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Mr. John R. Strang, P.E.
New York Department of Environmental Conservation
Region 4 Headquarters
1130 North Westcott Road
Schenectady, NY 12306

Subject: **Sediment Data Report for the Southern Feasibility Study Area**
Hudson River Operable Unit 2 Feasibility Study (FS)
BASF Rensselaer, NY

Dear Mr. Strang:

AECOM is pleased to provide you with the report on behalf of BASF Corporation (BASF):

- Sediment Data Report for the Southern Feasibility Study Area

Due to the file size, the Appendices referenced will be mailed to your office on CD. Please do not hesitate to contact Mr. J. Douglas Reid-Green at BASF (908-507-8820) if you have any questions concerning the FS sampling and analysis activities outlined herein.

Sincerely yours,

John A. Bleiler
Project Manager

cc: J. Douglas Reid-Green (BASF)
Hank Martin, P.E. (ELM)
Nathan Epler, PhD (Roux Associates)

AECOM Environment

Prepared for:
BASF Corporation
Florham Park, New Jersey

Prepared by:
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Chelmsford, MA
January 2013

Hudson River Operable Unit 2 Sediment Data Report for the Southern Feasibility Study Area

BASF Rensselaer
Rensselaer, New York

AECOM Environment

Prepared for:
BASF Corporation
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Chelmsford, MA
January 2013

Hudson River Operable Unit 2 Sediment Data Report for the Southern Feasibility Study Area

BASF Rensselaer Rensselaer, New York

Prepared By Ryan McCarthy

Reviewed By John A. Bleiler

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1.0 Introduction

BASF Corporation (BASF) has been conducting a remedial investigation (RI) of its former manufacturing facility in Rensselaer, New York (the "Site"; **Figure 1-1**) under the direction of the New York State Department of Environmental Conservation (NYSDEC) since 2001. As part of the RI, BASF has conducted soil and groundwater sampling in the upland portion of the Site and, based on the results of the this portion of the RI, has implemented a number of remedial actions including soil removal, installation of a groundwater treatment system, and construction and maintenance of engineering controls.

The RI has also included several phases of Hudson River sediment characterization, including collection and analysis of several hundred sediment samples, and performance of benthic macroinvertebrate surveys and sediment toxicity tests pursuant to work plans approved by the NYSDEC. In 2011, the NYSDEC informed BASF that it considered the sediment portion of the RI completed and directed BASF to initiate preparation of the Feasibility Study (FS) for the Hudson River sediment operable unit (referred to as OU-2).

The sediment portion of the RI has identified both metals and volatile organic compounds (VOCs) at levels greater than NYSDEC sediment quality criteria in sediment adjacent to the Site. Based on knowledge of historical operations at the Site, it has been concluded that the VOCs and at least a portion of the metals found in sediments adjacent to the Site originated from historic process wastewater discharges from historic Site production sewer lines. These discharges ended in 1973 when two wastewater treatment lagoons and a process wastewater treatment system were constructed and the production sewer lines were closed. No discharges of Site-related constituents from the former production sewers to the river occurred after construction of the wastewater treatment system.

The FS Study Area is immediately adjacent to and downstream of the Site and includes the Northern FS Study Area (adjacent to the Site) and the Southern FS Study Area (downstream of the Site) (**Figure 1-2**). The "Western Shoreline" refers to the area on the opposite shoreline of the Northern and Southern FS Study Areas.

The Hudson River Operable Unit 2 Investigation Report (ENSR, 2011) summarized the sediment quality data collected from the Hudson River adjacent to the Site since 2005 and the findings of human health and ecological risk assessments. The Sediment Nature and Extent Summary Report (AECOM, 2011) presented the analytical chemistry results from the 2009 field programs. The Hudson River Operable Unit 2 PCB Sampling and Analysis Report summarized the PCB and VOC data collected as part of the Fall 2011 field program (AECOM, 2012). Some inorganic constituents, such as lead, were detected at levels in excess of the NYSDEC screening criteria in the surficial sediment collected in the Southern FS Study Area. However, some uncertainty in the ecological risk characterization persisted in the Southern FS Study Area due to the limited chemical and toxicological data available from this portion of the Site. Therefore, as part of the preparation of the FS, BASF and NYSDEC agreed that additional chemical and toxicological data was needed to develop and evaluate remedial alternatives for the Southern FS Study Area.

This data summary report presents the results of a supplemental sampling effort conducted in November 2011 to better characterize the inorganic chemistry, grain size, and benthic toxicity of the

surficial sediments in the Southern FS Study Area and at a few locations on the western shoreline of the Hudson River (PCB and VOC from this sampling event were previously provided to NYSDEC in the July 2012 Hudson River Operable Unit 2 PCB Sampling and Analysis Report). The methodology used for collecting and analyzing samples was presented in the Southern Portion FS Study Area Sampling and Analysis Work Plan ("Work Plan"; AECOM, 2011a) is summarized in Section 2. The chemical and toxicological data presented in this report, in conjunction with data collected during prior sediment investigations, provide the information necessary to help characterize the nature and extent of metals impacts for use in the FS alternatives analysis and report.

2.0 Overview of Sampling and Analysis Activities

The objectives of the sampling and analysis plan for the Southern FS Study Area were described in the Work Plan (AECOM, 2011a) and include:

- To provide supplemental information to be used in conjunction with historically collected data from the Site to further characterize the sediments of the Southern FS Study Area; and,
- To evaluate potential remedies to address impacted sediments of this portion of the Site.

In November 2011, a total of 36 surficial sediment grab samples were collected in the Southern FS Study Area and along the western shoreline of the Hudson River (**Figure 2-1**). A grid sampling design was used, by which sampling locations were set at 160-foot triangular centers within the Southern FS Study Area. The field sampling for this effort was conducted in conjunction with the PCB characterization survey; the results of which are presented in the PCB Sampling and Analysis Report (AECOM, 2012).

A total of 40 surficial samples (0 to 6 inches [0 to 15 cm]) were analyzed from sediments collected from 36 locations (including 36 samples and 4 field duplicate samples). Six samples were collected from locations along the western shoreline of the Hudson River and the remaining 30 locations were within the Southern FS Study Area. All samples were analyzed for Target Analyte List (TAL) metals, TOC, and grain size. A subset of the sediment samples collected were also used in laboratory toxicity tests; these 14 locations from within the Southern FS Study Area and 3 locations from the western shoreline were co-located with sediment chemistry sampling locations as illustrated on **Figure 2-1**.

All sampling and analyses were conducted according to methods described in the Work Plan (AECOM, 2011a), the Work Plan for the Hudson River OU-2 (ENSR 2007), and the Quality Assurance Project Plan (ENSR 2005). The midge (*Chironomous tentans*) was the selected organism used in the toxicity tests, which is consistent with previous events (i.e., 2007 toxicity sampling event). The lethal and sub-lethal toxicity test endpoints considered in this event are also consistent with the 2007 protocol.

3.0 Analytical Results

The following subsections present the analytical results from the November 2011 sampling event. The laboratory reports are presented in **Appendix A**, the data validation reports in **Appendix B**, and the toxicity test reports in **Appendix C**.

3.1 Metals in Surficial Sediment

A summary of metals detected in the surficial sediment grab samples collected in the Southern FS Study Area and along the western shoreline is presented in **Table 3-1**. Metals were detected in all samples. A summary of select analytical results is presented below.

- Arsenic was detected in all 40 samples;
- Cadmium was detected in 27 of 40 samples;
- Chromium was detected in all 40 samples;
- Copper was detected in all 40 samples;
- Iron was detected in all 40 samples;.
- Lead was detected in all 40 samples;
- Manganese was detected in all 40 samples;
- Mercury was detected in all 40 samples;
- Nickel was detected in 38 of 40 samples[1];
- Silver was detected in 13 of 40 samples;
- Zinc was detected in all 40 samples;

3.2 Surficial Sediment Grain Size

Grain size analyses were conducted on 33 samples collected from the Southern FS Study Area[2] and 6 samples from the western shoreline. The substrate of most Southern FS Study Area samples was dominated by fine sand followed by medium sand, silt, and clay (**Table 3-2; Figure 3-1**). This is consistent with previous sediment sampling results in which surficial sediment samples from the Southern FS Study Area were reported to be dominated by fine sand (ENSR 2011). The five samples collected along the western shoreline were dominated by medium sand or fine gravel which is consistent with previous observations of more coarse-grained material in this area (ENSR 2011).

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[1] The analytical results for nickel detected in the sample 06SD261SF-SC-A-1 and the field duplicate 06SD261SF-SC-A-2 were rejected on the basis of the relative percent difference between the sample and the field duplicate.

[2] Grain size analysis was not conducted on the field duplicate 06SD261SF-SC-A-2; this sample was included in laboratory analyses for metals resulting in a total of 40 samples for inorganic analyses and 39 samples for grain size analyses.

Total organic carbon (TOC) in the Southern FS Study Area ranged from 610 mg/kg to 98,200 mg/kg with an average of 15,500 mg/kg for all surficial sediment samples. This range is consistent with the range reported for the 2005-2007 surficial sediment sampling in this area (2,000 to 47,100 mg/kg with an average of 13,865 mg/kg; ENSR 2011). Total organic carbon along the western shoreline ranged from 1,500 to 40,300 mg/kg with an average of 12,587 mg/kg, which is also consistent with the range reported for surficial sediment samples collected in 2005 to 2007 (1,140 to 8,550 mg/kg with an average of 3,818 mg/kg).

3.3 Results of Sediment Toxicity Testing

A laboratory toxicity testing program using the midge *C. tentans* was implemented to directly measure the potential for toxicity to benthic invertebrates due to exposure to contaminants in the sediment. Surficial sediment from 14 sampling locations within the Southern FS Study Area and 3 locations along the western shoreline was used for these tests (**Table 3-1**). Statistical comparisons were made to the laboratory control results for each test and the FS analysis of these data will also include evaluation relative to the upstream reference area test results analyzed in 2007. The toxicity testing report is included in Appendix C.

4.0 Summary

Surficial sediment samples were collected in the Southern FS Study Area in November 2011 to better characterize the inorganic chemistry, grain size, and toxicology of the surficial sediments in the Hudson River in this portion of OU-2 and along the western shoreline. The results of the detected metal concentrations, grain size, TOC, and the toxicity test results will be further evaluated in the FS.