

Sanitary Sewer Service Alternatives

Presented by Paul Dietz, III, PE

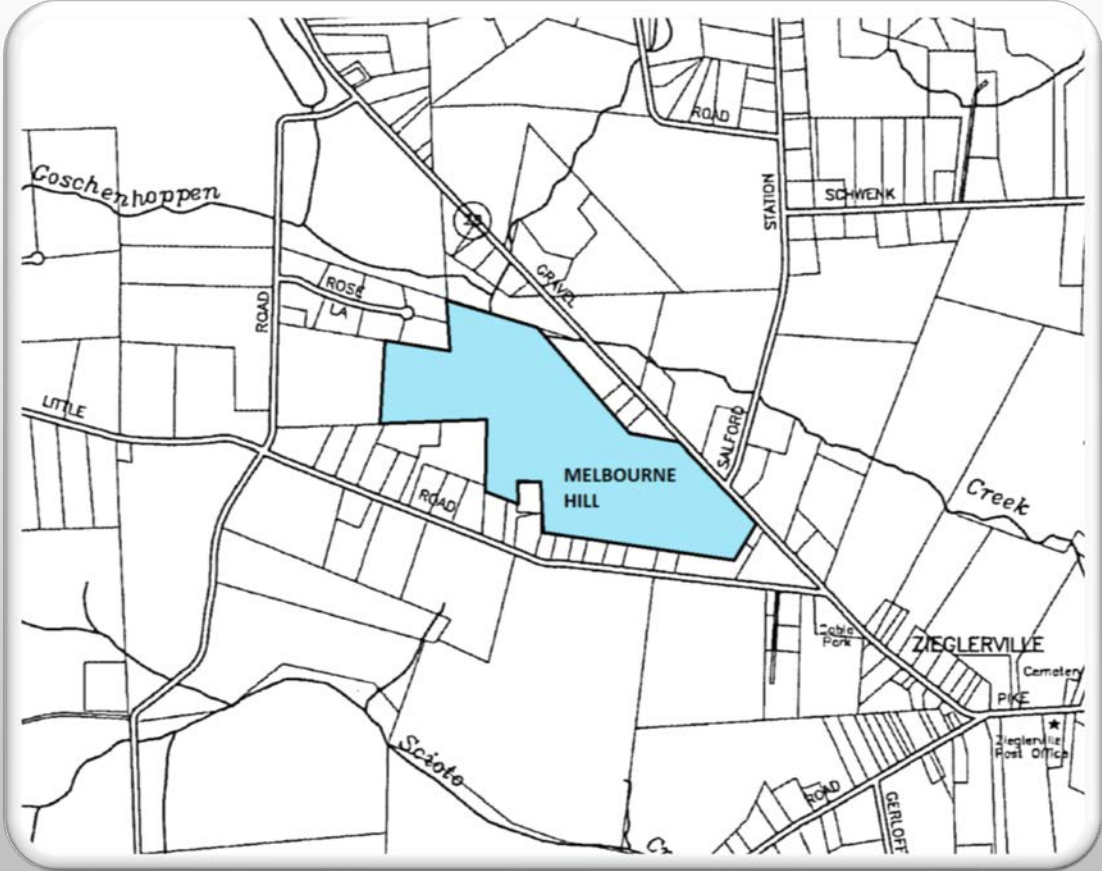
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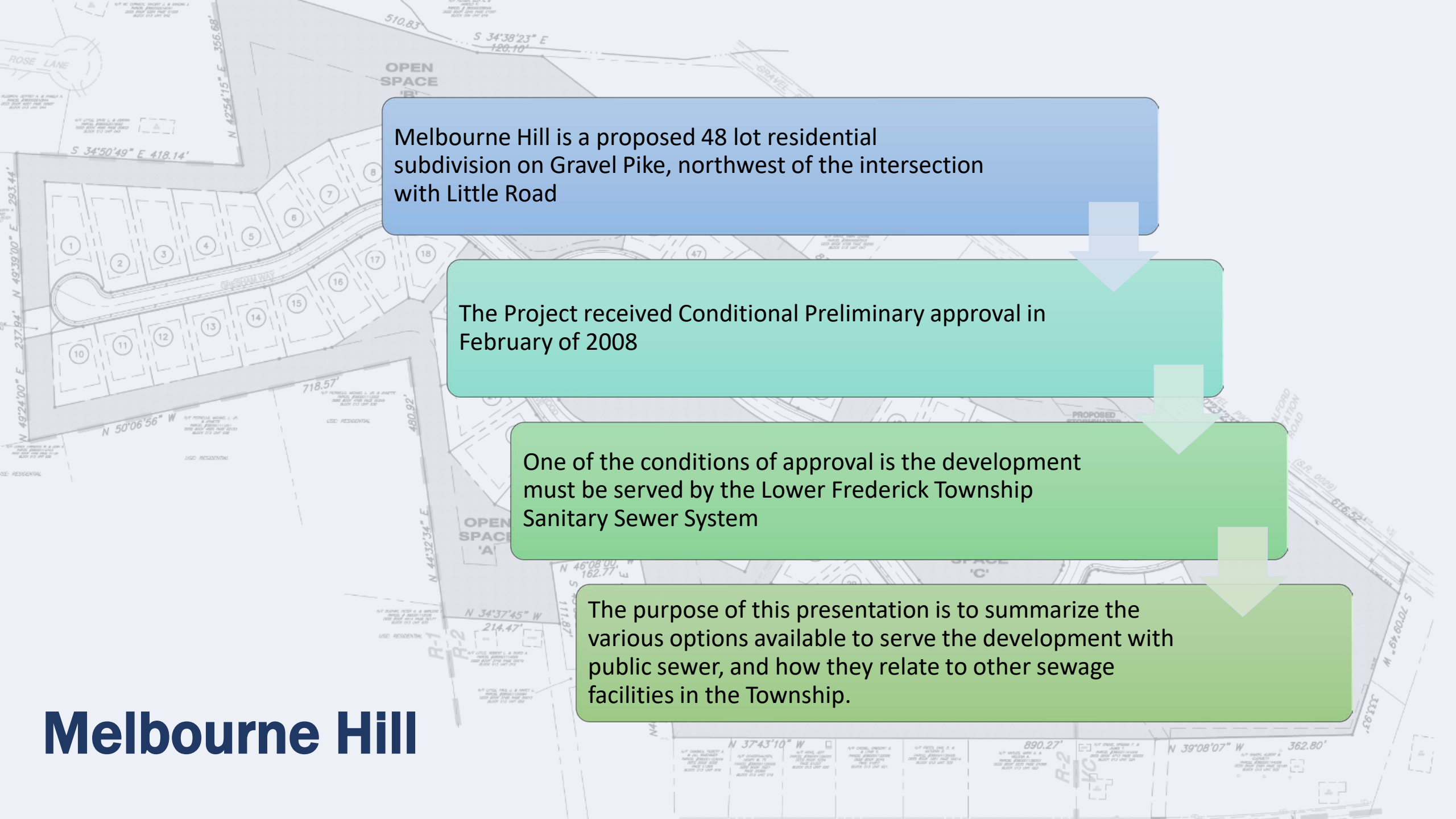
Prepared in cooperation with Value Engineering Inc

Value Engineering Inc



Discussion of Sanitary Sewer Options for the proposed Melbourne Hill development





Melbourne Hill is a proposed 48 lot residential subdivision on Gravel Pike, northwest of the intersection with Little Road

The Project received Conditional Preliminary approval in February of 2008

One of the conditions of approval is the development must be served by the Lower Frederick Township Sanitary Sewer System

The purpose of this presentation is to summarize the various options available to serve the development with public sewer, and how they relate to other sewage facilities in the Township.

Melbourne Hill

This Presentation:

OPTIONS

How they work:

- Gravity Flow
- Pump Station and
- Low Pressure System

Overview of Wastewater Treatment in the Township;
50/50 ratio of on-lot vs public sewer.

Township Responsibilities

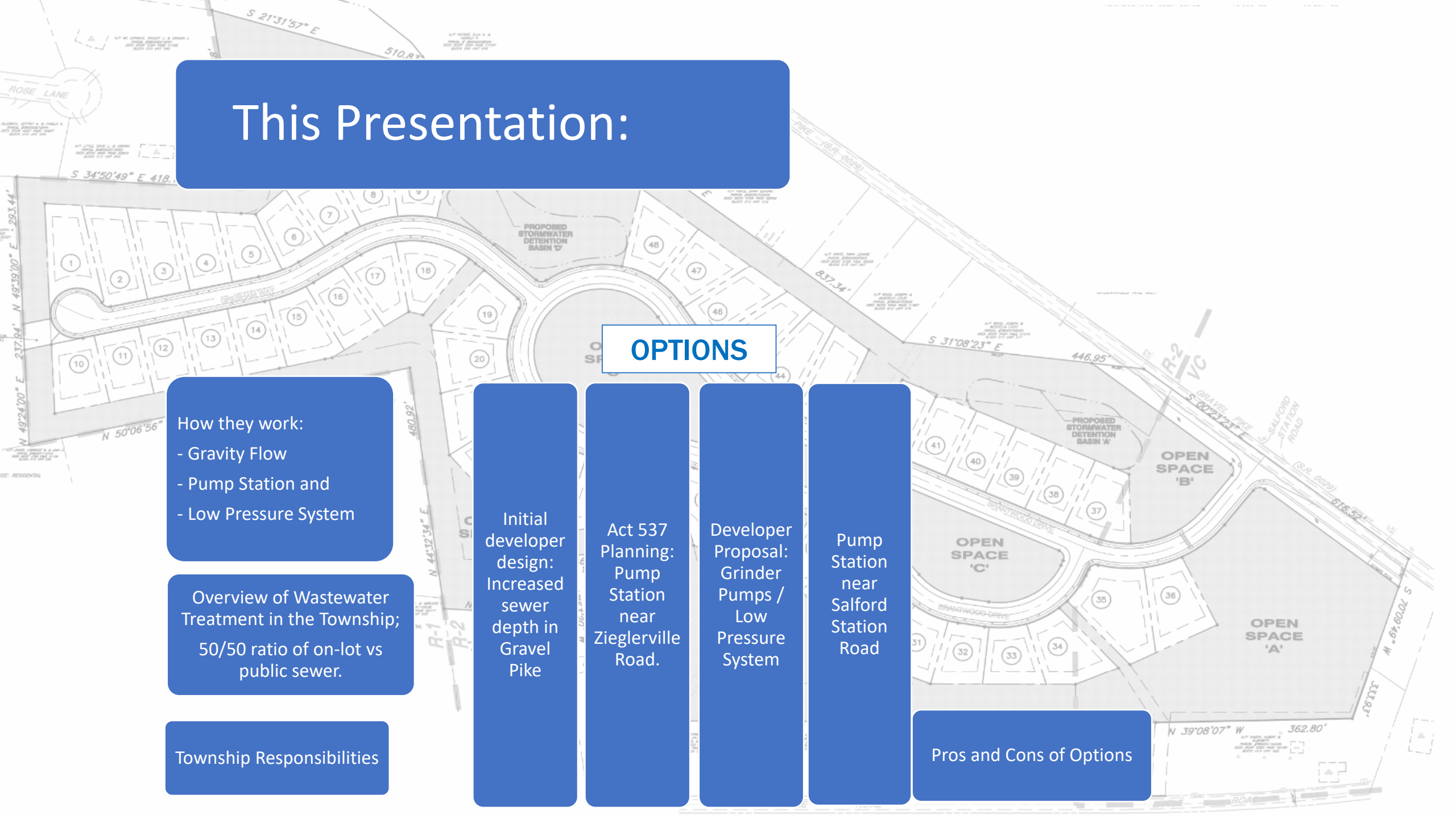
Initial developer design:
Increased sewer depth in Gravel Pike

Act 537 Planning:
Pump Station near Zieglerville Road.

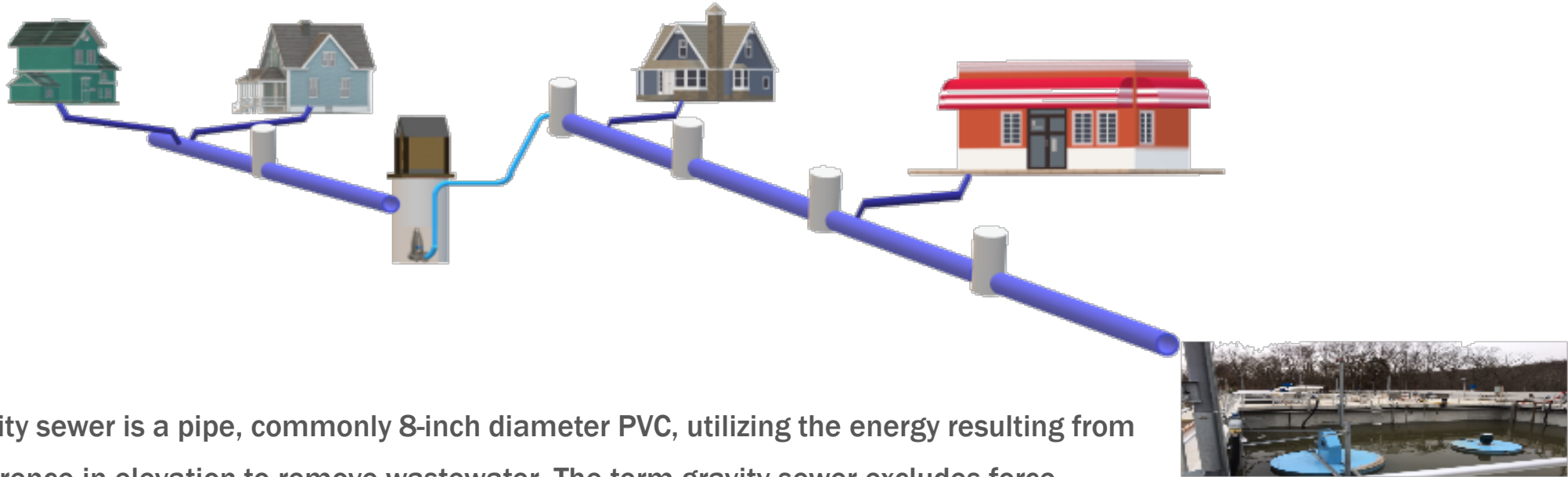
Developer Proposal:
Grinder Pumps / Low Pressure System

Pump Station near Salford Station Road

Pros and Cons of Options

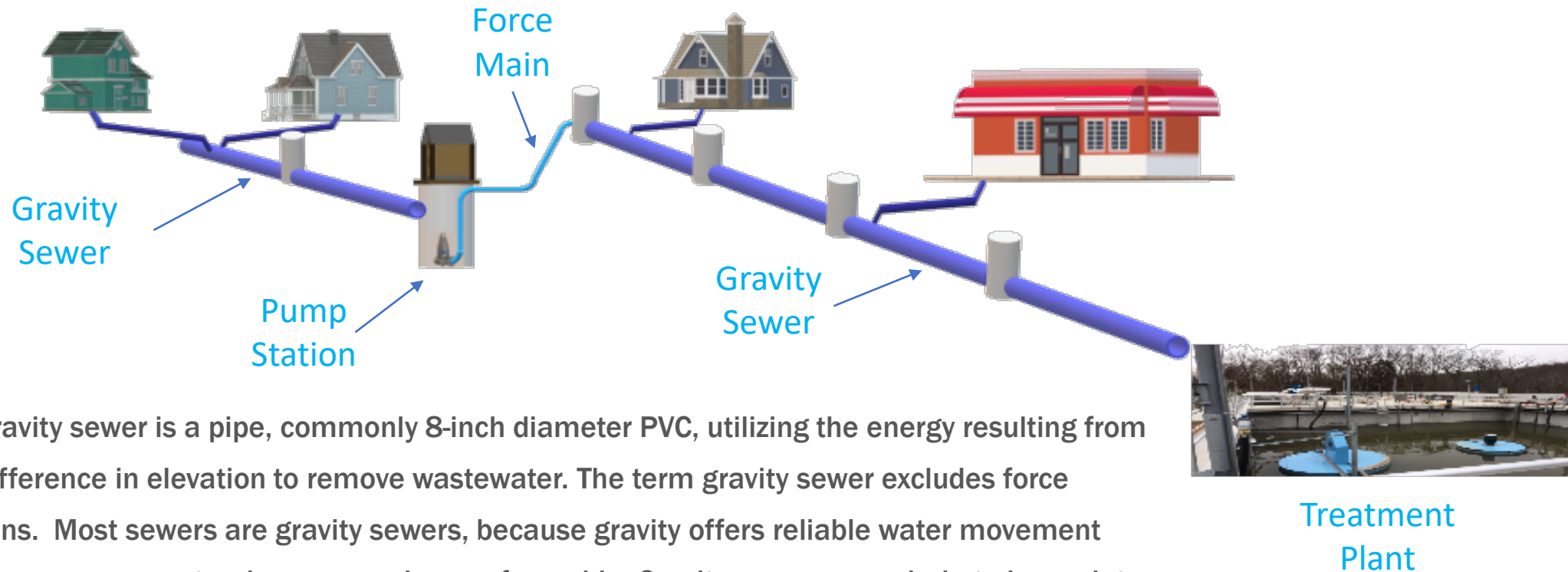


Gravity Sewer



A gravity sewer is a pipe, commonly 8-inch diameter PVC, utilizing the energy resulting from a difference in elevation to remove wastewater. The term gravity sewer excludes force mains. Most sewers are gravity sewers, because gravity offers reliable water movement with no energy costs wherever grades are favorable. Gravity sewers may drain to low points where pump stations lift the sewage to a higher elevation for entry into another gravity sewer, ultimately conveying the sewage to a sewage treatment plant.

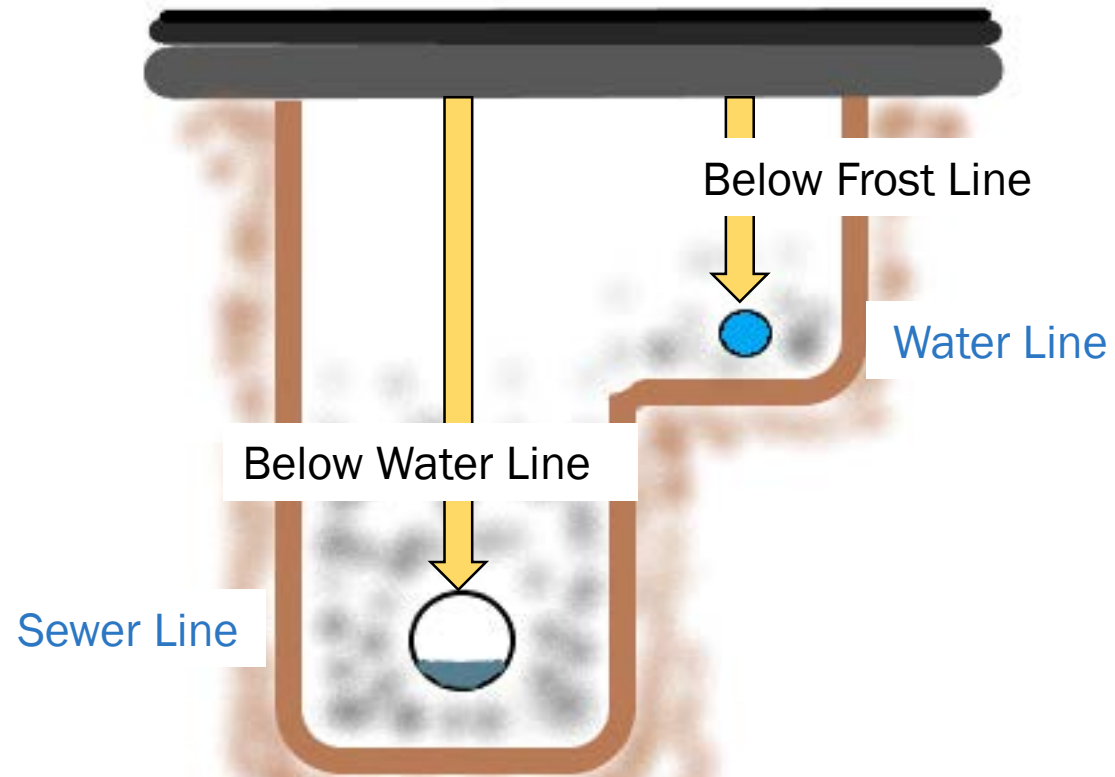
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Construction of Gravity Sewer Line

Typically, sewer lines are constructed 6 to 8 feet deep. This puts them below the homes they serve so the sewage leaves the home by gravity, and it puts them below the water lines to minimize risk of contamination of potable water.



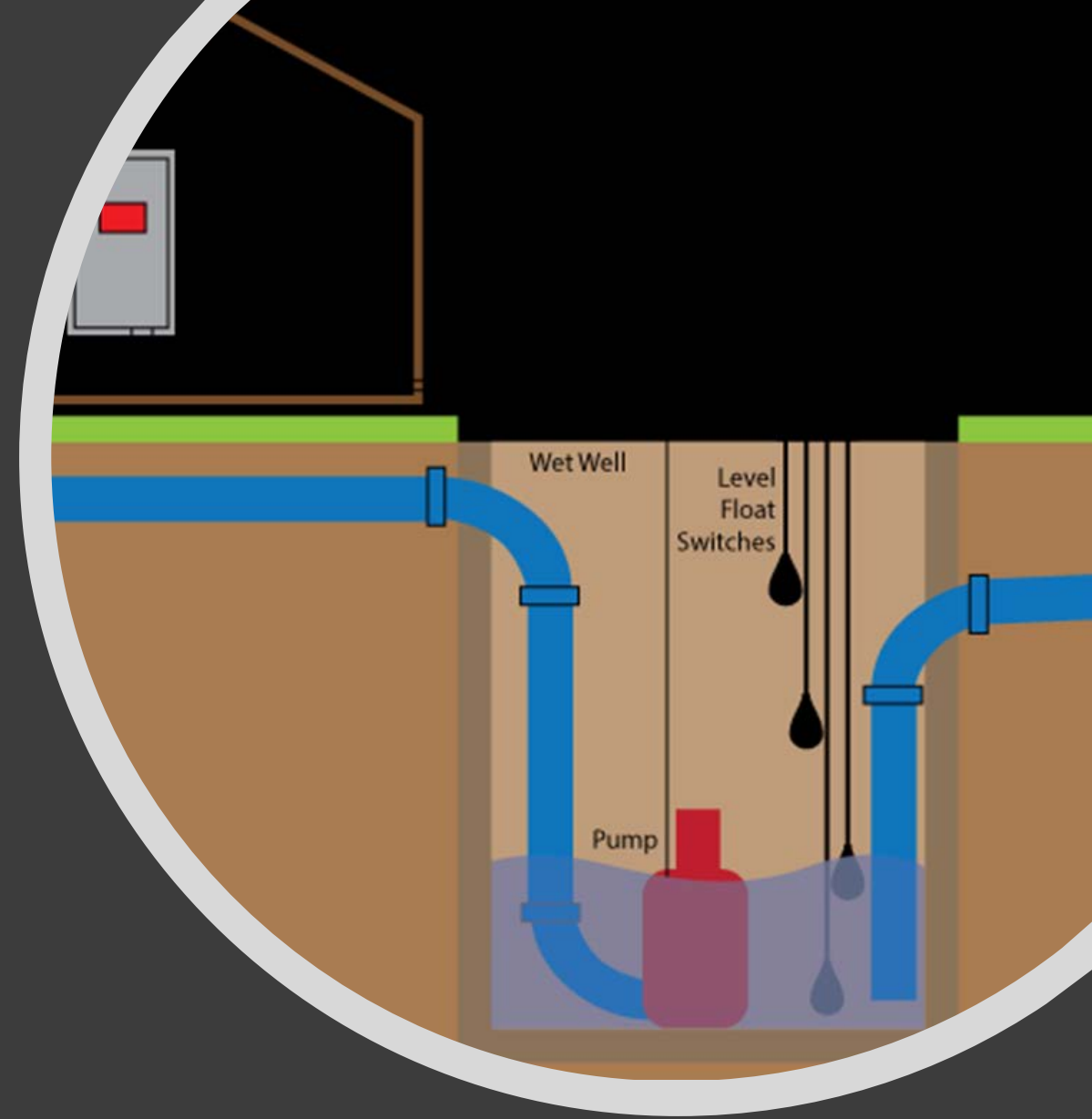
Existing Township Collection System



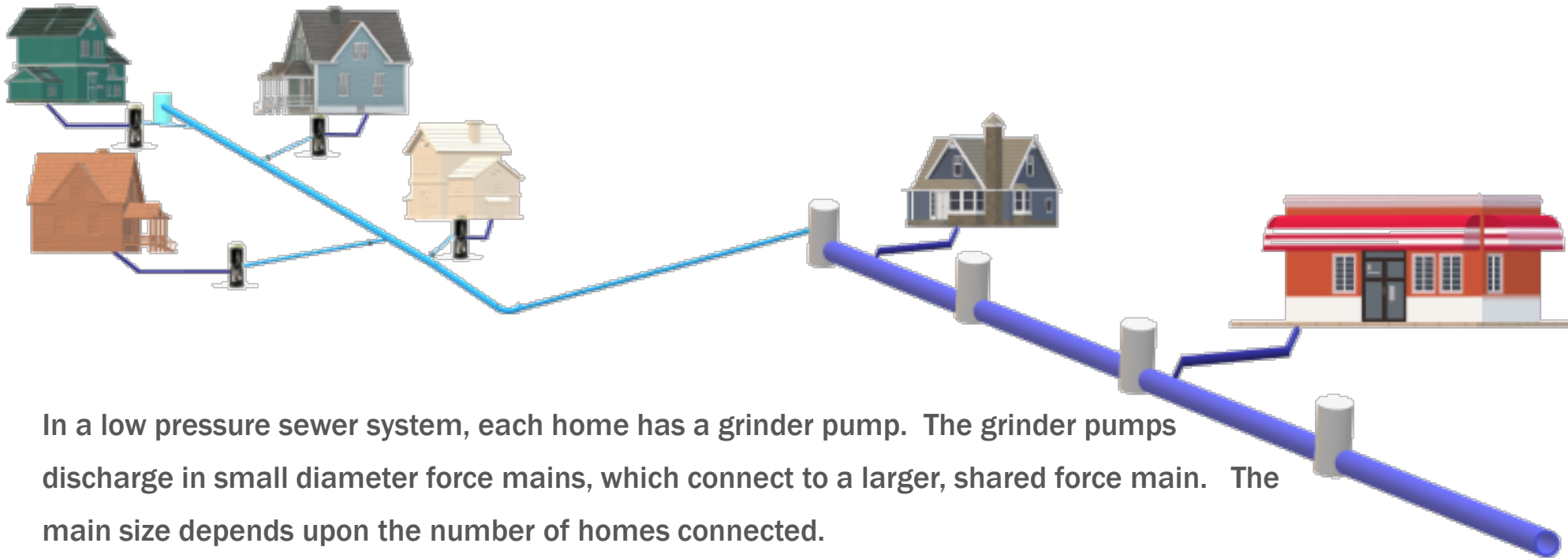
Pump Station

A Pump Station receives flow by gravity and uses pumps to push the flow through a force main.

The station depth, well volume and pump sizes are determined by engineering design.



Low Pressure Sewer system

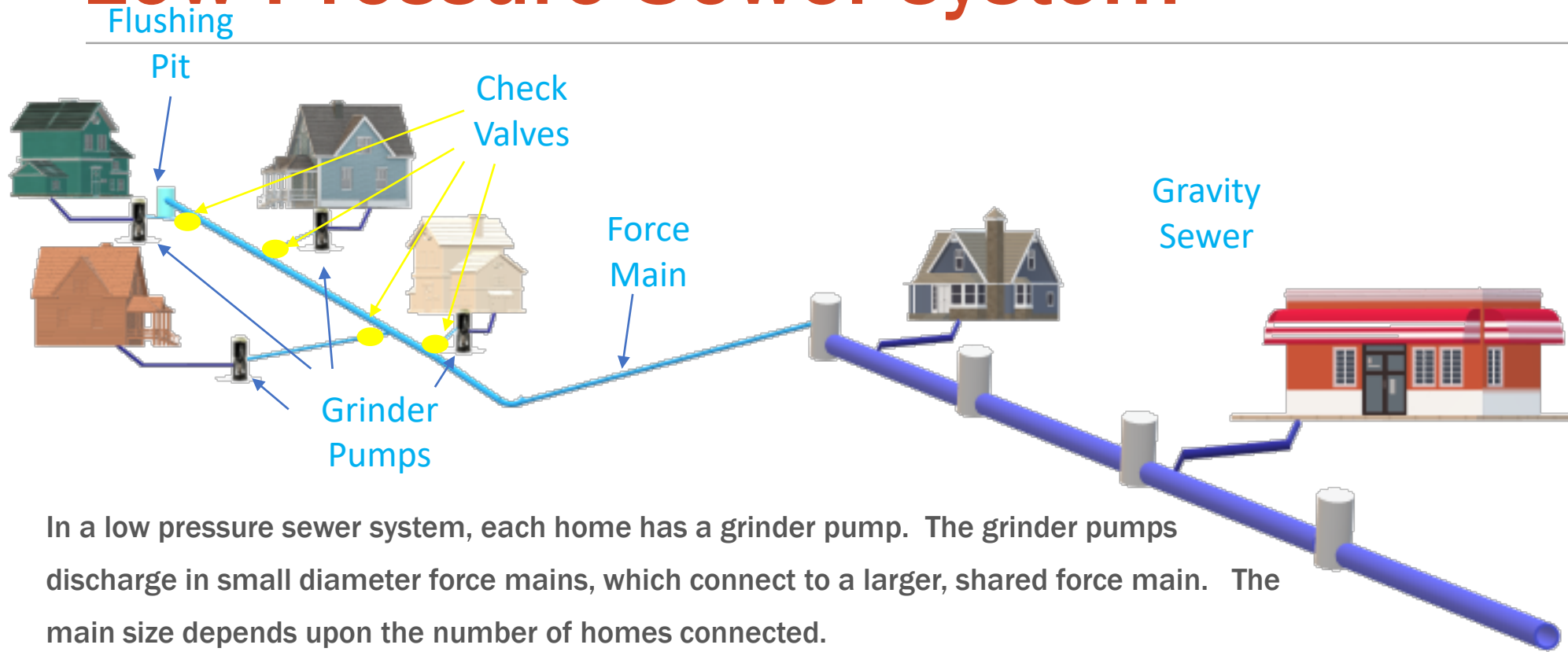


In a low pressure sewer system, each home has a grinder pump. The grinder pumps discharge in small diameter force mains, which connect to a larger, shared force main. The main size depends upon the number of homes connected.

Each connection has a check valve to prevent sewer in the shared main from backing up into the individual force main lines. Flushing valves are incorporated into the shared main to address any clogs, and air release valves at any high points in the line.



Low Pressure Sewer system



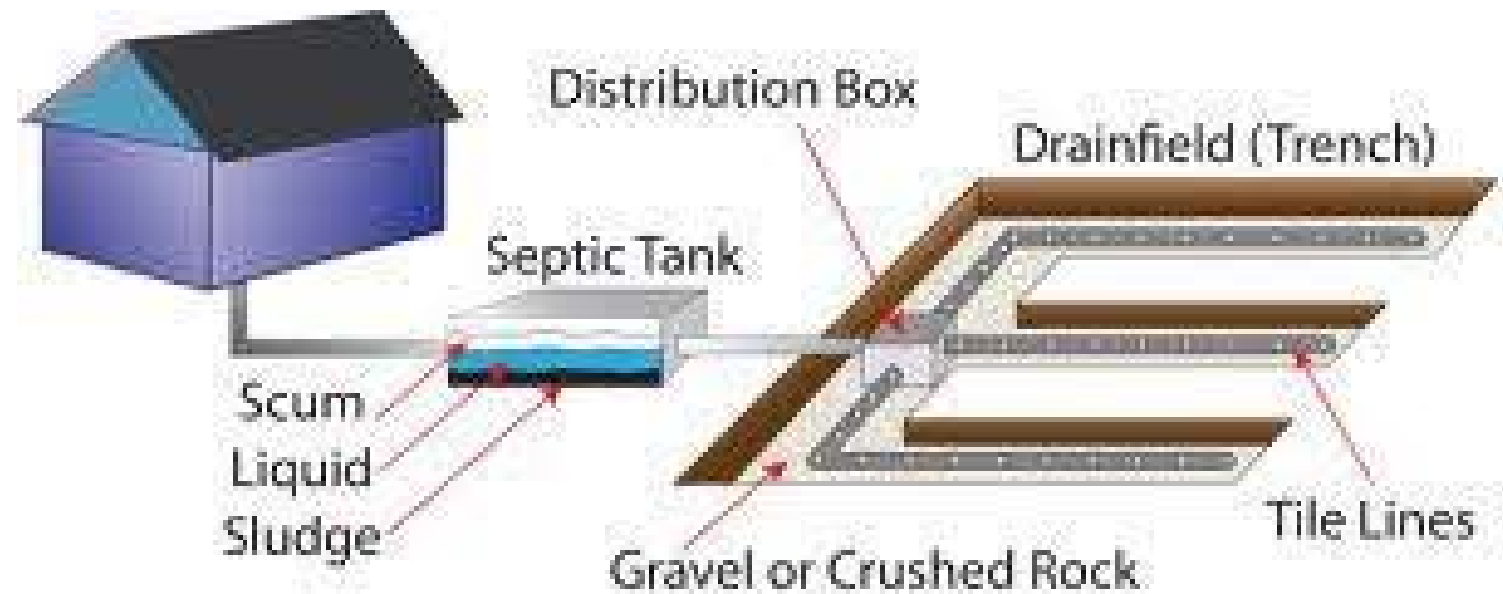
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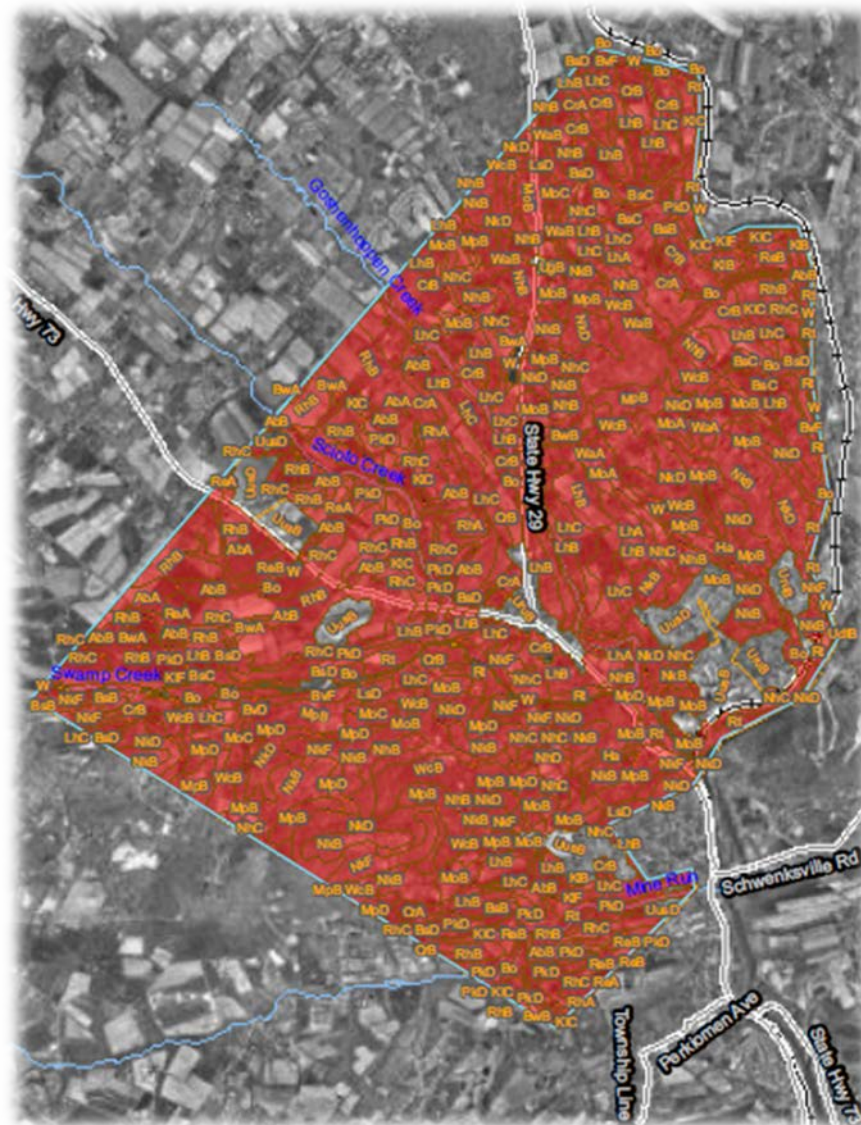
Treatment Plant

Common
On-Lot
Systems

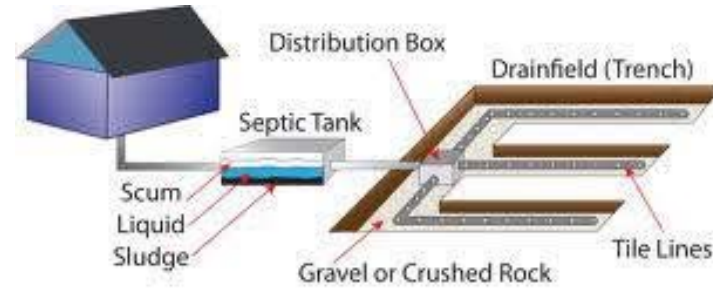


Schematic of a Drainfield

Lower Frederick Township Soils vs On-Lot Treatment



Soil Suitability Map for
In-Ground Septic
System Bed



Schematic of a Drainfield

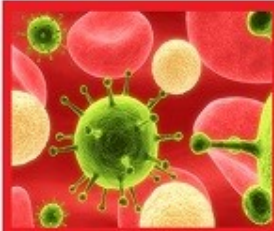


Problems selling home when system is tested

Negative Effects of Raw Sewage



Image Credit: © 2013 SI Restoration. All rights reserved.



Viruses

Norwalk virus, rotavirus,
Hepatitis A, Poliomyelitis
Virus, Adenovirus

Gastroenteritis

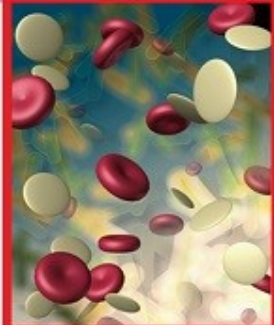
Diarrhea, Vomitting, Abdominal Pain, Nausea, Cramping

Hepatitis A

Jaundice, Fever, Diarrhea, Fatigue, Cramping, Loss of Appetite, Nausea

Poliomyelitis

Sore Throat, Fever, Vomitting, Nausea, Cramping, Constipation, Diarrhea



Bacteria

Campylobacter,
E. coli, Leptosria
Salmonella, Shigella

Campylobacteriosis

Bloody Diarrhea, Fever, Cramping, Nausea, Vomitting

Escherichia coli (E. coli)

Bloody Diarrhea, Fever, Cramping, Nausea, Vomitting

Leptospirosis

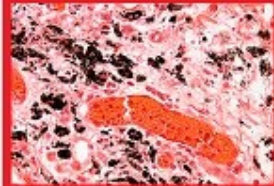
Fever, Headaches, Body Aches, Chills, Diarrhea, Vomitting, Jaundice, Rash

Salmonellosis

Diarrhea, Fever, Cramping

Shigellosis (Bacillary Dysentery)

Bloddy Diarrhea, Fever, Cramping



Parasites

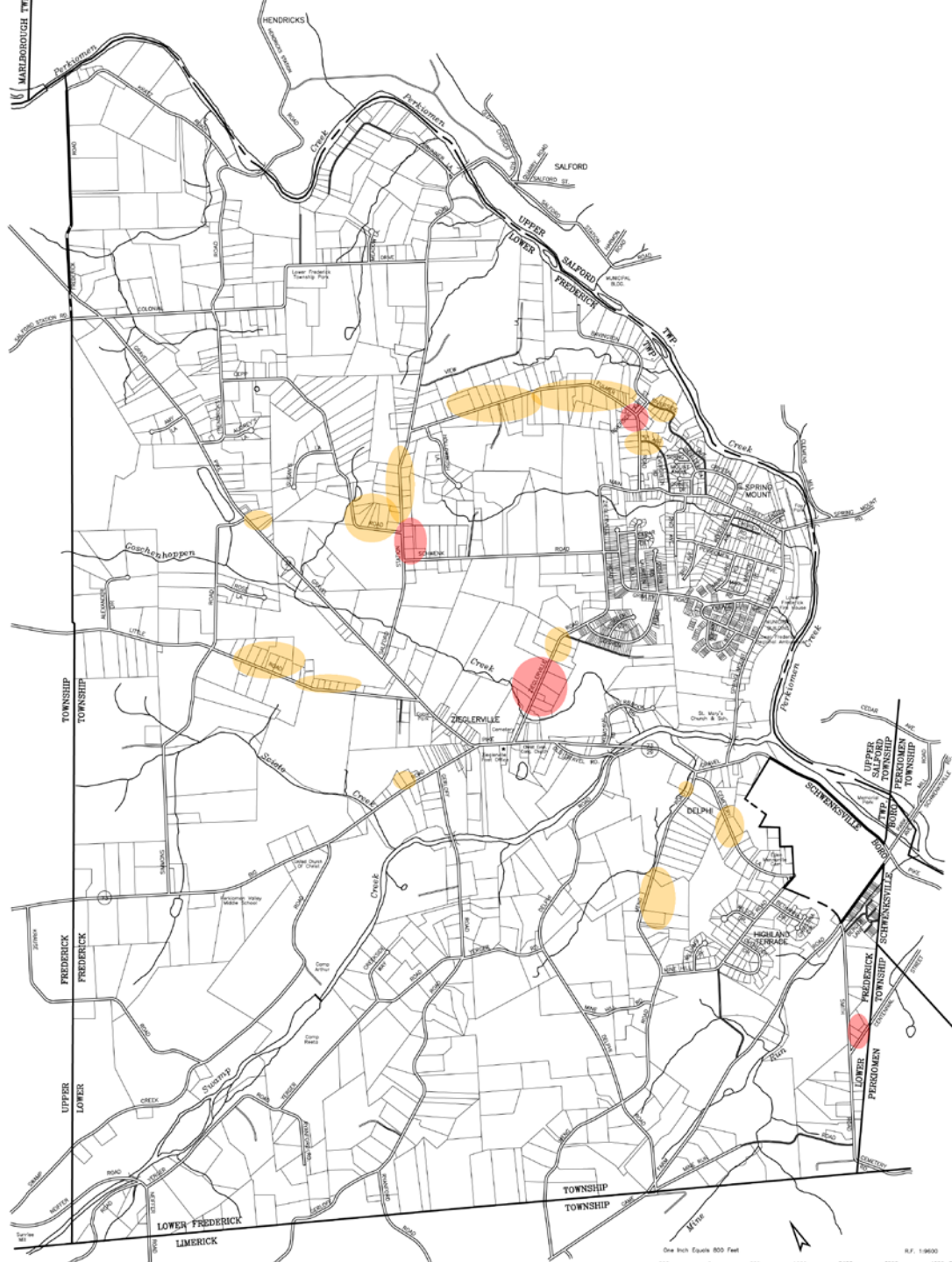
Cryptosporidium parvum
Giardia intestinalis

Cryptosporidiosis

Diarrhea, Loose Stool, Cramping, Slight Fever

Giardiasis

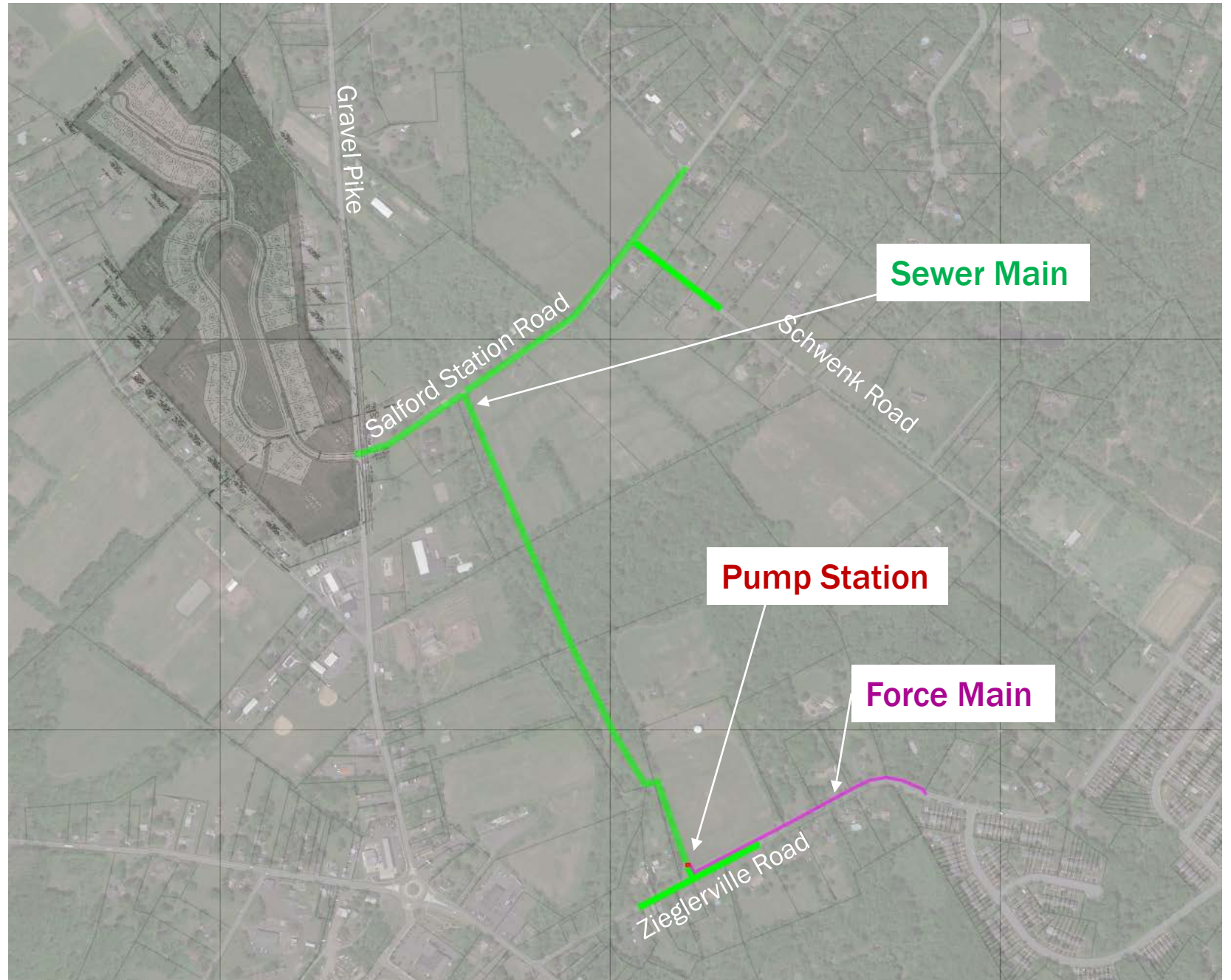
Diarrhea, Loose Stool, Cramping, Slight Fever



Areas that contain on-lot systems where conditions are suspect, per anecdotal information and Health Department records.

The Township is ultimately responsible to ensure that wastewater is properly addressed. DEP has the authority to initiate legal action against municipal governments that do not protect the public health by finding solutions to failed systems.

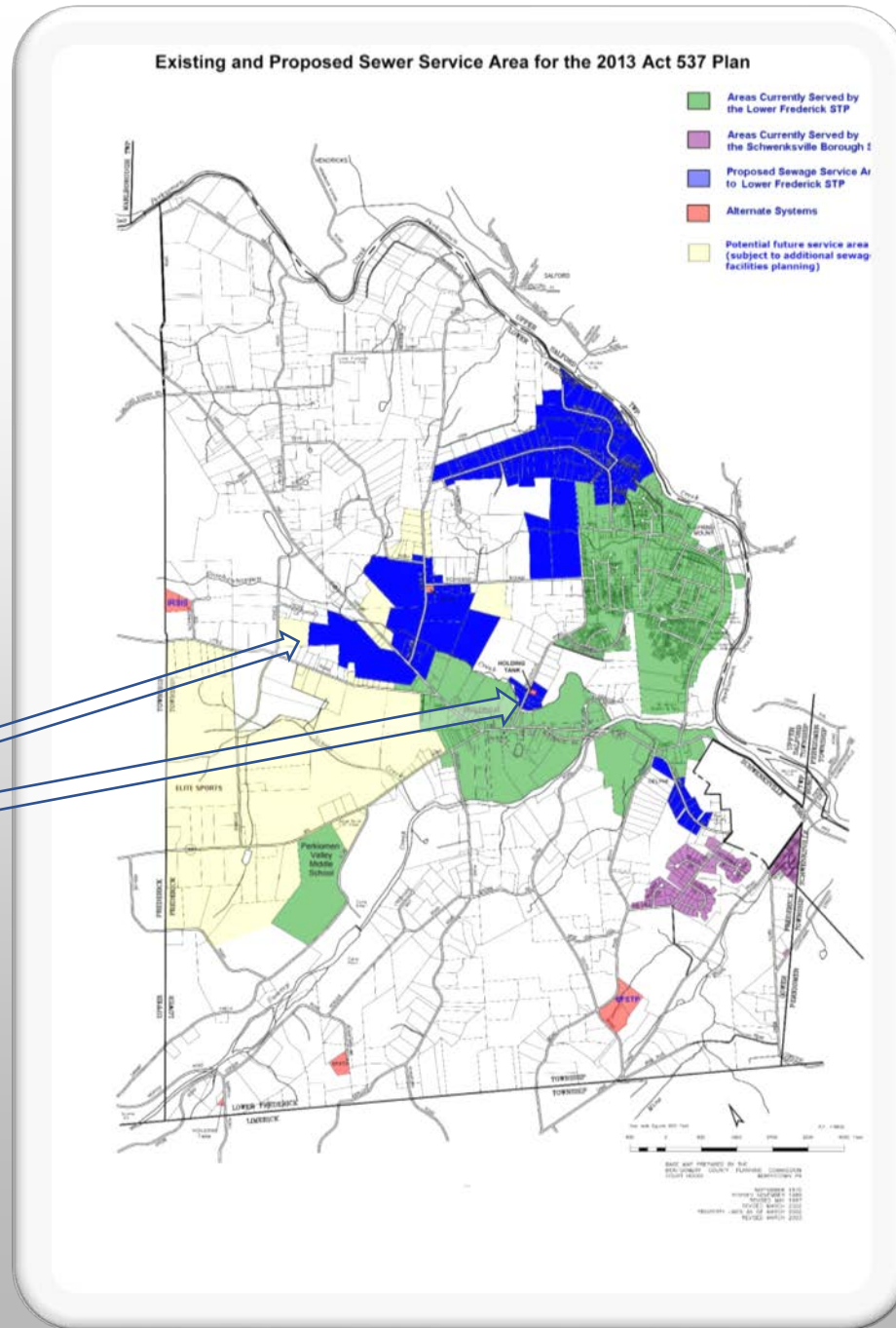
In the Act 537 Planning of 2013, a solution was developed that would serve many properties with on-lot system concerns, and also serve new development. In this way, the cost of serving the existing homes could be shared with the development.

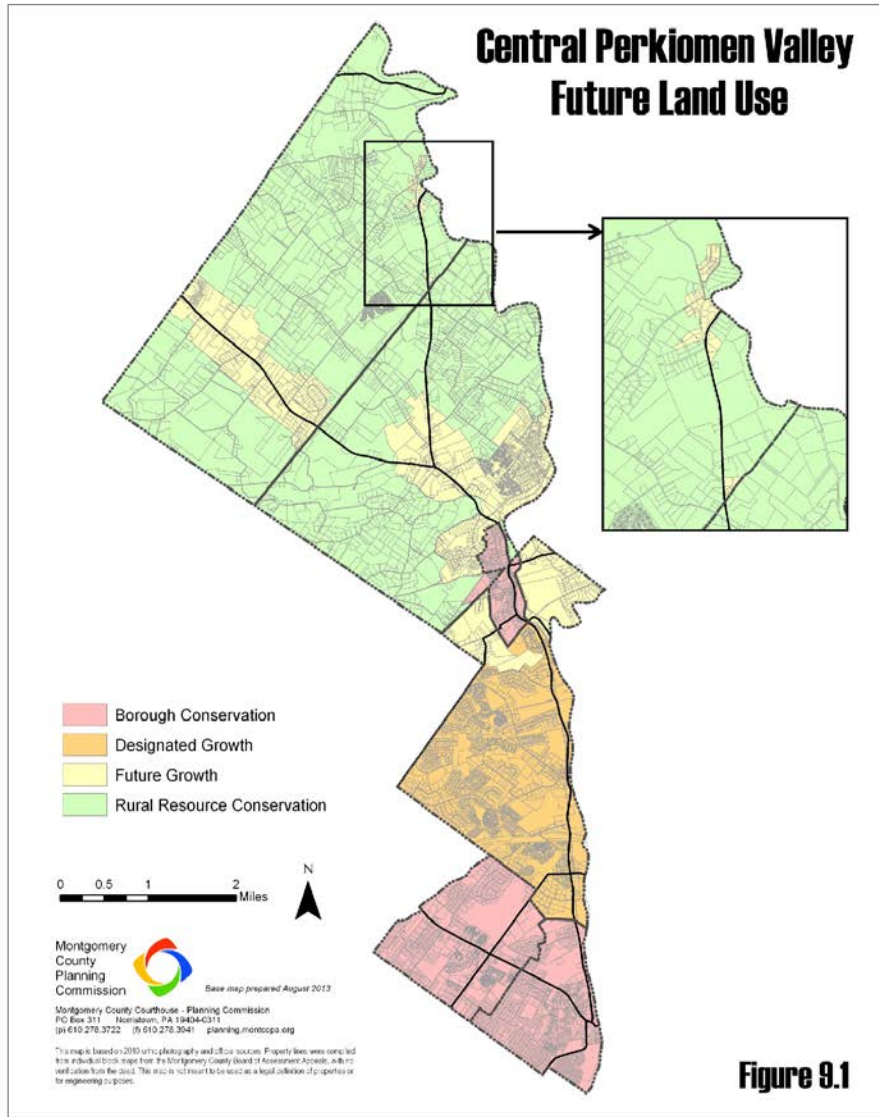


Sewage Planning

Act 537 Plan of 2013/2014

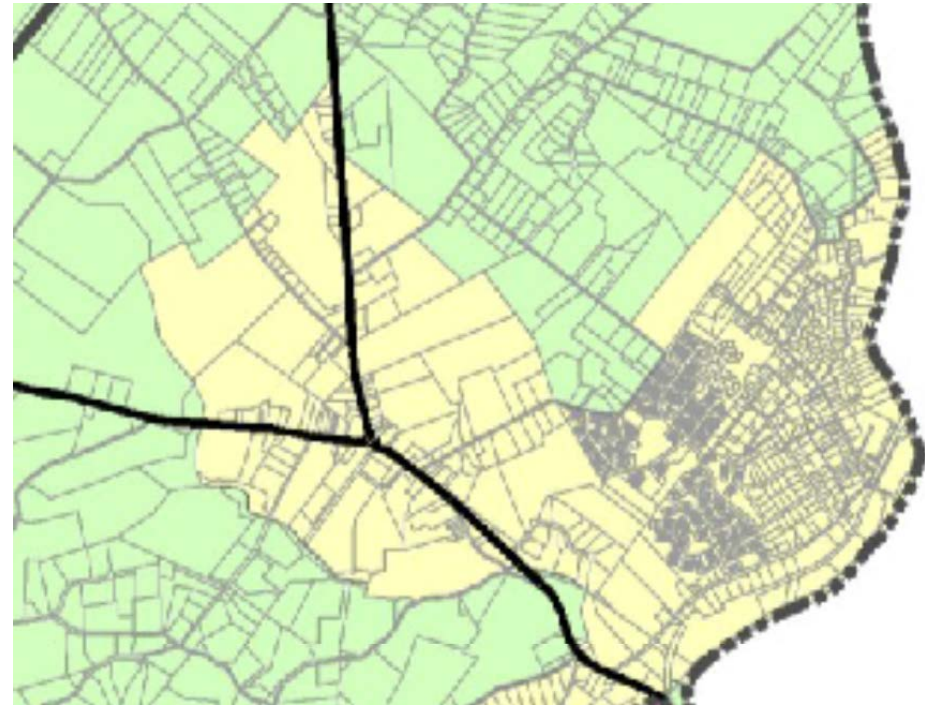
Areas to be served by extension of a sewer main along the Goshenhoppen Creek





The Regional Comprehensive Plan of 2014 directs, *“public water and sewer will not be permitted in the [Rural Resource Conservation Area] unless it is needed to address problem areas for the purpose of protecting public health ...”*

The County Health Department records of complaints and suspect systems drive the extension of public sewer just beyond the future growth area.




Pennsylvania Act 537

Section 10 of Act 537 Powers and Duties of the Department of Environmental Resources.

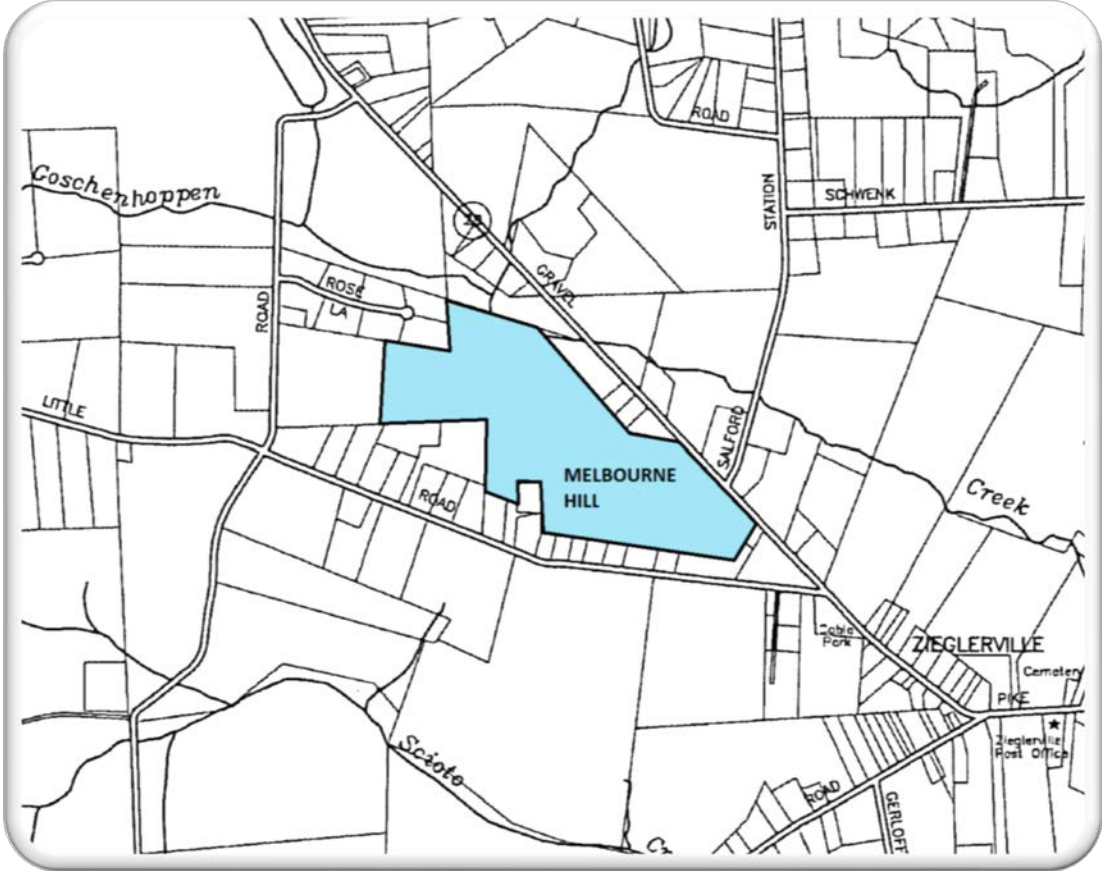
The department shall have the power and its duty shall be:

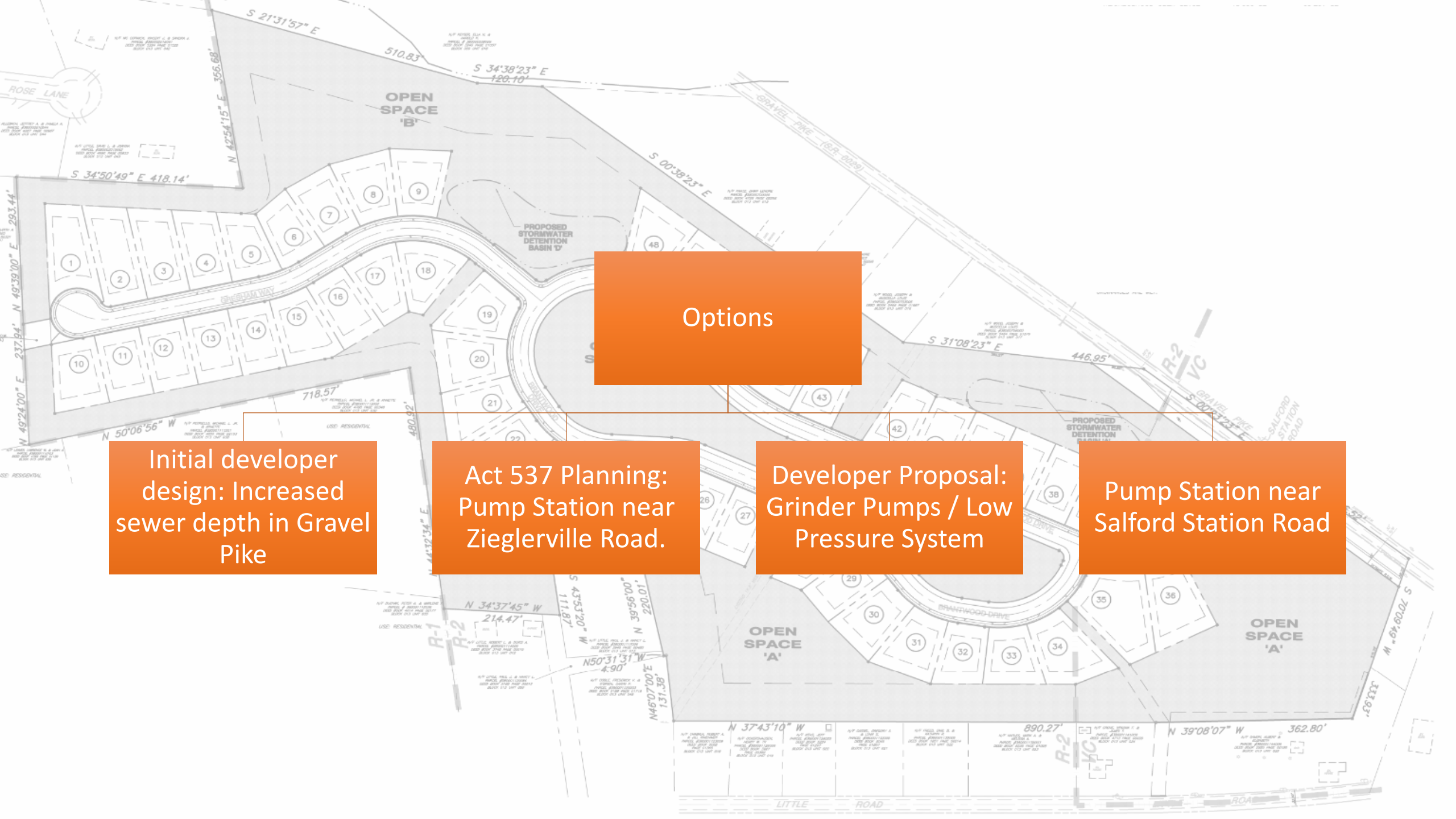
(3) To order the implementation of official plans and revisions thereto.

A hand holding a gavel over a scale of justice, symbolizing law and order.

If the Township does not undertake actions to address suspect or failed systems, PaDEP has the power and the duty to order the Township to implement the official plan.

Discussion of Sanitary Sewer Options for the proposed Melbourne Hill development





Options

Initial developer design: Increased sewer depth in Gravel Pike

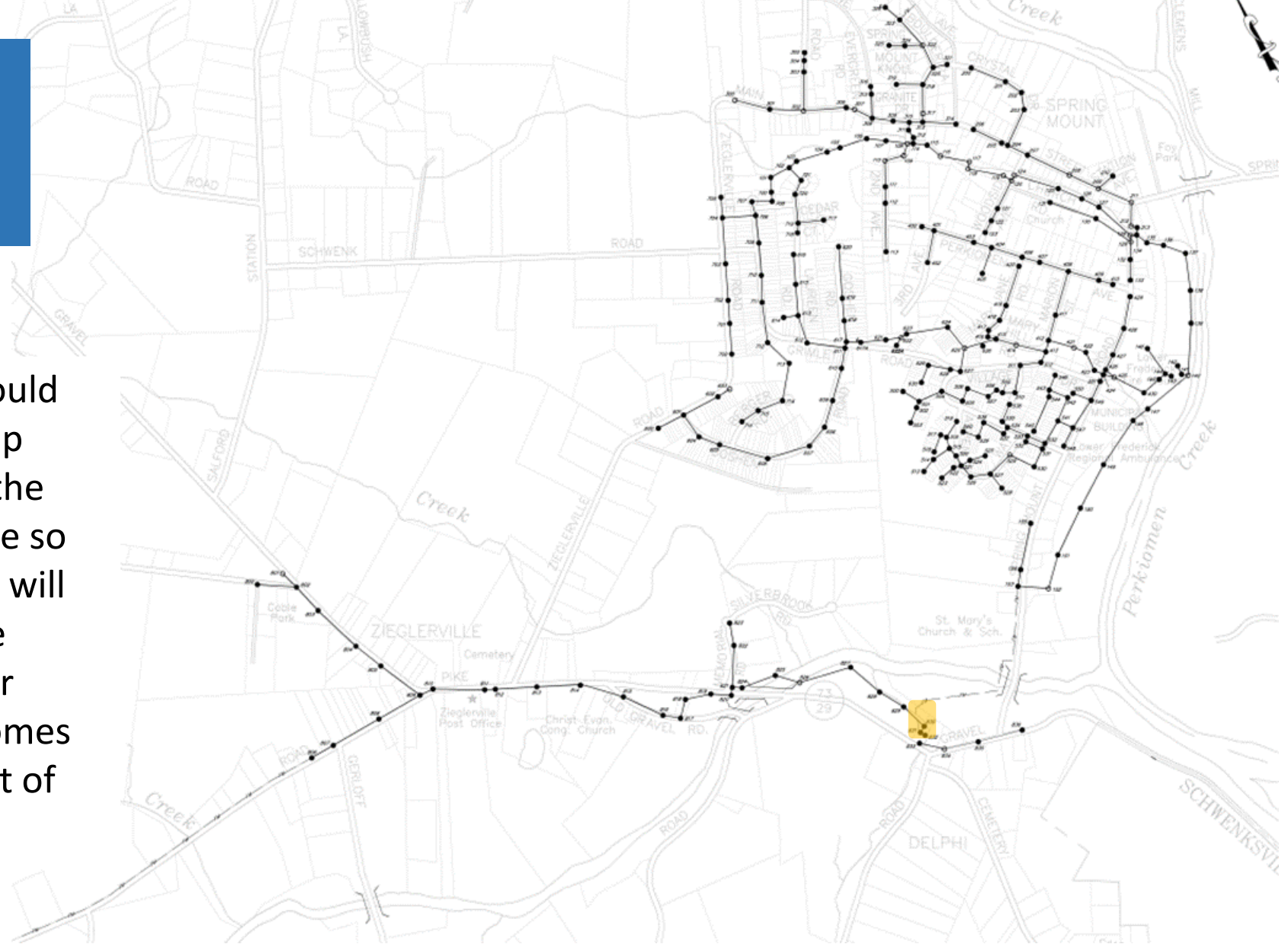
Act 537 Planning: Pump Station near Zieglerville Road.

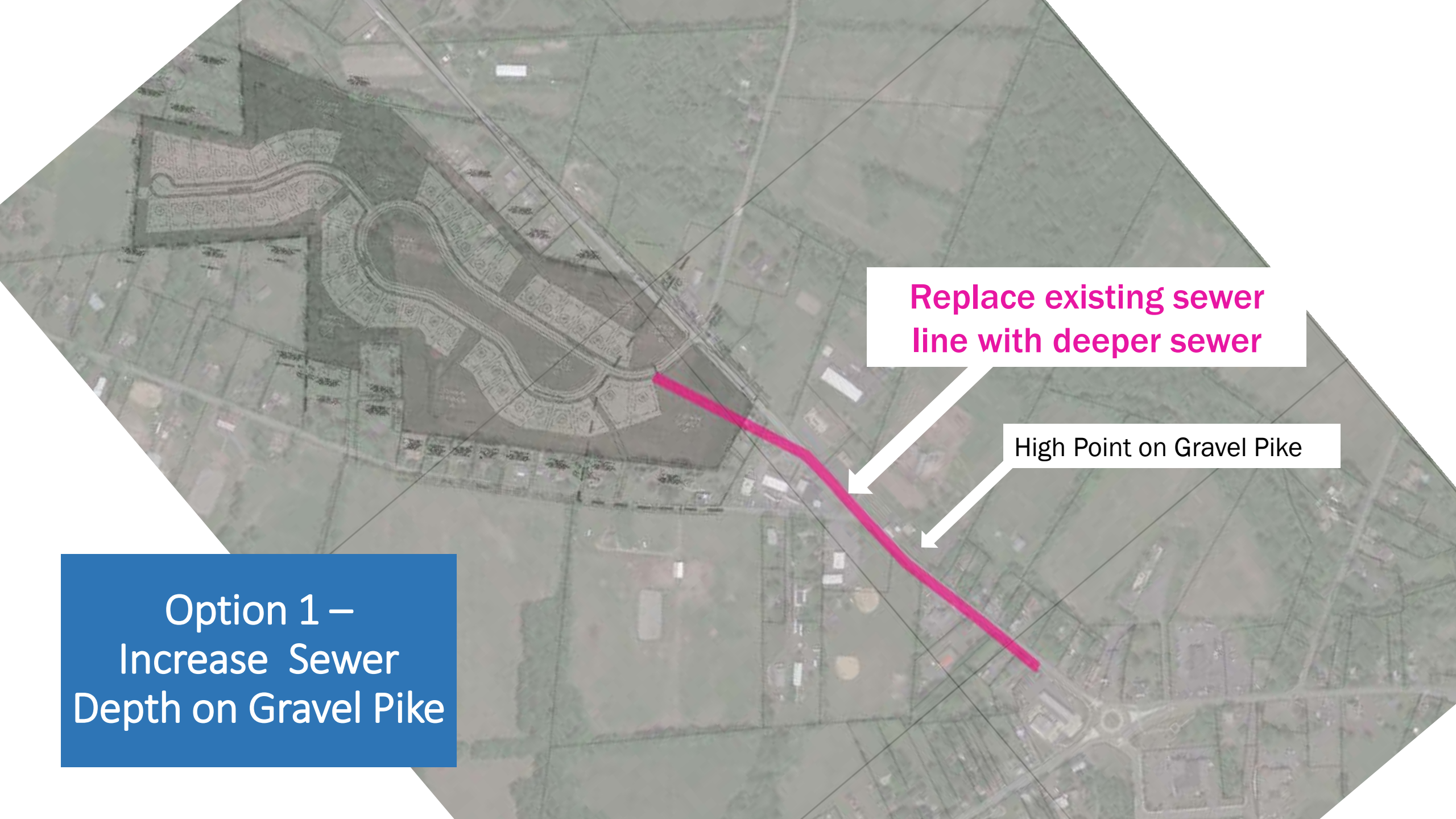
Developer Proposal: Grinder Pumps / Low Pressure System

Pump Station near Salford Station Road

Delphi Pump Station

Three of the four options would send flow to the Delphi Pump Station. Built 20 years ago, the station design did not include so many added connections. It will be necessary to evaluate the station capacity and consider station upgrades as more homes are added to this component of the system.





Replace existing sewer line with deeper sewer

High Point on Gravel Pike

Option 1 –
Increase Sewer
Depth on Gravel Pike



The draft design plan proposed manholes to 19 feet deep, where the max. depth today is about 13 feet.

Excessively deep manholes increase hazards to Public Works Staff.

Access for Inspection and Repair requires specialized equipment.

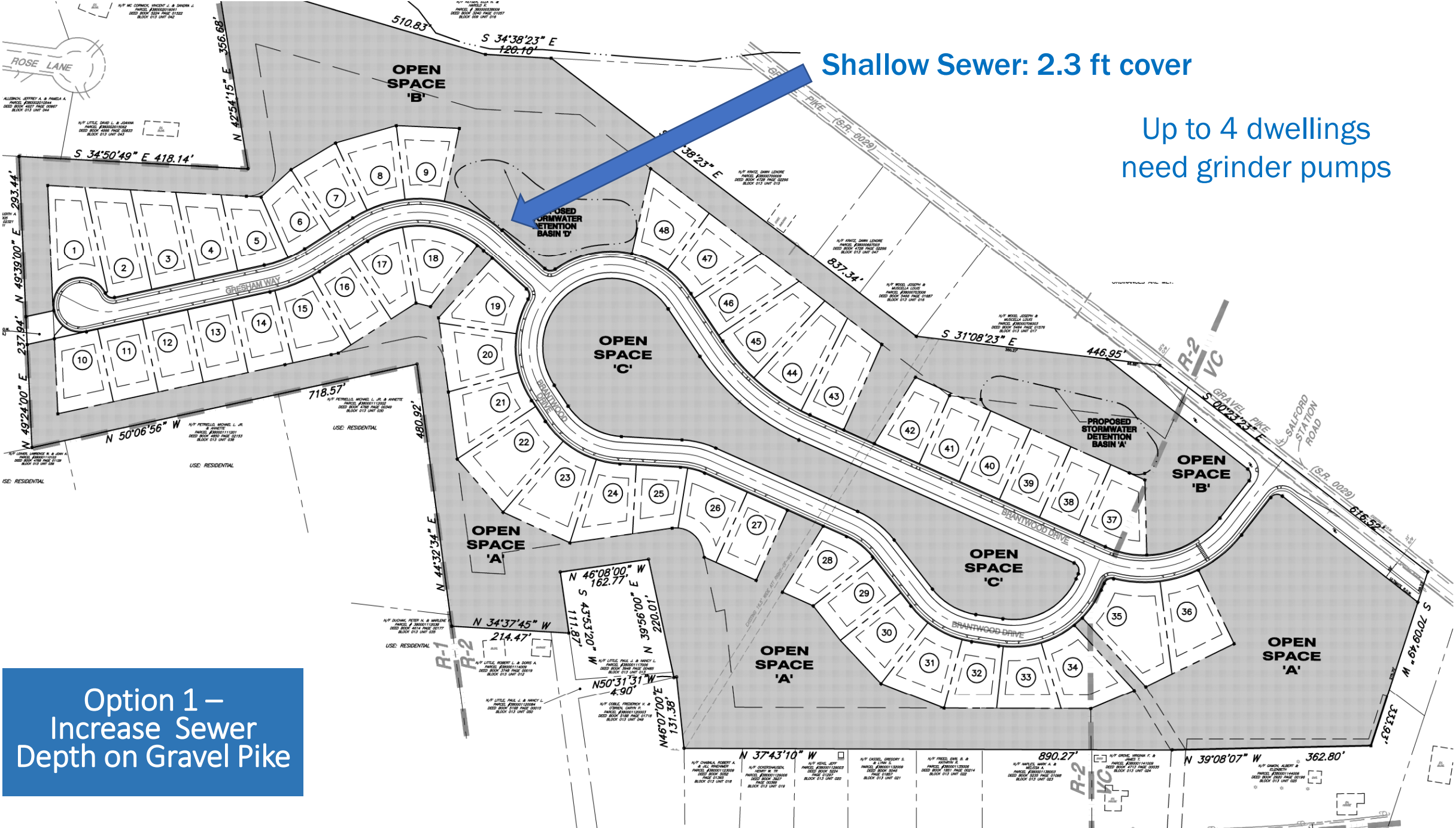
Option 1 –
Increase Sewer
Depth on Gravel Pike

Deep Manholes are
subject to increased
Hydrostatic Pressure:
more potential for leaks.



Shallow Sewer: 2.3 ft cover

Up to 4 dwellings need grinder pumps



Option 1 - Increase Sewer Depth on Gravel Pike

Option 1 -Increase Sewer Depth on Gravel Pike

20-foot deep manholes may cause:
Danger to Public Works Staff
Increased potential for I & I with depth

Serves only the proposed development. Does not resolve areas with on-lot system problems.

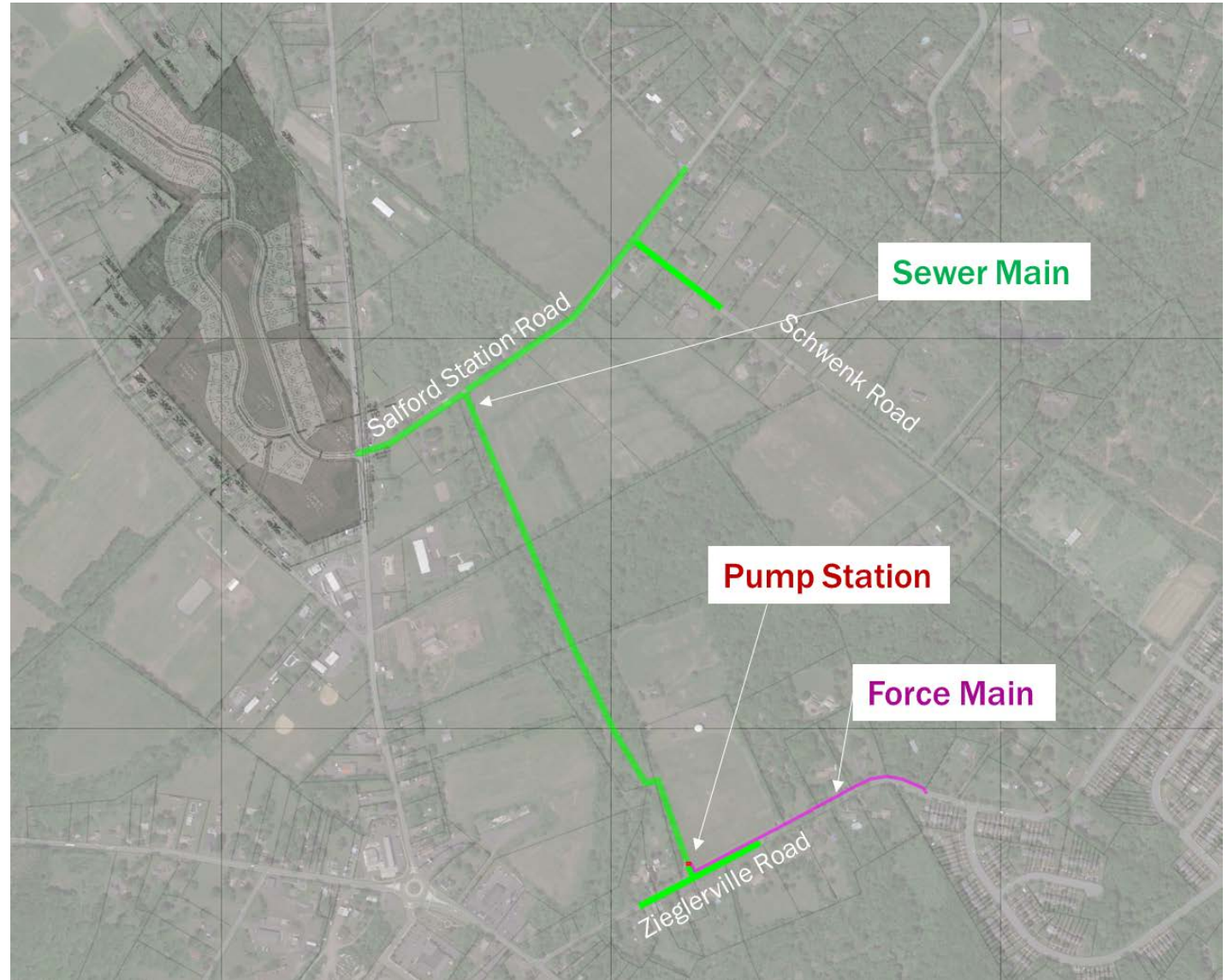
Shallow sewer line in development, some grinder pumps.

Increased flow to Delphi pump station, a 20 year old facility.

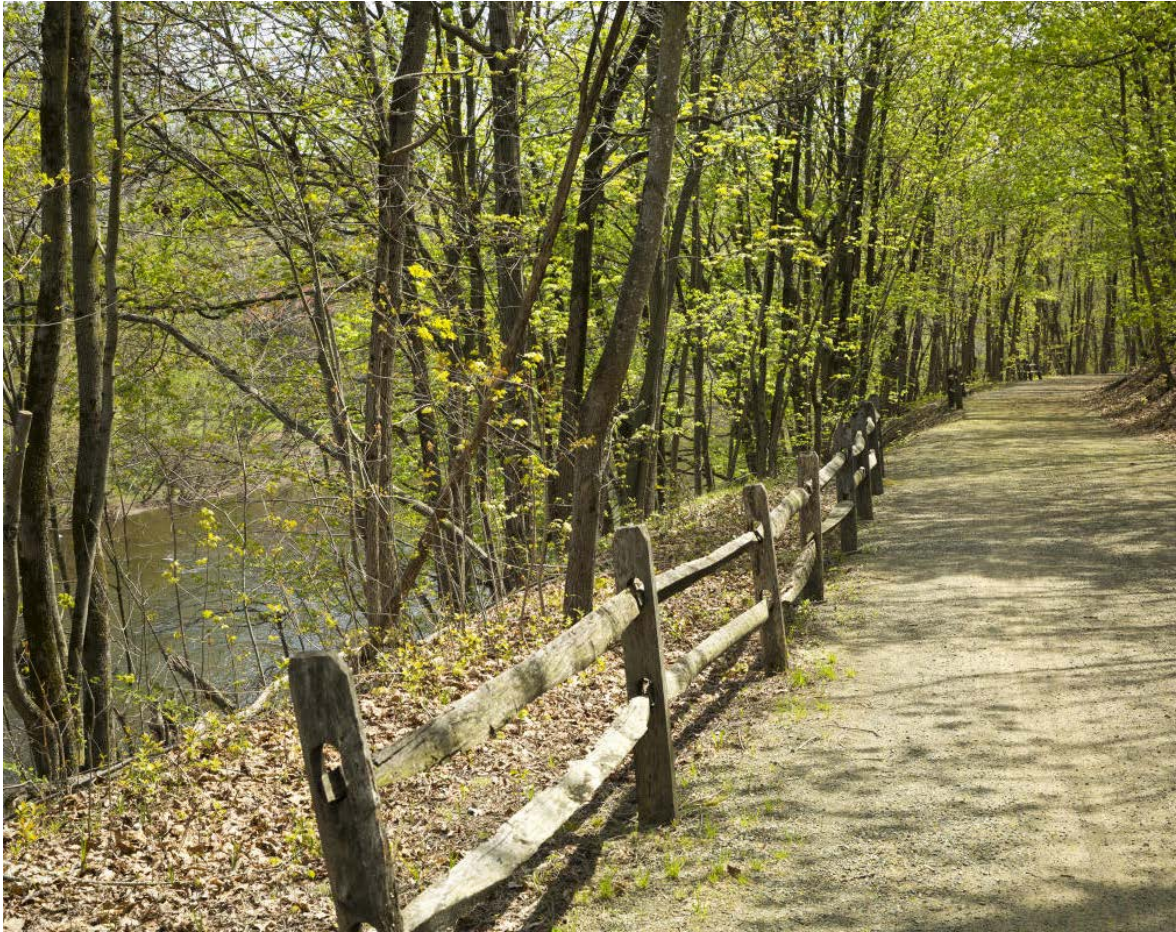


Option 2 – Goshenhoppen Main & Zieglerville Pump Station

- This option proposes the construction of a sewer main along the Goshenhoppen Creek
- A pump station near Zieglerville Road will pump to an existing manhole on Zieglerville Road.



Option 2 – Goshenhoppen Main & Zieglerville Pump Station



- Included in existing Act 537 planning
- Provides opportunity to connect problematic on-lot systems on Zieglerville, Salford Station and Cepp Roads
- No additional burden on Delphi pump station
- Opportunity to incorporate a walking trail on easement along Goshenhoppen Creek
- Opportunity to incorporate sidewalks on Zieglerville Road
- Expensive to construct.

Option 3 – Individual Grinder Pumps

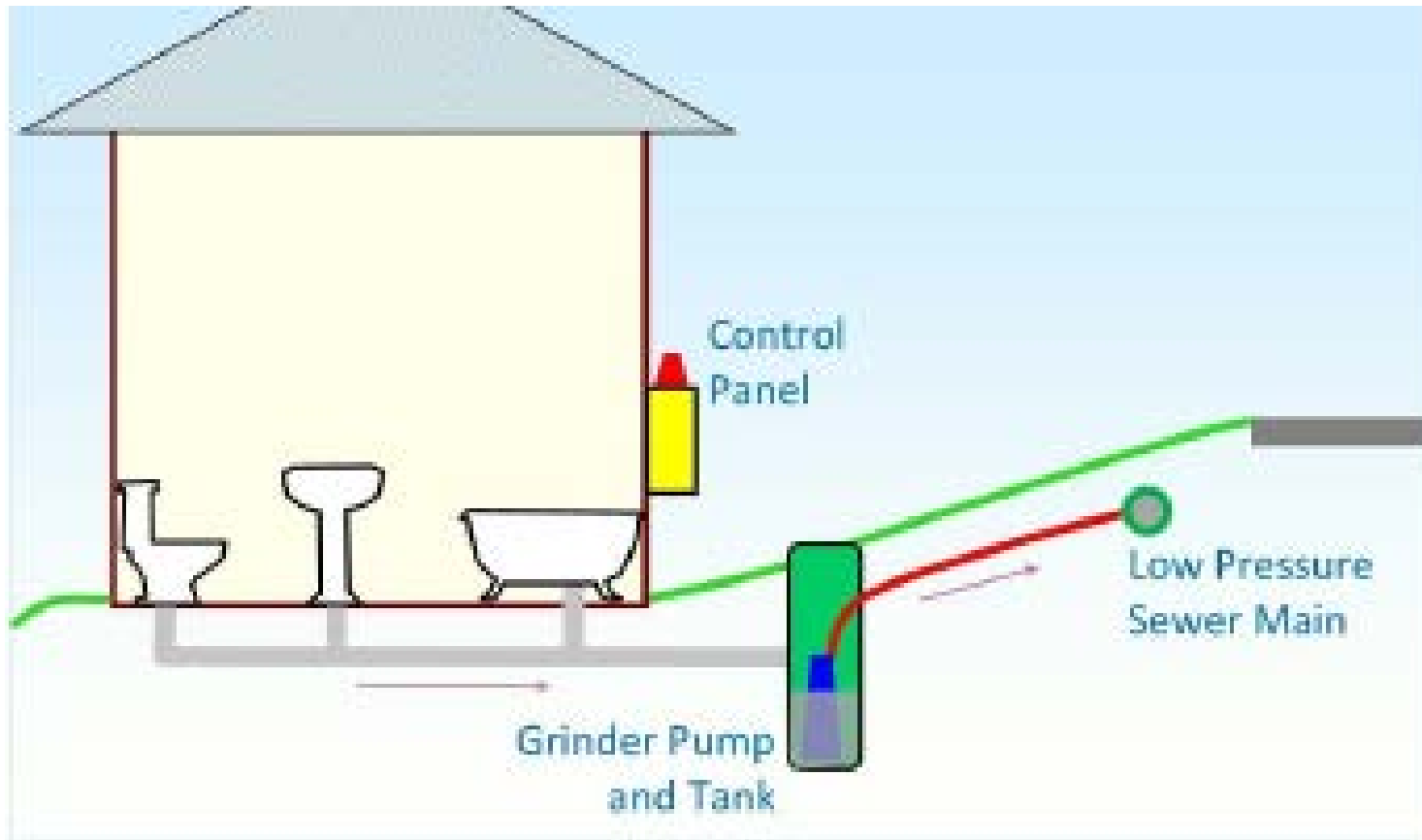
- For this option, each lot in the Melbourne Hill subdivision will have an individual grinder pump.
- The individual grinder pumps will be connected by a common low pressure force main owned and maintained by Lower Frederick.
- The individual grinder pump will be owned and maintained by individual property owners.
- The common force main will pump to the existing collection system.



New Township responsibilities



- Township will need to flush force main(s) annually
- Township stocks grinder pumps for emergency replacements in event of residential failures.



Option 3 – Individual Grinder Pumps

- Increase in sewer strength potentially causing:
 - Increased wear on collection system
 - Degradation of manholes, wet wells
 - Increased wear and tear on Delphi lift station
 - Increased hazard to Public Works staff
 - Increased cost to treat
- Grinder pumps are mechanical and do fail. About \$3,000 homeowner cost to replace pump inside wet well.
- Increased cost to homeowners to run and maintain grinder pumps
- Less Inflow & Infiltration into system

Option 3 – Individual Grinder Pumps

Can we solve concerns in other locations with grinder pumps?

Perhaps, but the proposed system in Melbourne does not significantly change the cost equation. The Township would need to run 3,000 feet of force main, and each property owner that connects will need to purchase, install and maintain a grinder pump. A rough estimate of cost for that force main installation is \$450,000.



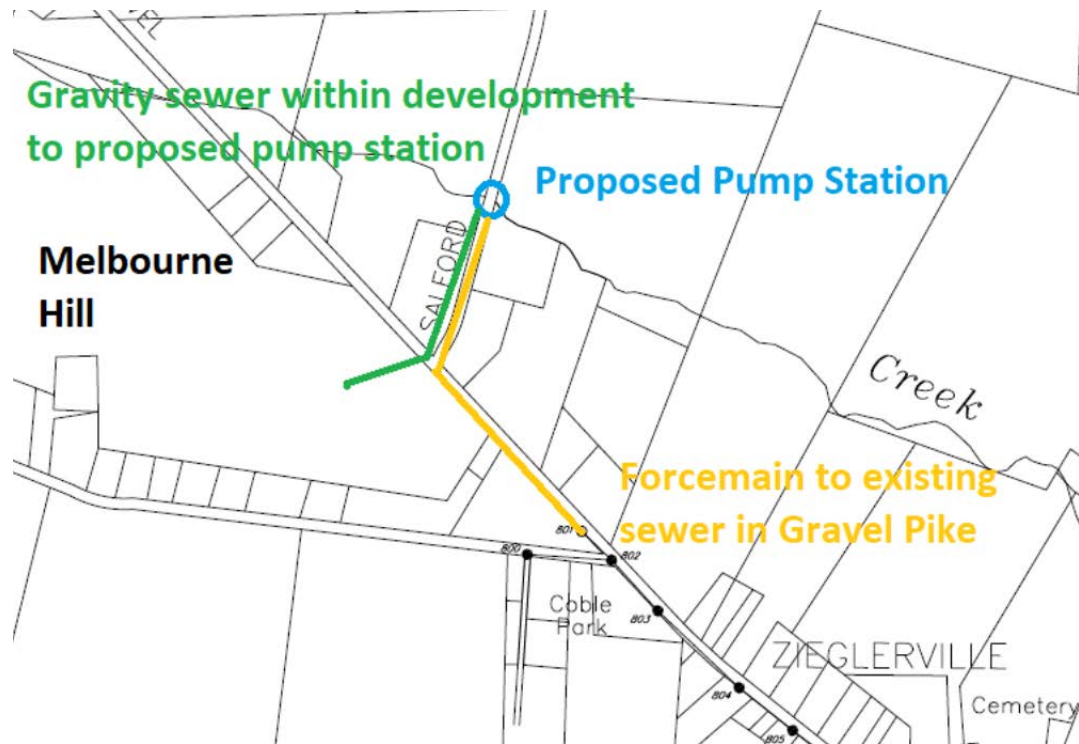
Option 4 – Salford Station Pump Station

- This option proposes the construction of a pump station along the Goshenhoppen Creek near Salford Station Road
- Flow is pumped back up to Gravel Pike.
- Potential for future connection of existing homes near Salford Station Road / Schwenk Road / Cepp Road. Rough cost for construction of 1,500 ft gravity line to connect existing properties is \$325,000.



Option 4 – Salford Station Pump Station

Opportunity to connect suspect on-lot systems on Cepp, Salford Station and Schwenk Roads.



Provides gravity
service for
development.

Pump
stations
in series

Flows to
Delphi
Station

Solutions for existing issues:

If existing problem areas are not resolved concurrent with providing sewer to the development, what are the other costs and options?

Zieglerville Road

Another alternative presented in the Act 537 plan was a low pressure system on Zieglerville Road. Costs were estimated at \$140,000 to \$250,000, not including the cost of the grinder pumps for each property.

Salford Station and Schwenk Roads

An alternative presented in the Act 537 plan was a low pressure system in Schwenk Road near Salford Station Road, connected to a gravity line constructed in Schwenk Road to Zieglerville Road. The cost was estimated at \$450,000, not including the cost of the grinder pumps for each property.

	Option 1 – Deeper Sewer in Gravel Pike	Option 2 – Main along Goshenhoppen Creek	Option 3 – Grinder Pumps for all Development Homes	Option 4 – Pump Station near Salford Station Road
Costs	No direct public expense to construct.	Over \$2 million. Developer asked to contribute.	No direct public expense to construct.	Undetermined. Presumably, the developer would build the pump station.
	Township still responsible for solutions to existing problems.	Township may need another loan to support costs.	Township still responsible for solutions to existing problems.	Township can construct gravity line in Salford Station Road for existing residents when necessary.
Pros				
	May be able to tie in properties on Little Road.	Serves new development and existing properties with concerns	May be able to tie in properties on Little Road.	Serves new development and many existing properties with concerns
	No new pump station to maintain.	Act 537 Approved	Less potential for Inflow and Infiltration	
		No added flow to Delphi Station		
Cons		Potential trail along Goshenhoppen Creek		
		Incorporate sidewalk or bike path construction along Zieglerville Road		
	Significant traffic interruptions and detours for construction.	Pump station to operate and maintain	Township owns and maintains force main through development.	Pump station to operate and maintain
	Manholes too deep for public works to inspect or service.	Expensive to build	Mechanical systems. Parts wear out and fail.	
	Increased I&I potential			
	Adding flow to Delphi Station		Adding flow to Delphi Station	Adding flow to Delphi Station
	Not a solution for other properties in region.		Increased sewage strength	
	DEP can still compel the Township to solve public health concerns with existing lots.		DEP can still compel the Township to solve public health concerns with existing lots.	DEP can still compel the Township to solve public health concerns with existing lots near Zieglerville Road.

	Option 1 – Deeper Sewer in Gravel Pike	Option 2 – Main along Goshenhoppen Creek	Option 3 – Grinder Pumps for all Development Homes	Option 4 – Pump Station near Salford Station Road
Costs to serve existing homes	\$140,000+\$450,000 =\$590,000	Township portion of \$2.1 million. Developer asked to contribute.	\$140,000+\$450,000 =\$590,000	\$140,000+\$325,000 =\$465,000

Note: Costs based upon 2013 estimates contained in Act 537 Plan



Questions?