



The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES



Thomas S. Burack, Commissioner

WATER CONSERVATION PLAN APPROVAL

September 24, 2015

Stephen Sewall
Breakfast Hill Golf Club
339 Breakfast Hill Road
Greenland, NH 03840

RE: Greenland – Breakfast Hill Golf Club (PWS ID #: 0987050)
Water Conservation Plan, NHDES # 999782

Dear Mr. Sewall:

On September 13, 2015, the New Hampshire Department of Environmental Services (“DES”) Drinking Water and Groundwater Bureau received a Water Conservation Plan (the “WCP”), signed on September 13, 2015, for Breakfast Hill Golf Club located in Greenland, New Hampshire. Pursuant to RSA 485:61 and Env-Wq 2101, applicants seeking permits from DES for new sources of groundwater where withdrawals exceed 57,600 gallons over any 24-hour period shall submit a water conservation plan to DES. Based on review of the WCP, DES has determined the WCP complies with Env-Wq 2101, *Water Conservation* rules.

Pursuant to Env-Wq 2101, the Town of Greenland and the Rockingham Planning Commission were provided a copy of the WCP, along with other required materials.

DES approves the WCP based on the following conditions:

1. From the date of this WCP approval, a pressure check and leak detection will be completed at least annually per the WCP.
2. A log will be maintained documenting dates of the pressure and leak test, as well as the results of the test and actions to remedy any leaks.
3. By **September 24, 2018**, and every five years thereafter, an irrigation audit will be conducted by and an audit report prepared by a professional irrigation auditor. The facility will implement the recommendations by the irrigation auditor within 1 year of the audit, unless otherwise approved by DES.
4. The facility shall continue to use best management practices related to course management and water efficiency as described in the WCP.
5. No later than source activation, all source meters, any additional meters proposed in the WCP, and data loggers shall be installed.
6. Upon source activation, all meters shall be tested and calibrated based on the schedule proposed in the WCP.

7. All meters shall be installed and maintained per the manufacturer's instructions or American Water Works Association standards.
8. No later than the source activation date, source meters and any other proposed meters shall be read monthly.
9. Upon source activation, the facility shall include water use data for the new source in its quarterly reports to the DES Water Use Registration and Reporting Program in accordance with Env-Wq 2102.
10. All new water using fixtures in the clubhouse shall be EPA WaterSense certified products.
11. By **September 24, 2018**, and every three years from the date of this approval, an ongoing compliance report shall be submitted to DES documenting how the facility has maintained compliance with the WCP and specifically conditions #1 through #7, above. The following shall be submitted with the report:
 - a. The irrigation audit report and an update on what actions have been taken to address recommendations in the report.
 - b. An update on water efficiency best management practices applied at the facility including the course and club house.
 - c. The leak and pressure log referenced in condition #2, above.
 - d. The date of installation and replacement of all meters, as well as testing and calibration records.
12. Revisions to the Plan shall not be implemented without further approval from DES.

Please feel free to contact me with any questions at (603) 271-6685 or via e-mail at stacey.herbold@des.nh.gov .

Sincerely,



Stacey Herbold
Water Conservation Program
Drinking Water and Groundwater Bureau

cc: Scott Fortier, Superintendent
Steve Roy, NHDES
Christine Bowman, NHDES

Water Conservation Plan
Breakfast Hill Golf Course
Greenland, New Hampshire
July 2015

Pursuant to Env-Wq 2101, Breakfast Hill Golf Course is required to implement a water conservation plan as part of the permitting process for a proposed new irrigation well.

1. Contact information: Steve Sewall, 339 Breakfast Hill Rd., Greenland, NH 03840 (Owner).
Scott Fortier, 339 Breakfast Hill Rd., Greenland, NH 03840 (Superintendent)
2. Water Sources and Conveyances
 - a. In use: We use a single 8" drilled well 45' deep designated PW-4 as our primary and only water source for the golf course irrigation system. It feeds our irrigation storage pond via 2" pipe located 300' away. This water source has lost significant yield over the last two years and is why we are seeking a new source.
 - b. Inactive but available: We have three inactive 20' deep dug wells installed during the construction of the golf course in 2000. These wells were all deemed unusable 2 years after construction due to their low yield.
 - c. Alternatives
 - i. We do not have access to reclaimed wastewater.
 - ii. The irrigation storage pond holds 2 million gallons and is lined.
3. Description of Water Measurement
 - a. Meters
 - i. PW-4
 1. Meter size: 3"
 2. Make Model: Master Meter AWWA Class II, model 25250100 flow meter.
 3. Last Calibrated: 7/5/13 by M2 Facility Solutions and found it to be 95% accurate at 10 gpm and 91% accurate at 100 gpm.
 4. The meter will be tested and calibrated or replaced per AWWA specifications prior to new source activation
 - ii. New Source: Not Available. An AWWA certified meter will be installed per AWWA standards prior to source activation.
 - iii. Holding Pond to Irrigation
 1. Pipe size: 6" Meter size is 2"
 2. Meter Make: Data Industrial Series 200 flow sensor.
 3. Last Calibrated/Installed: This meter has been replaced with a new, identical insertion meter on July 6th 2015.
 - iv. All well meters installed will be certified to meet AWWA standards.
 - v. Meters will be tested in accordance with AWWA standards as described below and be calibrated to meet AWWA accuracy standards (+/-3%) of flow:

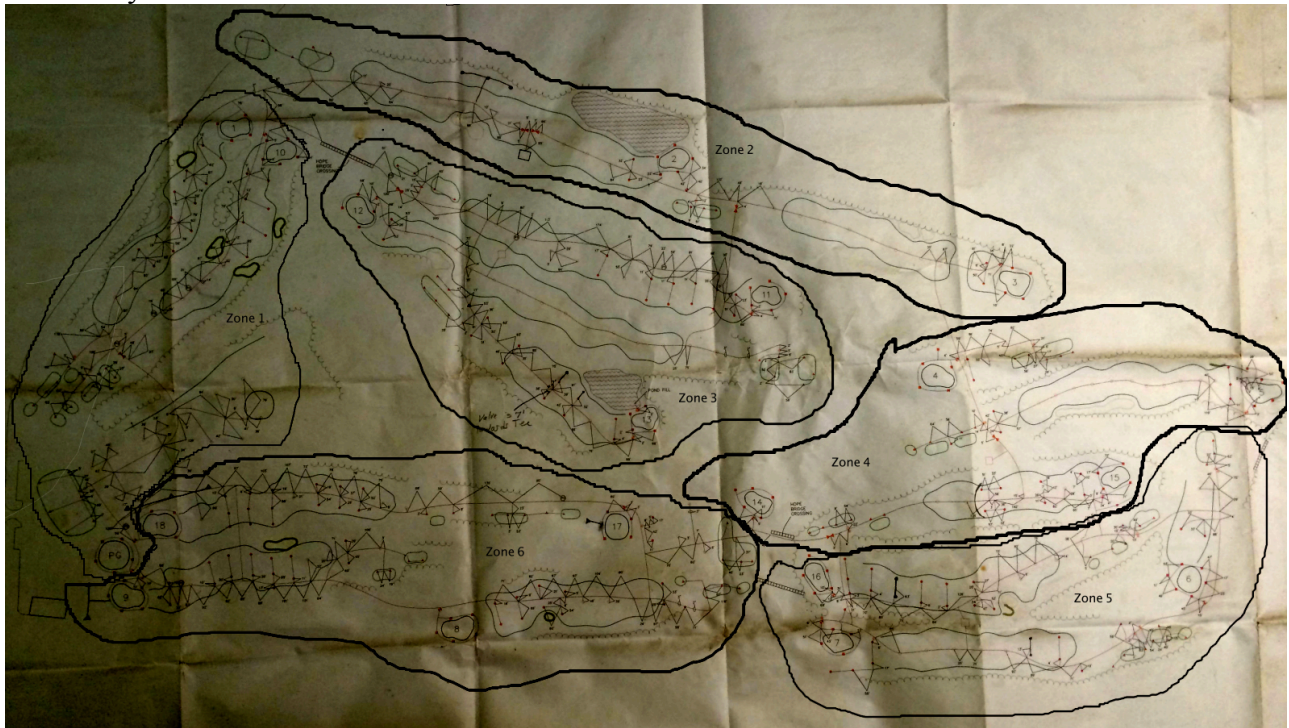
Meter Size (inches)	Testing Rate (yr)
<1"	10 yrs
1" - 2"	4 yrs
3"	2 yrs
>3"	1 yr

b. Pumping Rate by Run Time

- i. The pump from the pond to irrigation is a 15 hp submersible pump.
- ii. The well pump is 5hp.
- iii. PW-4 is has lost production volume and is limited to a flow rate of 55 gpm.
- iv. The pumps do not have an hour meter installed.

4. Irrigation System Design

a. System Schematic:



b. Irrigated area: 70 acres

- i. We have reduced water use by shutting down irrigation on the driving range. I have also replaced all possible heads with part-circle heads to reduce wasteful water of non-turf areas. We also have very little rough to irrigate due to our large natural wooded areas.

c. Zone count, head count, flow rates

- i. Greens: 19 greens. 4-6 heads each (91 total, 40gpm)
- ii. Tees: 19 Tee complexes 4-8 heads each (104 total, 27gpm)
- iii. Fairways: Single row which also covers the rough. Typically 1-2 heads every 60-90 ft, either a single Toro 690 (94 total, 82gpm) or two smaller Toro heads of varying style (76 total @40gpm)

- iv. Rough: The fairway heads cover all rough.
- d. Grass Types and why they're appropriate
 - i. Greens: The greens were seeded during construction using SR1119 due to its disease and traffic tolerance. It also has high heat and drought tolerance.
 - ii. Tees: Tees were seeded with SR1020 Dominant for similar reason, but with cost in mind. SR1020 resists weed infestations and has a high heat drought tolerance.
 - iii. Fairways: Fairways were also seeded with SR1020 for similar reasons.
 - iv. Rough: Sun and Shade Mix (Predominantly Kentucky Bluegrass, Rye, and Fescue is used for its wide ranging adaptability to varying types of conditions.

5. Irrigation Audit

a. Last Audit

- i. No formal irrigation audit has ever been performed. However, the irrigation system is very closely monitored due to our low water availability. All heads are checked on a weekly basis during high use periods for clogged nozzles, bad o-rings, improper rotation, water coverage, and run time. Constant adjustments and repairs are made to the system for maximum efficiency to reduce water consumption. I am in the process of replacing all the irrigation heads with newer high efficiency heads that use less water with better coverage.
- ii. An irrigation audit will be performed by 2018 and then every five years after. Audit findings will be addressed in accordance with the recommendations of the irrigation specialist performing the audit.

6. How do you determine when to irrigate (scheduling)

a. Type of system

- i. We use a computerized/automated Toro irrigation system with six LTC Network controllers to control the 6 irrigation zones. The zones are determined by the amount of area each controller can irrigate with a maximum of 64 stations per controller. Most stations control one or two heads. A few stations control 3 and 4 heads. They are not linked on a central computer, so adjustments are made on a daily basis in the field. An automatic rain shut off valve is not part of the system. The maintenance staff coordinates shutting off the irrigation system during rain events to avoid wasting water.
 - 1. To upgrade to a system with remote access will cost \$25,000 which is not a funding priority right now.

b. What inputs are used

- i. We use a single rain gauge to determine nightly precipitation. I also rely on internet reporting data to determine rain fall amounts.
- ii. We occasionally use a soil probe to check the moisture content. However, after managing the irrigation for 15 years, I primarily use personal judgment for soil moisture monitoring.
- iii. ET has not been used.
- iv. The personal judgment I used is based on several indicator sites on tees, greens and fairways: For example; I know the 1st ladies tee, the 4th and 14th Championship tees will be the first to show signs of wilt, telling me it's time to start irrigating tees. I use a similar method for greens, but will implement much more hand watering before soaking the entire green with sprinklers. The fairways have a lot of ledge and drain very quickly. Most fairways will need to be watered lightly, nightly to maintain desired conditions.

- c. What time of day does irrigation generally occur? The irrigation system will run between 8pm to 5am depending on what and how much I am watering. The fairway programs will start at 8pm followed by tees and greens in the early morning hours when needed.

7. How is the duration (run time) determined? As stated previously, the duration is determined by personal judgment and conditions.
8. How often do you irrigate assuming no rainfall?

Area	Frequency (irrigation events per week)	Duration (minutes per cycle)	Amount (Inches per irrigation cycle)
Greens	3	10	0.083"
Tees	3	10	0.067"
Fairways	7	5	0.080"
Roughs	N/A	N/A	

Green's heads have an output of 0.5" per hour. That equals 0.0083" per minute; 0.083" per ten minute cycle. If you include the overlap on the greens it is more like 0.25" per cycle on greens or 0.75" per week. Fairways are single row at .96" per hour. So the overlap will bring it to 0.160 per cycle or 1.12" per week. Tee heads are about 0.4" per hour with varying overlap. On average tees will get 0.5" per week.

Water is also being used to clean the golf carts each time one comes off the course, as well as mowers.

9. Leak Detection / Pressure Checks: Leak detection and pressure monitoring is conducted every spring when the system is charged for the season. In the future leak detection and pressure testing will done at least once a year per the method used to comply with our large ground water withdrawal permit:
 - a. This test simply measures the duration between cycles of the jockey irrigation pump to re-pressurize the system from 100 psi to 120 psi as pressure drops when no water is being used. In 2009 the cycle time was 65 minutes. In 2013 the cycle time was 40 minutes. We found a faulty check valve needed to be replaced causing the significant difference in cycle times. To measure gallons per minute lost per psi drop during the spring leak down tests, I conducted a test to determine the amount of water loss required to lower the system pressure from 118 psi to 100 psi, the pressure at which the pump restarts to recharge the system. I used a flow meter on a hose spicket tied into the irrigation system to measure the amount of water pumped out while I monitored the pressure in the pump house. It only took a loss of 15 gallons to reduce the pressure from 118 psi to 100 psi. This test shows that for each 0.83 gallons lost, the system pressure drops by 1 psi. This data will allow me to calculate the water loss during my annual spring leak-down test.
 - b. Method for detecting leaks in the pond lining: To monitor the pond lining water loss a fixed measuring stick will be placed in the pond to measure the depth. By calculating the surface area of the pond (95 ft by 515 ft), I can calculate the volume of water in every tenth of an inch of depth of the pond. Over a given time period when no water is being pumped I would monitor the change in depth of the pond. I would then use regional precipitation and evaporation data to to eliminate outside influences.
10. Management Practices
 - a. Cultivation: The greens are intensely maintained to provide a high quality product. Wetting agents are used to reduce watering requirements. Hand watering is practiced every July and August to minimize over-watering the greens. We also employ a rolling program which reducing mowing and watering needs. We mow fairways and rough at a relatively high height of cut, 0.70"/2.5" respectively. I feel this height tolerates traffic and drought condition the best while maintaining golfer satisfaction. Greens and tees are hollow tine aerated twice per year, spring and fall. Fairways are hollow tine aerated once every fall.

Reseeding is performed as needed using a slice seeder. Foliar fertilizer is applied to greens on a weekly basis at rate of .05 to .125 lbs of nitrogen per thousand. Annual nitrogen totals don't exceed 6 lbs per thousand. Tees and fairways are foliar fertilized every three weeks at a rate of .25 to .5 lbs per thousand. An organic granular fertilizer is applied to greens and tees as needed during aeration. Fairways and rough are fertilized one every spring with a slow release granular fertilizer at a rate of 1.5 lbs per thousand.

- b. Mowing Height: Greens: .125”-.140” Tees: .600” Fairways: .700” Rough: 2.5”

11. Clubhouse Use

- a. Domestic

- i. Count of fixtures by type

- 1. Before 1994

- 2. After 1994: 2 Urinals, 5 toilets, 1 dishwasher, 1 kitchen pre-rinse spray, 6 bathroom sinks, 1 bar sink, 2 kitchen hand washing sinks, 1 food prep sink, and 1 utility sink.

- 3. Any future upgrades to water using fixtures will be WaterSense certified.

- b. Landscaping

- i. The clubhouse landscaping is irrigated using the primary golf course irrigation system reduced down to residential style poly pipe and Hunter pop up rotor heads. Pressure reducers have also been installed prior to the system. The system contains 12 zones with approximately 100 heads with an average output of 3gpm and an average precipitation rate of 0.40 in/hr.

- ii. Percent turf: The area irrigated is 50,000 square feet. Less than 1% of that is non-turf irrigated with heads that also water the turf within their rotation.

12. Player/Employee Awareness: Employees are trained to identify if an irrigation problem is occurring on the golf course. This involves identify overly wet or dry areas on the course and reporting back to me. Players, while not trained, have been shown to be aware and conscience of irrigations problems on the course, such as an overly wet area or sprinklers that have activated during play or have remained on in the morning from the previous night's watering.

13. Every three years from the date of the water conservation plan approval, a compliance report will be submitted to DES documenting how the plan is being complied with. The report will include the following:

- a. Pressure test data and leak repairs for each year;
- b. A copy of the irrigation audit prepared by a professional irrigation auditor;
- c. Testing and calibration certificates for the meters; and
- d. Upgrades to club house fixtures.

I certify that I have read this Water Conservation Plan, understand the responsibilities of the water system as referenced in the plan, and that all information provided is complete, accurate, and not misleading.

Owner Name (print): Scott Fortier

Owner Signature: _____



Date: 9/13/15