REPORT

ONEIDA CREEK SUB-BASIN SEWER SYSTEM EVALUATIONS

ONEIDA CREEK WATER QUALITY IMPROVEMENT TASK FORCE

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O'BRIEN & GERE ENGINEERS, INC.

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1. Understanding of need

1.1. Introduction

As a result of years of problems associated with wastewater disposal in the Town of Vernon and Villages of Oneida Castle and Wampsville, including reported cases of *e-coli* presence in surface waters, a Task Force was established to resolve wastewater disposal problems and protect the Oneida Lake Watershed. The Task Force, via a grant from the NYS Environmental Protection Fund, administered by the City of Oneida from the Central New York Regional Planning & Development Board, authorized O'Brien & Gere Engineers, Inc. to perform this Study.

This Study is intended only to provide planning level evaluations for alternative collection, transmission and treatment system designs.

1.2. General

The Oneida Creek sub-basin includes the Oneida, Sconondoa, and Cowaselon Creeks which discharge to Oneida Lake. The majority of the area surrounding these Creeks is rural with population centers located in the City of Oneida, the Towns of Vernon and Verona, and the Village of Wampsville.

It has been reported as summarized in the "Oneida Creek Nonpoint Source Pollution Control Implementation Plan Proposal" Grant Application that the Village of Oneida Castle (Town of Vernon), and adjacent population centers within the Town of Vernon have, for decades, contributed significant amounts of non-point source pollutants that have and continue to contaminate the soils and waterways within the Oneida Creek sub-basin. Evidence of this is documented in biological assessments and investigations conducted by the Oneida County Health Department (OCHD), the Madison County Health Department (MCHD), Code officials, the U.S.D.A. Soil Conservation Service, the City of Oneida, and New York State Department of Environmental Conservation (DEC).

A major portion of the pollutants which were reported in the previously mentioned Grant Application to be discharging from private residences and municipal / commercial facilities (restaurants, motels, County operations, schools from two districts, and BOCES) is raw sewage. Whether this sewage was from failed OSWT's or direct discharges was not documented. Many property owners struggle to maintain their current on-site wastewater treatment (OSWT) systems. Most OSWT systems have been in use for 25 to 30 years or more and no longer provide sufficient disposal and/or treatment.

Attempts have been made in the past to reduce the discharge of raw sewage overland and into the Creeks by establishing a municipal sewer system. However, this option was rejected due to the high cost of implementing such a system and the resulting financial impact it would have on the property owners.

Therefore, the present need is to address remedial action alternatives for the community as a whole and specifically for the targeted study area previously noted herein.

2. Purpose of this report

2.1. General

The Oneida Creek Water Quality Improvement Task Force (Task Force) was formed as a regional community-based advisory body of public and private stakeholders. The goal of this Task Force was to identify the best practicable solution for eliminating the human generated non-point source pollutants from the Oneida Creek sub-basin. The result will be a significant reduction of the non-point source pollutants which in turn will reduce the potential health threat to those living within the sub-basin and to those swimming and fishing within the lower reaches of the Oneida, Cowaselon, and Sconondoa Creeks, and along the southeast shore of Oneida Lake.

The Task Force has conducted its own evaluations through review of the many studies and assessments conducted to date by others, and have concluded that a regional public sewer system with treatment at the City of Oneida Wastewater Treatment Plant (WWTP) appears to afford the most cost effective solution with the greatest impact on improving water quality. However, the Task Force needed to verify this conclusion with more detailed technical evaluations and cost analysis. To that end, O'Brien & Gere was retained to evaluate various options for serving the study area and to make an independent recommendation of the most cost effective solution based on review of alternate solutions and their estimated costs. Options studied included: taking no action; OSWT replacement; a regional approach to treatment; and establishment of smaller segmented systems each with their own treatment facilities.

The no action and OSWT options were evaluated from a functionality standpoint and cost was not a determining factor. The regional treatment approach and segmented systems options were compared to each other based on a 15-year project life cycle cost (Project life cycle costs include engineering, legal, miscellaneous, construction, and operation and maintenance costs). A 15-year period was selected to represent a reasonable time period associated with equipment longevity in particular for the economic analyses. It is noted, however, that this does not imply that the facilities would need total replacement at the end of the life-cycle period. The results are included in Section 3 of this Report.

The Task Force designated specific limits for a proposed municipal sewer project which will be referred to hereafter as the “Study Area”.

2.2. Level of engineering evaluations

In accordance with the requested Scope of Services, the evaluation of sewer system options were performed at a planning (conceptual) level.

Basic information was used for the evaluations such as aerial photographs, USGS mapping, utility records, on-site visits, and past reports provided by the Task Force. The estimates for construction, engineering, legal, and miscellaneous costs presented herein were based on general estimating practices and O'Brien & Gere's experience with similar systems.

This report is not intended to provide the level of detail typically found in a Facilities Plan.

2.3. Concurrent wastewater treatment study

At this time, O'Brien & Gere is independently finalizing several evaluations for the City of Oneida related to proposed expansion of the City's WWTP. This expansion would reportedly make treatment capacity available to the Study Area of this Report as well as the Town of Verona.

If the findings of this Report support a regional collection system with treatment at the City's WWTP and there is found to be sufficient interest in proceeding with plans for a municipal sewer system, this additional expansion requirement will need to be factored into the City's plans for expansion.

3. Sewer options evaluated

3.1. General

The Task Force developed an overall study area as shown on Figure 1 using planning and technical experts, elected-official questionnaires, and potential-user surveys. Further discussions pared this area to the current Study Area, which represents the densely populated areas of the original overall study area, and described by the following table:

Location	Area	Town/County
Prospect Street	6A and 6B	T. Vernon/Oneida Co.
Pratt Drive	7	T. Vernon/Oneida Co.
Morgan Road/Scholtz Road	8	T. Vernon/Oneida Co.
Village of Wampsville	11	T. Lenox and City of Oneida/Madison Co.
Village of Oneida Castle	12	T. Vernon/Oneida Co.
Sconondoa Road	13	T. Vernon/Oneida Co.

Generally all Areas except No. 11 are located east of Oneida Creek. Area 11 generally covers the Village of Wampsville. The Area designations refer to the numbering system developed by the Task Force planning and technical personnel when considering the potential for a much larger project area. The Areas listed above were selected due to need and the greatest interest at this time.

The above locations are shown in the alternative sewer system evaluations attached as Figures 2 through 7.

The following Options for serving the above Areas were considered:

OPTION A No Action

OPTION B Replacement of Existing On-site Wastewater Treatment (OSWT) Systems in-kind

OPTION C Regional Collection System With Treatment at the City of Oneida WWTP

OPTION D Segmented Systems with individual Treatment Facility

3.2. Option A – No action

3.2.1. Impact on public health

It has been documented by various sources (refer to the Grant Application referenced in Section 1.2) that the majority of the On-site Wastewater Treatment (OSWT) systems within the Study Area no longer provide sufficient disposal/treatment. The reported cause is a combination of system age, unsuitable soils and areas of high groundwater.

The discharge of raw or partially treated sewage to the environment is considered to be a potential threat to public health. It has been documented (US EPA "National Management Measures Guidance to Control Nonpoint Source Pollution from Urban Areas") that some states have identified on-site wastewater treatment systems as the third most common contributor to ground water pollution and also a significant threat to drinking water sources.

A 1999 outbreak of gastroenteritis at the Washington County, New York Fair was linked to a failing septic system at a nearby dormitory. A failed septic system was also responsible for forty six cases of Hepatitis A in Racine, Missouri in 1992, and other states have reported both health and water resource impacts from poorly functioning on-site disposal systems.

Therefore, it is evident that failing OSWT systems are serious situations that need to be dealt with expeditiously.

3.2.2. Function of an OSWT system

The function of an OSWT system (e.g. a conventional septic tank/subsurface soil absorption field (leach field) system) is to remove solids and contaminants such as pathogens, nitrogen compounds, phosphorus, biochemical oxygen demand (BOD), and various plant nutrients from human waste.

Pathogens are microorganisms (parasites, bacteria, and viruses) that can cause communicable diseases through direct or indirect body contact or ingestion of contaminated water or shellfish. Pathogens pose a particular threat when partially treated sewage forms pools on ground surfaces or migrates to recreational waters. Nitrogen and phosphorus (plant nutrients) discharges contribute to depletion of dissolved oxygen in surface waters. Excessive nitrate-nitrogen in drinking water is of special concern to the health of infants and pregnant women.

Wastewater should be filtered by adequate layers of in-situ soils as it migrates to the groundwater table.

3.2.3. Legal requirements

New York State law establishes regulatory requirements that are administered by the State or County Department of Health (DOH), specifically Article 75-A, Section 75.5, (Standards for individual sewage treatment systems). This Section states that individual sewage treatment systems (of 1,000 gpd or less) shall be designed and constructed in accordance with the standards of the State Commissioner of Health as set forth in Appendix 75-A of this Title.

It should be noted there is a procedure to approve plans and issue Certificates of Compliance for OSWT's. However, to our knowledge, there is no formal procedure or requirement for long-term monitoring and maintenance of OSWT's until a failed system has been documented.

3.2.4. Summary

No Action means OSWT systems continue to function as they have and will continue to decline. When OSWT systems no longer perform their required function and sewage is discharged to the environment, corrective action must be taken to protect public health. Therefore, a No Action Option should not be considered.

3.3. Option B – Replacement of existing OSWT systems in-kind

3.3.1. General

The following systems were evaluated for OSWT replacement:

- Septic Tank / Subsurface Soil Absorption Field System
- Mound System
- Raised Bed System

3.3.2. System descriptions

<u>Septic Tank / Subsurface Soil Absorption Field</u> - consists of a septic tank and subsurface leaching field. Septic tanks are buried in the ground, are generally watertight, single or multiple chamber settling and anaerobic digestion vessels. They are designed to receive and pretreat domestic wastewater, buffer peak flows, and keep settleable solids, oils, scum, and other floatable material out of the leach field. Wastewater effluent is discharged from the tank and passes through pipes to a series of underground perforated pipes. From the pipes, the partially treated effluent flows vertically through the soil. Treatment occurs in the septic tank, on and within the biomat that forms at the soil infiltrative surface, and in the soil. Treatment then continues as the effluent moves through

the underlying soil profiles. Treated effluent that is not drawn into plant roots, incorporated into microbial biomass, or evaporated, ultimately reaches ground waters and possibly nearby surface waters.

Regardless of the type of soil, sand, or other medium used for the leach field, some maintenance is required. In addition to periodic tank pumping to remove solids (every 2 to 3 years), it is important to restrict the operation of heavy equipment within the area proposed for soil absorption fields to prevent compaction of the soil structure and system clogging. Vehicles or other heavy equipment should not be operated over previously installed absorption fields or filters for the same reason. Concrete tanks are often capable of withstanding heavy loads, but operation of vehicles or other heavy equipment directly above them can cause settling or structural failure that can affect tank performance. Finally, because of the clogging effect of roots, vegetation above absorption fields and filter media should be restricted to types with short root structures. Trees or shrubbery should be immediately removed from absorption fields or filter medium installations.

The following general design requirements apply to this system:

- Ground surface must be above the 10 year flood elevation.
- Ground slopes must be no greater than 15 percent.
- There must be at least four feet of suitable soil cover above rock, unsuitable soils, and high seasonal groundwater levels.
- In-place soils must have a percolation rate of between one and 60 minutes per inch.

A <u>Mound System</u> is an alternative soil absorption system that is typically used at sites where insufficient ground water separation distances or slow permeability soil conditions exist. Mound systems are typically designed so that the effluent from the septic tank flows to a dosing tank and is then pumped to the top of the mound that is constructed above the natural soil surface. The mound consists of a layer of suitable sand fill, an absorption bed filled with aggregate within the sand fill, and a covering layer of topsoil. The topsoil layer, at least 6 inches deep, serves as a growth medium for vegetation.

The following general design requirements apply to this system:

- Ground surface must be above the 10 year flood elevation.
- The maximum high groundwater level must be at least one foot below the original ground surface.
- Bedrock must be at least two feet below the natural ground surface. The percolation rate of the naturally occurring soil must be less than 120 minutes/inch.
- The natural ground slope must be no greater than 12 percent.
- A pressure distribution network is required.
- A dual chamber septic tank or two tanks in series in addition to the dosing tank are required.

A Raised Bed System is similar to a mound system but the absorption bed is built directly on the ground surface, with aggregate placed on tilled soil instead of on top of raised sand. Raised bed systems are typically designed for sites unsuitable for subsurface systems, but with less restrictive site conditions than sites where mounds would be needed.

The following general design requirements apply to this system:

- Ground surface must be above the 10 year flood elevation.
- There must be at least one but no more than two feet of original soil covering over any impermeable soil layer or bedrock.
- The maximum high groundwater level must be at least one foot below the original ground surface.
- The percolation rate must be less than 60 minutes per inch.
- Slopes must be no greater than 15 percent.

3.3.3. Review of soils specific to the study area

General

Information related to the geology of the soils in the Study Area such as permeability, depth to water table and rock, and frost action was obtained from field data provided by the U.S. Dept. of Agriculture Soil Conservation Service (SCS). Normally, information provided from this organization is all inclusive as to site conditions and the acceptable/ unacceptable uses of the soils, mainly related to agriculture uses and construction, but also to installation of OSWT systems.

However, although all the field data has been obtained by the SCS, Oneida and Madison Counties soil analyses relative to OSWT use has not yet been fully analyzed and compiled for publication.

3.3.4. O'Brien & Gere's compilation of SCS data

Using SCS's raw field data, O'Brien & Gere reviewed the soil geology found within the Study Area and related each soil type to the use of OSWT systems. The following is a general summary of the conditions found within the Study Area. Refer to Table 1 for further details of the soil types and their geologic parameters.

General Summary

Areas 6A, 6B, 7, 8, 12, and 13 (Village of Oneida Castle/surrounding area in the Town of Vernon) – The soils immediately surrounding the residential properties are generally unsuitable for conventional OSWT systems due to high groundwater levels between 0.5 and 2 feet below grade and percolation rates that vary between 10 to 300 minutes per inch (in some areas as high as 1,000 minutes per inch) within the same soil type. High groundwater levels are also indicated in the low lying areas along Morgan and Scholtz Roads and in the areas adjacent to Oneida Creek. The maximum allowable percolation rate for a conventional OSWT system is 60 minutes/inch.

Soils immediately adjacent to the roadways, (where the majority of all housing is located) appear to be more suitable for OSWT systems as the soil percolation rates range between 10 and 30 minutes per inch. The groundwater depth listed in the SCS field data simply indicates that groundwater is located at a depth greater than three feet. Since the minimum groundwater depth requirement for a conventional OSWT system is four feet, global suitability of OSWT systems is uncertain and the use of a conventional OSWT system would need to be based on actual field testing at each property.

Area 11 (Wampsville) - the soils in Area 11 are generally unsuitable for OSWT systems due to high groundwater levels between 0.5 and 2 feet below grade, and percolation rates between 10 and 1,000 minutes per inch within the same soil type. The maximum allowable percolation rate for a conventional OSWT (Septic Tank/Subsurface Soil Absorption Field) system is 60 minutes per inch. Here, either Mound or Raised Bed systems would be required, assuming there was sufficient area to build the system on the particular property and all other requirements for an alternative system could be met.

In Wampsville, as one proceeds southerly from the County Office Building Complex, the ground elevation rises to NYS Route 5. The grade continues to rise both easterly and westerly along NYS Route 5. In this area the groundwater depth is reportedly closer to the minimum requirement of four feet below grade. However, the percolation rates are reported to vary between 10 and 100 minutes per inch even within the same soil type.

3.3.5. Summary of geological review

Based on a review of the field data supplied by the SCS, no soil type located within the Study Area was found to meet all minimum regulatory requirements for use of conventional OSWT system. This does not eliminate the possibility that there might be individual properties that could meet all requirements, but it does suggest that if replacement of the OSWT systems is to be pursued, the alternative Mound or Raised Bed system might be required.

3.3.6. Review of property size relative to a conventional OSWT system

General

Replacement of existing OSWT systems would need to meet all minimum design and installation requirements of the NYS Department of Health as published in Appendix 75A, of NYCRR 10.

Impact of Surface Area Requirements

Conventional Septic Tank / Subsurface Soil Absorption Field - assuming that current housing in all of the Areas has 3 or 4 bedrooms, a minimum septic tank size of 1,000 gallons would be required. Absorption trenches would need to be a minimum of 400 to 500 feet in total length. Based on established design criteria, the total surface area required for a septic tank system is about 4,000 square feet (sf).

By overlaying tax maps on aerial photography of the Study Area, and viewing typical placement of housing, the following approximate percentages of properties are indicated to be too small to meet the dimensional / setback requirements of a conventional OSWT system:

AREA	LOCATION	Approx. % of Lots too small	Est'd Smallest Lot Size (acres)	Est'd Largest Lot Size (acres)
6A & 6B	Prospect St	40	0.12	1.2
7	Pratt Dr	15	0.26	1.1
8	Morgan Rd/Scholtz Rd	0	0.64	1.5
11	Wampsville	35	0.24	5.6
12	Oneida Castle (V)	50	0.16	2.0
13	Sconondoa Rd	50	0.23	1.0

Mound or Raised Bed System – when existing geological conditions prove to be unsuitable for a conventional OSWT system, a Mound or Raised Bed system are acceptable choices although much more expensive.

However, even where the geology within the Study Area might be suitable for a Mound or Raised Bed system, there is an additional limitation. In order to construct this type of elevated system, the footprint, or land area required for construction, must be larger than the conventional subsurface system. This is caused by the need to construct reasonable side slopes which are maintainable between the finished grade of the elevated system and original grade.

A cursory review of the Study Area indicated the additional lot area needed to construct the side slopes would eliminate about 95 percent of all properties from further consideration.

Summary

A review of the dimensional/setback requirements for OSWT system replacement reveals that the lot sizes would rule out use of an OSWT system for essentially all of the Study Area except Area 8.

3.4. Option C – Regional collection systems with treatment at the City of Oneida WWTP

The feasibility of this option requires that certain areas be grouped together. Four groupings of areas, or "Base Area Groupings" ("BAG"), as shown in the table below, were identified based primarily on proximity to each other and topography.

Base Area Groupings ("BAG")		Refer to Figure
C.1	Areas 6A, 12 and 13	2
C.2	Area 6B	2
C.3	Areas 7 and 8	2
C.4	All of Area 11	6

In addition to the base collection systems represented by the BAG's listed above, three options were identified using various combinations of gravity and pressure sewers (the latter which use grinder pumping units). For example, C.1.a is an optional collection system to "BAG" C.1.

The following table illustrates these options and Figure references:

Base Area Groupings Options		Refer to Figure
C.1.a	Areas 6A, 12 and 13 with partial grinder unit service alternative	3
C.3.a	Areas 7 and 8 with partial grinder unit service alternative	3
C.4.a	Central part of Area 11 (provides service only to County Office Building, schools, County Department of Social Services (Health Facilities), the County Jail and the housing with the greatest density)	6

General

Option C examines the infrastructure needed for a Regional Sewage Collection System to collect sewage from homes, community facilities, and businesses within each grouping of Areas within the Study Area and transport it to the City of Oneida's existing sewer system.

Base Area Groupings ("BAG") C.1, C.2, and C.3 represent composite areas within the overall Regional Sewage Collection System proposed for that portion of the Study Area east of Oneida Creek formed by three topographic divides.

Alternative layouts to the BAG's are identified as C.1.a, C.3.a, and C.4.a and have the same geographic boundaries as each BAG (e.g. C.1.a is an option to C.1). Options C.1.a and C.3.a incorporate pressure sewers with grinder pumping units. This was done to provide a comparison of costs between a conventional gravity sewer and submersible pumping station system versus individual grinder units in two areas of differing density. (C.1.a is average density located in Area 12 and C.3.a is low density located in Areas 8 and 13).

Similarly, BAG C.4's option is C.4.a and is that portion of the overall Study Area located within the Village of Wampsville. Option C.4.a is located in the same general area as C.4 but considers a smaller portion of the Village of Wampsville. This option provides service only to the County Office Building Complex, the County Jail, the school, the Madison County Highway Department garage, the commercial facilities and some residential housing.

Included in the cost for developing the Wampsville sewer system (with treatment at the City of Oneida WWTP) is a force main connection to the City's collection system. A force main installed within the abandoned railroad bed provides the least cost solution for collection of the Wampsville sewage.

Land along and on both sides of the railroad bed is lower and appears to have minimal slope to take advantage of a gravity sewer system. It is likely that development of this adjacent land would require pumping to some degree in order to discharge into the City's collection system. Therefore, a force main as shown (with future connections via pumping facilities) appears to provide both the long and short term solution for handling future development.

The alternative solution for serving the adjacent land is a gravity sewer along both sides of the railbed or some combination of gravity sewer on one side and crossings or breaches of the railbed, all of which will require a more detailed examination and some idea of the type and extent of the proposed development. This future examination would have no impact on the cost of developing a sewer system to serve Wampsville.

3.4.1. Basis of design

The following Basis of Design was used for layout of the collection system options and estimating the proposed infrastructure under Option C:

Current population	House counts using aerial photography
People per house	3.0

Future population	Assumed development of single unit lots immediately adjacent to Roads.
Ultimate population density	9.0 people per acre.
Developable land	One half the current agricultural land.
Average flow per person	100 gal. per day (with infiltration).
Flow peaking factor	4.0
Gravity collection sewers	8-inch min.
Gravity collection laterals	6-inch min.
Manhole spacing	400 ft. max.
Parallel sewers	Used along State or County Roads to avoid cased crossing of laterals that would be required.
Central pumping station/type	Solids handling, submersible type with separate valve manhole used with conventional gravity system.
Central pumping station alternative/grinder pumps	Grinder pumps considered where flows resulted in detention times that would cause odor problems with conventional submersible pumps.
Residential grinder units (Municipal-owned)	1 Horsepower, semi-positive displacement pumps. These would provide for individual house service with either a Duplex Unit or a Simplex Unit *.
Main Force Mains	4" dia. minimum.
Grinder Pump Force Main	1.5" to 4" depending on flow requirements.
Piping material	PVC-ASTM 3034 for gravity and PVC-ASTM 2240 for pressure. (used in areas where user density or topography precludes conventional system)

* NOTE: The cost of a Duplex Unit is approximately equal to twice the value of a Simplex Unit, within the accuracy of the preliminary estimates utilized herein. Therefore, the cost analyses involving grinder pumps is virtually independent of which type of grinder system is selected. More importantly, the advantages and disadvantages associated with public versus private ownership of these grinder units should be discussed further by the individual municipalities as part of a future Facilities Plan.

3.4.2. Proposed infrastructure

The proposed infrastructure for each of the Base Area Groupings, including Options thereto, for Option C is summarized in the following table as well as on the attached Figures as indicated:

BAG/ BAG Option	Serving Areas	Type of Regional System *	Refer to Figure
C.1	6A, 12, 13	Conventional	2
C.1.a	6A, 12, 13	Conventional w/ PGS	3
C.2	6B	Conventional	2
C.3	7, 8	Conventional	2
C.3.a	7, 8	Conventional w/ PGS	3
C.4	11	Conventional	6
C.4.a	11	Conventional	6

* PGS indicates partial grinder service

3.4.3. Estimated cost comparisons for implementing, operating and maintaining a regional sewer system

Option C and each variation presented herein is capable of providing regional sewer collection and transmission service. However, the best solution for meeting the needs of the Study Area is implementation of the sewer system with the least cost over the expected life of the system (least life cycle cost). Life cycle costs for sewer collection systems are determined based on a present worth analysis which establishes not only the initial cost to implement the system but also includes an estimate of the present value of all money needed to operate and maintain the system over its expected life.

The present worth analysis performed for the Study Area under Option C included the following cost considerations:

Project costs – the cost for engineering, legal, miscellaneous, and construction of the project.

Operation and maintenance costs – the cost of operating and maintaining the sewer system over its expected life. Operational costs include items such as annual electrical costs and the manpower to oversee the system. Maintenance costs would include items such as the cleaning of manholes and collection piping, flushing of pressure piping, repair of pipe breaks, and replacement or repair of pumps and other equipment.

Both operation and maintenance costs are estimated over the expected life of the system based on the present value of future spending (i.e., determining the future value of money). An assumed interest rate of three percent per year was used for this project as this has been the approximate value of economic inflation in the construction industry recently.

A life expectancy of 15 years was used for the present worth analysis. A sewer system is expected to last beyond 15 years but generally the pumping and related equipment components have, during this period, reached the end of their expected useful life and have either undergone significant repair or complete replacement. This type of expenditure generally continues in a 15 year cycle.

A summary of the estimated Project costs and the present worth (value) of 15 years of Operation and Maintenance costs is presented below (note that all four BAG's make up the regional sewer system):

BAG	PROJECT COSTS	15 YEAR PRESENT WORTH OF O&M COSTS	TOTAL LIFE CYCLE COST
C.1	$5,555,000	$710,000	$6,265,000
C.2	$945,000	$140,000	$1,085,000
C.3	$2,100,000	$305,000	$2,405,000
C.4	$4,335,000	$605,000	$ 4,940,000

Three Options were evaluated for the above BAG's. Generally each Option included serving a portion of the BAG's with grinder units where it was thought that costs could be lowered. It should be noted that it has been assumed the Residential Grinder Units will be constructed, owned, maintained and operated by the individual municipalities.

A summary of the estimated Project costs and the present worth (value) of 15 years of Operation and Maintenance costs is presented below:

BAG OPTION	PROJECT COSTS	15 YEAR PRESENT WORTH OF O&M COSTS	TOTAL LIFE CYCLE COST
C.1.a	$5,640,000	$1,200,000	$6,840,000
C.3.a	$1,675,000	$355,000	$2,030,000
C.4.a	$3,255,000	$355,000	$3,610,000

A breakdown of the estimated project costs under Option C is included in Tables 2 through 8. A breakdown of the present worth of O&M costs is included in Tables 13 through 19.

3.4.4. Estimated cost of treatment provided by City of Oneida

Since Option C requires wastewater treatment at the City of Oneida's WWTP, the life cycle cost of treatment was determined so it could be included with the collection system to determine the total life cycle cost. The basis for the treatment cost used was the charge for treatment currently assessed by the City for outside customers which is reportedly $2.40 per 1000 gallons (or $1.80 per 100 cubic feet). This rate excludes City collection sewer system charges. As with the other life cycle calculations, the term and interest rate used were 15 years and three percent (3%) respectively.

The treatment cost includes items such as utilities, manpower, and solids handling / tipping fees. Table 20 summarizes the present worth value of fifteen years of treatment by the City of Oneida under two different scenarios: one with BAG C.4 and one with BAG C.4.a.

In summary, the present worth of this treatment is about:

With BAG C.4	$2,345,000.
With BAG C.4.a.	$2,094,000.

3.4.5. Regional collection sewer system with least life cycle cost

Based on the above present worth analyses, the sewer systems with the least estimated life cycle cost consists of the following BAGs/BAG Options. Note that because BAGs C.4 and C.4.a are not true alternatives to each other, two columns are shown, one with each BAG Option.

		Life Cycle Cost with	
BAG	BAG Option	BAG C.4	BAG C.4.a
C.1		$6,265,000	$6,265,000
C.2		$1,085,000	$1,085,000
	C.3.a	$2,030,000	$2,030,000
C.4		$4,940,000	
	C.4.a		$3,610,000
Sub-total (Sewer collection system)		$14,320,000	$12,990,000
Treatment (City of Oneida)		$2,345,000	$2,094,000
Total, Option "C" life cycle cost		$16,665,000	$15,084,000

It should be noted that, although the cost analysis demonstrates that pressure sewer systems have a lower life cycle cost (including maintenance), the ongoing maintenance associated with Grinder Units should receive future consideration. This would also include addressing power outage issues.

3.5. Option D – Segmented collection systems with their own treatment facilities

As with Option C, the feasibility of this option requires that certain areas be grouped together. Four groupings of areas, or "Base Area Groupings" ("BAG"), as shown in the table below, were identified based primarily on proximity to each other and topography.

Base Area Groupings ("BAG")		Refer to Figure
D.1	Area 12	4
D.2	Areas 6A, 6B, 7, 8, and 13	4
D.3	Areas 6A, 6B, 7, 8, 12, and 13	5
D.4	All of Area 11	7

General

Option D examines the infrastructure needed for a sewer system to collect sewage from the homes, community facilities, and businesses within segments of the Study Area and transmit it to new on-site package treatment plants (WWTP).

D.1 Area 12 - Village of Oneida Castle with its own WWTP.
D.2 Areas 6A, 6B, 7, 8, and 13 – all located east of Oneida Creek (except the Village of Oneida Castle) with a new package WWTP northwest of Area 7.
D.3 Areas 6A, 6B, 7, 8, 12, and 13 - all located east of Oneida Creek with a new package treatment plant in the Village of Oneida Castle.
D.4 All of Area 11 – located in the Village of Wampsville, and a small area in the City of Oneida, with its own package WWTP.

The segments comprising Option D were determined by location rather than topography.

All properties within the Village of Wampsville were included in BAG D.4 since it is logical that all properties would be needed to pay for the cost of a new WWTP.

3.5.1. Basis of Design

The Basis of Design for Option D is the same as listed for Option C with exception of the addition of package WWTPs under Option D.

The components of a packaged WWTP include a lift station, an equalization vault, the treatment facilities, an outfall and required site work such as roads, drainage, miscellaneous piping, landscaping, and fencing.

Required wastewater treatment plant capacities, in million gallons per day (MGD), are estimated to be:

BAG	Capacity
D.1	0.075 MGD
D.2	0.075 MGD
D.3	0.15 MGD
D.4	0.10 MGD

3.5.2. Proposed infrastructure

The infrastructure proposed for Option D is shown on the attached Figures:

BAG	Figure
D.1	4
D.2	4
D.3	5
D.4	7

3.5.3. Estimated costs for implementation, and operation and maintenance

The present worth analysis performed for the Study Area under Option D included the same cost considerations as listed under Option C for project, and operation and maintenance costs.

A summary of the estimated Project costs and the present worth (value) of 15 years of Operation and Maintenance costs, including treatment costs, (escalated at 3 percent per year) is presented below:

BAG	PROJECT COSTS	15 YEAR PRESENT WORTH OF O&M COSTS *	TOTAL LIFE CYCLE COST
D.1	$4,750,000	$1,535,000	$6,285,000
D.2	$5,460,000	$2,035,000	$7,495,000
D.3	$9,205,000	$2,595,000	$11,800,000
D.4	$4,955,000	$1,800,000	$6,755,000

* including treatment costs

The estimated cost of the packaged system equipment included in the above costs was provided by US Filter and included construction and painting by US Filter. The estimated cost of the overall project including on-site piping, electrical and controls, and site work was added based on O'Brien & Gere's experience with systems similar in function and size.

No administration building or other enclosures have been included in the above costs as it is assumed the facilities would be manned part time by the City of Oneida.

A breakdown of the estimated project costs under Option D is included in Tables 9 through 12. A breakdown of the present worth O&M costs is included in Tables 21 through 24.

3.5.4. Sewer system with least life cycle cost

Based on the above present worth analysis, the estimated life cycle cost for the above sewer systems are:

BAG	BAG Option	Life Cycle Cost	Most cost effective combination of Alternatives
D.1		$6,285,000	
D.2		$7,495,000	
D.3		$11,800,000	$11,800,000
D.4		$6,755,000	$6,755,000
Total, Option "D" life cycle cost			$18,555,000

3.5.5. Selection of proposed system based on life cycle costs

If a comparison is made of the life cycle costs for the best combination of BAGs under Option C (Regional Sewage Collection and transport to the City of Oneida) versus Option D (Segmented Sewage Collection with package WWTP's), the life cycle cost for implementing new sewer systems under Option D (sewer systems with separate WWTP facilities) is significantly more expensive than the cost of treating waste at the City of Oneida WWTP, as follows: (i.e. $18,555,000 under Option D vs. either $16,665,000 if BAG C.4 is selected or $15,084,000 if BAG C.4.a is selected). Therefore, it is recommended that Option D systems be eliminated from further consideration.

4. Conclusions

The Village of Oneida Castle (Town of Vernon), and adjacent population centers within the Town of Vernon contribute significant amounts of non-point source pollutants that contaminate the soils and waterways within the Oneida Creek sub-basin. Evidence of this is documented. A major portion of the pollutants is raw sewage.

Elimination of the open sewage discharges will significantly reduce a potential threat to public health.

Results of the option evaluations conducted to provide for a public sewage collection system for the Study Area, which compared a regional collection system versus a de-centralized (or segmented) collection system are summarized as follows:

Option A - No Action

No Action is not an Option since the majority of the OSWT systems within the Study Area no longer provide sufficient disposal / treatment and present a threat to public health from contaminants in human waste such as pathogens, nitrogen compounds, phosphorus, biochemical oxygen demand (BOD).

Option B – Replacement of existing OSWT systems in-kind

No soil type located within the Study Area was found to meet all minimum regulatory requirements for use of conventional OSWT system.

Insufficient lot sizes would preclude the use of an OSWT system for much of the Study Area.

A Mound or Raised Bed subsurface disposal system is not a viable option as approximately 95 percent of the existing lots do not meet the dimensional / setback requirements for these type of systems.

Use of a conventional OSWT (Septic Tank / Subsurface Soil Absorption Field) would be limited in addressing the overall threat to public health.

Option C – Regional collection system with treatment at the City of Oneida WWTP.

> The estimated 15 year present worth life cycle cost of the most cost effective system including treatment service by the City of Oneida, of those considered under Option C, is $16,665,000 if BAG C.4 is selected and $15,084.,000 if BAG C.4.a is selected.

Option D – Segmented systems with their own treatment facility.

> The estimated 15 year present worth life cycle cost of the most cost effective system considered under Option D is $18,555,000. This was for a combination of D.3 and D.4. BAG D.3 provides service to all of the Study Area east of Oneida Creek with treatment at a package WWTP in the Village of Oneida Castle and BAG D.4 provides service to that portion of the Study Area in the Village of Wampsville which would discharge to a separate package WWTP.

It is concluded that the most cost effective solution with the greatest impact on eliminating non-point source pollutants produced by the discharge of human sewage to the environment is to establish a Regional sewer collection system (Option C).

5. Summary & recommendations

5.1. Summary of project costs

The most cost effective solution appears to be to establish regional sewage collection systems with treatment at the existing City of Oneida WWTP. The estimated project cost based on 2005 dollars for each Base Area Grouping (BAG) is as follows:

BAG	Areas	Project Cost Estimate
C.1.	6A, 12, 13	$5,555,000
C.2.	6B	945,000
C.3.a.	7, 8	1,675,000
C.4	11	4,335,000 or
C.4.a.	11 (modified)	3,255,000

5.2. Recommended steps for establishing a regional sewer system

The first steps in the establishment of a regional sewage collection system for the Study Area will require public informational meetings followed by District formation proceedings for the unincorporated portions of the project (i.e. Towns). Significant collaboration on the part of the two municipalities in Oneida County will be needed to establish interest and commitment to enter into the necessary intermunicipal agreements, both between themselves and with the City of Oneida for treatment and transportation.

For the Village of Wampsville (Area 11), the decision to move forward can be independent of the other Areas as there is no physical relationship to the Areas in Oneida County. Note, however, that although the Village is not required to form a Sewer District, there is a small portion of Area 11 outside the Village which would require an intermunicipal agreement.

In considering future planning of this project, it should be noted that the State recently ruled, relative to a joint Town water project known as "Jack's Reef" in Onondaga County, that each municipality was required to form its own District and construct its share of the facilities. Upon discussion with appropriate counsel, consideration may wish to be given to a County District to implement the project.

The creation of Sewer Districts will require the preparation of appropriate Maps, Plans and Reports which will address project, user, and operation and maintenance costs to allow the formation of the District(s).

At this time it is appropriate to present this Report to the local representatives of the Areas to be served to begin discussions of the proposed facilities and alternative methods for charging the individual property owners. Additional work is also needed to evaluate options for funding of the project. Currently, low interest loans are available for qualified projects from the NYS Environmental Facilities Corp. (EFC) Clean Water State Revolving Fund (CWSRF) program. To obtain a grant to assist with this project, the Study Area would have to demonstrate that the average income of the population is below specific limits.

Recently, a new program was created by funding agencies to assist communities with determining co-funding opportunities for these types of projects. Participating agencies include: NYSEFC, NYS Dept. of Health, USDA SCS Rural Utilities Services (RUS), US Dept. of Commerce Community Development Block Grants, NYS Dept. of State Appalachian Regional Commission, and the NYS Oil Spill Fund. Additional information and application resources on this program can be found on the internet at www.nycofunding.org.

To determine local support and interest, informational meetings with the public should be held to discuss the findings herein, as well as funding and District requirements.

If there is sufficient support from the property owners, discussions should be held to expand the current limits of the City of Oneida Service Area for treatment to include the limits of the Study Area. In addition, preparation of District Formation documentation indicating the proposed boundaries, the proposed facilities, the proposed method of financing, and the estimated financial impact on the individual property owners should be conducted.

Upon formation of the District(s), Intermunicipal Agreements, and NYS Department of Audit and Control approval (if required), the project should proceed to the preliminary and final design stages to obtain the necessary regulatory and local permits and approvals.

Once all approvals are obtained and funding is in place, proceed with project advertisement, bidding, construction, and sale of bonds for the project.