Village of Richfield Northeast Corridor Infrastructure Analysis Washington County, WI

Analysis of Existing Water and Sanitary Utilities

Prepared for:
The Village of Richfield
4128 Hubertus Road
Hubertus, WI 53033

Prepared by:
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Suite 200
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Project No: 193706313
January 28, 2020

January 28th, 2020

Mr. Jim Healy
Village Administrator
Planning and Zoning Administrator
Village of Richfield
4128 Hubertus Road
Hubertus, WI 53033

RE: Northeast Corridor Infrastructure Analysis
Stantec Project No: 193706313

Dear Mr. Healy:

Enclosed is the Infrastructure Analysis for the proposed Village of Richfield Northeast Corridor development as requested. This analysis addresses existing water supply and sanitary sewer availability options for the Northeast Corridor area.
Some general assumptions were made regarding the proposed development to anticipated future water and sanitary demands. The infrastructure analysis in the following report has been completed on an engineering feasibility basis. No analysis of the political procedure and processes has been completed regarding a development requesting utility service across municipal lines.

Please feel free to contact us if you have any questions regarding the information contained herein.

Sincerely,

Stantec Consulting Services, Inc.

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1.0 INTRODUCTION

As part of Area-wide planning, the Village of Richfield has retained Stantec Consulting Services, Inc. (Stantec) to analyze the existing water and sanitary infrastructure in the Northeast Corridor of the Village and evaluate options to upgrade the services in order to facilitate redevelopment of the area. This report provides a description of the existing infrastructure as well as an investigation into the possibility of utilizing infrastructure from either neighboring Village of Germantown or Village of Jackson. The potential for centralized water and sanitary sewer infrastructure is also investigated. A summary of potential costs, assumptions, and future considerations is also provided within this report. The work was completed utilizing funds from a United States Environmental Protection Agency (EPA) Community-wide Brownfields Assessment Grant awarded to Washington County in Fiscal Year 2017. The work was authorized by the EPA on August 7, 2019. Further detail is provided in the following sections.

1.1 Northeast Corridor Opportunity Analysis 2016 Report

The Northeast Corridor includes the historic downtown area of Richfield as well as adjacent agricultural and commercial property lying directly to the east (Figure 1). The Northeast Corridor is generally bound by State Highway 167 to the south, State Highway 175 to the west, Pleasant Hill Road to the North and State Interstate 41 to the east. Commercial and industrial activities in the historic downtown area date to the mid-1800s.

In 2016 the Washington County Site Redevelopment Program prepared an analysis of potential development in the Northeast Corridor of Richfield. The report was created to further study the potential for commercial and industrial development which the Village's 2014 Compressive Plan stated was a high priority. The report came to the following conclusions and observations:

- The Village of Richfield has targeted this area for development in both the 2010 Community Build Out Analysis and the 2014 Comprehensive Plan
- Focusing on developing the Northeast Corridor will help to diversify Richfield's tax base taking advantage of existing transportation infrastructure and available real-estate.
- The intensity of development will directly depend on whether water and sewer services are provided to the property. Without water and sewer services the land values and thus property tax revenues will be significantly lower.
- An analysis of options for providing water and sewer services to the property needs to be conducted. With the options and costs better defined, the Village will have a much better understanding of the density/intensity of development necessary to pay for such services and the likelihood of them occurring any time soon.

1.2 Assumptions and Observations of Infrastructure Analysis

For this analysis the following assumptions and observations have been made:

- Existing Village of Germantown or Jackson infrastructure shall be available for future connection into by the Village of Richfield.
- Political issues will not inhibit a utility connection if Village of Germantown or Jackson utilities are available to service the proposed area in the Village of Richfield.
- It is assumed that the proposed development will be subject to applicable Village of Richfield, Village of Germantown or Jackson, and State of Wisconsin rules and regulations.
- The proposed land use will not generate nor have water demands outside that of a typical residential, commercial, or industrial land use.
- The site will be regulated under the Village of Richfield Municipal Code, State of Wisconsin NR 216, NR 151 and Wisconsin Pollutant Discharge Elimination System as well as the U.S. EPA Clean Water Act.

2.0 EXISTING INFRASTRUCTURE ANALYSIS

2.1 Water Utility Infrastructure

Village of Germantown:
The Village of Germantown Water Utility provides local water service to the Village of Germantown consisting of about 95 miles of public watermain. The village draws water through a series of wells from the Upper Dolomite and Sandstone aquifers. The Water Utility's assets include three operating towers, three operating deep aquifer wells, and three operating shallow aquifer wells.

The Village created a "Smart Growth Comprehensive Plan" in 2004 stating the water supply and distribution system provide a maximum daily pumpage of 2.744 million gallons; a minimum daily pumpage of 1.10 million gallons, and an average daily pumpage of 1.776 million gallons. The Village is currently working on updating their 2050 Comprehensive Plan.

Village of Richfield:
According to the Village's 2014 comprehensive plan, individual, private wells are the primary source of water. The one exception is the well serving the Reflections Village development located off STH 175. There is no municipal water system serving Richfield.

The recharge areas of the aquifers from which residents obtain their drinking water are located within the Village. This means the water does not have a long period of time to permeate through the ground naturally which would filter it naturally as if the recharge areas were located farther away from the Village. The water supply is also highly susceptible to contamination due to the presence of highly permeable glacial deposits overlying relatively shallow bedrock.

Not only are the aquifers susceptible to contamination, the area of proposed development has a low water-producing shallow aquifer which makes it unlikely that potable water would be sourced internally. According to the 2016 report the aquifer can only produce water for one residential unit per acre (about 280 gallons per day).

Village of Jackson:
The Jackson Water Utility was constructed in 1969 eliminating the need for individual wells. The entire source of water for the village is ground water which is obtained from 5 active wells. According to the 2018 Consumer Confidence Drinking Water Report, additional facilities include 2 water towers for a combined storage capacity of 700,000 gallons, and 1 booster station. The Utility also maintains a total of approximately 50 miles of water main and has 3,384 customers connected to those mains. In 2018 the water utility pumped a total of 241 million gallons of water (about 0.66 MGD).

2.2 Sanitary Sewer Utility Infrastructure

Village of Germantown:
According to the Village's "Smart Growth Comprehensive Plan", The Milwaukee Metropolitan Sewerage District (MMSD) provides local sanitary sewer service to the nearly 81 miles of Village-owned sanitary sewer lines in Germantown connecting to a main MMSD interceptor. There are 1,925 manholes and 10 lift stations owned by the Village.

The flow capacity of the Germantown sanitary sewer system is 6.23 million gallons; minimum daily flow is 1.09 million gallons. The average daily flow in 2002 was 2.311 million gallons which represents a daily excess capacity of 3.92 MG.

Village of Richfield:
Currently there is no Village-wide sanitary infrastructure. Development in the Village of Richfield is accommodated with private, on-site sanitary wastewater treatment systems designed to ensure that systems do not threaten groundwater resources. These individual systems are permitted by Washington County and maintained as required by County ordinances.

Village of Jackson:
According to the Village's 2009 Comprehensive Plan there is currently a wastewater treatment plant in the southeastern corner of the village. This provides service to the village and has an average flow design capacity of 1.25 MGD. Currently average daily flows are 0.8-1.1 MGD.

Capacity for Jackson's treatment plant has been sized to allow for the possibility of an extension of service to parts of Richfield. This service and any necessary upgrades to the treatment facility would be at Richfield's expense.

3.0 PROPOSED DEVELOPMENT - ANTICIPATED DEMANDS

The proposed development shown in the attached figures 2 and 3 consists of just below 450 acres covering five different land uses. Lot coverage which is expressed as floor area ratio (FAR) for the business park was estimated based on the density of the Briggs & Stratton complex in the Village of Germantown. Vandewalle & Associates describes the proposed land usages as the following.

<u>Business Park (1)</u>
This area is assumed to host a mix of light and medium industrial uses with related office facilities. Specific business types may include warehousing, logistics, distribution, advanced manufacturing, and assembly, but generally exclude heavy manufacturing users producing significant noise, pollution, or other adverse conditions. Lot coverage (expressed as floor area ratio [FAR]) is assumed at approximately 0.35.

The potential for one or more food processing users would likely require greater levels of municipal water usage per square foot versus other "average" users in the Business Park area. The amount and size of food processing users may be determined by the Village's estimated future maximum capacity.

<u>Interchange Commercial (2)</u>
Business types envisioned for this area are auto-oriented and include hotel, restaurants, gas stations, auto repair, and other small and medium-sized commercial and retail users, as well as indoor and outdoor recreation. These uses are assumed to be low-density (0.25 average FAR).

Note that this area includes Richfield Middle School, formerly Richfield Elementary School, that was reprogrammed following the consolidation of the Richfield Joint 1 School District and Friess Lake School District into the Holy Hill Area School District on July 1, 2018. The 2018-19 enrollment at this facility was 248 students.

<u>Single Family and Small-Scale Commercial (3)</u>
Future land uses are assumed to be evenly split between single-family residential (based on a blend of existing large-lot and newly constructed smaller-lot homes at an average of 3 dwelling units per acre) and small-scale, non-manufacturing commercial uses like those referenced above (0.25 FAR).

<u>Small-Scale Commercial and Light Industrial (4)</u>
This zone would blend existing single-family residential with additional small-scale commercial, flex and light industrial uses, again assuming lower density development at 0.25 FAR.

<u>Residential (5)</u>
This area is assumed to be exclusively residential in the future and feature a mix of unit sizes and formats that are generally denser than existing development, including small lot single family, duplex, townhome, and small-scale apartment buildings (2-3 stories). An average of 12 dwelling units per acre based on this mix of densities is assumed.

For each future land use applicable data is shown below in Table 1. The residential dwelling unit densities are based upon typical lot sizes for existing single and multifamily development in Richfield and it is assumed that there are 4 residents per residential unit.

Table 1 - Proposed Land Use

Future Land Use	Developable Acres	FAR	Estimated Commercial Bldg. Sq. Ft.[1]	Density (du/ac)	Res. Units[2]
1-Business Park	177.47	0.35	2,710,000		
2-Interchange Commercial	135.74	0.25	1,480,000		
3-Single Family and Small-Scale Commercial	50.05				
3.1 Single Family	25.025			3	80
3.2 Small Scale Commercial	25.025	0.25	270,000		
4-Small-Scale Commercial and Light Industrial	20.41	0.25	220,000		
5-Mixed Residential	59.49			12	710
Total	**443.16**	**4,680,000 (108 acres)**		**790**	

1. Values have been rounded up to the nearest multiple of 10,000
2. Values have been rounded up to the nearest multiple of 10

3.1 Anticipated Water Demand

General assumptions have been made regarding expected sanitary sewer flows generated by the proposed development based on MMSD guidelines from their 2020 conveyance report summarized below in Table 2. The anticipated peaking factor used for sanitary sewer demand calculations is 2.5. Peaking factor refers to the ratio of the maximum daily flow to the average daily flow.

Table 2 - Flow Generation Assumptions

Description	Gallons per Acre per Day	Gallons per Capita per Day
Commercial	1500	-
Industrial	1000	-
Population	-	68

*MMSD 2020 Facilities Plan: Chapter 3: Analytical Methods/Data Sources

Using these flow assumptions along with the proposed land use data the following Table 3 was created showing projected sanitary demands for each of the five infrastructure categories. This table shows that the average flow from the new development will be 0.748 MGD. A detailed breakdown of this analysis can be seen in Appendix A.

Table 3 - Projected Sanitary Demands

Future Land Use	Residential (GPD)	Commercial (GPD)	Industrial (GPD)	Average Flow Rate (GPD)	Peak Flow Rate (GPD)
1-Business Park	-	266,202	-	266,202	665,504
2-Interchange Commercial	-	203,608	-	203,608	509,020
3-Single Family and Small-Scale Commercial	21,760	37,541	-	59,301	148,251
4-Small-Scale Commercial and Light Industrial	-	15,306	10,204	25,511	63,776
5-Mixed Residential	193,120	-	-	193,120	482,800
Total	**214,880**	**522,657**	**10,204**	**747,741**	**1,869,352**

3.2 Storm Water Anticipated Demand

The Village of Richfield's Municipal Code pertaining to stormwater management plan requirements and performance standards is attached in Appendix B. The Village of Richfield's engineering department will confirm additional stormwater management requirements once preliminary engineering documents have been designed and a site plan presented. At that time, the potential for providing additional stormwater quality and/or quantity treatment can be determined.

4.0 UTILITY DEVELOPMENT WITHIN PROJECT BOUNDARY

4.1 Sanitary Sewer Infrastructure

Gravity fed sanitary sewer ranging in sizes of 8 to 15 inch PVC pipe 7 feet below grade has been routed throughout the proposed development and shown in Figure 3 – Germantown, Figure 2 - Jackson, and Figure 1 - Internal Connection. The sanitary pipes have been sized using the prior discussed water demand calculations in section 3.1. There is an amount of sewer proposed below existing Holy Hill Road and Wisconsin State Highway 175, a total length of about 7,000 feet. All sanitary sewer is assumed to drain with gravity to the northeast corner of the site where a lift station has been located to convey water to the existing infrastructure in Jackson or Germantown.

4.2 Water Infrastructure

The proposed watermain in the new development is 12 inch PVC pipe at least 6 feet below grade and can be seen in Figures 5 - Germantown, Figure 4 - Jackson, and Figure 2 - Internal Connection. The proposed system will incorporate two loops to give the system a better ability to withstand maintenance and unexpected problems. Looped systems are common in water infrastructure. The proposed system is routed below both proposed roads along with Holy Hill Road and Wisconsin Highway 175. No new additional road removal is typically required when done in conjuncture with the sanitary system.

4.3 Storm Water Infrastructure

It is anticipated that the final stormwater management design will include necessary infrastructure, piping and best management practices (BMP's) as determined during the design process. It is likely that multiple stormwater BMP's will be necessary, such as detention ponds. Although impervious area for residential areas was not determined for the purpose of this report, the proposed FAR's for commercial and industrial uses show that there will be an increase of at least 107 acres of impervious area that will require stormwater runoff management.

4.4 Utility Infrastructure Opinion of Probable Costs within the Project Boundary

Costs were calculated using bid tabs and state averages from the Wisconsin Department of Transportation. Pipe material, length, and size were all considered for this estimate. Onsite sanitary sewer has a cost of $2.2 Million and watermain has a cost of $1.1 Million. These costs remain constant for the estimates in both upcoming sections 5 and 6. For a detailed breakdown of probable costs, see Appendix C.

5.0 GERMANTOWN CONNNECTION

5.1 Sanitary Sewer Infrastructure

Existing Germantown sanitary sewer is located along both Holy Hill and Rockfield roads about half a mile from the proposed development seen in Figure 1 – Germantown Connection. This is the closest Germantown sanitary sewer to the site and thus was assumed this would be the location that the proposed development would connect into.

Interstate Highway 41 lies between the new development and the existing Germantown sanitary main which may require directional boring construction methods. As shown in Figure 2 – Germantown Connection, the boring is only required for the sanitary run under Interstate 41. Only one connection from the proposed sanitary sewer to the existing Germantown infrastructure is required and three different boring location possibilities are shown. Although only one connection is required, any additional connections would increase redundancy in the system.

In order to route future development's sanitary flow to Germantown's system a lift station would be required. The lift station would be located at the Northeast corner of the site adjacent to Interstate 94 and will route the sanitary sewer along and across the interstate.

5.2 Water Infrastructure

Like the existing sanitary sewer infrastructure, there is existing watermain from Germantown located along Holy Hill and Rockfield roads seen in Figure 4 – Germantown Connection. Again, this is the nearest water infrastructure to the project site from Germantown and it was assumed that the new development could tie in at these locations. Note that unlike the proposed sanitary sewer, the proposed watermain will connect into the existing watermain at both Rockfield and Holy Hill Road to create a looped system.

A 12 inch watermain could be bored a length of 1000 feet along Holy Hill road connecting to the south end of the proposed development area. Two other boring alternatives are then shown to connect to the northern end of the proposed development to Germantown's infrastructure.

5.3 Germantown Connection Opinion of Probable Cost

A summary of costs for the three different alternatives is shown below in Table 4. Costs were calculated using bid tabs and state averages from the Wisconsin Department of Transportation. For a detailed breakdown of probable costs, see Appendix C. Note that this includes both routing to the proposed development and the onsite utility cost discussed in Section 4.0.

Table 4 Germantown Connection Cost

	Alternative		
	1	2	3
Sanitary Sewer to Site	1.20M	1.06M	1.32M
Watermain to Site	0.58M	0.57M	0.58M[1]
Internal Sanitary Sewer	2.25M	2.25M	2.25M
Internal Watermain	1.06M	1.06M	1.06M
Administration	0.51M	0.50M	0.52M
Contingency	1.02M	0.99M	1.04M
Total	**6.62M**	**6.43M**	**6.78M**

1. Due to there being three sanitary sewer alternatives and two watermain alternatives, alternative three includes the average of watermain one and two alternatives.

6.0 JACKSON CONNECTION

6.1 Sanitary Sewer Infrastructure

The nearest Jackson sanitary sewer infrastructure is located about three and a half miles north of the proposed development area. This is the second closest community to the proposed project site. This connection, like the proposed connection to Germantown would require a directionally bored sanitary main below Interstate 41 to reach the lift station discussed in section 5.2. This can be seen in Figure 1 – Jackson Connection.

For this analysis it was assumed that all sewer would be laid alongside roadways to prevent additional construction cost of removing and relaying roadway. Additionally, this entire run would be forcemain rather than gravity fed. It was assumed that a single lift station would be enough to route the sanitary sewer from Richfield to Jackson. If this alternative was chosen, this assumption would need to be further investigated.

6.2 Water Infrastructure

The watermain route from Jackson to the proposed development is very similar to the sanitary connection. It requires a watermain run of about three and a half miles and a directionally bored run below Interstate 41. There are however two alternatives for where the watermain would connect into the Jackson infrastructure. It is important to note that unlike the proposed watermain connection to Germantown, this option is not looped and therefore not recommended.

6.3 Jackson Connection Opinion of Probable Cost

A summary of costs for the two different alternatives is shown below in Table 5. Costs were calculated using bid tabs and state averages from the Wisconsin Department of Transportation. For a detailed breakdown of probable costs, see Appendix C. Note that this includes both the onsite utility cost discussed in Section 4.0 and the cost of routing utilities to the site.

Table 5 - Jackson Connection Cost

	Alternative	
	1	2
Sanitary Sewer to Site	1.89M	1.89M
Watermain to Site	2.39M	2.34M
Internal Sanitary Sewer	2.25M	2.25M
Internal Watermain	1.06M	1.06M
Administration	0.76M	0.76M
Contingency	1.52M	1.51M
Total	**9.87M**	**9.80M**

7.0 NEW WELL, TOWER, AND TREATMENT FACILITY ANALYSIS

7.1 New Wastewater Treatment Facility

New wastewater treatment facility (WWTF) needing to treat on average 0.75MGD would take up around 5 acres of land. In order to make room for future expansion a 10 acre area is shown on Figure 1 – New Well/Tower/Treatment Plant Connection. This WWTF could be sited in the far Northeast corner of the area due to the existing topography allowing for gravity draining sanitary sewer from upland areas to the WWTF.

7.2 New Well and Tower

A 0.75MG capacity tower is proposed in the far southwest corner of the site to ensure the average daily demand can be accounted for. To provide enough water to the tower with a maximum daily demand of 1.9 MGD, (determined in section 3.2) one of the following options would be necessary. Note this implies that firm capacity is desired and designed for, firm capacity meaning that one of the wells can go down while still providing the maximum daily flow requirements.

- Two 1,320 GPM wells
- Three 660 GPM wells

- Four 440 GPM wells

This amount of pumping is unrealistic as the aquifer can currently only sustainably produce 280 gallons per day per acre on average. As such, it is unlikely that the Village Groundwater Ordinance requirements could be met. Further investigation would need to be done to determine a new pumping location along with the maximum allowable onsite pumpage.

7.3 Internal Well, Tower, and Treatment Facility Opinion of Probable Cost

Internal Stantec estimates from industry experts were used to create the following cost estimate in Table 6. This table includes only order of magnitude analysis for needed infrastructure that can handle the proposed demands. A more in-depth analysis can be found in Appendix C.

Table 6 Internal Well, Tower and Treatment Facility Cost

	Cost
Sanitary Sewer	2.05M
Watermain	1.06M
WWTF	25.0M
Tower	2.0M
Well	3.0M
Administration	3.31M
Contingency	6.62M
Total	**43.04M**

8.0 SUMMARY OF INFRASTRUCTURE ANALYSIS

The infrastructure analysis performed for the proposed project area has identified multiple locations to potentially extend utilities. As the land development discussions advance design and more information becomes available related to the land use, water usage and sanitary demands; the Village of Richfield, the Village of Germantown, and the Village of Jackson should be consulted, and further details coordinated.

While this study has determined that it may be feasible to obtain water and sewer service from neighboring municipalities, it should be noted that Stantec had no direct communications with the Village of Germantown or Village of Jackson to discuss the feasibility. Economically, the option to connect to the Village of Germantown for water and sewer is the most feasible, however, further discussions between each municipality will determine the viability of the Germantown connection.

FIGURES

(b) Site grading. Site grading shall ensure, to the maximum extent practicable, positive flows away from all buildings, roadways, driveways and septic systems, be coordinated with the general stormwater drainage patterns for the area, and minimize adverse impacts on adjacent properties.

(c) Subsurface drainage. No discharge of groundwater from tile lines, sump pumps or other means shall be allowed onto another person's land or any public space without the written approval of the owner or unit of government. The administering authority shall be notified of any drain tiles that are uncovered during construction, which the administering authority may require to be restored or connected to other drainage systems.

(d) Open channels. All open channel drainage systems shall at a minimum be designed to carry the peak flows from a ten-year, twenty-four-hour design storm using planned land use for the entire contributing watershed area. Side slopes shall be no steeper than 3h:1v unless otherwise approved by the administering authority for unique site conditions. Open channels that carry runoff from more than 130 acres shall at a minimum be designed to carry the peak flows from a twenty-five-year, twenty-four-hour design storm.

(e) Structure protection and safety. For buildings designed for human occupation on a regular basis, the following additional requirements shall apply:

[1] The lowest elevation of the structure that is exposed to the ground surface that is hydrologically connected to any stormwater BMP shall be a minimum of two feet above the maximum water surface elevation produced by the one-hundred-year, twenty-four-hour design storm, including flows through any stormwater BMP that may temporarily or permanently store water at a depth of greater than one foot, not including conveyance systems;

[2] For internally drained areas the maximum water elevation shall be determined using the volume produced by the one-hundred-year, twenty-four-hour design storm with a NRCS runoff curve number of 98 for the entire watershed, to reflect frozen ground conditions; and

[3] The structure shall be set back at least 20 feet from any stormwater BMP that may temporarily or permanently store water at a depth of greater than one foot, not including conveyance systems. Setback distance shall be measured from the closest edge of water at the elevation produced by the one-hundred-year, twenty-four-hour design storm.

(8) Additional requirements. The administering authority may establish more stringent requirements than the minimums set forth in this section, such as addressing thermal impacts of stormwater, chronic wetness conditions, downstream flooding, a total maximum daily load (TMDL) standard for a watershed, or other applicable state or federal laws, if the administering authority determines that an added level of protection is needed to protect cold water streams, outstanding water resources, exceptional water resources, environmentally sensitive areas, downstream property, or public health or safety.

(9) Modeling. Refer to § **167-14** for details on calculating runoff volumes and predevelopment conditions.

(10) Notwithstanding Subsection **A(2)** through **(7)**, if the design cannot achieve the applicable performance standards specified, the stormwater management plan shall include a written and site-specific explanation why that level of reduction is not attained, the design shall achieve a reduction to the maximum extent practicable for the identified performance standard. In such case a technical waiver in accordance with § **167-8** must be obtained for areas not meeting the above-noted performance standards.

B. Guiding principles. To satisfy the requirements of this section, unless otherwise waived under § **167-8**, all proposed land development activities shall, to the extent practical:

(1) Be planned and implemented in a manner that best fits the terrain of the site, avoiding steep slopes and other environmentally sensitive areas;

(2) Preserve natural watershed boundaries and drainage patterns;

(3) 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;

(4) Utilize natural or constructed vegetated swales or reinforced permeable open channels for stormwater conveyance and attenuation;

(5) Minimize impervious surfaces and have them drain to vegetated areas for flow attenuation, pollutant filtering and groundwater recharge; and

(6) Reserve adequately sized areas to allow for detention of flows and treatment of pollutants from stormwater before being discharged from the site.

C. Final stormwater management plan contents. The following shall be the minimum requirements for items to be included in a final stormwater management plan:

(1) Existing site map and data. The requirements for the existing site map and data are the same as those listed under § **167-9**.

(2) Site development plan. A site development plan, using the same map scale as the existing site map, shall include all of the following map items and supporting documentation:

(a) Locations and dimensions of all proposed land-disturbing construction activities, including proposed cuts, fills and two-foot contours;

(b) Delineation and labeling of all proposed impervious areas and accompanying area computations;

(c) Location of all proposed stormwater conveyance systems and grade stabilization structures, including grade lines, cross-sections, flow/velocity computations based on a ten-year, twenty-four-hour design storm, and the delineation of proposed subwatersheds for each reach;

(d) Location of all proposed stormwater best management practices and facilities, including plan views, cross-sections, profiles, inlet/outlet and other detail drawings and supporting flow computations;

(e) Summary of hydrologic and hydraulic computations prepared to meet the requirements of Subsection **C(1)**, above, and for the design of all stormwater management facilities. All major assumptions used in developing input parameters shall be clearly stated, and all geographic areas used in making the calculations shall be clearly cross-referenced to the required map(s);

(f) Results of investigations of soils and groundwater required under § **167-14**, including location and elevation of each investigation site, for the placement and design of stormwater management facilities;

(g) Location(s) and dimensions of all proposed easements or other methods used to ensure the preservation of flow paths and adequate access for maintenance purposes, in accordance with § **167-18**;

(h) A detailed construction inspection plan, outlining the critical elements in the plan that need to be surveyed or inspected by a representative of the project engineer, the administering authority or the municipality, and the timing and notification requirements involved. Examples of critical elements for a construction inspection plan include, but are not limited to, checking subgrade elevations or the placement of footings, pipes or other structures prior to covering, soil testing, material inspections and final grade checks before seeding. Inspections conducted by the administering authority or the municipality do not waive the permit holder's responsibility for construction oversight and verification.

(i) Certification, from a professional engineer registered in the State of Wisconsin, that all calculations and designs included in the final stormwater management plan have been reviewed and approved as being in accordance with the requirements of this article.

(j) The name(s), address, daytime phone, e-mail address, and fax number of the contact person during the plan review process, the construction supervisor, and the engineer that will certify construction of all stormwater management facilities under § **167-15**;

(k) For sites where changes are proposed in stormwater flow paths, or where proposed stormwater discharges may otherwise have a significant negative impact on downstream property owner(s), the administering authority may require the applicant to obtain written authorization or complete other legal arrangements with the affected property owner(s); and

(l) Other items deemed necessary by the administering authority to ensure compliance with the requirements of this article.

D. Preliminary stormwater management plan contents. Preliminary stormwater management plans shall contain the same information listed under Subsection **C** above, with the following exceptions:

(1) No computations will be required for stormwater conveyance systems, water control structures or other individual system components; and

(2) No detail drawings, cross-sections or profiles will be required unless the administering authority determines they are necessary to assess the general feasibility of the preliminary stormwater management plan.