

LEWIS ROAD PLANNED RESIDENTIAL DEVELOPMENT EAST QUOGUE, SOUTHAMPTON, NY

GROUNDWATER MONITORING PLAN REV. 2

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LEWIS ROAD PLANNED RESIDENTIAL DEVELOPMENT
EAST QUOGUE, SOUTHAMPTON, NY**

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1.0 INTRODUCTION

P.W. Grosser Consulting, Inc. was contracted to develop a Groundwater Monitoring Plan for the proposed community and golf course called the Lewis Road Planned Residential Development (PRD), located in East Quogue, New York. The project is proposed by the Discovery Land Company (DLC), a private development company. The Groundwater Monitoring Plan is required by the Town of Southampton. The project is located within the Long Island Pine Barrens Region where protection of groundwater quality is a priority.

1.1 Purpose

The purpose of this Groundwater Monitoring Plan for the Lewis Road PRD is to describe:

- an effective groundwater monitoring network;
- procedures for installation of the groundwater monitoring network;
- procedures for establishing baseline groundwater quality conditions beneath the proposed development;
- procedures for groundwater sampling, analysis, and data evaluation;
- a plan for future annual groundwater monitoring; and
- required reporting.

1.2 Project Description

The Lewis Road PRD is a proposed Planned Residential Development (PRD) on 608.79 acres located in the hamlet of East Quogue, Town of Southampton, Suffolk County, New York. The planned project will be a seasonal resort residential community consisting of 118 various sized units with a golf course, clubhouse, and other outdoor recreational amenities including a ball field, community pool, tennis courts, pickle ball courts, a basketball court, and related facilities. The project will also include construction of 12 workforce housing units and a state-of-the-art Turf Center/Environmental Maintenance Facility and administration building in the southwest panhandle of the site.

The overall project incorporates four distinct parcels of land grouped into three properties located north and east of Lewis Road near Spinney Road and extending north of Sunrise Highway (New York State Route 27). The Hills property consists of 521.17 acres south of Sunrise Highway and 87.62 acres north of Sunrise Highway. The Kracke property is adjacent to the west side of the Hills property and consists of 87.62 acres. The Parlato property consists of multiple parcels and road abandonments totaling 120.50 acres located east of the Hills property.

As part of the Master Plan for the PRD, no development will occur on the Parlato property (120.50 acres) or on the Hills property north of Sunrise Highway (87.62 acres); this acreage will be dedicated to the Town of Southampton for Open



Space and preserved. These properties are at least partially located in the Core Area of the Pine Barrens and development is prohibited there. A 4-acre area in the Parlato property will be dedicated to the Suffolk County Water Authority (SCWA) for a future public supply well field. In addition, a tertiary sanitary wastewater treatment plant designed and engineered to serve only the proposed project will be constructed within the Hills property south of Sunrise Highway.

The 18-hole golf course will be maintained using low input, environmentally sustainable methods, and the turf will be primarily fertilized using fertigation. Some stormwater will be collected onsite and retained for site irrigation. In addition, two (2) irrigation wells will be installed onsite, each with a pumping capacity of 600 gallons per minute (GPM) to provide irrigation water for the golf course. One of these wells will be installed downgradient of, and within, an existing nitrogen plume resulting from agricultural activity occurring to the north and west of the site. The irrigation well will intersect the existing nitrogen plume, which is flowing southeast toward Weesuck Creek, and is already beneath the site. This irrigation well will recover nitrogen laden groundwater which will be used to "fertigate" (simultaneously irrigate and fertilize) the golf course. The second irrigation well will be a backup and will be located outside of the plume and north of the golf course. If needed, groundwater from the backup well will be used to dilute the nitrogen content of the primary irrigation water.

2.0 PHYSICAL SETTING

The site is located on the south shore of Long Island in the Pine Barrens region.

2.1 Site Description

The property is undeveloped but was previously disturbed for the development of Sunrise Highway and for aviation issues for nearby Gabreski Airport. Historical aerial photography shows that the site has repeatedly been disturbed primarily in the center of the Hills property south of Sunrise Highway. Currently, the property is mostly vegetated with some cleared areas and dumped debris and is situated downgradient of active farms and the adjacent East Coast Sand Mine. Site topography is hilly in the northern portion near Sunrise Highway and generally flat in the southern portion. Elevation ranges from a high of approximately 255 feet above mean sea level (msl) down to 100 feet msl in the north end of the Site, with elevation decreasing to the south. The southern portion of the property ranges from 100 feet msl down to approximately 17 feet msl at Lewis Road. The northern portion generally slopes from north to south at approximately 0.041 feet per foot, while the southern portion slopes gently to the south at approximately 0.013 feet per foot.

The nearest surface-water body is Weesuck Creek, off-site and southeast of the property and flows southeast toward, and into, Shinnecock Bay.

2.2 Land Use

The property of the future Lewis Road PRD is undeveloped pine barrens land that has been previously disturbed for highway construction and aviation purposes. Surrounding properties include active farmland to the west, an active sand mine to the northwest, undeveloped pine barrens land to the north, east and south, and an SCWA well field and residential homes along Spinney Road to the southwest. Sunrise Highway (NYS Route 27) runs east-west through the northern portion of the property. Gabreski Airport is located approximately 0.65 miles to the west.

2.3 Geology

The geologic setting of Long Island is well documented and consists of crystalline bedrock composed of schist and gneiss overlain by layers of unconsolidated deposits. Immediately overlying the bedrock is the Raritan Formation, consisting of the Lloyd sand confined by the Raritan Clay Member. The Lloyd sand is an aquifer and consists of discontinuous layers of gravel, sand, sandy and silty clay, and solid clay. The Raritan Clay is a solid and silty clay with few lenses of sand and gravel, abundant lignite and pyrite, and gray, red, or white in color.

Above the Raritan Clay lies the Magothy Formation. The Magothy Aquifer consists of layers of fine to coarse sand of moderate to high permeability, with interbedded lenses of silt and clay of low permeability resulting in areas of preferential horizontal flow; therefore, this aquifer generally becomes more confined with depth. The Magothy Aquifer is overlain by the Upper Glacial Aquifer. The Upper Glacial Aquifer is the water-table aquifer at this location and is comprised of medium to coarse sand and gravel with occasional thin lenses of fine sand and brown clay. This aquifer extends from the land surface to the top of the Magothy Aquifer; therefore, it is hydraulically connected to the Magothy Aquifer.

The site is underlain by unconsolidated Pleistocene glacial deposits consisting of both terminal moraine and glacial outwash deposits. The north portion of the property is located on the Ronkonkoma Moraine. Moraine deposits are typically poorly sorted and range in grain size from clay to boulders. The south portion of the site is located on the outwash plain, where deposits are primarily well-sorted sands and gravels.

Based on a review of the FEMA Flood Insurance Rate Map (FIRM) for Southampton, NY, the entire property is located with Zone X, an area of minimal flood risk (FEMA, 2021).

2.4 Hydrogeology

Groundwater on Long Island is derived from precipitation. Precipitation entering the soils in the form of recharge passes through the unsaturated zone to a level below which all strata are saturated. This level is referred to as the water table. In general, the groundwater table coincides with sea level on the north and south shores of Long Island and rises in elevation toward the center of the Island. The high point of the parabola is referred to as the groundwater divide. Differences in groundwater elevation create a hydraulic gradient which causes groundwater to flow perpendicular to the contours of equal elevation, or generally toward the north and south shores from the middle of the Island (Freeze and Cherry, 1979). Near the shore, water entering the system tends to flow horizontally in a shallow flow system through the Upper Glacial Aquifer to be discharged from subsurface systems into streams or marine surface waters as subsurface outflow. Water that enters the system further inland generally flows vertically to deeper aquifers before flowing toward the shores (Krulikas, 1986).

The major water-bearing units beneath the subject site include the Upper Glacial aquifer, the Magothy aquifer, and the Lloyd aquifer (Jensen and Soren, 1974; Koszalka, 1984). The top altitude of the Upper Glacial aquifer is equal to the topographic elevation of the property which ranges from 17 to 255 feet above mean sea level (asl) and ranges in thickness from 117 to 355 feet. The top of the

Magothy aquifer is approximately 200 feet below msl (bsl) and exhibits an approximate thickness of 800 feet (Koszalka, 1984). Below the Magothy lies the Raritan Clay which restricts vertical flow between the Lloyd aquifer and the Magothy. The Lloyd aquifer is 1,100 feet bsl and exhibits a thickness of 350 feet (Jensen and Soren, 1974; Koszalka, 1984). Bedrock is present at a depth of about 1,450 feet bsl.

The subject parcel is southeast of the regional groundwater divide, indicating that flow is generally toward the southeast. **Figure 1** depicts the general direction of groundwater flow in the area of the site. Groundwater will be ultimately discharged from the subsurface system in the form of stream flow and/or subsurface outflow to the waters of Weesuck Creek and western Shinnecock Bay. The elevation of groundwater beneath the subject site ranges from approximately 10 to 15 feet msl, depending on meteorological conditions associated with the water year (Eckhardt, Wexler, 1986). The average topographic elevation of the property ranges from approximately 17 to 255 feet msl, therefore, the depth to groundwater ranges from approximately 6 to 240 feet.

Review of the present geographic delineation of the Groundwater Management Zones as determined by Suffolk County Department of Health Services (SCDHS) indicates that the site lies within Zone III, a deep recharge area of pristine water quality. The aquifer underlying the subject property is the Upper Glacial aquifer and is noted to have an average horizontal hydraulic conductivity of 254.6 feet per day (ft/day) (McClymonds and Franke, 1972) and an average vertical hydraulic conductivity of 27 feet/day (Franke and Cohen, 1972). Darcy's Law uses horizontal hydraulic conductivity, porosity and the slope of the water table to compute the velocity of groundwater flow. The formula for velocity, $V = Ki/n$, was solved using hydraulic conductivity ($K = 254.6$ feet/day), hydraulic gradient ($i = 0.0012121$ feet/foot; based on 2 feet vertical over 1,650 feet horizontal), and porosity ($n = 0.30$). Using Darcy's Law, the groundwater velocity in the vicinity of the site is estimated to be 1.03 feet/day (Town of Southampton, 2016).

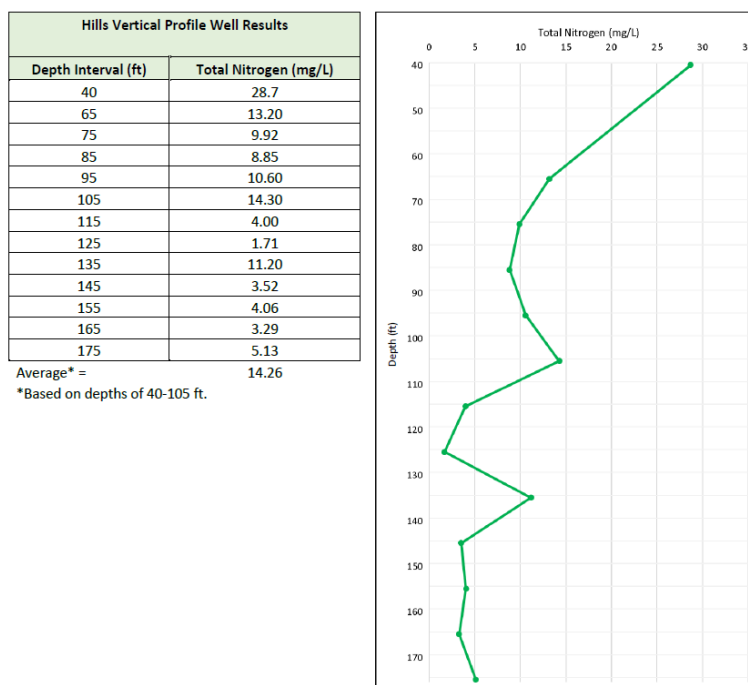
2.5 Site-Specific Groundwater Quality Data

Site specific groundwater data was collected from six (6) monitoring wells installed on the subject property (TW-1, TW-2, KWM-1, KWM-2, KWM-3, and KWM-4) on May 20, 2016. Nitrogen concentrations results ranged from 1.2 mg/L to 28.7 mg/L in the groundwater. The results revealed increasing nitrogen concentrations towards the center of the row of test wells, TW-1, and indicating that a nitrogen plume exists on the subject property. This nitrogen plume originates west of the site, on the adjacent agricultural land and flows southeast beneath the site and toward Weesuck Creek.

A vertical profile well was installed adjacent to the location of TW-1, which was drilled to a depth of 175 feet below grade, where a clay layer was encountered separating the Upper Glacial aquifer from the Magothy aquifer.

Samples were taken at ten-foot intervals starting at a depth of 175 feet and continuing to a depth of 40 feet below grade, the groundwater table. Nitrogen levels ranged from 1.71 mg/L to 28.7 mg/L and varied with depth, as shown below:

Vertical Profile Well Sampling Results



The average nitrogen concentration of the groundwater between the depths of 40 and 105 feet below grade was 14.26 mg/L.

2.6 Surface Water

The nearest observed saltwater body to the proposed irrigation well locations is the Shinnecock Bay, located approximately 4,390 feet to the southeast. This surface-water body is a saltwater body with interconnection to the Atlantic Ocean, located directly south of the site.

The nearest freshwater body is Weesuck Creek approximately 2,000 feet to the southeast of the site. Weesuck Creek flows southeast and discharges into Shinnecock Bay.

3.0 GOLF COURSE ENVIRONMENT

The golf course will occupy 93.17 acres of the total 161.90 acres developed in this project, and more specifically will be located on the southern portion of the Hills property. A state-of-the-art Turf Center/Environmental Maintenance Facility will be located onsite in the southwest panhandle of the site. Two irrigation wells will be installed onsite. The irrigation wells will be connected by piping to two interconnected, lined irrigation ponds, constructed near the center of the developed area. The ponds are primarily sited in previously cleared areas.

The golf course will consist of approximately 35.99 acres (39%) of non-fertilized, sand, natural and revegetated areas, and approximately 57.18 acres (61%) of fertilized areas within the golf envelope. The fertilized areas are approximately broken down as follows:

- Rough – 30.99 acres
- Tees – 3.18 acres
- Greens – 3.58 acres
- Fairways – 19.43 acres

3.1 Environmental Goals

The developer of the Lewis Road PRD golf course is committed to constructing and maintaining the golf course utilizing environmentally sustainable turf management practices which minimize the use of traditional application practices using pesticides and fertilizers. The owner's goal is to combine challenging golf within an environmentally sensitive framework. The project will employ two compatible guidelines in working toward this goal. First, a fertigation system will be constructed to recover and reuse nitrogen-laden water for golf course irrigation. This system will include:

- green liners which will collect stormwater drainage from the greens and, where feasible, pipe this drainage to the irrigation ponds for reuse, and
- an irrigation well which will pump groundwater from an existing nitrogen plume (originating from adjacent active farms) to irrigation ponds for reuse.

Drainage from other green liners will be piped to rain gardens for purification. Second, an Integrated Turf Health Management (ITHM) protocol will be adopted for the construction and maintenance of the golf course. The ITHM is based on the research of Dr. Michael Boehm and his colleagues at Ohio State University and has been peer reviewed by Dr. Alfred Turgeon and Dr. Mike Fidenza, each from the Penn State Turf Science Department of Agricultural Sciences, and by Dr. A. Martin Petrovic, Emeritus Faculty at the School of Integrative Plant Science Horticulture Section of Cornell University. The *Integrated Turf Health Management Plan for the Hills of Southampton, East Quogue, NY*, prepared by

Jeffery L. Seeman, CGCS/CEP (2016) details the protocols that will be implemented at the site. ITHM represents an advancement beyond earlier Integrated Pest Management (IPM) programs. An ITHM will be provided under separate cover.

3.2 Establishment and Maintenance

Following is a preliminary list of elements key to reaching the project goal of establishing and maintaining an environmentally sensitive golf course that minimizes adverse environmental impacts.

- Implementing environmentally sensitive design and construction procedures.
- Building a healthy soil profile, primarily through the use of soil amendments and cultivation practices.
- Properly irrigating and draining the course.
- Using the most appropriate disease-and pest-resistant turf grass varieties on the in-play areas.
- Using native and compatible grass, shrub, and tree species in secondary rough and out-of-play restoration areas. Material shall be suitable to withstand non-management (no irrigation, fertilizers, etc. after grow-in).
- Following a vigilant and proactive Integrated Turf Health Management Program.

Some of the procedures and techniques that will be employed include:

- Soil ecology monitoring and management.
- Daily scouting of the course for determination of maintenance needs and early detection of disease with regular condition reports (weekly, monthly, annual).
- Collecting and managing the data using geographic information system technology, and a facility management application specifically tailored for this project and site. This data will enhance the decision-making process required of the Superintendent in maintaining soil and turf health. In addition, the data will be available to the research/educational project members.
- Regular testing to assess soil conditions in terms of biological activity, organic content, macro-and micronutrient levels, compaction, and drainage characteristics.
- Establishment of acceptable thresholds for regionally common pests and disease.
- Pre-planned response actions to early warning detections and threshold exceedance.
- Use of organic, non-toxic primary treatment options such as physical removal of pest ridden or diseased section, adjustment of watering rates,

cutting heights, nutritional levels, etc., and the use of biological/organic products to treat pests or disease organisms.

To protect storm drains and groundwater, liquid fertilization will be implemented as opposed to pelleted fertilizer. Other environmentally friendly techniques that will be employed are detailed in the *Integrated Turf Health Management Plan for the Hills of Southampton, East Quogue, NY* (Seeman, 2016).

3.3 Green Liners

In order to control nitrate leaching from the most actively managed part of the course, the greens will be lined with an impermeable 40 mil high density polyethylene (HDPE) liner. Drainage will be collected and conveyed to a lined irrigation pond for irrigation recycling or to nearby rain gardens for purification. Having the greens lined will allow for consistent sample collection and analysis that will enhance the study of the use of natural and organic materials.

While use of a green liner system is not a common practice, it is consistent with the environmental sensitivity applied throughout the project and the developer is committed to reducing nitrogen leaching from the golf course. The liner prevents leaching of nitrogen and other turf care products that may be used on the greens in emergencies. These protocols are supported by the *Integrated Turf Health Management Plan for the Hills of Southampton, East Quogue, NY*, prepared by Jeffery L. Seeman, CGCS/CEP (2016).

As the greens are typically the most intensively managed areas of the course, this approach will enhance the water quality protection efforts for the overall project. The use of the liners is not just for water quality protection, but also serves a research function by allowing periodic monitoring of the quantity and quality of water moving through the system. The use of lined greens, with the planned drainage swales and drainpipe system of the project's drainage system, will also improve water conservation by providing a means to recycle the irrigation water from these areas of the course. The drainage system will include sampling ports installed off the sides of the greens.

Although the use of liners in golf course greens is a relatively new approach, the technology employed has been proven on other golf courses in the Town of Southampton and across the USA. This project will take the liner concept further by incorporating the drainage systems into a water recycling and fertigation system, as well as a series of rain gardens that will purify the water. The liner will be made of HDPE material and be approximately 40 mils thick. The life span of this material is predicted to exceed 700 years when exposed to leachate at 20°C (68°F) (Rowe et al, 2009). Failures are exceedingly rare, and when reported and are usually related to the liner being punctured, not deterioration of the material.



The performance of the liner system will be reviewed by monitoring and recording the volume of water collected for each green over time and comparing the results to the amount of water applied through irrigation and precipitation.

If a significant unexplained increase or reduction in the amount of water collected by the drain system is observed, monitoring will be increased to assess the possibility of a failure or leak. If monitoring indicates a failure in the drainage system, surrounding terrain will be inspected for such evidence as overly moist or soft ground. If a failure in the liner is suspected, samples of the collected water will be analyzed for pesticide/fertilizer compounds which were applied to the green within the past 12 months. If it is determined that a failure is probable, repairs will be performed, and the liner or system component fixed or replaced.

Drainage water from the green liners for Holes 3, 8, and 9 will be piped into the onsite irrigation pond and reused in the fertigation process. The remainder of the green liners will be directed to rain gardens, which will be distributed throughout the golf course adjacent to fairways. The series of rain gardens will capture about 50% of the water, remove 70 to 80% of the nitrogen in the greens drainage water, and remove most of the short-lived pesticides by retaining the water in the rain garden system for removal (Petrovic, 2016).

4.0 GROUNDWATER MONITORING NETWORK

For the maintenance of environmental quality and to facilitate monitoring for research and management adjustments, monitoring wells will be installed in key locations as shown on **Figure 2**. The groundwater monitoring network will consist of 14 shallow monitoring wells: three (3) in background locations, nine (9) throughout the golf course, and two (2) immediately downgradient of the sewage treatment plant (STP). The nine (9) monitoring wells on the golf course will be distributed across the course adjacent to tee, fairway, and green areas.

The hydrological analysis performed indicates that groundwater flows southeast to east-southeast toward the major surface-water bodies in the area. The effective result is that, depending on location on the course, groundwater flow is either toward Weesuck Creek or Shinnecock Bay. Therefore, the proposed monitoring well locations were selected to determine groundwater quality adjacent to and locally downgradient of relatively high maintenance areas such as tee boxes, and, in a regional sense, downgradient of the full course at positions along the southeast boundary (**Figure 2**).

4.1 Monitoring Well Placement

The goal of the monitoring well placement plan is to determine the groundwater quality from preexisting features (up gradient sand mine, agricultural fields with a known nitrate impact, and residential properties on Spinney Road) and post construction features including the golf course greens (via rain garden and irrigation pond), tees, fairways, golf course maintenance facility, sewage treatment plant, and the general water quality of the project site including groundwater flow towards Weesuck Creek and Shinnecock Bay.

A total of 14 monitoring wells will be installed at the following locations:

- Upgradient background wells BW-1 through BW-3 will be installed along the west, upgradient edge of the site;
- Golf Course wells GW-A through GW-I will be installed throughout the course, adjacent and downgradient of tees, fairways, and greens; and
- Sewage Treatment Plant (STP) monitoring wells STP-1 and STP-2 will be installed approximately 80 feet apart and immediately downgradient of the STP.

The rationale for selecting each monitoring well location is detailed in **Table 1**, below. Proposed well locations are shown in **Figure 2**.

TABLE 1
Monitoring Well Location Selection

WELL	PURPOSE
BW-1	To monitor upgradient, background groundwater quality from the active sand mine northwest of the site, flowing southeast toward the northern area of the golf course.
BW-2	To monitor upgradient, background groundwater quality from the agricultural area northwest of the site, flowing southeast toward the central (main) area of the golf course and PRD residences.
BW-3	To monitor background groundwater quality from the active farming area west of the site and upgradient of the onsite STP, flowing southeast toward the southern area of the golf course.
GW-A	To monitor leaching from the tee area at the 14 th hole, the rain garden accepting drainage from the green area at the 13 th hole, and general groundwater quality in the northwestern area of the course.
GW-B	To monitor for potential leakage from the two irrigation ponds along the east-central side of the course.
GW-C	To monitor leaching from the tee area at the 6 th hole, the rain garden in the 7 th hole fairway, and general downgradient groundwater quality in the southeast corner of the site migrating toward Weesuck Creek and Shinnecock Bay.
GW-D	To monitor groundwater quality downgradient of the maintenance area.
GW-E	To monitor leaching from the fairway area at the 10 th hole, the rain gardens accepting drainage from the 10 th and 11 th holes, and general groundwater quality in the west side of the course.
GW-F	To monitor leaching from the tee area at the 9 th hole, and general groundwater quality in the central portion of the course.
GW-G	To monitor leaching from the tee area at the 16 th and 18 th holes.
GW-H	To monitor leaching from the rain garden accepting drainage from the green area at the 18 th hole, and general groundwater quality in the north-central area of the course, and upgradient of the irrigation ponds.
GW-I	To monitor leaching from the fairway area at the 4 th hole, and general groundwater quality along the east, downgradient side of the course migrating toward Weesuck Creek.
STP-1	To monitor groundwater quality downgradient of the STP.
STP-2	To monitor groundwater quality downgradient of the STP

Wells that require no clearing will be installed pre-construction. Wells that require clearing will not be installed pre-construction, and therefore will not be

included in the pre-construction monitoring. These wells will be installed during clearing activities for the golf course. If it is determined that a groundwater quality impact for the Spinney Road properties, then an additional background monitoring well(s) will be installed just east of the Spinney Road properties but before the golf course.

4.2 Monitoring Well Installation

Monitoring wells will be constructed to straddle the water table and extend approximately 10 feet below into the Upper Glacial aquifer. The two (2) irrigation wells will also be part of the monitoring network, but these wells will be screened from approximately 30 to 60 feet below the water table.

Monitoring wells will be constructed of four-inch diameter, flush joint, schedule 40 PVC casing with 15 feet of 0.010-inch slot PVC screen, as shown in **Figure 2**. It is anticipated that a hollow-stem auger rig will be used to install the wells and split-spoon core barrel soil samples will be collected at 5-foot intervals to characterize the subsurface geology. A PWGC hydrogeologist will be onsite to oversee drilling and well installation, and to characterize the soil samples and geologically log each well. Since perched groundwater can occur on top of clay lenses in the Upper Glacial moraine deposits, the hydrogeologist shall confirm that the water table has been reached prior to well installation.

After drilling to the required depth, the screen and riser will be set into the borehole. Screens will be set so that 10 feet of screen is below the water table and 5 feet is above. A filter pack consisting of Number 0 Morie Sand will be placed in the borehole annulus around the well screen to 5 feet above the top of the screen. A 2-foot layer of bentonite pellets will be placed on top of the filter sand and hydrated with deionized water to form an effective seal. The remainder of the borehole annulus will then be filled with a cement-bentonite mixture to surface level. Each well will be set flush to grade in a protective manhole, with a watertight locking cap installed on top of the PVC casing.

4.3 Monitoring Well Development

Monitoring wells will be developed by over-pumping to remove fine material and allow water in the formation to flow freely into the well screen. The equipment used to develop the wells will be cleaned and decontaminated prior to use and between each well using a laboratory-grade detergent and water solution, and a tap water rinse. A portable turbidity, pH, temperature and conductivity meter will be used to monitor the effectiveness of the well development. The development of the well will continue until the turbidity of the well water is equivalent to or less than 50 Nephelometric Turbidity Units (NTUs). PWGC will monitor pH, temperature, and specific conductivity until

each parameter stabilizes (three consecutive five-minute interval readings within 10% of each other). Following development, the wells will be allowed to equilibrate a minimum of two weeks prior to sampling.

4.4 Surveying

The 14 monitoring wells will be surveyed vertically so that groundwater elevations can be determined. The survey will establish the elevation for the manhole surface and the top of each monitoring well casing to the nearest 0.01-foot, using a local benchmark to reference the elevations to the National Geodetic Vertical Datum of 1929. Water-level measurements will be obtained and used to determine groundwater elevation relative to mean sea level (msl). This information can be used to monitor water-level trends over time and to construct a groundwater contour map showing the direction of flow. The location of each monitoring well will also be surveyed in for horizontal control.

4.5 Water-Level Gauging

Water-level measurements will be collected during each groundwater sampling event. Water levels will be gauged with an electronic water-level probe relative to a survey point permanently marked on the top of the well casing. These depth-to-water measurements will be recorded in a dedicated bound project field notebook along with the time collected and the general weather conditions. Measuring equipment will be decontaminated between wells using a laboratory-grade detergent and water solution and tap water rinse.

Depth-to-water measurements will be subtracted from the surveyed measuring point elevations to determine the groundwater elevation relative to mean sea level (msl) at each well. This information obtained over time will be used to monitor water-level trends and to construct a groundwater contour map showing the direction of groundwater flow. The groundwater flow is essential to make sure the groundwater monitoring well locations adequately determine the locations of background wells, golf course wells, and maintenance facility/sewage treatment plant wells. Groundwater monitoring well location(s) may be adjusted to take into consideration the actual direction of groundwater flow.

5.0 SAMPLING AND ANALYSIS PROGRAM (SAP)

The SAP will employ a monitoring network of 14 monitoring wells:

- three (3) background monitoring wells to detect and track nutrients and other inputs migrating through the soil and the groundwater from upgradient, preexisting uses,
- nine (9) monitoring wells installed on the course to detect and track nutrients and other inputs migrating through the soil and the groundwater, and
- two (2) monitoring wells installed downgradient of the STP to monitor groundwater quality downgradient of the STP.

The basic network of monitoring wells will be supplemented by collecting water samples from the drainage system of the lined greens, from the onsite irrigation ponds, and from the two onsite irrigation wells.

5.1 Pesticide Risk Assessment

Pesticide risk assessment is used to identify pesticides that pose a risk of ground and surface water contamination, and the health risk to workers/golfers, beneficial organisms, and wildlife.

A comprehensive list of compounds historically used at local courses has been reviewed to select a target compound analytical list for the program's baseline. These target compounds were chosen for monitoring based on leaching potential and frequency of detection during the Golf Course Impact Study, performed by SCDHS (2002). This list includes the following compounds:

- Dacthal
- Metalaxyl
- Bromicil
- DEHP

The list of pesticides considered for emergency use on-site is presented in **Table 2**. However, please note that inclusion on this list does not indicate that any or all of these pesticides will actually be used onsite.

Since the project is located in an area of active farming, samples will also be analyzed for commonly detected agricultural pesticides in Suffolk County. These chemicals are:

- Aldicarb
- Metolachlor
- EDB
- DEET
- DCPA

Table 2
Pesticides Considered for Use

ACTIVE INGREDIENT	COMMON NAME	A.I. %	FEIQ LOW RATE	FEIQ HIGH RATE	EIQ
Pesticides Considered for Use					
2,4-D-dicamba-mecroprop	Trimec	25.93%	52 oz/A = 17.4	64 oz/A = 21.4	20.7
2-chloro-4-ethylamino-6-isopropylamino-s-triazine	Atrazine	41.9%			22.85
Azoxystrobin	Heritage, Quadris	50%	.2 oz/M = 7.3	.4 oz/M = 14.7	26.9
Bacillus subtilis	Companion	0.03%	4 oz/M = 0	6 oz/M = 0.1	10.3
Bensulide	Bensumec	46.00%	5.6 oz/M = 182.3	7.3 oz/M = 237.7	26
Bensulide Oxadiazon	Ronstar	14.00%	2.6 lbs = 16.3		44.7
Bispyribac-sodium, polyoxin D	Affirm	11.30%	6.2 oz/A 1.1		24.6
Boscalid	Emerald	70.00%	.13 oz/M = 6.6	.18 oz/M = 9.3	26.5
Carfentrazone-ethyl	Quicksilver	21.30%	2 oz/A = .5	6.7 oz/A = 1.8	21.3
Chlorothalonil	Daconil Ultrex	82.50%	1 oz/M = 84	3.25 oz/M = 273.2	37.4
Ethephon	Proxy	21.70%	5 oz/M = 73.3		24.8
Fenoxaprop-p-ethyl	Acclaim	6.59%	3.5 oz/A = .6		42
Fluazifop-P-Butyl	Fusilade 2	24.40%	8 oz/A = 3.5	16 oz/A = 7.0	28.7
Fludioxonil	Medallion	1.20%	5 oz/M = 3.9	11 oz/M = 8.6	23.9
Fosetyl-Al	Signature	60%	2 oz/M = 12	6 oz/M = 36	39.2
Imidacloprid	Mallet	21.40%	.45 oz/M = 9.6	.6 oz/M = 12.8	36.7
Mefenoxam	Subdue	22%	.5 oz/M = 5.7	1 oz/M = 11.4	19.1
Mesotrione	Tenacity	40.00%	5 oz/A = 2.3		18.7
Metconazole	Tourney	50%	8 oz/A = 6.0	16 oz/A = 12.0	24
Myclobutanil	Eagle	19.70%	1.2 15.5	2.4 30.9	24
Paclobutrazol	Trimmit	22.90%	0.1 /A.6	0.25/ 1.5	26.4
Phosphonates					
Propamocarb Hydrochloride	Banol	66.50%	1.3 oz/M = 56.2	4 oz/M = 173	23.9
Prodiamine	Barracade	40.70%	10 oz/Acre = 3	24 oz/Acre = 7.2	11.7
Propiconazole	Banner	14.30%	0.5 oz/M = 6.2	4 oz/M = 49.6	31.6

ACTIVE INGREDIENT	COMMON NAME	A.I. %	FEIQ LOW RATE	FEIQ HIGH RATE	EIQ
Pyraclostrobin	Insignia	23.30%	0.4 oz/M = 6.9	0.7 oz/M = 12	27
Sethoxydim	Segment	13.00%	0.8 oz/M = 5.9	1.4 oz/M = 10.4	20.9
Spinosad	Match Point	36.00%	12 oz/A = 3.9	18 oz/A = 5.8	14.4
Triadimefon	Bayleton	43%	0.25 oz/M = 7.9	1.4 oz/M = 44.2	27
Trinexapac-ethyl	Primo	11.30%	3 oz/A = 0.4	44 oz/A = 5.9	19
New Chemicals					
Acibenzolar-s-methyl (ASM)	Secure action	0.60%	0.5 oz/M = 0.2		20.7
Cyazofamid	Segway	34.50%	0.45 oz/M = 6.5	0.90 oz/M = 13	15.3
Difenoconazole	Briskway	11.40%	22/A 6.5	52/A 15.4	41.5
Fluazinam	Secure	40%	0.5 oz/M = 12.7		23.3
Pydiflumetofen	Posterity	18.30%	7 oz/A .7	14 oz/A 1.4	0.7
Tebucanazole	Torque	38.7	0.6 oz/M = 25.5		40.3
Indoxacarb	Provaunt	30%	2 oz/A = 1.2	12 oz/A = 7.2	31.2
Cyantraniliprole	Ferrence	18.60%	12/A 2.7	20/A	11.7
Lamda-Chyhalothrin	Scimitar	9.70%	5 oz/A = 1.3	10 oz/A = 2.6	44.2
Cyfluthrin	Tempo	11.80%	4 oz/A = 1.2	8 oz /A = 2.4	39.6
Bionematicide (organic)	Zelto				
Carbaryl	Sevin	43.00%	1 qt/A = 19.5		22.7
Topramezone	Pylex	29.70%	1.0 oz/A = 0.5	1.5 oz/A = 0.8	27.2
Dithiopyr	Dimension 2EW	24.00%	16 oz/A=3.8		15.73
Siduron	Tupersan	50%	4 lb/A = 23.5	12 lb/A = 70.5	11.7
Flupiclude	Stellar	5.54%	1.2 oz/M 4.7		26
Propamocarb Hydrochloride	Stellar	55.40%	1.2 oz/M 43.2	2.4 fl/M 86.5	23.9
Flurprimidol	Muskateer	5.60%	12 oz/A 1.3	18/A 2.0	31
paclobutracol	Muskateer	5.60%	12 oz/A 1.1	18/A 2.1	26.4
Trinexapac-ethyl	Muskateer	1.40%	12/A .2	18/A .3	19
Benzovindiflupyr	Ascernity	2.24%	1 oz/M .27		



The results of the risk analysis performed on each of these compounds indicated that the potential leaching impact from the selected list was extremely low. Several of the products showed no leaching at all in the 10-year model, and none on the list showed leaching concentrations that are considered detectable by current practical laboratory methods.

Any pesticide with an FEIQ above 30 should not be used on fairways, tees, roughs or lawn areas and should only be considered for use on the lined greens as a last resort when other pesticides have not worked.

New, more environmentally friendly products are constantly being developed. The applicant may file a request with the Town Planning and Development Administrator to add these products as they become available. The Town will respond to such requests within 45 days.

It should be noted that New York State Department of Health (NYSDOH) and/or USEPA approved methods may not be currently available or may not currently exist for several of the listed compounds. In addition, it may not be feasible to analyze for every constituent on the site-specific list. However, alternative analysis methods, if available, will be considered in order to analyze for the presence of as many compounds on the list as possible. As test methods become available in the future, compounds that previously could not be tested will be included in the next scheduled sampling event to establish a baseline.

5.2 Baseline Investigation and Sampling

DLC will make effort to install each monitoring well as soon as possible. However, it should be noted that wells that will be installed in areas that need to be cleared cannot be installed pre-construction and will likely coincide, then, with the golf course construction. All wells that can be installed in areas previously cleared will be installed pre-construction. A minimum of three consecutive months of groundwater gauging and sampling will be completed at these wells prior to any clearing, construction, or use of chemicals onsite to establish a site-specific baseline. If after three consecutive months of baseline sampling construction has not started then groundwater gauging and sampling will continue every other month for up to a one-year period. The sampling collection program will be performed by a qualified environmental consulting company selected by the Town Planning and Development Administrator in accordance with New York State Department of Environmental Conservation (NYSDEC) and United States Environmental Protection Agency (USEPA) protocols to assure sample integrity.

During baseline sampling, samples collected from the full monitoring network shall be analyzed for:

- the complete nitrogen series (total nitrogen, total Kjeldahl nitrogen [TKN], nitrate, nitrite, and ammonia),
- the four historically used golf course pesticides (Dacthal, Metalaxyl, Bromicil, and DEHP),
- the commonly detected pesticides in Long Island groundwater (Aldicarb, Metolachlor, EDB, DEET, and DCPA) and
- the pesticides listed in **Table 2**.

As previously discussed, an existing nitrogen plume resulting from upgradient agricultural activity is present beneath the site. This contamination is expected to be detected in multiple monitoring wells during the baseline and quarterly sampling rounds. If the adjacent sand and gravel mine is contributing to groundwater contamination specifically related to the sampling parameters for the golf course, these contaminants should be detected during the baseline monitoring events.

5.3 Annual Sampling Plan

Following baseline sampling, the groundwater monitoring network will be gauged and sampled four times annually (March, June, September, and December). Samples will be collected from the network of installed monitoring wells. As additional areas are cleared and wells are installed, these wells will be added to the network, until samples are collected from the entire network of 14 monitoring wells. To assess impacts from the fertigation of the golf course, each quarterly round of groundwater samples will be analyzed for:

- the complete nitrogen series, and
- the four historical compounds listed previously,
- the commonly detected pesticides in Long Island groundwater listed previously, and
- site-specific compounds, consisting of pesticides/herbicides that may have been used on the course during the previous twelve-month period.

If atrazine is detected during baseline monitoring it will be continued to be tested for.

Every third quarter of the year (September), water samples from the green liners, two irrigation wells, and the irrigation ponds will be collected and analyzed for:

- the complete nitrogen series (excluding the irrigation wells), and
- the four historical compounds listed previously,
- the commonly detected pesticides in Long Island groundwater listed previously, and
- site-specific compounds (pesticides/herbicides that may have been used on the course during the previous twelve-month period).



If atrazine is detected during baseline monitoring it will be continued to be tested for.

Green liner drainage will be collected from either the piping or the sump prior to the water's discharge into the irrigation ponds. Drainage that is conveyed to rain gardens will not be sampled directly from the rain gardens. Instead, monitoring wells installed downgradient of rain gardens will be sampled to determine if this drainage is having an impact on groundwater quality. The irrigation well samples will not be analyzed for the nitrogen series, since these wells will be equipped with continuous nitrate monitoring meters. Only one sample will be collected from the irrigation ponds since these ponds are interconnected.

During the first one to two years following construction startup, concentrations of nutrients (including nitrogen) in groundwater are expected to significantly increase. This temporary, initial spike is expected and typically occurs following vegetation removal during clearing activities and prior to new turf and vegetation becoming established. This gap in established vegetation allows nutrients, that would otherwise be absorbed by plant roots, to leach into the groundwater. When construction is complete and new turf and vegetation established, these concentrations are expected to return to baseline, or near baseline, levels.

An independent comprehensive review of the results will be made and changes (if any) to the SAP will be recommended to the Town for approval. Analytical results will be evaluated by a Cornell University professor and turf management expert (A. Martin Petrovic, PhD), after two years of monitoring after the project has been completed and every two years afterward. He will make appropriate recommendations to the Town of Southampton and DLC. As part of the two-year evaluation, Dr. Petrovic will determine if the groundwater monitoring frequency can be reduced to twice each year and make a recommendation. The sampling frequency will be subject to review by the Town Planning and Development Administrator and may be adjusted in response to trends in sample results. PWGC will review the expert's report and assist the Town in any revisions, as appropriate.

If approved by the Town, any recommended program modifications will be implemented as part of the next scheduled monitoring round.

5.4 Five-Year Sampling Plan

The baseline sampling event will be repeated on a five-year schedule and updated by modifying the **Table 2** list to reflect only those compounds which were used on the course during the previous five years. The five-year testing frequency of any golf course applied pesticides over the past five years is



necessary, especially if pesticides are no longer used by the golf course or as a result of the two-year comprehensive review recommendation. This schedule should provide sufficient sampling information and recognizes that many of the compounds contained on the site-specific list have relatively high retardation factors and leach slowly through the soil to groundwater. This sampling protocol will be subject to periodic review, based on the analytical data base as it accumulates.

Samples collected for the five-year sampling event will be analyzed for:

- the nitrogen series compounds,
- the four historical compounds listed previously,
- the commonly detected pesticides in Long Island groundwater listed previously, and
- the compounds on the **Table 2** list that were used on the golf course at any time during the previous five years.

Sample analytical work for the monitoring program will be performed by a NYSDOH-Certified Environmental Laboratory. A summary of the sampling plan for the year 2022 is provided in **Table 3**.

Table 3
The Lewis Road PRD Golf Course 2022 Monitoring Program

Well	Nitrogen Sampling						Pesticide Sampling			
	Monitoring Frequency	Field ¹ Measurements	Sampling Parameters	Goal Concentration ² (ppm)	Management Response Level (ppm)	Resampling Threshold (ppm)	Monitoring Frequency	Sampling Parameters	Resampling Threshold ³	Suspended Use Level ³
Background Wells										
BW-1	Quarterly	Yes	N series	5	10	NA	Quarterly	Historical, LI + Table 2	NA	NA
BW-2	Quarterly	Yes	N series	5	10	NA	Quarterly	Historical, LI + Table 2	NA	NA
BW-3	Quarterly	Yes	N series	5	10	NA	Quarterly	Historical, LI + Table 2	NA	NA
Turf Response Wells⁶										
GW-A	Quarterly	Yes	N series	2	4	4	Quarterly	Historical, LI + Table 2	>25% HAL	>25% NYS AWQS
GW-B	Quarterly	Yes	N series	2	4	4	Quarterly	Historical, LI + Table 2	>25% HAL	>25% NYS AWQS
GW-C	Quarterly	Yes	N series	2	4	4	Quarterly	Historical, LI + Table 2	>25% HAL	>25% NYS AWQS
GW-D	Quarterly	Yes	N series	2	4	4	Quarterly	Historical, LI + Table 2	>25% HAL	>25% NYS AWQS
GW-E	Quarterly	Yes	N series	2	4	4	Quarterly	Historical, LI + Table 2	>25% HAL	>25% NYS AWQS
GW-F	Quarterly	Yes	N series	2	4	4	Quarterly	Historical, LI + Table 2	>25% HAL	>25% NYS AWQS
GW-G	Quarterly	Yes	N series	2	4	4	Quarterly	Historical, LI + Table 2	>25% HAL	>25% NYS AWQS
GW-H	Quarterly	Yes	N series	2	4	4	Quarterly	Historical, LI + Table 2	>25% HAL	>25% NYS AWQS
GW-I	Quarterly	Yes	N series	2	4	4	Quarterly	Historical, LI + Table 2	>25% HAL	>25% NYS AWQS
STP Wells										
STP-1	Quarterly	Yes	N series	2	4	4	Quarterly	Historical, LI + Table 2	>25% HAL	>25% NYS AWQS
STP-2	Quarterly	Yes	N series	2	4	4	Quarterly	Historical, LI + Table 2	>25% HAL	>25% NYS AWQS
Irrigation Wells, Irrigation Ponds and Greens Drainage										
IW-1	Continuous	Yes	Nitrate Meter	5	10	NA	Annually	Site-Specific ⁴	NA	NA

Well	Nitrogen Sampling						Pesticide Sampling			
	Monitoring Frequency	Field ¹ Measurements	Sampling Parameters	Goal Concentration ² (ppm)	Management Response Level (ppm)	Resampling Threshold (ppm)	Monitoring Frequency	Sampling Parameters	Resampling Threshold ³	Suspended Use Level ³
IW-2	Continuous	Yes	Nitrate Meter	5	10	NA	Annually	Site-Specific ⁴	NA	NA
IP-1/IP-2	Annually ⁵	NA	N series	2	4	4	Annually	Site-Specific ⁴	>25% HAL	>50% NYS AWQS
GD-1	Annually	NA	N series	2	4	4	Annually	Site-Specific ⁴	>25% HAL	>50% NYS AWQS

(1) Field Measurements include conductivity (QS/cm), Temperature (°F), and pH.

(2) When analytical results show nitrate is less than 5 ppm for 2 years, wells may be removed from monitoring program.

(3) Resampling and suspension levels are a detection of > 25% of the HAL, 10% of the aquatic LC50, or 50 Qg/l, whichever is lower.

(4) Pesticide Sampling will include all Pesticides used on-site during the previous 12-month period.

(5) Only one pond sample will be collected since the ponds are interconnected with a pipe.

NYS AWQS – New York State Ambient Water Quality Standards and Guidance Values

(6) it is expected that, at times, nitrate—nitrogen may exceed 2 mg/L at individual wells. Therefore, the goal will also be an average of <2 mg/L of nitrate-nitrogen for all turf monitoring wells after adjustments for background concentrations.

5.5 Pesticide Response Actions

When feasible, the use of organic formulations to control pests and provide nutrients to the turf is the preferred choice to minimize the likelihood of contamination. Detection of pesticides will be thoroughly investigated to determine the approximate time range when compounds were applied by correlating compounds, rate of flow, and application procedures. If necessary, precipitation events over the prior period will be reviewed to correlate findings. The following action procedures have been established and will be implemented in the event that a pesticide used on the course is detected in an onsite sample of groundwater, greens drainage water, or irrigation pond water.

5.5.1 Tees and Fairways

- The use of the product will be halted on tees and fairways, pending the following measures.
- The well will be tested again within one week to confirm the presence of the pesticide and to see if the concentration is rising. Consider applying mitigation measures if pesticide is confirmed or rising in concentration.
- Document the environmental (rainfall after application) and management (amount of irrigation after application, amount of pesticide application, etc.) conditions at the time of the pesticide application and immediately after.
- Use of a particular product on tees and fairways will be suspended if it is detected within the monitoring well above 25% of the NYS AWQS/USEPA Guidance, 10% of the aquatic 50% Lethal Concentration (LC50) or 50 µg/l, whichever is lower.

5.5.2 Greens Drainage and Irrigation Ponds

- The use of the product will be temporarily suspended on the greens, pending the following measures:
- The greens drainage or pond will be tested again within one week to confirm the presence of the pesticide and determine if the concentration is rising. Consider applying mitigation measures if pesticide is confirmed or rising in concentration.
- Document the environmental (rainfall after application) and management (amount of irrigation after application, amount of pesticide application, etc.) conditions at the time of the pesticide application and immediately after.
- Use of a particular product on greens will be suspended if it is:
 - Detected in the greens' drainage or an irrigation pond above 100% of the NYS AWQS/USEPA Guidance, 50% of the aquatic LC50 or 50 µg/l, whichever is lower, or;

- Any pesticide detected twice in one year in a monitoring well above 25% of the NYS AWQS/USEPA Guidance, 10% of the aquatic LC50, or 50 µg/l, would be removed from use on the course pending review by the Town.

Mitigation measures to reduce the amount of pesticides applied may include raising the ITHM application threshold, spot treating instead of broadcasting, or selection of different fertilizer or pesticide formulas that includes less of the target compound. If the use of a product is suspended or banned as specified above, compounds with lower mobility and persistence properties will be substituted.

5.6 Nitrogen Response Actions

To minimize the likelihood of contamination from fertilizers, the first choice will be the use of low application rates (spoon feeding) for the minimum level of nitrogen (as a macro nutrient) that is required to sustain healthy turf. Controlled release (i.e., slow release) formulations will be used which have been proven to greatly reduce nitrogen leaching potential. In addition, nitrogen testing will be performed to monitor the effects of fertilizers which may be used, as needed, on the course. The application of nitrogen to the course will be carefully monitored in conjunction with routine soil nutrient analysis as part of the overall ITHM Plan and Best Management Practices. Routine soil sampling of the root-zone will be integral for planning and early detection of potential nutrient loading long before these nutrients have the ability to move through the soil profile into the groundwater. The monitoring will also assist in accounting for the nitrogen present in the irrigation water derived from the irrigation wells. The nitrogen in the well water will be continuously monitored with a nitrogen monitor. This well testing will be performed quarterly and the compounds that are being used will be adjusted, as necessary, based on the results of these tests. Other adjustments to fertilizer application will be made if it is recognized that certain compounds are leaching more than others.

The site has high background nitrate-nitrogen levels related to off-site agricultural activities, and it's likely also there will be substantial differences in nitrate-nitrogen concentrations in the three background wells. Therefore, after background monitoring is completed and groundwater contour/flow direction is determined then the background level for a specific groundwater monitoring well will be assigned and will continue to be modified based on new groundwater sampling results.

- Temporarily increase the sampling frequency.
- Consider applying mitigation techniques.
- Cease fertilizer applications until levels are below the threshold.
- Re-evaluate application procedures and product formulation.



- Adjust ITHM accordingly.

Mitigation measures to reduce the amount of fertilizer applied may include raising the IPM application threshold, spot treating instead of broadcasting, or selection of a different product formula that includes less of the target compound.

6.0 SAMPLING METHODOLOGY AND QA/QC PROCEDURES

6.1 Monitoring Well Sampling

Prior to each sampling event, measurements will be obtained to calculate groundwater elevations and the volume of water contained in the well casing. A minimum of three casing volumes will be purged from each well using a submersible pump or other suitable purging equipment. Field parameters including pH, conductivity, and temperature will be monitored periodically while purging. Upon completion of the purging, a water sample will be obtained using either a disposable dedicated polyethylene bailer and rope, or a pump and new polyethylene tubing capable of low-flow sampling.

6.2 Quality Assurance/Quality Control (QA/QC) Procedures

Collected samples will be placed in laboratory-supplied containers and delivered to a New York State Department of Health approved laboratory for analysis of some or all of the following compounds, as indicated by sample type, location and event (baseline, 5 yr, 1 yr, quarterly):

- Site-specific list of insecticides, herbicides, and fungicides provided by the golf course management
- Nitrogen series (Total N, TKN, NO₂, NO₃, NH₃).
- SCDHS 2002 Golf Course Pesticide Study - detected compound list: Dacthal, metalaxyl, bromicil, DEHP

QA/QC implemented during sampling activities will include the use of trip blanks and field blanks. A laboratory prepared trip blank will accompany samples while in transit on each day of sampling to ensure contamination of the samples does not occur during handling and transport. A field blank will be prepared to document whether decontamination procedures are effectively preventing cross contamination between sampling locations. The field blank shall be prepared by pouring laboratory supplied water over the decontaminated sampling device into laboratory supplied containers. Field blanks will only be prepared when non-dedicated, non-disposable materials are used to collect samples. One field blank will be prepared for each different combination of sampling method/decontamination procedure employed. Trip blanks and field blanks will be analyzed for the same suite of analysis as that of the collected samples.

7.0 REPORTING REQUIREMENTS

Monitoring results be reported to the Town and DLC following each quarterly sampling event. An annual report will be sent to the Town that will contain the sampling results, interpretation, program modifications, and any response action taken to address pesticide detections or nitrogen threshold exceedances that occurred during the year. Additionally, whenever a result is above the threshold value, the Town will be notified immediately and informed of the steps taken to reduce the risk of any further contamination of groundwater. Annual reports will include:

- copies of the insecticide/herbicide/fungicide usage log;
- weather information (onsite precipitation records; high, low and average temperatures; relative humidity);
- a record of the field efforts conducted for the monitoring program;
- irrigation well pumping records;
- irrigation system flow rate, based on net evapotranspiration (daily rainfall – onsite evapotranspiration (ET));
- monitoring well sampling forms;
- laboratory reports; and
- any other pertinent records generated by the maintenance of the course.

The plan will test the wells quarterly for the first five years. At the five-year anniversary, a decision will be made as to whether it is safe to reduce testing to twice a year. If the reduction in sampling is not approved, it will be assessed again following the next third quarterly sampling round. Additionally, testing of certain monitoring wells may be eliminated if these wells prove to be redundant or defective. Any reductions and/or modifications to the list of compounds analyzed during the groundwater monitoring program will also be assessed and discussed. This evaluation of the monitoring program will be made following the third quarterly sampling of each year and the results included in each annual report.

8.0 ADDITIONAL SITE EVALUATION AND INVESTIGATION

The Lewis Road PRD Groundwater Monitoring Plan will be reviewed every five years. This review will consider reducing the groundwater monitoring frequency, eliminating redundant or damaged monitoring wells, and reducing or changing the compounds analyzed. As with the annual reports, program modifications will be recommended at this time. Monitoring wells that are considered “Turf Response Wells” (GW-A through GW-I) will be used to evaluate the impacts from the golf course and to trigger response actions in pesticide/fertilizer use. The response action trigger for nitrogen will be developed for each of the “Turf Response Wells.” This will be developed based upon a review of the baseline data. BW-01 through BW-03 are designated non-Turf wells and will not be used to trigger response actions. A new well may be installed in the future, should the sampling results for the first two years justify it. The Non-Turf wells will be purged and sampled annually for specific conductance, physical parameters and nitrate. Should nitrate concentrations be less than 5 ppm for 2 years the role of the non-Turf wells within the monitoring program can be reconsidered and potentially dropped from the program.

An overview of the 2022 Sampling Program is presented in **Table 3**.

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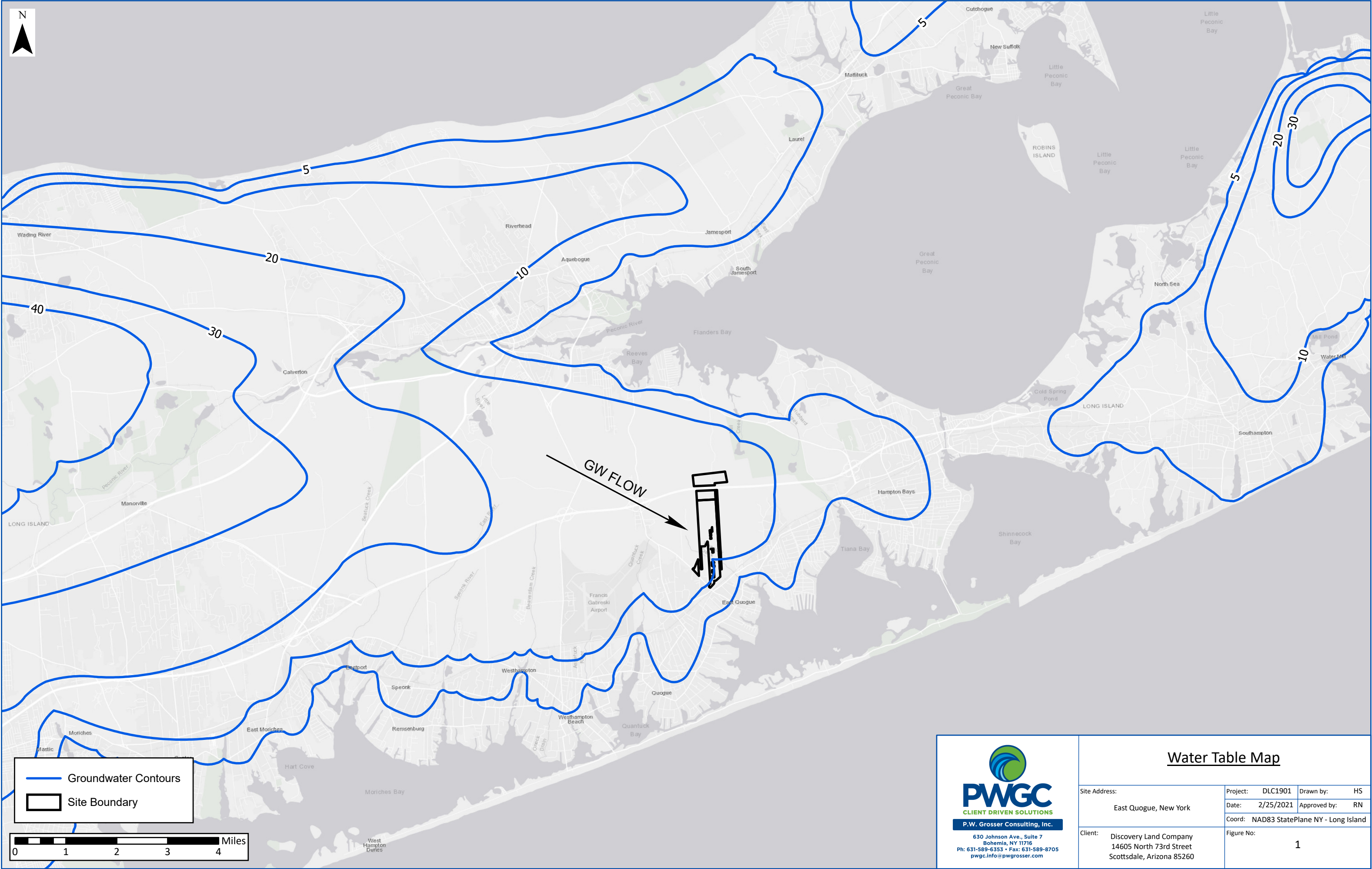
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Water Table Map				
Site Address:	Project:	DLC1901	Drawn by:	HS
	Date:	2/25/2021	Approved by:	RN
	Coord:			NAD83 StatePlane NY - Long Island
Client:	Discovery Land Company 14605 North 73rd Street Scottsdale, Arizona 85260		Figure No:	1

