND CHUTE
OUTAGAMIE COUNTY, WISCONSIN

w:\PROJECTS\G0003\9402711\6\GIS\Figure4_B.mxd December 13, 2016 kpk

APPENDIX A

SLAMM WATER QUALITY ANALYSIS

Data file name: W:\PROJECTS\G0003\940271\16\SLAMM\Misty Pond.mdb
WinSLAMM Version 10.2.1
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Green Bay WI 1969.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 01/02/69 Study period ending date: 12/28/69
Start of Winter Season: 11/25 End of Winter Season: 03/29
Date: 12-13-2016 Time: 08:22:50
Site information:
Misty Pond, Town of Grand Chute
LU# 1 - Residential: Low Density Residential Total area (ac): 49.640
3 - Roofs 3: 0.943 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
6 - Roofs 6: 0.519 ac. Pitched Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
8 - Roofs 8: 2.509 ac. Pitched Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 0.050 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 1.588 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
27 - Driveways 3: 0.111 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
28 - Driveways 4: 0.535 ac. Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.174 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
33 - Sidewalks 3: 0.030 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
34 - Sidewalks 4: 0.144 ac. Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
37 - Streets 1: 1.092 ac. Smooth Street Length = 0.69496 curb-mi Street Width (assuming two curb-mi per street mile) = 25.92857 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
38 - Streets 2: 2.085 ac. Intermediate Street Length = 1.34028 curb-mi Street Width (assuming two curb-mi per street mile) = 25.66667 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
39 - Streets 3: 0.298 ac. Rough Street Length = 0.19856 curb-mi Street Width (assuming two curb-mi per street mile) = 24.75 ft
Default St. Dirt Accum. Annual Winter Load = 2750 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
52 - Small Landscaped Areas 2: 6.363 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
53 - Small Landscaped Areas 3: 30.767 ac. Normal Clayey Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
58 - Undeveloped Areas 2: 0.374 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
59 - Undeveloped Areas 3: 1.810 ac. Normal Clayey Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
69 - Isolated Areas: 0.099 ac. Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
72 - Other Pervious Areas 2: 0.017 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
73 - Other Pervious Areas 3: 0.082 ac. Normal Clayey Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
79 - Other Part Con Imp Areas 2: 0.009 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
80 - Other Part Con Imp Areas 3: 0.041 ac. Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 2 - Residential: Medium Density Res. No Alleys Total area (ac): 8.777
3 - Roofs 3: 0.395 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
6 - Roofs 6: 0.156 ac. Pitched Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
8 - Roofs 8: 0.765 ac. Pitched Disconnected Normal Clayey Medium/High Density No Alleys Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 0.018 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.492 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
27 - Driveways 3: 0.028 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
28 - Driveways 4: 0.138 ac. Disconnected Normal Clayey Medium/High Density No Alleys Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.097 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
33 - Sidewalks 3: 0.016 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
34 - Sidewalks 4: 0.080 ac. Disconnected Normal Clayey Medium/High Density No Alleys Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
37 - Streets 1: 0.325 ac. Smooth Street Length = 0.17554 curb-mi Street Width (assuming two curb-mi per street mile) = 30.525 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
38 - Streets 2: 0.667 ac. Intermediate Street Length = 0.35108 curb-mi Street Width (assuming two curb-mi per street mile) = 31.35 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
39 - Streets 3: 0.132 ac. Rough Street Length = 0.070216 curb-mi Street Width (assuming two curb-mi per street mile) = 30.9375 ft
Default St. Dirt Accum. Annual Winter Load = 2750 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
46 - Large Landscaped Areas 2: 0.003 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
47 - Large Landscaped Areas 3: 0.015 ac. Normal Clayey Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
52 - Small Landscaped Areas 2: 0.856 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
53 - Small Landscaped Areas 3: 4.191 ac. Normal Clayey Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
58 - Undeveloped Areas 2: 0.006 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
59 - Undeveloped Areas 3: 0.029 ac. Normal Clayey Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
69 - Isolated Areas: 0.018 ac. Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
72 - Other Pervious Areas 2: 0.060 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
73 - Other Pervious Areas 3: 0.292 ac. Normal Clayey Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 3 - Residential: Suburban Residential Total area (ac): 22.556
6 - Roofs 6: 0.094 ac. Pitched Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

8 - Roofs 8: 0.492 ac. Pitched Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
15 - Paved Parking 3: 0.004 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
16 - Paved Parking 4: 0.019 ac. Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.361 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
27 - Driveways 3: 0.044 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
28 - Driveways 4: 0.227 ac. Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
33 - Sidewalks 3: 0.004 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
34 - Sidewalks 4: 0.019 ac. Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
37 - Streets 1: 0.158 ac. Smooth Street Length = 9.022401E-02 curb-mi Street Width (assuming two curb-mi per street mile) = 28.875 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
38 - Streets 2: 0.744 ac. Intermediate Street Length = 0.473676 curb-mi Street Width (assuming two curb-mi per street mile) = 25.92857 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
52 - Small Landscaped Areas 2: 3.076 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
53 - Small Landscaped Areas 3: 16.052 ac. Normal Clayey Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
58 - Undeveloped Areas 2: 0.199 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
59 - Undeveloped Areas 3: 1.041 ac. Normal Clayey Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
69 - Isolated Areas: 0.023 ac. Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 4 - Institutional: Hospital Total area (ac): 2.178
1 - Roofs 1: 0.693 ac. Flat Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
3 - Roofs 3: 0.085 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 0.453 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
21 - Unpaved Parking 3: 0.001 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
22 - Unpaved Parking 4: 0.012 ac. Disconnected Normal Clayey Medium/High Density No Alleys Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.133 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.061 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
37 - Streets 1: 0.092 ac. Smooth Street Length = 0.044649 curb-mi Street Width (assuming two curb-mi per street mile) = 34.12683 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
38 - Streets 2: 0.145 ac. Intermediate Street Length = 0.0699138 curb-mi Street Width (assuming two curb-mi per street mile) = 34.13084 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
46 - Large Landscaped Areas 2: 0.010 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
47 - Large Landscaped Areas 3: 0.106 ac. Normal Clayey Medium/High Density No Alleys Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
52 - Small Landscaped Areas 2: 0.026 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
53 - Small Landscaped Areas 3: 0.280 ac. Normal Clayey Medium/High Density No Alleys Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
58 - Undeveloped Areas 2: 0.000 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
59 - Undeveloped Areas 3: 0.004 ac. Normal Clayey Medium/High Density No Alleys Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
69 - Isolated Areas: 0.023 ac. Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
72 - Other Pervious Areas 2: 0.005 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
73 - Other Pervious Areas 3: 0.050 ac. Normal Clayey Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 5 - Institutional: Misc. Institutional Total area (ac): 4.265
1 - Roofs 1: 0.230 ac. Flat Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
3 - Roofs 3: 0.360 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
8 - Roofs 8: 0.025 ac. Pitched Disconnected Normal Clayey Medium/High Density No Alleys Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 1.161 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.128 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.094 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
37 - Streets 1: 0.171 ac. Smooth Street Length = 0.081035 curb-mi Street Width (assuming two curb-mi per street mile) = 34.73684 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
38 - Streets 2: 0.288 ac. Intermediate Street Length = 0.1377595 curb-mi Street Width (assuming two curb-mi per street mile) = 34.53251 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
39 - Streets 3: 0.056 ac. Rough Street Length = 0.0268695 curb-mi Street Width (assuming two curb-mi per street mile) = 34.57143 ft
Default St. Dirt Accum. Annual Winter Load = 2750 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
47 - Large Landscaped Areas 3: 0.228 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
53 - Small Landscaped Areas 3: 1.132 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
59 - Undeveloped Areas 3: 0.078 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
63 - Paved Playgrounds 1: 0.073 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
66 - Paved Playgrounds 4: 0.073 ac. Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
73 - Other Pervious Areas 3: 0.113 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
80 - Other Part Con Imp Areas 3: 0.057 ac. Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 6 - Commercial: Strip Commercial Total area (ac): 0.332
1 - Roofs 1: 0.065 ac. Flat Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
3 - Roofs 3: 0.012 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 0.136 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
22 - Unpaved Parking 4: 0.005 ac. Disconnected Normal Clayey Medium/High Density No Alleys Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.007 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.014 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
37 - Streets 1: 0.038 ac. Smooth Street Length = 0.014608 curb-mi Street Width (assuming two curb-mi per street mile) = 43.125 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

38 - Streets 2: 0.029 ac. Intermediate Street Length = 0.011288 curb-mi Street Width (assuming two curb-mi per street mile) = 41.73529 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
53 - Small Landscaped Areas 3: 0.019 ac. Normal Clayey Medium/High Density No Alleys Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
59 - Undeveloped Areas 3: 0.001 ac. Normal Clayey Medium/High Density No Alleys Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
73 - Other Pervious Areas 3: 0.006 ac. Normal Clayey Medium/High Density No Alleys Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 7 - Industrial: Light Industrial Total area (ac): 0.905
1 - Roofs 1: 0.186 ac. Flat Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
3 - Roofs 3: 0.023 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
7 - Roofs 7: 0.021 ac. Flat Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 0.298 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
22 - Unpaved Parking 4: 0.057 ac. Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.023 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.012 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
37 - Streets 1: 0.017 ac. Smooth Street Length = 0.0076925 curb-mi Street Width (assuming two curb-mi per street mile) = 35.71764 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
38 - Streets 2: 0.079 ac. Intermediate Street Length = 0.037105 curb-mi Street Width (assuming two curb-mi per street mile) = 34.93171 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
39 - Streets 3: 0.003 ac. Rough Street Length = 0.0013575 curb-mi Street Width (assuming two curb-mi per street mile) = 35.2 ft
Default St. Dirt Accum. Annual Winter Load = 2750 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
47 - Large Landscaped Areas 3: 0.032 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
53 - Small Landscaped Areas 3: 0.089 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
59 - Undeveloped Areas 3: 0.039 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
73 - Other Pervious Areas 3: 0.025 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
80 - Other Part Con Imp Areas 3: 0.002 ac. Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 8 - Other Urban: Wetland Total area (ac): 1.040
59 - Undeveloped Areas 3: 1.040 ac. Normal Clayey Medium/High Density No Alleys Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

Control Practice 1: Wet Detention Pond CP# 1 (DS) - Misty Pond
Particle Size Distribution file name: Not needed - calculated by program
Initial stage elevation (ft): 6
Peak to Average Flow Ratio: 3.8
Maximum flow allowed into pond (cfs): No maximum value entered
Outlet Characteristics:
Outlet type: Sharp Crested Weir
1. Sharp crested weir length (ft): 10
2. Sharp crested weir height from invert: 5.4
3. Sharp crested weir invert elevation above datum (ft): 7.9
Outlet type: Orifice 1
1. Orifice diameter (ft): 0.5
2. Number of orifices: 1
3. Invert elevation above datum (ft): 6
Outlet type: Broad Crested Weir
1. Weir crest length (ft): 25
2. Weir crest width (ft): 10
3. Height from datum to bottom of weir opening: 11
Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	0.01	0.3040	0.00	0.00
2	5.00	0.5430	0.00	0.00
3	6.00	0.8600	0.00	0.00
4	6.50	0.8900	0.00	0.00
5	7.50	0.9500	0.00	0.00
6	8.50	1.0110	0.00	0.00
7	9.50	1.0740	0.00	0.00
8	10.50	1.1390	0.00	0.00
9	11.50	1.2040	0.00	0.00
10	12.50	1.2710	0.00	0.00
11	13.30	1.3250	0.00	0.00

Misty Pond - Output Summary

Data file name: W:\PROJECTS\G0003\940271\16\SLAMM\Misty Pond.mdb
Data file description: Misty Pond, Town of Grand Chute
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Green Bay WI 1969.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Start of Winter Season: 11/25 End of Winter Season: 03/29
Model Run Start Date: 01/02/69 Model Run End Date: 12/28/69
Date of run: 12-13-2016 Time of run: 08:22:42
Total Area Modeled (acres): 89.693
Years in Model Run: 0.99

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	1.297E+06	-	185.0	14984	-
Outfall Total with Controls:	1.299E+06	-0.15%	34.20	2773	81.49%
Annualized Total After Outfall Controls:	1.317E+06			2811	

Pollutant	Concentration - No Controls	Concentration - With Controls	Conc. Units	Pollutant Yield No Controls	Pollutant Yield With Controls	Pol. Yield Units	Percent Reduction
Particulate Solids	185.0	34.20	mg/L	14984	2773	lbs	81.49 %
Total Phosphorus	0.7416	0.3159	mg/L	60.05	25.62	lbs	57.34 %

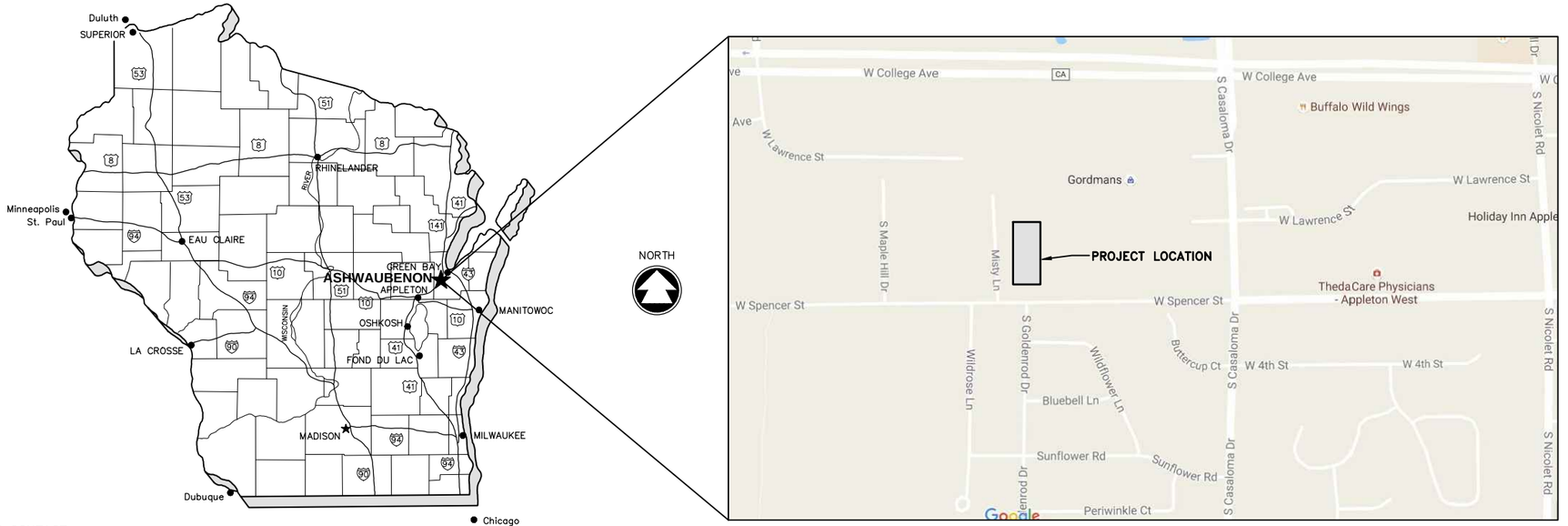
APPENDIX B

PRELIMINARY CONSTRUCTION PLANS

PRELIMINARY
(NOT FOR CONSTRUCTION)

MISTY POND
TOWN OF GRAND CHUTE

OUTAGAMIE COUNTY, WI
CONTRACT # G0003-9-14-00271



CONTACT INFORMATION

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SHEET INDEX

DATE
Nov., 2016
PROJECT NO.
G0003-9-14-00271

STANDARD ABBREVIATIONS

AC	ACRE	LT	LEFT
AGG	AGGREGATE	LVC	LENGTH OF VERTICAL CURVE
AH	AHEAD	MAINT	MAINTENANCE
ASPH	ASPHALT PAVEMENT	MAT'L	MATERIAL
AVG	AVERAGE	MAX	MAXIMUM
B-B	BACK TO BACK	MIN	MINIMUM
BEG	BEGIN	MH	MANHOLE
BIT	BITUMINOUS	MP	MILE POST
BK	BACK	NB	NORTHBOUND
B/L	BASE LINE	NO	NUMBER
BLDG	BUILDING	NOR	NORMAL
BM	BENCH MARK	OD	OUTSIDE DIAMETER
BOC	BACK OF CURB	OBLIT	OBLITERATE
BRG	BEARING	PAV'T	PAVEMENT
C-C	CENTER TO CENTER	PC	POINT OF CURVATURE
CY	CUBIC YARD	PCC	PORTLAND CEMENT CONCRETE OR POINT OF COMPOUND CURVATURE
C&G	CURB AND GUTTER	PE	PRIVATE ENTRANCE
CB	CATCH BASIN	PED	PEDESTAL
CE	COMMERCIAL ENTRANCE	PGL	PROFILE GRADE LINE
CHD	CHORD	PI	POINT OF INTERSECTION
C/L	CENTER LINE	P/L	PROPERTY LINE
CL	CLASS (FOR CONC PIPE)	PLE	PERMANENT LIMITED EASEMENT
CMP	CORRUGATED METAL PIPE	PP	POWER POLE
CO	CLEAN OUT	PRC	POINT OF REVERSE CURVATURE
CONC	CONCRETE	PROP	PROPOSED
CORR	CORRUGATED	PSD	PASSING SIGHT DISTANCE
CP	CONTROL POINT	PSI	POUNDS PER SQUARE INCH
CR	CRUSHED	PT	POINT OF TANGENCY
CS	CURB STOP	PVC	POLYVINYL CHLORIDE OR POINT OF VERTICAL CURVATURE
CSW	CONCRETE SIDEWALK	PVI	POINT OF VERTICAL INTERSECTION
CTH	COUNTY TRUNK HIGHWAY	PVT	POINT OF VERTICAL TANGENCY
CULV	CULVERT	R	RADIUS
D	DEPTH OR DELTA	RCP	REINFORCED CONCRETE PIPE
DI	DUCTILE IRON	RD	ROAD
DIA	DIAMETER	REBAR	REINFORCEMENT ROD
DIS	DISCHARGE	REM	REMOVE
EA	EACH	RECON	RECONSTRUCT
EB	EASTBOUND	REQ'D	REQUIRED
EBS	EXCAVATION BELOW SUBGRADE	R/L	REFERENCE LINE
EG	EDGE OF GRAVEL	RP	RADIUS POINT
ELEV	ELEVATION	RR	RAILROAD
ELEC	ELECTRIC	RT	RIGHT
EMB	EMBANKMENT	R/W	RIGHT-OF-WAY
EMAT	EROSION MAT	SB	SOUTHBOUND
ENT	ENTRANCE	SE	SUPERELEVATION
EOR	END OF RADIUS	SF	SQUARE FEET
EP	EDGE OF PAVEMENT	SI	SLOPE INTERCEPT
EXC	EXCAVATION	STH	STATE TRUNK HIGHWAY
EX	EXISTING	SY	SQUARE YARD
EW	ENDWALL	SALV	SALVAGED
F-F	FACE TO FACE	SAN	SANITARY
FDN	FOUNDATION	SEC	SECTION
FE	FIELD ENTRANCE	SHLDR	SHOULDER
FERT	FERTILIZER	S/L	SURVEY LINE
FG	FINISHED GRADE	SQ	SQUARE
F/L	FLOW LINE	STA	STATION
FT	FOOT	STD	STANDARD
FTG	FOOTING	STO	STORM
GRAV	GRAVEL	SW	SIDEWALK
GN	GRID NORTH	TC	TOP OF CURB
GV	GAS VALVE	TEL	TELEPHONE
HDPE	HIGH DENSITY POLYETHYLENE	TEMP	TEMPORARY
HE	HIGHWAY EASEMENT	TLE	TEMPORARY LIMITED EASEMENT
HMA	HOT MIX ASPHALT	TV	TELEVISION
HP	HIGH POINT	TYP	TYPICAL
HT	HEIGHT	UG	UNDERGROUND
HYD	HYDRANT	USH	U.S. HIGHWAY
ID	INSIDE DIAMETER	VAR	VARIES
IN	INCH	VC	VERTICAL CURVE
INL	INLET	VERT	VERTICAL
INV	INVERT	WB	WESTBOUND
IP	IRON PIPE	WM	WATER MAIN
JCT	JUNCTION	WV	WATER VALVE
LB	POUND		
LF	LINEAR FOOT		
LP	LIGHT POLE		

GENERAL NOTES

1) THE UTILITIES SHOWN IN PLAN AND PROFILE ARE INDICATED IN ACCORDANCE WITH AVAILABLE RECORDS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING EXACT LOCATIONS AND ELEVATIONS OF ALL UTILITIES, INCLUDING ANY PRIVATE UTILITIES, FROM THE OWNERS OF THE RESPECTIVE UTILITIES. ALL UTILITIES SHALL BE NOTIFIED 72 HRS. PRIOR TO EXCAVATION.

2) THE PROPERTY LINES, RIGHT-OF-WAY LINES AND OTHER PROPERTY INFORMATION ON THIS DRAWING WERE DEVELOPED OR OBTAINED AS PART OF THE COUNTY GEOGRAPHIC INFORMATION SYSTEM OR THROUGH THE COUNTY PROPERTY TAX MAPPING FUNCTION. McMAHON DOES NOT GUARANTEE THIS INFORMATION TO BE CORRECT, CURRENT OR COMPLETE. THE PROPERTY AND RIGHT-OF-WAY INFORMATION ARE INTENDED FOR USE AS A GENERAL REFERENCE AND ARE NOT INTENDED OR SUITABLE FOR SITE-SPECIFIC USES. ANY USE TO THE CONTRARY OF THE ABOVE STATED USES IS THE RESPONSIBILITY OF THE USER AND SUCH USE IS AT THE USER'S OWN RISK.

3) NO TREES OR SHRUBS ARE TO BE REMOVED WITHOUT PRIOR APPROVAL FROM THE OWNER.

STANDARD SYMBOLS

2" IRON PIPE FOUND	TELEPHONE CABLE – BURIED
1 1/4" REBAR FOUND	ELECTRIC CABLE – BURIED
1 1/4" x 30" IRON REBAR WEIGHING 4.30 LB/LF SET	UTILITIES – OVERHEAD
1" (1.315 OD) IRON PIPE FOUND	FIBER OPTIC CABLE – BURIED
1" IRON PIPE SET	GAS MAIN
3/4" IRON REBAR FOUND	CABLE TELEVISION – BURIED
3/4" IRON PIPE FOUND	DITCH LINE
3/4"x 24" IRON REBAR WEIGHING 1.5 LB/LF SET	STREET C/L OR R/L
MAG NAIL FOUND	PROPERTY LINE
MAG NAIL SET	RIGHT-OF-WAY LINE
GEAR NAIL SET	SECTION LINE
RAILROAD SPIKE FOUND	EXISTING CONTOURS
RAILROAD SPIKE SET	PROPOSED CONTOURS
CHISEL CROSS FOUND	EXISTING SANITARY SEWER
CHISEL CROSS SET	PROPOSED SANITARY SEWER
COUNTY MONUMENT	EXISTING WATER MAIN
CONCRETE MONUMENT FOUND	PROPOSED WATER MAIN
CONTROL POINT HORIZONTAL	EXISTING STORM SEWER
CONTROL POINT VERTICAL	PROPOSED STORM SEWER
SOIL BORING or MONITORING WELL	EXISTING CURB & GUTTER
POWER POLE	PROPOSED CURB & GUTTER
POWER POLE W/GUY WIRE	PROPOSED REJECT CURB & GUTTER
TELEPHONE OR TELEVISION PEDESTAL	EXISTING CULVERT WITH END SECTIONS
MAILBOX	PROPOSED CULVERT WITH END SECTIONS
SIGN	BUILDING OUTLINE
RAILROAD CROSS BUCK	FENCE LINE
RAILROAD GATE ARM	SAW CUT REQ'D
RAILROAD TRACKS	SILT FENCE
LIGHT POLE	GUARD RAIL
WOOD POLE	DITCH CHECK
TRAFFIC SIGNAL	INLET PROTECTION
TRAFFIC SIGNAL MAST ARM	TRACKING PAD
CONIFEROUS TREE	TURBIDITY BARRIER OR SHEET PILING
DECIDUOUS TREE	SANDBAG COFFERDAM
TREE OR BRUSH LINE	LIMITS OF DISTURBANCE
BED ROCK (IN PROFILE VIEW)	
HANDICAPPED PARKING STALL	RIP-RAP (SIZE AS SPECIFIED)
EXISTING SPOT ELEVATION	EXISTING PAVEMENT
× 750.00 PROPOSED SPOT ELEVATION	TOPSOIL, SEED, FERTILIZER AND MULCH
DRAINAGE HIGH POINT	
DRAINAGE DIRECTION	
EXISTING MANHOLE	
PROPOSED MANHOLE	
EXISTING INLET	
PROPOSED INLET	
EXISTING YARD DRAIN	
PROPOSED YARD DRAIN	
EXISTING CLEAN OUT	
PROPOSED CLEAN OUT	
EXISTING WATER VALVE	
PROPOSED WATER VALVE	
EXISTING CURB STOP	
PROPOSED CURB STOP	
EXISTING FIRE HYDRANT	
PROPOSED FIRE HYDRANT	
PROPOSED WATER FITTING	
PROPOSED WATER REDUCER	
PROPOSED ENDCAP	
GAS VALVE	

EROSION & SEDIMENT CONTROL PLAN

BEST MANAGEMENT PRACTICES:

THE CONTRACTOR IS RESPONSIBLE FOR FURNISHING, INSTALLING, MAINTAINING AND REMOVING BEST MANAGEMENT PRACTICES IN ACCORDANCE WITH WISCONSIN DEPARTMENT OF NATURAL RESOURCES (DNR) TECHNICAL STANDARDS. THESE STANDARDS MAY BE FOUND ON THE DNR WEBSITE AT http://www.dnr.wi.gov/runoff/stormwater/techstds.htm. RIP-RAP SHALL BE IN ACCORDANCE WITH SECTION 606, WIS-DOT STANDARD SPECIFICATIONS FOR HIGHWAY AND STRUCTURE CONSTRUCTION, LATEST EDITION, UNTIL TECHNICAL STANDARD 1065 IS COMPLETED BY THE DNR. THE MINIMUM BEST MANAGEMENT PRACTICES SPECIFIED FOR THIS PROJECT ARE AS FOLLOWS:

[ ] LAND APPLICATION OF POLYACRYLAMIDE (1050)	[X] DE-WATERING (1061)
[ ] WATER APPLICATION OF POLYMERS (1051)	[X] DITCH CHECK (1062)
[ ] NON-CHANNEL EROSION MAT (1052)	[ ] SEDIMENT TRAP (1063)
[ ] CHANNEL EROSION MAT (1053)	[ ] SEDIMENT BASIN (1064)
[ ] VEGETATIVE BUFFER (1054)	[X] RIP-RAP (1065)
[ ] SEDIMENT BALE BARRIER (1055)	[ ] CONSTRUCTION DIVERSION (1066)
[X] SILT FENCE (1056)	[X] GRADING PRACTICES (1067)
[X] TRACKING PAD & TIRE WASHING (1057)	[X] DUST CONTROL (1068)
[X] MULCHING (1058)	[ ] TURBIDITY BARRIER (1069)
[X] SEEDING (1059)	[ ] SILT CURTAIN (1070)
[X] STORM DRAIN INLET PROTECTION (1060)	[ ] MANUFACTURED PERIMETER PRODUCTS (1071)

THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES AND IMPLEMENT BEST MANAGEMENT PRACTICES TO PREVENT OR REDUCE ALL OF THE FOLLOWING:

A. DEPOSITION OR TRACKING OF SOIL ONTO STREETS BY VEHICLES.

B. DISCHARGE OF SEDIMENT INTO STORM WATER INLETS.

C. DISCHARGE OF SEDIMENT INTO ADJACENT STREAMS, RIVERS, LAKES AND WETLANDS.

D. DISCHARGE OF SEDIMENT FROM DITCHES AND STORM SEWERS THAT FLOW OFFSITE.

E. DISCHARGE OF SEDIMENT FROM DEWATERING ACTIVITIES, DEWATERING SHALL BE COMPLETED PER WI-DNR TECHNICAL STANDARD 1061.

F. DISCHARGE OF SEDIMENT FROM SOIL STOCKPILES EXISTING FOR 7 DAYS OR MORE.

G. DISCHARGE OF SEDIMENT FROM EROSIVE OUTLET FLOWS.

H. TRANSPORT OF CHEMICALS, CEMENT AND BUILDING MATERIALS BY RUNOFF.

I. TRANSPORT OF UNTREATED VEHICLE AND WHEEL WASH WATER BY RUNOFF.

THE CONTRACTOR SHALL IMPLEMENT THE FOLLOWING PREVENTATIVE MEASURES:

A. PRESERVE EXISTING VEGETATION WHENEVER POSSIBLE.

B. MINIMIZE SOIL COMPACTION AND PRESERVE TOPSOIL.

C. MINIMIZE LAND DISTURBANCES ON SLOPES OF 20% OR MORE.

D. MINIMIZE THE AMOUNT OF SOIL EXPOSED AT ANY ONE TIME.

E. DIVERT CLEAR WATER AWAY FROM EXPOSED SOILS.

F. TEMPORARILY STABILIZE EXPOSED SOILS THAT WILL NOT BE ACTIVE FOR 14 DAYS OR MORE. USE MULCHING, SEEDING, POLYACRYLAMIDE OR GRAVELING TO STABILIZE.

G. PERMANENTLY STABILIZE EXPOSED SOILS AS SOON AS POSSIBLE.

H. CONTRACTOR SHALL EDUCATE ITS EMPLOYEES AND SUBCONTRACTORS ABOUT PROPER SPILL PREVENTION AND RESPONSE PROCEDURES. IF A SPILL OCCURS, THE CONTRACTOR SHALL EVACUATE THE AREA AND IMMEDIATELY NOTIFY THE LOCAL MUNICIPALITY, FIRE DEPARTMENT OR 911 EMERGENCY SYSTEM. IF NO FIRE, EXPLOSION OR LIFE / HEALTH SAFETY HAZARD EXISTS, THE NEXT STEP IS TO CONTAIN THE SPILL AND PERFORM CLEANUP. USE DRY CLEANUP METHODS, NOT WET.

THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING OR REPLACING BEST MANAGEMENT PRACTICES DESTROYED AS A RESULT OF CONSTRUCTION ACTIVITIES BY THE END OF THE WORK DAY. THE CONTRACTOR IS RESPONSIBLE FOR REPLACING BEST MANAGEMENT PRACTICES TEMPORARILY REMOVED FOR CONSTRUCTION ACTIVITY AS SOON AS THOSE ACTIVITIES ARE COMPLETED. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING AND DISPOSING OF TEMPORARY BEST MANAGEMENT PRACTICES AFTER CONSTRUCTION IS COMPLETE AND PERMANENT VEGETATION IS ESTABLISHED.

INSPECTION & MAINTENANCE:

THE CONTRACTOR IS RESPONSIBLE FOR INSPECTING BEST MANAGEMENT PRACTICES WEEKLY, AND WITHIN 24 HOURS FOLLOWING A RAINFALL OF 0.5 INCHES OR GREATER. WRITTEN DOCUMENTATION OF EACH INSPECTION SHALL BE KEPT AT THE CONSTRUCTION SITE AND SHALL INCLUDE THE FOLLOWING INFORMATION: DATE, TIME, AND LOCATION OF INSPECTION; NAME OF INDIVIDUAL WHO PERFORMED THE INSPECTION; AN ASSESSMENT OF THE CONDITION OF BEST MANAGEMENT PRACTICES; A DESCRIPTION OF ANY BEST MANAGEMENT PRACTICE IMPLEMENTATION AND MAINTENANCE PERFORMED; AND A DESCRIPTION OF THE PRESENT PHASE OF CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING, REPAIRING, OR REPLACING BEST MANAGEMENT PRACTICES AS NECESSARY WITHIN 24 HOURS OF AN INSPECTION OR NOTIFICATION. THE CONTRACTOR IS RESPONSIBLE FOR INSPECTING, MAINTAINING, REPAIRING, OR REPLACING BEST MANAGEMENT PRACTICES UNTIL ALL LAND DISTURBING CONSTRUCTION ACTIVITY IS COMPLETED AND A UNIFORM PERENNIAL VEGETATIVE COVER IS ESTABLISHED WITH A DENSITY OF AT LEAST 70%.

THE CONTRACTOR IS RESPONSIBLE FOR POSTING THE PERMIT IN A CONSPICUOUS LOCATION ON THE CONSTRUCTION SITE. THE CONTRACTOR IS RESPONSIBLE FOR KEEPING A COPY OF THE APPROVED REPORTS, PLANS, AMENDMENTS, INSPECTION REPORTS, AND PERMITS AT THE CONSTRUCTION SITE AT ALL TIMES UNTIL ALL LAND DISTURBING CONSTRUCTION ACTIVITY IS COMPLETED AND A UNIFORM PERENNIAL VEGETATIVE COVER IS ESTABLISHED WITH A DENSITY OF AT LEAST 70%. THE CONTRACTOR IS RESPONSIBLE FOR NOTIFYING THE OWNER WHEN THE VEGETATIVE DENSITY REACHES AT LEAST 70%. THE OWNER IS RESPONSIBLE FOR TERMINATING DNR PERMIT COVERAGE.

AMENDMENTS:

THE CONTRACTOR IS RESPONSIBLE FOR AMENDING THE EROSION & SEDIMENT CONTROL PLAN IF: THERE IS A CHANGE IN CONSTRUCTION, OPERATION OR MAINTENANCE AT THE SITE WHICH HAS THE REASONABLE POTENTIAL FOR THE DISCHARGE OF POLLUTANTS; THE ACTIONS REQUIRED BY THE PLAN FAIL TO REDUCE THE IMPACTS OF POLLUTANTS CARRIED BY CONSTRUCTION SITE RUNOFF; OR IF THE DNR NOTIFIES THE APPLICANT OF CHANGES NEEDED IN THE PLAN. THE DNR AND OWNER SHALL BE NOTIFIED 5 WORKING DAYS PRIOR TO MAKING CHANGES TO THE PLAN.

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NO.	DATE	REVISION

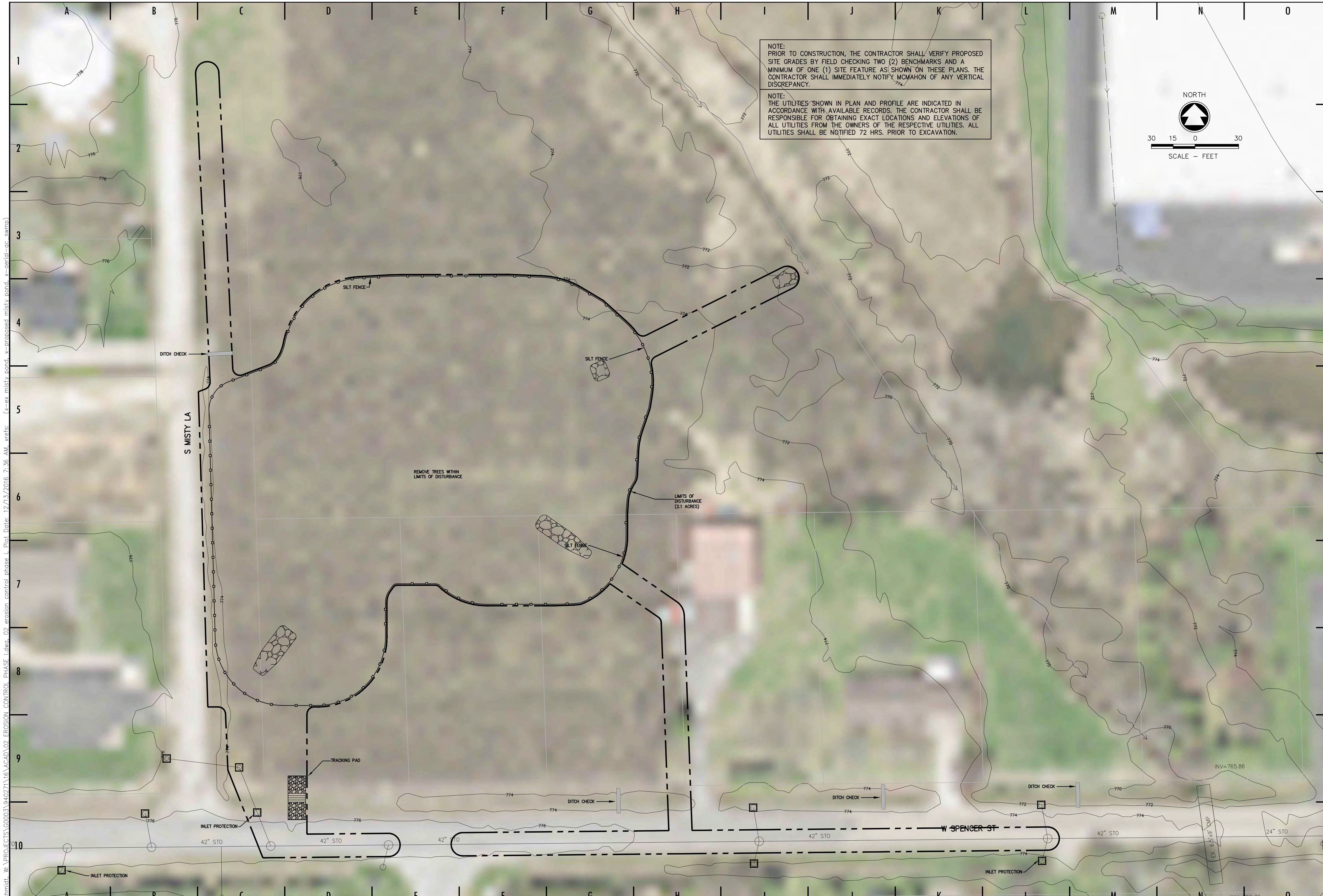
MISTY POND
TOWN OF GRAND CHUTE, OUTAGAMIE CO., WI
ABBREVIATIONS SYMBOLS & NOTES

DESIGNED	DRAWN
–	AWS

PROJECT NO.
G0003-9-14-00271

DATE
NOV., 2016

SHEET NO.
01



NOTE:
PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL VERIFY PROPOSED SITE GRADES BY FIELD CHECKING TWO (2) BENCHMARKS AND A MINIMUM OF ONE (1) SITE FEATURE AS SHOWN ON THESE PLANS. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY MCMAHON OF ANY VERTICAL DISCREPANCY.

NOTE:
THE UTILITIES SHOWN IN PLAN AND PROFILE ARE INDICATED IN ACCORDANCE WITH AVAILABLE RECORDS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING EXACT LOCATIONS AND ELEVATIONS OF ALL UTILITIES FROM THE OWNERS OF THE RESPECTIVE UTILITIES. ALL UTILITIES SHALL BE NOTIFIED 72 HRS. PRIOR TO EXCAVATION.

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NO.	DATE	REVISION

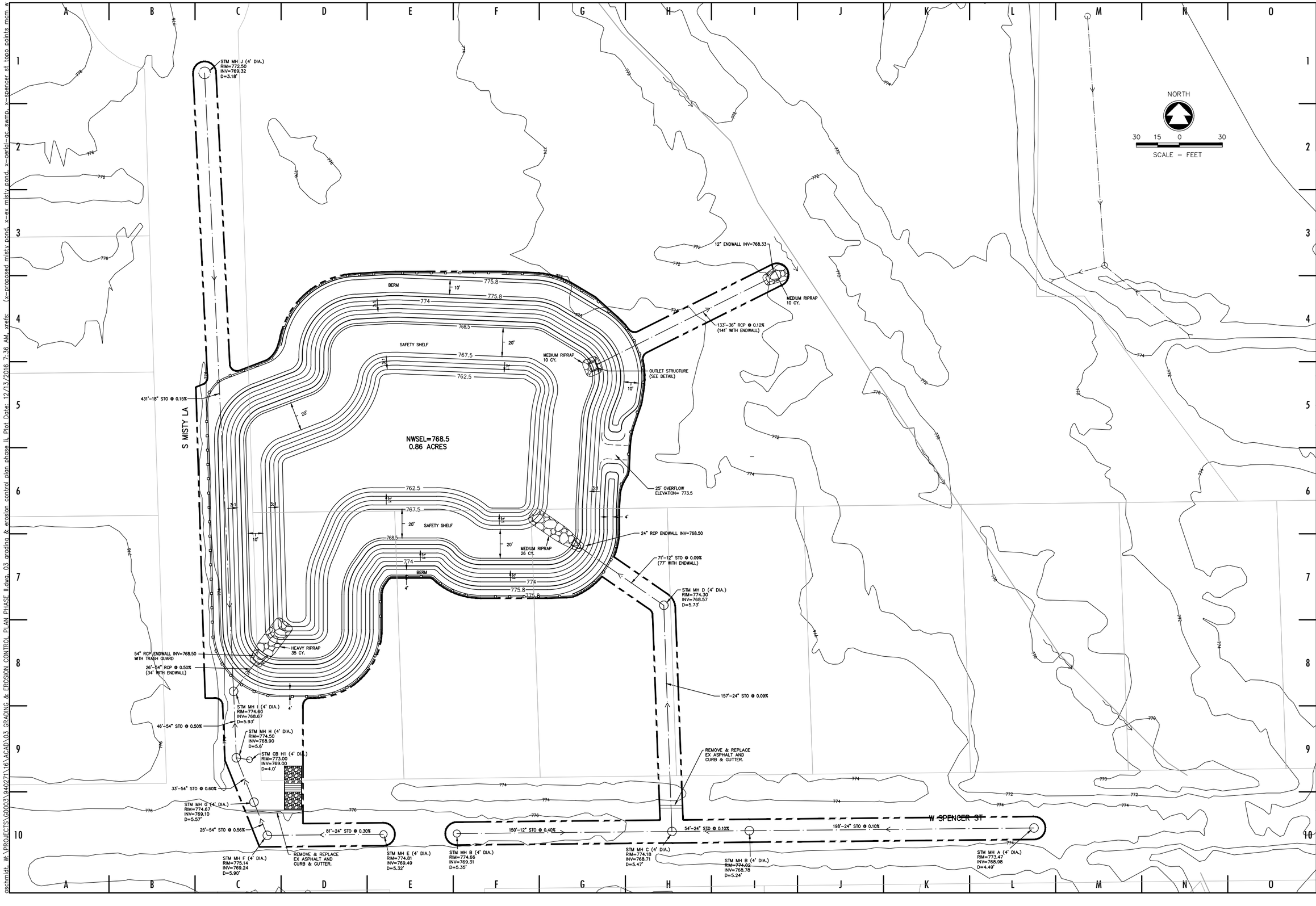
MISTY POND
TOWN OF GRAND CHUTE, OUTAGAMIE CO., WI
EROSION CONTROL PHASE I

DESIGNED	DRAWN
–	AWS

PROJECT NO. G0003-9-14-00271

DATE NOV., 2016

SHEET NO. 02



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NO.	DATE	REVISION

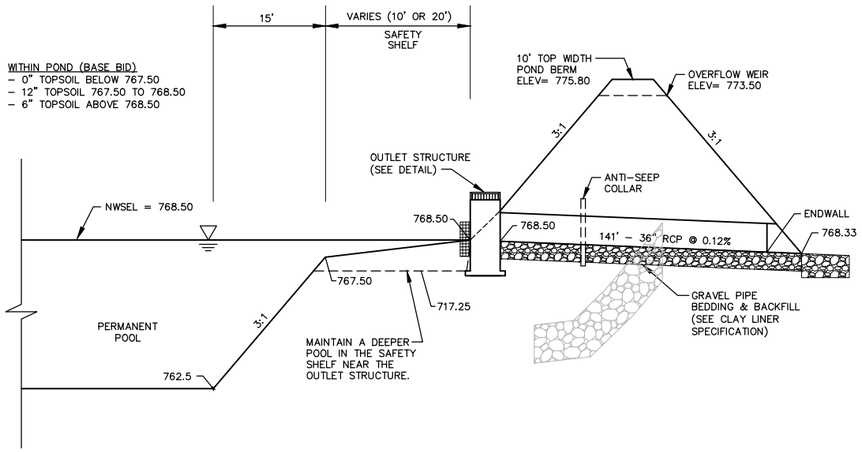
MISTY POND
TOWN OF GRAND CHUTE, OUTAGAMIE CO., WI
GRADING & EROSION CONTROL PLAN PHASE II

DESIGNED	DRAWN
–	AWS

PROJECT NO.
G0003-9-14-00271

DATE
NOV., 2016

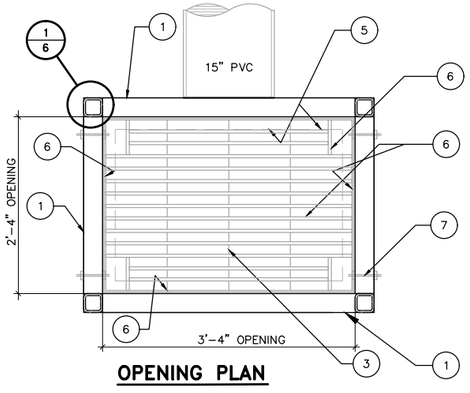
SHEET NO.
03



POND CROSS–SECTION

NOTE: ALL ELEVATIONS ARE TO FINISHED GRADE

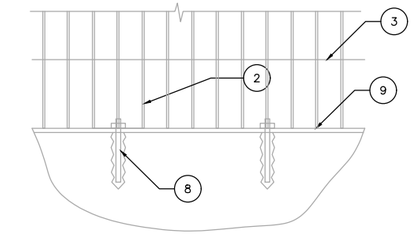
* SEE CLAY LINER SPECIFICATION.



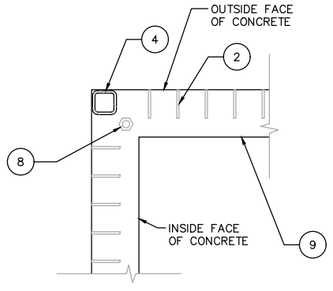
TOP TRASH RACK DETAIL PLAN VIEW

ELEMENT KEY

1	HSS 3x3x1/4
2	1/4"x3" PLATE @ 3"o.c. MAXIMUM
3	1/2" DIA BAR @ 10"o.c. MAXIMUM
4	HSS2x2x1/4
5	1/4"x2" HORIZONTAL PLATE WELDED TO SIDE OF HSS3x3x1/4
6	1/4"x2" PLATE @ 2"o.c. MAXIMUM
7	3/8" DIA. SST BOLT
8	3/8" DIA. SST ADHESIVE ANCHOR @ 24"o.c. MAXIMUM
9	3/8"x5"x CONT. PLATE



GRATE SUPPORT DETAIL 2/6



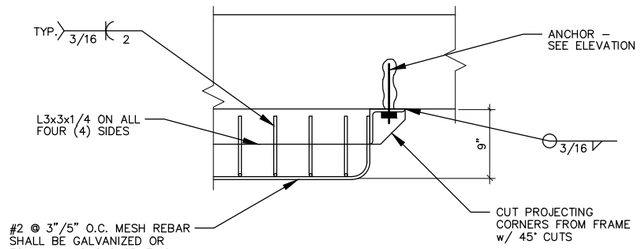
CORNER DETAIL 1/6

STRUCTURAL STEEL

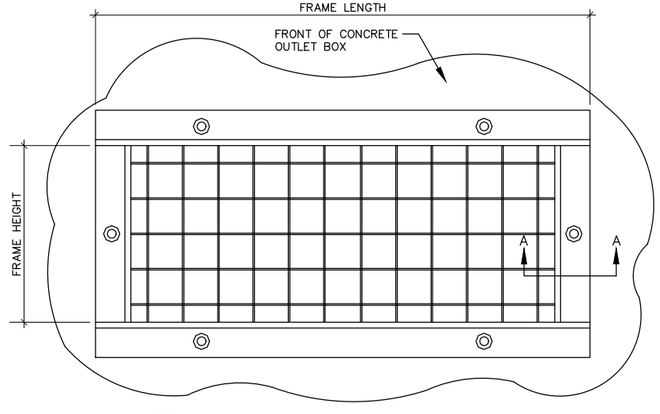
1. STRUCTURAL STEEL SHALL MEET THE FOLLOWING SPECIFICATIONS:
   BARS & PLATES – ASTM A36 THREADED BOLTS – ASTM A301
   ANCHOR BOLTS – ASTM A36 THREADED BOLTS – ASTM A36
   WELDS – E70 XX
   ALL STEEL SHALL BE GALVANIZED
2. ALL DETAILING, FABRICATION AND ERECTION SHALL CONFORM TO THE AISC "LOAD AND RESISTANCE FACTOR DESIGN SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS" AND "CODE OF STANDARD PRACTICE FOR BUILDINGS AND BRIDGES", CURRENT EDITION.
3. ALL WELDING SHALL BE PERFORMED BY A CERTIFIED WELDER IN ACCORDANCE WITH A.W.S. CODE FOR WELDING IN BUILDING CONSTRUCTION. SURFACES FOR FIELD WELDED MATERIAL SHALL BE PROPERLY PREPARED PRIOR TO BEING WELDED TO ASSURE A GOOD QUALITY WELD. REMOVE PAINT, GREASE, DIRT, ETC.
4. ALL STEEL MEMBERS SHALL BE WELDED WITH A 3/16" CONTINUOUS FILLET WELD (UNLESS OTHERWISE NOTED)
5. ALL WELDS SHALL BE TOUCHED UP WITH GALVANIZING COMPOUND.

PAINT:

SURFACE	TNEMEC COATING SYSTEM	COVERAGE SQ. FT./GAL	THICKNESS /COAT DMT	COLOR
STEEL (OUTDOORS)	SHOP PRIMER 69–1255 BEIGE	277	4.0	BEIGE
	1 COAT 69 H.B. EPOXY	221	5.0	BLACK
	1 COAT 74 ENDURA–SHELD IV	310	3.0	BLACK



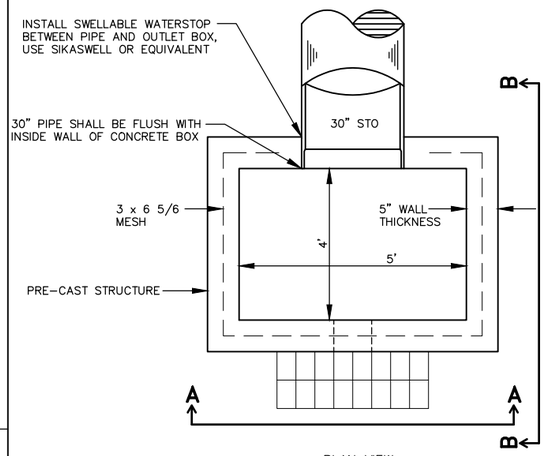
SECTION A–A



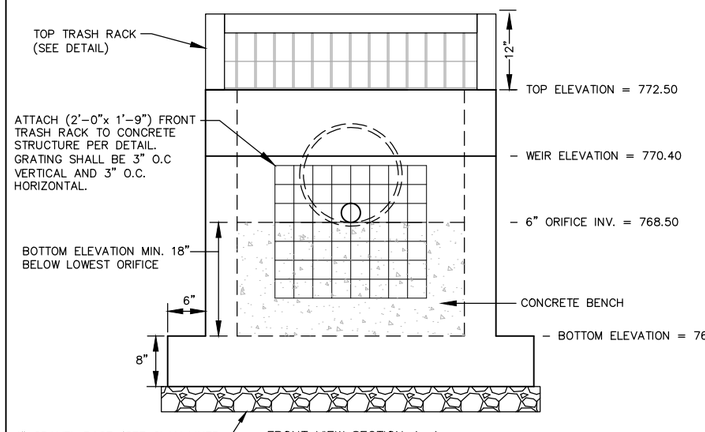
NOTES:

1. WHEN FRAME HEIGHT IS 24 INCHES OR LESS, PROVIDE (1) ANCHOR PER VERTICAL LEG, OTHERWISE PROVIDE TWO OR MORE ANCHORS @ 24" O.C. MAX.
2. WHEN FRAME LENGTH IS 12" OR LESS, PROVIDE (1) ANCHOR PER HORIZONTAL LEG, OTHERWISE PROVIDE TWO OR MORE ANCHORS @ 24" O.C. MAX.
3. PROVIDE ¼" EPOXY ANCHOR EMBEDDED 4" MIN. INTO CONCRETE WHERE REQUIRED BY THIS DRAWING OR NOTES.
4. SEE OUTLET STRUCTURE DETAIL FOR TRASH RACK FRAME SIZE.

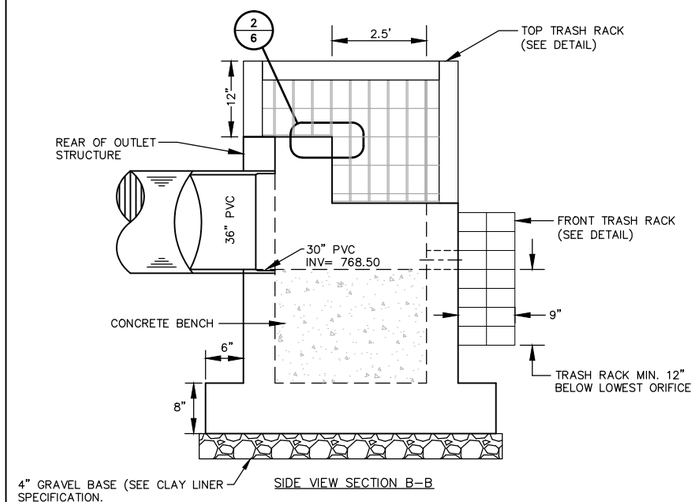
FRONT TRASH RACK DETAIL–ELEVATION VIEW



PLAN VIEW



FRONT VIEW SECTION A–A



SIDE VIEW SECTION B–B

POND OUTLET STRUCTURE

McMAHON
ENGINEERING A+E HI-TECH
1445 McMAHON DRIVE NEENAH, WI 54956
Mailing: P.O.BOX 1025 NEENAH, WI 54957-1025
Tel: (920) 751-4200 Fax: (920) 751-4284
www.mcmgrp.com

NO.	DATE	REVISION

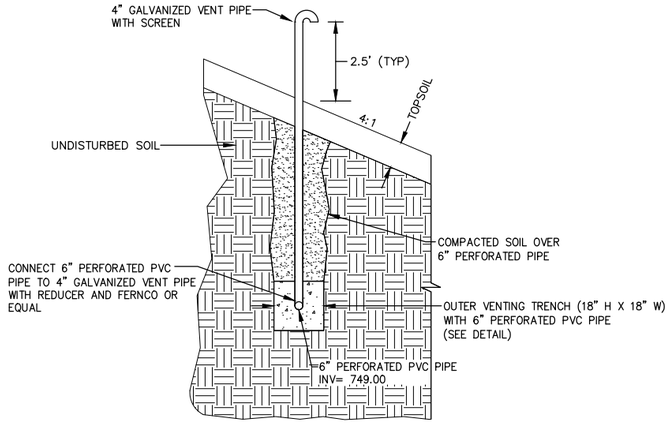
MISTY POND
TOWN OF GRAND CHUTE, OUTAGAMIE CO., WI
POND DETAILS

DESIGNED	DRAWN
–	AWS

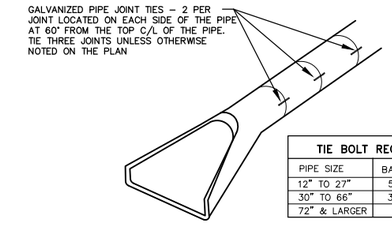
PROJECT NO.
G0003–9–14–00271

DATE
NOV., 2016

SHEET NO.
04

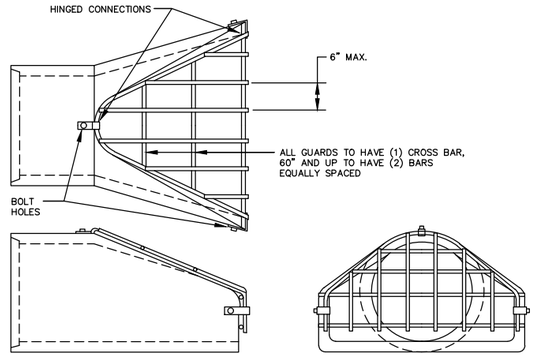


VENT DETAIL



TIE BOLT REQUIREMENTS		
PIPE SIZE	BAR DIA.	BOLTS
12" TO 27"	5/8"	32"
30" TO 66"	3/4"	32"
72" & LARGER	1"	32"

CONCRETE APRON DETAIL

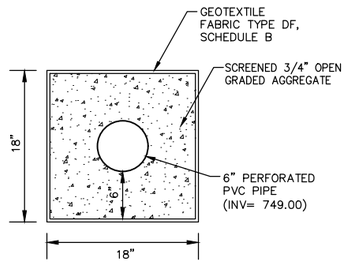


HOT DIP GALVANIZED PER ASTM–A153

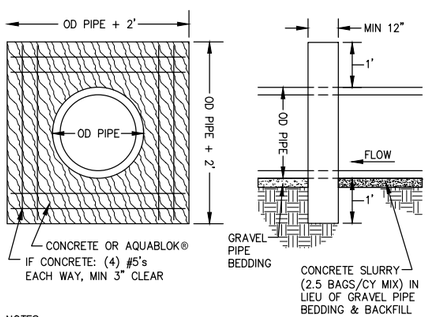
BAR SIZES

	STANDARD DESIGN					HEAVY DESIGN			
	PIPE SIZE	HOLE DIA. REQ'D.	BOLT DIA.	BAR SIZE		PIPE SIZE	HOLE DIA. REQ'D.	BOLT DIA.	BAR SIZE
ROUND	12"–24"	3/4"	5/8"	5/8"	ROUND	12"–18"	3/4"	5/8"	3/4"
	27"–48"	7/8"	3/4"	3/4"		21"–48"	7/8"	3/4"	1"
	54"–90"	1 1/8"	1"	1"		54"–90"	1 1/8"	1"	1 1/4"
ARCH	22"–29"	3/4"	5/8"	5/8"	ARCH	22"	3/4"	5/8"	3/4"
	36"–59"	7/8"	3/4"	3/4"		29"–59"	7/8"	3/4"	1"
	65"–88"	1 1/8"	1"	1"		65"–88"	1 1/8"	1"	1 1/4"
BOLT LG. = PIPE WALL THK. + 2 1/2"									

TRASH GUARD FOR FLARED ENDS



OUTER VENTING TRENCH DETAIL



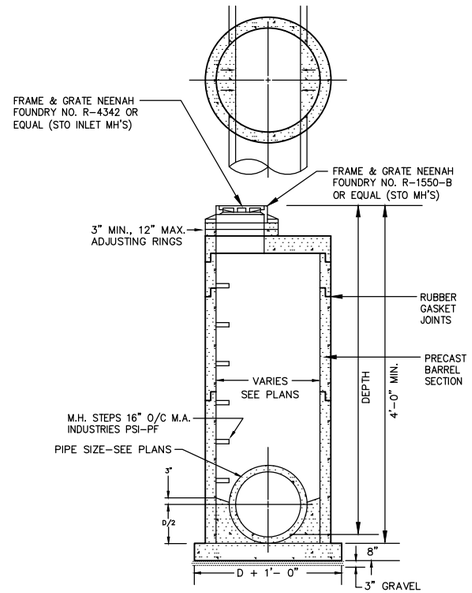
NOTES:

1) CONTRACTOR SHALL FORM THE COLLAR USING LUMBER OR SHEETING TO THE DIMENSIONS NOTED IN THE DETAIL PRIOR TO POURING/INSTALLING THE CONCRETE OR AQUABLOK®.

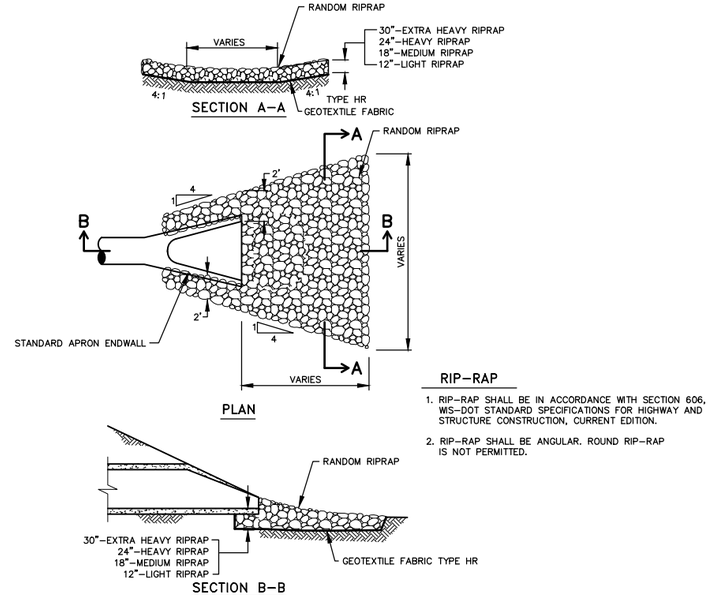
2) IF AQUABLOK® IS SELECTED, IT SHALL BE INSTALLED AND HYDRATED PER THE MANUFACTURERS RECOMMENDATION FOR THIS TYPE OF APPLICATION.

3) UPON CURING OF CONCRETE OR HYDRATING OF AQUABLOCK®, CONTRACTOR SHALL BACKFILL TRENCH PER SPECIFICATIONS MANUAL.

ANTI–SEEP COLLAR



STORM MH OR INLET MH DETAIL



RIP–RAP

1. RIP–RAP SHALL BE IN ACCORDANCE WITH SECTION 606, WIS–DOT STANDARD SPECIFICATIONS FOR HIGHWAY AND STRUCTURE CONSTRUCTION, CURRENT EDITION.
2. RIP–RAP SHALL BE ANGULAR. ROUND RIP–RAP IS NOT PERMITTED.

RIPRAP AT STORM SEWER OUTFALL

McMAHON ENGINEERING A+E HITECTURE
1445 McMAHON DRIVE NEENAH, WI 54956
Mailing: P.O.BOX 1025 NEENAH, WI 54957-1025
Tel: (920) 751-4200 Fax: (920) 751-4284
www.mcmgrp.com

NO.	DATE	REVISION

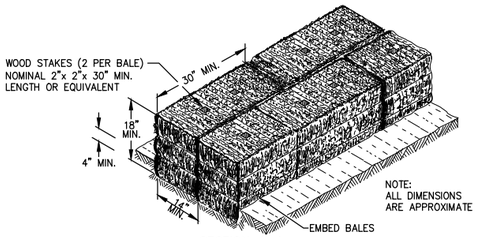
MISTY POND
TOWN OF GRAND CHUTE, OUTAGAMIE CO., WI
MISCELLANEOUS DETAILS

DESIGNED	DRAWN
–	AWS

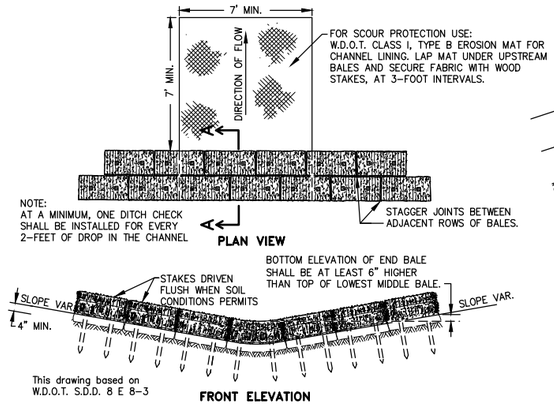
PROJECT NO.
G0003–9–14–00271

DATE
NOV., 2016

SHEET NO.
05



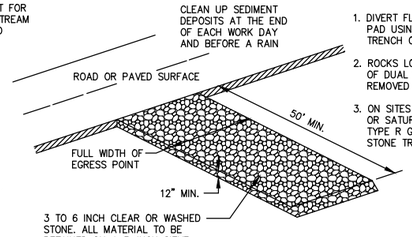
SECTION A–A



PLAN VIEW

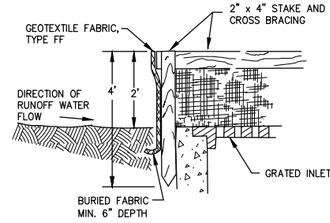
FRONT ELEVATION

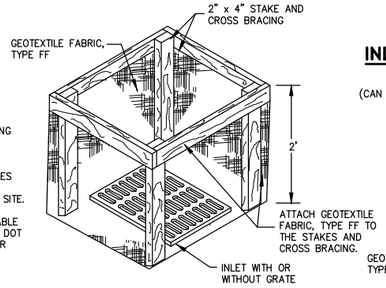
DITCH CHECK DETAIL



1. DIVERT FLOW AWAY FROM TRACKING PAD USING CULVERTS, SHALLOW TRENCH OR DIVERSION DAM.
2. ROCKS LODGED BETWEEN THE TIRES OF DUAL VEHICLES SHALL BE REMOVED PRIOR TO LEAVING THE SITE.
3. ON SITES WITH A HIGH WATER TABLE OR SATURATED SOILS, INSTALL A DOT TYPE R GEOTEXTILE FABRIC UNDER STONE TRACKING PAD.

TRACKING PAD DETAIL





INLET PROTECTION, TYPE A

GENERAL NOTES

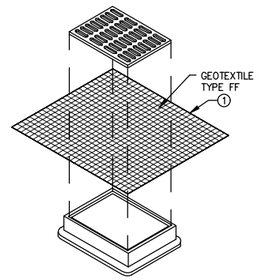
MANUFACTURED ALTERNATIVES APPROVED AND LISTED ON THE DEPARTMENT'S EROSION CONTROL PRODUCT ACCEPTABILITY LIST MAY BE SUBSTITUTED.

WHEN REMOVING OR MAINTAINING INLET PROTECTION, CARE SHALL BE TAKEN SO THAT THE SEDIMENT TRAPPED ON THE GEOTEXTILE FABRIC DOES NOT FALL INTO THE INLET. ANY MATERIAL FALLING INTO THE INLET SHALL BE REMOVED IMMEDIATELY.

① FINISHED SIZE, INCLUDING FLAP POCKETS WHERE REQUIRED, SHALL EXTEND A MINIMUM OF 10" AROUND THE PERIMETER TO FACILITATE MAINTENANCE OR REMOVAL.

② FOR INLET PROTECTION, TYPE C (WITH CURB BOX), AN ADDITIONAL 18" OF FABRIC IS WRAPPED AROUND THE WOOD AND SECURED WITH STAPLES. THE WOOD SHALL NOT BLOCK THE ENTIRE HEIGHT OF THE CURB BOX OPENING.

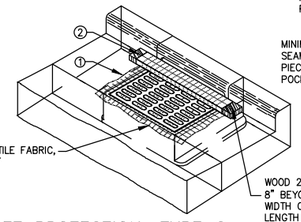
③ FLAP POCKETS SHALL BE LARGE ENOUGH TO ACCEPT WOOD 2X4.



INLET PROTECTION, TYPE B

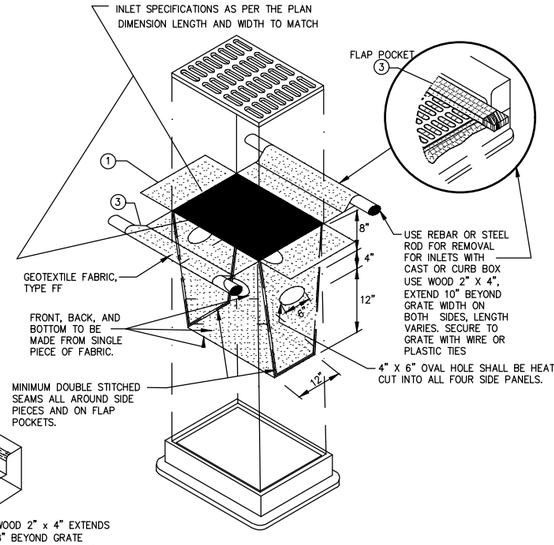
(WITHOUT CURB BOX)

(CAN BE INSTALLED IN ANY INLET WITHOUT A CURB BOX)



INLET PROTECTION, TYPE C

(WITH CURB BOX)



INLET PROTECTION, TYPE D

(CAN BE INSTALLED IN ANY INLET TYPE WITH OR WITHOUT A CURB BOX AS PER NOTE ②)

INSTALLATION NOTES

TYPE B & C

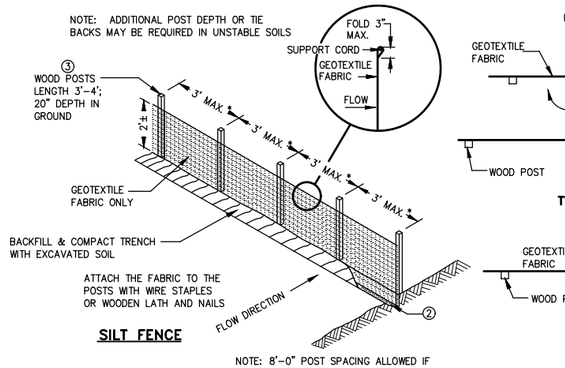
TRIM EXCESS FABRIC IN THE FLOW LINE TO WITHIN 3" OF THE GRATE.
THE CONTRACTOR SHALL DEMONSTRATE A METHOD OF MAINTENANCE, USING A SEWN FLAP, HAND HOLDS OR OTHER METHOD TO PREVENT ACCUMULATED SEDIMENT FROM ENTERING THE INLET.

TYPE D

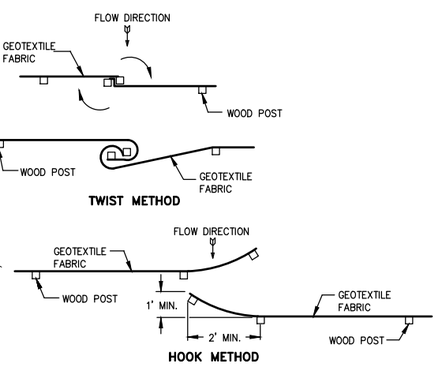
DO NOT INSTALL INLET PROTECTION TYPE D IN INLETS SHALLOWER THAN 30", MEASURED FROM THE BOTTOM OF THE INLET TO THE TOP OF THE GRATE.
TRIM EXCESS FABRIC IN THE FLOW LINE TO WITHIN 3" OF THE GRATE.
THE INSTALLED BAG SHALL HAVE A MINIMUM SIDE CLEARANCE, BETWEEN THE INLET WALLS AND THE BAG, MEASURED AT THE BOTTOM OF THE OVERFLOW HOLES, OF 3". WHERE NECESSARY THE CONTRACTOR SHALL CINCH THE BAG, USING PLASTIC ZIP TIES, TO ACHIEVE THE 3" CLEARANCE. THE TIES SHALL BE PLACED AT A MAXIMUM OF 4" FROM THE BOTTOM OF THE BAG.

This drawing based on Wisconsin Department of Transportation Standard Detail Drawing 8 E 10–2.

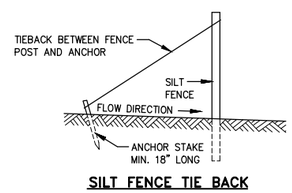
STORM DRAIN INLET PROTECTION



SILT FENCE



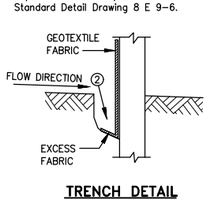
JOINING TWO LENGTHS OF SILT FENCE ⑤



SILT FENCE TIE BACK

(WHEN ADDITIONAL SUPPORT REQUIRED)

This drawing based on Wisconsin Department of Transportation Standard Detail Drawing 8 E 9–6.



TRENCH DETAIL

SILT FENCE DETAIL

GENERAL NOTES

① HORIZONTAL BRACE REQUIRED WITH 2" X 4" WOODEN FRAME OR EQUIVALENT AT TOP OF POSTS.

② TRENCH SHALL BE A MINIMUM OF 4" WIDE & 6" DEEP TO BURY AND ANCHOR THE GEOTEXTILE FABRIC. FOLD MATERIAL TO FIT TRENCH AND BACKFILL & COMPACT TRENCH WITH EXCAVATED SOIL.

③ WOOD POSTS SHALL BE A MINIMUM SIZE OF 1 1/8" X 1 1/8" OF OAK OR HICKORY

④ SILT FENCE TO EXTEND ACROSS THE TOP OF THE PIPE.

⑤ CONSTRUCT SILT FENCE FROM A CONTINUOUS ROLL IF POSSIBLE BY CUTTING LENGTHS TO AVOID JOINTS. IF A JOINT IS NECESSARY USE ONE OF THE FOLLOWING TWO METHODS; A) OVERLAP THE END POSTS AND TWIST, OR ROTATE, AT LEAST 180 DEGREES, B) HOOK THE END OF EACH SILT FENCE LENGTH.

CLAY LINER SPECIFICATIONS (TYP.)

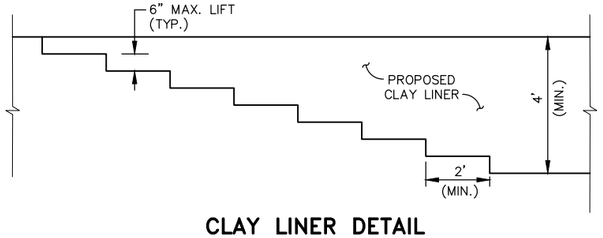
LINER THICKNESS = 4 FEET
IN PLACE HYDRAULIC CONDUCTIVITY = 1 X 10–7 CM/SEC OR LESS
MINIMUM OF 50% BY WEIGHT WHICH PASSES THE 200 SIEVE
AVERAGE LIQUID LIMIT OF 25 OR GREATER, NONE LESS THAN 20
AVERAGE PLASTICITY INDEX OF 12 OR GREATER, NONE LESS THAN 10

ALL CLAY LAYERS IN THE LINER TO BE CONSTRUCTED IN LIFT HEIGHTS NO GREATER THAN 6 INCHES AFTER COMPACTION USING FOOTED COMPACTION EQUIPMENT HAVING FEET AT LEAST AS LONG AS THE LOOSE LIFT HEIGHT. CLAY IS TO BE DISKED OR OTHERWISE MECHANICALLY PROCESSED BEFORE COMPACTION TO BREAK UP CLODS AND ALLOW FOR MOISTURE ADJUSTMENT. CLOD SIZE TO BE NO GREATER THAN 4 INCHES.

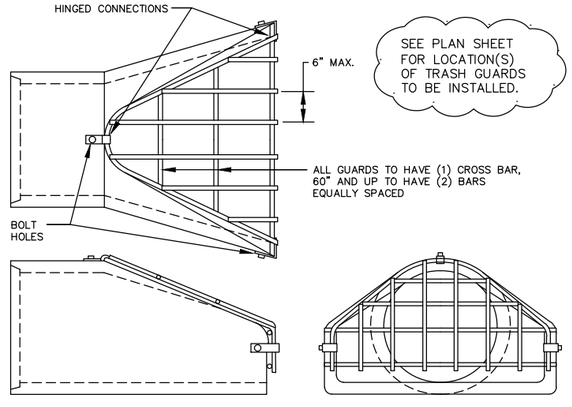
A SUFFICIENT NUMBER OF PASSES OF THE COMPACTION EQUIPMENT IS TO BE MADE OVER EACH LIFT OF CLAY TO ENSURE COMPLETE REMOLDING OF THE CLAY.

ALL CLAY TO BE COMPACTED TO 90% MODIFIED OR 95% STANDARD PROCTOR DENSITY AT A MOISTURE CONTENT OF AT LEAST 2% WET OF OPTIMUM IF USING THE MODIFIED PROCTOR METHOD AND WET OF OPTIMUM IF USING THE STANDARD PROCTOR METHOD, BASED ON THE CHARACTERISTICS OF THE APPROPRIATE PROCTOR CURVE FOR THE CLAY BEING PLACED. THE CLAY LINER IS TO BE KEYED TOGETHER TO FORM A CONTINUOUS CLAY SEAL, SEE DETAIL.

CLAY LINER SHALL BE PLACED OVER NATIVE SOILS THAT DO NOT SATISFY THE CLAY LINER SPECIFICATIONS. A GEOTECHNICAL ENGINEER SHALL DETERMINE WHICH SOILS DO NOT SATISFY THE CLAY LINER SPECIFICATIONS. THE GEOTECHNICAL ENGINEER SHALL INSPECT SOILS WITHIN THE PERMANENT POOL AND UP TO THE POND'S 2–YEAR, 24–HOUR WATER SURFACE ELEVATION OF 771.90. UPON COMPLETION OF THE LINER, A GEOTECHNICAL ENGINEER REGISTERED IN WISCONSIN SHALL PROVIDE AN AFFIDAVIT INDICATING IF THE CLAY LINER SATISFIES THESE SPECIFICATIONS.



CLAY LINER DETAIL



HOT DIP GALVANIZED PER ASTM–A153

BAR SIZES

	STANDARD DESIGN			
	PIPE SIZE	HOLE DIA. REQ'D.	BOLT DIA.	BAR SIZE
ROUND	10"–24"	3/4"	5/8"	5/8"
	27"–48"	7/8"	3/4"	3/4"
	54"–90"	1 1/8"	1"	1"
ARCH	22"–29"	3/4"	5/8"	5/8"
	36"–59"	7/8"	3/4"	3/4"
	65"–88"	1 1/8"	1"	1"
BOLT LG.= PIPE WALL THK. + 2 1/2"				

TRASH GUARD FOR FLARED ENDS

McMAHON ENGINEERING A+E HITEC
1445 McMAHON DRIVE NEENAH, WI 54956
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Tel: (920) 751-4200 Fax: (920) 751-4284
www.mcmgrp.com

NO.	DATE	REVISION

MISTY POND
TOWN OF GRAND CHUTE, OUTAGAMIE CO., WI
EROSION CONTROL DETAILS

DESIGNED	DRAWN
–	AWS

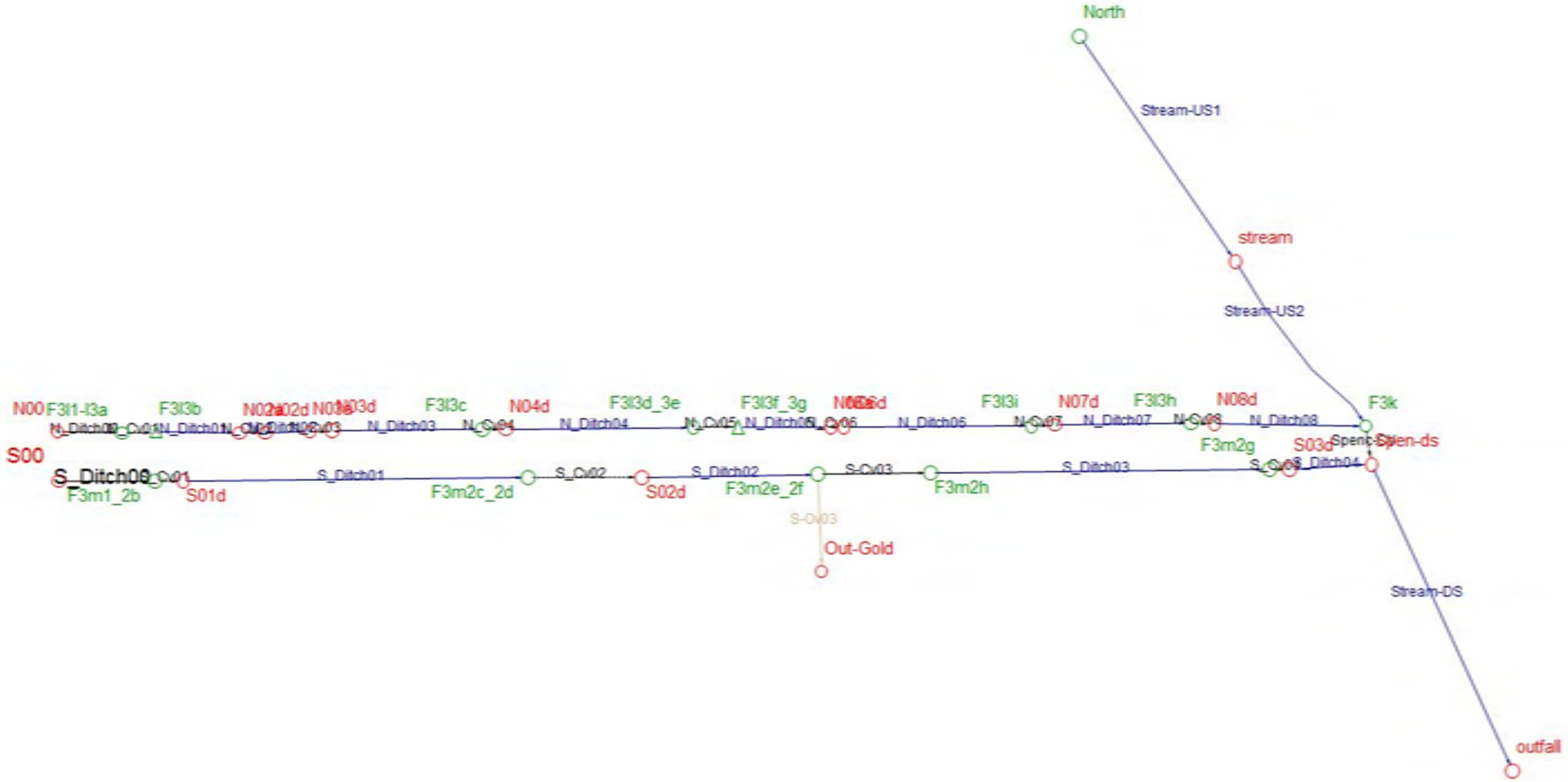
PROJECT NO.
G0003–9–14–00271

DATE
NOV., 2016

SHEET NO.
06

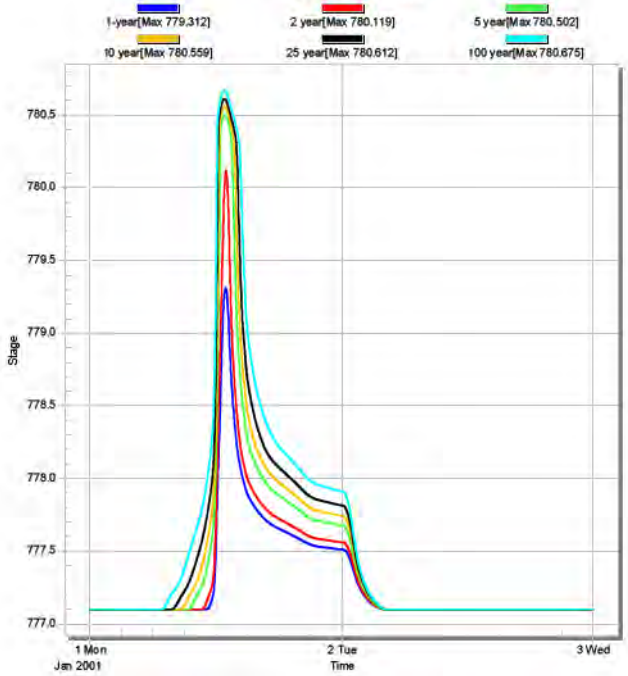
APPENDIX C

HYDROLOGIC & HYDRAULIC MODEL DATA & RESULTS


North
Stream-US1
stream
Stream-US2
N00
F3l1-l3a
F3l3b
N02d
N03d
F3l3c
N04d
F3l3d_3e
F3l3f_3g
F3l3i
N07d
F3l3h
N08d
F3k
S00
S_Ditch00
F3m1_2b
S01d
F3m2c_2d
S02d
F3m2e_2f
F3m2h
F3m2g
S03d
Spent-Sden-ds
Out-Gold
Stream-DS
outfall

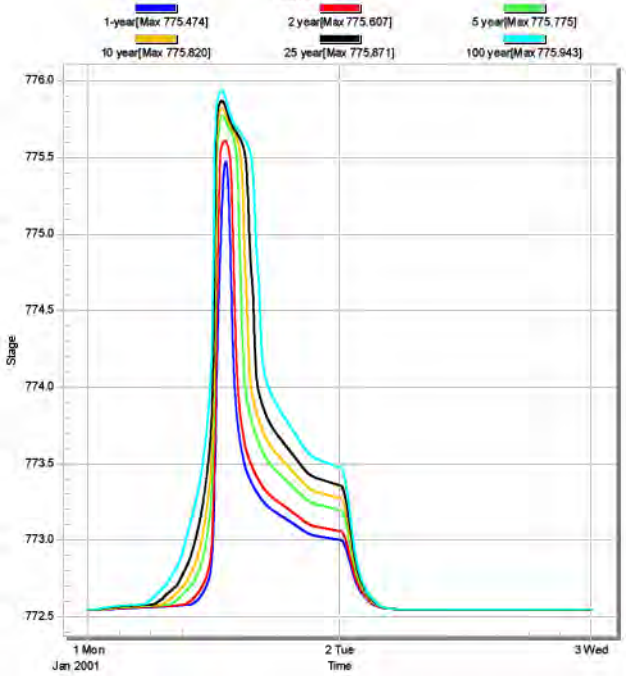
Node - F3l1-l3a

Maple Hill Drive



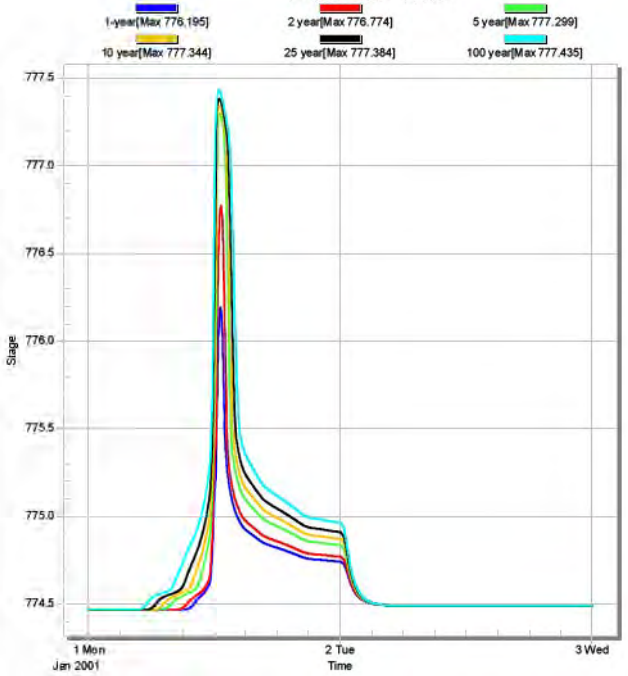
Node - F3l3d_3e

Misty Lane



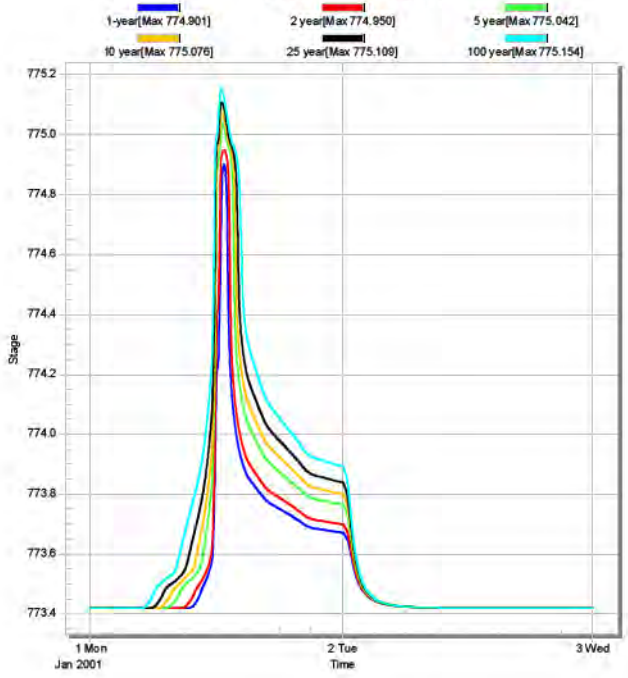
Node - F3m2c_2d

Wildrose Lane



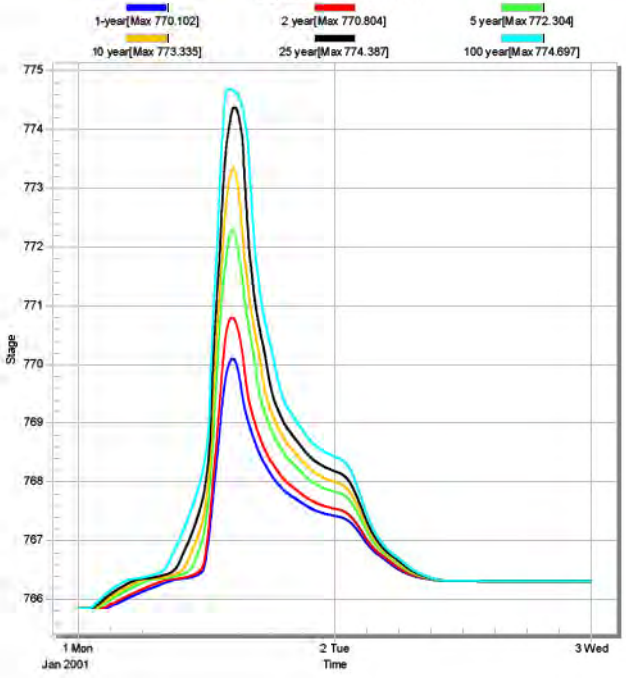
Node - F3m2e_2f

Goldenrod Drive



Node - F3k

Spencer Street



```
 Current Directory:   C:\PROGRA~2\XPSOLU~1\XPSWMM~1
 Engine Name: C:\PROGRA~2\XPSOLU~1\XPSWMM~1\SWMMEN~2.EXE
 Input File : W:\PROJECTS\G0003\940271\16\SWMM\Existing\Ex-Misty_1-year.XP

          *================================================*
          |                   xpswmm                       |
          |     Storm and Wastewater Management Model      |
          |         Developed by XP Solutions Inc.         |
          |================================================|
          |                                                |
          | Last Update      : Jan., 2013                  |
          | Interface Version: 2012                        |
          | Engine Version   : 12.0                        |
          | Data File Version: 12.6                        |
          |                                                |
          |                                                |
          *================================================*
*============================================================*
 | Parameter Values on the Tapes Common Block.These are the |
 | values read from the data file and dynamically allocated |
 | by the model for this simulation.                        |
 *==========================================================*

  Number of Subcatchments in the Runoff Block (NW)....    22
  Number of Channel/Pipes in the Runoff Block (NG)....     0
  Runoff Water quality constituents (NRQ).............     0
  Runoff Land Uses per Subcatchment (NLU).............     0
  Number of Elements in the Transport Block (NET).....     0
  Number of Storage Junctions in Transport (NTSE).....     0
  Number of Input Hydrographs in Transport (NTH)......     0
  Number of Elements in the Extran Block (NEE)........    45
  Number of Groundwater Subcatchments in Runoff (NGW).     0
  Number of Interface locations for all Blocks (NIE)..    45
  Number of Pumps in Extran (NEP).....................     0
  Number of Orifices in Extran (NEO)..................     0
  Number of Tide Gates/Free Outfalls in Extran (NTG)..     2
  Number of Extran Weirs (NEW)........................     0
  Number of scs hydrograph points.....................  3361
  Number of Extran printout locations (NPO)...........     0
  Number of Tide elements in Extran (NTE).............     2
  Number of Natural channels (NNC)....................     3
  Number of Storage junctions in Extran (NVSE)........     2
  Number of Time history data points in Extran(NTVAL).     0
  Number of Variable storage elements in Extran (NVST)     4
  Number of Input Hydrographs in Extran (NEH).........     0
  Number of Particle sizes in Transport Block (NPS)...     0
  Number of User defined conduits (NHW)...............    22
  Number of Connecting conduits in Extran (NECC)......    20
  Number of Upstream elements in Transport (NTCC).....    10
  Number of Storage/treatment plants (NSTU)...........     1
  Number of Values for R1 lines in Transport (NR1)....     0
  Number of Nodes to be allowed for (NNOD)............    45
  Number of Plugs in a Storage Treatment Unit.........     1

 ######################################################
 #    Entry made to the Runoff Layer(Block) of SWMM    #
 #    Last Updated Jan., 2013 by XP Solutions          #

 *==========================================================*
 |         RUNOFF TABLES IN THE OUTPUT FILE.                |
 |  These are the more important tables in the output file. |
 |  You can use your editor to find the table numbers,      |
 |  for example: search for Table R3 to check continuity.   |
 |  This output file can be imported into a Word Processor  |
 |  and printed on US letter or A4 paper using portrait     |
 |  mode, courier font, a size of 8 pt. and margins of 0.75 |
 |                                                          |
 | Table R1  - Physical Hydrology Data                      |
 | Table R2  - Infiltration data                            |
 | Table R3  - Raingage and Infiltration Database Names     |
 | Table R4  - Groundwater Data                             |
 | Table R5  - Continuity Check for Surface Water           |
 | Table R6  - Continuity Check for Channels/Pipes          |
 | Table R7  - Continuity Check for Subsurface Water        |
 | Table R8  - Infiltration/Inflow Continuity Check         |
 | Table R9  - Summary Statistics for Subcatchments         |
 | Table R10 - Sensitivity anlysis for Subcatchments        |
 *==========================================================*

                     Misty Pond
##########################################
#            RUNOFF JOB CONTROL          #
##########################################

 Snowmelt parameter - ISNOW.......................            0
 Number of rain gages - NRGAG.....................            1
 Quality is not simulated - KWALTY................            0
 Default evaporation rate used - IVAP.............            0
 Hour of day at start of storm - NHR..............            0
 Minute of hour at start of storm - NMN...........            0
 Time TZERO at start of storm (hours).............        0.000
 Use U.S. Customary units for most I/O - METRIC...            0
 Runoff input print control...                                0
 Runoff graph plot control....                                0
 Runoff output print control..                                0
 Limit number of groundwater convergence messages to      10000

 Print headers every 50 lines - NOHEAD (0=yes, 1=no)          0

 Print land use load percentages -LANDUPR (0=no, 1=yes)       0
 Month, day, year of start of storm is:               1/ 1/2001
 Wet time step length (seconds).......                     60.0
 Dry time step length (seconds).......                  86400.0
 Wet/Dry time step length (seconds)...                     60.0
 Simulation length is......                                48.0 Hours

 If Horton infiltration model is being used
 A mixture of infiltration options may be used in
 XP-SWMM2000 as a watershed specific option.
 Rate for regeneration of infiltration = REGEN * DECAY
 Decay is read in for each subcatchment
```

```
 REGEN = ..........................................  0.01000


 Raingage #.................................          1
 KTYPE  - Rainfall input type..............           0
 NHISTO - Total number of rainfall values..         240
 KINC   - Rainfall values(pairs) per line..          10
 KPRINT - Print rainfall(0-Yes,1-No).......           0
 KTIME  - Precipitation time units
 0 --> Minutes  1 --> Hours................           1
 KPREP  - Precipitation unit type
 0 --> Intensity  1 --> Volume.............           1
 KTHIS - Variable rainfall intervals
 0 --> No, > 1 --> Yes.....................           0
 THISTO - Rainfall time interval...........        0.10
 TZRAIN - Starting time(KTIME units).......        0.00

####################################
# Rainfall input summary from Runoff #
####################################

 Total rainfall for gage #     1 is    2.2000 inches

   ############################
   #        Data Group F1     #
   # Evaporation Rate (in/day) #
   ############################

  JAN.  FEB.  MAR.  APR.  MAY   JUN.  JUL.  AUG.  SEP.  OCT.  NOV  DEC.
  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ---- ----
 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100

  ################################################
  #  Table R1.  S U B C A T C H M E N T  D A T A  #
  #             Physical Hydrology Data          #
  ################################################
```

Subcatchment Number	Name	Channel or inlet	Width (ft)	Area (ac)	Per-cent Imperv	Slope ft/ft	"n" Imprv	"n" Perv	Deprs -sion Storge	Deprs -sion Strge	Prcnt Zero Deten -tion
1	F3m1_2b#1	F3m1_2b	1.0000	3.1700	0.00	1.000	0.020	0.020	0.000	0.000	0.00
2	F3m1_2b#2	F3m1_2b	1.0000	8.6300	0.00	1.000	0.020	0.020	0.000	0.000	0.00
3	F3m1_2b#3	F3m1_2b	1.0000	.50000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
4	F3m2c_2d#1	F3m2c_2d	1.0000	.35100	0.00	1.000	0.020	0.020	0.000	0.000	0.00
5	F3m2c_2d#2	F3m2c_2d	1.0000	.21200	0.00	1.000	0.020	0.020	0.000	0.000	0.00
6	F3m2e_2f#1	F3m2e_2f	1.0000	.27700	0.00	1.000	0.020	0.020	0.000	0.000	0.00
7	F3m2e_2f#2	F3m2e_2f	1.0000	.15800	0.00	1.000	0.020	0.020	0.000	0.000	0.00
8	F3m2h#1	F3m2h	1.0000	.33800	0.00	1.000	0.020	0.020	0.000	0.000	0.00
9	F3m2g#1	F3m2g	1.0000	.65400	0.00	1.000	0.020	0.020	0.000	0.000	0.00
10	F3l1-l3a#1	F3l1-l3a	1.0000	5.0290	0.00	1.000	0.020	0.020	0.000	0.000	0.00
11	F3l1-l3a#2	F3l1-l3a	1.0000	41.083	0.00	1.000	0.020	0.020	0.000	0.000	0.00
12	F3l1-l3a#3	F3l1-l3a	1.0000	14.677	0.00	1.000	0.020	0.020	0.000	0.000	0.00
13	F3l3b#1	F3l3b	1.0000	1.5930	0.00	1.000	0.020	0.020	0.000	0.000	0.00
14	F3l3c#1	F3l3c	1.0000	1.9090	0.00	1.000	0.020	0.020	0.000	0.000	0.00
15	F3l3d_3e#1	F3l3d_3e	1.0000	.97000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
16	F3l3d_3e#2	F3l3d_3e	1.0000	6.1690	0.00	1.000	0.020	0.020	0.000	0.000	0.00
17	F3l3f_3g#1	F3l3f_3g	1.0000	1.8640	0.00	1.000	0.020	0.020	0.000	0.000	0.00
18	F3l3f_3g#2	F3l3f_3g	1.0000	.25000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
19	F3l3i#1	F3l3i	1.0000	.15700	0.00	1.000	0.020	0.020	0.000	0.000	0.00
20	F3l3h#1	F3l3h	1.0000	.98000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
21	North#1	North	1.0000	936.23	0.00	1.000	0.020	0.020	0.000	0.000	0.00
22	F3k#1	F3k	1.0000	3.1390	0.00	1.000	0.020	0.020	0.000	0.000	0.00

```
#############################################################################################################
#          Table R2.  SUBCATCHMENT  DATA                                                                     #
#                     Infiltration or Time of Concentration Data                                            #
#                                                                                                           #
# Infiltration Type      Infl #1(#5)       Infl #2(#6)          Infl #3(#7)              Infl #4(#8)      #
# SCS                 ->   Comp CN          Time Conc          Shape Factor        Depth or Fraction        #
# SBUH                ->   Comp CN          Time Conc                N/A                     N/A           #
# Green Ampt          ->   Suction          Hydr Cond           Initial MD                   N/A           #
# Horton              ->  Max Rate           Min Rate   Decay Rate (1/sec)      Max. Infilt. Volume        #
# Proportional        ->  Constant               N/A                N/A                     N/A           #
# Initial/Cont Loss   ->   Initial         Continuing                N/A                     N/A           #
# Initial/Proportional ->  Initial           Constant                N/A                     N/A           #
# Laurenson Parameters ->   B Value       Pervious "n"      Impervious Cont                Exponent        #
# Rational Formula     -> Tc Method   Flow Path Length      Flow Path Slope  Roughness or Retardance        #
#                              (#1 - #4 is Impervious Data / #5 - #8 is Pervious Data)                      #
#                     Rational Formula Tc Method: 1 = Constant                                              #
#                                                 2 = Friend's Equation                                     #
#                                                 3 = Kinematic Wave                                        #
#                                                 4 = Alameda Method                                        #
#                                                 5 = Izzard's Formula                                      #
#                                                 6 = Kerby's Equation                                      #
#                                                 7 = Kirpich's Equation                                    #
#                                                 8 = Bransby Williams Equation                             #
#                                                 9 = Federal Aviation Authority Equation                   #
#############################################################################################################
```

Subcatchment Number	Name	Infl # 1	Infl # 2	Infl # 3	Infl # 4	Infl # 5	Infl # 6	Infl # 7	Infl # 8
1	F3m1_2b#1	78.1000	0.5000	484.0000	0.2000				
2	F3m1_2b#2	79.8000	0.7833	484.0000	0.2000				
3	F3m1_2b#3	86.8000	0.0833	484.0000	0.2000				
4	F3m2c_2d#1	86.8000	0.1000	484.0000	0.2000				
5	F3m2c_2d#2	86.8000	0.0833	484.0000	0.2000				
6	F3m2e_2f#1	86.8000	0.1167	484.0000	0.2000				
7	F3m2e_2f#2	86.8000	0.0833	484.0000	0.2000				
8	F3m2h#1	86.8000	0.1667	484.0000	0.2000				
9	F3m2g#1	86.8000	0.3167	484.0000	0.2000				
10	F3l1-l3a#1	76.6000	0.4000	484.0000	0.2000				
11	F3l1-l3a#2	77.5000	1.1500	484.0000	0.2000				
12	F3l1-l3a#3	81.9000	1.1667	484.0000	0.2000				
13	F3l3b#1	81.7000	0.6833	484.0000	0.2000				
14	F3l3c#1	86.8000	0.4000	484.0000	0.2000				
15	F3l3d_3e#1	98.0000	0.0833	484.0000	0.2000				
16	F3l3d_3e#2	84.4000	0.6833	484.0000	0.2000				
17	F3l3f_3g#1	90.4000	0.8167	484.0000	0.2000				
18	F3l3f_3g#2	98.0000	0.0833	484.0000	0.2000				

```
   19          F3l3i#1    98.0000    0.0833  484.0000    0.2000
   20          F3l3h#1    98.0000    0.0833  484.0000    0.2000
   21          North#1    81.6000    2.7667  484.0000    0.2000
   22            F3k#1    81.1000    0.8333  484.0000    0.2000

############################################################
#     Table R3.  SUBCATCHMENT  DATA                        #
#                Rainfall and Infiltration Database Names  #
############################################################

      Subcatchment          Gage  Infiltration       Routing
  Number           Name       No       Type            Type
  ====== =============== ======= ============ ====================
       1        F3m1_2b#1       1   SCS Method       SCS curvilinear
       2        F3m1_2b#2       1   SCS Method       SCS curvilinear
       3        F3m1_2b#3       1   SCS Method       SCS curvilinear
       4       F3m2c_2d#1       1   SCS Method       SCS curvilinear
       5       F3m2c_2d#2       1   SCS Method       SCS curvilinear
       6       F3m2e_2f#1       1   SCS Method       SCS curvilinear
       7       F3m2e_2f#2       1   SCS Method       SCS curvilinear
       8          F3m2h#1       1   SCS Method       SCS curvilinear
       9          F3m2g#1       1   SCS Method       SCS curvilinear
      10       F3l1-l3a#1       1   SCS Method       SCS curvilinear
      11       F3l1-l3a#2       1   SCS Method       SCS curvilinear
      12       F3l1-l3a#3       1   SCS Method       SCS curvilinear
      13          F3l3b#1       1   SCS Method       SCS curvilinear
      14          F3l3c#1       1   SCS Method       SCS curvilinear
      15       F3l3d_3e#1       1   SCS Method       SCS curvilinear
      16       F3l3d_3e#2       1   SCS Method       SCS curvilinear
      17       F3l3f_3g#1       1   SCS Method       SCS curvilinear
      18       F3l3f_3g#2       1   SCS Method       SCS curvilinear
      19          F3l3i#1       1   SCS Method       SCS curvilinear
      20          F3l3h#1       1   SCS Method       SCS curvilinear
      21          North#1       1   SCS Method       SCS curvilinear
      22            F3k#1       1   SCS Method       SCS curvilinear

 Total Number of Subcatchments...              22
 Total Tributary Area (acres)....         1025.90
 Impervious Area (acres).........            0.00
 Pervious Area (acres)...........         1025.90
 Total Width (feet)..............           22.00
 Impervious Area (%).............            0.00

  ####################################################
  #          S U B C A T C H M E N T  D A T A        #
  #   Default, Ratio values for subcatchment data    #
  #   Used with the calibrate node in the runoff.    #
  # 1 - width     2 - area       3 - impervious %    #
  # 4 - slope     5 - imp "n"    6 - perv "n"        #
  # 7 - imp ds    8 - perv ds    9 - 1st infil       #
  #10 - 2nd infil               11 - 3rd infil       #
  ####################################################

 Column           1         2         3         4         5         6         7         8         9        10        11
 Default     0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 Ratio       1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000

 ***********************************************************
 *     Arrangement of Subcatchments and Channel/Pipes      *
 ***********************************************************
     Inlet
 F3m1_2b         No Tributary Channel/Pipes
                 Tributary Subareas........ F3m1_2b#1  F3m1_2b#2  F3m1_2b#3
 F3m2c_2d        No Tributary Channel/Pipes
                 Tributary Subareas........ F3m2c_2d#1 F3m2c_2d#2
 F3m2e_2f        No Tributary Channel/Pipes
                 Tributary Subareas........ F3m2e_2f#1 F3m2e_2f#2
 F3m2h           No Tributary Channel/Pipes
                 Tributary Subareas........ F3m2h#1
 F3m2g           No Tributary Channel/Pipes
                 Tributary Subareas........ F3m2g#1
 F3l1-l3a        No Tributary Channel/Pipes
                 Tributary Subareas........ F3l1-l3a#1 F3l1-l3a#2 F3l1-l3a#3
 F3l3b           No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3b#1
 F3l3c           No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3c#1
 F3l3d_3e        No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3d_3e#1 F3l3d_3e#2
 F3l3f_3g        No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3f_3g#1 F3l3f_3g#2
 F3l3i           No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3i#1
 F3l3h           No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3h#1
 North           No Tributary Channel/Pipes
                 Tributary Subareas........ North#1
 F3k             No Tributary Channel/Pipes
                 Tributary Subareas........ F3k#1

 ***********************************************************
 * Hydrographs will be stored for the following  14 INLETS *
 ***********************************************************
 F3m1_2b   F3m2c_2d  F3m2e_2f  F3m2h     F3m2g     F3l1-l3a
 F3l3b     F3l3c     F3l3d_3e  F3l3f_3g  F3l3i     F3l3h
 North     F3k

 ************************************************
 *  Quality Simulation not included in this run *
 ************************************************

 ***************************************************
 *  Precipitation Interface File Summary           *
 *  Number of precipitation station....        1   *
 ***************************************************

 Location Station Number
 -------- --------------
        1.             1
 XXX End of Header Section XXX
```

```
 ######################################################
 #    Entry made to the HYDRAULIC Layer of XP-SWMM     #
 #    Last Updated in Jan., 2013 by XP Solutions       #

 ######################################################
 #    Entry made to the Runoff Layer(Block) of SWMM    #
 #    Last Updated Jan., 2013 by XP Solutions          #

 *==========================================================*
 |         RUNOFF TABLES IN THE OUTPUT FILE.                |
 |  These are the more important tables in the output file. |
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 |  for example: search for Table R3 to check continuity.   |
 |  This output file can be imported into a Word Processor  |
 |  and printed on US letter or A4 paper using portrait     |
 |  mode, courier font, a size of 8 pt. and margins of 0.75 |
 |                                                          |
 | Table R1  - Physical Hydrology Data                      |
 | Table R2  - Infiltration data                            |
 | Table R3  - Raingage and Infiltration Database Names     |
 | Table R4  - Groundwater Data                             |
 | Table R5  - Continuity Check for Surface Water           |
 | Table R6  - Continuity Check for Channels/Pipes          |
 | Table R7  - Continuity Check for Subsurface Water        |
 | Table R8  - Infiltration/Inflow Continuity Check         |
 | Table R9  - Summary Statistics for Subcatchments         |
 | Table R10 - Sensitivity anlysis for Subcatchments        |
 *==========================================================*

                     Misty Pond
##########################################
#             RUNOFF JOB CONTROL         #
##########################################

 Snowmelt parameter - ISNOW.....................            0
 Number of rain gages - NRGAG...................            1
 Quality is not simulated - KWALTY..............            0
 Default evaporation rate used - IVAP...........            0
 Hour of day at start of storm - NHR............            0
 Minute of hour at start of storm - NMN.........            0
 Time TZERO at start of storm (hours)...........        0.000
 Use U.S. Customary units for most I/O - METRIC...          0
 Runoff input print control...                              0
 Runoff graph plot control....                              0
 Runoff output print control..                              0
 Limit number of groundwater convergence messages to    10000

 Print headers every 50 lines - NOHEAD (0=yes, 1=no)        0

 Print land use load percentages -LANDUPR (0=no, 1=yes)     0
 Month, day, year of start of storm is:             1/ 1/2001
 Wet time step length (seconds).......                 60.0
 Dry time step length (seconds).......              86400.0
 Wet/Dry time step length (seconds)...                 60.0
 Simulation length is......                            48.0 Hours

 If Horton infiltration model is being used
 A mixture of infiltration options may be used in
 XP-SWMM2000 as a watershed specific option.
 Rate for regeneration of infiltration = REGEN * DECAY
 Decay is read in for each subcatchment
 REGEN = ..........................................  0.01000

 Raingage #.............................            1
 KTYPE  - Rainfall input type...........            0
 NHISTO - Total number of rainfall values..       240
 KINC   - Rainfall values(pairs) per line..        10
 KPRINT - Print rainfall(0-Yes,1-No).......         0
 KTIME  - Precipitation time units
 0 --> Minutes  1 --> Hours.............            1
 KPREP  - Precipitation unit type
 0 --> Intensity  1 --> Volume..........            1
 KTHIS - Variable rainfall intervals
 0 --> No, > 1 --> Yes..................            0
 THISTO - Rainfall time interval........       0.10
 TZRAIN - Starting time(KTIME units).....      0.00

#####################################
# Rainfall input summary from Runoff #
#####################################

 Total rainfall for gage #     1 is    2.2000 inches

   ############################
   #        Data Group F1     #
   # Evaporation Rate (in/day) #
   ############################

  JAN.  FEB.  MAR.  APR.  MAY   JUN.  JUL.  AUG.  SEP.  OCT.  NOV  DEC.
  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ---- ----
 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100


  ##################################################
  #  Table R1.  S U B C A T C H M E N T  D A T A    #
  #            Physical Hydrology Data             #
  ##################################################
```

Subcatchment Number	Name	Channel or inlet	Width (ft)	Area (ac)	Percent Imperv	Slope ft/ft	"n" Imprv	"n" Perv	Depression Storge Imprv	Depression Storge Perv	Prcnt Zero Deten -tion
1	F3m1_2b#1	F3m1_2b	1.0000	3.1700	0.00	1.000	0.020	0.020	0.000	0.000	0.00
2	F3m1_2b#2	F3m1_2b	1.0000	8.6300	0.00	1.000	0.020	0.020	0.000	0.000	0.00
3	F3m1_2b#3	F3m1_2b	1.0000	.50000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
4	F3m2c_2d#1	F3m2c_2d	1.0000	.35100	0.00	1.000	0.020	0.020	0.000	0.000	0.00
5	F3m2c_2d#2	F3m2c_2d	1.0000	.21200	0.00	1.000	0.020	0.020	0.000	0.000	0.00
6	F3m2e_2f#1	F3m2e_2f	1.0000	.27700	0.00	1.000	0.020	0.020	0.000	0.000	0.00
7	F3m2e_2f#2	F3m2e_2f	1.0000	.15800	0.00	1.000	0.020	0.020	0.000	0.000	0.00
8	F3m2h#1	F3m2h	1.0000	.33800	0.00	1.000	0.020	0.020	0.000	0.000	0.00
9	F3m2g#1	F3m2g	1.0000	.65400	0.00	1.000	0.020	0.020	0.000	0.000	0.00

10	F3l1-l3a#1	F3l1-l3a	1.0000	5.0290	0.00	1.000	0.020	0.020	0.000	0.000	0.00
11	F3l1-l3a#2	F3l1-l3a	1.0000	41.083	0.00	1.000	0.020	0.020	0.000	0.000	0.00
12	F3l1-l3a#3	F3l1-l3a	1.0000	14.677	0.00	1.000	0.020	0.020	0.000	0.000	0.00
13	F3l3b#1	F3l3b	1.0000	1.5930	0.00	1.000	0.020	0.020	0.000	0.000	0.00
14	F3l3c#1	F3l3c	1.0000	1.9090	0.00	1.000	0.020	0.020	0.000	0.000	0.00
15	F3l3d_3e#1	F3l3d_3e	1.0000	.97000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
16	F3l3d_3e#2	F3l3d_3e	1.0000	6.1690	0.00	1.000	0.020	0.020	0.000	0.000	0.00
17	F3l3f_3g#1	F3l3f_3g	1.0000	1.8640	0.00	1.000	0.020	0.020	0.000	0.000	0.00
18	F3l3f_3g#2	F3l3f_3g	1.0000	.25000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
19	F3l3i#1	F3l3i	1.0000	.15700	0.00	1.000	0.020	0.020	0.000	0.000	0.00
20	F3l3h#1	F3l3h	1.0000	.98000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
21	North#1	North	1.0000	936.23	0.00	1.000	0.020	0.020	0.000	0.000	0.00
22	F3k#1	F3k	1.0000	3.1390	0.00	1.000	0.020	0.020	0.000	0.000	0.00

```
##############################################################################################################
#          Table R2.  SUBCATCHMENT  DATA                                                                     #
#                     Infiltration or Time of Concentration Data                                             #
#                                                                                                            #
# Infiltration Type      Infl #1(#5)       Infl #2(#6)          Infl #3(#7)              Infl #4(#8)  #
# SCS                 ->   Comp CN          Time Conc         Shape Factor        Depth or Fraction  #
# SBUH                ->   Comp CN          Time Conc                N/A                      N/A  #
# Green Ampt          ->   Suction          Hydr Cond          Initial MD                     N/A  #
# Horton              ->  Max Rate           Min Rate   Decay Rate (1/sec)      Max. Infilt. Volume  #
# Proportional        ->  Constant              N/A                 N/A                      N/A  #
# Initial/Cont Loss   ->   Initial         Continuing               N/A                      N/A  #
# Initial/Proportional ->  Initial           Constant                N/A                      N/A  #
# Laurenson Parameters ->  B Value       Pervious "n"      Impervious Cont                Exponent  #
# Rational Formula     -> Tc Method   Flow Path Length      Flow Path Slope  Roughness or Retardance  #
#                                (#1 - #4 is Impervious Data / #5 - #8 is Pervious Data)                     #
#                     Rational Formula Tc Method: 1 = Constant                                               #
#                                                 2 = Friend's Equation                                      #
#                                                 3 = Kinematic Wave                                         #
#                                                 4 = Alameda Method                                         #
#                                                 5 = Izzard's Formula                                       #
#                                                 6 = Kerby's Equation                                       #
#                                                 7 = Kirpich's Equation                                     #
#                                                 8 = Bransby Williams Equation                              #
#                                                 9 = Federal Aviation Authority Equation                    #
##############################################################################################################
```

Subcatchment Number	Name	Infl # 1	Infl # 2	Infl # 3	Infl # 4	Infl # 5	Infl # 6	Infl # 7	Infl # 8
1	F3m1_2b#1	78.1000	0.5000	484.0000	0.2000				
2	F3m1_2b#2	79.8000	0.7833	484.0000	0.2000				
3	F3m1_2b#3	86.8000	0.0833	484.0000	0.2000				
4	F3m2c_2d#1	86.8000	0.1000	484.0000	0.2000				
5	F3m2c_2d#2	86.8000	0.0833	484.0000	0.2000				
6	F3m2e_2f#1	86.8000	0.1167	484.0000	0.2000				
7	F3m2e_2f#2	86.8000	0.0833	484.0000	0.2000				
8	F3m2h#1	86.8000	0.1667	484.0000	0.2000				
9	F3m2g#1	86.8000	0.3167	484.0000	0.2000				
10	F3l1-l3a#1	76.6000	0.4000	484.0000	0.2000				
11	F3l1-l3a#2	77.5000	1.1500	484.0000	0.2000				
12	F3l1-l3a#3	81.9000	1.1667	484.0000	0.2000				
13	F3l3b#1	81.7000	0.6833	484.0000	0.2000				
14	F3l3c#1	86.8000	0.4000	484.0000	0.2000				
15	F3l3d_3e#1	98.0000	0.0833	484.0000	0.2000				
16	F3l3d_3e#2	84.4000	0.6833	484.0000	0.2000				
17	F3l3f_3g#1	90.4000	0.8167	484.0000	0.2000				
18	F3l3f_3g#2	98.0000	0.0833	484.0000	0.2000				
19	F3l3i#1	98.0000	0.0833	484.0000	0.2000				
20	F3l3h#1	98.0000	0.0833	484.0000	0.2000				
21	North#1	81.6000	2.7667	484.0000	0.2000				
22	F3k#1	81.1000	0.8333	484.0000	0.2000				

```
##########################################################
#     Table R3.  SUBCATCHMENT  DATA                       #
#                Rainfall and Infiltration Database Names  #
##########################################################
```

Subcatchment Number	Name	Gage No	Infiltration Type	Routing Type
1	F3m1_2b#1	1	SCS Method	SCS curvilinear
2	F3m1_2b#2	1	SCS Method	SCS curvilinear
3	F3m1_2b#3	1	SCS Method	SCS curvilinear
4	F3m2c_2d#1	1	SCS Method	SCS curvilinear
5	F3m2c_2d#2	1	SCS Method	SCS curvilinear
6	F3m2e_2f#1	1	SCS Method	SCS curvilinear
7	F3m2e_2f#2	1	SCS Method	SCS curvilinear
8	F3m2h#1	1	SCS Method	SCS curvilinear
9	F3m2g#1	1	SCS Method	SCS curvilinear
10	F3l1-l3a#1	1	SCS Method	SCS curvilinear
11	F3l1-l3a#2	1	SCS Method	SCS curvilinear
12	F3l1-l3a#3	1	SCS Method	SCS curvilinear
13	F3l3b#1	1	SCS Method	SCS curvilinear
14	F3l3c#1	1	SCS Method	SCS curvilinear
15	F3l3d_3e#1	1	SCS Method	SCS curvilinear
16	F3l3d_3e#2	1	SCS Method	SCS curvilinear
17	F3l3f_3g#1	1	SCS Method	SCS curvilinear
18	F3l3f_3g#2	1	SCS Method	SCS curvilinear
19	F3l3i#1	1	SCS Method	SCS curvilinear
20	F3l3h#1	1	SCS Method	SCS curvilinear
21	North#1	1	SCS Method	SCS curvilinear
22	F3k#1	1	SCS Method	SCS curvilinear

```
 Total Number of Subcatchments...          22
 Total Tributary Area (acres)....     1025.90
 Impervious Area (acres).........        0.00
 Pervious Area (acres)...........     1025.90
 Total Width (feet)..............       22.00
 Impervious Area (%).............        0.00

  ################################################
  #          S U B C A T C H M E N T  D A T A    #
  #   Default, Ratio values for subcatchment data #
  #   Used with the calibrate node in the runoff. #
  # 1 - width     2 - area       3 - impervious %  #
  # 4 - slope     5 - imp "n"    6 - perv "n"      #
  # 7 - imp ds    8 - perv ds    9 - 1st infil     #
```

```
  #10 - 2nd infil              11 - 3rd infil      #
  ################################################

Column          1         2         3         4         5         6         7         8         9        10        11
Default    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
Ratio      1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000

*********************************************************
*     Arrangement of Subcatchments and Channel/Pipes    *
*********************************************************

    Inlet
F3m1_2b         No Tributary Channel/Pipes
                Tributary Subareas........ F3m1_2b#1  F3m1_2b#2  F3m1_2b#3
F3m2c_2d        No Tributary Channel/Pipes
                Tributary Subareas........ F3m2c_2d#1 F3m2c_2d#2
F3m2e_2f        No Tributary Channel/Pipes
                Tributary Subareas........ F3m2e_2f#1 F3m2e_2f#2
F3m2h           No Tributary Channel/Pipes
                Tributary Subareas........ F3m2h#1
F3m2g           No Tributary Channel/Pipes
                Tributary Subareas........ F3m2g#1
F3l1-l3a        No Tributary Channel/Pipes
                Tributary Subareas........ F3l1-l3a#1 F3l1-l3a#2 F3l1-l3a#3
F3l3b           No Tributary Channel/Pipes
                Tributary Subareas........ F3l3b#1
F3l3c           No Tributary Channel/Pipes
                Tributary Subareas........ F3l3c#1
F3l3d_3e        No Tributary Channel/Pipes
                Tributary Subareas........ F3l3d_3e#1 F3l3d_3e#2
F3l3f_3g        No Tributary Channel/Pipes
                Tributary Subareas........ F3l3f_3g#1 F3l3f_3g#2
F3l3i           No Tributary Channel/Pipes
                Tributary Subareas........ F3l3i#1
F3l3h           No Tributary Channel/Pipes
                Tributary Subareas........ F3l3h#1
North           No Tributary Channel/Pipes
                Tributary Subareas........ North#1
F3k             No Tributary Channel/Pipes
                Tributary Subareas........ F3k#1

*********************************************************
* Hydrographs will be stored for the following  14 INLETS *
*********************************************************
F3m1_2b   F3m2c_2d  F3m2e_2f  F3m2h     F3m2g     F3l1-l3a
F3l3b     F3l3c     F3l3d_3e  F3l3f_3g  F3l3i     F3l3h
North     F3k

***********************************************
*  Quality Simulation not included in this run *
***********************************************

***************************************************
*  Precipitation Interface File Summary           *
*  Number of precipitation station....        1   *
***************************************************

Location Station Number
-------- --------------
       1.             1

    Misty Pond

*============================================================*
|        HYDRAULICS TABLES IN THE OUTPUT FILE                |
|  These are the more important tables in the output file.   |
|  You can use your editor to find the table numbers,        |
|  for example: search for Table E20 to check continuity.    |
|  This output file can be imported into a Word Processor    |
|  and printed on US letter or A4 paper using portrait       |
|  mode, courier font, a size of 8 pt. and margins of 0.75   |
|                                                            |
| Table E1   - Basic Conduit Data                            |
| Table E2   - Conduit Factor Data                           |
| Table E3a  - Junction Data                                 |
| Table E3b  - Junction Data                                 |
| Table E4   - Conduit Connectivity Data                     |
| Table E4a  - Dry Weather Flow Data                         |
| Table E4b  - Real Time Control Data                        |
| Table E5   - Junction Time Step Limitation Summary         |
| Table E5a  - Conduit Explicit Condition Summary            |
| Table E6   - Final Model Condition                         |
| Table E7   - Iteration Summary                             |
| Table E8   - Junction Time Step Limitation Summary         |
| Table E9   - Junction  Summary  Statistics                 |
| Table E10  - Conduit   Summary  Statistics                 |
| Table E11  - Area assumptions used in the analysis         |
| Table E12  - Mean conduit information                      |
| Table E13  - Channel losses(H) and culvert info            |
| Table E13a - Culvert Analysis Classification               |
| Table E14  - Natural Channel Overbank Flow Information     |
| Table E14a - Natural Channel Encroachment Information      |
| Table E14b - Floodplain Mapping                            |
| Table E15  - Spreadsheet Info List                         |
| Table E15a - Spreadsheet Reach List                        |
| Table E16  - New Conduit Output Section                    |
| Table E17  - Pump Operation                                |
| Table E18  - Junction Continuity Error                     |
| Table E19  - Junction Inflow & Outflow Listing             |
| Table E20  - Junction Flooding and Volume List             |
| Table E21  - Continuity balance at simulation end          |
| Table E22  - Model Judgement Section                       |
*============================================================*

Time Control from Hydraulics Job Control
Year.........    2001 Month.......       1
Day..........       1 Hour........       0
Minute.......       0 Second......       0


Control information for simulation
```

```
 ----------------------------------

 Integration cycles.................      2880
 Length of integration step is......     60.00 seconds
 Simulation length..................     48.00 hours
 Do not create equiv. pipes(NEQUAL).        0
 Use U.S. customary units for I/O...        0
 Printing starts in cycle...........        1
 Intermediate printout intervals of.      500 cycles
 Intermediate printout intervals of.   500.00 minutes
 Summary printout intervals of......      500 cycles
 Summary printout time interval of..   500.00 minutes
 Hot start file parameter (REDO)....        0
 Initial time.......................     0.00 hours

 Iteration variables: Flow Tolerance.   0.00010
                      Head Tolerance.   0.00050
     Minimum depth (m or ft).........   0.00001
     Underrelaxation parameter.......   0.85000
     Time weighting parameter........   0.85000
     Conduit roughness factor........   1.00000
     Flow adjustment factor..........   1.00000
     Initial Condition Smoothing.....         0
     Courant Time Step Factor........   1.00000
     Default Expansion/Contraction K.   0.00000
     Default Entrance/Exit K.........   0.00000
     Routing Method..................   Dynamic Wave
 Default surface area of junctions...     12.57 square feet.
 Minimum Junction/Conduit Depth......   0.00001 feet.
 Ponding Area Coefficient............   5000.00
 Ponding Area Exponent...............    1.0000
 Minimum Orifice Length..............   1000.00 feet.
 NJSW input hydrograph junctions.....     0
      or user defined hydrographs....

         Natural Cross-Section information for Channel Stream-US1
         ========================================================
          Cross-Section ID (from X1 card) :     1.0 Channel sequence number :     1

   Left Overbank Length   :    689.8 ft               Maximum Elevation        :    10.00 ft.
   Main Channel Length    :    689.8 ft               Maximum Depth            :    10.00 ft.
   Right Overbank Length  :    689.8 ft               Maximum Section Area     : 1913.615 ft^2
                                                      Maximum hydraulic radius :     3.93 ft.
   Manning N :      0.035  to Station         309.9    Max topwidth             :   482.80 ft.
     "    "  :      0.035  in main Channel             Maximum Wetted Perimeter : 4.87E+02 ft
     "    "  :      0.035  Beyond station     330.0    Max left bank area       :  1350.82 ft^2
                                                      Max right bank area      :   403.62 ft^2
   Allowable Encroachment Depth :    0.00 ft           Max center channel area  : 159.1763 ft^2

         Natural Cross-Section information for Channel Stream-DS
         =======================================================
          Cross-Section ID (from X1 card) :     2.0 Channel sequence number :     2

   Left Overbank Length   :   1015.9 ft               Maximum Elevation        :    10.00 ft.
   Main Channel Length    :   1015.9 ft               Maximum Depth            :    10.00 ft.
   Right Overbank Length  :   1015.9 ft               Maximum Section Area     : 1078.171 ft^2
                                                      Maximum hydraulic radius :     3.02 ft.
   Manning N :      0.045  to Station         147.0    Max topwidth             :   351.24 ft.
     "    "  :      0.045  in main Channel             Maximum Wetted Perimeter : 3.57E+02 ft
     "    "  :      0.045  Beyond station     166.4    Max left bank area       :   386.11 ft^2
                                                      Max right bank area      :   512.60 ft^2
   Allowable Encroachment Depth :    0.00 ft           Max center channel area  : 179.4589 ft^2

         Natural Cross-Section information for Channel Stream-US2
         ========================================================
          Cross-Section ID (from X1 card) :     3.0 Channel sequence number :     3

   Left Overbank Length   :    464.1 ft               Maximum Elevation        :    10.00 ft.
   Main Channel Length    :    464.1 ft               Maximum Depth            :    10.00 ft.
   Right Overbank Length  :    464.1 ft               Maximum Section Area     : 1381.562 ft^2
                                                      Maximum hydraulic radius :     5.75 ft.
   Manning N :      0.040  to Station         136.1    Max topwidth             :   233.79 ft.
     "    "  :      0.040  in main Channel             Maximum Wetted Perimeter : 2.40E+02 ft
     "    "  :      0.040  Beyond station     145.7    Max left bank area       :   736.05 ft^2
                                                      Max right bank area      :   554.06 ft^2
   Allowable Encroachment Depth :    0.00 ft           Max center channel area  :  91.4482 ft^2

*===================================================*
|          Table E1 - Conduit Data                  |
*===================================================*
```

Inp Num	Conduit Name	Length (ft)	Conduit Class	Area (ft^2)	Manning Coef.	Max Width (ft)	Depth (ft)	Trapezoid Side Slopes	Hazen Williams c-factor
1	S_Ditch01	366.2800	Trapezoid	114.0000	0.0300	1.0000	6.0000	3.0000	3.0000
2	S_Ditch02	187.7000	Trapezoid	114.0000	0.0300	1.0000	6.0000	3.0000	3.0000
3	S-Cv03	120.5500	Arch	1.6000	0.0240	1.7500	1.2500		
4	S_Ditch03	359.4700	Trapezoid	114.0000	0.0350	1.0000	6.0000	3.0000	3.0000
5	S_Ditch04	86.6300	Trapezoid	117.6000	0.0300	1.0000	6.0000	3.4000	2.8000
6	N_Ditch01	88.7800	Trapezoid	114.0000	0.0300	1.0000	6.0000	3.0000	3.0000
7	N_Ditch02	47.3900	Trapezoid	114.0000	0.0300	1.0000	6.0000	3.0000	3.0000
8	N_Ditch03	159.5800	Trapezoid	114.0000	0.0300	1.0000	6.0000	3.0000	3.0000
9	N_Ditch04	200.0400	Trapezoid	114.0000	0.0300	1.0000	6.0000	3.0000	3.0000
10	N_Ditch05	99.0800	Trapezoid	114.0000	0.0300	1.0000	6.0000	3.0000	3.0000
11	N_Ditch06	199.7500	Trapezoid	92.4000	0.0300	1.0000	6.0000	2.6500	2.1500
12	N_Ditch07	144.8400	Trapezoid	99.6000	0.0300	1.0000	6.0000	2.7000	2.5000
13	N_Ditch08	161.3500	Trapezoid	100.5000	0.0350	1.0000	6.0000	2.7500	2.5000
14	Stream-US1	689.8000	Natural	1913.6151	0.0350	482.8000	10.0000		
15	Stream-DS	1015.9100	Natural	1078.1714	0.0450	351.2400	10.0000		
16	S-Ov03	102.9900	Trapezoid	401.0000	0.0110	0.5000	2.0000	100.0000	100.0000
17	Stream-US2	464.1100	Natural	1381.5624	0.0400	233.7867	10.0000		
18	N_Ditch00	291.0000	Trapezoid	114.0000	0.0300	1.0000	6.0000	3.0000	3.0000
19	S_Ditch00	183.0000	Trapezoid	52.0000	0.0300	1.0000	4.0000	3.0000	3.0000
20	S-Cv01	30.4200	Circular	3.1416	0.0240	2.0000	2.0000		
21	S-Ov01	30.4200	Trapezoid	401.0000	0.0110	0.5000	2.0000	100.0000	100.0000
22	S-Cv02	120.6400	Arch	1.6000	0.0240	1.7500	1.2500		
23	S-Ov02	120.6400	Trapezoid	401.0000	0.0110	0.5000	2.0000	100.0000	100.0000
24	S-Cv04	21.4000	Circular	1.7671	0.0240	1.5000	1.5000		
25	S-Ov04	21.4000	Trapezoid	401.0000	0.0110	0.5000	2.0000	100.0000	100.0000
26	Spenc-Cv.1	40.8200	Arch	46.0000	0.0240	9.3333	6.2500		
27	Spenc-Ov	10.8500	Trapezoid	3202.0000	0.0110	0.5000	4.0000	200.0000	200.0000

28	N-Cv01	36.6900	Circular	3.1416	0.0240	2.0000	2.0000		
29	N-Ov01	36.6900	Trapezoid	400.0000	0.0110	0.0100	2.0000	100.0000	100.0000
30	N-Cv02	26.5500	Circular	3.1416	0.0240	2.0000	2.0000		
31	N-Ov02	26.5500	Trapezoid	400.0000	0.0110	0.0100	2.0000	100.0000	100.0000
32	N-Cv03	24.0800	Circular	3.1416	0.0240	2.0000	2.0000		
33	N-Ov03	24.0800	Trapezoid	400.0000	0.0110	0.0100	2.0000	100.0000	100.0000
34	N-Cv04	24.6200	Circular	3.1416	0.0240	2.0000	2.0000		
35	N-Ov04	24.6200	Trapezoid	400.0000	0.0110	0.0100	2.0000	100.0000	100.0000
36	N-Cv05	46.8500	Circular	3.1416	0.0240	2.0000	2.0000		
37	N-Ov05	46.8500	Trapezoid	400.0000	0.0110	0.0100	2.0000	100.0000	100.0000
38	N-Cv06	13.9100	Circular	3.1416	0.0240	2.0000	2.0000		
39	N-Ov06	13.9100	Trapezoid	400.0000	0.0110	0.0100	2.0000	100.0000	100.0000
40	N-Cv07.1	24.6100	Circular	3.1416	0.0240	2.0000	2.0000		
41	N-Ov07	24.6100	Trapezoid	400.0000	0.0110	0.0100	2.0000	100.0000	100.0000
42	N-Cv08.1	24.3200	Circular	3.1416	0.0240	2.0000	2.0000		
43	N-Ov08	24.3200	Trapezoid	400.0000	0.0110	0.0100	2.0000	100.0000	100.0000

Total length of all conduits .... 5808.1000 feet

==========
| Table E2 - Conduit Factor Data |
==========

Conduit Name	Number of Barrels	Entrance Loss Coef	Exit Loss Coef	Exp/Contc Coefficnt	Time Weighting Parameter	Low Flow Roughness Factor	Depth at Which n Changes	Sediment Depth	Flow Routing
S-Cv03	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
S-Cv01	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
S-Cv02	1.0000	0.5000	0.5000	0.0000	0.8500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
S-Cv04	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
Spenc-Cv.1	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
N-Cv01	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
N-Cv02	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
N-Cv03	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
N-Cv04	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
N-Cv05	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
N-Cv06	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
N-Cv07.1	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
N-Cv08.1	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave

==========
| If there are messages about (sqrt(g*d)*dt/dx), or |
| the sqrt(wave celerity)*time step/conduit length |
| in the output file all it means is that the |
| program will lower the internal time step to |
| satisfy this condition (explicit condition). |
| You control the actual internal time step by |
| using the minimum courant time step factor in the |
| HYDRAULICS job control. The message put in words |
| states that the smallest conduit with the fastest |
| velocity will control the time step selection. |
| You have further control by using the modify |
| conduit option in the HYDRAULICS Job Control. |
==========

Conduit Name	Courant Ratio	
S_Ditch01	1.63	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
S_Ditch02	3.18	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
S-Cv03	3.16	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
S_Ditch03	1.66	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
S_Ditch04	6.90	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N_Ditch01	6.73	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N_Ditch02	12.61	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N_Ditch03	3.75	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N_Ditch04	2.99	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N_Ditch05	6.03	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N_Ditch06	3.00	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N_Ditch07	4.13	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N_Ditch08	3.71	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Stream-US1	0.98	
Stream-DS	0.59	
S-Ov03	3.31	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Stream-US2	1.78	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N_Ditch00	2.05	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
S_Ditch00	2.68	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
S-Cv01	15.83	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
S-Ov01	11.20	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
S-Cv02	3.16	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
S-Ov02	2.82	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
S-Cv04	19.49	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
S-Ov04	15.92	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Spenc-Cv.1	20.85	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Spenc-Ov	44.38	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Cv01	13.12	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Ov01	9.28	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Cv02	18.14	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Ov02	12.82	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Cv03	20.00	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Ov03	14.14	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Cv04	19.56	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Ov04	13.83	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Cv05	10.28	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Ov05	7.27	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Cv06	34.62	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Ov06	24.48	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Cv07.1	19.57	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Ov07	13.83	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Cv08.1	19.80	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
N-Ov08	14.00	===> Warning ! (sqrt(wave celerity)*time step/conduit length)

==========
| Conduit Volume |
==========

Full pipe or full open conduit volume
Input full depth volume..... 3.5674E+06 cubic feet

===> Warning !! The upstream and downstream junctions for the following conduits
have been reversed to correspond to the positive flow and decreasing

slope convention. A negative flow in the output thus means
the flow was from your original upstream junction to your original
downstream junction. Any initial flow has been multiplied by -1.

1. Conduit #...S-Cv02 has been changed.
2. Conduit #...Spenc-Cv.1 has been changed.
3. Conduit #...N-Cv03 has been changed.

Table E3a - Junction Data

Inp Num	Junction Name	Ground Elevation	Crown Elevation	Invert Elevation	Qinst cfs	Initial Depth-ft	Interface Flow (%)
1	F3m1_2b	800.0000	782.3600	777.9000	0.0000	0.0000	100.0000
2	S01d	800.0000	783.7500	777.7500	0.0000	0.0000	100.0000
3	F3m2c_2d	800.0000	780.4700	774.4700	0.0000	0.0000	100.0000
4	S02d	800.0000	780.4900	774.4900	0.0000	0.0000	100.0000
5	F3m2e_2f	800.0000	779.4200	773.4200	0.0000	0.0000	100.0000
6	F3m2h	800.0000	779.3600	773.3600	0.0000	0.0000	100.0000
7	F3m2g	800.0000	776.7900	770.7900	0.0000	0.0000	100.0000
8	S03d	800.0000	776.4800	770.4800	0.0000	0.0000	100.0000
9	Spen-ds	800.0000	778.0600	766.3200	0.0000	0.0000	100.0000
10	F3k	800.0000	778.2500	765.8600	0.0000	0.0000	100.0000
11	F3l1-l3a	800.0000	783.1000	777.1000	0.0000	0.0000	100.0000
12	F3l3b	800.0000	782.8900	776.8900	0.0000	0.0000	100.0000
13	N02a	800.0000	782.1200	776.1200	0.0000	0.0000	100.0000
14	N02d	800.0000	781.9500	775.9500	0.0000	0.0000	100.0000
15	N03a	800.0000	781.6100	775.6100	0.0000	0.0000	100.0000
16	N03d	800.0000	781.7400	775.7400	0.0000	0.0000	100.0000
17	F3l3c	800.0000	779.8200	773.8200	0.0000	0.0000	100.0000
18	N04d	800.0000	779.7700	773.7700	0.0000	0.0000	100.0000
19	F3l3d_3e	800.0000	778.5500	772.5500	0.0000	0.0000	100.0000
20	F3l3f_3g	800.0000	778.3000	772.3000	0.0000	0.0000	100.0000
21	N06a	800.0000	778.0800	772.0800	0.0000	0.0000	100.0000
22	N06d	800.0000	777.9700	771.9700	0.0000	0.0000	100.0000
23	F3l3i	800.0000	777.2100	770.8900	0.0000	0.0000	100.0000
24	N07d	800.0000	777.0100	770.6100	0.0000	0.0000	100.0000
25	F3l3h	800.0000	775.9800	769.9800	0.0000	0.0000	100.0000
26	N08d	800.0000	775.9600	769.9600	0.0000	0.0000	100.0000
27	North	800.0000	780.3600	770.3600	0.0000	0.0000	100.0000
28	outfall	800.0000	770.8300	760.8300	0.0000	0.0000	100.0000
29	Out-Gold	800.0000	776.6200	774.0000	0.0000	0.0000	100.0000
30	stream	800.0000	778.1100	768.1100	0.0000	0.0000	100.0000
31	N00	800.0000	786.7700	780.7700	0.0000	0.0000	100.0000
32	S00	800.0000	783.7400	779.7400	0.0000	0.0000	100.0000

Table E3b - Junction Data

Inp Num	Junction Name	X Coord.	Y Coord.	Type of Manhole	Type of Inlet	Maximum Capacity	Pavement Shape	Pavement Slope
1	F3m1_2b	0.0000	0.0000	No P	Normal		0	0.0000
2	S01d	0.0000	0.0000	No P	Normal		0	0.0000
3	F3m2c_2d	0.0000	0.0000	No P	Normal		0	0.0000
4	S02d	0.0000	0.0000	No P	Normal		0	0.0000
5	F3m2e_2f	0.0000	0.0000	No P	Normal		0	0.0000
6	F3m2h	0.0000	0.0000	No P	Normal		0	0.0000
7	F3m2g	0.0000	0.0000	No P	Normal		0	0.0000
8	S03d	0.0000	0.0000	No P	Normal		0	0.0000
9	Spen-ds	0.0000	0.0000	No P	Normal		0	0.0000
10	F3k	0.0000	0.0000	No P	Normal		0	0.0000
11	F3l1-l3a	0.0000	0.0000	No P	Normal		0	0.0000
12	F3l3b	0.0000	0.0000	No P	Normal		0	0.0000
13	N02a	0.0000	0.0000	No P	Normal		0	0.0000
14	N02d	0.0000	0.0000	No P	Normal		0	0.0000
15	N03a	0.0000	0.0000	No P	Normal		0	0.0000
16	N03d	0.0000	0.0000	No P	Normal		0	0.0000
17	F3l3c	0.0000	0.0000	No P	Normal		0	0.0000
18	N04d	0.0000	0.0000	No P	Normal		0	0.0000
19	F3l3d_3e	0.0000	0.0000	No P	Normal		0	0.0000
20	F3l3f_3g	0.0000	0.0000	No P	Normal		0	0.0000
21	N06a	0.0000	0.0000	No P	Normal		0	0.0000
22	N06d	0.0000	0.0000	No P	Normal		0	0.0000
23	F3l3i	0.0000	0.0000	No P	Normal		0	0.0000
24	N07d	0.0000	0.0000	No P	Normal		0	0.0000
25	F3l3h	0.0000	0.0000	No P	Normal		0	0.0000
26	N08d	0.0000	0.0000	No P	Normal		0	0.0000
27	North	0.0000	0.0000	No P	Normal		0	0.0000
28	outfall	0.0000	0.0000	No P	Normal		0	0.0000
29	Out-Gold	0.0000	0.0000	No P	Normal		0	0.0000
30	stream	0.0000	0.0000	No P	Normal		0	0.0000
31	N00	0.0000	0.0000	No P	Normal		0	0.0000
32	S00	0.0000	0.0000	No P	Normal		0	0.0000

Table E4 - Conduit Connectivity

Input Number	Conduit Name	Upstream Node	Downstream Node	Upstream Elevation	Downstream Elevation	
1	S_Ditch01	S01d	F3m2c_2d	777.7500	774.4700	No Design
2	S_Ditch02	S02d	F3m2e_2f	774.4900	773.4200	No Design
3	S-Cv03	F3m2e_2f	F3m2h	773.4200	773.3600	No Design
4	S_Ditch03	F3m2h	F3m2g	773.3600	770.7900	No Design
5	S_Ditch04	S03d	Spen-ds	770.4800	766.3200	No Design
6	N_Ditch01	F3l3b	N02a	776.8900	776.1200	No Design
7	N_Ditch02	N02d	N03a	775.9500	775.6100	No Design
8	N_Ditch03	N03d	F3l3c	775.7400	773.8200	No Design
9	N_Ditch04	N04d	F3l3d_3e	773.7700	772.5500	No Design
10	N_Ditch05	F3l3f_3g	N06a	772.3000	772.0800	No Design
11	N_Ditch06	N06d	F3l3i	771.9700	770.8900	No Design
12	N_Ditch07	N07d	F3l3h	770.6100	769.9800	No Design
13	N_Ditch08	N08d	F3k	769.9600	765.8600	No Design
14	Stream-US1	North	stream	770.3600	768.1100	No Design
15	Stream-DS	Spen-ds	outfall	766.3200	760.8300	No Design
16	S-Ov03	F3m2e_2f	Out-Gold	774.8200	774.6200	No Design

17	Stream-US2	stream	F3k	768.1100	765.8600	No Design
18	N_Ditch00	N00	F3l1-l3a	780.7700	777.1000	No Design
19	S_Ditch00	S00	F3m1_2b	779.7400	777.9000	No Design
20	S-Cv01	F3m1_2b	S01d	777.9000	777.7500	No Design
21	S-Ov01	F3m1_2b	S01d	780.3600	780.1600	No Design
22	S-Cv02	S02d	F3m2c_2d	774.4900	774.4700	No Design
23	S-Ov02	F3m2c_2d	S02d	777.1000	776.9000	No Design
24	S-Cv04	F3m2g	S03d	770.7900	770.4800	No Design
25	S-Ov04	F3m2g	S03d	773.5500	773.3500	No Design
26	Spenc-Cv.1	Spen-ds	F3k	766.3200	765.8600	No Design
27	Spenc-Ov	F3k	Spen-ds	774.2500	774.0600	No Design
28	N-Cv01	F3l1-l3a	F3l3b	777.1000	776.8900	No Design
29	N-Ov01	F3l1-l3a	F3l3b	780.2500	780.0500	No Design
30	N-Cv02	N02a	N02d	776.1200	775.9500	No Design
31	N-Ov02	N02a	N02d	778.4700	778.2700	No Design
32	N-Cv03	N03d	N03a	775.7400	775.6100	No Design
33	N-Ov03	N03a	N03d	777.4700	777.2700	No Design
34	N-Cv04	F3l3c	N04d	773.8200	773.7700	No Design
35	N-Ov04	F3l3c	N04d	777.4600	777.2600	No Design
36	N-Cv05	F3l3d_3e	F3l3f_3g	772.5500	772.3000	No Design
37	N-Ov05	F3l3d_3e	F3l3f_3g	775.4200	775.2200	No Design
38	N-Cv06	N06a	N06d	772.0800	771.9700	No Design
39	N-Ov06	N06a	N06d	774.2300	774.0300	No Design
40	N-Cv07.1	F3l3i	N07d	770.8900	770.6100	No Design
41	N-Ov07	F3l3i	N07d	775.2100	775.0100	No Design
42	N-Cv08.1	F3l3h	N08d	769.9800	769.9600	No Design
43	N-Ov08	F3l3h	N08d	773.8600	773.6600	No Design

==========
| Storage Junction Data |
==========

STORAGE JUNCTION NUMBER OR NAME	JUNCTION TYPE	MAXIMUM OR CONSTANT SURFACE AREA (FT2)	PEAK OR CONSTANT VOLUME (CUBIC FEET)	CROWN ELEVATION (FT)	DEPTH STARTS FROM
F3l3b	Stage/Area	14723.2800	292312.5204	800.0000	Node Invert
F3l3f_3g	Stage/Area	1742.4000	46470.5476	800.0000	Node Invert

==========
| Variable storage data for node | F3l3b
==========

Data Point	Elevation ft	Depth ft	Area ft^2	Volume ft^3	Area acres	Volume ac-ft
1	776.8900	0.0000	43.5600	0.0000	0.0010	0.0000
2	778.0000	1.1100	2134.4400	918.6712	0.0490	0.0211
3	780.0000	3.1100	5270.7600	8091.4795	0.1210	0.1858
4	782.0000	5.1100	14723.2800	27293.4804	0.3380	0.6266
5	800.0000	23.1100	14723.2800	292312.5204	0.3380	6.7106

==========
| Variable storage data for node | F3l3f_3g
==========

Data Point	Elevation ft	Depth ft	Area ft^2	Volume ft^3	Area acres	Volume ac-ft
1	772.3000	0.0000	43.5600	0.0000	0.0010	0.0000
2	774.0000	1.7000	1742.4000	1168.1476	0.0400	0.0268
3	775.3000	3.0000	1742.4000	3433.2676	0.0400	0.0788
4	800.0000	27.7000	1742.4000	46470.5476	0.0400	1.0668

==========
| FREE OUTFALL DATA (DATA GROUP I1) |
| BOUNDARY CONDITION ON DATA GROUP J1 |
==========

Outfall at Junction....outfall has boundary condition number... 1
Outfall at Junction....Out-Gold has boundary condition number... 2

==========
| INTERNAL CONNECTIVITY INFORMATION |
==========

CONDUIT	JUNCTION	JUNCTION
FREE # 1	outfall	BOUNDARY
FREE # 2	Out-Gold	BOUNDARY

==========
| Boundary Condition Information |
| Data Groups J1-J4 |
==========

BC NUMBER.. 1 has no control water surface.
BC NUMBER.. 2 has no control water surface.

==========
| XP Note Field Summary |
==========

==========
| Conduit Convergence Criteria |
==========

Conduit Name	Full Flow	Conduit Slope
S_Ditch01	1093.4128	0.0090
S_Ditch02	872.3959	0.0057
S-Cv03	1.1473	0.0005
S_Ditch03	837.4180	0.0071
S_Ditch04	2615.1821	0.0480
N_Ditch01	1076.0728	0.0087
N_Ditch02	978.7008	0.0072
N_Ditch03	1267.4045	0.0120
N_Ditch04	902.3507	0.0061
N_Ditch05	544.4678	0.0022
N_Ditch06	679.2905	0.0054
N_Ditch07	660.5770	0.0043
N_Ditch08	1381.6903	0.0254
Stream-US1	11550.4562	0.0033

Stream-DS	5467.8432	0.0054
S-Ov03	2389.1023	0.0019
Stream-US2	11473.5976	0.0048
N_Ditch00	1297.5987	0.0126
S_Ditch00	406.8824	0.0101
S-Cv01	8.6047	0.0049
S-Ov01	4395.9492	0.0066
S-Cv02	0.6621	0.0002
S-Ov02	2207.4283	0.0017
S-Cv04	6.8482	0.0145
S-Ov04	5241.1355	0.0093
Spenc-Cv.1	458.7549	0.0113
Spenc-Ov	90883.0461	0.0175
N-Cv01	9.2706	0.0057
N-Ov01	3989.3813	0.0055
N-Cv02	9.8053	0.0064
N-Ov02	4689.7224	0.0075
N-Cv03	9.0036	0.0054
N-Ov03	4924.3755	0.0083
N-Cv04	5.5222	0.0020
N-Ov04	4870.0719	0.0081
N-Cv05	8.9513	0.0053
N-Ov05	3530.4056	0.0043
N-Cv06	10.8969	0.0079
N-Ov06	6479.1172	0.0144
N-Cv07.1	13.0706	0.0114
N-Ov07	4871.0613	0.0081
N-Cv08.1	3.5140	0.0008
N-Ov08	4900.0173	0.0082

```
*==================================*
|    Initial Model Condition       |
| Initial Time =      0.02 hours   |
*==================================*
```

Junction / Depth / Elevation ===> "*" Junction is Surcharged.

F3m1_2b/	0.00 /	777.90		S01d/	0.00 /	777.75		F3m2c_2d/	0.00 /	774.47
S02d/	0.00 /	774.49		F3m2e_2f/	0.00 /	773.42		F3m2h/	0.00 /	773.36
F3m2g/	0.00 /	770.79		S03d/	0.00 /	770.48		Spen-ds/	0.00 /	766.32
F3k/	0.00 /	765.86		F3l1-l3a/	0.00 /	777.10		F3l3b/	0.00 /	776.89
N02a/	0.00 /	776.12		N02d/	0.00 /	775.95		N03a/	0.00 /	775.61
N03d/	0.00 /	775.74		F3l3c/	0.00 /	773.82		N04d/	0.00 /	773.77
F3l3d_3e/	0.00 /	772.55		F3l3f_3g/	0.00 /	772.30		N06a/	0.00 /	772.08
N06d/	0.00 /	771.97		F3l3i/	0.00 /	770.89		N07d/	0.00 /	770.61
F3l3h/	0.00 /	769.98		N08d/	0.00 /	769.96		North/	0.00 /	770.36
outfall/	0.00 /	760.83		Out-Gold/	0.00 /	774.00		stream/	0.00 /	768.11
N00/	0.00 /	780.77		S00/	0.00 /	779.74				

Conduit/ FLOW ===> "*" Conduit uses the normal flow option.

S_Ditch01/	0.00	S_Ditch02/	0.00	S-Cv03/	0.00
S_Ditch03/	0.00	S_Ditch04/	0.00	N_Ditch01/	0.00
N_Ditch02/	0.00	N_Ditch03/	0.00	N_Ditch04/	0.00
N_Ditch05/	0.00	N_Ditch06/	0.00	N_Ditch07/	0.00
N_Ditch08/	0.00	Stream-US1/	0.00	Stream-DS/	0.00
S-Ov03/	0.00	Stream-US2/	0.00	N_Ditch00/	0.00
S_Ditch00/	0.00	S-Cv01/	0.00	S-Ov01/	0.00
S-Cv02/	0.00	S-Ov02/	0.00	S-Cv04/	0.00
S-Ov04/	0.00	Spenc-Cv.1/	0.00	Spenc-Ov/	0.00
N-Cv01/	0.00	N-Ov01/	0.00	N-Cv02/	0.00
N-Ov02/	0.00	N-Cv03/	0.00	N-Ov03/	0.00
N-Cv04/	0.00	N-Ov04/	0.00	N-Cv05/	0.00
N-Ov05/	0.00	N-Cv06/	0.00	N-Ov06/	0.00
N-Cv07.1/	0.00	N-Ov07/	0.00	N-Cv08.1/	0.00
N-Ov08/	0.00	FREE # 1/	0.00	FREE # 2/	0.00

Conduit/ Velocity

S_Ditch01/	0.00	S_Ditch02/	0.00	S-Cv03/	0.00
S_Ditch03/	0.00	S_Ditch04/	0.00	N_Ditch01/	0.00
N_Ditch02/	0.00	N_Ditch03/	0.00	N_Ditch04/	0.00
N_Ditch05/	0.00	N_Ditch06/	0.00	N_Ditch07/	0.00
N_Ditch08/	0.00	Stream-US1/	0.00	Stream-DS/	0.00
S-Ov03/	0.00	Stream-US2/	0.00	N_Ditch00/	0.00
S_Ditch00/	0.00	S-Cv01/	0.00	S-Ov01/	0.00
S-Cv02/	0.00	S-Ov02/	0.00	S-Cv04/	0.00
S-Ov04/	0.00	Spenc-Cv.1/	0.00	Spenc-Ov/	0.00
N-Cv01/	0.00	N-Ov01/	0.00	N-Cv02/	0.00
N-Ov02/	0.00	N-Cv03/	0.00	N-Ov03/	0.00
N-Cv04/	0.00	N-Ov04/	0.00	N-Cv05/	0.00
N-Ov05/	0.00	N-Cv06/	0.00	N-Ov06/	0.00
N-Cv07.1/	0.00	N-Ov07/	0.00	N-Cv08.1/	0.00
N-Ov08/	0.00				

Conduit/ Cross Sectional Area

S_Ditch01/	0.00	S_Ditch02/	0.00	S-Cv03/	0.00
S_Ditch03/	0.00	S_Ditch04/	0.00	N_Ditch01/	0.00
N_Ditch02/	0.00	N_Ditch03/	0.00	N_Ditch04/	0.00
N_Ditch05/	0.00	N_Ditch06/	0.00	N_Ditch07/	0.00
N_Ditch08/	0.00	Stream-US1/	0.00	Stream-DS/	0.00
S-Ov03/	0.00	Stream-US2/	0.00	N_Ditch00/	0.00
S_Ditch00/	0.00	S-Cv01/	0.00	S-Ov01/	0.00
S-Cv02/	0.00	S-Ov02/	0.00	S-Cv04/	0.00
S-Ov04/	0.00	Spenc-Cv.1/	0.00	Spenc-Ov/	0.00
N-Cv01/	0.00	N-Ov01/	0.00	N-Cv02/	0.00
N-Ov02/	0.00	N-Cv03/	0.00	N-Ov03/	0.00
N-Cv04/	0.00	N-Ov04/	0.00	N-Cv05/	0.00
N-Ov05/	0.00	N-Cv06/	0.00	N-Ov06/	0.00
N-Cv07.1/	0.00	N-Ov07/	0.00	N-Cv08.1/	0.00
N-Ov08/	0.00				

Conduit/ Hydraulic Radius

S_Ditch01/	0.00	S_Ditch02/	0.00	S-Cv03/	0.00
S_Ditch03/	0.00	S_Ditch04/	0.00	N_Ditch01/	0.00
N_Ditch02/	0.00	N_Ditch03/	0.00	N_Ditch04/	0.00
N_Ditch05/	0.00	N_Ditch06/	0.00	N_Ditch07/	0.00
N_Ditch08/	0.00	Stream-US1/	0.00	Stream-DS/	0.00
S-Ov03/	0.00	Stream-US2/	0.00	N_Ditch00/	0.00
S_Ditch00/	0.00	S-Cv01/	0.00	S-Ov01/	0.00
S-Cv02/	0.00	S-Ov02/	0.00	S-Cv04/	0.00
S-Ov04/	0.00	Spenc-Cv.1/	0.00	Spenc-Ov/	0.00
N-Cv01/	0.00	N-Ov01/	0.00	N-Cv02/	0.00
N-Ov02/	0.00	N-Cv03/	0.00	N-Ov03/	0.00

N-Cv04/	0.00	N-Ov04/	0.00	N-Cv05/	0.00
N-Ov05/	0.00	N-Cv06/	0.00	N-Ov06/	0.00
N-Cv07.1/	0.00	N-Ov07/	0.00	N-Cv08.1/	0.00
N-Ov08/	0.00				

Conduit/	Upstream/	Downstream	Elevation					
S_Ditch01/	774.47/	774.47	S_Ditch02/	773.42/	773.42	S-Cv03/	773.36/	773.36
S_Ditch03/	770.79/	770.79	S_Ditch04/	766.32/	766.32	N_Ditch01/	776.12/	776.12
N_Ditch02/	775.61/	775.61	N_Ditch03/	773.82/	773.82	N_Ditch04/	772.55/	772.55
N_Ditch05/	772.08/	772.08	N_Ditch06/	770.89/	770.89	N_Ditch07/	769.98/	769.98
N_Ditch08/	765.86/	765.86	Stream-US1/	768.11/	768.11	Stream-DS/	760.83/	760.83
S-Ov03/	774.00/	774.00	Stream-US2/	765.86/	765.86	N_Ditch00/	777.10/	777.10
S_Ditch00/	777.90/	777.90	S-Cv01/	777.75/	777.75	S-Ov01/	777.75/	777.75
S-Cv02/	774.47/	774.47	S-Ov02/	774.49/	774.49	S-Cv04/	770.48/	770.48
S-Ov04/	770.48/	770.48	Spenc-Cv.1/	765.86/	765.86	Spenc-Ov/	766.32/	766.32
N-Cv01/	776.89/	776.89	N-Ov01/	776.89/	776.89	N-Cv02/	775.95/	775.95
N-Ov02/	775.95/	775.95	N-Cv03/	775.61/	775.61	N-Ov03/	775.74/	775.74
N-Cv04/	773.77/	773.77	N-Ov04/	773.77/	773.77	N-Cv05/	772.30/	772.30
N-Ov05/	772.30/	772.30	N-Cv06/	771.97/	771.97	N-Ov06/	771.97/	771.97
N-Cv07.1/	770.61/	770.61	N-Ov07/	770.61/	770.61	N-Cv08.1/	769.96/	769.96
N-Ov08/	769.96/	769.96						

Cycle 500 Time 8 Hrs - 20.00 Min

Junction /	Depth	/ Elevation	===> "*" Junction is Surcharged.					
F3m1_2b/	0.00 /	777.90	S01d/	0.00 /	777.75	F3m2c_2d/	0.00 /	774.47
S02d/	0.00 /	774.49	F3m2e_2f/	0.00 /	773.42	F3m2h/	0.00 /	773.36
F3m2g/	0.00 /	770.79	S03d/	0.00 /	770.48	Spen-ds/	0.00 /	766.32
F3k/	0.44 /	766.30	F3l1-l3a/	0.00 /	777.10	F3l3b/	0.00 /	776.89
N02a/	0.00 /	776.12	N02d/	0.00 /	775.95	N03a/	0.00 /	775.61
N03d/	0.00 /	775.74	F3l3c/	0.00 /	773.82	N04d/	0.00 /	773.77
F3l3d_3e/	0.02 /	772.57	F3l3f_3g/	0.02 /	772.32	N06a/	0.03 /	772.11
N06d/	0.02 /	771.99	F3l3i/	0.04 /	770.93	N07d/	0.03 /	770.64
F3l3h/	0.08 /	770.06	N08d/	0.02 /	769.98	North/	0.00 /	770.36
outfall/	0.00 /	760.83	Out-Gold/	0.00 /	774.00	stream/	0.00 /	768.11
N00/	0.00 /	780.77	S00/	0.00 /	779.74			

Conduit/	FLOW	===> "*" Conduit uses the normal flow option.					
S_Ditch01/	0.00	S_Ditch02/	0.00	S-Cv03/	0.00	S_Ditch03/	0.00
S_Ditch04/	0.00	N_Ditch01/	0.00	N_Ditch02/	0.00	N_Ditch03/	0.00
N_Ditch04/	0.00	N_Ditch05/	0.00*	N_Ditch06/	0.00*	N_Ditch07/	0.01*
N_Ditch08/	0.01*	Stream-US1/	0.00	Stream-DS/	0.00	S-Ov03/	0.00
Stream-US2/	0.00	N_Ditch00/	0.00	S_Ditch00/	0.00	S-Cv01/	0.00
S-Ov01/	0.00	S-Cv02/	0.00	S-Ov02/	0.00	S-Cv04/	0.00
S-Ov04/	0.00	Spenc-Cv.1/	0.00	Spenc-Ov/	0.00	N-Cv01/	0.00
N-Ov01/	0.00	N-Cv02/	0.00	N-Ov02/	0.00	N-Cv03/	0.00
N-Ov03/	0.00	N-Cv04/	0.00	N-Ov04/	0.00	N-Cv05/	0.00*
N-Ov05/	0.00	N-Cv06/	0.00	N-Ov06/	0.00	N-Cv07.1/	0.01
N-Ov07/	0.00	N-Cv08.1/	0.01	N-Ov08/	0.00	FREE # 1/	0.00
FREE # 2/	0.00						

Cycle 1000 Time 16 Hrs - 40.00 Min

Junction /	Depth	/ Elevation	===> "*" Junction is Surcharged.					
F3m1_2b/	0.28 /	778.18	S01d/	0.18 /	777.93	F3m2c_2d/	0.38 /	774.85
S02d/	0.21 /	774.70	F3m2e_2f/	0.36 /	773.78	F3m2h/	0.22 /	773.58
F3m2g/	0.29 /	771.08	S03d/	0.13 /	770.61	Spen-ds/	2.08 /	768.40
F3k/	2.76 /	768.62	F3l1-l3a/	0.62 /	777.72	F3l3b/	0.42 /	777.31
N02a/	0.62 /	776.74	N02d/	0.51 /	776.46	N03a/	0.73 /	776.34
N03d/	0.39 /	776.13	F3l3c/	0.69 /	774.51	N04d/	0.47 /	774.24
F3l3d_3e/	0.71 /	773.26	F3l3f_3g/	0.65 /	772.95	N06a/	0.68 /	772.76
N06d/	0.55 /	772.52	F3l3i/	0.63 /	771.52	N07d/	0.59 /	771.20
F3l3h/	0.74 /	770.72	N08d/	0.41 /	770.37	North/	3.13 /	773.49
outfall/	1.20 /	762.03	Out-Gold/	0.00 /	774.00	stream/	2.59 /	770.70
N00/	0.00 /	780.77	S00/	0.00 /	779.74			

Conduit/	FLOW	===> "*" Conduit uses the normal flow option.					
S_Ditch01/	0.33*	S_Ditch02/	0.35*	S-Cv03/	0.37	S_Ditch03/	0.39*
S_Ditch04/	0.41*	N_Ditch01/	1.82	N_Ditch02/	1.83	N_Ditch03/	1.84*
N_Ditch04/	1.91*	N_Ditch05/	2.23	N_Ditch06/	2.24*	N_Ditch07/	2.26
N_Ditch08/	2.28*	Stream-US1/	61.81	Stream-DS/	68.34	S-Ov03/	0.00
Stream-US2/	63.13	N_Ditch00/	0.00	S_Ditch00/	0.00	S-Cv01/	0.33
S-Ov01/	0.00	S-Cv02/	-0.35	S-Ov02/	0.00	S-Cv04/	0.41
S-Ov04/	0.00	Spenc-Cv.1/	-66.86	Spenc-Ov/	0.00	N-Cv01/	1.76
N-Ov01/	0.00	N-Cv02/	1.82	N-Ov02/	0.00	N-Cv03/	-1.83
N-Ov03/	0.00	N-Cv04/	1.91	N-Ov04/	0.00	N-Cv05/	2.13
N-Ov05/	0.00	N-Cv06/	2.23	N-Ov06/	0.00	N-Cv07.1/	2.25
N-Ov07/	0.00	N-Cv08.1/	2.28	N-Ov08/	0.00	FREE # 1/	68.34
FREE # 2/	0.00						

Cycle 1500 Time 25 Hrs - 0.00 Min

Junction /	Depth	/ Elevation	===> "*" Junction is Surcharged.					
F3m1_2b/	0.08 /	777.98	S01d/	0.05 /	777.80	F3m2c_2d/	0.15 /	774.62
S02d/	0.07 /	774.56	F3m2e_2f/	0.15 /	773.57	F3m2h/	0.09 /	773.45
F3m2g/	0.12 /	770.91	S03d/	0.05 /	770.53	Spen-ds/	1.00 /	767.32
F3k/	1.51 /	767.37	F3l1-l3a/	0.29 /	777.39	F3l3b/	0.20 /	777.09
N02a/	0.29 /	776.41	N02d/	0.22 /	776.17	N03a/	0.40 /	776.01
N03d/	0.19 /	775.93	F3l3c/	0.34 /	774.16	N04d/	0.23 /	774.00
F3l3d_3e/	0.32 /	772.87	F3l3f_3g/	0.31 /	772.61	N06a/	0.31 /	772.39
N06d/	0.27 /	772.24	F3l3i/	0.29 /	771.18	N07d/	0.28 /	770.89
F3l3h/	0.39 /	770.37	N08d/	0.20 /	770.16	North/	1.72 /	772.08
outfall/	0.54 /	761.37	Out-Gold/	0.00 /	774.00	stream/	1.12 /	769.23
N00/	0.00 /	780.77	S00/	0.00 /	779.74			

Conduit/	FLOW	===> "*" Conduit uses the normal flow option.					
S_Ditch01/	0.03*	S_Ditch02/	0.05*	S-Cv03/	0.05	S_Ditch03/	0.07*
S_Ditch04/	0.07*	N_Ditch01/	0.39*	N_Ditch02/	0.40	N_Ditch03/	0.41*
N_Ditch04/	0.43*	N_Ditch05/	0.49	N_Ditch06/	0.51*	N_Ditch07/	0.53
N_Ditch08/	0.56*	Stream-US1/	13.46	Stream-DS/	14.40	S-Ov03/	0.00
Stream-US2/	13.53	N_Ditch00/	0.00	S_Ditch00/	0.00	S-Cv01/	0.02
S-Ov01/	0.00	S-Cv02/	-0.04	S-Ov02/	0.00	S-Cv04/	0.07
S-Ov04/	0.00	Spenc-Cv.1/	-14.15	Spenc-Ov/	0.00	N-Cv01/	0.37
N-Ov01/	0.00	N-Cv02/	0.39	N-Ov02/	0.00	N-Cv03/	-0.40
N-Ov03/	0.00	N-Cv04/	0.42	N-Ov04/	0.00	N-Cv05/	0.46
N-Ov05/	0.00	N-Cv06/	0.50	N-Ov06/	0.00	N-Cv07.1/	0.52
N-Ov07/	0.00	N-Cv08.1/	0.54	N-Ov08/	0.00	FREE # 1/	14.40
FREE # 2/	0.00						

Cycle 2000 Time 33 Hrs - 20.00 Min

```
       Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
         F3m1_2b/   0.00 /   777.90            S01d/   0.00 /   777.75         F3m2c_2d/   0.02 /   774.49
            S02d/   0.00 /   774.49         F3m2e_2f/   0.00 /   773.42            F3m2h/   0.00 /   773.36
           F3m2g/   0.00 /   770.79            S03d/   0.00 /   770.48          Spen-ds/   0.02 /   766.34
             F3k/   0.48 /   766.34         F3l1-l3a/   0.00 /   777.10            F3l3b/   0.00 /   776.89
            N02a/   0.00 /   776.12            N02d/   0.00 /   775.95            N03a/   0.13 /   775.74
            N03d/   0.00 /   775.74           F3l3c/   0.00 /   773.82            N04d/   0.00 /   773.77
         F3l3d_3e/   0.00 /   772.55         F3l3f_3g/   0.00 /   772.30            N06a/   0.00 /   772.08
            N06d/   0.00 /   771.97           F3l3i/   0.00 /   770.89            N07d/   0.00 /   770.61
           F3l3h/   0.00 /   769.98            N08d/   0.00 /   769.96           North/   0.00 /   770.36
         outfall/   0.00 /   760.83         Out-Gold/   0.00 /   774.00          stream/   0.01 /   768.12
             N00/   0.00 /   780.77             S00/   0.00 /   779.74

          Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
        S_Ditch01/       0.00*       S_Ditch02/       0.00*          S-Cv03/       0.00        S_Ditch03/       0.00
        S_Ditch04/       0.00*       N_Ditch01/       0.00        N_Ditch02/       0.00*       N_Ditch03/       0.00
        N_Ditch04/       0.00        N_Ditch05/       0.00        N_Ditch06/       0.00        N_Ditch07/       0.00*
        N_Ditch08/       0.00*      Stream-US1/       0.00        Stream-DS/       0.01           S-Ov03/       0.00
       Stream-US2/       0.00*       N_Ditch00/       0.00        S_Ditch00/       0.00           S-Cv01/       0.00
           S-Ov01/       0.00          S-Cv02/       0.00          S-Ov02/       0.00           S-Cv04/       0.00
           S-Ov04/       0.00       Spenc-Cv.1/      -0.01         Spenc-Ov/       0.00           N-Cv01/       0.00
           N-Ov01/       0.00           N-Cv02/       0.00           N-Ov02/       0.00           N-Cv03/       0.00
           N-Ov03/       0.00           N-Cv04/       0.00           N-Ov04/       0.00           N-Cv05/       0.00
           N-Ov05/       0.00           N-Cv06/       0.00           N-Ov06/       0.00         N-Cv07.1/       0.00
           N-Ov07/       0.00         N-Cv08.1/       0.00           N-Ov08/       0.00         FREE # 1/       0.01
         FREE # 2/       0.00

 Cycle       2500      Time         41 Hrs - 40.00 Min

       Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
         F3m1_2b/   0.00 /   777.90            S01d/   0.00 /   777.75         F3m2c_2d/   0.02 /   774.49
            S02d/   0.00 /   774.49         F3m2e_2f/   0.00 /   773.42            F3m2h/   0.00 /   773.36
           F3m2g/   0.00 /   770.79            S03d/   0.00 /   770.48          Spen-ds/   0.00 /   766.32
             F3k/   0.46 /   766.32         F3l1-l3a/   0.00 /   777.10            F3l3b/   0.00 /   776.89
            N02a/   0.00 /   776.12            N02d/   0.00 /   775.95            N03a/   0.13 /   775.74
            N03d/   0.00 /   775.74           F3l3c/   0.00 /   773.82            N04d/   0.00 /   773.77
         F3l3d_3e/   0.00 /   772.55         F3l3f_3g/   0.00 /   772.30            N06a/   0.00 /   772.08
            N06d/   0.00 /   771.97           F3l3i/   0.00 /   770.89            N07d/   0.00 /   770.61
           F3l3h/   0.00 /   769.98            N08d/   0.00 /   769.96           North/   0.00 /   770.36
         outfall/   0.00 /   760.83         Out-Gold/   0.00 /   774.00          stream/   0.00 /   768.11
             N00/   0.00 /   780.77             S00/   0.00 /   779.74

          Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
        S_Ditch01/       0.00*       S_Ditch02/       0.00          S-Cv03/       0.00        S_Ditch03/       0.00
        S_Ditch04/       0.00*       N_Ditch01/       0.00        N_Ditch02/       0.00*       N_Ditch03/       0.00
        N_Ditch04/       0.00        N_Ditch05/       0.00        N_Ditch06/       0.00        N_Ditch07/       0.00
        N_Ditch08/       0.00*      Stream-US1/       0.00        Stream-DS/       0.00           S-Ov03/       0.00
       Stream-US2/       0.00*       N_Ditch00/       0.00        S_Ditch00/       0.00           S-Cv01/       0.00
           S-Ov01/       0.00          S-Cv02/       0.00          S-Ov02/       0.00           S-Cv04/       0.00
           S-Ov04/       0.00       Spenc-Cv.1/       0.00*        Spenc-Ov/       0.00           N-Cv01/       0.00
           N-Ov01/       0.00           N-Cv02/       0.00           N-Ov02/       0.00           N-Cv03/       0.00
           N-Ov03/       0.00           N-Cv04/       0.00           N-Ov04/       0.00           N-Cv05/       0.00
           N-Ov05/       0.00           N-Cv06/       0.00           N-Ov06/       0.00         N-Cv07.1/       0.00
           N-Ov07/       0.00         N-Cv08.1/       0.00           N-Ov08/       0.00         FREE # 1/       0.00
         FREE # 2/       0.00

 *==================================================*
 | Table E5 - Junction Time Limitation Summary      |
 |              (0.10 or 0.25)* Depth * Area        |
 | Time step = ------------------------------       |
 |                  Sum of Flow                     |
 *==================================================*
 |  The time this junction was the limiting junction |
 |               is listed in the third column.     |
 *==================================================*

         Junction     Time(.10)  Time(.25)  Time(sec)
-----------------     ---------  ---------  ---------
          F3m1_2b      183.2143   458.0357 172800.000
             S01d      316.0842   600.0000     0.0000
         F3m2c_2d      131.8693   329.6731     0.0000
             S02d      375.3870   600.0000     0.0000
         F3m2e_2f      133.2176   333.0441     0.0000
            F3m2h      376.0629   600.0000     0.0000
            F3m2g      159.6839   399.2098     0.0000
             S03d      318.1567   600.0000     0.0000
          Spen-ds      194.7914   486.9786     0.0000
              F3k      168.3799   420.9498     0.0000
         F3l1-l3a      129.3143   323.2859     0.0000
            F3l3b      240.8086   600.0000     0.0000
             N02a      192.6867   481.7168     0.0000
             N02d      282.3428   600.0000     0.0000
             N03a      229.0503   572.6257     0.0000
             N03d      258.6959   600.0000     0.0000
            F3l3c      179.2889   448.2222     0.0000
             N04d      189.9876   474.9690     0.0000
         F3l3d_3e      119.9031   299.7578     0.0000
         F3l3f_3g      137.6743   344.1858     0.0000
             N06a      112.7759   281.9397     0.0000
             N06d      204.8173   512.0433     0.0000
            F3l3i      127.9906   319.9765     0.0000
             N07d      218.7756   546.9389     0.0000
            F3l3h      125.6967   314.2417     0.0000
             N08d      287.9111   600.0000     0.0000
            North       98.7538   246.8844     0.0000
          outfall      600.0000   600.0000     0.0000
         Out-Gold      600.0000   600.0000     0.0000
           stream      109.7702   274.4255     0.0000
              N00      600.0000   600.0000     0.0000
              S00      600.0000   600.0000     0.0000
The junction requiring the smallest time step was...F3m1_2b

 *==========================================================*
 |       Table E5a - Conduit Explicit Condition Summary     |
 |       Courant   =         Conduit Length                 |
 |       Time step = ---------------------------------      |
 |                     Velocity + sqrt(g*depth)             |
 |                                                          |
 |                  Conduit Implicit Condition Summary      |
 |       Courant   =         Conduit Length                 |
 |       Time step = ---------------------------------      |
```

| Velocity |

The 3rd column is the Explicit time step times the minimum courant time step factor

Minimum Conduit Time Step in seconds in the 4th column in the list. Maximum possible is 10 * maximum time step

The 5th column is the maximum change at any time step during the simulation. The 6th column is the wobble value which is an indicator of the flow stability.

You should use this section to find those conduits that are slowing your model down. Use modify conduits to alter the length of the slow conduits to make your simulation faster, or change the conduit name to "CHME?????" where ????? are any characters, this will lengthen the conduit based on the model time step, not the value listed in modify conduits.

Conduit	Time(exp)	Expl*Cmin	Time(imp)	Time(min)	Max Qchange	Wobble	Type of Soln
S_Ditch01	65.8190	65.8190	206.5605	129.0000	0.0059	0.0076	Normal Soln
S_Ditch02	34.8975	34.8975	121.9880	0.0000	0.0048	0.0092	Normal Soln
S-Cv03	13.0030	13.0030	50.9792	0.0000	0.0056	6.4143	Normal Soln
S_Ditch03	66.9724	66.9724	215.3882	0.0000	0.0075	0.0092	Normal Soln
S_Ditch04	13.7240	13.7240	24.6403	0.0000	0.0143	0.0030	Normal Soln
N_Ditch01	12.8952	12.8952	41.7402	0.0000	0.0090	0.0269	Normal Soln
N_Ditch02	6.9140	6.9140	30.6999	0.0000	0.0101	0.0295	Normal Soln
N_Ditch03	21.6048	21.6048	59.1247	0.0000	0.0100	0.0227	Normal Soln
N_Ditch04	28.8557	28.8557	107.5189	0.0000	0.0117	0.0322	Normal Soln
N_Ditch05	13.9951	13.9951	73.5757	0.0000	0.0122	0.0600	Normal Soln
N_Ditch06	26.9333	26.9333	92.6345	0.0000	0.0111	0.0479	Normal Soln
N_Ditch07	20.0384	20.0384	80.1587	0.0000	0.0100	0.0492	Normal Soln
N_Ditch08	20.3868	20.3868	49.4700	0.0000	0.0171	0.0235	Normal Soln
Stream-US1	65.9066	65.9066	211.5736	0.0000	0.0559	0.0266	Normal Soln
Stream-DS	89.3505	89.3505	307.3216	0.0000	-0.0555	0.0579	Normal Soln
S-Ov03	59.0326	59.0326	171.8630	0.0000	0.0014	0.0003	Normal Soln
Stream-US2	52.5021	52.5021	177.3882	0.0000	0.0527	0.0267	Normal Soln
N_Ditch00	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
S_Ditch00	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
S-Cv01	3.5825	3.5825	10.4445	0.0000	0.0051	0.9720	Normal Soln
S-Ov01	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
S-Cv02	12.0109	12.0109	46.5728	0.0000	-0.0046	12.1443	Normal Soln
S-Ov02	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
S-Cv04	2.4023	2.4023	6.9846	0.0000	0.0142	1.2448	Normal Soln
S-Ov04	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
Spenc-Cv.1	2.5213	2.5213	9.0536	1267.0000	-0.0511	0.6925	Normal Soln
Spenc-Ov	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
N-Cv01	2.8421	2.8421	8.2087	0.0000	0.0150	3.2313	Normal Soln
N-Ov01	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
N-Cv02	2.0544	2.0544	5.9505	0.0000	0.0087	2.9947	Normal Soln
N-Ov02	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
N-Cv03	1.9403	1.9403	5.3542	28.0000	-0.0092	2.9569	Normal Soln
N-Ov03	9.0414	9.0414	16.2467	0.0000	-0.0029	0.0005	Normal Soln
N-Cv04	1.8588	1.8588	5.4797	0.0000	0.0105	5.3251	Normal Soln
N-Ov04	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
N-Cv05	3.2055	3.2055	9.5379	13.0000	0.0131	3.4687	Normal Soln
N-Ov05	29.9963	29.9963	73.2812	0.0000	0.0007	0.0001	Normal Soln
N-Cv06	1.0689	1.0689	3.0799	1394.0000	0.0195	2.8520	Normal Soln
N-Ov06	4.3012	4.3012	6.8939	0.0000	0.0028	0.0005	Normal Soln
N-Cv07.1	1.7740	1.7740	4.8058	25.0000	0.0113	2.6123	Normal Soln
N-Ov07	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
N-Cv08.1	1.7206	1.7206	4.5961	24.0000	0.0100	9.4755	Normal Soln
N-Ov08	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln

The conduit with the smallest time step limitation was..N-Cv06
The conduit with the largest wobble was.....S-Cv02
The conduit with the largest flow change in any consecutive time step.....Stream-US1

****
* End of time step DO-loop in Runoff *
****

Final Date (Mo/Day/Year) = 1/ 2/2001
Total number of time steps = 2879
Final Julian Date = 2001002
Final time of day = 86340. seconds.
Final time of day = 23.98 hours.
Final running time = 47.9833 hours.
Final running time = 1.9993 days.

****
* Extrapolation Summary for Watersheds *
* Explains the number of time steps and iterations *
* used in the solution of the subcatchments. *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of OVERLND Calls *
****

Subcatchment	# Steps	# Calls	Subcatchment	# Steps	# Calls			
F3m1_2b#1	0	0	F3m1_2b#2	0	0	F3m1_2b#3	0	0
F3m2c_2d#1	0	0	F3m2c_2d#2	0	0	F3m2e_2f#1	0	0
F3m2e_2f#2	0	0	F3m2h#1	0	0	F3m2g#1	0	0
F3l1-l3a#1	0	0	F3l1-l3a#2	0	0	F3l1-l3a#3	0	0
F3l3b#1	0	0	F3l3c#1	0	0	F3l3d_3e#1	0	0
F3l3d_3e#2	0	0	F3l3f_3g#1	0	0	F3l3f_3g#2	0	0
F3l3i#1	0	0	F3l3h#1	0	0	North#1	0	0
F3k#1	0	0						

##########
Rainfall input summary from Runoff Continuity Check
##########

Total rainfall read for gage # 1 is 2.2000 in
Total rainfall duration for gage # 1 is 1440.00 minutes

****
* Table R5. CONTINUITY CHECK FOR SURFACE WATER *

```
*       Any continuity error can be fixed by lowering the  *
*       wet and transition time step. The transition time  *
*       should not be much greater than the wet time step. *
************************************************************
```

	cubic feet	Inches over Total Basin
Total Precipitation (Rain plus Snow)	8.192877E+06	2.200
Total Infiltration	5.247941E+06	1.409
Total Evaporation	3.724035E+05	0.100
Surface Runoff from Watersheds	2.576491E+06	0.692
Total Water remaining in Surface Storage	0.000000E+00	0.000
Infiltration over the Pervious Area...	5.247941E+06	1.409

Infiltration + Evaporation + Surface Runoff + Snow removal + Water remaining in Surface Storage + Water remaining in Snow Cover.....	8.196835E+06	2.201
Total Precipitation + Initial Storage.	8.192877E+06	2.200

```
The error in continuity is calculated as
**************************************
* Precipitation + Initial Snow Cover  *
*      - Infiltration -               *
*Evaporation - Snow removal -         *
*Surface Runoff from Watersheds -     *
*Water in Surface Storage -           *
*Water remaining in Snow Cover        *
*-------------------------------------*
* Precipitation + Initial Snow Cover  *
**************************************
Percent Continuity Error.............                -0.0483

**************************************************
* Table R6. Continuity Check for Channel/Pipes     *
*           You should have zero continuity error  *
*           if you are not using runoff hydraulics *
**************************************************
```

	cubic feet	Inches over Total Basin
Initial Channel/Pipe Storage.....	0.000000E+00	0.000
Final Channel/Pipe Storage.....	0.000000E+00	0.000
Surface Runoff from Watersheds.....	2.576491E+06	0.692
Groundwater Subsurface Inflow or Diversion..	0.000000E+00	0.000
Evaporation Loss from Channels.....	0.000000E+00	0.000
Groundwater Flow Diverted Out of Network....	0.000000E+00	0.000
Channel/Pipe/Inlet Outflow.....	2.576491E+06	0.692
Initial Storage + Inflow.....	2.576491E+06	0.692
Final Storage + Outflow + Diverted GW.....	2.576491E+06	0.692

```
*******************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     ----------------------------------   *
*  Final Storage + Outflow  + Evaporation  *
*******************************************
Percent Continuity Error.....................          0.0000

        ################################################
        # Table R9. Summary Statistics for Subcatchments #
        ################################################

Note: Total Runoff Depth includes pervious & impervious areas.
      Pervious and Impervious Runoff Depth is only the runoff from those two areas.
      For catchments receiving redirected flow, this flow will only be shown if the flow is not
      directed directly to the outlet. Flow that is getting redirected is also listed with
      the original subcatchment.
```

Subcatchment.....	F3m1_2b#1	F3m1_2b#2	F3m1_2b#3	F3m2c_2d#1	F3m2c_2d#2	F3m2e_2f#1
Area (acres).....	3.17000	8.63000	0.05000	0.35100	0.21200	0.27700
Percent Impervious.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Rainfall (in)....	2.20000	2.20000	2.20000	2.20000	2.20000	2.20000
Max Intensity (in/hr)..	3.01620	3.01620	3.01620	3.01620	3.01620	3.01620
Pervious Area						
Total Runoff Depth (in)	0.54610	0.61778	0.97013	0.97600	0.97013	0.98035
Peak Runoff Rate (cfs).	1.36107	3.15831	0.08016	0.54523	0.33989	0.41861
Total Impervious Area						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Area with depression storage						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Area without depression storage						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Area						
Total Runoff Depth (in)	0.54610	0.61778	0.97013	0.97600	0.97013	0.98035
Peak Runoff Rate (cfs).	1.36107	3.15831	0.08016	0.54523	0.33989	0.41861
Rational Formula						
Pervious Tc. (mins)....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Perv. Intensity (in/hr)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Pervious C	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Tc. (mins)..	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Imp. Intensity (in/hr).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious C	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area (Ha).....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area Tc.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area Intensity.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Subcatchment.....	F3m2e_2f#2	F3m2h#1	F3m2g#1	F3l1-l3a#1	F3l1-l3a#2	F3l1-l3a#3
Area (acres).....	0.15800	0.33800	0.65400	5.02900	41.08300	14.67700
Percent Impervious.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Rainfall (in)....	2.20000	2.20000	2.20000	2.20000	2.20000	2.20000
Max Intensity (in/hr)..	3.01620	3.01620	3.01620	3.01620	3.01620	3.01620
Pervious Area						
Total Runoff Depth (in)	0.97013	0.97286	0.97639	0.48848	0.52256	0.71145
Peak Runoff Rate (cfs).	0.25331	0.47165	0.73256	2.14959	9.09394	4.78702
Total Impervious Area						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Area with depression storage						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Area without depression storage						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Area						
Total Runoff Depth (in)	0.97013	0.97286	0.97639	0.48848	0.52256	0.71145
Peak Runoff Rate (cfs).	0.25331	0.47165	0.73256	2.14959	9.09394	4.78702
Rational Formula						
Pervious Tc. (mins)....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Perv. Intensity (in/hr)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Pervious C	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Tc. (mins)..	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Imp. Intensity (in/hr).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious C	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area (Ha).....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area Tc.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area Intensity.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Subcatchment.....	F3l3b#1	F3l3c#1	F3l3d_3e#1	F3l3d_3e#2	F3l3f_3g#1	F3l3f_3g#2
Area (acres).....	1.59300	1.90900	0.09700	6.16900	1.86400	0.02500
Percent Impervious.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Rainfall (in)....	2.20000	2.20000	2.20000	2.20000	2.20000	2.20000
Max Intensity (in/hr)..	3.01620	3.01620	3.01620	3.01620	3.01620	3.01620
Pervious Area						
Total Runoff Depth (in)	0.70289	0.97344	1.86954	0.83860	1.21079	1.86954
Peak Runoff Rate (cfs).	0.75760	1.87859	0.26995	3.62667	1.45191	0.06957
Total Impervious Area						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Area with depression storage						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Area without depression storage						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Area						
Total Runoff Depth (in)	0.70289	0.97344	1.86954	0.83860	1.21079	1.86954
Peak Runoff Rate (cfs).	0.75760	1.87859	0.26995	3.62667	1.45191	0.06957
Rational Formula						
Pervious Tc. (mins)....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Perv. Intensity (in/hr)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Pervious C	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Tc. (mins)..	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Imp. Intensity (in/hr).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious C	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area (Ha).....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area Tc.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area Intensity.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Subcatchment.....	F3l3i#1	F3l3h#1	North#1	F3k#1
Area (acres).....	0.15700	0.09800	936.22500	3.13900
Percent Impervious.....	0.00000	0.00000	0.00000	0.00000
Total Rainfall (in)....	2.20000	2.20000	2.20000	2.20000
Max Intensity (in/hr)..	3.01620	3.01620	3.01620	3.01620
Pervious Area				
Total Runoff Depth (in)	1.86954	1.86954	0.69762	0.67397
Peak Runoff Rate (cfs).	0.43692	0.27273	153.52602	1.23043
Total Impervious Area				
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000
Impervious Area with depression storage				
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000

```
Impervious Area without depression storage
------------------------------------------
Total Runoff Depth (in)          0.00000          0.00000          0.00000          0.00000
Peak Runoff Rate (cfs).          0.00000          0.00000          0.00000          0.00000

Total Area
----------
Total Runoff Depth (in)          1.86954          1.86954          0.69762          0.67397
Peak Runoff Rate (cfs).          0.43692          0.27273        153.52602          1.23043

Rational Formula
----------------
Pervious Tc. (mins)....          0.00000          0.00000          0.00000          0.00000
Perv. Intensity (in/hr)          0.00000          0.00000          0.00000          0.00000
Pervious C ............          0.00000          0.00000          0.00000          0.00000
Impervious Tc. (mins)..          0.00000          0.00000          0.00000          0.00000
Imp. Intensity (in/hr).          0.00000          0.00000          0.00000          0.00000
Impervious C ..........          0.00000          0.00000          0.00000          0.00000
Partial Area (Ha)......          0.00000          0.00000          0.00000          0.00000
Partial Area Tc........          0.00000          0.00000          0.00000          0.00000
Partial Area Intensity.          0.00000          0.00000          0.00000          0.00000

===> Runoff simulation ended normally.

*==================================================*
|  Table E6. Final Model Condition                 |
|            This table is used for steady state   |
|            flow comparison and is the information|
|            saved to the hot-restart file.        |
|            Final Time =    48.017 hours         |
*==================================================*

Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
        F3m1_2b/   0.00 /   777.90/           S01d/   0.00 /   777.75/        F3m2c_2d/   0.02 /   774.49/
           S02d/   0.00 /   774.49/        F3m2e_2f/   0.00 /   773.42/           F3m2h/   0.00 /   773.36/
         F3m2g/   0.00 /   770.79/            S03d/   0.00 /   770.48/         Spen-ds/   0.00 /   766.32/
           F3k/   0.46 /   766.32/        F3l1-l3a/   0.00 /   777.10/           F3l3b/   0.00 /   776.89/
          N02a/   0.00 /   776.12/            N02d/   0.00 /   775.95/           N03a/   0.13 /   775.74/
          N03d/   0.00 /   775.74/           F3l3c/   0.00 /   773.82/           N04d/   0.00 /   773.77/
       F3l3d_3e/   0.00 /   772.55/        F3l3f_3g/   0.00 /   772.30/           N06a/   0.00 /   772.08/
          N06d/   0.00 /   771.97/           F3l3i/   0.00 /   770.89/           N07d/   0.00 /   770.61/
         F3l3h/   0.00 /   769.98/            N08d/   0.00 /   769.96/          North/   0.00 /   770.36/
        outfall/   0.00 /   760.83/        Out-Gold/   0.00 /   774.00/         stream/   0.00 /   768.11/
           N00/   0.00 /   780.77/             S00/   0.00 /   779.74/

  Conduit/       Flow   ===> "*" Conduit uses the normal flow option.
      S_Ditch01/       0.00*/       S_Ditch02/       0.00 /         S-Cv03/       0.00 /
      S_Ditch03/       0.00 /       S_Ditch04/       0.00*/      N_Ditch01/       0.00 /
      N_Ditch02/       0.00*/       N_Ditch03/       0.00 /      N_Ditch04/       0.00 /
      N_Ditch05/       0.00 /       N_Ditch06/       0.00 /      N_Ditch07/       0.00 /
      N_Ditch08/       0.00*/      Stream-US1/       0.00 /      Stream-DS/       0.00 /
         S-Ov03/       0.00 /      Stream-US2/       0.00*/      N_Ditch00/       0.00 /
      S_Ditch00/       0.00 /          S-Cv01/       0.00 /        S-Ov01/       0.00 /
         S-Cv02/       0.00 /          S-Ov02/       0.00 /        S-Cv04/       0.00 /
         S-Ov04/       0.00 /      Spenc-Cv.1/       0.00 /       Spenc-Ov/       0.00 /
         N-Cv01/       0.00 /          N-Ov01/       0.00 /        N-Cv02/       0.00 /
         N-Ov02/       0.00 /          N-Cv03/       0.00*/       N-Ov03/       0.00 /
         N-Cv04/       0.00 /          N-Ov04/       0.00 /        N-Cv05/       0.00 /
         N-Ov05/       0.00 /          N-Cv06/       0.00 /        N-Ov06/       0.00 /
       N-Cv07.1/       0.00 /          N-Ov07/       0.00 /      N-Cv08.1/       0.00 /
         N-Ov08/       0.00 /        FREE # 1/       0.00 /       FREE # 2/       0.00 /

    Conduit/   Velocity
      S_Ditch01/       0.00 /       S_Ditch02/       0.01 /         S-Cv03/       0.03 /
      S_Ditch03/       0.01 /       S_Ditch04/       0.00 /      N_Ditch01/       0.00 /
      N_Ditch02/       0.00 /       N_Ditch03/       0.00 /      N_Ditch04/       0.01 /
      N_Ditch05/       0.00 /       N_Ditch06/       0.00 /      N_Ditch07/       0.00 /
      N_Ditch08/       0.00 /      Stream-US1/       0.00 /      Stream-DS/       0.02 /
         S-Ov03/       0.00 /      Stream-US2/       0.00 /      N_Ditch00/       0.00 /
      S_Ditch00/       0.00 /          S-Cv01/       0.00 /        S-Ov01/       0.00 /
         S-Cv02/       0.00 /          S-Ov02/       0.00 /        S-Cv04/       0.00 /
         S-Ov04/       0.00 /      Spenc-Cv.1/       0.00 /       Spenc-Ov/       0.00 /
         N-Cv01/       0.00 /          N-Ov01/       0.00 /        N-Cv02/       0.00 /
         N-Ov02/       0.00 /          N-Cv03/       0.00 /        N-Ov03/       0.00 /
         N-Cv04/       0.00 /          N-Ov04/       0.00 /        N-Cv05/       0.00 /
         N-Ov05/       0.00 /          N-Cv06/       0.00 /        N-Ov06/       0.00 /
       N-Cv07.1/       0.00 /          N-Ov07/       0.00 /      N-Cv08.1/       0.00 /
         N-Ov08/       0.00 /

    Conduit/      Width
      S_Ditch01/       1.01 /       S_Ditch02/       1.00 /         S-Cv03/       1.10 /
      S_Ditch03/       1.00 /       S_Ditch04/       1.00 /      N_Ditch01/       1.00 /
      N_Ditch02/       1.08 /       N_Ditch03/       1.00 /      N_Ditch04/       1.00 /
      N_Ditch05/       1.00 /       N_Ditch06/       1.00 /      N_Ditch07/       1.00 /
      N_Ditch08/       1.24 /      Stream-US1/       0.00 /      Stream-DS/       0.04 /
         S-Ov03/       0.55 /      Stream-US2/       0.59 /      N_Ditch00/       1.00 /
      S_Ditch00/       1.00 /          S-Cv01/       0.78 /        S-Ov01/       0.00 /
         S-Cv02/       1.10 /          S-Ov02/       0.00 /        S-Cv04/       0.59 /
         S-Ov04/       0.00 /      Spenc-Cv.1/       7.45 /       Spenc-Ov/       0.00 /
         N-Cv01/       0.78 /          N-Ov01/       0.00 /        N-Cv02/       0.78 /
         N-Ov02/       0.00 /          N-Cv03/       0.80 /        N-Ov03/       0.06 /
         N-Cv04/       0.78 /          N-Ov04/       0.00 /        N-Cv05/       0.78 /
         N-Ov05/       0.02 /          N-Cv06/       0.78 /        N-Ov06/       0.04 /
       N-Cv07.1/       0.78 /          N-Ov07/       0.00 /      N-Cv08.1/       0.78 /
         N-Ov08/       0.00 /

     Junction/        EGL
       F3m1_2b/       0.00 /           S01d/       0.00 /       F3m2c_2d/       0.02 /
          S02d/       0.00 /        F3m2e_2f/       0.00 /          F3m2h/       0.00 /
         F3m2g/       0.00 /           S03d/       0.00 /        Spen-ds/       0.00 /
           F3k/       0.46 /       F3l1-l3a/       0.00 /          F3l3b/       0.00 /
          N02a/       0.00 /           N02d/       0.00 /           N03a/       0.13 /
          N03d/       0.00 /          F3l3c/       0.00 /           N04d/       0.00 /
       F3l3d_3e/       0.00 /       F3l3f_3g/       0.00 /           N06a/       0.00 /
          N06d/       0.00 /          F3l3i/       0.00 /           N07d/       0.00 /
         F3l3h/       0.00 /           N08d/       0.00 /          North/       0.00 /
        outfall/       0.00 /       Out-Gold/       0.00 /         stream/       0.00 /
           N00/       0.00 /            S00/       0.00 /

     Junction/  Freeboard
       F3m1_2b/      22.10 /           S01d/      22.25 /       F3m2c_2d/      25.51 /
```

S02d/	25.51 /	F3m2e_2f/	26.58 /	F3m2h/	26.64 /
F3m2g/	29.21 /	S03d/	29.52 /	Spen-ds/	33.68 /
F3k/	33.68 /	F3l1-l3a/	22.90 /	F3l3b/	23.11 /
N02a/	23.88 /	N02d/	24.05 /	N03a/	24.26 /
N03d/	24.26 /	F3l3c/	26.18 /	N04d/	26.23 /
F3l3d_3e/	27.45 /	F3l3f_3g/	27.70 /	N06a/	27.92 /
N06d/	28.03 /	F3l3i/	29.11 /	N07d/	29.39 /
F3l3h/	30.02 /	N08d/	30.04 /	North/	29.64 /
outfall/	39.17 /	Out-Gold/	26.00 /	stream/	31.89 /
N00/	19.23 /	S00/	20.26 /		

Junction/ Max Volume

F3m1_2b/	12.15 /	S01d/	7.76 /	F3m2c_2d/	21.69 /
S02d/	9.26 /	F3m2e_2f/	18.61 /	F3m2h/	8.27 /
F3m2g/	13.33 /	S03d/	5.00 /	Spen-ds/	42.05 /
F3k/	53.31 /	F3l1-l3a/	27.80 /	F3l3b/	1873.60 /
N02a/	27.94 /	N02d/	20.55 /	N03a/	24.47 /
N03d/	12.52 /	F3l3c/	29.90 /	N04d/	22.22 /
F3l3d_3e/	36.75 /	F3l3f_3g/	1796.20 /	N06a/	28.18 /
N06d/	20.12 /	F3l3i/	30.42 /	N07d/	23.66 /
F3l3h/	30.52 /	N08d/	12.50 /	North/	54.91 /
outfall/	23.53 /	Out-Gold/	0.50 /	stream/	42.58 /
N00/	0.00 /	S00/	0.00 /		

Junction/Total Fldng

F3m1_2b/	0.00 /	S01d/	0.00 /	F3m2c_2d/	0.00 /
S02d/	0.00 /	F3m2e_2f/	0.00 /	F3m2h/	0.00 /
F3m2g/	0.00 /	S03d/	0.00 /	Spen-ds/	0.00 /
F3k/	0.00 /	F3l1-l3a/	0.00 /	F3l3b/	0.00 /
N02a/	0.00 /	N02d/	0.00 /	N03a/	0.00 /
N03d/	0.00 /	F3l3c/	0.00 /	N04d/	0.00 /
F3l3d_3e/	0.00 /	F3l3f_3g/	0.00 /	N06a/	0.00 /
N06d/	0.00 /	F3l3i/	0.00 /	N07d/	0.00 /
F3l3h/	0.00 /	N08d/	0.00 /	North/	0.00 /
outfall/	0.00 /	Out-Gold/	0.00 /	stream/	0.00 /
N00/	0.00 /	S00/	0.00 /		

Conduit/ Cross Sectional Area

S_Ditch01/	0.00 /	S_Ditch02/	0.00 /	S-Cv03/	0.00 /
S_Ditch03/	0.00 /	S_Ditch04/	0.00 /	N_Ditch01/	0.00 /
N_Ditch02/	0.02 /	N_Ditch03/	0.00 /	N_Ditch04/	0.00 /
N_Ditch05/	0.00 /	N_Ditch06/	0.00 /	N_Ditch07/	0.00 /
N_Ditch08/	0.10 /	Stream-US1/	0.00 /	Stream-DS/	0.01 /
S-Ov03/	0.00 /	Stream-US2/	0.16 /	N_Ditch00/	0.00 /
S_Ditch00/	0.00 /	S-Cv01/	0.00 /	S-Ov01/	0.00 /
S-Cv02/	0.01 /	S-Ov02/	0.00 /	S-Cv04/	0.00 /
S-Ov04/	0.00 /	Spenc-Cv.1/	2.23 /	Spenc-Ov/	0.00 /
N-Cv01/	0.00 /	N-Ov01/	0.00 /	N-Cv02/	0.00 /
N-Ov02/	0.00 /	N-Cv03/	0.01 /	N-Ov03/	0.00 /
N-Cv04/	0.00 /	N-Ov04/	0.00 /	N-Cv05/	0.00 /
N-Ov05/	0.00 /	N-Cv06/	0.00 /	N-Ov06/	0.00 /
N-Cv07.1/	0.00 /	N-Ov07/	0.00 /	N-Cv08.1/	0.00 /
N-Ov08/	0.00 /				

Conduit/ Final Volume

S_Ditch01/	0.79 /	S_Ditch02/	0.02 /	S-Cv03/	0.00 /
S_Ditch03/	0.06 /	S_Ditch04/	0.02 /	N_Ditch01/	0.00 /
N_Ditch02/	0.86 /	N_Ditch03/	0.00 /	N_Ditch04/	0.02 /
N_Ditch05/	0.01 /	N_Ditch06/	0.01 /	N_Ditch07/	0.01 /
N_Ditch08/	16.48 /	Stream-US1/	0.02 /	Stream-DS/	8.88 /
S-Ov03/	0.00 /	Stream-US2/	72.08 /	N_Ditch00/	0.00 /
S_Ditch00/	0.00 /	S-Cv01/	0.00 /	S-Ov01/	0.00 /
S-Cv02/	1.40 /	S-Ov02/	0.00 /	S-Cv04/	0.00 /
S-Ov04/	0.00 /	Spenc-Cv.1/	91.06 /	Spenc-Ov/	0.00 /
N-Cv01/	0.00 /	N-Ov01/	0.00 /	N-Cv02/	0.00 /
N-Ov02/	0.00 /	N-Cv03/	0.21 /	N-Ov03/	0.00 /
N-Cv04/	0.00 /	N-Ov04/	0.00 /	N-Cv05/	0.00 /
N-Ov05/	0.00 /	N-Cv06/	0.00 /	N-Ov06/	0.00 /
N-Cv07.1/	0.00 /	N-Ov07/	0.00 /	N-Cv08.1/	0.00 /
N-Ov08/	0.00 /				

Conduit/ Hydraulic Radius

S_Ditch01/	0.00 /	S_Ditch02/	0.00 /	S-Cv03/	0.00 /
S_Ditch03/	0.00 /	S_Ditch04/	0.00 /	N_Ditch01/	0.00 /
N_Ditch02/	0.01 /	N_Ditch03/	0.00 /	N_Ditch04/	0.00 /
N_Ditch05/	0.00 /	N_Ditch06/	0.00 /	N_Ditch07/	0.00 /
N_Ditch08/	0.03 /	Stream-US1/	0.00 /	Stream-DS/	0.00 /
S-Ov03/	0.00 /	Stream-US2/	0.02 /	N_Ditch00/	0.00 /
S_Ditch00/	0.00 /	S-Cv01/	0.01 /	S-Ov01/	0.00 /
S-Cv02/	0.02 /	S-Ov02/	0.00 /	S-Cv04/	0.00 /
S-Ov04/	0.00 /	Spenc-Cv.1/	0.31 /	Spenc-Ov/	0.00 /
N-Cv01/	0.01 /	N-Ov01/	0.00 /	N-Cv02/	0.00 /
N-Ov02/	0.00 /	N-Cv03/	0.01 /	N-Ov03/	0.00 /
N-Cv04/	0.01 /	N-Ov04/	0.00 /	N-Cv05/	0.01 /
N-Ov05/	0.00 /	N-Cv06/	0.01 /	N-Ov06/	0.00 /
N-Cv07.1/	0.01 /	N-Ov07/	0.00 /	N-Cv08.1/	0.01 /
N-Ov08/	0.00 /				

Conduit/ Upstream/ Downstream Elevation

S_Ditch01/	777.75/	774.49	S_Ditch02/	774.49/	773.42	S-Cv03/	773.42/	773.36/
S_Ditch03/	773.36/	770.79	S_Ditch04/	770.48/	766.32	N_Ditch01/	776.89/	776.12/
N_Ditch02/	775.95/	775.74	N_Ditch03/	773.82/	773.82	N_Ditch04/	773.77/	772.55/
N_Ditch05/	772.30/	772.08	N_Ditch06/	771.97/	770.89	N_Ditch07/	770.61/	769.98/
N_Ditch08/	769.96/	766.32	Stream-US1/	770.36/	768.11	Stream-DS/	766.32/	760.83/
S-Ov03/	774.00/	774.00	Stream-US2/	768.11/	766.32	N_Ditch00/	777.10/	777.10/
S_Ditch00/	777.90/	777.90	S-Cv01/	777.90/	777.75	S-Ov01/	777.75/	777.75/
S-Cv02/	774.49/	774.49	S-Ov02/	774.49/	774.49	S-Cv04/	770.79/	770.48/
S-Ov04/	770.48/	770.48	Spenc-Cv.1/	766.32/	766.32	Spenc-Ov/	766.32/	766.32/
N-Cv01/	777.10/	776.89	N-Ov01/	776.89/	776.89	N-Cv02/	775.95/	775.95/
N-Ov02/	775.95/	775.95	N-Cv03/	775.74/	775.74	N-Ov03/	775.74/	775.74/
N-Cv04/	773.82/	773.77	N-Ov04/	773.77/	773.77	N-Cv05/	772.55/	772.30/
N-Ov05/	772.30/	772.30	N-Cv06/	772.08/	771.97	N-Ov06/	771.97/	771.97/
N-Cv07.1/	770.89/	770.61	N-Ov07/	770.61/	770.61	N-Cv08.1/	769.98/	769.96/
N-Ov08/	769.96/	769.96						

===
| Table E7 - Iteration Summary |
===

Total number of time steps simulated..... 2880
Total number of passes in the simulation..... 39068

```
Total number of time steps during simulation....      37571
Ratio of actual # of time steps / NTCYC.........     13.045
Average number of iterations per time step......      1.040
Average  time step size(seconds)................      4.599
Smallest time step size(seconds)................      1.053
Largest  time step size(seconds)................     60.000
Average minimum Conduit Courant time step (sec).     16.955
Average minimum implicit time step (sec)........      4.046
Average minimum junction time step (sec)........      4.046
Average Courant Factor Tf.......................      4.046
Number of times omega reduced...................       1479
```

===
| Table E8 - Junction Time Step Limitation Summary |
===
| Not Convr = Number of times this junction did not |
| converge during the simulation. |
| Avg Convr = Average junction iterations. |
| Conv err = Mean convergence error. |
| Omega Cng = Change of omega during iterations |
| Max Itern = Maximum number of iterations |
===

Junction	Not Convr	Avg Convr	Total Itt	Omega Cng	Max Itern	Ittrn >10	Ittrn >25	Ittrn >40
F3m1_2b	0	1.26	47488	0	5	0	0	0
S01d	0	1.32	49510	0	5	0	0	0
F3m2c_2d	0	1.18	44247	0	4	0	0	0
S02d	0	1.35	50631	0	5	0	0	0
F3m2e_2f	0	1.32	49513	0	6	0	0	0
F3m2h	0	1.30	48750	0	5	0	0	0
F3m2g	20	1.52	57279	49	501	25	23	22
S03d	94	2.52	94827	129	501	98	95	94
Spen-ds	0	2.01	75645	0	106	53	21	14
F3k	0	2.01	75330	4	29	16	1	0
F3l1-l3a	0	1.40	52573	31	24	1	0	0
F3l3b	0	1.60	60181	265	14	1	0	0
N02a	0	1.55	58247	57	8	0	0	0
N02d	0	1.71	64260	214	106	3	2	1
N03a	0	1.48	55773	1	260	1	1	1
N03d	0	1.45	54463	2	372	2	2	2
F3l3c	0	1.45	54336	16	17	2	0	0
N04d	0	1.64	61543	60	60	7	2	1
F3l3d_3e	0	1.52	56952	0	9	0	0	0
F3l3f_3g	0	1.78	66937	0	5	0	0	0
N06a	0	1.62	60736	17	447	3	3	3
N06d	0	1.65	61862	85	447	4	2	2
F3l3i	33	2.01	75406	180	501	36	34	34
N07d	58	2.44	91500	244	501	68	63	63
F3l3h	0	1.57	58957	31	7	0	0	0
N08d	0	1.54	57944	94	9	0	0	0
North	0	1.60	60251	0	5	0	0	0
outfall	0	1.79	67075	0	6	0	0	0
Out-Gold	0	1.06	39981	0	4	0	0	0
stream	0	1.92	72022	0	6	0	0	0
N00	0	1.00	37571	0	1	0	0	0
S00	0	1.00	37571	0	1	0	0	0

```
Total number of iterations for all junctions..   1899361
Minimum number of possible iterations.........   1202272
Efficiency of the simulation..................      1.58
                                                Excellent Efficiency
```

===
| Extran Efficiency is an indicator of the efficiency of |
| the simulation. Ideal efficiency is one iteration per |
| time step. Altering the underrelaxation parameter, |
| lowering the time step, increasing the flow and head |
| tolerance are good ways of improving the efficiency, |
| another is lowering the internal time step. The lower the|
| efficiency generally the faster your model will run. |
| If your efficiency is less than 1.5 then you may try |
| increasing your time step so that your overall simulation|
| is faster. Ideal efficiency would be around 2.0 |
| |
| Good Efficiency < 1.5 mean iterations |
| Excellent Efficiency < 2.5 and > 1.5 mean iterations |
| Good Efficiency < 4.0 and > 2.5 mean iterations |
| Fair Efficiency < 7.5 and > 4.0 mean iterations |
| Poor Efficiency > 7.5 mean iterations |
===

===
| Table E9 - JUNCTION SUMMARY STATISTICS |
| The Maximum area is only the area of the node, it |
| does not include the area of the surrounding conduits|
===

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Time of Occurence Min.	Feet of Surcharge at Max Elevation	Freeboard of node feet	Maximum Junction Area ft^2	Maximum Gutter Depth feet	Maximum Gutter Width feet	Maximum Gutter Velocity ft/s
F3m1_2b	800.0000	782.3600	778.8665	12	29	0.0000	21.1335	12.5660	0.0000	0.0000	0.0000
S01d	800.0000	783.7500	778.3674	12	30	0.0000	21.6326	12.5660	0.0000	0.0000	0.0000
F3m2c_2d	800.0000	780.4700	776.1958	12	37	0.0000	23.8042	12.5660	0.0000	0.0000	0.0000
S02d	800.0000	780.4900	775.2267	12	40	0.0000	24.7733	12.5660	0.0000	0.0000	0.0000
F3m2e_2f	800.0000	779.4200	774.9013	12	42	0.0000	25.0987	12.5660	0.0000	0.0000	0.0000
F3m2h	800.0000	779.3600	774.0179	12	44	0.0000	25.9821	12.5660	0.0000	0.0000	0.0000
F3m2g	800.0000	776.7900	771.8508	12	43	0.0000	28.1492	12.5660	0.0000	0.0000	0.0000
S03d	800.0000	776.4800	770.8778	12	43	0.0000	29.1222	12.5660	0.0000	0.0000	0.0000
Spen-ds	800.0000	778.0600	769.6661	14	27	0.0000	30.3339	12.5660	0.0000	0.0000	0.0000
F3k	800.0000	778.2500	770.1023	14	26	0.0000	29.8977	12.5660	0.0000	0.0000	0.0000
F3l1-l3a	800.0000	783.1000	779.3125	12	54	0.0000	20.6875	12.5660	0.0000	0.0000	0.0000
F3l3b	800.0000	782.8900	778.3999	13	0	0.0000	21.6001	2650.1122	0.0000	0.0000	0.0000
N02a	800.0000	782.1200	778.3435	13	0	0.0000	21.6565	12.5660	0.0000	0.0000	0.0000
N02d	800.0000	781.9500	777.5851	13	0	0.0000	22.4149	12.5660	0.0000	0.0000	0.0000
N03a	800.0000	781.6100	777.5570	13	0	0.0000	22.4430	12.5660	0.0000	0.0000	0.0000
N03d	800.0000	781.7400	776.7366	13	1	0.0000	23.2634	12.5660	0.0000	0.0000	0.0000
F3l3c	800.0000	779.8200	776.1995	13	5	0.0000	23.8005	12.5660	0.0000	0.0000	0.0000
N04d	800.0000	779.7700	775.5380	13	7	0.0000	24.4620	12.5660	0.0000	0.0000	0.0000
F3l3d_3e	800.0000	778.5500	775.4742	13	7	0.0000	24.5258	12.5660	0.0000	0.0000	0.0000

F313f_3g	800.0000	778.3000	774.3604	13	7	0.0000	25.6396	1742.4000	0.0000	0.0000	0.0000
N06a	800.0000	778.0800	774.3225	13	7	0.0000	25.6775	12.5660	0.0000	0.0000	0.0000
N06d	800.0000	777.9700	773.5715	13	9	0.0000	26.4285	12.5660	0.0000	0.0000	0.0000
F313i	800.0000	777.2100	773.3108	13	10	0.0000	26.6892	12.5660	0.0000	0.0000	0.0000
N07d	800.0000	777.0100	772.4931	13	12	0.0000	27.5069	12.5660	0.0000	0.0000	0.0000
F313h	800.0000	775.9800	772.4084	13	13	0.0000	27.5916	12.5660	0.0000	0.0000	0.0000
N08d	800.0000	775.9600	770.9548	13	13	0.0000	29.0452	12.5660	0.0000	0.0000	0.0000
North	800.0000	780.3600	774.7294	14	15	0.0000	25.2706	12.5660	0.0000	0.0000	0.0000
outfall	800.0000	770.8300	762.7022	14	27	0.0000	37.2978	12.5660	0.0000	0.0000	0.0000
Out-Gold	800.0000	776.6200	774.0397	12	42	0.0000	25.9603	12.5660	0.0000	0.0000	0.0000
stream	800.0000	778.1100	771.4985	14	21	0.0000	28.5015	12.5660	0.0000	0.0000	0.0000
N00	800.0000	786.7700	780.7700	0	0	0.0000	19.2300	12.5660	0.0000	0.0000	0.0000
S00	800.0000	783.7400	779.7400	0	0	0.0000	20.2600	12.5660	0.0000	0.0000	0.0000

Table E10 - CONDUIT SUMMARY STATISTICS

Note: The peak flow may be less than the design flow and the conduit may still surcharge because of the downstream boundary conditions.

* denotes an open conduit that has been overtopped this is a potential source of severe errors

Conduit Name	Design Flow (cfs)	Conduit Design Velocity (ft/s)	Maximum Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Time of Occurence Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Time of Occurence Min.	Ratio of Max. to Design Flow	Maximum Water Elev at Pipe Ends Upstream (ft)	Maximum Water Elev at Pipe Ends Dwnstrm (ft)	Ratio d/D US	Ratio d/D DS
S_Ditch01	1093.413	9.5913	72.0000	4.1699	12	30	1.7737	12	19	0.0038	778.3674	776.1958	0.103	0.288
S_Ditch02	872.3959	7.6526	72.0000	4.0061	12	39	1.5388	12	18	0.0046	775.2267	774.9013	0.123	0.247
S-Cv03	1.1473	0.7170	15.0000	3.6357	12	42	2.3647	12	42	3.1690	774.9013	774.0179	1.185	0.526
S_Ditch03	837.4180	7.3458	72.0000	3.6791	12	44	1.6690	12	45	0.0044	774.0179	771.8508	0.110	0.177
S_Ditch04	2615.182	22.2379	72.0000	3.7982	12	43	3.5170	12	5	0.0015	770.8778	769.6661	0.066	0.558
N_Ditch01	1076.073	9.4392	72.0000	14.4193	12	58	2.1276	12	19	0.0134	778.3999	778.3435	0.252	0.371
N_Ditch02	978.7008	8.5851	72.0000	14.4057	13	0	1.5438	12	24	0.0147	777.5851	777.5570	0.273	0.324
N_Ditch03	1267.404	11.1176	72.0000	14.4033	13	1	2.6991	12	43	0.0114	776.7366	776.1995	0.166	0.397
N_Ditch04	902.3507	7.9154	72.0000	14.4904	13	6	1.8606	14	5	0.0161	775.5380	775.4742	0.295	0.487
N_Ditch05	544.4678	4.7760	72.0000	16.2835	13	7	1.3469	12	9	0.0299	774.3604	774.3225	0.343	0.374
N_Ditch06	679.2905	7.3516	72.0000	16.2599	13	8	2.1566	12	20	0.0239	773.5715	773.3108	0.267	0.403
N_Ditch07	660.5770	6.6323	72.0000	16.2281	13	11	1.8071	12	18	0.0246	772.4931	772.4084	0.314	0.405
N_Ditch08	1381.690	13.7482	72.0000	16.2257	13	13	3.4115	2	9	0.0117	770.9548	770.1023	0.166	0.707
Stream-US1	11550.46	6.0359	120.0000	153.4675	14	15	3.2603	14	15	0.0133	774.7294	771.4985	0.437	0.339
Stream-DS	5467.843	5.0714	120.0000	158.3445	14	28	3.3057	14	56	0.0290	769.6661	762.7022	0.335	0.187
S-Ov03	2389.102	5.9579	24.0000	0.3889	12	42	0.5993	12	42	0.0002	774.9013	774.6597	0.041	0.020
Stream-US2	11473.60	8.3048	120.0000	153.0010	14	18	2.6169	18	2	0.0133	771.4985	770.1023	0.339	0.424
N_Ditch00	1297.599	11.3824	72.0000	0.0000	0	0	0.0000	0	0	0.0000	780.7700	779.3125	.0000	.0000
S_Ditch00	406.8824	7.8247	48.0000	0.0000	0	0	0.0000	0	0	0.0000	779.7400	778.8665	.0000	.0000
S-Cv01	8.6047	2.7390	24.0000	4.1819	12	29	2.9126	12	28	0.4860	778.8665	778.3674	0.483	0.309
S-Ov01	4395.949	10.9625	24.0000	0.0000	0	0	0.0000	0	0	0.0000	778.3674	778.3674	.0000	.0000
S-Cv02	0.6621	0.4138	15.0000	-4.0200	12	37	-2.5907	12	37	-6.0714	776.1958	775.2267	1.365	0.605
S-Ov02	2207.428	5.5048	24.0000	0.0000	0	0	0.0000	0	0	0.0000	775.2267	775.2267	.0000	.0000
S-Cv04	6.8482	3.8753	18.0000	3.7986	12	43	3.0641	12	43	0.5547	771.8508	770.8778	0.707	0.265
S-Ov04	5241.135	13.0702	24.0000	0.0000	0	0	0.0000	0	0	0.0000	770.8778	770.8778	.0000	.0000
Spenc-Cv.1	458.7549	9.9729	75.0000	-157.765	14	24	-4.5087	14	18	-0.3439	770.1023	769.6661	0.605	0.609
Spenc-Ov	90883.05	28.3832	48.0000	0.0000	0	0	0.0000	0	0	0.0000	769.6661	769.6661	.0000	.0000
N-Cv01	9.2706	2.9509	24.0000	14.3079	12	54	4.4696	12	54	1.5434	779.3125	778.3999	1.106	0.755
N-Ov01	3989.381	9.9735	24.0000	0.0000	0	0	0.0000	0	0	0.0000	778.3999	778.3999	.0000	.0000
N-Cv02	9.8053	3.1211	24.0000	14.4068	13	0	4.4620	13	0	1.4693	778.3435	777.5851	1.112	0.818
N-Ov02	4689.722	11.7243	24.0000	0.0000	0	0	0.0000	0	0	0.0000	777.5851	777.5851	.0000	.0000
N-Cv03	9.0036	2.8659	24.0000	-13.2918	13	0	-4.4976	12	51	-1.4763	777.5570	776.7366	0.908	0.563
N-Ov03	4924.375	12.3109	24.0000	1.1128	13	0	1.4822	13	1	0.0002	777.5570	777.3531	0.043	0.042
N-Cv04	5.5222	1.7578	24.0000	14.5442	13	4	4.4933	13	4	2.6338	776.1995	775.5380	1.190	0.884
N-Ov04	4870.072	12.1752	24.0000	0.0000	0	0	0.0000	0	0	0.0000	775.5380	775.5380	.0000	.0000
N-Cv05	8.9513	2.8493	24.0000	15.4957	13	7	4.9121	13	7	1.7311	775.4742	774.3604	1.462	1.030
N-Ov05	3530.406	8.8260	24.0000	0.1719	13	7	0.6405	13	7	0.0000	775.4742	775.2389	0.027	.0095
N-Cv06	10.8969	3.4686	24.0000	14.5791	13	7	4.5164	13	6	1.3379	774.3225	773.5715	1.121	0.801
N-Ov06	6479.117	16.1978	24.0000	1.7045	13	7	2.0181	13	7	0.0003	774.3225	774.1160	0.046	0.043
N-Cv07.1	13.0706	4.1605	24.0000	16.2568	13	10	5.5523	2	7	1.2438	773.3108	772.4931	1.210	0.942
N-Ov07	4871.061	12.1777	24.0000	0.0000	0	0	0.0000	0	0	0.0000	772.4931	772.4931	.0000	.0000
N-Cv08.1	3.5140	1.1185	24.0000	16.2267	13	13	5.2914	13	13	4.6177	772.4084	770.9548	1.214	0.497
N-Ov08	4900.017	12.2500	24.0000	0.0000	0	0	0.0000	0	0	0.0000	770.9548	770.9548	.0000	.0000
FREE # 1	Undefnd	Undefnd	Undefn	158.3445	14	27								
FREE # 2	Undefnd	Undefnd	Undefn	0.3889	12	42								

Table E11. Area assumptions used in the analysis| Subcritical and Critical flow assumptions from Subroutine Head. See Figure 17-1 in the manual for further information.

Conduit Name	Duration of Dry Flow(min)	Duration of Sub-Critical Flow(min)	Durat. of Upstream Critical Flow(min)	Durat. of Downstream Critical Flow(min)	Maximum Hydraulic Radius-m	Maximum X-Sect Area(ft^2)	Maximum Vel*D (ft^2/s)
S_Ditch01	567.5333	2312.4667	0.0000	0.0000	0.4102	5.5378	1.8416
S_Ditch02	598.7000	2281.3000	0.0000	0.0000	0.4538	4.9284	1.5137
S-Cv03	560.5000	2319.5000	0.0000	0.0000	0.4477	1.2656	2.5292
S_Ditch03	562.2222	2317.7778	0.0000	0.0000	0.3987	3.1132	1.4341
S_Ditch04	568.2222	2311.7778	0.0000	0.0000	0.3157	13.8531	2.2006
N_Ditch01	661.8571	2218.1429	0.0000	0.0000	0.8255	12.4463	2.9321
N_Ditch02	1171.6000	1708.4000	0.0000	0.0000	0.8663	11.4386	2.5743
N_Ditch03	838.1111	2041.8889	0.0000	0.0000	0.6101	10.6908	4.4068
N_Ditch04	568.4444	2311.5556	0.0000	0.0000	0.9700	19.1898	2.6382
N_Ditch05	128.0000	2752.0000	0.0000	0.0000	1.0632	16.0460	2.3278
N_Ditch06	149.5000	2730.5000	0.0000	0.0000	0.8692	11.8493	3.7903
N_Ditch07	129.5000	2750.5000	0.0000	0.0000	0.9917	14.3024	2.9754
N_Ditch08	131.6667	2748.3333	0.0000	0.0000	0.6505	20.7793	5.5085
Stream-US1	1545.4167	1334.5833	0.0000	0.0000	1.4883	37.3597	12.6419
Stream-DS	530.5000	2349.5000	0.0000	0.0000	1.8178	36.8211	8.3659
S-Ov03	2853.7922	0.0000	0.0000	26.2078	0.0398	0.4106	0.0362
Stream-US2	677.5625	2202.4375	0.0000	0.0000	1.0985	98.2076	8.2023
N_Ditch00	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
S_Ditch00	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
S-Cv01	1839.4773	1040.5227	0.0000	0.0000	0.4749	1.1473	2.3056
S-Ov01	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
S-Cv02	594.3000	2285.7000	0.0000	0.0000	0.4474	1.3349	3.1871
S-Ov02	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

S-Cv04	726.4444	2153.5556	0.0000	0.0000	0.4239	0.8066	2.2344
S-Ov04	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Spenc-Cv.1	516.8571	2363.1429	0.0000	0.0000	2.2059	31.8402	17.0817
Spenc-Ov	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N-Cv01	1853.1905	1026.8095	0.0000	0.0000	0.6021	2.8997	8.2781
N-Ov01	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N-Cv02	1731.8095	1148.1905	0.0000	0.0000	0.6045	3.0112	8.6079
N-Ov02	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N-Cv03	828.4444	2051.5556	0.0000	0.0000	0.5928	2.2948	6.6117
N-Ov03	2847.0536	0.0000	0.0000	32.9464	0.0433	0.7240	0.1260
N-Cv04	1215.3333	1664.6667	0.0000	0.0000	0.6035	3.1046	9.3092
N-Ov04	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N-Cv05	986.1667	1893.8333	0.0000	0.0000	0.6076	3.1962	12.2420
N-Ov05	2861.9248	0.0000	0.0000	18.0752	0.0254	0.1444	0.0233
N-Cv06	866.3333	2013.6667	0.0000	0.0000	0.6017	2.9871	8.6773
N-Ov06	2829.5818	0.0000	0.0000	50.4182	0.0459	0.7980	0.1801
N-Cv07.1	737.9776	2142.0224	0.0000	0.0000	0.6050	3.1578	10.8459
N-Ov07	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N-Cv08.1	393.0000	2487.0000	0.0000	0.0000	0.5897	2.3489	9.0567
N-Ov08	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

| Table E12. Mean Conduit Flow Information |

Conduit Name	Mean Flow (cfs)	Total Flow (ft^3)	Mean Percent Change	Low Flow Weightng	Mean Froude Number	Mean Hydraulic Radius	Mean Cross Area	Mean Conduit Roughness
S_Ditch01	0.1496	25853.550	0.0000	0.9423	0.3061	0.1159	0.3840	0.0300
S_Ditch02	0.1613	27870.218	0.0000	0.9346	0.2921	0.1305	0.4557	0.0300
S-Cv03	0.1682	29066.610	0.0000	0.9440	0.3152	0.1903	0.4251	0.0240
S_Ditch03	0.1753	30285.440	0.0000	0.9437	0.3253	0.1322	0.4381	0.0350
S_Ditch04	0.1890	32659.294	0.0000	0.9423	0.2279	0.1411	1.1390	0.0300
N_Ditch01	0.7456	128833.12	0.0000	0.9147	0.3540	0.2342	1.4040	0.0300
N_Ditch02	0.7457	128849.04	0.0000	0.8704	0.2288	0.2691	1.7710	0.0300
N_Ditch03	0.7458	128868.11	0.0000	0.8884	0.4148	0.2099	1.0883	0.0300
N_Ditch04	0.7847	135596.03	0.0000	0.9422	0.3196	0.2673	1.8802	0.0300
N_Ditch05	0.9460	163472.11	0.0000	0.9965	0.2267	0.3428	2.8634	0.0300
N_Ditch06	0.9463	163522.86	0.0000	0.9956	0.3655	0.2901	1.6770	0.0300
N_Ditch07	0.9527	164618.60	0.0000	0.9964	0.2840	0.3153	2.1262	0.0300
N_Ditch08	0.9578	165510.00	0.0000	0.9963	0.2398	0.2839	2.2559	0.0350
Stream-US1	13.7223	2371215.0	0.0004	0.8175	0.2626	0.8048	13.1588	0.0350
Stream-DS	14.9230	2578686.9	0.0004	0.9517	0.4194	0.8152	15.4552	0.0450
S-Ov03	0.0020	347.0983	0.0000	0.0385	0.0279	0.0011	0.0157	0.0110
Stream-US2	13.7270	2372032.0	0.0004	0.9084	0.2155	0.6500	16.9473	0.0400
N_Ditch00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0315	0.2506	0.0300
S_Ditch00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0152	0.0578	0.0300
S-Cv01	0.1495	25824.960	0.0000	0.7683	0.4337	0.1387	0.2608	0.0240
S-Ov01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
S-Cv02	-0.1612	-27849.26	0.0000	0.9358	0.2191	0.1971	0.4373	0.0240
S-Ov02	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
S-Cv04	0.1887	32606.732	0.0000	0.9300	1.0444	0.1410	0.2504	0.0240
S-Ov04	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
Spenc-Cv.1	-14.7316	-2545626.	0.0004	0.9528	0.2355	1.1795	14.1367	0.0240
Spenc-Ov	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
N-Cv01	0.7220	124770.07	0.0000	0.7617	0.4570	0.2537	0.7823	0.0240
N-Ov01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
N-Cv02	0.7456	128847.48	0.0000	0.7861	0.5020	0.2561	0.8044	0.0240
N-Ov02	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
N-Cv03	-0.7384	-127602.8	0.0000	0.8892	0.3938	0.2903	0.8733	0.0240
N-Ov03	0.0073	1255.6133	0.0000	0.0496	0.0519	0.0016	0.0239	0.0110
N-Cv04	0.7849	135629.79	0.0000	0.8694	0.5217	0.2727	0.8734	0.0240
N-Ov04	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
N-Cv05	0.8971	155021.02	0.0000	0.9063	0.5270	0.2779	0.9497	0.0240
N-Ov05	0.0005	91.4588	0.0000	0.0274	0.0280	0.0005	0.0040	0.0110
N-Cv06	0.9284	160424.89	0.0000	0.9260	0.6709	0.2718	0.9096	0.0240
N-Ov06	0.0178	3069.6547	0.0000	0.0756	0.1019	0.0027	0.0420	0.0110
N-Cv07.1	0.9525	164595.82	0.0000	0.9434	0.8336	0.2648	0.8884	0.0240
N-Ov07	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
N-Cv08.1	0.9565	165287.27	0.0000	0.9746	0.5845	0.2842	0.9442	0.0240
N-Ov08	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
FREE # 1	14.9233	2578741.8						
FREE # 2	0.0020	347.1863						

| Table E13. Channel losses(H), headwater depth (HW), tailwater depth (TW), critical and normal depth (Yc and Yn). Use this section for culvert comparisons |

Conduit Name	Maximum Flow	Head Loss	Friction Loss	Critical Depth	Normal Depth	HW Elevat	TW Elevat	
S_Ditch01	4.1692	0.0000	2.0361	0.5059	0.6017	778.3674	776.1123	Max Flow
S_Ditch02	4.0060	0.0000	0.7516	0.4978	0.6605	775.2264	774.8972	Max Flow
S-Cv03	3.6357	0.0639	0.6464	0.6060	1.2500	774.9013	774.0179	Max Flow
S_Ditch03	3.6791	0.0000	2.2126	0.4814	0.6455	774.0179	771.8508	Max Flow
S_Ditch04	3.7982	0.0000	3.3626	0.4841	0.3758	770.8778	767.8208	Max Flow
N_Ditch01	14.4187	0.0000	0.6569	0.9179	1.0594	778.3991	778.3423	Max Flow
N_Ditch02	14.4041	0.0000	0.2629	0.9174	1.1033	777.5850	777.5568	Max Flow
N_Ditch03	14.4029	0.0000	1.1361	0.9174	0.9916	776.7365	776.1797	Max Flow
N_Ditch04	14.4886	0.0000	0.8644	0.9202	1.1479	775.5380	775.4741	Max Flow
N_Ditch05	16.2835	0.0000	0.2233	0.9742	1.4903	774.3604	774.3225	Max Flow
N_Ditch06	16.2589	0.0000	1.0107	1.0379	1.3289	773.5706	773.3083	Max Flow
N_Ditch07	16.2276	0.0000	0.5285	1.0131	1.3547	772.4917	772.4065	Max Flow
N_Ditch08	16.2247	0.0000	2.5510	1.0102	0.9901	770.9547	768.8192	Max Flow
Stream-US1	153.4631	0.0000	2.3937	3.1604	4.3299	774.7293	771.4953	Max Flow
Stream-DS	158.3445	0.0000	4.8966	1.8722	2.9796	769.6661	762.7022	Max Flow
S-Ov03	0.3887	0.0000	0.1493	0.0397	0.0644	774.9013	774.6597	Max Flow
Stream-US2	152.9956	0.0000	2.0313	2.6213	3.3066	771.4974	770.0849	Max Flow
N_Ditch00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
S_Ditch00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
S-Cv01	4.1817	0.0939	0.1818	0.7174	0.9835	778.8665	778.3667	Max Flow
S-Ov01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
S-Cv02	0.0000	0.0000	0.7702	0.0000	0.0000	774.4901	774.4901	Max Flow
S-Ov02	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
S-Cv04	3.7982	0.0913	0.2213	0.7444	0.7980	771.8508	770.8778	Max Flow
S-Ov04	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
Spenc-Cv.1	0.0000	0.0000	0.0756	0.0000	0.0000	766.3217	766.3217	Max Flow
Spenc-Ov	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
N-Cv01	14.3060	0.2580	0.4690	1.3625	2.0000	779.3123	778.3825	Max Flow

N-Ov01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
N-Cv02	14.4061	0.2717	0.3376	1.3672	2.0000	778.3435	777.5850	Max Flow
N-Ov02	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
N-Cv03	0.0003	0.0015	0.2888	0.0004	0.0009	775.7400	775.7400	Max Flow
N-Ov03	1.1127	0.0000	0.1985	0.0891	0.0831	777.5570	777.3531	Max Flow
N-Cv04	14.5439	0.2885	0.3181	1.3737	2.0000	776.1971	775.5322	Max Flow
N-Ov04	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
N-Cv05	15.4953	0.3782	0.7430	1.4184	2.0000	775.4740	774.3603	Max Flow
N-Ov05	0.1712	0.0000	0.1411	0.0188	0.0207	775.4741	775.2388	Max Flow
N-Cv06	14.5784	0.2746	0.1812	1.3753	2.0000	774.3224	773.5706	Max Flow
N-Ov06	1.7035	0.0000	0.1978	0.1031	0.0860	774.3225	774.1160	Max Flow
N-Cv07.1	16.2560	0.3780	0.4032	1.4530	2.0000	773.3107	772.4899	Max Flow
N-Ov07	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
N-Cv08.1	16.2267	0.2980	0.4478	1.4518	2.0000	772.4084	770.9547	Max Flow
N-Ov08	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow

Table E13a. CULVERT ANALYSIS CLASSIFICATION, and the time the culvert was in a particular classification during the simulation. The time is in minutes. The Dynamic Wave Equation is used for all conduit analysis but the culvert flow classification condition is based on the HW and TW depths.

Conduit Name	Mild Slope Critical D Outlet Control	Mild Slope TW Control Outlet Control	Steep Slope TW Insignf Entrance Control	Slug Flow Outlet/ Entrance Control	Mild Slope TW > D Outlet Control	Mild Slope TW <= D Outlet Control	Outlet Control	Inlet Control	Inlet Configuration
S_Ditch01	0.0000	2314.0000	566.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
S_Ditch02	0.0000	2283.0000	597.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
S-Cv03	0.0000	2320.0000	560.0000	0.0000	0.0000	0.0000	0.0000	0.0000	18 inch Corner, 90 deg Headwall
S_Ditch03	163.0000	2155.0000	562.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
S_Ditch04	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N_Ditch01	1071.0000	1148.0000	661.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N_Ditch02	8.0000	1701.0000	1171.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N_Ditch03	515.0000	1528.0000	837.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N_Ditch04	872.0000	1441.0000	567.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N_Ditch05	728.0000	2024.0000	128.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N_Ditch06	617.0000	2114.0000	149.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N_Ditch07	268.0000	2483.0000	129.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N_Ditch08	0.0000	2641.0000	232.0000	0.0000	0.0000	0.0000	7.0000	0.0000	None
Stream-US1	8.0000	1326.0000	1546.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
Stream-DS	717.0000	1632.0000	531.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
S-Ov03	12.0000	14.0000	2854.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
Stream-US2	0.0000	2203.0000	677.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N_Ditch00	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
S_Ditch00	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
S-Cv01	815.0000	225.0000	1840.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Headwall
S-Ov01	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
S-Cv02	0.0000	2249.0000	594.0000	0.0000	37.0000	0.0000	0.0000	0.0000	18 inch Corner, 90 deg Headwall
S-Ov02	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
S-Cv04	866.0000	1164.0000	728.0000	0.0000	0.0000	0.0000	0.0000	122.0000	Headwall
S-Ov04	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
Spenc-Cv.1	0.0000	1503.0000	516.0000	861.0000	0.0000	0.0000	0.0000	0.0000	18 inch Corner, 90 deg Headwall
Spenc-Ov	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N-Cv01	753.0000	169.0000	1854.0000	0.0000	0.0000	0.0000	0.0000	104.0000	Headwall
N-Ov01	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N-Cv02	45.0000	1007.0000	1732.0000	0.0000	0.0000	0.0000	0.0000	96.0000	Headwall
N-Ov02	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N-Cv03	0.0000	2052.0000	828.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Headwall
N-Ov03	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N-Cv04	396.0000	1244.0000	1212.0000	0.0000	0.0000	0.0000	0.0000	28.0000	Headwall
N-Ov04	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N-Cv05	1.0000	1862.0000	973.0000	0.0000	44.0000	0.0000	0.0000	0.0000	Headwall
N-Ov05	9.0000	9.0000	2862.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N-Cv06	40.0000	1837.0000	850.0000	0.0000	0.0000	0.0000	0.0000	153.0000	Headwall
N-Ov06	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N-Cv07.1	5.0000	1873.0000	731.0000	0.0000	0.0000	0.0000	0.0000	271.0000	Headwall
N-Ov07	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
N-Cv08.1	957.0000	1405.0000	395.0000	0.0000	0.0000	0.0000	0.0000	123.0000	Headwall
N-Ov08	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None

Kinematic Wave Approximations
Time in Minutes for Each Condition

Conduit Name	Duration of Normal Flow	Slope Criteria	Super-Critical	Roll Waves
S_Ditch01	2290.9000	2315.1111	24.7111	0.0000
S_Ditch02	1490.5707	2281.2000	0.6000	0.0000
S-Cv03	0.0000	0.0000	0.0000	0.0000
S_Ditch03	1150.2500	2253.0000	0.0000	0.0000
S_Ditch04	2196.3889	2254.3889	39.0773	0.0000
N_Ditch01	721.0884	2189.0000	0.0000	0.0000
N_Ditch02	1362.9444	2183.1111	0.0000	0.0000
N_Ditch03	1087.9722	1593.3889	0.0000	0.0000
N_Ditch04	1018.8353	1428.8889	1.0000	0.0000
N_Ditch05	218.1616	1487.6343	338.0000	0.0000
N_Ditch06	1282.1120	1976.6667	3.5000	0.0000
N_Ditch07	1099.4667	2594.6667	78.0000	0.0000
N_Ditch08	2675.3333	2675.3333	0.0000	0.0000
Stream-US1	0.0000	0.0000	0.0000	0.0000
Stream-DS	0.0000	0.0000	0.4286	0.0000
S-Ov03	0.0000	0.0000	2105.6326	0.0000
Stream-US2	1414.7684	2202.6875	0.0000	0.0000
N_Ditch00	0.0000	0.0000	0.0000	0.0000
S_Ditch00	0.0000	0.0000	0.0000	0.0000
S-Cv01	0.0000	0.0000	0.0000	0.0000
S-Ov01	0.0000	0.0000	0.0000	0.0000
S-Cv02	0.0000	0.0000	0.0000	0.0000
S-Ov02	0.0000	0.0000	0.0000	0.0000
S-Cv04	0.0000	0.0000	60.1111	0.0000
S-Ov04	0.0000	0.0000	0.0000	0.0000
Spenc-Cv.1	82.6667	358.7083	0.0000	0.0000
Spenc-Ov	0.0000	0.0000	0.0000	0.0000
N-Cv01	0.0000	0.0000	0.0000	0.0000

N-Ov01	0.0000	0.0000	0.0000	0.0000
N-Cv02	0.0000	0.0000	0.0000	0.0000
N-Ov02	0.0000	0.0000	0.0000	0.0000
N-Cv03	241.6667	449.8333	2.0000	0.0000
N-Ov03	0.0175	0.0175	9.2174	0.0000
N-Cv04	0.0000	0.0000	0.0000	0.0000
N-Ov04	0.0000	0.0000	0.0000	0.0000
N-Cv05	184.5256	246.1377	0.8333	0.0000
N-Ov05	0.0000	0.0000	7.1930	0.0000
N-Cv06	0.0000	0.0000	195.0000	0.0000
N-Ov06	0.0179	0.0179	48.9636	0.0000
N-Cv07.1	0.1667	1204.0000	652.8333	0.0000
N-Ov07	0.0000	0.0000	0.0000	0.0000
N-Cv08.1	0.0000	0.0000	1.3333	0.0000
N-Ov08	0.0000	0.0000	0.0000	0.0000

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| Table E14 - Natural Channel Overbank Flow Information |
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Conduit Name	Maximum Velocity Left (Velocity)	Maximum Velocity Center (Velocity)	Maximum Velocity Right (Velocity)	Maximum Flow Left (Flow)	Maximum Flow Center (Flow)	Maximum Flow Right (Flow)	Maximum Area Left (Area)	Maximum Area Center (Area)	Maximum Area Right (Area)	Max. Storage Volume Left (Area)	Max. Storage Volume Center (Area)	Max. Storage Volume Right (Area)	Maximum Depth
Stream-US1	0.3175	4.1629	0.8031	0.0048	153.1535	0.3093	0.0150	36.7900	0.3851	10.3803	25377.773	265.6543	3.9202
Stream-DS	0.0000	4.3063	0.0000	0.0000	158.3445	0.0000	0.0000	36.7704	0.0000	0.0000	37355.417	0.0000	2.6503
Stream-US2	1.2165	2.4418	1.1054	16.8688	79.6671	56.4652	13.8663	32.6259	51.0831	6435.4774	15141.994	23708.161	3.8791

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| Table E14a - Natural Channel Encroachment Information |
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Conduit Name	Existing Conveyance Condition Left Bank	Centre Channel	Right Bank	Total	Left Station	Right Station	Encroachment Conveyance Condition Left Bank	Centre Channel	Right Bank	Total	Left Station	Right Station	% Volume Reduction Left	% Volume Reduction Right	Encroachment Data Depth Incr.	Method
Stream-US1	0.06789	2176.5	4.3955	2181.0	309.44	332.75	0.06789	2176.5	4.3955	2181.0	309.44	332.75	0.0000	0.0000	0.0000	None
Stream-DS	0.0000	1799.2	0.0000	1799.2	147.20	165.65	0.0000	1799.2	0.0000	1799.2	147.20	165.65	0.0000	0.0000	0.0000	None
Stream-US2	530.78	2506.7	1776.7	4814.2	122.97	202.03	530.78	2506.7	1776.7	4814.2	122.97	202.03	0.0000	0.0000	0.0000	None

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| Table E14b - Floodplain Mapping |
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Conduit Name	Upstream WS Elev.	Downstream WS Elev.	Channel Length	Center Station	Left Offsets Natural	Left Offsets Encroach	Left Offsets Bank	Right Offsets Natural	Right Offsets Encroach	Right Offsets Bank	Channel Widths Total	Channel Widths Encroach.
Stream-US1	774.7294	771.4985	689.8000	316.4700	7.0287	7.0287	6.6000	16.2788	16.2788	13.5300	23.3075	23.3075
Stream-DS	769.6661	762.7022	1015.9100	153.5100	6.3070	6.3070	6.5100	12.1364	12.1364	12.9300	18.4434	18.4434
Stream-US2	771.4985	770.1023	464.1100	141.4700	18.4973	18.4973	5.4100	60.5582	60.5582	4.2000	79.0554	79.0554

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| Table E15 - SPREADSHEET INFO LIST |
| Conduit Flow and Junction Depth Information for use in |
| spreadsheets. The maximum values in this table are the |
| true maximum values because they sample every time step.|
| The values in the review results may only be the |
| maximum of a subset of all the time steps in the run. |
| Note: These flows are only the flows in a single barrel.|
===

Conduit Name	Maximum Flow (cfs)	Total Flow (ft^3)	Maximum Velocity (ft/s)	Maximum Volume (ft^3)	##	Junction Name	Invert Elevation (ft)	Maximum Elevation (ft)
S_Ditch01	4.1699	25853.5502	1.7737	1066.7535	##	F3m1_2b	777.9000	778.8665
S_Ditch02	4.0061	27870.2177	1.5388	924.9555	##	S01d	777.7500	778.3674
S-Cv03	3.6357	29066.6102	2.3647	152.5643	##	F3m2c_2d	774.4700	776.1958
S_Ditch03	3.6791	30285.4400	1.6690	461.9001	##	S02d	774.4900	775.2267
S_Ditch04	3.7982	32659.2942	3.5170	965.2365	##	F3m2e_2f	773.4200	774.9013
N_Ditch01	14.4193	128833.1228	2.1276	1104.9591	##	F3m2h	773.3600	774.0179
N_Ditch02	14.4057	128849.0375	1.5438	542.0659	##	F3m2g	770.7900	771.8508
N_Ditch03	14.4033	128868.1118	2.6991	1706.0021	##	S03d	770.4800	770.8778
N_Ditch04	14.4904	135596.0293	1.8606	3838.5914	##	Spen-ds	766.3200	769.6661
N_Ditch05	16.2835	163472.1134	1.3469	1589.8244	##	F3k	765.8600	770.1023
N_Ditch06	16.2599	163522.8638	2.1566	2366.8889	##	F3l1-l3a	777.1000	779.3125
N_Ditch07	16.2281	164618.5959	1.8071	2071.5598	##	F3l3b	776.8900	778.3999
N_Ditch08	16.2257	165510.0034	3.4115	3352.7347	##	N02a	776.1200	778.3435
Stream-US1	153.4675	2371214.965	3.2603	25653.8080	##	N02d	775.9500	777.5851
Stream-DS	158.3445	2578686.931	3.3057	12738.3555	##	N03a	775.6100	777.5570
S-Ov03	0.3889	347.0983	0.5993	8.3891	##	N03d	775.7400	776.7366
Stream-US2	153.0010	2372031.951	2.6169	45285.6325	##	F3l3c	773.8200	776.1995
N_Ditch00	0.0000	0.0000	0.0000	988.7020	##	N04d	773.7700	775.5380
S_Ditch00	0.0000	0.0000	0.0000	120.9589	##	F3l3d_3e	772.5500	775.4742
S-Cv01	4.1819	25824.9602	2.9126	34.8926	##	F3l3f_3g	772.3000	774.3604
S-Ov01	0.0000	0.0000	0.0000	0.0000	##	N06a	772.0800	774.3225
S-Cv02	4.0200	27849.2561	2.5907	193.5259	##	N06d	771.9700	773.5715
S-Ov02	0.0000	0.0000	0.0000	0.0000	##	F3l3i	770.8900	773.3108
S-Cv04	3.7986	32606.7321	3.0641	17.2617	##	N07d	770.6100	772.4931
S-Ov04	0.0000	0.0000	0.0000	0.0000	##	F3l3h	769.9800	772.4084
Spenc-Cv.1	157.7649	2545626.081	4.5087	1299.7043	##	N08d	769.9600	770.9548
Spenc-Ov	0.0000	0.0000	0.0000	0.0000	##	North	770.3600	774.7294
N-Cv01	14.3079	124770.0683	4.4696	106.3900	##	outfall	760.8300	762.7022
N-Ov01	0.0000	0.0000	0.0000	0.0000	##	Out-Gold	774.0000	774.0397
N-Cv02	14.4068	128847.4808	4.4620	79.9459	##	stream	768.1100	771.4985
N-Ov02	0.0000	0.0000	0.0000	0.0000	##	N00	780.7700	780.7700
N-Cv03	13.2918	127602.8245	4.4976	55.2574	##	S00	779.7400	779.7400
N-Ov03	1.1128	1255.6133	1.4822	7.2417	##			
N-Cv04	14.5442	135629.7892	4.4933	76.4329	##			
N-Ov04	0.0000	0.0000	0.0000	0.0000	##			
N-Cv05	15.4957	155021.0220	4.9121	149.7398	##			
N-Ov05	0.1719	91.4588	0.6405	0.6342	##			
N-Cv06	14.5791	160424.8894	4.5164	41.5492	##			
N-Ov06	1.7045	3069.6547	2.0181	4.7731	##			
N-Cv07.1	16.2568	164595.8224	5.5523	77.7121	##			
N-Ov07	0.0000	0.0000	0.0000	0.0000	##			
N-Cv08.1	16.2267	165287.2650	5.2914	57.1236	##			
N-Ov08	0.0000	0.0000	0.0000	0.0000	##			
FREE # 1	158.3445	2578741.838	0.0000	0.0000	##			
FREE # 2	0.3889	347.1863	0.0000	0.0000	##			

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| Table E15a - SPREADSHEET REACH LIST |
| Peak flow and Total Flow listed by Reach or those |
| conduits or diversions having the same |
| upstream and downstream nodes. |
===

Upstream Node	Downstream Node	Maximum Flow (cfs)	Total Flow (ft^3)
S01d	F3m2c_2d	4.1699	25853.5502
S02d	F3m2e_2f	4.0061	27870.2177
F3m2e_2f	F3m2h	3.6357	29066.6102
F3m2h	F3m2g	3.6791	30285.4400
S03d	Spen-ds	3.7982	32659.2942
F3l3b	N02a	14.4193	128833.123
N02d	N03a	14.4057	128849.037
N03d	F3l3c	14.4033	128868.112
N04d	F3l3d_3e	14.4904	135596.029
F3l3f_3g	N06a	16.2835	163472.113
N06d	F3l3i	16.2599	163522.864
N07d	F3l3h	16.2281	164618.596
N08d	F3k	16.2257	165510.003
North	stream	153.4675	2371214.97
Spen-ds	outfall	158.3445	2578686.93
F3m2e_2f	Out-Gold	0.3889	347.0983
stream	F3k	153.0010	2372031.95
F3m1_2b	S01d	4.1819	25824.9602
S02d	F3m2c_2d	4.0200	27849.2561
F3m2g	S03d	3.7986	32606.7321
Spen-ds	F3k	157.7649	2545626.08
F3l1-l3a	F3l3b	14.3079	124770.068
N02a	N02d	14.4068	128847.481
N03d	N03a	14.4045	128858.438
F3l3c	N04d	14.5442	135629.789
F3l3d_3e	F3l3f_3g	15.6676	155112.481
N06a	N06d	16.2836	163494.544
F3l3i	N07d	16.2568	164595.822
F3l3h	N08d	16.2267	165287.265

##
Table E16. New Conduit Information Section
Conduit Invert (IE) Elevation and Conduit
Maximum Water Surface (WS) Elevations
##

Conduit Name	Upstream Node	Downstream Node	IE Up	IE Dn	WS Up	WS Dn	Conduit Type
S_Ditch01	S01d	F3m2c_2d	777.7500	774.4700	778.3674	776.1958	Trapezoid
S_Ditch02	S02d	F3m2e_2f	774.4900	773.4200	775.2267	774.9013	Trapezoid
S-Cv03	F3m2e_2f	F3m2h	773.4200	773.3600	774.9013	774.0179	Arch
S_Ditch03	F3m2h	F3m2g	773.3600	770.7900	774.0179	771.8508	Trapezoid
S_Ditch04	S03d	Spen-ds	770.4800	766.3200	770.8778	769.6661	Trapezoid
N_Ditch01	F3l3b	N02a	776.8900	776.1200	778.3999	778.3435	Trapezoid
N_Ditch02	N02d	N03a	775.9500	775.6100	777.5851	777.5570	Trapezoid
N_Ditch03	N03d	F3l3c	775.7400	773.8200	776.7366	776.1995	Trapezoid
N_Ditch04	N04d	F3l3d_3e	773.7700	772.5500	775.5380	775.4742	Trapezoid
N_Ditch05	F3l3f_3g	N06a	772.3000	772.0800	774.3604	774.3225	Trapezoid
N_Ditch06	N06d	F3l3i	771.9700	770.8900	773.5715	773.3108	Trapezoid
N_Ditch07	N07d	F3l3h	770.6100	769.9800	772.4931	772.4084	Trapezoid
N_Ditch08	N08d	F3k	769.9600	765.8600	770.9548	770.1023	Trapezoid
Stream-US1	North	stream	770.3600	768.1100	774.7294	771.4985	Natural
Stream-DS	Spen-ds	outfall	766.3200	760.8300	769.6661	762.7022	Natural
S-Ov03	F3m2e_2f	Out-Gold	774.8200	774.6200	774.9013	774.6597	Trapezoid
Stream-US2	stream	F3k	768.1100	765.8600	771.4985	770.1023	Natural
N_Ditch00	N00	F3l1-l3a	780.7700	777.1000	780.7700	779.3125	Trapezoid
S_Ditch00	S00	F3m1_2b	779.7400	777.9000	779.7400	778.8665	Trapezoid
S-Cv01	F3m1_2b	S01d	777.9000	777.7500	778.8665	778.3674	Circular
S-Ov01	F3m1_2b	S01d	780.3600	780.1600	778.3674	778.3674	Trapezoid
S-Cv02	S02d	F3m2c_2d	774.4900	774.4700	775.2267	776.1958	Arch
S-Ov02	F3m2c_2d	S02d	777.1000	776.9000	775.2267	775.2267	Trapezoid
S-Cv04	F3m2g	S03d	770.7900	770.4800	771.8508	770.8778	Circular
S-Ov04	F3m2g	S03d	773.5500	773.3500	770.8778	770.8778	Trapezoid
Spenc-Cv.1	Spen-ds	F3k	766.3200	765.8600	769.6661	770.1023	Arch
Spenc-Ov	F3k	Spen-ds	774.2500	774.0600	769.6661	769.6661	Trapezoid
N-Cv01	F3l1-l3a	F3l3b	777.1000	776.8900	779.3125	778.3999	Circular
N-Ov01	F3l1-l3a	F3l3b	780.2500	780.0500	778.3999	778.3999	Trapezoid
N-Cv02	N02a	N02d	776.1200	775.9500	778.3435	777.5851	Circular
N-Ov02	N02a	N02d	778.4700	778.2700	777.5851	777.5851	Trapezoid
N-Cv03	N03d	N03a	775.7400	775.6100	776.7366	777.5570	Circular
N-Ov03	N03a	N03d	777.4700	777.2700	777.5570	777.3531	Trapezoid
N-Cv04	F3l3c	N04d	773.8200	773.7700	776.1995	775.5380	Circular
N-Ov04	F3l3c	N04d	777.4600	777.2600	775.5380	775.5380	Trapezoid
N-Cv05	F3l3d_3e	F3l3f_3g	772.5500	772.3000	775.4742	774.3604	Circular
N-Ov05	F3l3d_3e	F3l3f_3g	775.4200	775.2200	775.4742	775.2389	Trapezoid
N-Cv06	N06a	N06d	772.0800	771.9700	774.3225	773.5715	Circular
N-Ov06	N06a	N06d	774.2300	774.0300	774.3225	774.1160	Trapezoid
N-Cv07.1	F3l3i	N07d	770.8900	770.6100	773.3108	772.4931	Circular
N-Ov07	F3l3i	N07d	775.2100	775.0100	772.4931	772.4931	Trapezoid
N-Cv08.1	F3l3h	N08d	769.9800	769.9600	772.4084	770.9548	Circular
N-Ov08	F3l3h	N08d	773.8600	773.6600	770.9548	770.9548	Trapezoid

===
| Table E18 - Junction Continuity Error. Division by Volume added 11/96 |
| |
Continuity Error = Net Flow + Beginning Volume - Ending Volume
Total Flow + (Beginning Volume + Ending Volume)/2
Net Flow = Node Inflow - Node Outflow
Total Flow = absolute (Inflow + Outflow)
Intermediate column is a judgement on the node continuity error.
Excellent < 1 percent Great 1 to 2 percent Good 2 to 5 percent
Fair 5 to 10 percent Poor 10 to 25 percent Bad 25 to 50 percent
Terrible > 50 percent
===

Junction Name	<------Continuity Error -------> Volume	% of Node	% of Inflow	Remaining Volume	Beginning Volume	Net Flow Thru Node	Total Flow Thru Node	Failed to Converge
F3m1_2b	-11.7968	-0.0228	0.0005	0.0013	0.0000	-11.7955	51639.2115	0

S01d	-32.3074	-0.0625	0.0013	1.3523	0.0000	-30.9552	51678.5104	0
F3m2c_2d	-8.3708	-0.0150	0.0003	1.8840	0.0000	-6.4868	55693.3739	0
S02d	-21.9912	-0.0395	0.0009	0.2863	0.0000	-21.7050	55719.4737	0
F3m2e_2f	-3.2730	-0.0056	0.0001	0.0091	0.0000	-3.2638	58826.4269	0
F3m2h	-26.4707	-0.0437	0.0010	0.0202	0.0000	-26.4506	60545.9408	0
F3m2g	-5.1383	-0.0079	0.0002	0.0147	0.0000	-5.1236	65210.5064	20
S03d	-54.2039	-0.0831	0.0021	0.0276	0.0000	-54.1763	65266.0263	94
Spen-ds	-422.7013	-0.0082	0.0164	19.4938	0.0000	-403.2074	5156972.305	0
F3k	-596.6518	-0.0117	0.0232	172.9961	0.0000	-423.6556	5090847.790	0
F3l1-l3a	-19.5412	-0.0078	0.0008	0.0018	0.0000	-19.5394	249521.9027	0
F3l3b	-2.4729	-0.0010	0.0001	0.0015	0.0000	-2.4714	257667.8763	0
N02a	-16.8780	-0.0065	0.0007	0.0008	0.0000	-16.8773	257680.6036	0
N02d	-7.5053	-0.0029	0.0003	1.4377	0.0000	-6.0676	257696.5183	0
N03a	-15.7005	-0.0061	0.0006	3.4325	0.0000	-12.2680	257707.4753	0
N03d	-16.6261	-0.0065	0.0006	0.3627	0.0000	-16.2634	257726.5496	0
F3l3c	-17.4242	-0.0064	0.0007	0.0013	0.0000	-17.4229	271244.4214	0
N04d	27.8246	0.0103	0.0011	0.0064	0.0000	27.8310	271225.8185	0
F3l3d_3e	-79.8214	-0.0257	0.0031	0.0054	0.0000	-79.8160	310147.1880	0
F3l3f_3g	-2.2906	-0.0007	0.0001	0.0056	0.0000	-2.2851	326947.3554	0
N06a	-25.6154	-0.0078	0.0010	0.0017	0.0000	-25.6136	326966.6575	0
N06d	-34.9659	-0.0107	0.0014	0.0040	0.0000	-34.9619	327017.4079	0
F3l3i	-11.9324	-0.0036	0.0005	0.0035	0.0000	-11.9290	329184.4404	33
N07d	-26.2709	-0.0080	0.0010	0.0034	0.0000	-26.2675	329214.4183	58
F3l3h	-7.7043	-0.0023	0.0003	0.0026	0.0000	-7.7017	330571.1088	0
N08d	-252.4685	-0.0763	0.0098	27.6343	0.0000	-224.8342	330797.2684	0
North	-406.2539	-0.0086	0.0158	0.0333	0.0000	-406.2205	4741997.841	0
outfall	-34.0959	-0.0007	0.0013	1.6996	0.0000	-32.3963	5157428.769	0
Out-Gold	-0.0014	-0.0002	0.0000	0.0005	0.0000	-0.0009	694.2846	0
stream	-937.4179	-0.0198	0.0364	121.8505	0.0000	-815.5674	4743246.916	0
N00	-0.0015	0.0000	0.0000	0.0015	0.0000	0.0000	0.0000	0
S00	-0.0009	0.0000	0.0000	0.0009	0.0000	0.0000	0.0000	0

The total continuity error was -3070.1 cubic feet
The remaining total volume was 352.58 cubic feet
Your mean node continuity error was Excellent
Your worst node continuity error was Excellent

Table E19 - Junction Inflow & Outflow Listing Units are either ft^3 or m^3 depending on the units in your model.

Junction Name	Constant Inflow to Node	User Inflow to Node	Interface Inflow to Node	DWF Inlow to Node	Inflow through Outfall	RNF Layer Inflow to Node	Inflow from 2D Layer	Outflow from Node	Evaporation from Node	Basin Infil.
F3m1_2b	0.0000	0.0000	0.0000	0.0000	0.0000	25812.3026	0.0000	0.0000	0.0000	0.0000
F3m2c_2d	0.0000	0.0000	0.0000	0.0000	0.0000	1989.6617	0.0000	0.0000	0.0000	0.0000
F3m2e_2f	0.0000	0.0000	0.0000	0.0000	0.0000	1541.8037	0.0000	0.0000	0.0000	0.0000
F3m2h	0.0000	0.0000	0.0000	0.0000	0.0000	1193.3860	0.0000	0.0000	0.0000	0.0000
F3m2g	0.0000	0.0000	0.0000	0.0000	0.0000	2317.5875	0.0000	0.0000	0.0000	0.0000
F3k	0.0000	0.0000	0.0000	0.0000	0.0000	7679.3699	0.0000	0.0000	0.0000	0.0000
F3l1-l3a	0.0000	0.0000	0.0000	0.0000	0.0000	124751.3847	0.0000	0.0000	0.0000	0.0000
F3l3b	0.0000	0.0000	0.0000	0.0000	0.0000	4064.2963	0.0000	0.0000	0.0000	0.0000
F3l3c	0.0000	0.0000	0.0000	0.0000	0.0000	6744.7218	0.0000	0.0000	0.0000	0.0000
F3l3d_3e	0.0000	0.0000	0.0000	0.0000	0.0000	19436.1587	0.0000	0.0000	0.0000	0.0000
F3l3f_3g	0.0000	0.0000	0.0000	0.0000	0.0000	8361.7022	0.0000	0.0000	0.0000	0.0000
F3l3i	0.0000	0.0000	0.0000	0.0000	0.0000	1065.1897	0.0000	0.0000	0.0000	0.0000
F3l3h	0.0000	0.0000	0.0000	0.0000	0.0000	664.8955	0.0000	0.0000	0.0000	0.0000
North	0.0000	0.0000	0.0000	0.0000	0.0000	2.3709E+06	0.0000	0.0000	0.0000	0.0000
outfall	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.5787E+06	0.0000	0.0000
Out-Gold	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	347.1863	0.0000	0.0000

Table E20 - Junction Flooding and Volume Listing. The maximum volume is the total volume in the node including the volume in the flooded storage area. This is the max volume at any time. The volume in the flooded storage area is the total volume above the ground elevation, where the flooded pond storage area starts. The fourth column is instantaneous, the fifth is the sum of the flooded volume over the entire simulation Units are either ft^3 or m^3 depending on the units.

Junction Name	Surcharged Time (min)	Flooded Time(min)	Out of 1D-System (Flooded Volume)	Maximum Volume	Passed to 2D cell OR Volume Stored in allowed Flood Pond of 1D-System
F3m1_2b	0.0000	0.0000	0.0000	12.1455	0.0000
S01d	0.0000	0.0000	0.0000	7.7585	0.0000
F3m2c_2d	0.0000	0.0000	0.0000	21.6862	0.0000
S02d	0.0000	0.0000	0.0000	9.2573	0.0000
F3m2e_2f	0.0000	0.0000	0.0000	18.6138	0.0000
F3m2h	0.0000	0.0000	0.0000	8.2676	0.0000
F3m2g	0.0000	0.0000	0.0000	13.3302	0.0000
S03d	0.0000	0.0000	0.0000	4.9983	0.0000
Spen-ds	0.0000	0.0000	0.0000	42.0473	0.0000
F3k	0.0000	0.0000	0.0000	53.3086	0.0000
F3l1-l3a	0.0000	0.0000	0.0000	27.8020	0.0000
F3l3b	0.0000	0.0000	0.0000	1873.5953	0.0000
N02a	0.0000	0.0000	0.0000	27.9408	0.0000
N02d	0.0000	0.0000	0.0000	20.5469	0.0000
N03a	0.0000	0.0000	0.0000	24.4658	0.0000
N03d	0.0000	0.0000	0.0000	12.5227	0.0000
F3l3c	0.0000	0.0000	0.0000	29.9002	0.0000
N04d	0.0000	0.0000	0.0000	22.2169	0.0000
F3l3d_3e	0.0000	0.0000	0.0000	36.7455	0.0000
F3l3f_3g	0.0000	0.0000	0.0000	1796.1976	0.0000
N06a	0.0000	0.0000	0.0000	28.1790	0.0000
N06d	0.0000	0.0000	0.0000	20.1240	0.0000
F3l3i	0.0000	0.0000	0.0000	30.4193	0.0000
N07d	0.0000	0.0000	0.0000	23.6633	0.0000
F3l3h	0.0000	0.0000	0.0000	30.5155	0.0000
N08d	0.0000	0.0000	0.0000	12.5003	0.0000
North	0.0000	0.0000	0.0000	54.9060	0.0000
outfall	0.0000	0.0000	0.0000	23.5259	0.0000
Out-Gold	0.0000	0.0000	0.0000	0.4990	0.0000
stream	0.0000	0.0000	0.0000	42.5798	0.0000
N00	0.0000	0.0000	0.0000	0.0000	0.0000

```
             S00        0.0000     0.0000       0.0000      0.0000               0.0000

*==================================*
| Simulation Specific Information  |
*==================================*
Number of Input Conduits.........        43 Number of Simulated Conduits......        45
Number of Natural Channels........         3 Number of Junctions...............        32
Number of Storage Junctions.......         2 Number of Weirs...................         0
Number of Orifices................         0 Number of Pumps...................         0
Number of Free Outfalls...........         2 Number of Tide Gate Outfalls......         0

*==========================================================*
| Average % Change in Junction or Conduit is defined as:  |
| Conduit  % Change ==> 100.0 ( Q(n+1) - Q(n) ) / Qfull   |
| Junction % Change ==> 100.0 ( Y(n+1) - Y(n) ) / Yfull   |
*==========================================================*
The Conduit with the largest average change was..FREE # 1   with     0.000 percent
The Junction with the largest average change was.F3k        with     0.014 percent
The Conduit with the largest sinuosity was.......S-Cv02     with    12.144

*================================================================*
| Table E21. Continuity balance at the end of the simulation     |
|            Junction Inflow, Outflow or Street Flooding         |
| Error = Inflow  + Initial Volume - Outflow - Final   Volume    |
*================================================================*
       Inflow          Inflow       Average
       Junction   Volume,ft^3   Inflow, cfs
---------------  ------------  -------------
        F3m1_2b    25814.2513         0.1494
       F3m2c_2d     1990.5677         0.0115
       F3m2e_2f     1542.5007         0.0089
          F3m2h     1193.8906         0.0069
          F3m2g     2318.3343         0.0134
            F3k     7679.7549         0.0444
       F3l1-l3a   124751.8344         0.7219
          F3l3b     4064.6853         0.0235
          F3l3c     6746.5204         0.0390
       F3l3d_3e    19438.6779         0.1125
       F3l3f_3g     8362.7611         0.0484
          F3l3i     1065.7542         0.0062
          F3l3h      665.2478         0.0038
          North   2.37078E+06        13.7198
        outfall    -2.579E+06       -14.9233
       Out-Gold     -347.1863        -0.0020

       Outflow      Outflow          Average
       Junction  Volume,ft^3    Outflow, cfs
---------------  ------------   -------------
        outfall   2.57874E+06        14.9233
       Out-Gold      347.1863         0.0020

*====================================================*
| Initial system volume        =         0.0000 Cu Ft |
| Total system inflow volume   =   2.576564E+06 Cu Ft |
| Inflow + Initial volume      =   2.576564E+06 Cu Ft |
*====================================================*
| Total system outflow         =   2.579089E+06 Cu Ft |
| Volume left (Final volume)   =       352.5769 Cu Ft |
| Evaporation                  =         0.0000 Cu Ft |
| Basin Infiltration           =         0.0000 Cu Ft |
| Outflow + Final Volume       =   2.579442E+06 Cu Ft |
*====================================================*

*================================================*
| Total Model Continuity Error                   |
| Error in Continuity, Percent =        -0.1117 |
| Error in Continuity, ft^3    =      -2877.945 |
| + Error means a continuity loss, - a gain      |
*================================================*

#####################################################
# Table E22. Numerical Model judgement section      #
#####################################################

Overall error was (minimum of Table E18 & E21)             -0.1117 percent
Worst nodal error was in node stream           with        -0.0198 percent
Of the total inflow this loss was                           0.0364 percent
Your overall continuity error was                  Excellent
                                                  Excellent Efficiency
Efficiency of the simulation                       1.58
Most Number of Non Convergences at one Node       94.
Total Number Non Convergences at all Nodes       205.
Total Number of Nodes with Non Convergences        4.

#########################################################
# Table E23. New Basin Design Information               #
#            Maximum Hydraulic Grade Line,              #
#            Out Conduit Sizes and Maximum Flow         #
#########################################################
A) Resize d/s Pipes based on given HGL
B) Resize Basin based on given HGL
C) Resize d/s Pipes and Basin based on HGL and max discharge
D) Resize d/s pipes based on given max discharge

   Basin Name    Type    Max.HGL   Conduit         Depth   Width   Barrels   Max.Flow
                           (ft)                     (ft)    (ft)             (ft^3/s)
---------------- ------  --------- --------------- ------- ------- --------- ---------
===> Hydraulic model simulation ended normally.
===> XP-SWMM Simulation ended normally.
===> Your input file was named  : W:\PROJECTS\G0003\940271\16\SWMM\Existing\Ex-Misty_1-year.DAT
===> Your output file was named : W:\PROJECTS\G0003\940271\16\SWMM\Existing\Ex-Misty_1-year.out

*============================================================*
|             SWMM Simulation Date and Time Summary          |
*============================================================*
| Starting Date... December    7, 2016  Time...   13: 6:50:80  |
|   Ending Date... December    7, 2016  Time...   13: 7:31:32  |
|  Elapsed Time...    0.67533 minutes or     40.52000 seconds  |
*============================================================*
```

```
 Current Directory:   W:\PROJECTS\G0003\940271\16\SWMM\Existing
 Engine Name: C:\PROGRA~2\XPSOLU~1\XPSWMM~1\SWMMEN~2.EXE
 Input File : W:\PROJECTS\G0003\940271\16\SWMM\Existing\Ex-Misty_2 year.XP


####################################
# Rainfall input summary from Runoff #
####################################

 Total rainfall for gage #     1 is    2.5000 inches

*=========================================================*
 |     Table E15 - SPREADSHEET INFO LIST                   |
 | Conduit Flow and Junction Depth Information for use in  |
 | spreadsheets.  The maximum values in this table are the |
 | true maximum values because they sample every time step.|
 | The values in the review results may only be the        |
 | maximum of a subset of all the time steps in the run.   |
 | Note: These flows are only the flows in a single barrel.|
 *=========================================================*
```

Conduit Name	Maximum Flow (cfs)	Total Flow (ft^3)	Maximum Velocity (ft/s)	Maximum Volume (ft^3)	##	Junction Name	Invert Elevation (ft)	Maximum Elevation (ft)
S_Ditch01	5.7006	34151.7702	1.8069	2264.9612	##	F3m1_2b	777.9000	779.0532
S_Ditch02	5.1555	36659.7353	1.5231	1021.3167	##	S01d	777.7500	778.4600
S-Cv03	3.7462	35894.9133	2.4335	153.6129	##	F3m2c_2d	774.4700	776.7748
S_Ditch03	3.8015	37410.0833	1.6761	504.5536	##	S02d	774.4900	775.3110
S_Ditch04	4.0098	40376.1919	3.6640	1508.1891	##	F3m2e_2f	773.4200	774.9499
N_Ditch01	19.7499	171044.2223	2.1426	1397.9205	##	F3m2h	773.3600	774.0276
N_Ditch02	19.7463	171084.7857	1.7732	595.5619	##	F3m2g	770.7900	771.8919
N_Ditch03	19.6436	171091.4621	2.6176	2876.7071	##	S03d	770.4800	770.8881
N_Ditch04	19.8731	179548.9726	1.8686	4279.7844	##	Spen-ds	766.3200	770.2259
N_Ditch05	22.3608	214476.4794	1.3475	1855.9969	##	F3k	765.8600	770.8042
N_Ditch06	21.6144	214553.3034	2.1731	5311.1290	##	F3l1-l3a	777.1000	780.1189
N_Ditch07	21.1242	215814.4681	1.8143	3346.5227	##	F3l3b	776.8900	778.6504
N_Ditch08	21.0955	216906.4465	3.4271	4587.9667	##	N02a	776.1200	778.6016
Stream-US1	203.5577	3076059.664	3.4129	31916.8799	##	N02d	775.9500	777.6856
Stream-DS	210.9686	3345173.573	3.3069	20014.8141	##	N03a	775.6100	777.6445
S-Ov03	1.4669	2705.5251	0.8760	65.9524	##	N03d	775.7400	777.0830
Stream-US2	202.9633	3077665.884	2.6154	75927.8520	##	F3l3c	773.8200	776.9495
N_Ditch00	0.0000	0.0000	0.0000	2423.4024	##	N04d	773.7700	775.6907
S_Ditch00	0.0000	0.0000	0.0000	196.8110	##	F3l3d_3e	772.5500	775.6073
S-Cv01	5.7147	34100.2813	3.1963	43.0262	##	F3l3f_3g	772.3000	774.5487
S-Ov01	0.0000	0.0000	0.0000	0.0000	##	N06a	772.0800	774.5060
S-Cv02	5.1580	36638.4954	3.2877	194.1372	##	N06d	771.9700	774.5607
S-Ov02	0.0000	0.0000	0.0000	0.0000	##	F3l3i	770.8900	774.5255
S-Cv04	4.0103	40310.1433	3.1071	17.9484	##	N07d	770.6100	773.1021
S-Ov04	0.0000	0.0000	0.0000	0.0000	##	F3l3h	769.9800	773.0681
Spenc-Cv.1	210.1616	3304424.289	5.2501	1504.2710	##	N08d	769.9600	771.0739
Spenc-Ov	0.0000	0.0000	0.0000	0.0000	##	North	770.3600	775.1265
N-Cv01	19.3178	165776.4581	6.1729	111.5173	##	outfall	760.8300	763.0248
N-Ov01	0.0000	0.0000	0.0000	0.0000	##	Out-Gold	774.0000	774.0957
N-Cv02	16.6862	166285.4422	5.3031	80.6043	##	stream	768.1100	771.7907
N-Ov02	3.0706	4791.0807	1.8084	24.1733	##	N00	780.7700	780.7700
N-Cv03	13.3521	155743.8588	4.5014	67.8230	##	S00	779.7400	779.7400
N-Ov03	7.2868	15344.6147	2.4041	60.7880	##			
N-Cv04	19.8684	179538.3488	6.3123	76.9707	##			
N-Ov04	0.0000	0.0000	0.0000	0.0000	##			
N-Cv05	15.7224	189681.9095	4.9752	154.0686	##			
N-Ov05	6.2079	14612.4049	1.7832	141.7413	##			
N-Cv06	15.0042	159608.3580	4.5938	45.8109	##			
N-Ov06	26.1672	54891.2615	3.4033	233.5004	##			
N-Cv07.1	21.2077	215806.6120	6.7115	81.0444	##			
N-Ov07	0.0000	0.0000	0.0000	0.0000	##			
N-Cv08.1	21.0959	216620.8079	6.9922	59.4370	##			
N-Ov08	0.0000	0.0000	0.0000	0.0000	##			
FREE # 1	210.9685	3345247.470	0.0000	0.0000	##			
FREE # 2	1.4669	2705.6957	0.0000	0.0000	##			

```
 Current Directory:   W:\PROJECTS\G0003\940271\16\SWMM\Existing
 Engine Name: C:\PROGRA~2\XPSOLU~1\XPSWMM~1\SWMMEN~2.EXE
 Input File : W:\PROJECTS\G0003\940271\16\SWMM\Existing\Ex-Misty_10 year.XP

####################################
# Rainfall input summary from Runoff #
####################################

 Total rainfall for gage #     1 is    3.8000 inches


 *=========================================================*
 |     Table E15 - SPREADSHEET INFO LIST                   |
 | Conduit Flow and Junction Depth Information for use in  |
 | spreadsheets.  The maximum values in this table are the |
 | true maximum values because they sample every time step.|
 | The values in the review results may only be the        |
 | maximum of a subset of all the time steps in the run.   |
 | Note: These flows are only the flows in a single barrel.|
 *=========================================================*
```

Conduit Name	Maximum Flow (cfs)	Total Flow (ft^3)	Maximum Velocity (ft/s)	Maximum Volume (ft^3)	##	Junction Name	Invert Elevation (ft)	Maximum Elevation (ft)
S_Ditch01	13.2103	75540.7684	2.0292	4550.1700	##	F3m1_2b	777.9000	779.9854
S_Ditch02	13.3471	80386.2546	2.2769	1414.7273	##	S01d	777.7500	778.7729
S-Cv03	4.0241	60088.2782	2.6051	161.0995	##	F3m2c_2d	774.4700	777.3441
S_Ditch03	4.7854	63015.1435	1.6899	1073.7264	##	S02d	774.4900	775.6772
S_Ditch04	-48.2962	70532.6383	3.1524	3089.5689	##	F3m2e_2f	773.4200	775.0760
N_Ditch01	48.5137	384350.9480	3.0632	1708.5868	##	F3m2h	773.3600	774.0994
N_Ditch02	48.5153	384412.4450	3.2884	747.9558	##	F3m2g	770.7900	772.3104
N_Ditch03	48.5279	384466.5706	2.6017	4936.1656	##	S03d	770.4800	771.6124
N_Ditch04	49.3406	400954.0809	2.4724	5265.9675	##	Spen-ds	766.3200	771.3089
N_Ditch05	57.2855	468858.7112	2.4186	3798.2248	##	F3k	765.8600	773.3348
N_Ditch06	57.2897	468941.3218	2.2126	9026.0541	##	F3l1-l3a	777.1000	780.5588
N_Ditch07	57.3393	471113.9619	1.7415	6250.4217	##	F3l3b	776.8900	778.9613

N_Ditch08	-124.7028	472626.5841	4.8935	13924.2301	##	N02a	776.1200	778.7806
Stream-US1	448.8256	6529518.750	3.7637	74618.0713	##	N02d	775.9500	777.9875
Stream-DS	453.8712	7101982.778	3.3065	70178.7691	##	N03a	775.6100	777.8375
S-Ov03	9.4554	24044.2535	1.4567	588.1637	##	N03d	775.7400	777.8277
Stream-US2	436.6945	6533132.771	2.6119	258656.3993	##	F3l3c	773.8200	777.7425
N_Ditch00	0.0000	0.0000	0.0000	3599.0973	##	N04d	773.7700	776.0759
S_Ditch00	-0.5815	0.4320	0.1239	1103.7907	##	F3l3d_3e	772.5500	775.8199
S-Cv01	13.2319	75462.8529	4.3418	71.9844	##	F3l3f_3g	772.3000	775.6228
S-Ov01	0.0000	0.0000	0.0000	0.0000	##	N06a	772.0800	775.5803
S-Cv02	5.9391	66633.0158	3.7437	194.7384	##	N06d	771.9700	775.5811
S-Ov02	7.5896	13737.1096	1.2936	588.2885	##	F3l3i	770.8900	775.5302
S-Cv04	6.2471	68639.8372	3.7790	24.0265	##	N07d	770.6100	774.1980
S-Ov04	0.0000	0.0000	0.0000	0.0000	##	F3l3h	769.9800	774.1575
Spenc-Cv.1	451.0303	7032350.603	9.9012	1880.0530	##	N08d	769.9600	773.3316
Spenc-Ov	0.0000	0.0000	0.0000	0.0000	##	North	770.3600	776.1409
N-Cv01	20.5468	295677.4245	6.5420	116.7878	##	outfall	760.8300	764.5218
N-Ov01	27.2457	77513.3374	2.8616	346.6035	##	Out-Gold	774.0000	774.2165
N-Cv02	16.7448	278253.7898	5.3504	83.9498	##	stream	768.1100	773.4726
N-Ov02	32.6538	106146.1246	3.3889	254.3471	##	N00	780.7700	780.7700
N-Cv03	13.2922	209444.2348	4.5041	79.0656	##	S00	779.7400	779.9864
N-Ov03	46.6854	174968.0772	3.0578	522.5308	##			
N-Cv04	23.6601	329387.4263	7.4784	81.0837	##			
N-Ov04	26.2466	71482.0382	3.3007	192.9208	##			
N-Cv05	15.8840	249928.9549	5.0291	154.2961	##			
N-Ov05	48.2255	200503.9236	3.0108	754.7488	##			
N-Cv06	15.3544	163716.0424	4.7031	45.8104	##			
N-Ov06	57.8311	305109.4786	3.7655	2932.1883	##			
N-Cv07.1	24.9232	363159.7514	7.8771	81.0464	##			
N-Ov07	36.8418	107913.2519	3.5914	252.4256	##			
N-Cv08.1	26.9951	383045.6337	8.6681	80.0948	##			
N-Ov08	30.3738	89323.1662	3.4401	212.2850	##			
FREE # 1	453.8649	7102174.828	0.0000	0.0000	##			
FREE # 2	9.4554	24043.9783	0.0000	0.0000	##			

Current Directory: W:\PROJECTS\G0003\940271\16\SWMM\Existing
Engine Name: C:\PROGRA~2\XPSOLU~1\XPSWMM~1\SWMMEN~2.EXE
Input File : W:\PROJECTS\G0003\940271\16\SWMM\Existing\Ex-Misty_100 year.XP

```
#####################################
# Rainfall input summary from Runoff #
#####################################
```

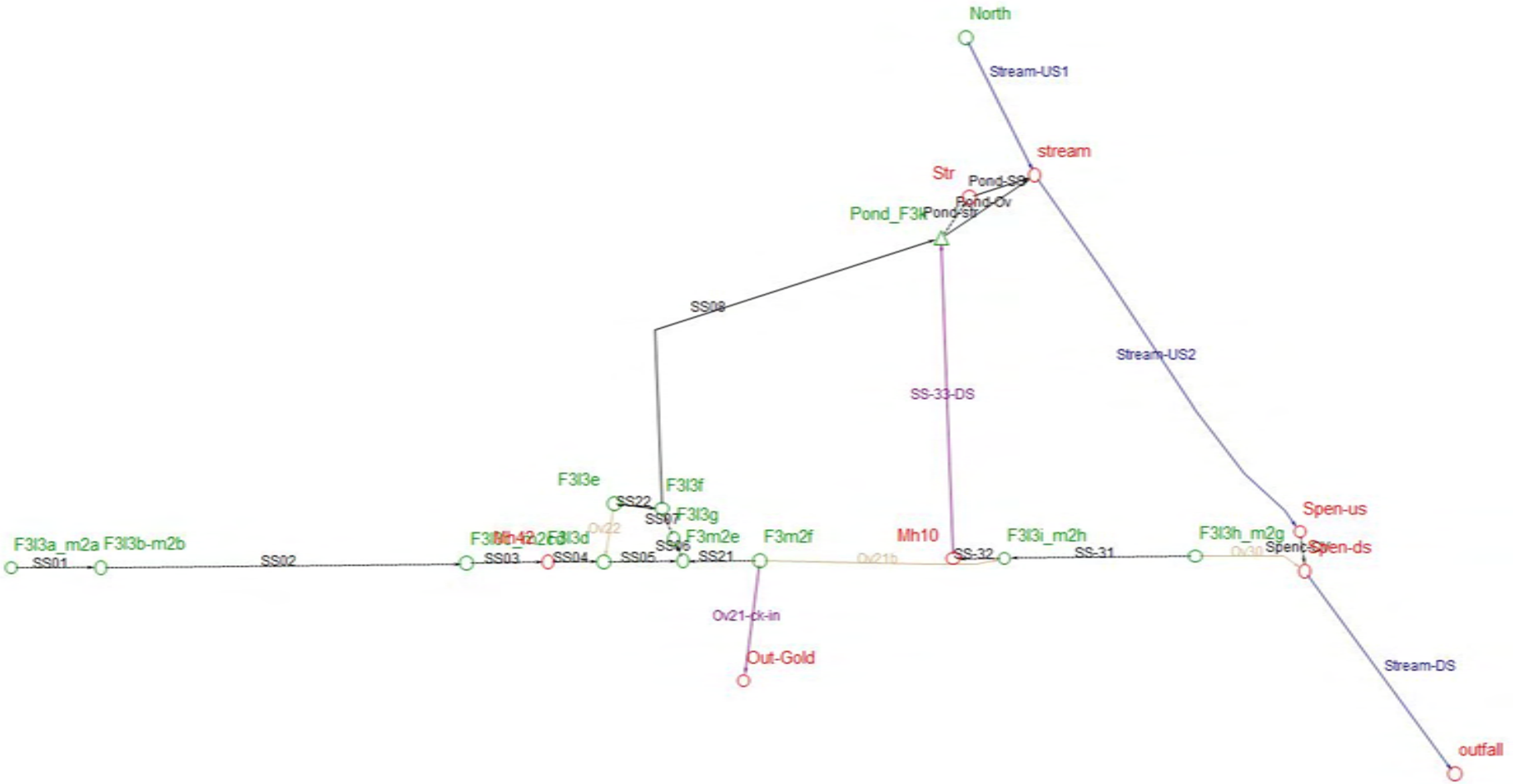
Total rainfall for gage # 1 is 5.3000 inches

```
*=========================================================*
|     Table E15 - SPREADSHEET INFO LIST                   |
| Conduit Flow and Junction Depth Information for use in  |
| spreadsheets.  The maximum values in this table are the |
| true maximum values because they sample every time step.|
| The values in the review results may only be the        |
| maximum of a subset of all the time steps in the run.   |
| Note: These flows are only the flows in a single barrel.|
*=========================================================*
```

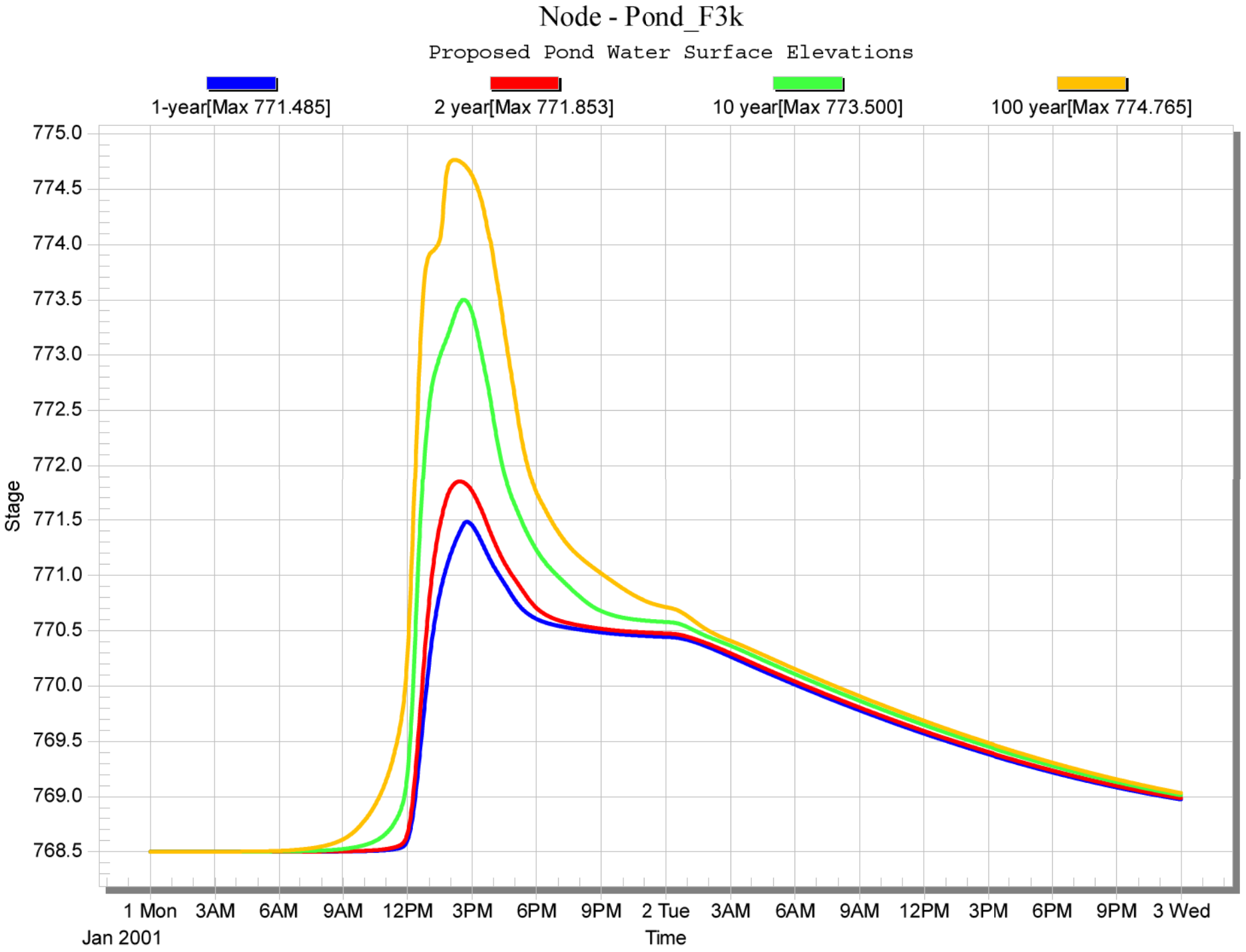
Conduit Name	Maximum Flow (cfs)	Total Flow (ft^3)	Maximum Velocity (ft/s)	Maximum Volume (ft^3)	##	Junction Name	Invert Elevation (ft)	Maximum Elevation (ft)
S_Ditch01	23.2306	129853.8534	2.6862	5444.6067	##	F3m1_2b	777.9000	780.5185
S_Ditch02	23.5176	137547.7804	2.8640	1746.5776	##	S01d	777.7500	779.0476
S-Cv03	4.1891	84950.0958	2.7053	165.7921	##	F3m2c_2d	774.4700	777.4351
S_Ditch03	5.5404	89625.5287	1.6960	1605.9369	##	S02d	774.4900	775.9576
S_Ditch04	-139.7107	96067.6947	4.2263	4988.3865	##	F3m2e_2f	773.4200	775.1540
N_Ditch01	84.9979	665982.9881	4.2661	1990.8342	##	F3m2h	773.3600	774.1486
N_Ditch02	84.9994	666061.5008	4.5202	902.9168	##	F3m2g	770.7900	772.5798
N_Ditch03	85.0021	666111.3091	3.8091	5503.7097	##	S03d	770.4800	772.7700
N_Ditch04	86.2530	692326.8571	3.4368	6105.9607	##	Spen-ds	766.3200	772.1543
N_Ditch05	99.1111	801044.9632	2.3668	4260.8039	##	F3k	765.8600	774.6970
N_Ditch06	99.1065	801071.5003	2.4511	9636.7193	##	F3l1-l3a	777.1000	780.6750
N_Ditch07	99.1766	804155.0566	2.3741	7939.7746	##	F3l3b	776.8900	779.2639
N_Ditch08	99.2166	806559.3575	5.2786	21189.1501	##	N02a	776.1200	778.8864
Stream-US1	758.8021	10980276.54	3.7530	276078.6456	##	N02d	775.9500	778.2883
Stream-DS	792.2603	11915102.13	3.7629	136169.0794	##	N03a	775.6100	777.9896
S-Ov03	19.5667	58559.6519	1.7696	1028.2314	##	N03d	775.7400	778.0900
Stream-US2	758.5832	10976425.03	2.6316	396503.9547	##	F3l3c	773.8200	777.8562
N_Ditch00	0.0000	0.0000	0.0000	3962.5847	##	N04d	773.7700	776.4183
S_Ditch00	-1.1332	8.2071	0.2318	2046.1710	##	F3l3d_3e	772.5500	775.9428
S-Cv01	17.9948	123948.7381	5.9034	80.2027	##	F3l3f_3g	772.3000	775.8604
S-Ov01	5.2539	5839.2516	2.0318	61.2786	##	N06a	772.0800	775.7655
S-Cv02	5.9296	93692.9210	3.7351	194.8345	##	N06d	771.9700	775.7667
S-Ov02	18.1368	43839.2348	1.6378	1174.1908	##	F3l3i	770.8900	775.6366
S-Cv04	7.7590	98981.2469	4.5301	39.6337	##	N07d	770.6100	774.6967
S-Ov04	0.0000	0.0000	0.0000	0.0000	##	F3l3h	769.9800	774.6932
Spenc-Cv.1	542.3801	10795202.91	11.8388	1882.6478	##	N08d	769.9600	774.6945
Spenc-Ov	266.1638	1034694.520	6.6493	428.0192	##	North	770.3600	776.6628
N-Cv01	20.7059	410853.4986	6.5952	120.8348	##	outfall	760.8300	765.3452
N-Ov01	64.0595	236411.5156	3.5510	658.3428	##	Out-Gold	774.0000	774.2926
N-Cv02	16.7811	381228.1836	5.3618	87.4394	##	stream	768.1100	774.7691
N-Ov02	71.4819	284820.1818	4.1251	458.3890	##	N00	780.7700	780.7700
N-Cv03	13.2977	256689.1937	4.5055	79.3052	##	S00	779.7400	780.5186
N-Ov03	90.8666	409365.1510	3.1765	1098.6060	##			
N-Cv04	23.7508	453716.6710	7.5099	81.0835	##			
N-Ov04	64.9961	238471.5173	4.1401	386.0123	##			
N-Cv05	15.8976	325258.3313	5.7461	154.2958	##			
N-Ov05	90.9873	447417.7418	3.1851	1590.1039	##			
N-Cv06	15.3479	211783.1896	4.7008	45.8113	##			
N-Ov06	99.8009	589206.7737	3.8196	3728.2706	##			
N-Cv07.1	25.5755	473151.2612	9.0363	81.0481	##			
N-Ov07	79.2191	330908.2784	4.3567	445.3405	##			
N-Cv08.1	27.2921	356518.2787	8.7131	80.0749	##			
N-Ov08	72.7243	449335.5437	4.2802	2129.0478	##			
FREE # 1	792.2500	11915493.29	0.0000	0.0000	##			
FREE # 2	19.5667	58559.2795	0.0000	0.0000	##			

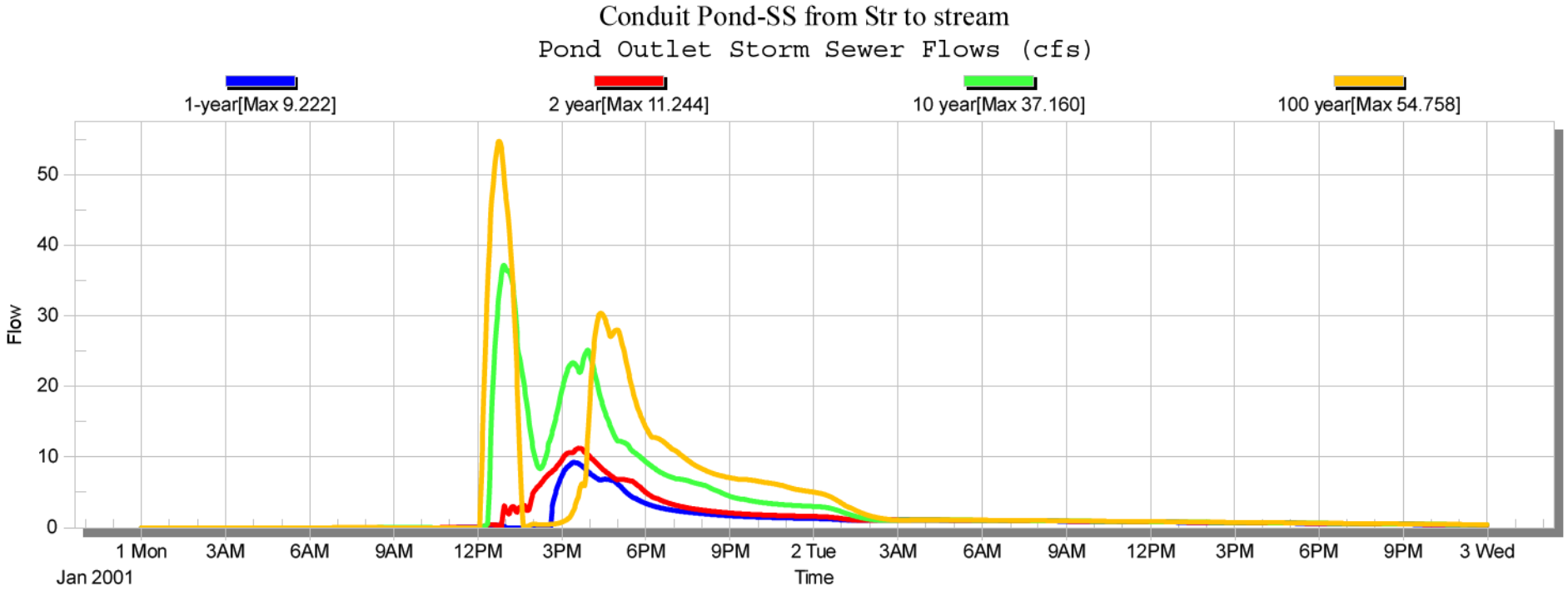
XP-SWMM Model Schematic

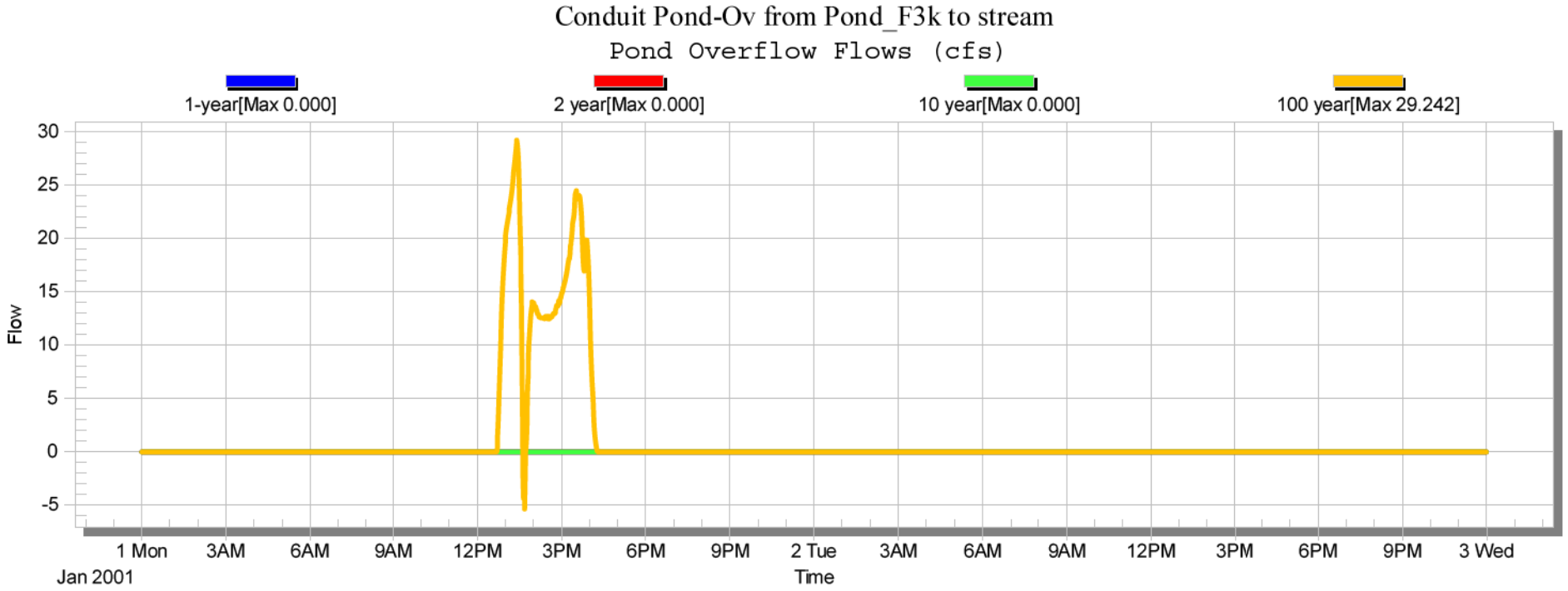
Proposed Model

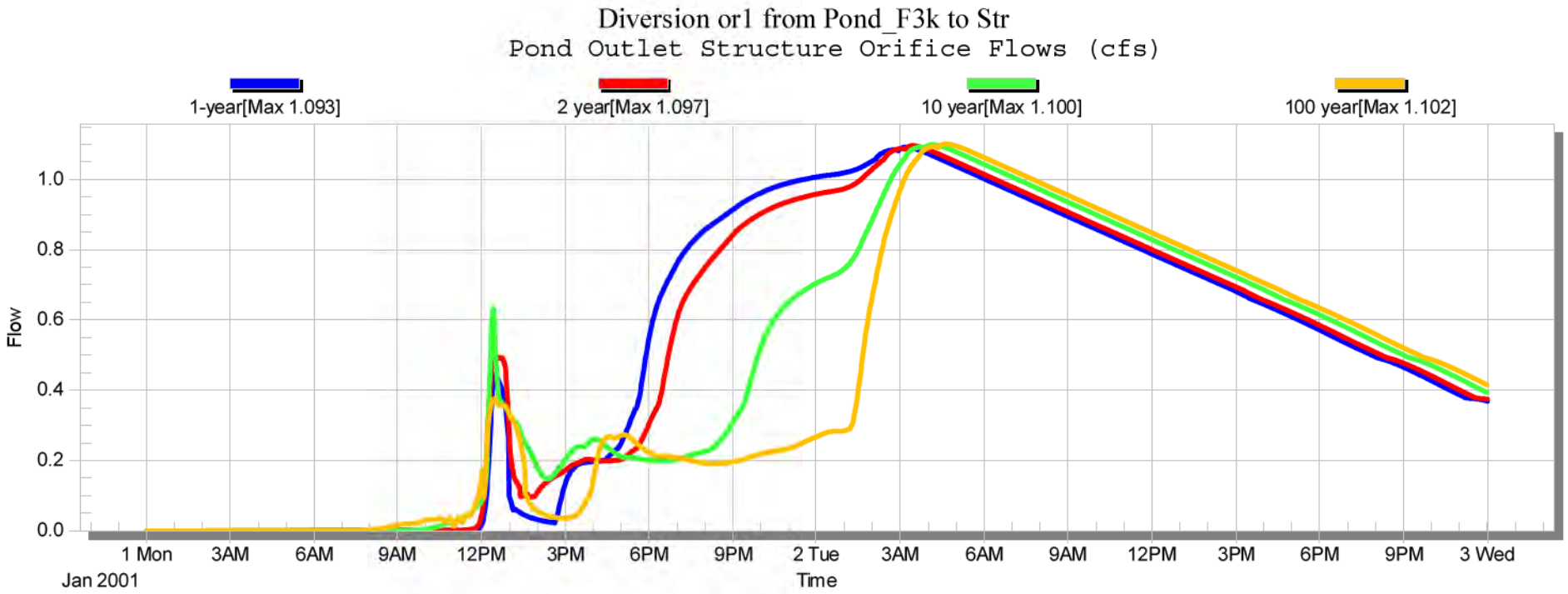


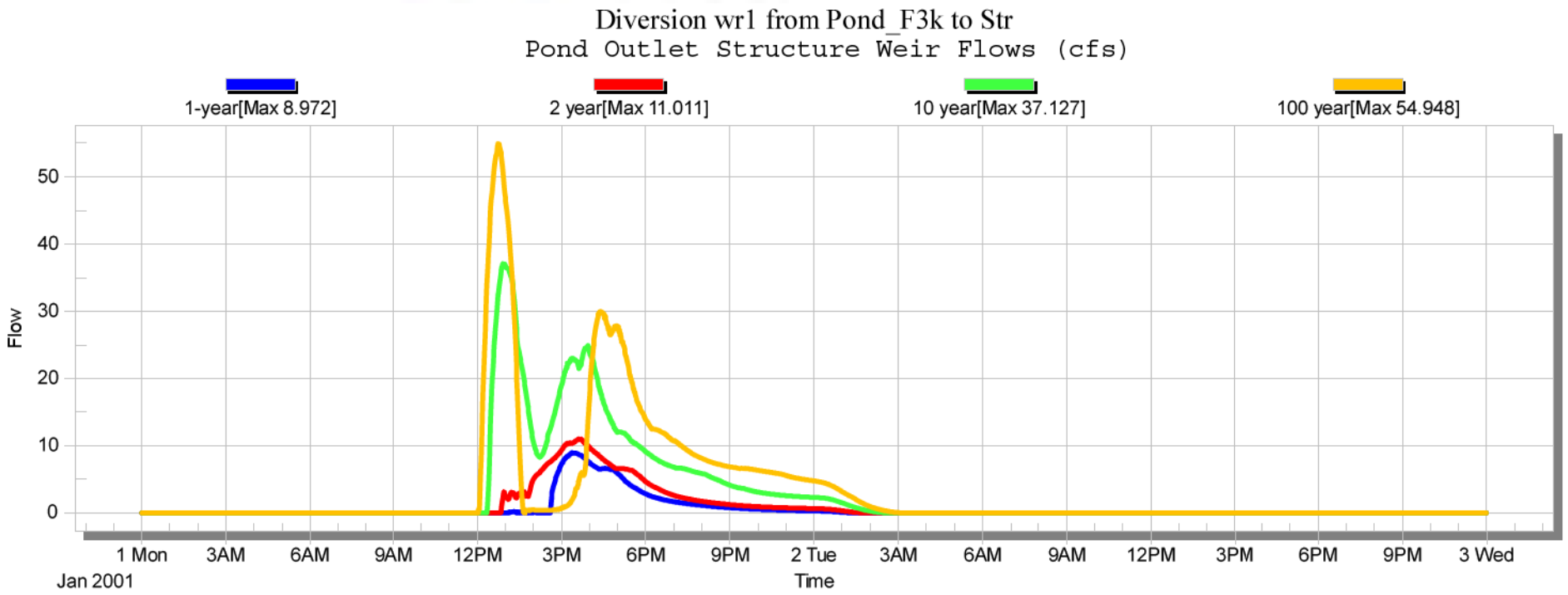
w:\PROJECTS\G0003\940271\16\SWMM\Proposed\Proposed-Misty.xp


Node - Pond_F3k
Proposed Pond Water Surface Elevations
1-year[Max 771.485]
2 year[Max 771.853]
10 year[Max 773.500]
100 year[Max 774.765]
775.0
774.5
774.0
773.5
773.0
772.5
772.0
771.5
771.0
770.5
770.0
769.5
769.0
768.5
Stage
1 Mon
3AM
6AM
9AM
12PM
3PM
6PM
9PM
2 Tue
3AM
6AM
9AM
12PM
3PM
6PM
9PM
3 Wed
Jan 2001
Time

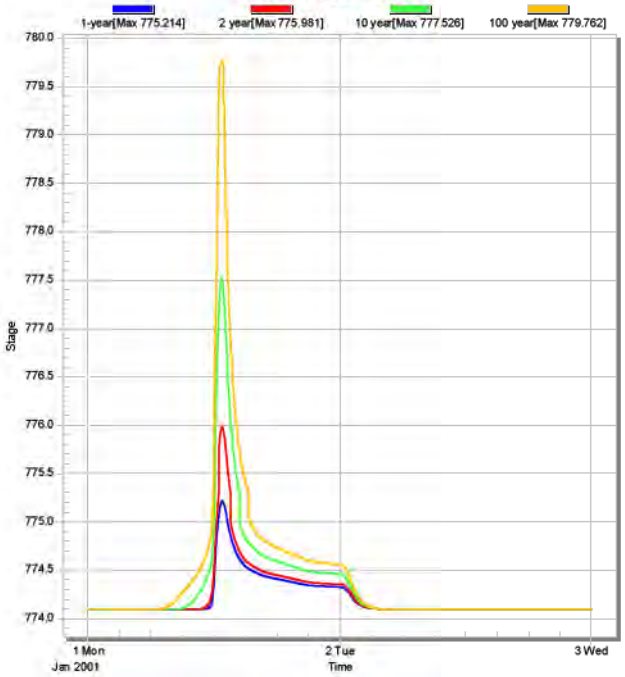

Conduit Pond-SS from Str to stream
Pond Outlet Storm Sewer Flows (cfs)
1-year[Max 9.222]
2 year[Max 11.244]
10 year[Max 37.160]
100 year[Max 54.758]
Flow
50
40
30
20
10
0
1 Mon
3AM
6AM
9AM
12PM
3PM
6PM
9PM
2 Tue
3AM
6AM
9AM
12PM
3PM
6PM
9PM
3 Wed
Jan 2001
Time


Conduit Pond-Ov from Pond_F3k to stream
Pond Overflow Flows (cfs)
1-year[Max 0.000]
2 year[Max 0.000]
10 year[Max 0.000]
100 year[Max 29.242]
Flow
30
25
20
15
10
5
0
-5
1 Mon
3AM
6AM
9AM
12PM
3PM
6PM
9PM
2 Tue
3AM
6AM
9AM
12PM
3PM
6PM
9PM
3 Wed
Jan 2001
Time

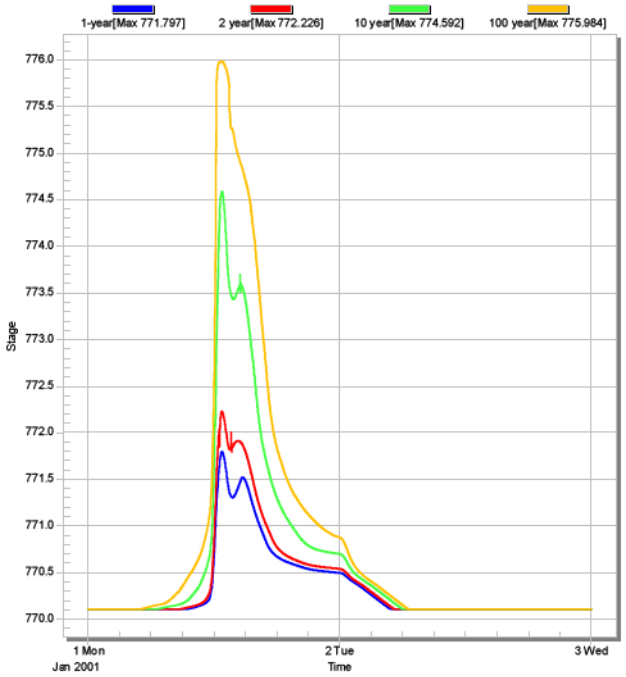

Diversion or1 from Pond_F3k to Str
Pond Outlet Structure Orifice Flows (cfs)
1-year[Max 1.093]
2 year[Max 1.097]
10 year[Max 1.100]
100 year[Max 1.102]
Flow
1.0
0.8
0.6
0.4
0.2
0.0
1 Mon
3AM
6AM
9AM
12PM
3PM
6PM
9PM
2 Tue
3AM
6AM
9AM
12PM
3PM
6PM
9PM
3 Wed
Jan 2001
Time


Diversion wr1 from Pond_F3k to Str
Pond Outlet Structure Weir Flows (cfs)
1-year[Max 8.972]
2 year[Max 11.011]
10 year[Max 37.127]
100 year[Max 54.948]
Flow
50
40
30
20
10
0
1 Mon
3AM
6AM
9AM
12PM
3PM
6PM
9PM
2 Tue
3AM
6AM
9AM
12PM
3PM
6PM
9PM
3 Wed
Jan 2001
Time

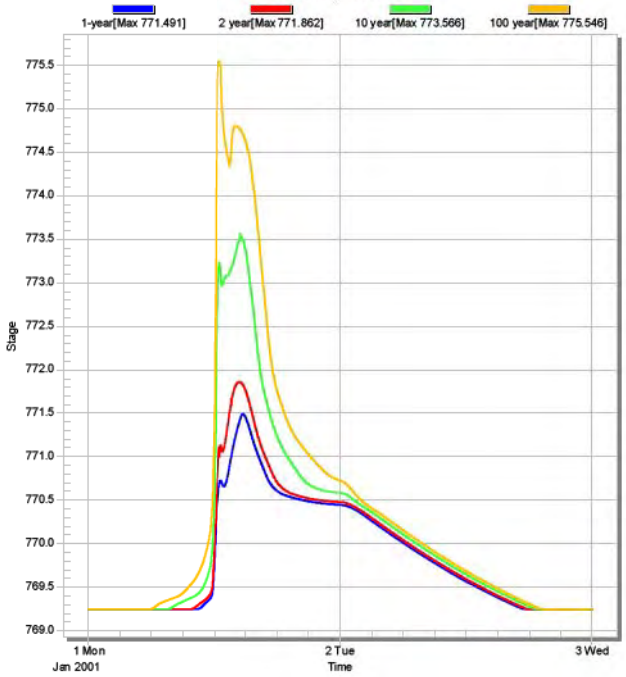
Node - F3l3a_m2a
Maple Hill Drive



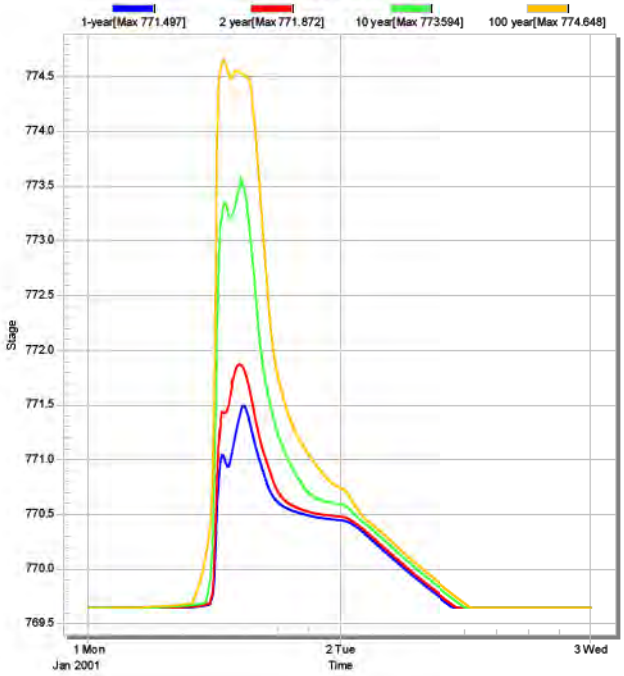
Node - F3l3c_m2cd
Wildrose Lane



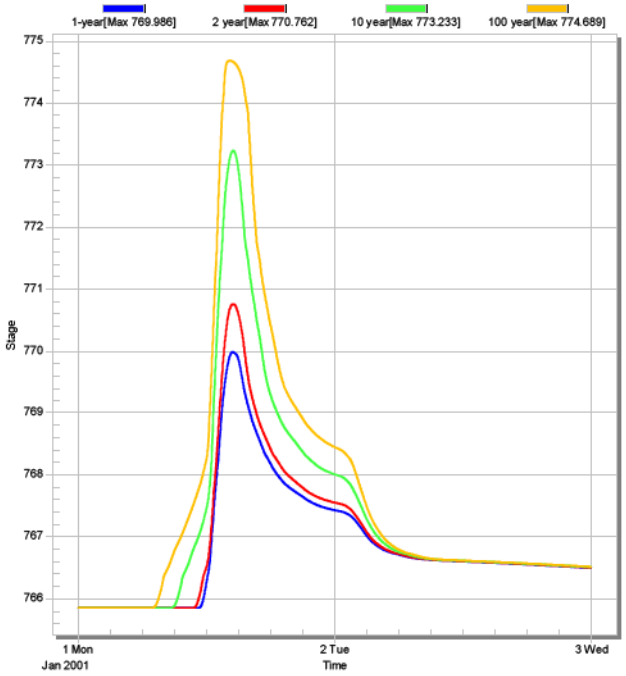
Node - F3l3e
Misty Lane

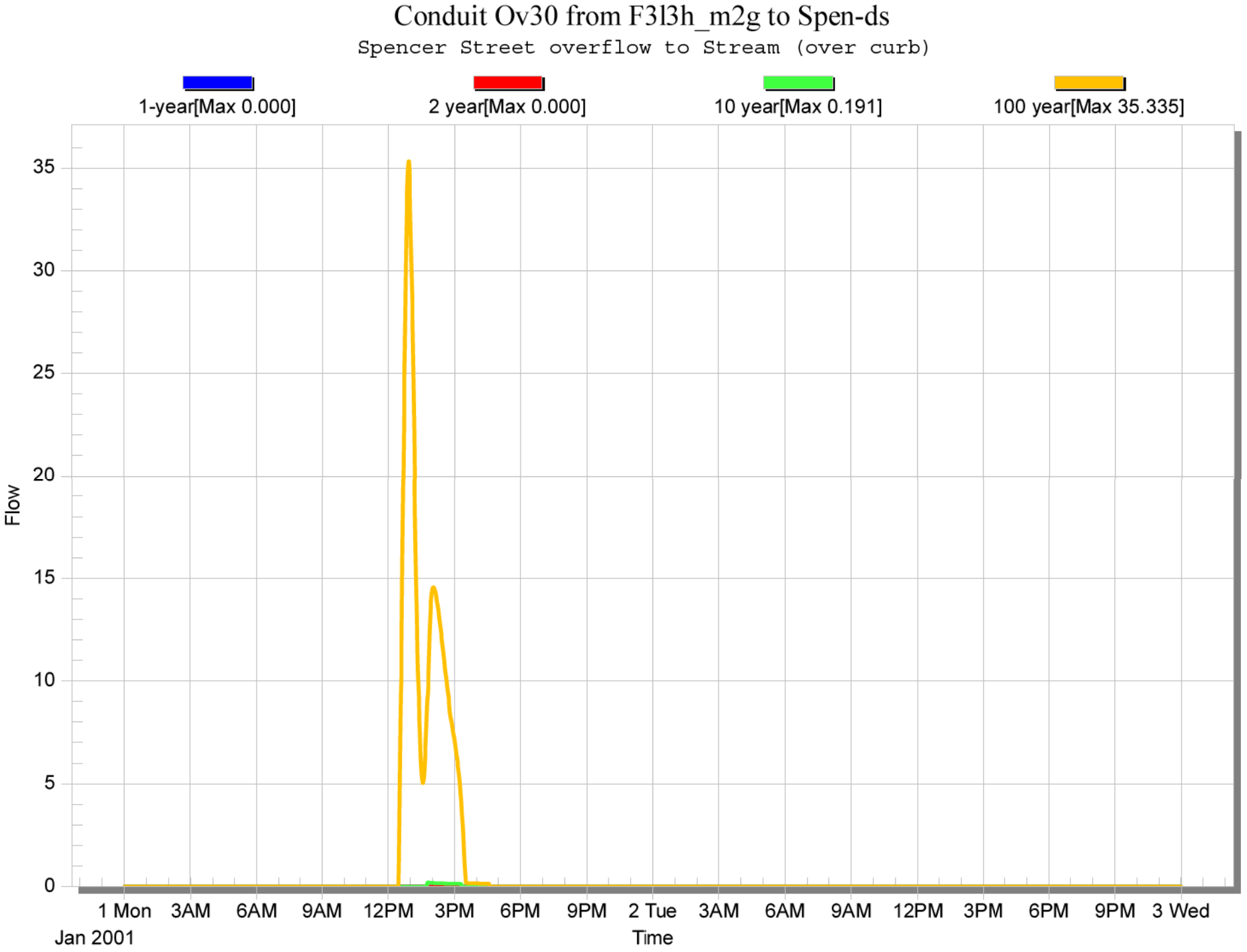


Node - F3m2f
Goldenrod Drive



Node - Spen-us
Spencer Street




Conduit Ov30 from F3l3h_m2g to Spen-ds
Spencer Street overflow to Stream (over curb)
1-year[Max 0.000]
2 year[Max 0.000]
10 year[Max 0.191]
100 year[Max 35.335]
Flow
35
30
25
20
15
10
5
0
1 Mon
3AM
6AM
9AM
12PM
3PM
6PM
9PM
2 Tue
3AM
6AM
9AM
12PM
3PM
6PM
9PM
3 Wed
Jan 2001
Time

```
 Current Directory:   C:\PROGRA~2\XPSOLU~1\XPSWMM~1
 Engine Name: C:\PROGRA~2\XPSOLU~1\XPSWMM~1\SWMMEN~2.EXE
 Input File : :\PROJECTS\G0003\940271\16\SWMM\Proposed\Proposed-Misty_1-year.XP

          *================================================*
          |                   xpswmm                       |
          |     Storm and Wastewater Management Model      |
          |         Developed by XP Solutions Inc.         |
          |================================================|
          |                                                |
          | Last Update      : Jan., 2013                  |
          | Interface Version: 2012                        |
          | Engine Version   : 12.0                        |
          | Data File Version: 12.6                        |
          |                                                |
          |                                                |
          *================================================*

 *==========================================================*
 | Parameter Values on the Tapes Common Block.These are the |
 | values read from the data file and dynamically allocated |
 | by the model for this simulation.                        |
 *==========================================================*

  Number of Subcatchments in the Runoff Block (NW)....    22
  Number of Channel/Pipes in the Runoff Block (NG)....     0
  Runoff Water quality constituents (NRQ).............     0
  Runoff Land Uses per Subcatchment (NLU).............     0
  Number of Elements in the Transport Block (NET).....     0
  Number of Storage Junctions in Transport (NTSE).....     0
  Number of Input Hydrographs in Transport (NTH)......     0
  Number of Elements in the Extran Block (NEE)........    37
  Number of Groundwater Subcatchments in Runoff (NGW).     0
  Number of Interface locations for all Blocks (NIE)..    37
  Number of Pumps in Extran (NEP).....................     0
  Number of Orifices in Extran (NEO)..................     1
  Number of Tide Gates/Free Outfalls in Extran (NTG)..     2
  Number of Extran Weirs (NEW)........................     1
  Number of scs hydrograph points.....................  3361
  Number of Extran printout locations (NPO)...........     0
  Number of Tide elements in Extran (NTE).............     2
  Number of Natural channels (NNC)....................     3
  Number of Storage junctions in Extran (NVSE)........     1
  Number of Time history data points in Extran(NTVAL).     0
  Number of Variable storage elements in Extran (NVST)     9
  Number of Input Hydrographs in Extran (NEH).........     0
  Number of Particle sizes in Transport Block (NPS)...     0
  Number of User defined conduits (NHW)...............    22
  Number of Connecting conduits in Extran (NECC)......    20
  Number of Upstream elements in Transport (NTCC).....    10
  Number of Storage/treatment plants (NSTU)...........     1
  Number of Values for R1 lines in Transport (NR1)....     0
  Number of Nodes to be allowed for (NNOD)............    37
  Number of Plugs in a Storage Treatment Unit.........     1


 ######################################################
 #    Entry made to the Runoff Layer(Block) of SWMM    #
 #    Last Updated Jan., 2013 by XP Solutions          #

 *==========================================================*
 |         RUNOFF TABLES IN THE OUTPUT FILE.                |
 |  These are the more important tables in the output file. |
 |  You can use your editor to find the table numbers,      |
 |  for example: search for Table R3 to check continuity.   |
 |  This output file can be imported into a Word Processor  |
 |  and printed on US letter or A4 paper using portrait     |
 |  mode, courier font, a size of 8 pt. and margins of 0.75 |
 |                                                          |
 | Table R1  - Physical Hydrology Data                      |
 | Table R2  - Infiltration data                            |
 | Table R3  - Raingage and Infiltration Database Names     |
 | Table R4  - Groundwater Data                             |
 | Table R5  - Continuity Check for Surface Water           |
 | Table R6  - Continuity Check for Channels/Pipes          |
 | Table R7  - Continuity Check for Subsurface Water        |
 | Table R8  - Infiltration/Inflow Continuity Check         |
 | Table R9  - Summary Statistics for Subcatchments         |
 | Table R10 - Sensitivity anlysis for Subcatchments        |
 *==========================================================*

                  Misty Pond
##########################################
#             RUNOFF JOB CONTROL         #
##########################################

 Snowmelt parameter - ISNOW.....................          0
 Number of rain gages - NRGAG...................          1
 Quality is not simulated - KWALTY..............          0
 Default evaporation rate used - IVAP...........          0
 Hour of day at start of storm - NHR............          0
 Minute of hour at start of storm - NMN.........          0
 Time TZERO at start of storm (hours)...........      0.000
 Use U.S. Customary units for most I/O - METRIC...        0
 Runoff input print control...                            0
 Runoff graph plot control....                            0
 Runoff output print control..                            0
 Limit number of groundwater convergence messages to    10000

 Print headers every 50 lines - NOHEAD (0=yes, 1=no)      0

 Print land use load percentages -LANDUPR (0=no, 1=yes)   0
 Month, day, year of start of storm is:           1/ 1/2001
 Wet time step length (seconds).....                 60.0
 Dry time step length (seconds).....               86400.0
 Wet/Dry time step length (seconds)...               60.0
 Simulation length is......                          48.0 Hours

 If Horton infiltration model is being used
 A mixture of infiltration options may be used in
 XP-SWMM2000 as a watershed specific option.
```

```
 Rate for regeneration of infiltration = REGEN * DECAY
 Decay is read in for each subcatchment
 REGEN = ..........................................  0.01000


 Raingage #.............................          1
 KTYPE  - Rainfall input type.............          0
 NHISTO - Total number of rainfall values..       240
 KINC   - Rainfall values(pairs) per line..        10
 KPRINT - Print rainfall(0-Yes,1-No).......          0
 KTIME  - Precipitation time units
 0 --> Minutes  1 --> Hours................          1
 KPREP  - Precipitation unit type
 0 --> Intensity  1 --> Volume.............          1
 KTHIS - Variable rainfall intervals
 0 --> No, > 1 --> Yes.....................          0
 THISTO - Rainfall time interval...........       0.10
 TZRAIN - Starting time(KTIME units).......       0.00


####################################
# Rainfall input summary from Runoff #
####################################

 Total rainfall for gage #     1 is    2.2000 inches

   ############################
   #        Data Group F1     #
   # Evaporation Rate (in/day) #
   ############################

  JAN.  FEB.  MAR.  APR.  MAY   JUN.  JUL.  AUG.  SEP.  OCT.  NOV  DEC.
  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ---- ----
 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100

  ##################################################
  #  Table R1.  S U B C A T C H M E N T  D A T A    #
  #            Physical Hydrology Data             #
  ##################################################
```

Number	Subcatchment Name	Channel or inlet	Width (ft)	Area (ac)	Per-cent Imperv	Slope ft/ft	"n" Imprv	"n" Perv	Deprs-sion Storge Imprv	Deprs-sion Strge Perv	Prcnt Zero Deten-tion
1	F3m2f#1	F3m2f	1.0000	.15800	0.00	1.000	0.020	0.020	0.000	0.000	0.00
2	F3l3h_m2g#1	F3l3h_m2g	1.0000	.98000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
3	F3l3h_m2g#2	F3l3h_m2g	1.0000	.65400	0.00	1.000	0.020	0.020	0.000	0.000	0.00
4	North#1	North	1.0000	936.23	0.00	1.000	0.020	0.020	0.000	0.000	0.00
5	F3l3e#1	F3l3e	1.0000	6.1690	0.00	1.000	0.020	0.020	0.000	0.000	0.00
6	F3l3a_m2a#1	F3l3a_m2a	1.0000	5.0290	0.00	1.000	0.020	0.020	0.000	0.000	0.00
7	F3l3a_m2a#2	F3l3a_m2a	1.0000	41.083	0.00	1.000	0.020	0.020	0.000	0.000	0.00
8	F3l3a_m2a#3	F3l3a_m2a	1.0000	14.677	0.00	1.000	0.020	0.020	0.000	0.000	0.00
9	F3l3a_m2a#4	F3l3a_m2a	1.0000	3.1700	0.00	1.000	0.020	0.020	0.000	0.000	0.00
10	F3l3a_m2a#5	F3l3a_m2a	1.0000	8.6300	0.00	1.000	0.020	0.020	0.000	0.000	0.00
11	F3l3b-m2b#1	F3l3b-m2b	1.0000	1.5930	0.00	1.000	0.020	0.020	0.000	0.000	0.00
12	F3l3b-m2b#2	F3l3b-m2b	1.0000	.50000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
13	F3l3c_m2cd#1	F3l3c_m2cd	1.0000	1.9090	0.00	1.000	0.020	0.020	0.000	0.000	0.00
14	F3l3c_m2cd#2	F3l3c_m2cd	1.0000	.35100	0.00	1.000	0.020	0.020	0.000	0.000	0.00
15	F3l3c_m2cd#3	F3l3c_m2cd	1.0000	.21200	0.00	1.000	0.020	0.020	0.000	0.000	0.00
16	F3l3d#1	F3l3d	1.0000	.97000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
17	F3m2e#1	F3m2e	1.0000	.27700	0.00	1.000	0.020	0.020	0.000	0.000	0.00
18	F3l3g#1	F3l3g	1.0000	.25000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
19	F3l3f#1	F3l3f	1.0000	1.8640	0.00	1.000	0.020	0.020	0.000	0.000	0.00
20	Pond_F3k#1	Pond_F3k	1.0000	3.1390	0.00	1.000	0.020	0.020	0.000	0.000	0.00
21	F3l3i_m2h#1	F3l3i_m2h	1.0000	.15700	0.00	1.000	0.020	0.020	0.000	0.000	0.00
22	F3l3i_m2h#2	F3l3i_m2h	1.0000	.33800	0.00	1.000	0.020	0.020	0.000	0.000	0.00

```
#############################################################################################################
#          Table R2.  SUBCATCHMENT  DATA                                                                    #
#                     Infiltration or Time of Concentration Data                                            #
#                                                                                                           #
# Infiltration Type      Infl #1(#5)       Infl #2(#6)          Infl #3(#7)              Infl #4(#8)      #
# SCS                  ->   Comp CN          Time Conc         Shape Factor        Depth or Fraction        #
# SBUH                 ->   Comp CN          Time Conc                N/A                      N/A          #
# Green Ampt           ->   Suction          Hydr Cond          Initial MD                     N/A          #
# Horton               ->  Max Rate           Min Rate   Decay Rate (1/sec)      Max. Infilt. Volume        #
# Proportional         ->  Constant               N/A                N/A                      N/A          #
# Initial/Cont Loss    ->   Initial         Continuing               N/A                      N/A          #
# Initial/Proportional ->   Initial           Constant               N/A                      N/A          #
# Laurenson Parameters ->   B Value       Pervious "n"      Impervious Cont                Exponent        #
# Rational Formula     -> Tc Method   Flow Path Length      Flow Path Slope  Roughness or Retardance        #
#                                (#1 - #4 is Impervious Data / #5 - #8 is Pervious Data)                    #
#                     Rational Formula Tc Method: 1 = Constant                                              #
#                                                 2 = Friend's Equation                                     #
#                                                 3 = Kinematic Wave                                        #
#                                                 4 = Alameda Method                                        #
#                                                 5 = Izzard's Formula                                      #
#                                                 6 = Kerby's Equation                                      #
#                                                 7 = Kirpich's Equation                                    #
#                                                 8 = Bransby Williams Equation                             #
#                                                 9 = Federal Aviation Authority Equation                   #
#############################################################################################################
```

Number	Subcatchment Name	Infl # 1	Infl # 2	Infl # 3	Infl # 4	Infl # 5	Infl # 6	Infl # 7	Infl # 8
1	F3m2f#1	86.8000	0.0833	484.0000	0.2000				
2	F3l3h_m2g#1	98.0000	0.0833	484.0000	0.2000				
3	F3l3h_m2g#2	86.8000	0.3167	484.0000	0.2000				
4	North#1	81.6000	2.7667	484.0000	0.2000				
5	F3l3e#1	84.4000	0.6833	484.0000	0.2000				
6	F3l3a_m2a#1	76.6000	0.4000	484.0000	0.2000				
7	F3l3a_m2a#2	77.5000	1.1500	484.0000	0.2000				
8	F3l3a_m2a#3	81.9000	1.1667	484.0000	0.2000				
9	F3l3a_m2a#4	78.1000	0.5000	484.0000	0.2000				
10	F3l3a_m2a#5	79.8000	0.7833	484.0000	0.2000				
11	F3l3b-m2b#1	81.7000	0.6833	484.0000	0.2000				
12	F3l3b-m2b#2	86.8000	0.0833	484.0000	0.2000				
13	F3l3c_m2cd#1	86.8000	0.4000	484.0000	0.2000				
14	F3l3c_m2cd#2	86.8000	0.1000	484.0000	0.2000				

15	F3l3c_m2cd#3	86.8000	0.0833	484.0000	0.2000
16	F3l3d#1	98.0000	0.0833	484.0000	0.2000
17	F3m2e#1	86.8000	0.1167	484.0000	0.2000
18	F3l3g#1	98.0000	0.0833	484.0000	0.2000
19	F3l3f#1	90.4000	0.8167	484.0000	0.2000
20	Pond_F3k#1	81.1000	0.8333	484.0000	0.2000
21	F3l3i_m2h#1	98.0000	0.0833	484.0000	0.2000
22	F3l3i_m2h#2	86.8000	0.1667	484.0000	0.2000

```
############################################################
#     Table R3.  SUBCATCHMENT  DATA                        #
#                Rainfall and Infiltration Database Names  #
############################################################
```

Subcatchment Number	Name	Gage No	Infiltration Type	Routing Type
1	F3m2f#1	1	SCS Method	SCS curvilinear
2	F3l3h_m2g#1	1	SCS Method	SCS curvilinear
3	F3l3h_m2g#2	1	SCS Method	SCS curvilinear
4	North#1	1	SCS Method	SCS curvilinear
5	F3l3e#1	1	SCS Method	SCS curvilinear
6	F3l3a_m2a#1	1	SCS Method	SCS curvilinear
7	F3l3a_m2a#2	1	SCS Method	SCS curvilinear
8	F3l3a_m2a#3	1	SCS Method	SCS curvilinear
9	F3l3a_m2a#4	1	SCS Method	SCS curvilinear
10	F3l3a_m2a#5	1	SCS Method	SCS curvilinear
11	F3l3b-m2b#1	1	SCS Method	SCS curvilinear
12	F3l3b-m2b#2	1	SCS Method	SCS curvilinear
13	F3l3c_m2cd#1	1	SCS Method	SCS curvilinear
14	F3l3c_m2cd#2	1	SCS Method	SCS curvilinear
15	F3l3c_m2cd#3	1	SCS Method	SCS curvilinear
16	F3l3d#1	1	SCS Method	SCS curvilinear
17	F3m2e#1	1	SCS Method	SCS curvilinear
18	F3l3g#1	1	SCS Method	SCS curvilinear
19	F3l3f#1	1	SCS Method	SCS curvilinear
20	Pond_F3k#1	1	SCS Method	SCS curvilinear
21	F3l3i_m2h#1	1	SCS Method	SCS curvilinear
22	F3l3i_m2h#2	1	SCS Method	SCS curvilinear

```
Total Number of Subcatchments...              22
Total Tributary Area (acres)....         1025.90
Impervious Area (acres).........            0.00
Pervious Area (acres)...........         1025.90
Total Width (feet)..............           22.00
Impervious Area (%).............            0.00

 ###################################################
 #          S U B C A T C H M E N T  D A T A       #
 #   Default, Ratio values for subcatchment data   #
 #   Used with the calibrate node in the runoff.   #
 # 1 - width     2 - area       3 - impervious %   #
 # 4 - slope     5 - imp "n"    6 - perv "n"       #
 # 7 - imp ds    8 - perv ds    9 - 1st infil      #
 #10 - 2nd infil              11 - 3rd infil      #
 ###################################################

Column          1         2         3         4         5         6         7         8         9        10        11
Default    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
Ratio      1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000

*********************************************************
*     Arrangement of Subcatchments and Channel/Pipes    *
*********************************************************

    Inlet
F3m2f          No Tributary Channel/Pipes
               Tributary Subareas........ F3m2f#1
F3l3h_m2g      No Tributary Channel/Pipes
               Tributary Subareas........ F3l3h_m2g# F3l3h_m2g#
North          No Tributary Channel/Pipes
               Tributary Subareas........ North#1
F3l3e          No Tributary Channel/Pipes
               Tributary Subareas........ F3l3e#1
F3l3a_m2a      No Tributary Channel/Pipes
               Tributary Subareas........ F3l3a_m2a# F3l3a_m2a# F3l3a_m2a# F3l3a_m2a# F3l3a_m2a#
F3l3b-m2b      No Tributary Channel/Pipes
               Tributary Subareas........ F3l3b-m2b# F3l3b-m2b#
F3l3c_m2cd     No Tributary Channel/Pipes
               Tributary Subareas........ F3l3c_m2cd F3l3c_m2cd F3l3c_m2cd
F3l3d          No Tributary Channel/Pipes
               Tributary Subareas........ F3l3d#1
F3m2e          No Tributary Channel/Pipes
               Tributary Subareas........ F3m2e#1
F3l3g          No Tributary Channel/Pipes
               Tributary Subareas........ F3l3g#1
F3l3f          No Tributary Channel/Pipes
               Tributary Subareas........ F3l3f#1
Pond_F3k       No Tributary Channel/Pipes
               Tributary Subareas........ Pond_F3k#1
F3l3i_m2h      No Tributary Channel/Pipes
               Tributary Subareas........ F3l3i_m2h# F3l3i_m2h#


*********************************************************
* Hydrographs will be stored for the following  13 INLETS *
*********************************************************
F3m2f     F3l3h_m2g North     F3l3e     F3l3a_m2a F3l3b-m2b
F3l3c_m2cdF3l3d     F3m2e     F3l3g     F3l3f     Pond_F3k
F3l3i_m2h

************************************************
*  Quality Simulation not included in this run *
************************************************

************************************************
*  Precipitation Interface File Summary        *
*  Number of precipitation station....      1  *
************************************************

Location Station Number
```

```
 -------- --------------
       1.              1

 XXX End of Header Section XXX

 #######################################################
 #    Entry made to the HYDRAULIC Layer of XP-SWMM     #
 #    Last Updated in Jan., 2013 by XP Solutions       #

 #######################################################
 #    Entry made to the Runoff Layer(Block) of SWMM    #
 #    Last Updated Jan., 2013 by XP Solutions          #

 *==========================================================*
 |         RUNOFF TABLES IN THE OUTPUT FILE.                 |
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 |  for example: search for Table R3 to check continuity.   |
 |  This output file can be imported into a Word Processor  |
 |  and printed on US letter or A4 paper using portrait     |
 |  mode, courier font, a size of 8 pt. and margins of 0.75 |
 |                                                          |
 | Table R1  - Physical Hydrology Data                      |
 | Table R2  - Infiltration data                            |
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 | Table R4  - Groundwater Data                             |
 | Table R5  - Continuity Check for Surface Water           |
 | Table R6  - Continuity Check for Channels/Pipes          |
 | Table R7  - Continuity Check for Subsurface Water        |
 | Table R8  - Infiltration/Inflow Continuity Check         |
 | Table R9  - Summary Statistics for Subcatchments         |
 | Table R10 - Sensitivity anlysis for Subcatchments        |
 *==========================================================*

                   Misty Pond
###########################################
#             RUNOFF JOB CONTROL          #
###########################################

 Snowmelt parameter - ISNOW......................           0
 Number of rain gages - NRGAG....................           1
 Quality is not simulated - KWALTY...............           0
 Default evaporation rate used - IVAP............           0
 Hour of day at start of storm - NHR.............           0
 Minute of hour at start of storm - NMN..........           0
 Time TZERO at start of storm (hours)............       0.000
 Use U.S. Customary units for most I/O - METRIC...          0
 Runoff input print control...                              0
 Runoff graph plot control....                              0
 Runoff output print control..                              0
 Limit number of groundwater convergence messages to    10000

 Print headers every 50 lines - NOHEAD (0=yes, 1=no)        0

 Print land use load percentages -LANDUPR (0=no, 1=yes)     0
 Month, day, year of start of storm is:             1/ 1/2001
 Wet time step length (seconds).......                   60.0
 Dry time step length (seconds).......                86400.0
 Wet/Dry time step length (seconds)...                   60.0
 Simulation length is......                              48.0 Hours

 If Horton infiltration model is being used
 A mixture of infiltration options may be used in
 XP-SWMM2000 as a watershed specific option.
 Rate for regeneration of infiltration = REGEN * DECAY
 Decay is read in for each subcatchment
 REGEN = ..........................................  0.01000

 Raingage #..............................         1
 KTYPE  - Rainfall input type.............        0
 NHISTO - Total number of rainfall values..     240
 KINC   - Rainfall values(pairs) per line..      10
 KPRINT - Print rainfall(0-Yes,1-No).......       0
 KTIME  - Precipitation time units
 0 --> Minutes  1 --> Hours................       1
 KPREP  - Precipitation unit type
 0 --> Intensity  1 --> Volume............        1
 KTHIS - Variable rainfall intervals
 0 --> No, > 1 --> Yes....................        0
 THISTO - Rainfall time interval..........     0.10
 TZRAIN - Starting time(KTIME units).......    0.00


######################################
# Rainfall input summary from Runoff #
######################################

 Total rainfall for gage #     1 is    2.2000 inches

   ############################
   #       Data Group F1      #
   # Evaporation Rate (in/day) #
   ############################

  JAN.  FEB.  MAR.  APR.  MAY   JUN.  JUL.  AUG.  SEP.  OCT.  NOV  DEC.
  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ---- ----
 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.100

  #################################################
  # Table R1.  S U B C A T C H M E N T  D A T A   #
  #           Physical Hydrology Data              #
  #################################################
```

Subcatchment Number	Subcatchment Name	Channel or inlet	Width (ft)	Area (ac)	Per-cent Imperv	Slope ft/ft	"n" Imprv	"n" Perv	Deprs -sion Storge Imprv	Deprs -sion Strge Perv	Prcnt Zero Deten -tion
1	F3m2f#1	F3m2f	1.0000	.15800	0.00	1.000	0.020	0.020	0.000	0.000	0.00
2	F3l3h_m2g#1	F3l3h_m2g	1.0000	.98000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
3	F3l3h_m2g#2	F3l3h_m2g	1.0000	.65400	0.00	1.000	0.020	0.020	0.000	0.000	0.00
4	North#1	North	1.0000	936.23	0.00	1.000	0.020	0.020	0.000	0.000	0.00

5	F3l3e#1	F3l3e	1.0000	6.1690	0.00	1.000	0.020	0.020	0.000	0.000	0.00
6	F3l3a_m2a#1	F3l3a_m2a	1.0000	5.0290	0.00	1.000	0.020	0.020	0.000	0.000	0.00
7	F3l3a_m2a#2	F3l3a_m2a	1.0000	41.083	0.00	1.000	0.020	0.020	0.000	0.000	0.00
8	F3l3a_m2a#3	F3l3a_m2a	1.0000	14.677	0.00	1.000	0.020	0.020	0.000	0.000	0.00
9	F3l3a_m2a#4	F3l3a_m2a	1.0000	3.1700	0.00	1.000	0.020	0.020	0.000	0.000	0.00
10	F3l3a_m2a#5	F3l3a_m2a	1.0000	8.6300	0.00	1.000	0.020	0.020	0.000	0.000	0.00
11	F3l3b-m2b#1	F3l3b-m2b	1.0000	1.5930	0.00	1.000	0.020	0.020	0.000	0.000	0.00
12	F3l3b-m2b#2	F3l3b-m2b	1.0000	.50000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
13	F3l3c_m2cd#1	F3l3c_m2cd	1.0000	1.9090	0.00	1.000	0.020	0.020	0.000	0.000	0.00
14	F3l3c_m2cd#2	F3l3c_m2cd	1.0000	.35100	0.00	1.000	0.020	0.020	0.000	0.000	0.00
15	F3l3c_m2cd#3	F3l3c_m2cd	1.0000	.21200	0.00	1.000	0.020	0.020	0.000	0.000	0.00
16	F3l3d#1	F3l3d	1.0000	.97000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
17	F3m2e#1	F3m2e	1.0000	.27700	0.00	1.000	0.020	0.020	0.000	0.000	0.00
18	F3l3g#1	F3l3g	1.0000	.25000E-01	0.00	1.000	0.020	0.020	0.000	0.000	0.00
19	F3l3f#1	F3l3f	1.0000	1.8640	0.00	1.000	0.020	0.020	0.000	0.000	0.00
20	Pond_F3k#1	Pond_F3k	1.0000	3.1390	0.00	1.000	0.020	0.020	0.000	0.000	0.00
21	F3l3i_m2h#1	F3l3i_m2h	1.0000	.15700	0.00	1.000	0.020	0.020	0.000	0.000	0.00
22	F3l3i_m2h#2	F3l3i_m2h	1.0000	.33800	0.00	1.000	0.020	0.020	0.000	0.000	0.00

```
##############################################################################################################
#          Table R2.  SUBCATCHMENT  DATA                                                                     #
#                     Infiltration or Time of Concentration Data                                             #
#                                                                                                            #
# Infiltration Type      Infl #1(#5)       Infl #2(#6)          Infl #3(#7)              Infl #4(#8)  #
# SCS                 ->   Comp CN          Time Conc         Shape Factor        Depth or Fraction  #
# SBUH                ->   Comp CN          Time Conc                 N/A                      N/A  #
# Green Ampt          ->   Suction          Hydr Cond           Initial MD                     N/A  #
# Horton              ->  Max Rate           Min Rate   Decay Rate (1/sec)      Max. Infilt. Volume  #
# Proportional        ->  Constant                N/A                 N/A                      N/A  #
# Initial/Cont Loss   ->   Initial         Continuing                 N/A                      N/A  #
# Initial/Proportional ->  Initial           Constant                 N/A                      N/A  #
# Laurenson Parameters ->  B Value       Pervious "n"      Impervious Cont                Exponent  #
# Rational Formula    -> Tc Method   Flow Path Length      Flow Path Slope  Roughness or Retardance  #
#                              (#1 - #4 is Impervious Data / #5 - #8 is Pervious Data)                       #
#                      Rational Formula Tc Method: 1 = Constant                                              #
#                                                  2 = Friend's Equation                                     #
#                                                  3 = Kinematic Wave                                        #
#                                                  4 = Alameda Method                                        #
#                                                  5 = Izzard's Formula                                      #
#                                                  6 = Kerby's Equation                                      #
#                                                  7 = Kirpich's Equation                                    #
#                                                  8 = Bransby Williams Equation                             #
#                                                  9 = Federal Aviation Authority Equation                   #
##############################################################################################################
```

Subcatchment Number	Name	Infl # 1	Infl # 2	Infl # 3	Infl # 4	Infl # 5	Infl # 6	Infl # 7	Infl # 8
1	F3m2f#1	86.8000	0.0833	484.0000	0.2000				
2	F3l3h_m2g#1	98.0000	0.0833	484.0000	0.2000				
3	F3l3h_m2g#2	86.8000	0.3167	484.0000	0.2000				
4	North#1	81.6000	2.7667	484.0000	0.2000				
5	F3l3e#1	84.4000	0.6833	484.0000	0.2000				
6	F3l3a_m2a#1	76.6000	0.4000	484.0000	0.2000				
7	F3l3a_m2a#2	77.5000	1.1500	484.0000	0.2000				
8	F3l3a_m2a#3	81.9000	1.1667	484.0000	0.2000				
9	F3l3a_m2a#4	78.1000	0.5000	484.0000	0.2000				
10	F3l3a_m2a#5	79.8000	0.7833	484.0000	0.2000				
11	F3l3b-m2b#1	81.7000	0.6833	484.0000	0.2000				
12	F3l3b-m2b#2	86.8000	0.0833	484.0000	0.2000				
13	F3l3c_m2cd#1	86.8000	0.4000	484.0000	0.2000				
14	F3l3c_m2cd#2	86.8000	0.1000	484.0000	0.2000				
15	F3l3c_m2cd#3	86.8000	0.0833	484.0000	0.2000				
16	F3l3d#1	98.0000	0.0833	484.0000	0.2000				
17	F3m2e#1	86.8000	0.1167	484.0000	0.2000				
18	F3l3g#1	98.0000	0.0833	484.0000	0.2000				
19	F3l3f#1	90.4000	0.8167	484.0000	0.2000				
20	Pond_F3k#1	81.1000	0.8333	484.0000	0.2000				
21	F3l3i_m2h#1	98.0000	0.0833	484.0000	0.2000				
22	F3l3i_m2h#2	86.8000	0.1667	484.0000	0.2000				

```
############################################################
#     Table R3.  SUBCATCHMENT  DATA                        #
#                Rainfall and Infiltration Database Names  #
############################################################
```

Subcatchment Number	Name	Gage No	Infiltration Type	Routing Type
1	F3m2f#1	1	SCS Method	SCS curvilinear
2	F3l3h_m2g#1	1	SCS Method	SCS curvilinear
3	F3l3h_m2g#2	1	SCS Method	SCS curvilinear
4	North#1	1	SCS Method	SCS curvilinear
5	F3l3e#1	1	SCS Method	SCS curvilinear
6	F3l3a_m2a#1	1	SCS Method	SCS curvilinear
7	F3l3a_m2a#2	1	SCS Method	SCS curvilinear
8	F3l3a_m2a#3	1	SCS Method	SCS curvilinear
9	F3l3a_m2a#4	1	SCS Method	SCS curvilinear
10	F3l3a_m2a#5	1	SCS Method	SCS curvilinear
11	F3l3b-m2b#1	1	SCS Method	SCS curvilinear
12	F3l3b-m2b#2	1	SCS Method	SCS curvilinear
13	F3l3c_m2cd#1	1	SCS Method	SCS curvilinear
14	F3l3c_m2cd#2	1	SCS Method	SCS curvilinear
15	F3l3c_m2cd#3	1	SCS Method	SCS curvilinear
16	F3l3d#1	1	SCS Method	SCS curvilinear
17	F3m2e#1	1	SCS Method	SCS curvilinear
18	F3l3g#1	1	SCS Method	SCS curvilinear
19	F3l3f#1	1	SCS Method	SCS curvilinear
20	Pond_F3k#1	1	SCS Method	SCS curvilinear
21	F3l3i_m2h#1	1	SCS Method	SCS curvilinear
22	F3l3i_m2h#2	1	SCS Method	SCS curvilinear

```
 Total Number of Subcatchments...            22
 Total Tributary Area (acres)....       1025.90
 Impervious Area (acres).........          0.00
 Pervious Area (acres)...........       1025.90
 Total Width (feet)..............         22.00
 Impervious Area (%).............          0.00

  ################################################
  #          S U B C A T C H M E N T  D A T A    #
  #   Default, Ratio values for subcatchment data #
```

```
  #   Used with the calibrate node in the runoff.   #
  # 1 - width     2 - area       3 - impervious %   #
  # 4 - slope     5 - imp "n"    6 - perv "n"       #
  # 7 - imp ds    8 - perv ds    9 - 1st infil      #
  #10 - 2nd infil               11 - 3rd infil      #
  ###################################################

 Column           1         2         3         4         5         6         7         8         9        10        11
 Default     0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 Ratio       1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000

 *********************************************************
 *     Arrangement of Subcatchments and Channel/Pipes    *
 *********************************************************
     Inlet
 F3m2f           No Tributary Channel/Pipes
                 Tributary Subareas........ F3m2f#1
 F3l3h_m2g       No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3h_m2g# F3l3h_m2g#
 North           No Tributary Channel/Pipes
                 Tributary Subareas........ North#1
 F3l3e           No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3e#1
 F3l3a_m2a       No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3a_m2a# F3l3a_m2a# F3l3a_m2a# F3l3a_m2a# F3l3a_m2a#
 F3l3b-m2b       No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3b-m2b# F3l3b-m2b#
 F3l3c_m2cd      No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3c_m2cd F3l3c_m2cd F3l3c_m2cd
 F3l3d           No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3d#1
 F3m2e           No Tributary Channel/Pipes
                 Tributary Subareas........ F3m2e#1
 F3l3g           No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3g#1
 F3l3f           No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3f#1
 Pond_F3k        No Tributary Channel/Pipes
                 Tributary Subareas........ Pond_F3k#1
 F3l3i_m2h       No Tributary Channel/Pipes
                 Tributary Subareas........ F3l3i_m2h# F3l3i_m2h#

 *********************************************************
 * Hydrographs will be stored for the following  13 INLETS *
 *********************************************************
 F3m2f     F3l3h_m2g North     F3l3e     F3l3a_m2a F3l3b-m2b
 F3l3c_m2cdF3l3d     F3m2e     F3l3g     F3l3f     Pond_F3k
 F3l3i_m2h

 ************************************************
 *  Quality Simulation not included in this run *
 ************************************************

************************************************
 *  Precipitation Interface File Summary          *
 *  Number of precipitation station....        1   *
 ************************************************

 Location Station Number
 -------- --------------
        1.             1

     Misty Pond

 *============================================================*
 |        HYDRAULICS TABLES IN THE OUTPUT FILE                |
 |  These are the more important tables in the output file.   |
 |  You can use your editor to find the table numbers,        |
 |  for example: search for Table E20 to check continuity.    |
 |  This output file can be imported into a Word Processor    |
 |  and printed on US letter or A4 paper using portrait       |
 |  mode, courier font, a size of 8 pt. and margins of 0.75   |
 |                                                            |
 | Table E1   - Basic Conduit Data                            |
 | Table E2   - Conduit Factor Data                           |
 | Table E3a  - Junction Data                                 |
 | Table E3b  - Junction Data                                 |
 | Table E4   - Conduit Connectivity Data                     |
 | Table E4a  - Dry Weather Flow Data                         |
 | Table E4b  - Real Time Control Data                        |
 | Table E5   - Junction Time Step Limitation Summary         |
 | Table E5a  - Conduit Explicit Condition Summary            |
 | Table E6   - Final Model Condition                         |
 | Table E7   - Iteration Summary                             |
 | Table E8   - Junction Time Step Limitation Summary         |
 | Table E9   - Junction  Summary  Statistics                 |
 | Table E10  - Conduit   Summary  Statistics                 |
 | Table E11  - Area assumptions used in the analysis         |
 | Table E12  - Mean conduit information                      |
 | Table E13  - Channel losses(H) and culvert info            |
 | Table E13a - Culvert Analysis Classification               |
 | Table E14  - Natural Channel Overbank Flow Information     |
 | Table E14a - Natural Channel Encroachment Information      |
 | Table E14b - Floodplain Mapping                            |
 | Table E15  - Spreadsheet Info List                         |
 | Table E15a - Spreadsheet Reach List                        |
 | Table E16  - New Conduit Output Section                    |
 | Table E17  - Pump Operation                                |
 | Table E18  - Junction Continuity Error                     |
 | Table E19  - Junction Inflow & Outflow Listing             |
 | Table E20  - Junction Flooding and Volume List             |
 | Table E21  - Continuity balance at simulation end          |
 | Table E22  - Model Judgement Section                       |
 *============================================================*

 Time Control from Hydraulics Job Control
 Year.........    2001 Month.......       1
 Day..........       1 Hour........       0
 Minute.......       0 Second......       0
```

```
Control information for simulation
----------------------------------

Integration cycles.................      2880
Length of integration step is......     60.00 seconds
Simulation length..................     48.00 hours
Do not create equiv. pipes(NEQUAL).         0
Use U.S. customary units for I/O...         0
Printing starts in cycle...........         1
Intermediate printout intervals of.       500 cycles
Intermediate printout intervals of.    500.00 minutes
Summary printout intervals of......       500 cycles
Summary printout time interval of..    500.00 minutes
Hot start file parameter (REDO)....         0
Initial time.......................      0.00 hours

Iteration variables: Flow Tolerance.   0.00010
                     Head Tolerance.   0.00050
    Minimum depth (m or ft).........   0.00001
    Underrelaxation parameter.......   0.85000
    Time weighting parameter........   0.85000
    Conduit roughness factor........   1.00000
    Flow adjustment factor..........   1.00000
    Initial Condition Smoothing.....         0
    Courant Time Step Factor........   1.00000
    Default Expansion/Contraction K.   0.00000
    Default Entrance/Exit K.........   0.00000
    Routing Method..................   Dynamic Wave
Default surface area of junctions...     12.57 square feet.
Minimum Junction/Conduit Depth......   0.00001 feet.
Ponding Area Coefficient............   5000.00
Ponding Area Exponent...............    1.0000
Minimum Orifice Length..............   1000.00 feet.
NJSW input hydrograph junctions.....      0
     or user defined hydrographs....

*=========================================================*
|               Flap Gate Conduit Information             |
|               ----------------------------              |
| Positive Flap Gate - Flow only allowed from the upstream |
|                      to the downstream junction         |
| Negative Flap Gate - Flow only allowed from the          |
|                      downstream to the upstream junction |
*=========================================================*

   Conduit   Type of Flap Gate
   -------   -----------------
SS-33-DS     Positive Flap Gate
Pond-SS      Positive Flap Gate

        Natural Cross-Section information for Channel Stream-US1
        ========================================================
         Cross-Section ID (from X1 card) :     1.0 Channel sequence number :     1

  Left Overbank Length   :    689.8 ft               Maximum Elevation        :    10.00 ft.
  Main Channel Length    :    689.8 ft               Maximum Depth            :    10.00 ft.
  Right Overbank Length  :    689.8 ft               Maximum Section Area     : 1913.615 ft^2
                                                     Maximum hydraulic radius :     3.93 ft.
  Manning N :      0.035  to Station         309.9    Max topwidth             :   482.80 ft.
    "    "  :      0.035  in main Channel            Maximum Wetted Perimeter : 4.87E+02 ft
    "    "  :      0.035  Beyond station     330.0    Max left bank area       :  1350.82 ft^2
                                                     Max right bank area      :   403.62 ft^2
  Allowable Encroachment Depth :    0.00 ft          Max center channel area  : 159.1763 ft^2

        Natural Cross-Section information for Channel Stream-DS
        =======================================================
         Cross-Section ID (from X1 card) :     2.0 Channel sequence number :     2

  Left Overbank Length   :   1015.9 ft               Maximum Elevation        :    10.00 ft.
  Main Channel Length    :   1015.9 ft               Maximum Depth            :    10.00 ft.
  Right Overbank Length  :   1015.9 ft               Maximum Section Area     : 1078.171 ft^2
                                                     Maximum hydraulic radius :     3.02 ft.
  Manning N :      0.045  to Station         147.0    Max topwidth             :   351.24 ft.
    "    "  :      0.045  in main Channel            Maximum Wetted Perimeter : 3.57E+02 ft
    "    "  :      0.045  Beyond station     166.4    Max left bank area       :   386.11 ft^2
                                                     Max right bank area      :   512.60 ft^2
  Allowable Encroachment Depth :    0.00 ft          Max center channel area  : 179.4589 ft^2

        Natural Cross-Section information for Channel Stream-US2
        ========================================================
         Cross-Section ID (from X1 card) :     3.0 Channel sequence number :     3

  Left Overbank Length   :    464.1 ft               Maximum Elevation        :    10.00 ft.
  Main Channel Length    :    464.1 ft               Maximum Depth            :    10.00 ft.
  Right Overbank Length  :    464.1 ft               Maximum Section Area     : 1381.562 ft^2
                                                     Maximum hydraulic radius :     5.75 ft.
  Manning N :      0.040  to Station         136.1    Max topwidth             :   233.79 ft.
    "    "  :      0.040  in main Channel            Maximum Wetted Perimeter : 2.40E+02 ft
    "    "  :      0.040  Beyond station     145.7    Max left bank area       :   736.05 ft^2
                                                     Max right bank area      :   554.06 ft^2
  Allowable Encroachment Depth :    0.00 ft          Max center channel area  :  91.4482 ft^2

*=================================================*
|          Table E1 - Conduit Data                |
*=================================================*
```

Inp Num	Conduit Name	Length (ft)	Conduit Class	Area (ft^2)	Manning Coef.	Max Width (ft)	Depth (ft)	Trapezoid Side Slopes	Hazen Williams c-factor
1	Stream-US1	689.8000	Natural	1913.6151	0.0350	482.8000	10.0000		
2	Stream-DS	1015.9100	Natural	1078.1714	0.0450	351.2400	10.0000		
3	Ov21-ck-in	102.9900	Trapezoid	401.0000	0.0110	0.5000	2.0000	100.0000	100.0000
4	Stream-US2	464.1100	Natural	1381.5624	0.0400	233.7867	10.0000		
5	SS-33-DS	202.1100	Circular	3.1416	0.0130	2.0000	2.0000		
6	SS08	236.2900	Circular	15.9043	0.0130	4.5000	4.5000		
7	SS22	50.2100	Circular	1.7671	0.0130	1.5000	1.5000		
8	Ov21b	255.8400	Trapezoid	1800.3000	0.0110	0.1000	3.0000	200.0000	200.0000
9	Ov30	10.0000	Trapezoid	1800.3000	0.0110	0.1000	3.0000	200.0000	200.0000
10	Ov22	5.0000	Trapezoid	1800.3000	0.0110	0.1000	3.0000	200.0000	200.0000
11	Pond-SS	95.0000	Circular	7.0686	0.0130	3.0000	3.0000		
12	Pond-Ov	30.0000	Trapezoid	129.0000	0.0300	25.0000	3.0000	6.0000	6.0000

13	Spenc-Cv.1	40.8200	Arch	46.0000	0.0240	9.3333	6.2500		
14	Spenc-Ov	10.8500	Trapezoid	3202.0000	0.0110	0.5000	4.0000	200.0000	200.0000
15	SS31	198.4900	Circular	3.1416	0.0130	2.0000	2.0000		
16	Ov31	198.4900	Trapezoid	1800.3000	0.0110	0.1000	3.0000	200.0000	200.0000
17	SS32	53.8900	Circular	3.1416	0.0130	2.0000	2.0000		
18	SS21.1	80.9600	Circular	3.1416	0.0130	2.0000	2.0000		
19	Ov21	80.9600	Trapezoid	1800.3000	0.0110	0.1000	3.0000	200.0000	200.0000
20	SS06.1	25.1200	Circular	15.9043	0.0130	4.5000	4.5000		
21	Ov06	5.0000	Trapezoid	1800.3000	0.0110	0.1000	3.0000	200.0000	200.0000
22	SS07.1	33.2700	Circular	15.9043	0.0130	4.5000	4.5000		
23	Ov07	5.0000	Trapezoid	1800.3000	0.0110	0.1000	3.0000	200.0000	200.0000
24	SS01.1	93.0200	Circular	12.5664	0.0130	4.0000	4.0000		
25	Ov01	93.0200	Trapezoid	1800.3000	0.0110	0.1000	3.0000	200.0000	200.0000
26	SS02.1	380.9800	Circular	12.5664	0.0130	4.0000	4.0000		
27	Ov02	380.9800	Trapezoid	1800.3000	0.0110	0.1000	3.0000	200.0000	200.0000
28	SS03.1	85.0200	Circular	12.5664	0.0130	4.0000	4.0000		
29	Ov03	85.0200	Trapezoid	1800.3000	0.0110	0.1000	3.0000	200.0000	200.0000
30	SS04.1	57.9900	Circular	12.5664	0.0130	4.0000	4.0000		
31	Ov04	57.9900	Trapezoid	1800.3000	0.0110	0.1000	3.0000	200.0000	200.0000
32	SS05.1	82.0400	Circular	12.5664	0.0130	4.0000	4.0000		
33	Ov05	82.0400	Trapezoid	1800.3000	0.0110	0.1000	3.0000	200.0000	200.0000

Total length of all conduits .... 5288.2100 feet

==
| Table E2 - Conduit Factor Data |
==

Conduit Name	Number of Barrels	Entrance Loss Coef	Exit Loss Coef	Exp/Contc Coefficnt	Time Weighting Parameter	Low Flow Roughness Factor	Depth at Which n Changes	Sediment Depth	Flow Routing
SS-33-DS	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
SS08	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
SS22	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
Pond-SS	1.0000	0.5000	0.5000	0.0000	0.8500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
Spenc-Cv.1	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
SS31	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
SS32	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
SS21.1	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
SS06.1	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
SS07.1	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
SS01.1	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
SS02.1	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
SS03.1	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
SS04.1	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave
SS05.1	1.0000	0.5000	0.5000	0.0000	0.6500	1.0000	0.0000	0.0000	Standard - Dynamic Wave

==
| If there are messages about (sqrt(g*d)*dt/dx), or |
| the sqrt(wave celerity)*time step/conduit length |
| in the output file all it means is that the |
| program will lower the internal time step to |
| satisfy this condition (explicit condition). |
| You control the actual internal time step by |
| using the minimum courant time step factor in the |
| HYDRAULICS job control. The message put in words |
| states that the smallest conduit with the fastest |
| velocity will control the time step selection. |
| You have further control by using the modify |
| conduit option in the HYDRAULICS Job Control. |
==

Conduit Name	Courant Ratio	
Stream-US1	0.98	
Stream-DS	0.59	
Ov21-ck-in	3.31	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Stream-US2	1.78	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
SS-33-DS	2.38	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
SS08	3.06	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
SS22	8.30	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Ov21b	1.63	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Ov30	41.70	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Ov22	83.40	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Pond-SS	6.21	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Pond-Ov	16.50	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Spenc-Cv.1	20.85	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Spenc-Ov	44.38	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
SS31	2.43	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Ov31	2.10	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
SS32	8.93	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
SS21.1	5.95	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Ov21	5.15	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
SS06.1	28.75	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Ov06	83.40	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
SS07.1	21.71	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Ov07	83.40	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
SS01.1	7.32	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Ov01	4.48	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
SS02.1	1.79	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Ov02	1.09	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
SS03.1	8.01	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Ov03	4.90	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
SS04.1	11.74	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Ov04	7.19	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
SS05.1	8.30	===> Warning ! (sqrt(wave celerity)*time step/conduit length)
Ov05	5.08	===> Warning ! (sqrt(wave celerity)*time step/conduit length)

==================
| Conduit Volume |
==================

Full pipe or full open conduit volume
Input full depth volume..... 5.4214E+06 cubic feet

===> Warning !! The upstream and downstream junctions for the following conduits
have been reversed to correspond to the positive flow and decreasing
slope convention. A negative flow in the output thus means
the flow was from your original upstream junction to your original
downstream junction. Any initial flow has been multiplied by -1.

1. Conduit #...Spenc-Cv.1 has been changed.
2. Conduit #...Ov31 has been changed.
3. Conduit #...Ov21 has been changed.

Table E3a - Junction Data

Inp Num	Junction Name	Ground Elevation	Crown Elevation	Invert Elevation	Qinst cfs	Initial Depth-ft	Interface Flow (%)
1	Spen-ds	800.0000	778.0600	766.3200	0.0000	0.0000	100.0000
2	Spen-us	800.0000	778.2500	765.8600	0.0000	0.0000	100.0000
3	North	800.0000	780.3600	770.3600	0.0000	0.0000	100.0000
4	outfall	800.0000	770.8300	760.8300	0.0000	0.0000	100.0000
5	Out-Gold	800.0000	776.6200	774.0000	0.0000	0.0000	100.0000
6	stream	800.0000	778.1100	768.1100	0.0000	0.0000	100.0000
7	F313h_m2g	800.0000	776.1000	768.9800	0.0000	0.0000	100.0000
8	F313i_m2h	800.0000	776.6600	768.7800	0.0000	0.0000	100.0000
9	Mh10	800.0000	770.7100	768.7100	0.0000	0.0000	100.0000
10	F3m2f	800.0000	777.3300	769.6500	0.0000	0.0000	100.0000
11	F3m2e	800.0000	778.1700	769.2400	0.0000	0.0000	100.0000
12	F313g	800.0000	778.1700	769.1200	0.0000	0.0000	100.0000
13	F313f	800.0000	778.1700	768.9800	0.0000	0.0000	100.0000
14	F313a_m2a	800.0000	782.5800	774.1000	0.0000	0.0000	100.0000
15	F313b-m2b	800.0000	781.7000	773.0600	0.0000	0.0000	100.0000
16	F313c_m2cd	800.0000	778.6300	770.1100	0.0000	0.0000	100.0000
17	Mh42	800.0000	778.3900	769.7500	0.0000	0.0000	100.0000
18	F313d	800.0000	778.3800	769.5000	0.0000	0.0000	100.0000
19	F313e	800.0000	778.4800	769.2500	0.0000	0.0000	100.0000
20	Pond_F3k	800.0000	776.5000	768.5000	0.0000	0.0000	100.0000
21	Str	800.0000	771.5000	768.5000	0.0000	0.0000	100.0000

Table E3b - Junction Data

Inp Num	Junction Name	X Coord.	Y Coord.	Type of Manhole	Type of Inlet	Maximum Capacity	Pavement Shape	Pavement Slope
1	Spen-ds	0.0000	0.0000	No P	Normal		0	0.0000
2	Spen-us	0.0000	0.0000	No P	Normal		0	0.0000
3	North	0.0000	0.0000	No P	Normal		0	0.0000
4	outfall	0.0000	0.0000	No P	Normal		0	0.0000
5	Out-Gold	0.0000	0.0000	No P	Normal		0	0.0000
6	stream	0.0000	0.0000	No P	Normal		0	0.0000
7	F313h_m2g	0.0000	0.0000	No P	Normal		0	0.0000
8	F313i_m2h	0.0000	0.0000	No P	Normal		0	0.0000
9	Mh10	0.0000	0.0000	No P	Normal		0	0.0000
10	F3m2f	0.0000	0.0000	No P	Normal		0	0.0000
11	F3m2e	0.0000	0.0000	No P	Normal		0	0.0000
12	F313g	0.0000	0.0000	No P	Normal		0	0.0000
13	F313f	0.0000	0.0000	No P	Normal		0	0.0000
14	F313a_m2a	0.0000	0.0000	No P	Normal		0	0.0000
15	F313b-m2b	0.0000	0.0000	No P	Normal		0	0.0000
16	F313c_m2cd	0.0000	0.0000	No P	Normal		0	0.0000
17	Mh42	0.0000	0.0000	No P	Normal		0	0.0000
18	F313d	0.0000	0.0000	No P	Normal		0	0.0000
19	F313e	0.0000	0.0000	No P	Normal		0	0.0000
20	Pond_F3k	0.0000	0.0000	No P	Normal		0	0.0000
21	Str	0.0000	0.0000	No P	Normal		0	0.0000

Table E4 - Conduit Connectivity

Input Number	Conduit Name	Upstream Node	Downstream Node	Upstream Elevation	Downstream Elevation	
1	Stream-US1	North	stream	770.3600	768.1100	No Design
2	Stream-DS	Spen-ds	outfall	766.3200	760.8300	No Design
3	Ov21-ck-in	F3m2f	Out-Gold	774.8200	774.6200	No Design
4	Stream-US2	stream	Spen-us	768.1100	765.8600	No Design
5	SS-33-DS	Mh10	Pond_F3k	768.7100	768.5000	No Design
6	SS08	F313f	Pond_F3k	768.9800	768.5000	No Design
7	SS22	F313e	F313f	769.2500	768.9800	No Design
8	Ov21b	F3m2f	F313i_m2h	774.3300	773.6600	No Design
9	Ov30	F313h_m2g	Spen-ds	773.1000	772.9000	No Design
10	Ov22	F313e	F313d	775.4800	775.3800	No Design
11	Pond-SS	Str	stream	768.5000	768.3800	No Design
12	Pond-Ov	Pond_F3k	stream	773.5000	773.4000	No Design
13	Spenc-Cv.1	Spen-ds	Spen-us	766.3200	765.8600	No Design
14	Spenc-Ov	Spen-us	Spen-ds	774.2500	774.0600	No Design
15	SS31	F313h_m2g	F313i_m2h	768.9800	768.7800	No Design
16	Ov31	F313i_m2h	F313h_m2g	773.6600	773.1000	No Design
17	SS32	F313i_m2h	Mh10	768.7800	768.7100	No Design
18	SS21.1	F3m2f	F3m2e	769.6500	769.2400	No Design
19	Ov21	F3m2e	F3m2f	774.6700	774.3300	No Design
20	SS06.1	F3m2e	F313g	769.2400	769.1200	No Design
21	Ov06	F3m2e	F313g	775.1700	775.0700	No Design
22	SS07.1	F313g	F313f	769.1200	768.9800	No Design
23	Ov07	F313g	F313f	775.1700	775.1700	No Design
24	SS01.1	F313a_m2a	F313b-m2b	774.1000	773.0600	No Design
25	Ov01	F313a_m2a	F313b-m2b	779.5800	778.7000	No Design
26	SS02.1	F313b-m2b	F313c_m2cd	773.0600	770.1100	No Design
27	Ov02	F313b-m2b	F313c_m2cd	778.7000	775.6300	No Design
28	SS03.1	F313c_m2cd	Mh42	770.1100	769.7500	No Design
29	Ov03	F313c_m2cd	Mh42	775.6300	775.3900	No Design
30	SS04.1	Mh42	F313d	769.7500	769.5000	No Design
31	Ov04	Mh42	F313d	775.3900	774.9800	No Design
32	SS05.1	F313d	F3m2e	769.5000	769.2400	No Design
33	Ov05	F313d	F3m2e	774.9800	774.6700	No Design

Storage Junction Data

STORAGE JUNCTION	JUNCTION	MAXIMUM OR CONSTANT SURFACE	PEAK OR CONSTANT VOLUME	CROWN ELEVATION	DEPTH STARTS

NUMBER OR NAME	TYPE	AREA (FT2)	(CUBIC FEET)	(FT)	FROM
Pond_F3k	Stage/Area	57717.0000	1.742325E+06	800.0000	Node Invert

Variable storage data for node | Pond_F3k

Data Point	Elevation ft	Depth ft	Area ft^2	Volume ft^3	Area acres	Volume ac-ft
1	768.5000	0.0000	37461.6000	0.0000	0.8600	0.0000
2	769.0000	0.5000	38768.4000	19056.3759	0.8900	0.4375
3	770.0000	1.5000	41382.0000	59124.0712	0.9500	1.3573
4	771.0000	2.5000	44039.1600	101827.3346	1.0110	2.3376
5	772.0000	3.5000	46783.4400	147231.2689	1.0740	3.3800
6	773.0000	4.5000	49614.8400	195422.9952	1.1390	4.4863
7	774.0000	5.5000	52446.2400	246446.4779	1.2040	5.6576
8	775.0000	6.5000	55364.7600	300344.8538	1.2710	6.8950
9	775.8000	7.3000	57717.0000	345573.8432	1.3250	7.9333
10	800.0000	31.5000	57717.0000	1.742325E+06	1.3250	39.9983

Orifice Data

Conduit Name	From Junction	To Junction	Type	Area (ft2)	Depth (ft)	Discharge Coefficient	Height Above Junction (ft)
or1	Pond_F3k	Str	Circ Side	0.20	0.00	0.600	0.000

====> EQUIVALENT PIPE INFORMATION FOR ORIFICE 1
CONDUIT NAME..... or1
Upstream node..... Pond_F3k
Downstream node..... Str
PIPE DIAMETER..... 0.50
PIPE LENGTH..... 1000.00
MANNINGS ROUGHNESS..... 0.0024
INVERT ELEVATION AT UPSTREAM END..... 768.5000
INVERT ELEVATION AT DOWNSTREAM END... 768.4900

Note: For a Bottom-outlet orifice the invert elevation of the downstream node will be adjusted to accomodate the equivalent conduit. Conduit grades are not affected.

Weir Data

Weir Name	From Junction	To Junction	Type	Crest Height(ft)	Weir Top(ft)	Weir Length(ft)	Discharge Coefficient	Weir Power
wr1	Pond_F3k	Str	1	1.90	31.50	10.00	3.0000	1.5000

FREE OUTFALL DATA (DATA GROUP I1)
BOUNDARY CONDITION ON DATA GROUP J1

Outfall at Junction....outfall has boundary condition number... 1
Outfall at Junction....Out-Gold has boundary condition number... 2

Weir Outfall Data
Boundary Condition on data group J1

INTERNAL CONNECTIVITY INFORMATION

CONDUIT	JUNCTION	JUNCTION
or1	Pond_F3k	Str
wr1	Pond_F3k	Str
FREE # 1	outfall	BOUNDARY
FREE # 2	Out-Gold	BOUNDARY

Boundary Condition Information
Data Groups J1-J4

BC NUMBER.. 1 has no control water surface.
BC NUMBER.. 2 has no control water surface.

XP Note Field Summary

Conduit Convergence Criteria

Conduit Name	Full Flow	Conduit Slope
Stream-US1	11550.4562	0.0033
Stream-DS	5467.8432	0.0054
Ov21-ck-in	2389.1023	0.0019
Stream-US2	11473.5976	0.0048
SS-33-DS	7.2921	0.0010
SS08	88.6319	0.0020

SS22	7.7029	0.0054
Ov21b	16309.4332	0.0026
Ov30	45071.3626	0.0200
Ov22	45071.3626	0.0200
Pond-SS	23.7052	0.0013
Pond-Ov	604.5318	0.0033
Spenc-Cv.1	458.7549	0.0113
Spenc-Ov	90883.0461	0.0175
SS31	7.1810	0.0010
Ov31	16928.1847	0.0028
SS32	8.1533	0.0013
SS21.1	16.0989	0.0051
Ov21	20653.3212	0.0042
SS06.1	135.9167	0.0048
Ov06	45071.3626	0.0200
SS07.1	127.5644	0.0042
Ov07	1007.8263	0.0000
SS01.1	151.8846	0.0112
Ov01	30998.3701	0.0095
SS02.1	126.3995	0.0077
Ov02	28609.0732	0.0081
SS03.1	93.4708	0.0042
Ov03	16932.8773	0.0028
SS04.1	94.3146	0.0043
Ov04	26797.9186	0.0071
SS05.1	80.8647	0.0032
Ov05	19590.8695	0.0038
or1	0.6670	0.0000

```
*==================================*
|    Initial Model Condition       |
| Initial Time =      0.02 hours   |
*==================================*
```

Junction / Depth / Elevation ===> "*" Junction is Surcharged.

Spen-ds/	0.00 /	766.32	Spen-us/	0.00 /	765.86	North/	0.00 /	770.36
outfall/	0.00 /	760.83	Out-Gold/	0.00 /	774.00	stream/	0.00 /	768.11
F3l3h_m2g/	0.00 /	768.98	F3l3i_m2h/	0.00 /	768.78	Mh10/	0.00 /	768.71
F3m2f/	0.00 /	769.65	F3m2e/	0.00 /	769.24	F3l3g/	0.00 /	769.12
F3l3f/	0.00 /	768.98	F3l3a_m2a/	0.00 /	774.10	F3l3b-m2b/	0.00 /	773.06
F3l3c_m2cd/	0.00 /	770.11	Mh42/	0.00 /	769.75	F3l3d/	0.00 /	769.50
F3l3e/	0.00 /	769.25	Pond_F3k/	0.00 /	768.50	Str/	0.00 /	768.49

Conduit/ FLOW ===> "*" Conduit uses the normal flow option.

Stream-US1/	0.00	Stream-DS/	0.00	Ov21-ck-in/	0.00
Stream-US2/	0.00	SS-33-DS/	0.00	SS08/	0.00
SS22/	0.00	Ov21b/	0.00	Ov30/	0.00
Ov22/	0.00	Pond-SS/	0.00	Pond-Ov/	0.00
Spenc-Cv.1/	0.00	Spenc-Ov/	0.00	SS31/	0.00
Ov31/	0.00	SS32/	0.00	SS21.1/	0.00
Ov21/	0.00	SS06.1/	0.00	Ov06/	0.00
SS07.1/	0.00	Ov07/	0.00	SS01.1/	0.00
Ov01/	0.00	SS02.1/	0.00	Ov02/	0.00
SS03.1/	0.00	Ov03/	0.00	SS04.1/	0.00
Ov04/	0.00	SS05.1/	0.00	Ov05/	0.00
or1/	0.00	wr1/	0.00	FREE # 1/	0.00
FREE # 2/	0.00				

Conduit/ Velocity

Stream-US1/	0.00	Stream-DS/	0.00	Ov21-ck-in/	0.00
Stream-US2/	0.00	SS-33-DS/	0.00	SS08/	0.00
SS22/	0.00	Ov21b/	0.00	Ov30/	0.00
Ov22/	0.00	Pond-SS/	0.00	Pond-Ov/	0.00
Spenc-Cv.1/	0.00	Spenc-Ov/	0.00	SS31/	0.00
Ov31/	0.00	SS32/	0.00	SS21.1/	0.00
Ov21/	0.00	SS06.1/	0.00	Ov06/	0.00
SS07.1/	0.00	Ov07/	0.00	SS01.1/	0.00
Ov01/	0.00	SS02.1/	0.00	Ov02/	0.00
SS03.1/	0.00	Ov03/	0.00	SS04.1/	0.00
Ov04/	0.00	SS05.1/	0.00	Ov05/	0.00
or1/	0.00				

Conduit/ Cross Sectional Area

Stream-US1/	0.00	Stream-DS/	0.00	Ov21-ck-in/	0.00
Stream-US2/	0.00	SS-33-DS/	0.00	SS08/	0.00
SS22/	0.00	Ov21b/	0.00	Ov30/	0.00
Ov22/	0.00	Pond-SS/	0.00	Pond-Ov/	0.00
Spenc-Cv.1/	0.00	Spenc-Ov/	0.00	SS31/	0.00
Ov31/	0.00	SS32/	0.00	SS21.1/	0.00
Ov21/	0.00	SS06.1/	0.00	Ov06/	0.00
SS07.1/	0.00	Ov07/	0.00	SS01.1/	0.00
Ov01/	0.00	SS02.1/	0.00	Ov02/	0.00
SS03.1/	0.00	Ov03/	0.00	SS04.1/	0.00
Ov04/	0.00	SS05.1/	0.00	Ov05/	0.00
or1/	0.00				

Conduit/ Hydraulic Radius

Stream-US1/	0.00	Stream-DS/	0.00	Ov21-ck-in/	0.00
Stream-US2/	0.00	SS-33-DS/	0.00	SS08/	0.00
SS22/	0.00	Ov21b/	0.00	Ov30/	0.00
Ov22/	0.00	Pond-SS/	0.00	Pond-Ov/	0.00
Spenc-Cv.1/	0.00	Spenc-Ov/	0.00	SS31/	0.00
Ov31/	0.00	SS32/	0.00	SS21.1/	0.00
Ov21/	0.00	SS06.1/	0.00	Ov06/	0.00
SS07.1/	0.00	Ov07/	0.00	SS01.1/	0.00
Ov01/	0.00	SS02.1/	0.00	Ov02/	0.00
SS03.1/	0.00	Ov03/	0.00	SS04.1/	0.00
Ov04/	0.00	SS05.1/	0.00	Ov05/	0.00
or1/	0.00				

Conduit/ Upstream/ Downstream Elevation

Stream-US1/	768.11/	768.11	Stream-DS/	760.83/	760.83	Ov21-ck-in/	774.00/	774.00
Stream-US2/	765.86/	765.86	SS-33-DS/	768.50/	768.50	SS08/	768.50/	768.50
SS22/	768.98/	768.98	Ov21b/	768.78/	768.78	Ov30/	766.32/	766.32
Ov22/	769.50/	769.50	Pond-SS/	768.11/	768.11	Pond-Ov/	768.11/	768.11
Spenc-Cv.1/	765.86/	765.86	Spenc-Ov/	766.32/	766.32	SS31/	768.78/	768.78
Ov31/	768.98/	768.98	SS32/	768.71/	768.71	SS21.1/	769.24/	769.24
Ov21/	769.65/	769.65	SS06.1/	769.12/	769.12	Ov06/	769.12/	769.12
SS07.1/	768.98/	768.98	Ov07/	768.98/	768.98	SS01.1/	773.06/	773.06
Ov01/	773.06/	773.06	SS02.1/	770.11/	770.11	Ov02/	770.11/	770.11
SS03.1/	769.75/	769.75	Ov03/	769.75/	769.75	SS04.1/	769.50/	769.50

```
          Ov04/   769.50/   769.50          SS05.1/   769.24/   769.24          Ov05/   769.24/   769.24
           or1/   768.49/   768.49

Cycle        500      Time          8 Hrs - 20.00 Min

      Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
        Spen-ds/   0.00 /   766.32          Spen-us/   0.00 /   765.86          North/   0.00 /   770.36
        outfall/   0.00 /   760.83         Out-Gold/   0.00 /   774.00         stream/   0.00 /   768.11
      F3l3h_m2g/   0.02 /   769.00        F3l3i_m2h/   0.04 /   768.82          Mh10/   0.05 /   768.76
          F3m2f/   0.00 /   769.65            F3m2e/   0.01 /   769.25          F3l3g/   0.01 /   769.13
          F3l3f/   0.01 /   768.99        F3l3a_m2a/   0.00 /   774.10       F3l3b-m2b/   0.00 /   773.06
     F3l3c_m2cd/   0.00 /   770.11             Mh42/   0.00 /   769.75          F3l3d/   0.01 /   769.51
          F3l3e/   0.00 /   769.25         Pond_F3k/   0.00 /   768.50            Str/   0.00 /   768.49

        Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
     Stream-US1/       0.00        Stream-DS/       0.00       Ov21-ck-in/       0.00       Stream-US2/       0.00
       SS-33-DS/       0.01             SS08/       0.00            SS22/       0.00            Ov21b/       0.00
           Ov30/       0.00             Ov22/       0.00          Pond-SS/       0.00          Pond-Ov/       0.00
     Spenc-Cv.1/       0.00         Spenc-Ov/       0.00             SS31/       0.00*            Ov31/       0.00
           SS32/       0.01           SS21.1/       0.00            Ov21/       0.00           SS06.1/       0.00*
           Ov06/       0.00           SS07.1/       0.00*           Ov07/       0.00           SS01.1/       0.00
           Ov01/       0.00           SS02.1/       0.00            Ov02/       0.00           SS03.1/       0.00
           Ov03/       0.00           SS04.1/       0.00            Ov04/       0.00           SS05.1/       0.00
           Ov05/       0.00              or1/       0.00             wr1/       0.00         FREE # 1/       0.00
        FREE # 2/       0.00

Cycle       1000      Time          16 Hrs - 40.00 Min

      Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
        Spen-ds/   2.14 /   768.46          Spen-us/   2.84 /   768.70          North/   3.13 /   773.49
        outfall/   1.23 /   762.06         Out-Gold/   0.00 /   774.00         stream/   2.68 /   770.79
      F3l3h_m2g/   1.90 /   770.88        F3l3i_m2h/   2.10 /   770.88          Mh10/   2.17*/   770.88
          F3m2f/   1.24 /   770.89            F3m2e/   1.65 /   770.89          F3l3g/   1.76 /   770.88
          F3l3f/   1.90 /   770.88        F3l3a_m2a/   0.35 /   774.45       F3l3b-m2b/   0.36 /   773.42
     F3l3c_m2cd/   0.81 /   770.92             Mh42/   1.15 /   770.90          F3l3d/   1.39 /   770.89
          F3l3e/   1.63 /   770.88         Pond_F3k/   2.38 /   770.88            Str/   2.33 /   770.82

        Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
     Stream-US1/      61.83        Stream-DS/      72.16       Ov21-ck-in/       0.00       Stream-US2/      69.98
       SS-33-DS/       0.07             SS08/       2.71            SS22/       0.21            Ov21b/       0.00
           Ov30/       0.00             Ov22/       0.00          Pond-SS/       6.81          Pond-Ov/       0.00
     Spenc-Cv.1/     -71.16         Spenc-Ov/       0.00             SS31/       0.04            Ov31/       0.00
           SS32/       0.06           SS21.1/       0.01            Ov21/       0.00           SS06.1/       2.36
           Ov06/       0.00           SS07.1/       2.37            Ov07/       0.00           SS01.1/       2.08
           Ov01/       0.00           SS02.1/       2.14*           Ov02/       0.00           SS03.1/       2.25
           Ov03/       0.00           SS04.1/       2.28            Ov04/       0.00           SS05.1/       2.31
           Ov05/       0.00              or1/       0.22             wr1/       6.54         FREE # 1/      72.16
        FREE # 2/       0.00

Cycle       1500      Time          25 Hrs -  0.00 Min

      Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
        Spen-ds/   1.01 /   767.33          Spen-us/   1.53 /   767.39          North/   1.71 /   772.07
        outfall/   0.54 /   761.37         Out-Gold/   0.00 /   774.00         stream/   1.16 /   769.27
      F3l3h_m2g/   1.44 /   770.42        F3l3i_m2h/   1.64 /   770.42          Mh10/   1.71 /   770.42
          F3m2f/   0.77 /   770.42            F3m2e/   1.18 /   770.42          F3l3g/   1.30 /   770.42
          F3l3f/   1.44 /   770.42        F3l3a_m2a/   0.15 /   774.25       F3l3b-m2b/   0.16 /   773.22
     F3l3c_m2cd/   0.32 /   770.43             Mh42/   0.67 /   770.42          F3l3d/   0.92 /   770.42
          F3l3e/   1.17 /   770.42         Pond_F3k/   1.92 /   770.42            Str/   0.79 /   769.28

        Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
     Stream-US1/      13.45        Stream-DS/      14.82       Ov21-ck-in/       0.00       Stream-US2/      14.64
       SS-33-DS/       0.01             SS08/       0.45            SS22/       0.01            Ov21b/       0.00
           Ov30/       0.00             Ov22/       0.00          Pond-SS/       1.11          Pond-Ov/       0.00
     Spenc-Cv.1/     -14.68         Spenc-Ov/       0.00             SS31/       0.00            Ov31/       0.00
           SS32/       0.01           SS21.1/       0.00            Ov21/       0.00           SS06.1/       0.42
           Ov06/       0.00           SS07.1/       0.43            Ov07/       0.00           SS01.1/       0.39
           Ov01/       0.00           SS02.1/       0.40*           Ov02/       0.00           SS03.1/       0.41
           Ov03/       0.00           SS04.1/       0.41            Ov04/       0.00           SS05.1/       0.42
           Ov05/       0.00              or1/       1.02             wr1/       0.08         FREE # 1/      14.82
        FREE # 2/       0.00

Cycle       2000      Time          33 Hrs - 20.00 Min

      Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
        Spen-ds/   0.31 /   766.63          Spen-us/   0.77 /   766.63          North/   0.01 /   770.37
        outfall/   0.06 /   760.89         Out-Gold/   0.00 /   774.00         stream/   0.38 /   768.49
      F3l3h_m2g/   0.78 /   769.76        F3l3i_m2h/   0.98 /   769.76          Mh10/   1.05 /   769.76
          F3m2f/   0.11 /   769.76            F3m2e/   0.52 /   769.76          F3l3g/   0.64 /   769.76
          F3l3f/   0.78 /   769.76        F3l3a_m2a/   0.00 /   774.10       F3l3b-m2b/   0.00 /   773.06
     F3l3c_m2cd/   0.00 /   770.11             Mh42/   0.01 /   769.76          F3l3d/   0.26 /   769.76
          F3l3e/   0.51 /   769.76         Pond_F3k/   1.26 /   769.76            Str/   0.41 /   768.90

        Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
     Stream-US1/       0.00*       Stream-DS/       0.91       Ov21-ck-in/       0.00       Stream-US2/       0.89*
       SS-33-DS/       0.02             SS08/       0.03            SS22/       0.00            Ov21b/       0.00
           Ov30/       0.00             Ov22/       0.00          Pond-SS/       0.88          Pond-Ov/       0.00
     Spenc-Cv.1/      -0.89         Spenc-Ov/       0.00             SS31/       0.00            Ov31/       0.00
           SS32/       0.01           SS21.1/       0.00            Ov21/       0.00           SS06.1/       0.01
           Ov06/       0.00           SS07.1/       0.01            Ov07/       0.00           SS01.1/       0.00*
           Ov01/       0.00           SS02.1/       0.00*           Ov02/       0.00           SS03.1/       0.00*
           Ov03/       0.00           SS04.1/       0.00            Ov04/       0.00           SS05.1/       0.01
           Ov05/       0.00              or1/       0.88             wr1/       0.00         FREE # 1/       0.91
        FREE # 2/       0.00

Cycle       2500      Time          41 Hrs - 40.00 Min

      Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
        Spen-ds/   0.24 /   766.56          Spen-us/   0.70 /   766.56          North/   0.00 /   770.36
        outfall/   0.04 /   760.87         Out-Gold/   0.00 /   774.00         stream/   0.30 /   768.41
      F3l3h_m2g/   0.26 /   769.24        F3l3i_m2h/   0.46 /   769.24          Mh10/   0.53 /   769.24
          F3m2f/   0.00 /   769.65            F3m2e/   0.00 /   769.24          F3l3g/   0.12 /   769.24
          F3l3f/   0.26 /   769.24        F3l3a_m2a/   0.00 /   774.10       F3l3b-m2b/   0.00 /   773.06
     F3l3c_m2cd/   0.00 /   770.11             Mh42/   0.00 /   769.75          F3l3d/   0.00 /   769.50
          F3l3e/   0.00 /   769.25         Pond_F3k/   0.74 /   769.24            Str/   0.34 /   768.83

        Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
     Stream-US1/       0.00*       Stream-DS/       0.60       Ov21-ck-in/       0.00       Stream-US2/       0.59*
       SS-33-DS/       0.01             SS08/       0.01            SS22/       0.00*           Ov21b/       0.00
           Ov30/       0.00             Ov22/       0.00          Pond-SS/       0.59          Pond-Ov/       0.00
     Spenc-Cv.1/      -0.59         Spenc-Ov/       0.00             SS31/       0.00            Ov31/       0.00
```

SS32/	0.01	SS21.1/	0.00*	Ov21/	0.00	SS06.1/	0.00
Ov06/	0.00	SS07.1/	0.00	Ov07/	0.00	SS01.1/	0.00*
Ov01/	0.00	SS02.1/	0.00*	Ov02/	0.00	SS03.1/	0.00*
Ov03/	0.00	SS04.1/	0.00*	Ov04/	0.00	SS05.1/	0.00*
Ov05/	0.00	or1/	0.58	wr1/	0.00	FREE # 1/	0.60
FREE # 2/	0.00						

```
 *=====================================================*
 | Table E5 - Junction Time Limitation Summary         |
 |              (0.10 or 0.25)* Depth * Area           |
 | Time step = -------------------------------         |
 |                   Sum of Flow                       |
 *=====================================================*
 |  The time this junction was the limiting junction   |
 |                is listed in the third column.       |
 *=====================================================*
```

Junction	Time(.10)	Time(.25)	Time(sec)
Spen-ds	164.7125	411.7813	172800.000
Spen-us	155.7501	389.3752	0.0000
North	100.7698	251.9244	0.0000
outfall	600.0000	600.0000	0.0000
Out-Gold	600.0000	600.0000	0.0000
stream	112.1482	280.3705	0.0000
F3l3h_m2g	107.9907	269.9768	0.0000
F3l3i_m2h	188.7176	471.7940	0.0000
Mh10	120.8929	302.2323	0.0000
F3m2f	128.9820	322.4550	0.0000
F3m2e	301.8361	600.0000	0.0000
F3l3g	420.5098	600.0000	0.0000
F3l3f	231.7578	579.3944	0.0000
F3l3a_m2a	193.8093	484.5234	0.0000
F3l3b-m2b	283.9273	600.0000	0.0000
F3l3c_m2cd	431.8749	600.0000	0.0000
Mh42	406.0173	600.0000	0.0000
F3l3d	128.6942	321.7354	0.0000
F3l3e	135.7885	339.4711	0.0000
Pond_F3k	182.4408	456.1019	0.0000
Str	157.6020	394.0050	0.0000

The junction requiring the smallest time step was...Spen-ds

```
 *=========================================================*
 |       Table E5a - Conduit Explicit Condition Summary    |
 |       Courant   =         Conduit Length                |
 |       Time step = ---------------------------------     |
 |                   Velocity + sqrt(g*depth)              |
 |                                                         |
 |                 Conduit Implicit Condition Summary      |
 |       Courant   =         Conduit Length                |
 |       Time step = ---------------------------------     |
 |                           Velocity                      |
 *=========================================================*
 |  The 3rd column is the Explicit time step times the     |
 |      minimum courant time step factor                   |
 |                                                         |
 |  Minimum Conduit Time Step in seconds in the 4th column |
 |  in the list. Maximum possible is 10 * maximum time step|
 |                                                         |
 |  The 5th column is the maximum change at any time step  |
 |  during the simulation. The 6th column is the wobble    |
 |  value which is an indicator of the flow stability.     |
 |                                                         |
 |  You should use this section to find those conduits that|
 |  are slowing your model down.  Use modify conduits to   |
 |  alter the length of the slow conduits to make your     |
 |  simulation faster, or change the conduit name to       |
 |  "CHME?????" where ????? are any characters, this will  |
 |  lengthen the conduit based on the model time step,     |
 |  not the value listed in modify conduits.               |
 *=========================================================*
```

Conduit	Time(exp)	Expl*Cmin	Time(imp)	Time(min)	Max Qchange	Wobble	Type of Soln
Stream-US1	65.9042	65.9042	211.5191	130.0000	0.1507	0.0266	Normal Soln
Stream-DS	89.3638	89.3638	307.3957	0.0000	0.1150	0.0554	Normal Soln
Ov21-ck-in	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
Stream-US2	51.7059	51.7059	171.8362	0.0000	0.1339	0.0267	Normal Soln
SS-33-DS	20.9194	20.9194	103.5361	0.0000	0.0078	0.7842	Normal Soln
SS08	20.3740	20.3740	55.3566	0.0000	0.0379	0.5094	Normal Soln
SS22	5.4625	5.4625	23.3766	0.0000	0.0097	1.3195	Normal Soln
Ov21b	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
Ov30	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
Ov22	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
Pond-SS	8.6568	8.6568	55.5053	0.0000	0.0391	0.8554	Normal Soln
Pond-Ov	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
Spenc-Cv.1	2.5542	2.5542	9.1541	712.0000	-0.1226	0.6646	Normal Soln
Spenc-Ov	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
SS31	21.6341	21.6341	159.0402	0.0000	0.0034	0.6734	Normal Soln
Ov31	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
SS32	5.7901	5.7901	31.8932	0.0000	0.0086	1.2561	Normal Soln
SS21.1	9.4947	9.4947	66.6890	0.0000	0.0038	0.2138	Normal Soln
Ov21	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
SS06.1	2.3452	2.3452	8.1257	1990.0000	0.0289	0.3229	Normal Soln
Ov06	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
SS07.1	3.1005	3.1005	10.2635	37.0000	0.0299	0.3420	Normal Soln
Ov07	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
SS01.1	7.7088	7.7088	15.3039	0.0000	0.0263	0.2277	Normal Soln
Ov01	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
SS02.1	28.4719	28.4719	63.3687	0.0000	0.0318	0.2811	Normal Soln
Ov02	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
SS03.1	7.6245	7.6245	23.6375	0.0000	0.0282	0.3979	Normal Soln
Ov03	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
SS04.1	5.2785	5.2785	17.1040	0.0000	0.0275	0.3948	Normal Soln
Ov04	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
SS05.1	7.4806	7.4806	24.5038	11.0000	0.0278	0.4621	Normal Soln
Ov05	600.0000	600.0000	600.0000	0.0000	0.0000	0.0000	Normal Soln
or1	76.6903	76.6903	181.6526	0.0000	0.0012	4.0177	Normal Soln

The conduit with the smallest time step limitation was..SS06.1

```
The conduit with the largest wobble was.................or1
The conduit with the largest flow change in any
consecutive time step..................................Stream-US1

 ***********************************************
 *      End of time step DO-loop in Runoff      *
 ***********************************************

 Final Date (Mo/Day/Year)   =             1/ 2/2001
 Total number of time steps =                  2879
 Final Julian Date          =               2001002
 Final time of day          =                 86340. seconds.
 Final time of day          =                 23.98   hours.
 Final running time         =               47.9833   hours.
 Final running time         =                1.9993    days.

 ****************************************************
 *     Extrapolation Summary for Watersheds         *
 * Explains the number of time steps and iterations *
 * used in the solution of the subcatchments.       *
 * # Steps ==> Total Number of Extrapolated Steps   *
 * # Calls ==> Total Number of OVERLND Calls        *
 ****************************************************

 Subcatchment   # Steps   # Calls Subcatchment   # Steps   # Calls
 -------------  -------  -------- -------------  -------  --------
 F3m2f#1              0         0 F3l3h_m2g#1          0         0 F3l3h_m2g#2          0         0
 North#1              0         0 F3l3e#1              0         0 F3l3a_m2a#1          0         0
 F3l3a_m2a#2          0         0 F3l3a_m2a#3          0         0 F3l3a_m2a#4          0         0
 F3l3a_m2a#5          0         0 F3l3b-m2b#1          0         0 F3l3b-m2b#2          0         0
 F3l3c_m2cd#1         0         0 F3l3c_m2cd#2         0         0 F3l3c_m2cd#3         0         0
 F3l3d#1              0         0 F3m2e#1              0         0 F3l3g#1              0         0
 F3l3f#1              0         0 Pond_F3k#1           0         0 F3l3i_m2h#1          0         0
 F3l3i_m2h#2          0         0


##########################################################
# Rainfall input summary from Runoff Continuity Check    #
##########################################################

 Total rainfall read for gage #         1 is       2.2000 in
 Total rainfall duration for gage #     1 is      1440.00 minutes

 ************************************************************
 * Table R5. CONTINUITY CHECK FOR SURFACE WATER             *
 *       Any continuity error can be fixed by lowering the  *
 *       wet and transition time step. The transition time  *
 *       should not be much greater than the wet time step. *
 ************************************************************
                                                                Inches over
                                                 cubic feet    Total Basin
 Total Precipitation (Rain plus Snow)           8.192877E+06      2.200
 Total Infiltration                             5.247941E+06          1.409
 Total Evaporation                              3.724035E+05          0.100
 Surface Runoff from Watersheds                 2.576491E+06          0.692
 Total Water remaining in Surface Storage       0.000000E+00          0.000
 Infiltration over the Pervious Area...         5.247941E+06          1.409
                   --------
 Infiltration + Evaporation +
 Surface Runoff + Snow removal +
 Water remaining in Surface Storage +
 Water remaining in Snow Cover.........         8.196835E+06          2.201
 Total Precipitation + Initial Storage.         8.192877E+06          2.200


 The error in continuity is calculated as
 ****************************************
 * Precipitation + Initial Snow Cover   *
 *      - Infiltration -                *
 *Evaporation - Snow removal -          *
 *Surface Runoff from Watersheds -      *
 *Water in Surface Storage -            *
 *Water remaining in Snow Cover         *
 *--------------------------------------*
 * Precipitation + Initial Snow Cover   *
 ****************************************
 Percent Continuity Error...............                          -0.0483


 ****************************************************
 * Table R6. Continuity Check for Channel/Pipes     *
 *           You should have zero continuity error  *
 *           if you are not using runoff hydraulics *
 ****************************************************
                                                                  Inches over
                                                  cubic feet      Total Basin
 Initial Channel/Pipe Storage.................  0.000000E+00          0.000
 Final Channel/Pipe Storage...................  0.000000E+00          0.000
 Surface Runoff from Watersheds...............  2.576491E+06          0.692
 Groundwater Subsurface Inflow or Diversion..   0.000000E+00          0.000
 Evaporation Loss from Channels...............  0.000000E+00          0.000
 Groundwater Flow Diverted Out of Network....   0.000000E+00          0.000
 Channel/Pipe/Inlet Outflow...................  2.576491E+06          0.692
 Initial Storage + Inflow.....................  2.576491E+06          0.692
 Final Storage + Outflow + Diverted GW........  2.576491E+06          0.692
 ********************************************
 * Final Storage + Outflow + Evaporation  - *
 * Watershed Runoff - Groundwater Inflow  - *
 *     Initial Channel/Pipe Storage         *
 *     ---------------------------------    *
 *  Final Storage + Outflow  + Evaporation  *
 ********************************************
 Percent Continuity Error.....................                    0.0000

         ################################################
         # Table R9. Summary Statistics for Subcatchments #
         ################################################

 Note: Total Runoff Depth includes pervious & impervious areas.
       Pervious and Impervious Runoff Depth is only the runoff from those two areas.
       For catchments receiving redirected flow, this flow will only be shown if the flow is not
```

directed directly to the outlet. Flow that is getting redirected is also listed with the original subcatchment.

Subcatchment.....	F3m2f#1	F3l3h_m2g#1	F3l3h_m2g#2	North#1	F3l3e#1	F3l3a_m2a#1
Area (acres).....	0.15800	0.09800	0.65400	936.22500	6.16900	5.02900
Percent Impervious.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Rainfall (in)....	2.20000	2.20000	2.20000	2.20000	2.20000	2.20000
Max Intensity (in/hr)..	3.01620	3.01620	3.01620	3.01620	3.01620	3.01620
Pervious Area						
Total Runoff Depth (in)	0.97013	1.86954	0.97639	0.69762	0.83860	0.48848
Peak Runoff Rate (cfs).	0.25331	0.27273	0.73256	153.52602	3.62667	2.14959
Total Impervious Area						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Area with depression storage						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Area without depression storage						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Area						
Total Runoff Depth (in)	0.97013	1.86954	0.97639	0.69762	0.83860	0.48848
Peak Runoff Rate (cfs).	0.25331	0.27273	0.73256	153.52602	3.62667	2.14959
Rational Formula						
Pervious Tc. (mins)....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Perv. Intensity (in/hr)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Pervious C	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Tc. (mins)..	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Imp. Intensity (in/hr).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious C	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area (Ha).....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area Tc.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area Intensity.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Subcatchment.....	F3l3a_m2a#2	F3l3a_m2a#3	F3l3a_m2a#4	F3l3a_m2a#5	F3l3b-m2b#1	F3l3b-m2b#2
Area (acres).....	41.08300	14.67700	3.17000	8.63000	1.59300	0.05000
Percent Impervious.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Rainfall (in)....	2.20000	2.20000	2.20000	2.20000	2.20000	2.20000
Max Intensity (in/hr)..	3.01620	3.01620	3.01620	3.01620	3.01620	3.01620
Pervious Area						
Total Runoff Depth (in)	0.52256	0.71145	0.54610	0.61778	0.70289	0.97013
Peak Runoff Rate (cfs).	9.09394	4.78702	1.36107	3.15831	0.75760	0.08016
Total Impervious Area						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Area with depression storage						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Area without depression storage						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Area						
Total Runoff Depth (in)	0.52256	0.71145	0.54610	0.61778	0.70289	0.97013
Peak Runoff Rate (cfs).	9.09394	4.78702	1.36107	3.15831	0.75760	0.08016
Rational Formula						
Pervious Tc. (mins)....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Perv. Intensity (in/hr)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Pervious C	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Tc. (mins)..	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Imp. Intensity (in/hr).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious C	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area (Ha).....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area Tc.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area Intensity.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Subcatchment.....	F3l3c_m2cd#1	F3l3c_m2cd#2	F3l3c_m2cd#3	F3l3d#1	F3m2e#1	F3l3g#1
Area (acres).....	1.90900	0.35100	0.21200	0.09700	0.27700	0.02500
Percent Impervious.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Rainfall (in)....	2.20000	2.20000	2.20000	2.20000	2.20000	2.20000
Max Intensity (in/hr)..	3.01620	3.01620	3.01620	3.01620	3.01620	3.01620
Pervious Area						
Total Runoff Depth (in)	0.97344	0.97600	0.97013	1.86954	0.98035	1.86954
Peak Runoff Rate (cfs).	1.87859	0.54523	0.33989	0.26995	0.41861	0.06957
Total Impervious Area						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Area with depression storage						
Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Impervious Area without depression storage

Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Total Area

Total Runoff Depth (in)	0.97344	0.97600	0.97013	1.86954	0.98035	1.86954
Peak Runoff Rate (cfs).	1.87859	0.54523	0.33989	0.26995	0.41861	0.06957

Rational Formula

Pervious Tc. (mins)....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Perv. Intensity (in/hr)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Pervious C	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious Tc. (mins)..	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Imp. Intensity (in/hr).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Impervious C	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area (Ha).....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area Tc.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Partial Area Intensity.	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Subcatchment.....	F3l3f#1	Pond_F3k#1	F3l3i_m2h#1	F3l3i_m2h#2
Area (acres).....	1.86400	3.13900	0.15700	0.33800
Percent Impervious.....	0.00000	0.00000	0.00000	0.00000
Total Rainfall (in)....	2.20000	2.20000	2.20000	2.20000
Max Intensity (in/hr)..	3.01620	3.01620	3.01620	3.01620

Pervious Area

Total Runoff Depth (in)	1.21079	0.67397	1.86954	0.97286
Peak Runoff Rate (cfs).	1.45191	1.23043	0.43692	0.47165

Total Impervious Area

Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000

Impervious Area with depression storage

Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000

Impervious Area without depression storage

Total Runoff Depth (in)	0.00000	0.00000	0.00000	0.00000
Peak Runoff Rate (cfs).	0.00000	0.00000	0.00000	0.00000

Total Area

Total Runoff Depth (in)	1.21079	0.67397	1.86954	0.97286
Peak Runoff Rate (cfs).	1.45191	1.23043	0.43692	0.47165

Rational Formula

Pervious Tc. (mins)....	0.00000	0.00000	0.00000	0.00000
Perv. Intensity (in/hr)	0.00000	0.00000	0.00000	0.00000
Pervious C	0.00000	0.00000	0.00000	0.00000
Impervious Tc. (mins)..	0.00000	0.00000	0.00000	0.00000
Imp. Intensity (in/hr).	0.00000	0.00000	0.00000	0.00000
Impervious C	0.00000	0.00000	0.00000	0.00000
Partial Area (Ha).....	0.00000	0.00000	0.00000	0.00000
Partial Area Tc.....	0.00000	0.00000	0.00000	0.00000
Partial Area Intensity.	0.00000	0.00000	0.00000	0.00000

===> Runoff simulation ended normally.

Table E6. Final Model Condition
This table is used for steady state flow comparison and is the information saved to the hot-restart file.
Final Time = 48.017 hours

Junction / Depth / Elevation ===> "*" Junction is Surcharged.

Spen-ds/	0.18 /	766.50/	Spen-us/	0.64 /	766.50/	North/	0.00 /	770.36/
outfall/	0.02 /	760.85/	Out-Gold/	0.00 /	774.00/	stream/	0.22 /	768.33/
F3l3h_m2g/	0.00 /	768.98/	F3l3i_m2h/	0.19 /	768.97/	Mh10/	0.26 /	768.97/
F3m2f/	0.00 /	769.65/	F3m2e/	0.00 /	769.24/	F3l3g/	0.00 /	769.12/
F3l3f/	0.00 /	768.98/	F3l3a_m2a/	0.00 /	774.10/	F3l3b-m2b/	0.00 /	773.06/
F3l3c_m2cd/	0.00 /	770.11/	Mh42/	0.00 /	769.75/	F3l3d/	0.00 /	769.50/
F3l3e/	0.00 /	769.25/	Pond_F3k/	0.47 /	768.97/	Str/	0.28 /	768.77/

Conduit/ Flow ===> "*" Conduit uses the normal flow option.

Stream-US1/	0.00*/	Stream-DS/	0.38 /	Ov21-ck-in/	0.00 /
Stream-US2/	0.37*/	SS-33-DS/	0.00 /	SS08/	0.00*/
SS22/	0.00*/	Ov21b/	0.00 /	Ov30/	0.00 /
Ov22/	0.00 /	Pond-SS/	0.37 /	Pond-Ov/	0.00 /
Spenc-Cv.1/	-0.37 /	Spenc-Ov/	0.00 /	SS31/	0.00 /
Ov31/	0.00 /	SS32/	0.00 /	SS21.1/	0.00*/
Ov21/	0.00 /	SS06.1/	0.00 /	Ov06/	0.00 /
SS07.1/	0.00 /	Ov07/	0.00 /	SS01.1/	0.00*/
Ov01/	0.00 /	SS02.1/	0.00*/	Ov02/	0.00 /
SS03.1/	0.00*/	Ov03/	0.00 /	SS04.1/	0.00*/
Ov04/	0.00 /	SS05.1/	0.00*/	Ov05/	0.00 /
or1/	0.37 /	wr1/	0.00 /	FREE # 1/	0.38 /
FREE # 2/	0.00 /				

Conduit/ Velocity

Stream-US1/	0.00 /	Stream-DS/	0.39 /	Ov21-ck-in/	0.00 /
Stream-US2/	0.44 /	SS-33-DS/	0.02 /	SS08/	0.00 /
SS22/	0.00 /	Ov21b/	0.00 /	Ov30/	0.00 /
Ov22/	0.00 /	Pond-SS/	1.22 /	Pond-Ov/	0.00 /
Spenc-Cv.1/	-0.11 /	Spenc-Ov/	0.00 /	SS31/	0.00 /
Ov31/	0.00 /	SS32/	0.01 /	SS21.1/	0.00 /
Ov21/	0.00 /	SS06.1/	0.00 /	Ov06/	0.00 /
SS07.1/	0.00 /	Ov07/	0.00 /	SS01.1/	0.00 /

```
          Ov01/       0.00 /          SS02.1/       0.00 /          Ov02/       0.00 /
         SS03.1/       0.00 /          Ov03/       0.00 /         SS04.1/       0.00 /
          Ov04/       0.00 /          SS05.1/       0.00 /          Ov05/       0.00 /
           or1/       2.00 /

       Conduit/      Width
    Stream-US1/       0.15 /       Stream-DS/       4.42 /      Ov21-ck-in/       0.00 /
    Stream-US2/       3.50 /        SS-33-DS/       1.38 /           SS08/       1.86 /
          SS22/       0.59 /          Ov21b/       0.00 /          Ov30/       0.00 /
          Ov22/       0.00 /         Pond-SS/       1.67 /        Pond-Ov/       0.00 /
    Spenc-Cv.1/       8.09 /        Spenc-Ov/       0.00 /          SS31/       0.82 /
          Ov31/       0.00 /          SS32/       1.19 /         SS21.1/       0.78 /
          Ov21/       0.00 /         SS06.1/       1.76 /          Ov06/       0.00 /
         SS07.1/       1.76 /          Ov07/       0.00 /         SS01.1/       1.57 /
          Ov01/       0.00 /         SS02.1/       1.57 /          Ov02/       0.00 /
         SS03.1/       1.57 /          Ov03/       0.00 /         SS04.1/       1.57 /
          Ov04/       0.00 /         SS05.1/       1.57 /          Ov05/       0.00 /
           or1/       0.25 /

       Junction/        EGL
         Spen-ds/       0.18 /         Spen-us/       0.65 /          North/       0.00 /
        outfall/       0.03 /        Out-Gold/       0.00 /         stream/       0.47 /
     F3l3h_m2g/       0.00 /       F3l3i_m2h/       0.19 /          Mh10/       0.26 /
          F3m2f/       0.00 /          F3m2e/       0.00 /          F3l3g/       0.00 /
          F3l3f/       0.00 /       F3l3a_m2a/       0.00 /       F3l3b-m2b/       0.00 /
    F3l3c_m2cd/       0.00 /          Mh42/       0.00 /          F3l3d/       0.00 /
          F3l3e/       0.00 /        Pond_F3k/       0.47 /            Str/       0.34 /

       Junction/  Freeboard
         Spen-ds/      33.50 /         Spen-us/      33.50 /          North/      29.64 /
        outfall/      39.15 /        Out-Gold/      26.00 /         stream/      31.67 /
     F3l3h_m2g/      31.02 /       F3l3i_m2h/      31.03 /          Mh10/      31.03 /
          F3m2f/      30.35 /          F3m2e/      30.76 /          F3l3g/      30.88 /
          F3l3f/      31.02 /       F3l3a_m2a/      25.90 /       F3l3b-m2b/      26.94 /
    F3l3c_m2cd/      29.89 /          Mh42/      30.25 /          F3l3d/      30.50 /
          F3l3e/      30.75 /        Pond_F3k/      31.03 /            Str/      31.23 /

       Junction/ Max Volume
         Spen-ds/      40.66 /         Spen-us/      51.85 /          North/      54.92 /
        outfall/      22.96 /        Out-Gold/       0.00 /         stream/      42.35 /
     F3l3h_m2g/      30.34 /       F3l3i_m2h/      32.79 /          Mh10/      33.65 /
          F3m2f/      23.20 /          F3m2e/      28.36 /          F3l3g/      29.82 /
          F3l3f/      31.54 /       F3l3a_m2a/      14.00 /       F3l3b-m2b/      13.52 /
    F3l3c_m2cd/      21.20 /          Mh42/      22.28 /          F3l3d/      25.17 /
          F3l3e/      28.16 /        Pond_F3k/  123504.25 /            Str/      37.42 /

       Junction/Total Fldng
         Spen-ds/       0.00 /         Spen-us/       0.00 /          North/       0.00 /
        outfall/       0.00 /        Out-Gold/       0.00 /         stream/       0.00 /
     F3l3h_m2g/       0.00 /       F3l3i_m2h/       0.00 /          Mh10/       0.00 /
          F3m2f/       0.00 /          F3m2e/       0.00 /          F3l3g/       0.00 /
          F3l3f/       0.00 /       F3l3a_m2a/       0.00 /       F3l3b-m2b/       0.00 /
    F3l3c_m2cd/       0.00 /          Mh42/       0.00 /          F3l3d/       0.00 /
          F3l3e/       0.00 /        Pond_F3k/       0.00 /            Str/       0.00 /

       Conduit/ Cross Sectional Area
    Stream-US1/       0.04 /       Stream-DS/       0.96 /      Ov21-ck-in/       0.00 /
    Stream-US2/       0.85 /        SS-33-DS/       0.28 /           SS08/       0.09 /
          SS22/       0.00 /          Ov21b/       0.00 /          Ov30/       0.00 /
          Ov22/       0.00 /         Pond-SS/       0.30 /        Pond-Ov/       0.00 /
    Spenc-Cv.1/       3.51 /        Spenc-Ov/       0.00 /          SS31/       0.02 /
          Ov31/       0.00 /          SS32/       0.17 /         SS21.1/       0.00 /
          Ov21/       0.00 /         SS06.1/       0.00 /          Ov06/       0.00 /
         SS07.1/       0.00 /          Ov07/       0.00 /         SS01.1/       0.00 /
          Ov01/       0.00 /         SS02.1/       0.00 /          Ov02/       0.00 /
         SS03.1/       0.00 /          Ov03/       0.00 /         SS04.1/       0.00 /
          Ov04/       0.00 /         SS05.1/       0.00 /          Ov05/       0.00 /
           or1/       0.18 /

       Conduit/  Final Volume
    Stream-US1/      25.10 /       Stream-DS/     974.16 /      Ov21-ck-in/       0.00 /
    Stream-US2/     392.29 /        SS-33-DS/      56.13 /           SS08/      21.28 /
          SS22/       0.00 /          Ov21b/       0.00 /          Ov30/       0.00 /
          Ov22/       0.00 /         Pond-SS/      28.70 /        Pond-Ov/       0.00 /
    Spenc-Cv.1/     143.11 /        Spenc-Ov/       0.00 /          SS31/       3.12 /
          Ov31/       0.00 /          SS32/       8.95 /         SS21.1/       0.00 /
          Ov21/       0.00 /         SS06.1/       0.00 /          Ov06/       0.00 /
         SS07.1/       0.00 /          Ov07/       0.00 /         SS01.1/       0.00 /
          Ov01/       0.00 /         SS02.1/       0.00 /          Ov02/       0.00 /
         SS03.1/       0.00 /          Ov03/       0.00 /         SS04.1/       0.00 /
          Ov04/       0.00 /         SS05.1/       0.00 /          Ov05/       0.00 /
           or1/     183.87 /

       Conduit/ Hydraulic Radius
    Stream-US1/       0.01 /       Stream-DS/       0.09 /      Ov21-ck-in/       0.00 /
    Stream-US2/       0.14 /        SS-33-DS/       0.18 /           SS08/       0.04 /
          SS22/       0.00 /          Ov21b/       0.00 /          Ov30/       0.00 /
          Ov22/       0.00 /         Pond-SS/       0.17 /        Pond-Ov/       0.00 /
    Spenc-Cv.1/       0.44 /        Spenc-Ov/       0.00 /          SS31/       0.02 /
          Ov31/       0.00 /          SS32/       0.13 /         SS21.1/       0.00 /
          Ov21/       0.00 /         SS06.1/       0.00 /          Ov06/       0.00 /
         SS07.1/       0.01 /          Ov07/       0.00 /         SS01.1/       0.00 /
          Ov01/       0.00 /         SS02.1/       0.00 /          Ov02/       0.00 /
         SS03.1/       0.00 /          Ov03/       0.00 /         SS04.1/       0.00 /
          Ov04/       0.00 /         SS05.1/       0.00 /          Ov05/       0.00 /
           or1/       0.14 /

       Conduit/ Upstream/ Downstream Elevation
    Stream-US1/   770.36/   768.33       Stream-DS/   766.50/   760.85      Ov21-ck-in/   774.00/   774.00/
    Stream-US2/   768.33/   766.50        SS-33-DS/   768.97/   768.97           SS08/   768.98/   768.97/
          SS22/   769.25/   768.98           Ov21b/   768.97/   768.97           Ov30/   766.50/   766.50/
          Ov22/   769.50/   769.50          Pond-SS/   768.77/   768.56         Pond-Ov/   768.33/   768.33/
    Spenc-Cv.1/   766.50/   766.50        Spenc-Ov/   766.50/   766.50           SS31/   768.98/   768.97/
          Ov31/   768.98/   768.98           SS32/   768.97/   768.97         SS21.1/   769.24/   769.24/
          Ov21/   769.65/   769.65          SS06.1/   769.12/   769.12           Ov06/   769.12/   769.12/
         SS07.1/   769.12/   768.98           Ov07/   768.98/   768.98         SS01.1/   773.06/   773.06/
          Ov01/   773.06/   773.06          SS02.1/   770.11/   770.11           Ov02/   770.11/   770.11/
         SS03.1/   769.75/   769.75          Ov03/   769.75/   769.75         SS04.1/   769.50/   769.50/
          Ov04/   769.50/   769.50          SS05.1/   769.24/   769.24           Ov05/   769.24/   769.24/
           or1/   768.97/   768.77
```

```
*=========================================================*
|         Table E7 -  Iteration Summary                   |
*=========================================================*

Total number of time steps simulated.............       2880
Total number of passes in the simulation........      68709
Total number of time steps during simulation....      31573
Ratio of actual # of time steps / NTCYC.........     10.963
Average number of iterations per time step......      2.176
Average  time step size(seconds)................      5.473
Smallest time step size(seconds)................      2.308
Largest  time step size(seconds)................     60.000
Average minimum Conduit Courant time step (sec).     12.493
Average minimum implicit time step (sec)........      5.666
Average minimum junction time step (sec)........      5.666
Average Courant Factor Tf.......................      5.666
Number of times omega reduced...................       1037


*=========================================================*
|     Table E8 - Junction Time Step Limitation Summary    |
*=========================================================*
|   Not Convr = Number of times this junction did not     |
|               converge during the simulation.           |
|   Avg Convr = Average junction iterations.              |
|   Conv err  = Mean convergence error.                   |
|   Omega Cng = Change of omega during iterations         |
|   Max Itern = Maximum number of iterations              |
*=========================================================*
```

Junction	Not Convr	Avg Convr	Total Itt	Omega Cng	Max Itern	Ittrn >10	Ittrn >25	Ittrn >40
Spen-ds	0	2.15	68004	0	7	0	0	0
Spen-us	0	2.27	71766	0	19	1	0	0
North	0	1.72	54291	0	5	0	0	0
outfall	0	1.77	55894	0	6	0	0	0
Out-Gold	0	1.00	31573	0	1	0	0	0
stream	0	2.11	66639	0	8	0	0	0
F3l3h_m2g	0	1.31	41356	0	5	0	0	0
F3l3i_m2h	0	2.37	74953	1	8	0	0	0
Mh10	0	2.45	77207	0	7	0	0	0
F3m2f	0	1.35	42624	0	8	0	0	0
F3m2e	0	2.52	79449	0	13	5	0	0
F3l3g	0	3.00	94845	0	6	0	0	0
F3l3f	0	2.84	89666	20	11	1	0	0
F3l3a_m2a	0	1.32	41558	0	5	0	0	0
F3l3b-m2b	0	1.48	46590	0	6	0	0	0
F3l3c_m2cd	0	1.63	51384	0	5	0	0	0
Mh42	0	1.83	57873	0	5	0	0	0
F3l3d	0	1.77	55902	0	9	0	0	0
F3l3e	0	1.47	46505	0	5	0	0	0
Pond_F3k	0	2.64	83232	19	99	904	334	278
Str	0	3.16	99822	997	499	933	427	419

```
Total number of iterations for all junctions..   1331133
Minimum number of possible iterations.........    663033
Efficiency of the simulation..................      2.01
                                          Excellent Efficiency

*=========================================================*
| Extran Efficiency is an indicator of the efficiency of  |
| the simulation.  Ideal efficiency is one iteration per  |
| time step.  Altering the underrelaxation parameter,     |
| lowering the time step, increasing the flow and head    |
| tolerance are good ways of improving the efficiency,    |
| another is lowering the internal time step. The lower the|
| efficiency generally the faster your model will run.    |
| If your efficiency is less than 1.5 then you may try    |
| increasing your time step so that your overall simulation|
| is faster.  Ideal efficiency would be around 2.0        |
|                                                         |
| Good Efficiency      < 1.5           mean iterations    |
| Excellent Efficiency < 2.5 and > 1.5 mean iterations    |
| Good      Efficiency < 4.0 and > 2.5 mean iterations    |
| Fair      Efficiency < 7.5 and > 4.0 mean iterations    |
| Poor Efficiency      > 7.5           mean iterations    |
*=========================================================*


*=========================================================*
|        Table E9 - JUNCTION SUMMARY STATISTICS           |
| The Maximum area is only the area of the node, it       |
| does not include the area of the surrounding conduits   |
*=========================================================*
```

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Time of Occurence Min.	Feet of Surcharge at Max Elevation	Freeboard of node feet	Maximum Junction Area ft^2	Maximum Gutter Depth feet	Maximum Gutter Width feet	Maximum Gutter Velocity ft/s
Spen-ds	800.0000	778.0600	769.5558	14	29	0.0000	30.4442	12.5660	0.0000	0.0000	0.0000
Spen-us	800.0000	778.2500	769.9861	14	28	0.0000	30.0139	12.5660	0.0000	0.0000	0.0000
North	800.0000	780.3600	774.7303	14	15	0.0000	25.2697	12.5660	0.0000	0.0000	0.0000
outfall	800.0000	770.8300	762.6570	14	29	0.0000	37.3430	12.5660	0.0000	0.0000	0.0000
Out-Gold	800.0000	776.6200	774.0000	0	0	0.0000	26.0000	12.5660	0.0000	0.0000	0.0000
stream	800.0000	778.1100	771.4800	14	21	0.0000	28.5200	12.5660	0.0000	0.0000	0.0000
F3l3h_m2g	800.0000	776.1000	771.3948	15	14	0.0000	28.6052	12.5660	0.0000	0.0000	0.0000
F3l3i_m2h	800.0000	776.6600	771.3894	15	14	0.0000	28.6106	12.5660	0.0000	0.0000	0.0000
Mh10	800.0000	770.7100	771.3877	15	14	0.6777	28.6123	12.5660	0.0000	0.0000	0.0000
F3m2f	800.0000	777.3300	771.4966	14	45	0.0000	28.5034	12.5660	0.0000	0.0000	0.0000
F3m2e	800.0000	778.1700	771.4966	14	45	0.0000	28.5034	12.5660	0.0000	0.0000	0.0000
F3l3g	800.0000	778.1700	771.4929	14	45	0.0000	28.5071	12.5660	0.0000	0.0000	0.0000
F3l3f	800.0000	778.1700	771.4897	14	45	0.0000	28.5103	12.5660	0.0000	0.0000	0.0000
F3l3a_m2a	800.0000	782.5800	775.2138	12	47	0.0000	24.7862	12.5660	0.0000	0.0000	0.0000
F3l3b-m2b	800.0000	781.7000	774.1357	12	46	0.0000	25.8643	12.5660	0.0000	0.0000	0.0000
F3l3c_m2cd	800.0000	778.6300	771.7974	12	46	0.0000	28.2026	12.5660	0.0000	0.0000	0.0000
Mh42	800.0000	778.3900	771.5230	12	45	0.0000	28.4770	12.5660	0.0000	0.0000	0.0000
F3l3d	800.0000	778.3800	771.5028	14	44	0.0000	28.4972	12.5660	0.0000	0.0000	0.0000
F3l3e	800.0000	778.4800	771.4907	14	45	0.0000	28.5093	12.5660	0.0000	0.0000	0.0000
Pond_F3k	800.0000	776.5000	771.4849	14	45	0.0000	28.5151	45359.623	0.0000	0.0000	0.0000
Str	800.0000	771.5000	771.4682	14	42	0.0000	28.5318	12.5660	0.0000	0.0000	0.0000

Table E10 - CONDUIT SUMMARY STATISTICS

Note: The peak flow may be less than the design flow and the conduit may still surcharge because of the downstream boundary conditions.

* denotes an open conduit that has been overtopped this is a potential source of severe errors

Conduit Name	Design Flow (cfs)	Conduit Design Velocity (ft/s)	Maximum Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Time of Occurence Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Time of Occurence Min.	Ratio of Max. to Design Flow	Maximum Water Elev at Pipe Ends Upstream (ft)	Maximum Water Elev at Pipe Ends Dwnstrm (ft)	Ratio d/D US	Ratio d/D DS
Stream-US1	11550.46	6.0359	120.0000	153.4690	14	15	3.2612	14	15	0.0133	774.7303	771.4800	0.437	0.337
Stream-DS	5467.843	5.0714	120.0000	151.6342	14	29	3.3050	14	48	0.0277	769.5558	762.6570	0.324	0.183
Ov21-ck-in	2389.102	5.9579	24.0000	0.0000	0	0	0.0000	0	0	0.0000	774.0000	774.0000	.0000	.0000
Stream-US2	11473.60	8.3048	120.0000	153.0075	14	18	2.7063	12	57	0.0133	771.4800	769.9861	0.337	0.413
SS-33-DS	7.2921	2.3212	24.0000	1.5320	12	4	1.9526	12	4	0.2101	771.3877	771.4849	1.339	1.492
SS08	88.6319	5.5728	54.0000	21.9585	12	41	4.2687	12	32	0.2477	771.4897	771.4849	0.558	0.663
SS22	7.7029	4.3590	18.0000	3.6175	12	26	2.1498	12	22	0.4696	771.4907	771.4897	1.494	1.673
Ov21b	16309.43	9.0593	36.0000	0.0000	0	0	0.0000	0	0	0.0000	771.3894	771.3894	.0000	.0000
Ov30	45071.36	25.0355	36.0000	0.0000	0	0	0.0000	0	0	0.0000	769.5558	769.5558	.0000	.0000
Ov22	45071.36	25.0355	36.0000	0.0000	0	0	0.0000	0	0	0.0000	771.5028	771.5028	.0000	.0000
Pond-SS	23.7052	3.3536	36.0000	9.2220	15	25	1.7116	27	58	0.3890	771.4682	771.4800	0.989	1.033
Pond-Ov	604.5318	4.6863	36.0000	0.0000	0	0	0.0000	0	0	0.0000	771.4800	771.4800	.0000	.0000
Spenc-Cv.1	458.7549	9.9729	75.0000	-151.786	14	25	-4.4593	14	21	-0.3309	769.9861	769.5558	0.587	0.591
Spenc-Ov	90883.05	28.3832	48.0000	0.0000	0	0	0.0000	0	0	0.0000	769.5558	769.5558	.0000	.0000
SS31	7.1810	2.2858	24.0000	0.8152	12	8	1.2484	12	12	0.1135	771.3948	771.3894	1.207	1.305
Ov31	16928.18	9.4030	36.0000	0.0000	0	0	0.0000	0	0	0.0000	771.3948	771.3948	.0000	.0000
SS32	8.1533	2.5953	24.0000	1.5300	12	3	1.6913	12	3	0.1877	771.3894	771.3877	1.305	1.339
SS21.1	16.0989	5.1244	24.0000	0.2259	11	56	1.2174	11	53	0.0140	771.4966	771.4966	0.923	1.128
Ov21	20653.32	11.4722	36.0000	0.0000	0	0	0.0000	0	0	0.0000	771.4966	771.4966	.0000	.0000
SS06.1	135.9167	8.5459	54.0000	18.3286	12	46	3.0916	12	47	0.1349	771.4966	771.4929	0.501	0.527
Ov06	45071.36	25.0355	36.0000	0.0000	0	0	0.0000	0	0	0.0000	771.4929	771.4929	.0000	.0000
SS07.1	127.5644	8.0207	54.0000	18.3384	12	46	3.2419	12	47	0.1438	771.4929	771.4897	0.527	0.558
Ov07	1007.826	0.0000	36.0000	0.0000	0	0	0.0000	0	0	0.0000	771.4897	771.4897	.0000	.0000
SS01.1	151.8846	12.0866	48.0000	17.2938	12	47	6.0800	12	47	0.1139	775.2138	774.1357	0.278	0.269
Ov01	30998.37	17.2184	36.0000	0.0000	0	0	0.0000	0	0	0.0000	774.1357	774.1357	.0000	.0000
SS02.1	126.3995	10.0585	48.0000	17.7672	12	47	6.0124	12	47	0.1406	774.1357	771.7974	0.269	0.422
Ov02	28609.07	15.8913	36.0000	0.0000	0	0	0.0000	0	0	0.0000	771.7974	771.7974	.0000	.0000
SS03.1	93.4708	7.4382	48.0000	18.2375	12	46	3.5969	12	47	0.1951	771.7974	771.5230	0.422	0.443
Ov03	16932.88	9.4056	36.0000	0.0000	0	0	0.0000	0	0	0.0000	771.5230	771.5230	.0000	.0000
SS04.1	94.3146	7.5053	48.0000	18.2420	12	47	3.3905	12	47	0.1934	771.5230	771.5028	0.443	0.501
Ov04	26797.92	14.8853	36.0000	0.0000	0	0	0.0000	0	0	0.0000	771.5028	771.5028	.0000	.0000
SS05.1	80.8647	6.4350	48.0000	18.2645	12	47	3.3481	12	47	0.2259	771.5028	771.4966	0.501	0.564
Ov05	19590.87	10.8820	36.0000	0.0000	0	0	0.0000	0	0	0.0000	771.4966	771.4966	.0000	.0000
or1	0.6670	0.4815	5.9947	1.0926	27	11	5.5050	27	13	1.6381	771.4849	771.4682	5.975	5.962
wr1	Undefnd	Undefnd	Undefn	9.0545	15	24								
FREE # 1	Undefnd	Undefnd	Undefn	151.6342	14	29								
FREE # 2	Undefnd	Undefnd	Undefn	0.0000	0	0								

Table E11. Area assumptions used in the analysis Subcritical and Critical flow assumptions from Subroutine Head. See Figure 17-1 in the manual for further information.

Conduit Name	Duration of Dry Flow(min)	Duration of Sub-Critical Flow(min)	Durat. of Upstream Critical Flow(min)	Durat. of Downstream Critical Flow(min)	Maximum Hydraulic Radius-m	Maximum X-Sect Area(ft^2)	Maximum Vel*D (ft^2/s)
Stream-US1	675.2857	2204.7143	0.0000	0.0000	1.4879	37.1845	12.6164
Stream-DS	723.7778	2156.2222	0.0000	0.0000	1.8178	34.8660	8.3048
Ov21-ck-in	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Stream-US2	677.1429	2202.8571	0.0000	0.0000	1.1082	91.1162	8.3597
SS-33-DS	126.0000	2754.0000	0.0000	0.0000	0.6070	3.2648	0.7752
SS08	130.0000	2750.0000	0.0000	0.0000	1.2114	10.1399	6.2177
SS22	982.9000	1897.1000	0.0000	0.0000	0.4549	1.8115	3.0938
Ov21b	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ov30	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ov22	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pond-SS	676.8571	945.7714	0.0000	1257.3714	0.9126	7.1022	3.7946
Pond-Ov	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Spenc-Cv.1	723.7222	2156.2778	0.0000	0.0000	2.1853	30.8480	16.3967
Spenc-Ov	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SS31	127.1429	2752.8571	0.0000	0.0000	0.6072	3.2674	0.6826
Ov31	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SS32	126.0000	2754.0000	0.0000	0.0000	0.6084	3.2902	1.0964
SS21.1	1310.2333	1569.7667	0.0000	0.0000	0.6038	3.1595	0.3993
Ov21	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SS06.1	516.1250	2363.8750	0.0000	0.0000	1.1293	8.2423	5.4788
Ov06	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SS07.1	360.8750	2519.1250	0.0000	0.0000	1.1654	8.8107	5.5315
Ov07	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SS01.1	1863.9667	1016.0333	0.0000	0.0000	0.6406	2.7913	6.6539
Ov01	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SS02.1	1714.2381	1165.7619	0.0000	0.0000	0.6503	3.8227	8.3028
Ov02	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SS03.1	1687.6190	1192.3810	0.0000	0.0000	0.8932	5.2064	6.2207
Ov03	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SS04.1	1434.2424	1445.7576	0.0000	0.0000	0.9259	5.8032	6.0410
Ov04	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SS05.1	761.2778	2118.7222	0.0000	0.0000	1.0071	6.7945	6.0167
Ov05	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
or1	341.5000	2538.5000	0.0000	0.0000	0.1477	0.2024	7.0719

Table E12. Mean Conduit Flow Information

Conduit Name	Mean Flow (cfs)	Total Flow (ft^3)	Mean Percent Change	Low Flow Weightng	Mean Froude Number	Mean Hydraulic Radius	Mean Cross Area	Mean Conduit Roughness
Stream-US1	13.7241	2371526.5	0.0008	0.9464	0.2106	0.6149	9.3600	0.0350
Stream-DS	14.8238	2561555.3	0.0008	0.9296	0.3741	0.6308	11.2022	0.0450
Ov21-ck-in	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110

Stream-US2	14.8141	2559883.1	0.0007	0.9459	0.2391	0.5613	12.6750	0.0400
SS-33-DS	0.0305	5277.9105	0.0000	0.9959	0.0779	0.4761	2.0731	0.0130
SS08	1.1164	192911.75	0.0001	0.9958	0.1582	0.6666	3.7720	0.0130
SS22	0.1087	18784.301	0.0000	0.8694	0.0319	0.3135	1.0724	0.0130
Ov21b	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
Ov30	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
Ov22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
Pond-SS	1.0870	187841.78	0.0000	0.9460	0.2980	0.4453	2.1380	0.0130
Pond-Ov	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0300
Spenc-Cv.1	-14.8185	-2560642.	0.0007	0.9296	0.1952	0.9953	11.2392	0.0240
Spenc-Ov	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
SS31	0.0174	3005.3026	0.0000	0.9957	0.0305	0.4361	1.7006	0.0130
Ov31	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
SS32	0.0305	5267.3351	0.0000	0.9959	0.0330	0.4692	1.9640	0.0130
SS21.1	0.0033	569.2591	0.0000	0.7728	0.0199	0.3132	1.0651	0.0130
Ov21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
SS06.1	0.9587	165668.58	0.0001	0.9031	0.1246	0.5507	2.8960	0.0130
Ov06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
SS07.1	0.9597	165828.18	0.0001	0.9417	0.1132	0.5985	3.2377	0.0130
Ov07	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
SS01.1	0.8704	150398.32	0.0001	0.5833	0.7298	0.1281	0.3734	0.0130
Ov01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
SS02.1	0.8951	154667.17	0.0001	0.6194	0.5572	0.1417	0.4364	0.0130
Ov02	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
SS03.1	0.9458	163426.26	0.0001	0.6300	0.1990	0.2525	1.0197	0.0130
Ov03	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
SS04.1	0.9458	163440.64	0.0001	0.7308	0.1120	0.3596	1.5732	0.0130
Ov04	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
SS05.1	0.9497	164107.17	0.0001	0.8404	0.1320	0.4474	2.0928	0.0130
Ov05	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0110
or1	0.5196	89788.884	0.0000	0.9822	0.7406	0.1178	0.1830	0.0024
wr1	0.5657	97756.790						
FREE # 1	14.8236	2561521.3						
FREE # 2	0.0000	0.0000						

==
| Table E13. Channel losses(H), headwater depth (HW), tailwater |
| depth (TW), critical and normal depth (Yc and Yn). |
| Use this section for culvert comparisons |
==

Conduit Name	Maximum Flow	Head Loss	Friction Loss	Critical Depth	Normal Depth	HW Elevat	TW Elevat	
Stream-US1	153.4646	0.0000	2.3959	3.1604	4.3300	774.7301	771.4768	Max Flow
Stream-DS	151.6337	0.0000	4.8070	1.8270	2.8748	769.5558	762.6570	Max Flow
Ov21-ck-in	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
Stream-US2	153.0042	0.0000	2.2837	2.6213	3.3067	771.4789	769.9622	Max Flow
SS-33-DS	1.5312	0.0359	0.2548	0.4265	0.6214	769.3471	768.6487	Max Flow
SS08	21.9545	0.1995	0.4537	1.3315	1.5241	770.6636	769.6105	Max Flow
SS22	3.6175	0.0723	0.1751	0.7260	0.7231	770.6309	770.5140	Max Flow
Ov21b	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
Ov30	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
Ov22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
Pond-SS	9.2220	0.0286	0.1079	0.9591	1.2989	771.2742	771.2308	Max Flow
Pond-Ov	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
Spenc-Cv.1	-0.3722	0.0001	0.0748	0.0450	0.0476	766.5030	766.5041	Max Flow
Spenc-Ov	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
SS31	0.8152	0.0265	0.1668	0.3091	0.4536	769.5101	769.3930	Max Flow
Ov31	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
SS32	1.5260	0.0425	0.0581	0.4258	0.5853	769.4417	769.3460	Max Flow
SS21.1	0.2257	0.0796	0.1856	0.1619	0.1646	769.8600	769.8368	Max Flow
Ov21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
SS06.1	18.3285	0.1431	0.1105	1.2135	1.1143	771.0434	770.8620	Max Flow
Ov06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
SS07.1	18.3376	0.1562	0.0977	1.2138	1.1499	770.8620	770.6516	Max Flow
Ov07	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
SS01.1	17.2921	0.5526	0.9810	1.2182	0.9086	775.2138	774.1357	Max Flow
Ov01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
SS02.1	17.7668	1.0528	2.2663	1.2358	1.0108	774.1357	771.7971	Max Flow
Ov02	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
SS03.1	18.2371	0.2118	0.3402	1.2532	1.1957	771.7971	771.5225	Max Flow
Ov03	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
SS04.1	18.2420	0.1805	0.2262	1.2534	1.1903	771.5225	771.2922	Max Flow
Ov04	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
SS05.1	18.2641	0.1751	0.2350	1.2542	1.2919	771.2922	771.0434	Max Flow
Ov05	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Max Flow
or1	1.0926	0.0000	1.2837	0.4815	0.4996	770.2517	768.9681	Max Flow

==
| Table E13a. CULVERT ANALYSIS CLASSIFICATION, |
| and the time the culvert was in a particular |
| classification during the simulation. The time is |
| in minutes. The Dynamic Wave Equation is used for |
| all conduit analysis but the culvert flow classification |
| condition is based on the HW and TW depths. |
==

Conduit Name	Mild Slope Critical D Outlet Control	Mild Slope TW Control Outlet	Steep Slope TW Insignf Entrance Control	Slug Flow Outlet/ Entrance Control	Mild Slope TW > D Outlet Control	Mild Slope TW <= D Outlet Control	Outlet Control	Inlet Control	Inlet Configuration
Stream-US1	2.0000	2203.0000	675.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
Stream-DS	404.0000	1753.0000	723.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
Ov21-ck-in	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
Stream-US2	0.0000	2203.0000	677.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
SS-33-DS	608.0000	1671.0000	127.0000	51.0000	311.0000	112.0000	0.0000	0.0000	Square Edge with Headwall
SS08	545.0000	2185.0000	130.0000	0.0000	0.0000	0.0000	0.0000	20.0000	Square Edge with Headwall
SS22	0.0000	1329.0000	983.0000	83.0000	384.0000	101.0000	0.0000	0.0000	Square Edge with Headwall
Ov21b	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
Ov30	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
Ov22	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
Pond-SS	365.0000	1716.0000	676.0000	96.0000	27.0000	0.0000	0.0000	0.0000	Square Edge with Headwall
Pond-Ov	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
Spenc-Cv.1	0.0000	1294.0000	723.0000	863.0000	0.0000	0.0000	0.0000	0.0000	18 inch Corner, 90 deg Headwall
Spenc-Ov	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
SS31	0.0000	2615.0000	129.0000	0.0000	136.0000	0.0000	0.0000	0.0000	Square Edge with Headwall
Ov31	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
SS32	1.0000	2595.0000	126.0000	0.0000	158.0000	0.0000	0.0000	0.0000	Square Edge with Headwall

SS21.1	0.0000	1474.0000	1310.0000	0.0000	96.0000	0.0000	0.0000	0.0000	Square Edge with Headwall
Ov21	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
SS06.1	0.0000	1580.0000	517.0000	773.0000	0.0000	0.0000	10.0000	0.0000	Square Edge with Headwall
Ov06	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
SS07.1	3.0000	2124.0000	361.0000	392.0000	0.0000	0.0000	0.0000	0.0000	Square Edge with Headwall
Ov07	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
SS01.1	0.0000	0.0000	2859.0000	0.0000	0.0000	0.0000	21.0000	0.0000	Square Edge with Headwall
Ov01	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
SS02.1	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Square Edge with Headwall
Ov02	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
SS03.1	1.0000	775.0000	1688.0000	389.0000	0.0000	0.0000	27.0000	0.0000	Square Edge with Headwall
Ov03	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
SS04.1	0.0000	979.0000	1434.0000	451.0000	0.0000	0.0000	16.0000	0.0000	Square Edge with Headwall
Ov04	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
SS05.1	3.0000	2115.0000	762.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Square Edge with Headwall
Ov05	0.0000	0.0000	2880.0000	0.0000	0.0000	0.0000	0.0000	0.0000	None
or1	511.0000	283.0000	350.0000	0.0000	868.0000	0.0000	868.0000	0.0000	None

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| Kinematic Wave Approximations |
| Time in Minutes for Each Condition |
=====================================

Conduit Name	Duration of Normal Flow	Slope Criteria	Super-Critical	Roll Waves
Stream-US1	1170.1429	1170.1429	0.0000	0.0000
Stream-DS	0.0000	0.0000	0.0000	0.0000
Ov21-ck-in	0.0000	0.0000	0.0000	0.0000
Stream-US2	1389.8150	2176.4233	0.0000	0.0000
SS-33-DS	0.0000	1977.2835	255.0747	0.0000
SS08	11.0000	2101.4231	615.5833	0.0000
SS22	473.4750	2258.6000	0.2000	0.0000
Ov21b	0.0000	0.0000	0.0000	0.0000
Ov30	0.0000	0.0000	0.0000	0.0000
Ov22	0.0000	0.0000	0.0000	0.0000
Pond-SS	0.0000	790.1352	22.5083	0.0000
Pond-Ov	0.0000	0.0000	0.0000	0.0000
Spenc-Cv.1	0.0000	0.0000	0.0000	0.0000
Spenc-Ov	0.0000	0.0000	0.0000	0.0000
SS31	291.1667	2511.0000	0.0000	0.0000
Ov31	0.0000	0.0000	0.0000	0.0000
SS32	0.0000	2497.6913	0.0000	0.0000
SS21.1	945.2048	2256.1427	2.0000	0.0000
Ov21	0.0000	0.0000	0.0000	0.0000
SS06.1	215.9167	2453.8436	389.0000	0.0000
Ov06	0.0000	0.0000	0.0000	0.0000
SS07.1	286.0000	2488.9739	34.0000	0.0000
Ov07	0.0000	0.0000	0.0000	0.0000
SS01.1	1396.5890	2087.6952	2218.0000	0.0000
Ov01	0.0000	0.0000	0.0000	0.0000
SS02.1	2210.2568	2307.3333	144.5972	0.0000
Ov02	0.0000	0.0000	0.0000	0.0000
SS03.1	1153.0714	2165.6667	16.3333	0.0000
Ov03	0.0000	0.0000	0.0000	0.0000
SS04.1	977.9242	2320.3333	2.0000	0.0000
Ov04	0.0000	0.0000	0.0000	0.0000
SS05.1	658.5556	2181.6667	240.0000	0.0000
Ov05	0.0000	0.0000	0.0000	0.0000
or1	0.0385	99.3188	1240.5625	0.0000

===
| Table E14 - Natural Channel Overbank Flow Information |
===

Conduit Name	<---- Maximum Velocity -----> Left Velocity	Center Velocity	Right Velocity	<------ Maximum Flow -------> Left Flow	Center Flow	Right Flow	<------ Maximum Area ------> Left Area	Center Area	Right Area	<--- Max. Storage Volume ---> Left Area	Center Area	Right Area	Maximum Depth
Stream-US1	0.2950	4.1819	0.7936	0.0035	153.1772	0.2884	0.0118	36.6283	0.3634	8.1407	25266.227	250.6406	3.9122
Stream-DS	0.0000	4.3553	0.0000	0.0000	151.6342	0.0000	0.0000	34.8162	0.0000	0.0000	35370.151	0.0000	2.5435
Stream-US2	1.2895	2.6181	1.1659	16.3427	83.0726	53.5922	12.6735	31.7303	45.9668	5881.8811	14726.348	21333.657	3.7859

===
| Table E14a - Natural Channel Encroachment Information |
===

Conduit Name	<------- Existing Conveyance Condition -------> Left Bank	Centre Channel	Right Bank	Total	Left Station	Right Station	<----- Encroachment Conveyance Condition -----> Left Bank	Centre Channel	Right Bank	Total	Left Station	Right Station	<- % Volume --> Reduction Left	Reduction Right	<-- Encroachment Data --> Depth Incr.	Method
Stream-US1	0.04910	2160.6	4.0675	2164.7	309.49	332.67	0.04910	2160.6	4.0675	2164.7	309.49	332.67	0.0000	0.0000	0.0000	None
Stream-DS	0.0000	1663.7	0.0000	1663.7	147.24	165.40	0.0000	1663.7	0.0000	1663.7	147.24	165.40	0.0000	0.0000	0.0000	None
Stream-US2	470.79	2393.1	1543.8	4407.7	123.55	199.11	470.79	2393.1	1543.8	4407.7	123.55	199.11	0.0000	0.0000	0.0000	None

==================================
| Table E14b - Floodplain Mapping |
==================================

Conduit Name	Upstream WS Elev.	Downstream WS Elev.	Channel Length	Center Station	<----- Left Offsets Natural	Encroach	<----- Right Offsets Bank	Natural	Encroach	<- Channel Widths-> Bank	Total	Encroach.
Stream-US1	774.7303	771.4800	689.8000	316.4700	6.9796	6.9796	6.6000	16.2000	16.2000	13.5300	23.1797	23.1797
Stream-DS	769.5558	762.6570	1015.9100	153.5100	6.2676	6.2676	6.5100	11.8870	11.8870	12.9300	18.1545	18.1545
Stream-US2	771.4800	769.9861	464.1100	141.4700	17.9217	17.9217	5.4100	57.6417	57.6417	4.2000	75.5634	75.5634

===
| Table E15 - SPREADSHEET INFO LIST |
| Conduit Flow and Junction Depth Information for use in |
| spreadsheets. The maximum values in this table are the |
| true maximum values because they sample every time step.|
| The values in the review results may only be the |
| maximum of a subset of all the time steps in the run. |
| Note: These flows are only the flows in a single barrel.|
===

Conduit Name	Maximum Flow (cfs)	Total Flow (ft^3)	Maximum Velocity (ft/s)	Maximum Volume (ft^3)	## ## ##	Junction Name	Invert Elevation (ft)	Maximum Elevation (ft)

Stream-US1	153.4690	2371526.465	3.2612	25525.0085	##	Spen-ds	766.3200	769.5558
Stream-DS	151.6342	2561555.319	3.3050	11770.0957	##	Spen-us	765.8600	769.9861
Ov21-ck-in	0.0000	0.0000	0.0000	0.0000	##	North	770.3600	774.7303
Stream-US2	153.0075	2559883.100	2.7063	41941.8856	##	outfall	760.8300	762.6570
SS-33-DS	1.5320	5277.9105	1.9526	665.6302	##	Out-Gold	774.0000	774.0000
SS08	21.9585	192911.7545	4.2687	2395.9396	##	stream	768.1100	771.4800
SS22	3.6175	18784.3011	2.1498	92.7060	##	F3l3h_m2g	768.9800	771.3948
Ov21b	0.0000	0.0000	0.0000	0.0000	##	F3l3i_m2h	768.7800	771.3894
Ov30	0.0000	0.0000	0.0000	0.0000	##	Mh10	768.7100	771.3877
Ov22	0.0000	0.0000	0.0000	0.0000	##	F3m2f	769.6500	771.4966
Pond-SS	9.2220	187841.7788	1.7116	680.7510	##	F3m2e	769.2400	771.4966
Pond-Ov	0.0000	0.0000	0.0000	0.0000	##	F3l3g	769.1200	771.4929
Spenc-Cv.1	151.7863	2560642.372	4.4593	1259.2022	##	F3l3f	768.9800	771.4897
Spenc-Ov	0.0000	0.0000	0.0000	0.0000	##	F3l3a_m2a	774.1000	775.2138
SS31	0.8152	3005.3026	1.2484	653.7047	##	F3l3b-m2b	773.0600	774.1357
Ov31	0.0000	0.0000	0.0000	0.0000	##	F3l3c_m2cd	770.1100	771.7974
SS32	1.5300	5267.3351	1.6913	177.4816	##	Mh42	769.7500	771.5230
SS21.1	0.2259	569.2591	1.2174	262.4263	##	F3l3d	769.5000	771.5028
Ov21	0.0000	0.0000	0.0000	0.0000	##	F3l3e	769.2500	771.4907
SS06.1	18.3286	165668.5810	3.0916	207.0477	##	Pond_F3k	768.5000	771.4849
Ov06	0.0000	0.0000	0.0000	0.0000	##	Str	768.4900	771.4682
SS07.1	18.3384	165828.1785	3.2419	293.1304	##			
Ov07	0.0000	0.0000	0.0000	0.0001	##			
SS01.1	17.2938	150398.3207	6.0800	259.6435	##			
Ov01	0.0000	0.0000	0.0000	0.0000	##			
SS02.1	17.7672	154667.1727	6.0124	832.9621	##			
Ov02	0.0000	0.0000	0.0000	0.0000	##			
SS03.1	18.2375	163426.2585	3.5969	442.6492	##			
Ov03	0.0000	0.0000	0.0000	0.0000	##			
SS04.1	18.2420	163440.6352	3.3905	336.5254	##			
Ov04	0.0000	0.0000	0.0000	0.0000	##			
SS05.1	18.2645	164107.1679	3.3481	557.4181	##			
Ov05	0.0000	0.0000	0.0000	0.0000	##			
or1	1.0926	89788.8837	5.5050	205.4706	##			
wr1	9.0545	97756.7901	0.0000	0.0000	##			
FREE # 1	151.6342	2561521.259	0.0000	0.0000	##			
FREE # 2	0.0000	0.0000	0.0000	0.0000	##			

==
| Table E15a - SPREADSHEET REACH LIST |
| Peak flow and Total Flow listed by Reach or those |
| conduits or diversions having the same |
| upstream and downstream nodes. |
==

Upstream Node	Downstream Node	Maximum Flow (cfs)	Total Flow (ft^3)
North	stream	153.4690	2371526.46
Spen-ds	outfall	151.6342	2561555.32
stream	Spen-us	153.0075	2559883.10
Mh10	Pond_F3k	1.5320	5277.9105
F3l3f	Pond_F3k	21.9585	192911.754
F3l3e	F3l3f	3.6175	18784.3011
Str	stream	9.2220	187841.779
Spen-ds	Spen-us	151.7863	2560642.37
F3l3h_m2g	F3l3i_m2h	0.8152	3005.3026
F3l3i_m2h	Mh10	1.5300	5267.3351
F3m2f	F3m2e	0.2259	569.2591
F3m2e	F3l3g	18.3286	165668.581
F3l3g	F3l3f	18.3384	165828.179
F3l3a_m2a	F3l3b-m2b	17.2938	150398.321
F3l3b-m2b	F3l3c_m2cd	17.7672	154667.173
F3l3c_m2cd	Mh42	18.2375	163426.258
Mh42	F3l3d	18.2420	163440.635
F3l3d	F3m2e	18.2645	164107.168
Pond_F3k	Str	9.2399	187545.674

##
Table E16. New Conduit Information Section
Conduit Invert (IE) Elevation and Conduit
Maximum Water Surface (WS) Elevations
##

Conduit Name	Upstream Node	Downstream Node	IE Up	IE Dn	WS Up	WS Dn	Conduit Type
Stream-US1	North	stream	770.3600	768.1100	774.7303	771.4800	Natural
Stream-DS	Spen-ds	outfall	766.3200	760.8300	769.5558	762.6570	Natural
Ov21-ck-in	F3m2f	Out-Gold	774.8200	774.6200	774.0000	774.0000	Trapezoid
Stream-US2	stream	Spen-us	768.1100	765.8600	771.4800	769.9861	Natural
SS-33-DS	Mh10	Pond_F3k	768.7100	768.5000	771.3877	771.4849	Circular
SS08	F3l3f	Pond_F3k	768.9800	768.5000	771.4897	771.4849	Circular
SS22	F3l3e	F3l3f	769.2500	768.9800	771.4907	771.4897	Circular
Ov21b	F3m2f	F3l3i_m2h	774.3300	773.6600	771.3894	771.3894	Trapezoid
Ov30	F3l3h_m2g	Spen-ds	773.1000	772.9000	769.5558	769.5558	Trapezoid
Ov22	F3l3e	F3l3d	775.4800	775.3800	771.5028	771.5028	Trapezoid
Pond-SS	Str	stream	768.5000	768.3800	771.4682	771.4800	Circular
Pond-Ov	Pond_F3k	stream	773.5000	773.4000	771.4800	771.4800	Trapezoid
Spenc-Cv.1	Spen-ds	Spen-us	766.3200	765.8600	769.5558	769.9861	Arch
Spenc-Ov	Spen-us	Spen-ds	774.2500	774.0600	769.5558	769.5558	Trapezoid
SS31	F3l3h_m2g	F3l3i_m2h	768.9800	768.7800	771.3948	771.3894	Circular
Ov31	F3l3i_m2h	F3l3h_m2g	773.6600	773.1000	771.3948	771.3948	Trapezoid
SS32	F3l3i_m2h	Mh10	768.7800	768.7100	771.3894	771.3877	Circular
SS21.1	F3m2f	F3m2e	769.6500	769.2400	771.4966	771.4966	Circular
Ov21	F3m2e	F3m2f	774.6700	774.3300	771.4966	771.4966	Trapezoid
SS06.1	F3m2e	F3l3g	769.2400	769.1200	771.4966	771.4929	Circular
Ov06	F3m2e	F3l3g	775.1700	775.0700	771.4929	771.4929	Trapezoid
SS07.1	F3l3g	F3l3f	769.1200	768.9800	771.4929	771.4897	Circular
Ov07	F3l3g	F3l3f	775.1700	775.1700	771.4897	771.4897	Trapezoid
SS01.1	F3l3a_m2a	F3l3b-m2b	774.1000	773.0600	775.2138	774.1357	Circular
Ov01	F3l3a_m2a	F3l3b-m2b	779.5800	778.7000	774.1357	774.1357	Trapezoid
SS02.1	F3l3b-m2b	F3l3c_m2cd	773.0600	770.1100	774.1357	771.7974	Circular
Ov02	F3l3b-m2b	F3l3c_m2cd	778.7000	775.6300	771.7974	771.7974	Trapezoid
SS03.1	F3l3c_m2cd	Mh42	770.1100	769.7500	771.7974	771.5230	Circular
Ov03	F3l3c_m2cd	Mh42	775.6300	775.3900	771.5230	771.5230	Trapezoid
SS04.1	Mh42	F3l3d	769.7500	769.5000	771.5230	771.5028	Circular
Ov04	Mh42	F3l3d	775.3900	774.9800	771.5028	771.5028	Trapezoid
SS05.1	F3l3d	F3m2e	769.5000	769.2400	771.5028	771.4966	Circular
Ov05	F3l3d	F3m2e	774.9800	774.6700	771.4966	771.4966	Trapezoid
or1	Pond_F3k	Str	768.5000	768.4900	771.4849	771.4682	Circ Orif

```
*==========================================================================*
|    Table E18 - Junction Continuity Error.   Division by Volume added 11/96  |
|                                                                            |
|  Continuity Error = Net Flow + Beginning Volume - Ending Volume            |
|                     ---------------------------------------------------    |
|                     Total Flow + (Beginning Volume + Ending Volume)/2      |
|                                                                            |
|  Net Flow   = Node Inflow - Node Outflow                                   |
|  Total Flow = absolute (Inflow + Outflow)                                  |
|  Intermediate column is a judgement on the node continuity error.          |
|                                                                            |
|  Excellent  < 1 percent    Great  1 to  2 percent  Good  2 to  5 percent   |
|  Fair  5 to 10  percent    Poor  10 to 25 percent  Bad  25 to 50 percent   |
|  Terrible > 50  percent                                                    |
*==========================================================================*
```

Junction Name	<------Continuity Error -------> Volume	% of Node	% of Inflow	Remaining Volume	Beginning Volume	Net Flow Thru Node	Total Flow Thru Node	Failed to Converge
Spen-ds	-1308.7605	-0.0255	0.0508	310.9003	0.0000	-997.8602	5122197.691	0
Spen-us	-1228.0242	-0.0240	0.0477	421.2889	0.0000	-806.7353	5120525.472	0
North	-740.5637	-0.0156	0.0287	42.5780	0.0000	-697.9857	4742348.763	0
outfall	-285.7242	-0.0056	0.0111	267.4239	0.0000	-18.3003	5123076.578	0
Out-Gold	-0.0005	0.0000	0.0000	0.0005	0.0000	0.0000	0.0000	0
stream	-963.3877	-0.0188	0.0374	428.6247	0.0000	-534.7630	5119251.344	0
F3l3h_m2g	-29.4760	-0.4919	0.0011	5.2421	0.0000	-24.2339	5989.2428	0
F3l3i_m2h	-24.5297	-0.2327	0.0010	13.0495	0.0000	-11.4802	10532.7102	0
Mh10	-62.0083	-0.5867	0.0024	48.6632	0.0000	-13.3451	10545.2456	0
F3m2f	-14.9414	-1.3271	0.0006	0.0026	0.0000	-14.9388	1125.8998	0
F3m2e	-34.0306	-0.0103	0.0013	0.0018	0.0000	-34.0288	331331.1400	0
F3l3g	-6.0069	-0.0018	0.0002	0.0005	0.0000	-6.0064	331666.5091	0
F3l3f	-160.3632	-0.0416	0.0062	35.6499	0.0000	-124.7133	385717.6348	0
F3l3a_m2a	-9.2280	-0.0031	0.0004	0.0009	0.0000	-9.2271	300789.0749	0
F3l3b-m2b	-38.4603	-0.0124	0.0015	0.0047	0.0000	-38.4556	309306.4012	0
F3l3c_m2cd	-26.6067	-0.0081	0.0010	0.0047	0.0000	-26.6021	326831.3308	0
Mh42	-30.0856	-0.0092	0.0012	0.0014	0.0000	-30.0842	326866.8937	0
F3l3d	-30.2111	-0.0092	0.0012	0.0014	0.0000	-30.2097	328206.4315	0
F3l3e	-12.7562	-0.0340	0.0005	0.0003	0.0000	-12.7559	37565.0007	0
Pond_F3k	179.5169	0.0446	0.0070	18164.8643	0.0000	18344.3812	393415.1609	0
Str	-321.8638	-0.0857	0.0125	90.2057	0.0000	-231.6581	375387.4526	0

The total continuity error was -5147.5 cubic feet
The remaining total volume was 19829. cubic feet
Your mean node continuity error was Excellent
Your worst node continuity error was Excellent

```
  *====================================================*
  |  Table E19 - Junction Inflow & Outflow Listing     |
  |              Units are either ft^3 or m^3          |
  |              depending on the units in your model.|
  *====================================================*
```

Junction Name	Constant Inflow to Node	User Inflow to Node	Interface Inflow to Node	DWF Inlow to Node	Inflow through Outfall	RNF Layer Inflow to Node	Inflow from 2D Layer	Outflow from Node	Evaporation from Node	Basin Infil.
North	0.0000	0.0000	0.0000	0.0000	0.0000	2.3709E+06	0.0000	0.0000	0.0000	0.0000
outfall	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.5615E+06	0.0000	0.0000
F3l3h_m2g	0.0000	0.0000	0.0000	0.0000	0.0000	2982.0564	0.0000	0.0000	0.0000	0.0000
F3l3i_m2h	0.0000	0.0000	0.0000	0.0000	0.0000	2258.1010	0.0000	0.0000	0.0000	0.0000
F3m2f	0.0000	0.0000	0.0000	0.0000	0.0000	556.1578	0.0000	0.0000	0.0000	0.0000
F3m2e	0.0000	0.0000	0.0000	0.0000	0.0000	985.3407	0.0000	0.0000	0.0000	0.0000
F3l3g	0.0000	0.0000	0.0000	0.0000	0.0000	169.5689	0.0000	0.0000	0.0000	0.0000
F3l3f	0.0000	0.0000	0.0000	0.0000	0.0000	8191.7712	0.0000	0.0000	0.0000	0.0000
F3l3a_m2a	0.0000	0.0000	0.0000	0.0000	0.0000	150387.1568	0.0000	0.0000	0.0000	0.0000
F3l3b-m2b	0.0000	0.0000	0.0000	0.0000	0.0000	4240.2443	0.0000	0.0000	0.0000	0.0000
F3l3c_m2cd	0.0000	0.0000	0.0000	0.0000	0.0000	8733.4054	0.0000	0.0000	0.0000	0.0000
F3l3d	0.0000	0.0000	0.0000	0.0000	0.0000	657.9272	0.0000	0.0000	0.0000	0.0000
F3l3e	0.0000	0.0000	0.0000	0.0000	0.0000	18777.6340	0.0000	0.0000	0.0000	0.0000
Pond_F3k	0.0000	0.0000	0.0000	0.0000	0.0000	7679.3553	0.0000	0.0000	0.0000	0.0000

```
  *====================================================*
  | Table E20 - Junction Flooding and Volume Listing.  |
  |             The maximum volume is the total volume |
  |             in the node including the volume in the|
  |             flooded storage area. This is the max  |
  |             volume at any time. The volume in the  |
  |             flooded storage area is the total volume|
  |             above the ground elevation, where the  |
  |             flooded pond storage area starts.      |
  | The fourth column is instantaneous, the fifth is the|
  | sum of the flooded volume over the entire simulation|
  | Units are either ft^3 or m^3 depending on the units.|
  *====================================================*
```

Junction Name	Surcharged Time (min)	Flooded Time(min)	Out of 1D-System (Flooded Volume)	Maximum Volume	Passed to 2D cell OR Volume Stored in allowed Flood Pond of 1D-System
Spen-ds	0.0000	0.0000	0.0000	40.6610	0.0000
Spen-us	0.0000	0.0000	0.0000	51.8482	0.0000
North	0.0000	0.0000	0.0000	54.9167	0.0000
outfall	0.0000	0.0000	0.0000	22.9575	0.0000
Out-Gold	0.0000	0.0000	0.0000	0.0000	0.0000
stream	0.0000	0.0000	0.0000	42.3474	0.0000
F3l3h_m2g	0.0000	0.0000	0.0000	30.3442	0.0000
F3l3i_m2h	0.0000	0.0000	0.0000	32.7898	0.0000
Mh10	157.9803	0.0000	0.0000	33.6482	0.0000
F3m2f	0.0000	0.0000	0.0000	23.2045	0.0000
F3m2e	0.0000	0.0000	0.0000	28.3565	0.0000
F3l3g	0.0000	0.0000	0.0000	29.8184	0.0000
F3l3f	0.0000	0.0000	0.0000	31.5367	0.0000
F3l3a_m2a	0.0000	0.0000	0.0000	13.9961	0.0000
F3l3b-m2b	0.0000	0.0000	0.0000	13.5174	0.0000
F3l3c_m2cd	0.0000	0.0000	0.0000	21.2035	0.0000
Mh42	0.0000	0.0000	0.0000	22.2793	0.0000
F3l3d	0.0000	0.0000	0.0000	25.1666	0.0000
F3l3e	0.0000	0.0000	0.0000	28.1564	0.0000
Pond_F3k	0.0000	0.0000	0.0000	123504.2457	0.0000
Str	0.0000	0.0000	0.0000	37.4241	0.0000

```
*==================================*
| Simulation Specific Information  |
```

```
*==================================*
Number of Input Conduits.....        33 Number of Simulated Conduits......        37
Number of Natural Channels.....       3 Number of Junctions..............        21
Number of Storage Junctions.....      1 Number of Weirs..................         1
Number of Orifices.............       1 Number of Pumps..................         0
Number of Free Outfalls.....          2 Number of Tide Gate Outfalls.....         0

*==========================================================*
| Average % Change in Junction or Conduit is defined as:  |
| Conduit  % Change ==> 100.0 ( Q(n+1) - Q(n) ) / Qfull   |
| Junction % Change ==> 100.0 ( Y(n+1) - Y(n) ) / Yfull   |
*==========================================================*

The Conduit with the largest average change was..Stream-DS  with     0.001 percent
The Junction with the largest average change was.North      with     0.016 percent
The Conduit with the largest sinuosity was.......or1        with     4.018

*================================================================*
| Table E21. Continuity balance at the end of the simulation     |
|            Junction Inflow, Outflow or Street Flooding         |
| Error = Inflow  + Initial Volume - Outflow - Final   Volume    |
*================================================================*
       Inflow          Inflow       Average
       Junction   Volume,ft^3   Inflow, cfs
---------------  ------------  -------------
           North   2.37082E+06        13.7200
      F3l3h_m2g     2983.9401         0.0173
      F3l3i_m2h     2260.0725         0.0131
          F3m2f      556.6406         0.0032
          F3m2e      986.1321         0.0057
          F3l3g      169.7496         0.0010
          F3l3f     8193.4007         0.0474
      F3l3a_m2a   150390.7541         0.8703
      F3l3b-m2b     4240.9078         0.0245
     F3l3c_m2cd     8737.8997         0.0506
          F3l3d      658.6284         0.0038
          F3l3e    18780.6996         0.1087
       Pond_F3k     7679.8221         0.0444
        outfall    -2.562E+06       -14.8236

       Outflow      Outflow          Average
       Junction  Volume,ft^3    Outflow, cfs
---------------  ------------   ------------
        outfall   2.56152E+06        14.8236

*====================================================*
| Initial system volume        =         0.0000 Cu Ft |
| Total system inflow volume   =   2.576521E+06 Cu Ft |
| Inflow + Initial volume      =   2.576521E+06 Cu Ft |
*====================================================*
| Total system outflow         =   2.561521E+06 Cu Ft |
| Volume left (Final volume)   =     19828.5093 Cu Ft |
| Evaporation                  =         0.0000 Cu Ft |
| Basin Infiltration           =         0.0000 Cu Ft |
| Outflow + Final Volume       =   2.581350E+06 Cu Ft |
*====================================================*

*================================================*
| Total Model Continuity Error                   |
| Error in Continuity, Percent =        -0.1874 |
| Error in Continuity, ft^3    =      -4828.328 |
| + Error means a continuity loss, - a gain      |
*================================================*

##################################################
# Table E22. Numerical Model judgement section   #
##################################################

Overall error was (minimum of Table E18 & E21)             -0.1874 percent
Worst nodal error was in node Spen-ds          with        -0.0256 percent
Of the total inflow this loss was                           0.0508 percent
Your overall continuity error was                 Excellent
                                                 Excellent Efficiency
Efficiency of the simulation                      2.01
Most Number of Non Convergences at one Node       0.
Total Number Non Convergences at all Nodes        0.
Total Number of Nodes with Non Convergences       0.

##########################################################
# Table E23. New Basin Design Information                #
#            Maximum Hydraulic Grade Line,               #
#            Out Conduit Sizes and Maximum Flow          #
##########################################################

A) Resize d/s Pipes based on given HGL
B) Resize Basin based on given HGL
C) Resize d/s Pipes and Basin based on HGL and max discharge
D) Resize d/s pipes based on given max discharge

   Basin Name    Type    Max.HGL   Conduit         Depth   Width   Barrels   Max.Flow
                           (ft)                     (ft)    (ft)             (ft^3/s)
---------------- ------  --------- --------------- ------- ------- --------- ---------
===> Hydraulic model simulation ended normally.
===> XP-SWMM Simulation ended normally.
===> Your input file was named  : W:\PROJECTS\G0003\940271\16\SWMM\Proposed\Proposed-Misty_1-year.DAT
===> Your output file was named : W:\PROJECTS\G0003\940271\16\SWMM\Proposed\Proposed-Misty_1-year.out

*============================================================*
|             SWMM Simulation Date and Time Summary          |
*============================================================*
| Starting Date... December   12, 2016  Time...   10:37:12: 8  |
|   Ending Date... December   12, 2016  Time...   10:37:42:85  |
|  Elapsed Time...    0.51283 minutes or     30.77000 seconds  |
*============================================================*
```

Current Directory: W:\PROJECTS\G0003\940271\16\SWMM\Proposed
Engine Name: C:\PROGRA~2\XPSOLU~1\XPSWMM~1\SWMMEN~2.EXE
Input File : :\PROJECTS\G0003\940271\16\SWMM\Proposed\Proposed-Misty_2 year.XP

```
####################################
# Rainfall input summary from Runoff #
####################################
```

Total rainfall for gage # 1 is 2.5000 inches

```
*=========================================================*
|     Table E15 - SPREADSHEET INFO LIST                   |
| Conduit Flow and Junction Depth Information for use in  |
| spreadsheets.  The maximum values in this table are the |
| true maximum values because they sample every time step.|
| The values in the review results may only be the        |
| maximum of a subset of all the time steps in the run.   |
| Note: These flows are only the flows in a single barrel.|
*=========================================================*
```

Conduit Name	Maximum Flow (cfs)	Total Flow (ft^3)	Maximum Velocity (ft/s)	Maximum Volume (ft^3)	##	Junction Name	Invert Elevation (ft)	Maximum Elevation (ft)
Stream-US1	203.5556	3076369.692	3.4114	32030.2194	##	Spen-ds	766.3200	770.1934
Stream-DS	206.7555	3329435.754	3.3069	19496.3760	##	Spen-us	765.8600	770.7618
Ov21-ck-in	0.0000	0.0000	0.0000	0.0000	##	North	770.3600	775.1263
Stream-US2	209.1006	3328433.885	2.7112	74566.5471	##	outfall	760.8300	763.0004
SS-33-DS	1.8636	6436.1016	2.1001	665.6288	##	Out-Gold	774.0000	774.0000
SS08	29.6624	253004.1271	4.4461	2767.6477	##	stream	768.1100	771.8056
SS22	4.6503	23860.2414	2.5622	92.9331	##	F3l3h_m2g	768.9800	771.8527
Ov21b	0.0000	0.0000	0.0000	0.0000	##	F3l3i_m2h	768.7800	771.8527
Ov30	0.0000	0.0000	0.0000	0.0000	##	Mh10	768.7100	771.8527
Ov22	0.0000	0.0000	0.0000	0.0000	##	F3m2f	769.6500	771.8722
Pond-SS	11.2483	250528.8034	1.7135	703.9392	##	F3m2e	769.2400	771.8722
Pond-Ov	0.0000	0.0000	0.0000	0.0000	##	F3l3g	769.1200	771.8660
Spenc-Cv.1	206.8800	3328333.214	5.2039	1493.2110	##	F3l3f	768.9800	771.8605
Spenc-Ov	0.0000	0.0000	0.0000	0.0000	##	F3l3a_m2a	774.1000	775.9814
SS31	1.0096	3705.2936	1.3152	653.7069	##	F3l3b-m2b	773.0600	774.9808
Ov31	0.0000	0.0000	0.0000	0.0000	##	F3l3c_m2cd	770.1100	772.2264
SS32	1.8661	6429.4512	1.8169	177.4817	##	Mh42	769.7500	771.9503
SS21.1	0.3266	709.8228	1.0368	264.8064	##	F3l3d	769.5000	771.8825
Ov21	0.0000	0.0000	0.0000	0.0000	##	F3l3e	769.2500	771.8624
SS06.1	25.1319	218862.1738	3.2798	248.9788	##	Pond_F3k	768.5000	771.8527
Ov06	0.0000	0.0000	0.0000	0.0000	##	Str	768.4900	771.8288
SS07.1	25.1472	219047.7552	3.4493	347.8454	##			
Ov07	0.0000	0.0000	0.0000	0.0001	##			
SS01.1	23.7814	199655.0243	6.1775	547.6117	##			
Ov01	0.0000	0.0000	0.0000	0.0000	##			
SS02.1	24.4172	205182.1348	6.2872	1736.3444	##			
Ov02	0.0000	0.0000	0.0000	0.0000	##			
SS03.1	25.0148	216144.2237	3.6954	587.9534	##			
Ov03	0.0000	0.0000	0.0000	0.0000	##			
SS04.1	25.0208	216148.6555	3.5368	424.8896	##			
Ov04	0.0000	0.0000	0.0000	0.0000	##			
SS05.1	25.0500	216923.6820	3.5339	679.2503	##			
Ov05	0.0000	0.0000	0.0000	0.0000	##			
or1	1.0966	88580.7386	5.5236	205.4715	##			
wr1	11.0809	161861.3050	0.0000	0.0000	##			
FREE # 1	206.7555	3329404.052	0.0000	0.0000	##			
FREE # 2	0.0000	0.0000	0.0000	0.0000	##			

Current Directory: W:\PROJECTS\G0003\940271\16\SWMM\Proposed
Engine Name: C:\PROGRA~2\XPSOLU~1\XPSWMM~1\SWMMEN~2.EXE
Input File : \PROJECTS\G0003\940271\16\SWMM\Proposed\Proposed-Misty_10 year.XP

```
####################################
# Rainfall input summary from Runoff #
####################################
```

Total rainfall for gage # 1 is 3.8000 inches

```
*=========================================================*
|     Table E15 - SPREADSHEET INFO LIST                   |
| Conduit Flow and Junction Depth Information for use in  |
| spreadsheets.  The maximum values in this table are the |
| true maximum values because they sample every time step.|
| The values in the review results may only be the        |
| maximum of a subset of all the time steps in the run.   |
| Note: These flows are only the flows in a single barrel.|
*=========================================================*
```

Conduit Name	Maximum Flow (cfs)	Total Flow (ft^3)	Maximum Velocity (ft/s)	Maximum Volume (ft^3)	##	Junction Name	Invert Elevation (ft)	Maximum Elevation (ft)
Stream-US1	448.6407	6529150.896	3.7595	73438.6301	##	Spen-ds	766.3200	771.2718
Stream-DS	441.9670	7098612.555	3.3065	67690.6870	##	Spen-us	765.8600	773.2332
Ov21-ck-in	0.0000	0.0000	0.0000	0.0000	##	North	770.3600	776.1420
Stream-US2	446.8223	7096805.838	2.7106	249808.5687	##	outfall	760.8300	764.4802
SS-33-DS	3.3019	10840.7270	2.2859	665.6300	##	Out-Gold	774.0000	774.0000
SS08	69.1473	552545.0781	5.1340	3925.8089	##	stream	768.1100	773.3986
SS22	9.4709	48078.8864	5.3075	92.7011	##	F3l3h_m2g	768.9800	773.1328
Ov21b	0.0000	0.0000	0.0000	0.0000	##	F3l3i_m2h	768.7800	773.1345
Ov30	0.1945	841.3118	4.5616	0.0107	##	Mh10	768.7100	773.1352
Ov22	0.0000	0.0000	0.0000	0.0000	##	F3m2f	769.6500	773.6179
Pond-SS	37.1622	565011.2209	5.2284	703.9612	##	F3m2e	769.2400	773.6123
Pond-Ov	0.0001	0.0054	0.0215	0.0000	##	F3l3g	769.1200	773.5940
Spenc-Cv.1	441.9564	7097087.521	9.7063	1879.8595	##	F3l3f	768.9800	773.5736
Spenc-Ov	0.0000	0.0000	0.0000	0.0000	##	F3l3a_m2a	774.1000	777.5268
SS31	1.8738	6031.9473	1.3564	653.7072	##	F3l3b-m2b	773.0600	776.5595
Ov31	0.0000	0.0000	0.0000	0.8374	##	F3l3c_m2cd	770.1100	774.5923
SS32	3.3539	10873.4517	2.1216	177.4817	##	Mh42	769.7500	774.1562
SS21.1	0.4927	1356.2429	0.6285	264.8082	##	F3l3d	769.5000	773.7581
Ov21	0.0000	0.0000	0.0000	0.0000	##	F3l3e	769.2500	773.5811
SS06.1	59.4172	485995.2849	4.0232	396.7035	##	Pond_F3k	768.5000	773.5004
Ov06	0.0000	0.0000	0.0000	0.0000	##	Str	768.4900	773.4719
SS07.1	59.4275	486294.5239	4.1771	532.3819	##			
Ov07	0.0000	0.0000	0.0000	0.0001	##			

SS01.1	56.6737	448255.4862	6.1420	1074.6701	##
Ov01	0.0000	0.0000	0.0000	0.0000	##
SS02.1	58.1545	459836.5605	6.0881	4764.8411	##
Ov02	0.0000	0.0000	0.0000	0.0000	##
SS03.1	59.2860	481035.8808	4.5176	1113.7082	##
Ov03	0.0000	0.0000	0.0000	0.0000	##
SS04.1	59.2795	481047.8767	4.5480	750.6415	##
Ov04	0.0000	0.0000	0.0000	0.0000	##
SS05.1	59.3028	482270.3429	4.6287	1070.8379	##
Ov05	0.0000	0.0000	0.0000	0.0000	##
or1	1.0997	81249.0030	5.5386	207.1959	##
wr1	37.1640	483837.8180	0.0000	0.0000	##
FREE # 1	441.9670	7098648.565	0.0000	0.0000	##
FREE # 2	0.0000	0.0000	0.0000	0.0000	##

Current Directory: W:\PROJECTS\G0003\940271\16\SWMM\Proposed
Engine Name: C:\PROGRA~2\XPSOLU~1\XPSWMM~1\SWMMEN~2.EXE
Input File : PROJECTS\G0003\940271\16\SWMM\Proposed\Proposed-Misty_100 year.XP

```
####################################
# Rainfall input summary from Runoff #
####################################
```

Total rainfall for gage # 1 is 5.3000 inches

```
*=========================================================*
|     Table E15 - SPREADSHEET INFO LIST                   |
| Conduit Flow and Junction Depth Information for use in  |
| spreadsheets.  The maximum values in this table are the |
| true maximum values because they sample every time step.|
| The values in the review results may only be the        |
| maximum of a subset of all the time steps in the run.   |
| Note: These flows are only the flows in a single barrel.|
*=========================================================*
```

Conduit Name	Maximum Flow (cfs)	Total Flow (ft^3)	Maximum Velocity (ft/s)	Maximum Volume (ft^3)	##	Junction Name	Invert Elevation (ft)	Maximum Elevation (ft)
Stream-US1	758.7767	10981202.64	3.7467	275409.3635	##	Spen-ds	766.3200	772.1379
Stream-DS	785.0279	11956296.57	3.7517	134985.6488	##	Spen-us	765.8600	774.6886
Ov21-ck-in	0.0000	0.0000	0.0000	0.0000	##	North	770.3600	776.6626
Stream-US2	771.3353	11809214.04	2.6738	395801.5134	##	outfall	760.8300	765.3341
SS-33-DS	8.5880	25989.7821	2.7099	665.6303	##	Out-Gold	774.0000	774.0000
SS08	102.3668	796787.3913	6.2734	3939.5908	##	stream	768.1100	774.7639
SS22	14.7332	77430.3413	8.1784	92.7016	##	F3l3h_m2g	768.9800	773.3076
Ov21b	38.2164	146968.7983	1.9195	2009.2572	##	F3l3i_m2h	768.7800	773.9219
Ov30	35.3662	139069.3934	4.1541	76.3030	##	Mh10	768.7100	773.9075
Ov22	1.4126	992.8893	1.7786	0.4073	##	F3m2f	769.6500	774.6483
Pond-SS	54.7579	645703.7076	7.6922	703.9655	##	F3m2e	769.2400	774.9277
Pond-Ov	29.3275	192903.8209	2.1707	1296.6381	##	F3l3g	769.1200	774.7935
Spenc-Cv.1	540.5202	10852915.11	11.7966	1882.6321	##	F3l3f	768.9800	774.7834
Spenc-Ov	253.1618	963974.0792	6.5702	410.8383	##	F3l3a_m2a	774.1000	779.7616
SS31	-10.7057	-82101.1697	-3.3749	653.7081	##	F3l3b-m2b	773.0600	778.7752
Ov31	-24.3487	-46251.5392	-1.7954	1116.1297	##	F3l3c_m2cd	770.1100	775.9836
SS32	8.6006	26039.8684	2.7128	177.4817	##	Mh42	769.7500	775.6711
SS21.1	-9.6163	-83121.4391	-3.0263	264.8112	##	F3l3d	769.5000	775.3026
Ov21	-28.8287	-61656.1312	-2.0596	1262.3277	##	F3l3e	769.2500	775.5458
SS06.1	84.1777	691148.2722	5.1444	418.8205	##	Pond_F3k	768.5000	774.7647
Ov06	0.0000	0.0000	0.0000	0.0000	##	Str	768.4900	774.7640
SS07.1	84.1641	691574.3958	5.0546	554.7049	##			
Ov07	0.0000	0.0000	0.0000	0.0001	##			
SS01.1	91.8445	759396.6460	7.2913	1223.5813	##			
Ov01	15.9304	16915.6625	2.4674	97.8513	##			
SS02.1	99.6022	794745.7004	7.9043	4843.1506	##			
Ov02	1.5513	809.6974	0.4396	460.7450	##			
SS03.1	68.8186	673325.0389	5.4631	1120.0207	##			
Ov03	55.3213	156170.3042	2.2276	2038.5324	##			
SS04.1	71.6887	705381.2663	5.6899	763.9376	##			
Ov04	48.6057	123844.1590	2.9771	833.2182	##			
SS05.1	74.7850	710372.1028	5.9371	1080.7445	##			
Ov05	50.0088	121738.0935	2.4172	1646.7281	##			
or1	1.1017	74081.1083	5.5489	210.4232	##			
wr1	54.9652	571410.8482	0.0000	0.0000	##			
FREE # 1	785.0278	11956501.23	0.0000	0.0000	##			
FREE # 2	0.0000	0.0000	0.0000	0.0000	##			