Consider the Town of Jaffrey to be a victim of its location – that is from the perspective of sewage disposal. Receiving streams for treated wastewater are small with very low potential for dilution. The headwater of the Contoocook River is the chosen water body for the WWTF to discharge into and it is a major portion of the stream flow. Dilution is minimal with a 1.78 ratio which plays an important role in determining the limits to which the wastewater generated in the community must be treated. The most evident impact of a small receiving stream can best be demonstrated with the recent issue of the NPDES permit for Jaffrey. In 2010 the USEPA enacted new effluent discharge limits for wastewater contributions to the Contoocook River. Some of the permit limits are complex and are separated into time periods throughout the year. A summary of the requirements for an average design flow of 1.25 million gallons per day are:

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Here is a quick summary of the wastewater history of Jaffrey. The Town has been a leader in its approach to waste treatment. Facultative, stabilization ponds were constructed in 1960 to provide centralized wastewater disposal for the community. Increasingly strict discharge limits brought about by the passage of the Clean Water Act in the 1970’s dictated a need to upgrade the treatment plant and decrease the concentration of constituents in the treatment system effluent. Three new, lined, aerated lagoons constructed in the 1980’s provided approximately 10 acres and 38,000,000 gallons of treatment volume to achieve secondary effluent limits established by a new NPDES discharge permit.

The aerated lagoon plant served the needs of the community until newer water quality regulations were enacted in the late 1990s. The New Hampshire Department of Environmental Services (NHDES) conducted a Total Maximum Daily Load (TMDL) study and model-
Upcoming Events

Winter Meeting: December 10th at the Hanover WWTF with lunch at the Fireside Restaurant, where the Plant of the Year Award recipient will be announced, and the candidates selected for “Wastewater Boot Camp” will also be announced.

Board of Directors Openings

There are three openings on the NHWPCA Board of Directors. They are, Secretary, 3rd Director, and Director-at-Large. For more information on these openings contact Mike Sullivan at mikesullivan@davidsullivan.com, or any NHWPCA Board of Directors member.

NHDES Wastewater Operator Training Fall 2010 Schedule Is Ready!

Go to http://des.nh.gov/organization/division/water/wweb/ottraining.htm and download your schedule today.

Newsletter Committee

Steve Clifton, Mary Jane Meier, Chris Hipkiss, Stephanie Rochefort, Todd Gianotti, Dave Michelsen, and Joseph Laliberte. We welcome additional members. We are looking for meaningful articles for the ‘Wastewater Operator in a timely fashion. Send submission articles for THE COLLECTOR to—Steve Clifton via email at wscclifton@underwoodengineers.com

Editor - Steve Clifton, Publisher - Todd Gianotti

THE COLLECTOR is the Official Newsletter of the NHWPCA
ing of the Contoocook River in the early 2000s. The study concluded that the water quality of the Contoocook River was impaired for dissolved oxygen, total phosphorus and Escherichia coli. The Jaffrey POTW was the major contributor of the constituents of concern in the river. Jaffrey received an Administrative Order (AO) from the United States Environmental Protection Agency (USEPA) to further improve the quality of its wastewater discharge. The new discharge limits dictated that an entirely new treatment technology would be necessary because the aerated lagoon system was no longer able to satisfy the stricter discharge limits.

Town officials decided that replacing the existing treatment facility was the best solution after exhaustive evaluation of alternative approaches that were proposed. A mechanical, advanced treatment system patented by the EIMCO Corporation was the chosen alternative. The EIMCO Carrousel Oxidation Ditch process has simple, compact geometry that couples into one tank structure the function of the aeration equipment with recycle pumping systems. State of the art instrumentation and computer controls allow the facility to be automatically controlled to maintain the optimum level of effluent quality and use a minimum amount of energy input. The treatment units are designed to achieve biological removal of ammonia nitrogen and phosphorus.

The heart of the biological unit is a three compartment design as shown in the enclosed diagram. The two square compartments at the influent end of the tankage are anaerobic zones. These sections of the tank are to be devoid of dissolved oxygen and nitrates to ensure the initial release of phosphorus from the microorganisms in the wastewater and to allow growth of Polyphosphate Accumulating Organisms (PAOs) that have the ability to absorb several times more phosphorus than other common organisms in downstream portions of the tank layout ("luxury" phosphorus uptake). The second zone of the carrousel arrangement is an anoxic zone for removal of the nitrates that are produced in the aerated, oval section of the unit. In the anerobic zone carbonaceous material is oxidized, "luxury" uptake of phosphorus occurs and nitrification takes place converting nitrogen compounds in the influent wastewater to nitrates. The unique layout of the oval portion of the EIMCO tank arrangement introduces the nitrates back into the anoxic zone by virtue of the mixing velocity created by forward flow from the surface aerators in the oxidation ditch.

Following the multi-stage biological treatment process there is capability to add Polyaluminum Chloride (PAC) prior to two secondary settling tanks for additional phosphorus removal. However, a strict permit limit for phosphorus for much of the year has demanded that a tertiary process be a part of the system to ensure that phosphorus content consistency is achieved in the effluent. An Actiflo system is being constructed to provide an extra level of certainty that the discharge of phosphorus meets the regulated limit. Actiflo uses a ballasted floc concept to accomplish its treatment goal. Microsand particles and a polymer are introduced as wastewater flow enters a tank with a series of three compartments to accomplish flocculation, maturation and settling. The sand provides added surface area and weight to the coagulated particles to enhance settling of remaining particulates. Clarified supernatant from the settling zone

(Continued on page 2)
passes on to downstream units before ultimate discharge. The sand and attached solids are drawn from the bottom of the settling compartment and introduced into a cyclone separator to recover the microsand for reuse at the beginning of the tertiary process. If the Actiflo concept sounds familiar, it is being used on a larger scale at the Nashua POTW for their new storm water treatment facility.

The finishing touches in the treatment process are provided by a post aeration tank to boost the dissolved oxygen in the effluent and an ultraviolet disinfection system for bacteria destruction. Treated flow is transported to a connection with the existing outfall pipe from the lagoons and is discharged into the Contoocook River at the same location as it always has.

At this stage most will say that all of this is well and good but how long did it take to build and how much did the project cost? Construction began in June of 2007 and substantial completion was considered to be April 2009. The total construction cost of the biological portion of the project was approximately $11,000,000 and the phosphorus polishing segment is an additional $1,750,000 which is under construction now.

Editor's Note: The NHWPCA wish to thank the Town of Jaffrey, Wright Pierce Engineers and Penta Corporation for putting on a great 2010 Fall Meeting for the association at the Jaffrey WWTF.
In 2005, the Hooksett Sewer Commission retained Graves Engineering, Inc. (GEI) to develop a capital improvements program to upgrade the circa 1968 Hooksett Wastewater Treatment Plant (WWTP) and expand the flow capacity from the current NPDES permitted flow of 1.1 MGD to 2.2 MGD, with the objective of not needing to construct additional aeration tanks. The AnoxKaldnes Integrated Fixed Film Activated Sludge (IFAS) and Moving Bed® Biofilm Reactor (MBBR) processes, which both utilize polyethylene biofilm carriers to provide an environment in which specific bacterial populations can grow very effectively, were the only technologies that could meet the objective. The biocarriers provide far greater surface area for the growth of microorganism (biomass) than conventional activated sludge processes. Thus, it is possible to handle greater flow and higher loading conditions without the need for additional aeration tanks.

Working with AnoxKaldnes, GEI invited Plant Superintendent Bruce Kudrick and George Neill of the NHDES to visit several wastewater treatment facilities in Colorado and Wyoming that utilize the AnoxKaldnes IFAS and MBBR technologies. A pilot study at the Hooksett WWTP demonstrated the effectiveness of the IFAS (with RAS) and MBBR (without RAS) processes to remove soluble BOD to below 10 mg/L. The current discharge limits are 30 mg/L BOD and TSS. Because the plant capacity is being increased twofold without adding aeration tank volume, the plant will be required to treat to a BOD and TSS level of 15 mg/L. Based on the site visits, supporting performance data, and the pilot study, the NHDES approved the AnoxKaldnes IFAS process as an innovative technology.

Anticipating that a future discharge permit for the expanded 2.2 MGD plant will likely include limitations on Phosphorous (P) and nutrients, the treatment process evolved into a BNR process utilizing a variation of the Bardolpho® process for bio P removal and denitrification and the IFAS process utilizing AnoxKaldnes' Biofilm Chip™-M media - distinguishing features of the plant. Hooksett WWTP will be the first plant in the United States to utilize the high surface area Biofilm Chip™–M media.

Biofilm Chip™–M is a high-density polyethylene (HDPE) wafer with approximate dimensions of 48 mm diameter and 2.2 mm thick (Figure 1). The wafers have small perforations allowing for a high surface area. This media has an effective surface area for biofilm growth of 365.8 ft²/ft³ and is used in the Hooksett IFAS Reactors at fill rates of up to 55%, giving a biofilm surface area of approximately 201.2 ft²/ft³ (660 m²/m³) of reactor. There are approximately 160,000 individual pieces of media per cubic meter (35.31 ft³). The total effective surface area for biofilm growth in the IFAS Reactors is approximately 3,526,700 ft² (81 acres). In order to upgrade and expand the plant within the available funds, construction was divided into two (2) phases as follows:

**Phase 2 Capital Improvements** included the relocation of a perennial stream, reversing the influent flow pattern, construction of influent, intermediate, and effluent flow splitter boxes, a 60-foot diameter by 14 feet SWD secondary clarifier, a Blower/Storage Building addition to house three (3) 100 HP, 2,200 SCFM, VFD, positive displacement blowers, Chemical Building No. 1 to house Sodium Hypochlorite (disinfection) and Sodium Bisulfate (dechlorination) storage tanks and chemical metering pumps, retrofitting the existing RAS Pump Room with three (3) 7.5 HP, 764 GPM, VFD, RAS/WAS vertical centrifugal pumps, a 500 kW emergency generator, Motor Control Center 1, and a SCADA system. Construction of the Phase 2 Capital Improvements project was completed on time in November 2009 by Penta Corporation at a cost of $4.8 million. The project was funded in part by the New Hampshire State Revolving Loan Fund (SRF).

**Phase 2A Capital Improvements**, currently under construction, includes an aerated grit chamber and grit classifier, converting existing activated sludge Aeration Tanks 1 and 2 to a series of Anoxic and Anaerobic Reactors for bio P removal and denitrification, converting Aeration Tanks 3 and 4 to a series of IFAS Reactors for nitrification and BOD removal, rapid mix
“THINGS ARE NOT ALWAYS WHAT THEY APPEAR TO BE”

BY CHRIS HIPKISS, FRANKLIN WWTF

Most people have read or used the above phrase at sometime and the “Near Miss” I am going to describe below actually resulted in a lost time accident. I am referring to it as a “Near Miss” because it could have been a much more serious accident.

The Situation

Two mechanics were assigned to replace a non functioning methane gas metering devise with a meter of a newer design. The original installation consisted of two inch diameter flanged iron spools one being one foot long and the seconded being two feet long. The meter in-between was one foot long by one and half feet high with part of the meter appearing to be cast out of aluminum. The flanges on the meter were a six bolt pattern and the flanges going to the plant piping were a four bolt pattern. The meter installation was located six and a half feet above floor level and the replacement metering devise consisted of a four foot long two inch diameter spool made of stainless steel with the metering sensor installed in the spool.

The lead mechanic was on a ladder removing the four bolts on each end of the metering assembly while the second mechanic was positioned under the meter and was prepared to remove it after the bolts were removed. When the metering assemble consisting of the meter and the two spools was free the second mechanic struggled with its weight and in doing so suffered neck, shoulder and back mussel strains which resulted in lost work time. Latter it was determined that the total weight of the three components to be close to 120 pounds and even though I refer to this as a “Near Miss” if the second mechanic had lost his balance and fell with that amount of weight falling on his chest the accident would have been much more serious.

A better plan of action?

I am sure that those reading this article would have more than one suggestion on how they would have proceeded with this maintenance task. I am not going to prescribe a proper method but will put forth some suggestions on precautions to take when faced with a new task. Since this metering equipment had been in place for some time and was not functional the chances of having a readily available spec sheet giving the weight of the meter would be a long shot. Since they were swapping out the old meter with new one with a completely different design you can’t compare apples to apples because the new meter is an orange. You could over design the project from the start by setting up scaffolding with appropriate lifting devises but since the space they were working in was two flights of stairs below grade this was not likely.

Hindsight being what it is taking out three of the four bolts and loosing the fourth bolt on each end flange would have allowed for the movement of the total assemble to judge the weight. Another approach, but taking more time, would have been to take out ten bolts leaving two loosened bolts in to judge the weight of the meter and remove that first and then taking out the two spools. Like I said earlier there are, I am sure, other approaches to this task.

In Conclusion

Before taking on a task that you have never done before do some research or be prepared for the unexpected and swapping out a meter with one that is completely different should be considered a new task. Remember “Things are not always what they appear to be”
I was working back in the “dinosaur days” when QA/QC was first invented and we had to start writing up explanations for QA/QC failures for any of our NPDES tests. Of course, I had a few of these failures to explain, but I found it quite easy to do. For example: “The GGA standard for all of the batches analyzed during the first two weeks of July failed to deplete sufficiently and so the standard results were below the lower control limit and the results could not be used for NPDES reporting. The regular lab analyst was on vacation. All previous and subsequent BOD batches that were analyzed by the regular lab analyst were within compliance for all QA/QC parameters. To prevent recurrence of this problem, extra training will be performed before the next scheduled vacation.” I used variations of this wording for vacations, sick days, classes – whenever I wasn’t there. Of course the DES and EPA would accept this, right? What did they think would happen if I wasn’t there? Or maybe this was an indication of a bigger problem in my laboratory? You think?

Once I admitted that there was a problem, I began to work on a solution. I made up a schedule of how much training would be needed to keep two other people proficient in setting up a BOD test. My schedule of training would have worked to keep two other employees proficient, but it was totally unrealistic. We just don’t have the manpower to take people away from their primary jobs in order to be ready for “just-in-case” somebody else has to set up a BOD.

So, I broke the problem down into smaller parts to come up with solutions. Luckily, our NPDES permit only requires BOD tests to be run twice per week and the days are not specified. And, after a lengthy controversy, it has been established that the BOD sample can be held for 48 hours after the end of the composite-time. This gives a lot of flexibility. If I have a planned day or two off, I can re-arrange the lab schedule to get the BOD tests done. If I have an unplanned day off, the sample can be refrigerated and held until my return. I took advantage of this most recently when I found myself unable to get to work in the morning because of flooded roads. After the situation had dried up a bit I ventured out to get gas for my generator and to set up a BOD. This works for the whole treatment plant staff, because a short-staffed situation is not made worse by taking somebody away from their primary job for many hours to work in the lab.

And I do like to take the occasional week-long vacation. We take the stress out of this situation by sending BOD samples out to NHELAC-accredited commercial laboratory. They even supply the sample containers, chains of custody and courier service. Our commercial lab will even supply us with extra containers in case I’m unexpectedly absent and we need to send out samples.

Another part of the problem is that QA/QC failures were happening during read-outs. I heard complaints about how difficult it was to calibrate the BOD meter. Well, the truth of the matter is that it is NOT difficult to calibrate the BOD meter and every employee should be able to read out a BOD test. This was definitely a problem that could be cleared up by training. I made up a set up instructions on how to calibrate the BOD meter. Since BOD tests are read-out twice per week and there’s a big window of when to do it, it was quite easy to fit this training into everybody’s schedule. If it was known that an employee was working a holiday and would be reading out a BOD, an extra effort would be made for an extra training session. Now, we have arrived at the point where any employee here can calibrate the BOD meter and read out a BOD. I just leave out my instruction sheet (or it’s hanging on the corkboard if I forget) and do the math the next day.

That was another issue – the math. It surprised me to find out that not everybody has a nerdy love of math. To help out, I made up a set of instructions on how to do BOD math. The instructions were step-by-step and four pages long. This didn’t really help. Then I realized that since the results weren’t final until the math had been double-checked anyway, there was no reason for anybody to stress out about the calculations. The calculations can certainly wait and be attacked with the buddy-system for proper QA/QC. So now, all employees not only CAN read out a BOD test, they DON’T MIND doing it!
chambers, and flocculation chambers, Chemical Building No. 2 to house Ferric Chloride (chemical P removal) and Polymer (coagulation) storage tanks and chemical metering pumps, retrofitting the RAS Pump Room with two (2) 7.5 HP, 213 GPM, VFD, double disc sludge transfer pumps, a 2.0 meter belt press, a serpentine sludge conveyor, polymer batching system consisting of mix tanks and peristaltic metering pumps for sludge conditioning, converting two abandoned secondary clarifiers to sludge holding tanks complete with a fine bubble aeration system, and Motor Control Center 2. All of the equipment will be integrated into the SCADA system. Penta Corporation, the low bidder at $4.8 million, was able to make the transition from Phase 2 to Phase 2A without demobilizing/mobilizing. Scheduled for substantial completion in April 2011, the project is currently ahead of schedule. The project is being funded in part by SRF and American Reinvestment and Recovery (ARRA) funds. GEI is continuing to provide construction administration and full time resident observation services.

**Process Description:** Screened and degritted influent flow and return activated sludge (RAS) enters the first Anoxic Reactor where pre-denitrification of nitrates occurs and any dissolved oxygen (DO) is consumed from the RAS prior to the Anaerobic Reactor (Selector). In the Selector, bacteria feed on the organic substrate in the influent wastewater, leading to soluble BOD uptake. Under anaerobic conditions, the phosphorus accumulating organism (PAOs) release P as orthophosphate (PO4) and store polyhydroxybutyrate (PHB). The Selector also controls the growth of filamentous organisms due to the PAOs ability to uptake soluble BOD in the absence of DO or Nitrates or Nitrites. Upon return to aerobic conditions in the IFAS process, the PHB is metabolized and P is taken back by the organisms and utilized for cell growth in the IFAS Reactors. The phosphorus is removed from the wastewater as the biomass is removed in the sludge wasting procedure. The second and third stage Anoxic Reactors provide additional denitrification using the nitrate produced in the IFAS process. Denitrification also returns alkalinity to the activated sludge process. Nitrified mixed liquor suspended solids (MLSS) from the IFAS Reactors is recycled to the second stage Anoxic Reactors to improve denitrification and to reduce the nitrate concentration in the plant effluent and the RAS. Each Anoxic/Aerobic reactor has two (2) 3.0 HP submersible propeller mixers that continuously mix the wastewater to prevent solids disposition and provide solids concentration uniformity without oxygenation. The hydraulic residence time (HRT) in each reactor is about 30 minutes at the design average daily flow (ADF).

Following the last anoxic zone the wastewater flows into the first of two (2) IFAS Reactors. The first IFAS Reactor volume is filled to 55% capacity with the Biofilm Chip media. The second IFAS Reactor is filled to 52% capacity. Stainless steel screens (sieves) in each reactor prevent the media from escaping the tank (See Photo). Each reactor has three (3) stainless steel medium bubble aeration grids consisting of laterals and diffusers (4 mm holes drilled at equally spaced intervals). The IFAS Reactors remove BOD, promote ammonia nitrogen (NH3-N) removal (nitrification), strip residual nitrogen gas, and minimize the release of P in the final clarifiers. The HRT in each reactor is about 1.32 hours at ADF.

In the IFAS process, the microorganisms cling to the internal structures of the biocarriers and form a biomass. Air is blown into the aeration grids to supply oxygen required to promote growth of the microorganisms along with the mixing energy required to keep the biocarriers suspended and completely mixed within the aerobic reactors. The amount of air is controlled by DO probes in the reactors. The biomass uses the oxygen and consumes organic pollutants and nutrients in the mixed liquor to grow and reproduce. Eventually, the biomass (MLSS) grows to the point where it sloughs off the biocarrier and is suspended within the reactor. An added benefit of the IFAS process is that is inherently stable and resistant to filamentous growth and organic and hydraulic shock loadings.

From the second stage IFAS Reactor, MLSS flow into a Rapid Mix Chamber where FeCl3 is added, as necessary to enhance P removal by precipitation, and is rapidly dispersed by a 1.0 HP, 26-inch diameter, dual impeller submersible high-speed mixer. The flow then

16" Dia. S.S. Screen in First Stage IFAS

(Continued on page 7)
passes in a downward flow manner into and through the Flocculation Chambers where Polymer is added as a coagulant aid to enhance solids separation in the secondary clarifiers. Two (2) 1.0 HP, 51-inch diameter, single impeller submersible mixers maintain the nitrified MLSS in suspension and promote the formation of larger rapidly settleable flocs by the adherence of floc-forming organisms to filamentous organisms. A 7.5 HP, 1,145 GPM, VFD submersible pump recycles nitrified mixed liquor from the Flocculation Chamber to the second stage Anoxic Reactor for denitrification. The HRT in the Flocculation Chamber is 33 minutes at ADF.

The final clarifiers separate the flocculated and coagulated MLSS from the wastewater via gravity settling. This separation leads to the formation of a secondary effluent in the upper portion of the clarifier that has a low level of activated sludge solids in suspension and settled activated sludge containing large quantities of active bacteria on the bottom. A portion of the settled solids is “returned” (pumped) to the head end of the BNR reactors to maintain the biological process. To preclude an overabundance of activated sludge in the system and to control the food-to-microorganism ratio (F:M) in the IFAS Reactors, a portion of the activated sludge is “wasted” to the sludge holding tanks.

The clarifier effluent flows to a Contact Splitter Box where it is divided and flows into two (2) 400-foot long, 36” diameter serpentine contact tubes that discharge into the Chlorine Contact Tank. Sodium hypochlorite is added at the inlet to the Contact Splitter Box for disinfection. Sodium Bisulfate is added at the head end of the Chlorine Contact Tank as necessary for de-chlorination prior to discharge to the Merrimack River.

We wish to acknowledge Stantec Inc. who provided process design services for the secondary clarifier, as well architectural, structural, mechanical, electrical, and instrumentation and controls design for Phase 2 and Phase 2A in association with GEI, as well as the Hooksett Sewer Commission for its support.

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Footnote: ¹ Phase 1 Capital Improvements was completed in October 2006 and includes installation of three (3) 1,600 GPM, 15 HP Submersible effluent pumps with variable speed drives, a screw wash press, retrofitting a 25 mm mechanical bar screen to a 6 mm screen, and the upgrades of the Martins Ferry Pumping Station.
Reporting, reporting, reporting!!!! Everyone wants a report. It’s no doubt that reports are powerful tools. They are used to make daily decisions, monitor performance, ensure compliance and set policy; your reports directly affect the actions of others. However, you can’t report to someone if you don’t know what is required.

In 2005 the Department of Environmental Services (DES) adopted new Septage Management Rules (Env-Wq 1600), which include reporting requirements for wastewater facilities accepting septage. DES has presented these requirements at several workshops, but in case you missed them, this article offers an explanation for you.

Revocation of Discharge Privilege

Env-Wq 1609.13(f) states that any wastewater facility that revokes a hauler’s discharge privilege must report the revocation to DES within 48 hours. The report can be made via a simple email to Timothy.Sweatt@des.nh.gov or by fax Att: Tim Sweatt at (603) 271-4128. The report should simply state the date and the name of the hauler no longer allowed to discharge to your facility.

Once the wastewater treatment facility (WWTF) reports the revocation of a septage hauler’s discharge privilege to DES, no further action is required on the part of the WWTF staff. DES will work directly with the hauler; even if the WWTF reinstates them. It is the hauler’s responsibility to report their reinstatement to DES in writing within 5 days of reinstatement. The revocation of a hauler’s privilege to discharge at your facility should be an infrequent occurrence, but you must remember to report it when it does occur.

All haulers are required to have a minimum of one disposal location where they can take septage. Your report will allow us to ensure that all haulers are in compliance with this regulation. When DES is notified of a hauler with no remaining disposal locations, DES can help. DES can assist the hauler to find alternative disposal locations, meet the requirements to be reinstated at a treatment facility, or the hauler will be required to surrender his vehicle registration plate. The important part of the process is to minimize the time a hauler is continuing to operate without a proper disposal location and to prevent any temptation to illegally dispose of waste.

Annual Report

Env-Wq 1609.13(e) requires any wastewater facility that receives septage to report to DES by the end of January each year. The report should include the gallons of septage received by each hauler during the previous calendar year. They should be submitted to DES via mail to: NH Department of Environmental Services, Residual Management Section, PO BOX 95, Concord, NH 03302-0095. Facilities failing to report can be issued a letter of deficiency from the department. If you need a reporting format contact Timothy.Sweatt@des.nh.gov to receive the annual report format by email.

You can create the annual report in many ways by compiling daily tipping slips left at your facility, or having a septage hauler send you a report at the end of the year. The rules allow you the flexibility to agree on a schedule with your haulers, and allow for a reporting schedule that can be a basis for an automated billing system.

(Continued on page 9)
The data from these reports is used for many purposes at the DES. Data is compiled to track state trends and determine where septage is being treated; examples of compiled data can be seen in Figure 1 and Figure 2. The most important use is to help plan, design and build regional septage facilities. This can include assisting your facility in planning or upgrading your local septage receiving. The data can help your facility obtain grants from DES, through the State Aid Grant Plus (SAG-Plus) grant program. This program can pay for up to 50% of any project that increases septage disposal capacity.

Septage disposal data also helps the department assure an accurate accounting of septage haulers by cross-checking against the data provided by the receiving facilities. DES can audit haulers who cannot account for large amounts of septage. This system can help prevent the temptation of illegally disposing of septage waste.

Your reports are being used in many ways, making your facility part of the big picture by helping to assure accountability in NH’s septage hauling businesses, thereby protecting public health and the environment. Your reports also assist DES in planning for future septage disposal capacity. So, while reporting may require some work at your end, feel free to ask how the data will be used. You might be surprised at how important your reporting is.
Memorial to Public Works Employees Enters the Design Stage
Scholarship Offered to Student with Winning Design
Jim Rivers Memorial Committee

Concord—After months of preparation and laying groundwork, a committee established to oversee the design and construction of a memorial for New Hampshire public works employees who died in the course of performing their public duties has reached the design stage. They are now offering New Hampshire students an opportunity to participate in this worthwhile project.

The original legislation (HB608) was passed in 2009, and signed into law by Governor John Lynch in June of that year. Since that time the committee has been meeting monthly, organizing sub-committees, preparing for necessary fund raising, and setting up guidelines for the architectural competition as well as specifications for the actual memorial.

“We take the design portion of his project very seriously,” said Committee Chair Carl Quiram, who represents the NH Public Works Association. “We would like to end up with a memorial that captures the essence of what our public works employees do on a daily basis and of the ultimate sacrifices that many have had to make. I would encourage the future architects of our state to become involved in this noteworthy project,” he added.

The committee is looking for a high school senior, or a current college student, who may have an interest in architectural design. Any student who is interested in participating in this project should submit a proposal of their idea to the committee no later than November 1, 2010. The student whose idea is selected will not only be given the opportunity to work on the project with the committee in “fine-tuning” the final design, but they will also receive a $1200 scholarship toward their education.

The site for the memorial is located at the New Hampshire Department of Transportation grounds on Hazen Drive in Concord. The committee in charge of oversight of the project represents several organizations involved in public works in New Hampshire, including the NH Public Works Association, the NH Road Agents Association, the NH Municipal Association, the NH State Employees Association, the NH Water Works Association, the NH Water Pollution Control Association, and the NH Department of Transportation. Their charge is to raise the necessary funds and then to design and construct the memorial.

The committee has put together a package to include the site map, examples of other public works memorials and specifications of what the committee would like to see included in the final design. For further information, contact Chairman Quiram by email at cquiram@goffstownnh.gov.

ADS FROM THE PAST
The North Conway Water Precinct (Precinct) is a specially chartered municipal corporation providing water and sewer service to Precinct residents in North Conway and Bartlett, New Hampshire. The Precinct owns and operates an advanced (non-discharging) wastewater treatment plant with a capacity of 1.5 Million Gallon per Day (MGD). Energy costs represent a large percentage of the operating budget for the Precinct’s facility. The goal of the Alternative Energy Systems Project is to both improve the energy efficiency of existing systems and incorporate new alternative energy systems to reduce the use of carbon-based energy sources and associated greenhouse gas emissions.

The Precinct received $2.4 million in project funding through the State of New Hampshire Department of Environmental Service Clean Water State Revolving Loan program. This funding was made available by the 20 percent set aside for green projects provided within the American Recovery and Reinvestment Act (ARRA), and includes a 50 percent grant via principal forgiveness. The design of the project was completed on a fast-track basis to meet critical ARRA milestone dates.

CDM conducted an energy audit of the existing Precinct offices and wastewater facilities and an initial evaluation of alternative energy alternatives to determine the best use of available project funding. The feasibility study recommended installation of a geothermal system that will provide a major portion of the heating and cooling load for the treatment facility, replacement of existing HVAC equipment and control systems with more efficient equipment, and installation of a solar photovoltaic (PV) system to further offset the facility’s electrical requirements by providing approximately 173,000 kWh annually of energy supply.

The PV system includes 744 solar panels, and is the largest solar power system in New Hampshire. The ground mounted system resides in a field adjacent to the treatment plant. The solar panels feed into two 75 kilowatt inverters which convert the DC voltage into AC voltage that is then fed directly into the Precinct facility. The PV system will provide approximately 13 percent of the treatment plant’s electrical needs and reduce the Precinct’s annual electrical costs by approximately $30,000.

The geothermal system includes sixteen closed-loop wells, each approximately 475-feet deep, that will provide heat in the winter and cooling in the summer to portions of the maintenance garage and the plant administration areas. The heat pump system consists of two ground loop pumps, two building loop pumps and two heat pumps.

The HVAC system work included:

- Replacement of coils in air handling units and variable air volume (VAV) boxes with resized reheat coils
- Providing a new control system for the entire plant HVAC system

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• Installation of two condensing oil boilers with 92 percent efficiency

• Replacement of underground piping that was losing 20 degrees between buildings

• Installation of a VFD in process building HVAC unit to allow modulation when odor control system runs

• Providing a back-up heat exchanger for heat pumps and insulating the attic space with a spray foam insulation (SPF) system between the roof rafters to provide thermal resistance and prevent air leakage.

The removal of heat pump load and increased efficiency of the new boilers is anticipated to save 6,000 gallons of oil/year. The project will provide 410,000 lbs of CO₂ reduction annually, which equates to taking approximately 35 cars off the road. Additionally, the project decreases the Precinct’s overall sulfur dioxide (SO₂) and nitrogen oxide (NOx) emissions.

Construction of the project was completed under two contracts – one for the solar system and a second for the geothermal system and existing facility energy improvements. Design, bidding and construction of the project was completed in less than 18 months, with a dedication event attended by US Senator Jeanne Shaheen held in August 2010.

At the event, Senator Shaheen, who serves on the Senate’s Energy and Natural Resources Committee stated, “This is a great model for the whole state and the country for how to do a project that produces energy efficiency and cost savings at the same time.” Also in attendance was Tom Burack, Commissioner of New Hampshire’s Department of Environmental Services, who indicated, “We now have a leading example of how alternative energy can lower costs at wastewater plants. You all have done something extraordinary here.”

The project provides significant environmental and economical benefits to the North Conway Water Precinct and meets the goals and requirements of the American Recovery and Reinvestment Act of 2009. It also provides original and innovative application of alternative energy technologies, as the use of solar and geothermal technologies have significantly reduced the traditional energy demands and the carbon footprint of this wastewater treatment facility. Additionally, the project served to create new jobs as part of the ARRA program while applying green technologies to improve the sustainability of plant operations and reduce facility energy costs.

The Precinct’s local electric utility is required to purchase Renewable Energy Certificates (REC), providing further economic benefit to the Precinct. One REC represents the environmental value of a megawatt-hour ("MWh") of renewable generation. Additionally, the Precinct’s local electric utility offers rebates on the installation of geothermal heat pumps and fossil fuel savings.

The project represents one of first alternative energy projects of its size in the region and includes the installation of one of the first condensing oil fired boilers in the US. These improvements will reduce fossil fuel energy consumption, provide significant long-term cost and environmental benefits to the Precinct and its ratepayers, and serve as a model for other water and wastewater facilities that wish to reduce energy consumption and provide for more sustainable operating practices.
Great Bay has emerged at the forefront of a debate on how to address increasing water pollution in the coastal watershed. A large area - more than 1,000 square miles - drains into the bay. The water flowing from 42 New Hampshire communities and 10 in Maine ends its journey in this estuary. The cliché about “there is no away” turns out to be true; the “away” for these communities is Great Bay, and the Great Bay ecosystem is showing signs of failure.

What may be surprising is that Great Bay is not the only water body in trouble. Looking at a map of water quality impairments in the Great Bay Estuary, you’ll see a vast network of colored veins spread throughout the bay’s seven tributaries and their sub-tributaries. These colored veins represent lakes and rivers where water quality standards are not being met for a variety of parameters, including dissolved oxygen, sediment, bacteria, and nitrogen.

The pollution is in everybody’s town, not just the ones that directly border Great Bay. Great Bay has raised the profile of a regional water quality problem. So, what’s going on? And perhaps the question on wastewater treatment operators’ minds: Is it really our problem?

Last year, the New Hampshire Department of Environmental Services (NHDES) determined that most of the Great Bay Estuary failed to meet the proposed water quality criteria for nitrogen, resulting in a designation as an impaired water body under the Clean Water Act, which is administered by the Environmental Protection Agency. An impairment creates the requirement for regulatory action. NHDES is currently working on a waste load allocation that will determine loading thresholds to meet nutrient criteria and how much reduction from existing loads - both non-point source pollution and the 18 wastewater treatment plants in the watershed - will be needed under different permitting scenarios.

Wastewater treatment plants are part of the nitrogen problem, contributing about 30 percent of the nitrogen load. Non-point source pollution contributes the remaining 70 percent of the total nitrogen load to Great Bay. Non-point nitrogen sources include runoff from paved surfaces, septic systems, agriculture, and lawn fertilizers, and atmospheric deposition – nitrogen from air pollution landing on the ground and then getting washed into the water and downstream during precipitation events. Non-point source pollution is difficult to address because it involves so many sources that are often very hard to pinpoint and control. Wastewater pollution is difficult to address because of the costs of the technology to upgrade treatment plants.

Both wastewater and non-point pollution management are challenged by population growth. Approximately one quarter of New Hampshire’s population lives in the coastal watershed. Population growth here continues to outpace other regions of the state, increasing demands on land use as well as existing water and wastewater infrastructure.

Inevitably, with more people come more impervious surfaces, such as rooftops, roads and parking lots. Numerous studies have indicated the correlation between percent of impervious surface in a watershed to increased non-point source pollution in the water. Meanwhile, more frequent and heavy rainstorms, which can overwhelm wastewater treatment plants and rapidly transport polluted runoff into the water, are expected to increase as an effect of climate change.

Solutions to addressing non-point source pollution
The most effective solutions to minimizing non-point source pollution involve planning ahead before development breaks ground. For instance, protecting and conserving natural buffers between water bodies and development reduces storm water quantity as well as providing a pollutant filter. In addition, land conservation, in particular lands identified in The

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Land Conservation Plan for New Hampshire’s Coastal Watersheds helps buffer water bodies from pollution as well as offering drinking water protection and reduced flood risk, among other land protection benefits.

According to the Piscataqua Region Environmental Planning Assessment, which was completed in 2010 by the Piscataqua Region Estuaries Partnership (PREP) and the regional planning commissions, a large majority of municipalities in the coastal watershed currently fail to ensure that modern storm water management standards are applied to new community development or redevelopment. Compounding the problem is that when municipalities have regulations, they are rarely consistent from community to community, making it hard to address a regional water quality problem. Consistent policies need to be in place to ensure consistent levels of protection.

The Great Bay Estuary’s recent nitrogen impairment means that the existing developed landscape is contributing too much nitrogen to the watershed. Every piece of developed land is both a part of the problem and the solution. The concept of storm water utility districts looks at individual parcels as contributors to the pollution problem and offers a way for communities to support maintenance and improvements to storm water infrastructure by assessing a fee structure based on many variables, including the amount of impervious surface and what is being done to address storm water effects on an individual property. The cities of Portsmouth and Dover are currently working on feasibility studies for storm water utility development.

Behavior change of individual landowners in the absence of a storm water utility or regulatory requirement is the wild card in restoring Great Bay. Using less fertilizer and installing low impact development practices, such as rain gardens and buffers, are all specific behaviors that reduce nitrogen loading impacts. Many barriers discourage people from making changes in their lives, including powerful cultural norms (e.g. my lawn needs to be greener than my neighbor’s). Multiple organizations throughout the watershed are trying to address these barriers through targeted outreach programs.

Working together to restore Great Bay

The present is a challenging and exciting time in storm water management in New Hampshire. In November the Storm Water Commission, a legislative commission of industry, business, agriculture, municipal and other stakeholder representatives that has been meeting for two years to study storm water’s impact on the state’s surface waters and ways to improve management, will release its final recommendations.

In addition, the NHDES Watershed Assistance Program broke ground on a number of exciting storm water reduction projects this summer and fall – including a pervious basketball court and sidewalk as well as other storm water retrofits at the School Street School in Rochester and rain garden plantings at the Hodgson Brook buffer restoration site in Portsmouth. The Watershed Assistance Program’s annual grant program, made possible by the EPA, provides assistance to groups and municipalities to address non-point source pollution in both impaired and high-quality waters.

Momentum for action is building with the recent unveiling of the PREP ten year management plan (available at http://www.prep.unh.edu/), the result of a two year stakeholder process, which includes several actions related to storm water. Among them is making storm water regulations consistent among the coastal watershed towns. Last year the Southeast Watershed Alliance, a collaboration of municipal representatives working across boundaries on water quality problems in the coastal watershed, was launched with the help of NHDES. NHDES and PREP look to the Southeast Watershed Alliance, with its close ties to the communities, to be initiators of conversations on the importance of addressing non-point source pollution consistently across the region.

Reducing current pollutant loads as well as forward-looking solutions and a proactive approach to land use will be key in protecting and restoring the Great Bay Estuary. Some of those actions will fall on the shoulders of wastewater treatment operators, but many blanket the watershed to address non-point source pollution.

(Editors Note: Issues facing Great Bay will be highlighted over the next several newsletters. We will describe the problem, identify the issues and provide timely articles from all stakeholders to provide a fair and balanced point of view.)
The 21st annual NHWPCA Golf Tournament was held on August 5th at the historical Beaver Meadows Golf Course in Concord. The Association is proud to support the City of Concord’s 100-year-old municipal course, the oldest 18-hole course in the State. In return, the Association was treated to a beautifully manicured course, exceptional services from all their hardworking staff, and a delicious meal both before and after our tournament.

Over 85 wastewater professionals descended on the course for a great day of golf, laughs, and fellowship. The rain delayed itself until the afternoon providing a hot and muggy morning for 21 teams to battled it out over 18 challenging holes. At the end of the day Brown & Caldwell’s team pulled away with a great round of 12 under par to claim first place. Awards were to also presented to the second and third place teams along with closet-to-the-pin, longest drive, and straightest drive.

A very special thank you to our sponsors and participants this year. With the sluggish economy, coupled with so many other competing professional outings/meetings, we greatly appreciate our sponsors and participants continued support. Through the generosity of our sponsors we were able to provide a raffle prize to all participants. As usual, our recently retired master of ceremonies George Neill provided a hilarious monologue lampooning all participants as we distributed the prizes. In addition, we had a putting contest special raffle that included tickets to the Patriots, Red Sox, and Bruins. As a result of our special raffle, we were able to make a generous contribution to NHWPCA’s Operations Challenge Team - The Sea-coast Sewer Snakes. We will be returning to the historic Beaver Meadows Golf Course next year for our 22nd annual golf tournament on Thursday August 4th, please be sure to mark it on your calendars.

Lastly, we would like to once again thank our sponsors listed below for their extremely generous support of our tournament. They are the ones that make the tournament such a huge success.

Answer to question on page 9

Johnson's filter press, circa 1884. This press hastens the consolidation of sludge in a precipitation tank by pressure. Samuel M. Gray, Proposed Plan for a Sewerage System, and for the Disposal of the Sewage of the City of Providence (Providence: Providence Press Company, Printers to the City, 1884), Plate 23, opposite page 100.)
Training Center Make-Over in Franklin

By Mary Jane Meier

Over the summer the classrooms at the Franklin Training Center received a major make-over and interior remodel. This is the first time since the Franklin Training Center's construction thirty long years ago. Updating our training facility was long overdue. The walls have been painted and the floor tiles replaced. The kitchenette area boasts a new design with actual cabinets and countertop work areas. Replacement lighting and ceiling tiles offer a noticeable improvement. The restrooms have new fixtures and fresh coats of paint. Wes Ripple deserves the accolades for his perseverance through both the design and construction phases of work. The project was made possible through a US EPA grant. Special thanks goes out to David Chin of EPA and the staff at the Franklin Treatment Plant. Everyone has been so very helpful during the whole process. A delay in the completion date caused our September 8 class on Proactive Pump Maintenance to be held in the garage bay of the treatment plant. Thanks to the entire facility staff for your generosity and cooperation. Hopefully these improvements will last another thirty years! Future updates in the seating and tables are planned for later this year. Take a few minutes to look around when you attend classes this Fall. See you there!