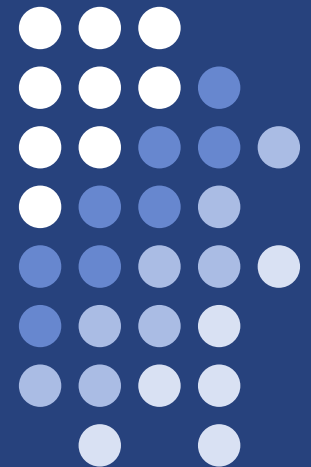
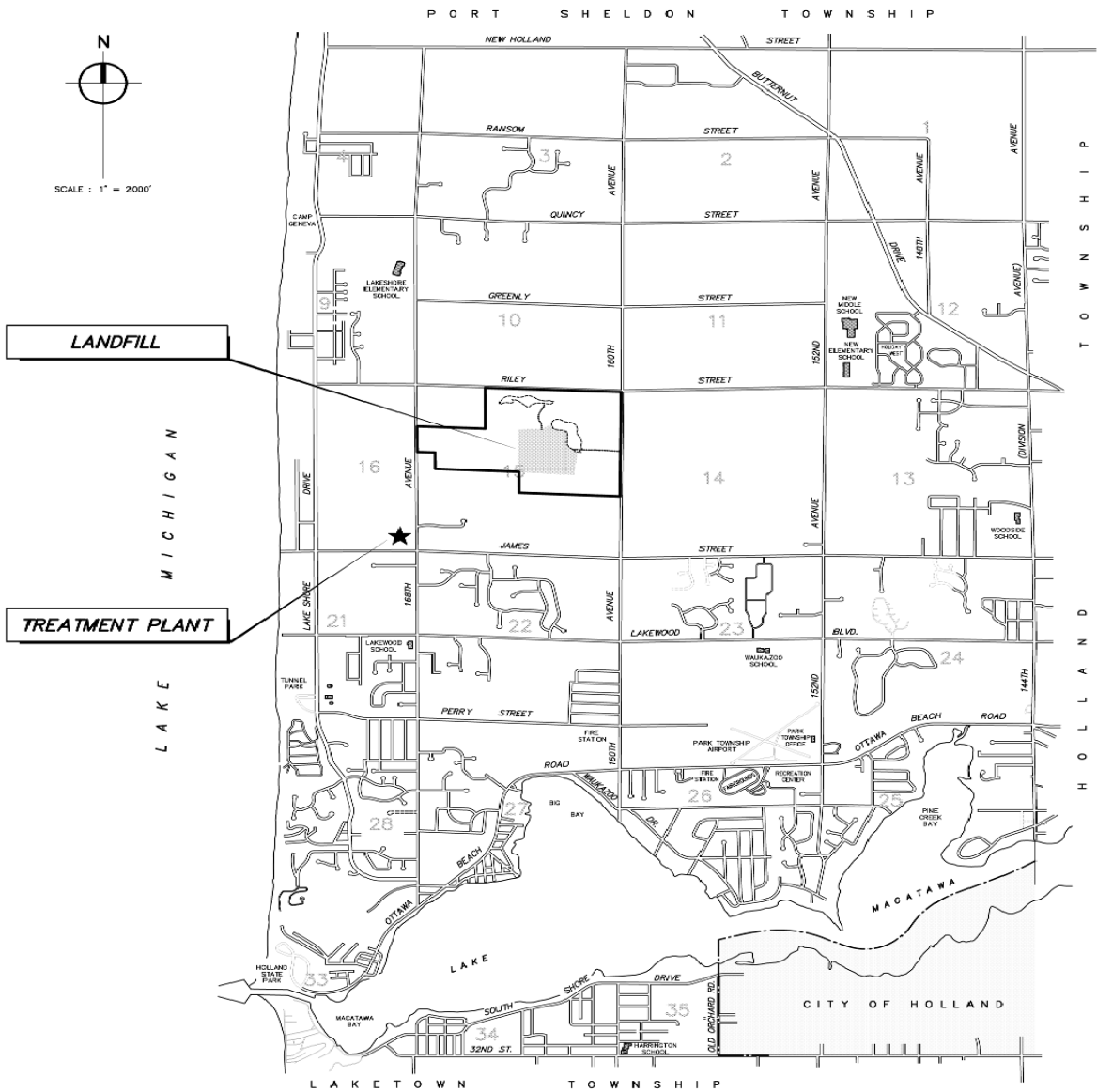


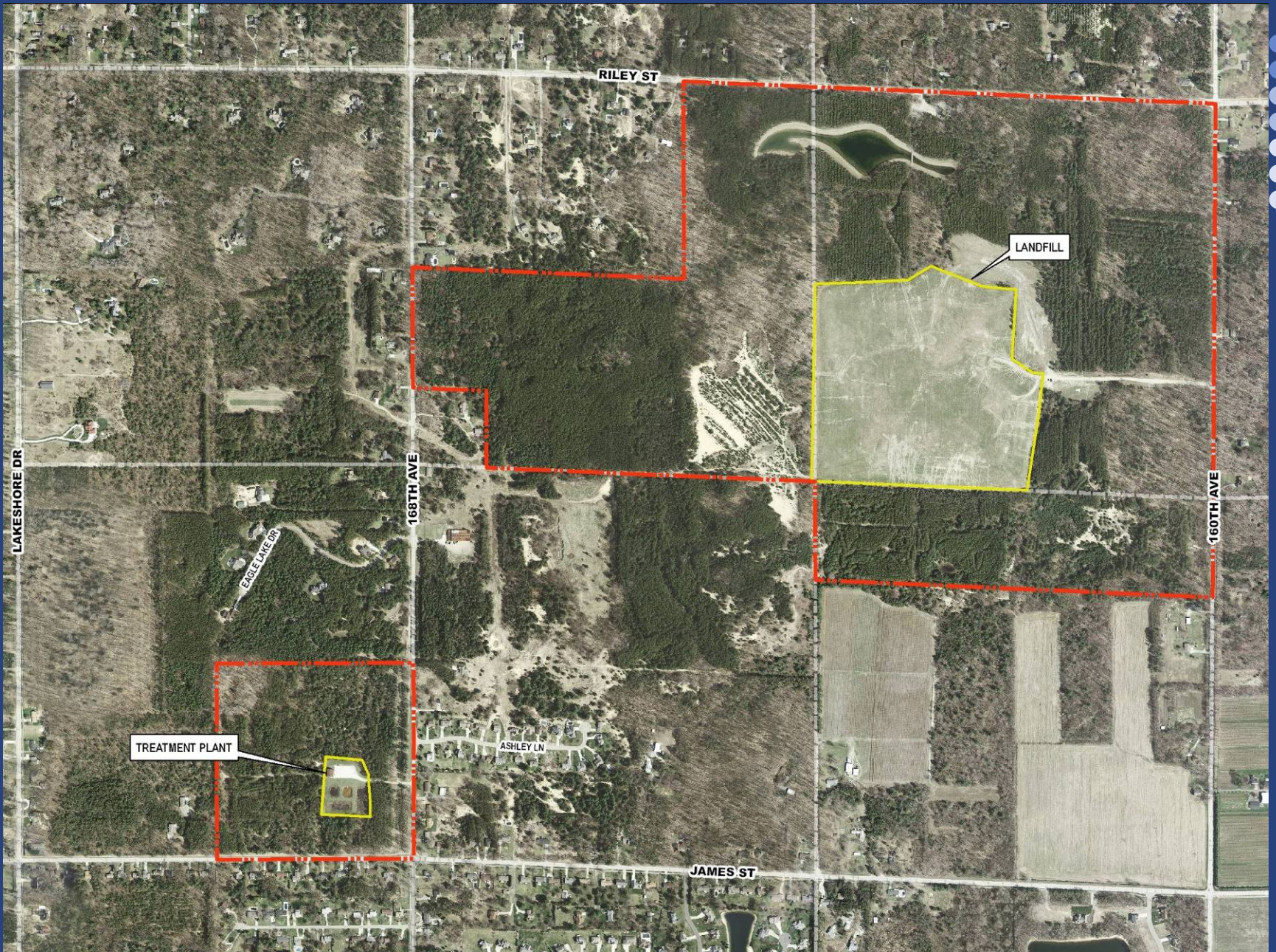
SW Ottawa County Landfill

Barbara Marczak, P.E.

October 26, 2009







Landfill Operation



- 1968 – Landfill Constructed
- 1968 - 1980 – Site in Operation (“State of the Art”)
- 1979 – Groundwater contamination discovered
- 1980 – Site Closed
- 1981 – Site Capped
- 1986 – SUPERFUND list

GW Investigation & Cleanup



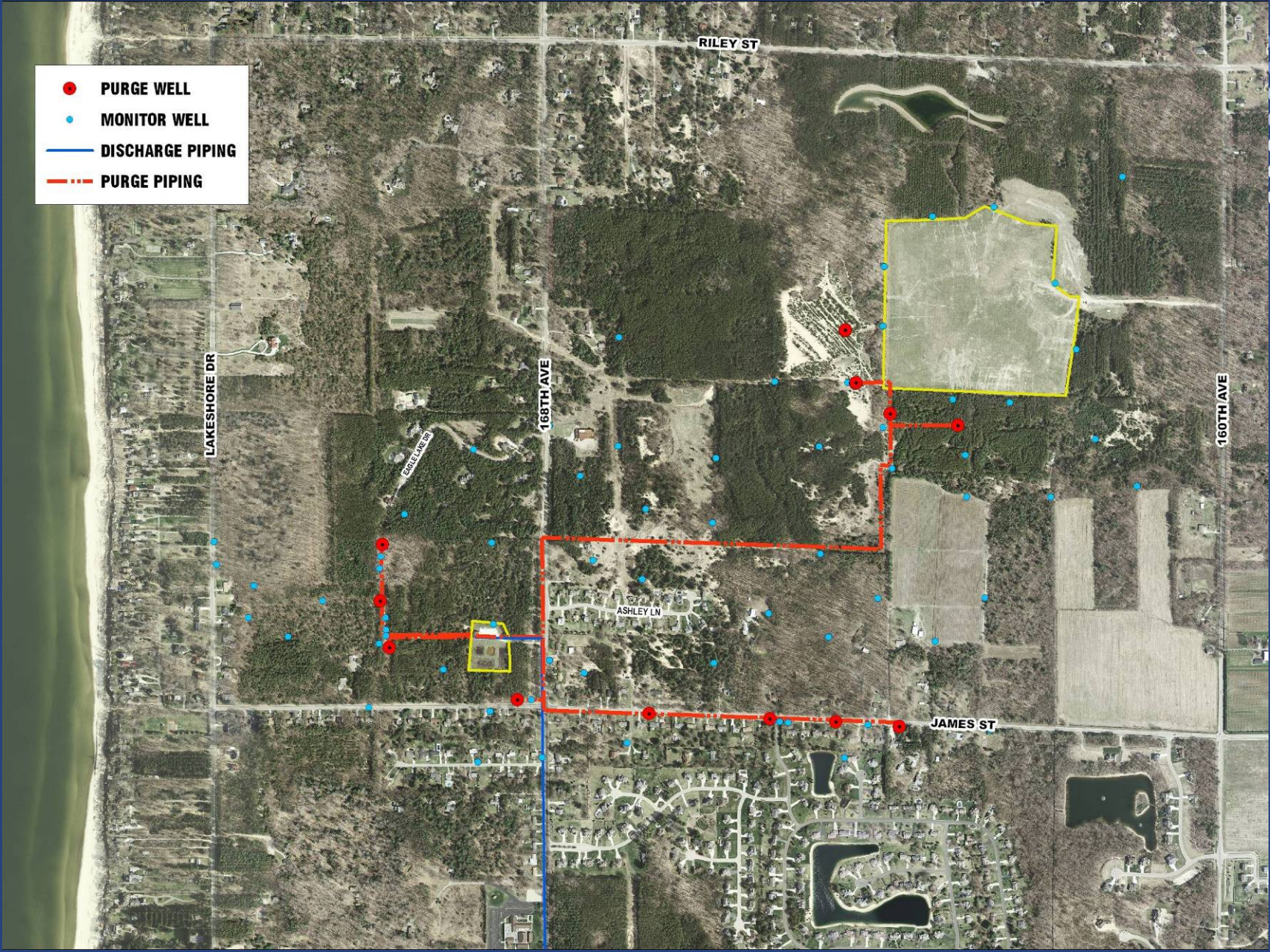
- 1979-2009 – Groundwater Investigation
- 1987 – Purge & Treatment System Installed
- 1992 – 1994 - More wells and treatment added
- 1994 – 2008 – System monitoring and more investigation
- 1996 – Proposed upgrades
- 2003 – Watermain extended south on Lakeshore Drive
- 2006 – New landfill cover
- 2008 – New purge wells
- 2009 – Modified treatment system

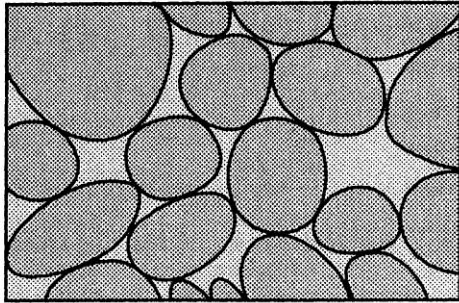
GW Contamination Investigation



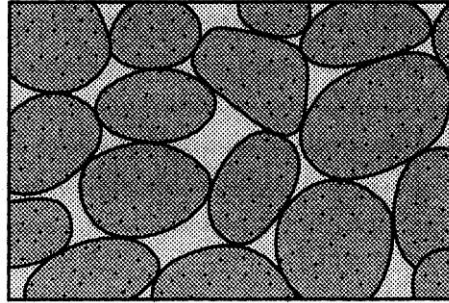
- 1979-2009 – Installation of 115 Monitor Wells
- Basic Hydrogeology
 1. Unconfined Aquifer
 2. Groundwater occurs 5 to 25 feet below ground
 3. Fine to Coarse Sand, Surface to 40-50 feet
 4. Silt/Clay 40-50 feet deep
 5. Hydraulic Gradient: 0.004 ft/ft
 6. Groundwater Flow Direction: Southwest then West

- PURGE WELL
- MONITOR WELL
- DISCHARGE PIPING
- - - PURGE PIPING

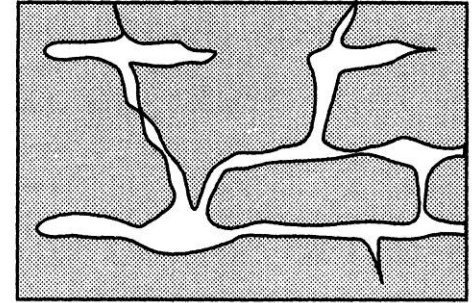




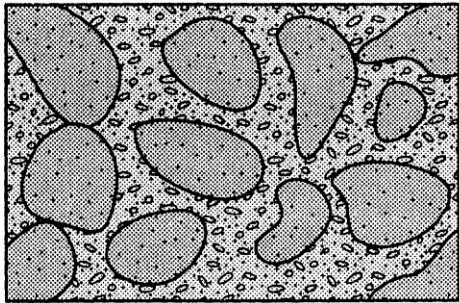
(a)



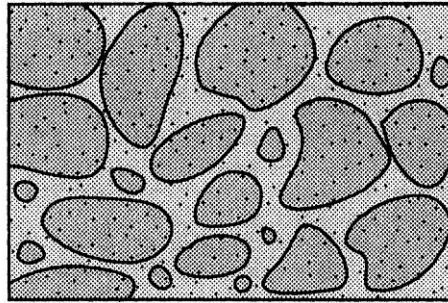
(c)



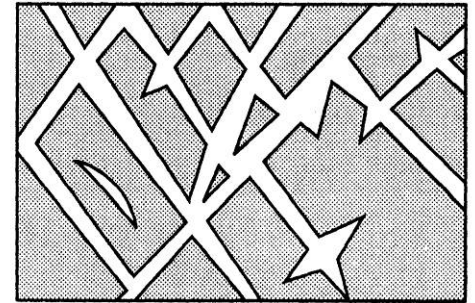
(e)



(b)

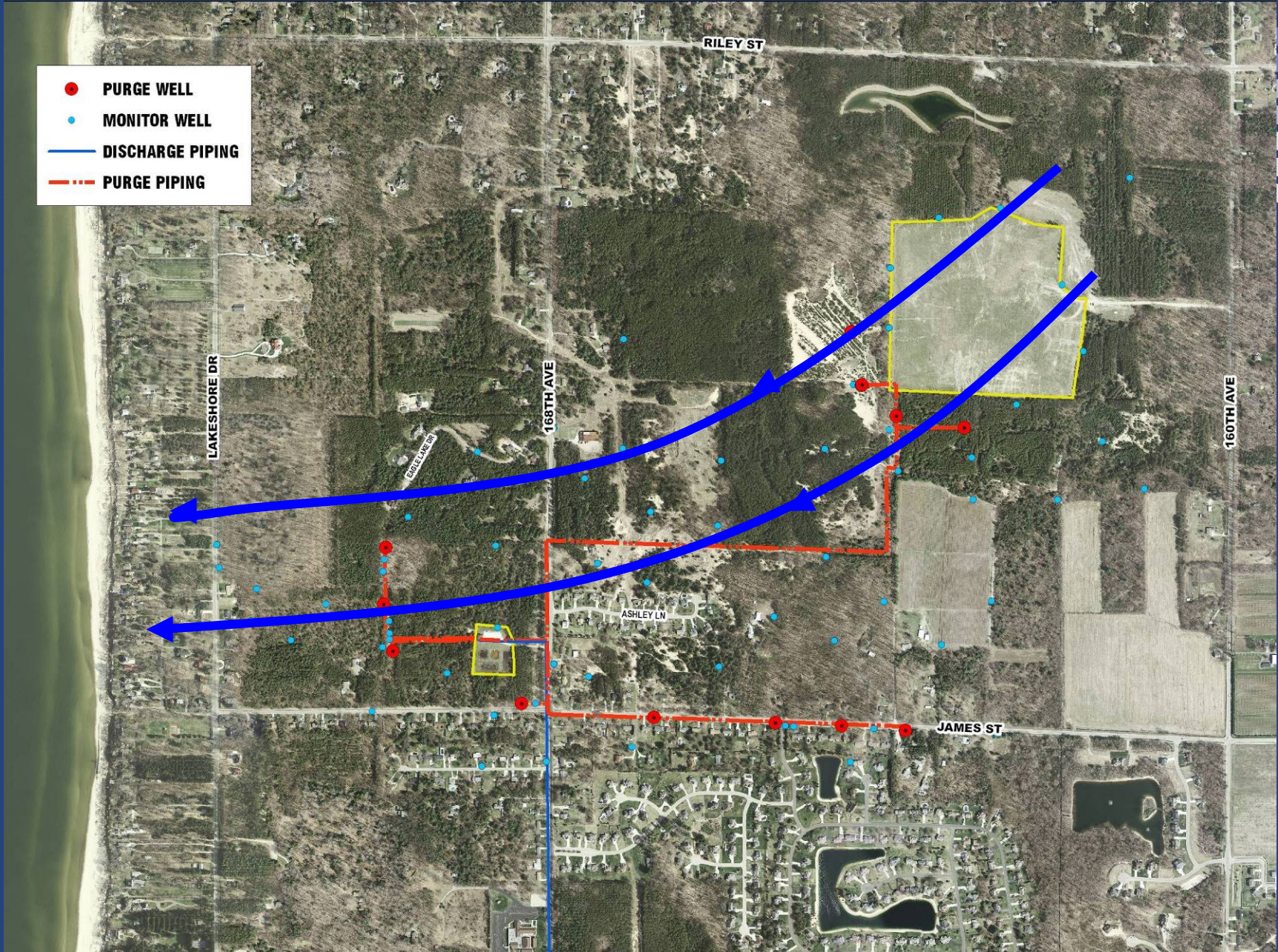


(d)

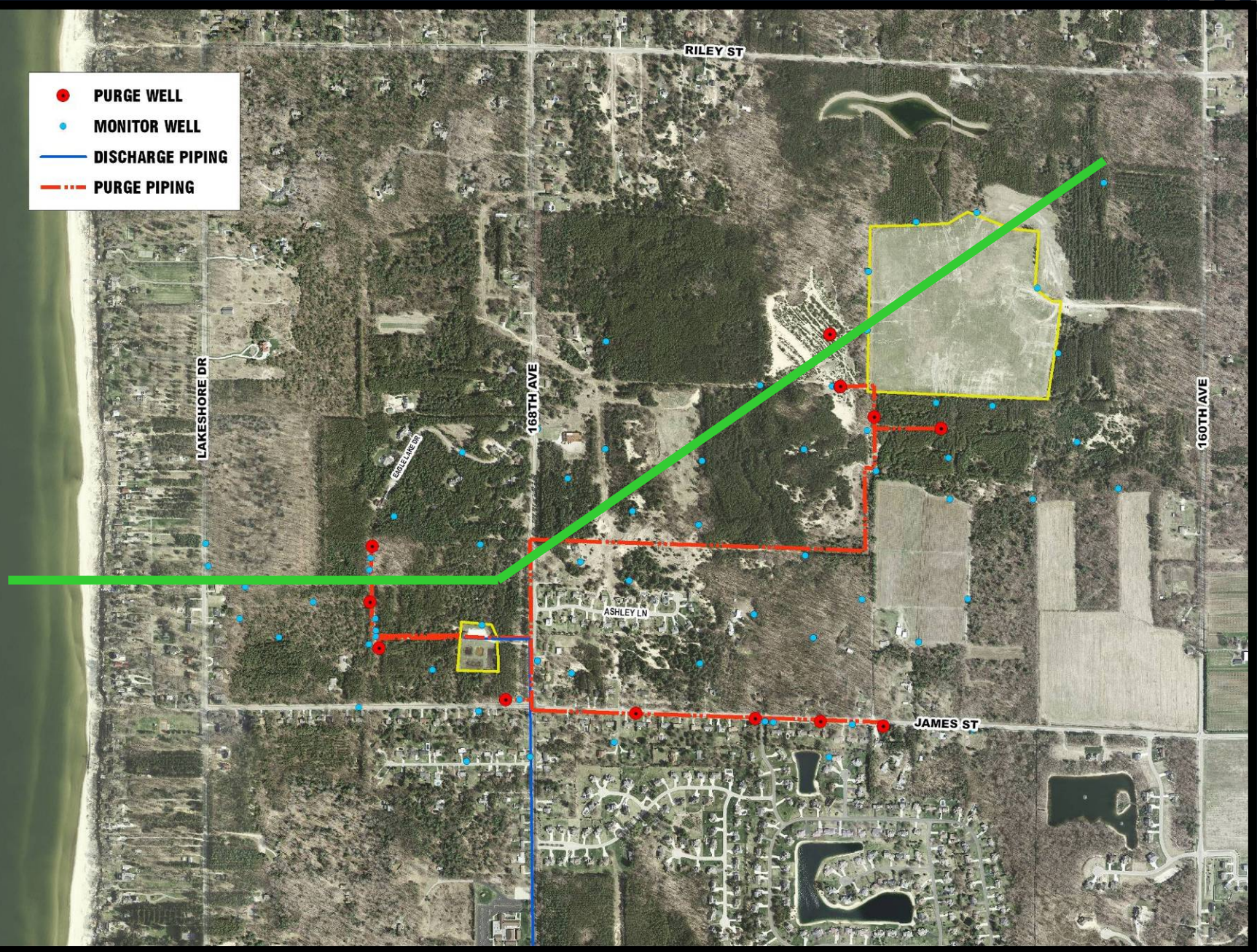


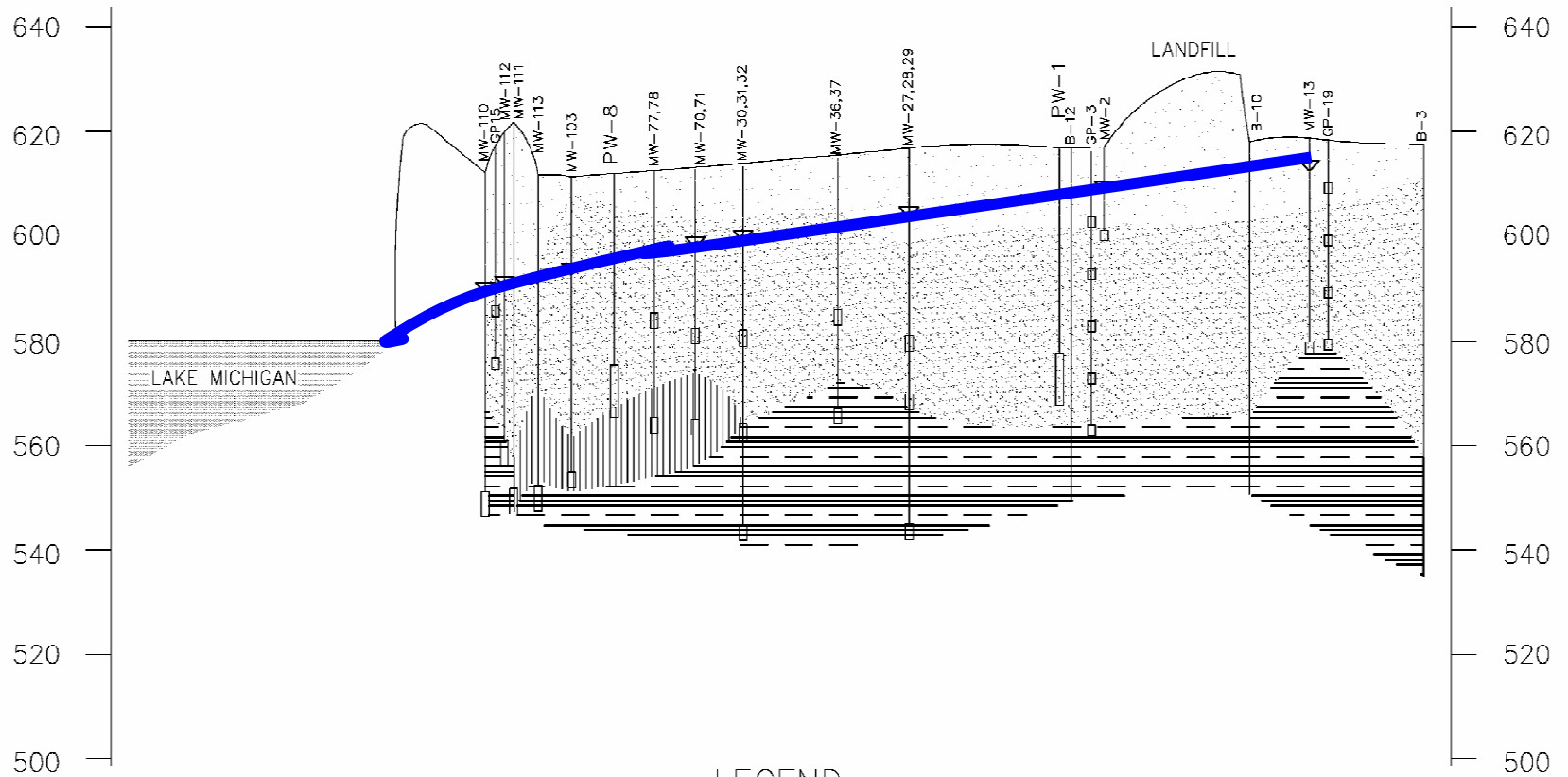
(f)

- PURGE WELL
- MONITOR WELL
- DISCHARGE PIPING
- - - PURGE PIPING








- PURGE WELL
- MONITOR WELL
- DISCHARGE PIPING
- - - PURGE PIPING





LEGEND

	Very Fine Sand, Silt
	Fine Sand
	Medium Sand
	Topsoil and Fine Sand
	Static Water Level

HORIZONTAL SCALE: 1" = 1000'

VERTICAL SCALE: 1" = 20'

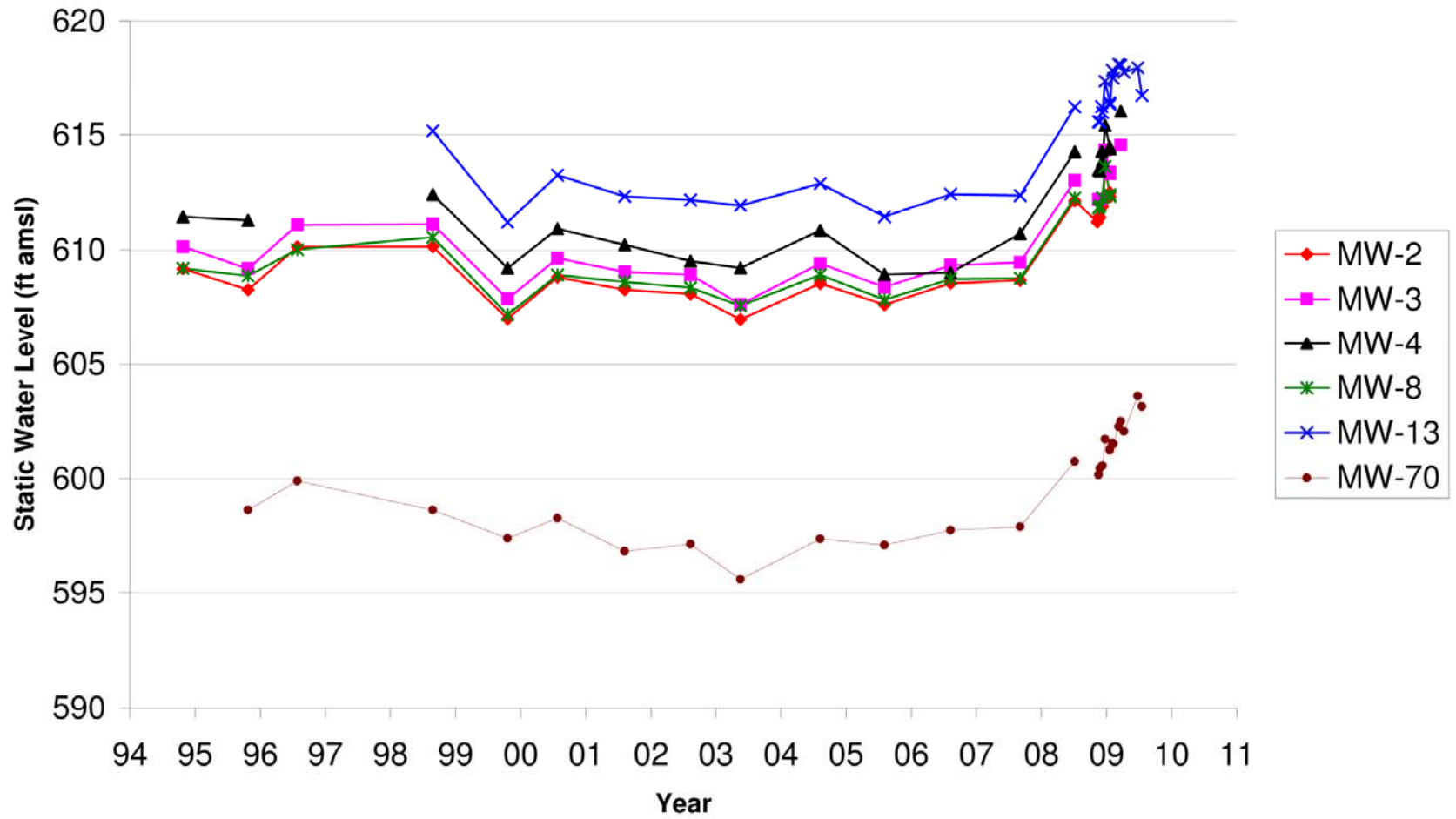
SOUTHWEST OTTAWA COUNTY LANDFILL
 OTTAWA COUNTY ROAD COMMISSION
 2050473-2

FIGURE 2
CROSS SECTION

Prein&Newhof
 Engineers, Geologists, Environmental Scientists & Architects
 3225 Riverchase Blvd. NE, Grand Rapids, Michigan 49515
 Telephone: (616) 941-4400 Fax: (616) 941-4402
 Product No.: 17000 Date: 10/3/00



Southwest Ottawa County Landfill Static Water Levels



GW Contamination Investigation



- Basic Hydrogeology (continued)
 6. Aquifer characteristics: hydraulic conductivity and storage coefficients allows us to predict time of travel, what happens under pumping conditions, and zones of capture
 7. Estimated Groundwater Flow Rate: 1 to 3 feet/day

GW Contamination Investigation



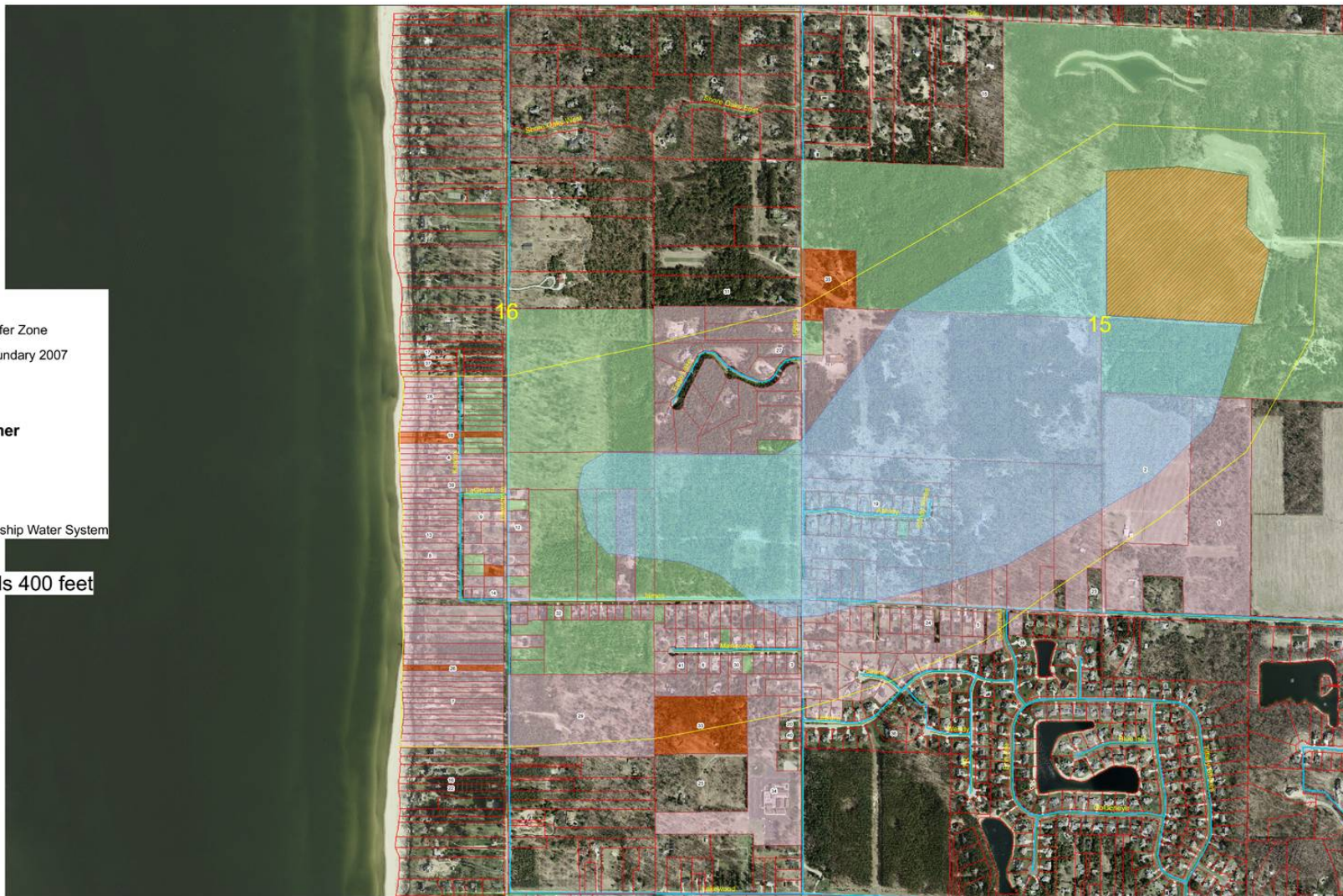
- 1979-2009 – Installation of 115 Monitor Wells
- Contamination
 - Indicator Parameters: Specific Conductance & Iron
 - Primary Contaminants: Volatile Organic Compounds (ppb range)
 - VOC contamination is largely gone within 500 to 1,000 feet of the landfill
 - Elevated iron seen further out as a result of biodegradation of VOCs through iron reduction
 - No VOCs above health based drinking water criteria except next to landfill

Southwest Ottawa County Landfill Plume Boundary with Buffer Zone

Legend

- Plume Buffer Zone
 - Plume Boundary 2007
 - Landfill
- ### EQ_Parcels
- #### Water Customer
- No
 - Vacant
 - Yes
- Park Township Water System

1 inch equals 400 feet



1987 Groundwater Remediation



I. Purge Wells

- 7 purge wells – 2 near landfill, 5 downgradient
- 3 purge wells added in 1992

II. Treatment System

- Iron Removal
 1. Oxidation with Potassium Permanganate
 2. Filtration
- VOC Removal
 1. Carbon Adsorption

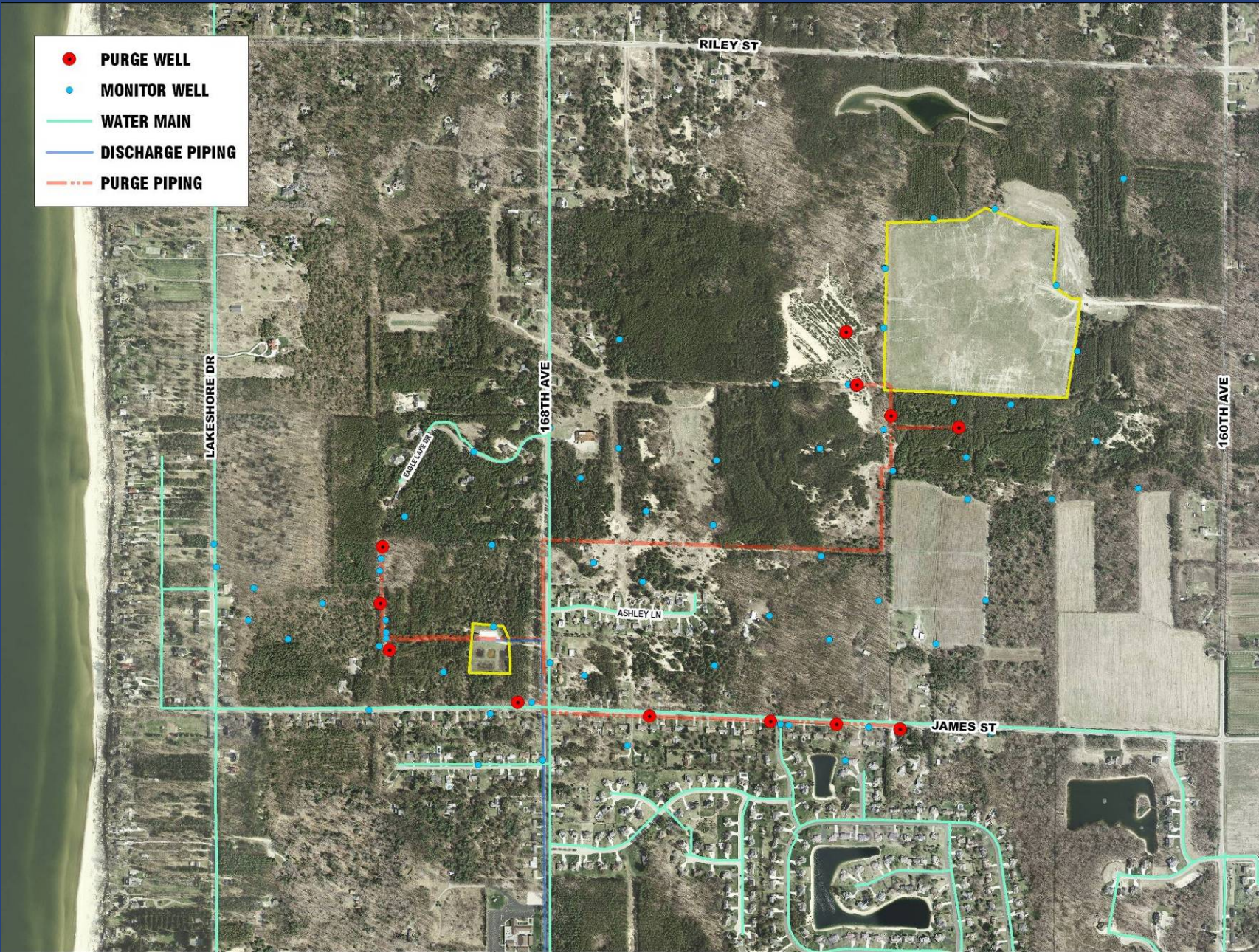
2003-2008 Remediation



I. Water Main Extension in 2003 (\$500,000)

- Eliminate Potential Human Exposure
- Extended $\frac{1}{4}$ mile of 12-inch Watermain
- Connected approx. 20 homes
- Abandoned existing wells
- Set up ordinance prohibiting future wells in the area

- PURGE WELL
- MONITOR WELL
- WATER MAIN
- DISCHARGE PIPING
- PURGE PIPING

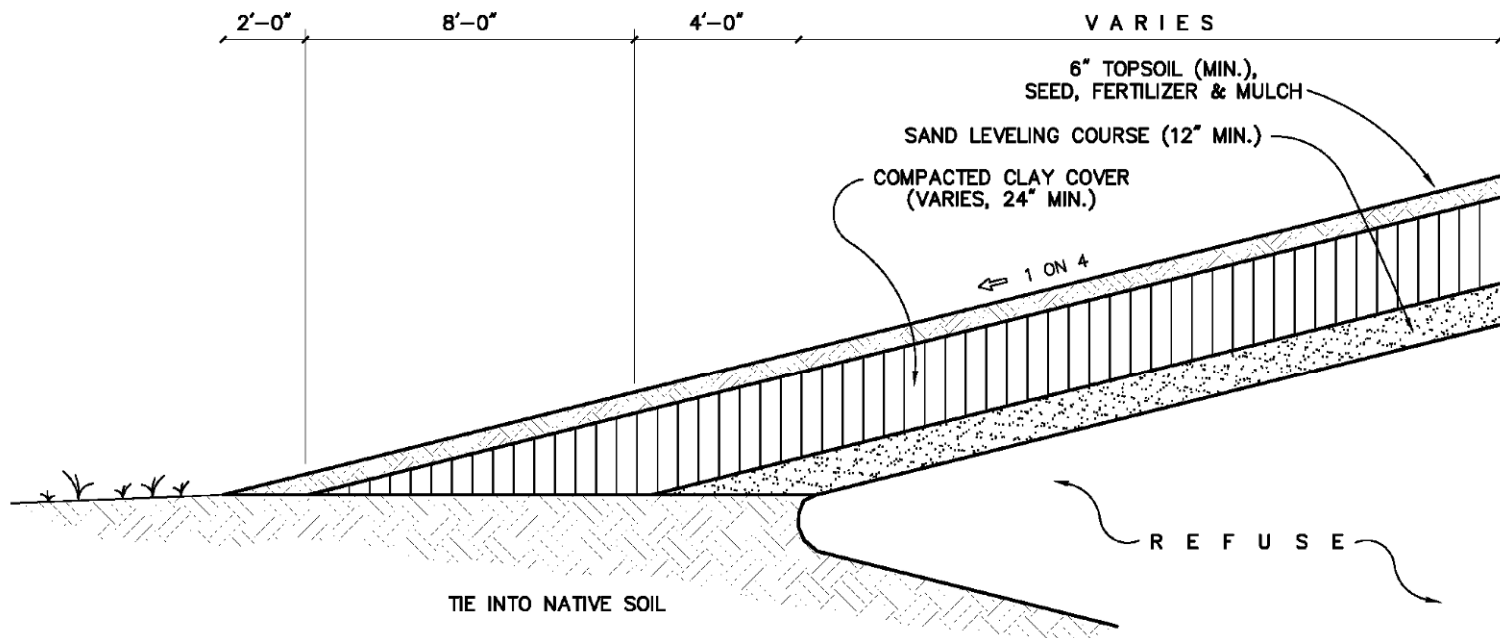


2006-2008 Remediation



I. Landfill Cover 2006 (\$1,500,000)

- Minimize infiltration through waste materials
- Reshaped to improve shedding of water
- Cover Construction
 - 1 foot sand
 - 2 feet compacted clay
 - 0.5 feet topsoil
 - 46 relief vents



TYPICAL COVER SECTION

SCALE : NONE

2006-2008 Remediation



II. Landfill Cover

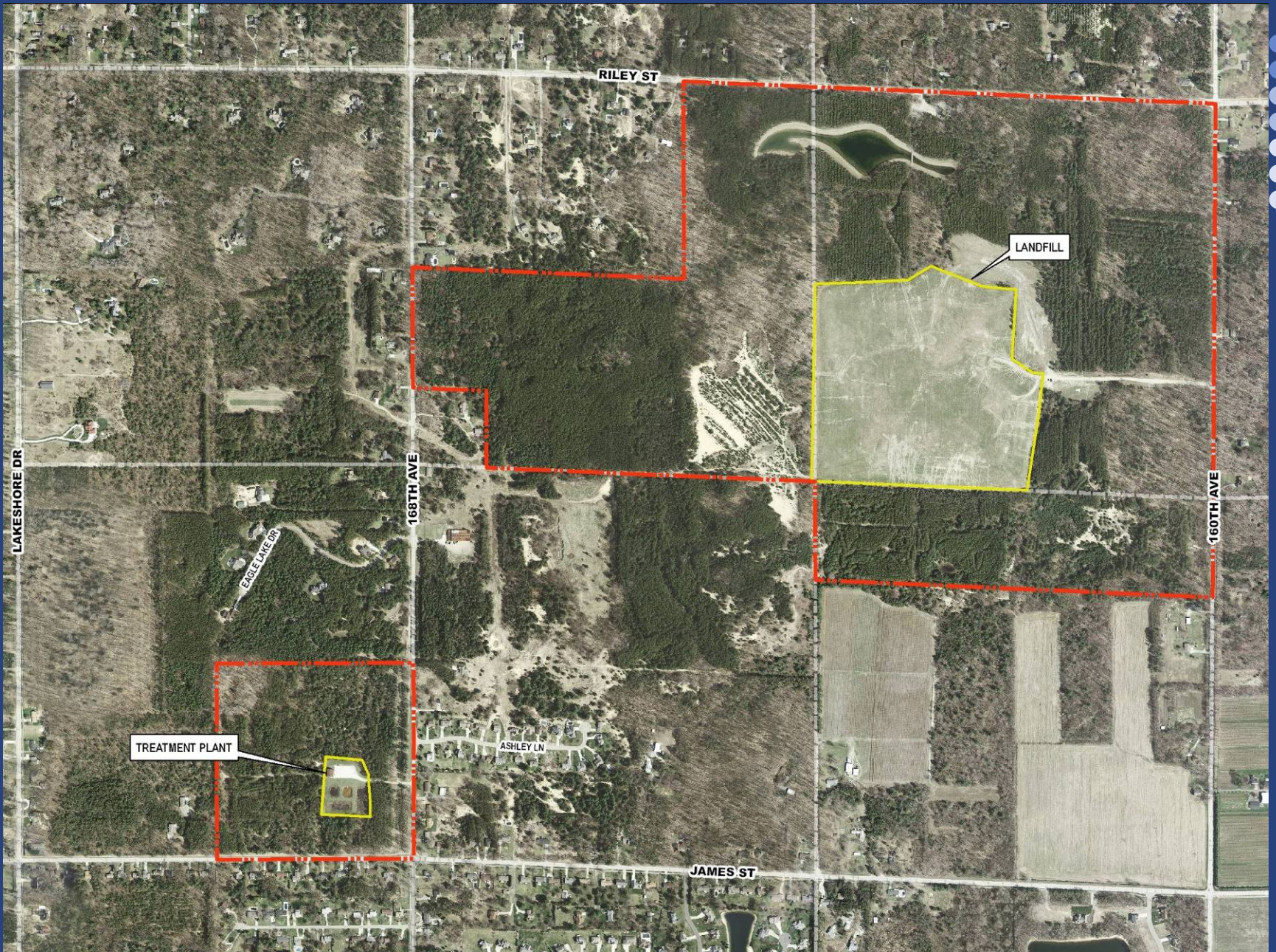
- 16,000 cubic yards of waste relocation
- 80,000 cubic yards sand from pond site
- 220,000 cubic yards (400,000 tons) clay and topsoil brought to site from Autumn Hills Landfill
- 8,000 Truckloads (40 per day for 200 days, 16 mile round trip)

2006-2008 Remediation

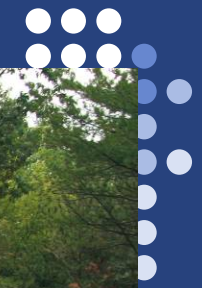


II. Landfill Cover

- Park Benefits
 - Future Potential Sledding Hill
 - Future Open-Space Wildflower Meadow
 - Water Feature
 - Relocated lady's slippers prior to construction



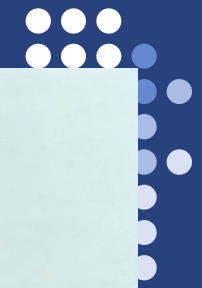














BILLY TRAILS

PARK HOURS
APRIL - OCTOBER 3
7 A.M. - 10 P.M.
NOVEMBER - MARCH
7 A.M. - 8 P.M.

- NO HUNTING
- NO MOTOR VEHICLES
- REVEREND PARKING
- DOGS MUST REMAIN ON LEASH AT ALL TIMES
- DOG OWNERS MUST CLEAN UP AFTER THEIR PETS

Ottawa County Parks & Recreation Commission
(616) 738-4810

Riley Trails



Cross Country Ski Info



Cross country skiing is allowed on all Riley Trails. Ski trails are not groomed. Skiers must follow the directional arrows shown on maps and signs. Level of difficulty symbols are also provided on maps and signs to aid skiers in selecting a trail suitable to their abilities. These national standard signs indicate the relative difficulty for cross country ski trails at Riley Trails. All trails are two-way, except for trails with significant hills which are signed as one-way for skier safety. All trails at Riley Trails are designated easier unless otherwise noted. **Choose your route accordingly and always ski within your ability.**



Ottawa County Parks & Recreation Commission
12220 Fillmore, West Olive, MI 49460
Phone 616-738-4810
www.miottawa.org/parks

Most Ottawa County Parks with trail systems have trail maps located at all major trail intersections. During the master planning process for Riley Trails, many members of the public requested fewer trail signs. In response to that request, park staff is experimenting with the following system for trail signing: A 2.5 mile "Main Trail Loop" (shown on the map in red) has been identified and marked with confidence arrows to make it easy to follow. Trail maps are located periodically at trail intersections along the Main Trail Loop and at the park boundary to orient the trail users and allow them to see options for taking secondary trails. Secondary trails do not have confidence arrows or trail maps, but eventually reconnect to the Main Trail Loop or end at a signed property boundary.

PARK HISTORY

This 300 acre property with its roots has long been enjoyed by hikers, and to its designation as an Ottawa County park many years in maintaining the site. Riley Trails includes 40 acres that in 1979 after ground water in the area started through the installation of a recap the landfill and upgrade the entrance to the park was created. Historically, the landfill cap itself has of potentially harmful methane gas, gas levels are significantly reduced, are determined to be at safe levels. public with trails, overlook, and site

TRAIL ETIQUETTE

Historically, the paths of Riley Trails hikers, runners, mountain bikers, do uses to continue, park visitors are or care to alert other trail users when p of the impact to the sandy soils and

DOGS

Dog walking is a popular activity at R county park rules require that dogs n park visitors. Dog owners must also c Dog owners should also be aware th including nearby VanBuren Dunes, P currently do not have marked trails, if for additional information.

PINK LADY'S SLIPPI

Riley Trails is home to one of the large in the county parks system. This mem Although most plant species find the c a difficult place to grow, the pink lady!

PROGRAMS & EVE

Ottawa County Parks offers a variety of the parks system. Outdoors Ottawa Co schedule of programs as well as article be placed on the mailing list, call the co

Information For

- No alcohol permitted
- No motor vehicles beyond parking lot
- Horses are NOT allowed
- No Hunting
- Dogs must remain on leash at all times. Dog owners must clean up after their c
- No camping or fires

All Ottawa County Park rules & regulations are in effect at Riley Trails - see separate

- Park Hours

April 1 - October 31 November 1 - 7 A.M. - 10 P.M.



2006-2008 Remediation



III. Groundwater Remediation (\$1,800,000)

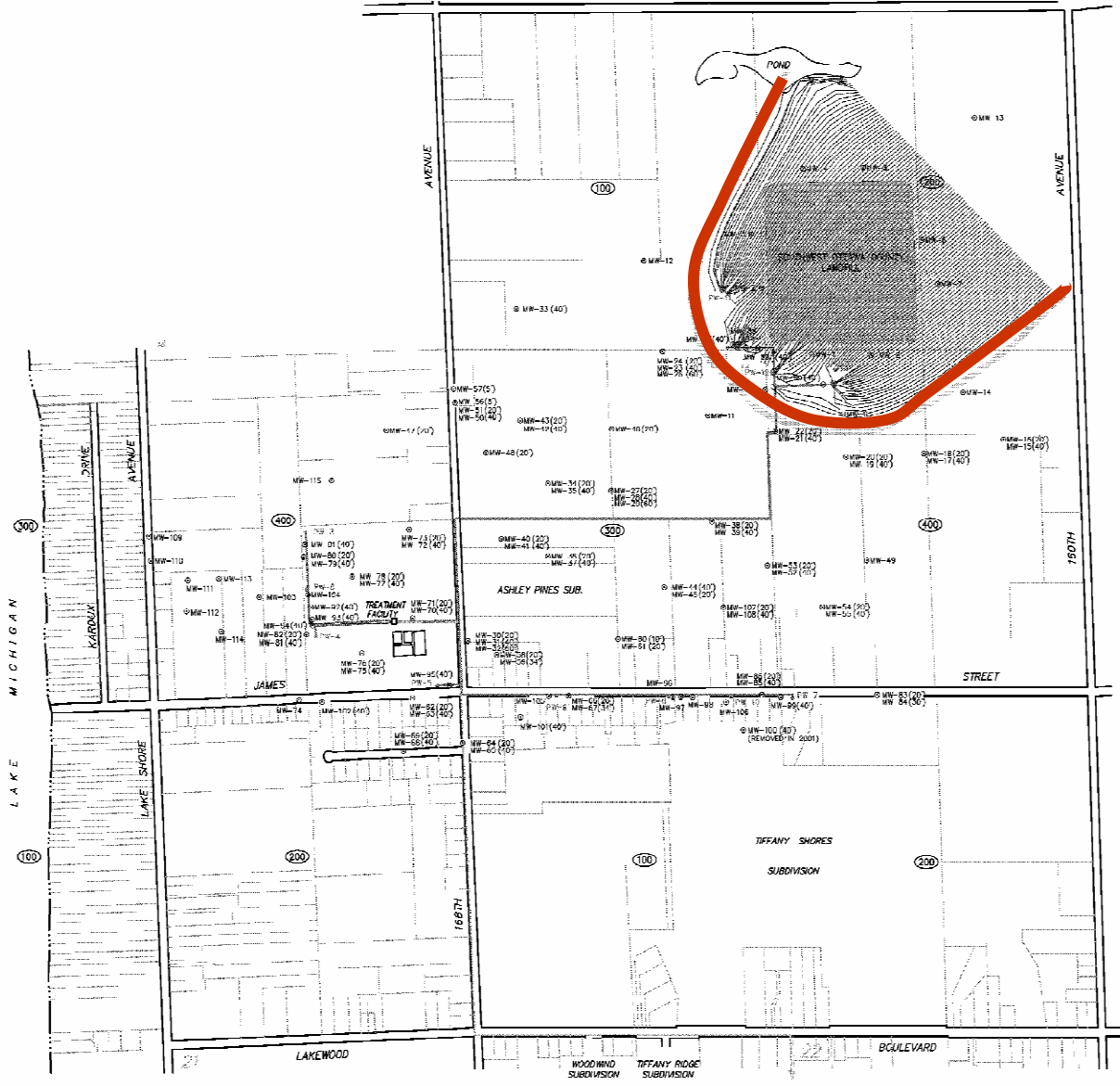
- Installed 4 new purge wells to improve capture of contaminants.
- The only current wells that exceed the NPDES permit for discharge are next to the landfill



SCALE : 1" = 800'

LEGEND

- ⊙ MW (40) MONITORING WELL
- ⊙ PW PURGE WELL
- PURGE WELL PIPING
- - - DISCHARGE PIPING
- PATHLINE
- CAPTURE ZONE LIMITS



SOUTHWEST OTTAWA COUNTY LANDFILL
OTTAWA COUNTY ROAD COMMISSION

FIGURE 3
CAPTURE ZONE AT EXTRACTION
RATE OF 75 GPM PER WELL

2050473-2

PREIN & NEWHOF
CONSULTING ENGINEERS
GRAND RAPIDS, MICHIGAN
79049

T:\Land Projects\2050473\Contract 2 Design

2006-2008 Remediation



III. Groundwater Remediation

- Improved the treatment system.
 - Using aeration for oxidation to reduce chemical use and cost.
 - Added a new system for iron removal: flocculation, settling, & filtration.
 - No changes to carbon absorption for VOC removal.
 - System is automated to run with no operator present

2006-2008 Remediation



III. Groundwater Remediation

- Benefits
 - Reduced flow to treat by one-half
 - Capture and treat twice as much contamination
 - Reduced maintenance on purge wells
 - Capture more contaminated groundwater