

NORTHFIELD TOWNSHIP

**North Territorial Sanitary Sewer
Improvements**

CONTRACTS 0196.064-S-1, S-2, AND S-3

May 1998

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INTRODUCTION

GENERAL

The North Territorial Sanitary Sewer Improvements are located in Northfield Township, Washtenaw County, Michigan. Phase I of the project is designed to provide sanitary sewer service to existing and future developments along North Territorial Road from US-23 to Nollar Road. The development of this area has been hindered due to poor soil conditions and a high groundwater table. The project will include approximately 11,500 linear feet of gravity sewer, 21,000 linear feet of transmission main along US-23, a new pump station at North Territorial Road, and the reconstruction of the Eight Mile Road Station. Northfield Township will own, operate, and maintain the proposed system.

SERVICE AREA

Enclosed is a map (Figure 1) which delineates the proposed Phase 1 and Ultimate service areas. The Phase 1 service area consists of primarily vacant land along North Territorial Road from US-23 to Nollar Road. The majority of the land is zoned RTM (research), which supports development such as offices and light industrial facilities. The "Ultimate" service area was determined by the Township as a tool to facilitate the sizing of the interceptor sewers and pump stations being installed.

PROPOSED FACILITIES

The system will be a combination of gravity sewers, pump stations, and force mains. The area along North Territorial Road will be served by a gravity sewer on the south side of the road. The sewer will drain west from Nollar Road to a submersible pump station near Five Mile Road. A gravity sewer will also be extended west of US-23 to provide service for the MDOT rest area and the portion of the "Ultimate" service area which is west of US-23. The pump station will discharge through a 12-inch pressure main across US-23 and north along US-23 to Eight Mile Road. The force main will discharge to the Eight Mile Road pump station, which will be reconstructed to handle this additional flow. The new Eight Mile Road Pump Station will continue to discharge to the Northfield Township Wastewater Treatment Plant on Lemay Road in Green Oak Township, Livingston County, Michigan. Table 1 shows proposed sizes and footage of the gravity sewers and force mains.

Table 1
Sizes of Gravity Sewers and Force Mains

Item	Size	Lineal Feet	TOTAL
Gravity Sewer	8"	2,050	
	12"	3,700	
	18"	5,750	11,500
Force Main	12"	21,000	21,000

EXISTING SEWER SYSTEM

The existing sanitary sewer system in Northfield Township is composed of gravity sewers and force mains discharging to the main pump station on Eight Mile Road and ultimately to the Northfield Wastewater Treatment Plant. The existing wastewater treatment plant uses primary settling tanks, a trickling filter, aeration tanks, final settling tank, and sand filters to treat wastewater. The Township is currently expanding the facility by adding an additional aeration tank, final settling tank, and sand filters. Future expansions plans include constructing an equalization basin, primary settling tank, final tank, sand filter, and a sludge storage tank. The pump station at Eight Mile Road will be reconstructed to accommodate the additional flow due to planned future developments in the service area.

BASIS OF DESIGN

The design capacities of the gravity sanitary sewer, force main, and pumping stations are based on the projected development of the service districts. The design assumptions for the development rate are listed below.

GRAVITY SEWER

The flows from gravity sewer are based on the predicted average flow, with a peaking factor to account for the diurnal fluctuations associated with sanitary flow.

Population (average household)	2.6
Per Capita Flow Rate	100 gal/day
Peaking Factor	Based on Ten States Standards

The commercial and industrial users were equated to residential users by Residential Equivalent Units (REUs). Each REU equates to 260 gallons per day based on the residential user flow. Table 2 shows the existing facilities and the number of REUs that they have been assigned for design purposes

Table 2
Existing Facilities

No.	Description	REUs
1-4	Single Family Homes	4
5	Duplex Home	2
6	Sunoco	2
7	Moehrle, Inc.	5
8	Carter Lumber	1
9	Ann Arbor Dog Training	1
10	Bloom Roofing System	1
11	Rhetec	31
12	MDOT Rest Area	22
	TOTAL	69

The projected wastewater flows are based on zoning and future anticipated land use. Table 3 lists zoning classifications, areas, and the existing and estimated flow associated with each zoning.

Table 3
Estimated Flows

Zoning	Avg.Flow/ Acre	Phase 1 Acres	Ultimate Acres	REUs /Acre	Phase 1 Flow	Ultimate Flow
R	520	0	1500	2	0	780,000
O	650	0	150	2.5	0	97,500
RTM	650	400	550	2.5	260,000	357,500
GI	650	70	70	2.5	45,500	45,500
GC	780	69	220	3	53,820	171,600
PSC	910	40	100	3.5	36,400	91,000
TOTAL		579	2,550		395,720	1,543,100

The zoning terms are defined as follows:

- R residential
- O office
- RTM research
- GI general industrial
- GC general commercial
- PSC planned shopping center

Figure 2 shows a map of the zoning within Phase 1 and the Ultimate service areas. Figure 3 shows the flow patterns and estimated size of the main in the Phase 1 service area.

Table 4 shows the subareas of the Ultimate service area and the projected flows contributing to the main; this table does not include the flow from the two new developments shown on Figure 3. The total ultimate peak flow to the North Territorial pump station is expected to be 4.73 MGD.

Table 4
Subareas and Expected Flows

Subarea	Zoning	Avg. Flow (gpd)	Projected Flow (MGD)
A	PSC/R	168,350	0.66
B	R	187,200	0.56
C	R/GI	334,100	1.01
D	RTM/R	187,200	0.61
E	GC/O/R	315,221	0.99
F	GC/R	75,267	0.32

Table 5 indicates the pipe sizes and expected flows for the sewer system on North Territorial Road. The pipe numbers correspond to the numbers on the map in Figure 3. The sewers are sized to carry the future ultimate flow as the service area is developed.

Table 5
North Territorial Pipe Sizing

Pipe Number	Pipe Size (inches)	Pipe Cap. (MGD)	Projected Peak Flow (MGD)
1	8	0.72	0.25
2	12	1.56	0.60
3 - 5	18	3.54	1.90
6	8	0.72	0.01
7	18	3.54	2.76
8	18	3.54	1.97
9	12	1.56	1.31
TOTAL			4.73

3300 gpm

SUBMERSIBLE PUMPING STATIONS

Eight Mile Road

The submersible station on Eight Mile Road will be designed to provide continuous flow to the WWTP by using variable speed pumps that will be controlled with sonic level transmitters. The pumps will be non-clog sewage pumps that will pass three-inch solids. The pumps will discharge flow from the wet

well through a plug valve (shutoff) and a check valve (to prevent backflow) to a common header pipe in the valve vault located in the electrical building.

The pumps will be explosion-proof, UL or FM approved. The pumping station will be provided with stainless steel lifting chains, slides, and guide rail systems for pump removal and maintenance. The pump station will have a divided wet well with sluice gates to allow isolation of either side of the station for maintenance.

The Eight Mile Road pump station will be provided with a permanent generator for use in case of a power outage. The generator will be equipped with an automatic transfer switch that will automatically transfer power from the control panel to the generator in the event of power failure. The Eight Mile Road pump station will also have a bypass line that will enable the operators to run the pump station with a portable pump in the event that either the pumps in the station are down or the control panel is not functioning. Table 6 shows existing and future REUs considered in the design of the Eight Mile pump station.

Table 6
Existing and Future Service at Eight Mile Station

Service Area	REUs
Existing Flow	2,730
Shadowood	44
Eagle Gardens	162
Wildwood	70
Winterhaven Condominiums	30
Westbrook Apartments	132
Future	400
TOTAL	3568

Table 7 provides a summary of design parameters for the Eight Mile Road pumping station.

Table 7
Eight Mile Road Pumping Station Design Data

Design REUs	4168
Design Hour(gpd/REU)	260
Peaking Factor	4*
Design Peak Hour Flow (gpm)	3300
Design Firm Pumping Capacity (gpm)	3300
Number of Pumps	4
Pump Control Method	Sonic Level Transmitter
Total Dynamic Head (feet)	100
Force Main Length (feet) and Size (inches)	6,000 12 & 8
Wet Well Dimensions (feet)	16.5 x 17
Wet Well Working Volume (gallons)	3345
Wet Well Storage Volume (gallons)	9186
Type of Telemetry	radio

* Value obtained from flow study.

North Territorial Road Pump Station

The submersible station at North Territorial Road will be designed as a triplex station to accommodate flow from future planned developments. Two pumps will be installed initially, with the third pump added once future flows are introduced to the sewer system.

The pump station at North Territorial Road will have submersible pumps. The pumps will be non-clog sewage pumps that will pass three-inch solids. The pumps will discharge flow from the wet well through a plug valve (shutoff) and a check valve (to prevent backflow) to a common header pipe in an underground valve vault. The submersible station at North Territorial Road will be equipped with a portable generator for use in the event of a power outage. The pumps will be explosion-proof, UL or FM approved. The pumping station will be provided with stainless steel lifting chains, slides, and guide rails systems for pump removal and maintenance.

Table 8 provides a summary of design parameters for the North Territorial Road Pumping Station.

Table 8
North Territorial Road Pumping Station Design Data

Design REUs	600
Design Hour (gpd/REU)	260
Peaking Factor	3
Design Peak Hour Flow (gpm)	700
Design Firm Pumping Capacity (gpm)	3300
Number of Pumps	3
Pump Control Method	Sonic Level Transmitter
Total Dynamic Head (feet)	80
Force Main Length (feet) and Size (inches)	23,000 ft., 12-inch
Wet Well Dimensions (feet)	10 x 12
Wet Well Working Volume (gallons)	4040
Wet Well Storage Volume (gallons)	7181
Type of Telemetry	radio

Telemetry

The Eight Mile Road pump station will be provided with a sonic level transmitter that will read the level of volume in the station. The transmitter will read levels and send the information via radio transmitter to monitoring equipment at the plant. The monitoring equipment at the plant will notify the operators to respond to the alarm. This communication equipment helps increase response time and prevent extended down-time of the pumping station.

The pump station at North Territorial Road will be equipped with a sonic level transmitter in the wet well. The sonic level transmitter will read levels and send the information via radio transmitter to monitoring equipment at the plant. The monitoring equipment at the plant will notify operators to respond to the alarm.

McNAMEE
PORTER
& SEELEY
INC.

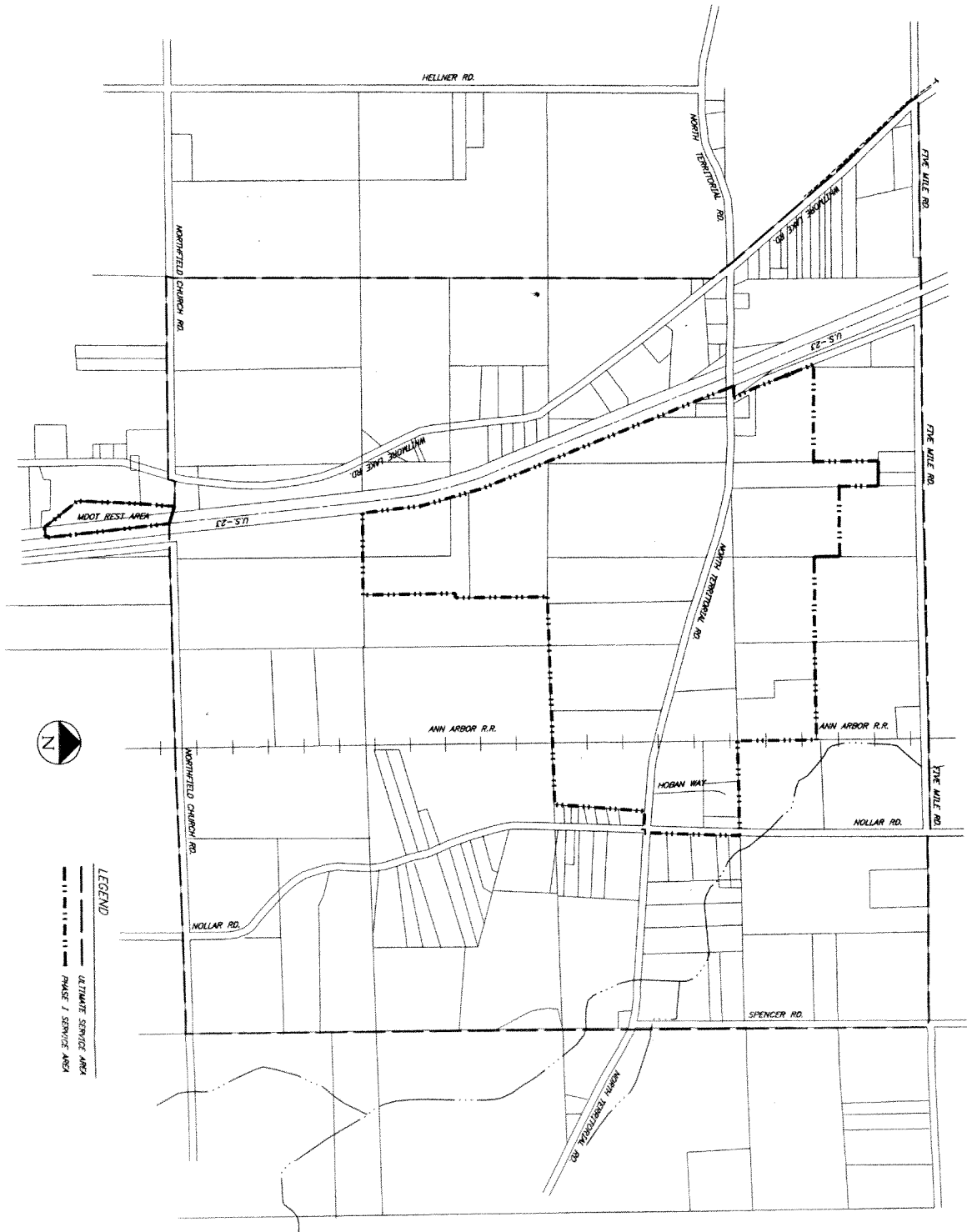
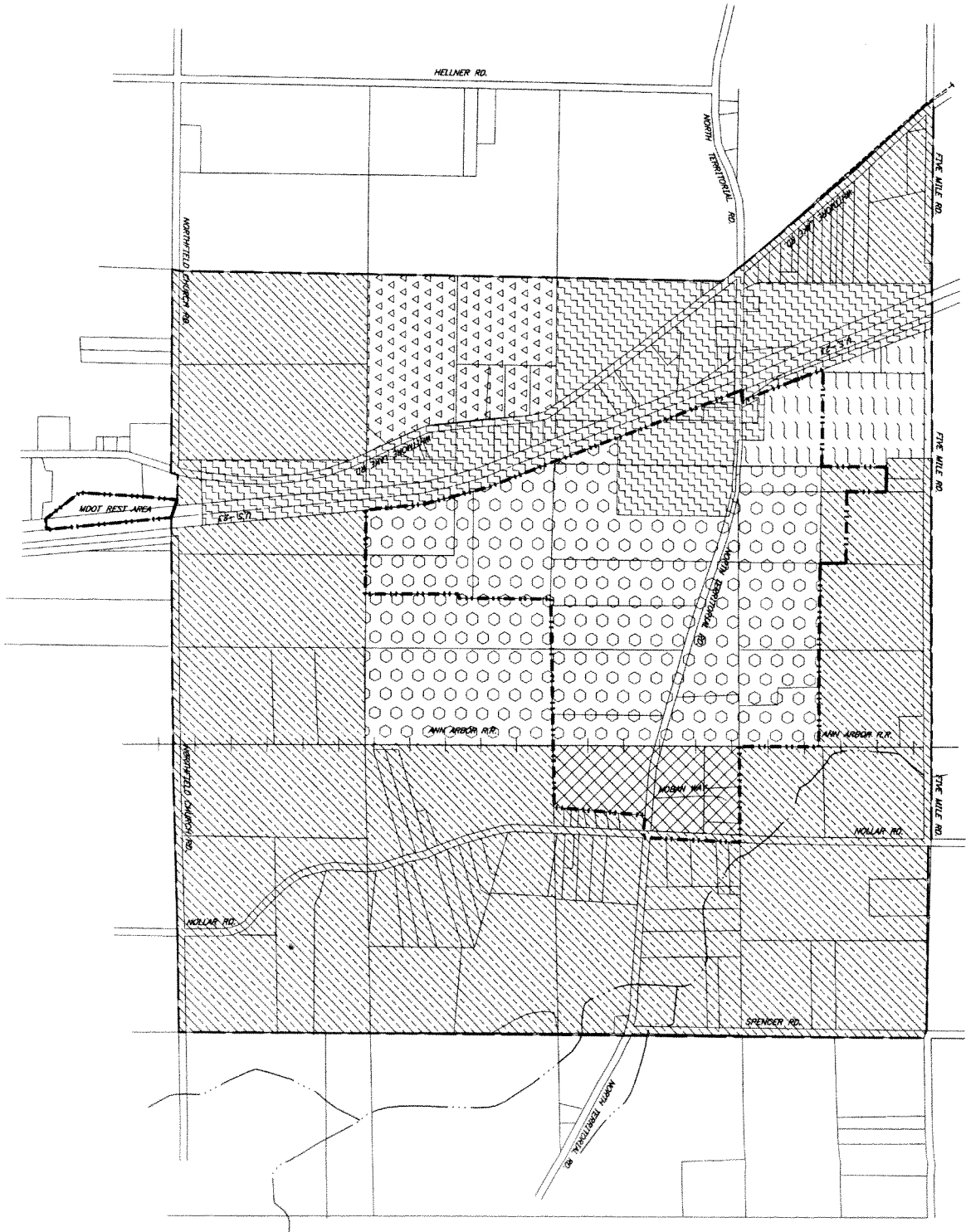


FIGURE 1
NORTHFIELD TOWNSHIP, WASHINGTON COUNTY
NORTH TERRITORIAL SANITARY SEWER
BASIS OF DESIGN
SERVICE AREA

McNAMEE
PORTER
& SEELY
INC.



LEGEND

- RESIDENTIAL
- OFFICE
- GENERAL COMMERCIAL
- GENERAL INDUSTRIAL
- RESEARCH
- PLANNED SHOPPING CENTERS
- ULTIMATE SERVICE AREA
- PHASE I SERVICE AREA

FIGURE 2
NORTHFIELD TOWNSHIP, WASHTENAW COUNTY
NORTH TERRITORIAL SANITARY SEWER
BASIS OF DESIGN
ZONING

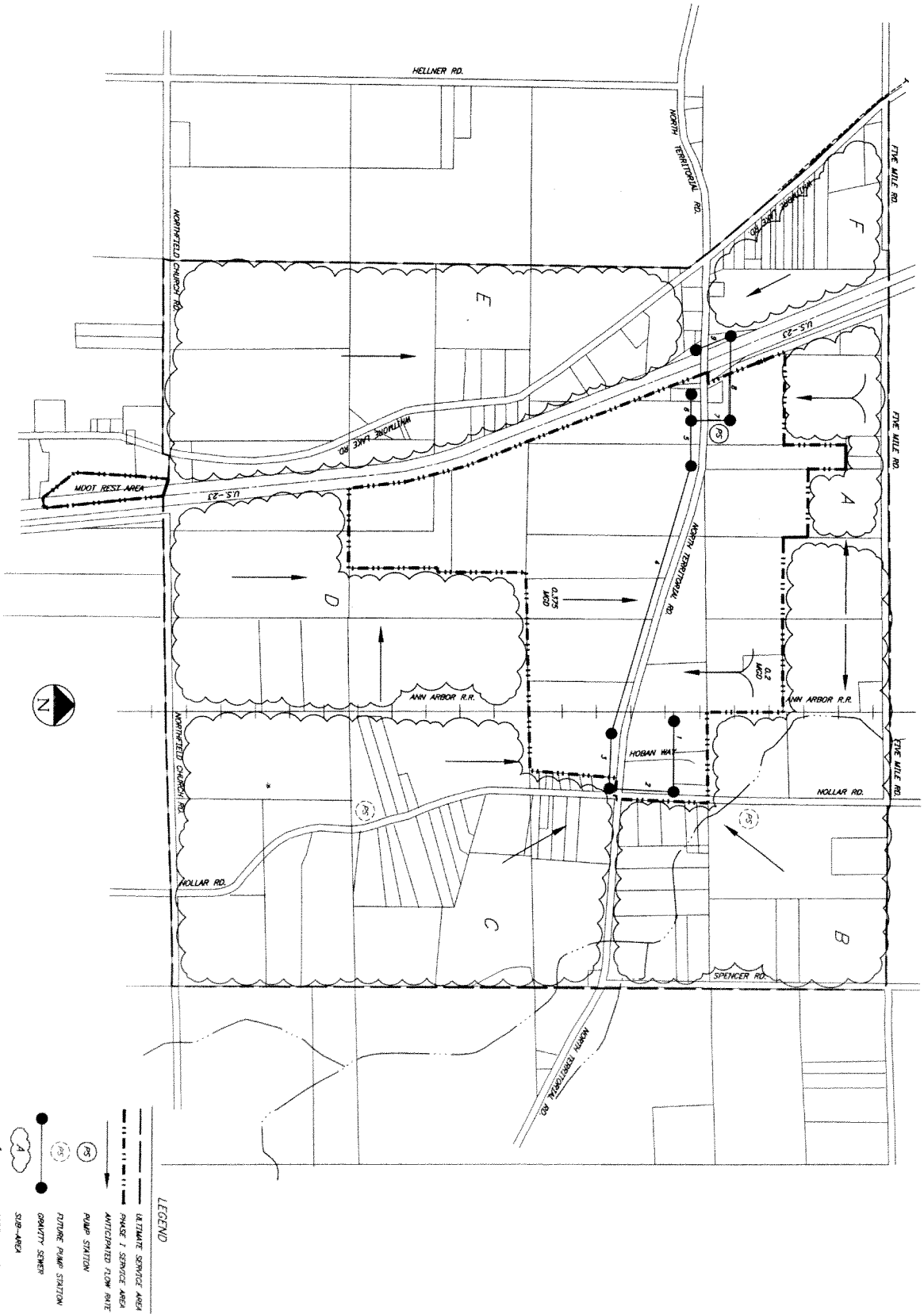


FIGURE 3
NORTHFIELD TOWNSHIP, WASHINGTON COUNTY
NORTH TERRITORIAL SANITARY SEWER
BASIS OF DESIGN
ESTIMATED FLOWS