Appendix I

Wastewater Treatment Plant Report

INSITE
ENGINEERING, SURVEYING &
LANDSCAPE ARCHITECTURE, P.C.

PRELIMINARY
WASTEWATER SYSTEM REPORT

For

UNION PLACE
Town of Carmel, New York

September 10, 2010

Prepared by:
Insite Engineering, Surveying & Landscape Architecture, P.C.
3 Garrett Place
Carmel, New York

1.0 INTRODUCTION

Located in the Town of Carmel, Putnam County, the proposed Union Place project is situated on a 287-acre +/- parcel along U.S. Route 6 and Baldwin Place Road, just north of the Westchester County Line. The overall project site consists of six parcels identified as Tax Map Numbers 75.19-1-1.12, 86.6-1-4, 86.10-1-2, 86.10-1-3, 86.11-1-1 and 86.14-1-7. It is proposed to develop approximately eighty acres on the western portion of the site as mixed-use development consisting of commercial, office, retail, and residential development. On the eastern portion of the property, approximately one hundred acres is proposed to be developed as Union Heights, a housing community. Union Place and Union Heights are proposed to be connected via local roads and walking trails.

2.0 WASTEWATER DESIGN FLOW

The average daily wastewater design flow for the proposed action is based on the hydraulic loading rates listed in the New York State Department of Environmental Conservation (NYSDEC's) 1988 publication *Design Standard for Wastewater Treatment Works – Intermediate Sized Sewerage Facilities (DEC88)*. The total average daily design flow for the proposed action has been calculated below:

Use	Unit Flow Rate	Size	Demand
Large (non-food) Retail Space[1,5]	0.01 gpd/sf	213,000 sf	2,130 gal/day
Medium to Small Retail Space[2]	0.08 gpd/sf	208,000 sf	16,640 gal/day
Specialty Grocer[2]	6,000 gpd	1	6,000 gal/day
Office Space[2]	0.08 gpd/sf	475,000 sf	38,000 gal/day
Hotel[2]	96 gpd/room	90	8,640 gal/day
Restaurants[2,3]	2,800 gpd/restaurant	3 restaurants	8,400 gal/day
Residential[2,4]	240 gpd/unit	480 units	115,200 gal/day
Community Space[5]	260 gpd	1	260 gal/day
Total Average Daily Design Flow	----------	----------	195,270 gal/day

[1] Large (non-food) Retail Space usage based on study of actual users.
[2] A 20% reduction has been applied to the unit flow rate cited as permissible by PCDOH Bulletin CS-31.
[3] Each restaurant is assumed to have 100-seats at 28 gpd/seat.
[4] Residential unit flow rate is based upon 2-bedroom units.
[5] Specific value for use category not cited in DEC88, usage based on actual flow data and/or past projects.

3.0 WASTEWATER COLLECTION SYSTEM

The wastewater collection system is proposed to consist of 8" diameter PVC SDR 35 sewer mains and precast concrete sewer manholes. The sewer mains are proposed to be located generally in the proposed road system. Individual 4" diameter PVC SDR 35 sewer service connections with cleanouts are proposed for each unit. Wastewater flow will be directed to pump stations located throughout the site. Each pump station will direct sewage to the wastewater treatment system.

4.0 WASTEWATER TREATMENT

Three types of wastewater treatment systems have been identified for the subject property depending on the ultimate design flow for the proposed action and alternatives. Each type of system is discussed in further detail below.

4.1 Wastewater Treatment Plant (WWTP)

Where the design flow ranges between 150,000 gpd and 200,000 gpd a centralized WWTP is proposed for wastewater treatment.

The WWTP has been located centrally in the site. This location isolates the WWTP, providing a minimum of 850' +/- to the neatest offsite structure and 300' +/- to the closest onsite structure. The WWTP will sit in the lower portion of the site in order to mitigate visual impacts and odors. Appropriate odor control processes will be provided in the final design to minimize any impacts.

The WWTP will provide advanced treatment of wastewater in accordance with local, regional and state regulatory requirements. Treated effluent will be conveyed in a forcemain to a discharge point out of the New York City Department of Environmental Protection (NYCDEP) watershed. It is envisioned the forcemain will exit the western portion of the site and be routed within existing road rights of way to a point out of the watershed in the southwest corner of the Town of Carmel. Two NYSDEC Class C streams exist in this area which are suitable for discharge of the treated effluent. The treatment processes employed at the WWTP will need to ensure treated effluent complies with NYSDEC intermittent stream effluent limits, which represent the highest degree of treatment that can reasonably be achieved outside of the NYCDEP East of Hudson watershed.

4.2 Wastewater Treatment Plant (WWTP) with Subsurface Sewage Disposal (SSDS)

Where the design flow is greater than 50,000 gpd but less than 150,000 gpd, a WWTP with SSDS may be employed as an alternative to a centralized WWTP with a surface discharge as described in Section 4.1 above.

The WWTP will collect and entirely treat the flow from the sanitary sewage system. No treatment or renovation of the discharge will be required by soil, as with a traditional subsurface treatment system. The discharge from the plant has been treated to such a quality that it could be discharged to a surface water body or stream. The biomass that usually forms in a subsurface treatment system will not be established in this subsurface disposal system because treatment has already occurred in the WWTP.

The effluent from the WWTP would discharge to a multi-zoned SSDS pump station. This SSDS pump station will convey the WWTP effluent through a force main to the subsurface sewage disposal area. An automatic standby emergency backup generator located in the WWTP building will also be connected to the SSDS pump station, to provide continuous operation of the system, even during a power outage.

The SSDS pump station would discharge the treated effluent to a series of gravel absorption trenches, similar to those found in a typical subsurface sewage treatment system. This will allow the treated effluent to infiltrate into the in-situ soil.

4.3 Subsurface Sewage Treatment System (SSTS)

Where the design flow is between 30,000 gpd and 50,000 gpd a conventional SSTS system may be employed as an alternative to the WWTP with SSDS or centralized WWTP.

The SSTS would consist of primary treatment via septic tanks. Effluent from the septic tanks would enter a multi-zoned SSTS pump station. This SSTS pump station will convey the septic tank effluent through a force main to the SSTS area. An automatic standby emergency backup generator located in the WWTP building will also be connected to the SSDS pump station, to provide continuous operation of the system, even during a power outage.

The SSTS area will consist of two foot wide gravel absorption trenches used to treat and infiltrate the effluent into the in-situ soil

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2.0 DESIGN FLOW

It is assumed the average daily water demand will be equivalent to the average daily wastewater demand. The average daily wastewater demand for the proposed action is based on the hydraulic loading rates listed in the New York State Department of Environmental Conservation (NYSDEC's) 1988 publication *Design Standard for Wastewater Treatment Works – Intermediate Sized Sewerage Facilities (DEC88).* The total average daily design flow for the proposed action has been calculated below:

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Total Average Daily Design Flow = 195,270 gal/day = 136 gpm

Peak Flow (3 x Total Average Daily Design Flow) = 3 x 136 gpm = 408 gpm

3.0 WATER SOURCE

The proposed water source is from various drilled wells located throughout the site. Putnam County Department of Health requires permits for all drilled wells to be used for water supply in Putnam County. PCDOH permits have been issued for all drilled wells to be used for water supply, and subsequently tested in accordance with both local and state health department regulations for water supplies. For additional detail refer to the Hydrogeological Reports prepared for the subject project.

4.0 WATER CONTROL BUILDING

A control/treatment building will contain meters, raw water sampling spigots, and chlorination equipment. The discharge from the supply wells will be piped to this building. Adjacent to and uphill of the control/treatment building will be a vented potable water storage tank to provide a minimum of 15 minutes of chlorine contact time at peak design flow, supplemental storage to meet the peak flow requirements, and cycling of the well pumps. Booster pumps will be located in the control building to provide pressure for the potable distribution system. A generator will be installed to provide emergency backup power for the pump station.

Prior to any final water system design raw water samples from each supply well will be taken and analyzed for water quality. Based upon the sampling results, any subsequent treatment systems, if necessary, will be contained in the water control building.

5.0 DISINFECTION

Disinfection will be provided by liquid chlorine. A separate chemical solution crock and feed pump will inject chlorine into each of the raw well water sources prior to the vented storage tank. The chemical solution crocks and chemical feed pumps will be located in the water control building. The vented storage tank will then provide chlorine contact prior to the water being pumped to the distribution system. The chlorine contact time provided is calculated as follows:

Minimum required chlorine contact	=	15 min
Peak flow (see Section 2.0)	=	408 gpm
Minimum volume required (15 min x 408 gpm)	=	6,120 gallons
Vented storage tank volume (see Section 6.0)	=	200,000 gallons
Baffling factor	=	0.5
Minimum effective volume provided (0.5 x 200,000)	=	100,000 gallons > 6,120 gallons

6.0 STORAGE TANK

200,000 gallons of vented storage tank volume is proposed to provide chlorine contact and supplemented storage during times of peak flow. Based upon the final users additional storage may be required to satisfy fire demands. The Health Department's policy requires that the volume of the storage tank be equal to or greater than the average daily flow.

Average daily flow (see Section 2.0)	=	195,270 gallons
Total tank volume	=	200,000 gallons

The storage tank is proposed to be located south of the proposed clubhouse for Union Heights with a ground elevation 875 +/-. Either buried fiberglass reinforced plastic tanks, or above ground tanks will be used for water storage.

7.0 BOOSTER PUMPS

With a storage tank elevation of 875 +/- the mixed-use development, Union Place, and portions of Union Heights can be supplied by gravity while maintaining the minimum required pressure of 35 psi at the service connection, and 20 psi in all fixtures. The highest first floor elevation in the mixed-use development is 694 +/-, and the highest fixture will be located in Building E1 at elevation 740+/-. Based upon static elevations, the following water pressure is anticipated at the highest first floor elevation point of connection and the highest fixture in the Building E1:

Assumed water elevation in storage tank	= 875 +/-
Highest first floor elevation	= 694 +/-
Static head based on highest floor elevation (875 – 694)	= 181'
Static pressure at point of connection (181' / 2.31'/psi)	= 78 psi
Highest fixture elevation	= 740 +/-
Static head based on highest fixture elevation (845-740)	= 135'
Static pressure at highest fixture elevation (135' / 2.31'/psi)	= 58 psi

Based upon static head, many of the buildings in Union Heights will not have the required 35 psi at the point of connection. The highest building in the proposed action is the Clubhouse at Union Heights with a first floor elevation 872 +/-. Based upon the water storage tank elevation of 875 +/-, only 3' of static head or 1.3 psi of pressure is present at the point of connection, thus requiring a booster pump station for Union Heights. A duplex booster pump station is proposed to provide distribution system pressure and maintain 35 psi at each service connection and a minimum of 20 psi in all fixtures throughout Union Heights. The pumps are proposed to be variable speed such that a hydropnuematic tank will not be necessary. The pumps will be designed to maintain a constant output pressure with variable flow rates. A building will be constructed to house the booster pumps and ancillary equipment.

The booster pump station would be located off of the main gravity line supplying the mixed-use development, and would feed a series of water mains supplying Union Heights.

8.0 DISTRIBUTION SYSTEM

The distribution system is proposed to be a minimum 8" Φ PVC, Class 200 water pipe. The distribution system is proposed to originate at the water control building and be "looped" to the maximum extent practicable. The mixed-use development is to be serviced by gravity. A separate distribution system connected to a booster pump station will be provided for Union Heights. Individual service connections will be sized as the design progresses. Fire hydrants are proposed to be located throughout the entire project, with the buildings in the mixed use development containing sprinklers.