# NORTHFIELD TOWNSHIP BOARD WORKSHOP AGENDA

*NOTICE OF JOINT MEETING WITH PLANNING COMMISSION*

## March 29, 2016 - - 7:00 PM
## 8350 Main Street, 2nd Floor

CALL TO ORDER
PLEDGE/INVOCATION
ROLL CALL
ADOPT BALANCE OF AGENDA
CONSENT AGENDA: Ely Holdings, LLC +
CALL TO THE PUBLIC
BOARD MEMBER COMMENTS
CORRESPONDENCE AND ANNOUNCEMENTS

PRESENTATION:

1. Washtenaw County Road Commission Annual Meeting

JOINT MEETING WITH PLANNING COMMISSION:

1. Sewer Capacity

2nd CALL TO THE PUBLIC
BOARD MEMBER COMMENTS
ADJOURNMENT

* Denotes previous backup; + denotes no backup in package

This notice is posted in compliance with PA 267 of 1976 as amended (Open Meetings Act) MCLA 41.72A (2) (3) and the Americans with Disabilities Act. (ADA) individuals with disabilities requiring auxiliary aids or services should contact the Northfield Township Office, (734-449-2880) seven days in advance.

# 2016

# ANNUAL MEETING

# NORTHFIELD TOWNSHIP

**WASHTENAW COUNTY**
**BOARD OF COUNTY ROAD COMMISSIONERS**
**555 NORTH ZEEB ROAD**
**ANN ARBOR, MICHIGAN 48103**
**WWW.WCROADS.ORG**

ROY D. TOWNSEND, P.E.
MANAGING DIRECTOR
SHERYL SODERHOLM SIDDALL, P.E.
DIRECTOR OF ENGINEERING
COUNTY HIGHWAY ENGINEER
JAMES D. HARMON, P.E.
DIRECTOR OF OPERATIONS
TELEPHONE (734) 761-1500
FAX (734) 761-3737

Dear Northfield Board of Trustees:

We would like to thank all the Townships for last year's support in assisting the Road Commission complete numerous successful road improvement projects. Without your assistance most of the local road improvements would not have been possible. We are also pleased to provide Northfield Township Officials with our 2016 Annual Local Road Program. In addition, we have included a few other updates on our activities and major project initiatives in your Township.

Our Annual Meeting Booklet includes cost summaries of 2015 expenditures in your township. Also, to assist townships in determining the level of local road improvements that you are willing to entertain, we have provided the following items.

1. 2016 Local Road Program and Matching Fund Allocations
2. A Summary of 2015 Maintenance and Project Activities
3. Proposed 2016 Local Road Projects and Dust Control Program
4. 2016 Road & Bridge Improvement Projects
5. PA 283 Projects for 2016
6. Michigan's New Road Funding Summary

Please note **May 20** is the commitment due date for this year's 2016 Local Road Program. Your timely response and participation is essential to successfully accomplish this year's program.

We annually look forward to this opportunity to discuss common issues with the Township Officials and your citizens as we seek solutions to the challenges that we face. If you have any immediate concerns related to the attached information, please feel free to contact me at 327-6662 or our Directions of Operations, Jim Harmon at 327-6653.

Very truly yours,

*Roy D. Townsend*

Roy D. Townsend, P.E
Managing Director

RDT:amw

**WASHTENAW COUNTY ROAD COMMISSION**
**2016 LOCAL MATCHING PROGRAM**

The Washtenaw County Road Commission is anticipating it will receive $17,900,000 in Michigan Transportation Fund (MTF) revenues for 2015. The Road Commission is anticipating the same amount of MTF revenues for 2016.

The Road Commission has recognized that local road funds are inadequate to maintain the 1,064 centerline miles of local roads in Washtenaw County; the Road Commission has historically transferred funds from the Primary Road Fund to the Local Road Fund, even though this transfer severely limits maintenance activity on our primary road system.

A summary of our 2016 budget as approved by the Board of Road Commissioners at its regular meeting on December 1, 2015 (RC15-469) is provided as follows.

2016 Road Commission Budget

Revenues

| | |
|---|---|
| Michigan Transportation Fund | $ 17,900,000 |
| Federal/ State Funds | $ 13,707,000 |
| Trunkline Maintenance | $ 2,378,000 |
| Township Contributions | $ 3,750,500 |
| Other Contributions | $ 5,216,000 |
| Miscellaneous Income | $ 1,640,000 |
| Total | $ 44,592,500 |

Expenditures

| | |
|---|---|
| Administration | $ 1,061,000 |
| Operations | $ 8,715,000 |
| Engineering | $ 2,771,000 |
| Non-Departmental | $ 7,217,000 |
| Debt Service | $ 1,306,000 |
| Road Improvement Program | $ 24,989,000 |
| Total | $ 46,058,000 |

Matching Funds

The Road Commission has allocated a total of $500,000 in 2016 for the conventional Local Road Matching Program. This consists of a countywide allocation of $423,077 for matching programs on local roads in all twenty townships based on the distribution formula used by the Michigan Department of Transportation to allocate local road funds to the 83 counties of Michigan. In addition to this, recognizing the fact that the urban local roads receive a higher allocation of Michigan Transportation Funds, $76,923 is allocated based on the amount of urban local miles within eligible townships. Ann Arbor, Augusta, Dexter, Lima, Lodi, Northfield, Pittsfield, Salem, Saline, Scio, Superior, Sylvan, Webster, York and Ypsilanti Townships are within the urban area and are eligible for these additional matching funds.

The Road Commission has allocated $200,000 for the 2016 Drainage Matching Program for local uncurbed, non-subdivision roads. The Road Commission has recognized the need for directing more resources towards improving the drainage along our local roads. The drainage matching program is in addition to the conventional local road matching program available to the Townships. Some of the key features of drainage matching program include:

- Funding distribution is based on the total uncurbed, non-subdivision local road centerline mileage for each township
- Eligible work activities are limited to uncurbed, non-subdivision local roads
- Eligible work activities include roadside berm removal, ditch establishment & restoration, large culvert or bridge replacement

| TOWNSHIP | 2015 CONVENTIONAL LOCAL ROAD MATCHING PROGRAM | 2016 CONVENTIONAL LOCAL ROAD MATCHING PROGRAM | 2015 DRAINAGE MATCHING PROGRAM | 2016 DRAINAGE MATCHING PROGRAM |
|---|---|---|---|---|
| Salem | $ 16,373 | $ 16,425 | $ 10,493 | $ 10,493 |
| Northfield | 24,916 | 25,002 | 13,732 | 13,732 |
| Webster | 17,714 | 17,770 | 11,792 | 11,792 |
| Dexter | 15,974 | 16,023 | 6,932 | 6,932 |
| Lyndon | 11,956 | 11,995 | 10,048 | 10,048 |
| Sylvan | 13,731 | 13,443 | 11,489 | 11,489 |
| Lima | 15,393 | 15,447 | 12,745 | 12,745 |
| Scio | 37,857 | 37,425 | 7,157 | 7,157 |
| Ann Arbor | 10,759 | 10,580 | 3,833 | 3,833 |
| Superior | 31,537 | 31,412 | 8,793 | 8,793 |
| Ypsilanti | 104,199 | 104,177 | 5,924 | 5,924 |
| Pittsfield | 68,504 | 68,741 | 4,669 | 4,669 |
| Lodi | 22,538 | 22,623 | 12,879 | 12,879 |
| Freedom | 13,526 | 13,575 | 13,684 | 13,684 |
| Sharon | 10,406 | 10,442 | 9,971 | 9,971 |
| Manchester | 14,268 | 14,316 | 13,176 | 13,176 |
| Bridgewater | 11,725 | 11,765 | 11,481 | 11,481 |
| Saline | 9,471 | 9,504 | 8,125 | 8,125 |
| York | 27,101 | 27,206 | 8,521 | 8,521 |
| Augusta | 22,054 | 22,127 | 14,554 | 14,554 |
| | $ 500,000 | $ 500,000 | $ 200,000 | $ 200,000 |

*Totals do not equal sum of individual allocations, because of rounding

The WCRC Matching Program is subject to the following conditions:

a) Township Assistance

In order to allow local road improvements to proceed in a timely manner, townships are asked to assist Road Commission personnel in acquiring necessary tree removal and grading permits, holding public hearings and coordinating any necessary citizen contacts.

b) (b) Project Overruns

Road Commission staff will provide an estimated cost for each individual project to be included within the agreement between the township and the Road Commission. If, prior to beginning an individual project, it is determined that the original cost estimate will not cover project costs, the Road Commission will notify the township to determine, if the township desires to proceed with the project with a reduced scope or an additional funding commitment. Budgets are closely monitored on each project and every effort is made to avoid overruns. Any unexpected project cost overrun shall be taken from any

unexpended funds remaining in that township's total township agreement. If the overrun exceeds the total township agreement, the Road Commission may bill the township up to an additional 10 percent of the total agreement amount with the township. At the township's option, such overruns can be taken from the following years matching funds.

c) Billing Procedures

As has been the practice for the past several years, the first 40 percent of the total Matching Program for construction and heavy maintenance projects will be due in June or 30 days from receipt of the first invoice. A second 40 percent will be due in August or 30 days from receipt of the second invoice. A final billing will be due in December or 30 days from receipt of final invoice. Any credits due townships will be returned at the time of final billing or credited to the following year, as determined by the township. The above billing methods apply only to those projects considered to be construction and heavy maintenance and does not apply to dust control which will be billed at cost to the date at time of billing.

d) Administrative Fee

In addition to direct costs, the Washtenaw County Road Commission will charge an 8% administrative fee on all township improvement projects on local roads. The overhead charge is intended to cover costs not directly attributable to the individual project. The administrative fee is not charged for seasonal dust control or work performed by non-road commission crews.

e) Primary Road Matching

Any township board may, at their option, request that a part or all of their allocated matching WCRC funds, along with an equal amount of township funds, be used on a Primary Road Project within their township boundaries.

f) Reallocation of Funds

Any township that has not notified the WCRC of their intent to utilize matching funds by May 20, 2016 will forfeit all rights to the use of the matching money. The WCRC will determine the amount of unused matching funds and reallocate these funds to primary road maintenance.

g) Local Road and Bridge Planning /Engineering Projects

The Road Commission provides planning and engineering services for local road and bridge projects. If the township requests the Road Commission to provide these services, the township is expected to enter into an agreement with the Road Commission to reimburse the Commission for 50% of the cost for these services. Depending on the scope of the project and the amount of matching funds available to a township, these services may be eligible for the matching program.

The Road Commission recognizes that local road bridges are vital assets that require significant resources to maintain and replace. This program fosters a cooperative approach with the Townships, as we partner to renovate or replace deficient bridges. The Road Commission will continue to provide routine maintenance service and the federally mandated biennial inspections at our expense. Also, we will continue to seek federal grant funding to assist with any major renovation or replacement costs. All costs beyond the grant amounts for major renovation or replacement costs on local bridge

projects will be shared equally with the townships. Available local matching funds can be utilized to cover 50% the townships share of a local road bridge project costs.

h) Shoulder Paving

If a local road is to be paved, the Road Commission will pay the cost of paving the shoulders when it is feasible. The Road Commission has agreed to assume this cost because of the enhanced safety for vehicles and non-motorized travel and reduced maintenance costs inherent in paved shoulders. This provision will not apply to subdivision streets.

i) Dust Control

Conventional matching funds can be used for dust control only for solid applications.

j) Local Matching Fund Carryover

If a township determines that they desire to carry over the funds allocated for a given year into the following year, the township must provide written notification to the Road Commission that they are requesting this carryover, and identify an eligible project for which the funds will be held. The Road Commission carry-over fund will be preserved for one year. Beyond this point the funds will be reallocated as stated in Paragraph f. The carryover option allows the township to accumulate the funds that are allocated with the previous year allocation; in other words, the carry over funds cannot exceed the previous year's allocation.

# NORTHFIELD TOWNSHIP 2015 ACTIVITIES

| LOCATION | PROJECT | WCRC COST | TOWNSHIP COST | TOTAL COST |
|---|---|---|---|---|
| **PRIMARY** | | | | |
| Maintenance | Roads | $ 144,121.86 | | $ 144,121.86 |
| Maintenance | Winter | 82,665.10 | | 82,665.10 |
| Maintenance | Traffic | 16,918.69 | | 16,918.69 |
| * N. Territorial Rd (btwn Spencer & Sutton) | HMA Resurfacing | 304,992.49 | | 304,992.49 |
| N. Territorial Rd (btwn Sutton & Earhart) | HMA Resurfacing | 253,603.71 | | 253,603.71 |
| | | $ 802,301.85 | | $ 802,301.85 |
| **LOCAL** | | | | |
| Maintenance | Roads | $ 218,375.42 | | $ 218,375.42 |
| Maintenance | Winter | 57,777.84 | | 57,777.84 |
| Maintenance | Traffic | 15,413.79 | | 15,413.79 |
| Local Road | Dust Control | 44,727.88 | 12,386.05 | 57,113.93 |
| Township-Wide Drainage | Drainage | 11,078.84 | 41,140.46 | 52,219.30 |
| Township-Wide Limestone | Limestone | 15,183.11 | 56,381.37 | 71,564.48 |
| | | $ 362,556.88 | $ 109,907.88 | $ 472,464.76 |

* PA 283 Project

# NORTHFIELD TOWNSHIP

## PROPOSED 2016 LOCAL ROAD PROJECTS

- JENNINGS ROAD, US-23 ON-RAMP TO E.O.P
  Work to include roadside berm removal, pulverizing the existing surface, the placement of a 3" HMA overlay, placement of limestone shoulders and associated project restoration.
  Estimated project cost: $ 133,500

- JENNINGS ROAD, E.O.P. TO KEARNEY ROAD
  Work to include ditching, roadside berm removal, tree trimming, shaping the existing surface, the application of 8" (C.I.P.) 23a limestone (approximately 6,100 tons) with associated dust control and project restoration.
  Estimated project cost: $ 232,400

- JENNINGS ROAD, KEARNEY ROAD TO TOWNSHIP LINE
  Work to include ditching, roadside berm removal, tree trimming, shaping the existing surface, the application of 8" (C.I.P.) 23a limestone (approximately 1,600 tons) with associated dust control and project restoration.
  Estimated project cost: $ 72,800

- SIX MILE ROAD, EARHART ROAD TO RUSHTON ROAD
  Work to include ditching, roadside berm removal, tree trimming, shaping the existing surface, the application of 6" (C.I.P.) 23a limestone (approximately 2,200 tons) with associated dust control and project restoration.
  Estimated project cost: $ 81,900

- DIXBORO ROAD, FIVE MILE ROAD TO SIX MILE ROAD
  Work to include ditching, roadside berm removal, tree trimming, shaping the existing surface, the application of 6" (C.I.P.) 23a limestone (approximately 3,650 tons) with associated dust control and project restoration. This is a proposed township share project with Salem Township.
  Estimated project cost: $ 107,400
  Estimated cost to Northfield Township: $ 53,700

- NOLLAR ROAD, N. TERRITORIAL ROAD, SOUTH .28 MILE
  Work to include ditching, roadside berm removal, tree trimming, shaping the existing surface, the application of 6" (C.I.P.) 23a limestone (approximately 1,100 tons) with associated dust control and project restoration.
  Estimated project cost: $ 60,700

- NOLLAR ROAD, NORTHFIELD CHURCH ROAD, NORTH 1 MILE
  Work to include ditching, roadside berm removal, tree trimming, shaping the existing surface, the application of 6" (C.I.P.) 23a limestone (approximately 3,850 tons) with associated dust control and project restoration.
  Estimated project cost: $ 148,200

- NOLLAR ROAD, NORTHFIELD CHURCH ROAD TO JOY ROAD

  Work to include ditching, roadside berm removal, tree trimming, shaping the existing surface, the application of 8" (C.I.P.) 23a limestone (approximately 5,330 tons) with associated dust control and project restoration.

  Estimated project cost: $ 146,200

- JOY ROAD, HELLNER ROAD TO MAPLE ROAD

  Work to include ditching, roadside berm removal, tree trimming, shaping the existing surface, the application of 8" (C.I.P.) 23a limestone (approximately 2,550 tons) with associated dust control and project restoration. This is a proposed township share project with Ann Arbor Township.

  Estimated project cost: $ 119,500
  Estimated cost to Northfield Township: $ 59,750

- JOY ROAD, WHITMORE LAKE ROAD TO HELLNER ROAD

  Work to include ditching, roadside berm removal, tree trimming, shaping the existing surface, the application of 8" (C.I.P.) 23a limestone (approximately 4,950 tons) with associated dust control and project restoration. This is a proposed township share project with Ann Arbor Township.

  Estimated project cost: $ 167,000
  Estimated cost to Northfield Township: $ 83,500

- JOY ROAD, NOLLAR ROAD TO WHITMORE LAKE ROAD

  Work to include ditching, roadside berm removal, tree trimming, shaping the existing surface, the application of 8" (C.I.P.) 23a limestone (approximately 5,010 tons) with associated dust control and project restoration. This is a proposed township share project with Ann Arbor Township.

  Estimated project cost: $ 131,100
  Estimated cost to Northfield Township: $ 65,550

- JOY ROAD, PONTIAC TRAIL TO NOLLAR

  Work to include ditching, roadside berm removal, tree trimming, shaping the existing surface, the application of 8" (C.I.P.) 23a limestone (approximately 5,250 tons) with associated dust control and project restoration. This is a proposed township share project with Ann Arbor Township.

  Estimated project cost: $ 159,200
  Estimated cost to Northfield Township: $ 79,600

- JOY ROAD, EARHART ROAD TO PONTIAC TRAIL

  Work to include ditching, roadside berm removal, tree trimming, shaping the existing surface, the application of 4" (C.I.P.) 23a limestone (approximately 2,600 tons) with associated dust control and project restoration. This is a proposed township share project with Ann Arbor Township.

  Estimated project cost: $ 90,400
  Estimated cost to Northfield Township: $ 45,200

- JOY ROAD, DIXBORO ROAD TO EARHART ROAD

  Work to include ditching, roadside berm removal, tree trimming, shaping the existing surface, the application of 4" (C.I.P.) 23a limestone (approximately 2,850 tons) with associated dust control and project restoration. This is a proposed township share project with Ann Arbor Township.

  | | |
  |---|---|
  | Estimated project cost: | $ 118,700 |
  | Estimated cost to Northfield Township: | $ 59,350 |

- TOWNSHIP WIDE LIMESTONE

  Work to include the application of a 23a limestone surface with associated dust control on various local roads within the township. Locations to be determined by the Township Supervisor (or his designee) and District Foreman. Estimated cost of $17.37 per ton includes all labor, equipment and material costs.

- TOWNSHIP WIDE DITCHING

  Work to include ditching on various local roads within the township. Locations to be determined by the Township Supervisor (or his designee) and District Foreman.

  The township can establish a "not to exceed" cost

## WASHTENAW COUNTY ROAD COMMISSION

## 2016 DUST CONTROL

| MATERIAL | COST/GALLON APPLIED |
|---|---|
| Contract Brine | $0.1575 |

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## NORTHFIELD TOWNSHIP OPTIONS

49.61 miles certified local gravel roads

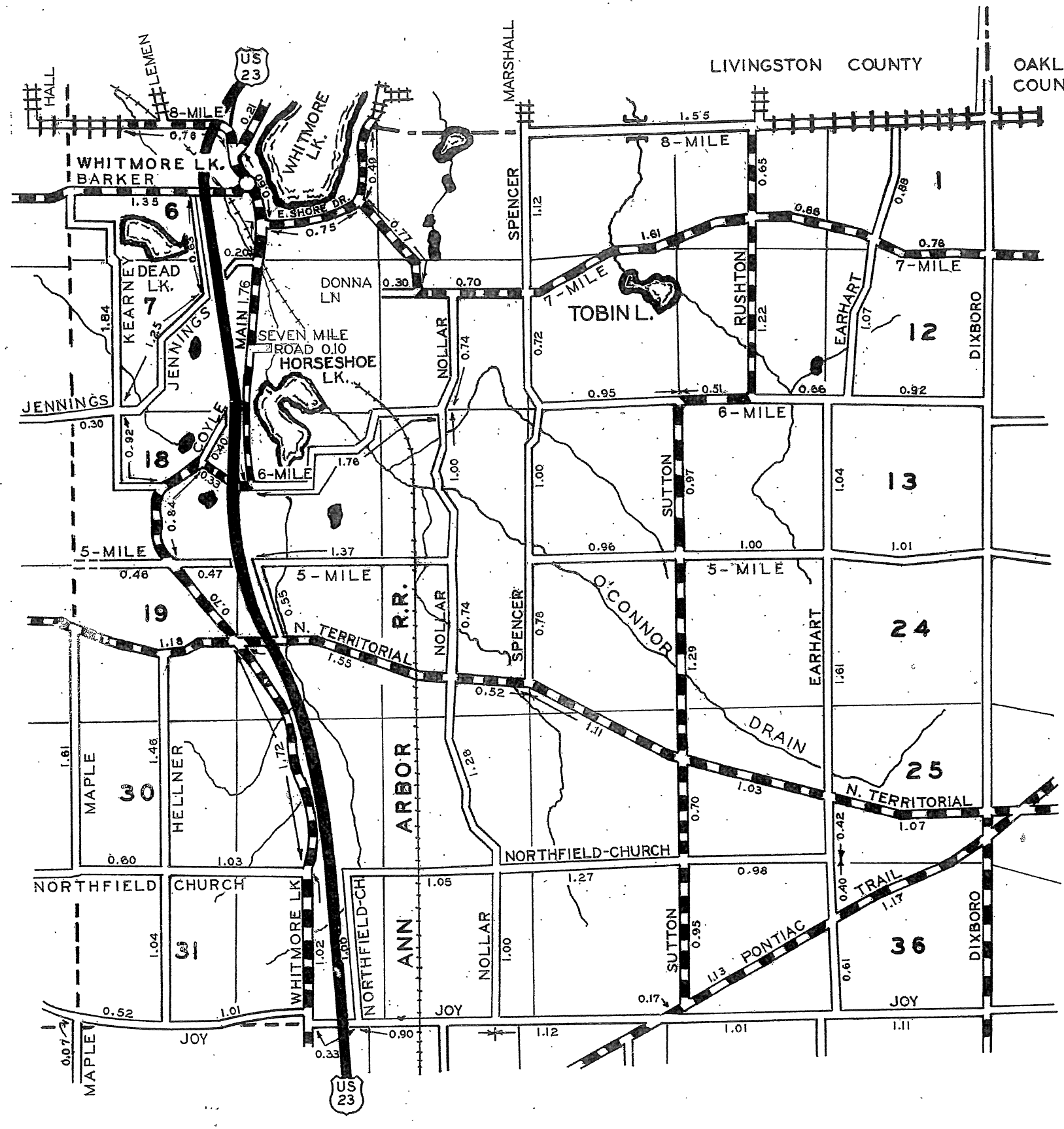
Contract Brine

(Recommended application rate – 2,000 gallons per mile)

| | |
|---|---|
| Two Solid Applications | 198,440 gallons = $ 31,254.30 |

For Information Only

2015 Use: 189,100 gallons Contract Brine
(2 solid applications)




LEGEND

COUNTY LINE

CORPORATE LIMITS

STATE TRUNKLINE

COUNTY PRIMARY

COUNTY LOCAL

AJACENT COUNTY

CITY OR VILLAGE STREET

PRIMARY ROAD SYSTEM IS 30.45 MILES

LOCAL ROAD SYSTEM IS 48.12 MILES

I HEREBY CERTIFY THAT THE ROADS SHOWN HEREON BY SYMBOL OR IN RED AS PRIMARY ROADS AND THOSE SHOWN HEREON BY SYMBOL OR IN GREEN AS LOCAL ROADS ARE IN USE AND ARE UNDER THE JURISDICTION OF THE COUNTY ROAD COMMISSION.

CHAIRMAN _____ DATE _____

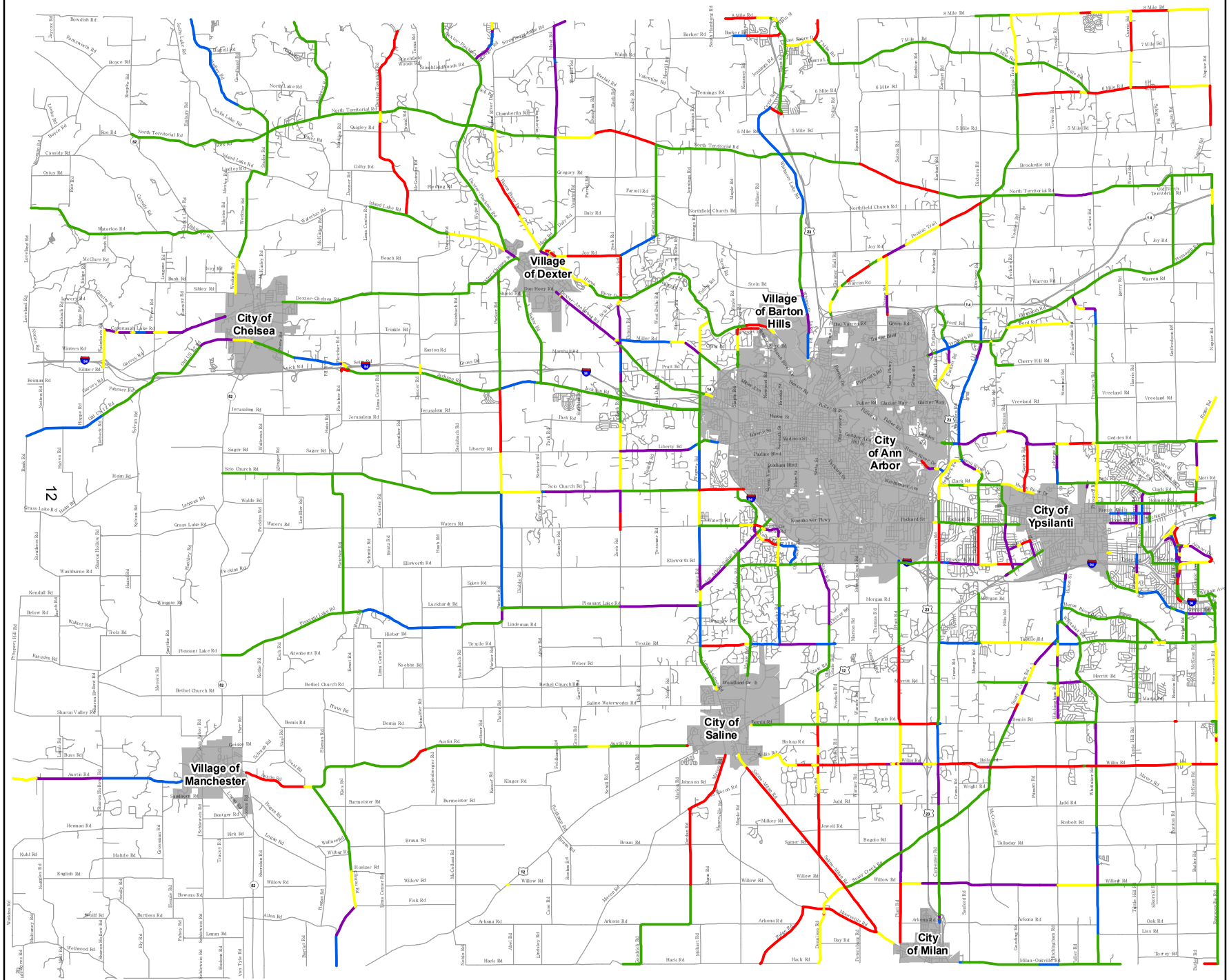
# NORTHFIELD TWP.

N W E S

SCALE 0 ½ 1 MILE

One Inch Equals 3000 Ft.

Prepared by




# Federal Aid Eligible Paved Roads

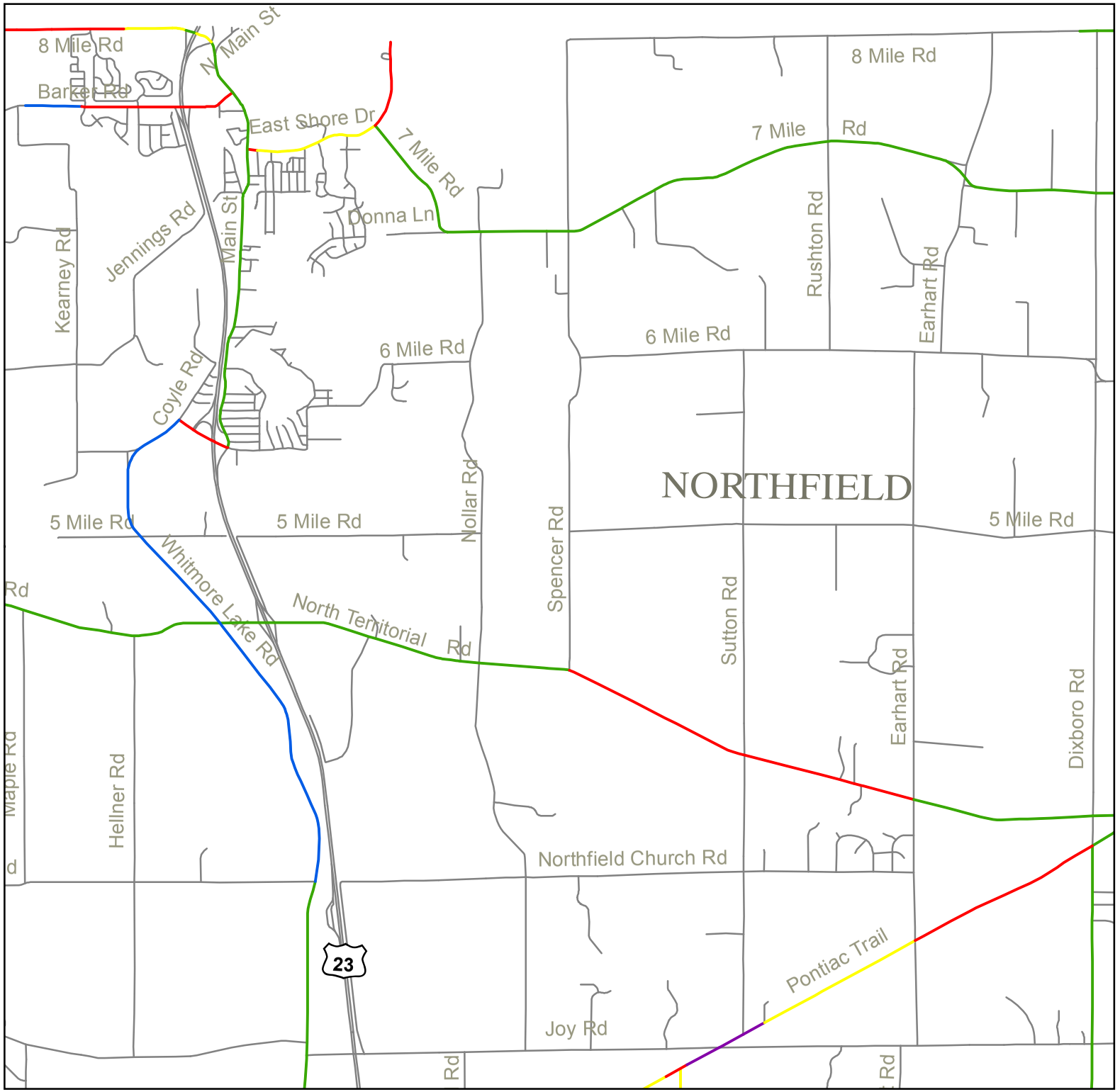
## 2014 Pavement Surface Evaluations and Ratings (PASER)

- 10 - New construction
- 9 - Like new condition, recent overlay, no defects.
- 8 - Occasional transverse crack, all cracks tight.
- 7 - First signs of aging. Transverse cracks 10'-40' apart. No raveling or rutting. Few, if any patches.
- 6 - Shows signs of aging, sound structural condition. First signs of block cracking. Slight raveling, polishing, flushing. No rutting.
- 5 - Surface aging, sound structural condition. Cracks open > 1/2". First signs of cracking at edges. Some patching and wedging. Moderate/severe raveling.
- 4 - Significant aging and first signs of need for strengthening. Longitudinal cracking in wheelpath. Rutting 1/2" - 1" deep. Patching in fair condition.
- 3 - <25% alligator cracking. Moderate rutting 1"-2" deep. Severe block cracking. Occassional pothole. Cracks showing erosion.
- 2 - Severe deterioration. >25% alligator cracking. Severe rutting >2". Closely spaced cracks with erosion. Potholes frequent.
- 1 - Loss of surface integrity. Extensive surface distress.

0 1 2 Miles

N

Date: March 01, 2016




Federal Aid
Eligible Paved Roads

2014 Pavement Surface
Evaluations and Ratings
(PASER)

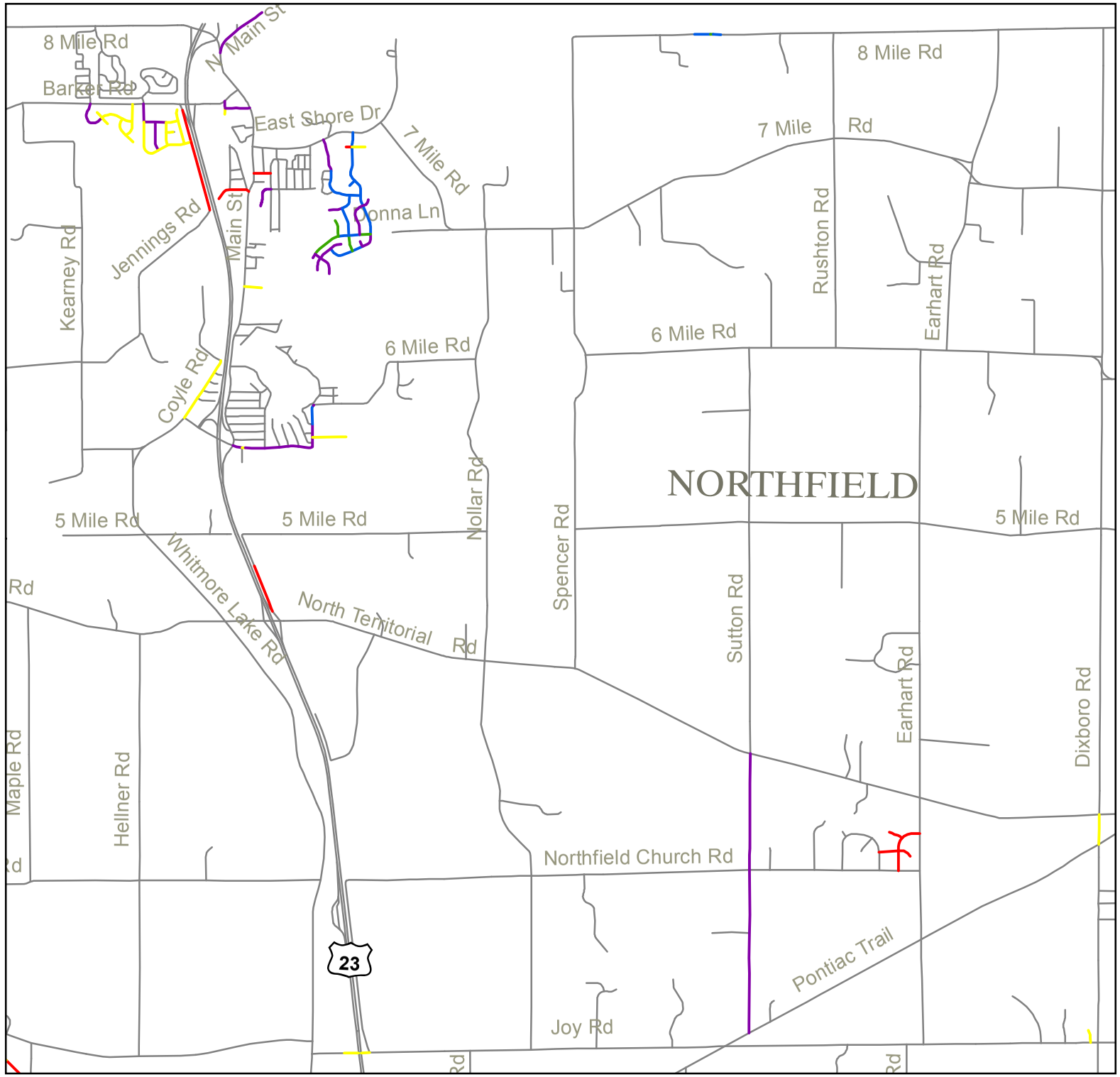
- Crack Seal - Rating 6-10
- Sealcoat - Rating 5
- Overlay - Rating 4
- Mill/Overlay - Rating 3
- Reconstruct - Rating 1-2

# Northfield Township

0 0.5 1 Miles

N

Date: 03/01/2016
Note: 2014 PASER Ratings




**2015 PASER Ratings**
**Paved Local Roads &**
**Non-Federal Aid Roads**

**2015 Pavement Surface Evaluations and Ratings (PASER)**

| | | |
|---|---|---|
| Crack Seal - Rating 6-10 | 0.42 miles |
| Sealcoat - Rating 5 | 1.66 miles |
| Overlay - Rating 4 | 4.38 miles |
| Mill/Overlay - Rating 3 | 2.43 miles |
| Reconstruct - Rating 1-2 | 4.26 miles |

# Northfield Township

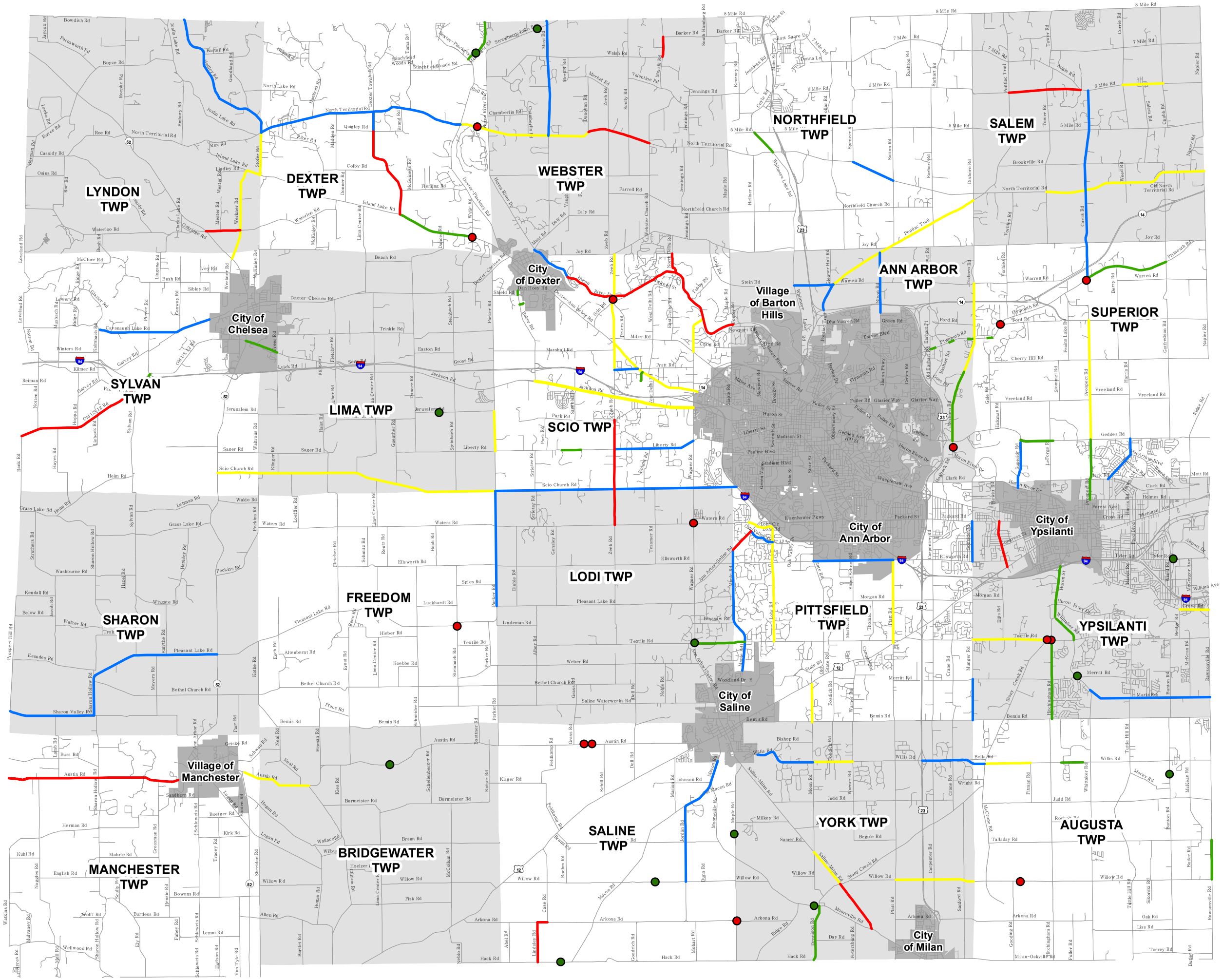
0 0.5 1 Miles

N

Date: 03/01/2016
Note: 2015 PASER Ratings

## Planned Capital Investments - Michigan Transportation Fund Obligations

| Project Name | Planning Area | Project Limits | Project Type | Year | Total MTF Cost (1,000's) | Total Project Cost (1,000's) |
|---|---|---|---|---|---|---|
| Asset Mgmt/GIS | WCRC | Countywide | GIS/Mapping | 2016-2020 | $50 | $50 |
| Diesel Retrofit | WCRC | Countywide | Equipment | 2016 | $600 | $1,000 |
| Equipment/Fleet | WCRC | Countywide | Equipment | 2016-2020 | $1,625 | $1,625 |
| Facility and Grounds | WCRC Property | Countywide | Facility & Grounds | 2016-2020 | $375 | $375 |
| Northeast Service Center | WCRC Property | Northeast Service Center | Site Civil Design | 2016 | $100 | $100 |
| Overlay Program | Countywide | Countywide | Resurface | 2016-2020 | $0 | $0 |
| Primary Limestone/Gravel | Countywide | Countywide | Resurface | 2016-2020 | $500 | $500 |
| Sealcoat Program | Countywide | Countywide | Resurface | 2016-2020 | $1,500 | $1,500 |
| Traffic Calming Program | Countywide | Countywide | Safety | 2016-2020 | $0 | $500 |
| | | | | | | |
| Local Bridge Program | Countywide | Countywide | Bridge | 2016-2020 | $500 | $1,250 |
| Primary Bridge Program | Countywide | Countywide | Bridge | 2016-2020 | $1,600 | $1,600 |
| Jerusalem Road Bridge | Lima | Over Mill Creek | Bridge - Preserve Deck | 2016 | $31 | $174 |
| Maple Road Bridge | Saline/York | Over Saline River | Bridge - Preserve Deck | 2016 | $25 | $144 |
| McGregor Road Bridge | Dexter | Over Portage Lake Outlet | Bridge - Replace | 2016 | $359 | $2,060 |
| Mooreville Road Bridge | York | Over Saline River | Bridge - Preserve Deck | 2016 | $33 | $190 |
| Wiard Road Bridge | Ypsilanti | Over Tyler Road | Bridge Removal | 2016 | $263 | $1,512 |
| Huron River Drive Bridge | Ann Arbor | Over Pittsfield-Ann Arbor Drain | Bridge - Preserve Deck | 2017 | $60 | $250 |
| Ridge Road Bridge | York | Over Macon Creek | Bridge - Replace | 2017 | $252 | $1,050 |
| Shield Road Bridge | Scio | Over Mill Creek | Bridge - Replace | 2017 | $466 | $1,938 |
| Superior Road Bridge | Superior | Over Huron River | Bridge - Preserve Deck | 2017 | $127 | $531 |
| | | | | | | |
| Limestone Program - PA 283 | Countywide | Countywide | Resurface | 2016 | $0 | $0 |
| HMA Resurfacing Program - PA 283 | Countywide | Countywide | Resurface | 2016 | $0 | $2,950 |
| Sealcoat Program - PA 283 | Countywide | Countywide | Resurface | 2016 | $0 | $1,300 |
| Pavement Preservation STL | Countywide | Countywide | Resurface | 2016-2020 | $346 | $1,727 |
| Pavement Preservation STU | Countywide | Countywide | Resurface | 2016-2020 | $612 | $3,062 |
| Pavement Preservation TEDF-D | Countywide | Countywide | Resurface | 2016-2020 | $165 | $833 |
| Resurfacing 3R STL | Countywide | Countywide | Resurface | 2016-2020 | $313 | $1,565 |
| Resurfacing 3R STU | Countywide | Countywide | Resurface | 2016-2020 | $787 | $3,939 |
| Resurfacing 3R TEDF-D | Countywide | Countywide | Resurface | 2016-2020 | $224 | $1,115 |
| | | | | | | |
| Ann Arbor-Saline Road | Lodi | At Textile Road | Safety - Intersection | 2016 | $125 | $625 |
| Guardrail Upgrades | Countywide | Countywide | Safety - Roadside | 2016 | $95 | $264 |
| Huron Road/Whittaker Road | Ypsilanti | Stony Creek Road to I-94 | Resurface | 2016 | $125 | $625 |
| Liberty Road | Scio | Park Road to Stag's Leap Lane | Drainage, Limestone | 2016 | $0 | $600 |
| Plymouth Road | Ann Arbor/Superior | Earhart Road to Ford Road | Traffic Signal Interconnect | 2016 | $25 | $300 |
| Prospect Road | Superior/Ypsilanti | Holmes Road to Geddes Road | Resurface | 2016 | $50 | $250 |
| Rawsonville Road | Augusta | Willow Road to Talladay Road | Resurface | 2016 | $0 | $625 |
| Scio Township SAD | Scio | Various Roads in Scio Township | Resurface | 2016 | $0 | $600 |
| Textile Road | Lodi | Ann Arbor-Saline Road to Maple Rd | Resurface | 2016 | $100 | $500 |
| Traffic Signal Backplate Installation | Countywide | Countywide | Safety - Intersection | 2016 | $67 | $278 |
| Whittaker Road | Ypsilanti | At Merritt Road | Safety - Roundabout | 2016 | $232 | $982 |
| Willis Road | Augusta | Hitchingham Road to Whittaker Road | Safety | 2016 | $264 | $1,244 |
| Carpenter Road | York/Pittsfield | Judd Road to Textile Road | Resurface | 2017 | $125 | $625 |
| Harris Road | Ypsilanti | Michigan Avenue to Holmes Road | Reconstruct | 2017 | $513 | $1,925 |
| Rawsonville Road | Augusta | Talladay Road to Judd Road | Resurface | 2017 | $0 | $400 |
| Scio Church Road | Scio/Lodi | At Wagner Road | Congestion - Roundabout | 2017 | $397 | $960 |
| STL | TBD | TBD | TBD | 2018 | $0 | $0 |
| STU | TBD | TBD | TBD | 2018 | $125 | $625 |
| TEDF-D | TBD | TBD | TBD | 2018 | $0 | $0 |
| STL | TBD | TBD | TBD | 2019 | $0 | $0 |
| STU | TBD | TBD | TBD | 2019 | $250 | $1,250 |
| TEDF-D | TBD | TBD | TBD | 2019 | $0 | $0 |
| STL | TBD | TBD | TBD | 2020 | $0 | $0 |
| STU | TBD | TBD | TBD | 2020 | $250 | $1,250 |
| TEDF-D | TBD | TBD | TBD | 2020 | $0 | $0 |
| | | | | | | |
| | | | | **Totals** | **$13,656** | **$46,768** |

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Washtenaw County Projects 2015 - 2016

## Projects

**Road Commission & Federal Funds**

- 2015
- 2016

**PA283**

- 2015
- 2016

0 1 2 4 Miles

Printed: March 3, 2016

N

# 2016-04 Washtenaw County Act PA 283

| Road | WCC Dist | Note | Project Limits | Type of Work | Length | Est. Cost | Est. Cost-0.5 |
|---|---|---|---|---|---|---|---|
| Parker Road | 1 | | Jerusalem to Liberty | Pulverize and Overlay | 1.0 | $ 300,000 | |
| Werkner, Isl Lk, Stofer | 1 | | M-52 to North Territorial | Chipseal | 3.5 | $ 90,000 | |
| North Territorial Road | 1 | | Dexter-Pinckney to Huron River Drive | Chipseal | 1.0 | $ 25,000 | |
| Zeeb Road | 1 | | Huron River Drive to Joy | Mill and Overlay | 1.1 | $ 180,000 | |
| Zeeb Road | 1 | | Pratt to Huron River Drive | Chipseal | 2.0 | $ 50,000 | |
| Scio Church Road | 1 | A-2 | Parker to 0.7-mile west of Steinbach | Chipseal | 1.7 | $ 20,000 | |
| Scio Church Road | 1 | | M-52 to 0.7-mile west of Steinbach | Chipseal | 5.5 | $ 120,000 | |
| Dexter Ann Arbor | 1 | | Zeeb to M 14 | Chipseal & Fog Seal | 2.8 | $ 90,000 | |
| Wagner | 1 | | Miller to Huron River Drive | Wedge & Chipseal | 1.00 | $ 40,000 | $ 915,000.00 |
| | | | | | 19.55 | | |
| Pontiac Trail | 2 | | Warren to Nixon | Spot Mill & Fill w/ Chipseal | 1.5 | $ 130,000 | |
| North Territorial Road | 2 | | Tower to Napier | Chipseal | 4.5 | $ 110,000 | |
| North Territorial Road | 2 | | Huron River Drive to Donovan | Chipseal | 2.5 | $ 70,000 | |
| Pontiac Trail | 2 | | Sutton to Dixboro | Wedge & Chipseal | 2.8 | $ 112,000 | |
| Prospect Road | 2 | | M-153 to Geddes | Chipseal | 3.0 | $ 75,000 | |
| Prospect Road | 2 | | Geddes to Clark | Mill & Overlay | 1.0 | $ 150,000 | |
| Dixboro Road | 2 | | Geddes to Warren | Chipseal | 4.0 | $ 100,000 | |
| Six Mile | 2 | | Currie to Chubb | Pulverize and Overlay | 1.00 | $ 300,000 | $ 1,047,000.00 |
| | | | | | 20.30 | | |
| Austin Road | 3 | | M-52 to Clinton | Mill & Overlay | 1.7 | $ 270,000 | |
| Willow Road | 3 | | Platt to 1/2 mile east of Sanford | Chipseal | 2.0 | $ 50,000 | |
| Scio Church Road | 3 | A-2 | Parker to 0.7-mile west of Steinbach | Chipseal | 0.0 | $ 20,000 | |
| Saline-Milan Road | 3 | | Stony Creek to Moon | Mill & Overlay | 1.0 | $ 150,000 | |
| Willis Road | 3 | | Moon to Warner | Pulverize and Overlay | 1.0 | $ 300,000 | |
| | | | | | | | $ 790,000.00 |
| | | | | | 5.70 | | |
| Waters Road | 4 | | Oak Valley to Ann Arbor-Saline | Mill & Overlay | 0.5 | $ 150,000 | |
| Platt Road | 4 | | Ellsworth to US 12 | Chipseal | 2.0 | $ 75,000 | |
| Moon Road | 4 | | US-12 to Bemis | Pulverize & Overlay | 1.0 | $ 300,000 | |
| Lohr Road | 4 | | Ellsworth to Textile | Chipseal | 2.0 | $ 50,000 | |
| Lohr Road | 4 | | Ellsworth to Ann Arbor-Saline | Mill & Overlay | 1.3 | $ 330,000 | |
| | | | | | | | $ 905,000.00 |
| | | | | | 6.80 | | |
| Textile Road | 5 & 6 | | Stony Creek to Munger | Mill & Overlay | 1.90 | $ 270,000 | |
| Willis Road | 5 & 6 | | Stony Creek to Pitman | Pulverize and Overlay | 1.20 | $ 360,000 | |
| Grove Road | 5 & 6 | | Bridge to Rawsonville | Mill & Overlay | 0.75 | $ 200,000 | |
| | | | | | | | $ 830,000.00 |
| | | | | | 3.85 | | |
| **Totals** | | | | | 56.20 | | **$ 4,487,000** |

# Michigan's New Road Funding Package

## What does it mean for Washtenaw County?

On November 10th, 2015, Governor Rick Snyder signed a $1.2 billion road funding package that will increase the funding provided to the Washtenaw County Road Commission through the Michigan Transportation Fund (MTF). The MTF includes all state-collected road revenue generated from fuel taxes and vehicle registration fees. The MTF is the Road Commission's main source of funding and this is the first increase since 1997.

While additional funding is great news for Washtenaw County's failing road system, the package does not provide any additional road funding in 2016 and residents will not see increases in road improvements until 2017. Read on to learn how this road funding package works, what it will take to fix our road system, and what remains uncertain about the future of state road funding in Washtenaw County.

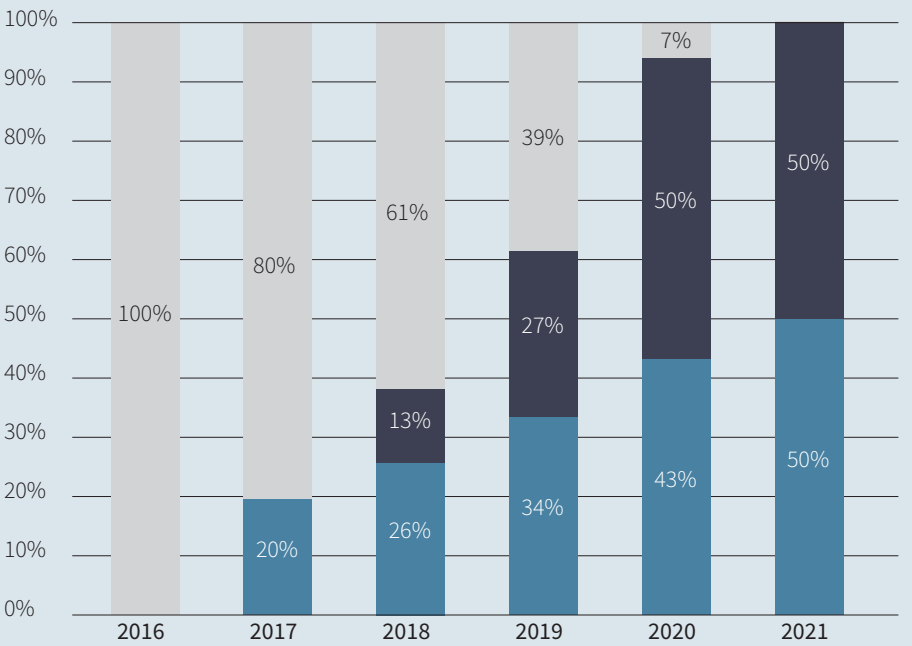
*6 Mile Road - 2015*

## What the road funding package will do

| | | |
|---|---|---|
| **Provides an additional $1.2B in MTF funding state-wide** | ⇨ | **The package does not provide full funding until 2021; 6 years from now.** |
| **The new funding will begin in 2017** | ⇨ | **The package provides no funding for road improvements in 2016.** |
| **The 1st increase in the MTF since 1997** | ⇨ | **20 years have passed with no state funding increase and it will take time for WCRC to catch up and fix all the county's "poor" and "failing" roads.** |
| **50% of the funding will come from increases in fuel taxes & vehicle registration fees** | ⇨ | **Beginning in 2017: 20% increase in vehicle registration fees, 7.3¢ increase in the state's gasoline tax, 11.3¢ increase in state's diesel tax.** |
| **Beginning in 2018, shifts will be made in the State's General Funds to provide the other 50% of funding.** | ⇨ | **Lawmakers are relying on continued economic growth to bring in more revenue to the General Fund to fund roads.** |


# How will the new road funding phase in?

The new road funding deal will generate $1.2 billion by 2021. The first $600 million will come from vehicle registration and fuel tax increases that start in 2017. The additional $600 million will be shifted from the state's $9.9 billion general fund towards roads starting in 2018.




% of the State's $1.2B road package that remains unfunded

% of the $600M generated from vehicle registration and fuel tax increases

% of the $600M generated from the State's General Fund (Uncertain)

**Funding Uncertainty:**
The State Legislature did not identify where specifically the $600 million from the State's General Fund will come from.

Lawmakers are counting on continued economic growth to bring in more tax revenue that could be used for roads. If economic growth does not continue, future legislators may set budget priorities that may or may not fully fund the $600 million.

# How much additional funding will WCRC receive?

In 2014, the Washtenaw County Road Commission received $17.5 million from the Michigan Transportation Fund (MTF). Estimates predict that the Road Commission will receive an additional $4.3 million in 2017, $5.7 million in 2018, $7.4 million in 2019, $9.4 million in 2020, and $12.5 million in 2021 (if the $600M General Fund dollars are redirected as the law intends).

# Will it be enough to fix our failing road system?

Over the past decade, the cost to maintain and repair roads has steadily risen, but the Washtenaw County Road Commission's budget has not kept pace with the rate of inflation. Even if WCRC receives the estimated full amount of funding in 2021 there will be years of catch-up work to be done to fix the county's "poor" and "failing" roads. WCRC estimates that to get all of the county's roads into "good" condition would require over $50 million. While the new state funding increase will help, it will take five years to phase-in and roads will continue to deteriorate as we await the new funding.

In addition to fixing the county's worst roads, WCRC must also balance the need to preserve the investments that have already been made in the county's "good" roads to increase their lifespans and avoid costly reconstruction projects. WCRC must also factor in the annual cost of winter maintenance, the need for new equipment, and other agency operation costs when determining how to allocate the new road funding from the state.

## TOWNSHIP CONTRIBUTION SUMMARY 2011 - 2015

| TOWNSHIP | TOTAL 2011 | TOTAL 2012 | TOTAL 2013 | TOTAL 2014 | TOTAL 2015 | 5 Year Average |
|---|---|---|---|---|---|---|
| ANN ARBOR | $ 49,000 | $ 54,000 | $ 122,000 | $ 224,919 | $ 43,175 | $ 98,618.80 |
| AUGUSTA | $ 97,000 | $ 202,000 | $ 203,000 | $ 192,169 | $ 158,618 | $ 170,557.40 |
| BRIDGEWATER | $ 32,000 | $ 34,000 | $ - | $ 40,306 | $ 54,651 | $ 32,191.40 |
| DEXTER | $ 90,000 | $ 105,000 | $ 82,000 | $ 536,784 | $ 55,724 | $ 173,901.60 |
| FREEDOM | $ 42,000 | $ 45,000 | $ 57,000 | $ 31,716 | $ 51,334 | $ 45,410.00 |
| LIMA | $ 47,000 | $ 51,000 | $ 70,000 | $ 117,285 | $ 118,676 | $ 80,792.20 |
| LODI | $ 150,000 | $ 415,000 | $ 141,000 | $ 483,502 | $ 67,065 | $ 251,313.40 |
| LYNDON | $ 20,000 | $ 23,000 | $ 16,000 | $ 45,285 | $ 19,390 | $ 24,735.00 |
| MANCHESTER | $ 100,000 | $ 128,000 | $ 47,000 | $ 64,246 | $ 77,675 | $ 83,384.20 |
| NORTHFIELD | $ 42,000 | $ 62,000 | $ 84,000 | $ 93,195 | $ 109,907 | $ 78,220.40 |
| PITTSFIELD | $ 183,000 | $ 792,000 | $ 393,000 | $ 880,819 | $ 907,340 | $ 631,231.80 |
| SALEM | $ 173,000 | $ 296,000 | $ 1,042,000 | $ 459,327 | $ 425,626 | $ 479,190.60 |
| SALINE | $ 101,000 | $ 92,000 | $ 110,000 | $ 143,066 | $ 159,024 | $ 121,018.00 |
| SCIO | $ 471,000 | $ 1,245,000 | $ 833,000 | $ 1,108,452 | $ 1,269,480 | $ 985,386.40 |
| SHARON | $ 54,000 | $ 34,000 | $ 20,000 | $ 14,755 | $ 24,306 | $ 29,412.20 |
| SUPERIOR | $ 161,000 | $ 280,000 | $ 322,000 | $ 324,001 | $ 244,797 | $ 266,359.60 |
| SYLVAN | $ 17,000 | $ 10,000 | $ 8,000 | $ 26,852 | $ 73,968 | $ 27,164.00 |
| WEBSTER | $ 135,000 | $ 153,000 | $ 89,000 | $ 16,019 | $ 15,765 | $ 81,756.80 |
| YORK | $ 26,000 | $ 34,000 | $ 108,000 | $ 418,883 | $ 460,000 | $ 209,376.60 |
| YPSILANTI | $ 1,190,000 | $ 4,970,000 | $ 2,794,000 | $ 2,510,384 | $ 1,048,026 | $ 2,502,482.00 |
| | **$ 3,180,000** | **$ 9,025,000** | **$ 6,541,000** | **$ 7,731,965** | **$ 5,384,547** | **$ 6,372,502.40** |

**Five year avg. 2011 - 2015** **$ 6,372,502**

## 2016 Summary of Paved Local and Subdivision Roads Needs for each TOWNSHIP

2016

| TOWNSHIP | Crack Seal Road Miles | Crack Sealing at $8k/mi | Surface Treatment Road Miles | Surface Treatment at $32k/mi | Mill & Overlay Road Miles | Mill & Overlay at $190k/mi | Pulverization & Pave Road Miles | Pulverization & Pave at $ 320k/mi | Total Needs for Local & Subd Paved Roads | Average 10 year Expediture Needs for Paved Roads |
|---|---|---|---|---|---|---|---|---|---|---|
| ANN ARBOR | 0.4 | $ 3,200 | 0.5 | $ 16,000 | 2.0 | $ 380,000 | 2.1 | $ 672,000 | $ 1,071,200 | $ 107,120 |
| AUGUSTA | 1.6 | $ 12,800 | 2.8 | $ 89,600 | 0.1 | $ 19,000 | 2.0 | $ 640,000 | $ 761,400 | $ 76,140 |
| BRIDGEWATER | 0.0 | $ - | 0.0 | $ - | 0.0 | $ - | 0.5 | $ 160,000 | $ 160,000 | $ 16,000 |
| DEXTER | 0.0 | $ - | 2.2 | $ 70,400 | 5.4 | $ 1,026,000 | 3.0 | $ 960,000 | $ 2,056,400 | $ 205,640 |
| FREEDOM | 0.0 | $ - | 0.0 | $ - | 0.0 | $ - | 0.5 | $ 160,000 | $ 160,000 | $ 16,000 |
| LIMA | 0.0 | $ - | 1.0 | $ 32,000 | 2.2 | $ 418,000 | 0.8 | $ 256,000 | $ 706,000 | $ 70,600 |
| LODI | 0.2 | $ 1,600 | 0.0 | $ - | 4.2 | $ 798,000 | 6.7 | $ 2,144,000 | $ 2,943,600 | $ 294,360 |
| LYNDON | 0.0 | $ - | 0.0 | $ - | 0.2 | $ 38,000 | 0.0 | $ - | $ 38,000 | $ 3,800 |
| MANCHESTER | 0.0 | $ - | 0.0 | $ - | 0.6 | $ 114,000 | 0.0 | $ - | $ 114,000 | $ 11,400 |
| NORTHFIELD | 0.0 | $ - | 2.1 | $ 67,200 | 5.0 | $ 950,000 | 1.8 | $ 576,000 | $ 1,593,200 | $ 159,320 |
| PITTSFIELD | 8.4 | $ 67,200 | 29.5 | $ 944,000 | 27.6 | $ 5,244,000 | 5.9 | $ 1,888,000 | $ 8,143,200 | $ 814,320 |
| SALEM | 0.9 | $ 7,200 | 0.3 | $ 9,600 | 2.4 | $ 456,000 | 1.0 | $ 320,000 | $ 792,800 | $ 79,280 |
| SALINE | 0.0 | $ - | 0.0 | $ - | 0.6 | $ 114,000 | 0.7 | $ 224,000 | $ 338,000 | $ 33,800 |
| SCIO | 2.6 | $ 20,800 | 2.5 | $ 80,000 | 4.9 | $ 931,000 | 6.2 | $ 1,984,000 | $ 3,015,800 | $ 301,580 |
| SHARON | 0.0 | $ - | 0.0 | $ - | 0.0 | $ - | 0.0 | $ - | $ - | $ - |
| SUPERIOR | 4.3 | $ 34,400 | 4.8 | $ 153,600 | 9.9 | $ 1,881,000 | 7.2 | $ 2,304,000 | $ 4,373,000 | $ 437,300 |
| SYLVAN | 0.8 | $ 6,400 | 0.6 | $ 19,200 | 11.1 | $ 2,109,000 | 2.1 | $ 672,000 | $ 2,806,600 | $ 280,660 |
| WEBSTER | 0.2 | $ 1,600 | 0.0 | $ - | 0.8 | $ 152,000 | 0.4 | $ 128,000 | $ 281,600 | $ 28,160 |
| YORK | 2.3 | $ 18,400 | 7.5 | $ 240,000 | 7.8 | $ 1,482,000 | 5.5 | $ 1,760,000 | $ 3,500,400 | $ 350,040 |
| YPSILANTI | 13.3 | $ 106,400 | 59.3 | $ 1,897,600 | 29.2 | $ 5,548,000 | 6.3 | $ 2,016,000 | $ 9,568,000 | $ 956,800 |
| **TOTALS** | **35.0** | **$ 280,000** | **113.1** | **$ 3,619,200** | 114.0 | **$ 21,660,000** | 52.7 | **$ 16,864,000** | **$ 42,423,200** | **$ 4,242,320** |

**TETRA TECH, INC.**

# INTEROFFICE MEMORANDUM

**TO:** Howard Fink, Northfield Township Manager

**FROM:** Brian Rubel

**DATE:** March 21, 2016

**SUBJECT:** Sewer Policies

During recent discussions on sewer capacity, the topic of Northfield's Township policy for new connections has been discussed. Recent studies have provided new insight on sewer capacity and these studies may assist in shaping the Board's direction.

Clarification on the following policy items would assist both the Township's engineering consultant and Township management in discussions with prospective new sewer users.

## NORTH TERRITORIAL PUMP STATION AREA

The North Territorial Pump Station was constructed from proceeds of a special assessment district (SAD). The main policy item here is whether the Board will allow development outside the original SAD to connect to the existing pump station.

Policy options to consider for this service area include:

- Exclude all new development
- Allow new development using the Township's exiting connection fee
- Allow new development and develop a new connection fee to pay for a prorated share of future infrastructure needed to support the development

## DOWNSTREAM GRAVITY SEWER AREA

The downstream gravity sewer area has little available sewer capacity. Policy options to consider include:

- Exclude all new development
- Allow fill-in development (perhaps less than 100 in total)
- Allow new development while having the developers finance improvements to the downstream sewer system
- Allow new development and develop a new connection fee so developers pay for a prorated share of future infrastructure needed to support the development

ENTIRE SERVICE AREA

The Capacity Inventory revealed that the Township had significant capacity commitments to Green Oak Township and the North Territorial Pump Station SAD. With the construction of a storage tank, the Township would have treatment capacity available to meet these commitments. However, additional development would require the Township to implement a WWTP expansion. The Northfield WWTP has been expanded numerous times (such expansions are a common way for a growing community to meet their wastewater needs) and the Township planned for such an expansion in 2005 when the contract with Green Oak was executed.

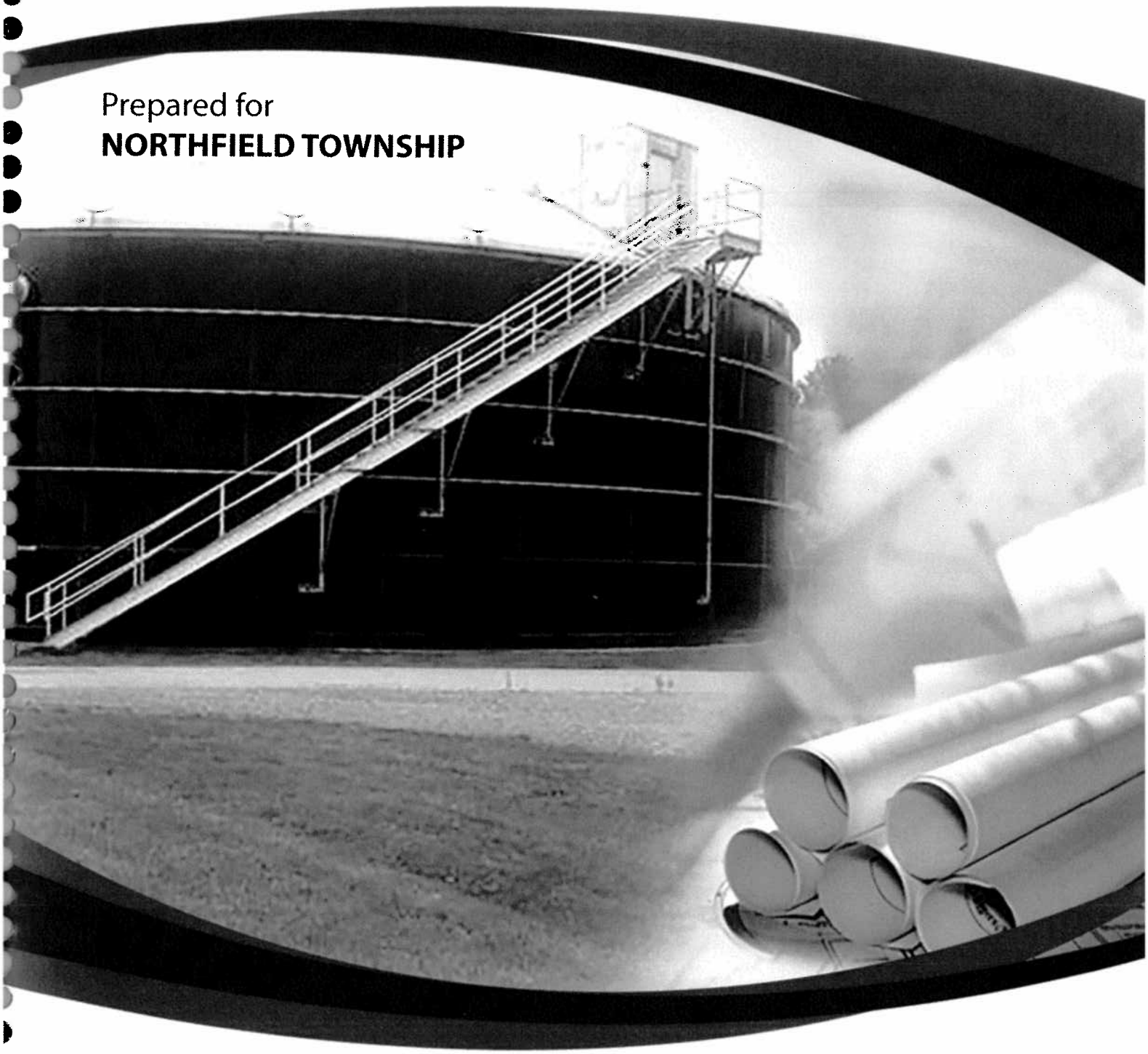
Policy options to consider include:

- Exclude all new development
- Allow fill-in development (Perhaps less than 100 in total)
- Allow new development and develop a new connection fee to pay for a prorated share of a future WWTP expansion. The WWTP would be expanded when plant influent flows reach approximately 85% of its rated capacity.

# Wastewater Treatment Plant Wet Weather Storage Tank

## Preliminary Design Report

Prepared for
**NORTHFIELD TOWNSHIP**



TETRA TECH

**FINAL**
March 2016

**NORTHFIELD TOWNSHIP**

# Wastewater Treatment Plant

# Wet Weather Storage Tank Preliminary Design Report

**March 21, 2016**

# Table of Contents

# INTRODUCTION

Northfield Township owns and operates a Wastewater Treatment Plant (WWTP) and sanitary collection system. The WWTP is located at 1150 Lemen Road, Whitmore Lake, Michigan 48189. As with most older sewer systems, the wastewater flow rates increase with rainfall. This makes operating the WWTP challenging. As early as 1988, the Township evaluated construction of a Wet Weather Storage (WWS) tank to manage the wet weather flow. However, the WWS tank was never constructed. Operational challenges from recent wet weather flow and inquiries regarding adding new development have led to this preliminary design report for a WWS tank at the Northfield WWTP.

# TANK SIZING

The WWTP's current average flow is 0.7 MGD and can be as high as 0.9 MGD during spring months (May generally being the peak month). The current WWTP capacity is 1.3 MGD. The Township's NPDES permit allows expansion up to 3 MGD. In 2002, Northfield, Green Oak, and Hamburg Township entered into a consent order that called for the WWTP to expand to 2.25 MGD. However the economy stalled and this expansion did not proceed.

In March 2015, as part of the Sanitary Sewer Capacity Inventory Report, Tetra Tech completed an analysis which resulted in a preliminary tank size of 1.7 MG to prevent overflows up to the 25-year, 24-hour design storm in accordance with the Michigan's sanitary sewer overflow (SSO) policy. The design storm hydrograph was based on several years of metered data from the WWTP's influent meter. This storage volume would allow the current plant to be used without other major improvements until the average dry weather flow during the spring reached 1.1 MGD, which is 85 percent of the WWTP's treatment capacity. Expansion of the WWTP would be required once average flows reached this magnitude.

As part of this preliminary design a second, but more data intensive analysis (a long-term simulation), was completed to take advantage of the portion of the State's SSO Policy. This allows communities to demonstrate that there will be no more than one overflow in ten years from the system instead of using the 25-year, 24-hour design storm. This approach can substantially reduce the amount of storage required to meet the State's SSO Policy relative to the design storm.

The long-term simulation was completed using EPA SWMM. Flows in response to rainfall are predicted by the model using a unit hydrograph method based on the response to rainfall recorded at the WWTP's influent meter and 54 years of hourly rainfall data. The model also uses a seasonally varying dry weather flow pattern to represent the higher dry weather flows measured in the spring season.

For the 54-year simulation, the minimum tank size that meets the State's SSO Policy will have a volume that is just larger than the sixth largest volume required, and will allow roughly one overflow every ten years on average. This volume was determined to be 1.3 MG.

Due to uncertainties in modeling, it is prudent to plan for a slightly larger storage tank than the analysis projects. For instance, it may be wise to plan on a 1.5 MG tank. The model predicts a 1.5 MG tank will have two overflows in the 54-year model simulation.

Further discussion of preliminary sizing of the WW tank and discussion of the long-term simulation in more detail are provided in Appendix A.

# TANK MATERIAL

Two types of tank materials were considered as part of the evaluation. One type of tank considered is a below grade concrete storage tank and the other type of tank considered is an above ground bolted steel storage tank.

## Concrete Tank

This type of tank would be a buried below grade concrete storage tank with a concrete cover. Considerations with this type of tank include:

- Considerable excavation and backfill would be required.
- Fitting the concrete tank onsite in an ideal location within the property lines will be challenging.
- A valve and meter vault would be required to divert flow from the 8 Mile Pump Station into the storage tank.
- A pump station would be required for draining the tank. These pumps would be used very infrequently and be another maintenance item for plant staff.
- The concrete tank would most likely have a concrete cover to contain odors. A concrete cover is not ideal since hydrogen sulfide can build up in the tank and deteriorate the concrete.
- A typical design life would be 50 to 100 years.
- Approximate cost of $3 per gallon of storage

Bolted Steel Tank

This type of tank would be an above-ground bolted steel storage tank with access stairs, platform, and a dome cover. Considerations with this type of tank include:

- Fill would need to be brought on site to raise the tank high enough for the tank to drain by gravity to the Grit and Screen Building. This eliminates the need for a pump station to drain the tank. Proper compaction methods would need to be followed to control tank settling.
- A valve and meter vault would be required to divert flow from the 8 Mile Pump Station into the storage tank.
- The same valve and meter vault would be used for draining the tank back to the Grit and Screen Building. Since draining the tank can be done by gravity, a pump station would not be required. This will provide one less maintenance item for the WWTP staff as compared to the concrete tank.
- Access stairs would be provided to the top of the tank with a platform for access into the tank at the top of the stairs.
- A dome cover would be located over the top of the tank to contain odors.
- The steel will be glass lined to control corrosion.
- A typical design life is at least 50 years.
- Approximate cost of $2 per gallon of storage

Based on review with plant staff it was decided to proceed with designing the bolted steel storage tank with the main reason that the bolted steel tank would be considerably less expensive than the concrete tank with a similar design life. Additional reasons for the bolted steel tank is that it will fit on site, a pump station is not required, and the tank and equipment will have minimal maintenance. From this point in the report only the bolted steel storage tank is discussed.

# TANK DIMENSIONS

Bolted steel tanks can be obtained in numerous combinations of height and diameter. For this project, we have identified a 100 feet diameter by 26.5 feet tank height as a reasonable combination to provide the 1.5 MG of storage. The floor elevation of the tank will be at elevation 915.00 which places the tank higher than the expected high water level at maximum flow in the Grit and Screen Building as shown on Figure 2 in Appendix B. This will allow the tank to be drained by gravity. The final tank diameter and tank height may be slightly adjusted during design of the tank.

# TANK, VALVE AND METER VAULT LOCATION

The WWS tank will be located directly south of the Grit and Screen Building. This location requires the least amount of fill to be brought on site for raising the floor of the WWS tank to allow gravity draining of the tank. This location also leaves the area to the south and east clear for future plant expansion. The location for the WWS tank is shown on Figure 3 in Appendix B.

A valve and meter vault will be located just south of the Grit and Screen Building and north of the WWS tank. The valve and meter vault will have throttling valves, open-close motor-actuated valves, open-close manual valves, magnetic flow meter, and sump pump. The vault will be located at the existing 90 degree bend on the 12-inch force main from the 8 Mile Pump Station to the Grit and Screen Building. This 90 degree bend will be replaced with the piping and valves shown on Figure 1 in Appendix B. The 90 degree bend and a small portion of the 14" Raw Sewage (RS) pipe from the Grit and Screen Building to the Primary Flow Split Structure will need to be relocated to move this pipe further away from the valve and meter vault perimeter. This piping is shown on Figure 5 in Appendix B.

The elevations of the WWS tank, valve and meter vault, and piping are shown on Figure 2 in Appendix B.

# TANK OPERATION

## Filling

The primary method to fill the WWS tank is through the 12-inch force main from 8 Mile Pump Station. A throttling valve will be installed on the 12-inch force main to control the flow rate to the Grit and Screen Building (perhaps to typically limit flows to less than the 2.5 mgd peak capacity of the WWTP). This throttling valve will be located in the valve and meter vault. The remaining pumped flow will go to the WWS Tank through the open motor-actuated plug valve and a flow meter located in the valve and meter vault. The influent flow to the WWTP will be measured by the existing Parshall Flume in the Grit and Screen Building and the influent flow the WWS tank will be measured by the new magnetic flow meter.

Normally the flow from the Woodland Center Correctional Facility Pump Station will be to the Grit and Screen Building. If the Grit and Screen Building needs to be temporarily taken out of service the flow from the 8-inch force main from Woodland Center Correctional Facility Pump Station can be sent to the WWS tank. The ground-buried valve to the Grit and Screen Building will be closed and the ground buried valve to the WWS tank will be opened.

See Figure 1 for the flow schematic and Figure 5 for the yard piping showing the piping arrangement. These figures are located in Appendix B.

## Maintenance

To allow for maintenance on the throttling valves and the flow meter, normally-open plug valves are located upstream and downstream of each piece of equipment. These are shown on Figure 1 in Appendix B.

These valves will also allow an alternate flow path from 8 Mile Pump Station to the Grit and Screen Building if the throttling valve to the Grit and Screen Building is out of service or requires maintenance. Flow from the 8 Mile Pump Station will be through the motor-actuated plug valve located in the valve and meter vault. The 12-inch valve located upstream of the 12-inch throttling valve will be closed. The 12-inch valve in the yard to the WWS tank will be closed. The flow will be routed through the valve and meter vault and the 10-inch pipe to the Grit and Screen Building.

## Draining/Overflows

The WWS tank will be drained by gravity to the Grit and Screen Building. The draining flow rate will be controlled by the new throttling valve in the valve and meter vault and existing Parshall flume at the Grit and Screen Building. The motor-actuated plug valve in the valve and meter vault to the 12-Inch 8 Mile Pump Station force main will be closed.

The WWS tank will also have an overflow pipe that will route flow to the influent of the Chlorine Contact Tank. Therefore, in extreme conditions, the tank could overflow wastewater to the chlorine contact tank for disinfection before discharging from the WWTP. This overflow pipe is shown on Figure 1 flow schematic and the overflow pipe elevation 940.50 is shown on Figure 2

which are both in Appendix B. The overflow piping will be routed along the south edge of the existing WWTP structures to the Chlorine Contact Tank. This pipe routing is shown on Figures 5 and 6 in Appendix B.

All of the pipe sizes shown are preliminary and the final sizes will be determined during design.

## Tank Cleaning

Cleaning of the tank will be done with a flexible flushing hose located on the platform at the top of the WWS tank. A new 6-inch potable water (PW) pipe will be installed from the existing 6-inch PW pipe near the existing hydrant located to the east of the Service Building to a new hydrant located near the northeast corner of the Grit and Screen Building. A new 2-inch pipe will be installed from the 6-inch PW into the Grit and Screen Building to replace the existing 2-inch copper pipe. At the WWS tank a 2-inch hose connection will be located at the top and bottom of the tank and a 2-inch pipe will be provided up the side of the tank. When the tank needs to be cleaned WWTP staff will connect a flexible hose from the new hydrant to the 2-inch pipe connection at the bottom of the tank. At the top of the tank WWTP staff will connect a flexible hose to the 2-inch pipe connection and will hose down the tank from the platform. The PW pipe route is shown on Figure 5 in Appendix B.

At the existing hydrant located east of the Service Building, recently Township fire department staff opened the fittings on the hydrant and measured in flow stream from the 2.25-inch fitting to be 9 psi. When the 1.5-inch fitting was opened, 24 psi was measured in the flow stream. The Township has stated this corresponds to approximately 550 gpm. The static pressure was not able

to be measured which makes projecting these observations to the higher tank and the farther point quite challenging. However, it appears that it is likely that that this hose stream is sufficient to clean all or part of the new tank. An entry may need to be made into the tank for complete flushing on the far side of the tank.

Flushing hose connections will be located at various points on the piping in the valve and meter vault to clean the pipe when not in use. Flexible hoses from the fire hydrant can be connected to these flushing hose connections. These flushing connections will be required to clean the pipe after the tank has been drained since the elevation of the pipe will be below the normal water level in the Grit and Screen Building. This pipe will always be full of water.

## Instrumentation and Control

Influent flow to the Grit and Screen Building will continue to be measured by the existing Parshall Flume in the Grit and Screen Building. The throttling valve on the 12-inch 8 Mile force main will throttle the flow to the WWTP and send the excess flow to the WWS tank if influent flow to the WWTP is above an operator entered flow rate in SCADA.

A magnetic flow meter will be located on the pipe to the WWS tank. This meter will measure the pumped flow from 8 Mile Pump Station into the WWS tank. This meter can also be used to measure the total volume pumped to the WWS tank and to estimate any volume that may overflow the tank. This measured overflow will be recorded and used for reporting overflow events to the DEQ. The existing Parshall flume and new throttling valve will be used to control the flow rate drained from the tank to the Grit and Screen Building.

An ultrasonic level sensor will be located in the tank to monitor the level in the tank.

## Temporary Facilities

Temporary facilities will be required to control the wastewater flow when the tie-in is made on the 12-inch force main from 8 Mile Pump Station, when the tie-in is made to the 8-inch force main from Woodland Center Correctional Facility Pump Station, and when the small section of 14-inch RS to the Primary Flow Split Structure is relocated. Options for temporary operations include taps on the existing piping and temporary piping from these taps to the Primary Influent Flow Split Structure or to the Grit and Screen Building if temporary bulkheads are placed over the pump station force main influent pipes. Tanker/vactor trucks could also be used at the pump stations. This work would be done during low flow periods.

# PUMP STATIONS

## 8 Mile Pump Station

The station consists of two Flygt dry pit submersible pumps with variable frequency drives. The duty point of the pumps are 1,750 gpm at 90 feet of total dynamic head. These pumps have recently been installed. The station also has two older pumps with variable frequency drives that are rarely used.

To fill the WWS tank, the existing pumps will need additional head to fill the tank to the overflow elevation 940.50. This will add approximately 26 feet of additional static head to these pumps. This assumes the original pumps were sized to pump to the high water elevation 914.72 in the Grit and Screen Building. The additional head does not account for dynamic losses in the piping system. These loses will be calculated as part of the design project. The additional head will reduce the capacity of the pumps by about 500 gpm when the tank is near the over flow elevation.

As part of this project it is recommended to remove the two old pumps in the pump station and to replace with two new Flygt dry pit submersible pumps with variable frequency drives. The new pumps will have approximately 30 feet of additional head at the design flow. This will add additional capacity to the pump station and reliability to the pump station as well. Additional electrical upgrades will be required as part of this work.

## Woodland Center Correctional Facility Pump Station

The station consists of two submersible pumps located in the wet well of the pump station. The duty point of these pumps appear to be 400 gpm at 63 feet total dynamic head based on the literature provided by the facility. These pumps are currently in process of having the variable frequency drives installed on the pumps. The shut off head of these pumps is 82 feet based on the literature provided and looking at the maximum curve for the pumps. These pumps will not pump to the overflow elevation in the tank and will only pump to a mid-level elevation. This most likely will not be a problem since as stated previously in the report these pumps will only pump to the WWS Tank if the Grit and Screen Building is temporarily out of service. WWTP staff will need to be aware of the limitations with this pumping system. These pumps could be replaced with higher head pumps. The cost opinion assumes these pumps will not be replaced.

# COST OPINION

The project cost opinion is $2.8 million dollars. The cost opinion is included in Appendix C.

# SCHEDULE

A sample project schedule is below:

- Final Design 3 to 5 months
- Bidding and Award 2 to 3 months
- Construction 12 months

The total duration until completion will be 17 to 20 months from initiation of final design. However, the funding source chosen by the Township may impose additional constraints.

# RECOMMENDATIONS

## Soil Borings

It is recommended to have soil borings done in the location of the WWS tank and the valve and meter vault to verify that the soils are adequate for locating those structures. We have contacted TTL Associates, Inc. for budget pricing and recommended number of soils borings and locations. The budget price for four soil borings, laboratory testing, engineering analysis and report is $8,285. The proposal from TTL Associates is included in Appendix D.

## Funding Sources

The Township should consult with its financial advisor on funding recommendations. The Township may choose to borrow funds for this Revolving Fund Loan (or SRF). While the SRF loan will probably consist of a lower interest rate, the SRF loan also requires an extensive set of studies to demonstrate that the proposed equalization tank is the cost effective solution to the wet weather. These studies will take approximately two years to complete and likely will cost $200,000 to $400,000. The cost of these studies may negate the savings from the lower interest rate.

## Final Recommendation

The final recommendation is to install a 1.5 MG above grade, bolted steel, WWS tank, the valve and meter vault, and associated piping. It is also recommended to replace the two existing pumps at the 8 Mile Pump Station.

# APPENDIX A

## Tank Sizing Reports

# Northfield Township WWTP Capacity Evaluation Report

March 18, 2015

**PRESENTED TO**

**Northfield Township**
8350 Main Street
Suite A
Whitmore Lake, Michigan 48189

**PRESENTED BY**

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## ACRONYMS AND ABBREVIATIONS

| Acronym/Abbreviations | Definition |
|---|---|
| gpd | gallons per day |
| I/I | infiltration and inflow |
| MDEQ | Michigan Department of Environmental Quality |
| MG | million gallons |
| MGD | million gallons per day |
| NPDES | National Pollution Discharge Elimination System |
| REU | residential equivalent unit |
| SAD | special assessment district |
| SRF | State Revolving Fund |
| SSES | Sewer System Evaluation Survey |
| WWTP | wastewater treatment plant |

# EXECUTIVE SUMMARY

Northfield Township owns and operates a wastewater treatment plant and sanitary collection system, which has an average flow rate of 0.7 MGD and can be as high as 0.9 MGD during the spring season. This is less than the treatment capacity of 1.3 MGD, but with potential future development, improvements will be necessary. The Township engaged Tetra Tech to define the potential growth within the existing wastewater service area and identify improvements necessary at the wastewater treatment plant to meet the growth. Tetra Tech used flow data measured at the influent of the wastewater treatment plant as a basis point to estimate the magnitude and timeline for the improvements. The purpose of this report is to document the level of projected growth, summarize the analysis used to develop recommendations, and summarize the recommendations.

In addition to service areas within Northfield Township, flows from neighboring Green Oak Township are also treated at the Northfield Township wastewater treatment plant. Two service agreements between the two townships specifies that Green Oak Township can discharge an additional 227,000 gallons per day (equivalent to 873 REUs) to Northfield Township than it does currently.

The four sanitary sewer special assessment districts in Northfield Township have a potential to include an additional 1,865 REUs with a design average day flow of 485,000 gallons per day. Three of these SADs have been in place several years with only modest recent interest in development and in new connections being made.

However, should this development occur, improvements will be needed to meet both the additional daily flow and to meet the requirements of the state for wet weather flows up to the 25-year, 24-hour design storm. An increase in treatment capacity will address dry weather flow requirements, while a long-planned storage basin at the wastewater treatment plant will address wet weather flow requirements.

The initial recommendation is to construct a storage basin large enough to meet future needs up to the next expansion in treatment capacity because the cost of the storage will be less than the cost of the facilities required to increase the treatment rate. A 1.7 million gallon storage basin is recommended in the near term before much growth occurs. The basin size may be able to be made smaller through a more detailed analysis during the preliminary design of the facility. Previous analysis of the WWTP indicated the basin will equalize peak flows and allow an even higher rate of flow to be treated. When between 800 and 1,500 REUs of growth occurs (the lower end corresponding to no storage basin and the upper end corresponding to a condition where the storage basin is in place), a commitment to increase the WWTP capacity will need to be made.

If the Township decides to construct the recommended storage and wants to pursue construction funding through the State Revolving Fund Loan Program, additional intermediate studies are required to secure the funding. These intermediate studies will take multiple years to complete; therefore, pursuit of funds through the state's loan program will likely mean that funding will not be available until at least July 2017. Should the Township desire to initiate construction earlier, the Township will need to arrange its funding through another source.

# 1.0 INTRODUCTION

Northfield Township owns and operates a wastewater collection and treatment system that serves portions of Northfield and Green Oak Townships, but has not previously adopted a defined sanitary sewer service area. The Township has evaluated developments on a case-by-case basis. A formal sanitary sewer master plan has been discussed but is yet to be completed. Developing a wastewater master plan for Northfield Township is a large undertaking. As an initial step in better understanding the sewer system needs, the Board of Trustees elected to initiate this study of the sewer system to better understand the Township's wastewater treatment needs. This study has the following objectives:

- Update the Township's sanitary sewer map to include changes since the last map was created in 1996
- Identify potential development in the existing special assessment districts within Northfield Township and the likely flow impact on the Township's wastewater treatment plant (WWTP)
- Understand the commitment to provide sewer service to Green Oak Township and the likely flow impact at the WWTP
- Conceptually size a wet weather storage tank (also referred to as an equalization basin) at the Township's WWTP

A smaller scale revised sewer map is included in this document, and a full scale map will be delivered to the Township separately.

Two other components that are commonly included in a master plan have been deferred to a later time, including the detailed analysis of wastewater treatment plant expansion(s) and impacts to the collection system caused by potential growth. Impacts to the collection system generally require flow monitoring and detailed calculations to fully understand.

# 2.0 EXISTING WASTEWATER INFRASTRUCTURE

## 2.1 INFRASTRUCTURE HISTORY AND CONFIGURATION

The Township's WWTP was originally constructed in 1961 to serve a State of Michigan correctional facility. The WWTP was then purchased by Northfield Township and sewer systems were constructed through the 1970s to initially serve portions of Green Oak Township and Northfield Township around Whitmore Lake and portions of Northfield Township around Horseshoe Lake. Expansion of the system continued in the 1980s and 1990s to serve growing residential development.

The Township's existing wastewater treatment plant has a National Pollution Discharge Elimination System (NPDES) permit limit of 1.3 MGD. This is a nominal limit on the average daily flow that the WWTP may accept, treat and discharge. Peak flows into the WWTP may be higher than this and are allowed as long as the WWTP can acceptably process and treat the water. Calculations by Tetra Tech in 2005 suggest that the WWTP may be able to treat up to 1.5 MGD on average and meet limits if the peak flows into the WWTP are controlled through the use of a storage basin.

The WWTP has been expanded and upgraded numerous times since its 1961 construction. In its current configuration, the plant provides primary treatment (clarification), secondary treatment with a trickling filter and a second stage activated sludge process, and tertiary treatment with travelling bridge sand filters. The wastewater is disinfected with chlorine gas and receives post aeration by a cascade before being discharged to the Horseshoe Lake Drain.

WWTP operations staff indicate that they can routinely treat a peak flow rate of 2.5 to 3.0 MGD. However, they also indicate that the sand filters have reduced capacity due to suspected biological fouling of the underplates. These plates are due to be refurbished in the next few years. In its present configuration, the sand filters can only process a peak flow rate of approximately 2 MGD.

## 2.2 WWTP FLOW RATES

Average flows to the WWTP are lower than the permit limit of 1.3 MGD. Between 2011 and 2014, the WWTP averaged 0.7 MGD of influent flow. In the spring, when more precipitation and a higher groundwater table typically occur, the average flow was 0.9 MGD.

During wet weather, influent flows to the WWTP increase. On several occasions the Township has observed the peak flow into the WWTP reaching 3 MGD, which is the limit that can be measured at the WWTP. This increase in flows with wet weather is typical of older systems and is due to stormwater and groundwater being allowed to enter the sewer system. This water is referred to as infiltration/inflow (I/I) and can occur due to leaks in the public sewer, leaks in the privately-owned laterals, and improper connections made to either the publicly-owned system (such as storm drains) or to privately-owned parts of the system (such as basement sump pumps).

The Township has not previously conducted a comprehensive evaluation of I/I. However, in 1999, a brief flow monitoring program was conducted that showed that most parts of the Township's sewer system experienced flow increases with rainfall. Thus, the I/I was not isolated to a single part of the system. The Township also conducted a survey that showed that several homeowners had sump pumps connected to the sanitary sewer. While these connections are in violation of the Township's sewer use ordinance, there is no record that the Township followed up on removing these sources of I/I. It is also known that high water levels in Horseshoe Lake have submerged toilets and other sewer inlets creating lake inflow.

# 3.0 WASTEWATER SERVICE TO GREEN OAK TOWNSHIP

Wastewater service to Green Oak Township originated in the 1960s and 1970s concurrently with service to Northfield Township. The majority of this early service area occurred around the perimeter of Whitmore Lake.

A 2001 agreement between the Townships allows an additional 124 REUs to be connected within the existing service area around Whitmore Lake. Mr. St. Charles, Green Oak Township Supervisor, indicated in a telephone call that Green Oak Township's records show that 20 REUs around the lake have been connected since the 2001 agreement. Therefore, 104 REUs remain to be connected from Green Oak Township around Whitmore Lake. At 260 gallons/day, these 104 REUs produce an average daily flow of 27,040 gallons/day.

Sometime after 2001, Green Oak Township approached Northfield Township about serving an additional area in Green Oak Township. Northfield and Green Oak Township entered into a sewer service agreement dated November 11, 2004, to serve development in a designated area west of US-23 and north of 8 Mile Road. This agreement specifies that an additional 200,000 gallons of average daily flow will be allowed from Green Oak Township equivalent to 1,600 residential equivalent units (REUs). These agreements with Green Oak Township are presented in Appendix A.

Recent discussions with Green Oak Township resulted in a determination that a negligible amount of development has occurred in this new service area, so Northfield Township has a remaining obligation of approximately 200,000 gallons per day (gpd) to Green Oak Township. The discussions with Green Oak Township also addressed the 1,600 REUs mentioned in the agreement. Northfield Township's engineering standards define one REU equal to 260 gpd of average daily flow. Thus, 200,000 gallons equates to 769 REUs, not the 1,600 REUs listed in the agreement. Green Oak Township Supervisor Mark St. Charles indicated that Green Oak Township was likely to honor the 769 REU allocation.

In summary, the agreement with Green Oak Township suggests that Northfield Township is obligated to provide an additional 873 REUs, or an equivalent average daily flow rate of 227,040 gpd.

# 4.0 FUTURE WASTEWATER SERVICE IN NORTHFIELD TOWNSHIP

Northfield Township has existing obligations to provide wastewater service to four special assessment districts (SADs). The SADs were created specifically to provide wastewater service. The four SADs include the Lake Point SAD, North Territorial SAD, Seven Mile Road SAD, and Whitmore Lake Road SAD, and are shown on Figure 1.

Northfield Township's design standard for average daily wastewater flow is 260 gpd per REU. The density of REUs for a particular zoning type is an estimate based on minimum lot size in the Township's zoning ordinance and values used on past planning projects.

## 4.1 LAKE POINT SAD

The Lake Point SAD was established in 2003. The SAD is small, consisting of four parcels along Lake Point Drive on a peninsula extending into Whitmore Lake. All of the parcels are zoned single family residential or low density residential and appear to be developed and understood to be already connected to the WWTP. There are four total REUs in this SAD, all of which are currently connected to the WWTP.

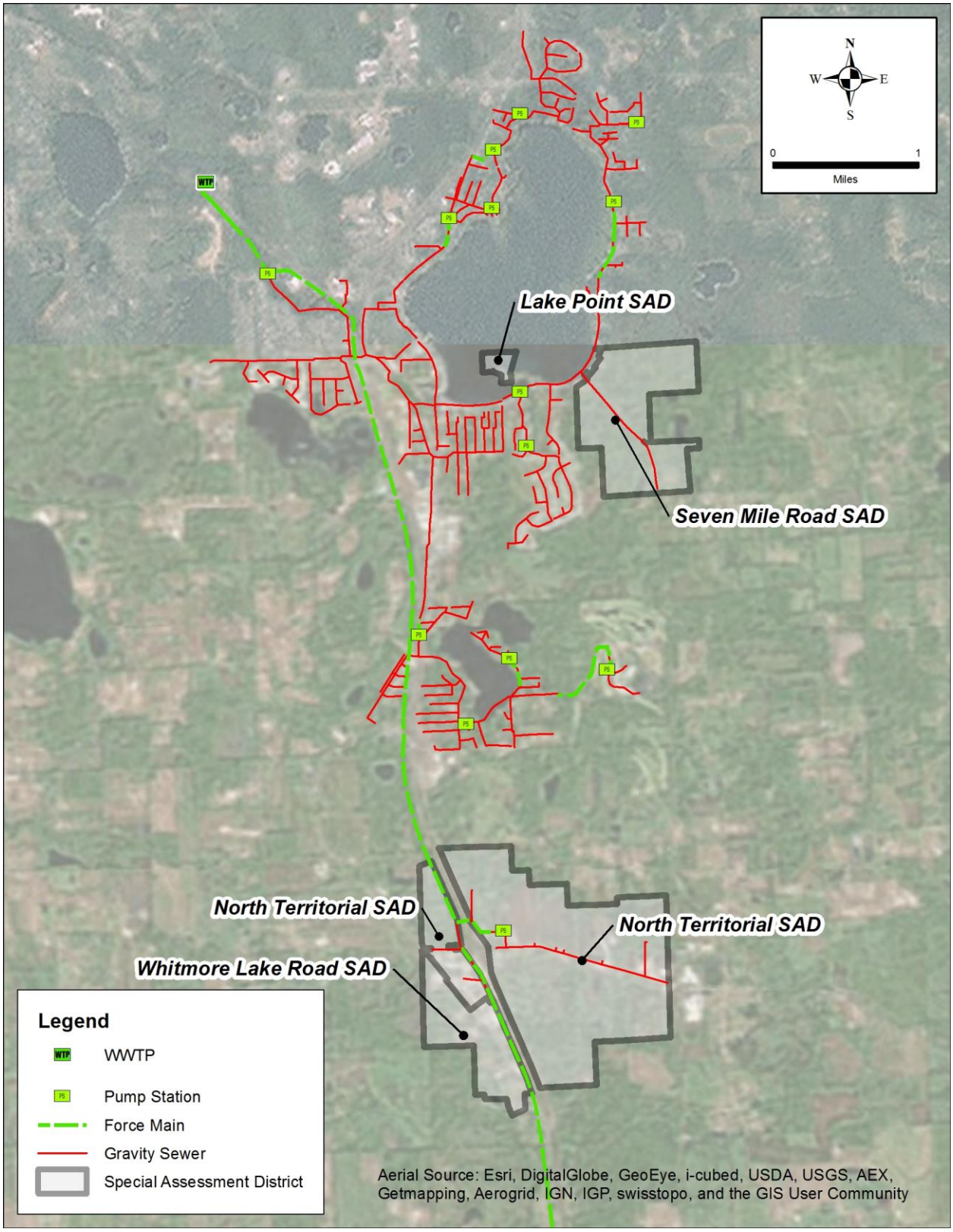
## 4.2 NORTH TERRITORIAL SAD

The North Territorial SAD was established around 2000 to provide wastewater service to a planned commercial area. A trunk sewer, pump, station, and force main were constructed. The force main discharges to the Township's Eight Mile Road Pump Station. To date, only a few parcels within the SAD have connected to the trunk sewer representing about 49 REUs. The concept for this SAD was that the area could be expanded both west and east as development demanded more wastewater service. Only the area within the current SAD is depicted on Figure 1. Table 1 shows the estimated wastewater demand for parcels within the current district limits.

**Table 1: REUs and Average Daily Wastewater Flow in the North Territorial SAD**

| Zoning | Parcel Density, REUs / acre | Current Parcels | Total Area, acres | Ultimate REUs | Average Daily Wastewater Flow, gpd |
|---|---|---|---|---|---|
| Local commercial | 3.0 | 3 | 16.59 | 50 | 13,000 |
| General commercial | 3.0 | 14 | 167.95 | 504 | 131,040 |
| Planned shopping center | 3.5 | 4 | 87.29 | 306 | 79.560 |
| Research, technology, manufacturing | 2.5 | 18 | 323.58 | 809 | 210,340 |
| **Total** | **-** | **39** | **595.41** | **1,669** | **433,940** |

**Figure 1: Map of Special Assessment Districts**



## 4.3 SEVEN MILE ROAD SAD

The Seven Mile Road SAD was established in approximately 2003 to serve the area along Seven Mile Road southeast of Whitmore Lake. The sewer has been constructed but only three connections have been made consisting of three REUs. Table 2 shows the estimated wastewater demand for the SAD.

**Table 2: REUs and Average Daily Wastewater Flow in the Seven Mile Road SAD**

| Zoning | Parcel Density, REUs / acre | Current Parcels | Total Area, acres | Ultimate REUs | Average Daily Wastewater Flow, gpd | Notes |
|---|---|---|---|---|---|---|
| Agricultural | 0.2 | 5 | 43.89 | 8 | 2,080 | Assumes 3 parcels are split into two parcels each |
| Low density residential | 0.5 | 10 | 21.60 | 13 | 3,380 | Assumes 1 parcel is split |
| Recreational conservation | 0.1 | 5 | 108.80 | 11 | 2,860 | Assumes 1 parcel is split |
| Single family residential | 4.0 | 2 | 45.14 | 140 | 36,400 | 20 percent of area allotted for right-of-ways. Remaining area developed at 4 parcels per acre |
| **Total** | **-** | **22** | **219.43** | **172** | **44,720** | **-** |

## 4.4 WHITMORE LAKE ROAD SAD

The Whitmore Lake Road SAD was established in 2013 to provide sewer service to 24 parcels along Whitmore Lake Road south of North Territorial Road. The Whitmore Lake SAD is tributary to the sewer improvements funded by the North Territorial SAD. No sewers have yet been constructed. Table 3 shows the estimated wastewater demand for the SAD. The basis of design for the Whitmore Lake Road district estimated a total of 76 REUs to be served.

**Table 3: REUs and Average Daily Wastewater Flow in the Whitmore Lake Road SAD**

| Zoning | Parcel Density, REUs / acre | Current Parcels | Total Area, acres | Ultimate REUs | Average Daily Wastewater Flow, gpd |
|---|---|---|---|---|---|
| Agricultural | 0.2 | 14 | 64.61 | 14 | 3,640 |
| Limited industrial | 1.0 | 8 | 45.27 | 43 | 11,180 |
| Local commercial | 3.0 | 2 | 6.52 | 19 | 4,940 |
| **Total** | **-** | **24** | **116.40** | **76** | **19,760** |

## 5.0 SUMMARY OF ADDITIONAL FLOWS TRIBUTARY TO THE WWTP

In the build-out condition, a total of 2,794 REUs were estimated to be served by the WWTP within the current SAD boundaries and growth areas within Green Oak Township. Of these 2,794 REUs, 56 are already connected to the sewer system leaving 2,738 to potentially connect. These REUs would increase the average daily flow beyond the existing WWTP capacity. Furthermore, as the existing treatment capacity is approached, there will be a greater need to provide storage for both daily fluctuations in the flow and wet weather peaks. A summary of the growth is provided in Table 4.

**Table 4: Summary of Additional Flows Tributary to the Northfield Township WWTP**

| Community | Location | Additional REUs | Additional Average Daily Wastewater Flow, gpd |
|---|---|---|---|
| Green Oak Township | around Whitmore Lake (2001 agreement) | 104 | 27,040 |
| | west of US-23 (2004 agreement) | 769 | 200,000 |
| | **Subtotal** | **873** | **227,040** |
| Northfield Township | Lake Point SAD[1] | 0 | 0 |
| | North Territorial SAD | 1,620 | 421,200 |
| | Seven Mile Road SAD | 169 | 43,940 |
| | Whitmore Lake Road SAD | 76 | 19,760 |
| | **Subtotal** | **1,865** | **484,900** |
| **Total** | | **2,738** | **711,940** |

[1] These properties are already developed and connected to the WWTP.

## 6.0 ALTERNATIVES TO MANAGE NEW CONNECTIONS

Determining available capacity is not a straightforward determination. A wastewater utility must consider treatment capacity during dry weather, treatment capacity during wet weather, and sewer system capacity. Analysis of the sewer system capacity was not an objective of this evaluation, however, average and wet weather conditions are discussed below.

## 6.1 AVERAGE FLOWS

The average flow for existing conditions is approximately 0.7 MGD and 0.9 MGD during springtime highs. The WWTP's rated capacity is presently 1.3 MGD with the potential of 1.5 MGD if storage is provided. Thus, there is existing WWTP capacity during average conditions to accommodate new connections.

The Michigan Department of Environmental Quality (MDEQ) is generally reluctant to allow new connections to a WWTP when the flow approaches 85 percent of the facility's rated capacity. Assuming a treatment capacity of 1.3 MGD, this necessitates a decision on an expansion when rates reach 1.1 MGD (1.3 x 0.85). Assuming a treatment capacity of 1.5 MGD, this necessitates a decision on an expansion when rates reach 1.3 MGD (1.5 x 0.85).

In 2005, Northfield Township explored a WWTP expansion to address the new connections it committed to in the 2004 agreement with Green Oak Township. That expansion was conceived to construct a storage basin and expand the treatment capacity to 2.25 MGD. Development did not occur and this expansion was not implemented.

Available capacity calculations are found below for various scenarios. The first two calculations consider growth without differentiating new connections between Green Oak Township and Northfield Township. The last two scenarios were calculated assuming the capacity in the Green Oak contract is reserved.

A summary of potential capacity available during average conditions without reserving capacity for Green Oak Township follows (assuming no storage provided):

| Allowable Rate before Expansion (MGD) | Springtime Rates (MGD) | Allowable Increase (MGD) | Allowable Increase (REU) |
|---|---|---|---|
| 1.1 | 0.9 | 0.2 | 800 |

The summary of potential capacity available during average conditions without reserving capacity for Green Oak Township follows (assuming storage provided):

| Allowable Rate before Expansion (MGD) | Springtime Rates (MGD) | Allowable Increase (MGD) | Allowable Increase (REU) |
|---|---|---|---|
| 1.3 | 0.9 | 0.4 | 1,500 |

The summary of potential capacity available during average conditions and reserving 0.227 MGD for Green Oak Township follows (assuming no storage provided):

| Allowable Rate before Expansion (MGD) | Springtime Rates (MGD) | Allowable Increase (MGD) | Allowable Increase (REU) |
|---|---|---|---|
| 1.1 | 0.9 | 0 | 0 |

The summary of potential capacity available during average conditions and reserving 0.227 MGD for Green Oak Township follows (assuming storage provided):

| Allowable Rate before Expansion (MGD) | Springtime Rates (MGD) | Allowable Increase (MGD) | Allowable Increase (REU) |
|---|---|---|---|
| 1.3 | 0.9 | 0.173 | 700 |

## 6.2 WET WEATHER FLOWS

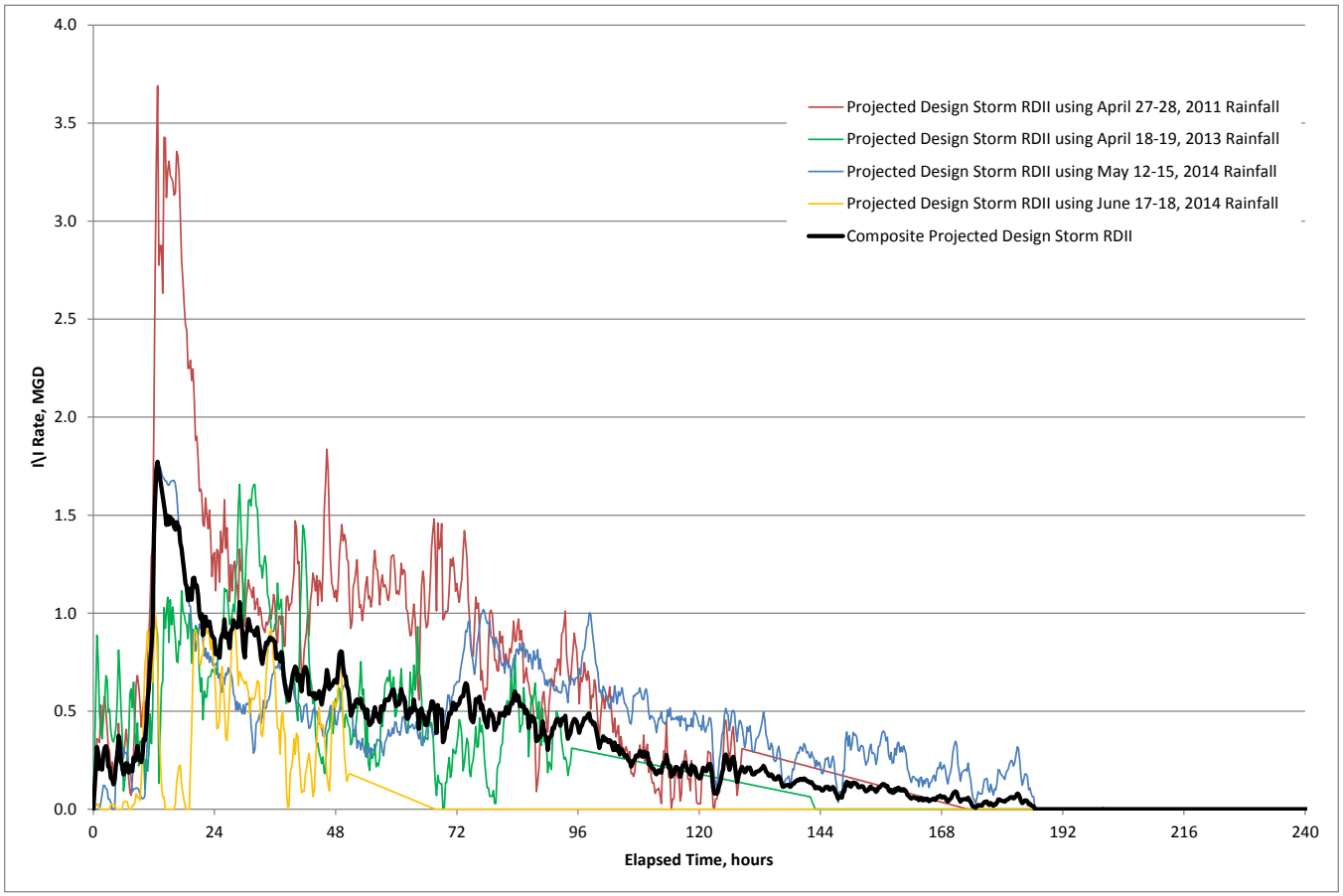
Storing wastewater during peak flow rates is a proven technique for managing flows in excess of the treatment capacity. Flows in excess of the treatment capacity are temporarily stored and returned to the system after the peak flows abate. Many, and perhaps most, wastewater treatment plants have storage tanks. The existing Northfield WWTP does not have any storage capacity. However, storage has been discussed for the WWTP since at least 1988 without the construction occurring.

In 2002, the State of Michigan adopted a policy on controlling untreated overflows from sewer systems. This policy requires that sewer systems control overflows for storms up to and including the 25-year, 24-hour storm. This storm is defined as 3.9 inches of rainfall in 24 hours throughout the state.

Flows measured at the WWTP for four severe storms between 2011 and 2014 were used to project a hydrograph for the 25-year, 24-hour storm, which can be added to a base flow to estimate the storage volume that would be necessary to eliminate overflows at the WWTP for events up to that size. The procedure used to create the hydrograph used for the 25-year, 24-hour storm followed these steps:

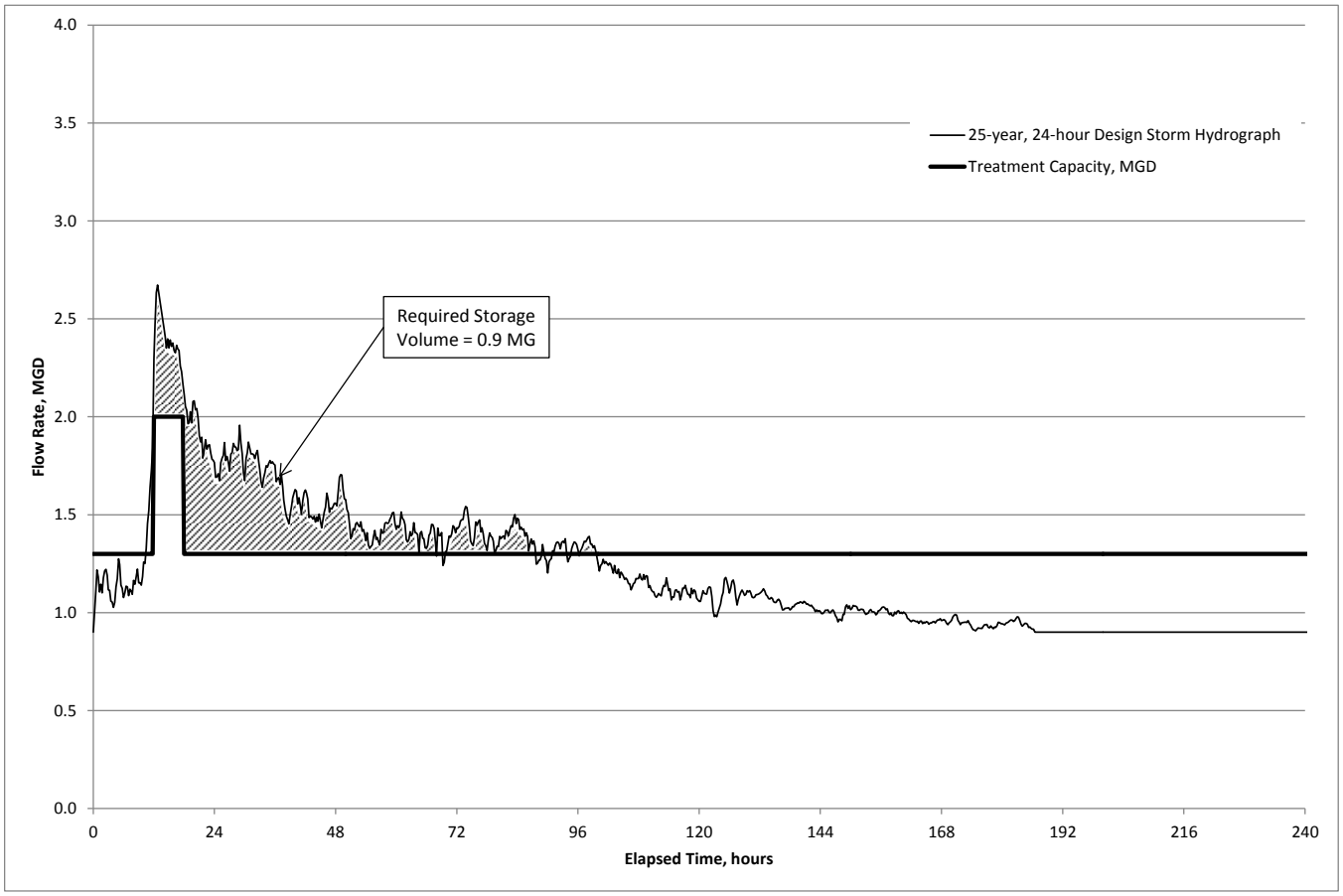
- The second through fifth most extreme events from 2011 to 2014 between April and October of each of those years, in terms of volume measured at the WWTP, were identified. The most extreme event, beginning on May 25, 2011, was excluded because it is known that inflow from Horseshoe Lake was occurring during and following this rainfall. The four rainfalls used in the analysis included:
    - April 27-28, 2011, 2.17 inches of rain, 3.0 million gallons (MG) of I/I estimated at the WWTP
    - April 18-19, 2013, 2.43 inches of rain, 1.7 MG of I/I
    - May 12-15, 2014, 4.30 inches of rain, 4.3 MG of I/I
    - June 17-18, 2014, 2.03 inches of rain, 0.5 MG of I/I
- The I/I and base flow components of the hydrograph were estimated. Plots of the components for each of the events are shown in Appendix B.
- The I/I component of the flow was projected to the 25-year, 24-hour design storm using a ratio of the design storm rainfall to the actual rainfall.
- The individual projections were averaged over an hourly period to smooth the peaks and valleys in the hydrograph using the 15-minute data from the WWTP.
- A composite of the four individual projections was created by averaging the four individual event projections. The composite projection is similar to the projection made for the May 12, 2014 event, which had the closest rainfall volume to the design storm. The individual and composite projections (with base flow removed) for the 25-year, 24-hour design storm is shown in Figure 2. The composite hydrograph was used for all analyses in this report. The tail of the hydrograph extends well beyond the end of the rainfall because of infiltration following the rainfall.

**Figure 2: Composite 25-year, 24-hour I/I Hydrograph Constructed from Individual Event Projections**



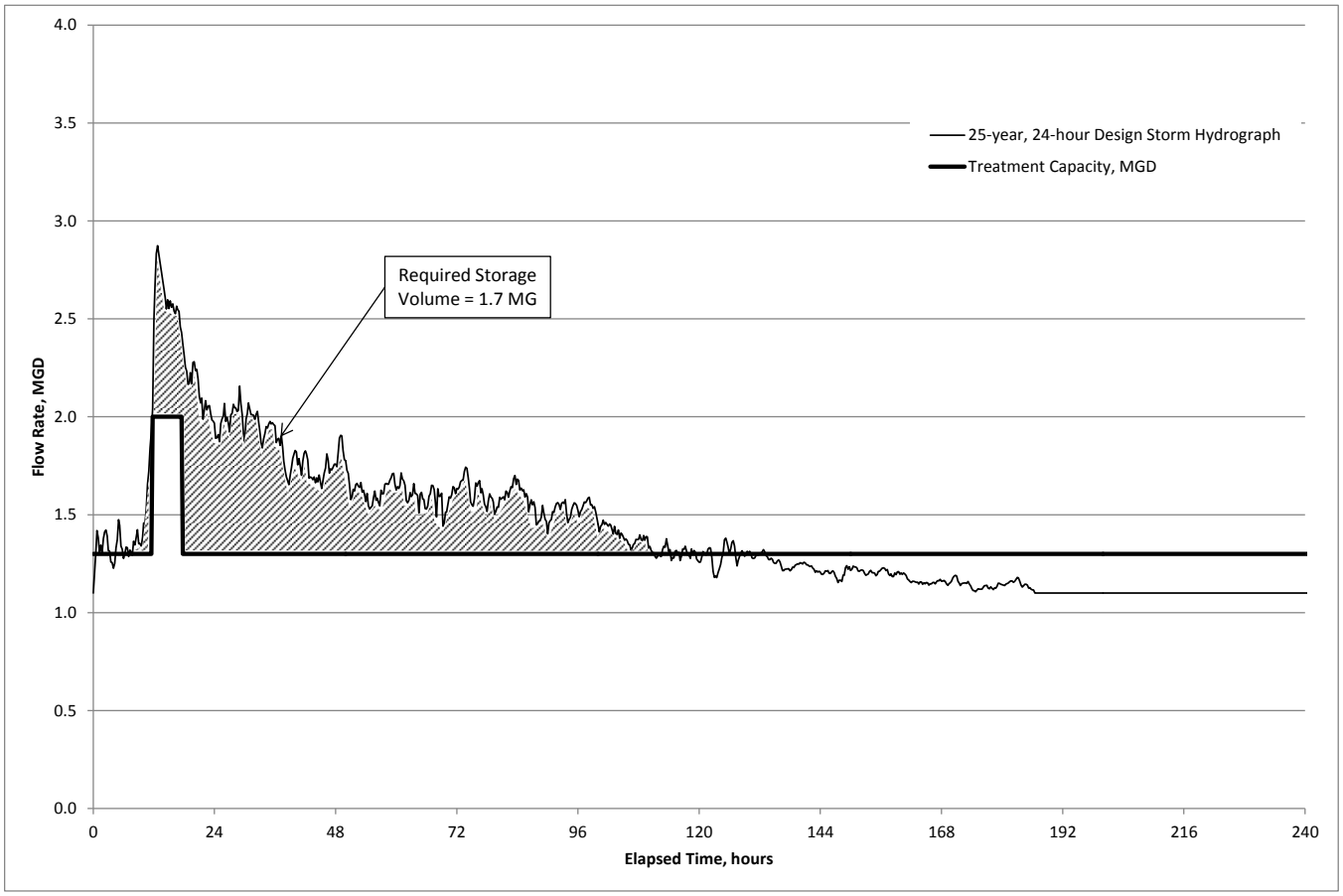

The required storage volume can now be estimated by adding the design storm I/I flows onto a base flow. For all the storage calculations it was assumed that the WWTP could treat 150 percent of its sustained treatment capacity for up to 6 hours and still meet its effluent limits. The remaining time, the WWTP could only treat its sustained capacity. For example, for the existing conditions, the WWTP could treat 2.0 MGD for 6 hours and 1.3 MGD for the remaining time. For existing conditions, we project that the required storage volume is 0.9 MG during spring (April and May) conditions. This is visually depicted in the hydrograph shown in Figure 3.

**Figure 3: Spring Design Storm Hydrograph with Treatment Capacity of 1.3 MGD and No Growth**




As growth occurs, the daily flow will increase and use more of the WWTP capacity. This will require that more of the flow during wet weather be stored. We project that the necessary storage volume will be 1.7 MG for an increase of 800 REUs or 0.2 MGD within the service area. This is visually depicted in the hydrograph shown in Figure 4.

**Figure 4: Spring Design Storm Hydrograph with Treatment Capacity of 1.3 MGD, and 800 REUs Growth**




Above this level of growth, the treatment capacity should be increased (see the *Average Flows* section), which will lessen the need for storage.

The MDEQ policy also provides an alternative methodology to demonstrate that the system will not overflow more than once every ten years. This analysis generally shows that a smaller basin size will meet the state's requirements, but requires a much more detailed approach and is best deferred as a preliminary design step if a storage project proceeds.

The cost for a storage tank will be dependent upon the type of construction (steel versus concrete) and features desired for the tank such as flushing or aeration. We suggest the Township budget $2.5 million to $3.0 million for a glass-lined steel tank. A concrete tank would have a higher initial cost but may also have a longer useful life.

# 7.0 GROWTH POLICY

Policy decisions on when to allow or deny new connections to the sewer system rest solely with the Northfield Township Board of Trustees. The MDEQ will occasionally deny new connections when there are obvious capacity problems with a sewer system (not presently the case with Northfield Township's system).

One important consideration is the SAD parcels. The Township has facilitated the construction of sewers in these areas. The property owners are paying an assessment for the construction of the sewers. However, these parcels are largely undeveloped and as such, have not connected to the sewer and have not paid the Township's system development charge (connection fee). This connection fee is established to recover the prorated share of the parcel's use of the treatment plant and downstream sewers.

A conservative policy decision could consider the 0.227 MGD commitment to Green Oak Township, the future SAD demands, and the higher springtime flows and determine that no other connections should be allowed until the wastewater plant is expanded. An alternate policy would be to consider that no significant development in Green Oak and the SADs has occurred in the last ten years, that new connections can be allowed and the WWTP will be expanded prior to the plant being overloaded.

Tetra Tech can appear at a future board meeting to answer any technical questions that will better allow the Board of Trustees to determine their policy regarding new connections.

# 8.0 PROJECT FUNDING

Wastewater utilities have the choice of financing capital projects with local funds (such as from reserves, connection fees and/or bonds) or from a state-funded loan. A self-financed project has few prerequisites and construction could be initiated within a few months of beginning.

The MDEQ administers a low interest, state funded loan program for wastewater improvements. This program is entitled the State Revolving Fund loan and abbreviated as SRF. A condition of receipt of the loan is that the loan monies are used to construct the cost-effective solution. This requires a series of studies to demonstrate that building storage is cost effective over removing the I/I at its source. Loan applications are due by July 1 each year and the prerequisite studies need to be completed ahead of this application date. Should Northfield Township begin the studies in the spring of 2015, it is likely that the loan could not be applied for until July 1, 2017, or later.

The first study that would be needed is termed an Infiltration/Inflow Study which measures flow throughout the system and makes projections regarding its likely sources and costs to remove. This study may cost $150,000 to $200,000 to complete. This study makes a recommendation that looking for I/I sources will likely be fruitful, but generally concludes that some level of detailed investigation is needed.

The second study is referred to as a Sewer System Evaluation Survey (SSES). It includes detailed investigations within the system to locate specific sources of I/I. This may involve inspecting manholes, sewer pipes, and quantifying illicit sump pumps among many other tasks. The cost of an SSES of Northfield Township's collection system cannot be determined until after completion of the I/I Study, but could range from $150,000 to $300,000.

# 9.0 SUMMARY AND RECOMMENDATIONS

## 9.1 SUMMARY

A capacity summary was completed that shows that Northfield Township has significant wastewater treatment obligations to both Green Oak Township and special assessment districts within Northfield Township. An additional 712,000 gallons per day (0.712 MGD) could be added to the system from these obligations.

Capacity determination in a wastewater system involves more than comparing a single set of numbers. An evaluation must be conducted that looks at the WWTP performance during average (dry weather), during wet weather, and in the sewer systems. This report evaluated conditions during average and wet weather conditions and deferred sewer analysis to a later time.

The Township has sufficient treatment capacity available to continue to accept new connections during average conditions (dry weather). Our analysis shows that approximately 800 REUs can be added until the WWTP flows will reach 1.1 MGD during the spring conditions and approximately 1,500 REUs until the WWTP reaches 1.3 MGD during these same spring conditions. A growth of 800 REUs is estimated to increase flows to 85 percent of the WWTP's permit limit during spring conditions, which is a typical threshold upon which the MDEQ may request

a WWTP expansion be considered. Past calculations suggest the WWTP may be able to treat 1.5 MGD if storage is built and thus the higher number of 1,500 REUs may be achievable.

However, during large storms, the Township's WWTP will struggle to treat the peak flow that arrives and meet permit limits. The Township has long discussed a storage basin to be constructed at the WWTP. The size of this basin is dependent upon the level of growth and the available WWTP capacity. A basin is significantly less expensive than a plant expansion. Therefore, the basin should be sized for a future flow condition to postpone a WWTP expansion as long as possible. The MDEQ requires that the basin be sized to contain wastewater for the 25-year, 24-hour storm of 3.9 inches. This condition suggests the basin be sized for 1.7 MG. As discussed in the report, a more sophisticated statistical analysis may show this size can be slightly reduced before it is built.

The basin will assist with existing WWTP operations and be even more critical as growth occurs. It is recommended that the basin be constructed prior to any large developments occurring. For the purpose of quantifying a threshold, it is suggested that the basin be constructed prior to allowing more than 100 REUs to connect.

Table 5 provides a timeline for recommended improvements to summarize the number of new connections (expressed as REUs) and thresholds that initiate new projects.

**Table 5: Timeline of Recommended Improvements**

| Number of Additional REUs | Average Dry Weather Flow, MGD | Average Dry Weather Flow during Peak Months, MGD | Recommended Improvement |
|---|---|---|---|
| 0 – 100 | 0.7 | 0.9 | Construct 1.7 MG storage basin |
| 800 – 1,500 | 0.9 – 1.1 | 1.1 – 1.3 | Expand WWTP |

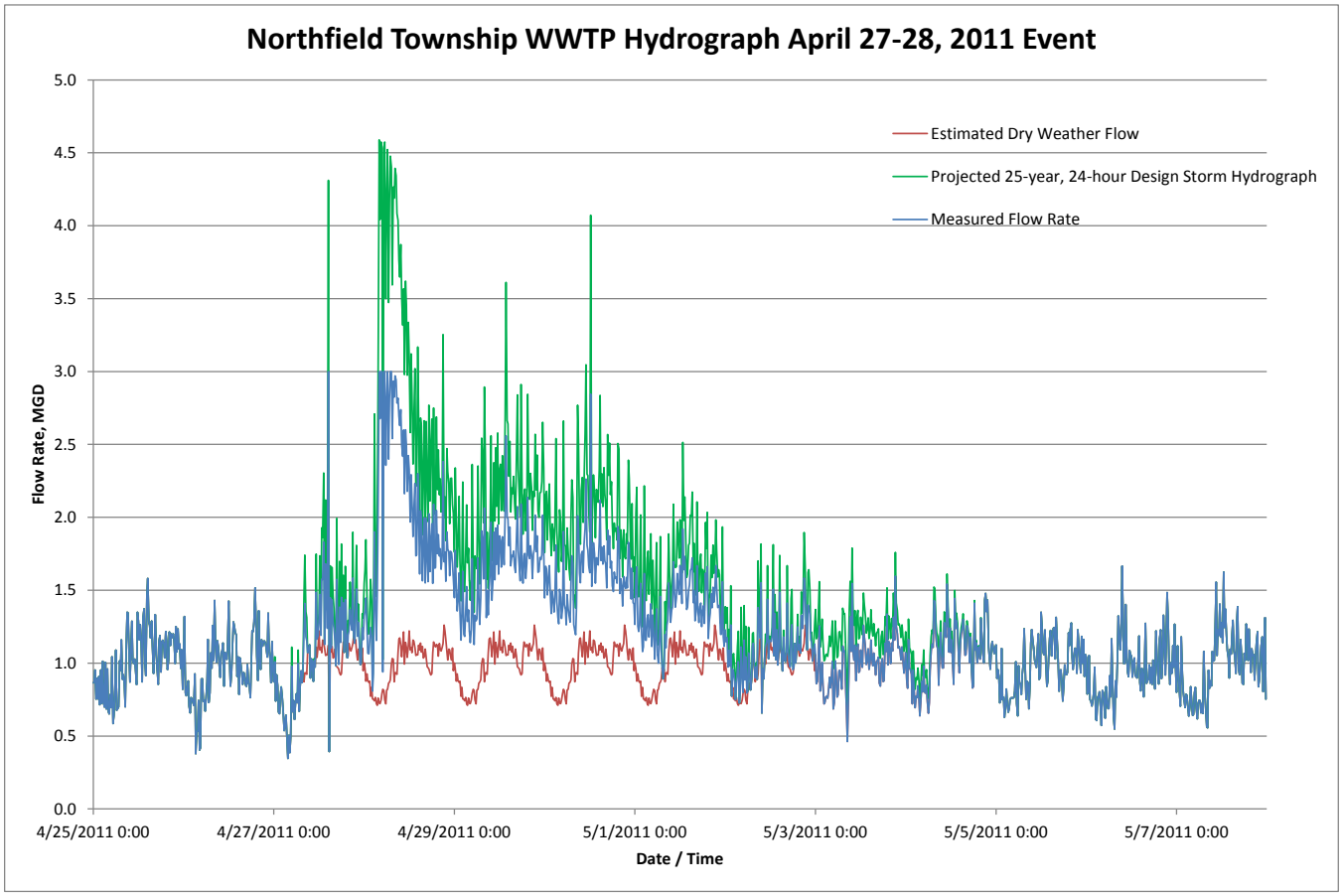
The REUs in Table 5 must consider new connections made from Green Oak Township and the 873 REUs committed to Green Oak. If Green Oak develops to the amounts included in the intergovernmental agreements, most or all of the surplus capacity in the existing wastewater treatment plant would be utilized.

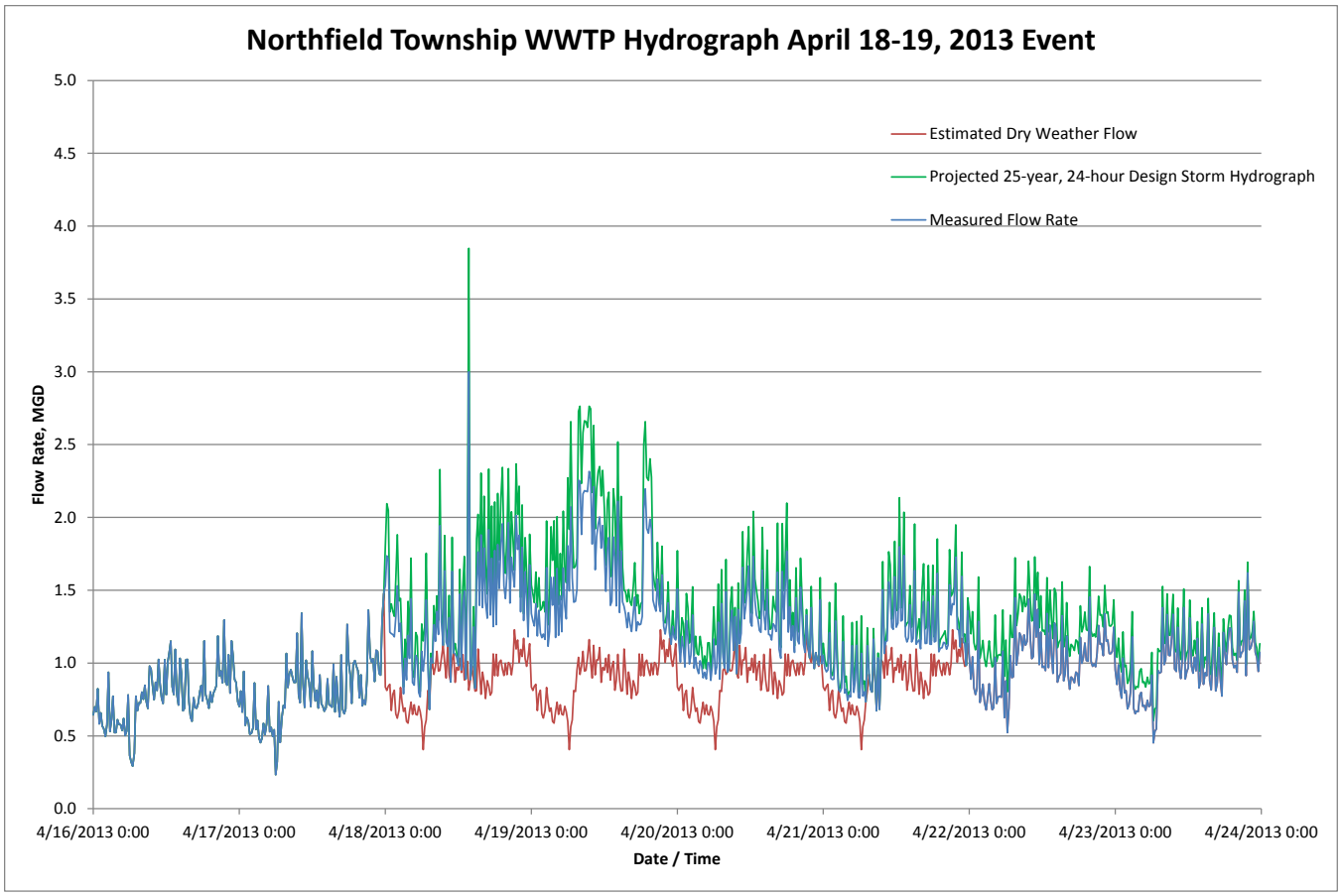
## 9.2 RECOMMENDATIONS

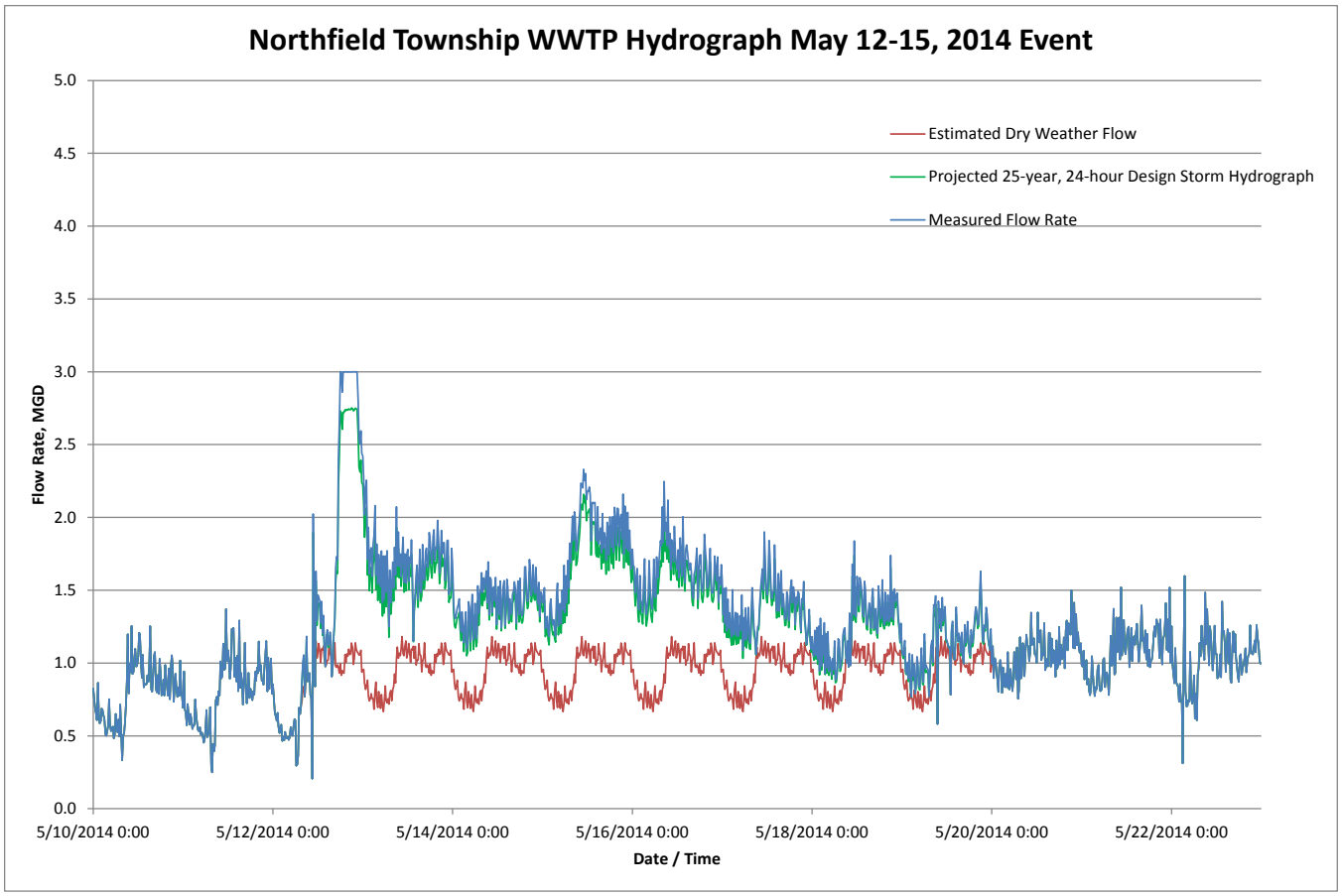
The Township should begin planning for the storage basin that has long been identified for the WWTP. The Township may also wish to revisit its 2005 thoughts about expanding the WWTP to confirm the size and cost of the expansion. The next step toward implementing the storage basin or WWTP expansion is to consider how these projects will be financed, because the method of financing may determine additional steps necessary. At a minimum, we recommend Northfield Township evaluate its system development charge (also referred to as connection fee) so that some of the cost of the basin and WWTP expansion is recovered through fees charged to new connections.

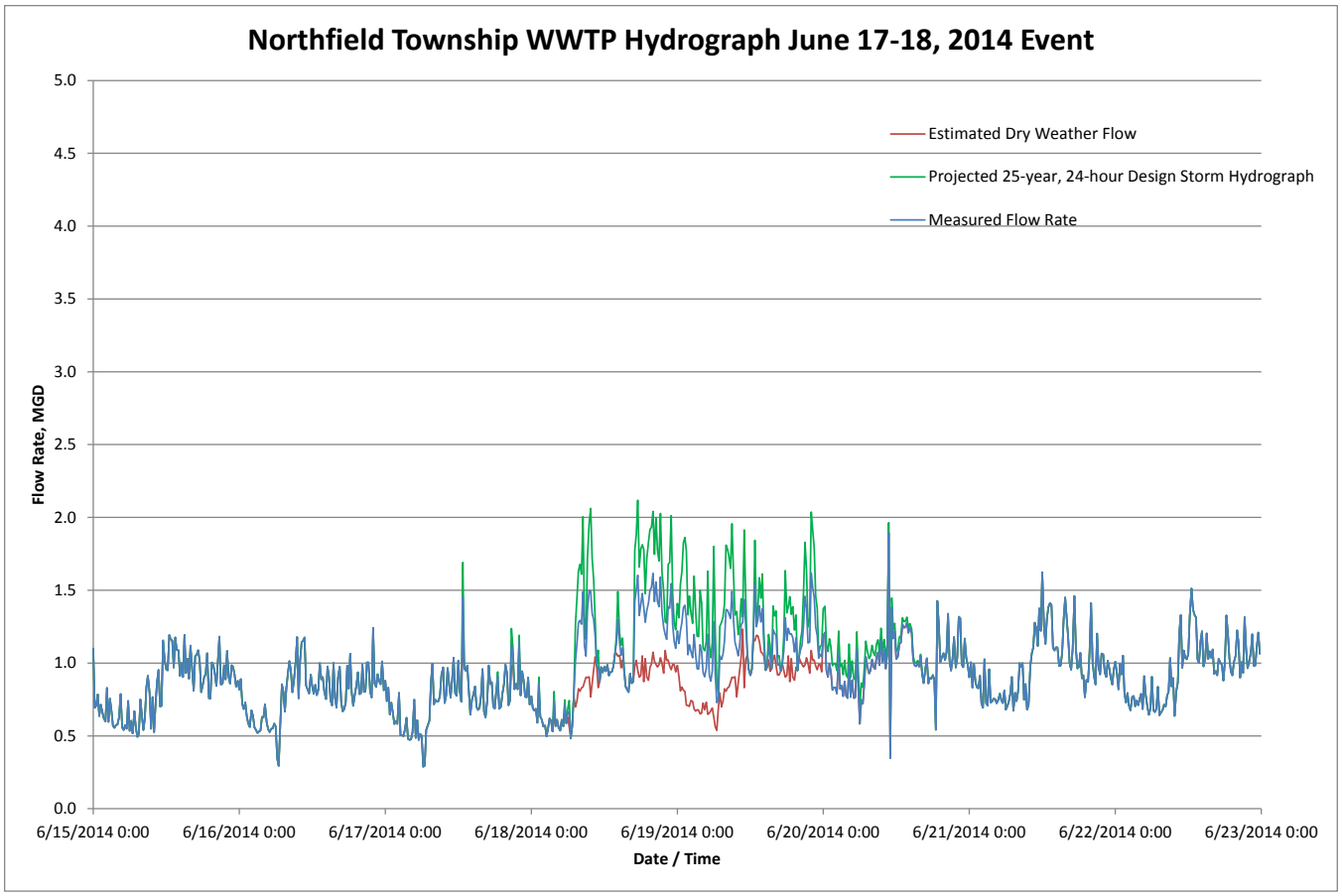
# APPENDIX A: GREEN OAK TOWNSHIP AGREEMENTS

# APPENDIX B: DATA USED FOR THE DEVELOPMENT OF THE 25-YEAR, 24-HOUR HYDROGRAPH




Northfield Township WWTP Hydrograph April 18-19, 2013 Event
Flow Rate, MGD
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
4/16/2013 0:00
4/17/2013 0:00
4/18/2013 0:00
4/19/2013 0:00
4/20/2013 0:00
4/21/2013 0:00
4/22/2013 0:00
4/23/2013 0:00
4/24/2013 0:00
Date / Time
Estimated Dry Weather Flow
Projected 25-year, 24-hour Design Storm Hydrograph
Measured Flow Rate


Northfield Township WWTP Hydrograph May 12-15, 2014 Event
Flow Rate, MGD
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
5/10/2014 0:00
5/12/2014 0:00
5/14/2014 0:00
5/16/2014 0:00
5/18/2014 0:00
5/20/2014 0:00
5/22/2014 0:00
Date / Time
Estimated Dry Weather Flow
Projected 25-year, 24-hour Design Storm Hydrograph
Measured Flow Rate


Northfield Township WWTP Hydrograph June 17-18, 2014 Event
Flow Rate, MGD
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
6/15/2014 0:00
6/16/2014 0:00
6/17/2014 0:00
6/18/2014 0:00
6/19/2014 0:00
6/20/2014 0:00
6/21/2014 0:00
6/22/2014 0:00
6/23/2014 0:00
Date / Time
Estimated Dry Weather Flow
Projected 25-year, 24-hour Design Storm Hydrograph
Measured Flow Rate

TETRA TECH

# MEMO

| | |
|---|---|
| ***To:*** | File \\iers008fs1\projects\IER\12748\200-12748-15003\Docs\Memos\LTS_Memo.docx |
| ***Cc:*** | |
| ***From:*** | Justin Voss |
| ***Date:*** | October 12, 2015 |
| ***Subject:*** | Northfield Township Long-Term Simulation Modeling Summary and Results |

## 1.0 INTRODUCTION

In March 2015, Tetra Tech evaluated the capacity of the Northfield Township WWTP for current conditions and the planned development of four Special Assessment Districts (SADs). Flow data at the WWTP's influent meter was used to project the growing season 25-year, 24-hour design storm hydrograph and evaluate the need for storage at the site for the design storm and prevent overflows in accordance with the State's SSO Policy. The report recommended 1.7 million gallons of storage that would store wet weather flows during the design storm and allow the current plant to be used until the average dry weather flow reached 1.1 MGD, which is 85 percent of the rated treatment capacity of the WWTP (1.3 MGD). An expansion of the treatment capacity would occur after average dry weather flows reached 1.1 MGD.

Instead of using the 25-year, 24-hour design storm, the State's SSO Policy also allows communities to complete an alternative, but more detailed, analysis that shows that there will be no more than 1 overflow in 10 years from the system. On past projects with other communities, this approach has substantially reduced the amount of storage required. For this current phase of the project, a long-term simulation of rainfall versus flow rate was completed in EPA SWMM to evaluate the storage necessary to limit overflows at the WWTP to no more than 1 in 10 years. This memorandum documents the analysis and its results.

## 2.0 SCENARIOS

Two scenarios were simulated with EPASWMM. The first assumed the treatment capacity remains at 1.3 MGD. The second scenario assumed that with storage, the treatment capacity could potentially be increased to 1.5 MGD as indicated in the March 2015 report.

The model was set up such that dry and wet weather flow components were input at a node, which discharged into a storage basin that was sized until the overflow limit was met. The outflow from the storage basin was controlled by a fixed rate assumed to be the treatment rate of the WWTP.

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# 3.0 DRY WEATHER FLOWS

Currently, the average dry weather flow rate at the WWTP varies from 0.7 to 0.9 MGD depending on the time of year. Spring dry weather flows are higher, on average, than other times of the year, so a monthly pattern was used in the model based on the average flows at the plant between 2011 and 2014.

Furthermore, as indicated in the March 2015 report, any storage that is constructed would have to be sized to accommodate growth in the system. It was assumed in that report that an expansion of the treatment rate of the plant could be avoided until the springtime average dry weather flow rate reached 85 percent of the capacity of the WWTP. Therefore, the springtime average dry weather flow rates used in the model are 1.1 and 1.3 MGD for 1.3 and 1.5 MGD treatment capacities. According to the March 2015 report, a springtime average flow rate of 1.1 MGD represents 800 REUs of development in the system, and a springtime average flow rate of 1.3 MGD represents 1,500 REUs of development in the system. The monthly dry weather flow pattern used in the model is shown in Table 1.

Table 1: Monthly Dry Weather Flow Rate used in Long-Term Simulation

| Month | Modeled Average Dry Weather Flow for 1.3 MGD Treatment Capacity Scenario, MGD | Modeled Average Dry Weather Flow for 1.5 MGD Treatment Capacity Scenario, MGD |
|---|---|---|
| January | 0.90 | 1.10 |
| February | 0.90 | 1.10 |
| March | 1.03 | 1.23 |
| April | 1.07 | 1.27 |
| May | 1.10 | 1.30 |
| June | 0.98 | 1.18 |
| July | 0.90 | 1.10 |
| August | 0.90 | 1.10 |
| September | 0.90 | 1.10 |
| October | 0.90 | 1.10 |
| November | 0.90 | 1.10 |
| December | 0.90 | 1.10 |

A diurnal pattern was not used in the model, assuming that the largest wet weather flow volumes would occur during and following storms that have a duration near 24 hours or greater.

## 4.0 RAINFALL

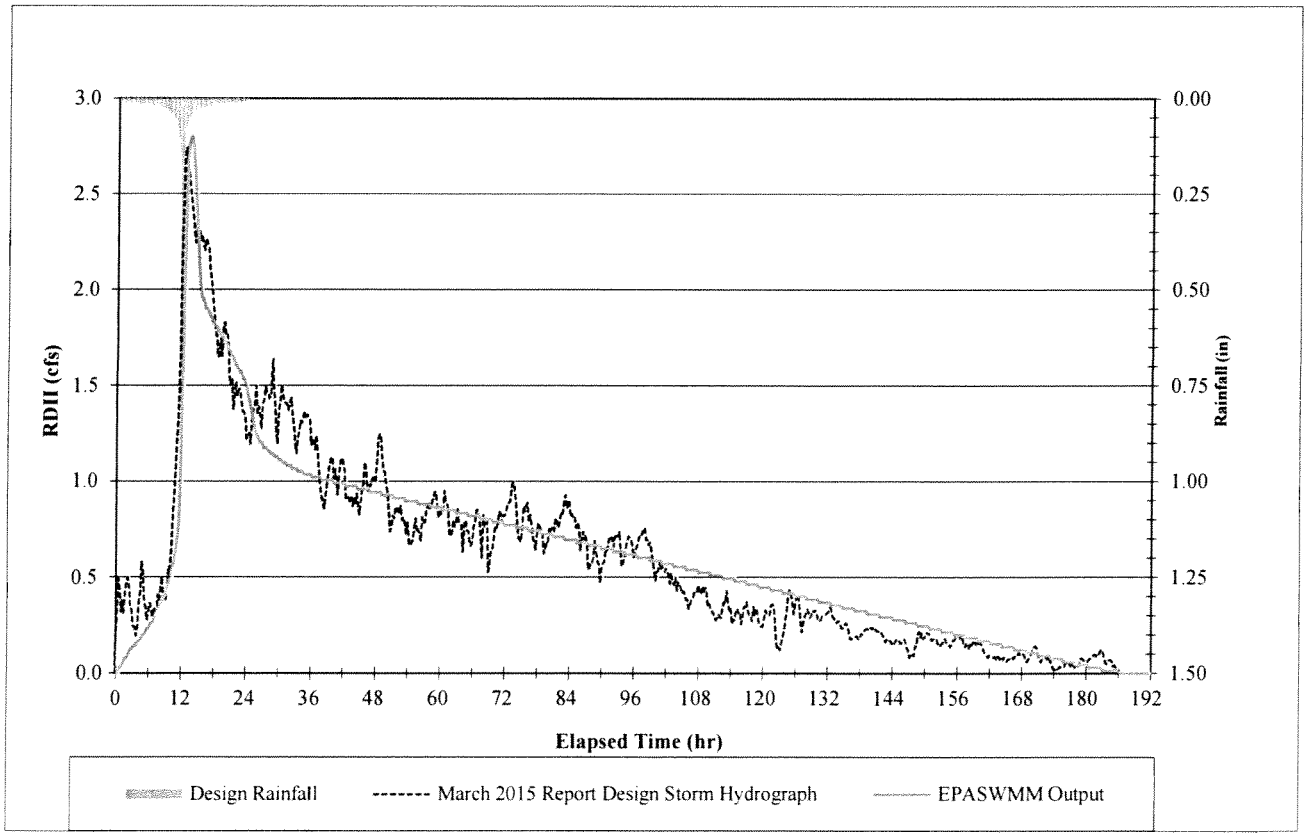
This is a long-term simulation, so hourly rainfall records from Detroit Metro Airport from October 1959 through December 2013 were imported into to the model. During this 54.25-year period, there was an average of 32.05 inches of precipitation per year. Even if individual events in the rainfall record are not identical, it was assumed that the long-term precipitation pattern at Detroit Metro Airport is similar to the long-term precipitation pattern in Northfield Township.

## 5.0 WET WEATHER UNIT HYDROGRAPH

A unit hydrograph approach was used to model the relationship between rainfall and wet weather flow rate in the model. A hydrograph was developed in the March 2015 report for the 25-year, 24-hour design storm and was used to develop unit hydrograph variables that would be compatible with the model. The design storm model output are shown with the hydrograph from the March 2015 report to show the two are similar. The EPA SWMM model has a 1 percent greater wet weather peak and volume than the hydrograph from the March 2015 report.

Increases in the wet weather flow component were not modeled because many of the main sewers in the areas of potential development are already constructed and new wet weather flow would have to come from direct sources, which would not be permitted, or from leaky local or private sewers or leads, which could be minimized by proper design and construction.

Figure 1: March 2015 Report Design Storm Wet Weather Composite Hydrograph Compared to EPASWMM Output



# 6.0 LONG-TERM SIMULATION RESULTS

For the 54-year simulation, the storage volume can be exceeded up to five times in the model and meet the State's SSO Policy. The ten largest events are summarized in Table 2. The storage volume would have to contain the sixth largest event, which is highlighted in red in the table.

Table 2: Monthly Dry Weather Flow Rate used in Long-Term Simulation

| Rank | Event Date | Modeled Storage Volume Required with 1.1 MGD Springtime Dry Weather Flow and 1.3 MGD Treatment Rate, million gallons | Modeled Storage Volume Required with 1.3 MGD Springtime Dry Weather Flow and 1.5 MGD Treatment Rate, million gallons |
|---|---|---|---|
| 1 | May 24, 2004 | 1.91 | 1.92 |
| 2 | May 28, 1968 | 1.64 | 1.65 |
| 3 | May 4, 1983 | 1.27 | 1.27 |
| 4 | September 1, 1975 | 1.26 | 1.26 |
| 5 | July 30, 2011 | 1.26 | 1.26 |
| **6** | **June 17, 1960** | **1.25** | **1.25** |
| 7 | September 13, 2000 | 1.22 | 1.22 |
| 8 | April 23, 2000 | 1.12 | 1.12 |
| 9 | June 4, 1989 | 1.11 | 1.11 |
| 10 | May 30, 2011 | 1.01 | 1.01 |

As expected, the predicted storage volumes for both scenarios are roughly the same because, in both cases, the difference between the treatment rate and the dry weather flow and the magnitude of the wet weather flow did not change.

From a hydraulic standpoint, a 1.3 million gallon (minimum) storage basin is recommended after rounding the modeled storage volume for the sixth largest event up to the next 0.1 million gallons. The third through sixth largest events are very similar in size, so the model predicts that 1.3 million gallons of storage would limit overflows to two during the simulation period.

The long-term simulation decreases the recommended storage volume by 0.4 million gallons (24 percent) relative to the recommendation in the March 2015 report.

# APPENDIX B

## Drawing Figures

## VALVE DESIGNATIONS

| SYMBOLS FLOW DIAGRAMS | TYPE | MARK |
|---|---|---|
| | A | GATE VALVE |
| | C | STANDARD CHECK VALVE |
| | P | PLUG VALVE |

### OPERATORS

THROTTLING SERVICE — ELECTRIC

OPEN - SHUT SERVICE — ELECTRIC

## PIPING ABBREVIATION-LEGEND

| | |
|---|---|
| D | DRAIN |
| FM | FORCE MAIN |
| FE | FINAL EFFLUENT |
| FTE | FINAL TANK EFFLUENT |
| ML | MIXED LIQUOR |
| N.O. | NORMALLY OPEN |
| N.C. | NORMALLY CLOSED |
| OF | OVERFLOW |
| PE | PRIMARY EFFLUENT |
| PW | POTABLE WATER |
| RS | RAW SEWAGE |
| SW | SERVICE WATER |
| TFE | TRICKLING FILTER EFFLUENT |
| WAS | WASTE ACTIVATED SLUDGE |
| WWD | WASHWATER DRAIN |

GRIT TANK
P-11-1
GRIT PUMP
GRIT CONCENTRATOR
GRIT CLASSIFIER
GRIT & SCREENINGS CONTAINER
MECHANICAL SCREEN
SCREENINGS TO CONTAINER
SP-6-1
SP-7-1
SP-5-1
9" PARSHALL FLUME
W-5-1
W-5-2
SP-3-1
SP-4-1
SP-3-2
MANUAL SCREEN
FUTURE
10" RET
12" FM
8" FM
VALVE AND METER VAULT
N.O.
N.C.
FROM WOODLAND CENTER CORRECTIONAL FACILITY PUMP STATION
14" RS
14"RS
INFLUENT FLOW SPLIT STRUCTURE
12"RS
8"
PRIMARY SETTLING TANK NO. 1
PRIMARY SETTLING TANK NO. 2
PRIMARY SETTLING TANK NO. 3
PRIMARY SETTLING TANK NO. 4
P-12-1
P-12-2
1-3
NC
W-6-1
W-6-2
RA-1-1
10"PE
14"PE
12" PE
12" OF
6"WBWW/WAS
6"WAS
WET WELL
PE-1
PE-2
PE-3
PRIMARY EFFLUENT PUMP STATION
TRICKLING FILTER
INTERMEDIATE SETTLING TANK
12" TFE
TO AERATION TANK INFLUEN
2" PW FLUSHING HOSE CONNECTION AT TOP AND BOTTOM OF TANK.
FLUSHING SPRAY NOZZLE
12" RS/RET
1.5 MG WET WEATHER STORAGE TANK
16" OF
FROM 8 MILE PUMP STATION
FROM 8 MILE PUMP STATION (NOT USED)
FINAL SETTLING TANK NO. 1
10"ML
AERATION TANK TANK NO. 1
PARSHALL FLUMES
FROM INTERMEDIATE SETTLING TANK
12"TFE
#1
#2
#3
PARSHALL FLUME
S-6-1
12" BYPASS
AERATION TANK TANK NO. 2
FINAL SETTLING TANK NO. 2
FINAL TANK FLOW SPLIT STRUCTURE
SP-1-1
SP-1-2
SP-2-1
S-1-1
S-2-1
S-2-2
W-2-1
W-2-2
W-2-3
W-2-4
14" ML
AERATION TANK TANK NO. 3
F-1-1
F-1-2
F-1-3
W-1-1
S-7-1
12" ML
FINAL SETTLING TANK NO. 3
W-3-1
S-3-1 NO
S-3-2 NC
EXIST. 12" BYPASS (O'FLOW)
WBWW WET WELL
FTE WET WELL
SFI-1
SFI-2
12" WWD
12" FTE
12" OVERFLOW/ FILTER BYPASS
10" FI
14" FE
16" FE
2" TO SW SYSTEM
SERVICE WATER SYSTEM
SWW-1
SWW-2
4"
SFE WET WELL
CHLORINE CONTACT TANK NO. 1
CHLORINE CONTACT TANK NO. 2
CHLORINE CONTACT TANK NO.3 AND DECHLORINATION TANK
16" BYPASS
16"
CASCADES
HORSESHOE LAKE DRAIN
8" WWD
WWD SUMP
W-4-1
W-4-2
W-4-3
W-4-4
INFLUENT CHANNEL
EFFLUENT CHANNEL
SP-6-1
SP-6-2
INFLUENT
EFFLUENT
FILTER NO. 1
FILTER NO. 2
FUTURE

TETRA TECH
www.tetratech.com
710 AVIS DRIVE, SUITE 100
ANN ARBOR, MI. 48108
PHONE: 734.665.6000, FAX: 734.665.2570

| MARK | DATE | DESCRIPTION | BY |
|---|---|---|---|

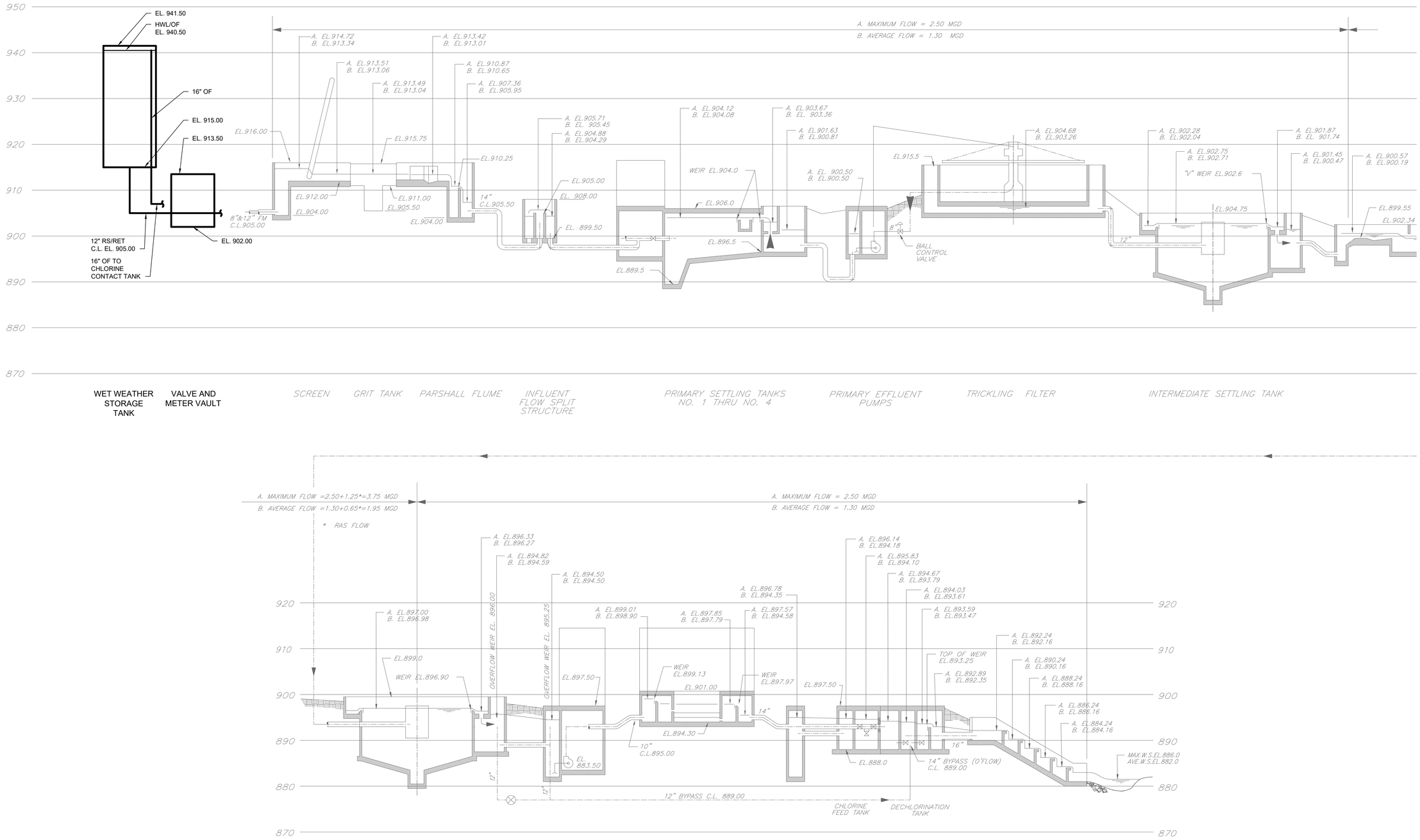
NORTHFIELD TOWNSHIP, MICHIGAN
WASTEWATER TREATMENT PLANT
WET WEATHER STORAGE TANK
PROCESS FLOW DIAGRAM

| | |
|---|---|
| Project #: | 200-12748-15003 |
| Designed By: | MAT |
| Drawn By: | |
| Checked By: | |

1



Bar Measures 1 inch







## HYDRAULIC PROFILE

SCALE: 1" = 10'V, NONE H

0 5' 10' 20'

SCALE: 1" = 10'

TETRA TECH
www.tetratech.com
710 AVIS DRIVE, SUITE 100
ANN ARBOR, MI. 48108
PHONE: 734.665.6000, FAX: 734.665.2570

| MARK | DATE | DESCRIPTION | BY |
|---|---|---|---|

NORTHFIELD TOWNSHIP, MICHIGAN
WASTEWATER TREATMENT PLANT
WET WEATHER STORAGE TANK
PROCESS
HYDRAULIC PROFILE

| | |
|---|---|
| Project #: | 200-12748-15003 |
| Designed By: | MAT |
| Drawn By: | |
| Checked By: | |

2



Bar Measures 1 inch

12/31/2015 5:35:21 PM - C:\P\200-12748-15003\CAD\SHEETFILES\HYD-PROF.DWG - TEITSMA, MARC

TETRA TECH
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710 AVIS DRIVE, SUITE 100
ANN ARBOR, MI. 48108
PHONE: 734.665.6000, FAX: 734.665.2570

16-31-100-002
NORTHFIELD TOWNSHIP
75 BARKER ROAD
WHITMORE LAKE, MI.

S 00°-06'-00" E 594.44'

N 89°-11'-32" E 1738.00'

S 00°-06'-00" E 77.37'

S 88°-04'-50" E 69.94'

N 87°-21'-55" W 757.15'

N 00°-04'-00" E 364.73'

VALVE AND METER VAULT

4:1 SLOPE

1.5 MG WET WEATHER STORAGE TANK 100' Ø
TANK FL. EL. 915.00

16-L31-100-002
NORTHFIELD TOWNSHIP

ORIT. & SCREEN BUILDING

FUTURE EQUALIZATION BASIN

GARAGE

SERVICE BLDG.

FERRIC CHLORIDE STORAGE TANK

P.E. PUMP SUCTION WELL

DIGESTER NO. 2

DIGESTER NO. 3

DIGESTER BUILDING

DIGESTER NO. 1

SLUDGE THKNR.

DIGESTER GAS COMPRESSOR HOUSING & RAD

SLUDGE STORAGE TANK

SLUDGE DECANT

FLOW SPLIT STRUCTURE

EQUIPMENT SHELTER

PRIMARY SETTLING TANKS NO. 1 & 2

FUEL TANK

TRICKLING FILTER

TRICKLING FILTER SETTLING TANK

AERATION TANK NO. 1

AERATION TANK NO. 2

AERATION TANK NO. 3

FINAL SETTLING TANK NO. 1

FINAL SETTLING TANK NO. 2

FINAL SETTLING TANK NO. 3

FINAL TANK FLOW SPLIT STRUCTURE

FILTER BUILDING NO. 1

FILTER BUILDING NO. 2

CHLORINE CONTACT TANK

TRANS FORMER

CASCADE

FUTURE PLANT EXPANSION

L 16° 31' 07"
RADIUS = 1943.00'
ARC = 526.28'
CHORD = N 49° 23' 47" E
LENGTH = 524.68'

SITE PLAN
SCALE: 1" = 30'

0 15' 30' 60'
SCALE: 1" = 30'

| MARK | DATE | DESCRIPTION | BY |
|---|---|---|---|

NORTHFIELD TOWNSHIP, MICHIGAN
WASTEWATER TREATMENT PLANT
WET WEATHER STORAGE TANK
SITE PLAN

| | |
|---|---|
| Project #: | 200-12748-15003 |
| Designed By: | MAT |
| Drawn By: | |
| Checked By: | |

3



Bar Measures 1 inch

12/31/2015 5:40:18 PM - C:\P\200-12748-15003\CAD\SHEETFILES\SITE-GRD.DWG - TEITSMA, MARC

100-035

100-030

100-029

100-013

011

ROAD

031

0-023

FUTURE PLANT EXPANSION

300-010

3.02 AC

300-005-013

300-006

13.03 AC.

300-002

LEMEN

## DISCLAIMER:

1. PROPERTY LINE INFORMATION FROM EX. DOCUMENT RECEIVED FROM NORTHFIELD TOWNSHIP AND EXISTING DRAWING INFORMATION. THIS INFORMATION HAS NOT BEEN VERIFIED WITH OFFICIAL RECORDS.

SITE PLAN

SCALE: 1" = 100'

0 50' 100' 200'

SCALE: 1" = 100'

TETRA TECH
www.tetratech.com
710 AVIS DRIVE, SUITE 100
ANN ARBOR, MI. 48108
PHONE: 734.665.6000, FAX: 734.665.2570

| MARK | DATE | DESCRIPTION | BY |
|---|---|---|---|

NORTHFIELD TOWNSHIP, MICHIGAN
WASTEWATER TREATMENT PLANT
WET WEATHER STORAGE TANK
PROPERTY PLAN

| | |
|---|---|
| Project #: | 200-12748-15003 |
| Designed By: | MAT |
| Drawn By: | |
| Checked By: | |

4



Bar Measures 1 inch

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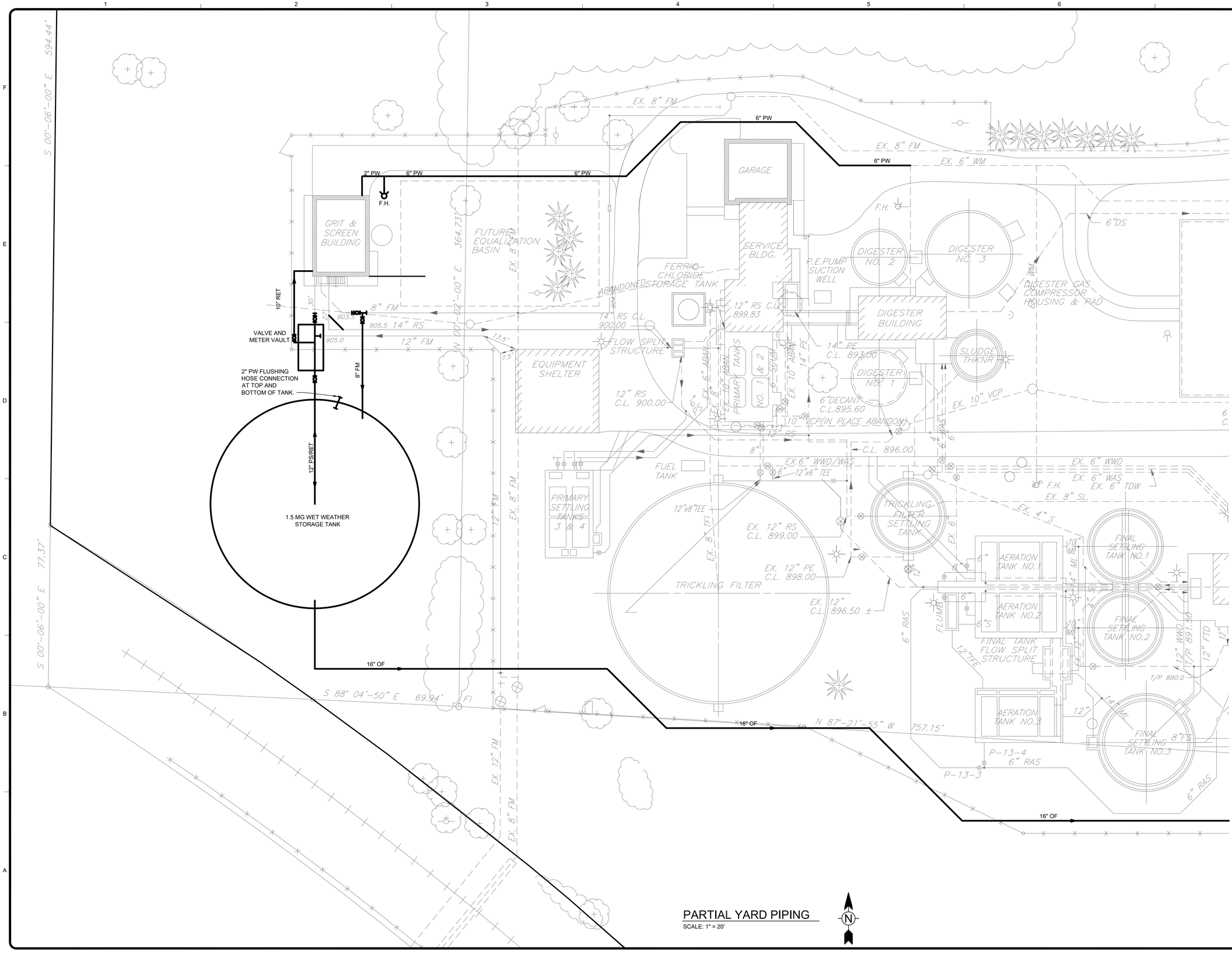


PARTIAL YARD PIPING
SCALE: 1" = 20'

0 10' 20' 40'
SCALE: 1" = 20'

Bar Measures 1 inch

TETRA TECH
www.tetratech.com
710 AVIS DRIVE, SUITE 100
ANN ARBOR, MI. 48108
PHONE: 734.665.6000, FAX: 734.665.2570

| MARK | DATE | DESCRIPTION | BY |
|---|---|---|---|

NORTHFIELD TOWNSHIP, MICHIGAN
WASTEWATER TREATMENT PLANT
WET WEATHER STORAGE TANK

# PARTIAL YARD PIPING PLAN

| | |
|---|---|
| Project #: | 200-12748-15003 |
| Designed By: | MAT |
| Drawn By: | |
| Checked By: | |

5



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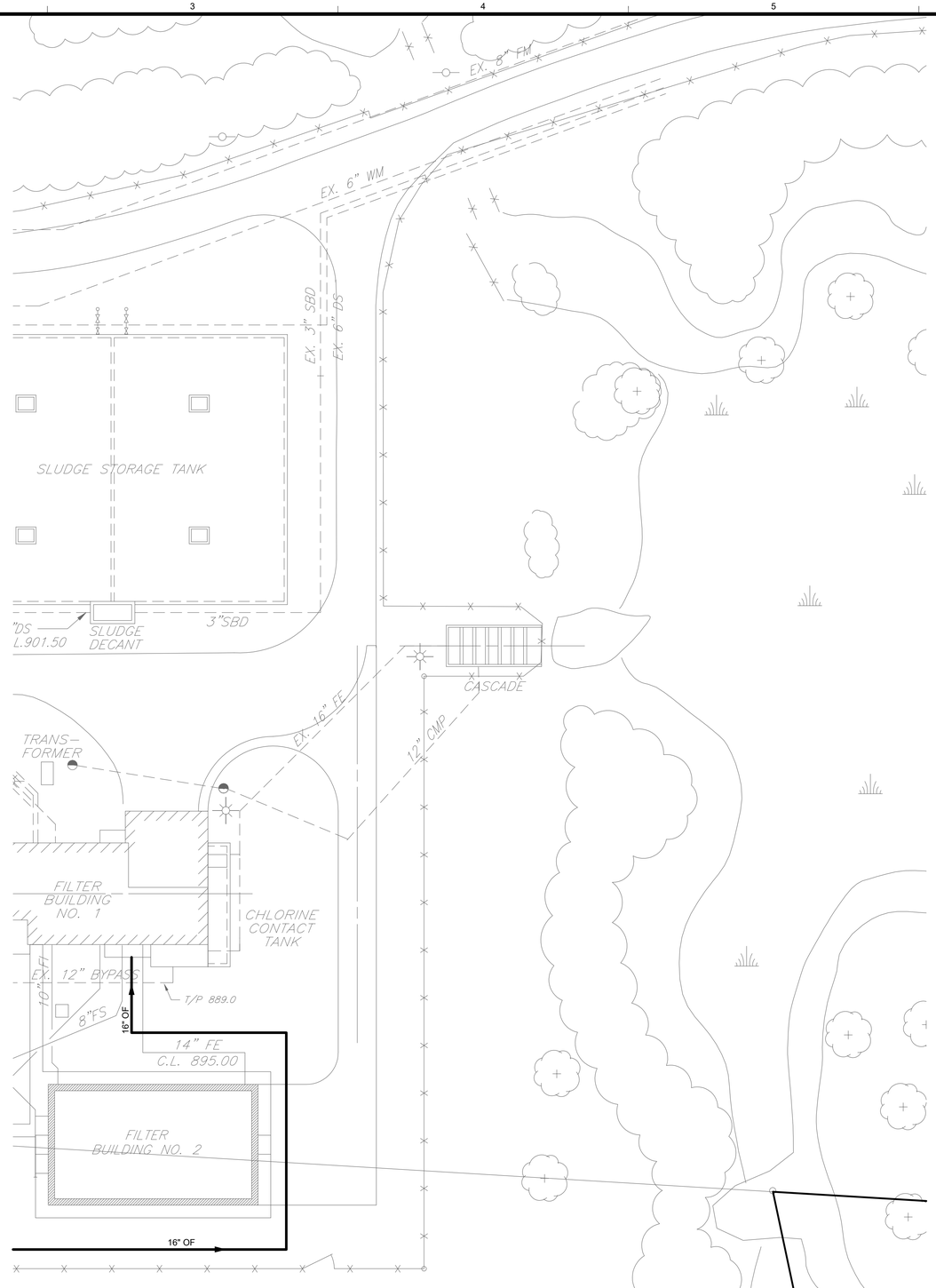



PARTIAL YARD PIPING

SCALE: 1" = 20'

N

0 10' 20' 40'

SCALE: 1" = 20'

TETRA TECH
www.tetratech.com
710 AVIS DRIVE, SUITE 100
ANN ARBOR, MI. 48108
PHONE: 734.665.6000, FAX: 734.665.2570

| MARK | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | | |

NORTHFIELD TOWNSHIP, MICHIGAN

WASTEWATER TREATMENT PLANT
WET WEATHER STORAGE TANK

# PARTIAL YARD PIPING PLAN

| | |
|---|---|
| Project #: | 200-12748-15003 |
| Designed By: | MAT |
| Drawn By: | |
| Checked By: | |

6



Bar Measures 1 inch

# APPENDIX C

## Cost Opinion

# OPINION OF PROBABLE CONSTRUCTION COST

## TETRA TECH

710 Avis Drive, Suite 100, Ann Arbor, MI 48108 Telephone: (734) 665-6000 FAX: (734) 665-2570

| | | | |
|---|---|---|---|
| PROJECT: | WWTP Wet Weather Storage Tank | DATE: | 12/30/2015 |
| LOCATION: | Northfield, MI | PROJECT NO. | 200-12748-15003 |
| BASIS FOR ESTIMATE: | [ X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL | ESTIMATOR: | MT |
| WORK: | Wet Weather Storage Tank Evaluation | CHECKED BY: | |
| | | CURRENT ENR: | |

| ITEM NO. | DESCRIPTION | QUANT. | UNIT | UNIT AMOUNT | TOTAL AMOUNT |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | Bolted Steel Storage Tank | 1 | LS | $700,000 | $700,000 |
| 4 | Tank Concrete | 1 | LS | $160,000 | $160,000 |
| 5 | Vault - Concrete | 1 | LS | $30,000 | $30,000 |
| 6 | Excavation/Backfill | 1 | LS | $60,000 | $60,000 |
| 7 | Tank Fill, Site Work | 1 | LS | $30,000 | $30,000 |
| 8 | Piping and Valves | 1 | LS | $290,000 | $290,000 |
| 9 | Temporary Facilities | 1 | LS | $50,000 | $50,000 |
| 10 | 8 Mile Pump Station - new pumps, electrical work | 1 | LS | $260,000 | $260,000 |
| 11 | Electrical/Instrumentation | 1 | LS | $80,000 | $80,000 |
| 12 | | | | | |
| 13 | | | | | |
| 14 | | | | | |
| 15 | | | | | |
| 16 | | | | | |
| 17 | | | | | |
| 18 | | | | | |
| 19 | | | | | |
| 20 | | | | | |
| 21 | Subtotal | | | | $1,660,000 |
| 22 | Contractor General Requirements | 10 | % | | $170,000 |
| 23 | Engineering, Legal, Administrative, and Contingencies | 40 | % | | $740,000 |
| 24 | Inflation to 2017 (say 10%) | 10 | % | | $257,000 |
| 25 | | | | | |
| | **TOTAL CONSTRUCTION COST** | | | | **$2,830,000** |

**APPENDIX D**
**Soil Boring Proposal**

associates | inc
Environmental, Geotechnical
Engineering & Testing

44265 Plymouth Oaks Boulevard
Plymouth, Michigan 48170
T 734-455-8600
F 734-455-8608
www.ttlassoc.com

January 5, 2016

**Proposal No. 13647.01**

Mr. Brian M. Rubel, P.E.
Tetra Tech
710 Avis Drive
Ann Arbor, Michigan 48108

**Geotechnical Subsurface Investigation**
**Proposed Above Ground Wet Weather Storage Tank and Valve Vault**
**Northfield Township Wastewater Treatment Plant**
**Whitmore Lake, Michigan**

Dear Mr. Rubel:

TTL Associates, Inc. (TTL) is pleased to provide this proposal to Tetra Tech for a geotechnical subsurface investigation for the above referenced project. TTL has developed this proposal for services based on an email Request for Proposal (RFP) from you to Ms. Katherine Chulski of TTL on December 18, 2015, which included a proposed site plan, as well as email correspondence sent from you to Ms. Chulski from December 18, 2015 and December 30,2015, regarding valve vault depth and proposed future expansion.

## PROJECT DESCRIPTION

It is our understanding that the project consists of construction of a new above-ground wet weather storage tank and a new valve vault at the existing Northfield Township wastewater treatment plant (WWTP). The WWTP is located approximately ½ mile north of 8 Mile Road and ¼ mile west of Lemen Road in Whitmore Lake, Michigan.

The site for the new tank is mostly undeveloped at this time, and includes a partially wooded area with a grassy path that traverses around the facility. The perimeter of the new tank is preliminary designed with slopes on the order of 4 horizontal to 1 vertical (4H:1V). Existing site grades are generally flat, indicated to range from Elevs. 913 to 910, although at the eastern edge of the tank perimeter a shallow depression with a bottom of Elev. 906 is indicated.

The tank will have a diameter of 100 feet with a tank floor indicated at Elev. 915. Based on existing site grades, approximately 3 to 4 feet of fill is required to raise site grades for the proposed tank. It is anticipated that the structure will have a concrete ringwall supported on footings. Structural loads were not available at the time of preparing this proposal. Maximum loads are assumed to not exceed 2,000 pounds per square foot (psf).

The valve vault will have a footprint of approximately 25 feet by 15 feet, with the bottom slab for this structure at a depth of roughly 6 to 8 feet below existing grade. Structural loads were not available at the time of preparing this proposal. Maximum loads are assumed to not exceed 2,000 psf.

We understand that soil borings are not needed for the future plant expansion immediately south of the existing facility. It is understood that this work is projected approximately 10 years in the future.

## SCOPE OF WORK

TTL proposes to conduct a geotechnical subsurface investigation to evaluate the properties of the underlying soils with respect to design and construction of foundations at the above referenced location. A drill rig and crew will be utilized to advance soil borings into the underlying soils for the purpose of collecting soil samples and performing in-situ tests. Laboratory testing will be conducted on the collected soil samples to provide physical properties and characteristics of the underlying materials. Geotechnical engineering recommendations pertaining to design and construction will be developed based on information obtained from the drilling and laboratory testing.

The proposed scope has been divided into the following three tasks.

### Task 1 - Mobilization, Drilling and Sampling

Based on the provided information, four (4) borings are proposed for this investigation. One boring will be performed near the center of the tank footprint and extended to a planned depth of 100 feet below existing grade. Three borings will be performed around the perimeter of the proposed tank footprint and extended to a planned depth of 20 feet. One of these perimeter borings will be located in the area of the proposed valve vault. The borings will be extended to these planned depths or to auger refusal, whichever is first encountered. If encountered soil conditions are such that deep foundations may be required, TTL will notify Tetra Tech to determine if deeper borings are warranted.

TTL will mobilize a drill rig and crew to the site, perform the indicated test borings, and return the collected soil samples to our laboratory for testing. The test borings will be located in the field by TTL in general accordance with the provided site plan. The borings will be located by taping or pacing methods. TTL will notify the utilities protection service (MISS DIG) for utility markings and clearances. **The client is to furnish TTL with plans identifying on-site underground structures and utilities, and to notify TTL of those structures and utilities not shown on said plans.** If obstructions, overhead power lines, or underground utilities are encountered, the test borings may have to be relocated. The relocation distance shall be kept to a minimum.

The test borings will be performed in general accordance with ASTM D 1586 and D 5434. Soil samples will be generally be collected at 2½-foot intervals to a depth of 10 feet and at 5-foot intervals thereafter using a split-spoon sampler. For the valve vault boring, soil samples will be collected at 2½-foot intervals to boring termination. Standard Penetration Tests will be performed at the same intervals. If soft to medium stiff cohesive soils are encountered, up to two Shelby tube samples will be obtained in general accordance with ASTM D 1587.

Groundwater readings will be obtained during drilling and upon completion of drilling operations. Upon completion of the drilling operations, each test boring will be backfilled with a mixture of bentonite chips and auger cuttings.

**Task 2 - Laboratory Testing**

Design and construction recommendations pertaining to foundations will be evaluated using soil index properties and engineering parameters determined from laboratory tests performed on the recovered soil samples. These tests will include the following:

- Moisture content determinations (ASTM D 2216)
- Dry density determinations and unconfined compressive strength tests (ASTM D 2166)
- Atterberg limits tests (ASTM D 4318)
- Particle size analyses (ASTM D 422)

All recovered soil samples will be tested for moisture content and visually or manually classified in accordance with the Unified Soil Classification System (ASTM D 2487 and D 2488). Dry density determinations and unconfined compressive strength tests will be performed on approximately 20 percent of the intact cohesive split-spoon samples as well as all recovered Shelby tube samples. Unconfined compressive strength estimates will be obtained for the remaining intact cohesive samples using a calibrated hand penetrometer. Additionally, an Atterberg limits test and a particle size analysis will be performed on two representative soil samples.

**Task 3 - Engineering Analysis, Recommendations and Report Preparation**

A geotechnical engineer will take the information from the driller's field logs and prepare engineering logs describing each encountered stratum. Geotechnical-related design and construction recommendations will be prepared under the direction of a licensed professional engineer. The recommendations will address soil conditions and characteristics, bearing capacities, and anticipated settlements. In addition, general construction recommendations will be provided by the geotechnical engineer, including excavation and backfill requirements, as well as groundwater conditions and control.

The final report will contain the field investigation and laboratory test data, state our findings and observations, and include a site plan and log identifying each test boring. The final report will also include the recommendations for tank foundations and valve vault foundations prepared under the direction of a licensed professional engineer.

## ESTIMATED COST

TTL proposes to conduct the investigation described herein for a lump sum fee of **$8,285.00**. This fee includes $3,980 for drilling and sampling of subsoils not exceeding 160 lineal feet, $855 for laboratory testing, and $3,450 for engineering analysis and report preparation. Additional drilling and sampling of overburden soils, if deemed necessary by subsurface conditions and authorized by Tetra Tech prior to demobilization, would be performed on an add basis of $30.00 per lineal foot. Delays incurred by the drilling crew due to circumstances beyond our control will be billed at the rate of $222.00 per hour.

The engineering fee includes analysis and consultation through submittal of the final report. Any project meetings, as well as additional analysis and consultation services, will be invoiced in accordance with the following unit rates:

- Project Engineer for additional analysis and engineering evaluation, per hour ..... $ 110.00
- Chief Geotechnical Engineer (P.E.) for meetings and consultation, per hour..... $ 146.00

## TERMS AND CONDITIONS

Work shall be performed in accordance with the attached TTL Agreement for Services. Please execute both copies of the agreement form and return one copy to our office as our authorization to proceed. As an alternative, you may provide a Purchase Order referencing this proposal by number and date.

TTL will apply reasonable care to avoid encountering underground structures and utilities, including notifying MISS DIG prior to the field work to obtain clearances within MISS DIG's jurisdiction. **The client is to furnish TTL with plans identifying on-site underground structures and utilities, and to notify TTL of those structures and utilities not shown on said plans.** Any claims resulting from damage to structures/utilities not identified or mismarked by MISS DIG locaters and/or the client are not the responsibility of TTL, regardless if such damages are direct, indirect, or consequential.

## SCHEDULE

TTL is prepared to begin work on this project upon receipt of written authorization to proceed. Based on our current drilling schedule, we anticipate that the field work can be completed within two weeks of receipt of written authorization and site plans showing existing on-site underground structures and utilities. Field operations are anticipated to require two days for completion. A PDF electronic copy

of our final report will be available approximately two weeks after completion of the drilling operations.

TTL Associates, Inc. appreciates this opportunity to provide Tetra Tech with our quality geotechnical services and we look forward to working with you on this project. Should you have any questions regarding this proposal, please contact us at (734) 455-8600.

Respectfully submitted,

**TTL Associates, Inc.**

Katherine D. Chulski, P.E.
Geotechnical Engineer

Curtis E. Roupe P.E.
Vice President

Attachments - Agreement for Services
- Terms and Conditions

T:\Geotech\Projects 2016\13647.01...\Proposal\13647.01 Geotech Proposal Wet Weather Storage Tank Northfield Twp WWTP MI

# AGREEMENT FOR SERVICES

**THIS AGREEMENT is by and between** _____

Tetra Tech

710 Avis Drive

Ann Arbor, Michigan 48108

hereinafter called **CLIENT** and TTL Associates, Inc. of 44265 Plymouth Oaks Boulevard, Plymouth, Michigan 48170, hereinafter called **TTL** who agrees as follows:

**DECLARATIONS**. **CLIENT** desires to engage **TTL** to provide services as described in **TTL** Proposal No. 13647.01 dated January 5, 2016, a copy of which is attached hereto, and along with the **TERMS AND CONDITIONS**, which appear on the reverse side of this document, are made a part of this **AGREEMENT**.

**ACCEPTANCE**. Execution of this **AGREEMENT** or the issuance of any other written authorization by **CLIENT** to **TTL** such as a written Purchase Order will constitute acceptance of this **AGREEMENT**.

For **CLIENT**, By _____
Signature

_____
Name

_____
Title

EXECUTED THIS _____ DAY OF _____ , 20_____

For **TTL Associates, Inc.**, By _____
Signature

Curtis E. Roupe, P.E.
Name

Vice President
Title

EXECUTED THIS 5th DAY OF January, 2016

Please sign one copy of this agreement and return it to TTL. The proposal is valid for 120 days.

TTL associates | inc
Environmental, Geotechnical Engineering & Testing

# TERMS AND CONDITIONS
# SCHEDULE A

As used herein, the word Client refers to the party purchasing services for work from TTL Associates, Inc. (TTL). The following terms and conditions shall govern the performance of services or work by TTL for or on behalf of Client, as contemplated by the order set forth on the reverse side hereof. Modification of these terms and conditions may be made only with the prior written consent of both parties and any attempts to alter such terms and conditions with purchase orders, acknowledgements, similar or other documentation shall be void.

1. Scope; Standards. TTL shall provide the services described on the reverse side hereof in accordance with generally accepted industry standards.

2. Work Product. Reports and results of TTL services are rendered for the exclusive use of Client, but at all times remain the property of TTL. The Client shall not advertise, publish or otherwise communicate TTL's work product to any third party without the prior written approval of an officer of TTL.

3. Legal Proceedings. If TTL work product is to be used in any legal proceeding, TTL shall charge and Client shall pay all TTL expenses together with then applicable TTL hourly rates for any court appearance, deposition, affidavit or the like by any TTL personnel. Preparation time shall also be billed and paid at such rates.

4. Adversarial Proceedings. In the event that TTL is ordered or subpoenaed to produce documents or testify on behalf of a third party, TTL shall so advise Client, whenever possible. Client may then determine whether it wishes to contest the subpoena or order.

5. **WARRANTY DISCLAIMER. OTHER THAN ITS COMMITMENT TO PERFORM SERVICES IN ACCORDANCE WITH GENERALLY ACCEPTED INDUSTRY STANDARDS, TTL MAKES NO WARRANTY WHATSOEVER. TTL MAKES NO WARRENTY OF MERCHANTABILITY AND NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE.**

6. **Limitation of Liability. In no event will TTL's liability to Client, or to third parties claiming through Client (including, without limitation, Client's insurers) exceed $50,000 regardless of the legal theory upon which a claim may be based, including contract, warranty, tort and indemnification. Without limiting the generality of the foregoing, this limitation is applicable to loss, destruction, or damage to Client property while in the possession or control of TTL. In no event will TTL be liable to Client or to third parties claiming through Client (including Client's insurers) for any incidental or consequential damages whatsoever regardless of the legal theory upon which a claim may be based.**

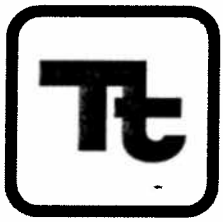
7. Samples. In the event that TTL services involve test samples, such samples will be obtained with reasonable care and preserved for a period of thirty (30) days. TTL reports relative to samples are applicable only to the specific samples tested and only depict conditions at the specific location of the test.

8. Pricing. Prices quoted by TTL are subject to change if not accepted by Client within sixty (60) days of the date of quotation or if the work is not commenced (through no fault of TTL) within sixty (60) days of the date of acceptance of such quotation.

9. Payment. **TTL invoices shall be paid within thirty (30) days of invoice date.** Amounts unpaid when due shall bear interest at the rate of one percent (1.0%) per month, compounded monthly, until paid.

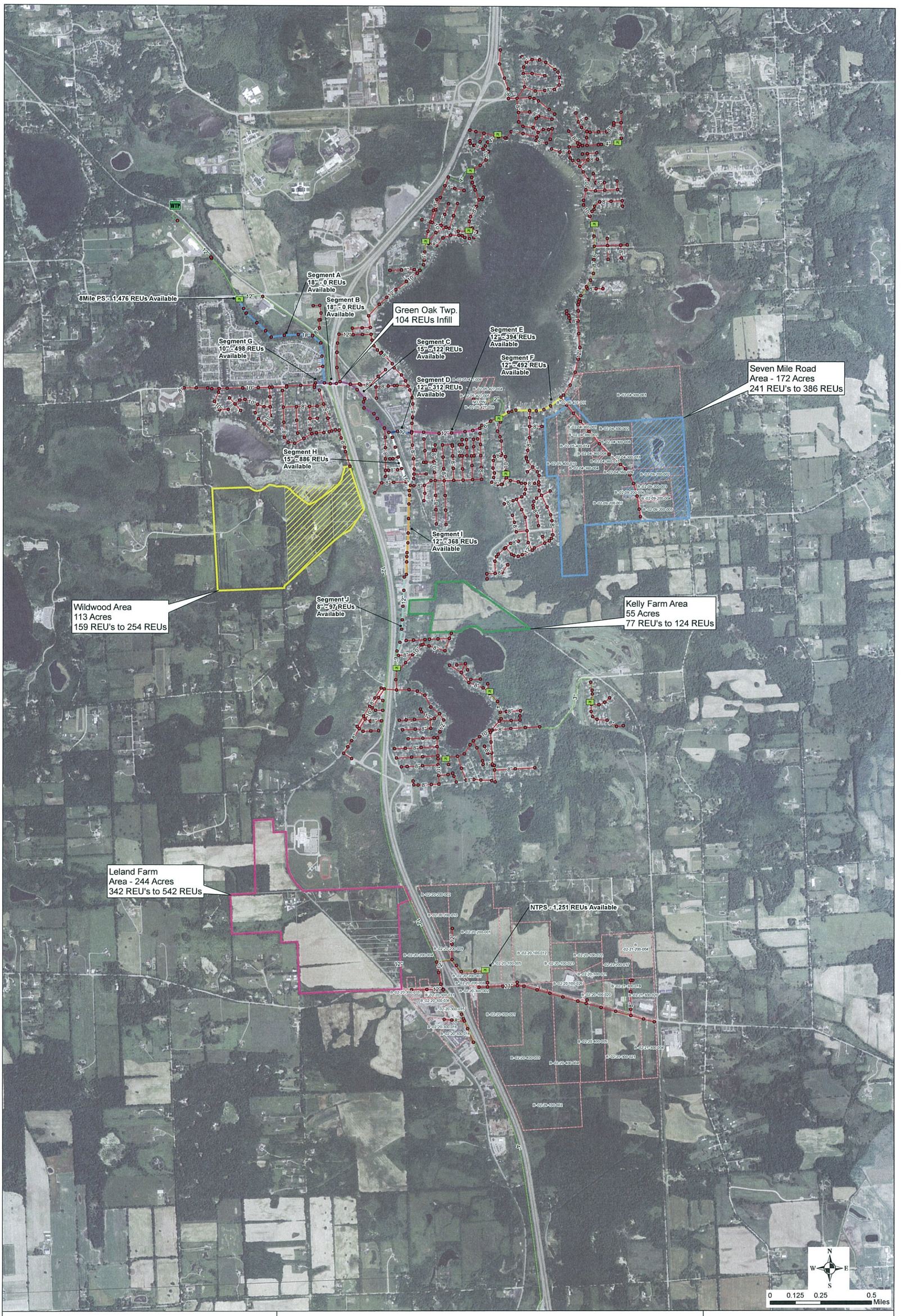
10. Governing Law. This agreement and all transactions relating hereto shall be governed by the laws of the State of Ohio.

11. Entire Agreement. This proposal constitutes the entire agreement between TTL and Client regarding the subject matter hereof and replaces all prior written or oral agreements and understandings. It may be amended or altered only in a writing signed by both parties.



TETRA TECH

710 Avis Drive, Suite 100
Ann Arbor, MI 48108
734.665.6000 | www.tetratech.com



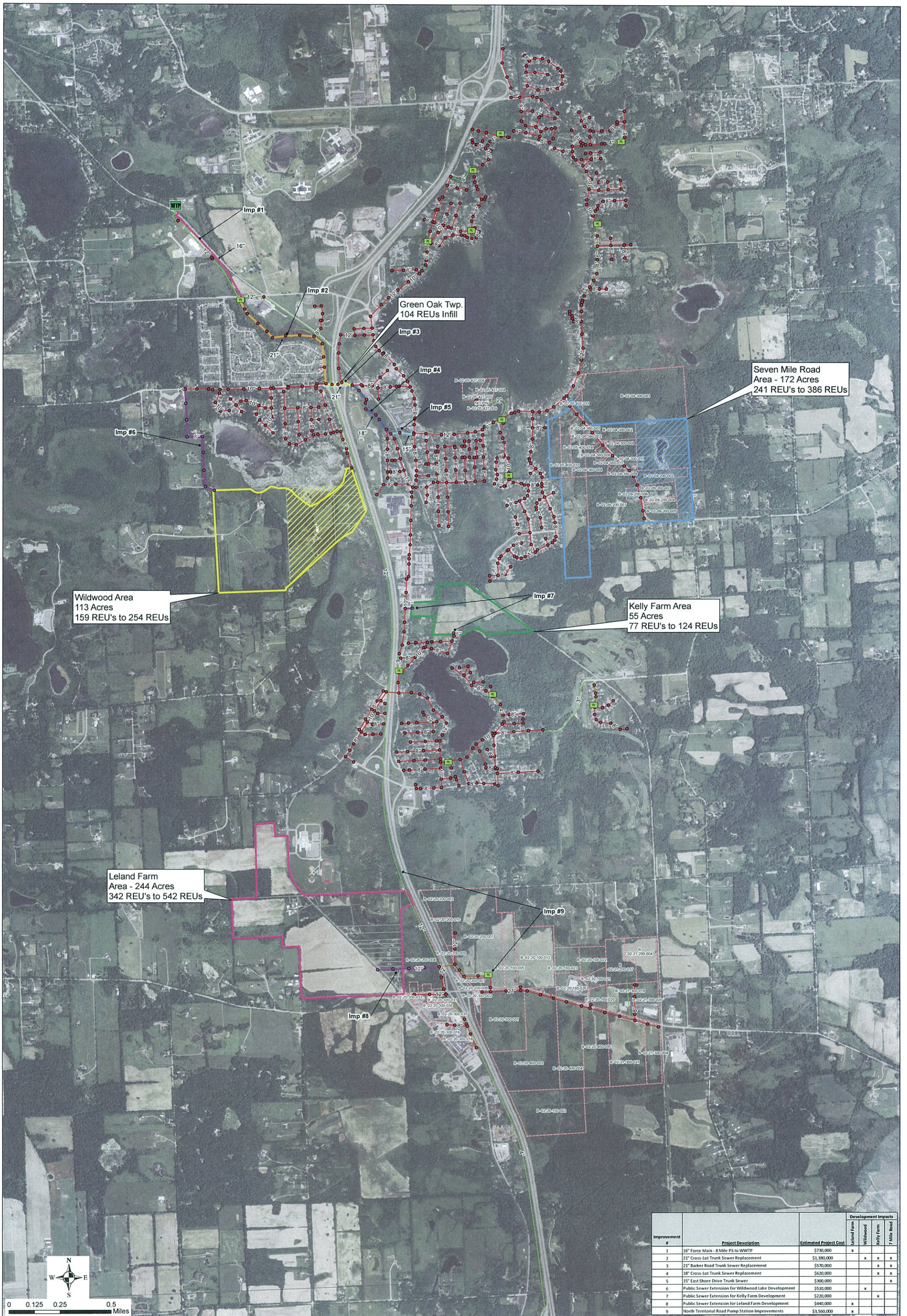

Pump Station
WTP WWTP
Sanitary Manhole
MDR Parcels - 7 Mile (Not Included in Analysis)
MDR Parcels - Wildwood (Not Included in Analysis)
Forcemain
Gravity Sewer
Special Assessments

**Figure 1 - Potential MDR Developments and Available Sewer Capacity Prior to Potential Development**

Note: Available capacity is approximate and flow monitoring should be conducted prior to finalizing decisions.

**Northfield Township**

**Tuesday, March 22, 2016**




| Improvement # | Project Description | Estimated Project Cost | Development Impacts | | | |
|---|---|---|---|---|---|---|
| | | | Leland Farm | Wildwood | Kelly Farm | 7 Mile Road |
| 1 | 16" Force Main - 8 Mile PS to WWTP | $730,000 | x | | | |
| 2 | 21" Cross-Lot Trunk Sewer Replacement | $1,380,000 | | x | x | x |
| 3 | 21" Barker Road Trunk Sewer Replacement | $570,000 | | | x | x |
| 4 | 18" Cross-Lot Trunk Sewer Replacement | $620,000 | | | x | x |
| 5 | 15" East Shore Drive Trunk Sewer | $300,000 | | | | x |
| 6 | Public Sewer Extension for Wildwood Lake Development | $510,000 | | x | | |
| 7 | Public Sewer Extension for Kelly Farm Development | $220,000 | | | x | |
| 8 | Public Sewer Extension for Leland Farm Development | $440,000 | x | | | |
| 9 | North Territorial Road Pump Station Improvements | $1,560,000 | x | | | |

- Pump Station
- WWTP
- Sanitary Manhole
- Proposed Manhole
- Special Assessments
- MDR Parcels - Wildwood (Not Included in Analysis)
- MDR Parcels - Wildwood (Not Included in Analysis)
- Proposed Sewer Extension
- Forcemain
- Gravity Sewer

## Figure 2 - Potential Sewer Upgrades for Development

Note: Available capacity is approximate and flow monitoring should be conducted prior to finalizing decisions.

**Northfield Township**

**Tuesday, March 22, 2016**