# SMALL SETTLEMENT SERVICING STUDY

## TOWNSHIP OF SOUTHWOLD

**DRAFT**  
A3900B  
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1 Small Settlement Area Servicing Study

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1.0 INTRODUCTION

The Small Settlement Servicing Study is intended to determine alternatives for providing services to settlement areas designated within the Township’s Official Plan. Based on the results of this study, the Township will be able to identify feasible servicing options, and potential issues related to each, for the Settlement Areas of Talbotville, Ferndale/Lynhurst, the Hamlet of Port Stanley and the Settlement Areas of Shedden and Fingal. The Small Settlement Servicing Study is required by the Ministry of Municipal Affairs and Housing (the MMAH) and the Ministry of Environment (the MOE) to demonstrate consistency with the servicing policies of the Provincial Policy Statement 2005 (the PPS).

The Official Plan was adopted by Southwold Township on February 14, 2011. The MMAH issued a draft decision dated December 7, 2011. The Draft Decision modifies the Adopted Plan Schedule A Land Use by deleting land designated Settlement Area on the north side of Ferndale community and deleting land designated Hamlet north of Port Stanley.

The MMAH stated Provincial concerns with the Adopted Official Plan in their letter of correspondence dated March 13, 2012. The MMAH and the MOE stated the need to prepare a servicing study (Small Settlement Servicing Study) to demonstrate consistency with the PPS requirements for the provision of municipal services to lands proposed to be added to the vacant land supply. The MMAH, the Ministry of Natural Resources (MNR) and the Ministry of Agriculture Food and Rural Affairs (OMAFRA) requested additional study to address PPS agricultural, vacant land supply and natural heritage policies. The report entitled, “Response to the Ministry of Agriculture Food and Rural Affairs” was prepared by Zelinka Priamo Ltd. (ZPL) to address OMAFRA issues and update vacant land supply. OMAFRA and MMAH found that this report satisfied the PPS agricultural policies. Reports prepared by ZPL to address MNR issues are under review.

Settlement Areas are the primary growth centres where full municipal or communal services are required to achieve forecasted growth. Hamlets are small, existing centres with growth potential limited to infilling and build out to existing urban centre boundaries. Development is constrained in both Settlements and Hamlets by the absence of wastewater treatment facilities.

The Adopted Official Plan contemplates development on municipal or communal wastewater treatment facilities in the Settlement Areas and the Hamlet north of Port Stanley. Wastewater treatment facilities are not contemplated in the Hamlets, where development is limited to infill.
2.0 SETTLEMENT AREAS

Map 1 identifies the Settlement Areas of Ferndale/Lynhurst, Talbotville, Shedden, Fingal and the Hamlet north of the Village of Port Stanley. The Settlement Area of Ferndale and the Hamlet area north of the Village of Port Stanley are proposed to be expanded in the Adopted Official Plan.

Table 1 and Table 2, show two concepts for the Allocation of Equivalent Residential Units (ERUs).

### Table 1: Allocation of Equivalent Residential Units (ERUs)

<table>
<thead>
<tr>
<th>Settlements</th>
<th>Vacant Land Supply (ha)</th>
<th>ERUs Infilling</th>
<th>ERUs Rounding Out / Minor Extension</th>
<th>ERUs Vacant Land Supply</th>
<th>Total Equivalent Residential Units</th>
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<tbody>
<tr>
<td>Ferndale/Lynhurst* Commercial Block</td>
<td>25.7&lt;sup&gt;*&lt;/sup&gt; 2.3</td>
<td>3</td>
<td>15</td>
<td>250</td>
<td>270</td>
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<tr>
<td>Talbotville&lt;sup&gt;3&lt;/sup&gt;</td>
<td>87.0&lt;sup&gt;3&lt;/sup&gt;</td>
<td>-</td>
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<td>-</td>
<td>-</td>
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<tr>
<td>Hamlet Port* Stanley</td>
<td>16.0&lt;sup&gt;*&lt;/sup&gt;</td>
<td>10</td>
<td>110</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
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<td>Shedden&lt;sup&gt;3&lt;/sup&gt;</td>
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<td>Fingal&lt;sup&gt;3&lt;/sup&gt;</td>
<td>45.4</td>
<td>50</td>
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<td></td>
</tr>
<tr>
<td>Hamlets&lt;sup&gt;4&lt;/sup&gt;</td>
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<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>217.4</td>
<td>21</td>
<td>116</td>
<td>950</td>
<td>1100</td>
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</table>

Note: Total ERUs are rounded to the nearest multiple of five (5)
* Shaded Settlement Areas in Table 1 & 2 proposed to be added in the Adopted Official Plan.

1. Infill means the creation of a residential lot between two existing residences which are on separated lots and which are situated on the same side of the road within Hamlet or Settlement Area designations.

2. Minor extensions and rounding out means the creation of lots adjacent to existing development within a Hamlet boundary or Settlement Area boundary and which is intended to use the existing infrastructure and results in a minor increase of the built-up area.

3. Designated ‘Hamlet’ in the existing Official Plan and ‘Settlement Area’ in the Adopted Official Plan.

TOWNSHIP OF SOUTHWOLD

MAP 1
SMALL SETTLEMENT AREA SERVICING STUDY

COMMUNITIES UNDER STUDY

Talbotville
Shadden
Fingal
Port Stanley
Hamlet
Table 1 shows ERUs allocated to the Ferndale/Lynhurst community, the Talbotville community and the Hamlet community north of Port Stanley. The Adopted Official Plan acknowledges that the lands added to the Ferndale/Lynhurst community and the lands added to the Hamlet of Port Stanley have the greatest potential for servicing based on the possible connections to the existing wastewater treatment facilities in St. Thomas and Central Elgin. Full municipal or communal services are not contemplated in Shedden, Fingal and the Hamlets (i.e. development on private services). The total ERUs reflect the forecasts in the Demographic Profile, Population Projections and Housing Needs Report, January 2009 to the year 2026.

Table 2 shows ERUs allocated to the Ferndale/Lynhurst community, the Talbotville community, the Hamlet community north of Port Stanley and the Shedden and Fingal communities. The total ERUs reflect the forecast stated in the Demographic Profile, Population Projections and Housing Needs Report, January 2009 to the year 2031. This table assumes full municipal or communal services are available to Shedden, Ferndale/Lynhurst, Talbotville, Fingal and the Hamlet community north of Port Stanley.

The ERU allocations are based on:

1. The land supply as shown on Schedule A Land Use in the Adopted Official Plan;

2. The proposed additions to the land supply at Ferndale/Lynhurst and the Hamlet north of Port Stanley are either planned to be provided with wastewater treatment facilities or alternative wastewater treatment facilities are available to these communities;

3. The dwelling unit forecasts to 2026 and 2031, stated in the Demographic Profile, Populations and Housing Needs background report;

4. The existing land use and land ownership patterns in the communities;

5. The development interests which have been expressed in the Talbotville, Ferndale/Lynhurst and the Port Stanley Hamlet communities;

6. The consideration of infilling, rounding out and minor extension opportunities; and

7. The existing residential densities and lot sizes in the communities.

The detailed basis for the allocation of ERU’s to settlement areas and the hamlet north of Port Stanley is found in the ZPL Addendum to the Allocation of Equivalent Residential Units Tables and Responses to OMAFRA and MMAH Land Supply Review.
3.0 PROVINCIAL POLICY

Relevant excerpts for the Small Settlement Area Servicing Study are found in the Provincial Policy Statement (PPS). The MMAH and the MOE concerns focus on consistency with policies found in Section 1.1.3.9 and Section 1.6 of the PPS.

Policy 1.1.3.9 states the Province’s policy for the establishment and expansion of settlement areas. Policy 1.1.3.9 b) requires infrastructure and public services facilities, be available or planned, are suitable for proposed development over the long term and protect public health and safety. Wastewater treatment facilities/systems must be available or planned for the lands added to the Ferndale/Lynhurst community and the lands added to the Hamlet north of Port Stanley.

Policy 1.6.1 directs that servicing be coordinated, efficient and cost effective and integrated with planning for growth to accommodate projected needs. The use of existing services should be optimized.

Policy 1.6.4 states direction for planning sewage and water services. Growth must be planned to efficiently use existing municipal services as the first priority and to efficiently use existing private communal services as the second priority where municipal services are unavailable. Servicing systems are to be provided in a sustainable manner, such that these are within the carrying capacity of the water resources upon which they rely, are financially viable, are compliant with regulatory requirements and are protective of human health and the natural environment.

The PPS requires that sufficient reserve capacity be confirmed within municipal or private communal wastewater treatment systems and water systems prior to any new lot creation, and the determination of reserve capacity must factor in hauled sewage from private systems. In the case where new development is proposed on private services, this would require that reserve capacity be allocated for this development at a wastewater treatment plant to receive hauled sewage in case of private system failure.

Policies 1.6.4.2 to 1.6.4.5 establish the hierarchy of servicing systems that may be considered. Municipal sewage and water services are the preferred method of servicing. Private communal sewage and water services may only be considered where municipal services are not provided. Individual on-site sewage and water services shall be used for development of five housing units or less where municipal or private communal services are unavailable and site conditions are suitable. Partial services are only permitted to address failed individual on-site services or to allow infilling and rounding out of development in settlement areas where sufficient reserve capacity at an existing WWTP is confirmed to accommodate flows in case of private system failure and site conditions are suitable.

4.0 MUNICIPAL SERVICING

4.1 General:

The Township of Southwold Small Settlement Servicing Study is intended to provide an overview of the servicing issues related to the proposed settlement areas as identified in the Township of Southwold Official Plan. This Study will deal primarily with the feasibility of providing water and sanitary servicing for the developments along with review of stormwater management policies currently in place to address the needs of these developments. This section is intended to provide an overview of these services within the Township in general terms. Subsequent sections will deal specifically with the individual settlement areas.
4.2 Water Servicing:

Water servicing of future settlement areas within Southwold would utilize the existing Southwold water distribution system (Refer to Appendix A). This system is supplied by the St. Thomas Area Secondary Water Supply which has a rated capacity of 54,605 m$^3$/day. The average total daily flow recorded by the system in 2010 was 7,172 m$^3$/day, approximately 13% of the rated capacity. The total units considered in the dwelling unit forecast to 2031 is 1,510 units, which equates to an average daily water use of 1,032 m$^3$/day, based on 250 m$^3$/year per residential home. This would increase the average total daily flow for the system to approximately 8,199 m$^3$/day, approximately 15% of the rated capacity.

Further, the primary water supplier, Lake Huron & Elgin Area Water Supply Systems(Primary System), have confirmed that the design rated capacity of the Primary system is 91,000 m$^3$/day with average and maximum day usage at 42,600 m$^3$/day and 68,100 m$^3$/day, respectively. The Primary System does not allocate supply to any individual municipality. It is available to all benefitting municipalities on an aggregate supply basis. Development outlined in the Adopted Southwold Official Plan is well within the available capacity of the current system. In addition, all the capacity previously utilized by the Ford Motor Company (approximately 274 m$^3$/day) is now available for future development within Southwold, prior to obtaining additional capacity from the Primary System. While some of this may be utilized by a new facility occupying the plant, it is unlikely that it’s water demand would be this high.

Given the above, water supply should be adequate for future development considered in this study.

4.3 Sanitary Servicing - Options Common to All Settlement Areas:

The Township of Southwold does not currently have a municipal sewage collection/treatment/disposal system. The existing development is serviced by private services or sent to the St. Thomas wastewater plant. Options regarding a Township wide sanitary servicing strategy are outlined in this section.

Option A: “Do Nothing”

Description: No improvements or upgrades would be provided to accommodate future settlement areas.

Discussion:

• This option would severely limit Southwold's ability to grow. For the most part, development would occur based on private servicing where site conditions permit.

• Limited growth will restrict Southwold's financial sustainability which in turn affects the community’s viability.

Option B: Treatment Plant to Service All Settlement Areas

Description: A central wastewater treatment plant (WWTP) would be established to accommodate all future settlement areas. A collection system would be constructed to service the various settlement areas and deliver sewage to the WWTP. A conveyance system would also be required to convey effluent from the WWTP to the receiver for disposal/discharge.
Advantages:

• Could be designed to service all the hamlets and future growth areas.

Disadvantages:

• Municipally owned land would be required to accommodate the facility. It is unclear where such a facility could be accommodated and if there would be community support at this location.

• Establishing a viable effluent discharge receiver may be difficult given the limited watercourses within the Township that actually have a constant base flow.

• Would require forcemains/sewers throughout the municipality to transmit sewage from settlement areas to the WWTP. Establishing this infrastructure would be disruptive to traffic, residences, existing servicing and natural heritage features.

• Cost would be prohibitive. Although detailed estimates have not been completed, the costs associated with not only the WWTP, but also the extensive network of sewer and forcemains required to collect the sewage from the various settlement areas and convey it to the WWTP, would be considerable. It is unlikely that either the municipality or the developer could afford to undertake a project of this scale with the limited development proposed.

• Although the WWTP could be phased to some extent, this would increase overall costs of the facility. With respect to the forcemains, many of these would be extremely long and designed to accommodate the ultimate development. If the development does not occur, the flows/volumes in these forcemains will not be sufficient enough to ensure cleansing velocities and prevent septicity of sewage.

Neither of these options are considered feasible, therefore, an independent sanitary servicing strategy for each future settlement area was considered. The following sections provide an outline of the various water and wastewater servicing options available to each settlement area.

5.0 FERNDALE SETTLEMENT AREA

Development Allocation: 270 Equivalent Residential Units (ERU) (Figure 1)

5.1 Water Servicing:

Ferndale settlement area would utilize the existing Southwold water system. As indicated previously, there is sufficient water supply to accommodate this development. Currently, there is a 750 mm trunk main on Ford Road and on McBain Line to the southwest and south sides of the settlement area, respectively. These trunk mains would have sufficient conveyance capacity to service this settlement area. Local mains would need to be extended from these trunk mains into the settlement area. Ideally, the local mains should be “looped” to the trunk main to maintain residual chlorine consistent with provincial regulations.
5.2 Sanitary Servicing:

Option A: St. Thomas Wastewater Treatment Plant (WWTP) via St. George Street Collection System

Description: Ferndale settlement area sewage would be conveyed to the St. Thomas WWTP via St. George Street collection system.

Discussion:

a) WWTP Capacity:

- The 1997 Agreement with St. Thomas provided for up to 1800 m³/d sewage treatment for Southwold. Further, the agreement indicates that 585 m³/d was allocated to existing and approved development at the date of signing of the agreement. The remaining capacity of 1,215 m³/d was allocated to the Township of Southwold for the secondary servicing area in the Lynhurst neighbourhood development.

- Exact capacity available to Southwold in the existing WWTP is unclear. However, St. Thomas has confirmed that there is currently sufficient available capacity to accommodate the proposed 270 units. Servicing beyond this level would require further investigation and negotiation.

- During the next 20 years of growth and development, the 8,516 m³/d of currently uncommitted hydraulic capacity at the WWTP will be committed on a plan of subdivision approval basis, when draft plan of subdivision conditions are issued. Based on St. Thomas's current population and employment projections, as well as the current commitments, this remnant unused capacity will not be adequate to satisfy new development needs within a 20-year planning horizon. The recent completion of the WPCP Wastewater Management Master Plan and Class EA by St. Thomas includes an expansion of 9,100 m³/d which will assist St. Thomas in its capacity allocation, within and beyond the 20-year planning period. The capacity upgrade of the plant will be initiated when flows reach 85% of the plants' currently rated capacity.

b) St. George Street Collection System:

- Based on previous servicing reviews undertaken by Central Elgin (i.e. Dillon-1996 & 2008, Houghton-2012), if the Ferndale area was to be serviced to the St.Thomas WWTP, it would be serviced by a sewer extension from the St. George Street sewer system (i.e. within Central Elgin). Further, these studies concluded that this sewer system from Wellington Road to the existing St. George Street sewage pumping station (SPS) is at or near capacity, therefore, it could not accommodate the Ferndale development in its’ current form. Replacement of the existing sewer would be required to provide sufficient capacity.

- St. Thomas Public Works staff have confirmed that there is sufficient capacity in the existing St. Thomas collection system downstream of the St. George SPS to the WWTP to accommodate the Ferndale settlement area.
**Option B: St. Thomas WWTP via Alternate/New Transmission Mains**

Description: Ferndale settlement area sewage would be conveyed to the St. Thomas WWTP via existing servicing routes or new sewers / forcemains.

Discussion:

- Other servicing routes (i.e. other than St.George Street sewer) through the Central Elgin/St.Thomas existing collection system have not been investigated in detail by St.Thomas and Central Elgin. To date, only the St.George Street route has been reviewed.

- Ferndale elevation is approximately 235 m, the WWTP approx. 205 m, distance is approx. 4.5 km, resulting in an average fall of 0.7%. Providing a gravity sewer between these points via Wellington Road and Sunset would present several constraints as follows:
  - Topography is not consistent, resulting in a long flat length near the WWTP end on the route;
  - There are approximately six watercourse crossings where syphons may be required to preserve grade on the sewer;
  - Environmental constraints/approvals are likely to be onerous given the watercourses involved.

- A forcemain would be more feasible than a sewer, however, it is a long distance resulting in high capital/operating costs and operational challenges (i.e. flushing, septicity, odour).

**Option C: Optimization of Existing Wastewater Collection System and Utilize St. Thomas WWTP**

Description: Ferndale settlement area sewage would be conveyed to the St.Thomas WWTP and alternate strategies would be utilized to optimize capacity of available infrastructure.

Discussion:

This option would utilize the existing St.George sewer route with alternative servicing strategies aimed at reducing design flows in the limiting sections of the St. George system to available capacity. Strategies being considered are as follows:

- Diversion of Pump Station 3 (PS3): if PS3 (i.e. Block A15, Crescent Ave.) was redirected to the WWTP or an existing sewer using a forcemain (approx. 2 km length to WWTP), this would reduce loading on the St.George sewer by approximately 100 ERUs. Thereby, freeing up capacity for Ferndale flows. (Refer to figure in Appendix B.)

- Diversion of PS2 to PS4: a forcemain would need to be constructed along the CNR ROW approximately 1 km. This would free up significant capacity in the St.George sewer. The viability of this strategy is dependant upon available capacity in the system downstream of PS4. Based on a preliminary review, St. Thomas staff have indicated that the capacity downstream of PS4 should not be a problem.
Flow monitoring by Central Elgin has confirmed that peak flow rates are correlated to rainfall events indicating that there is significant infiltration/inflow (I/I) to the system. Given this, providing equalization storage (i.e. CSO facility) for I/I volume along with a concerted effort to reduce the I/I within the system has the potential to increase available capacity in the sewer system during peak flow events without significant upgrades. Central Elgin staff have confirmed that there may be a suitable location (i.e. intersection of St. George and Wellington Road) to accommodate such a facility. This location is in a non-residential area and has sufficient land to accommodate the facility.

Increased capacity may be available in the St. George sewer if surcharging is accounted for. This option is considered acceptable by the Municipality of Central Elgin, since the sewers are deep and the risk of service surcharge low. Central Elgin has indicated that they are open to this strategy, however, it would have to be investigated thoroughly before it would be adopted.

Option D: New Self-Contained Sewage Package Plant (package plant) near Talbotville

Description: Ferndale and Talbotville settlement areas sewage would be conveyed to a new package plant near Talbotville.

Discussion:

- See Talbotville servicing for comments.
- This strategy is dependent on the assimilative capacity of the receiver (i.e. Dodd Creek), MOE approval requirements and the costs (capital/operational) of such a facility. In other words, a full EA Process.
- Topographic mapping indicates that both the Talbotville and Ferndale development areas are significantly higher than Dodd Creek and gravity sewer servicing and outfall should be feasible. Ferndale is approximately 2 km from both Talbotville and Dodd Creek, the amount of sewer required would depend on the location of the new WWTP.

Option E: Utilize existing Ford Motor Company Wastewater Treatment Plant (WWTP)

Description: Ferndale settlement area sewage would be conveyed to the existing Ford WWTP.

Discussion:

- Ford WWTP is rated for 3200 m³/day (1900 ERU). Ferndale requires 270 ERUs.
- Ontario Clean Water Agency (OCWA), who had been approached by the potential new owner to operate the facility, indicates that the potential owner is receptive to the idea of receiving sewage from the settlement areas for treatment. There are many details which need to be confirmed in order to consider this option viable including confirmation from new owners of available capacity, feasibility of the facility to treat residential sewage, timing for this capacity to be made available and costs associated with this option.
Based on preliminary topographic information, Ferndale is lower than the Ford plant. Therefore, sewage would need to be pumped to the plant. Ferndale is approximately 5.7 km to the Ford WWTP which would be a long forcemain resulting in high capital/operating costs.

**Sanitary Summary:**

- A combination of Options A & C would be preferred. Utilizing the existing St. George Street sewer to convey flows to the St. Thomas WWTP would be the most cost effective and efficient method of servicing the Ferndale settlement area, but only if it could be accomplished without replacing large sections of the St. George sewer. Therefore, one, or a combination of the strategies outlined in Option C, would need to be implemented to allow the existing St. George Street sewer to accommodate the Ferndale settlement area.

- Option B would include a long forcemain to the St. Thomas WWTP. Although this option would have it’s challenges (i.e. water crossings, operational issues, cost), it will need to be considered if details regarding other options make them impractical.

- The feasibility of the package plant option (i.e. Option D) is largely contingent upon establishing an acceptable receiver for the plant effluent. Without this, this option is not possible.

- There are a number of unknowns regarding the utilizing the Ford WWTP (i.e. Option E), at this time. This option would need to be investigated further once a new owner has been established.

Selecting the best sanitary servicing strategy for this settlement area will require additional investigations in the form of a Class EA undertaken by the municipality.

### 6.0 TALBOTVILLE SETTLEMENT AREA

**Development Allocation:** 605 Equivalent Residential Units (ERU) *(Figure 1)*

#### 6.1 Water Servicing:

Talbotville settlement area would utilize the existing Southwold water system. As indicated previously, there is sufficient water supply to accommodate this development. Currently, there is a 350 mm trunk main on Talbot Line along with 150 mm local mains on Sunset Road, Talbot Line, Shady Lane Crescent, Green Park Drive and Gore Road. This watermain distribution network would have sufficient conveyance capacity to service this settlement area. Local mains would need to be extended from these trunk mains into the settlement area. Ideally, the local mains should be “looped” to the trunk main to maintain residual chlorine consistent with provincial regulations.

#### 6.2 Sanitary Servicing:

**Option A: St Thomas WWTP via St. George Street**

Note: Options are similar to Ferndale Settlement Area.
Description: Talbotville settlement area sewage would be conveyed to the St. Thomas WWTP via St. George Street collection system.

Discussion:

a) WWTP Capacity:

- The 1997 Agreement with St. Thomas provided for up to 1800 m$^3$/d sewage treatment for Southwold. Further, the agreement indicates that 585 m$^3$/d was allocated to existing and approved development at the date of signing of the agreement. Therefore, the remaining capacity of 1,215 m$^3$/d was allocated to the Township of Southwold for the secondary servicing area in the Lynhurst neighbourhood developments which includes Talbotville and Ferndale.

- Exact capacity available in WWTP is unclear. To date, St. Thomas has only confirmed that there is 270 units of available capacity. Talbotville requires 605 units. The Talbotville settlement area has not been included in any City planning of sewage treatment capacity upgrades at the WWTP. However, the 1997 inter municipal service agreement does provide a City commitment to treat the sewage that is being generated by the current Lynhurst/Ferndale primary and secondary service areas and also commits to treat future additional flows that will be generated in the secondary service area, north of McBain Line. The treatment of flows from the Talbotville settlement area would need to be negotiated with St. Thomas and an amendment made to the agreement.

- During the next 20 years of growth and development, the 8,516 m$^3$/d of currently uncommitted hydraulic capacity at the WWTP will be committed on a plan of subdivision approval basis when draft plan of subdivision conditions are issued. Based on St. Thomas' current population and employment projections, as well as the current commitments, this remnant unused capacity will not be adequate to satisfy new development needs within a 20-year planning horizon. The recent completion of the WPCP Wastewater Management Master Plan and Class EA includes a capacity expansion of 9,100 m$^3$/d with a cost estimate for this capacity upgrade, which will assist St. Thomas in its capacity allocation within and beyond the 20-year planning period. The capacity upgrade of the plant will be initiated when flows reach 85% of the plants' currently rated capacity.

b) St. George Street Collection System:

- It is unlikely that the St. George sewer would be used to service the Talbotville area in its' current form since any available capacity realized/achieved through improvements, minor upgrades and/or operational changes would likely be utilized by the Ferndale settlement area, given it's close proximity. Also, sending Talbotville sewage via the St. George sewer is not an efficient route to the WWTP and would require pumping since there is no fall to the St. George sewer from Talbotville.

- However, if there is a significant upgrade to the St. George system proposed to accommodate development in St. Thomas, such as the replacement of the entire sewer and upgrades to the related pumping station (i.e. Ferndale - Option A), consideration should be given to including Talbotville in the design service area.
Option B: St. Thomas WWTP via Alternate/New Transmission Mains

Description: Talbotville settlement area sewage would be conveyed to the St Thomas WWTP via existing servicing routes or new sewers/forcemains.

Discussion:

• As with Option A, available capacity at the St. Thomas WWTP would need to be confirmed.

• Other servicing routes (i.e. other than St. George Street sewer) through the Central Elgin / St. Thomas existing collection system have not been investigated in detail. St. Thomas nor Central Elgin staff were aware of alternative servicing routes, however to date, only the St. George Street route has been reviewed.

• From Talbotville to the WWTP, there is an average fall of 0.6% over the approximate 4.7 km distance between them. Providing a sewer between these points via Wellington Road and Sunset would involve several constraints as follows;

  - Topography is not consistent, resulting in a long flat length near the WWTP end on the route.

  - There are approximately six watercourse crossings where syphons may be required to preserve grade on the sewer.

  - Environmental constraints/approvals are likely to be onerous given the watercourses involved.

• Given the above, a forcemain would be the better option, however, it is a long distance resulting in high capital/operating costs and operational challenges (i.e. flushing, septicity, odour).

Option C: Talbotville New Wastewater Package Plant

Description: Talbotville settlement area sewage would be conveyed to a new wastewater package plant that may service Ferndale as well.

Discussion:

• Talbotville development area is in proximity (i.e. < 1 km) to Dodd Creek which may be suitable as a receiver for a package plant effluent.

• This strategy is dependent upon the assimilative capacity of the receiver (i.e. Dodd Creek), MOE approval requirements and the costs (capital/operational) of such a facility.

• Dodd Creek Subwatershed study (SWS) provides some background regarding flows which may be useful in assessing suitability for direct discharge. Western part (i.e. upstream) of Dodd Creek has intermittent flow. Eastern part has base flow of 1-4 l/s. Also, during dry periods, the Ford WWTP was a significant contributor to the stream flow. Water quality is marginal. (Refer to Appendix C).
• Kettle Creek Conservation Authority (KCCA) may have flow records for this watercourse to assist in determining it’s viability as a receiver.

• Operation of the package plant with the low flows expected may initially be difficult.

• Topographic mapping indicates that the Talbotville development area is significantly higher than Dodd Creek and gravity sewer servicing and outfall should be feasible. Talbotville is approximately 1 km from Dodd Creek, the amount of sewer required would depend on the location of the new package plant.

• It is expected that any package plant would be owned and operated by the municipality (i.e. not privately owned or part of a condo corporation). If the package plant is privately owned, the MOE may require the Township to have a responsibility agreement with the owner to ensure long term operation of the facility.

**Option D: Utilize Existing Ford Motor Company Wastewater Treatment Plant (WWTP)**

Description: Talbotville settlement area sewage would be conveyed to the existing Ford WWTP.

Discussion:

• Ford WWTP is rated for 3200 m³/day (1900 ERU). Talbotville requires 605 ERUs.

• Ontario Clean Water Agency (OCWA), who had been approached by the potential new owner to operate the facility, indicates that the potential owner is receptive to the idea of receiving sewage from the settlement areas for treatment. There are, however, many details which need to be confirmed in order to consider this option viable including the confirmation from new owners of available capacity, feasibility of the facility to treat residential sewage, timing for this capacity to be made available and costs associated with this option.

• Based on preliminary topographic information, Talbotville is lower than the Ford plant. Therefore, sewage would need to be pumped to the plant. Talbotville is approximately 4.4 km to the Ford WWTP, which would be a long forcemain resulting in high capital/operating costs.

**Sanitary Summary:**

• Until critical details (i.e. Option A/B: availability of capacity at St. Thomas WWTP; Option C: confirming a suitability receiver) have been determined, it is difficult to recommend a preferred option.

• There are a number of unknowns regarding utilizing the Ford WWTP (i.e. Option D) at this time. This option would need to be investigated further, once a new owner has been established.

Selecting the best sanitary servicing strategy for this settlement area will require additional investigations in the form of a Class EA undertaken by the municipality.
7.0 PORT STANLEY SETTLEMENT AREA

Development Allocation: 120 Equivalent Residential Units (ERU) (Figure 2)

7.1 Water Servicing:

Port Stanley settlement area would utilize the existing Southwold water system. As indicated previously, there is sufficient water supply to accommodate this development. Currently, there is a 150 mm local main on Thomas Road and a 200 mm local main on Lake Line. These watermains would have sufficient conveyance capacity to service the two settlement areas considered. Local mains would need to be extended from existing mains into the settlement area. Ideally, the local mains should be “looped” to the trunk main to maintain residual chlorine consistent with provincial regulations.

7.2 Sanitary Servicing:

Option A: Individual Septic Systems

Description: Port Stanley settlement area would be developed on private services.

Discussion:

- Number of potential units would have to be reduced significantly to accommodate sewage treatment/disposal systems.
- Private servicing would require extensive geotechnical and hydrogeological studies to support their use and the Township would have to have a long term plan in place to connect these units to full municipal services.
- This development configuration is not consistent with the Provincial Policy Statement.

Option B: Port Stanley Lagoons

Description: Port Stanley settlement area would be conveyed to the Port Stanley Lagoons (Lagoons) for treatment.

Discussion:

- The Municipality of Central Elgin has confirmed that treatment capacity at the Lagoons would be available to service these developments. The subject development areas would be serviced directly to an existing sewage pumping station (SPS) located near the intersection of Union Road and Warren Street. Sewers would need to be extended from this SPS to the development areas, however, there appears to be sufficient grade to provide gravity service. The SPS has been recently upgraded, so capacity will not be an issue. This strategy is contingent on the municipalities agreeing on terms.
TOWNSHIP OF SOUTHWOLD
Official Plan
Schedule ‘A’
Port Stanley Hamlet

FIGURE 2
PORT STANLEY COMMUNITY

PORT STANLEY
VACANT RESIDENTIAL LAND SUPPLY 16.0 ha
EQUIVALENT RESIDENTIAL UNITS 110
INCLUDING DEVELOPMENT INTEREST
DEVELOPMENT INTEREST 80 ERUs
20 ERUs
10 ERUs

Port Stanley
N.T.S.

LEGEND
- Existing Rural Development Area
- Adopted Plan Proposed Expansion
- Area Under Consideration to be Deleted From Adopted Schedule ‘A’
Option C: New Wastewater Packaged Plant

Description: Port Stanley settlement area sewage would be conveyed to a new wastewater package plant for treatment.

Discussion:

• Given the small number of development units considered and the fact that they are located in two separate areas, requiring either two plants or a sewer/forcemain between the two areas, makes this option less attractive due to per unit costs involved.

• This strategy is dependent upon establishing an acceptable effluent receiver, MOE approval requirements and the costs (capital/operational) of such a facility.

• It is expected that any package plant would be owned and operated by the municipality (i.e. not privately owned or part of a condo corporation). If the package plant is privately owned, the MOE may require the Township to have a responsibility agreement with the owner to ensure long term operation of the facility.

Sanitary Summary:

• Option B appears to be the most feasible option, since it would utilize available capacity in existing infrastructure (i.e. WWTP, SPS and forcemain). This option is contingent on the municipalities agreeing on terms.

• Option A does not satisfy the Township’s development needs or Provincial Policy Statement.

• Establishing an acceptable effluent receiver and capital/operating associated with Option C make this option less attractive.

Selecting the best sanitary servicing strategy for this settlement area will require additional investigations in the form of a Class EA undertaken by the municipality.

8.0 SHEDDEN / FINGAL SETTLEMENT AREAS

Note: Shedden and Fingal settlement areas were considered from a planning density perspective with both individual and communal/municipal servicing configurations. Development allocation provided reflects both configurations.

Development Allocation:

Individual Servicing: 93 Equivalent Residential Units (43 ERU Shedden, 50 ERU Fingal) (Figures 3 & Figure 4)

Communal/Municipal Servicing: 505 Equivalent Residential Units (245 ERU Shedden, 260 ERU Fingal)
FIGURE 4
FINGAL COMMUNITY

VACANT RESIDENTIAL LAND SUPPLY  45.4 ha
EQUIVALENT RESIDENTIAL UNITS  50-260
8.1 Water Servicing:

Shedden and Fingal settlement area would utilize the existing Southwold water system. As indicated previously, there is sufficient water supply to accommodate this development. Currently, there are existing 300-350 mm trunk mains through both development areas with extensive local main networks in each. These watermain distribution networks would have sufficient conveyance capacity to service these settlement areas. Local mains would need to be extended from the existing network into the settlement area. Ideally, the local mains should be “looped” to the existing mains to maintain residual chlorine consistent with provincial regulations.

8.2 Sanitary Servicing:

Option A: Individual Septic Systems

Description: Shedden and Fingal settlement areas would be developed on private services.

Discussion:

• Number of potential units would be reduced significantly due to large lot size required to accommodate sewage treatment/disposal systems.

• Private servicing would require extensive geotechnical and hydrogeological studies to support their use and the Township would have to have a long term plan in place to connect these units to full municipal services (i.e. Option B).

• This development configuration is not in accordance with the Provincial Policy Statement (PPS).

Option B: Wastewater Packaged Plant

Description: Shedden and Fingal settlement areas would be serviced by new wastewater package plants.

Discussion:

• Given the distance (i.e. 4 km) between the development areas, it may not be feasible (i.e. cost, operation) to convey sewage between them. Therefore, each area may need its own package plant. Obtaining a suitable effluent receiver (i.e. watercourse) would need to be confirmed for direct discharge.

• Alternatively, subsurface disposal could be considered. This strategy would need to be confirmed with geotechnical and hydrogeological investigations, and additional lands would be needed to accommodate this option.

• It is expected that any package plant would be owned and operated by the municipality (i.e. not privately owned or part of a condo corporation). If the package plant is privately owned, the MOE may require the Township to have a responsibility agreement with the owner to ensure long term operation of the facility.
Sanitary Summary:

- Additional information regarding both options is required to determine the feasibility of either option and to identify a preferred option. If both options are determined to be feasible, Option B would be preferred, as it would allow for the efficient use of the lands and meet the PPS.

Selecting the best sanitary servicing strategy for this settlement area will require additional investigations in the form of a Class EA undertaken by the municipality.

9.0 STORMWATER MANAGEMENT (SWM)

9.1 General:

SWM for the various future settlement areas considered in the Adopted Official Plan is to be provided in accordance with Township of Southwold, Design and Construction Standards. This document outlines the SWM design criteria and guidelines to be adhered to for new development within the Township. A copy of the applicable section is contained in Appendix D. Primary reference is the “Stormwater Management Planning and Design Manual”, Ontario Ministry of the Environment, March 2003, which is to be applied in consultation with the local Conservation Authority, Department of Fisheries and the Township Engineer.

These standards/guidelines provide sufficient technical guidance, however, they are general in nature. Therefore, the specific SWM design will need to be customized for each development and settlement area to suit the type, size and configuration of the subject development. The design must also consider the issues related to the receiving watercourse including quality treatment level, flooding constraints, erosion susceptibility and adequacy of the outlet.

In addition, to the technical aspects of the SWM design, logistical issues such as requirements of the Municipal Drainage Act and legal requirements/rights related to the use of natural/non-legitimized watercourses will need to be considered as part of the overall SWM/Drainage strategy.

9.2 Objectives:

In general, the SWM strategy for each development should achieve the following objectives:

- Maintain or reduce flood risk and nuisance to downstream and adjacent properties.
- Ensure water quality of runoff does not deteriorate and protection levels as outlined in the MOE March 2003 guidelines are met.
- Include a hydrogeological assessment which considers water balance, appropriateness of groundwater recharge, interaction of SWM facilities with groundwater and potential impact of underground servicing on groundwater flow.
- Prevent an increase in erosion forces in receiving watercourses.
- Ensure that discharge of runoff is directed to an adequate/legal outlet.
• Ecological review to identify natural heritage features and significant habitat of endangered and threatened species. Prepare an Environmental Impact Study, if development is proposed adjacent to these features.

• Consider thermal impacts of development on receivers.

• Ensure that the strategy is appropriate for the configuration, scale and location of the development. All SWM strategies are to be considered in the design including end-of-pipe facilities, conveyance controls and Low Impact Development (LID) features. A treatment train approach to SWM is preferred where possible to improve treatment/control and reduce future maintenance requirements.

Providing a specific SWM strategy for each settlement area considered in the Official Plan is beyond the scope of this Study. Development of the settlement areas could however be completed with minimal impact to the receiving watercourses and adjacent properties provided an appropriate SWM strategy is implemented as part of the development plan. This strategy should conform to the standards and guidelines outlined in this section.
10.0 CONCLUSIONS / RECOMMENDATIONS

Based on our review of the servicing requirements for the Township of Southwold small settlement areas, we offer the following conclusions and recommendations:

- Water servicing of future settlement areas within Southwold would utilize the existing Southwold water distribution system which is supplied by the St. Thomas Area Secondary Water Supply. Both the primary and secondary water suppliers have indicated, that currently, there is sufficient available water supply to accommodate the development identified in the small settlement areas. The suppliers, however, do not allocate supply to any individual municipality. It is available to all benefitting municipalities on an aggregate supply basis.

- The existing Southwold water distribution system is in close proximity to the small settlement areas and sizing should be adequate to accommodate development proposed (i.e. residential). Local main extensions would be required to service the specific developments.

- Southwold does not currently have a municipal wastewater system. Existing development is serviced either by private services or sent to the St. Thomas wastewater plant. Options considered for a Township wide sanitary servicing strategy would include the “Do Nothing” or “Treatment Plant to service all settlement areas” options. The “Do Nothing” will not satisfy the requirements of the Provincial Policy Statement or the Township since this would severely limit growth, thereby, restricting Southwold's financial sustainability which in turn affects the community's viability. The later option would be cost prohibitive and difficult to implement. Given this, local/individual servicing solutions are recommended for each settlement area.

- Sanitary servicing options for the various settlement areas were identified and evaluated based on available information. Additional information requirements and issues were identified where applicable for further review. A summary of the options are provided in Table 3.

- The current Township Stormwater Management (SWM) policy generally addresses the requirements of future development, however, the SWM strategy for each settlement area should consider the objectives outlined within this study.

- This report is intended to be used as background information for future Class Environmental Assessments (Class EAs) to be undertaken by the municipality aimed at selecting the preferred servicing strategy for each of the small settlement areas.

- Capital costs associated with the various servicing options considered in this report would be recovered through a combination of federal/provincial funding, Development Charges and water/sewer rates.
<table>
<thead>
<tr>
<th>Settlement Area</th>
<th>Option</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ferndale</strong></td>
<td>A &amp; C</td>
<td>Utilizing the existing St. George Street sewer to convey flows to the St. Thomas WWTP. Strategies to reduce peak flows and increase available capacity will need to be implemented.</td>
<td>This option would utilize available capacity in existing infrastructure. Expected to be either a Class EA Schedule A, A+ or B project.</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Ferndale settlement area sewage would be conveyed to the St Thomas WWTP via existing servicing routes (other than St. George sewer) or new sewers/forcemains.</td>
<td>There is limited review of alternative routes through the existing sewer system. Feasible solution may include a long forcemain to the St. Thomas WWTP which would have its challenges (i.e. water crossings, operational issues, cost). Expected to be either a Class EA Schedule A, A+ or B project.</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>Ferndale and Talbotville settlement areas sewage would be conveyed to a new package plant near Talbotville.</td>
<td>The feasibility of this option is largely contingent upon establishing an acceptable receiver for the plant effluent. Would be a Class EA Schedule C project.</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>Ferndale settlement area sewage would be conveyed to the existing Ford WWTP</td>
<td>There are a number of unknowns regarding the utilizing the Ford WWTP (i.e. Option E) at this time, this option would need to be investigated further once a new owner has been established. Expected to be a Class EA Schedule B project.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Talbotville</strong></td>
<td>A</td>
<td>Talbotville settlement area sewage would be conveyed to the St Thomas WWTP via St George Street collection system.</td>
<td>Available capacity at the St. Thomas WWTP would need to be confirmed. Also, it is unlikely that the St. George sewer could be used to service the Talbotville area given it’s limited capacity. Expected to be either a Class EA Schedule A, A+ or B project.</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Option B: Talbotville sewage would be conveyed to the St Thomas WWTP via existing alternate servicing routes or new sewers/forcemains.</td>
<td>Available capacity at the St. Thomas WWTP would need to be confirmed. There is limited review of alternative routes through the existing sewer system. Feasible solution may include a long forcemain to the St. Thomas WWTP which would have its challenges (i.e. water crossings, operational issues, cost). Expected to be either a Class EA Schedule A or B project.</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Ferndale and Talbotville settlement areas sewage would be conveyed to a new package plant near Talbotville.</td>
<td>The feasibility of this option is largely contingent upon establishing an acceptable receiver for the plant effluent. This would be a Class EA Schedule C project.</td>
</tr>
<tr>
<td>Settlement Area</td>
<td>Option</td>
<td>Description</td>
<td>Comments</td>
</tr>
<tr>
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</tr>
<tr>
<td>Talbotville</td>
<td>D</td>
<td>Talbotville settlement area sewage would be conveyed to the existing Ford WWTP.</td>
<td>There are a number of unknowns regarding the utilizing the Ford WWTP at this time, this option would need to be investigated further once a new owner has been established. Expected to be a Class EA Schedule B project.</td>
</tr>
<tr>
<td>Port Stanley</td>
<td>A</td>
<td>Port Stanley settlement area would be developed on private services.</td>
<td>Number of potential units would be reduced significantly. Geotechnical and hydrogeological review required to confirm feasibility. Township long term plan required for full municipal services. Not consistent with the PPS. This would be a Class EA Schedule A project.</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Port Stanley settlement area would be conveyed to the Port Stanley Lagoons for treatment.</td>
<td>This option would utilize available capacity in existing infrastructure (i.e. Lagoon, SPS). Expected to be either a Class EA Schedule A, A+ or B project.</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Port Stanley settlement area(s) sewage would be conveyed to a new wastewater package plant(s) for treatment.</td>
<td>Dependent upon establishing an acceptable effluent receiver. Development is in two separate areas requiring either two plants or sewer/forcemain to connect them. This would be a Class EA Schedule C project.</td>
</tr>
<tr>
<td>Shedden and Fingal</td>
<td>A</td>
<td>Shedden and Fingal settlement areas would be developed on private services.</td>
<td>Number of potential units would be reduced significantly. Geotechnical and hydrogeological review required to confirm feasibility. Township long term plan required for full municipal services. Not consistent with the PPS. This would be a Class EA Schedule A project.</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Shedden and Fingal settlement areas would be serviced by new package plants.</td>
<td>Contingent on obtaining a suitable effluent receiver (i.e. watercourse/ subsurface). This would be a Class EA Schedule C project.</td>
</tr>
</tbody>
</table>

We trust that this study meets your present requirements. Should you have any questions, please do not hesitate to contact our office.

TRITON ENGINEERING SERVICES LIMITED


ZELINKA PRIAMO LTD.

George Balango, RPP, MCIP
APPENDIX A

Township of Southwold
Water Distribution System
APPENDIX B

Figure 1
St. George St. Sanitary Sewer Evaluation
July 2009
(Dillon Consulting)
APPENDIX C
Dodd Creek Community Based Watershed Strategy
4.2 Water Resources
4.2 Water Resources

4.2.1 Stream Morphology
Dodd Creek drains a clay plain; therefore, the bottom substrates are composed mainly of silts with some sand and little gravel. Approximately 80% of the stream reaches in the watershed have been significantly altered, with many being straightened and channelized for drainage purposes. The areas near Paynes Mills are predominantly in a natural state and are considered the most stable with erosion being limited to natural processes.

The riparian canopy is highly disturbed with an average of 80% of the stream area being partly to completely open and only 20% shaded by vegetation during mid-day. Vegetation can regulate in-stream primary production, supply energy and nutrients (in the form of litter, fruits, terrestrial insects and other organic matter) that are essential to aquatic organisms, and provide essential aquatic habitat by way of large woody debris. Shading also plays an important role in regulating water temperatures.

Aquafon Beech Limited. 1995. Kettle and Dodd Creek Subwatershed Study – Phase II to V.

4.2.2 Groundwater
Within the Upper Kettle and Dodd Creek watersheds, the groundwater system is known to consist of shallow, intermediate and deep overburden aquifers and a bedrock aquifer. These four aquifers provide a potable water supply for rural residences and some communities and help provide baseflows to streams.

Based on water well records, it is estimated that the overburden aquifers provide a potable water supply to rural wells in the Tempo and Glanworth areas. A low percentage of the water supply wells that have been surveyed extend into the bedrock aquifer. There are approximately 382 active and inactive wells in the Dodd Creek watershed.

Groundwater movement in the aquifers is regionally southwards toward Lake Erie. Because of this, areas outside the Dodd Creek watershed have the potential to influence the local aquifers and, therefore, groundwater quality. The susceptibility of the Dodd Creek watershed is low due to the predominance of fine-grained materials such as clay and compacted tills at ground surface.

Recharge areas are generally located in isolated pockets throughout the middle of the watershed while discharge areas only occur around White's Wetland. Approximately 12% of the Dodd Creek watershed
Dodd Creek Community Based Watershed Strategy

lies in a high infiltration potential zone. This percentage is determined by GIS analysis of four parameters influencing infiltration, quaternary geology, soils, land use and slope.

Aquafor Beech Limited. 1995. Kettle and Dodd Creek Subwatershed Study – Phase II to V.

4.23 Stream Flow

Historically, wetlands likely contributed the bulk of the summer flows to Dodd Creek but, through settlement and the clearing of land for agriculture, few of these wetlands exist today, leading to many areas of the watershed drying up annually.

Dodd Creek drains an area of approximately 132 km² with an approximate fall of 50 metres. Stream flow in the west areas of the Dodd Creek watershed is often intermittent and very reactive to periods of rain. The eastern portion of the watershed demonstrated base flows of approximately one to four litres per second and appears to be drawing its water from White’s Wetland and other groundwater seep sources. In dry conditions, it would appear that the Ford Plant is a significant contributor to Dodd Creek’s stream flow. From the data in the 1995 Stream Base Flow Hydrology Report, the main branch and western sections of Dodd Creek have a very poor natural recharge ability.


4.24 Surface Water Quality

Surface water quality data is available for the Dodd Creek watershed through a variety of studies. Much of this information is dated but it provides a good source of baseline data for the watershed. The Dodd Creek watershed was monitored at four separate sites from 1969-1995 through the Ministry of the Environment’s Provincial Water Quality Monitoring Network (PWQMN). Not all sites were monitored for the entire period. The PWQMN was reinstated in October 2004 after a 10 year gap to determine the current water quality conditions of the watershed.

The dominant land use in the watershed is agricultural and water quality results are expected to reflect that land use. Parameters such as bacteria, phosphorous and nitrates are often elevated in predominately agricultural settings and may affect the environmental health of Dodd Creek.

Fecal coliform levels in the Dodd Creek watershed were high throughout the monitoring period (1969-1995). Elevated fecal coliform levels indicate continuous inputs of contamination from human or animal waste into the water system. Conductivity values generally exceed 700 µS/cm during the autumn, indicating a concentration of dissolved ions (nutrients, salts).

Phosphorus levels were also above acceptable levels and showed a consistent increase over the monitoring period. Phosphorus enters water systems through human or animal wastes, fertilizers, soaps, industrial wastes, and the disturbance of land and its vegetation. When too much phosphorus is available, plants grow rapidly and can result in an algae bloom, decreasing dissolved oxygen levels and ultimately affecting the health of the organisms living in the stream.

Nitrate levels were above acceptable levels and showed a consistent increase over the monitoring period. Nitrate levels were generally in the acceptable range for the Dodd Creek watershed but the values increased over the 25 year monitoring period.

The surface water quality results in the Dodd Creek watershed mirror the trends found throughout the entire Kettle Creek watershed.

APPENDIX D

Township of Southwold
Design and Construction Standards
Section 2
Storm Sewers / Stormwater Management
SECTION 2 - STORM SEWERS/STORMWATER MANAGEMENT

2.1 Storm Sewers

2.1.1 General

Storm sewers shall be designed in accordance with the design principles as outlined in the most current edition of the Ministry of the Environment Guidelines for the Design of Storm Sewers. Design computation sheets shall be submitted to the Township’s Engineer for approval.

The basic design factors requiring evaluation are land use, design frequency, precipitation and runoff coefficient. The storm sewers shall be designed for a period of not less than 50 years and shall be designed to convey the 2-year minor storm event (unless otherwise required) to a sufficient outlet or to a storm water management facility which will control post-development peak flows to pre-development flows including the 2, 5, 25 and 100-year storm events.

The design of storm sewers shall be completed using the attached Rainfall Intensity Duration Curve, Drawing MSD-16. Alternatively, the intensities may be calculated using the following formula for the Intensity-Duration-Frequency relationship and corresponding constants:

\[
    i = \frac{a}{(t+b)}
\]

<table>
<thead>
<tr>
<th></th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>50 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>604.867</td>
<td>477.211</td>
<td>549.307</td>
<td>564.271</td>
<td>616.62</td>
<td>702.431</td>
</tr>
<tr>
<td>b</td>
<td>4.862</td>
<td>2.475</td>
<td>2.819</td>
<td>3.111</td>
<td>2.819</td>
<td>2.936</td>
</tr>
<tr>
<td>c</td>
<td>0.728</td>
<td>0.617</td>
<td>0.616</td>
<td>0.578</td>
<td>0.57</td>
<td>0.573</td>
</tr>
</tbody>
</table>

In addition, runoff from major storm events (i.e. 100-year and Regional Storms) shall be accommodated by an overland flow route that has been designed assuming that all of the source controls and storm water conveyance controls have failed.
2.1.2 **Estimated Quantity of Storm Runoff**

The Rational Formula is to be used to determine the quantity of storm water runoff. The use of other empirical runoff formulae must be approved by the Township’s Engineer. The Rational Formula is:

\[ Q = 2.78 \, C \, i \, A \]

in which \( Q \) is the storm water runoff in liters per second (l/s), \( C \) is the runoff coefficient, \( i \) is the average rainfall intensity in mm per hour, and \( A \) is the drainage area tributary to the point under design in hectares.

In order to determine the intensity of rainfall for use in the Rational Formula, the following time of concentrations shall be used:

- Flat residential districts \((c<0.35)\) 20 minutes or less
- Well developed districts 15 minutes or less
- Densely developed districts \((c>0.75)\) 10 minutes or less

The use of inlet times other than those indicated above, shall be subject to the approval of the Township’s Engineer.

The following runoff coefficients are to be used with the Rational Formula:

- Single Family Residential 0.35
- Multi Family Residential 0.65
- Undeveloped Residential 0.50
- Commercial 0.70
- Industrial 0.70
- Parks, Cemetery, Playgrounds & Farmlands 0.20

In general, infiltration of ground water can be ignored in storm sewer design computations.

2.1.3 **Location**

Storm sewers shall be located in accordance with the Standard Utility Location Drawing MSD 1A, MSD 2, and MSD 3.
2.1.4 **Minimum Pipe Size**

The minimum size of the storm sewer shall be 300mm diameter. The sewer gradient shall be such that a minimum velocity of 0.9 m/s is attained with the maximum velocity being:

- 4.6 m/s for 300mm to 825mm diameter sewers
- 6.0 m/s for 900mm diameter and larger storm sewers

2.1.5 **Cover**

Minimum depth of cover on storm sewers to be 1.5m.

2.1.6 **Hydraulic Calculations**

Hydraulics - Gravity Sewers

The Mannings Formula shall be used to design gravity storm sewers.

The Manning Equation is expressed as:

\[
V = \frac{1}{n} \cdot r^{\frac{2}{3}} \cdot S^{\frac{1}{2}}
\]

where:
- \( V \) is the velocity in metres per second
- \( r \) is the hydraulic radius in metres
- \( S \) is the slope of conduit
- \( n \) is the roughness coefficient

'n' values for pipes flowing full shall be as follows:
- 0.013 - polyvinyl chloride (PVC) pipe
- 0.015 - concrete pipe 100 mm to 450 mm dia.
- 0.013 - all pipe larger than 450 mm dia.

2.1.7 **Maintenance Hole Losses**

Allowances for hydraulic losses in maintenance holes shall be as follows:

<table>
<thead>
<tr>
<th>Type of Loss</th>
<th>Allowance</th>
</tr>
</thead>
<tbody>
<tr>
<td>straight through flow</td>
<td>- 0.025 m</td>
</tr>
<tr>
<td>22½° change in direction of flow</td>
<td>- 0.035m</td>
</tr>
<tr>
<td>45°+ change in direction of flow</td>
<td>- 0.050 m</td>
</tr>
<tr>
<td>90° change in direction of flow</td>
<td>- 0.075 m</td>
</tr>
</tbody>
</table>

Although the above invert drops will be adequate for sewers flowing at velocities at the low end of the acceptable range, the required drops should be calculated for high velocity sewers.
2.1.7 **Maintenance Hole Losses** (cont'd)

If the lateral inflow is a significant portion of the total flow through the manhole, then provision must be made for increased head loss. In such instances, a detailed hydraulic analysis of the head losses shall be submitted to the Township's Engineer.

2.2 **Stormwater Management**

2.2.1 **General**

Storm sewer systems shall include storm water management facilities and/or measures for both water quality and quantity in accordance with accepted practices as outlined in the most current edition of the publication entitled "Storm water Management Planning and Design Manual" prepared for the Ontario Ministry of the Environment. Storm water storage requirements for quality control shall be in accordance with Table 3.1 of the above noted Manual with the "Level of Protection" being determined in consultation with the applicable Conservation Authority, the Department of Fisheries (DFO) and the Township's Engineer.

The design of individual stormwater management (SWM) facilities shall apply a 3-hour Chicago Rainfall Distribution using the Atmospheric Environmental Services (AES) intensity chart, MSD-17. All storms provided (i.e. 2,5,10,25,50 and 100 year) shall be evaluated for quantity control purposes.

2.2.2 **Quantity and Quality of Storm Water**

a) **Land Use**

The Township's official land use plan shall be used to forecast the ultimate probable land use in any particular area. Consideration should be given to the effect of increased urbanization. Planning and development on a watershed or a sub-watershed basis is essential.

b) **General**

In the absence of watershed/sub-watershed planning, the following principles must be considered in determining water quantity and quality criteria:

- Post Development flows must be kept to Pre-Development flows for 2-year through 100-year storm return period.
- Water Quality control is to be done to the requirements of the M.O.E. stormwater management manual and the classification of the downstream receiving body.
- Overland flows from storm events greater than a 2 year event must be addressed and conveyed to a sufficient outlet.
2.2.2 **Quantity and Quality of Storm Water** (cont'd)

The use of computer software programs to determine and evaluate the storm water management facilities, runoff generated, etc. is acceptable provided the program is approved by the Township's Engineer. All design parameters and output are to be provided to the Township's Engineer by hard copy and on computer disc in a format acceptable to the Township's Engineer. In addition, a Certificate of Approval is required from the Ministry of the Environment prior to construction being undertaken.

2.3 **Open Channels and Culverts**

a) The use of open channels shall not be permitted in residential or urbanized areas, however, open channels may be permitted, if approved by the Township, in industrial or rural areas.

b) Design of open channels and culverts shall be completed using the attached Rainfall Intensity Duration Curve, Drawing MSD-16.

Alternatively, the intensities may be calculated using the following formula for the Intensity-Duration-Frequency relationship and corresponding constants.

\[ i = \frac{a}{(t+b)^c} \]

See Section 2.1.1 for a, b and c values.

The appropriate Design Storm shall be approved by the Township Engineer.

c) Thorough soils investigations and interpretations shall be a prerequisite to the detailed design of the open channel.
2.3 **Open Channels and Culverts** (cont'd)

d) The Manning Formula shall be used in the design of open channels:

i) For grass-lined channels, 'n' values shall be based on the product of the velocity (V) and the hydraulic radius (r):

<table>
<thead>
<tr>
<th>V x r</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.5</td>
<td>0.150</td>
</tr>
<tr>
<td>0.5 to 1.0</td>
<td>0.120</td>
</tr>
<tr>
<td>1.0 to 2.0</td>
<td>0.070</td>
</tr>
<tr>
<td>2.0 to 5.0</td>
<td>0.050</td>
</tr>
<tr>
<td>5.0 to 10.0</td>
<td>0.035</td>
</tr>
<tr>
<td>&gt;10.0</td>
<td>0.030</td>
</tr>
</tbody>
</table>

ii) Side slopes for grass-lined channels shall not be steeper than 3H:IV.

iii) Flow velocities shall be in the following ranges:

- sand, sandy loam, or silty loam
  
  0.75 m/s to 0.90 m/s

- gravel, or clay material
  
  0.75 m/s to 1.50 m/s

e) Full details of open channel design including energy dissipation structures shall be submitted to the Township's Engineer.

f) To carry open channel drainage under driveways and across intersections, an appropriate sized culvert shall be used with the minimum size being 375mm in diameter. It may be necessary to increase the culvert size to accommodate higher flows from upstream tributary areas.

g) Culverts shall be 2.0mm thick minimum galvanized corrugated steel pipe or H.D.P.E. 320Kpa Bell and Spigot pipe. This material shall conform to the requirements of CSA Standard CAN 3- G401-M81 - Corrugated Steel Pipe Products.
2.4 Pipe Materials

Pipe material shall be concrete, polyvinyl chloride (PVC), or high density polyethylene (HDPE).

Pipe sub-drains to be corrugated steel pipe or polyvinyl chloride (PVC) pipe.

i) Concrete Pipe

shall conform to CSA and ASTM Standards manufactured in accordance with the following specifications:

a) Non-Reinforced to CAN/CSA A257.1 (100mm - 600mm dia.)

b) Reinforced to CAN/CSA 257.2

ii) Polyvinyl Chloride (PVC) Pipe - smooth wall (100mm - 600mm inclusive)

shall be certified to CSA B182.1 and CSA B182.2 and conform to ASTM D3034. Pipe sizes 200 mm diameter and larger shall be SDR 35, and less than 200 mm diameter shall be SDR 28 for private drain connections (PDC).

iii) Ribbed Polyvinyl Chloride (PVC) Pipe (200mm - 600mm inclusive)

shall be certified to CSA B182.4 and meet the requirements of ASTM F794.

iv) High Density Polyethylene (HDPE) Pipe (200mm-600mm inclusive),

for use on storm sewers only, with integral bell and spigot, shall be certified to CSA B182.6.

2.4.1 Pipe Joints

i) Concrete Pipe

All joints shall be rubber gasket conforming to CSA A257.3 and ASTM C443M-94.

ii) PVC Pipe

Sealing gaskets shall meet the requirements of CSA B182.2 and ASTM F477.

All PVC fabricated and moulded fittings shall be CSA certified.

iii) HDPE Pipe

All HDPE fabricated pipe and moulded fittings shall be CSA certified.
2.5 **Maintenance Holes**

a) Maintenance Holes shall be located at the junctions of sewers and at changes in grade, alignment or diameter. Maintenance Holes shall be precast concrete conforming to OPSD-701.010 to 701.080.

b) Manhole frames and grates to be in accordance with OPSD 401.010 (Type A).

c) The precast concrete adjustment units used to extend maintenance holes and catch basins shall be in accordance with OPSD 704.010 and OPSS 408. Three courses, minimum, of approved adjustment units are required on precast maintenance holes. The outside and interior faces of all concrete rings should be plastered and trowelled smooth with mortar 6mm thick, consisting of one part masonry cement and 3 parts sand.

d) Maintenance hole steps shall be circular or rectangular aluminum and shall be in accordance with OPSD 405.010 or OPSD 405.020. Steps to be at 300mm centres vertically with 450mm maximum distance from top of maintenance hole to the first step.

e) Aluminum safety landings shall be provided in maintenance holes deeper than 5.0 m from the top of maintenance hole cover to the lowest invert. Details shall be in accordance with OPSD 404.020.

f) All precast maintenance hole section joints shall contain an approved rubber gasket or approved equal. Joints, lifting holes and pipe connections are to be filled with a non-shrink mortar mix.

g) Drop structures are required at maintenance holes where the difference in invert elevations is greater than 900mm for storm sewers and shall be in accordance with OPSD 1003.010 or OPSD 1003.020. Internal drop structures are an acceptable alternative, when connecting to existing manholes and shall be according to OPSD 1003.030 and 1003.031.

h) Benching of manholes is to be performed in accordance with OPSD 701.021.
2.5 Maintenance Holes (cont’d)

i) A flexible joint shall be provided on all pipes, within 0.3 m of the outside wall of the maintenance hole. Concrete bedding 20 MPa to solid ground and extending to the first pipe joint may be used as an alternate approach.

j) All maintenance holes installed must be a “boot type” KOR-N-SEAL style, or an approved equal.

k) Maintenance hole spacing shall be as follows:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Maximum Maintenance Hole Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 450 mm</td>
<td>120 m</td>
</tr>
<tr>
<td>525 mm to 750 mm</td>
<td>150 m</td>
</tr>
<tr>
<td>over 750 mm</td>
<td>180 m</td>
</tr>
</tbody>
</table>

l) Precast Maintenance hole tees may be used in storm sewers 1200 mm in diameter and over. The precast riser sections shall be at least 1200 mm in diameter. Maintenance hole tees shall be bedded on 28 MPa concrete. Full details shall be submitted to the Township's Engineer for approval.

2.6 Catch Basins

a) Catch basins shall conform to OPSD 705.010, 705.020, 705.030 and 705.040.

b) Catch basin leads shall not be less than 250 mm in diameter and shall connect to the storm sewer as shown in OPSD 708.01 or OPSD 708.03.

c) Catch basin frames and grates shall conform to the details in OPSD 400.020 and must meet ASTM Designation A-48. Catch basin frames with curb inlet overflow, OPSD 400.090, shall be used for arterial roads and at all low points in the road. Ditch inlet catchbasin grate shall conform to OPSD 403.010. Curb inlet catch basin to be in accordance with MSD-19.
2.6 **Catch Basins** (cont’d)

d) Curb inlet catch basins shall be provided at all low points in the road with single inlet catch basins at intersections. Additional catch basins shall also be provided as follows:

<table>
<thead>
<tr>
<th>Road Gradient (%)</th>
<th>Maximum Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 to 3.0</td>
<td>90 m</td>
</tr>
<tr>
<td>3.1 to 4.5</td>
<td>75 m</td>
</tr>
<tr>
<td>greater than 4.6</td>
<td>60 m</td>
</tr>
</tbody>
</table>

e) The precast concrete adjustments units used to extend maintenance hole and catch basins shall meet the OPSD 704.010 and OPSS 407. Three courses, minimum, of approved adjustment units are required on precast maintenance holes. The outside and interior faces of all concrete rings shall be plastered and trowelled smooth with mortar 6mm thick, consisting of 1 part masonry cement and 3 parts sand.

f) All joints, lifting holes, and pipe connections are to be filled with a non-shrink mortar mix.

2.7 **Installation**

a) Sewer pipe bedding shall conform to the Township’s bedding standards for gravity and pressure pipe and shall be in accordance with MSD 11 and MSD 12.

b) Approved excavated material may be used for backfill under roads, sidewalks and driveways where an independent soils investigation, carried out by a Geotechnical Engineer, indicates that this is practical. Compacting of the material shall be carried out in accordance with the recommendations of the Geotechnical Engineer. If the excavated material is unsuitable, the trench shall be backfilled with Granular 'B' material conforming to OPSS 1010 and compacted to 95 percent Standard Proctor Density.

c) Sewer service connections for **rigid** main pipe sewer shall be in accordance with OPSD 1006.010 and for **flexible** main pipe sewer shall be in accordance with OPSD 1006.020. A 50mm x 100mm timber marker stake shall be installed at the end of the private service connection from the invert to 300mm above finished ground. The stake shall be painted **brown**.
2.7 **Installation**  (cont'd)

d) All installations shall be subject to the inspection, approval and acceptance of the Township.

e) If any utilities or services are encountered during construction they are to be supported in accordance with the requirements of the various utility companies as applicable.

f) Road surfaces shall be restored to its original condition where existing roads are disturbed, all to the satisfaction of the Township.

g) All new sewers shall be inspected by means of a closed circuit television inspection in accordance with OPSS 409 and one copy of the video given to the Township for its records. This work shall be performed by an independent inspection company under the supervision of the Township and paid for by the Contractor.

h) Ring deflection testing shall be performed on all new pipe sewers constructed using plastic pipe in accordance with OPSS 410.07.15.05. Testing is to take place no sooner than 30 days after the completion of backfilling and installation of service connections and again just prior to the end of warranty.

2.8 **Private Drain Connections**

Refer to Section 5.1.