

# **Wolfeboro RIB 2011 Status Report**

**December 2, 2011**

## **Section 1: Introduction**

In 2006, the Town of Wolfeboro (the Town) reached an agreement with the State of New Hampshire and the New Hampshire Department of Environmental Services (NHDES) regarding an Administrative Order to address capacity issues with its Wastewater Treatment Effluent Disposal System. This agreement and subsequent work led the Town and its engineering consultant Wright-Pierce Engineers, Inc. (W-P) to evaluate groundwater disposal utilizing a Rapid Infiltration Basin (RIB) site (Whiten West). This groundwater discharge alternative was further studied and permitted for groundwater disposal of the Town's wastewater treatment facility effluent (July 2007). As the Town was under an Administrative Order and sewer moratorium with a difficult timeline/schedule, W-P prepared a design for the RIB site and effluent pump station and force main, and obtained NHDES approved construction drawings later in 2007. Construction of the RIB site began in 2008 and was completed in 2009, with operation beginning on March 3, 2009 (slightly behind the planned November 2008 completion date).

In addition to the Town's effort to resolve its effluent disposal problem, the Town took aggressive steps to upgrade its secondary Wastewater Treatment Plant (WWTP), which included over \$400,000 of capital improvements in 2007 and 2008. These capital investments allowed the Town and its WWTP operations firm to make process control changes (cyclic aeration) achieving enhanced nitrogen removal which resulted in a much improved treated effluent quality. Treated effluent discharged at the RIB site since March of 2009 and continuing through 2011 has, on the average been about 3 mg/l of Total Nitrogen and 0.7 mg/l of Total Phosphorus. Based on the WWTP's original basis of design, this is outstanding effluent quality. In addition, as a result of consultant reviews and concerns from the Town of Tuftonboro, the Town voluntarily took proactive steps to develop a more rigorous/detailed water quality monitoring program, to better understand 19 Mile Brook prior to, and following the March 2009 start up of the RIBs.

To the Town's surprise, after only 6 weeks of RIB use (which included a start-up and site performance test performed by W-P on April, 2 and April 3, 2009 in which W-P professional staff stated "everything looked good") the Town discovered the first "unexpected issue". On April 20, 2009, a slope failure was found above the Central Groundwater Discharge Area (CGWDA) along with groundwater seeps in and around this area

A second "unexpected issue" occurred during the weekend of June 6, 2009; over that weekend a sink holed developed and a significant quantity of fine sands had migrated from the hill side to wetland areas in the CGWDA. Both of these issues were reported to the NHDES and a follow-up

report was developed and issued to the NHDES on August 12, 2009. Since then, the Town has reported all significant issues found at the site to NHDES and actions have been taken by the Town to mitigate impacts.

The Town followed up these letter reports with a detailed RIB Status Report issued December 6, 2010. The RIB Status Report provided all data collected and an evaluation of RIB site impacts. The Status Report was followed up with a meeting with NHDES on December 12, 2010. Based on the Status Report and meeting, the Town committed to the following action items:

1. Enhanced sampling and analytical plan at the RIB site to monitor compliance with its groundwater discharge permit.
2. Hydrogeologic and Geotechnical analysis to assess the sites ability to handle existing and potential future RIB discharge flows.
3. Provide NHDES with an updated Status Report after an additional year of RIB site use (December 2011).

This report and appendices are being submitted to meet that commitment. It should be noted that the 2011 Status Report includes some overlapping data from the 2010 Status Report, but primarily contains new data collected during the 2011 calendar year. The 2010 Status Report was made public and an electronic copy is on the Town webpage. The 2010 Status Report contains significant analysis and discussion on the impacts of the RIB site on surface water and groundwater quality down slope of the site. That information and discussion is not repeated in the 2011 Status Report.

The Town also agreed at the December 12, 2010 meeting with NHDES, to conduct further geotechnical investigations and studies to determine the causes of the “unexpected issues”. This effort was contracted to W-P and their sub-consultant, S.W. Cole, by the Town. That report is being submitted under separate cover.

Section 2 of this 2011 Status Report details the enhanced RIB site monitoring program for 2011 and includes:

2-A: Site walk monitoring and findings

2-B: Flow discharge, bed rotations, precipitation and effluent pond elevations

2-C: Groundwater sampling and testing results

2-D: Surface Water sampling and testing results

2-E: Surface Water flows from Groundwater Discharges areas

2-F: Nineteen Mile Brook flows

2-G: Groundwater levels

Section 3 of this report discusses the Spray Irrigation System, permit renewal and 2011 pilot spray testing.

Section 4 discusses efforts in Calendar year 2011 to reduce Inflow/Infiltration (I/I) in the collection system and impacts on incoming flows to the treatment facility.

## **Section 2: RIB Site Monitoring Program**

### **2-A Site walk monitoring and findings:**

The Town increased its RIB site monitoring in 2011 by hiring an additional full-time qualified wastewater treatment operator whose responsibility was, and is to, operate and monitor the RIB site. This RIB operator, Jeremy Boston (JB), works for our contract operator, Woodard & Curran (W&C).

Figure 1, RIB Site Map shows the various groundwater monitoring wells (MW#); surface water sampling sites (19MB#); groundwater discharge areas and RIB locations on a 200 foot/inch scale topographic map. JB is responsible for continuous site monitoring and has documented these site inspections on a weekly RIB Site Checklist. These checklists are included in Appendix A to this report and document the extent of his inspections. The RIB site includes over 35 acres and many areas that needed inspections as determined by the Town. Identification numbers (ID) and descriptions indicate where JB visited each day. As presented in the weekly logs, it was not feasible to check every location, every day, but a significant effort was made to check as many locations as frequently as possible.

Much more attention has been placed on inspecting the Western and Central Ground Water Discharge Areas (WGWDA and CGWDA respectively) but inspection locations also include areas to the east of the power line and down gradient from RIBs 4 and 5. This effort is a follow up to the 2010 quarterly field reports completed by Weston & Sampson Engineers. Weston & Sampson was contracted by the Town to complete the photo documentation reports that were included in the 2010 Status Report. The Town felt the need to have more frequent observation reports to locate any potential issue prior to them becoming significant issues. In addition to the checklist, which documents the daily inspections, thousands of photographs have been taken and documented as part of this process. This was accomplished to see how the landscape might have changed over time and assist the engineers in determining overall impacts on the site. These digital photographs are too numerous to include in this report, but are available on a computer at the WWTP and filed by date.

As predicted in the Phase 3 Hydrogeologic Report, March of 2007 (W-P) there has been, and will continue to be, a significant expansion of wetlands/wetland resources adjacent to the RIB site. The groundwater discharge areas are increasing in size as a result of the RIB operation, and the soil is becoming more saturated at lower elevations, low lying vegetation has increased dramatically making it difficult to see the ground in many areas. JB spent a significant effort during 2011 opening up trails to sampling locations and areas where the site experienced “unexpected issue”. In addition, as the soil saturation has increased, mature trees have been dying off and subject to blow over. JB and W&C have been pro-active in attempting to cut down these trees prior to blowing over to reduce the soil exposure if trees are uprooted. This will continue to be a problem and a maintenance issue.

As a result of the “unexpected issues”, there are many areas where sandy soil has been exposed and is migrating down slope. As explained in the 2010 Status Report, some of this material has migrated into 19 Mile Brook. Following the Town’s effort to remove this material from 19 Mile Brook a sand trap was installed at the outlet to the WGWDA, this location is also known as the Tuftonboro Side, Weir 7, and 19 MB-7. A second sand trap was installed at the outlet to the CGWDA, this location is also known as the Wolfeboro Side, Weir 6, and 19MB-9. These two areas are the most important inspection points because if the sandy soil starts to migrate at a significant rate, the sand traps will catch the material prior to discharge to Nineteen Mile Brook and allows time for Town crews to remove the material before it enters the brook.

In February 2011, four minor groundwater breakouts were found in lower reaches of the WGWDA and CGWDA; these areas were staked out and have been on JB’s inspection rounds since. These areas have not grown in size and are still observed on a regular basis.

On February 10, 2011, JB working with Town staff pilot tested a process to remove sand from behind Weir 5. This trial was performed with the use of a small pump and silt bag. About 1.25 cubic yards of sand were removed during this trial. Within a short time the sand filled back in behind Weir 5. At this time it was difficult to see where the sandy material was coming from because of the heavy vegetation in the water channel (coming from 19MB#8).

On March 18, 2011 a second effort was made at removing migrating sand from behind Weir 5. Approximately 1.75 cubic yards was removed. The intent of these efforts was to develop a procedure to efficiently remove sandy material.

On July 25, 2011, JB noted a significant increase in sand build up in the Tuftonboro Sand Trap, this was evident in pictures sent to NHDES on that date, showing the sand trap on July 14, 2011 compared to July 25, 2011. On July 28, 2011, W&C working with Town crews began removing sand using the piloted sand removal (mud pump to silt bag) procedure used early in the year. During the first day of full-scale sand removal it was found that this procedure was not efficient and the Town changed the removal approach. Crews were able to set up a sump location in which to by-pass the WGWDA flow around the sand trap, effectively dewatering it, which

allowed the use of a backhoe to remove sand build up. By the end of the day on July 29, 2011, about 10 to 12 cubic yards were removed from this sand trap and stored in an upland location. On August 7, 2011, the Town responded to an August 5<sup>th</sup> NHDES inquiry about the sand migration as follows:

*“It has been a slow, but continuous migration of sand from the upper reaches of groundwater discharge areas and “Unexpected Issues” to lower areas to sand traps. The Town believes there are 3 possible sources of the sand:*

- 1- The initial occurrences’ of Unexpected issues, now just slowly moving down slope, or*
- 2- Continuous internal subsurface erosion, pushing sand to the surface and down slope, or*
- 3- The continuous Groundwater breakout flow that is flowing at such a velocity to be cutting a new channel via surface erosion as it flows from the upper to lower reaches of Groundwater discharge areas.*

*More than likely it is a combination of all 3 possibilities.”*

On August 17, 2011, the Sand Trap located at the outlet to the WGWDA was observed to be murky and subsequent observations that day found significant erosion occurring upslope between locations Weir 4 and Weir 5. NHDES was notified on August 17<sup>th</sup>, August 19<sup>th</sup> and August 25<sup>th</sup> of observations and actions taken by the Town. The groundwater breakout flow from the upper reach of the WGWDA (starting at 19MB#8 and the toe of slope in this general area), found a subsurface route between Weir 4 and Weir 5. This flow apparently developed a shallow “tunnel” and was most likely the source of sand migration that had slowly been showing up in Weir 5 and the Tuftonboro Sand Trap (as noted in February and July respectively).

On August 15, 2011 and August 16, 2011, approximately 1.8 inches of rain was recorded at the WWTP and it is assumed that this rainfall caused the “tunnel” to collapse, which resulted in significant erosion as the flow washed away much of the overburden that had caved it. W&C and Town crews were mobilized to remove sand from the Tuftonboro Sand Trap. On August 19, 2011 approximately 12 cubic yards were removed from the Tuftonboro Sand Trap. On August 22, 2011 the Sand Trap had filled back up; however, no sand was observed going through the Trap. On that day an additional 18 +/- cubic yards were removed. Photographs sent to NHDES on August 25, 2011 show the significant depression in the surface which can be seen starting from Weir 4 and going down slope. Based on rough field measurements the depression (and loss of soil) was estimated at 60 +/- cubic yards. The groundwater breakout flow was running through this depression and sand was migrating down slope.

Based on the potential for additional erosion, David Ford-Director of Public Works and Water and Sewer Utilities, directed Town crews to install approximately 600 linear feet of 4-inch and 6-inch plastic pipe. This piping system, for lack of better terminology, will be called the Ground Water Break Out (GWBO) Collection Piping System. The GWBO Collection Piping System begins at 19MB#8 and continues all the way to the Tuftonboro Sand Trap, with inlets at each significant breakout to capture the clear groundwater, before it begins eroding the surface. This

work was started on August 24, 2011 and completed on August 25, 2011. Since that time, the area has stabilized and there has been very little sand migration.

During this same week, the Town was preparing for Tropical Storm Irene and in consultation with its Consultants, W-P and S.W. Cole, reduced RIB flows to 100,000 gpd, all of it going to RIB 4. The Town received about 4 inches of rain from Tropical Storm Irene on August 28, 2011 and the GWBO piping system persevered and there were no signs of significant erosion in the WGWD or the CGWDA. The Town slowly increased RIB discharge flows following that event and even though we have seen extremely high precipitation for the months of August, September and October (8.2 inches, 6.4 inches and 7.0 inches, respectively) the site has stabilized, the piping system continues to hold and is preventing additional erosion and sand migration. While the GWBO Collection Piping System was installed as an emergency measure, the Town intends on keeping it in place through the winter of 2011/2012. Both sand traps are scheduled to be clean out during the first week of December 2011.

## **2-B RIB discharge flows, bed rotations, precipitation and effluent pond elevations:**

RIB discharge flows are recorded daily and the year-to-date log is shown in Appendix B. The Town voluntarily capped its daily maximum discharge flow to the RIB site at 405,000 gpd. In addition, based on discussion from our consultants, the Town reduced average daily flows to the RIB site from January through May 2011 to 300,000 gpd. In June and July these flows were increased to 338,433 gpd and 368,739 gpd, respectively. In August as a result of Tropical Storm Irene the average daily flow was reduced to 286,958 gpd. In September, October and November the flows were increased to approximately 355,020gpd, 379,484 and 375,000 gpd. In December 2011 the planned discharge is 300,000 gpd. These discharge flows are based on the S.W. Cole Report, please refer to that document for a detailed discussion on how these numbers were developed.

As stated above, the Town and New England region has seen unusually high precipitation during 2011. Precipitation data from January through November 2011 are shown in Appendix C. Even though the Town has made significant investments in its sewer collection system to reduce Infiltration and Inflow (I/I), it is still a problem as witnessed by the increased flows to the WWTP. As a result, the Effluent Storage Pond (ESP) has been filling at an increased rate. At this time the Town plans on limiting its discharge to the RIB site as recommended by the S. W. Cole Report (about 124 million gallons for the 2012 calendar year) and anticipates the need to use the Spray Irrigation System to discharge another 22 million gallons (in the Spring/Summer 2012). Based on the elevation in the ESP now (see Appendix D, approximately 54 million gallons as of November 20, 2011) the Town calculates it will reach a peak elevation or storage volume of 80 million gallons on June 1, 2012 and reduce that stored volume to 48 million gallons by the end of 2012.

RIB bed rotation has varied since we started operation. Initially we used a 2 days on bed 1, 7 days on bed 2 and 5 days on bed 3. This allowed for even flow discharge per square foot of basin. During the spring, summer and fall months beds were normally allowed to dry then raked in between rotations. During the winter months bed 1 was not used and beds 2 and 3 ran for much longer durations, from 14 days to a maximum of 61 days in 2010.

On June 1, 2010, basins 4 and 5 were completed and placed into operation. These beds were limited in flow discharge to 75,000 gpd and required a “bucket test” to measure the flow. Operators have to crack open the valve to one of these two beds and measure the time it takes to fill a five gallon bucket. Process is repeated a few times until the operator is confident they have a good measurement. This flow is subtracted from the total flow (measure at the pump station with a flow meter) to determine the flows going to the west side or beds 1, 2 or 3. Every time bed 4 or 5 is rotated or when the total flow rate is changed, operators are required to perform this bucket test to control flow rates. RIBs 4 and 5 were run for durations of up to 42 days in between rotations in 2010 and 2011.

Starting in December 2011 and based on recommendations for the S. W. Cole report operators will rotate RIBs 1, 2 and 3 on a 2 day, 7 day, and 5 day rotation respectively. Beds 4 will run with beds 1 and 3 and bed 5 will run with bed 2. Operators will investigate the possibility of setting up a portable v-notch weir to make flow calibrations easier and more accurate.

## **2-C Groundwater Testing and Sampling Results**

Groundwater sampling and testing from Monitoring Wells (MW) has been done in accordance with the RIB GW Permit conditions. In addition, the Town has increased frequency of conventional parameter testing from 2X a year to 4X a year. This data is shown in Appendix E. As expected all MW's tested except for the background MW-1 show sustained increased elevations of Chloride, Specific Conductivity and Nitrogen. MW-1 does not show any increase in these parameters, but some parameters do fluctuate between sampling dates and these changes are attributed to the changes in the regional groundwater table.

It should be noted that MW-23, located down gradient of RIB 5, did show a higher Total Phosphorus level than all other MW's and in one case higher than treated effluent being discharged to RIB's. The Town feels that this anomaly needs to be studied further to see what this could be attributed, to as it does not appear to be a result of RIB discharge.

Maximum levels of Total Nitrogen found in MW-8 and MW-15 were 2.5 mg/l, much less than permit limit of 10 mg/l.

MW 16b was not sampled in 2011 because each time sampling events were scheduled, the monitoring well was almost dry and after the well was purged insufficient groundwater was available in well to take a sample.

## **2-D Surface Water Testing and Sampling Results**

Surface water testing has continued with 15 sites tested on a monthly basis. This data is shown in Appendix F and begins with in November of 2010 and continues through November 2011. Results prior to November 2010 are contained in the 2010 RIB Status Report.

Sample sites 19MB#3 was discontinued as it is very close to 19MB#4. Site 19MB#12 and 19MB#14 through 19MB#17 are all located along the “Unnamed” tributary were discontinued, as they were either dry or not considered among the crucial locations that warranted continued sampling.

The GW Permit conditions only requires testing on 2 sites, twice a year, however the Town has committed to a significantly enhanced program of testing to better understand impacts from the RIB system. Figure 1 shows the locations of each testing site. Sites 19MB#8 and 19MB#10 are located at the upper reaches of ground water breakouts in the WGWDA and CGWDA respectively. Sites 19MB#7 and 19MB#9 are located at the outlets to both of these areas and are good indicators of specific water quality parameters that are being discharge to the 19 Mile Brook as a result of the RIB system.

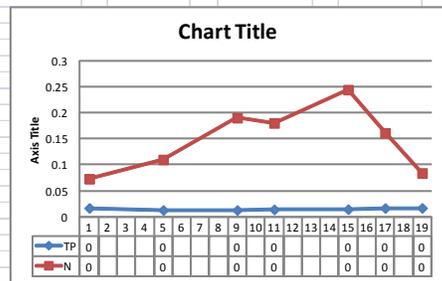
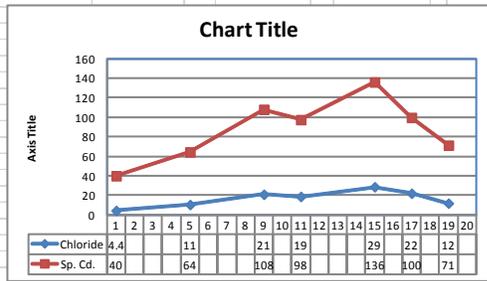
Chloride and Specific Conductivity are good indicators in showing the foot print of the treated effluent as these parameters are not filtered out as the treated effluent travels through soil column. Prior to the RIB system start up, these parameters measured approximately 4 mg/l for chloride and 40 uS for Specific Conductivity. Following RIB operations in March of 2009, these parameters remained fairly low and consistent until about June 2009 for site 19 MB#6 and August 2009 for site 19MB#2, when it is clear that these parameters began to increase. The two parameters of concerns are Nitrogen and Phosphorus. Nitrogen does not get treated or filtered as it travels through the soil and reductions in concentrations are usually attributed to dilution. Phosphorus does get filtered out in the sand just below the RIB bottoms. Total Nitrogen (TN) and Total Phosphorus (TP) concentrations for the treated effluent discharged to the RIBs are shown in Appendix F. The average concentration in 2011 for Total Nitrogen was 2.7 mg/l and for Total Phosphorus was 0.4 mg/l.

Table 1 below was developed to demonstrate the water quality impacts along 19 Mile Brook from RIB flows. This Table shows the average concentration of each of these parameters prior to impacts from the RIB system from 2007 to about mid 2009. In the lower section and the chart below it shows the impacts since mid 2009. It also shows the average for each of these

parameters coming from the Unnamed Brook (19MB#18), the CGWDA (19MB#9) and from the WGWDA (19MB#7).

**TABLE 1 Water Quality along Nineteen Mile Brook**

19MB - #1 Site located 250 feet upstream of Powerline in 19 Mile Brook 19MB-#18 Site located on the Unnamed Brook, 100 feet +/- from confluence with 19 Mile Brook 19MB- #19 Site located in 19 Mile Brook, just downstream of confluence with the Unnamed Brook 19MB-#9 Site located at outlet to CGWDA (aka, outlet to Wolf Sand Trap and Weir 6) 19MB- #20 Site located in 19 Mile Brook just downstream of Discharge from CGWDA 19MB- #2 Site located in 19 Mile Brook just upstream of discharge of WGWDA 19MB-#7 Site located at outlet to WGWDA (aka Tuft Sand Trap and Weir 7) 19MB- #21 Site located in 19 Mile Brook just downstream of discharge from WGWDA 19MB-#4 Site located in 19 Mile Brook, on upstream side of Route 109a Bridge 19MB- #5 Site located in 19 Mile Brook just upstream of Route 109 Bridge										
Parameter	Sampling Sites along 19 Mile Brook (See location descriptions above)									
	19MB - #1	19MB-#18	19MB- #19	19MB-#9	19MB- #20	19MB- #2	19MB-#7	19MB- #21	19MB-#4	19MB- #5
PRE-RIB										
Chloride	4.2					4.2			4	5.9
Sp. Cd.	42.7					36.7			41	51.6
TP	0.033					0.034			0.035	0.030
N	0.06					0.076			0.08	0.060
POST-RIB										
Chloride	4.4		10.5		21	18.8		28.7	22	11.9
Sp. Cd.	40		64.4		108	97.5		136	99.7	71.3
TP	0.0168		0.013		0.013	0.014		0.0145	0.0167	0.017
N	0.073		0.11		0.19	0.18		0.244	0.161	0.084
		19MB-#18		19MB-#9				19MB-#7		
POST-RIB										
Chloride		39		93				78.6		
Sp. Cd.		177		408				342		
TP		0.0132		0.022				0.028		
N		0.33		0.96				0.82		



As depicted in this Table and charts, Total Nitrogen levels entering directly as surface water from the Unnamed Brook, the WGWDA and the CGWDA average less than 1 mg/l. In the Towns Permit application it was conservatively estimated that these levels could be as high as 7 mg/l for Nitrogen. The Towns capital investments and operational upgrades at the WWTP resulted in a much improved treated effluent quality.

## **2-E Surface Water Flows from Groundwater Discharge Areas:**

Weir 7 was set up in 2010 to measure the flow of surface water leaving the WGWDA and Weir 6 was set up in 2010 to measure the flow of surface water leaving the CGWDA. Other weirs (1 through 5) were also set up early in 2010 to measure flows at different locations, however, these locations became difficult to maintain and were discontinued. These flow measurement locations were constructed as V-Notch weirs and the results from these measurements are shown in Appendix G. This Appendix shows the measured flow at weir 6 and 7 as well as their combined flow and that flow in relation to the RIB discharge flow. During low flow months of January and February of 2011 the average combined discharge from Weir 6 & 7 was approximately 188,550 gallons per day (gpd) versus a RIB discharge to RIB's 1, 2 & 3 of 250,000 gpd. This equates to about 63% of the total RIB flow being discharge through these 2 weirs. This is less than estimated in the 2007 Phase 3 Hydrogeologic Report (Appendix O), which predicted flows to be just under 50% of RIB flows.

As demonstrated in Section 2-D above, even with the increased surface water flows from the WGWDA and CGWDA being more than anticipated, the water quality is much better than predicted. However, the ongoing concern is the quantity of flow and the erosive forces it exerts on the slopes and soils between the upper reaches of the discharge areas to the brook. These flows and erosive forces were greatly mitigated when the GWBO Collection Piping system was installed in the WGWDA. The Town will continue its monitoring of these areas and determine a long-term plan to address these issues.

## **2-G Nineteen Mile Brook Flows:**

In 2010 Stream Gauging stations were installed along 19 Mile Brook. SG-10 was installed just upstream of the concrete box culvert on Route 109A; SG-11 was installed just downstream from the discharge of the WGWDA to 19 Mile Brook; SG-12 at the power line crossing of 19 Mile Brook and SG-13 about 150 feet upstream on the Unnamed Tributary. Early during 2010, SG-11, SG-12 and SG-13 were all compromised because of beaver dam construction and are no longer providing accurate data so the monitoring at these locations has been discontinued.

SG-10 is still functioning and provides important information as 19 Mile Brook is subject to flash flooding because of its small watershed (approximately 1,600 acres). Please refer to the December 6, 2010 RIB Status Report for a detailed discussion on the stream gauging effort. Stream gauging data for SG-1 is provided in Appendix H.

In 2011 with rainfall quantities much higher than normal for this region, 19 Mile Brook Flows were also much higher, which does provides a higher dilution factor and needs to be taken into

consideration when reviewing water quality issues. It should be noted that SG-10 readings) are always conducted on the same day as surface water sampling so that the Town can assess the impacts of dilution.

## **2-H Groundwater Levels**

Groundwater levels in 13 Monitoring Wells are continuously monitored with data loggers which are downloaded each month. This data, from January 2011 through November 2011, is shown in Appendix I. Detailed discussion on this data is included in the S.W. Cole Hydrogeological and Geotechnical Engineering Services Report on the RIB site and submitted to NHDES on a separate cover.

## **Section 3 Treated Effluent Spray Irrigation System:**

The Town submitted a Wastewater Treatment Facility Effluent Spray Irrigation System Discharge Permit application in November of 2010. NHDES issued a Groundwater Discharge Permit (GWP-198705015-W-003) on April 28, 2011. This permit allows for the discharge of up to 2.4 million gallons per week over approximately 46 acres. In this permit application the Town committed to removing spray piping laterals from the Mirror Lake watershed, this effort was completed by the summer of 2011. In addition, the Town eliminated spray areas 1 and 3 as they were located at lower elevations and contained many wet areas of concern.

In the Summer of 2011 the Town working with its contract operator, Woodard & Curran developed a Pilot Test Spray procedure that was intended to eliminate concerns of treated effluent being sprayed and running off into surface waters.

The pilot test procedure was as follows:

- 1- Commence pre-spray testing per the groundwater permit.
- 2- Run spray area 2 for one hour, during spraying, verify by field observation and photo documentation that there is no runoff at locations known in previous years to develop runoff.
- 3- Note: during the pilot test, if direct runoff from spraying is occurring, stop spray pumps, document and report to Town & NHDES.
- 4- Shut down spray area 2, turn on spray area 4 and run for 1 hour, during spray verify by field observation and photo documentation that there is no runoff.
- 5- Shut down 4, turn on spray area 5 and run for 1 hour, during spray verify by field observation and photo documentation that there is no runoff.
- 6- Repeat steps 2 thru 5, providing 2 complete cycles in one day. Document run times, flow rates and total flow in 1 hour increments and total flow for day.
- 7- Run this pilot test for 4 consecutive days, (if weather allows).

This pilot test protocol was somewhat modified because of piping problems in all areas. During the Spring much of the Operators efforts were in removing spray piping from Mirror Lake Watershed located in spray area 3. Spray piping laterals at the end of spray areas 4 and 5 were removed in the fall of 2010.

Early in the summer it was realized that additional work was required to stabilize the old piping system. A priority was given to areas 2 and 5. On July 24, 2011 was the first official pilot spray test date. Daily log sheets documenting these activities are contained in Appendix J.

Numerous piping issues continued to hamper operator's efforts in getting all 3 areas running during the same day. Also, as this procedure was set up to have operators on site during the entire process, the time was limited to less than 8 hours per day. During July and August only areas 2 and 5 were tested, with a maximum day flow of 235,013 gallons sprayed, without any active runoff. By the end of August, area 4 was finally ready to be run through the pilot test when Tropical Storm Irene hit and dropped 4 inches of rain on the site, further delaying the pilot test. September rainfall of 6.4 inches and 7.0 inches in October greatly limited operator's effort to fully implement the pilot test procedure. However, even with the many difficulties encountered, the results show that over 3.5 million gallons were discharge over 35 days without any active runoff.

The Town will be requesting funds in the 2012 capital budget to make additional upgrades to the spray pumping system that will allow for automation of valves and pumps, which will greatly enhance efforts to increase discharge rates while remaining compliant. Additionally, operators will be preparing the piping system in April, so that, weather permitting, the 3 spray areas will be ready for operation by May 1st. The Town conservatively estimates, even without automation, that 300,000 gpd can be sprayed 15 days per month. Assuming lower discharge rates in May and October, the Town estimates it can discharge at least 22 million gallons in 2012. This discharge capacity in combination with RIB discharge rates will allow the Town to maintain safe levels in the Effluent Storage Pond.

Photo documentation of pre and post spraying are on file at the WWTP for review.

#### **Section 4 Sewer System Inflow/Infiltration (I/I) reduction efforts in 2011**

The Town has continued to reduce I/I into the municipal sewer collection system in 2011, by working directly with the Ted Berry Company and making "short liner" repairs to the collection system in the Elm Street Pump Station sewer shed. The Town has also contracted with Ted Berry Company for the repair of numerous sewer manholes, this contract will begin shortly. Both of these efforts were approximately \$12,000 efforts and were done in the design build contract

method to save money. These efforts in combinations with I/I reduction contracts issues in 2007 and 2009 have made significant impacts in reduction of sewer flows to the WWTP. The Town is diligently continuing its effort for I/I reduction with the Downtown Streets project to be bid out next week and scheduled for construction in 2012.

NOTE: Appendices were too large of an electronic file to upload to the Web Page, please contact the Public Works Office for this information or it can be viewed at the Wolfeboro Town Library.