



Air and Waste Matters

DNREC Division of Air and Waste Management

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Highlights in this edition include:

**Christina River
Basin PCB
Project** 2
Continued...

**Air Quality
Monitoring—
Down to the
Nanoparticle** 3

**Innovations in
Treating
Landfill
Leachate** 4

**Innovations in
Treating Landfill
Leachate** 5
Continued...

**Putting
Stimulus Dollars
to Work in
Delaware** 6

**Business-
Industry-
Education
Alliance at AQM** 7

**More
Information
on the
Division** 8

Christina River Basin PCB Project

The Division of Air and Waste Management's Site Investigation and Restoration Branch (SIRB) and DNREC's Division of Water Resources, Watershed Assessment Branch (WAB) have collaborated on a regional environmental study of polychlorinated biphenyls (PCBs) in the Christina River Basin in northern New Castle County.

PCBs are hazardous industrial chemicals that are no longer manufactured in the U.S., but nevertheless are widespread in the environment as a result of past usage, poor disposal practices, and slow breakdown.

The study compiled information on the presence and levels of PCBs on hazardous substance sites within the Christina Basin and estimated how much PCBs on these sites continue to be released to nearby surface waters.

Although the presence of PCBs can pose a potential risk to people and wildlife that visit these sites, the release of PCBs can result in

especially high risks when these chemicals enter adjacent surface waters and bioaccumulate in fish and other aquatic life.

Bioaccumulation is the process where a chemical builds up in fish to levels far greater than in the water itself. Once in the fish, people who regularly eat those fish are at greater risk of various adverse health effects.

In addition, birds that consume fish such as ospreys, bald eagles, and

(Continued on page 2)



L. Jones, SIRB

With DNREC oversight, soil material is stockpiled prior to removal at the former Howard Street site. The site is now the location of the new ShopRite supermarket near Christina Landing (towers) and the Wilmington Riverfront.

Christina River Basin PCB Project *Continued...*

herons, as well as other fish-eating animals such as otters, are also at risk when they consume fish containing PCBs.

Like many states, PCBs are a major cause of fish consumption advisories in Delaware. This is certainly true for the Christina River Basin in northern New Castle County, where DNREC and the Department of Health and Social Services (DHSS) advise people to totally avoid eating fish from the tidal portions of the Christina, Brandywine, and White Clay Creeks and to severely limit consumption of fish caught from the non-tidal portions of the basin. PCBs in the fish are the primary risk driver for these advisories.

PCBs are probable human carcinogens and are associated with several other adverse health effects. They are able to pass from mother to unborn child and are believed to contribute to subtle yet lasting mental deficits in children after birth.

The project is a key and integral component of a much larger project that aims to link upland sources of PCBs with their primary impact in surrounding waterways. Because this project considers all sites known to be contaminated to one degree or another with PCBs, the information gathered will allow DNREC to look at the cumulative impact of PCBs in the area.

This brings a new and more holistic perspective to the problem, which in turn could lead to innovative management solutions. Looking at all sites

at once will also allow the Department to prioritize sites for remediation based on their relative impact.

It is DNREC's goal to systematically clean up these sites so that these properties are useful and no longer release PCBs to area surface waters. In doing so, PCB levels in the fish will slowly improve over time, and people will once again enjoy the health benefits of consuming local fish.

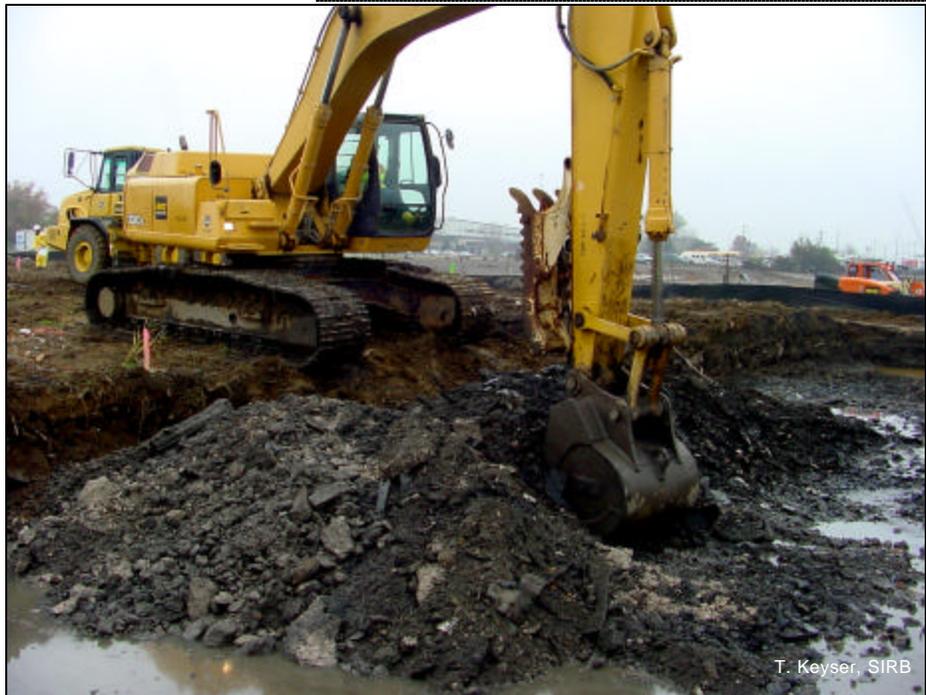
For more information, including a copy of the study, please visit:

<http://www.awm.delaware.gov/SIRB/Pages/ChristinaBasinPCBmass-loading.aspx>.

Article by T. Keyser, SIRB

<< **SERIES**

THIS ARTICLE IS FIRST IN A SERIES FEATURING DNREC'S FOCUS ON PCB CLEANUP IN DELAWARE.



T. Keyser, SIRB

A track hoe is used at the former Howard Street site to stockpile and load the PCB-contaminated soils for proper disposal at an EPA-approved PCB disposal facility.

Air Quality Monitoring—Down to the Nanoparticle

In the world of physics, nanoparticles are the Lilliputians of the molecular set. Their tiny size and small-scale features are the most important attributes of nanoparticles.

A nanometer is one billionth of a meter. A single hair has a width of about 100,000 nanometers. The air we breathe contains ultra-fine nanoparticles, but we have never had the ability to count them or assess how the numbers may be changing over time. We think these numbers may matter and accordingly, Division's Air Quality Management (AQM) Section is embarking on a new air quality project to monitor nanoparticles.



The 3031 TSI Ultrafine Particle Monitor used by AQM to continuously monitor particles in nanometers.

From TSI Specification Sheet for 3031 Ultrafine Particle Monitor

Small particle concentrations have been a health concern due to the relationship with the increased incidence of asthma and other related health conditions. DNREC has been monitoring particle concentrations for many years as part of an ambient air monitoring network. The focus to date has been on total mass of the particles in a given volume of air, but there is evidence indicating that the number of particles making up that mass may also be a major concern. Now Delaware will be one of a few states taking a lead in this research.

The sampling began in October 2009 at a current air monitoring site near Martin Luther King Blvd in Wilmington. Delaware is one of only three states operating this ultrafine monitor.

DNREC's sampler will continuously monitor particles in several size ranges and provide a total count for each range at a preset interval of time. The range will be between 20 and 500 nanometers. These nanoparticles are typically generated by the exhaust of internal combustion engines. The additional information on particle counts will give a more complete picture of how nanoparticles may affect our everyday lives, give clues for identifying their source, gain understanding on particle behavior and chemistry, learn whether any patterns or trends exists and whether they should be regulated. For more information on air quality and monitoring, please visit:

<http://www.awm.delaware.gov/Pages/AirQuality.aspx>.

Article by J. Martini, AQM



T. Allen, AQM

The shelter used to house the new Ultrafine Particle Monitor located near MLK Blvd in Wilmington.

Innovations in Treating Landfill Leachate

In landfill-speak, leachate is defined as liquid in contact with the solid waste. However, this is no ordinary liquid. It can be smelly and contaminant-laden requiring special handling and extra cost for disposal at waste water treatment plants. The Delaware Solid Waste Authority (DSWA) was sure there was a more cost-effective and environmentally-friendly way to handle the leachate. DSWA began to research the suitability of on-site treatment at the Central Solid Waste Management Center (CSWMC) landfill located near Sandtown, Delaware.

DSWA began operations at CSWMC in 1980 with the construction of the initial landfill cell, Area A and the co-joined Area B. Area A/B was operated until 1988 when it was covered with a two-foot thick soil cap. Unlike modern landfill cells, this was done prior to the implementation of Subtitle D landfill regulations requiring impermeable capping of landfills. The other landfill areas, C, D, and E, have been or will be capped using geomembrane capping materials, thus reducing leachate production.

As a result, Area A/B produces most of CSWMC's leachate—**over three million gallons of leachate annually**—that must be transported 65 miles to Wilmington's waste water treatment plant for treatment and disposal.

Prior to implementing a full-scale onsite treatment system, the DSWA constructed and operated a pilot treatment plant from 2003-2004. The pilot plant treated leachate taken directly from Area A/B by circulating the leachate through a series of treatment cells. The surfaces of the cells were planted with wetland plant species to enhance treatment. A suitability study was also com-

pleted, based on the operation of the pilot study.

In order to successfully treat three million gallons per year, the DSWA decided the final treatment system would utilize a series of three treatment cells, treating 10,000 gallons of water per day. The system is designed to operate by removing leachate from the Area A/B leachate collection piping, and transferring that leachate to four 5,000-gallon storage tanks on the top of Area A/B. From these tanks, the leachate is pumped to a series of three treatment cells. It takes about three days (one day per each cell) for leachate to cycle through the series of treatment cells, termed the Wetlands Biofilter System (WBS).



DSWA's Wetlands Biofilter System—Cells 1- 3 at CSWMC.

The chemical constituents of concern within the leachate are ammonia and chloride, with concern for the levels of biological oxygen demand (BOD) and chemical oxygen demand (COD). During treatment, oxygen is drawn through the drainage sand media during the vertical flow of the liquid as it leaves a manifold and flows

(Continued on page 5)

Innovations in Treating Landfill Leachate *Continued...*

downward to the sump. Bacteria aerobically degrade ammonia, with lower levels of BOD and COD. Nitrates and nitrites from the ammonia are used by the wetland plant species. The plant roots also enhance oxygenation of the sand media in the winter months. Chloride levels are a long-term concern with the treatment system, as chloride can stress vegetation and build up as salts in the landfill cover soils. A monitoring plan for the treatment system requires sampling and reporting to track the constituents of concern.

The treated effluent is discharged to an old leachate storage lagoon at the base of Area A/B. This lagoon was used during the 1980s for leachate storage. During construction of the new treatment system, the lagoon's Hypalon liner was inspected, repaired, and a secondary geomembrane liner was installed. The lagoon is designed to hold over two million gallons of treated effluent, with a floating cover to prevent the infiltration of precipitation.

The treated effluent is then transferred to the second part of the system, the landfill spray irrigation system and phyto-cap. A phyto-cap is a planted vegetative cover usually including trees, shrubs and grasses. Phyto-caps reduce the infiltration of liquid from precipitation and in this case help to uptake the sprayed effluent. During construction, a phyto-cap composed of planted trees and shrubs was added to the existing grasses on the 27-acre landfill cap. Trees, including pines and several deciduous species, were planted at a frequency of 500 trees per acre.

The irrigation system consists of 146 fine-spray, misting nozzles divided into six zones. Each of the zones can be isolated for irrigation on a timed schedule and programmed through a computer system. The system is linked to several sensors used to monitor wind velocity and direction, and soil moisture at two depths.

The Division's Solid and Hazardous Waste Management Branch (SHWMB) reviewed the regula-



A. Dalton, SHWMB

DSWA's planted phyto-cap which uses treated leachate effluent at the CSWMC.

tory aspects of the project. In order to construct and operate an on-site leachate treatment system, the *Delaware Regulations Governing Solid Waste* require a treatability study that may be developed either by the operation of a pilot plant, or through research that would document the performance of equivalent treatment system. CSWMC's system was the first to undergo treatability and pilot studies under the regulations.

The review of the spray irrigation project was conducted in conjunction with DNREC's Division of Water Resources. Based on the joint review, SHWMB could permit the treatment system under the facility's existing solid waste permit, because there would be no discharge from the lined landfill cell. Construction and operation of the treatment system was implemented under a major modification of the facilities landfill permit. The DSWA began operation of the wetlands treatment system cells in December 2008. Full system operation began in the spring of 2009. For more information on the permit, please visit:

<http://www.awm.delaware.gov/SHWMB/Pages/DSWACentralSolidWasteMgtCtrPermitApp.aspx>.

Article by A. Dalton, SHWMB

Tank Cleanups—Putting Stimulus Dollars to Work in Delaware

In August 2009, the Division's Tank Management Branch (TMB) was awarded \$1.23 million by the USEPA to assess and clean up leaking underground storage tanks (LUSTs) under the American Recovery and Reinvestment Act (ARRA) of 2009.

TMB will use the funding to cleanup 22 shovel ready LUST sites in Delaware.

Work has already begun. Three LUSTs were removed in October 2009 from a former gas station located at 724 North DuPont Road in Wilmington. A contractor was hired by TMB to remove the LUSTs. Prior to removing the tanks, another firm was subcontracted to pump out and dispose of the residual petroleum in the tanks. The property is targeted for ARRA funding and future redevelopment.



A. Rittberg, TMB

Gravel is used to backfill the excavation after the tanks are removed.

For more information on how DNREC is spending ARRA funding, please visit:

[http://
www.dnrec.delaware.gov/
Admin/Pages/ARRA.aspx](http://www.dnrec.delaware.gov/Admin/Pages/ARRA.aspx).

Article by A. Rittberg, TMB

Jason Turner (left), an environmental scientist with TMB, at the LUST site with Jim Maddox, the tank removal contractor.

A. Rittberg, TMB

Business-Industry-Education Alliance at AQM



Joe English (left), observes examples of air pollution microscopy, including some local pollen, using a microscope digital camera with Mike McDowell (right) of AQM.

The Division's Air Quality Management Section (AQM) once again hosted the Teacher Externship Program during the summer of 2009. The AQM section was delighted to work with Joe English, a teacher at William Penn High School, who also participated in the first Teacher Externship Program in 2002. The Teacher Externship Program is coordinated by the Delaware Business, Industry, Education (BIE) Alliance through a partnership with the Delaware Department of Education and the Delaware State Chamber of Commerce.

The program includes a unique 18-hour professional externship at a business or industrial site. Participating teachers learn the principles of contextual teaching and how the Delaware academic standards relate to on-the-job skills. The participants develop methods for showing their students the relationship between academics and real-life business, industry, and community applications. The teachers greatly appreciate the hands-on educational opportunities and receive professional development hours towards renewal of their continuing education requirements for licensing. Terri Brixen, the BIE program coordinator at AQM, remarked, "The teachers really like the "out of classroom" experience and are amazed at all the different scientific efforts and projects that AQM performs. It really helps us get our message out to students and other teachers."

For more information on AQM, please visit:

<http://www.awm.delaware.gov/AQM/Pages/Default.aspx>

Article by T. Brixen, AQM

**DELAWARE
DEPARTMENT OF
NATURAL
RESOURCES AND
ENVIRONMENTAL
CONTROL**

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www.awm.delaware.gov

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Restoration Branch
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at:

[http://
www.awm.delaware.gov
v/SIRB/Pages/
Brownfields.aspx](http://www.awm.delaware.gov/v/SIRB/Pages/Brownfields.aspx)

**for more Brownfields
information.**



The Division of Air and Waste Management includes the following sections and responsibilities:

- **Air Quality Management Section** — air monitoring and regulating air emissions.
- **Tank Management Branch** — maintenance and installation of underground and above ground storage tanks & overseeing cleanup of tanks which may leak.
- **Emergency Prevention and Response Branch** — preventing industrial accidents, assuring emergency planning and community right-to-know, and responding to environmental emergencies.
- **Environmental Crimes Unit** — the Enforcement Officers enforce the state's air, waste and water pollution laws, and participate on DNREC's Environmental Response Team by responding to environmental emergencies.
- **Site Investigation and Restoration Branch** — remediation of sites contaminated by hazardous substances (Superfund/Brownfields/Voluntary Cleanup Program).
- **Solid and Hazardous Waste Management Branch** — reuse, recycling, transport and disposal of solid and hazardous waste.

EASY REFERENCE PHONE NUMBERS

24-Hour Report and Spill Notification Line - 1-800-662-8802
Aboveground Storage Tanks - 302-395-2500
Air Quality - Dover Office - 302-739-9402
- New Castle Office - 302-323-4542
Asbestos - New Castle - 302-323-4542
- Kent & Sussex - 302-739-9402
Boiler Safety - 302-744-2735
Brownfields - 302-395-2600
Emergency Prevention and Response - 302-739-9404
Environmental Crimes Unit - 302-739-9401 or 1-800-662-8802
Hazardous Waste - 302-739-9403
Medical Waste - 302-739-9403
Open Burning - 302-739-9402
Outreach Ombudsman - 302-395-2515
Recycling - 302-739-9403
Site Investigation & Restoration Branch (Superfund/Brownfields) - 302-395-2600
Small Business Ombudsman - 302-739-9909
Solid Waste - 302-739-9403
Underground Storage Tanks - 302-395-2500

DID YOU KNOW?

The Boiler Safety Group has recently moved offices and is now located with DNREC's Energy Office on College Road in Dover. You may contact the Boiler Safety Group at the following numbers:

Division Director Jim Harlan—Boiler Safety Group—SLC D455

Office: (302)744-2735

Fax: (302)739-2526