7.0 POST-CONSTRUCTION MONITORING

7.1 Introduction

The approach taken by the Town to comply with the water quality standards (WQS) includes transport, storage and treatment of flows up to and including the 10-year 1-hour design storm event. The Town hopes to achieve this goal by completing the lift station expansion and storage basin described in Section 5.

This Section describes how the Town will conduct its post-construction monitoring program (PCMP) to assure that the goal of storing and treating up to and including the 10-year 1-hour design storm is met. In addition, this program will evaluate how the CSO controls are performing and to verify compliance with WQS.

7.2 Post-Construction Monitoring and Data Collection

Post-construction monitoring will include data collection from a number of monitoring points during rainfall events. This post-construction monitoring program will allow the Town to build a data base to allow them to determine the design storm for each wet weather event and to develop a relationship between wet weather flows and design storms.

The following monitoring stations will be used to collect storm and flow data for the post-construction monitoring:

7.2.1 Rainfall Gage

The Town maintains a tipping bucket type rain gage that is installed at the WWTP and is connected to the WWTP monitoring computer and SCADA system. This will allow the Town to collect data on the storm intensities so that storm events can be compared to the design storms. The procedure to analyze storms is discussed in Section 7.3. The design storms will then be compared to the flows that were captured to further define how much flow is being generated by a certain design storm. This will also determine, when an overflow does occur, that the wet weather event was either above or below a 10 yr 1-hour storm.

7.2.2 CSO 101 Outfall

The Town will relocate the existing flow meter at CSO 101 to monitor the flow rate, quantity and duration of overflow events at the new overflow weir. The data collected from the flow meter will be used for reporting purposes.

7.2.3 WW Lift Station Flow Meter

The WW lift station force main will include a flow meter to monitor flow that is pumped to the WW Storage Tank. The meter data will be used to determine the wet weather flow that is pumped to the storage basin for both volume and flow rates.

7.2.4 WWTP Flow Meter

The WWTP lift station force main will include a flow meter to monitor flow that is pumped to the WWTP. The meter data will be used to determine the wet weather flow that is pumped to the WWTP for flow rates.

7.3 Rainfall Monitoring

As with the CSO meter discussed in Section 5.3 the quantification of a CSO event and the storm or WW condition that causes an event is important to assure the WW treatment process is meeting the design intent. The tipping bucket rain gage at the WWTP will help to document the intensity of the rainfall events as they occur.

The following procedure is intended to guide the WWTP operators through the process of estimating a rainfall event recurrence interval. This procedure requires that the rainfall gage data collected will be at five (5) minute intervals. The procedure is not intended to be an exact procedure as all rainfall events can be significantly different from one another, both spatially and with respect to time distribution. This procedure is intended to be modified periodically as regional rainfall data is updated, data collection methods are improved and/or modified, and as operator familiarity with the estimating process improves.

7.3.1 Definitions

- Recurrence Interval
  Also known as return period, the recurrence interval is an estimate of the interval of time between rainfall events of a certain rainfall depth. The inverse of the recurrence interval is the expected frequency of the rainfall event (e.g. a 10-year event has a 1/10, 0.1, or 10% chance of being exceeded in any one year).

- Duration
  The time difference between the beginning and end of the rainfall event or analysis period.

7.3.2 Procedure

- Import rain gage data into a Microsoft Excel spreadsheet with time and depth as the columns. Ideally this data should be collected in five (5) minute increments.
- Compute the five (5) minute rainfall intensity for each five minute period.
- Define the beginning and end of a particular rainfall event where the depth first exceeds 0.02-inches in five minutes (or 0.24 inches per hour) and is sustained for a period longer than fifteen minutes. The difference in times will be the ***duration***.
- For the resulting period of rain as computed in the previous step, compute the depth of rainfall. This summation will be the ***depth***.
- With the duration and depth as computed in the previous two steps, review **Table 7.1** and determine the estimated recurrence interval.
- If there are multiple rainfall events (as defined by step 3) that can be interpreted within a given storm system or "wet" period, the user should treat each rainfall event separately and then treat the entire storm system, or "wet" period as a whole and compare the results. The greatest recurrence interval computed will be the recurrence interval reported.

7.3.3 Examples

- #1 1.75-inches falls in 1 hour. What is the estimated recurrence interval? *5 to 10 yrs*
- #2 2.1-inches falls in 45 minutes. What is the estimated recurrence interval? *Approx. 25yrs*

Table 7.1 Chesterton, Indiana Rainfall Depth (inches) for Given Recurrence Interval[1]												
Duration	**2-mo**	**3-mo**	**4-mo**	**6-mo**	**9-mo**	**1-yr**	**2-yr**	**5-yr**	**10-yr**	**25-yr**	**50-yr**	**100-yr**
10-day	2.07	2.5	2.88	3.38	3.89	4.23	4.84	5.79	6.67	8.03	9.23	10.58
5-day	1.68	2.01	2.27	2.63	3.03	3.29	3.84	4.70	5.50	6.81	7.99	9.37
72-hr	1.53	1.80	2.04	2.36	2.71	2.95	3.46	4.24	4.97	6.10	7.17	8.38
48-hr	1.40	1.64	1.83	2.12	2.44	2.65	3.12	3.87	4.56	5.58	6.52	7.58
24-hr	1.33	1.55	1.69	1.96	2.23	2.42	2.89	3.61	4.22	5.22	6.10	7.12
18-hr	1.25	1.45	1.59	1.84	2.09	2.27	2.72	3.39	3.97	4.91	5.73	6.69
12-hr	1.16	1.35	1.48	1.71	1.94	2.11	2.51	3.14	3.67	4.54	5.31	6.19
6-hr	1.00	1.16	1.27	1.47	1.67	1.82	2.17	2.71	3.16	3.91	4.57	5.34
3-hr	0.85	0.99	1.08	1.26	1.43	1.55	1.85	2.31	2.70	3.34	3.90	4.56
2-hr	0.77	0.90	0.98	1.13	1.29	1.40	1.68	2.09	2.45	3.03	3.54	4.13
1-hr	0.63	0.73	0.80	0.92	1.05	1.14	1.36	1.70	1.98	2.45	2.87	3.35
30-min	0.50	0.58	0.63	0.73	0.83	0.90	1.07	1.34	1.56	1.93	2.26	2.63
15-min	0.36	0.42	0.45	0.53	0.60	0.65	0.78	0.97	1.14	1.41	1.65	1.92
10-min	0.28	0.33	0.36	0.41	0.47	0.51	0.61	0.76	0.89	1.10	1.28	1.50
5-min	0.16	0.19	0.20	0.23	0.27	0.29	0.35	0.43	0.51	0.63	0.73	0.85

(1) Source: Rainfall Frequency Atlas of the Midwest, Bulletin 71, Midwest Climate Center & Illinois State Water Survey, Floyd A. Huff and James R. Angel, 1992.

Table 7.2 (for informational purposes only) Chesterton, Indiana Rainfall Intensity (inches/hour) for Given Recurrence Interval[1]												
Duration	**2-mo**	**3-mo**	**4-mo**	**6-mo**	**9-mo**	**1-yr**	**2-yr**	**5-yr**	**10-yr**	**25-yr**	**50-yr**	**100-yr**
10-day	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.04
5-day	0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.05	0.06	0.07	0.08
72-hr	0.02	0.03	0.03	0.03	0.04	0.04	0.05	0.06	0.07	0.08	0.10	0.12
48-hr	0.03	0.03	0.04	0.04	0.05	0.06	0.07	0.08	0.10	0.12	0.14	0.16
24-hr	0.06	0.06	0.07	0.08	0.09	0.10	0.12	0.15	0.18	0.22	0.25	0.30
18-hr	0.07	0.08	0.09	0.10	0.12	0.13	0.15	0.19	0.22	0.27	0.32	0.37
12-hr	0.10	0.11	0.12	0.14	0.16	0.18	0.21	0.26	0.31	0.38	0.44	0.52
6-hr	0.17	0.19	0.21	0.25	0.28	0.30	0.36	0.45	0.53	0.65	0.76	0.89
3-hr	0.28	0.33	0.36	0.42	0.48	0.52	0.62	0.77	0.90	1.11	1.30	1.52
2-hr	0.39	0.45	0.49	0.57	0.65	0.70	0.84	1.05	1.23	1.52	1.77	2.07
1-hr	0.63	0.73	0.80	0.92	1.05	1.14	1.36	1.70	1.98	2.45	2.87	3.35
30-min	1.00	1.16	1.26	1.46	1.66	1.80	2.14	2.68	3.12	3.86	4.52	5.26
15-min	1.44	1.68	1.80	2.12	2.40	2.60	3.12	3.88	4.56	5.64	6.60	7.68
10-min	1.68	1.98	2.16	2.46	2.82	3.06	3.66	4.56	5.34	6.60	7.68	9.00
5-min	1.92	2.28	2.40	2.76	3.24	3.48	4.20	5.16	6.12	7.56	8.76	10.20

(1) Based on Rainfall Frequency Atlas of the Midwest, Bulletin 71, Midwest Climate Center & Illinois State Water Survey, Floyd A. Huff and James R. Angel, 1992.

7.4 Post-Construction Monitoring

Any time the storage basin is filled 50% or over the operators will document the volume of flow that was captured by the storage basin along with the flow meter data from the WWTP and WW lift stations. The operators will also analyze the rain gage meter to estimate the rainfall event recurrence interval that caused the basin to fill.

If an overflow occurs the operators will estimate the rainfall event recurrence interval that caused the overflow to assure that the storm was greater than the 10 year one hour storm.

7.5 Milestone Reporting

7.5.1 Two Year Report

After Achievement of Full Operation of the WW lift station and WW storage basin, the Town will prepare and submit a report to the IDEM. The report will be submitted within two years following Achievement of Full Operation. The report will include data related to the following information:

- Documentation of any overflow/storm event with volume and peak flow rate that overflowed and the estimate of the rainfall event recurrence interval that caused the overflow.
- Data on the ability to convey, store and treat the 10-year 1-hour storm based on the storm events within the reporting period.
- Re-Evaluation and Corrective Actions (if necessary).

7.5.2 Final Post-Construction Monitoring Report

Within five years following Achievement of Full Operation of all LTCP projects, the Town will submit a final Post-Construction Monitoring Report to IDEM, containing the information on the ability to convey, store and treat the 10-year 1-hour storm.

The purpose of the Final Post-Construction Monitoring Report will be to document how well the Town's combined sewer system is performing as a whole, following completion of all LTCP projects, and will include an assessment of whether the improvements are meeting the 10-year 1-hour storm performance criteria.

The report will identify deficiencies or performance limiting factors in system design, process, operations, and/or maintenance that may limit the overall effectiveness of the CSO control measures in achieving their intended performance. Any corrective measures will be documented if necessary. The Town will evaluate alternative operating strategies for the implemented controls prior to considering structural modifications. If improvements or additional facilities and processes are needed to meet applicable requirements, the Town will identify them in the report.

7.6 Schedule

The schedule for the post construction monitoring is included in **Table 7.3**.

Note: Table 7.3 will be added at a later date

The Town of Chesterton's Public Notification of CSO's

1) In January 2004, March 2004 and in March of every subsequent year, the Town of Chesterton Utility will issue a Public Notice in the local Chesterton Tribune, Post Tribune, and The Times.

Notice

The Town of Chesterton maintains a sanitary sewage collection system that still includes sewers combined with stormwater. Chesterton Wastewater Treatment Plant has experienced approximately 6-10 Combined Sewage Overflows (CSO's) per year during heavy rains or excessive snow melting. When the Wastewater Treatment Plant expansion is finished, there will be even less CSO's due to increased plant capacity. During CSO events, water quality downstream of the plant may be impaired within the east branch of the Little Calumet River, the Burns Harbor waterways and Lake Michigan beach areas along the south end of the lake. Adverse health impacts may occur to persons entering these waterways to wade or swim during and immediately following CSO's. Special precautions should be taken to prevent accidental or intentional ingestion of this water. Bacterial levels will usually return to normal within 24 hours, at which time, normal recreational activities may resume.

Persons interested in direct notification of CSO events by mail, and or e-mail may provide contact information through a written request submitted to:

Chesterton Utility Superintendent
300 League Lane
Porter, IN 46304

Mr. Steven Yagelski
Superintendent
Town of Chesterton Utility

2) Potential media sources interested in receiving notification of CSO occurrences may include the following:

Newspapers:

a) Chesterton Tribune
193 S. Calumet
Chesterton IN 46304
219-926-1131

b) The Times – Vidette edition
1111 Glendale Blvd.
Valparaiso, IN 46383
219-462-5151 Fax: 219-425-7298

c) Post Tribune
902 Calumet Ave. Suite 4
Valparaiso, IN 46383
219-477-6010

Radio Stations:

d) WAKE Radio Station
2755 Sagers Rd.
Valparaiso, IN 46383
219-462-6111

e) WLJE FM Radio Station
2755 Sagers Rd
Valparaiso, IN 46383
219-462-8125

f) WDSO FM Radio Station FM 88.3
Duneland School Corporation
700 West Porter Ave.
Chesterton, IN 46304
219-983-3777

3) Possible groups interested in receiving notification of CSO occurrences may include the following:

a) Save The Dunes Council INC.
444 Barker Rd.
Michigan City, IN 46360
219-879-3937

b) Porter County Health Department
155 Indiana Ave.
Valparaiso, IN 46383
219-465-3525

c) Indiana Dunes National Lakeshore
1100 North Mineral Road
Porter, IN 46304
Park Office 219-926-7561 Ext 335

d) Town of Porter
303 Franklin Street
Porter, IN 46304
Public Works Director 219-926-4212

e) Town of Burns Harbor
Navaho Trail
Burns Harbor, IN 46304
Street Department 219-787-9187

f) Indiana Dunes State Park
State Road 49
Chesterton, IN 46304
219-926-1952

4) Posted at Chesterton wastewater treatment plant outfall 001 (CSO is combined with our plant effluent before discharging into the East Branch of the Little Calumet River) is a sign with the following wording:

WARNING
This is a combined sewer overflow (CSO).
Heavy rainfall may cause sewage to enter the stream.
For more information call
Chesterton Utility (219) 926-1032.

All wording for replacement signs or new signage at public access points and residents will read as follows:

Caution – Sewage or Wastewater pollution. Sewage or Wastewater may be in this water during and for several days after periods of rainfall or snowmelt. People who swim in, wade in, or ingest this water may get sick. For more information, please call the Town of Chesterton Utility, (219) 926-1032.

5) Attachment A is the list of property owners, along the banks of the East Branch of the Little Calumet River downstream of our CSO outfall, that will be offered signage with the above wording. Attachment B is a copy of the letter to the property owners. There are no water drinking water suppliers with surface water intakes located within 10 miles downstream of our CSO. Below is a list of bridges that intersect with the Little Calumet River and public access points that will also be offered signage:

- Bridges-The East Branch or the Little Calumet and
  - Waverly Road
  - Wagner Road
  - North Mineral Springs Road
  - North Babcock Road
  - State Road 149
  - Samuelson Road
  - State Road 249
  - Crisman Road
  - US 12
  - Interstate 94
  - US 20
  - Howe Road

- Parks and other public access points-
  - Hawthorn Park – Porter
  - Indiana Dunes National Lakeshore – Bailly Homestead, Chellberg Farm
  - Indiana Dunes National Lakeshore – Indiana Dunes Environmental Learning Center
  - Lefty's Coho Landing, Inc.
  - Marquette Yacht Club

James C. & Linda G. Wells
409 Porter Street
Porter, IN 46304

Nancy L. Hokanson
412 Michigan St.
Porter, IN 46304

Family Todd
412 Michigan St.
Porter, IN 46304

David Sullivan, Environmental Dept.
Northern Indiana Public Service Co.
801 E 86th Ave.
Merrillville, IN 46410

David Sullivan, Environmental Dept.
Northern Indiana Public Service Co.
801 E 86th Ave.
Merrillville, IN 46410

Danny Charles & Connie M. Perez
317 Iroquois Trail
Chesterton, IN 46304

Indian Springs Property Owners
Burns Harbor
Chesterton, IN 46304

Frank R & Evelyn Perry
1258 Chippewa Tr.
Chesterton, IN 46304

Terry R & Valerie Swanson
1259 Chippewa Tr.
Chesterton, IN 46304

Terry R & Valerie Swanson
1259 Chippewa Tr.
Chesterton, IN 46304

Danny Charles & Connie M. Perez
317 Iroquois Trail
Chesterton, IN 46304

Trust # 3811
Lake County Trust Company
2200 N Main St.
Crown Point, IN 46307

Trust # 3811
Lake County Trust Company
2200 N Main St.
Crown Point, IN 46307

David L. Montreuil
277 Meadowbrook
Burns Harbor, IN 46304

Albert L. & Patricia D. Raffin
451 Waverly Rd.
Porter, IN 46304

Gary-Hobart Water Corporation
400 Camby Ct. P.O. Box 570
Greenwood, IN 46142

David N. Rosner Trust # 1442
Lake County Trust Company
2599 NW 63rd Ln.
Boca Raton, FL 33496

Kendall R. Peterson
663 Surrey Walk
Valparaiso, IN 46385

Phyllis E. Wagner
663 Surrey Walk
Valparaiso, IN 46385

Roger F. & Katrina L. Hess
455 Porter Ave.
Porter, IN 46304

Annette M. Roth
1247 N Brummitt Rd.
Chesterton, IN 46304

National Steel Corp. Midwest Steel
4100 Edison Lakes Pkwy
Mishawaka, IN 46245

Marquette Boat Club Inc.
1218 N Crisman Rd.
Portage, IN 46368

David Sullivan, Environmental Dept.
Northern Indiana Public Service Co.
801 E 86th Ave.
Merrillville, IN 46410

State of Indiana Little
Calumet River Basin Dev Comm
8149 Kennedy
Highland, IN 46322

Lefty's Co-Ho Landing Inc.
6161 Burns Ditch
Portage, IN 46322

Lefty's Co-Ho Landing Inc.
6161 Burns Ditch
Portage, IN 46322

tional Steel Corp. Midwest Steel
00 Edison Lakes Pkwy
Mishawaka, IN 46245

State of Indiana Little
Calumet River Basin Dev Comm
8149 Kennedy
Highland, IN 46322

National Steel Corp. Midwest Steel
4100 Edison Lakes Pkwy
Mishawaka, IN 46245

Friday, December 26, 2003

David Sullivan, Environmental Dept.
Northern Indiana Public Service Co.
801 E 86th Ave.
Merrillville, IN 46410

Property:
To be assigned

Subject: Combined Sewer Overflow (CSO) Public Notification Rule 327 IAC 5-2.1

Attention: Potentially Affected Persons with property adjacent to the Little Calumet River downstream of the Chesterton Wastewater Treatment plant.

The Town of Chesterton maintains a sanitary sewage collection system that includes sewers combined with stormwater. Chesterton Wastewater Treatment Plant has experienced approximately 6-10 Combined Sewage Overflows (CSO's) per year during heavy rains or excessive snow melting. When the Wastewater Treatment Plant expansion is finished, there will be even less CSO's due to increased plant capacity. During CSO events, water quality downstream of the plant may be impaired within the east branch of the Little Calumet River, the Burns Harbor waterways and Lake Michigan beach areas along the south end of the lake. Adverse health impacts may occur to persons entering these waterways to wade or swim during and immediately following CSO's. Special precautions should be taken to prevent accidental or intentional ingestion of this water. Bacterial levels will usually return to normal within 24 hours, at which time, normal recreational activities may resume.

The State of Indiana has adopted a new environmental rule regarding the requirements for public notification of CSO occurrences. The Chesterton Wastewater Treatment Plant (WWTP) is offering owners of property adjacent to the Little Calumet River signs with the following language:

> **Caution – Sewage or Wastewater pollution. Sewage or Wastewater may be in this water during and for several days after periods of rainfall or snowmelt. People who swim in, wade in, or ingest this water may get sick. For more information, please call the Town of Chesterton Utility, (219) 926-1032.**

To receive a sign with this information, please contact Chief Operator Richard Condon at the address listed above by January 30, 2004. Your written request must identify the specific property location as listed above. You will be contacted when the signs become available.

Very truly yours,

Steven M. Yagelski
Superintendent Town of Chesterton Utility

ID	Dup No.	Owner-Last	First & Middle	Owner's Address	City	State	Zip	Care of:	Description	Property Address	Prop. City	P. State	p.Zip	Phone #
1	11 000162736	Wells	James C. & Linda G.	409 Porter Street	Porter	IN	46304		D# 01-3111 Ex Par Sold 35-37-6	409 Porter Street	Porter	IN	46304	
2	11 000069003	Hokanson	Nancy L.	412 Michigan St.	Porter	IN	46304		N & E of Porter Ave. 35-37-6	412 Michigan St.	Porter	IN	46304	926-1931
3	11 000006903	Todd	Family	412 Michigan St.	Porter	IN	46304		N & E of Porter Ave. 35-37-6	412 Michigan St.	Porter	IN	46304	
6	25 007110342	Service Co.	Northern Indiana Public	801 E 86th Ave.	Merrillville	IN	46410	David Sullivan, Environmental Dept.	PAR IN NE N OF NYC RR S OF LTLE CAL CRK DES DR 213 P504 33-37-6	To be assigned				
7	25 007110344	Service Co.	Northern Indiana Public	801 E 86th Ave.	Merrillville	IN	46410	David Sullivan, Environmental Dept.	E1/2 E1/2 NE N OF RIVER 33-37-6	To be assigned				
21	25 000024682	Perez	Danny Charles & Connie M.	317 Iroquois Trail	Chesterton	IN	46304		INDIAN SPRINGS LOT 35 EX PT TO USA	317 Iroquois St.	Chesterton	IN	46304	
22	25 000014550	Property Owners	Indian Springs	Burns Harbor	Chesterton	IN	46304		INDIAN SPRINGS SUBS PARK 1/62 TO EACH LOT OWNER	To be assigned				
23	25 000024900	Perry	Frank R & Evelyn	1258 Chippewa Tr.	Chesterton	IN	46304		INDIAN SPRINGS LOT 24 SWRLY PART	1258 Chippewa Tr.	Chesterton	IN	46304	
49	25 000032816	Swanson	Terry R & Valerie	1259 Chippewa Tr.	Chesterton	IN	46304		INDIAN SPRINGS LOT 23	Chippewa Tr.				
26	25 000032815	Swanson	Terry R & Valerie	1259 Chippewa Tr.	Chesterton	IN	46304		INDIAN SPRINGS LOT 21 NWRLY PART	1259 Chippewa Tr.	Chesterton	IN	46304	
28	25 000024680	Perez	Danny Charles & Connie M.	317 Iroquois Trail	Chesterton	IN	46304		INDIAN SPRINGS LOT 34 EX PART TO USA	Iroquois Tr.				
30	08 000332410	Trust Company	Lake County	2200 N Main St.	Crown Point	IN	46307	Trust # 3811	E1/2 SE N RIVER EX POWER LINE 35-37-7	NORTH OF RIVER				
31	08 000335202	Trust Company	Lake County	2200 N Main St.	Crown Point	IN	46307	Trust # 3811	PAR IN SE 35-37-7 DESC DR465 P605	US HWY 12				
37	25 000022301	Montreuil	David L.	277 Meadowbrook	Burns Harbor	IN	46304		PAR IN W258.4 E270.4 N425 S OF IBL W1/2 NW 33-37-6	277 Meadowbrook	Burns Harbor	IN	46304	

39	11 000124915	Raffin	Albert L. & Patricia D.	451 Waverly Rd.	Porter	IN	46304		S200 N479.8 W217.8 NW 36-37-6	451 Waverly Rd.	Porter	IN	46304
40	10 000070375	Water Corporation	Gary-Hobart	400 Camby Ct. P.O. Box 570	Greenwood	IN	46142		E1/2 NW N RR & E RIVER 36-37-6	Morningside Utility Lines			
41	10 000123100	Trust Company	Lake County	2599 NW 63rd Ln.	Boca Raton	FL	33496	David N. Rosner Trust # 1442	PAR N OF CAL. RIVER S RR DESC DR227 P580 36-37-6	Taylor St. W of Apts.			
42	11 000119907	Peterson	Kendall R.	663 Surrey Walk	Valparaiso	IN	46385		S3/4 W1/2 EX W390 N1141 EXN175 25-37-6	N. Waverly Rd.			
43	11 000119907	Wagner	Phyllis E.	663 Surrey Walk	Valparaiso	IN	46385		S3/4 W1/2 EX W390 N1141 EXN175 25-37-6	N. Waverly Rd.			
45	11 000067427	Hess	Roger F. & Katrina L.	455 Porter Ave.	Porter	IN	46304		PAR N OF CAL PK & W RIVER NW NE 35-37-6	455 Porter Ave.	Porter	IN	46304
46	11 000130731	Roth	Annette M.	1247 N Brummitt Rd.	Chesterton	IN	46304		PAR IN NE AS DESC DR 494 P487 EX PAR SOLD TO STATE 35-37-6	Porter Ave.			
47	08 000429900	Midwest Steel	National Steel Corp.	4100 Edison Lakes Pkwy	Mishawaka	IN	46245		PAR IN NW SE & SE INCLUDING BURNS DITCH EX PT SD25-37-7	Midwest Steel Division US HWY			
50	08 000383760	Inc.	Marquette Boat Club	1218 N Crisman Rd.	Portage	IN	46368		HEATH'S ADD TO E. CHICAGO LOTS 7-10 BLK 8	1218 Crisman			
51	08 007110003	Service Co.	Northern Indiana Public	801 E 86th Ave.	Merrillville	IN	46410	David Sullivan, Environmental Dept.	HEATH'S 1ST ADD LOTS 1-6 & 11-19 BLK 8 & 1/2 VAC ST EX NE COR LT 19	To be assigned			
52	08 005111530	River Basin Dev Comm	Calumet	8149 Kennedy	Highland	IN	46322	State of Indiana Little	HEATHS 1ST ADD LOTS 14-20 BLK 4 & 1/2 VAC ST	To be assigned			
53	08 000345849	Inc.	Lefty's Co-Ho Landing	6161 Burns Ditch	Portage	IN	46322		HEATHS 1ST ADD E CHICAGO LOTS 1&2 BLK 2& VAC ST DR445 P122	Burns Ditch			
54	08 000345848	Inc.	Lefty's Co-Ho Landing	6161 Burns Ditch	Portage	IN	46322		PAR IN NW S RD 12 N IBL & W BURNS DITCH 36-37-7	Burns Ditch			

55	08 000428510	Midwest Steel	National Steel Corp.	4100 Edison Lakes Pkwy	Mishawaka	IN	46245		PAR IN NW DESC DR210 P24 EX PAR SOLD 36-37-7	US HWY 12
57	08 005111698	River Basin Dev Comm	Little Calumet	6100 Southport Road	Portage	IN	46368	State of Indiana	NW1/4 BET RR&IBL E OF BURNSDITCH EX NLY 124.34 36-37-7	To be assigned
59	08 000429800	Midwest Steel	National Steel Corp.	4100 Edison Lakes Pkwy	Mishawaka	IN	46245		FRACT NW N IBL & E DITCH EX PARS SOLD 36-37-7	US HWY 12
60	08 000345845	Inc.	Lefty's Co-Ho Landing	6161 Burns Ditch	Portage	IN	46322		PAR NW N OF IBL & W OF BRNS DITCH DESC DR445 P122 36-37-7	6161 Burns Waterway
61	08 000466910	Paunicka	Joseph R.	38 Deana Rd.	Portage	IN	46368		HEATHS 1ST ADD TO E CHGO LOTS 5-6 BLK 5	To be assigned
62	08 000030828	Incorporated	BATS	11339 W. Snyder	Westville	IN	46391	Terrence L Cooper	HEATHS 1ST ADD TO E CHICAGO LOTS 11-20 BLK 5 DR482 P319	To be assigned
63	08 000345854	Inc.	Lefty's Co-Ho Landing	6161 Burns Ditch	Portage	IN	46322		HEATHS 1ST ADD E CHGO LOTS 1-3 &7-10 BLK 5 & 1/2 VAC ST DR445 P122	Burns Ditch
64	08 000345870	Inc.	Lefty's Co-Ho Landing	6161 Burns Ditch	Portage	IN	46322		HEATHS ADD E CHG LTS 11 & 12 BK 12 & LTS 5&6 11&12 BK17 LTS 5 9 &10 BK 18	Burns Ditch
65	08 000178349	Bank	First National	420 E 900 N	Valparaiso	IN	46383	Trust #13-2641	HEATHS 1ST ADD E CHGO LOTS 1-10 & 13-16 BLK 12 7 1/2 VAC ST 488/543	To be assigned
66	08 000448901	Service Co.	Northern Indiana Public	801 E 86th Ave.	Merrillville	IN	46410	David Sullivan, Environmental Dept.	HEATHS 1ST ADD TO EAST CHICAGO LOTS 1-3 BLK 13 7 1/2 VAC ST	To be assigned
67	08 000164904	Ewen	Charles L. & Donna	5385 Stagecoach Pl.	Portage	IN	46368		PT GOVT LOTS 6 & 5 DESC DR449 P 92 2-36-7	Stagecoach
68	08 000164913	Ewen	Charles L. & Donna Jean	5385 Stagecoach Pl.	Portage	IN	46368		E1/2 NW N BURNS DITCH EX POWER LINE EX PAR H&LD 2-36-7	Stagecoach
69	08 000165004	Ewen	John A. & Mary R.	1533 Marine Dr.	Portage	IN	46368		NE N BURNS DITCH EX PAR IN W290 NE 2-36-7	1533 Marine

70	08 000165000	Ewen	John & Mary	1533 Marine St.	Portage	IN	46368		W290 W1160 NE 2-36-7	1533 Marine	
71	08 003113046	Portage Redevelopment Commission	City of Portage	6070 Central Ave.	Portage	IN	46368		N1/2 E1/2 NE SE OF BURNS DITCH 2-36-7	To be assigned	
72	08 003111924		City of Portage	2100 Willowcreek Rd.	Portage	IN	46368		PARC IN NW S OF BURNSDITCH DESC CR304 P38 2-36-7	To be assigned	
73	08 000466919	Paunicka	Grandchildrens Trust	38 Diana Rd.	Ogden Dunes	IN	46368		W 492.77 NE & SE N OF I94 S OF BURNS DITCH 2-36-7	To be assigned	
74	08 000039300	Steel Corp.	Bethlehem	Martin Tower	Bethlehem	PA	18016		PARS SEC 19 30 31-37-6 & 36-37-7 & 2-36-7 & 3-36-6 226.955A	US HWY 12	
76	08 000608100	Marina Inc.	Treasure Chest	3298 Ripley St.	Lake Station	IN	46405		PAR IN NW SE DESC DR308 P73 36-37-7	1305 St. Rd. 149	
77	08 000151601	Duvall	Robert Scott & Jeanne Tully	1375 Burns Dr.	Portage	IN	46368		E112.9 W1095.85 N470 S1281.07 S BURNS DITCH SE 36-37-7	1375 Burns	
		America	United States of	P.O. Box 283	Valparaiso	IN	46383	Pioneer Title		See Enclosed List	
		Lakeshore Park	Indiana National	1100 Mineral Springs Road	Porter	IN	46304	Scott Hicks		See Enclosed List	219-926-7561 Ext-335
		Indiana	State of	State House	Indianapolis	IN	46204			See Enclosed List	
		State Park	Dunes	1600 North 25 East	Chesterton	IN	46304	Ted Bohman		See Enclosed List	219-926-1952
		Porter	Town of	303 Franklin St.	Chesterton	IN	46304	Scott Guy		Hawthorn Park	219-926-4212
		Burns Harbor	Town of	1240 Boo Road	Chesterton	IN	46304	Clerk Treasurer's Office		No Listing	219-787-9413

SANITARY SEWER BASELINE FLOW ANALYSIS SUMMARY REPORT

TOWN OF PORTER

April 2010

TOWN COUNCIL MEMBERS AND TOWN OFFICIALS

MICHELE BOLLINGER	**PRESIDENT**
JON GRANAT	**VICE PRESIDENT**
MICHEAL GENGER	**BOARD MEMBER**
DAVID BABCOCK	**BOARD MEMBER**
TODD MARTIN	**BOARD MEMBER**

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BRENDA BRUECKHEIMER	**DIRECTOR OF PUBLIC WORKS**
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CAROL POMEROY	**CLERK-TREASURER**

HAAS & ASSOCIATES, L.L.C.
CONSULTING ENGINEERS
526 FRANKLIN SQUARE
MICHIGAN CITY, IN 46360
PHONE: 219-872-9407 - FAX: 219-872-9489

SANITARY SEWER BASELINE FLOW ANALYSIS SUMMARY
TOWN OF PORTER

April 14, 2010
Revised April 30, 2010

Dry Weather Baseline Flow:

SUMMARY OF ANALYSES:

Weekly Diurnal Baseline Flow
Dry weather events were used to determine dry diurnal flows for each of the five metering stations. Average flow totals collected hourly by MISSION Software between March and October, 2009 were reviewed to obtain these dry events. These dates were the first opportunity to retrieve hourly flow totals, in that the MISSION system was put into service at all metering sites in April of 2009.

Each meters' flow data was entered into the EPA's software SSOAP Toolbox. The dry weather diurnal flow data was determined by the software parameters. Attached are spreadsheets with the weekday and weekend average hourly flows for each billing meter and un-metered area. The un-metered diurnal flow was estimated using the Porter Cove meter as a reference, using percentage flow per hour (similar conditions and assumed flow pattern).

Wet Weather Baseline Flow:

SUMMARY OF ANALYSES:

Analysis was completed using the EPA's SWMM modeling software (v.5, Build 5.0.018), in conjunction with the SSOAP Toolbox, mentioned above. The SSOAP Toolbox allows the Rainfall Derived Inflow and Infiltration (RDII) to be separated into short, medium and long-term I/I conditions in the sewer system. All billing meter flow data was calibrated in SWMM software using recorded storm events to ensure an accurate determination of design storm events.

I. Per IDEM / Town of Chesterton Requirements, the following data for each billing meter is attached:
   - A. 1-Year, 1-Hour Design Storm Hydrograph for the sewer system in MS Excel format
   - B. 10-Year, 1-Hour Design Storm Hydrograph for the sewer system in MS Excel format
   - C. Typical dry weather diurnal wastewater flow curve for a one week period in MS Excel format
   - D. A "Peak, ultimate storm flow" was identified by the Town of Porter as that created by a 50-Year, 18-Hour storm. A 3rd Quartile rainfall distribution model was used, based on data included in the "Rainfall Frequency Atlas of the Midwest" (Bulletin 71).
   - E. Peak instantaneous flows and total volume for each of the above three design storms have also been identified.
   - F. The following table is a summary of the Design Storm event findings, by billing meter.

SANITARY SEWER BASELINE FLOW ANALYSIS SUMMARY
TOWN OF PORTER

Meter	**Franklin**	**Marquardt**	**Morgan**	**Porter Cove**	**South 23rd**	**Un-metered areas**	**Totals**
Avg. Diurnal Flow (GPM)	96.22	87.61	12.50	30.70	21.33	42.19*	290.55
1Yr-1Hr Storm							
Flow Recording Length for Model	47 Hrs	47 Hrs	47 Hrs	47 Hrs	47 Hrs		
Peak Instantaneous Flow (GPM)	351.58	277.58	55.90	54.87	164.94	**(No Data)**	
Total Flow for Storm Report Length (MG)	0.456	0.318	0.040	0.092	0.083	0.119*	1.108
Total Flow, Peak 24-Hour Reporting Period (MG)	0.297	0.193	0.022	0.049	0.050	0.061*	0.672
Total I/I Flow for Storm Report Length (MG)	0.189	0.072	0.005	0.005	0.023	**(No Data)**	0.294
10Yr-1Hr Storm							
Flow Recording Length for Model	47 Hrs	47 Hrs	47 Hrs	47 Hrs	47 Hrs		
Peak Instantaneous Flow (GPM)	678.27	634.14	104.45	82.35	390.53	**(No Data)**	
Total Flow for Storm Report Length (MG)	0.632	0.415	0.044	0.115	0.111	0.119*	1.436
Total Flow, Peak 24-Hour Reporting Period (MG)	0.455	0.282	0.025	0.068	0.072	0.061*	0.963
Total I/I Flow for Storm Report Length (MG)	0.365	0.170	0.008	0.028	0.052	**(No Data)**	0.623
50Yr-18Hr Storm							
Flow Recording Length for Model	72 Hrs	95 Hrs	47 Hrs	59 Hrs	47 Hrs		
Peak Instantaneous Flow (GPM)	2,076.68	2,227.04	257.77	356.04	470.70	**(No Data)**	
Total Flow for Storm Report Length (MG)	1.823	1.534	0.110	0.323	0.242	0.119*	4.151
Total Flow, Peak 24-Hour Reporting Period (MG)	1.262	1.072	0.092	0.221	0.207	0.061*	2.915
Total I/I Flow for Storm Report Length (MG)	1.414	1.036	0.075	0.217	0.182	**(No Data)**	2.924

* Based on Contract Agreement between Town of Porter and Town of Chesterton: number of homes times 310 gpd/home. The current agreement number is 196 homes.

Notes for the preceding Table:

1. GPM = Gallons per Minute; MG = Million Gallons
2. Peak Instantaneous Flow was not totaled because it occurs at different times during a storm event for each meter.
3. 1 Year-1 Hour and 10 Year-1 Hour storms are modeled with even rainfall distribution (as requested from DLZ), and are 1.14" and 1.98" total rainfall, respectively. The rainfall quantity is taken from data included in the "Rainfall Frequency Atlas of the Midwest" (Bulletin 71).
4. Based on the need for the Town of Chesterton Wastewater Treatment Plant to store and treat a 10-year, 1-hour storm, Porter's portion of storage volume for peak daily flow in 24 hours will be 112,000 gallons (0.963 MG - 0.851 MG). This number represents the peak 24-hour total flow less the committed daily purchased allocation**. (See April 30, 2010 correspondence to Chesterton Town Council and Utility Board – Re: Sanitary Sewer Issues)

CONCLUSIONS:

1. It is recommended that the Town of Porter provide temporary metering in the un-metered areas to get a better understanding of actual flows for those areas.
2. The preceding analyses considered existing conditions only. No future development sanitary sewer flows were considered in the flow modeling process.
3. The Marquardt meter is currently undersized for the 10-Yr storm event, and the Franklin, Marquardt and Morgan meters are currently undersized for the 50-Yr storm event.
4. The model for the existing Marquardt meter system sewer indicates a surcharged condition will occur for approximately 7 hours during a 50 year return storm event. In order to prevent damage to upstream private property, it is recommended that future considerations include reducing I/I and/or upsizing the existing 12" sanitary sewer for this system.

** The Town of Porter committed to increase the daily purchased allocation to 851,000 GPD before the required storage tank is on line, in an April 30, 2010 correspondence to the Town of Chesterton.

Town of Porter
Flow Analysis Summary
Franklin Meter Data
Table B1

10 year 1 hour storm			1 year 1 hour storm			50 year 18 hour storm						Dry Weather Flow			
												Weekday		Weekend	
Day	Time	Flow CFS	Day	Time	Flow CFS	Day	Time	Flow CFS	Day	Time	Flow CFS	Time	Flow CFS	Time	Flow CFS
1	1:00:00	0.18	1	1:00:00	0.18	1	1:00:00	0.18	3	0:00:00	0.38	0:00	0.18	0:00	0.16
1	2:00:00	0.15	1	2:00:00	0.15	1	2:00:00	0.15	3	1:00:00	0.34	1:00	0.15	1:00	0.13
1	3:00:00	0.13	1	3:00:00	0.13	1	3:00:00	0.13	3	2:00:00	0.30	2:00	0.13	2:00	0.12
1	4:00:00	0.12	1	4:00:00	0.12	1	4:00:00	0.12	3	3:00:00	0.26	3:00	0.13	3:00	0.10
1	5:00:00	0.12	1	5:00:00	0.12	1	5:00:00	0.12	3	4:00:00	0.25	4:00	0.13	4:00	0.10
1	6:00:00	0.13	1	6:00:00	0.13	1	6:00:00	0.13	3	5:00:00	0.24	5:00	0.14	5:00	0.11
1	7:00:00	1.34	1	7:00:00	0.65	1	7:00:00	0.15	3	6:00:00	0.24	6:00	0.17	6:00	0.11
1	8:00:00	1.36	1	8:00:00	0.71	1	8:00:00	0.22	3	7:00:00	0.25	7:00	0.23	7:00	0.13
1	9:00:00	1.33	1	9:00:00	0.74	1	9:00:00	0.35	3	8:00:00	0.29	8:00	0.25	8:00	0.16
1	10:00:00	1.21	1	10:00:00	0.71	1	10:00:00	0.49	3	9:00:00	0.31	9:00	0.26	9:00	0.21
1	11:00:00	1.10	1	11:00:00	0.67	1	11:00:00	0.64	3	10:00:00	0.33	10:00	0.27	10:00	0.25
1	12:00:00	0.99	1	12:00:00	0.63	1	12:00:00	0.77	3	11:00:00	0.34	11:00	0.27	11:00	0.26
1	13:00:00	0.92	1	13:00:00	0.60	1	13:00:00	0.94	3	12:00:00	0.34	12:00	0.28	12:00	0.26
1	14:00:00	0.85	1	14:00:00	0.57	1	14:00:00	1.11	3	13:00:00	0.34	13:00	0.28	13:00	0.25
1	15:00:00	0.78	1	15:00:00	0.53	1	15:00:00	1.47	3	14:00:00	0.34	14:00	0.27	14:00	0.24
1	16:00:00	0.72	1	16:00:00	0.49	1	16:00:00	2.26	3	15:00:00	0.32	15:00	0.25	15:00	0.23
1	17:00:00	0.67	1	17:00:00	0.47	1	17:00:00	3.23	3	16:00:00	0.30	16:00	0.25	16:00	0.22
1	18:00:00	0.63	1	18:00:00	0.45	1	18:00:00	4.38	3	17:00:00	0.30	17:00	0.25	17:00	0.23
1	19:00:00	0.60	1	19:00:00	0.44	1	19:00:00	4.60	3	18:00:00	0.30	18:00	0.26	18:00	0.22
1	20:00:00	0.57	1	20:00:00	0.42	1	20:00:00	4.55	3	19:00:00	0.30	19:00	0.25	19:00	0.22
1	21:00:00	0.54	1	21:00:00	0.41	1	21:00:00	4.09	3	20:00:00	0.29	20:00	0.25	20:00	0.22
1	22:00:00	0.51	1	22:00:00	0.40	1	22:00:00	3.62	3	21:00:00	0.29	21:00	0.25	21:00	0.22
1	23:00:00	0.48	1	23:00:00	0.37	1	23:00:00	3.15	3	22:00:00	0.28	22:00	0.24	22:00	0.20
2	0:00:00	0.44	2	0:00:00	0.34	2	0:00:00	2.82	3	23:00:00	0.27	23:00	0.22	23:00	0.18
2	1:00:00	0.40	2	1:00:00	0.31	2	1:00:00	2.34	4	0:00:00	0.25				
2	2:00:00	0.35	2	2:00:00	0.27	2	2:00:00	1.95							
2	3:00:00	0.32	2	3:00:00	0.24	2	3:00:00	1.64							
2	4:00:00	0.30	2	4:00:00	0.23	2	4:00:00	1.41							
2	5:00:00	0.29	2	5:00:00	0.22	2	5:00:00	1.22							
2	6:00:00	0.29	2	6:00:00	0.23	2	6:00:00	1.08							
2	7:00:00	0.30	2	7:00:00	0.24	2	7:00:00	0.99							
2	8:00:00	0.33	2	8:00:00	0.28	2	8:00:00	0.93							
2	9:00:00	0.35	2	9:00:00	0.30	2	9:00:00	0.87							
2	10:00:00	0.37	2	10:00:00	0.32	2	10:00:00	0.83							
2	11:00:00	0.38	2	11:00:00	0.33	2	11:00:00	0.79							
2	12:00:00	0.38	2	12:00:00	0.34	2	12:00:00	0.74							
2	13:00:00	0.38	2	13:00:00	0.34	2	13:00:00	0.70							
2	14:00:00	0.37	2	14:00:00	0.33	2	14:00:00	0.66							
2	15:00:00	0.35	2	15:00:00	0.32	2	15:00:00	0.61							
2	16:00:00	0.33	2	16:00:00	0.30	2	16:00:00	0.57							
2	17:00:00	0.32	2	17:00:00	0.29	2	17:00:00	0.54							
2	18:00:00	0.32	2	18:00:00	0.29	2	18:00:00	0.52							
2	19:00:00	0.32	2	19:00:00	0.29	2	19:00:00	0.50							
2	20:00:00	0.31	2	20:00:00	0.29	2	20:00:00	0.48							
2	21:00:00	0.31	2	21:00:00	0.29	2	21:00:00	0.46							
2	22:00:00	0.30	2	22:00:00	0.28	2	22:00:00	0.44							
2	23:00:00	0.29	2	23:00:00	0.26	2	23:00:00	0.41							

Continued Next Column

Town of Porter
Flow Analysis Summary
Marquardt Meter Data
Table B2

10 year 1 hour storm

Day	Time	Flow CFS	Day	Time	Flow CFS	Day	Time	Flow CFS
1	0:15	0.01	1	19:30	0.32	2	14:45	0.23
1	0:30	0.18	1	19:45	0.32	2	15:00	0.23
1	0:45	0.17	1	20:00	0.32	2	15:15	0.23
1	1:00	0.16	1	20:15	0.32	2	15:30	0.22
1	1:15	0.14	1	20:30	0.32	2	15:45	0.22
1	1:30	0.13	1	20:45	0.32	2	16:00	0.22
1	1:45	0.12	1	21:00	0.31	2	16:15	0.22
1	2:00	0.12	1	21:15	0.31	2	16:30	0.22
1	2:15	0.12	1	21:30	0.31	2	16:45	0.22
1	2:30	0.11	1	21:45	0.31	2	17:00	0.22
1	2:45	0.11	1	22:00	0.31	2	17:15	0.22
1	3:00	0.11	1	22:15	0.30	2	17:30	0.23
1	3:15	0.11	1	22:30	0.30	2	17:45	0.23
1	3:30	0.11	1	22:45	0.30	2	18:00	0.23
1	3:45	0.11	1	23:00	0.29	2	18:15	0.23
1	4:00	0.11	1	23:15	0.27	2	18:30	0.23
1	4:15	0.11	1	23:30	0.27	2	18:45	0.23
1	4:30	0.11	1	23:45	0.26	2	19:00	0.23
1	4:45	0.11	2	0:00	0.26	2	19:15	0.24
1	5:00	0.11	2	0:15	0.24	2	19:30	0.24
1	5:15	0.11	2	0:30	0.23	2	19:45	0.24
1	5:30	0.13	2	0:45	0.22	2	20:00	0.24
1	5:45	0.31	2	1:00	0.22	2	20:15	0.25
1	6:00	0.65	2	1:15	0.19	2	20:30	0.25
1	6:15	1.13	2	1:30	0.18	2	20:45	0.25
1	6:30	1.40	2	1:45	0.18	2	21:00	0.25
1	6:45	1.30	2	2:00	0.18	2	21:15	0.25
1	7:00	1.21	2	2:15	0.17	2	21:30	0.25
1	7:15	1.19	2	2:30	0.16	2	21:45	0.25
1	7:30	1.12	2	2:45	0.16	2	22:00	0.25
1	7:45	1.05	2	3:00	0.16	2	22:15	0.24
1	8:00	0.98	2	3:15	0.16	2	22:30	0.24
1	8:15	0.95	2	3:30	0.16	2	22:45	0.24
1	8:30	0.90	2	3:45	0.16	2	23:00	0.24
1	8:45	0.85	2	4:00	0.16			
1	9:00	0.81	2	4:15	0.16			
1	9:15	0.77	2	4:30	0.16			
1	9:30	0.74	2	4:45	0.16			
1	9:45	0.71	2	5:00	0.16			
1	10:00	0.68	2	5:15	0.16			
1	10:15	0.65	2	5:30	0.16			
1	10:30	0.63	2	5:45	0.15			
1	10:45	0.61	2	6:00	0.15			
1	11:00	0.60	2	6:15	0.17			
1	11:15	0.58	2	6:30	0.18			
1	11:30	0.56	2	6:45	0.17			
1	11:45	0.55	2	7:00	0.17			
1	12:00	0.54	2	7:15	0.23			
1	12:15	0.51	2	7:30	0.25			
1	12:30	0.50	2	7:45	0.25			
1	12:45	0.49	2	8:00	0.25			
1	13:00	0.48	2	8:15	0.27			
1	13:15	0.46	2	8:30	0.28			
1	13:30	0.45	2	8:45	0.28			
1	13:45	0.44	2	9:00	0.28			
1	14:00	0.43	2	9:15	0.28			
1	14:15	0.41	2	9:30	0.28			
1	14:30	0.40	2	9:45	0.28			
1	14:45	0.40	2	10:00	0.28			
1	15:00	0.39	2	10:15	0.28			
1	15:15	0.37	2	10:30	0.28			
1	15:30	0.37	2	10:45	0.28			
1	15:45	0.36	2	11:00	0.28			
1	16:00	0.36	2	11:15	0.28			
1	16:15	0.35	2	11:30	0.28			
1	16:30	0.34	2	11:45	0.28			
1	16:45	0.34	2	12:00	0.28			
1	17:00	0.33	2	12:15	0.27			
1	17:15	0.34	2	12:30	0.27			
1	17:30	0.34	2	12:45	0.27			
1	17:45	0.33	2	13:00	0.27			
1	18:00	0.33	2	13:15	0.25			
1	18:15	0.33	2	13:30	0.25			
1	18:30	0.33	2	13:45	0.25			
1	18:45	0.33	2	14:00	0.25			
1	19:00	0.32	2	14:15	0.24			
1	19:15	0.33	2	14:30	0.23			

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1 year 1 hour storm

Day	Time	Flow CFS	Day	Time	Flow CFS	Day	Time	Flow CFS
1	0:15	0.01	1	19:30	0.27	2	14:45	0.22
1	0:30	0.18	1	19:45	0.27	2	15:00	0.22
1	0:45	0.17	1	20:00	0.27	2	15:15	0.21
1	1:00	0.16	1	20:15	0.27	2	15:30	0.21
1	1:15	0.14	1	20:30	0.27	2	15:45	0.21
1	1:30	0.13	1	20:45	0.27	2	16:00	0.21
1	1:45	0.12	1	21:00	0.27	2	16:15	0.20
1	2:00	0.12	1	21:15	0.27	2	16:30	0.20
1	2:15	0.12	1	21:30	0.27	2	16:45	0.20
1	2:30	0.11	1	21:45	0.27	2	17:00	0.20
1	2:45	0.11	1	22:00	0.27	2	17:15	0.21
1	3:00	0.11	1	22:15	0.26	2	17:30	0.22
1	3:15	0.11	1	22:30	0.26	2	17:45	0.22
1	3:30	0.11	1	22:45	0.26	2	18:00	0.21
1	3:45	0.11	1	23:00	0.26	2	18:15	0.22
1	4:00	0.11	1	23:15	0.23	2	18:30	0.22
1	4:15	0.11	1	23:30	0.23	2	18:45	0.22
1	4:30	0.11	1	23:45	0.23	2	19:00	0.22
1	4:45	0.11	2	0:00	0.23	2	19:15	0.23
1	5:00	0.11	2	0:15	0.20	2	19:30	0.23
1	5:15	0.11	2	0:30	0.19	2	19:45	0.23
1	5:30	0.12	2	0:45	0.19	2	20:00	0.23
1	5:45	0.18	2	1:00	0.19	2	20:15	0.24
1	6:00	0.32	2	1:15	0.16	2	20:30	0.24
1	6:15	0.51	2	1:30	0.15	2	20:45	0.24
1	6:30	0.62	2	1:45	0.15	2	21:00	0.24
1	6:45	0.59	2	2:00	0.15	2	21:15	0.24
1	7:00	0.57	2	2:15	0.14	2	21:30	0.24
1	7:15	0.61	2	2:30	0.13	2	21:45	0.24
1	7:30	0.59	2	2:45	0.13	2	22:00	0.24
1	7:45	0.57	2	3:00	0.13	2	22:15	0.23
1	8:00	0.54	2	3:15	0.13	2	22:30	0.23
1	8:15	0.55	2	3:30	0.13	2	22:45	0.23
1	8:30	0.53	2	3:45	0.13	2	23:00	0.23
1	8:45	0.51	2	4:00	0.13			
1	9:00	0.49	2	4:15	0.13			
1	9:15	0.48	2	4:30	0.13			
1	9:30	0.47	2	4:45	0.13			
1	9:45	0.45	2	5:00	0.13			
1	10:00	0.44	2	5:15	0.13			
1	10:15	0.43	2	5:30	0.13			
1	10:30	0.42	2	5:45	0.13			
1	10:45	0.41	2	6:00	0.13			
1	11:00	0.41	2	6:15	0.14			
1	11:15	0.40	2	6:30	0.15			
1	11:30	0.39	2	6:45	0.15			
1	11:45	0.38	2	7:00	0.15			
1	12:00	0.38	2	7:15	0.20			
1	12:15	0.37	2	7:30	0.23			
1	12:30	0.36	2	7:45	0.23			
1	12:45	0.35	2	8:00	0.23			
1	13:00	0.35	2	8:15	0.25			
1	13:15	0.33	2	8:30	0.26			
1	13:30	0.33	2	8:45	0.26			
1	13:45	0.32	2	9:00	0.26			
1	14:00	0.32	2	9:15	0.26			
1	14:15	0.30	2	9:30	0.27			
1	14:30	0.30	2	9:45	0.27			
1	14:45	0.29	2	10:00	0.27			
1	15:00	0.29	2	10:15	0.26			
1	15:15	0.28	2	10:30	0.26			
1	15:30	0.28	2	10:45	0.26			
1	15:45	0.27	2	11:00	0.26			
1	16:00	0.27	2	11:15	0.26			
1	16:15	0.26	2	11:30	0.26			
1	16:30	0.26	2	11:45	0.26			
1	16:45	0.26	2	12:00	0.26			
1	17:00	0.26	2	12:15	0.25			
1	17:15	0.26	2	12:30	0.25			
1	17:30	0.26	2	12:45	0.25			
1	17:45	0.26	2	13:00	0.25			
1	18:00	0.26	2	13:15	0.24			
1	18:15	0.27	2	13:30	0.23			
1	18:30	0.27	2	13:45	0.23			
1	18:45	0.26	2	14:00	0.23			
1	19:00	0.26	2	14:15	0.22			
1	19:15	0.27	2	14:30	0.22			

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Town of Porter
Flow Analysis Summary
Marquardt Meter Data
Table B2 (cont.)

50 year 18 hour storm

Day	Time	Flow CFS	Day	Time	Flow CFS	Day	Time	Flow CFS	Day	Time	Flow CFS	Day	Time	Flow CFS
1	0:15	0.02	1	20:00	3.54	2	15:45	0.31	3	11:30	0.27	4	7:15	0.20
1	0:30	0.17	1	20:15	3.37	2	16:00	0.31	3	11:45	0.27	4	7:30	0.22
1	0:45	0.17	1	20:30	3.19	2	16:15	0.30	3	12:00	0.27	4	7:45	0.22
1	1:00	0.16	1	20:45	3.04	2	16:30	0.30	3	12:15	0.26	4	8:00	0.22
1	1:15	0.14	1	21:00	3.06	2	16:45	0.30	3	12:30	0.26	4	8:15	0.24
1	1:30	0.13	1	21:15	2.81	2	17:00	0.30	3	12:45	0.26	4	8:30	0.25
1	1:45	0.12	1	21:30	2.61	2	17:15	0.30	3	13:00	0.26	4	8:45	0.25
1	2:00	0.12	1	21:45	2.49	2	17:30	0.30	3	13:15	0.24	4	9:00	0.25
1	2:15	0.12	1	22:00	2.39	2	17:45	0.30	3	13:30	0.24	4	9:15	0.26
1	2:30	0.11	1	22:15	2.29	2	18:00	0.30	3	13:45	0.24	4	9:30	0.26
1	2:45	0.11	1	22:30	2.20	2	18:15	0.31	3	14:00	0.24	4	9:45	0.26
1	3:00	0.11	1	22:45	2.13	2	18:30	0.30	3	14:15	0.23	4	10:00	0.26
1	3:15	0.11	1	23:00	2.06	2	18:45	0.30	3	14:30	0.23	4	10:15	0.26
1	3:30	0.11	1	23:15	1.93	2	19:00	0.30	3	14:45	0.23	4	10:30	0.26
1	3:45	0.11	1	23:30	1.80	2	19:15	0.31	3	15:00	0.23	4	10:45	0.26
1	4:00	0.11	1	23:45	1.68	2	19:30	0.31	3	15:15	0.22	4	11:00	0.26
1	4:15	0.11	2	0:00	1.57	2	19:45	0.30	3	15:30	0.22	4	11:15	0.26
1	4:30	0.11	2	0:15	1.44	2	20:00	0.30	3	15:45	0.22	4	11:30	0.26
1	4:45	0.11	2	0:30	1.35	2	20:15	0.31	3	16:00	0.22	4	11:45	0.26
1	5:00	0.11	2	0:45	1.27	2	20:30	0.31	3	16:15	0.21	4	12:00	0.25
1	5:15	0.11	2	1:00	1.20	2	20:45	0.30	3	16:30	0.21	4	12:15	0.25
1	5:30	0.11	2	1:15	1.10	2	21:00	0.30	3	16:45	0.21	4	12:30	0.25
1	5:45	0.12	2	1:30	1.04	2	21:15	0.30	3	17:00	0.21	4	12:45	0.25
1	6:00	0.12	2	1:45	0.98	2	21:30	0.30	3	17:15	0.22	4	13:00	0.25
1	6:15	0.14	2	2:00	0.93	2	21:45	0.30	3	17:30	0.22	4	13:15	0.23
1	6:30	0.17	2	2:15	0.87	2	22:00	0.30	3	17:45	0.22	4	13:30	0.23
1	6:45	0.18	2	2:30	0.83	2	22:15	0.29	3	18:00	0.22	4	13:45	0.23
1	7:00	0.19	2	2:45	0.79	2	22:30	0.29	3	18:15	0.23	4	14:00	0.23
1	7:15	0.27	2	3:00	0.76	2	22:45	0.29	3	18:30	0.23	4	14:15	0.22
1	7:30	0.30	2	3:15	0.72	2	23:00	0.29	3	18:45	0.23	4	14:30	0.22
1	7:45	0.32	2	3:30	0.69	2	23:15	0.26	3	19:00	0.23	4	14:45	0.22
1	8:00	0.34	2	3:45	0.66	2	23:30	0.26	3	19:15	0.24	4	15:00	0.22
1	8:15	0.39	2	4:00	0.64	2	23:45	0.26	3	19:30	0.24	4	15:15	0.21
1	8:30	0.42	2	4:15	0.61	3	0:00	0.25	3	19:45	0.24	4	15:30	0.21
1	8:45	0.44	2	4:30	0.59	3	0:15	0.23	3	20:00	0.24	4	15:45	0.21
1	9:00	0.45	2	4:45	0.57	3	0:30	0.22	3	20:15	0.24	4	16:00	0.21
1	9:15	0.46	2	5:00	0.55	3	0:45	0.22	3	20:30	0.24	4	16:15	0.20
1	9:30	0.47	2	5:15	0.53	3	1:00	0.22	3	20:45	0.24	4	16:30	0.20
1	9:45	0.48	2	5:30	0.51	3	1:15	0.19	3	21:00	0.24	4	16:45	0.20
1	10:00	0.49	2	5:45	0.50	3	1:30	0.17	3	21:15	0.24	4	17:00	0.20
1	10:15	0.50	2	6:00	0.48	3	1:45	0.17	3	21:30	0.24	4	17:15	0.21
1	10:30	0.51	2	6:15	0.49	3	2:00	0.17	3	21:45	0.24	4	17:30	0.21
1	10:45	0.52	2	6:30	0.47	3	2:15	0.16	3	22:00	0.24	4	17:45	0.21
1	11:00	0.53	2	6:45	0.46	3	2:30	0.15	3	22:15	0.24	4	18:00	0.21
1	11:15	0.54	2	7:00	0.45	3	2:45	0.15	3	22:30	0.24	4	18:15	0.22
1	11:30	0.55	2	7:15	0.51	3	3:00	0.15	3	22:45	0.24	4	18:30	0.22
1	11:45	0.56	2	7:30	0.50	3	3:15	0.15	3	23:00	0.24	4	18:45	0.22
1	12:00	0.57	2	7:45	0.49	3	3:30	0.15	3	23:15	0.21	4	19:00	0.22
1	12:15	0.57	2	8:00	0.48	3	3:45	0.15	3	23:30	0.21	4	19:15	0.23
1	12:30	0.58	2	8:15	0.50	3	4:00	0.15	3	23:45	0.21	4	19:30	0.23
1	12:45	0.60	2	8:30	0.49	3	4:15	0.15	4	0:00	0.21	4	19:45	0.23
1	13:00	0.62	2	8:45	0.49	3	4:30	0.15	4	0:15	0.18	4	20:00	0.23
1	13:15	0.62	2	9:00	0.48	3	4:45	0.15	4	0:30	0.17	4	20:15	0.23
1	13:30	0.66	2	9:15	0.48	3	5:00	0.15	4	0:45	0.17	4	20:30	0.24
1	13:45	0.71	2	9:30	0.47	3	5:15	0.15	4	1:00	0.17	4	20:45	0.24
1	14:00	0.78	2	9:45	0.46	3	5:30	0.15	4	1:15	0.15	4	21:00	0.24
1	14:15	0.91	2	10:00	0.46	3	5:45	0.15	4	1:30	0.13	4	21:15	0.24
1	14:30	1.12	2	10:15	0.45	3	6:00	0.15	4	1:45	0.13	4	21:30	0.24
1	14:45	1.35	2	10:30	0.44	3	6:15	0.16	4	2:00	0.13	4	21:45	0.24
1	15:00	1.63	2	10:45	0.44	3	6:30	0.17	4	2:15	0.12	4	22:00	0.24
1	15:15	2.00	2	11:00	0.43	3	6:45	0.17	4	2:30	0.12	4	22:15	0.23
1	15:30	2.43	2	11:15	0.43	3	7:00	0.17	4	2:45	0.12	4	22:30	0.23
1	15:45	2.85	2	11:30	0.42	3	7:15	0.22	4	3:00	0.12	4	22:45	0.23
1	16:00	3.11	2	11:45	0.42	3	7:30	0.24	4	3:15	0.12	4	23:00	0.23
1	16:15	3.88	2	12:00	0.41	3	7:45	0.24	4	3:30	0.12			
1	16:30	4.30	2	12:15	0.40	3	8:00	0.24	4	3:45	0.12			
1	16:45	4.69	2	12:30	0.39	3	8:15	0.27	4	4:00	0.12			
1	17:00	4.78	2	12:45	0.39	3	8:30	0.27	4	4:15	0.12			
1	17:15	4.87	2	13:00	0.39	3	8:45	0.27	4	4:30	0.12			
1	17:30	4.95	2	13:15	0.37	3	9:00	0.27	4	4:45	0.12			
1	17:45	4.94	2	13:30	0.36	3	9:15	0.28	4	5:00	0.12			
1	18:00	4.84	2	13:45	0.36	3	9:30	0.28	4	5:15	0.12			
1	18:15	4.74	2	14:00	0.36	3	9:45	0.28	4	5:30	0.12			
1	18:30	4.66	2	14:15	0.34	3	10:00	0.28	4	5:45	0.12			
1	18:45	4.46	2	14:30	0.34	3	10:15	0.27	4	6:00	0.12			
1	19:00	4.29	2	14:45	0.33	3	10:30	0.27	4	6:15	0.13			
1	19:15	4.14	2	15:00	0.33	3	10:45	0.27	4	6:30	0.14			
1	19:30	3.96	2	15:15	0.32	3	11:00	0.27	4	6:45	0.14			
1	19:45	3.74	2	15:30	0.32	3	11:15	0.27	4	7:00	0.14			
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Dry Weather Flow

Weekday				Weekend			
Time	Flow CFS	Time	Flow CFS	Time	Flow CFS	Time	Flow CFS
0	0.16	20	0.24	0	0.16	20	0.24
0	0.15	20	0.23	0	0.16	20	0.23
1	0.13	20	0.22	1	0.15	20	0.24
1	0.12	21	0.23	1	0.14	21	0.23
1	0.12	21	0.24	1	0.13	21	0.21
1	0.11	21	0.24	1	0.12	21	0.23
2	0.11	21	0.24	2	0.11	21	0.22
2	0.10	22	0.23	2	0.12	22	0.24
2	0.10	22	0.23	2	0.12	22	0.21
2	0.11	22	0.23	2	0.10	22	0.22
3	0.11	22	0.22	3	0.11	22	0.21
3	0.10	23	0.21	3	0.11	23	0.18
3	0.11	23	0.21	3	0.11	23	0.19
3	0.11	23	0.20	3	0.12	23	0.20
4	0.11	23	0.19	4	0.12	23	0.19
4	0.11	24	0.19	4	0.11	24	0.18
4	0.11	24	0.17	4	0.11	24	0.17
4	0.11			4	0.12		
5	0.11			5	0.11		
5	0.12			5	0.12		
5	0.11			5	0.11		
5	0.11			5	0.10		
6	0.12			6	0.09		
6	0.14			6	0.11		
6	0.16			6	0.10		
6	0.18			6	0.12		
7	0.23			7	0.12		
7	0.25			7	0.13		
7	0.26			7	0.14		
7	0.26			7	0.16		
8	0.27			8	0.17		
8	0.27			8	0.20		
8	0.27			8	0.22		
8	0.25			8	0.23		
9	0.25			9	0.25		
9	0.25			9	0.27		
9	0.23			9	0.27		
9	0.24			9	0.30		
10	0.22			10	0.31		
10	0.23			10	0.30		
10	0.22			10	0.30		
10	0.23			10	0.29		
11	0.23			11	0.30		
11	0.23			11	0.30		
11	0.21			11	0.29		
11	0.22			11	0.30		
12	0.22			12	0.30		
12	0.21			12	0.30		
12	0.21			12	0.29		
12	0.21			12	0.27		
13	0.21			13	0.27		
13	0.20			13	0.27		
13	0.20			13	0.28		
13	0.19			13	0.27		
14	0.20			14	0.25		
14	0.19			14	0.25		
14	0.19			14	0.24		
14	0.19			14	0.26		
15	0.18			15	0.25		
15	0.19			15	0.23		
15	0.19			15	0.23		
15	0.19			15	0.22		
16	0.18			16	0.22		
16	0.17			16	0.23		
16	0.19			16	0.22		
16	0.19			16	0.22		
17	0.19			17	0.21		
17	0.20			17	0.23		
17	0.19			17	0.23		
17	0.20			17	0.24		
18	0.21			18	0.21		
18	0.21			18	0.22		
18	0.22			18	0.23		
18	0.22			18	0.22		
19	0.23			19	0.23		
19	0.24			19	0.23		
19	0.22			19	0.23		
19	0.22			19	0.22		
20	0.22			20	0.23		
Continued Next Column				Continued Next Column			

Town of Porter
Flow Analysis Summary
Morgan Meter Data
Table B3

10 year 1 hour storm

Day	Time	Flow CFS	Day	Time	Flow CFS	Day	Time	Flow CFS
1	0:15	0.02	1	19:30	0.04	2	14:45	0.03
1	0:30	0.02	1	19:45	0.04	2	15:00	0.03
1	0:45	0.02	1	20:00	0.04	2	15:15	0.03
1	1:00	0.02	1	20:15	0.04	2	15:30	0.03
1	1:15	0.02	1	20:30	0.04	2	15:45	0.03
1	1:30	0.02	1	20:45	0.04	2	16:00	0.03
1	1:45	0.02	1	21:00	0.04	2	16:15	0.03
1	2:00	0.02	1	21:15	0.04	2	16:30	0.03
1	2:15	0.01	1	21:30	0.04	2	16:45	0.03
1	2:30	0.01	1	21:45	0.04	2	17:00	0.03
1	2:45	0.01	1	22:00	0.04	2	17:15	0.03
1	3:00	0.01	1	22:15	0.03	2	17:30	0.03
1	3:15	0.01	1	22:30	0.03	2	17:45	0.03
1	3:30	0.01	1	22:45	0.03	2	18:00	0.03
1	3:45	0.01	1	23:00	0.03	2	18:15	0.03
1	4:00	0.01	1	23:15	0.03	2	18:30	0.04
1	4:15	0.01	1	23:30	0.03	2	18:45	0.04
1	4:30	0.01	1	23:45	0.03	2	19:00	0.04
1	4:45	0.01	2	0:00	0.03	2	19:15	0.04
1	5:00	0.01	2	0:15	0.02	2	19:30	0.04
1	5:15	0.01	2	0:30	0.02	2	19:45	0.04
1	5:30	0.04	2	0:45	0.02	2	20:00	0.04
1	5:45	0.11	2	1:00	0.02	2	20:15	0.04
1	6:00	0.17	2	1:15	0.02	2	20:30	0.04
1	6:15	0.23	2	1:30	0.02	2	20:45	0.04
1	6:30	0.18	2	1:45	0.02	2	21:00	0.04
1	6:45	0.13	2	2:00	0.02	2	21:15	0.04
1	7:00	0.10	2	2:15	0.01	2	21:30	0.04
1	7:15	0.10	2	2:30	0.01	2	21:45	0.04
1	7:30	0.08	2	2:45	0.01	2	22:00	0.04
1	7:45	0.07	2	3:00	0.01	2	22:15	0.03
1	8:00	0.06	2	3:15	0.01	2	22:30	0.03
1	8:15	0.06	2	3:30	0.01	2	22:45	0.03
1	8:30	0.06	2	3:45	0.01	2	23:00	0.03
1	8:45	0.05	2	4:00	0.01			
1	9:00	0.05	2	4:15	0.01			
1	9:15	0.05	2	4:30	0.01			
1	9:30	0.05	2	4:45	0.01			
1	9:45	0.05	2	5:00	0.01			
1	10:00	0.05	2	5:15	0.01			
1	10:15	0.04	2	5:30	0.01			
1	10:30	0.04	2	5:45	0.01			
1	10:45	0.04	2	6:00	0.01			
1	11:00	0.04	2	6:15	0.02			
1	11:15	0.04	2	6:30	0.02			
1	11:30	0.04	2	6:45	0.02			
1	11:45	0.04	2	7:00	0.02			
1	12:00	0.04	2	7:15	0.04			
1	12:15	0.04	2	7:30	0.04			
1	12:30	0.04	2	7:45	0.04			
1	12:45	0.04	2	8:00	0.04			
1	13:00	0.04	2	8:15	0.04			
1	13:15	0.04	2	8:30	0.04			
1	13:30	0.04	2	8:45	0.04			
1	13:45	0.04	2	9:00	0.04			
1	14:00	0.04	2	9:15	0.04			
1	14:15	0.03	2	9:30	0.04			
1	14:30	0.03	2	9:45	0.04			
1	14:45	0.03	2	10:00	0.04			
1	15:00	0.03	2	10:15	0.04			
1	15:15	0.03	2	10:30	0.04			
1	15:30	0.03	2	10:45	0.04			
1	15:45	0.03	2	11:00	0.04			
1	16:00	0.03	2	11:15	0.03			
1	16:15	0.03	2	11:30	0.03			
1	16:30	0.03	2	11:45	0.03			
1	16:45	0.03	2	12:00	0.03			
1	17:00	0.03	2	12:15	0.03			
1	17:15	0.03	2	12:30	0.03			
1	17:30	0.03	2	12:45	0.03			
1	17:45	0.03	2	13:00	0.03			
1	18:00	0.03	2	13:15	0.03			
1	18:15	0.04	2	13:30	0.03			
1	18:30	0.04	2	13:45	0.03			
1	18:45	0.04	2	14:00	0.03			
1	19:00	0.04	2	14:15	0.03			
1	19:15	0.04	2	14:30	0.03			
Continued Next Column			Continued Next Column					

1 year 1 hour storm

Day	Time	Flow CFS	Day	Time	Flow CFS	Day	Time	Flow CFS
1	0:15	0.02	1	19:30	0.04	2	14:45	0.03
1	0:30	0.02	1	19:45	0.04	2	15:00	0.03
1	0:45	0.02	1	20:00	0.04	2	15:15	0.03
1	1:00	0.02	1	20:15	0.04	2	15:30	0.03
1	1:15	0.02	1	20:30	0.04	2	15:45	0.03
1	1:30	0.02	1	20:45	0.04	2	16:00	0.03
1	1:45	0.02	1	21:00	0.04	2	16:15	0.03
1	2:00	0.02	1	21:15	0.04	2	16:30	0.03
1	2:15	0.01	1	21:30	0.04	2	16:45	0.03
1	2:30	0.01	1	21:45	0.04	2	17:00	0.03
1	2:45	0.01	1	22:00	0.04	2	17:15	0.03
1	3:00	0.01	1	22:15	0.03	2	17:30	0.03
1	3:15	0.01	1	22:30	0.03	2	17:45	0.03
1	3:30	0.01	1	22:45	0.03	2	18:00	0.03
1	3:45	0.01	1	23:00	0.03	2	18:15	0.03
1	4:00	0.01	1	23:15	0.03	2	18:30	0.04
1	4:15	0.01	1	23:30	0.03	2	18:45	0.04
1	4:30	0.01	1	23:45	0.03	2	19:00	0.04
1	4:45	0.01	2	0:00	0.03	2	19:15	0.04
1	5:00	0.01	2	0:15	0.02	2	19:30	0.04
1	5:15	0.01	2	0:30	0.02	2	19:45	0.04
1	5:30	0.02	2	0:45	0.02	2	20:00	0.04
1	5:45	0.05	2	1:00	0.02	2	20:15	0.04
1	6:00	0.09	2	1:15	0.02	2	20:30	0.04
1	6:15	0.12	2	1:30	0.02	2	20:45	0.04
1	6:30	0.10	2	1:45	0.02	2	21:00	0.04
1	6:45	0.08	2	2:00	0.02	2	21:15	0.04
1	7:00	0.07	2	2:15	0.01	2	21:30	0.04
1	7:15	0.07	2	2:30	0.01	2	21:45	0.04
1	7:30	0.07	2	2:45	0.01	2	22:00	0.04
1	7:45	0.06	2	3:00	0.01	2	22:15	0.03
1	8:00	0.06	2	3:15	0.01	2	22:30	0.03
1	8:15	0.05	2	3:30	0.01	2	22:45	0.03
1	8:30	0.05	2	3:45	0.01	2	23:00	0.03
1	8:45	0.05	2	4:00	0.01			
1	9:00	0.05	2	4:15	0.01			
1	9:15	0.04	2	4:30	0.01			
1	9:30	0.04	2	4:45	0.01			
1	9:45	0.04	2	5:00	0.01			
1	10:00	0.04	2	5:15	0.01			
1	10:15	0.04	2	5:30	0.01			
1	10:30	0.04	2	5:45	0.01			
1	10:45	0.04	2	6:00	0.01			
1	11:00	0.04	2	6:15	0.02			
1	11:15	0.04	2	6:30	0.02			
1	11:30	0.04	2	6:45	0.02			
1	11:45	0.04	2	7:00	0.02			
1	12:00	0.04	2	7:15	0.04			
1	12:15	0.04	2	7:30	0.04			
1	12:30	0.03	2	7:45	0.04			
1	12:45	0.03	2	8:00	0.04			
1	13:00	0.03	2	8:15	0.04			
1	13:15	0.04	2	8:30	0.04			
1	13:30	0.04	2	8:45	0.04			
1	13:45	0.04	2	9:00	0.04			
1	14:00	0.04	2	9:15	0.04			
1	14:15	0.03	2	9:30	0.04			
1	14:30	0.03	2	9:45	0.04			
1	14:45	0.03	2	10:00	0.04			
1	15:00	0.03	2	10:15	0.04			
1	15:15	0.03	2	10:30	0.04			
1	15:30	0.03	2	10:45	0.04			
1	15:45	0.03	2	11:00	0.04			
1	16:00	0.03	2	11:15	0.03			
1	16:15	0.03	2	11:30	0.03			
1	16:30	0.03	2	11:45	0.03			
1	16:45	0.03	2	12:00	0.03			
1	17:00	0.03	2	12:15	0.03			
1	17:15	0.03	2	12:30	0.03			
1	17:30	0.03	2	12:45	0.03			
1	17:45	0.03	2	13:00	0.03			
1	18:00	0.03	2	13:15	0.03			
1	18:15	0.04	2	13:30	0.03			
1	18:30	0.04	2	13:45	0.03			
1	18:45	0.04	2	14:00	0.03			
1	19:00	0.04	2	14:15	0.03			
1	19:15	0.04	2	14:30	0.03			
Continued Next Column			Continued Next Column					

Town of Porter
Flow Analysis Summary
Morgan Meter Data
Table B3 (cont.)

50 year 18 hour storm								
Day	Time	Flow CFS	Day	Time	Flow CFS	Day	Time	Flow CFS
1	0:15	0.02	1	20:00	0.30	2	15:45	0.03
1	0:30	0.02	1	20:15	0.28	2	16:00	0.03
1	0:45	0.02	1	20:30	0.26	2	16:15	0.03
1	1:00	0.02	1	20:45	0.24	2	16:30	0.03
1	1:15	0.02	1	21:00	0.22	2	16:45	0.03
1	1:30	0.02	1	21:15	0.21	2	17:00	0.03
1	1:45	0.02	1	21:30	0.20	2	17:15	0.03
1	2:00	0.02	1	21:45	0.19	2	17:30	0.03
1	2:15	0.01	1	22:00	0.18	2	17:45	0.03
1	2:30	0.01	1	22:15	0.17	2	18:00	0.03
1	2:45	0.01	1	22:30	0.17	2	18:15	0.04
1	3:00	0.01	1	22:45	0.17	2	18:30	0.04
1	3:15	0.01	1	23:00	0.16	2	18:45	0.04
1	3:30	0.01	1	23:15	0.14	2	19:00	0.04
1	3:45	0.01	1	23:30	0.12	2	19:15	0.04
1	4:00	0.01	1	23:45	0.11	2	19:30	0.04
1	4:15	0.01	2	0:00	0.09	2	19:45	0.04
1	4:30	0.01	2	0:15	0.08	2	20:00	0.04
1	4:45	0.01	2	0:30	0.07	2	20:15	0.04
1	5:00	0.01	2	0:45	0.06	2	20:30	0.04
1	5:15	0.01	2	1:00	0.06	2	20:45	0.04
1	5:30	0.01	2	1:15	0.05	2	21:00	0.04
1	5:45	0.01	2	1:30	0.05	2	21:15	0.04
1	6:00	0.02	2	1:45	0.04	2	21:30	0.04
1	6:15	0.02	2	2:00	0.04	2	21:45	0.04
1	6:30	0.03	2	2:15	0.04	2	22:00	0.04
1	6:45	0.03	2	2:30	0.03	2	22:15	0.03
1	7:00	0.03	2	2:45	0.03	2	22:30	0.03
1	7:15	0.05	2	3:00	0.03	2	22:45	0.03
1	7:30	0.06	2	3:15	0.03	2	23:00	0.03
1	7:45	0.06	2	3:30	0.03			
1	8:00	0.06	2	3:45	0.02			
1	8:15	0.06	2	4:00	0.02			
1	8:30	0.07	2	4:15	0.02			
1	8:45	0.07	2	4:30	0.02			
1	9:00	0.07	2	4:45	0.02			
1	9:15	0.06	2	5:00	0.02			
1	9:30	0.06	2	5:15	0.02			
1	9:45	0.06	2	5:30	0.02			
1	10:00	0.06	2	5:45	0.02			
1	10:15	0.06	2	6:00	0.02			
1	10:30	0.06	2	6:15	0.02			
1	10:45	0.06	2	6:30	0.02			
1	11:00	0.06	2	6:45	0.02			
1	11:15	0.06	2	7:00	0.02			
1	11:30	0.06	2	7:15	0.04			
1	11:45	0.06	2	7:30	0.04			
1	12:00	0.06	2	7:45	0.04			
1	12:15	0.06	2	8:00	0.04			
1	12:30	0.06	2	8:15	0.04			
1	12:45	0.06	2	8:30	0.04			
1	13:00	0.07	2	8:45	0.04			
1	13:15	0.07	2	9:00	0.04			
1	13:30	0.07	2	9:15	0.04			
1	13:45	0.08	2	9:30	0.04			
1	14:00	0.08	2	9:45	0.04			
1	14:15	0.09	2	10:00	0.04			
1	14:30	0.09	2	10:15	0.04			
1	14:45	0.10	2	10:30	0.04			
1	15:00	0.11	2	10:45	0.04			
1	15:15	0.12	2	11:00	0.04			
1	15:30	0.13	2	11:15	0.03			
1	15:45	0.14	2	11:30	0.03			
1	16:00	0.15	2	11:45	0.03			
1	16:15	0.25	2	12:00	0.03			
1	16:30	0.37	2	12:15	0.03			
1	16:45	0.50	2	12:30	0.03			
1	17:00	0.53	2	12:45	0.03			
1	17:15	0.55	2	13:00	0.03			
1	17:30	0.57	2	13:15	0.04			
1	17:45	0.56	2	13:30	0.03			
1	18:00	0.53	2	13:45	0.03			
1	18:15	0.51	2	14:00	0.03			
1	18:30	0.49	2	14:15	0.03			
1	18:45	0.45	2	14:30	0.03			
1	19:00	0.42	2	14:45	0.03			
1	19:15	0.39	2	15:00	0.03			
1	19:30	0.37	2	15:15	0.03			
1	19:45	0.33	2	15:30	0.03			
Continued Next Column			Continued Next Column					

Dry Weather Flow							
Weekday				Weekend			
Time	Flow CFS	Time	Flow CFS	Time	Flow CFS	Time	Flow CFS
0	0.02	20	0.04	0	0.02	20.0	0.04
0	0.02	20	0.04	0	0.01	20.0	0.04
1	0.02	20	0.03	1	0.02	20.0	0.04
1	0.02	21	0.03	1	0.02	21.0	0.04
1	0.02	21	0.04	1	0.02	21.0	0.04
1	0.02	21	0.04	1	0.02	21.0	0.04
2	0.02	21	0.04	2	0.01	21.0	0.04
2	0.01	22	0.04	2	0.01	22.0	0.03
2	0.01	22	0.04	2	0.01	22.0	0.03
2	0.01	22	0.03	2	0.02	22.0	0.03
3	0.01	22	0.03	3	0.01	22.0	0.04
3	0.01	23	0.03	3	0.01	23.0	0.03
3	0.01	23	0.03	3	0.01	23.0	0.02
3	0.01	23	0.03	3	0.01	23.0	0.02
4	0.01	23	0.02	4	0.01	23.0	0.03
4	0.01	24	0.03	4	0.01	24.0	0.02
4	0.01	24	0.02	4	0.01	24.0	0.02
4	0.01			4	0.01		
5	0.01			5	0.01		
5	0.01			5	0.01		
5	0.01			5	0.01		
5	0.01			5	0.01		
6	0.01			6	0.01		
6	0.02			6	0.01		
6	0.02			6	0.01		
6	0.02			6	0.01		
7	0.03			7	0.01		
7	0.05			7	0.01		
7	0.05			7	0.02		
7	0.05			7	0.02		
8	0.04			8	0.02		
8	0.04			8	0.02		
8	0.05			8	0.03		
8	0.04			8	0.03		
9	0.03			9	0.04		
9	0.04			9	0.03		
9	0.03			9	0.04		
9	0.03			9	0.04		
10	0.03			10	0.05		
10	0.03			10	0.04		
10	0.03			10	0.04		
10	0.03			10	0.04		
11	0.03			11	0.04		
11	0.03			11	0.04		
11	0.03			11	0.04		
11	0.03			11	0.04		
12	0.03			12	0.04		
12	0.03			12	0.03		
12	0.03			12	0.03		
12	0.03			12	0.04		
13	0.03			13	0.04		
13	0.03			13	0.04		
13	0.03			13	0.05		
13	0.03			13	0.04		
14	0.03			14	0.03		
14	0.03			14	0.03		
14	0.03			14	0.03		
14	0.03			14	0.03		
15	0.03			15	0.03		
15	0.02			15	0.03		
15	0.03			15	0.03		
15	0.03			15	0.03		
16	0.03			16	0.03		
16	0.03			16	0.03		
16	0.03			16	0.03		
16	0.03			16	0.03		
17	0.03			17	0.04		
17	0.03			17	0.03		
17	0.03			17	0.04		
17	0.03			17	0.04		
18	0.04			18	0.04		
18	0.04			18	0.04		
18	0.04			18	0.04		
18	0.03			18	0.03		
19	0.03			19	0.05		
19	0.04			19	0.04		
19	0.04			19	0.03		
19	0.04			19	0.04		
20	0.04			20	0.03		
Continued Next Column				Continued Next Column			

Town of Porter
Flow Analysis Summary
Porter Cove Meter Data
Table B4

10 year 1 hour storm

Day	Time	Flow CFS	Day	Time	Flow CFS	Day	Time	Flow CFS
1	0:15	0.03	1	19:30	0.13	2	14:45	0.08
1	0:30	0.04	1	19:45	0.13	2	15:00	0.08
1	0:45	0.04	1	20:00	0.12	2	15:15	0.07
1	1:00	0.04	1	20:15	0.13	2	15:30	0.07
1	1:15	0.03	1	20:30	0.13	2	15:45	0.07
1	1:30	0.03	1	20:45	0.13	2	16:00	0.07
1	1:45	0.03	1	21:00	0.13	2	16:15	0.08
1	2:00	0.03	1	21:15	0.13	2	16:30	0.08
1	2:15	0.02	1	21:30	0.12	2	16:45	0.08
1	2:30	0.02	1	21:45	0.12	2	17:00	0.08
1	2:45	0.02	1	22:00	0.12	2	17:15	0.09
1	3:00	0.02	1	22:15	0.11	2	17:30	0.09
1	3:15	0.02	1	22:30	0.11	2	17:45	0.09
1	3:30	0.02	1	22:45	0.11	2	18:00	0.09
1	3:45	0.02	1	23:00	0.11	2	18:15	0.10
1	4:00	0.02	1	23:15	0.08	2	18:30	0.10
1	4:15	0.02	1	23:30	0.08	2	18:45	0.10
1	4:30	0.02	1	23:45	0.08	2	19:00	0.10
1	4:45	0.02	2	0:00	0.08	2	19:15	0.11
1	5:00	0.02	2	0:15	0.06	2	19:30	0.11
1	5:15	0.02	2	0:30	0.06	2	19:45	0.11
1	5:30	0.02	2	0:45	0.06	2	20:00	0.11
1	5:45	0.03	2	1:00	0.06	2	20:15	0.11
1	6:00	0.04	2	1:15	0.04	2	20:30	0.11
1	6:15	0.11	2	1:30	0.04	2	20:45	0.11
1	6:30	0.13	2	1:45	0.04	2	21:00	0.11
1	6:45	0.13	2	2:00	0.04	2	21:15	0.11
1	7:00	0.13	2	2:15	0.04	2	21:30	0.11
1	7:15	0.18	2	2:30	0.04	2	21:45	0.11
1	7:30	0.18	2	2:45	0.04	2	22:00	0.11
1	7:45	0.18	2	3:00	0.04	2	22:15	0.09
1	8:00	0.18	2	3:15	0.03	2	22:30	0.09
1	8:15	0.17	2	3:30	0.03	2	22:45	0.09
1	8:30	0.17	2	3:45	0.03	2	23:00	0.09
1	8:45	0.17	2	4:00	0.03			
1	9:00	0.16	2	4:15	0.03			
1	9:15	0.16	2	4:30	0.03			
1	9:30	0.16	2	4:45	0.03			
1	9:45	0.15	2	5:00	0.03			
1	10:00	0.15	2	5:15	0.04			
1	10:15	0.16	2	5:30	0.04			
1	10:30	0.15	2	5:45	0.03			
1	10:45	0.15	2	6:00	0.03			
1	11:00	0.15	2	6:15	0.06			
1	11:15	0.15	2	6:30	0.06			
1	11:30	0.15	2	6:45	0.06			
1	11:45	0.15	2	7:00	0.06			
1	12:00	0.14	2	7:15	0.12			
1	12:15	0.13	2	7:30	0.12			
1	12:30	0.13	2	7:45	0.12			
1	12:45	0.13	2	8:00	0.12			
1	13:00	0.13	2	8:15	0.11			
1	13:15	0.12	2	8:30	0.11			
1	13:30	0.12	2	8:45	0.11			
1	13:45	0.12	2	9:00	0.11			
1	14:00	0.12	2	9:15	0.10			
1	14:15	0.11	2	9:30	0.10			
1	14:30	0.11	2	9:45	0.10			
1	14:45	0.11	2	10:00	0.10			
1	15:00	0.11	2	10:15	0.11			
1	15:15	0.10	2	10:30	0.11			
1	15:30	0.10	2	10:45	0.11			
1	15:45	0.10	2	11:00	0.10			
1	16:00	0.10	2	11:15	0.10			
1	16:15	0.11	2	11:30	0.10			
1	16:30	0.10	2	11:45	0.10			
1	16:45	0.10	2	12:00	0.10			
1	17:00	0.10	2	12:15	0.09			
1	17:15	0.11	2	12:30	0.09			
1	17:30	0.11	2	12:45	0.09			
1	17:45	0.11	2	13:00	0.09			
1	18:00	0.11	2	13:15	0.08			
1	18:15	0.12	2	13:30	0.08			
1	18:30	0.12	2	13:45	0.08			
1	18:45	0.12	2	14:00	0.08			
1	19:00	0.12	2	14:15	0.08			
1	19:15	0.13	2	14:30	0.08			
Continued Next Column			Continued Next Column					

1 year 1 hour storm

Day	Time	Flow CFS	Day	Time	Flow CFS	Day	Time	Flow CFS
1	0:15	0.03	1	19:30	0.10	2	14:45	0.07
1	0:30	0.04	1	19:45	0.10	2	15:00	0.07
1	0:45	0.04	1	20:00	0.10	2	15:15	0.06
1	1:00	0.04	1	20:15	0.11	2	15:30	0.06
1	1:15	0.03	1	20:30	0.11	2	15:45	0.06
1	1:30	0.03	1	20:45	0.11	2	16:00	0.06
1	1:45	0.03	1	21:00	0.11	2	16:15	0.07
1	2:00	0.03	1	21:15	0.11	2	16:30	0.07
1	2:15	0.02	1	21:30	0.11	2	16:45	0.07
1	2:30	0.02	1	21:45	0.11	2	17:00	0.07
1	2:45	0.02	1	22:00	0.11	2	17:15	0.08
1	3:00	0.02	1	22:15	0.09	2	17:30	0.08
1	3:15	0.02	1	22:30	0.09	2	17:45	0.08
1	3:30	0.02	1	22:45	0.09	2	18:00	0.08
1	3:45	0.02	1	23:00	0.09	2	18:15	0.09
1	4:00	0.02	1	23:15	0.06	2	18:30	0.09
1	4:15	0.02	1	23:30	0.06	2	18:45	0.09
1	4:30	0.02	1	23:45	0.06	2	19:00	0.09
1	4:45	0.02	2	0:00	0.06	2	19:15	0.10
1	5:00	0.02	2	0:15	0.04	2	19:30	0.10
1	5:15	0.02	2	0:30	0.04	2	19:45	0.10
1	5:30	0.02	2	0:45	0.04	2	20:00	0.10
1	5:45	0.02	2	1:00	0.04	2	20:15	0.11
1	6:00	0.03	2	1:15	0.03	2	20:30	0.11
1	6:15	0.06	2	1:30	0.03	2	20:45	0.11
1	6:30	0.06	2	1:45	0.03	2	21:00	0.11
1	6:45	0.06	2	2:00	0.03	2	21:15	0.10
1	7:00	0.06	2	2:15	0.02	2	21:30	0.10
1	7:15	0.12	2	2:30	0.02	2	21:45	0.10
1	7:30	0.12	2	2:45	0.02	2	22:00	0.10
1	7:45	0.12	2	3:00	0.02	2	22:15	0.09
1	8:00	0.12	2	3:15	0.02	2	22:30	0.09
1	8:15	0.11	2	3:30	0.02	2	22:45	0.09
1	8:30	0.11	2	3:45	0.02	2	23:00	0.09
1	8:45	0.11	2	4:00	0.02			
1	9:00	0.11	2	4:15	0.02			
1	9:15	0.11	2	4:30	0.02			
1	9:30	0.10	2	4:45	0.02			
1	9:45	0.10	2	5:00	0.02			
1	10:00	0.10	2	5:15	0.02			
1	10:15	0.11	2	5:30	0.02			
1	10:30	0.11	2	5:45	0.02			
1	10:45	0.11	2	6:00	0.02			
1	11:00	0.11	2	6:15	0.05			
1	11:15	0.11	2	6:30	0.05			
1	11:30	0.11	2	6:45	0.05			
1	11:45	0.11	2	7:00	0.05			
1	12:00	0.11	2	7:15	0.11			
1	12:15	0.09	2	7:30	0.11			
1	12:30	0.09	2	7:45	0.11			
1	12:45	0.09	2	8:00	0.11			
1	13:00	0.09	2	8:15	0.10			
1	13:15	0.08	2	8:30	0.10			
1	13:30	0.08	2	8:45	0.10			
1	13:45	0.08	2	9:00	0.10			
1	14:00	0.08	2	9:15	0.09			
1	14:15	0.08	2	9:30	0.09			
1	14:30	0.07	2	9:45	0.09			
1	14:45	0.07	2	10:00	0.09			
1	15:00	0.07	2	10:15	0.10			
1	15:15	0.07	2	10:30	0.10			
1	15:30	0.07	2	10:45	0.10			
1	15:45	0.07	2	11:00	0.10			
1	16:00	0.07	2	11:15	0.10			
1	16:15	0.08	2	11:30	0.10			
1	16:30	0.08	2	11:45	0.10			
1	16:45	0.08	2	12:00	0.10			
1	17:00	0.08	2	12:15	0.08			
1	17:15	0.08	2	12:30	0.08			
1	17:30	0.08	2	12:45	0.08			
1	17:45	0.08	2	13:00	0.08			
1	18:00	0.08	2	13:15	0.08			
1	18:15	0.09	2	13:30	0.08			
1	18:30	0.09	2	13:45	0.08			
1	18:45	0.09	2	14:00	0.08			
1	19:00	0.09	2	14:15	0.07			
1	19:15	0.10	2	14:30	0.07			
Continued Next Column			Continued Next Column					

Town of Porter
Flow Analysis Summary
Porter Cove Meter Data
Table B4 (cont.)

50 year 18 hour storm									Dry Weather Flow							
									Weekday				Weekend			
Day	Time	Flow CFS	Day	Time	Flow CFS	Day	Time	Flow CFS	Time	Flow CFS	Time	Flow CFS	Time	Flow CFS	Time	Flow CFS
1	0:15	0.03	1	20:15	0.74	2	16:15	0.12	0	0.03	20	0.10	0	0.04	20	0.10
1	0:30	0.04	1	20:30	0.72	2	16:30	0.12	0	0.03	20	0.11	0	0.04	20	0.10
1	0:45	0.04	1	20:45	0.70	2	16:45	0.12	1	0.03	20	0.11	1	0.04	20	0.10
1	1:00	0.04	1	21:00	0.69	2	17:00	0.12	1	0.02	21	0.11	1	0.03	21	0.10
1	1:15	0.03	1	21:15	0.67	2	17:15	0.13	1	0.02	21	0.11	1	0.03	21	0.10
1	1:30	0.03	1	21:30	0.65	2	17:30	0.13	1	0.02	21	0.10	1	0.03	21	0.10
1	1:45	0.03	1	21:45	0.63	2	17:45	0.12	2	0.02	21	0.09	2	0.03	21	0.10
1	2:00	0.03	1	22:00	0.62	2	18:00	0.12	2	0.02	22	0.10	2	0.02	22	0.10
1	2:15	0.02	1	22:15	0.59	2	18:15	0.13	2	0.02	22	0.09	2	0.03	22	0.09
1	2:30	0.02	1	22:30	0.58	2	18:30	0.13	2	0.02	22	0.08	2	0.02	22	0.084
1	2:45	0.02	1	22:45	0.57	2	18:45	0.13	3	0.02	22	0.08	3	0.03	22	0.074
1	3:00	0.02	1	23:00	0.56	2	19:00	0.13	3	0.02	23	0.07	3	0.02	23	0.066
1	3:15	0.02	1	23:15	0.51	2	19:15	0.14	3	0.02	23	0.06	3	0.02	23	0.057
1	3:30	0.02	1	23:30	0.49	2	19:30	0.14	3	0.02	23	0.05	3	0.02	23	0.058
1	3:45	0.02	1	23:45	0.47	2	19:45	0.14	4	0.02	23	0.05	4	0.02	23	0.055
1	4:00	0.02	2	0:00	0.45	2	20:00	0.14	4	0.02	24	0.04	4	0.02	24	0.05
1	4:15	0.02	2	0:15	0.41	2	20:15	0.14	4	0.02	24	0.04	4	0.02	24	0.039
1	4:30	0.02	2	0:30	0.39	2	20:30	0.14	4	0.02			4	0.02		
1	4:45	0.02	2	0:45	0.38	2	20:45	0.14	5	0.02			5	0.02		
1	5:00	0.02	2	1:00	0.37	2	21:00	0.14	5	0.02			5	0.02		
1	5:15	0.02	2	1:15	0.34	2	21:15	0.14	5	0.02			5	0.02		
1	5:30	0.02	2	1:30	0.33	2	21:30	0.14	5	0.03			5	0.02		
1	5:45	0.02	2	1:45	0.32	2	21:45	0.14	6	0.04			6	0.02		
1	6:00	0.02	2	2:00	0.30	2	22:00	0.14	6	0.04			6	0.02		
1	6:15	0.05	2	2:15	0.29	2	22:15	0.12	6	0.06			6	0.03		
1	6:30	0.05	2	2:30	0.28	2	22:30	0.12	6	0.09			6	0.03		
1	6:45	0.05	2	2:45	0.27	2	22:45	0.12	7	0.12			7	0.03		
1	7:00	0.05	2	3:00	0.26	2	23:00	0.12	7	0.12			7	0.04		
1	7:15	0.11	2	3:15	0.25	2	23:15	0.09	7	0.14			7	0.04		
1	7:30	0.11	2	3:30	0.24	2	23:30	0.09	7	0.14			7	0.04		
1	7:45	0.11	2	3:45	0.23	2	23:45	0.09	8	0.12			8	0.05		
1	8:00	0.11	2	4:00	0.22	3	0:00	0.09	8	0.11			8	0.07		
1	8:15	0.10	2	4:15	0.22	3	0:15	0.07	8	0.10			8	0.08		
1	8:30	0.10	2	4:30	0.21	3	0:30	0.07	8	0.09			8	0.08		
1	8:45	0.10	2	4:45	0.20	3	0:45	0.07	9	0.09			9	0.09		
1	9:00	0.10	2	5:00	0.20	3	1:00	0.07	9	0.08			9	0.11		
1	9:15	0.10	2	5:15	0.19	3	1:15	0.05	9	0.08			9	0.12		
1	9:30	0.10	2	5:30	0.19	3	1:30	0.05	9	0.08			9	0.13		
1	9:45	0.10	2	5:45	0.18	3	1:45	0.05	10	0.08			10	0.15		
1	10:00	0.10	2	6:00	0.18	3	2:00	0.05	10	0.08			10	0.14		
1	10:15	0.11	2	6:15	0.20	3	2:15	0.05	10	0.07			10	0.14		
1	10:30	0.11	2	6:30	0.19	3	2:30	0.05	10	0.07			10	0.14		
1	10:45	0.11	2	6:45	0.19	3	2:45	0.05	11	0.09			11	0.14		
1	11:00	0.11	2	7:00	0.19	3	3:00	0.05	11	0.08			11	0.14		
1	11:15	0.11	2	7:15	0.24	3	3:15	0.04	11	0.08			11	0.14		
1	11:30	0.11	2	7:30	0.23	3	3:30	0.04	11	0.07			11	0.12		
1	11:45	0.11	2	7:45	0.23	3	3:45	0.04	12	0.07			12	0.13		
1	12:00	0.11	2	8:00	0.23	3	4:00	0.04	12	0.07			12	0.13		
1	12:15	0.10	2	8:15	0.21	3	4:15	0.04	12	0.07			12	0.12		
1	12:30	0.10	2	8:30	0.21	3	4:30	0.04	12	0.07			12	0.11		
1	12:45	0.10	2	8:45	0.21	3	4:45	0.04	13	0.07			13	0.11		
1	13:00	0.11	2	9:00	0.20	3	5:00	0.04	13	0.06			13	0.11		
1	13:15	0.10	2	9:15	0.19	3	5:15	0.04	13	0.06			13	0.11		
1	13:30	0.11	2	9:30	0.19	3	5:30	0.04	13	0.06			13	0.10		
1	13:45	0.12	2	9:45	0.19	3	5:45	0.04	14	0.07			14	0.10		
1	14:00	0.13	2	10:00	0.19	3	6:00	0.04	14	0.05			14	0.11		
1	14:15	0.14	2	10:15	0.19	3	6:15	0.07	14	0.05			14	0.11		
1	14:30	0.17	2	10:30	0.19	3	6:30	0.07	14	0.04			14	0.09		
1	14:45	0.19	2	10:45	0.18	3	6:45	0.07	15	0.05			15	0.09		
1	15:00	0.23	2	11:00	0.18	3	7:00	0.07	15	0.05			15	0.10		
1	15:15	0.27	2	11:15	0.18	3	7:15	0.12	15	0.05			15	0.10		
1	15:30	0.32	2	11:30	0.18	3	7:30	0.12	15	0.05			15	0.08		
1	15:45	0.37	2	11:45	0.17	3	7:45	0.12	16	0.06			16	0.09		
1	16:00	0.42	2	12:00	0.17	3	8:00	0.12	16	0.06			16	0.09		
1	16:15	0.49	2	12:15	0.16	3	8:15	0.11	16	0.06			16	0.10		
1	16:30	0.56	2	12:30	0.16	3	8:30	0.11	16	0.07			16	0.09		
1	16:45	0.62	2	12:45	0.16	3	8:45	0.11	17	0.07			17	0.09		
1	17:00	0.65	2	13:00	0.15	3	9:00	0.11	17	0.07			17	0.09		
1	17:15	0.69	2	13:15	0.14	3	9:15	0.11	17	0.07			17	0.09		
1	17:30	0.73	2	13:30	0.14	3	9:30	0.11	17	0.07			17	0.10		
1	17:45	0.75	2	13:45	0.14	3	9:45	0.11	18	0.08			18	0.09		
1	18:00	0.76	2	14:00	0.14	3	10:00	0.11	18	0.08			18	0.11		
1	18:15	0.78	2	14:15	0.13	3	10:15	0.11	18	0.08			18	0.11		
1	18:30	0.79	2	14:30	0.13	3	10:30	0.11	18	0.08			18	0.11		
1	18:45	0.79	2	14:45	0.13	3	10:45	0.11	19	0.09			19	0.11		
1	19:00	0.78	2	15:00	0.13	3	11:00	0.11	19	0.09			19	0.11		
1	19:15	0.79	2	15:15	0.12	3	11:15	0.11	19	0.10			19	0.11		
1	19:30	0.78	2	15:30	0.12	3	11:30	0.11	19	0.10			19	0.11		
1	19:45	0.77	2	15:45	0.12	3	11:45	0.11	20	0.10			20	0.11		
1	20:00	0.75	2	16:00	0.12	3	12:00	0.11	Continued Next Column				Continued Next Column			
Continued Next Column			Continued Next Colum													

Town of Porter
Flow Analysis Summary
S. 23rd St. Meter Data
Table B5

10 year 1 hour storm			1 year 1 hour storm			50 year 18 hour storm			Dry Weather Flow			
									Weekday		Weekend	
Day	Time	Flow CFS	Day	Time	Flow CFS	Day	Time	Flow CFS	Time	Flow CFS	Time	Flow CFS
1	1:00	0.03	1	1:00	0.03	1	1:00	0.03	0	0.03	0	0.03
1	2:00	0.04	1	2:00	0.04	1	2:00	0.04	1	0.04	1	0.03
1	3:00	0.04	1	3:00	0.04	1	3:00	0.04	2	0.04	2	0.03
1	4:00	0.04	1	4:00	0.04	1	4:00	0.04	3	0.05	3	0.03
1	5:00	0.03	1	5:00	0.03	1	5:00	0.03	4	0.04	4	0.02
1	6:00	0.04	1	6:00	0.04	1	6:00	0.04	5	0.04	5	0.03
1	7:00	0.84	1	7:00	0.33	1	7:00	0.06	6	0.06	6	0.03
1	8:00	0.43	1	8:00	0.23	1	8:00	0.09	7	0.06	7	0.04
1	9:00	0.28	1	9:00	0.17	1	9:00	0.13	8	0.05	8	0.04
1	10:00	0.19	1	10:00	0.13	1	10:00	0.16	9	0.06	9	0.06
1	11:00	0.13	1	11:00	0.09	1	11:00	0.16	10	0.05	10	0.06
1	12:00	0.12	1	12:00	0.09	1	12:00	0.17	11	0.06	11	0.06
1	13:00	0.11	1	13:00	0.08	1	13:00	0.18	12	0.06	12	0.06
1	14:00	0.08	1	14:00	0.07	1	14:00	0.19	13	0.05	13	0.04
1	15:00	0.08	1	15:00	0.06	1	15:00	0.31	14	0.05	14	0.05
1	16:00	0.07	1	16:00	0.06	1	16:00	0.60	15	0.05	15	0.05
1	17:00	0.07	1	17:00	0.06	1	17:00	0.83	16	0.05	16	0.05
1	18:00	0.06	1	18:00	0.05	1	18:00	1.02	17	0.05	17	0.03
1	19:00	0.07	1	19:00	0.07	1	19:00	0.85	18	0.06	18	0.07
1	20:00	0.07	1	20:00	0.06	1	20:00	0.71	19	0.06	19	0.04
1	21:00	0.07	1	21:00	0.06	1	21:00	0.52	20	0.06	20	0.04
1	22:00	0.07	1	22:00	0.06	1	22:00	0.41	21	0.06	21	0.06
1	23:00	0.04	1	23:00	0.04	1	23:00	0.30	22	0.04	22	0.03
2	0:00	0.04	2	0:00	0.04	2	0:00	0.27	23	0.03	23	0.02
2	1:00	0.04	2	1:00	0.04	2	1:00	0.19				
2	2:00	0.04	2	2:00	0.04	2	2:00	0.14				
2	3:00	0.04	2	3:00	0.04	2	3:00	0.12				
2	4:00	0.05	2	4:00	0.04	2	4:00	0.10				
2	5:00	0.04	2	5:00	0.04	2	5:00	0.08				
2	6:00	0.04	2	6:00	0.04	2	6:00	0.08				
2	7:00	0.05	2	7:00	0.05	2	7:00	0.08				
2	8:00	0.06	2	8:00	0.06	2	8:00	0.08				
2	9:00	0.05	2	9:00	0.05	2	9:00	0.07				
2	10:00	0.06	2	10:00	0.06	2	10:00	0.08				
2	11:00	0.05	2	11:00	0.05	2	11:00	0.07				
2	12:00	0.06	2	12:00	0.06	2	12:00	0.07				
2	13:00	0.06	2	13:00	0.06	2	13:00	0.07				
2	14:00	0.05	2	14:00	0.05	2	14:00	0.06				
2	15:00	0.05	2	15:00	0.05	2	15:00	0.06				
2	16:00	0.05	2	16:00	0.05	2	16:00	0.06				
2	17:00	0.05	2	17:00	0.05	2	17:00	0.06				
2	18:00	0.05	2	18:00	0.04	2	18:00	0.05				
2	19:00	0.06	2	19:00	0.06	2	19:00	0.07				
2	20:00	0.06	2	20:00	0.06	2	20:00	0.06				
2	21:00	0.06	2	21:00	0.06	2	21:00	0.06				
2	22:00	0.06	2	22:00	0.06	2	22:00	0.06				
2	23:00	0.03	2	23:00	0.03	2	23:00	0.04				

Town of Porter Flow Analysis Summary Un-Metered Areas Table B6			
Dry Weather Flow			
Weekday		Weekend	
Time	Flow CFS	Time	Flow CFS
0	0.04	0	0.05
1	0.03	1	0.04
2	0.03	2	0.03
3	0.03	3	0.02
4	0.03	4	0.02
5	0.05	5	0.03
6	0.13	6	0.04
7	0.16	7	0.07
8	0.12	8	0.12
9	0.12	9	0.17
10	0.12	10	0.17
11	0.11	11	0.16
12	0.10	12	0.14
13	0.10	13	0.12
14	0.08	14	0.12
15	0.09	15	0.11
16	0.10	16	0.11
17	0.11	17	0.11
18	0.12	18	0.11
19	0.13	19	0.11
20	0.15	20	0.13
21	0.13	21	0.12
22	0.11	22	0.09
23	0.07	23	0.07

TECHNICAL MEMORANDUM

Date: 2/11/2011

Subject: Long Term Control Plan - Chesterton, Indiana
WWTP Wet Weather Storage Volume Estimation

1.0 Objective

The objective of this memorandum is to describe the methodology that was used to determine the storage volume required at the Chesterton wastewater treatment plant to store/treat the combined sewer inflow corresponding to the 1-yr 1-hr and the 10-yr 1-hr design storms. The analysis utilizes observed rainfall and flow meter data in conjunction with the PCSWMM hydraulic/hydrologic model for flow simulation.

2.0 Storm Event Selection

The rainfall data for selected storm events and concurrent flow meter data at the Meter 5 (the 8th and Carla meter location) were utilized and a total of 18 storm events between August 2006 and July 2010 were analyzed in this study (see **Table C1**). The return interval of the storm events shown in **Table C1** is determined using the recurrence interval for the maximum 1-hr rainfall depth during the storm event as illustrated below:

1. Obtain the 5 minute interval rainfall data for the storm event
2. For each data point, calculate the total rainfall for the succeeding one hour. For example, if the current rainfall data point being considered is at 1:00 AM, the 1-hr total rainfall for that data point is the total rainfall for the succeeding one hour, which is the sum of the rainfall at 1:00 AM, 1:05 AM, … and 1:55 AM.
3. Look up the 1-hr total rainfall in the Rainfall Frequency Atlas of the Midwest – Bulletin 71, Indiana Section 1 to get the 1-hr recurrence interval (see **Table 2.1**)
4. The 1-hr recurrence interval for the storm is the largest 1-hr recurrence interval for the storm event.

Of the 18 storm events considered in this study, six events (with start dates 7/8/08, 8/4/08, 9/4/08, 9/12/08, 5/13/09, 5/13/10) were considered to have unreliable rainfall or flow meter data because the flow meter data did not correspond well with the rainfall data (see **Table C1** and **Figures C1 to C6** for additional information). Five other events (with start dates 8/19/07, 8/22/07, 10/10/07, 11/21/07, 4/5/09) with recurrence intervals less than the 2 month return period were considered to be too small to be used for calibration (see **Table C1**) since the intent of this study is to develop storms with return periods of 1-yr and 10-yr. The response of the sewer-shed to such small events is expected to be significantly different from that of the 1-yr and 10-yr storms. The remaining 7 events have 1-hr return period between 4 months to 2-yr. Of these 7 events, 3 storms (with start dates 1/7/08, 6/23/10, 7/24/10) have features that do not make it ideal for calibration (see **Figures C7 to C9** for explanation); these events were utilized as check storms for comparison of the simulated results with the observed data; such comparisons reveal characteristics of the data and the limitations of the hydraulic model developed herein. The four remaining storm events (with start dates 8/23/06, 8/28/06, 9/12/06, and 8/15/07) were selected for calibration.

Table C1: Concurrent Rainfall & Flow Meter Data

From Date	To Date	Total Rainfall (in)	Duration (hr)	1- hr recurrence	Event Category	Comment
8/23/06 6:50 PM	8/23/06 7:30 PM	1.01	0.67	6 month	Calibration Event	Good event
8/28/06 10:50 AM	8/28/06 3:40 PM	1.96	4.83	6 month	Calibration Event	Good event
9/12/06 7:25 PM	9/12/06 9:55 PM	1.52	2.40	1 year	Calibration Event	Good event
8/15/07 6:00 PM	8/15/07 9:55 PM	1.04	4.00	6 month	Calibration Event	Good event
8/19/07 8:50 AM	8/20/07 5:35 PM	2.13	32.83	< 2 month	Not used	Event too small
8/22/07 11:25 PM	8/23/07 4:30 PM	1.01	17.17	< 2 month	Not used	Event too small
10/10/07 9:25 PM	10/11/07 8:00 PM	0.79	22.67	< 2 month	Not used	Event too small
11/21/07 2:25 AM	11/21/07 11:45 PM	1.19	21.42	< 2 month	Not used	Event too small
1/7/08 6:45 PM	1/8/08 10:40 PM	3.3	28.00	4 month	Check Storm	Possible snow melt impacts
7/8/08 6:40 PM	7/8/08 10:00 PM	1.53	3.42	1 year	Not used	Problem with Meter Output Negative flow
8/4/08 2:50 PM	8/5/08 3:10 AM	2.48	12.42	2 year	Not used	Problem with Meter Output Negative flow
9/4/08 5:00 AM	9/5/08 4:55 AM	4.08	24.00	1 year	Not used	Problem with Meter Output Negative flow
9/12/08 12:10 AM	9/14/08 5:55 PM	12.15	65.83	1 year	Not used	Problem with Meter Output Data missing
4/5/09 9:15 AM	4/6/09 1:30 AM	1.59	16.33	< 2 month	Not used	Event too small
5/13/09 11:00 PM	5/14/09 1:30 AM	1.15	2.58	6 month	Not Used	Antecedent flow too high
5/13/10 12:45 AM	5/13/10 11:15 AM	2.13	10.58	6 month	Not used	Bad match between rainfall & flow data
6/23/10 9:00 AM	6/23/10 9:45 PM	2.26	12.83	4 month	Check Storm	Large 5-min burst in rainfall
7/24/10 12:00 AM	7/24/10 11:45 PM	3.54	23.83	2 year	Check Storm	2-yr return interval larger than others

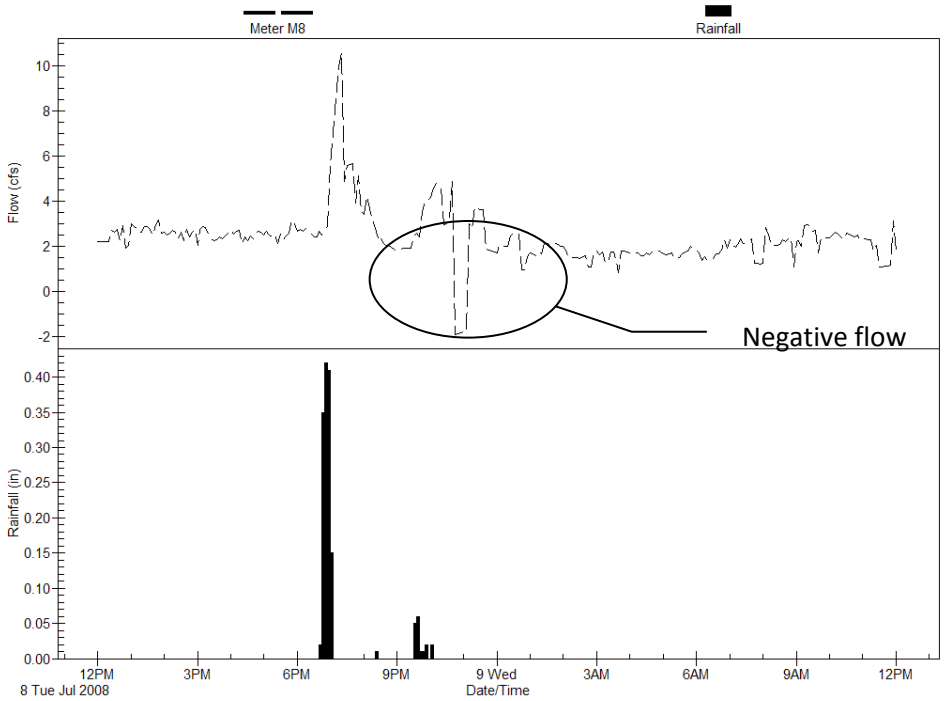


Figure C1 Questionable Data- 2008-07-08 Event

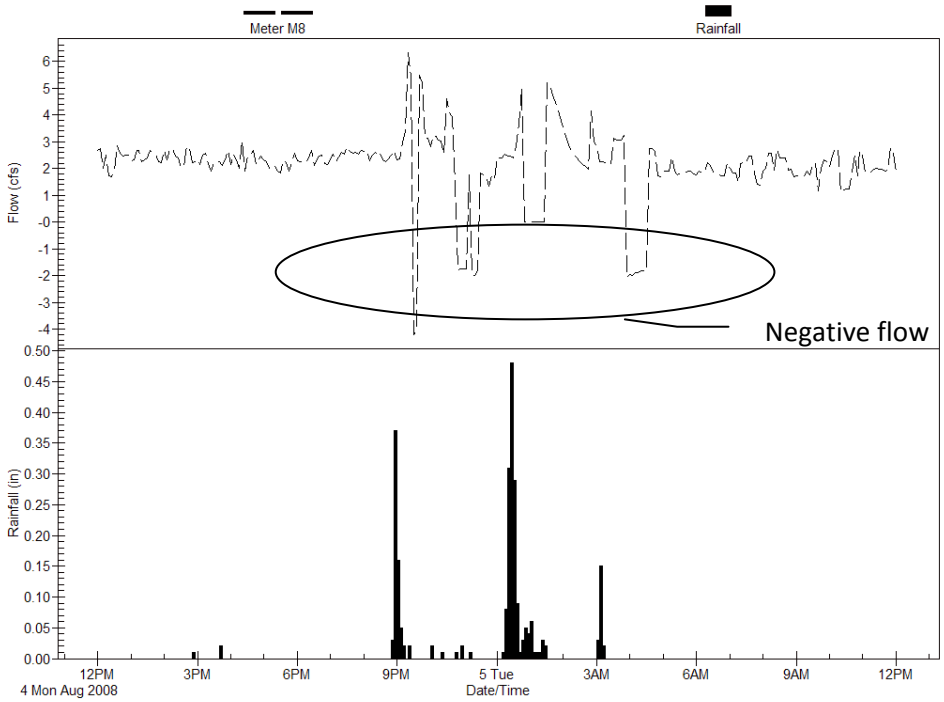


Figure C2 Questionable Data - 2008-08-04 Event

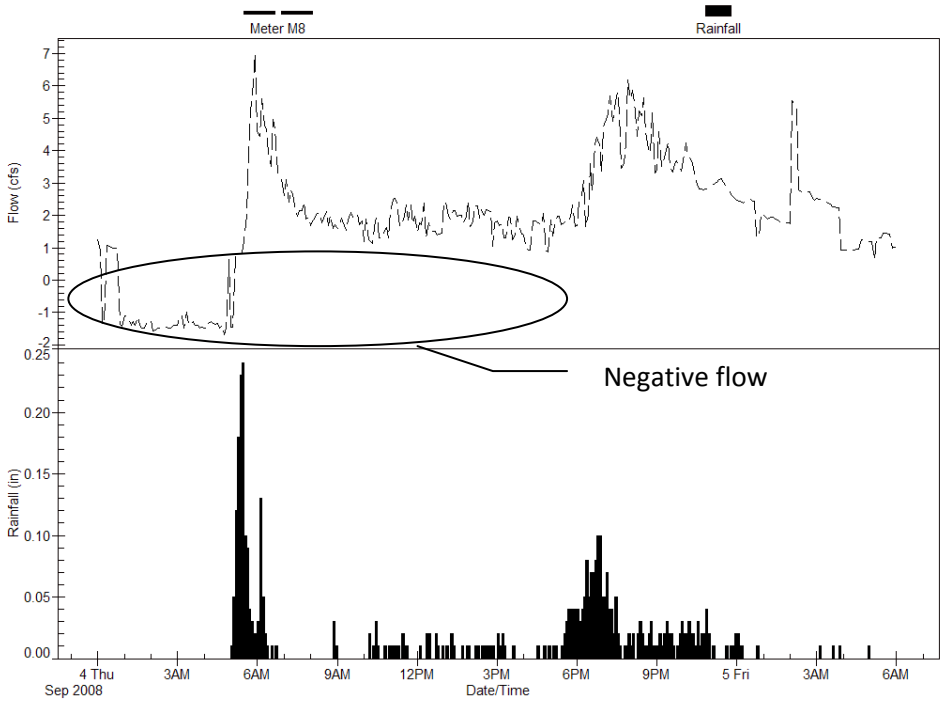


Figure C3 Questionable Data - 2008-09-04 Event

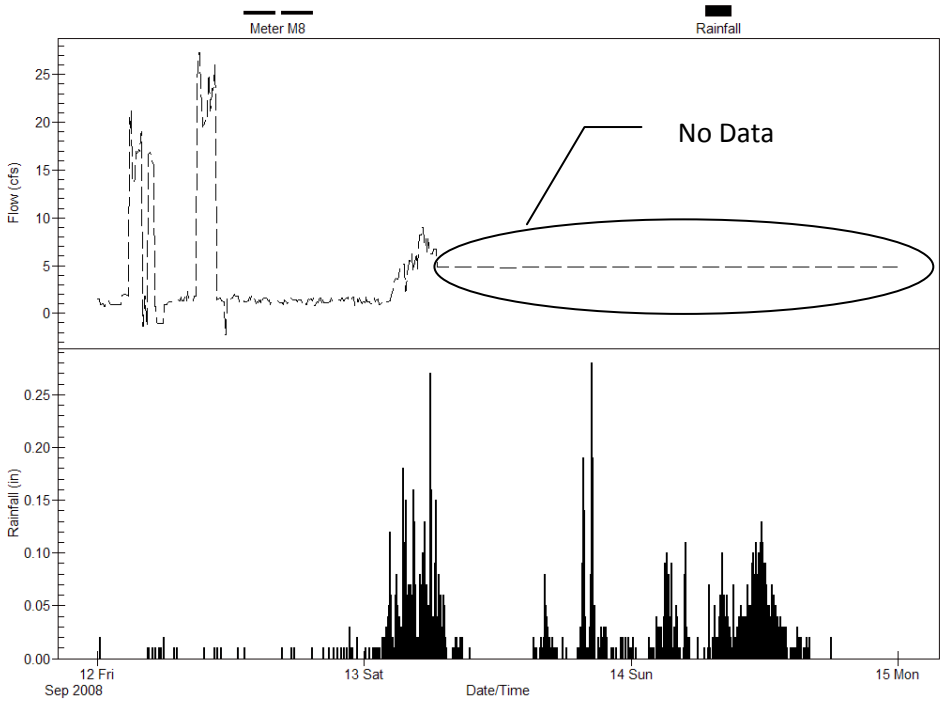


Figure C4 Questionable Data - 2008-09-12 Event

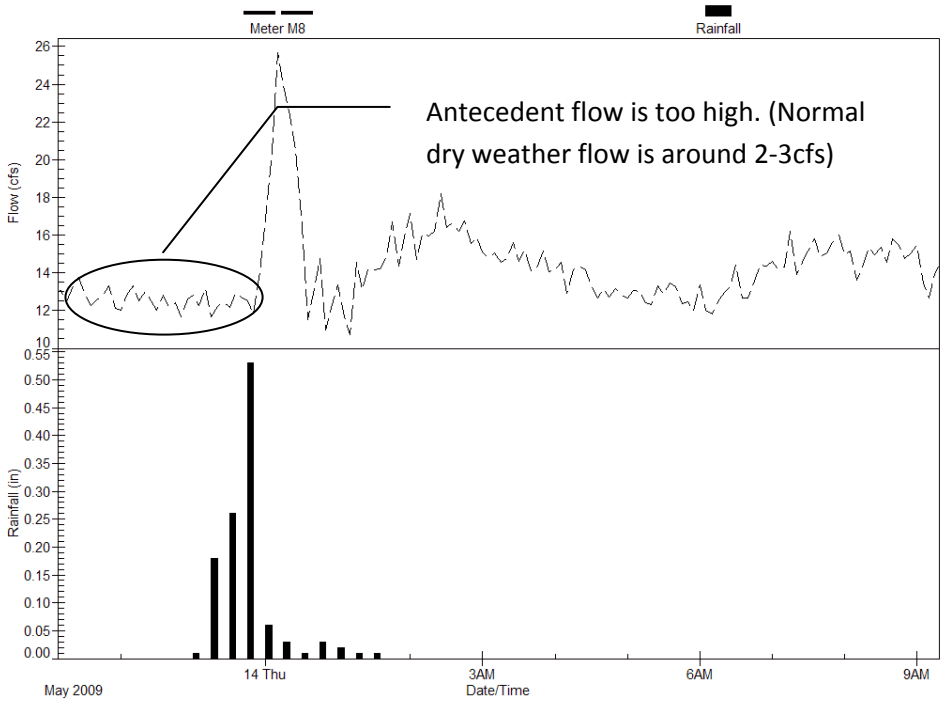


Figure C5 Questionable Data - 2009-05-13 Event

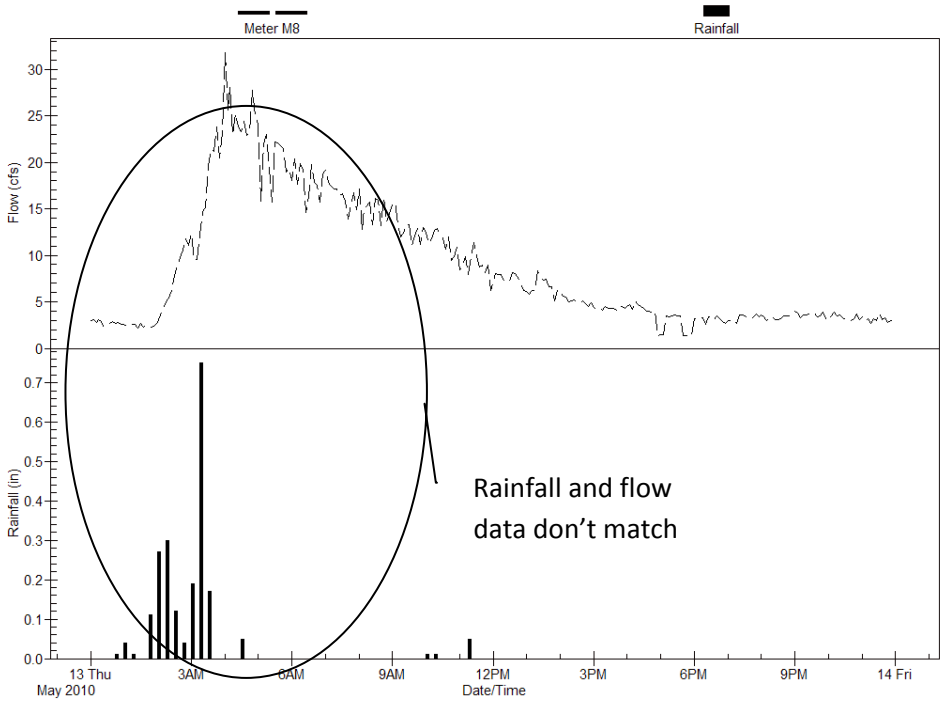


Figure C6 Questionable Data - 2010-05-13 Event

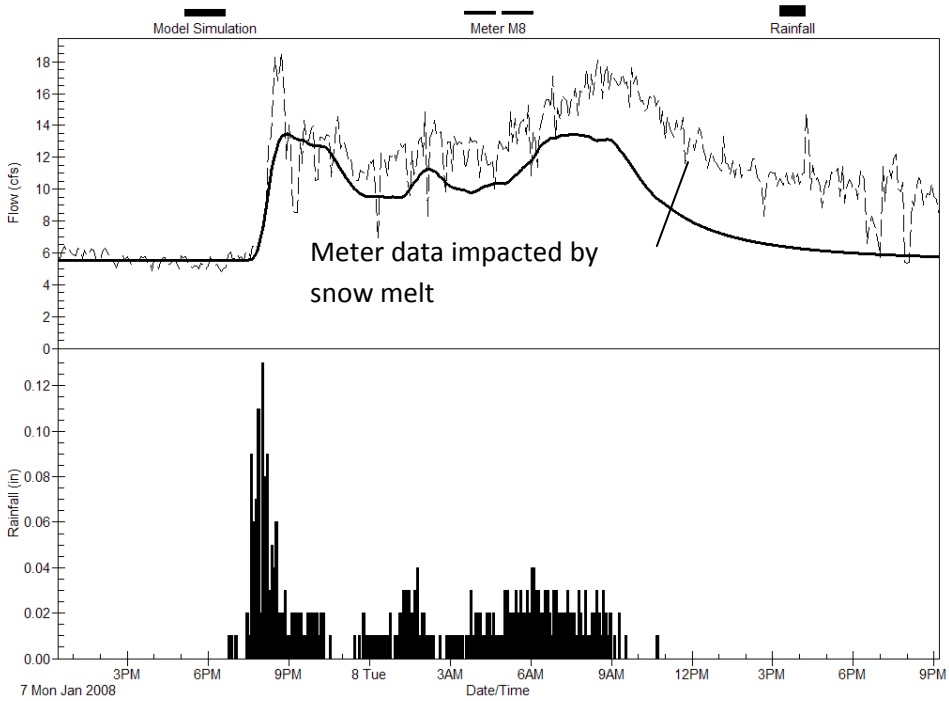


Figure C7 Check Storm Results/Data for the 2008-01-07 Event

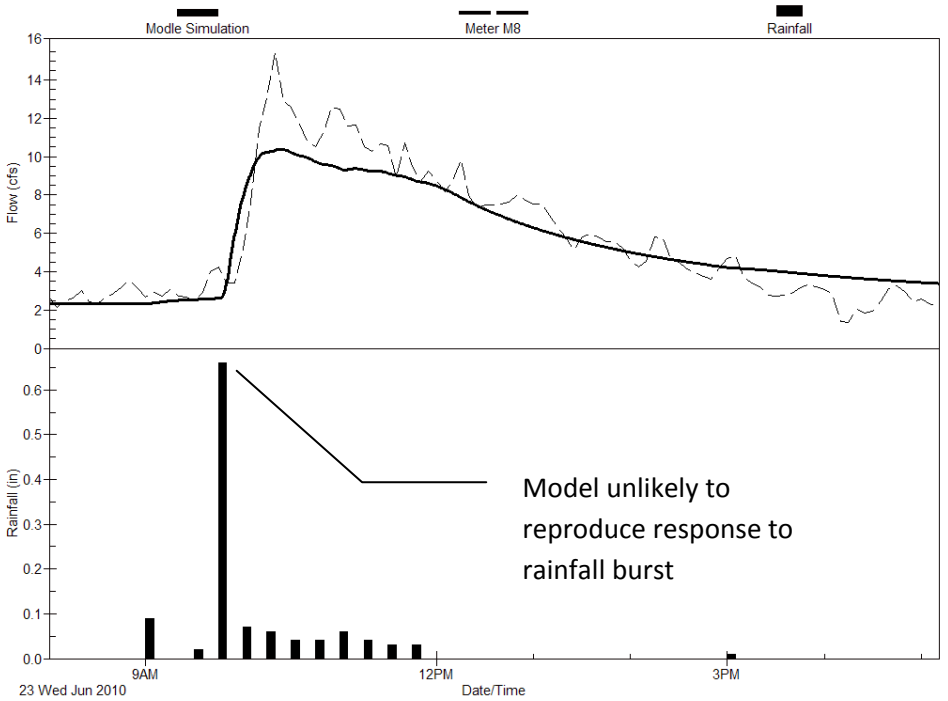


Figure C8 Check Storm Results/Data for the 2010-06-23 Event

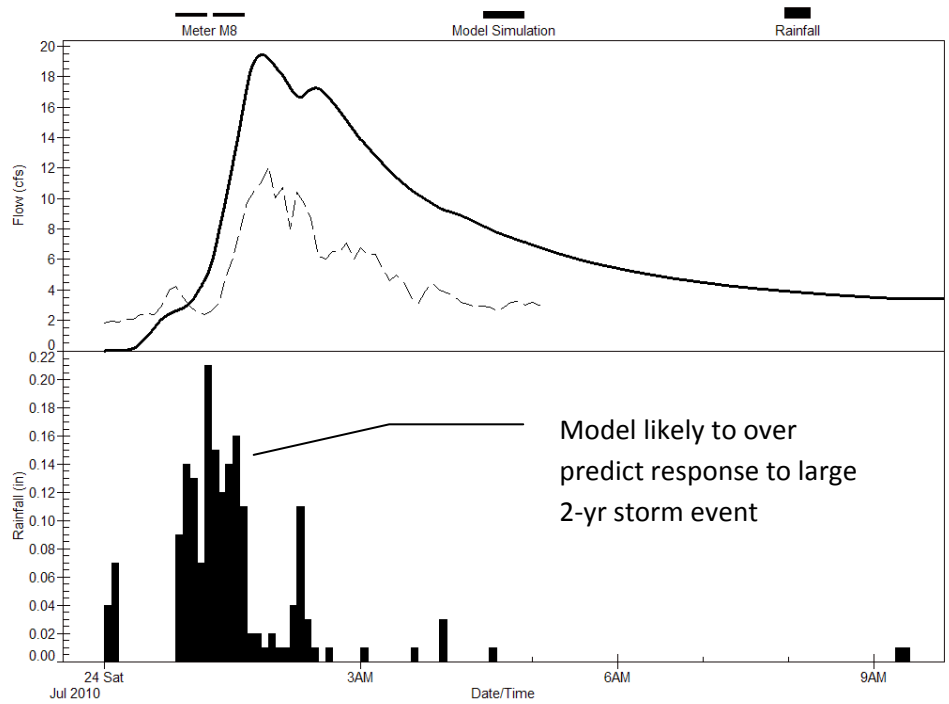


Figure C9 Check Storm Results for the 2010-07-24 Event

It is unfortunate that storms with characteristics close to the 10-year 1-hour event did not occur during the flow monitoring period considered herein. It is however felt that utilizing a hydraulic model calibrated to a 1-yr 1-hr design storm will provide a conservative inflow hydrograph for the 10-yr 1-hr event, because it is likely that a 10-yr event will cause localized surcharging utilizing storage in the collection system (since typically combined sewer systems are designed for events less than the 10-yr event) which will reduce the peak 10-yr inflow.

3.0 Model Development

As shown in Figure 2.1, the WWTP accepts flows from 3 metered catchments and an unmetered catchment.

1. Meter 1: WWTP influent meter
2. Meter 3: Porter principal meter
3. Meter 4: Marquardt and Penny meter
4. Meter 8: 8th and Carla meter
5. Unmetered area

Meters 3 and 4 are meters/areas in the Town of Porter's collection system that convey sanitary sewer flows but are influenced by wet weather, while Meter 8 is on a system that also includes combined

sewers. Therefore the flow contribution from Meter 8 is significantly larger than the other metered areas. Since the Unmetered Area is a very small sanitary sewer-shed area, the wet weather flow component from this area is ignored.

3.1 Flow monitoring data

A previous report (Sanitary Sewer Baseline Flow Analysis Summary Report, Town of Porter, April 2010**)** estimated the 1-yr 1-hr and the 10-yr 1-hr inflow hydrographs and the corresponding dry weather flow contribution for Meters 3 and 4. These flows were directly utilized in this study to determine the corresponding inflows from these areas. The Baseline report is included in **Appendix B**.

Determination of dry weather flow entering the Chesterton WWTP is discussed in Section 2.8.11 of this Report.

3.2 SWMM Model for Meter 8 area

As shown in **Figure C1**, the Meter 8 collection system was modeled as two sub catchments, catchment 51, a 700 acre area with separated storm and sanitary sewer system and catchment 52, a 58.2 acre area with combined system. It should be noted that this is a simplified model of the sewer-shed since individual smaller sub catchments and sewer distribution network (pipes, manholes, junction boxes etc) are not modeled in detail.

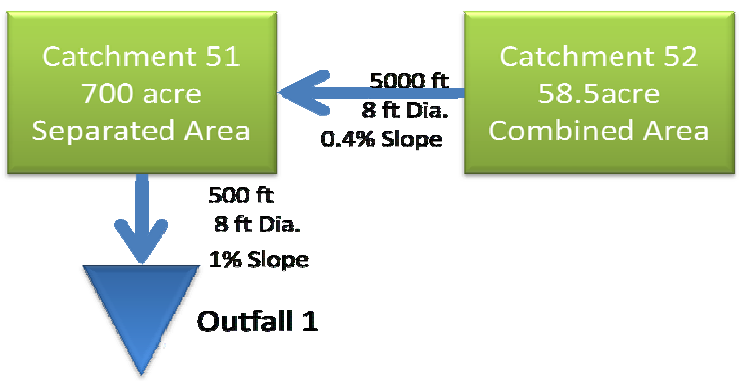


Figure C10 SWMM Model Schematic

Rainfall abstraction is calculated using Horton's methodology in the SWMM model. Horton's equation, describes infiltration at a given point in time by:

$$f_p = f_c + (f_0 - fc) \times e^{-Bt}$$

where:

f_c = final asymptotic rate of infiltration ([INFIL2] in SWMM)

f_0 = maximum infiltration rate ([INFIL1] in SWMM)

B = rate of decay ([INFIL3] in SWMM)

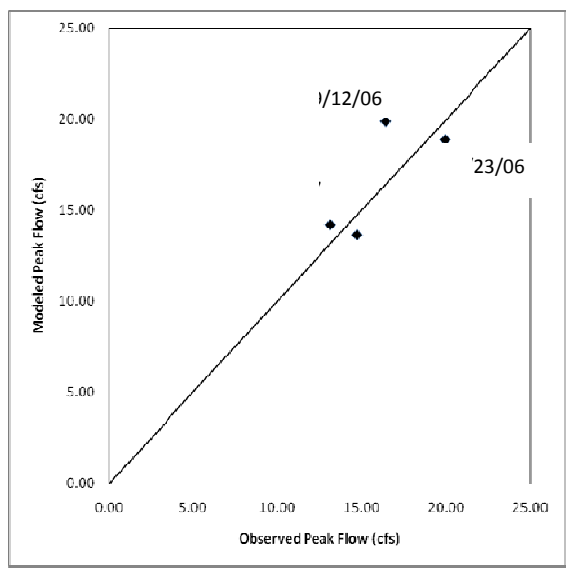
The calibration parameters in the SWMM model for the two sub catchments are the area, width, % impervious, roughness values for the pervious areas and impervious areas, and the three infiltration parameters. All parameters, except the sub catchment areas (which were measured from a map of the area) were calibrated to the selected storm events. The model was calibrated using the PCSWMM Genetic Algorithm Calibration (GAC) tool (refer to Paragraph 5.0 of this Appendix for a description of the GAC procedures). The final calibrated values for the parameters are shown in **Table C2**.

Table C2 Calibrated SWMM Runoff module parameters

Parameters	51	52
WIDTH	489.8	343.5
WAREA	700	58.5
IMPERV	1.462	36.54
WSLOPE	0.000552	0.001657
IMPER_N	0.04577	0.04577
PERV_N	0.3949	0.3949
INFIL1	4.418	4.418
INFIL2	0.889	0.889
INFIL3	0.0183	0.0183

The estimated flow travel length for combined area 52 (see **Figure C10**) using the calibrated values is 7418 ft (WAREA/WIDTH) which is a reasonable estimate based on measurements of the map of the area. Since the study area is fairly flat, the calibrated slope values (WSLOPE) appear to be reasonable.

The 5000 ft pipe in **Figure C10** approximates the actual distance between areas 51 and 52. This hydraulic component provides for attenuation and shift of the peak flow from the combined basin to the meter location and provides better calibration results.



The dry weather flow is modeled as constant flow during the calibration process, which was calculated by averaging the flows from the dry period immediately before the storm event.

3.3 Calibration Results

As indicated and discussed in Section 2.0, the model was calibrated using 4 storms events (see **Table C1**). The calibration results are shown in **Figures C11 to C14**.

The focus of the calibration was to obtain a good match of the overall volume, and the timing and peak of the flow hydrograph when comparing the simulated results

to the observed flow meter data. The calibrated model predictions for the four events are relatively good as shown by the comparison of the simulated and observed peak flow, time to peak, and flow volumes in **Figures C15 to C17.**

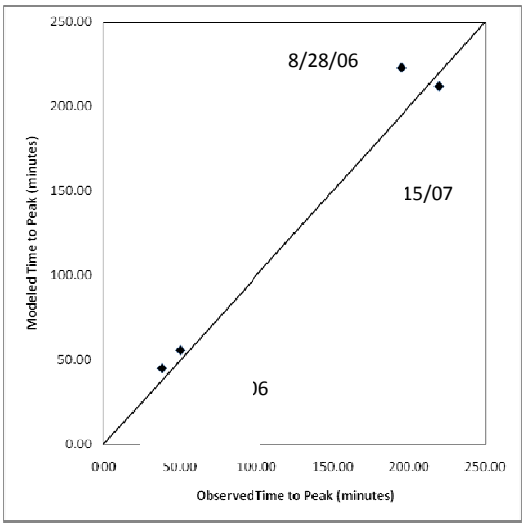


Figure C16 Comparison of Time to Peak

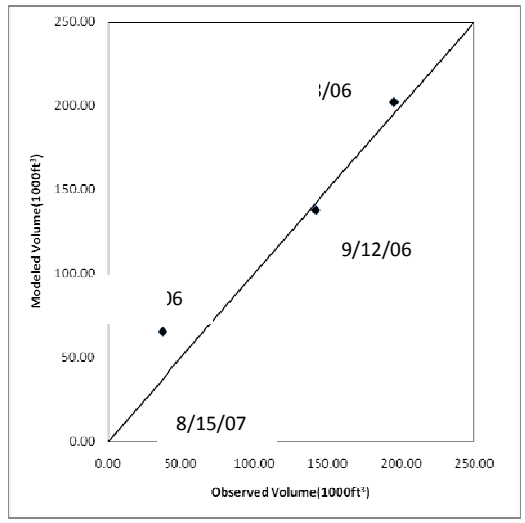


Figure C17 Comparison of Flow Volume

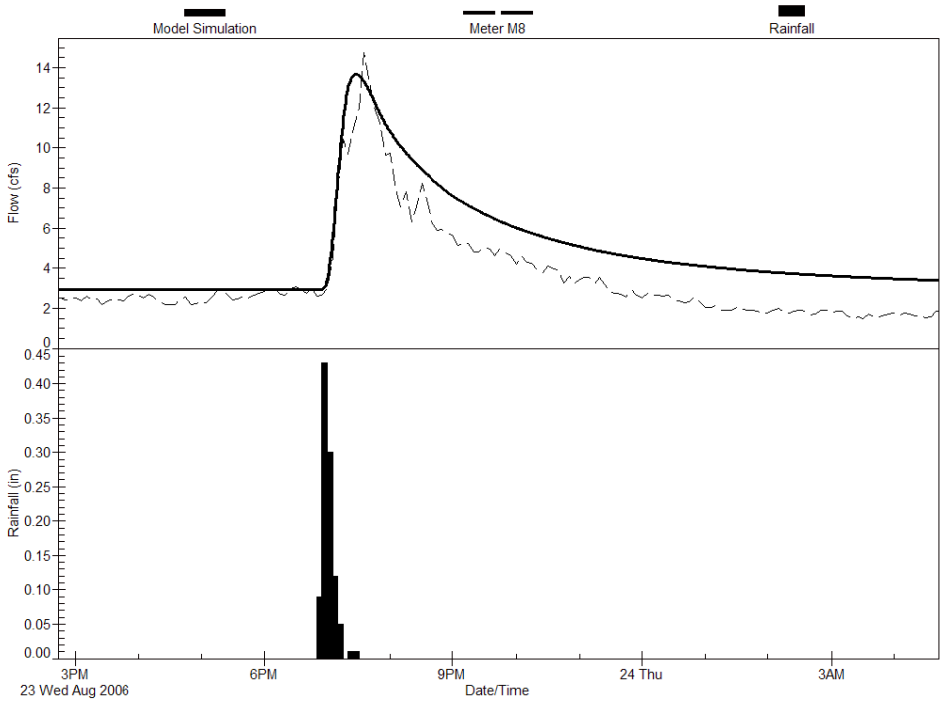


Figure C11 Calibration Data/Results for the 2006-08-23 Event

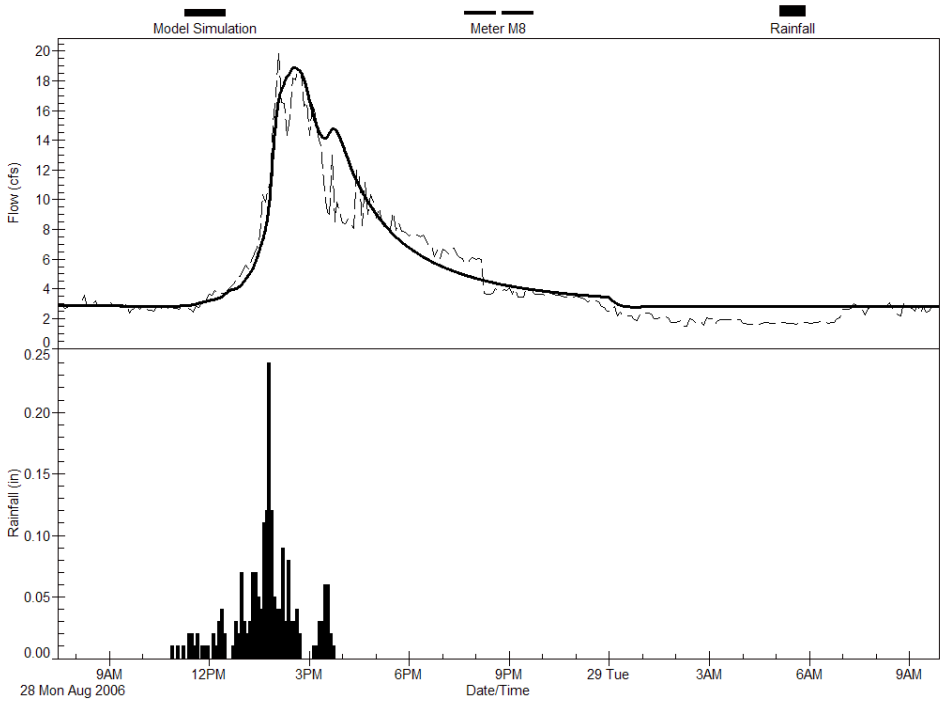


Figure C12 Calibration Data/Results for the 2006-08-28 Event

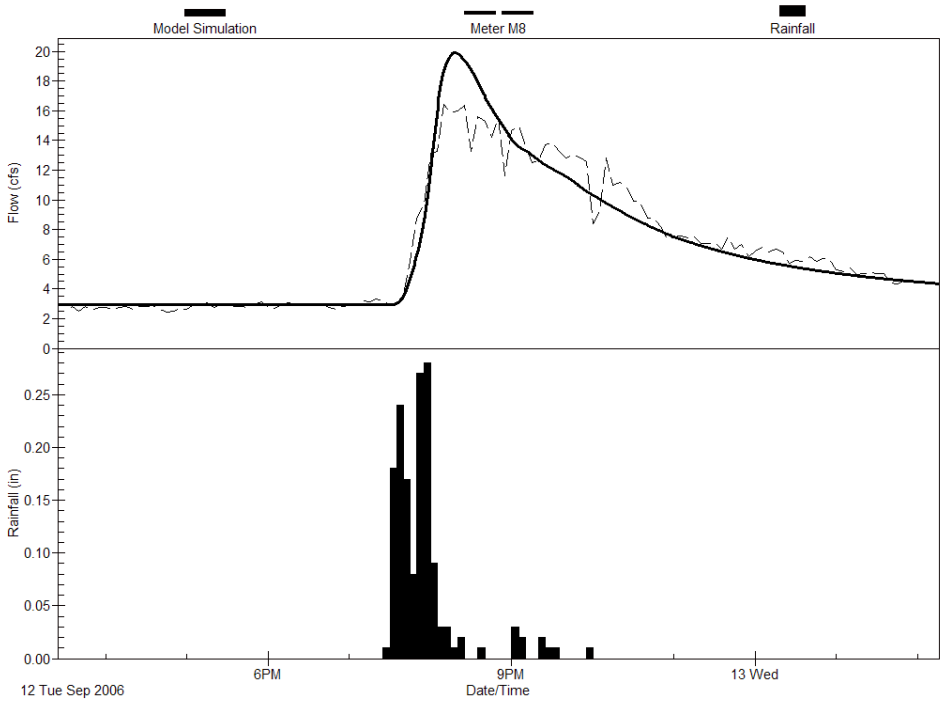


Figure C13 Calibration Results/Data for the 2006-09-12 Event

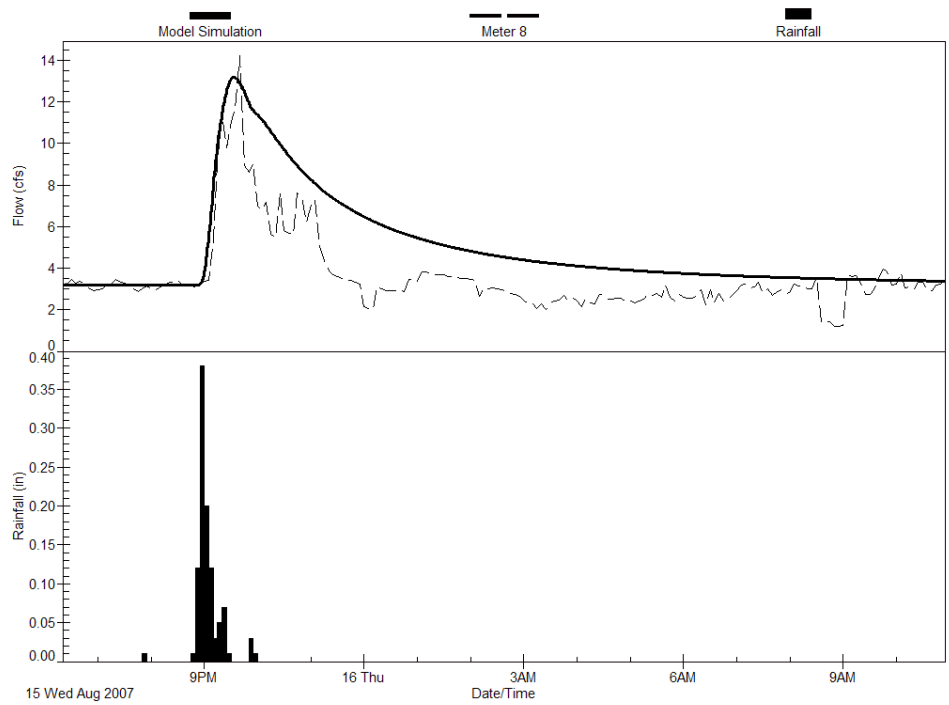


Figure C14 Calibration Results/Data for the 2007-08-15 Event

3.4 Check Storm Comparisons

The results for the check storm runs indicate features of the data and limitations of the model. For example, for the 2008-01-07 event, **Figure C7**, it is likely that snow melt occurred because of which the observed flows are higher than the simulated flows.

For the 2010-06-23 event, **Figure C8**, the sharp peak in the flow meter data (not matched by the simulated results) is caused by a 5 minute burst intense rainfall which likely cannot be captured by the simplified model developed in this study.

For the 2010-07-24 event, **Figure C9**, which is a 2-year storm, the simulation overestimates the peak flow and the volume; this is probably due to the fact that the model is calibrated using 6-month and 1-year storms. For a larger storm such as the 2-year event, there is likely to be sewer surcharging which would reduce the peak flows and volumes within the system. This indicates that using the 1-year calibrated model developed herein to predict a larger storm event (such as the 2-year and 10-year events) would lead to more conservative (higher) estimates of peak flows, volumes, and storage requirements.

4.0 Results

The results of the modeling of the Meter 8 area are included in **Table C4** which summarizes the flows from the 1 year one hour storm and the 10 year one hour storm. Also the diurnal dry weather flows

projected to the year 2025 are included in **Table C4**. Further development of the storage volumes, and flow capacities are discussed in Chapter 2 of this Report.

5.0 Genetic Algorithm Calibration

The genetic algorithm calibration (GAC) is a tool available in PCSWMM that allows for automatic model calibration which optimizes selected input parameters in the model to obtain an acceptable value of a given objective function. The objective function could be, for example, the sum of the square of error between the simulated peak flow and the observed peak flow. The intent of the GAC would be then to obtain a combination of input parameters that produce an acceptably low value for say the sum of the squared errors between simulated and observed peak flow values. The GAC allows for a systematic procedure for varying the parameters so as to obtain an acceptable value of the objective function. As the name indicates, this procedure was developed in the field of genetics.

The GAC starts with two initial random (or user defined) combination of parameters which are labeled as parents. The objective functions for each parent are determined. The parameters are generally internally grouped into two or more strata. Then children are generated from the parents by mixing or interchanging the values of the parameters in each strata of the parents. If only two strata (or groups) are defined for the parameters, only two children will be formed using this process. If there are many strata, then multiple children can be generated. Additional children can then be generated by mutating (randomly changing) particular parameters. In the end, the objective function for all children are obtained and compared with the parents. The two best sets of variables that give the least value (say, lowest least square errors in the simulated and observed peaks) of the objective function are then selected as the parents for the next generation. The procedure is then repeated till a child with an acceptably low value of the objective function is produced.

The GAC procedure can be successfully utilized in PCSWMM models if proper procedures are used. This includes setting limits on the variation in parameters to reasonable values based on ground truth, and developing the right number of strata to group the variables. However, because of the large number of input variables generally involved in a hydrologic model, the GAC (or any other calibration tool) cannot identify one unique combination of variables that minimizes the objective function; rather many combinations of variables could be found that give acceptably low value of the objective function; the set with the lowest objective function for the maximum predetermined number of iterations is usually chosen as the calibrated set of parameters.

Town of Chesterton
Long Term Control Plan
Meter 8 Area Computer Model Results
Table C3

10 Year 1 Hour storm

Time	Meter 8 Flow cfs	Time	Meter 8 Flow cfs
7:05:00 AM	0.00	1:10:00 PM	4.02
7:10:00 AM	0.00	1:15:00 PM	3.88
7:15:00 AM	0.00	1:20:00 PM	3.74
7:20:00 AM	0.00	1:25:00 PM	3.61
7:25:00 AM	0.00	1:30:00 PM	3.48
7:30:00 AM	0.00	1:35:00 PM	3.34
7:35:00 AM	0.00	1:40:00 PM	3.21
7:40:00 AM	0.00	1:45:00 PM	3.08
7:45:00 AM	0.00	1:50:00 PM	2.95
7:50:00 AM	0.00	1:55:00 PM	2.82
7:55:00 AM	0.00	2:00:00 PM	2.69
8:00:00 AM	0.00	2:05:00 PM	2.55
8:05:00 AM	0.00	2:10:00 PM	2.42
8:10:00 AM	0.00	2:15:00 PM	2.29
8:15:00 AM	0.00	2:20:00 PM	2.16
8:20:00 AM	0.00	2:25:00 PM	2.03
8:25:00 AM	0.00	2:30:00 PM	1.89
8:30:00 AM	0.00	2:35:00 PM	1.76
8:35:00 AM	0.00	2:40:00 PM	1.63
8:40:00 AM	0.00	2:45:00 PM	1.50
8:45:00 AM	0.00	2:50:00 PM	1.37
8:50:00 AM	0.00	2:55:00 PM	1.24
8:55:00 AM	0.01	3:00:00 PM	1.10
9:00:00 AM	0.04	3:05:00 PM	0.97
9:05:00 AM	0.15	3:10:00 PM	0.84
9:10:00 AM	0.51	3:15:00 PM	0.71
9:15:00 AM	1.19	3:20:00 PM	0.58
9:20:00 AM	2.30	3:25:00 PM	0.45
9:25:00 AM	3.89	3:30:00 PM	0.31
9:30:00 AM	6.38	3:35:00 PM	0.18
9:35:00 AM	10.60	3:40:00 PM	0.05
9:40:00 AM	16.99	3:45:00 PM	0.00
9:45:00 AM	23.44	3:50:00 PM	0.00
9:50:00 AM	27.02		
9:55:00 AM	27.70		
10:00:00 AM	26.82		
10:05:00 AM	25.34		
10:10:00 AM	23.67		
10:15:00 AM	22.05		
10:20:00 AM	20.56		
10:25:00 AM	19.21		
10:30:00 AM	17.95		
10:35:00 AM	16.75		
10:40:00 AM	15.68		
10:45:00 AM	14.72		
10:50:00 AM	13.84		
10:55:00 AM	13.04		
11:00:00 AM	12.29		
11:05:00 AM	11.61		
11:10:00 AM	11.01		
11:15:00 AM	10.48		
11:20:00 AM	9.98		
11:25:00 AM	9.52		
11:30:00 AM	9.08		
11:35:00 AM	8.66		
11:40:00 AM	8.27		
11:45:00 AM	7.89		
11:50:00 AM	7.52		
11:55:00 AM	7.19		
12:00:00 PM	6.90		
12:05:00 PM	6.62		
12:10:00 PM	6.37		
12:15:00 PM	6.12		
12:20:00 PM	5.88		
12:25:00 PM	5.66		
12:30:00 PM	5.44		
12:35:00 PM	5.24		
12:40:00 PM	5.04		
12:45:00 PM	4.85		
12:50:00 PM	4.68		
12:55:00 PM	4.51		
1:00:00 PM	4.34		
1:05:00 PM	4.17		

Continued Next Column

1 Year 1 Hour Storm

Time	Meter 8 Flow cfs
7:05:00 AM	0.00
7:10:00 AM	0.00
7:15:00 AM	0.00
7:20:00 AM	0.00
7:25:00 AM	0.00
7:30:00 AM	0.00
7:35:00 AM	0.00
7:40:00 AM	0.00
7:45:00 AM	0.00
7:50:00 AM	0.00
7:55:00 AM	0.00
8:00:00 AM	0.00
8:05:00 AM	0.00
8:10:00 AM	0.00
8:15:00 AM	0.00
8:20:00 AM	0.00
8:25:00 AM	0.00
8:30:00 AM	0.00
8:35:00 AM	0.00
8:40:00 AM	0.00
8:45:00 AM	0.00
8:50:00 AM	0.00
8:55:00 AM	0.00
9:00:00 AM	0.01
9:05:00 AM	0.02
9:10:00 AM	0.06
9:15:00 AM	0.17
9:20:00 AM	0.49
9:25:00 AM	0.97
9:30:00 AM	1.81
9:35:00 AM	3.21
9:40:00 AM	5.61
9:45:00 AM	8.42
9:50:00 AM	10.36
9:55:00 AM	11.19
10:00:00 AM	11.29
10:05:00 AM	11.01
10:10:00 AM	10.58
10:15:00 AM	10.11
10:20:00 AM	9.64
10:25:00 AM	9.19
10:30:00 AM	8.76
10:35:00 AM	8.36
10:40:00 AM	7.97
10:45:00 AM	7.59
10:50:00 AM	7.24
10:55:00 AM	6.93
11:00:00 AM	6.64
11:05:00 AM	6.36
11:10:00 AM	6.10
11:15:00 AM	5.86
11:20:00 AM	5.62
11:25:00 AM	5.40
11:30:00 AM	5.19
11:35:00 AM	4.99
11:40:00 AM	4.80
11:45:00 AM	4.62
11:50:00 AM	4.45
11:55:00 AM	4.27
12:00:00 PM	4.11
12:05:00 PM	3.97
12:10:00 PM	3.84
12:15:00 PM	3.72
12:20:00 PM	3.60
12:25:00 PM	3.49
12:30:00 PM	3.38
12:35:00 PM	3.27
12:40:00 PM	3.17
12:45:00 PM	3.07
12:50:00 PM	2.98
12:55:00 PM	2.89
1:00:00 PM	2.80
1:05:00 PM	2.72

Total Plant Dry Weather Flow

Time	Projected Dry Weather Flow CFS	Time	Projected Dry Weather Flow CFS	Time	Projected Dry Weather Flow CFS	Time	Projected Dry Weather Flow CFS
00:00:11	7.422642	06:05:31	4.309232	12:10:56	9.057356	18:15:21	7.59164
00:05:12	6.708186	06:10:32	4.474141	12:15:57	8.967331	18:20:22	6.661929
00:10:13	7.309532	06:15:33	4.444686	12:20:58	9.01504	18:25:23	6.945281
00:15:14	6.805264	06:20:34	4.617891	12:25:59	9.501676	18:30:24	7.628563
00:20:15	6.247272	06:25:35	4.632619	12:30:00	9.344443	18:35:25	7.713403
00:25:16	6.115967	06:30:36	4.513138	12:35:01	9.129958	18:40:26	7.361183
00:30:17	6.882015	06:35:37	4.338895	12:40:03	9.199862	18:45:28	6.819577
00:35:19	6.874962	06:40:38	4.302594	12:45:04	8.900122	18:50:29	7.702201
00:40:20	6.634963	06:45:40	4.395524	12:50:05	8.746	18:55:30	7.263482
00:45:21	6.724573	06:50:41	4.672238	12:55:06	8.479035	19:00:31	7.233404
00:50:22	6.511748	06:55:42	4.767658	13:00:08	8.359139	19:05:32	7.346663
00:55:23	6.183798	07:00:43	4.726171	13:05:09	8.528404	19:10:33	7.341477
01:00:24	5.884058	07:05:44	4.77471	13:10:12	8.715301	19:15:34	7.07949
01:05:25	6.31365	07:10:45	4.945427	13:15:13	7.929754	19:20:35	8.030566
01:10:26	6.409276	07:15:46	4.976334	13:20:14	8.007542	19:25:36	8.298776
01:15:27	6.012458	07:20:48	4.998945	13:25:15	8.248163	19:30:37	7.416567
01:20:29	5.627879	07:25:49	5.137302	13:30:16	8.652656	19:35:39	7.658641
01:25:30	5.951266	07:30:50	5.571665	13:35:17	7.819608	19:40:41	7.621095
01:30:31	5.760635	07:35:51	5.83946	13:40:19	8.158553	19:45:42	8.078899
01:35:32	5.503835	07:40:53	5.847135	13:45:20	7.921457	19:50:43	8.077861
01:40:33	5.238944	07:45:54	6.03092	13:50:21	7.577949	19:55:44	7.833714
01:45:34	5.836556	07:50:55	6.086097	13:55:22	8.45041	20:00:45	7.85425
01:50:35	5.419825	07:55:56	5.755035	14:00:23	8.049443	20:05:47	8.148181
01:55:36	5.059722	08:00:57	5.744664	14:05:24	7.97373	20:10:48	8.203358
02:00:37	5.066982	08:05:58	6.367168	14:10:25	7.998	20:15:48	8.196512
02:05:38	5.075902	08:10:59	7.043708	14:15:26	8.071224	20:20:49	7.688926
02:10:40	4.98961	08:15:00	7.731035	14:20:28	8.551637	20:25:51	7.979746
02:15:41	5.115314	08:20:01	8.216841	14:25:29	8.272018	20:30:52	8.429874
02:20:42	5.193101	08:25:02	8.348353	14:30:30	8.513261	20:35:53	8.294421
02:25:43	5.378338	08:30:03	8.400003	14:35:31	8.124326	20:40:54	8.560349
02:30:44	5.008901	08:35:04	8.859466	14:40:32	7.724604	20:45:55	8.607228
02:35:45	4.642576	08:40:05	8.937253	14:45:33	8.080765	20:50:56	8.15876
02:40:46	4.53077	08:45:07	8.756165	14:50:35	7.612591	20:55:57	8.316408
02:45:47	4.692774	08:50:08	8.711981	14:55:36	8.233643	21:00:58	8.139469
02:50:48	4.496128	08:55:09	8.439208	15:00:37	7.761112	21:05:59	7.936963
02:55:49	4.334746	09:00:10	9.195091	15:05:38	7.935148	21:10:00	8.207921
03:00:51	4.91286	09:05:11	9.324944	15:10:39	7.787456	21:15:01	8.476546
03:05:52	5.044579	09:10:12	9.056526	15:15:40	7.433162	21:20:02	9.046363
03:10:53	4.948331	09:15:13	9.23803	15:20:41	7.865865	21:25:04	8.951566
03:15:54	4.742973	09:20:14	9.094487	15:25:42	8.255631	21:30:05	8.596442
03:20:55	4.845859	09:25:15	8.948247	15:30:43	7.541234	21:35:06	8.586277
03:25:56	4.725963	09:30:17	9.16128	15:35:45	7.671709	21:40:07	8.473434
03:30:57	4.638427	09:35:18	9.016077	15:40:46	7.610724	21:45:09	8.404567
03:35:58	4.621418	09:40:19	8.765914	15:45:47	7.234027	21:50:10	8.429666
03:40:59	4.949938	09:45:20	8.966916	15:50:48	7.172627	21:55:11	8.639588
03:45:00	4.867225	09:50:25	9.113363	15:55:50	7.584587	22:00:12	8.364533
03:50:01	4.840674	09:55:27	9.299845	16:00:51	7.373421	22:05:13	8.182822
03:55:03	4.655644	10:00:28	8.688334	16:05:52	7.34687	22:10:14	8.39461
04:00:04	4.545912	10:05:29	8.563046	16:10:53	7.455357	22:15:15	8.517825
04:05:05	4.643613	10:10:30	8.301681	16:15:54	7.475063	22:20:16	8.486088
04:10:06	4.517494	10:15:31	8.860088	16:20:55	7.076793	22:25:18	8.140506
04:15:07	4.750855	10:20:33	9.475332	16:25:56	7.078868	22:30:19	8.013972
04:20:08	4.67701	10:25:34	8.921281	16:30:58	6.972455	22:35:20	8.414109
04:25:10	4.672653	10:30:35	8.102753	16:35:59	7.187095	22:40:21	8.139261
04:30:10	4.725756	10:35:36	8.390669	16:40:00	7.223447	22:45:22	7.921665
04:35:12	5.003715	10:40:37	8.611792	16:45:01	8.65556	22:50:23	7.753437
04:40:13	4.781763	10:45:38	8.316823	16:50:02	7.611346	22:55:24	7.865036
04:45:14	4.556906	10:50:39	8.282182	16:55:03	7.003362	23:00:25	8.12723
04:50:15	4.506708	10:55:40	10.16027	17:00:04	6.874339	23:05:26	8.361421
04:55:16	4.388264	11:00:42	8.849717	17:05:05	7.949046	23:10:27	8.34856
05:00:17	4.198256	11:05:43	8.538154	17:10:06	8.338396	23:15:28	8.090929
05:05:18	4.28434	11:10:44	7.15624	17:15:07	6.958972	23:20:29	7.769617
05:10:19	4.616854	11:15:45	8.377393	17:20:08	6.495154	23:25:30	7.999452
05:15:20	4.661867	11:20:46	10.43367	17:25:09	7.955476	23:30:32	7.840352
05:20:21	4.635731	11:25:47	9.231392	17:30:10	7.745347	23:35:33	7.783722
05:25:22	4.575575	11:30:48	7.061028	17:35:11	7.019957	23:40:34	7.815459
05:30:24	4.667053	11:35:49	7.76049	17:40:13	6.823933	23:45:35	7.266801
05:35:25	4.597771	11:40:50	8.778567	17:45:14	7.589566	23:50:36	7.344381
05:40:25	4.457546	11:45:51	8.508283	17:50:15	6.839698	23:55:38	7.257674
05:45:27	4.30052	11:50:52	8.975836	17:55:16	7.492695		
05:50:28	4.303009	11:55:52	8.925429	18:00:17	7.131763		
05:55:29	4.156562	12:00:53	8.842456	18:05:18	7.311192		
06:00:30	4.143701	12:05:55	8.505172	18:10:19	7.554717		

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Anticipated Project Costs for Chesterton, Indiana LTCP

Headworks and Storage Tank

SUMMARY			
DIV. 02 - EXISTING CONDITIONS			$0.00
DIV. 03 - CONCRETE			$1,834,767.60
DIV. 04 - MASONRY			$97,140.00
DIV. 05 - METALS			$136,046.40
DIV. 07 - THERMAL AND MOISTURE PROTECTION			$67,809.60
DIV. 08 - OPENINGS			$63,060.00
DIV. 09 - FINISHES			$46,980.00
DIV. 10 - SPECIALTIES			$5,328.00
DIV. 22 - PLUMBING			$43,266.00
DIV. 23 - HEATING, VENTILATING, AND AIR CONDITIONING			$67,927.20
DIV. 25 - INSTRUMENTATION & CONTROLS			$143,418.00
DIV. 26 - ELECTRICAL			$541,200.00
DIV. 31 - EARTHWORK			$1,198,740.00
DIV. 32 - EXTERIOR IMPROVEMENTS			$236,550.00
DIV. 33 - UTILITIES			$516,726.00
DIV. 44 - POLLUTION CONTROL EQUIPMENT			$2,508,780.00
Subtotal All Divisions			$7,507,738.80
Construction Contingency	Add 20%	$	1,501,500.00
Total Construction (Year 2011):		**$**	**9,009,200.00**
Escalation to Construction Assume in **2015** (3 yrs @ 3%)	Add 9%	$	810,800.00
Engineering Design	10%	$	900,900.00
Construction Inspection	8%	$	720,700.00
Total Project Cost (Year 2015)		**$**	**11,441,600.00**

Anticipated Project Costs for
Chesterton, Indiana LTCP

HEADWORKS - Lift Station, Grit Removal and Screening

Description	Quantity	Units	Unit Price	Total	Subtotals
DIV. 02 - EXISTING CONDITIONS					
	Subtotal Div. 2 - Existing Conditions				$0.00
DIV. 03 - CONCRETE					
Base Slab	361.0	cy	$400.00	$144,400.00	
Foundation Wall	238.0	cy	$540.00	$128,520.00	
Elevated Slab	106.0	cy	$740.00	$78,440.00	
Concrete Column	16.0	cy	$1,580.00	$25,280.00	
Concrete Beams	45.0	cy	$1,100.00	$49,500.00	
Slab on Grade - 6"	25.0	cy	$400.00	$10,000.00	
Flow Divider @ Bar Screen	11.2	cy	$540	$6,048.00	
Precast - 10"	2783.0	sf	$15.00	$41,745.00	
Concrete Stoops	5.0	cy	$227.00	$1,135.00	
	Subtotal Div. 3 - Concrete				$485,068.00
DIV. 04 - MASONRY					
12" CMU	2,800	SF	$20.00	$56,000.00	
8" CMU	875	SF	$18.00	$15,750.00	
Masonry Cell Insulation	2,800	SF	$2.00	$5,600.00	
Single-Wythe Flashing	200	LF	$3.00	$600.00	
Scaffolding, Setup and Take Down	1	LS	$2,000.00	$2,000.00	
Cold-Weather Measures (anticipated)	1	LS	$1,000.00	$1,000.00	
	Subtotal Div. 4 - Masonry				$80,950.00
DIV. 05 - METALS					
Aluminum Grating - 2-1/2" x 3/16	576	SF	$27.00	$15,552.00	
Aluminum Stairs	36	Riser	$490.00	$17,640.00	
Aluminum Guardrail	300	LF	$90.00	$27,000.00	
Aluminum Handrail	80	LF	$40.00	$3,200.00	
Roof Ladder, Aluminum	32	VLF	$180.00	$5,760.00	
Misc. Steel Lintels	100	LF	$80.00	$8,000.00	
Misc. Metal Fabrications	1	LS	$3,500.00	$3,500.00	
	Subtotal Div. 5 - Metals				$80,652.00
DIV. 07 - THERMAL AND MOISTURE PROTECTION					
TPO Roofing Membrane	2,600	SF	$3.00	$7,800.00	
TPO Roof Flashing Membrane	1,060	SF	$3.00	$3,180.00	
Roof Insulation (R-30)	2,600	SF	$4.00	$10,400.00	
Aluminum Coping	216	LF	$13.00	$2,808.00	
Vapor Retarder	2,600	SF	$0.25	$650.00	
Downspouts	110	LF	$9.00	$990.00	
Scuppers and Conductor Head	8	EA	$200.00	$1,600.00	
Vent Stack Flashing	1	EA	$100.00	$100.00	
Curb Flashing	9	EA	$120.00	$1,080.00	
Sheet Waterproofing and Protection Board	3,900	SF	$6.00	$23,400.00	
Joint Sealants	1,500	LF	$3.00	$4,500.00	
	Subtotal Div. 7 - Thermal & Moisture Protection:				$56,508.00
DIV. 08 - OPENINGS					
Aluminum Doors	3	EA	$1,250.00	$3,750.00	
Aluminum Frames	3	EA	$700.00	$2,100.00	
Door Hardware Mat'l	1	LS	$7,600.00	$7,600.00	
Door Hardware Labor	3	EA	$400.00	$1,200.00	
Skylight	6	EA	$500.00	$3,000.00	
Overhead Door System, Motorized, Insulated	1	EA	$7,000.00	$7,000.00	
Louver	1	EA	$1,500.00	$1,500.00	
Windows	4	EA	$600.00	$2,400.00	
	Subtotal Div. 8 - Openings				$28,550.00
DIV. 09 - FINISHES					
High-Performance Coatings - Walls	4,950	SF	$3.00	$14,850.00	
High Performance Coatings - Ceiling	5,800	SF	$3.50	$20,300.00	
High-Performance Coatings - Piping	500	LF	$8.00	$4,000.00	
	Subtotal Div. 9 - Finishes				$39,150.00
DIV. 10 - SPECIALTIES					
Fire Extinguisher	2	EA	$100.00	$200.00	
Acrylic Signs	3	EA	$80.00	$240.00	

HEADWORKS - Lift Station, Grit Removal and Screening

Description	Quantity	Units	Unit Price	Total	Subtotals
Aluminum Dedication Plaque	1	EA	$4,000.00	$4,000.00	
	Subtotal Div. 10 - Specialties				$4,440.00
DIV. 22 - PLUMBING					
Hose bibs	8	EA	$520.00	$4,160.00	
Floor drains	8	EA	$325.00	$2,600.00	
3" sanitary piping	240	LF	$23.00	$5,520.00	
3" copper piping w/ insulation	30	LF	$127.00	$3,810.00	
2-1/2" copper piping w/ insulation	85	LF	$98.00	$8,330.00	
2" copper piping w/ insulation	40	LF	$68.00	$2,720.00	
1-1/2" copper piping w/ insulation	40	LF	$48.00	$1,920.00	
1-1/4" copper piping w/ insulation	20	LF	$39.00	$780.00	
1" copper piping w/ insulation	15	LF	$31.00	$465.00	
3/4" copper piping w/ insulation	250	LF	$23.00	$5,750.00	
	Subtotal Div. 22 - Plumbing				$36,055.00
DIV. 23 - HEATING, VENTILATING, AND AIR CONDITIONING					
Radiant heaters	15	EA	$1,000.00	$15,000.00	
SF-1	1	EA	$1,320.00	$1,320.00	
SF-2	2	EA	$7,500.00	$15,000.00	
SF-3	1	EA	$700.00	$700.00	
Electric cabinet heater	1	EA	$1,840.00	$1,840.00	
1" gas piping	55	LF	$14.00	$770.00	
3/4" gas piping	100	LF	$12.00	$1,200.00	
1/2" gas piping	340	LF	$11.00	$3,740.00	
Gas pressure regulator	1	EA	$116.00	$116.00	
Aluminum ductwork	450	LB	$21.00	$9,450.00	
Supply grille	5	EA	$432.00	$2,160.00	
Return grille	5	EA	$162.00	$810.00	
Control damper - 96x72	2	EA	$2,250.00	$4,500.00	
	Subtotal Division 23 - HVAC				$56,606.00
DIV. 25 - INSTRUMENTATION & CONTROLS					
Gas Detector	1	ea	4,125.00	4,125.00	
Gas Detector - heads	4	ea	2,470.00	9,880.00	
H2S Unit	1	ea	2,822.00	2,822.00	
OX Unit	1	ea	2,688.00	2,688.00	
Connection to SCADA	1	LS	5,000.00	5,000.00	
	Subtotal Div. 25 - Instrumentation & Controls				$24,515.00
DIV. 26 - ELECTRICAL					
Electrical Demo	1	LS	$20,000.00	$20,000.00	
Electrical Site	1	LS	$29,100.00	$29,100.00	
Lighting Plan	1	LS	$27,800.00	$27,800.00	
Power Plan	1	LS	$225,000.00	$225,000.00	
Emergency Generator	1	LS	$100,000.00	$100,000.00	
	Subtotal Div. 26 - Electrical				$401,900.00
DIV. 31 - EARTHWORK					
Common Excavation (Building and Site Work)	3910	CYS	$20.00	$78,200.00	
Backfill	1900	CYS	$40.00	$76,000.00	
Temporary Sheet Pile Wall	1280	SF	$25.00	$32,000.00	
				$0.00	
				$0.00	
				$0.00	
	Subtotal Div. 31 - Earthwork				$186,200.00
DIV. 32 - EXTERIOR IMPROVEMENTS					
Erosion Control	1	LS	$5,000.00	$5,000.00	
Pavement Removal	71	SYS	$20.00	$1,420.00	
Sidewalk	221	SYS	$50.00	$11,050.00	
Concrete Pads	24	SYS	$65.00	$1,560.00	
HMA Surface, Type A	12	TONS	$100.00	$1,200.00	
HMA Base, Type A	50	TONS	$85.00	$4,250.00	
Compacted Aggregate, No. 53	50	TONS	$25.00	$1,250.00	
8" Concrete Pavement	80	SYS	$75.00	$6,000.00	
Seeding	1360	SYS	$3.00	$4,080.00	
	Subtotal Div. 32 - Exterior Improvements				$35,810.00
DIV. 33 - UTILITIES					

Anticipated Project Costs for
Chesterton, Indiana LTCP

HEADWORKS - Lift Station, Grit Removal and Screening

Description	Quantity	Units	Unit Price	Total	Subtotals
2" NPW Removal	128	LFT	$25.00	$3,200.00	
Sanitary Sewer Removal (16" or Smaller)	295	LFT	$25.00	$7,375.00	
Sanitary Manhole Removal	1	EA	$750.00	$750.00	
Non Potable Water, PVC, SCH 80, 2"	140	LFT	$35.00	$4,900.00	
	Subtotal Div. 33 - Utilities				$16,225.00
DIV. 44 - POLLUTION CONTROL EQUIPMENT					
4 Raw Dry Pit Pumps	1	LS	345,000.00	$345,000.00	
Equipment Installation	1		138,000.00	$138,000.00	
125 HP 460 V controller (VFD)	1	LS	33,600.00	$33,600.00	
Screens - 2 ea with appurtenances - package price	1	LS	265,000.00	$265,000.00	
Equipment Installation	1		106,000.00	$106,000.00	
Screen Conveyor	1	LS	30,000.00	$30,000.00	
Equipment Installation	1		12,000.00	$12,000.00	
Vortex Grit Removal Equipment	1	EA	150,000.00	$150,000.00	
Grit Equipment Installation	1	LS	60,000.00	$60,000.00	
Grit Washer	1	EA	40,000.00	$40,000.00	
Washer installation	1	LS	16,000.00	$16,000.00	
Grit Conveyor	1	LS	50,000.00	$50,000.00	
Equipment Installation	1		20,000.00	$20,000.00	
Gates 36" channel	4	EA	$40,500.00	$162,000.00	
Pump Suction and Discharge Piping	4	EA	$75,250.00	$301,000.00	
Forcemain on Building	1	EA	$54,050.00	$54,050.00	
	Subtotal Div. 44 - Pollution Control Equipment				$1,782,650.00

SUMMARY	Summary of Totals Above	Summary NW Indiana Pricing Add 20%
DIV. 02 - EXISTING CONDITIONS	$0.00	$0.00
DIV. 03 - CONCRETE	$485,068.00	$582,081.60
DIV. 04 - MASONRY	$80,950.00	$97,140.00
DIV. 05 - METALS	$80,652.00	$96,782.40
DIV. 07 - THERMAL AND MOISTURE PROTECTION	$56,508.00	$67,809.60
DIV. 08 - OPENINGS	$28,550.00	$34,260.00
DIV. 09 - FINISHES	$39,150.00	$46,980.00
DIV. 10 - SPECIALTIES	$4,440.00	$5,328.00
DIV. 22 - PLUMBING	$36,055.00	$43,266.00
DIV. 23 - HEATING, VENTILATING, AND AIR CONDITIONING	$56,606.00	$67,927.20
DIV. 25 - INSTRUMENTATION & CONTROLS	$24,515.00	$29,418.00
DIV. 26 - ELECTRICAL	$401,900.00	$482,280.00
DIV. 31 - EARTHWORK	$186,200.00	$223,440.00
DIV. 32 - EXTERIOR IMPROVEMENTS	$35,810.00	$42,972.00
DIV. 33 - UTILITIES	$16,225.00	$19,470.00
DIV. 44 - POLLUTION CONTROL EQUIPMENT	$1,782,650.00	$2,139,180.00
Subtotal All Divisions	$3,315,279.00	$3,978,334.80

Anticipated Project Costs for
Chesterton, Indiana LTCP

Storage Basin

Description	Quantity	Units	Unit Price	Total	Subtotals
DIV. 02 - EXISTING CONDITIONS					
	Subtotal Div. 2 - Existing Conditions				$0.00
DIV. 03 - CONCRETE					
Base Slab	728.0	cy	$400.00	$291,200.00	
Foundation Wall	601.0	cy	$540.00	$324,540.00	
Elevated Slab	447.0	cy	$740.00	$330,780.00	
Concrete Column	52.0	cy	$1,580.00	$82,160.00	
Concrete Walls	43.5	cy	$350	$15,225.00	
	Subtotal Div. 3 - Concrete				$1,043,905.00
DIV. 04 - MASONRY					
	Subtotal Div. 4 - Masonry				$0.00
DIV. 05 - METALS					
Aluminum Handrail	368	LF	$40.00	$14,720.00	
Ladder	100	VFT	$180.00	$18,000.00	
	Subtotal Div. 5 - Metals				$32,720.00
DIV. 07 - THERMAL AND MOISTURE PROTECTION					
	Subtotal Div. 7 - Thermal & Moisture Protection:				$0.00
DIV. 08 - OPENINGS					
Access Door 4'x4" with Fall Protection Grating	6	EA	$4,000.00	$24,000.00	
	Subtotal Div. 8 - Openings				$24,000.00
DIV. 09 - FINISHES					
	Subtotal Div. 9 - Finishes				$0.00
DIV. 10 - SPECIALTIES					
	Subtotal Div. 10 - Specialties				$0.00
DIV. 22 - PLUMBING					
	Subtotal Div. 22 - Plumbing				$0.00
DIV. 23 - HEATING, VENTILATING, AND AIR CONDITIONING					
	Subtotal Division 23 - HVAC				$0.00
DIV. 25 - INSTRUMENTATION & CONTROLS					
SCADA Control and Telemetry	1	LS	95,000.00	95,000.00	
	Subtotal Div. 25 - Instrumentation & Controls				$95,000.00

Storage Basin

DIV. 26 - ELECTRICAL

Electrical Demo	1	LS	$20,000.00	20,000.00	
Electrical Site	1	LS	$29,100.00	29,100.00	
	Subtotal Div. 26 - Electrical				$49,100.00

DIV. 31 - EARTHWORK

Common Excavation (Building and Site Work)	17170	CYS	$20.00	$343,400.00	
Removal of Mount Chesterton	14250	CYS	$20.00	$285,000.00	
Backfill	6145	CYS	$30.00	$184,350.00	
	Subtotal Div. 31 - Earthwork				$812,750.00

DIV. 32 - EXTERIOR IMPROVEMENTS

Erosion Control	1	LS	$20,000.00	$20,000.00	
HMA Surface, Type A	113	TONS	$100.00	$11,300.00	
HMA Base, Type A	603	TONS	$85.00	$51,255.00	
Compacted Aggregate, No. 53	1369	SYS	$40.00	$54,760.00	
Bollards	8	EA	$1,200.00	$9,600.00	
Seeding	4800	SYS	$3.00	$14,400.00	
	Subtotal Div. 32 - Exterior Improvements				$161,315.00

DIV. 33 - UTILITIES

Non Potable Water, PVC, SCH 80, 2"	600	LFT	$35.00	$21,000.00	
Yard Hydrant	3	EA	$1,700.00	$5,100.00	
Forcemain 12" DIP	40	LFT	$72.00	$2,880.00	
Forcemain 8" DIP	40	LFT	$60.00	$2,400.00	
Forcemain 30" DIP	800	LFT	$180.00	$144,000.00	
Tee 8"	1	EA	$1,100.00	$1,100.00	
Tee 12"	1	EA	$1,300.00	$1,300.00	
Valve 8"	1	EA	$1,800.00	$1,800.00	
Valve 12"	1	EA	$3,000.00	$3,000.00	
Tee 16"x30"	1	EA	$11,000.00	$11,000.00	
Valve 16"	1	EA	$10,000.00	$10,000.00	
90 Fitting	2	EA	$5,000.00	$10,000.00	
45 Fitting	1	EA	$5,000.00	$5,000.00	
Valve 30"	1	EA	$50,000.00	$50,000.00	
Sanitary Sewer, 8" PVC, SDR 35 (Plant Drain)	30	LFT	$60.00	$1,800.00	
Manhole Over Existing 48"	1	EA	$64,000.00	$64,000.00	
Sanitary Manhole	4	EA	$3,000.00	$12,000.00	
Sanitary Sewer, 24" PVC, SDR 35	800	LFT	$85.00	$68,000.00	
	Subtotal Div. 33 - Utilities				$414,380.00

DIV. 44 - POLLUTION CONTROL EQUIPMENT

Actuated Return Valve	1	EA	$30,000.00	$30,000.00	
Porter Control Valve	1	EA	$ 30,000.00	$30,000.00	
Tank Venting	1	EA	$ 8,000.00	$8,000.00	
Flushing System	1	EA	$ 240,000.00	$240,000.00	
	Subtotal Div. 44 - Pollution Control Equipment				$308,000.00

Storage Basin

SUMMARY	Summary of Totals Above	Summary NW Indiana Pricing Add 20%
DIV. 02 - EXISTING CONDITIONS	$0.00	$0.00
DIV. 03 - CONCRETE	$1,043,905.00	$1,252,686.00
DIV. 04 - MASONRY	$0.00	$0.00
DIV. 05 - METALS	$32,720.00	$39,264.00
DIV. 07 - THERMAL AND MOISTURE PROTECTION	$0.00	$0.00
DIV. 08 - OPENINGS	$24,000.00	$28,800.00
DIV. 09 - FINISHES	$0.00	$0.00
DIV. 10 - SPECIALTIES	$0.00	$0.00
DIV. 22 - PLUMBING	$0.00	$0.00
DIV. 23 - HEATING, VENTILATING, AND AIR CONDITIONING	$0.00	$0.00
DIV. 25 - INSTRUMENTATION & CONTROLS	$95,000.00	$114,000.00
DIV. 26 - ELECTRICAL	$49,100.00	$58,920.00
DIV. 31 - EARTHWORK	$812,750.00	$975,300.00
DIV. 32 - EXTERIOR IMPROVEMENTS	$161,315.00	$193,578.00
DIV. 33 - UTILITIES	$414,380.00	$497,256.00
DIV. 44 - POLLUTION CONTROL EQUIPMENT	$308,000.00	$369,600.00
Subtotal All Divisions	$2,941,170.00	$3,529,404.00

Chesterton Tribune

Utility plan threatens Little League field

By KEVIN NEVERS

It will probably cost the Chesterton Utility more to eliminate releases of sewage into the Little Calumet River during heavy rains than it did to expand the wastewater treatment plant.

Of the three alternative plans presented to the Utility Service Board at its meeting Monday, the least expensive would cost an estimated $4.859 million, the most $6.568 million.

The original contract price of the plant expansion, in contrast, was only $4.208 million, with overruns of around $585,000 or nearly 14 percent.

Meanwhile, the fate of the State Park Little League (SPLL) softball field—whose left and left center fields slightly encroach on the proposed site of the most likely of the three alternatives, the construction of a a storage tank to hold sewage until it can be treated—remains in doubt. At a minimum the storage tank option would deprive SPLL of a significant amount of parking. But it could also force SPLL simply to abandon the field altogether.

Superintendent Steve Yagelski promised SPLL representatives on Monday that staff will do everything possible to preserve the field. Should that not be possible, he added, Park Superintendent Bruce Mathias is “working actually to prepare an area in Dogwood Park that (SPLL) would be able to use.” For his part Porter Town Council President Bill Sexton told the SPLL reps that the Porter Parks and Recreation Department has “vacant land” close to the existing SPLL facility which might do as well.

The Three Alternatives

At issue is the mandate of the U.S. Environmental Protection Agency (EPA)—administered and enforced by the Indiana Department of Environmental Management (IDEM)—to eliminate what are known as combined sewage overflows (CSOs): the release of sewage into waterways during heavy rains. CSOs occur when sanitary and stormwater sewers are not separated and large quantities of stormwater flowing into the wastewater treatment plant overwhelm its capacity.

As presented by Mark Nye of DLZ, the three alternatives would address the problem of CSOs in different ways:

•In essence a mini treatment facility could be constructed for an estimated $6.515 million. This alternative would affect SPLL parking but not the field.

•A circular concrete storage tank could be constructed for $4.859 million, or a rectangular one for $5.196 million. Both would be able to store 1.2 million gallons until they could be treated. Nye said that this alternative would have “the most impact on parking and the field.”

•The remaining combined sanitary and stormwater sewers in town could be separated for an estimated $6.568 million.

SPLL has Questions

Ken Jaeger, Bill Ricard, and Elise Jones of SPLL had plenty of questions for the Service Board and staff. Why couldn't the storage tank be constructed on some other part of the Utility's property?

For two reasons, Yagelski said. Much of that property needs to be held in reserve for any future expansion of the treatment plant. The remainder of the property—on the eastern edge—is not only a wetland unsuitable for building but a low area which would require gallonage stored there to be pumped uphill to be treated, adding to the expense of the project.

Why not construct the storage tank underground, as Goshen is doing?

Watertable issues, Yagelski said. And, again, the gallonage stored in an underground tank would have to be pumped up.

Why not simply expand the treatment plant, instead of building a "band aid" storage tank?

The treatment plant is operating right now at between 50 and 60 percent capacity, Yagelski said. There's no demonstrable need to expand it, IDEM will not grant a permit to expand it until capacity hits 85 percent, and in any case the issue is stormwater, not sewage.

If the problem is combined sewers, why not just separate them?

There's absolutely no guarantee that doing so would eliminate CSOs, Town Engineer Mark O'Dell said, partly because Chesterton's sanitary sewer system is so old that even separated sewers are liable to infiltration from ground water and runoff, partly because separating Chesterton's sewers would do nothing to eliminate the infiltration of sanitary sewers in the Town of Porter and the Indian Boundary Conservancy District. The Utility could spend $6.568 million to separate, then discover in the first heavy rain that it's still necessary to dump sewage, and be ordered by IDEM to spend millions more on another alternative.

Cost

It's unclear how exactly the Service Board intends to fund implementation of the plan, whichever one it chooses in the end, but the consensus among members is that at some point a rate hike will be necessary to pay for it. When and how much are anybody's guess right now.

"That's always the nice thing about IDEM and EPA," Member Scot McCord said. "'Do it but we're not going to help you do,' they say. That's always the nice thing."

Next

The Service Board took no action Monday but will be accepting comments and input from the public on two more occasions: at a special meeting at 7 p.m. April 2; and at its regular monthly meeting at 7 p.m. April 16. At 7 p.m. April 30 the Service Board will take receipt of a finalized plan for review. At 7 p.m. May 21 it will approve that plan. And on May 22, one day before the deadline, it will submit that plan to IDEM.

Should the Utility's plan fail to win the approval of IDEM and EPA, it will be subject to the decree of an administrative judge who will order it to undertake a particular plan on a particular time table with no particular regard to expense.

Posted 3/20/2007

Chesterton Tribune

Adv.

Yikes! Utility storage tank could cost $11.4 million; expect a rate hike

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www.sementanks.com

By KEVIN NEVERS

A month ago Chesterton Town Engineer Mark O'Dell estimated the cost of building a 1.2 million storage tank at the wastewater treatment plant—part of an IDEM-mandated "long-term control plan" to reduce sanitary sewer bypasses into the Little Calumet River—"easily" at $5 million.

Just how easily O'Dell had no idea.

Try doubling that figure. Then add another mil and a half.

At Monday's meeting of the Utility Service Board, Mark Nye of DLZ, the Utility's contracted engineering firm, officially estimated the cost of that project at $11,441,600.

That sum breaks down as follows:

•Hard construction: $7,507,738.

•Add 20 percent as a construction contingency, given the fact that no soil borings have been completed yet and no surveys: $1,501,500.

•Add an inflationary 3 percent for each year before the project is let: $810,800, if the project does not begin until 2015.

•Engineering design: $900,900.

•Construction inspection: $720,700.

As Nye tactfully put it to the Service Board, "It's something you'll have to work with your financial consultant about, to see when you can afford this."

At immediate issue now is when the Indiana Department of Environmental Management will actually approve the storage tank, basic plans for which DLZ will submit at the end of May. If it does so by the end of the year, then the Utility can expedite engineering, President Larry Brandt said, with the possibility that the tank and all supporting infrastructure can by completed by the end of 2014.

"Every delay increases the cost," Brandt noted. "On top of that, every delay puts more crap into the lake. Let's aggressively go ahead and get this done, the sooner the better."

There is that pesky question, of course, of how exactly the Utility will pay for the project. Brandt envisioned on Monday a

10- or 20-year bond issue and fully expects the need for a sanitary sewer rate increase to go along with it. “Just off the top of my head, we’re looking at a 20 to 25 percent rate increase. That’s just a guess.”

What is not a guess is that the next biennial rate study to be conducted by H.J.Umbaugh & Associates, the Utility’s contracted rate consultant, will absolutely need to take the storage tank into consideration, Brandt added.

O’Dell did suggest that Nye’s cost estimate is not the final one. “We’re going to fine-tune a lot of this stuff,” he said. “We’re hoping the cost will go down.”

“Well, at least we know now what we’re talking about,” Brandt remarked.

It is, after all, “a big swimming pool,” Nye joked.

Part of the project will include an upgrade of the wastewater treatment plant’s main lift station, which in heavy rain events will pump a maximum of 1.2 million gallons away from the plant itself into the tank. When flow rates begin to decrease as the rain lessens and the plant is in a position to catch up, a gravity line will then flow the excess back to the pump station and then into the treatment plant.

The tank itself will be uncovered.

It will *not* be built on the State Park Little League fields or on any part of the area used for Little League parking.

Nye has said that a tank of this size would have alleviated the need to bypass sewage in all but four of the 27 bypass events in the last four years. Only a tank with a 12-million gallon capacity—which apparently even IDEM recognizes would be prohibitively expensive—would have precluded bypassing in all 27 of those events.

Posted 3/22/2011

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Chesterton Tribune

Adv.

Storage tank will not be built on State Park Little League fields

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By KEVIN NEVERS

The Chesterton Utility Service Board has opted *not* to build a new storage tank—mandated by the Indiana Department of Environmental Management—on the State Park Little League ball fields.

Instead, the tank will be constructed to the north and west of the fields.

So DLZ engineer Mark Nye announced at the Service Board's meeting Tuesday night.

The peculiar elevations of the Utility's property prompted the re-location, Nye noted, since the original site by the ball fields would have forced the tank, when full, to be pumped twice, rather than once and then gravity-flowed to treatment.

To reduce the 1.2 million gallon tank's footprint as much as possible, Nye said, it will be placed some 20 feet deep, with around three to four feet of structure remaining above ground. "It hasn't been determined whether the tank will be covered or left open," Nye added. Covering it will likely cost more but leaving it open could cause an odor issue as well as expose the contents to the elements.

Construction of the tank is part of the Utility's long term control plan to reduce sewage bypasses into the Little Calumet River. That plan will be submitted to IDEM late in May, with public comment scheduled for the Service Board's April 18 meeting.

Estimated price tag: "easily" $5 million, Town Engineer Mark O'Dell said.

President Larry Brandt wanted to know when exactly the Utility can expect IDEM approval of the long term control plan, for two reasons specifically. First, "the sooner we can build this thing, the sooner we can improve the community," he said.

But second, Brandt observed, "we've got to plan now to get that kind of money."

O'Dell figured construction will likely begin in 2013 with completion in 2014.

Inasmuch as the "funding mechanism will probably be a bond issue"—as Town Attorney Chuck Lukmann projected—H.J. Umbaugh & Associates, the Utility's contracted rate consultant, needs to have as much information as possible when it conducts the next biennial rate study in 2012, Brandt said.

"We're assuming there will be no federal or state funding" for the project, Brandt added, given the fact that the Town of Chesterton is generally "too affluent" to qualify for such assistance.

The tank, when finished, will hold wastewater to be held and later treated to one extent or another, depending on the kind of rain event:

•A so-called one-year, one-hour storm—with rainfall of 1.14 inches per hour—will require the storage and thorough treatment of all wastewater in the tank.

•A 10-year, one-hour storm—with rainfall of 1.98 inches per hour—will require the primary treatment and disinfection of flows.

•All flows above the 10-year, one-hour storm will receive some primary treatment and disinfection.

A tank of this size would have alleviated the need to bypass sewage in all but four of the 27 bypass events in the last four years. Only a tank with a 12-million gallon capacity—which even IDEM recognizes to be prohibitively expensive—would have precluded bypassing in all 27 of those events, Nye has said.

Posted 2/23/2011

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