Watershed Approach to Toxics Assessment and Restoration (WATAR) Program
2013 Progress Report
Delaware Department of Natural Resources and Environmental Control

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Introduction: The Watershed Approach to Toxics Assessment and Restoration (WATAR) was conceived in 2012 with the intention of building a bridge between the surface water toxics program and the site investigation and restoration program in Delaware. The focus of the WATAR program is surface waters, sediments and fish impacted by toxics and the associated sources/sites responsible for those impacts. The concept was officially endorsed by DNREC leadership in the fall of 2012 following a series of briefings and the completion of a 5-year work plan. That plan placed considerable emphasis on the development of toxics TMDLs. The plan was rewritten in early 2013 in response to an EPA determination that PCB TMDLs were already in place for tributaries of the Delaware Estuary as a result of the Delaware Estuary PCB TMDLs. Importantly, the revised plan shifted the focus of WATAR from developing toxics TMDLs to implementing toxics TMDLs.

The revised WATAR work plan identified 13 specific activities that the WATAR Team would work on during 2013. Those 13 activities are listed below with a status report on each. In addition to the 13 items, there were several additional activities that arose during 2013 in which the WATAR Team became involved. Those activities are listed and discussed at the end of this progress report.

1. **Create WATAR "road show" for presentations to potential partner groups**
   Status: Completed
   Discussion: The WATAR approach was presented or otherwise discussed at various forums during 2013, including: a) the Region 3 EPA – State Water Directors Meeting; b) a University of Delaware College of Engineering invited seminar; c) a University of Delaware – Delaware Environmental Institute (DENIN) Conference on the effect of sea level rise on waste sites held November 22, 2013; d) a national Sediment Management Workgroup Symposium held in Baltimore on May 8 and 9, 2013; and e) Urban Waters Federal Partnership – Delaware River Watershed listening session on June 23, 2013 where the WATAR initiative was informally presented to the other partners. Three presentations of particular relevance to the WATAR approach included the following:

- Keyser, T.A. 2013. Addressing Chemical Contaminants/Legacy Pollutants: PCB Reduction Strategies for the Christina River Basin. Invited presentation given April 29, 2013 at the Region 3 EPA – State Water Directors Meeting in Wilmington, DE.
- Greene RW. 2013. Monitoring & Assessment of Toxics in Delaware Surface Water. Invited presentation given April 5, 2013 at the University of Delaware, College of Engineering, Newark, DE.
- Cargill, J.G. Incorporating Bioavailability into the Assessment of Contaminated Sediment Sites. Invited presentation given May 8, 2013 at the Sediment Management Workgroup Symposium, Baltimore, MD, May 8-9, 2013.

2. **Continue data compilation**
   Status: Completed
   Discussion: This is an ongoing activity. Sites and samples that have been compiled into the EQuis database are listed in Appendix A by watershed and data vintage.

3. **Prepare a project-specific QAPP for 2013 toxics sampling**
   Status: Completed for AXYS Environmental
   Discussion: AXYS Analytical Services, under contract with DNREC, prepared the following document to guide specialty analyses of surface water, sediment, and fish tissue samples in 2013:

   - Analysis Plan for Watershed Approach to Toxics Assessment and Restoration (WATAR), July 2013. AXYS Analytical Services Ltd, Sidney, BC.

   This plan supplemented other existing QAPPs governing field sample collection, sample handling, and sample analyses that already exist under the Hazardous Substance Cleanup Act and the DNREC-Site Investigation and Restoration Program.

4. **Complete methylmercury study of the Delaware Estuary and compile additional mercury data for Zone 5**
   Status: Nearly Complete
   Discussion: University of Connecticut (UCONN) researchers submitted a draft final report in November of 2013 and DNREC provided suggested edits shortly thereafter. A final report is expected in early 2014. The following poster was presented during 2013:

   - Gosnell K, Ortiz V, DiMento B, Gichuki S, Balcom P, Schartup A, Mason R, Greene R, and Cavallo G. 2013. Sources, cycling and fate of methylmercury in the Delaware River Estuary. Poster presentation, July 28, 2013, International Conference on Mercury as a Global Pollutant, Edinburg, Scotland.

   This is the premier conference in the world focused on the fate, transport and effects of mercury in the environment.

5. **Perform toxics monitoring in the Red Lion Creek, C&D Canal, and Saint Jones watersheds in accordance with the QAPP**
   Status: Completed
   Discussion: Surface water, sediment and fish tissue **s**amples were successfully collected between September 9, 2013 and October 11, 2013. Personnel from the Division of Watershed Stewardship, the Division of Waste and Hazardous Substances, the Division of Water, and the Division of Fish and

Wildlife all contributed to this unprecedented sampling effort. Furthermore, sampling on the Red Lion Creek was successfully coordinated with EPA Region 3 staff who were sampling Red Lion Creek sediments impacted by the defunct MetaChem facility. Similarly, the sampling along the Saint Jones River was successfully coordinated with specialized sampling of water, sediment and fish within, immediately upstream, and immediately downstream of Mirror Lake (see full description of the Mirror Lake project below, item 11). At the end of 2013, not all of the data had been received from contract laboratories. The data that has been received appear to show several long-term improvements. A more complete review and assessment of the data will occur in 2014.

6. **Enhance routine monitoring of divalent metals in Delaware surface waters to include parameters needed to run the Biotic Ligand Model**
   Status: Completed
   Discussion: The enhanced monitoring was initiated in July of 2013.

7. **Draft HSCA Sediment Guidance**
   Status: Ongoing
   Discussion: In mid-2012, DNREC-SIRS contracted with The Louis Berger Group, Inc. to assess sediment assessment guidance documents throughout the United States with respect to incorporating bioavailability into risk management decisions. In April 2013, DNREC-SIRS received the following report:

   - The Louis Berger Group. April 2013. Final Sediment Guidance Review Report. Morristown, NJ.

   The Louis Berger Group reviewed a total of 23 guidance documents from US coastal states. Guidance from Oregon, New Jersey and Ohio were identified as those which have "a sufficiently developed program from which useful bioavailability concepts and guidance can be derived." This information, together with first-hand experience and EPA, USACE, and ITRC sediment guidance documents, will provide DNREC and the WATAR Team with a sufficient baseline for developing its own robust and up-to-date guidance for the evaluation of contaminated sediments in the State. This process is expected to continue for some time. As data is collected, evaluated, and interpreted through WATAR, processes will continue to be evaluated and documented for inclusion in the HSCA Sediment Guidance document.

8. **Define and implement SIRS Brownfield policy to require high resolution sediment sampling at sites along waterways (reimbursable through HSCA fund)**
   Status: Investigated but not fully completed
   Discussion: DNREC's Brownfield Program provides funding for investigation and remediation of brownfield sites to qualified developers/landowners. DNREC-SIRS personnel are evaluating the efficacy of using State brownfield funding to collect high resolution sediment data adjacent to sites during brownfield investigation (BFI) activities. If HSCA Brownfield funding can be utilized to collect supplemental data to the WATAR initiative, then more robust data sets will be available for some of the more impacted waterways in Delaware, where responsible parties may be impossible to find/engage for remediation/restoration.

   The Brownfield Program in Delaware is closely monitored by the HSCA Advisory Committee (HAC), which is made up of state and private stakeholders. Utilization of brownfield funds for new items must be presented to and approved by the full HAC. The WATAR Team will continue to promote the

inclusion of high resolution sediment data into the Brownfield process; however, it may take some additional time to illustrate the merit of this extra expenditure to the stakeholders that are involved.

9. **Continue to provide technical assistance to the City of Wilmington and New Castle County Department of Special Services on the City's PCB trackback effort**
   Status: Completed
   Discussion: Analysis of trackback data lead to the preparation and delivery of the following 2 presentations:

   - Greene RW. 2013. Polychlorinated Biphenyls in BASF Batch Wastewater Discharge to New Castle County Sewer. Presentation given January 10, 2013 at New Castle County Special Services Building, New Castle, DE.
   - Greene RW. 2013. Polychlorinated Biphenyls in DSWA Cherry Island Landfill Leachate. Presentation given February 5, 2013 at the Delaware Solid Waste Authority, Wilmington, DE.

   BASF initiated an internal trackdown of their process in 2013. That investigation is ongoing. DSWA and DNREC disagree on the severity of the PCB loading discharged from their pretreatment facility to the City's wastewater treatment plant. Additional work is needed to reach an understanding.

10. **Begin development of pilot watershed web-based mapping utility**
    Status: Initiated but not completed
    Discussion: The Team has been in contact with multiple vendors regarding the creation of a web-based mapping tool. The utilities that were viewed by the Team were above and beyond the scope of what was originally envisioned for data presentation. The decision has been made to focus time and effort towards getting more WATAR data into the EQuis database. The mapping tool will be developed in conjunction with the population of the database.

11. **Proceed to construction on the Mirror Lake remediation/restoration project**
    Status: Completed
    Discussion: In mid-2013, construction plans & specifications for the project were finalized; Federal and State permits were secured; and property access agreements were obtained. Construction officially started on October 1, 2013 and ended on December 5, 2013, ahead of schedule and under budget. In all, 79 tons of SediMite (activated carbon pellets) were applied to 5 acres of lake and channel sediments in 10 days. Nine hundred and sixty-seven (967) cubic yards (1325 tons) of sand were placed in Mirror Lake to create an intertidal wetland; 62 tons of stone were placed in Mirror Lake to create 2 rock vane hydraulic control structures; and 760 linear feet of 16-inch diameter coir log, double stacked, were place on the west bank of the lake to prevent erosion. Sixty-seven (67) volunteers helped on the project. The Department of Correction Boot Camp Program, AmeriCorps, and the Homeless Shelter contributed 770 hours of volunteer labor; DNREC staff contributed 511 hours of labor; and Brightfields contributed 167 hours of labor. Temporary construction entrances were removed and lay down areas were seeded, matted, and stabilized for the winter. Mulch, stone, and fencing left over from the project were given to the City of Dover. There were no injuries and no permit violations during the project. Sediment samples were collected a few weeks after SediMite application to verify that the correct dose of activated carbon reached the sediments. The remainder of the plantings on the new intertidal wetland and along the bank in front of Frazier's Restaurant is scheduled for the spring of 2014. Samples of sediment, water, and fish will be collected for contaminants analysis in the fall of 2014 and will be compared to pre-construction

results. The results will also be used to determine if the existing fish consumption advisory can be relaxed. The success of this project (and the Meco Ditch Remediation Project discussed later) prompted Governor Markell and Secretary O'Mara to ask the WATAR Team to develop a list of priority projects that offer the best opportunities to reduce toxics problems in Delaware surface waters over the next 10 to 15 years.

12. Continue tech transfer

Status: Completed

Discussion: This is an ongoing activity.

As data is received from the three watersheds sampled in 2013, the WATAR Team members will actively teach/learn techniques and processes for evaluating and interpreting the data. As WATAR Team members become efficient with sample collection and data analysis, further technology transfer to others can occur.

13. Progress Report and accounting for items listed above

Status: Completed

Discussion: This document represents the Progress Report for 2013.

Other significant activities of the WATAR Team during 2013 are presented below.

- **Meco Ditch Remediation Project:** The project included excavation and removal of oil-soaked and stained soil and sediment containing high concentrations of PCBs and PAHs, both characterized using advanced analytical methods. Following excavation, a remedial liner designed to sorb oil and PCBs was placed along the banks and bottom of the ditch to capture any residual contamination. The liner is kept in place by its own weight and stone armoring. A follow-up inspection indicates that the remedial action has stopped the ongoing release to Little Mill Creek. This action is important because Little Mill Creek flows into the Russell Peterson Wildlife area and then into the Christina River a short distance downstream where highly restrictive fish advisories exist. Abating the ongoing release from Meco Ditch also removed a barrier to a major flood risk mitigation project being implemented by the USACE and the New Castle Conservation District (NCCD) along the lower Little Mill Creek**.** That project will include treatment of selected sediments in Little Mill Creek downstream of Meco Ditch using activated carbon, followed by capping and isolation with clean fill. As a side benefit, sampling for the Meco Ditch and Little Mill Creek flood risk mitigation project was also able to identify a likely link between PCBs in Little Mill Creek and yet another local upland source. The WATAR team will be following up on that information through normal programmatic channels.

- **NVF Zinc Remediation:** The WATAR Team continued to monitor zinc concentrations in the Red Clay Creek, track compliance with the zinc TMDL and NVF Wasteload Allocation, and provide oversight for the NVF Yorklyn site redevelopment by the DNREC Division of Parks and Recreation. Plans are in place to expand the groundwater treatment system (two additional hotspot recovery wells) to eliminate additional zinc mass in groundwater once building demolition is completed at the site. This action will reduce the amount of time necessary to achieve remedial goals.

- **Status of Contaminants in the Piedmont Preliminary Assessment Report:** Senior DNREC managers directed staff to assess the extent to which goals and objectives in the 1998 Piedmont Basin Preliminary Assessment Report have been met. The following assessment was prepared to address goals and objectives related to zinc, PCBs and other toxic contaminants:

    - Greene RW. 2013. Status of Goals for Contaminant Issues Identified in the Piedmont Preliminary Assessment Report. Report dated July 3, 2013. Delaware Department of Natural Resources and Environmental Control, Dover, DE.

  The status report concludes that goals and objectives for zinc have largely been met; that goals and objectives for PCBs have been partially met; and that goals and objectives for other toxic contaminants are being dealt with on a case-by-case basis.

- **Pilot Study of Polycyclic Aromatic Hydrocarbons:** The WATAR Team coordinated with Delaware's Natural Resource Damage Assessment (NRDA) Program to produce the following report:

    - Burton W and Greene RW. 2013. Natural Resource Damage Assessment Baseline Study, Delaware Estuary Polycyclic Aromatic Hydrocarbon (PAH) Pilot Study, SIRS Project No. DE-1325. Report dated January 2013.

This work was also presented at the 2013 Delaware Estuary Science and Environmental Summit in Cape May, NJ on January 28, 2013 under the following title:

- Burton W, Greene R, and DeCowsky G. 2013. Pilot Study of Polyaromatic Hydrocarbons in the Delaware Estuary Using Passive Diffusion Sampling Technology. Presentation prepared by Versar, Columbia, MD and DNREC, Dover and New Castle, DE.

Of significance is the fact that this was the first use of passive samplers in the Delaware Estuary.

- **Monitoring for the Nanticoke River Maintenance Dredging Project:** The US Army Corps of Engineers, at the request of the Sussex County Development Office, dredged the Nanticoke River downstream of Seaford, Delaware to improve navigation and increase commerce. Dredged material was pumped by hydraulic pipeline to an upland confined disposal facility (CDF) where solids were settled out and captured and water was returned to the Nanticoke. The subaqueous lands permit required Sussex County to collect toxics data in the Nanticoke River and at the CDF discharge to verify that water quality was protected during the dredging operation. The WATAR team provided technical assistance to Sussex County in the collection and assessment of the toxics data, while Sussex County paid for the laboratory analyses. Pre-dredging, during dredging and post-dredging data were summarized in the following presentation:

  - Greene RW and Tyler R. 2013. Nanticoke River Maintenance Dredging – 2013. Presentation given June 21, 2013 at the Sussex County Engineers Office, Georgetown, DE.

  Proper consideration of bioavailability principles demonstrated that the dredging operation did not adversely affect surface water quality in the Nanticoke River.

- **Cool Run/Del Chapel Tributary zinc survey:** The Del Chapel site is located in Newark, Delaware. It formerly manufactured vulcanized fiber and released copious amounts of zinc to the ground. The site was remediated in the 1990s as part of the Brownfields Development Program. The site is now University of Delaware student housing and is largely capped with buildings and parking lots. Investigations following remediation revealed that zinc in the groundwater was being discharged to a small tributary in the White Clay Creek Watershed. The fact that the site was already capped made further conventional remediation difficult, if not impossible. In or around 2005, an innovative plan was developed to inject magnesium hydroxide into the groundwater between the zinc plume and the small tributary. The purpose was to precipitate the dissolved zinc in place and reduce the dissolved phase transport to the stream. Monitoring indicated that the approach worked very well for a period of approximately 5 years, after which zinc concentrations in the tributary began to slowly rise. A detailed synoptic monitoring event was performed during 2013 to characterize the extent of the release. Data from that event indicate that dissolved zinc concentrations are high near the site and that concentrations decline downstream in response to base flow dilution. Based on these findings, consideration is being given to a second treatment of magnesium hydroxide or another alternative.

- **Pinnacle Way Sediment Quality Assessment:** Sediment samples were collected from Wharton's Branch and Holiday Acres Backwash as part of a Brownfield Investigation at the 29984 Pinnacle Way Site located near Millsboro, Delaware. The site is being proposed for redevelopment from its former use as a pickle plant to a chicken processing facility. Sediment sample data were evaluated to determine if contaminant concentrations in sediments are resulting in elevated risk to aquatic life or

human health as they currently sit. A secondary evaluation was conducted by DNREC-SIRS staff to determine if contaminants in sediments could be linked to operations at the former pickle plant. Based upon the results of the assessment, there does not appear to be elevated aquatic life or human health risk from chemical contaminants detected in sediment samples. In addition, comparison of data to the HSCA Screening Values for protection of human health indicate that there is little to no potential for effects on human health if these sediments were excavated and moved into an upland location. The following report was completed in support of the overall investigation:

- Cargill J. 2013. Analysis of Chemical Contaminants in Sediments, 29984 Pinnacle Way (DE-1555) Brownfield Site. Report dated October 2013. Delaware Department of Natural Resources and Environmental Control, New Castle, DE.

C&D Canal trailhead/parking lot area investigation: In August/September 2013, a Facility Evaluation was conducted by DNREC-SIRS at a proposed DNREC Division of Parks and Recreation trailhead associated with Lums Pond South (which included WATAR Team members in SIRS). During the investigation, the WATAR Team collected composite soil samples and water samples from underdrain discharges into the C&D Canal to determine whether past activities or current discharges at the location may be harmful to human or environmental health. Historically, sewage sludge from Baltimore was spread on the site to encourage vegetative growth (USACE). Untreated sewage sludge has the potential to contain elevated concentrations of metals and polychlorinated biphenyls (PCBs). Data from the composite soil samples indicated that PCBs are not present in the soil samples. Aqueous underdrain discharge sample data are currently being assessed. A final Facility Evaluation Report is in preparation and is anticipated to be completed in February/March 2014.

- **Short-Term Discharge of Tetrachloroethylene:** The City of Newark has a public drinking water well south of the City which became contaminated with TCE. The City is placing advanced treatment on the well. During the design phase, the City asked if they could temporarily discharge water pumped from the well to the non-tidal Christina River. The WATAR team worked with the City, other programs in DNREC and the Division of Public Health to predict in-stream concentrations and fate of TCE in the Christina during the temporary discharge. The following assessment was prepared:

  - Greene RW. 2013. Screening Level Assessment of Short-Term Discharge of Tetrachloroethylene (PCE) to the Christina River from City of Newark Contaminated Well 14R. Report dated February 14, 2013. Delaware Department of Natural Resources and Environmental Control, Dover, DE.

  The assessment concluded that there is little to no ecological or human health risk associated with the discharge provided concentrations and pumping rates did not increase and the discharge was curtailed in a timely manner.

- **Interface between WATAR Team and Delaware's Toxics in Biota Committee:** The WATAR Team, in accordance with its 5-year plan, collects fish tissue samples from priority Delaware watersheds impacted by toxics. The Delaware Toxics in Biota Committee reviews such data and makes recommendations to the Secretary of DNREC and the Secretary of the Department of Health and Social Services (DHSS) when new or revised fish consumption advisories may be needed. The following two fish tissue contamination reports, relevant to the WATAR Team and the Delaware Toxics in Biota Committee, were prepared during 2013:

- Greene RW. 2013. Assessment of 2012 Delaware Toxics in Biota Data. Report dated August 2013. Delaware Department of Natural Resources and Environmental Control, Dover, DE.

- Greene RW. 2013. Assessment of Biota and Sediment Data Collected by the Center for the Inland Bays in Conjunction with the Burton Island Bioaccumulation Study. Report dated May 10, 2013. Delaware Department of Natural Resources and Environmental Control, Dover, DE.

- **Peer Reviewed Publications:** Members of the WATAR Team published the following journal articles during 2013:

  - Greene RW, Di Toro DM, Farley KJ, Phillips KL, and Tomey C. 2013. Modeling Water Column Partitioning of Polychlorinated Biphenyls to Natural Organic Matter and Black Carbon. *Environ. Sci. Technol.*, 47, 6408-6414.

  - P. Mayer, T. Parkerton, R. Adams, J. Cargill, J. Gan, T. Gouin, P. Gschwend, S. Hawthorne, P. Helm, G. Witt, J. You, B. Escher. Passive Sampling Methods for Contaminated Sediments: Scientific Rationale Supporting Use of Freely Dissolved Concentrations. Accepted for print in IEAM, November 2013, Pending Publication.

  - M. Greenberg, P. Chapman, I. Allan, K. Anderson, S. Apitz, C. Beegan, T. Bridges, S. Brown, J. Cargill, M. McCulloch, C. Menzie, J. Shine, T. Parkerton. Passive Sampling Methods for Contaminated Sediments: Risk Assessment and Management. Accepted for print in IEAM, December 2013, Pending Publication.

Appendix A

I. Historical Data

Brandywine:

DE-0094 Container Corporation
DE-0266 Amtrak Wilmington Refueling Facility
DE-0281 Diamond State Salvage
DE-1002 Haynes Park
DE-1097 1121 Thatcher St
DE-1127 East 7th Street Peninsula
DE-1130 Bancroft Mills
DE-1144 Diamond State Foundry
DE-1147 Peninsula Park
DE-1198 Wilmington Rolling Mill
DE-1294 Peninsula Ventures
DE-1299 Maffett 12th Street Property
DE-1384 Up the Creek Restaurant and Marina
DE-1397 1101 E 8th Street (Former Carney Harris)
DE-1408 SIP

Christina River:

DE-1041 Dravo Marsh
DE-1073 DP&L/Congo Marsh

II. Current SIRS Data

Christina River:

DE-0357 New Castle County Airport
DE-0173 Syntech
DE-0105 Chrysler Assembly Pit
DE-1073 DP&L/Congo Marsh
DE-1524 Former Crowell Corp
DE-1173 Domino Salvage
DE-1376 701 A Street
DE-1123 560 Terminal Ave
DE-1496 M & N Property
DE-1502 733 South Market Street
DE-1484 DMA Expansion
DE-1103 Meco Drive

St. Jones:

DE-1093 P&F Motorcycles

Little Creek:

DE-0358 White Oak Salvage

Broadkill River:
DE-1351 Homestead
DE-1407 Georgetown Groundwater

C&D Canal:
DE-1548 Trails and Pathways- C&D Canal Site #7

Indian River:
DE-1529 Shortly Road Equipment Yard
DE-1494 Dukes Salvage

Brandywine:
DE-1138 George Gray School
DE-1505 901 East 17th Street
DE-1404 1000 East 12th Street
DE-0355 St Patrick's House-1419 N French St
DE-1435 Royal Dry Cleaners

Dragon Run:
DE-1449 2440 Red Lion Road

Delaware River:
DE-0167 New Castle Gas Company

Naamans Creek:
DE-0279 Grubb Rd

Nanticoke:
DE-0251 Seaboard Lumber
DE-1030 ONeal Farm

Shellpot Creek:
DE-1498 Riverside Redevelopment

Mispillion River:
DE-0226 Ella Harrington

Iron Branch:
DE-1555 29984 Pinnacle Way

Red Lion Creek:
DE-0053 Standard Chlorine/Metachem

III. Current WATAR Data
C&D Canal Watershed
Red Lion Creek Watershed
St. Jones River Watershed