



Brookfield Water Pollution Control Authority Planning Study to Provide Municipal Sewer Service to Candlewood Lake Area Scope of Work, Budget & Schedule

Prepared by:

LOMBARDO ASSOCIATES, INC.

188 Church Street
Newton, Massachusetts 02458

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1 BACKGROUND INFORMATION

The following background information on Candlewood Lake is extracted largely from Candlewood Lake and Squantz Pond 2017 Water Quality Monitoring Report submitted to the Candlewood Lake Authority on February 16, 2018 – see http://docs.wixstatic.com/ugd/c55130_8a7bbb7272b54c5d897740f8aa5095f1.pdf.

Candlewood Lake is a man-made, pumped-storage reservoir created in the late 1920s for the purpose of generating hydroelectricity, Figures 1-1 and 1-2. After being constructed, the lake became an important asset due to the environmental and recreational resources it provided. Candlewood Lake has a surface area of 5,064 acres, a 65-mile shoreline, and a watershed of 25,907 acres. The lake has a maximum depth of 89 feet (25 meters), and an average depth of 33 feet (10 meters). It is located in the Towns of Brookfield, Danbury, New Fairfield, Sherman and New Milford.

Candlewood Lake is characterized as a mesotrophic to late mesotrophic lake. Water quality data support that Candlewood Lake is almost always phosphorus limited. There is concern that septic phosphorus may be a significant influence on the lake's water quality.

The Brookfield Water Pollution Control Authority (WPCA) is interested in addressing the wastewater management issues/needs in the areas of concern adjacent to Candlewood Lake. Figures 1-3 and 1-4 illustrate the areas in Brookfield that drain to Candlewood Lake, hereinafter referred to as the Study Area.. Figure 1-5 the areas of concern as defined by the Brookfield WPCA within the Study Area

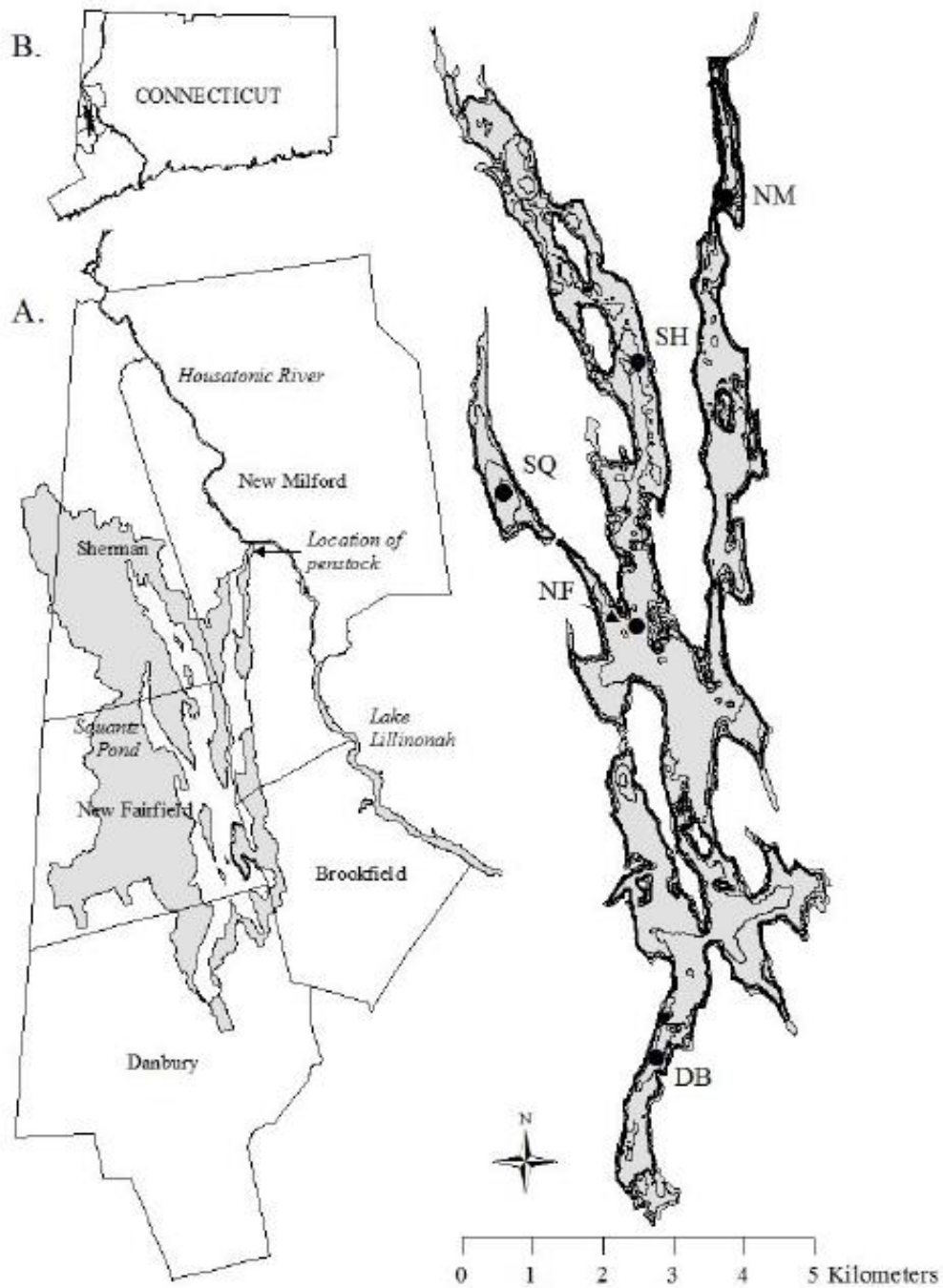
The Study Area has the approximate number of developed properties / septic systems as listed on Table 1-1.

Table 1-1 Approximate Number of Developed Properties in Study Area

Approx. Number of Developed Properties-Septic Systems in Brookfield Candlewood Lake Study Area	
Candlewood Lake Road	109
Candlewood Shores	573
Arrowhead Point	244
Pleasant Rise	121
Total	1,047

The objective of the proposed Engineering Plan is to address Brookfield WPCA interest in providing municipal wastewater management services to the Study Area to address inadequate wastewater management practices that are understood to be contributing to Candlewood Lake water quality difficulties.

The following Section presents the proposed Scope of Work to achieve this objective.



Location of sampling sites on Candlewood Lake (DB, NF, NM, SH) and Squantz Pond (SQ). Inset A shows the location of the watershed and municipalities in relation to the lakes. Inset B shows the location of the lake and municipalities within the State of Connecticut.

Figure 1-1 Candlewood Lake – Location Map

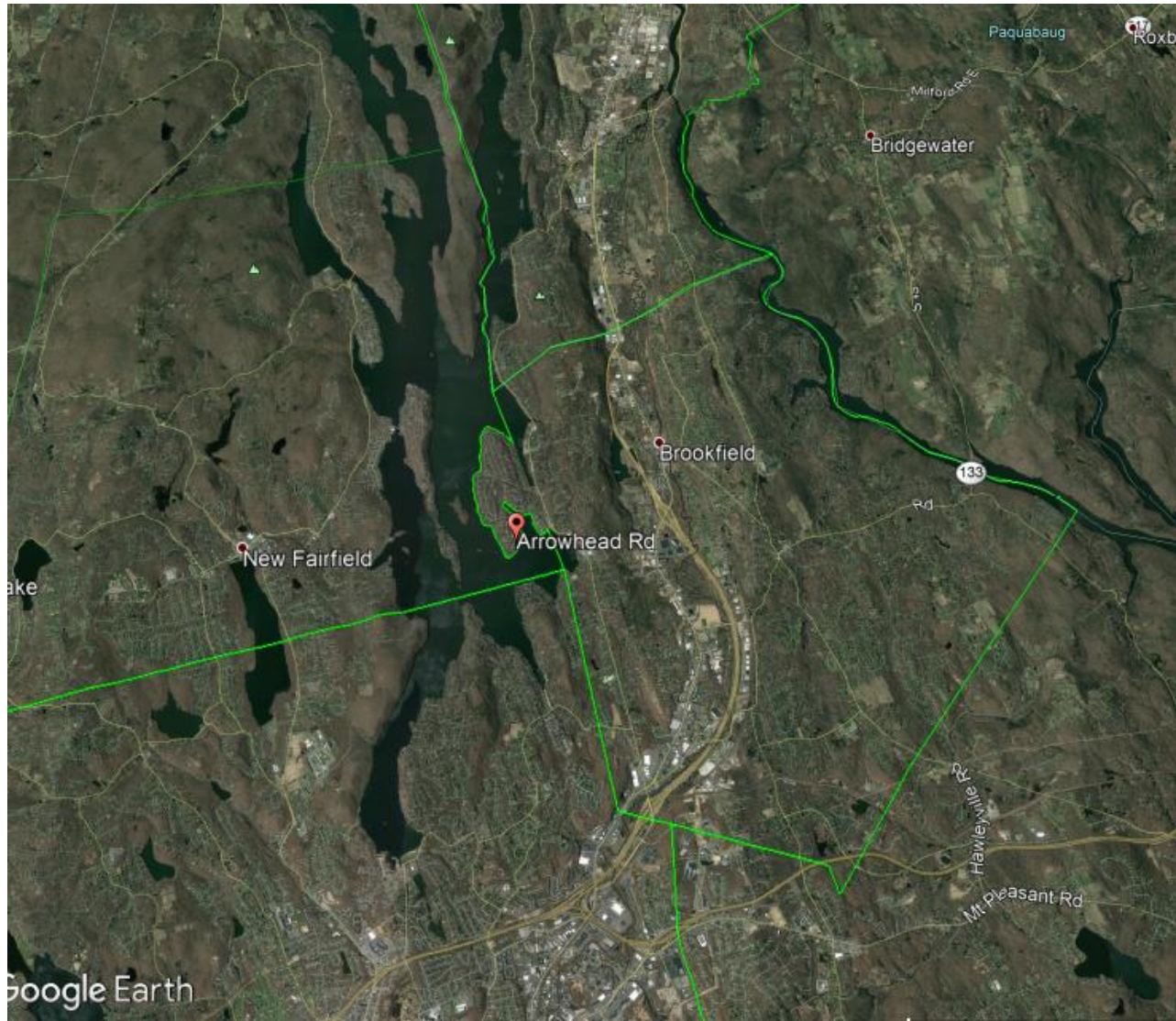


Figure 1-2 Candlewood Lake Aerial Photo with Town Boundaries

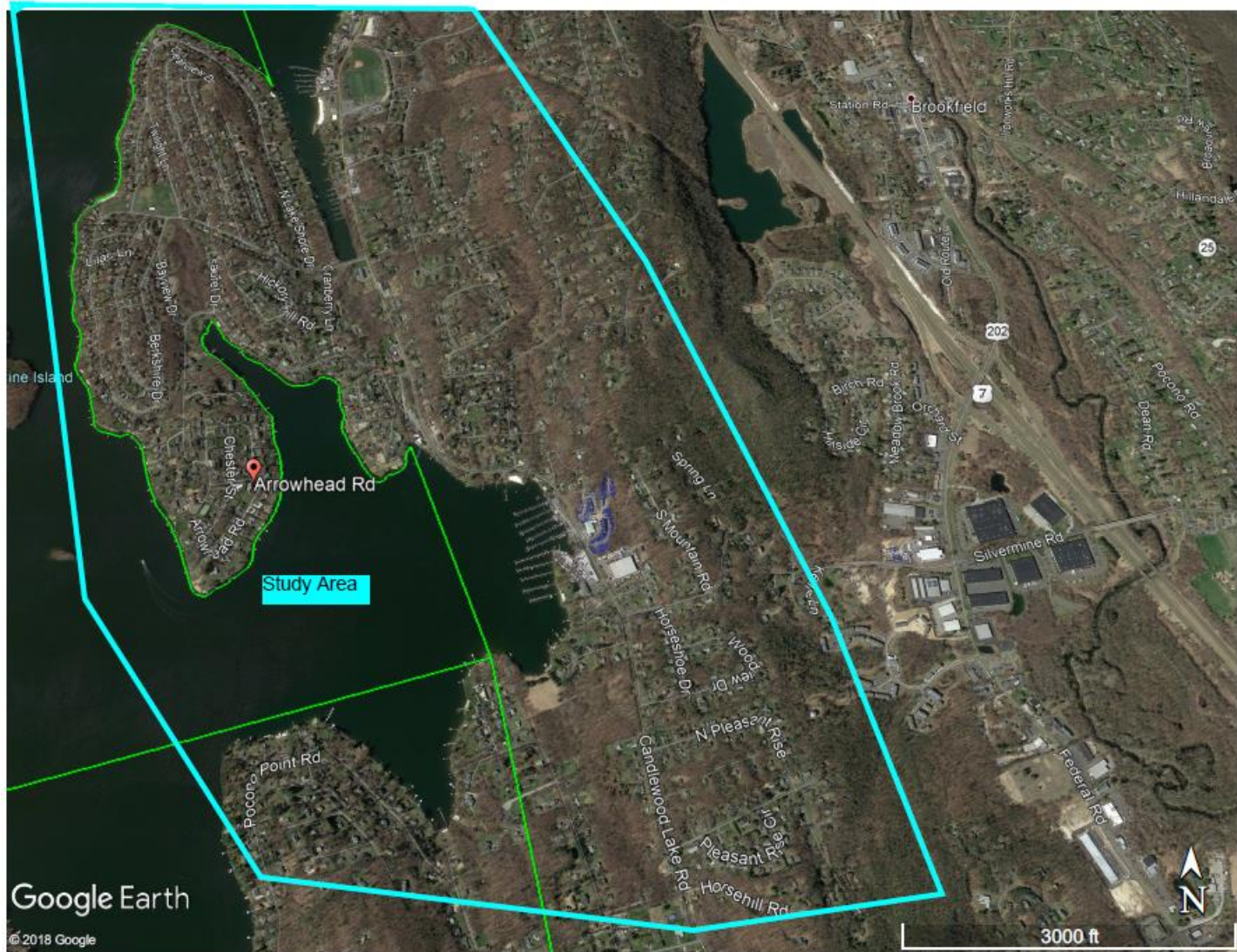


Figure 1-3 Brookfield-Candlewood Lake Aerial Photo with Study Area Boundaries on Aerial

Figure 1-4 Brookfield-Candlewood Lake Aerial Photo with Study Area Boundaries on Topo



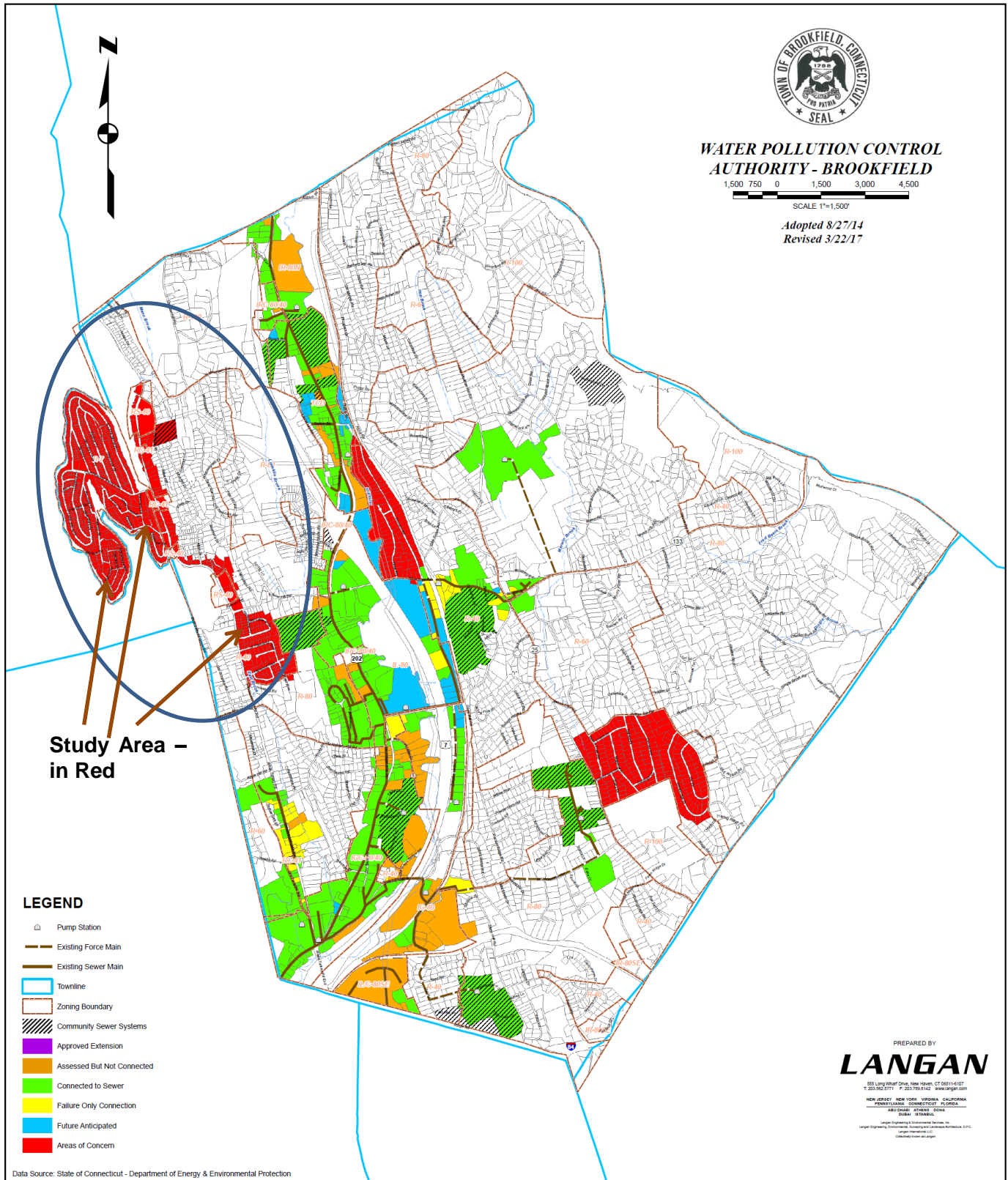


Figure 1-5 Brookfield Sewered Areas and Areas of Concern

2 PROJECT APPROACH

The proposed project approach consists of the following Tasks to develop an Engineering Plan for the Study Area:

1. Study Areas Data Gathering, Review and Identification of Any Data Gaps
2. Initial Determination of Needed Wastewater Management Improvements and estimated wastewater flows
3. Identification & Evaluation of Wastewater Management Options
 - a. On-site system upgrades
 - b. Neighborhood System with subsurface discharge or direct discharge to the Lake
 - c. Connection to existing or to be developed wastewater system
4. Identification of local Wastewater Treatment and Disposal Site(s) with estimates of their Capacities
5. Alternative Solution Scenarios Development
6. Preliminary Engineering and Capital/Annual O&M Budgets of Alternatives
7. Preferred Solution Scenario Selection
8. Identification of Potential Grants//Loans
9. Preliminary Financing Plan, Projected User Charges & Implementation Plan with permitting timeline
10. Engineering Plan Report
11. Meetings with the Brookfield WPCA – throughout the project

As illustrated on Figure 2-1, Lombardo Associates, Inc. (LAI) proposes a detailed lot by lot analysis project approach that we have refined over 40 years of working for unsewered communities that were addressing the inadequacies of individual septic systems and associated water quality difficulties. The process is described in the US EPA funded publication “Cluster Wastewater Systems Planning Handbook, Project No. WU-HT-01-45. Prepared for the National Decentralized Water Resources Capacity Development Project, Washington University, St. Louis, MO, by Lombardo Associates, Inc., Newton, MA, 2004. In addition we propose to scientifically determine the ability of Study Area soils to remove septic phosphorus. The project proposes issuance of Task Reports that will then become chapters, as refined and integrated, of the Engineering Plan.

Scope of Work

Task 1 Study Areas Data Gathering, Review and Identification of Any Data Gaps

LAI will gather and review existing information for the Candlewood Lake study area parcels as well as nearby lands that may be candidates for neighborhood systems. Information to be gathered will include:

- Town and County Planning Departments GIS shape files on the Study Area’s natural resources, topography, aerial photography and wastewater practices.
- Town property information (i.e. assessor’s database and tax maps that can be integrated with the County’s shape files) – which is to be provided by the Town
- Water use data by property
- Wastewater management practices for the Study Areas – retrieved from Board of Health records.
- Lake water quality reports, in particular from the Candlewood Lake Authority.

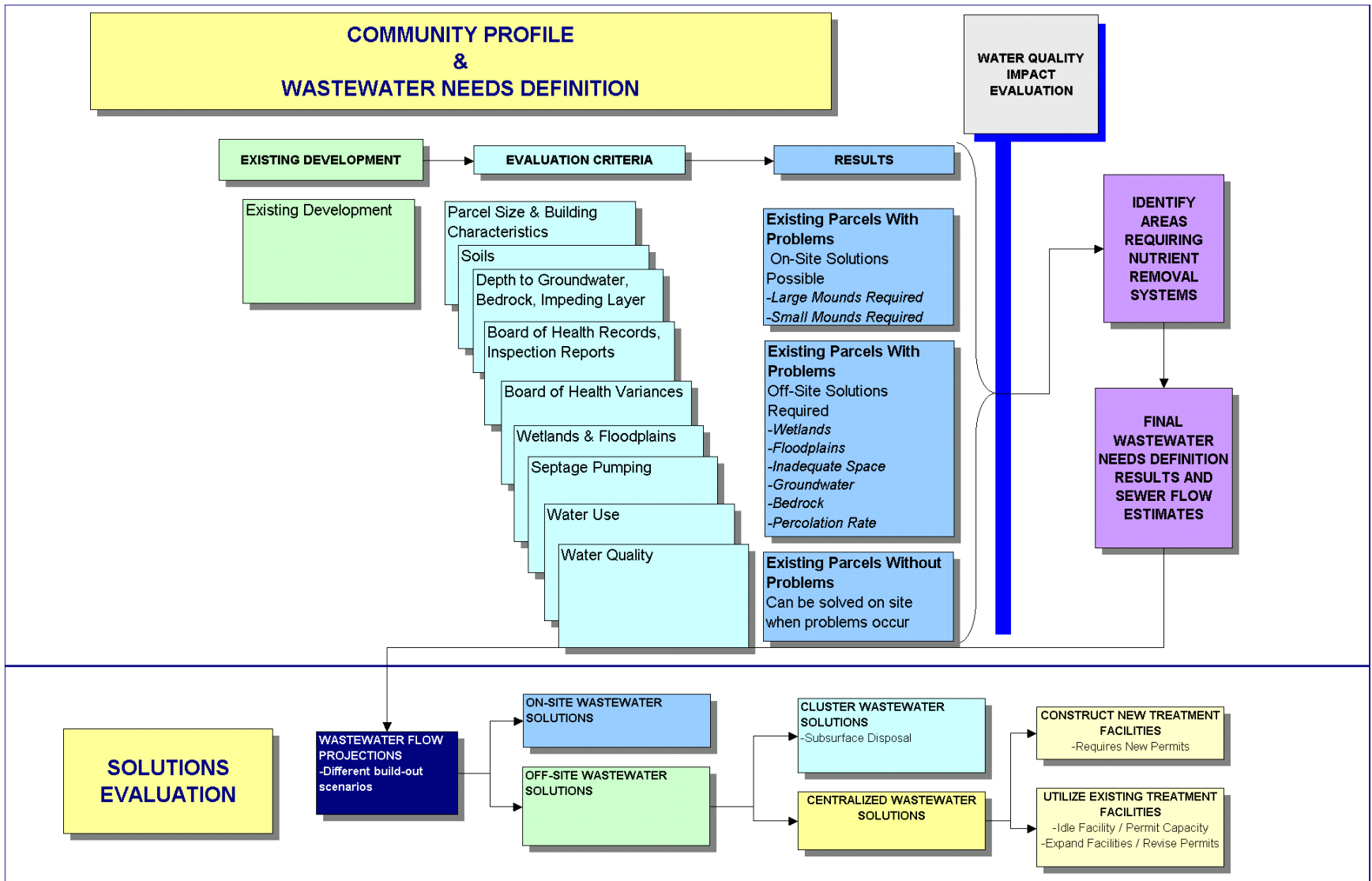


Figure 2-1 Wastewater Needs Definition Methodology

- Field review of study area
- A spreadsheet profile of property ownership, assessor's information, property development characteristics, natural resources information (such soils type, depth to bedrock/impermeable layer, etc.) and wastewater system characteristics will be created.
- The spreadsheet will become attributes of the parcel shape files.

A Task 1 Report/Technical Memorandum (TM) will be prepared on the results of these efforts.

Task 2 Initial Determination of Needed Wastewater Management Improvements

2.1 Phosphorus Removal Capacity of Study Area Soils – Case Study Analysis

The soils phosphorus removal capacity of the Study Area Soils, which are predominately fine sandy loams and shown on Figure 2-2, will be determined by performance of the following activities.

Drainfield Soils Removal of Septic Phosphorus at 3 Sites

- ✓ Based upon Task 1 statistics on age of septic systems and depth to groundwater, LAI will identify desirable locations (i.e. areas of properties) to determine soils removal of septic phosphorus. WPCA will create a list of willing property owners within the specified desirable locations. Following a field review, LAI will select three (3) sites from the willing property owners' list and develop a field sampling plan for each site. LAI and WPCA will met with the property owners and describe the proposed testing plan details. WPCA to then obtain access agreement from property owner. LAI will provide the WPCA a recommended Access Agreement.
- ✓ At each of the three (3) sites, soil samples below drainfield will be taken at 4 locations, at 6+/- depths per location and analyzed for phosphorus removal
- ✓ LAI will install three multi-level bundle piezometers at each site and obtain groundwater samples at 3-5 depths and sample for TP, Soluble Reactive Phosphorus (SRP), nitrate-N, Cl⁻, and the artificial sweetener acesulfame (ACE).

Groundwater Analysis

To determine the extent to which septic phosphorus is being discharged to Candlewood Lake and information on hydrogeologic characteristics, three groundwater multi-level bundle piezometers, with the ability to sample at 5 depths at each location, will be installed and sampled monthly for three (3) months for TP, SRP, nitrate-N, ACE and Cl⁻ at shoreline property location. LAI and WPCA will work together as described above to identify locations, obtaining access agreements, etc. Additionally soil samples will be taken, have sieve analysis performed to estimate hydraulic conductivity. Soils will be analyzed for total iron, aluminum and calcium.

Subtask Report

LAI will prepare a report on the findings of Task 2.1 efforts to quantify Study Area soils phosphorus removal.

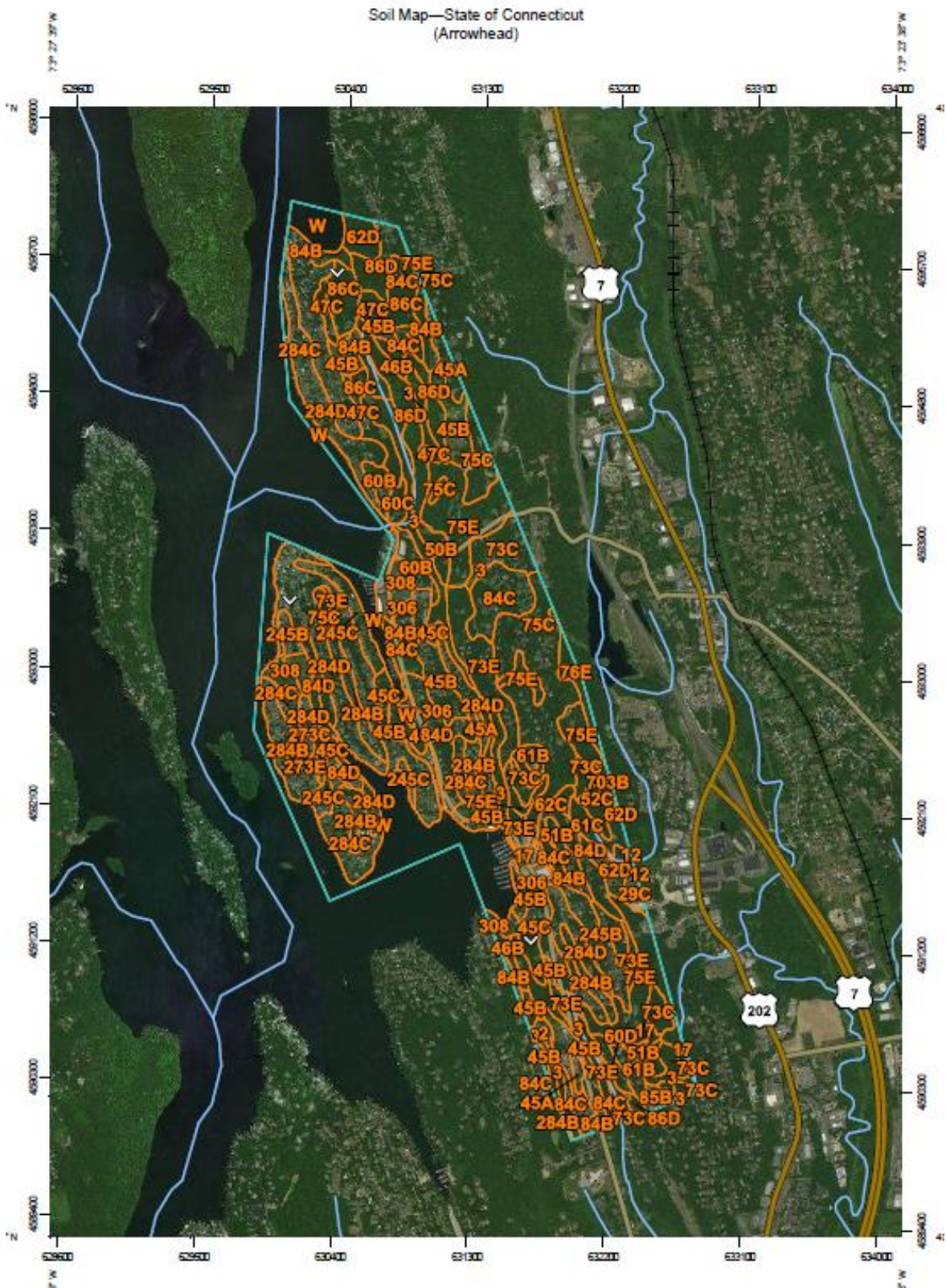


Figure 2-2 Study Area Soils—from NRCS

2.2 Lot by Lot Analysis

Using the Needs Definition Methodology illustrated on Figure 2-1 and the data collected in Task 1, for each of the Study area properties, LAI will make a determination on which properties can be served with:

- ✓ On-site solutions and likely acceptable type(s)
- ✓ Off-site solution required

For properties requiring off-site solutions, we will group the properties to create concentrated sub-areas (i.e., hot spots) and estimate the wastewater flow and nutrient loads from each sub-area.

A Task 2 Report/TM will be prepared that presents the results of these efforts. A meeting with the BWPCA (as described in Task 8) is proposed to review the results of Tasks 1 and 2, along with initial efforts of Site Screening, Task 4.

Task 3 Identification & Evaluation of Wastewater Management Options

LAI will prepare a brief summary of the wastewater management options available to address the needs identified by Task 2 and will include connection to existing BWPCA wastewater system, Neighborhood System with subsurface discharge and or direct discharge to the Lake and/or On-site system upgrades. It is recognized that direct discharge will be challenging to permit, if at all possible, and require high levels of treatment and treatment system redundancy. Consequently subsurface discharge will be the initial focus.

We will screen the options to identify which options are technically feasible / viable for the study area. Furthermore, based upon expected cost competitiveness and ease of operation/reliability, we will perform a preliminary ranking of the viable alternatives. A Task 3 Report/TM will be prepared.

Task 4 Wastewater Treatment and Disposal Site Screening

LAI will identify properties, in particular publically owned ones, which appear to be viable candidates for wastewater treatment and/or disposal/reuse. While we will prepare a preliminary professional estimate of each site's disposal capacity, hydrogeologic testing is required to determine a site's capacity where groundwater mounding may be the limiting factor. Our estimate(s) of site capacities will utilize soils and surficial geology data collected in Task 1.

A Task 4 Report/TM will be prepared that presents the results of these efforts.

Task 5 Alternative Scenarios Development

For properties requiring off-site solutions as determined in Task 2.2, LAI will group the properties to create concentrated sub-areas (i.e., hot spots) and estimate the wastewater flow for each sub-area.

Using the results of Tasks 3 and 4, LAI will then create three (3) to five (5) Wastewater Solution Scenarios that will address the Task 2 defined Wastewater Management Needs. The Scenarios are anticipated to range from maximum reliance on individual on-site systems to a single Study Area wide wastewater management solution approach.

A Task 5 Report/TM will be prepared that presents the results of these efforts.

Task 6 Preliminary Engineering and Capital/Annual O&M Budgets

For each of the Solution Scenarios developed in Task 5, LAI will prepare:

- ✓ Preliminary Layouts of Engineering Solutions
- ✓ Preliminary Capital and Annual O&M Budgets

A Task 6 Report/TM will be prepared that presents the results of these efforts.

Task 7 Preferred Solution Scenario Selection

Utilizing the results of the previous tasks, LAI will conduct 2 charrettes with the Brookfield WPCA to determine the WPCA's Preferred Solution Scenario. For the selected Scenario (with any desired refinements), LAI will prepare a Task 7 report/TM that defines the Preferred Solution Scenario along with updated Engineering Layouts and Cost Estimates.

Task 8 Identification of Potential Grants//Loans

LAI will identify grants/loans and funding requirements that are available from the State of CT and document such in a Task 8 Report/TM.

Task 9 Preliminary Financing Plan, Projected User Charges & Implementation Plan

Using the Task 7 budgets and potential/expected grants as described in Task 8, LAI will prepare a Financing Plan for the Proposed Improvements defined in Task 7. Based upon the expected capital and annual O&M costs, potential grants and financing (i.e. bonds for 20 – 30 years), we will estimate required annual user charges for financial sustainability.

An Implementation Plan (i.e. Gantt Chart) will be prepared to illustrate project components (including permitting) and how they would be phased in over time.

Task 10 Engineering Plan Report

A draft Study Area Wastewater Engineering Plan that incorporates the results of the previous Tasks will be prepared and submitted for Brookfield WPCA review and comment. LAI will incorporate responses to the Brookfield WPCA comments into a Proposed Wastewater Engineering Plan.

The Proposed Wastewater Management Engineering Plan will then be submitted to CT DEEP for review and comment. LAI will incorporate responses to the CT DEEP comments into a Final Wastewater Engineering Plan.

An electronic (pdf) and ten (10) printed copies of the Final Wastewater Engineering Plan will be provided to the Brookfield WPCA.

Task 11 Public Meetings

A minimum of four (4) meetings are proposed to be held with the Brookfield WPCA at the following milestones:

- Tasks 1 and 2 to review the Needs Definition completion and initial efforts at Site Screening of Task 4.
- 2- Task 7 charrettes – one for review of Scenarios and one for selection of preferred option
- Task 8 Draft Engineering Plan

Additionally, LAI, through the WPCA and Town of Brookfield, will meet with the Candlewood Lake Authority (CLA), owner First Light and neighboring 5 Towns at two meetings convened by the WPCA/Town at the following project milestones:

- ✓ After initiation of Tasks 1, to introduce the project, its methodology and objectives
- ✓ Approximately after completion of Task 5 Alternatives Scenarios Development to review project findings.

The goal of the CLA and Towns meetings are to engage the Candlewood Lake towns in addressing the water quality restoration needs of Candlewood Lake.

LAI will submit monthly project status reports and participate in a project review conference call monthly with the WPCA.

3 SCHEDULE & BUDGET

Start Date - May 13, 2019

Figure 3-1 presents the proposed project schedule.

Schedule for:		Brookfield WPCA - Candlewood Lake Wastewater Management Plan																				
Months after Receipt of Authorization to Proceed		1	2	3	4	5	6	7	8	9	10											
Task #	Task Description																					
Task 1	Study Areas Data Gathering, Review and Identification of Any Data Gaps	█	█	█	█	█																
Task 2	Initial Determination of Needed Wastewater Management		█	█	█	█	█	█														
Task 3	ID & Evaluate Wastewater Management Options						█	█	█													
Task 4	Wastewater Treatment and Disposal Site Screening						█	█														
Task 5	Alternative Scenarios Development								█	█												
Task 6	Preliminary Engineering and Cost Estimates								█	█	█											
Task 7	Preferred Solution Scenario Selection										█	█	█									
Task 8	Identification of Potential Grants//Loans											█	█									
Task 9	Financing, User Charges &												█	█	█	█						
Task 10	Engineering Plan Report																		█	█	█	█
Task 11	Meetings			█				█				█		█						█		
	Project Status Conference Calls		*		*		*		*		*		*		*		*		*		*	