Sandwich, Massachusetts
Comprehensive Water Resources Management Plan

Interim Wastewater Solutions Study

DRAFT
August 2011

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ES  EXECUTIVE SUMMARY

The Town of Sandwich has long been focused on promoting mixed-use development in two key areas -- the South Sandwich Village Center and the Sandwich Industrial Park. The ability of the Town to successfully develop these two areas will come down to providing a solution to the wastewater treatment and disposal issues which continue to hinder develop. If the Town were to take no action, the land would not likely be developed to its highest use and the Town would not obtain additional tax revenues.

This report identifies a solution to the wastewater collection, treatment and disposal issues that would remove these impediments for multiple projects in the targeted growth areas. Construction of wastewater treatment works will be an expensive undertaking, estimated at $25M, but it will position the Town to promote the desired growth. Further, construction of a larger joint project is estimated to save over $15M when compared to the cumulative costs of numerous developers constructing multiple smaller projects on their own. These costs and savings should be shared by all parties benefiting from the solution. If appropriately designed and sited, this interim solution could serve as the first phase of a town-wide wastewater solution.

1.0  INTRODUCTION

The Town of Sandwich developed a 2009 Local Comprehensive Plan which envisioned mixed-use, smart-growth development located in several strategic planning areas. These strategic planning areas are shown on Figure 1. The Town has identified the South Sandwich Village Center (SSVC) and the Industrial Park as the strategic planning areas of highest priority. The SSVC was the subject of a request for proposals for large-scale, mixed-use development in 2004 to 2005. The Town and the successful developer were not able to move the project forward due, in part, to a lack of wastewater facilities. The ability to develop these planning areas is complicated by the fact that they are located within numerous zoning districts and watersheds, as shown on Figure 2 and Figure 3, respectively, and are located in the water supply protection
Planning District
(as denoted in Local Comprehensive Plan)
Watershed Boundary

Source: Base data obtained from the Town of Sandwich and MassGIS

Sandwich CWRMP
Interim Solutions

Strategic Planning Areas

PROJ NO: 12217B DATE: Jul 2011 FIGURE: 1
Sandwich CWRMP
Interim Wastewater Solutions

Major Groundwater Basins

Source: Base data obtained from the Town of Sandwich and MassGIS

Septic Nitrogen Removal Percentage

Major Basin
- Canal Buzzard's Bay
- Cape Cod Bay
- Nantucket Sound

0% 80% 0% 0% 60% 79% 100% 61% 0% 0%
area of the Sandwich Water District. Some of these watersheds are tributary to coastal waters that have water quality problems caused by excess wastewater-related nitrogen. Resolution of these complicated wastewater issues is integral to the implementation of the Town's strategic vision.

The Town has initiated a comprehensive, town-wide wastewater planning process; however, this planning process is expected to take a minimum of 3 years to complete. If the Town were to wait for the completion of this town-wide plan, a wastewater solution for these areas would not be operational for as many as eight to ten years.

One or more developers have stated that they are prepared to proceed with projects in 2011 and 2012. Accordingly, the Town hopes to facilitate development in these strategic planning areas by identifying "interim wastewater solutions". The purpose of this study is to identify solutions which will satisfy the immediate needs and which will be readily expanded or incorporated into the Town-wide plan in subsequent years.

It is expected that any wastewater solutions would be planned and constructed in multiple phases in order to balance the need for wastewater solutions with the cost impacts of the infrastructure. In order to facilitate the progress of interim solutions, wastewater needs and solutions were assigned to one of three categories as presented in Table 1.

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Facilities On-Line In</th>
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<tr>
<td>Primary Focus</td>
<td>Interim Wastewater Solution</td>
<td>2 to 4 years</td>
</tr>
<tr>
<td>Secondary Focus</td>
<td>Interim Wastewater Solution</td>
<td>5 to 8 years</td>
</tr>
<tr>
<td>Future</td>
<td>Comprehensive Wastewater Solutions</td>
<td>8 to 30 years</td>
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The key issues for this project are:

1. The highly desirable, developable land targeted for economic growth in the strategic planning areas is located in the recharge areas of the Sandwich Water District's public water supply wells (Zone IIs or Water Resource Protection Districts), or the watersheds of nitrogen-sensitive coastal embayments, or both.


3. The Cape Cod Commission's (Commission's) Regional Policy Plan prohibits the construction of new wastewater treatment facilities in a Zone II, unless they are used to remediate existing water quality problems.

4. Many of the developments proposed in the strategic planning areas would be considered Developments of Regional Impact (DRIs) under the Commission's enabling legislation. The Commission's Regional Policy Plan establishes performance standards for DRIs that limit new nitrogen loads in watersheds of impaired coastal waters. These standards require a "nitrogen offset" equal to some or all of the amount of new nitrogen load to be discharged in watersheds of threatened coastal waters.

5. The Massachusetts Estuaries Project (MEP) is studying the impact of watershed nitrogen loading on coastal waters on Cape Cod. The Department of Environmental Protection (DEP) will not issue a new Groundwater Discharge Permit in a watershed where the published MEP Technical Report indicates that existing nitrogen loads are too high to support water quality goals, unless a nitrogen offset (equal to the nitrogen load from the proposed project) is completed prior to development of the proposed project. This is applicable to the projects in the SSVC and to Forestdale Village.

6. Some prospective effluent disposal sites are located outside watersheds with completed MEP Technical Reports, but are located in watersheds with pending MEP Technical Reports (Sandwich Harbor and Scorton Creek Watersheds). There may be some degree of nitrogen over-loading in one or both of those watersheds, but that has not yet been determined. Refer to Section 12 for discussion of contingency planning for this issue.
7. Some prospective effluent disposal locations are in areas that might be needed for future water supplies, including tracts identified by the Cape Cod Commission for protection.

8. The developments that have been proposed are large enough to require private WWTFs if developed on their own. At the scale of these projects, such facilities are relatively expensive on a per gallon treated basis, and considerable savings would accrue to all projects (and developers) if a single facility could be built to serve all of the projects.

9. There is considerable undeveloped land near the Sandwich Industrial Park. A significant fraction of that land has been determined to be critical wildlife habitat, and accommodating that habitat imposes constraints on these projects.

10. The Cape Cod Commission prepared a report entitled *Interim Wastewater Management Solutions for Selected Sandwich, Massachusetts Economic Growth Areas* (February 2011, referred to as the "DLTA Report"). This study is consistent with both the Local Comprehensive Plan and the DLTA Report.

11. The Town does not want to relinquish control of any Town-owned land for uses other than wastewater treatment and disposal until after the completion of the Comprehensive Wastewater Management Plan. The CWRMP is currently under development and will eventually define the town-wide wastewater management needs, solutions and costs.

2.0 ESTIMATED WASTEWATER FLOWS IN STUDY AREA

The study area for this project is shown on Figure 4 and includes parcels from the following Local Comprehensive Plan strategic planning areas:

- South Sandwich Village Center (SSVC) -- all parcels
- South Sandwich Residential Area -- selected parcels
- Industrial Park -- all parcels
- Ridge District -- selected parcels
- Forestdale Residential Area -- selected parcels

The study area includes a number of specific projects which are in various stages of conceptual planning and permitting. These projects include:
• The "Community Green" project being developed by Housing Assistance Corporation.
• The "Autumnwood" affordable housing project being developed by Autumnwood, LLC.
• The "Forestdale Village" project being developed by Forestdale Village, LLC.
• Existing schools with individual wastewater treatment plants (Forestdale, Oak Ridge, High School)
• Vacant land and existing properties owned in SSVC by Tsakalos Realty Trust.
• Vacant land owned by the Town and Sandwich Housing Authority (SHA) in SSVC, including the land that the Town has issued previous Requests for Proposals to private developers for development in the SSVC ("RFP").
• Vacant land owned by the SHA in the South Sandwich Residential Area.
• Vacant land owned by Highland Passage, LLC in the Ridge District.
• Vacant land owned by the Town, PA Landers, Inc., Bevilacqua Realty Trust in or adjacent to the Industrial Park.

The projects in the study area were categorized as "primary focus" or "secondary focus" based on the timeframe by which a wastewater solution would be needed. The determination as to which projects are of primary focus and which are of secondary focus was made by the Town based on direct feedback from potential developers.

We have utilized the following terminology in order to categorize and estimate wastewater flows:

• **Current Conditions.** Conditions represented by the general population, level of commercial activity and wastewater generation rates that exist at the present time.

• **Future Conditions.** Conditions that will exist once additional development occurs in Sandwich at some point in the future.

• **New Flow.** Increase in wastewater flows caused by growth and redevelopment.

Estimated new wastewater flows were based on information gained at multiple meetings held among Wright-Pierce staff, Town staff, Horsley Witten Group (representing Tsakalos Realty Trust), and Mark Wisentaner (representing Autumnwood, LLC and Highland Passage, LLC), or
were estimated by Wright-Pierce. The estimated wastewater flows are summarized in Table 2. The basis for estimating existing and future wastewater flows is presented in Appendix A.

<table>
<thead>
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<th>Table 2 - Estimated Study Area Water Use and Wastewater Generation</th>
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<tr>
<td><strong>Annual Average, gpd</strong></td>
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<tr>
<td>Current Wastewater Generation - Primary Focus</td>
</tr>
<tr>
<td>Current Wastewater Generation - Secondary Focus</td>
</tr>
<tr>
<td>New Wastewater Generation - Primary Focus</td>
</tr>
<tr>
<td>New Wastewater Generation - Secondary Focus</td>
</tr>
<tr>
<td>Estimated Future Flow - Total Study Area</td>
</tr>
<tr>
<td>Say 360,000</td>
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<tr>
<td>Estimated Future Flow - Primary Focus</td>
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<td>Say 230,000</td>
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3.0 ESTIMATED WASTEWATER FLOWS TOWN-WIDE

One of the goals of this study is to align the results of any interim wastewater solution with the Town's long-term wastewater needs. While the CWRMP is several years from completion, initial estimates of Town-wide wastewater flows have been made. Based on work completed by Wright-Pierce as a part of the on-going CWRMP, the current Town-wide water use and wastewater generation have been estimated at approximately 1,850,000 gallons per day (gpd) and 1,670,000 gpd, respectively, on an annual average basis.

The Town's Local Comprehensive Plan outlines the following new development town-wide:

- New Residential units: 2,696 units
- New Commercial space: 971,270 square feet (sf)
- New Civic space: 146,000 sf
- New Industrial space: 1,307,045 sf
Based on an initial analysis, this town-wide development could result in an additional 600,000 gpd of new wastewater flow, on an annual average basis. This analysis, which was completed as a part of the CWRMP, assumes that new wastewater generation rates will be the same as current wastewater generation rates for each type of land use (i.e., residential, commercial, etc.).

From a planning perspective, it is important to determine the Town-wide wastewater flow which could require treatment and disposal via a method other than existing Title 5 systems. At this early stage of the CWRMP process, there is not sufficient information in hand to make this assessment and educated assumptions are needed.

- For this study, the assumption has been made that approximately 50% of the Town-wide current wastewater flow may need to be collected for treatment (800,000 gpd, on an annual average basis) to address nitrogen control or other needs.

- For this study, the assumption has been made that as much as 75% of the new wastewater flow may need to be collected for treatment (450,000 gpd) to address one or more wastewater management needs.

The above assumptions must be assessed and refined as a part of the on-going CWRMP; however, we believe that these are reasonable initial estimates on which to move forward on the interim solutions. Further, there is no presumption that centralized wastewater treatment and disposal facilities are the final answer for Sandwich. The purpose of this analysis is to obtain or set-aside sufficient land to provide for future needs should municipal wastewater infrastructure be needed and chosen.

The estimates of Town-wide wastewater flows for current conditions, for new flow, and for projected future conditions are summarized below in Table 3.
Table 3 - Estimated Town-Wide Water Use and Wastewater Generation

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<thead>
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<th></th>
<th>Annual Average, gpd</th>
<th>Short-Term Peak, gpd</th>
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<tr>
<td>Current Wastewater Generation</td>
<td>1,670,000</td>
<td>3,340,000</td>
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<tr>
<td>Assumed Current Wastewater needing Collection</td>
<td>800,000</td>
<td>1,600,000</td>
</tr>
<tr>
<td>New Wastewater Generation</td>
<td>600,000</td>
<td>1,200,000</td>
</tr>
<tr>
<td>Assumed New Wastewater needing Collection</td>
<td>450,000</td>
<td>900,000</td>
</tr>
<tr>
<td>Assumed Future Wastewater needing Collection</td>
<td>1,250,000</td>
<td>2,500,000</td>
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For purposes of comparison, the estimated new wastewater flows for the study area (Table 2 - 360,000 gpd) is approximately 80% of the estimated Town-wide new wastewater flow needing collection (Table 3 - 450,000 gpd). If these early Town-wide projections prove out to be accurate, then the flows from the primary and secondary focus projects (360,000 gpd) would represent about 30% of the projected Town-wide need (1,250,000 gpd).

4.0 SITING REQUIREMENTS & CONSIDERATIONS

This section of the report summarizes the estimated land area requirements for treatment and disposal facilities and summarizes the key considerations related to siting the facilities. The sizing of wastewater facilities is generally governed by the short-term peak flow. Accordingly, the following flows have been utilized:

- 460,000 gpd as short-term peak, primary focus only (Table 2)
- 720,000 gpd as short-term peak, primary and secondary focus (Table 2)
- 2,500,000 gpd as short-term peak, estimated future town-wide (Table 3)

4.1 Treatment

In order to maximize future flexibility with regard to future wastewater needs, the Town would secure sufficient land area to locate a wastewater treatment facility that would address the study area needs as well as Town-wide future needs on a single site, whether or not it is used in that capacity in the long-term. A treatment facility for any of the above flow rates would be expected
to include preliminary, primary, secondary and advanced treatment (i.e., nitrogen removal to 3 to 5 mg/l) in accordance with the Cape Cod Commission Regional Policy Plan. At a single site, approximately 7 to 10 acres of land would be required to site a treatment facility of this size and nature.

4.2 Disposal

Similar to the discussion above regarding treatment facility siting, the Town would ideally secure sufficient land area to locate a wastewater disposal facility that would address the study area needs as well as town-wide future needs on a single site. However, it is often difficult to find land of sufficient size or infiltrative capacity in a single site. That said, it is not necessary to find a single site for effluent disposal, as effluent can be distributed to two or more sites in town.

Groundwater effluent disposal systems fall into one of two major categories. One type applies the effluent at the ground surface, while the other disperses the effluent below the surface. Surface application options include spray irrigation and rapid infiltration. Subsurface systems include leaching facilities (trenches, beds or chambers), wicks, and drip irrigation. The goal of both surface and subsurface approaches is to allow the effluent to percolate down to the groundwater and be carried away by the regional groundwater flow.

The relative weighting of advantages and disadvantages for a given disposal technology is best determined by considering the features of the specific site. Once potential effluent disposal sites are identified, the best pairing of sites and technologies will be addressed as composite wastewater plans are developed. The pairing depends on both the site and the disposal technology. All effluent disposal sites require proper separation distance from homes and businesses, property boundaries, water supplies and sensitive environmental receptors.

Given the constraints related to abutters as well as the Natural Heritage and Endangered Species Program (NHESP) requirements in the vicinity of the study area, it is most appropriate to favor subsurface disposal trenches or rapid infiltration basins (RIBs). We have completed an analysis of disposal land area needs based on multiple disposal scenarios including subsurface disposal
and rapid infiltration basins. The key factors and results of our analysis are summarized below in Table 4.

### Table 4 - Land Required for Effluent Disposal

<table>
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<tr>
<th></th>
<th>For Peak Flow of</th>
<th>For Peak Flow of</th>
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<tbody>
<tr>
<td></td>
<td>460,000 gpd</td>
<td>2,500,000 gpd</td>
</tr>
<tr>
<td>Number of Sites</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Loading Rate, gpd/sf</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Reserve Area, %</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Buffer Distance, ft</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Gross Area Required, ac</td>
<td>10</td>
<td>45</td>
</tr>
</tbody>
</table>

Based on the short-term peak flows summarized above, approximately 10 acres of land on a single site would be required for an interim solution ("primary focus" area only), compared with the over 40 acres that are needed to accommodate the estimated future town-wide wastewater flows. For general planning purposes, the Town should expect that approximately 50 acres of land may be needed for a comprehensive town-wide solution.

It is important to note that this analysis is very sensitive to each of the noted variables. For example, if the loading rates for rapid infiltration basins could be increased from 5 gpd/sf to 7 gpd/sf, and the buffer zones could be reduced to 100 feet (by utilizing buffer zones on adjacent protected property), then a site of approximately 6 acres would be suitable for the effluent from the primary focus area.

The disposal facility(s) should not be located within the Zone IIs, within watersheds with significant nitrogen removal requirements (Popponesset Bay or Three Bay), or proximate to freshwater ponds. The disposal facility(s) would ideally be located in watersheds with no nitrogen removal requirements.
4.3 Summary

A summary of the siting considerations is presented below. The identified parcels are shown on Figure 4.

1. The Town should seek sufficient land to locate a single treatment facility to serve the primary and secondary focus projects as well as future town-wide needs in order to maximize future flexibility. Town-wide needs are expected to include some combination of public sewers, on-site denitrification systems, Title 5 systems as well as innovative approaches.

2. The treatment and disposal facilities should be located as far away from residential areas as possible to minimize public resistance to the proposed location.

3. The disposal facilities must be located outside the Zone IIIs. As a result, several Town-owned parcels have been eliminated from consideration for disposal; including Parcels 28-055, 056 and 057, since they are not appropriate for effluent disposal.

4. Several Town-owned parcels near the Industrial Park appear reasonable for use as a treatment location; including, Parcels 28-055 (12.90 acres) and 28-057 (6.04 acres). These are within the Zone IIIs and in the Sandwich Harbor watershed.

5. One Town-owned parcel near the Industrial Park appears reasonable for use as a disposal location; including, Parcel 28-058 (6.13 acres). This is outside the Zone IIIs and in the Sandwich Harbor watershed.

6. Several privately-owned parcels near the Industrial Park appear reasonable for use as disposal locations, including Parcels 28-041 (20.00 acres), 28-060 (38.81 acres) and 28-037 (47.54 acres). These are outside the Zone IIIs and in the Sandwich Harbor watershed, with the exception of 28-037, which is outside the Zone II and straddles the boundary between the Sandwich Harbor and Scorton Creek watersheds.

7. Two additional Town-owned parcels in the study area also appear reasonable for use as disposal location(s); including, Parcels 28-101 (5.04 acres), 28-102 (17.51 acres) and 28-121 (9.15 acres). These are outside the Zone IIIs and in the Scorton Creek watershed.

8. A hydrogeologist should evaluate the influence of effluent flow and groundwater mounding from the effluent disposal site(s) in relation to the edge(s) of the delineated
Zone IIIs as well as any nearby private wells. Each of the sites identified above has significant depth to groundwater, therefore, groundwater mounding is not expected to govern the decision making process.

9. The selected treatment and disposal sites will likely need to be re-zoned to be consistent with Town requirements, or the Zoning By-Laws will need to be modified to allow for treatment and/or disposal in the current zones. The Town will need to clarify whether municipally-owned effluent disposal sites, if separate from a treatment facility, are excluded from any zoning districts.

10. The Town should encourage the developers to accept some wastewater effluent for reuse within their projects, as this will reduce the Town's ultimate need for disposal sites.

11. In addition to conveying flow from sources to the treatment facility, the collection system layout should consider several items, including: facilitating future connections to neighborhoods that may later need public sewer (e.g. nitrogen loading, failing septic, water supply protection, etc.); and facilitating effluent reuse.

5.0 REGULATORY REQUIREMENTS

There are numerous and complicated regulatory constraints for a project of this type. These constraints are summarized below.

5.1 Town

Sandwich Zoning Article V creates Water Resource Protection Districts that are coincident with the delineated Zone II areas for Sandwich Water District public supply wells. This article states that wastewater treatment plants are prohibited from a Zone II unless the discharge is located outside of the Zone II, and that for all uses, combined wastewater flow disposed on-site shall not exceed 20,000 gpd.

Sandwich Zoning allows that a wastewater treatment facility may be located only in an Industrial or Marine Zone. That requirement notwithstanding, the treatment facility could otherwise be located in any watershed and/or within a Zone II (with approval from the Town and the Sandwich Water District) as long as the disposal location is outside the Zone II. The
treatment facility does not need to be co-located with the disposal facility. Current zoning does not appear to specifically address where it is allowable to locate effluent disposal if physically separate from treatment.

**Sandwich Board of Heath (BOH) Groundwater Protection District Regulations** requires additional Board of Health review and obtaining a water quality certificate for developments in this district that potentially use or generate toxic or hazardous substances including petroleum products, sludge or septage, pesticides or herbicides, animal manure, car washes, chemical or bacteriological laboratories, metal plating and other uses.

**Sandwich BOH Regulation for the Design, Operation & Maintenance of Small Wastewater Treatment Facilities** limits the volume of sewage flow from any project to the aggregate volume that would be generated by each lot within the project area based upon the sizing criteria for a septic system in full compliance with Title 5. This regulation also establishes standards for the design, operation and monitoring of private WWTFs.

**Sandwich BOH Nitrates Loading Policy** limits the average recharge nitrate concentration of a project to 5 ppm. It is more stringent than the Cape Cod Commission Technical Bulletin 91-001 with respect to: recharge rate (17 inches used instead of 19 inches from TB91-001); flow (no adjustments are made with occupancy, instead full Title 5 flows are used); and concentration (40 mg/l are used for nitrate nitrogen concentration in sewage effluent instead of 35 mg/l).

**5.2 Department of Environmental Protection**

DEP has established a policy that prohibits the issuance of a groundwater discharge permit in a nitrogen-sensitive watershed unless the applicant has already put into effect a project that removes an existing nitrogen load equal to or greater than the load that the proposed project will add to the groundwater. Based on discussions with DEP staff, the nitrogen offset must be in place on or before the start-up of the proposed new WWTF; the applicant cannot merely fund a related study or set money aside for Town use on a future project. A nitrogen-sensitive watershed is one where a draft or final MEP Technical Report indicates that a reduction in
nitrogen load is needed to restore or maintain water quality, even if a TMDL has not yet been issued. At this time, DEP will not apply this policy in watersheds where no MEP technical report has been issued.

5.3 Cape Cod Commission

The proposed interim wastewater solution would likely be considered to be a Development of Regional Impact (DRI) under the Cape Cod Commission's enabling legislation and its Regional Policy Plan (RPP). Many of the projects proposed by the individual developers would also require DRI approval by the Commission. There are several regulatory constraints that apply to this project.

The Commission has adopted a "fair share" approach as a literal application of a TMDL to project-scale development in sensitive watersheds as a way to implement its Minimum Performance Standard WR3.1. This approach applies unless a comprehensive wastewater management plan is in place. In general terms, the fair share is computed by dividing the threshold septic nitrogen load for an embayment (as documented in a MEP Technical Report) by the total area of that embayment's watershed. The Commission staff makes adjustments in the watershed area to account for certain factors, and adjusts the allowable load to account for natural attenuation. As reported in the Commission's DLTA Report, the fair shares for portions of the Popponesset and Three Bay watersheds in Sandwich have been computed to be 2.96 kg/yr/acre and 30.5 kg/yr/acre, respectively. For example, a 10-acre parcel in the Three Bay watershed would be allocated a fair share load of 305 kg/yr. If the nitrogen loading from the proposed project is less than that, then the applicant has complied with RPP Performance Standard WR3.1. If the proposed load is greater than 305 kg/yr, then the applicant must either: 1) provide an offset (such as by collecting and treating wastewater from nearby unsewered neighborhoods), or 2) pay a fee to the Commission equal to $1,550 per annual kg of loading. The offset or fee basis is the load in excess of the fair share. The fee is placed in escrow and then made available to towns for developing or implementing wastewater management strategies.
A project with a proposed 300 kg/yr discharge in the Popponesset watershed would be required to provide a 300 kg/yr offset in order to secure a DEP groundwater discharge permit, but would meet the Commission's fair share policy without an offset. In this case, the DEP policy would supersede the Commission policy.

By way of comparison, the current SSVC flows produce a total of approximately 1,130 kg/yr of nitrogen (23,000 gpd at 35 mg/l) and the Interim Solutions WWTF would produce a total of approximately 1,590 kg/yr of nitrogen (230,000 gpd at 5 mg/l) for the primary focus flows.

Minimum Performance Standard WR3.2 covers the circumstances where a DRI is located in the watershed of an embayment where there is evidence of water quality degradation, but a MEP Technical Report is not yet available. In this case, the project cannot increase the nitrogen loading in the watershed. An offset must be provided, or the above-noted fee must be paid. It is our understanding that this minimum performance standard is applied on a case-by-case basis, and to date has not been applied to projects in the Sandwich Harbor and Scorton Creek watersheds.

Other Commission-imposed constraints:

- A public or private wastewater treatment facility cannot be located in a Zone II unless the facility serves to remediate existing problems (MPS WR2.3 and WR5.2)
- Nitrate loading from the project must be below 5 ppm for projects in general and below 1 ppm in potential water supply areas, based on the Commission's Technical Bulletin 91-001. The nitrate loading limit reverts to 5 ppm in a potential water supply area if the Town or the Water District signs off. (MPS WR2.1 and WR2.6).
- MPS WR6.1 prohibits a private WWTF if a feasible public option is expected to be constructed within 3 years.
- All WWTFs must meet a 5 ppm total nitrogen limit, either in the effluent or in the groundwater at the downgradient property line. (MPS 6.2).
- MPS WR6.5 requires that projects with private WWTFs give the municipality the opportunity to take ownership when so desired by the municipality.
• No WWTFs are allowed in ACECs or critical wildlife habitat. (MPS WR6.6)
• WWTFs larger than 2,000 gpd must participate in a Operation, Maintenance and Compliance Agreement (OMC Agreement) with the Commission and the local BOH. (MPS WR6.9), if the effluent limit is lower than would be included in the typical groundwater discharge permit (10 mg/l).

5.4 Massachusetts Environmental Policy Act (MEPA)

The Massachusetts Environmental Policy Act (MEPA) requires that the project proponent study the environmental consequences of their actions, including permitting and financial assistance. It also requires the proponent to take all feasible measures to avoid, minimize, and mitigate damage to the environment. MEPA applies to any projects that exceed MEPA review thresholds and that require a state agency action, specifically that they are either proposed by a state agency or are proposed by municipal, nonprofit or private parties and require a permit, financial assistance or land transfer from state agencies. MEPA review provides the mechanism through which this information collection and mitigation mandate is executed, and it empowers the Secretary of the Executive Office Energy & Environmental Affairs (EOEEA) to oversee the review process. The process is public and encourages comments from citizens and from state, regional and local agencies. Based on our understanding of the various individual projects (as well as the potential joint project), none of the projects described herein appear to require a Mandatory Environmental Impact Report (EIR) for wastewater issues; however, most of the projects would require an Environmental Notification Form (ENF) and review. The most significant components of the MEPA review for this project is expected to include the Natural Heritage and Endangered Species Program, as described below, and the public input.

5.5 Natural Heritage and Endangered Species Program

Most of the existing undisturbed land in the study area is within the Priority Habitats of Rare Species area and the Estimated Habitats of Rare Wildlife area designated by the Natural Heritage and Endangered Species Program. This will require careful consideration of the total amount of land to be disturbed for development as well as for the associated wastewater collection, treatment and disposal facilities. At the 2011 Annual Town Meeting, the Sandwich Board of
Selectmen received voter approval to place conservation restrictions on approximately 38 acres of land to serve as an offset for the disturbance of approximately 20 acres of land for the purposes of wastewater treatment and disposal in the vicinity of the study area. These parcels are identified in Appendix A. The disposition of these parcels should be revisited prior to submitting the MEPA ENF.

5.6 Summary

The regulatory requirements create considerable complexity; however, the constraints are more readily resolved if the effluent disposal is located in the Sandwich Harbor or Scorton Creek watershed and those watersheds are found not to be nitrogen limited (refer to Section 12.0 - Management of Risk Associated with Future MEP Reports). Several items require additional communication and coordination with regulatory agencies prior to implementation. These items are identified in the Implementation section of this report and are listed below:

- Coordinate sign-off with Town and Water District regarding use of undeveloped land in a potential water supply area.
- Change zoning to allow for the wastewater treatment and disposal in portions of the study area.
- Confirm approach to location of treatment and disposal facilities with Commission staff (RPP MPS WR2.3 and WR5.2).
- Confirm MEPA review process.
- Confirm NHESP habitat protection offsets for recommended alternatives and proposed development plans.

6.0 IDENTIFICATION OF ALTERNATIVES

We have identified a number of alternatives to address wastewater needs in the study area. These alternatives are described below.
1. **Construct Treatment Works near the Industrial Park.** Under this alternative, wastewater infrastructure would be planned for the primary and secondary focus projects and for all future town-wide needs; however, construction would only be for the primary focus projects. The collection system would serve the designated projects and would consist of conventional gravity sewers, with pump stations and force mains where necessary. The treatment and disposal facilities would be located on land to the northeast of the Industrial Park (in the Sandwich Harbor and Scorton Creek watersheds). This alternative has been carried forward for more detailed consideration. (Disposal facilities located on Massachusetts Military Reservation (MMR) land in the Canal South watershed but outside the Zone II would be ideal; however, given the time constraints on this project, this option does not appear feasible as an interim solution. Disposal facilities located on MMR land should be considered in the CWRMP.)

2. **Construct Collection Facilities with Discharge to the MMR System.** The existing Massachusetts Military Reservation (MMR) WWTF has a current average daily flow of 210,000 gallons per day as compared to an design average daily capacity of 300,000 gallons per day (alternatively, the current short-term peak flow is 580,000 gallons per day as compared to a design short-term peak flow of 800,000 gallons per day). The flow rate for primary focus projects is slightly higher than the remaining capacity at the MMR WWTF. This alternative has been eliminated from consideration, since the time to plan and implement expansions of these facilities would not be compatible with the time constraints of this project; however, use of the MMR system should be considered in the CWRMP.

3. **Construction Collection Facilities with Discharge to the Town School Systems.** The primary focus flow rate is significantly higher than the overall disposal capacity of the Town school systems. The Forestdale School site is located entirely within a Zone II and a portion of the Oak Ridge School site is located within a Zone II. The High School is located entirely outside of a Zone II. We have assumed that the Town does not want to implement a significant expansion of wastewater treatment operation at the High School. Given the lack
of favorable conditions described above, this alternative has been eliminated from consideration.

4. **No Action.** Under this alternative, the Town would end any efforts related to facilitating a wastewater solution for the study area. Since much of the land in the Interim Solutions study area is either in a nitrogen-sensitive watershed or a Zone II Wellhead Protection Area, this alternative would significantly limit the type, nature and size of development until such time as a comprehensive wastewater solution is available. Under this scenario, the developers could implement projects of significantly smaller size and scope or could propose less conventional approaches (e.g., urine diversion, composting toilets, etc.). The "No Action" alternative carries an opportunity cost to the developers (land cannot be developed to its highest use) and to the Town (missed tax revenues, land cannot be developed for civic uses). This option is contrary to the stated purposes of this investigation but becomes the de facto choice if this study is not brought to a successful conclusion.

Methods to address procurement and project delivery are described in Section 9 of this report.

### 7.0 DESCRIPTION OF RECOMMENDED ALTERNATIVE

Given the overall constraints on the study area, Alternative 1 (Construct Treatment Works near Industrial Park) is the recommended alternative. The components of the recommended alternative are summarized below and are depicted on Figure 5.

- **Collection:**
  - Sewage Pump Stations (2)
  - Sewers (19,200 ft, 8-inch and 12-inch dia.)
  - Sewage Forcemain (8,500 ft, 4-inch dia.)

- **Treatment:**
  - Located on Parcel 28--057 (or Parcel 28--055)
  - Design Short-Term Peak Flow of 460,000 gpd
  - Preliminary Treatment
  - Primary Treatment
  - Sequencing Batch Reactor (biological nitrogen removal)
Denitrification Filters and Disinfection
Effluent Disposal Pump Station
Effluent Forcemain to Disposal (500 ft & 5,000 ft, 4-inch dia.)

- Disposal: Located on a combination of Parcels 28--058, 041, 101, 102, 121
  Design Short-Term Peak Flow of 460,000 gpd

- Other: Extend public water to houses on Kiah's Way Extension.

The Town could also consider constructing an effluent reuse forcemain to the Industrial Park and SSVC in order to encourage the reuse of effluent (10,500 ft, 4-inch dia.). This item has not been incorporated in the project costs.

8.0 PLANNING-LEVEL PROJECT COST ESTIMATES

The participants will each be faced with costs in two categories, regardless of whether they act individually or cooperatively in a joint solution. The first category is "capital cost", the cost to plan, permit, design and build the needed facilities. The second category is "operation and maintenance (O&M) costs" which include the ongoing annual expenses to run the facilities (e.g., labor, electrical energy, fuel, chemicals, biosolids disposal, laboratory testing, equipment maintenance, etc.).

We have applied the cost model presented in the Barnstable County Cost Report ("Comparison of Costs for Wastewater Management Systems Applicable to Cape Cod", April 2010). This cost model includes the following key components:

- wastewater collection,
- transport-to-treatment,
- wastewater treatment,
- transport-to-disposal,
- effluent disposal,
- sludge/septage handling, and
- land acquisition.
The cost model was populated with key technical data on each of the alternatives (e.g., linear feet of pipe, number of pump stations, size of treatment facility, etc.). Once basic construction costs were estimated, allowances were added for: contingencies; technical services and legal expenses; site investigation costs; and land costs.

Table 5 presents a summary of the capital costs, annual operating cost and "present worth" cost estimates for the recommended alternative. A present worth analysis is a standard economic tool that allows the calculation of a single "cost" to represent the combination of capital costs and annual expenses for operation and maintenance. In essence, the present worth represents the amount of money that one would invest to be able to pay the capital costs at the beginning of the project and allow periodic withdrawals to pay the annual O&M expenses over a certain period at a given interest rate. For the purposes of this study, the present worth has been computed assuming a 4% interest rate (public) or 5% interest rate (private) and a 20-year planning period. All costs presented herein are expressed in projected future dollars (August 2012, ENR Construction Cost Index 9450, projected). Table 5 also presents a summary of the costs associated with "No Action" by the Town, with each of the primary focus developers acting individually.

Construction of wastewater treatment works will be an expensive undertaking, estimated at $25M, but it will position the Town to promote the desired growth. It is important to emphasis the economies of scale related to construction of a joint facilities rather than multiple individual projects. Specifically, construction of a joint project is estimated to save over $15M in capital costs and just under $1.2M annually on operations and maintenance expenses when compared to the cumulative costs of numerous developers constructing multiple smaller projects on their own.
Table 5 - Planning-Level Cost Estimates
Interim Wastewater Solutions (August 2012, ENR CCI 9450, projected)

<table>
<thead>
<tr>
<th></th>
<th>Alternative 1 Treatment Works (0.46-mdg)</th>
<th>Alternative 4 No Action by Town (indiv. projects)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collection and Transport to Treatment</td>
<td>$5.0 M</td>
<td>$6.8 M</td>
</tr>
<tr>
<td>Treatment</td>
<td>$10.6 M</td>
<td>$18.9 M</td>
</tr>
<tr>
<td>Transport to Disposal and Disposal</td>
<td>$2.9 M</td>
<td>$1.8 M</td>
</tr>
<tr>
<td>Construction Subtotal</td>
<td>$18.5 M</td>
<td>$27.5 M</td>
</tr>
<tr>
<td>Construction Contingency, Administration, Legal and Technical Services (35%)</td>
<td>$6.5 M</td>
<td>$12.7 M</td>
</tr>
<tr>
<td>Total - Capital Cost</td>
<td>$25.0 M</td>
<td>$40.2 M</td>
</tr>
<tr>
<td>Annual Operation &amp; Maintenance (O&amp;M)</td>
<td>$0.97 M</td>
<td>$2.16 M</td>
</tr>
<tr>
<td>Present Worth of Annual O&amp;M</td>
<td>$12.0 M</td>
<td>$26.9 M</td>
</tr>
<tr>
<td>Total - Present Worth of Alternative</td>
<td>$37.0 M</td>
<td>$67.1 M</td>
</tr>
</tbody>
</table>

9.0 AVAILABLE PROJECT DELIVERY METHODS

The Town requested that legal counsel identify the methods by which wastewater facilities could be designed, built and operated (so-called "project delivery methods") available for this project, and to address relevant issues. The recommended project delivery options are detailed in a letter from Kopelman and Paige to George Dunham dated July 8, 2011 (Appendix B) and are briefly summarized below. Please refer to Appendix B for a more detailed description of each option.

- **Option A - Traditional Publicly Owned Treatment Works (POTW).** Wastewater collection, treatment and disposal facilities would be constructed by the Town as a conventional design-bid-build project. The Town would operate the facilities, either with Town staff or on contract basis. This approach would require approval at Town Meeting. This is a traditional approach and was most recently implemented in Chatham.
• **Option B - POTW via Design-Build-Operate Contract.** Wastewater collection, treatment and disposal facilities would be constructed on behalf of the Town via a design-build-operate ("DBO") approach. The Contractor would operate the facilities on behalf of the Town for a specified period of time. This approach would require special legislation initiated under a Home Rule petition approved at Town Meeting. This is a less common approach and was most recently implemented in Provincetown.

• **Option C - Privately Owned Treatment Facility on Town Land.** Wastewater collection facilities would be constructed by the Town and/or private parties. Wastewater treatment and disposal facilities would be constructed by a private party (or perhaps a consortium of developers) on Town land leased to that private party. The Town and other interested parties would contract with the treatment facility owner for capacity. The private party would operate the treatment and disposal facilities. This approach would not require special legislation; however, this option may not have a precedent on this scale and would require very careful legal and financial planning to successfully execute it.

• **Option D - No Action.** Under this option, the Town would take no action to facilitate a wastewater solution for the study area, other than to participate through the regulatory process. The developers would need to solve their wastewater needs independently.

### 10.0 RECOMMENDED PROJECT DELIVERY METHOD

As a preferred project delivery method is determined, consideration should be given to the cost and time aspects associated with each option, for example:

- Option A requires the successful negotiation of a binding memorandum of understanding (MOU) between the Town and specific developers relatively soon. The MOU would need to address legal and financial issues, such as land ownership and transfer, financial contribution and timing.
• Option B would require a Town Meeting vote relatively soon to allow for special legislation under a Home Rule petition.

• Option C would require an extensive request for proposals (RFP) to procure the treatment works. The RFP would need to address legal and technical issues and would take time to obtain and review proposals.

The recommended project delivery method should be selected with consultation from the Town's attorney.

11.0 COST ALLOCATION METHODS

Given the public and private interests involve in this project, the allocation of costs among interested parties must be given due consideration. The applicable costs for this project will consist of:

• Capital costs to plan, design, permit and construct the initial facilities;
• Capital costs to plan, design, permit and construct the future facilities;
• Annual costs associated with operations and maintenance of the facilities, including appropriate capital reserve account for major maintenance;
• Funds placed in escrow for future nitrogen offsets in the event that Sandwich Harbor and Scorton Creek require nitrogen removal to meet a future Total Maximum Daily Load.

There are numerous methods to allocate the various costs described above (e.g., equal or uniform allocation, based on flow, based on nitrogen load, etc.). The method of cost allocation must be fair but does not require absolute precision. Increasing precision often comes with increasing complexity and administrative cost. Ultimately, the participants will need to agree upon the cost allocation method. Further detail on this matter is beyond the scope of this study. For the purposes of this study, we have assumed that costs associated with transport to treatment, treatment, transport to disposal disposal, and related project costs will be allocated based on flow. Costs associated with collection will be allocated to each project individually. A preliminary allocation of capacity and cost is presented in Table 6 below.
Table 6 - Allocation of Capacity and Cost (Primary Focus Only)

<table>
<thead>
<tr>
<th>Developer</th>
<th>Primary Flow Projects</th>
<th>% of Total, Flow &amp; Cost</th>
<th>Cost Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tsakalos Realty Trust</td>
<td>147,800</td>
<td>32%</td>
<td>$8.2M</td>
</tr>
<tr>
<td>Autumnwood, LLC</td>
<td>80,000</td>
<td>17%</td>
<td>$4.2M</td>
</tr>
<tr>
<td>PA Landers, Inc.</td>
<td>24,000</td>
<td>5%</td>
<td>$1.5M</td>
</tr>
<tr>
<td>SSVC &amp; Industrial Park (Town)*</td>
<td>114,800</td>
<td>25%</td>
<td>$5.9M</td>
</tr>
<tr>
<td>Sandwich Housing Authority</td>
<td>8,000</td>
<td>2%</td>
<td>$0.5M</td>
</tr>
<tr>
<td>RFP for SSVC</td>
<td>70,000</td>
<td>15%</td>
<td>$3.7M</td>
</tr>
<tr>
<td>Housing Assistance Corp.</td>
<td>19,600</td>
<td>4%</td>
<td>$1.0M</td>
</tr>
<tr>
<td>Total</td>
<td>464,200</td>
<td>100%</td>
<td>$25.0M</td>
</tr>
</tbody>
</table>

* This line item includes 20+ privately-owned parcels that have been aggregated into one group.

12.0 MANAGEMENT OF RISKS RELATED TO FUTURE MEP REPORTS

The over-riding goal of wastewater management on Cape Cod is removal of nitrogen from the watersheds of sensitive coastal embayments. Currently, MEP technical reports are completed for the Popponesset Bay and Three Bay watersheds. Those reports show that existing nitrogen load must be reduced by 61% and 60%, respectively, to restore water quality. In addition, steps must be taken to eliminate 100% of nitrogen loads from new projects and developments in those watersheds. Therefore, effluent from the study area will not be directed to the Popponesset Bay or Three Bay watersheds and will be directed to other watersheds. Given the distribution of land in Town, the Sandwich Harbor, Scorton Creek and Canal South are the most likely candidates for effluent disposal. The Town owns significant acreage of land in the Sandwich Harbor and Scorton Creek watersheds. MEP technical reports are underway for the Sandwich Harbor and Scorton Creek watersheds and are not expected to be completed until 2012. It is unknown at this time whether there will be nitrogen removal requirements. Given this uncertainty, it is important
to identify methods to manage the nitrogen-related risks associated with advancing developments. Several approaches to managing this risk are identified below:

- Do not locate disposal facilities in the Sandwich Harbor or Scorton Creek watersheds.
- Identify specific capital projects that would be used to address future nitrogen removal requirements associated with either or both watersheds. Require that the developers put money in escrow to implement these projects.

Examples of capital projects which could be implemented as nitrogen offsets include:

- Construct the disposal facilities as temporary facilities and be prepared to abandon (if required) and replace them with disposal facilities in areas where nitrogen capacity exists.
- Reserve land in Scorton Creek watershed for future disposal facilities in the event that Sandwich Harbor watershed requires nitrogen removal and Scorton Creek does not.
- Provide public sewers, denitrification systems, urine diversion systems or composting toilet systems to a sufficient number of properties in the watershed(s) to remove the equivalent amount of nitrogen which was added to the watershed(s).
- Provide for effluent reuse within the project area or within the watershed(s) to reduce the volume of effluent disposed. There are several possibilities for effluent reuse, including lawn irrigation and toilet flushing. The requirements for effluent reuse are governed by the DEP under its Reclaimed Water Permit Program and Standards (314 CMR 20.00).

A nitrogen offset may be required for disposal sites located in the Sandwich Harbor and/or Scorton Creek watersheds. Therefore, we recommend that a "contingent nitrogen offset" be conceptualized and agreed to by all parties. It may be appropriate to address costs related to the contingent nitrogen offset in the form of an escrow account. Evaluating and selecting a nitrogen offset is beyond the scope of this study.
13.0 IMPLEMENTATION PLAN

There are many planning and administrative issues that need to be addressed if interim wastewater solutions are to be developed in Sandwich. The following implementation items, generally listed in order of action, will be required in order to implement this project.

1. Distribute this draft report for review by the Town Board of Selectmen. Revised and circulate an updated draft report, if desired by the Board.
2. Determine the preferred project delivery method.
3. Solicit input from DEP and the Cape Cod Commission on regulatory issues.
4. Convene a meeting(s) with interested parties, including the developers.
5. Finalize location of treatment and disposal facilities. Finalize location of potential Town roads between Route 130 and Quaker Meetinghouse Road.
6. Coordinate sign-off with Town and Water District for use of existing undeveloped land in potential water supply areas for use as effluent disposal sites.
7. Prepare and execute Memoranda of Understanding (or more binding agreements) to gain binding financial commitment from each private interest.
8. Coordinate NHESP habitat protection offsets for private development as well as for future Town facilities. Confirm interpretation of 2011 Annual Town Meeting Article 22 (Land Use Restrictions on Town Property) with NHESP.
9. Coordinate site location(s) with Massachusetts Historical Commission.
10. Determine the time needed for design, construction and local approvals and incorporate that time into a final implementation schedule.
11. Finalize this report to address all comments received and distribute to interested parties.
12. Establish "contingent nitrogen offset" for Sandwich Harbor and Scorton Creek watersheds.
13. Initiate MEPA and DRI review process.
14. Hold Special Town Meeting (October 2011) and/or Annual Town Meeting (May 2012) to address items requiring Town Meeting approval, including:
   a. Change zoning, as required to support treatment, disposal and development.
   b. Acquire or sell land.
   c. Appropriate funds for capital or operation costs.
   d. Authorize pursuit of special legislation, if required.
   e. Authorize Selectmen to layout a system of common sewers.
15. Complete property acquisition transaction(s) for privately-owned parcels identified as potential treatment and disposal sites. Acquire existing private properties that may constrain siting. Settle title disputes (if any).
16. Initiate proceedings to extend public water to selected properties near disposal sites, if necessary.
17. Obtain access to parcels for hydrogeologic investigations and testing.
18. Complete Preliminary Design.
19. Complete Town and State permitting, including Town Site Plan, DEP Groundwater Discharge Permit application and WWTF Site Assignment.
20. Obtain other State approvals.
21. Reserve and preserve all Town-owned land for municipal wastewater treatment and disposal until CWRMP is completed.
22. Design, construct and start up the wastewater solution.
14.0 PRELIMINARY IMPLEMENTATION SCHEDULE

Several of the developers have expressed some urgency in advancing wastewater solutions. Accordingly, a fast-track implementation schedule has been developed. This preliminary implementation schedule is outlined below.

Meet with Board of Selectmen Aug. 2011
Meet with developers Sep. 2011
Prepare Memorandum of Understanding with developers Sep. 2011
Hold Special Town Meeting for selected items Oct. 2011
Execute a Memorandum of Understanding with developers Oct. 2011
Finalize Report and Initiate MEPA and DRI Reviews Nov. 2011
Secure land for treatment and disposal Dec. 2011
Complete preliminary design Mar. 2012
Complete groundwater discharge permit application Mar. 2012
Hold Town Meeting for additional items (as necessary) May 2012

The execution of a Memorandum of Understanding between the developers and the Town is a critical step. It should be detailed enough to confirm each developer's participation in the project at a fixed flow rate and with a fixed percentage contribution for a well-defined set of next steps.
APPENDIX A
Wright-Pierce
Estimate of Wastewater Flows
This memorandum summarizes the projects and associated flows which will be utilized for the Interim Wastewater Solutions project. A draft of this memorandum was distributed to Town staff on 23 May 2011. This memorandum incorporates comments received from the Town during meeting held on 21 June 2011 and 29 June 2011.

Study Area

Several meetings were held among Town staff, Horsley Witten Group (representing Tsakalos), Mark Wisentaner and Wright-Pierce in order to develop a full understanding of the development potential within the study area. The study area includes a number of specific projects which are in various stages of conceptual planning and permitting, including:

- The "Community Green" project being developed by Housing Assistance Corporation.
- The "Autumnwood" affordable housing project being developed by Wisentaner.
- The "Forestdale Village" project being developed by Powers.
- Existing schools with individual wastewater treatment plants (Forestdale, Oak Ridge, High School)
- Vacant land and existing properties owned in SSVC by Tsakalos.
- Vacant land owned by the Town and Sandwich Housing Authority (SHA) in SSVC.
- Vacant land owned by the SHA in the South Sandwich Residential Area.
- Vacant land owned by Wisentaner in the Ridge District ("Highland Passage").
- Vacant land owned by the Town, Landers, Bevilacqua in or adjacent to the Industrial Park.

The parcels in the study area were divided into two categories, "primary focus" and "secondary focus". Development projects on the primary focus parcels were determined to be likely to occur within one to three years of an implemented wastewater solution. The secondary focus parcels were included because their development would be anticipated once a wastewater solution was implemented, but more likely in the five- to ten-year time horizon. The determination as to which parcels were primary and secondary focus was made by the Town based on direct feedback from potential developers.
Wastewater Flows

Estimating wastewater quantities started with the parcel-by-parcel water use records provided by the Sandwich Water District and incorporated into the Town's most up-to-date GIS database. Total metered water use for the 3-year period, 2007 to 2009, was utilized to assess the existing water use for parcels within the study area.

We have utilized the following terminology in order categorize and estimate wastewater flows:

- **Current Conditions.** Conditions represented by the general population, level of commercial activity and wastewater generation rates that exist at the present time.

- **Future Conditions.** Conditions that will exist once additional development occurs in Sandwich at some point in the future.

- **New Flow.** The increase in wastewater flows caused by growth, development and redevelopment.

- **Annual Average Flow.** The total wastewater flow over the course of one year, divided by 365 days per year (indicated in gallons per day, gpd). Annual average flows are of particular interest when considering the impact of wastewater flow on the environment (i.e. groundwater, coastal waters, etc.).

- **Short-Term Peak Flow.** Wastewater flow during a two to three day peak event, such as Fourth of July weekend (indicated in gallons per day, gpd). Short-term peak flows are of particular interest when sizing wastewater collection, treatment and disposal facilities.

In general, Title 5 (Massachusetts 310 CMR 15) has been used as the basis for the unit flows. Title 5 provides unit flow rates for various types of developments - residential, commercial, institutional, etc. While the use of Title 5 unit flow rates is a relatively crude method to estimate wastewater flow, it is the industry standard approach in the absence of specific development plans. This approach is a reasonable approach for facilities of this size.

**Current Wastewater Flows:** The majority of the parcels in the study area are connected to the public water system, and their water use is measured twice per year by the Sandwich Water District. The difference between the measured water flow and the estimated wastewater flow is termed "consumptive use" and includes such things as lawn irrigation, outdoor showers, water incorporated into a manufactured products, etc. (collectively estimated at 10% of water use). Actual annual average water use was converted to estimated annual average wastewater flow. Short-term peak wastewater flow was estimated by multiplying the annual average wastewater flow by a factor to two (as suggested in Massachusetts 310 CMR 15, Title 5).
New Wastewater Flows: New wastewater flows fall into two major categories: new development on vacant land; and redevelopment of existing properties. New wastewater flows were estimated for development of vacant land in the following manner:

- Short-term peak flows were provided by the developer; or
- Short-term peak flows were estimated by the Town or Wright-Pierce using Title 5.

New wastewater flows were estimated for redevelopment of land in the following manner:

- For existing facilities or proposed projects with an existing DEP Groundwater Discharge Permit, the permitted flow was input as the short-term peak flow.
- For existing properties without an existing treatment system (e.g. properties in the SSVC or Industrial Park), new redevelopment flow was set at 20% of existing wastewater flow.

Compatibility with the 2009 Local Comprehensive Plan

The Town's Local Comprehensive Plan was utilized as the basis for type and nature of future development (e.g., residential, commercial, mixed, industrial, etc.); however, the Local Comprehensive Plan utilized slightly lower unit flow values than are indicated in Title 5. The detailed backup information regarding the how the unit flow values were derived for the Local Comprehensive Plan were not available; therefore, the Town decided that Title 5 unit flows should be used to be more conservative. In summary, development within the study area is consistent with the Local Comprehensive Plan, although at higher wastewater flows.
2) Proposed flows for SSVC are consistent with estimates in CCC DLTA Report, but are slightly higher than those presented in the 2009 Local Comprehensive Plan.


3) Housing Assistance Corp., multiple parcels. Map 28-41, 42, 43, 48,

1) Existing water use data for SSVC and Industrial Park were taken from the CCC DLTA report and correlated with the W-P database. Wastewater was estimated at 95% of water use.

### Notes

1. Existing water use data for SSVC and Industrial Park were taken from the CCC DLTA report and correlated with the W-P database. Wastewater was estimated at 95% of water use.
2. Proposed flows for SSVC are consistent with estimates in CCC DLTA Report, but are slightly higher than those presented in the 2009 Local Comprehensive Plan.
APPENDIX B
Kopelman and Paige
Summary of Ownership Options
July 8, 2011

Mr. George H. Dunham
Town Manager
Sandwich Town Hall
130 Main Street
Sandwich, MA 02563

Re: Wastewater Facilities Planning — Summary of Ownership Options

Dear Mr. Dunham:

You have asked me to summarize the discussion at our meeting on June 29, 2011, with the Town’s wastewater consultant, Wright-Pierce Engineers, concerning the optional methods available to the Town to provide wastewater treatment facilities in the South Sandwich Village Center with the potential to expand the facilities to serve other areas of Town.

I understand that the Town is in the beginning phase of developing a Comprehensive Water Resource Management Plan (“CWRMP”). You have contracted with Wright-Pierce Engineers to develop the plan. Phase 1 of the CWRMP is a “Needs Assessment” which you expect to be completed within the next thirty (30) days.

As part of Phase 1, the Town is investigating various methods for the delivery of wastewater services to residences, businesses, and municipal buildings. At our meeting, we discussed the following options:

Option 1: Traditional Method of Providing Publicly-Owned Wastewater Treatment Facilities

The first option is the traditional method of providing town-owned wastewater treatment facilities, commonly referred to as “public-owned treatment works” or “POTW”. It is the method, for example, that the Town of Chatham utilized for its wastewater expansion project. The facilities would include a wastewater treatment plant, either a surface or ground water effluent disposal method, and a sewer collection system including sewer pumping stations. Typically, traditional systems are located on publicly-owned land and the design and construction is funded by an appropriation and bond authorization at Town Meeting. The project may or may not include grants and loans from a combination of federal and state programs such as low interest loans from the State Revolving Fund (“SRF”). Although the design of wastewater treatment facilities are not subject to public bidding under the Massachusetts Designer Selection Law, the construction activity is governed by the public construction statutes including the Filed Sub-Bid Law (G.L. c. 149) and the public works construction statute (G.L. c. 30, §39M). Once constructed, the facilities are operated by Town employees who typically work within the Department of Public Works. In the alternative, the Town can procure the services of a wastewater operator to operate the Town’s system on a
contract basis. Such a contract for services would be subject to bidding under the Uniform Procurement Act (G.L. c. 30B).

The cost to design and construct the treatment works typically would require a Town Meeting appropriation and a debt authorization. The Town would have the option of paying the debt service from the tax levy (with or without a Proposition 2 and ½ debt exclusion ballot question) or through the assessment of betterments and/or privilege fees assessed against those individuals and businesses that are benefited by the project. The financing could be any combination of the above-described methods. The yearly operating cost (appropriated as a departmental expense each year as part of the Town’s operating budget) for either Town employees or a private vendor to operate the system can be recouped in whole or in part from yearly user fees charged to those individuals or businesses connected to the system. Typically, a sewer department is operated as an Enterprise Fund pursuant to G. L. c. 44, §44F½.

It is also possible to fund all or a portion of project costs by having individuals and businesses make voluntary contributions to the Town in the form of gifts of money and/or supplies and services. Pursuant to G.L. c. 44, §53A, such gifts of money can be deposited in a gift account maintained by the Town and then used to defray project costs without further appropriation by Town Meeting. The key, however, is that the developers would have to make the gift to the Town (actually transfer the funds into a Town bank account) before the Town could enter into any legally binding contract to expend the funds. In my opinion, however, a Town Meeting vote would still be necessary under G.L. c. 83, §1, to authorize the Board of Selectmen or some other Town board to lay out a system of common sewers to serve all or a portion of the Town and to assess betterments.

Furthermore, there may be special procurement rules that apply depending on the nature of any grant programs that might be available.

Finally, if the Town decides to proceed with Option 1, it will be necessary to designate either the Board of Selectmen to act as Sewer Commissioners or to create a separate Board of Sewer Commissioners. Depending on what model the Town decides to follow, a Charter amendment, a ballot question, or a Town Meeting vote would be required. This is also true with respect to Option 2 set forth below.

Option 2: Public Facility - Design Build Operate Contract

The second option for the Town to consider would be the design build operate or “DBO” approach. Under this method, the Town would issue a Request for Proposals for a single vendor for a twenty year contract with the Town for the design, construction, and operation of a publicly-owned wastewater system on Town-owned land. This is the approach that the Town of Provincetown used for its new wastewater treatment system. Because this option involves a combined method of
procurement of construction and operating services that is not allowed under the Massachusetts Construction Laws, the Town would have to obtain special legislation initiated by a Home Rule petition approved at Town Meeting. I am attaching for your information an example of such special legislation that was approved by the General Court for the Provincetown project.

In order to have a successful DBO procurement, it has been my experience that the Town would need to invest some time and resources in developing a conceptual design plan (up to perhaps a 30-percent design) before an RFP can be issued. The cost of the preliminary design work could be funded either through a Town Meeting appropriation or through voluntary contributions, grants, or gifts.

Although it is possible to write the special legislation in such a way that would allow the Town to enter into an agreement with the vendor to finance the design and construction by amortizing that cost over the twenty (20) year terms of the operating agreement (the financing cost for design and construction would be part of the yearly service fee), it would most likely not be cost effective for the Town to enter into such a financing arrangement since, typically, the Town can borrow funds at a cheaper rate than a private operator especially if low interest SRF loans are available. Rather, if this option is pursued, the Town should be prepared to appropriate sufficient funds upfront to pay the vendor for the design and construction. Furthermore, the Town could pay all or a portion of the cost for design and construction under a DBO contract using gift funds from private developers.

Option 3: Privately-Owned Facility on Town Land

The third option could be the combination of a public private project that would take the following form: the Town could make available for lease to a private party or a private consortium sufficient land for the construction of a wastewater treatment plant and effluent beds, but the private entity would construct, own and operate the facility. Under this scenario, although the facilities would be located on public land, they would be private-owned. There is a provision in the General Laws (G.L. c. 30B, §1(e)) that permit such private public projects for wastewater facilities. The construction of the facility is exempt from the Public Construction Laws (although not necessarily the Prevailing Wage Law). In order for the Town to enter into such an arrangement, a Request for Proposals would have to be issued in compliance with c. 30B.

Under this option, the Town could contract to reserve some amount of treatment capacity in the private facility to serve municipal buildings as well as residential and commercial uses. The Town would still have the authority to install common sewers to serve the uses for the capacity that is reserved by the Town. Private parties that invest in the private treatment plant as well as other private parties would have to separately contract with the owner of the treatment plant and would
have to install private sewers by way of easements in order to deliver the sewage to the plant for treatment. Alternately, the Town could extend its sewer system to serve these properties as well.

While this option could certainly be implemented, it is not without some significant complications and would require very careful financial planning by the Town. Moreover, the Town would have to rely on a private party to maintain and operate a wastewater treatment plant in conformance with all applicable environmental laws and would have to have a contingency plan in place to take over the privately-owned treatment facilities in the event of a bankruptcy or other cessation of business by the private parties. This is especially true if the Town would be counting on a certain volume of treatment capacity to serve properties through the installation of a common publicly-owned sewer collection system. The challenge for the Town in entering into this type of arrangement is to insure adequate performance security in order to minimize the risk and impact of a default by the private party owning and operating the treatment facility.

Presumably, such an arrangement would include a yearly service fee paid by the Town to the private party owning the treatment facility for the treatment of sewage delivered to the facility by the Town and would be funded as an operating expense of the Town with the recoupment of the cost through user fees. I am not aware of any example of another municipality following this approach on such a large scale, however. The closest example would be a municipality that enters into an intermunicipal agreement for wastewater treatment at a POTW owned by another municipality. Given the fact that intermunicipal agreements are regulated under Massachusetts law with certain financial protections required, there is much less risk when a town depends on another municipality for the maintenance of treatment capacity rather than a private party.

Option 4: No Action

Of course, the final option that the Town could consider would be the no action alternative. Under this option, the Town would not become involved in any way, other than through the regulatory process, with the siting and operation of privately-owned wastewater treatment plants. Each developer would have to solve their wastewater needs on their own through Title 5 systems and package treatment plants. The Town would not develop any centralized treatment capacity to serve municipal buildings or provide wastewater treatment to any residents or businesses located in the Town.

Please let me know if you have any further questions.
Mr. George H. Dunham  
Town Manager  
July 8, 2011  
Page 5

Very truly yours,

John W. Giorgio

JWG/bp  
cc: Board of Selectmen  
429221/sand/0114
<table>
<thead>
<tr>
<th>Project Identification</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>Total of All Projects</th>
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<tr>
<td>Project Name</td>
<td>SSVC</td>
<td>Autumnwood</td>
<td>SSVG &amp; Ind Park</td>
<td>SHA</td>
<td>SSVG</td>
<td>HAC</td>
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<td>Title 5 Design Flow, gpd</td>
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<td>80,000</td>
<td>24,000</td>
<td>114,800</td>
<td>8,000</td>
<td>70,000</td>
<td>19,600</td>
<td>464,200</td>
<td>464,200</td>
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</table>

| On-Site Disposal Possible? | No | Yes | No | Likely | Yes | No | Yes | | |
| DRI Review Required? | Likely | Likely | Likely | Unlikely | Unlikely | Likely | Unlikely | | |
| MEPAX ENF & Review Required? | Likely | Likely | Likely | Unlikely | Unlikely | Likely | Likely | | |
| MEPAX Env Impact Report Required? | Possible | Possible | Possible | Unlikely | Unlikely | Unlikely | Unlikely | | |
| Joint Project Eliminate MEPAX ENF? | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | Unlikely | | |

| Wastewater Flow | | | | | | | | | |
| Average flow, gpd | 73,600 | 40,000 | 12,000 | 57,000 | 4,000 | 35,000 | 9,800 | | |
| Title 5 flow, gpd | 147,800 | 80,000 | 24,000 | 114,800 | 8,000 | 70,000 | 19,600 | 464,200 | 464,200 |

| Capital Costs from Barnstable County Cost Report (BCCR) Cost Curves for Treatment and O&M | | | | | | | | | |
| Collection | Distance, 1000 ft | 6.90 | 3.00 | 1.60 | 3.40 | 0.50 | 2.60 | 1.00 | 19.00 | 19.00 |
| | Cost per foot | 200 | 175 | 200 | 200 | 175 | 200 | 175 | | |
| | Construction cost | 1,380,000 | 525,000 | 320,000 | 680,000 | 87,500 | 520,000 | 175,000 | 3,687,500 | 3,687,500 |
| Transport to treatment | Distance, 1000 ft | 6.00 | 0.50 | 2.50 | 1.00 | 0.50 | 10.00 | 0.50 | | |
| | Cost per foot | 150 | 125 | 150 | 150 | 125 | 150 | 125 | 150 | |
| | Construction cost | 900,000 | 62,500 | 375,000 | 150,000 | 62,500 | 1,500,000 | 62,500 | 3,112,500 | 1,275,000 |
| Treatment (BCCR) | Cost per unit flow (BCCR) | 30 | 38 | 58 | 33 | 70 | 40 | 62 | 21 | |
| | Cost per unit flow (Mid Point) | 33 | 42 | 64 | 36 | 77 | 44 | 68 | 23 | |
| | Flow, gpd | 147,800 | 80,000 | 24,000 | 114,800 | 8,000 | 70,000 | 19,600 | 464,200 | 10,712,000 |
| Construction cost | 4,872,000 | 3,340,000 | 1,530,000 | 4,163,000 | 619,000 | 3,077,000 | 1,335,000 | 18,932,000 | | |
| Transport to disposal | Distance, 1000 ft | 0.50 | 0.25 | 0.50 | 0.25 | 0.25 | 0.50 | 0.25 | 5.50 | |
| | Cost per foot | 150 | 100 | 150 | 150 | 100 | 150 | 100 | 150 | |
| | Construction cost | 75,000 | 25,000 | 75,000 | 37,500 | 25,000 | 75,000 | 25,000 | 337,500 | 825,000 |
| Disposal | Cost per unit flow | 2.5 | 2.5 | 4.5 | 2.5 | 4.5 | 3.0 | 4.5 | | |
| | Cost per unit flow (Mid Point) | 2.7 | 2.7 | 4.9 | 2.7 | 4.9 | 3.3 | 4.9 | | |
| | Flow, gpd | 147,800 | 80,000 | 24,000 | 114,800 | 8,000 | 70,000 | 19,600 | 464,200 | | |
| | Construction cost | 406,020 | 219,767 | 118,674 | 315,366 | 39,558 | 236,766 | 96,917 | 1,427,060 | 2,040,321 |
### Interim Wastewater Solutions (Primary Focus Projects Only)

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<tr>
<td>A</td>
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<td>Autumnwood</td>
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<tr>
<td>Total of All Projects</td>
<td></td>
</tr>
<tr>
<td>One Joint Project</td>
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</tr>
</tbody>
</table>

**Total construction cost**

- **Cost**: 7,633,000, 4,172,000, 2,419,000, 5,346,000, 830,000, 5,403,000, 1,694,000
- **Unit costs, $/gpd**: 52, 52, 101, 47, 104, 77, 86

**Construction contingencies, administrative, legal, technical services**

- **Percentage**: 35, 35, 35, 35, 35, 35, 35

**Land**

- **Treatment area, acres**: 2.50, 2.00, 1.50, 2.50, 0.25, 2.00, 1.50
- **Disposal area, acres**: 3.7, 2.2, 0.7, 2.9, 0.2, 1.9, 0.6
- **Total area (Treat & Disp), acres**: 6.2, 4.2, 2.2, 5.4, 0.6, 3.9, 2.1
- **Cost per acre**: 250,000, 0, 250,000, 0, 0, 250,000, 0
- **Cost**: 1,558,000, 0, 554,000, 0, 0, 982,000, 0

**Total capital cost**: 11,863,000, 5,632,000, 3,820,000, 7,217,000, 1,121,000, 8,278,000, 2,287,000

**Capital costs summary**

- **Total**: 11,863,000, 5,632,000, 3,820,000, 7,217,000, 1,121,000, 8,278,000, 2,287,000

**O&M Costs from Cost Curves**

- **Annual average flow, gpd**: 73,600, 40,000, 12,000, 57,000, 4,000, 35,000, 9,800
- **Unit cost, $/yr per gpd (BCCR)**: 7.0, 9.0, 12.5, 7.5, 13.0, 9.3, 13.9
- **Unit cost, $/yr per gpd (Mid Point)**: 7.7, 9.9, 13.7, 8.4, 14.3, 10.2, 14.3
- **O&M cost, $/yr**: 556,000, 396,000, 165,000, 476,000, 57,000, 358,000, 140,000

**O&M Cost summary**

- **556,000, 396,000, 165,000, 476,000, 57,000, 358,000, 140,000

**Present Worth**

- **Interest rate, %**: 5
- **PW Factor**: 12.46

**Capital cost**: 11,863,000, 5,632,000, 3,820,000, 7,217,000, 1,121,000, 8,278,000, 2,287,000

**O&M cost**: 556,000, 396,000, 165,000, 476,000, 57,000, 358,000, 140,000

**PW of O&M**: 7,054,000, 4,935,000, 2,095,000, 5,932,000, 710,000, 4,481,000, 1,745,000

**Total present worth**: 18,917,000, 10,967,000, 5,876,000, 13,149,000, 1,831,000, 12,737,000, 4,032,000