COMMONWEALTH of VIRGINIA

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November 21, 2017

Mr. Michael Liberati
DuPont Corporate Remediation Group
Chestnut Run Plaza 715-236
Wilmington, DE 19805

VIA ELECTRONIC MAIL

Re: Revised AOC 4 Remediation Selection Process Document
Former DuPont Waynesboro Plant
Waynesboro, Virginia
EPA ID# VAD003114832

Dear Mr. Liberati:

This letter acknowledges the receipt and review of the Revised AOC 4 Remediation Selection Process Document, submitted to the Virginia Department of Environmental Quality, Office of Remediation Programs (Department) by AECOM on behalf of the E.I du Pont de Nemours and Company (DuPont).

The Department approves the document with no further comment at this time.

If you have any questions, you may contact me at 703-583-3825 or by email at Kurt.Kochan@deq.virginia.gov.

Sincerely,

Kurt W. Kochan
Corrective Action Project Manager
Office of Remediation Programs

cc: DuPont Waynesboro Correspondence File
Brett Fisher, Calvin Jordan, VDEQ-CO
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AECOM

Area of Concern (AOC) 4 Remediation Selection Process

Former DuPont Waynesboro Site, Virginia

E.I. du Pont de Nemours and Company

Project Number: 60390328

September 20, 2017

Prepared for:

E.I. du Pont de Nemours and Company

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1. Background

1.1 Purpose

Interim remedial measures (IRM) at the former DuPont Waynesboro Site (Site) are being conducted by E.I. Du Pont de Nemours and Company (DuPont) in accordance with the requirements set forth in a Resource Conservation and Recovery Act (RCRA) Corrective Action Permit (Final Hazardous Waste Permit for Corrective Action-Renewal EPA ID No. VAD003114832; Permit). In February 2014, the Virginia Department of Environmental Quality (VDEQ) amended the Permit to incorporate Area of Concern (AOC) 4, which includes off-site aquatic and riparian/floodplain areas extending from South River Relative River Mile (RRM) 0 at the Site, to RRM 25, and continuing through a portion of the South Fork Shenandoah (SFS) River (Figure 1-1).

IRM associated with the AOC 4 remedial strategy will eliminate or reduce exposure and migration of mercury in the system to protect human health and the environment. The remedial strategy was originally developed in the Remediation Proposal submitted to the Natural Resources Defense Council (NRDC; Anchor QEA et al., 2013), and were subsequently refined in the Interim Measures Design, Implementation, and Monitoring Work Plan (IMWP; Anchor QEA and URS et al., 2015) approved by VDEQ in March 2015. The first IRM was a river bank stabilization and river channel restoration constructed from October 2016 through February 2017. The IRM was designed to reduce total mercury (THg) loading from bank soils that have been found to have levels of THg elevated relative to regional background. The IRM was the result of more than a decade of comprehensive investigation and characterization of the river summarized in the Ecological Study Report (URS, 2012a), and collaboration with the South River Science Team (SRST) a group of stakeholders representing local, state and federal government, and academic, consultants, private citizens and DuPont representatives. The SRST was founded in 2001 to facilitate communication and consensus-based decision-making for the complex program. The iterative remedial strategy follows an enhanced adaptive management framework (EAM), which provides a flexible decision-making process that can be adjusted as remediation action outcomes are better understood, and as landowner and other stakeholder preferences or concerns arise (Figure 1-2). The EAM is integrated into the RCRA process as shown in Figure 1-3.

The purpose of this document is to summarize the agreements and intent of the existing AOC 4 program strategies, so they are incorporated into the program as it matures. It will function as an abbreviated Corrective Measures Study (CMS), since the typical CMS report or work plan will not be developed for the program; instead the remedy will be performed as a series of IRM as described in Section 3 below. The outline of the document is based on the RCRA First Tool 9, Remedy Selection Process Template. ‘Tool 9’ is intended to summarize site-specific goals and the process for remedy selection. It is intended to be ‘evergreen’ and may be revisited at the request of DuPont or VDEQ, as necessary, should major components of the strategy change, based on relevant outcomes within the EAM framework.

1.2 Project Regulatory History

In July 2005 a Consent Decree (CD) was issued between DuPont, the NRDC, and the Virginia Chapter of the Sierra Club (U.S. District Court, 2005) to address mercury contamination in the South River watershed. The CD required that a 6-year Ecological Study be performed, followed by the submittal of a Remediation Proposal. The purpose of the Ecological Study was to

compile results from a range of scientific disciplines and develop a coordinated, integrated, watershed-level approach to characterize mercury fate and transport in the South River and a segment of the SFS River, answer key site characterization questions, and inform remediation decisions. The CD also required that a Remediation Proposal (Anchor QEA and URS et al., 2013) be developed subsequent to the Ecological Study (URS, 2012a), and in consideration of regulatory guidelines. At that time it was agreed that subsequent corrective action design and implementation of the recommended remedy would be performed under an amendment to the Waynesboro on-site RCRA regulatory program between DuPont and the VDEQ, in collaboration with the United States Environmental Protection Agency (USEPA) and with input from the SRST. The overall objectives were to accelerate remedial design and implementation to reduce exposures of humans and ecological receptors to mercury in the South River and a segment of the SFS River. All work performed would be consistent with the requirements of the National Contingency Plan and USEPA (2005) guidance.

1.3 Physical Setting

A detailed description of the physical setting of AOC 4 is provided in the Ecological Study Report (URS, 2012a) and the RCRA Facility Investigation Report [(RFI) AECOM, 2015] and briefly summarized here. The Waynesboro Site is an active industrial facility, located on approximately 177 acres of relatively flat land along the South River in the southeastern corner of Waynesboro, Virginia; it abuts the South River within AOC 4. The river flows approximately 25 miles north to its confluence with North River at Port Republic, Virginia where the combined flow forms the SFS River. The river channel within AOC 4 extends from RRM 0 at the outfall of the Site to approximately 5 miles downstream of the confluence of the SFS River (Figure 1-1).

AOC 4 land use features consist of the South River, adjacent floodplains, ponds, and agricultural, commercial/industrial and residential properties. Open space areas and the South River are used for recreation. The area immediately adjacent to the South River predominantly consists of agricultural pastures and fields with a narrow border of trees along the banks; riparian forests are present in some areas. Forested areas and the South River are used for hunting. Land use in the watershed is composed of approximately 33% agricultural, 56% forested, and 11% developed areas (Fry et al., 2009); wetlands cover 0.01% of the watershed, which is less than the open water areas (0.6%) and barren lands (0.05%). Future land use with AOC 4 is expected to vary consistent with watershed development.

1.4 Remedy Overview

The AOC 4 remedy will be best achieved by conducting remedial measures in an EAM framework that facilitates decision-making based on on-going monitoring data collection. The sources of mercury primarily occur in the first 12 miles of the South River, beginning at the former DuPont Site, and include river banks and sediment with THg levels elevated relative to regional background. The main working hypothesis is that reducing or eliminating the loading of inorganic mercury (IHg) within segments of the South River in a stepwise manner will result in improvements in, and downstream of that segment.

The EAM approach requires that the river system be divided into manageable segments, beginning with source controls at the former Waynesboro Site, followed by addressing banks and adjacent in-channel bed sediments in a successive upstream-to-downstream sequence. The actual sequence will partially depend on several factors, including access to private property. The outcome of Phase 1 IRM will inform the scope of subsequent phases as part of an iterative learning process within the EAM framework, recognizing the importance of natural variability in ecological systems and measures of effectiveness of remediation measures. Since

loading of IHg to the South River is also linked to its transfer into the terrestrial food web, it is expected that reducing IHg loading to the river will also result in reduced transfer to the semi-aquatic and terrestrial food webs. Efforts to identify approaches to address mercury in the floodplain and terrestrial food web are underway through the collaborative efforts of the SRST.

Source control at the former Waynesboro Site is on-going and will be completed in late 2018. A Bank Pilot Project involving stabilization of a 500-ft bank segment at RRM 0.1 was completed in 2009. The first segment of the South River to be addressed by the Phase 1 IRM includes bank soils and in-channel sediments located at Constitution Park. The City Shops bank at RRM 1.4 will be addressed in fall, 2017. As described above, the concept for the Phase 1 IRM was originally developed in the Remediation Proposal submitted to the NRDC (Anchor QEA and URS et al., 2013), and was subsequently refined in the VDEQ-approved IMWP (Anchor QEA and URS et al., 2015). Design and implementation of Phase 1 is being performed as a series of IRMs under RCRA within in an EAM framework.

1.5 Scope of Document

This document includes the following sections:

- Section 2.0: RCRA Facility Investigation;
- Section 3.0: Conceptual System Model;
- Section 4.0: Remedial Action Objectives;
- Section 5.0: Remedial Strategy;
- Section 6.0: Additional Considerations;
- Section 7.0: Summary; and
- Section 8.0: References

2. RCRA Facility Investigation

A comprehensive RFI report was prepared for AOC 4 documenting the nature, extent, fate, and transport of mercury that historically migrated from the Site into the surface water, sediments, and floodplain soils, and was subsequently taken up by biota within AOC 4 (AECOM, 2015). The RFI summarizes key aspects of the physical, geological, geomorphological, chemical, and biological studies conducted over more than three decades. A detailed description of the findings of these studies is provided in Section 8.0 of the AOC 4 RFI (AECOM, 2015). A summary is provided here.

Based on investigations performed to date, the majority of mercury loading in the South River begins at the Site and decreases moving downstream for approximately 10 to 12 miles. Within the first 12 river miles downstream of the Site, the largest sources of mercury loading include riverbanks, outfalls from the Site, and sediment. The primary mechanism for the continued loading to this segment of the South River is through the slow, but chronic erosion of legacy mercury that resides in river bank soils. Based on this understanding, as described in the Remediation Proposal, remediation will begin in these areas and proceed downstream. Addressing mercury loading to the South River is expected to reduce impacts to the aquatic environment, and to reduce mercury transfer into the terrestrial food web.

Although most of the riverbanks with high THg concentrations are believed to be in the first 12 miles the South River downstream of the Site, receptors such as fish and birds below RRM 12 and the upper segment of the SFS River show elevated mercury concentrations. The majority of mercury loaded to these lower reaches comes from the first 12 river miles downstream of the Site, largely as a function of increased agricultural runoff and presence of mill dams during the time mercury was used at the Site.

An understanding of mercury contamination in sediment deposits has been achieved on a reach scale. Management of deposits removed from individual locations adjacent to BMAs targeted for remediation, may need additional evaluation or characterization on a case by case basis where adequate data do not exist.

3. Conceptual System Model (CSM)

A detailed description of the aquatic and terrestrial mercury conceptual system models is provided in Section 7.0 of the AOC 4 RFI (AECOM, 2015). A summary is provided here.

3.1 Summary of the Aquatic HgCSM

The current aquatic Mercury Conceptual System Model (HgCSM) integrates geomorphological, chemical, and biological data collected by the SRST and others. The purpose of the aquatic HgCSM is to support remedial decision-making by identifying the most critical aspects of the mercury movement in AOC 4. Figure 2-1 shows a schematic of the current aquatic HgCSM, which focuses on the three factors relevant to understanding the need for a remedial action: 1) mercury sources to the South River and the extent to which these sources are controlled; 2) mercury-impacted media—bank soils and in-channel sediments; and 3) the aquatic food web elements. The aquatic HgCSM depicts the transfer of mercury from sediments to the aquatic food web (to fish and from fish to piscivores). Figure 2-1 shows sources and pathways of inorganic mercury to areas where mercury may be converted to methylmercury, under baseflow conditions. Mercury movement from the sediments in AOC 4 to higher trophic level organisms is primarily driven by consumption of methylmercury (MeHg) by aquatic invertebrates. A key assumption in the aquatic HgCSM is that inorganic mercury from various sources is equally available for methylation. Ongoing examination of this assumption is necessary as analytical technology develops to measure the concentrations and the origins of bioavailable mercury. A summary of the findings of investigations conducted to date that support the aquatic HgCSM is provided in Section 7.0 of the RFI (URS, 2012b).

3.2 Summary of the Terrestrial CSM

A terrestrial HgCSM was created and presented in the AOC RFI (URS, 2012b) to synthesize existing information regarding trophic transfer of mercury in the terrestrial food web, and the diversity and types of organisms present in the floodplain. The terrestrial HgCSM differs from the aquatic HgCSM in that loading rates or fluxes of mercury between compartments of soil, vegetation, and tissue were not measured; however, the terrestrial HgCSM is based on field data and is integrated with the risk assessment approach for the South River, so the relationships can be used to plan potential remediation. The terrestrial HgCSM is shown in Figure 2-2.

The terrestrial HgCSM was designed based on two lines of evidence – the MeHg concentration and the $\delta^{15}N$ of the food web element. Terrestrial organisms were organized according to trophic levels and MeHg tissue concentrations. The height of the boxes is proportional to the range of MeHg concentrations and trophic position observed at several locations in the floodplain. Arrows depict potential paths and magnitudes of mercury trophic transfer, which is based in part on the ecological conceptual site model and the general life history characteristics of the terrestrial organisms.

MeHg concentrations and $\delta^{15}N$ suggest that the main sources of MeHg to higher trophic levels in the floodplain are via detritivorous invertebrates and emergent aquatic insects from the South River. Detritivorous invertebrates (e.g., earthworms) have much higher MeHg concentrations and a greater range in $\delta^{15}N$ than strictly herbivorous invertebrates (e.g., tent caterpillars). As a consequence, MeHg concentrations in the organisms that feed on this pathway (e.g., invertivorous mammals) were higher than in strictly herbivorous animals. The influence of MeHg from emergent aquatic insects can be seen in the high $\delta^{15}N$ values and MeHg concentrations in

terrestrial animals that feed on them (predatory spiders, aerial insectivorous birds, and mammals). MeHg concentrations and trophic positions were higher in predatory birds that feed on small mammals and birds.

The influence of these findings on the outcome of the risk assessment, and input to remedial-decision making is discussed in the following section.

3.3 Risk Assessment Findings

Detailed human and ecological risk assessments were performed for AOC 4 (URS, 2015). The human health and ecological conceptual site models are provided in Figures 2-3a, 2-3b and 2-4. The human health CSMs detail both potentially complete and incomplete pathways for each of the possible off-site receptors under both current and future land use and hypothetical future land use.

The goal of the risk assessments is to identify areas of potentially unacceptable risks to human or ecological receptors that may require corrective actions. These areas include media containing mercury concentrations that exceed risk-based criteria in floodplain soils, sediment, and/or dietary items for either humans or ecological receptors. Both the human health risk assessment and the ecological risk assessment for AOC 4 were developed using widely accepted guidance, and in close collaboration with the USEPA and VDEQ. They were approved by the agencies in July, 2015.

The following sections summarize the findings of the risk assessments, particularly as they relate to remedial decision-making. Further details can be found in the AOC 4 risk assessment report (URS, 2015).

3.3.1 Human

The Human Health Risk Assessment (HHRA) shows limited potential for human health risks at the exposure areas evaluated under current land uses. As part of remedy evaluation, areas that are identified in the risk assessment as being of potential concern under current or reasonably anticipated future land use conditions will be further evaluated to determine appropriate remedial strategies to mitigate potential unacceptable risks.

3.3.2 Ecological

The results of the Ecological Risk Assessment (ERA) indicate that potential adverse effects on aquatic and terrestrial ecological receptors are due to trophic transfer of MeHg originating in the South River system—a finding that is consistent with the current understanding of the system on which the proposed remedial strategy is based.

3.4 System Uncertainties

Remediation technologies capable of disrupting mercury transport, methylation, and/or exposure mechanisms are limited in number, and some have not been tested in fluvial systems such as the South River or outside the laboratory. Lessons learned from remediation of mercury sites demonstrate the complex nature of the problem based on the unique chemistry of mercury and its behavior in the environment. Moreover, all bank remediation technologies will release some amount of mercury during or after implementation of the remedy.

A variety of pilot, research and comprehensive system characterization studies have been performed in collaboration with the SRST to reduce uncertainties regarding the system and its potential response, and the behavior of mercury in the environment. In addition, more typical

pre-remediation data are collected to better understand specific Bank Management Areas (BMA) targeted for remediation, such as bank soils, bathymetry, and treatability studies. Lessons learned from the Pilot Bank Study, and the Phase 1 IRM already performed will also help inform the remedy moving forward in an adaptive management framework. Nonetheless, it is likely that in the future, AOC 4 remedial decision-making will be influenced as the knowledge base increases regarding the movement and treatment of mercury in the system. Pilot studies performed to date include:

- Bank Pilot
- Pond Amendment Pilot
- Laboratory-based Amendment Pilot studies
- Field-based Amendment Pilot studies
- Amendment Cap studies

4. Remedial Action Objectives (RAOs)

Consistent with USEPA guidance (2005), remedial action objectives (RAOs) should reflect objectives that are achievable through remediation. RAOs are medium-specific and consist of the following:

- General response objectives
- Performance objectives
- Measurable metrics

Both short- and long-term RAOs are appropriate to address bioaccumulation and food web exposures in the South River. Short-term RAOs are expected to be met following interim measure construction, while long-term RAOs may require additional corrective actions in other segments or throughout the South River before they are attained. Preliminary RAOs may be refined during bank specific IRMs and corrective action design, as well as follow-on adaptive management. Short- and long-term RAOs for AOC 4 are listed below.

4.1.1 Short-term RAOs

- *General response objectives*: Reduce mercury transport and exposure and improve bank habitat functions within the upper 2 miles of the South River
- *Performance objectives*: Conduct and/or maintain bank remediation actions in the upper 2 miles of the South River to achieve sustainable reductions in mercury concentrations and improve water quality and bank habitat functions within this reach
- *Measurable metrics:* Bank erosion rates, measured using detailed topographic surveys, erosion pins, and/or root analysis; establishment of bank vegetation; and mercury concentrations in physical media and biological tissues

4.1.2 Long-term RAOs

- *General response objectives*: Reduce MeHg exposure and improve habitat conditions throughout the South River and SFS River
- *Performance objectives*: Conduct and/or maintain remediation actions that sustain reductions in tissue MeHg concentrations and improve water quality and habitat functions throughout the South River and SFS River
- *Measurable metrics:* Mercury concentrations in biological tissues and physical media, and bank and in-channel habitat metrics

Appendices to the IMWP include both short-term and long-term monitoring plans that incorporate measureable metrics developed collaboratively with the SRST and under VDEQ oversight.

5. Remedial Strategy

Aquatic exposure and migration pathways pose the greatest potential threat to both aquatic and terrestrial receptors. This section outlines the remedial alternatives that are being considered to address these pathways, and provides a rationale for future consideration of potential terrestrial exposure.

5.1.1 Aquatic

As discussed in Section 1.4 above, the remedy will be performed in an upstream to downstream sequence assuming access to private properties is gained, in an adaptive management framework, targeting bank segments that contribute a disproportionately greater mercury load (BMAs). Specific technologies were combined to develop the following BMA alternatives, highlighting the tradeoffs between different Phase 1 BMA remediation approaches:

- Institutional Controls and Monitoring
- Enhanced Vegetative Stabilization
- Structural Stabilization
- Removal and Disposal

Each of these alternatives has 'pros' and 'cons' depending on its application. They are briefly described in the following paragraphs and in more detail in the IMWP (Anchor QEA and URS et al., 2015).

Institutional Controls and Monitoring. Institutional controls—potentially including conservation easements and long-term bank monitoring and adaptive management—may be effective for certain BMAs or portions of BMAs, and may also help promote habitat restoration objectives. Since other options are more protective institutional controls may be incorporated as a supplemental design component of the overall BMA remedy design, as appropriate.

Enhanced Vegetative Stabilization. Enhanced vegetative stabilization incorporates a range of remediation and habitat restoration technologies that use the existing bank soils and slopes to enhance the bank's stability by promoting establishment of native vegetation. Within RRM 0 to 2, a range of individual BMAs (or portions of BMAs) may have slopes amenable to enhanced vegetative stabilization techniques. This approach includes bank monitoring to evaluate long-term stability.

Structural Stabilization. This approach also incorporates one or more techniques that work with the existing bank soils and native vegetation for stabilization, but uses a more intrusive approach than enhanced vegetative stabilization.

Removal and Disposal. This alternative involves the removal and off-site disposal of the targeted bank deposit. Slope reconstruction following removal may involve additional removal or shaping of bank soils and removing/replacing overlying vegetation to construct a stable bank based on the specific bank characteristics.

Since costs associated with implementing full removal and disposal are substantial and disproportionate to the marginal additional protectiveness that would be achieved beyond enhanced vegetative stabilization and structural stabilization, there may be situations where focused removal is appropriate.

Prospective Bank Management Area Remedies. Enhanced vegetative stabilization and structural stabilization best meet the RAOs and overall National Contingency Plan evaluation criteria, and are distinct from the other alternatives in achieving greater protectiveness with far less short-term impact on the environment during remedy implementation, less impact on the community, and less impact on sustainability core elements. Enhanced vegetative stabilization may also provide opportunities for habitat restoration of certain BMAs or portions of BMAs.

During interim measures design, additional investigations and evaluations will be performed to further assess which elements of the technologies summarized above are most appropriately applied to a given BMA (or portion of a BMA) based on landowner preferences, site characteristics, regulatory requirements, and other factors. The interim measures design evaluations will further refine the remedy for each BMA, likely including appropriate combinations of technologies to specific situations.

5.1.2 Terrestrial

The human health risk assessment shows limited potential for human health risks for the terrestrial exposure areas evaluated under current land uses using conservative assumptions. As a result, the risk estimates presented in the HHRA provide a conservative yet meaningful basis upon which to evaluate remedial actions for AOC 4. Exposure pathways that were identified as being of potential concern under current or future potential land use conditions will be carried forward for further consideration as appropriate. Remedial options will be considered, and remedial measures recommended insuring the human health protectiveness. In addition, a soil assessment strategy has been developed collaboratively with VDEQ to address potential exposure issues regarding surficial floodplain soils under possible future use and activities (Figure 3-1).

The nature and extent of mercury in the floodplain within AOC 4 indicates that mercury uptake (primarily by soil invertebrates), and methylation by soil microbes is the primary concern for ecological exposure. Therefore, the primary goal involving the riparian and terrestrial habitats in AOC 4 is to reduce mercury bioavailability for uptake and methylation. The Floodplain Pilot Study and several ongoing SRST investigations are being conducted in an effort to understand the efficacy of biochar to reduce mercury bioavailability in soils without causing any unintended adverse effects. The use of biochar in the Phase 1A IRM was based on these inputs from the SRST.

Lastly, since a significant portion of the ecological exposure on the floodplain is contributed by aquatic migration and exposure pathways, IRMs constructed in the river also contribute to overall improvement of terrestrial exposure areas on the floodplain. Long-term terrestrial exposure monitoring will provide data to evaluate and explain potential trends.

5.1.3 RCRA Balancing Criteria

Final designs for individual BMAs will be tailored to site-specific bank characteristics, and follow landowner preferences, access agreements, and regulatory agency approvals. Each BMA remedial alternative outlined in Section 5.1.1 above was evaluated in consideration of both the NCP criteria and the seven RCRA balancing criteria described in Section 5.0 of the Remediation Proposal (Anchor QEA and URS et al., 2013). Evaluation of the effectiveness of the different BMA remedial alternatives focused on short- and long-term reduction in MeHg exposure, and improving bank and in-channel habitat functions in both the short- and long-term. From this evaluation, Alternative 2 (Enhanced Vegetative Stabilization) and Alternative 3 (Structural Stabilization) proved to be distinct from the other alternatives in achieving greater protectiveness with far less short-term impact on the environment during remedy implementation, less impact on the community, and less impact on sustainability of core design elements (Anchor QEA and URS et al., 2015).

5.1.4 Timeframe for Achieving RAOs

An important element of the EAM is its ability for on-going evaluation of the efficacy of the remedial measures to achieve the remedial goals. Short-term and long-term monitoring plans

have been developed as part of the IMWP to evaluate the effectiveness of the remedial actions relative to short- and long-term RAOs. The short-term (2-10 years) and the long-term (>10 years) monitoring plans have similar overall goals, but differ in spatial and temporal aspects. Short-term monitoring is spatially limited (e.g., to specific bank areas and the Site) and focused on relative rapid reduction of mercury loading locally at individual locations, whereas the long-term monitoring applies to the improvements at the watershed level. Details of each of the plans can be found in Appendices D and E, respectively, of the Phase I IMWP (Anchor QEA and URS et al., 2015).

Another aspect of the monitoring plans is the ability, over time to identify and eliminate redundant datasets, or datasets which do not contribute to the overall understanding of the system or the remedy. Where this is the case, documentation will be provided to VDEQ that supports the redundancy and potential elimination of collection of that dataset.

Owing to the likely long term nature of the remedy, two vehicles have been incorporated into the program to encourage communication, and protect property owners and DuPont. An Environmental Covenant under the Uniform Environmental Covenant Act (UECA) will be executed between DuPont and the VDEQ for each BMA. In addition, a long term maintenance requirement will be documented for each parcel in a BMA specific Maintenance Plan for each BMA.

6. Additional Considerations

A number of additional elements critical to the success of the program are briefly addressed in this section.

6.1 Community Involvement Plan

DuPont is committed to implementing remedial actions on the South River and SFS River in a manner that protects human health and the environment. A key part of this process is the involvement of community stakeholders. As such, DuPont has developed a Community Involvement Plan that incorporates a variety of both traditional and innovative methods that are used to inform and seek feedback from community stakeholders prior to and during remedial activities. DuPont will continue its existing community involvement and outreach efforts to enhance the understanding and compliance with the fish consumption advisories. The Community Involvement Plan will be revised as the project progresses and project needs change.

Outreach plan tools used to facilitate community involvement include: the SRST office located in the center of Waynesboro, hosting community informational meetings, a newsletter, information bulletin boards, SRST website, public fact sheets, a frequently asked questions flyer, mailing lists, and telephone and electronic mail. These tools are described in detail in the Community Involvement Plan (DuPont, 2014).

6.2 South River Science Team

As discussed above, the SRST is a multi-stakeholder, collaborative program, formed in 2001 to reassess legacy mercury in the South River and SFS River. It includes representatives of academia, local, state and federal government, non-government organizations, researchers, consultants and DuPont. Over the years the SRST has been instrumental in vetting technical issues, directing and performing data collection and generally guiding the overall program. A variety of key inputs that influenced direction of the program were vetted through the SRST, including:

- Consideration of the importance of fish habitat in the remedy
- Incorporation of ‘biochar’ in the remedy
- Replacing lethal fish collection with nonlethal tissue plug collection

6.3 Promotores de Salud

Region-specific demographics require targeted outreach activities aimed at unique populations. In 2010, the SRST, working through James Madison University, developed a community outreach program, called Promotores de Salud, that takes a more interactive approach to communicating the fish consumption advisory to non-English speaking populations in the community. Promotores are members of the local community who educate fellow residents in the watershed regarding fish consumption. The program provides educational materials on mercury and promotes improvements to general health and well-being of the local Hispanic, Russian and Arabic speaking populations.

6.4 Deliverables

Several major program decisions and directions have been captured in key RCRA documents. Table 4-1 provides a list of approved program deliverables. Additional key deliverables shared with VDEQ to date include:

- *Final Phase 1A Design Package*
- *Annual Short-term Monitoring Report*
- *Long-term Monitoring Report*
- *Surficial Soil Strategy* (Figure 4-1)

6.5 Program Schedule

The initial schedule for Phase 1 IRM design and construction was aggressive by design in order to expedite the overall program schedule. Stakeholder discussions resulted in significant program level schedule delays, and reduction in extent of Phase 1 construction. Construction of the Phase 1 IRM was delayed nearly eight months, and only one (Constitution Park) of three BMAs was approved and constructed. Based on this learning, DuPont will continue to work toward design and follow-on IRMs at locations providing the greatest load reductions, with property owners willing to move forward.

Design, permitting and construction of follow-on Phase 1B AOC 4 IRMs are anticipated to occur in 2017 and 2018, with design and construction of the remaining Phase 1 BMAs targeted for 2018-2020. DuPont and VDEQ will update the project schedule at least quarterly during the Phase 1 IRM design period. Meetings will be scheduled as needed to facilitate progress of ongoing efforts, and to resolve any issues that may arise.

The nature of the EAM framework remedy can influence the current schedule, particularly in subsequent remedial phases as monitoring data are collected and evaluated. Any schedule modifications would be based on direction from the VDEQ.

7. Summary

7.1 Conceptual Strategy

The AOC 4 remedial strategy and IRM were developed collaboratively and documented in several regulatory approved deliverables including the Remediation Proposal (Anchor QEA and URS et al., 2013), and the IMWP (Anchor QEA and URS et al., 2015). The undertaking has spanned more than a decade of investigation, evaluation, collaboration and documentation involving multiple stakeholder members of the SRST. This document serves as an abbreviated CMS, and summary of the agreements and intent of the existing AOC 4 program strategies, so they are incorporated into the program as it matures.

7.2 Remedial Strategy

Based on the AOC 4 conceptual system models, and the AOC 4 HHRA and ERA, aquatic exposure and migration pathways pose the greatest potential threat to both aquatic and terrestrial receptors. As such, the initial phase of the remedy involves addressing river bank soils and closely associated sediments which contribute a disproportionately high load of mercury to the aquatic system.

The goals of the AOC 4 remedy are best achieved by conducting remedial measures in an EAM approach that facilitates decision-making based on monitoring results. This type of approach requires that the river system be divided into manageable segments, beginning with source controls at the former Waynesboro Site, followed by addressing banks and adjacent in-channel bed sediments in a successive upstream to downstream sequence. The outcome of the Phase 1 IRM will help adjust the scope of subsequent phases as part of an iterative learning process, recognizing the importance of natural variability in ecological systems, and variability in measures of effectiveness of remedial measures. Short-term and long-term monitoring plans are an important part of the IMWP to evaluate the effectiveness of the remedial actions relative to short- and long-term RAOs, and to provide input to the EAM decision process.

7.3 Additional Considerations

There are a number of elements critical to the success of the program, particularly the inception of the SRST in 2001. The SRST ensures that all issues are thoroughly vetted by stakeholders before moving forward, and that the process is sufficiently transparent.

The Ecological Study Report (URS, 2012) and Remediation Proposal (Anchor QEA and URS et al., 2013) were approved by the NRDC prior to AOC 4 being incorporated into RCRA. Key RCRA program decisions and directions have been captured in the following VDEQ approved deliverables:

- *RCRA Facilities Investigation Report*
- *Final Phase 1A Design Package*
- *Annual Short-term Monitoring Reports*
- *Long-term Monitoring Report*
- *Surficial Soil Strategy Framework*

DuPont's goal is to maintain an aggressive remediation schedule within the parameters of the program and SRST. Property ownership and stakeholder involvement can result in unforeseen impacts. The nature of the EAM framework will also influence schedule, particularly in subsequent remedial phases as monitoring data are collected and evaluated. Any schedule modifications would be based on direction from the VDEQ.

8. References

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Tables

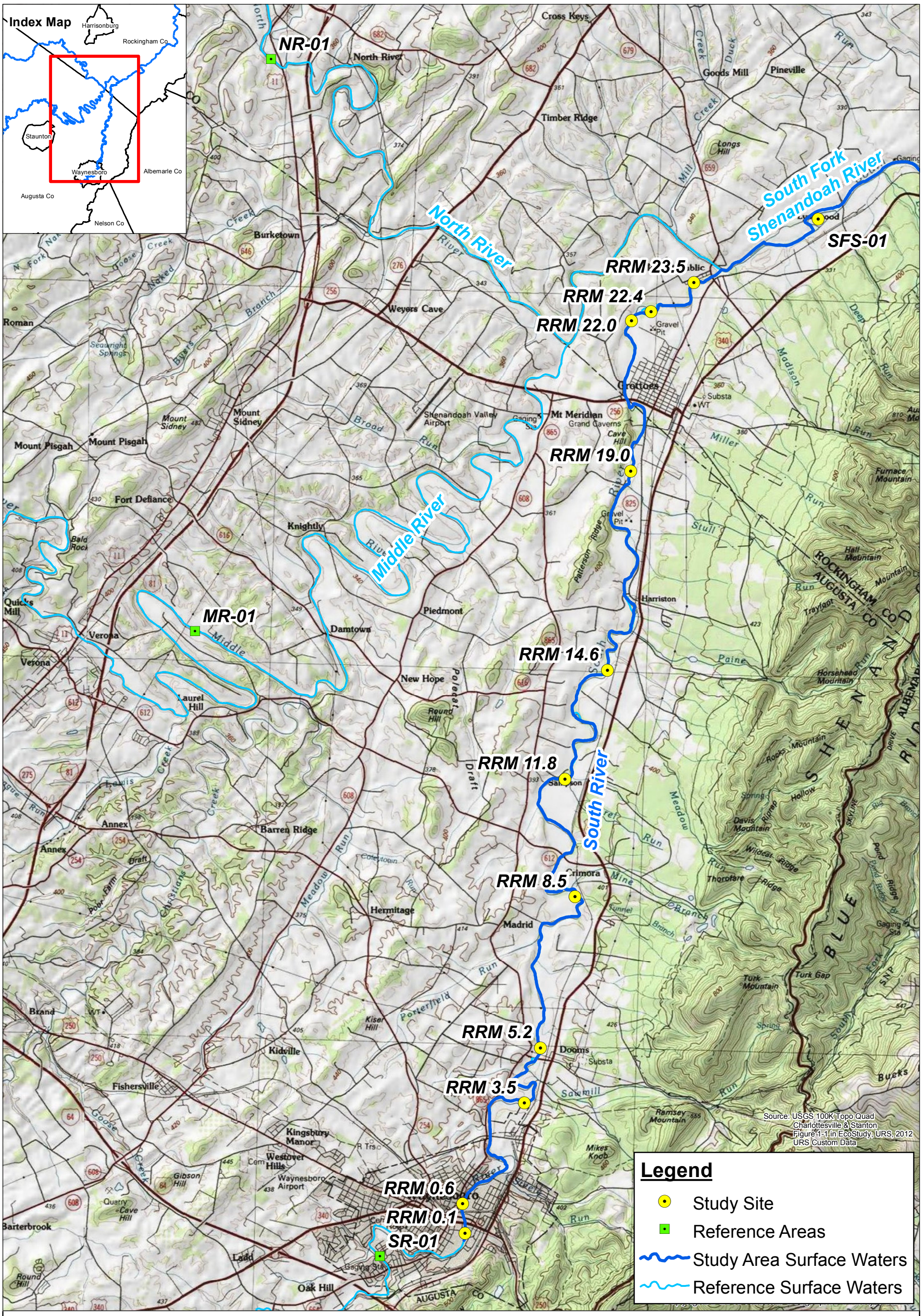
Table 4-1
Key RCRA Program Deliverables
AOC 4 Remediation Selection Process
Former DuPont Waynesboro Site, Area of Concern 4
South River and a Segment of the South Fork Shenandoah River, VA

Deliverable	**Final Document Submital / Agency Approval[1]**
AOC-4 HASP	4/4/2014
AOC-4 RFI Report (Excluding Risk Appendices)	11/13/2015
AOC-4 QAPP	8/29/2014
Community Involvement Plan	10/20/2014
AOC-4 Phase I Interim Measures Design, Implementation, and Monitoring Work Plan	3/25/2015
AOC 4 Phase IA Final Basis of Design Report	10/6/2016
WWTP Remedial Design	*6/19/2017*
Short-Term Monitoring Plan	8/29/2014
Long-Term Monitoring Plan	8/29/2014
AOC 4 Short-Term Monitoring Data Summary - 2016	3/1/2017
AOC 4 Baseline Long-Term Monitoring Report - 2016	*6/19/2017*
AOC 4 Annual Short-Term Monitoring Report - 2016	7/24/2017
Human Health Risk Assessment	11/13/2015
Ecological Risk Assessment	7/13/2015
Retrospective Data Quality Assessment	9/2/2014
Non-RCRA Soils Approach Memo	3/18/2016
Surficial Soils Strategy	*6/21/2017*
AOC 4 Final Remediation Process Selection Report	*9/19/2017*

Notes:

1 - Documents that are still in the Agency review process are shown with italicized dates.

Figures



AECOM

E. I. du PONT de NEMOURS & COMPANY

SOUTH RIVER PROJECT

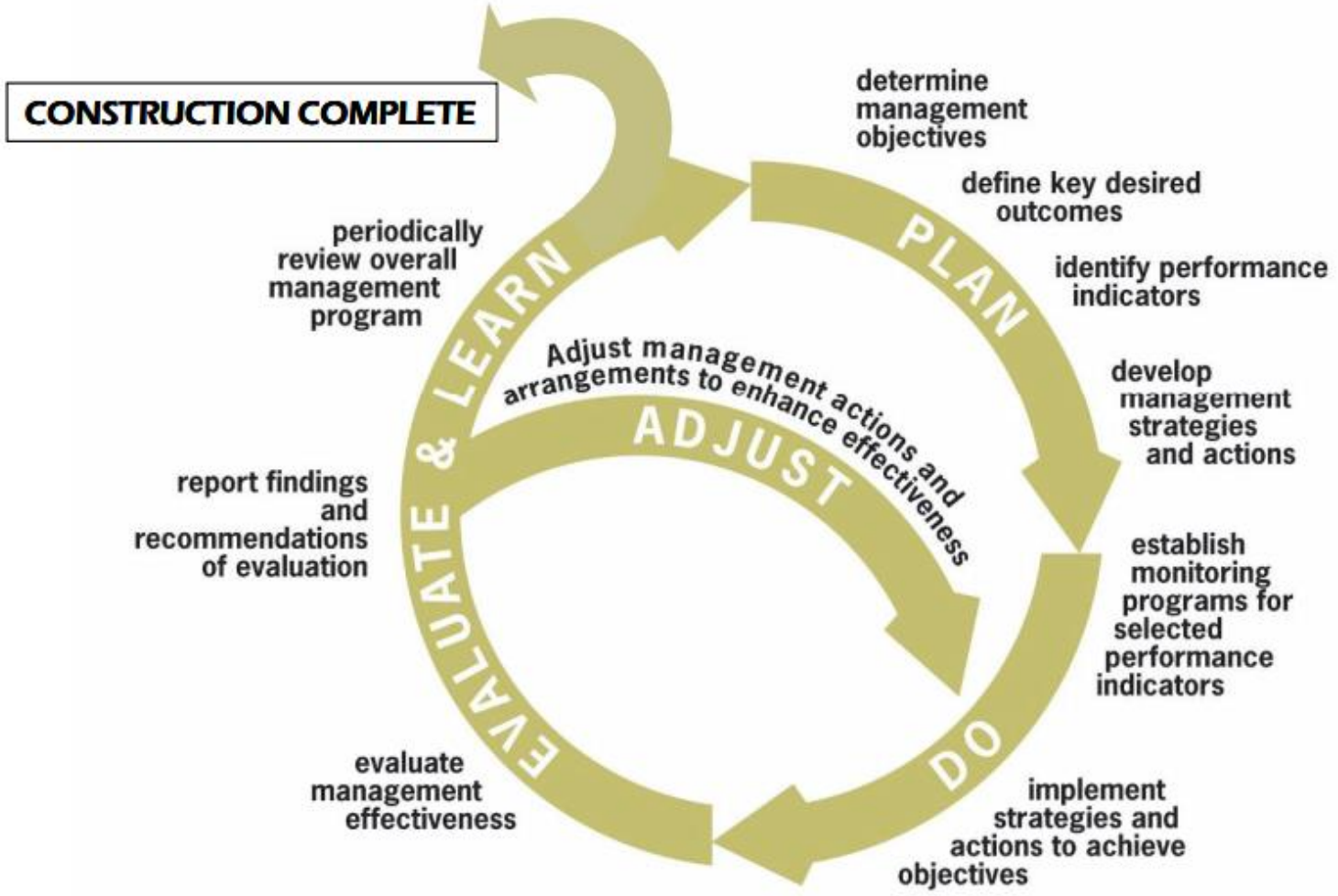
PROJECT NO. 18986307

0 0.5 1 2 3 Miles

Figure 1-1
AOC 4 Study Area
Remediation Selection Process
Former DuPont Waynesboro Site
Area of Concern 4
South River and a Segment of the South Fork Shenandoah River, Va

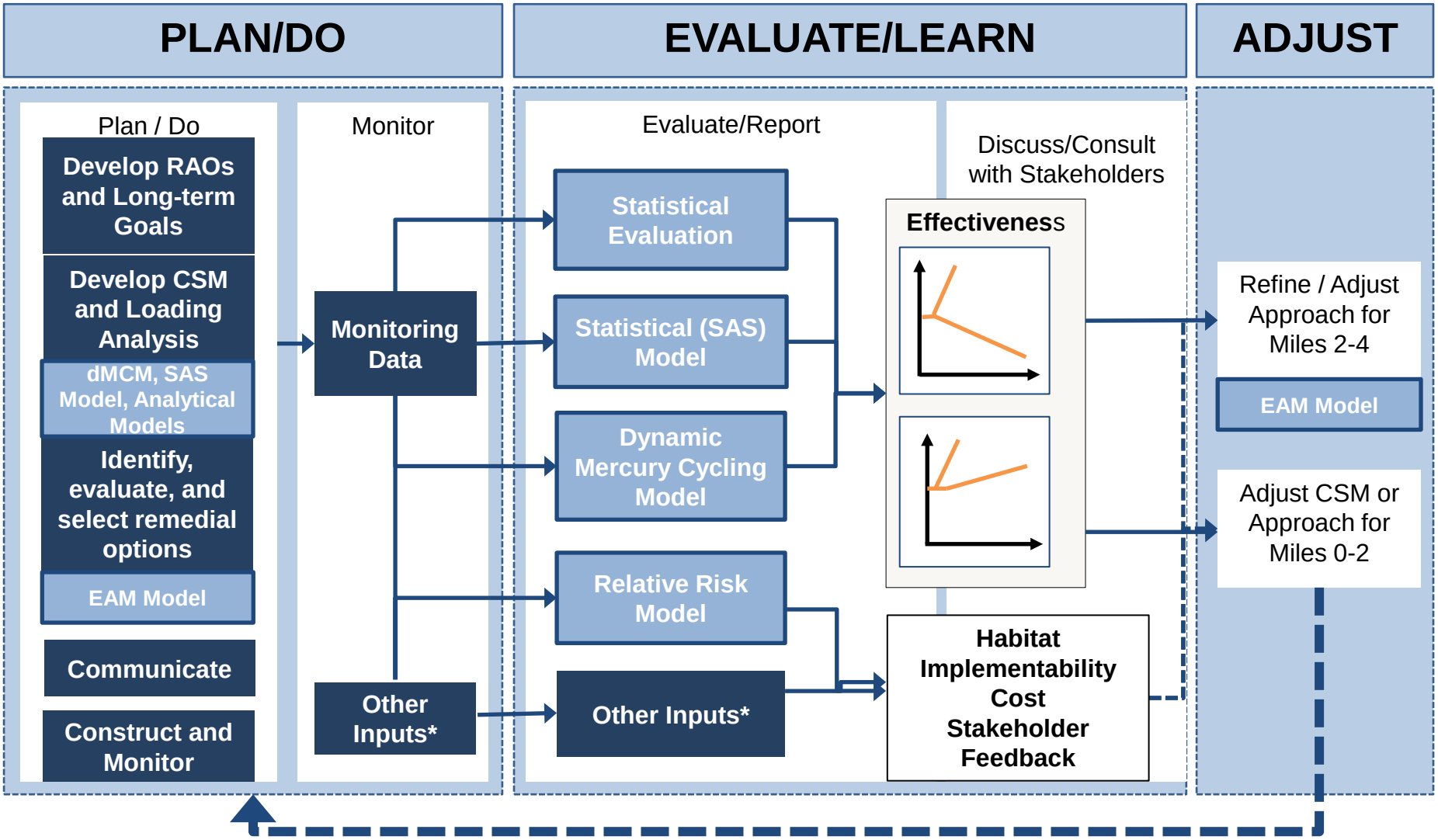
Path: S:\Temporary\ECO.tmp\Marie\AOC 4 Remediation Selection Process\Figure 1-1 Investigation Area Overview Map_06212017.mxd

Figure 1-2
Enhanced Adaptive Management Framework
AOC 4 Remediation Selection Process
Former DuPont Waynesboro Site, Area of Concern 4
South River and a Segment of the South Fork Shenandoah River, VA



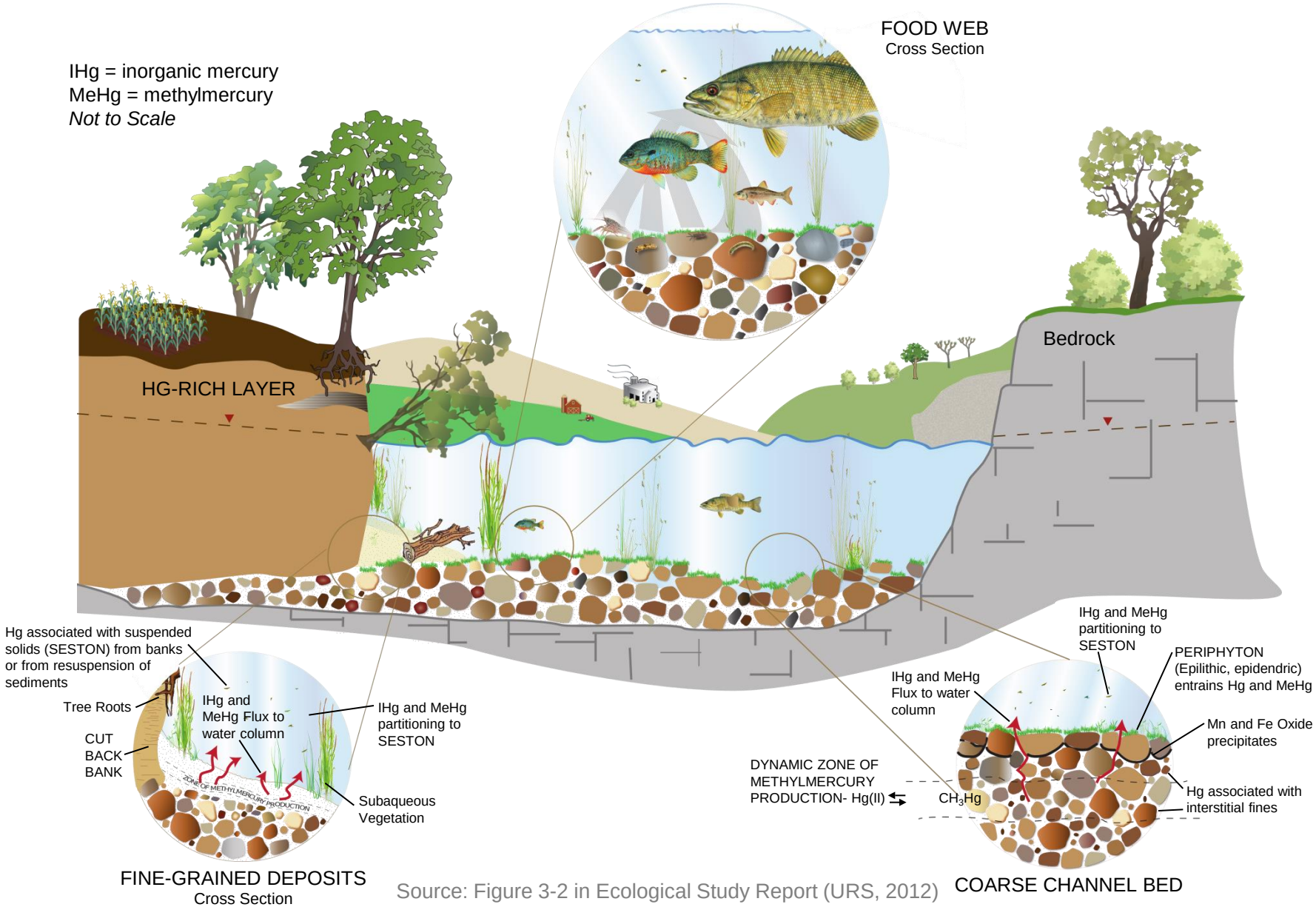
Source: Adopted from Anchor QEA and URS (2013) and Jones (2005)

Figure 1-3
Integration of adaptive Management and RCRA Process
AOC 4 Remediation Selection Process
Former DuPont Waynesboro Site, Area of Concern 4
South River and a Segment of the South Fork Shenandoah River, VA



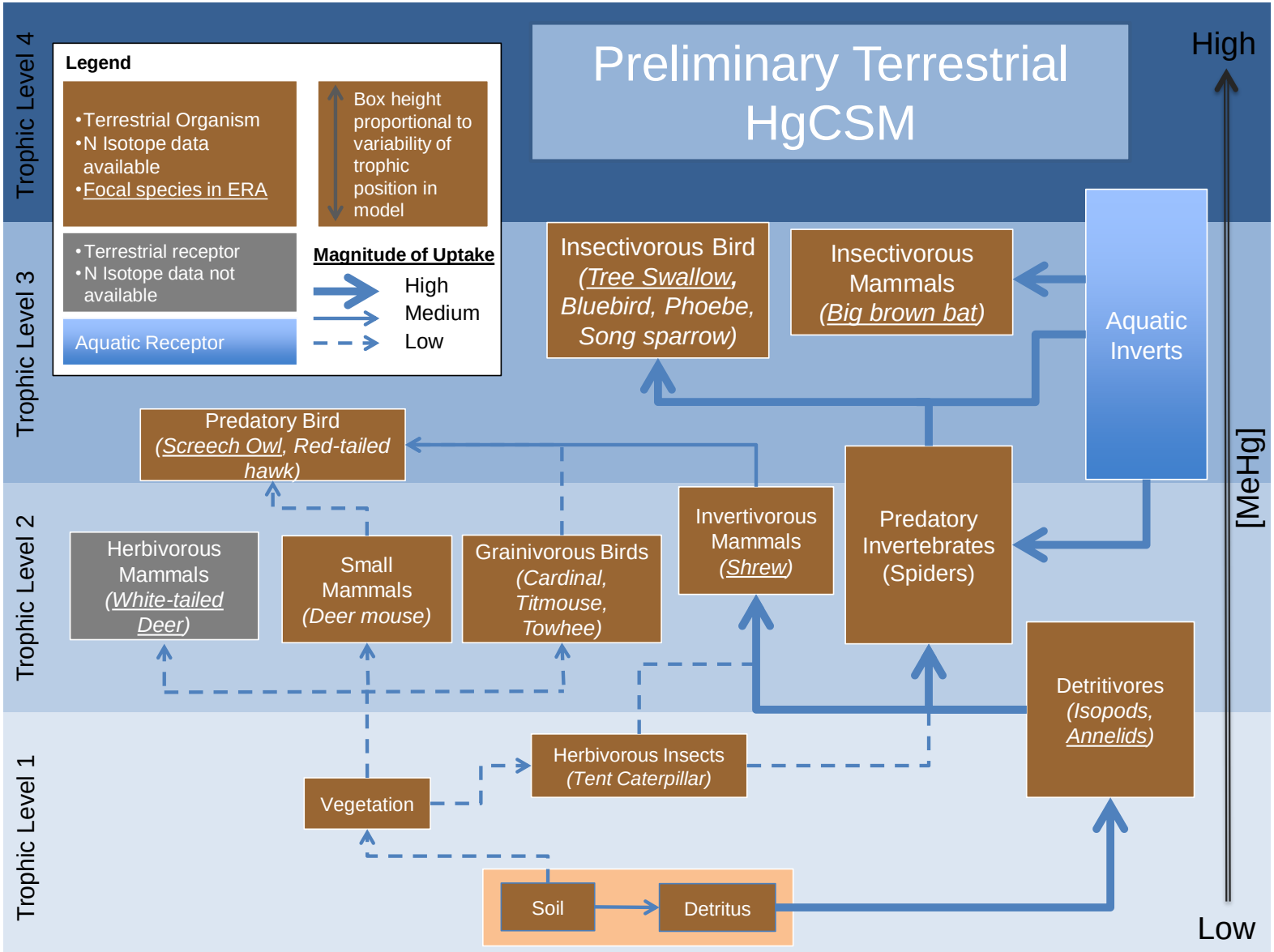
*Other Inputs include: Habitat condition improvements, permitting and implementation issues encountered and actual costs

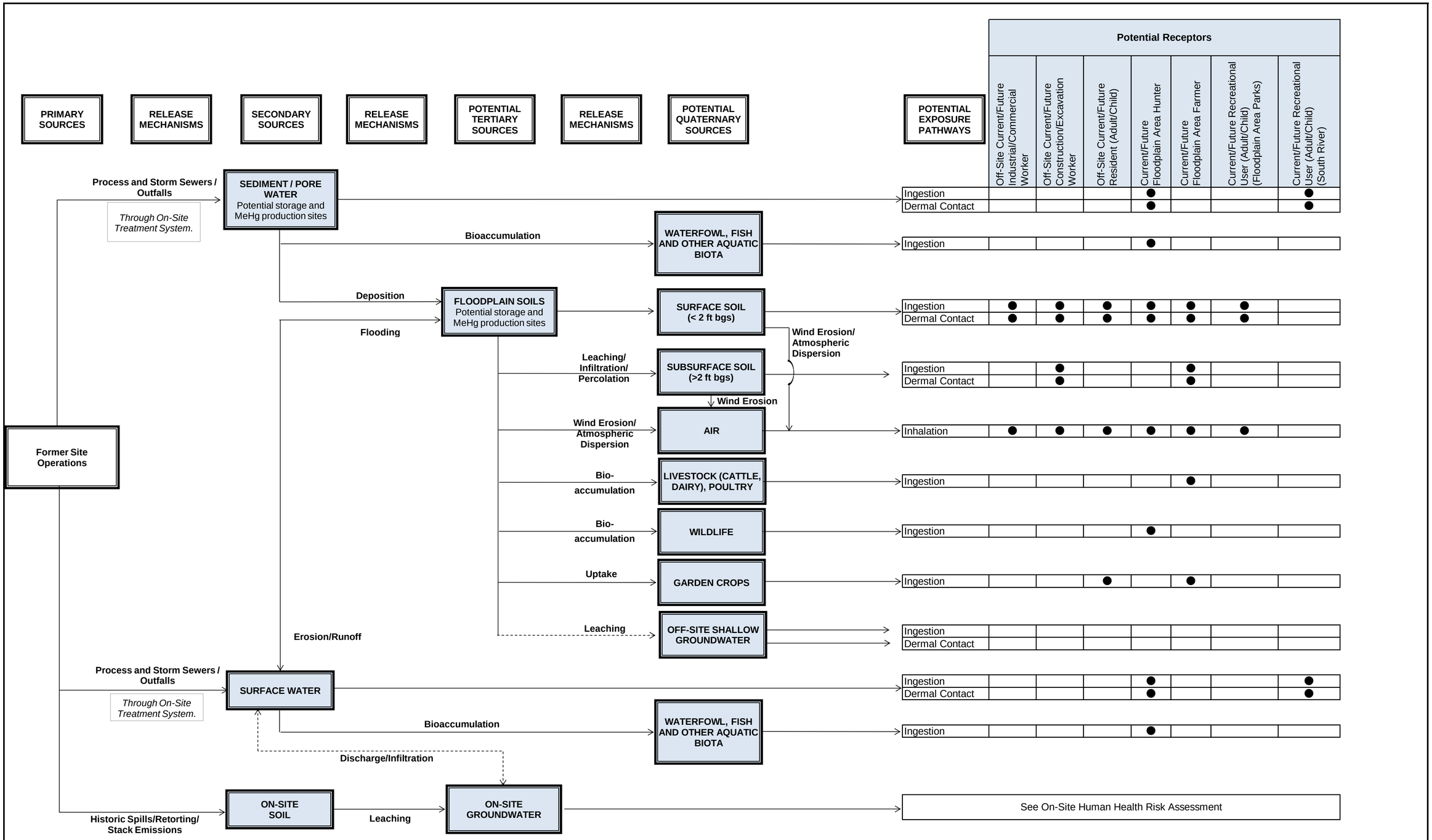
Figure 2-1
Aquatic Mercury Conceptual System Model
AOC 4 Remediation Selection Process
Former DuPont Waynesboro Site, Area of Concern 4
South River and a Segment of the South Fork Shenandoah River, VA



Source: Figure 3-2 in Ecological Study Report (URS, 2012)

Figure 2-2
Terrestrial Mercury Conceptual System Model
AOC 4 Remediation Selection Process
Former DuPont Waynesboro Site, Area of Concern 4
South River and a Segment of the South Fork Shenandoah River, VA





Notes: ● POTENTIALLY COMPLETE EXPOSURE PATHWAY
BLANK = INCOMPLETE EXPOSURE PATHWAY
-·→ LIMITED OR INSIGNIFICANT CONTAMINANT MIGRATION PATHWAY
—→ CONTAMINANT MIGRATION PATHWAY
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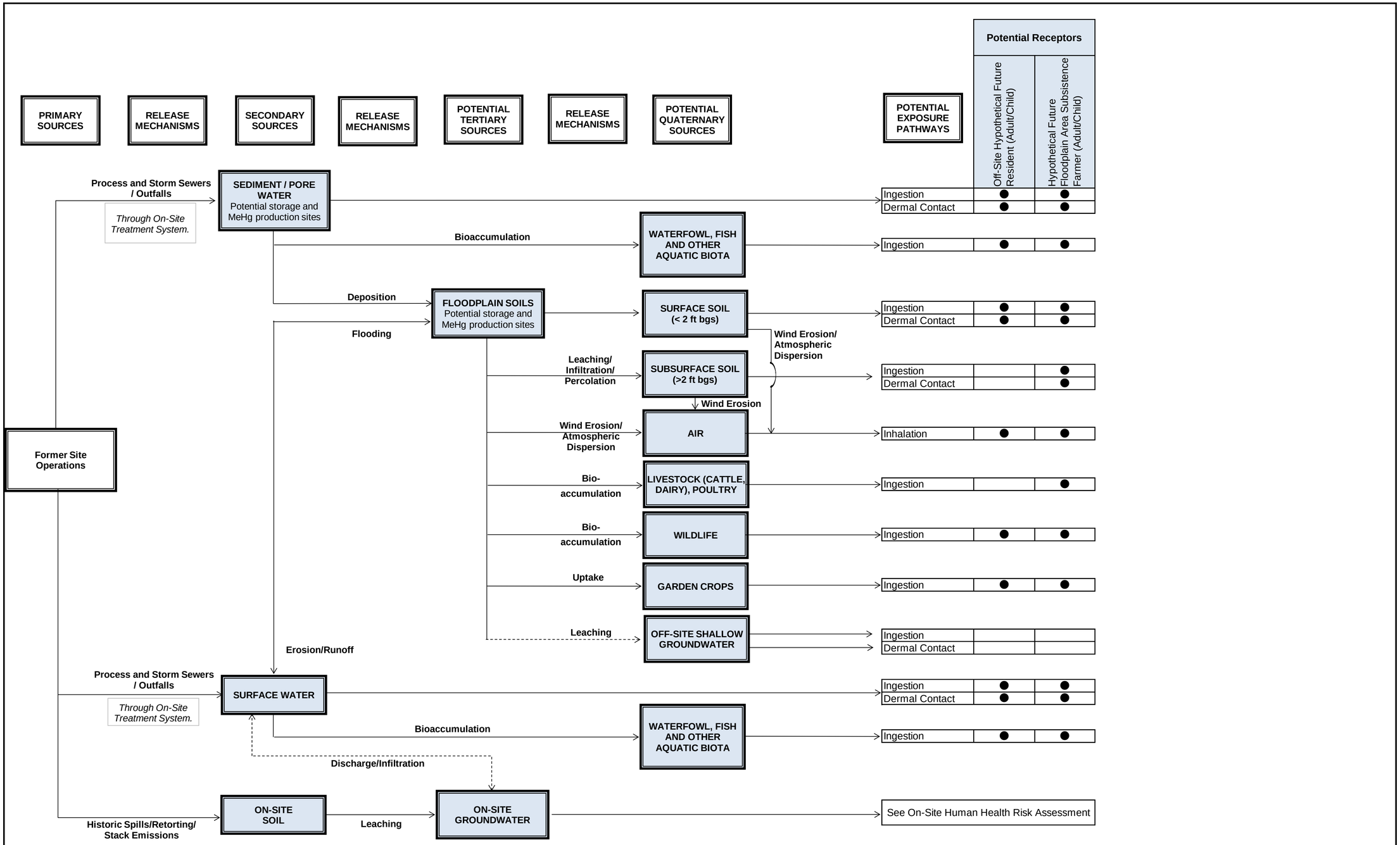
AOC 4 Human Health Conceptual Site Model, Current/Future Land Use

Former DuPont Waynesboro Site, Area of Concern 4

South River and a Segment of the South Fork Shenandoah River, VA

1/27/2014

Figure 2-3a



Notes: ● POTENTIALLY COMPLETE EXPOSURE PATHWAY

BLANK = INCOMPLETE EXPOSURE PATHWAY

- - → LIMITED OR INSIGNIFICANT CONTAMINANT MIGRATION PATHWAY

→ CONTAMINANT MIGRATION PATHWAY

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AOC 4 Human Health Conceptual Site Model, Hypothetical Future Land Use

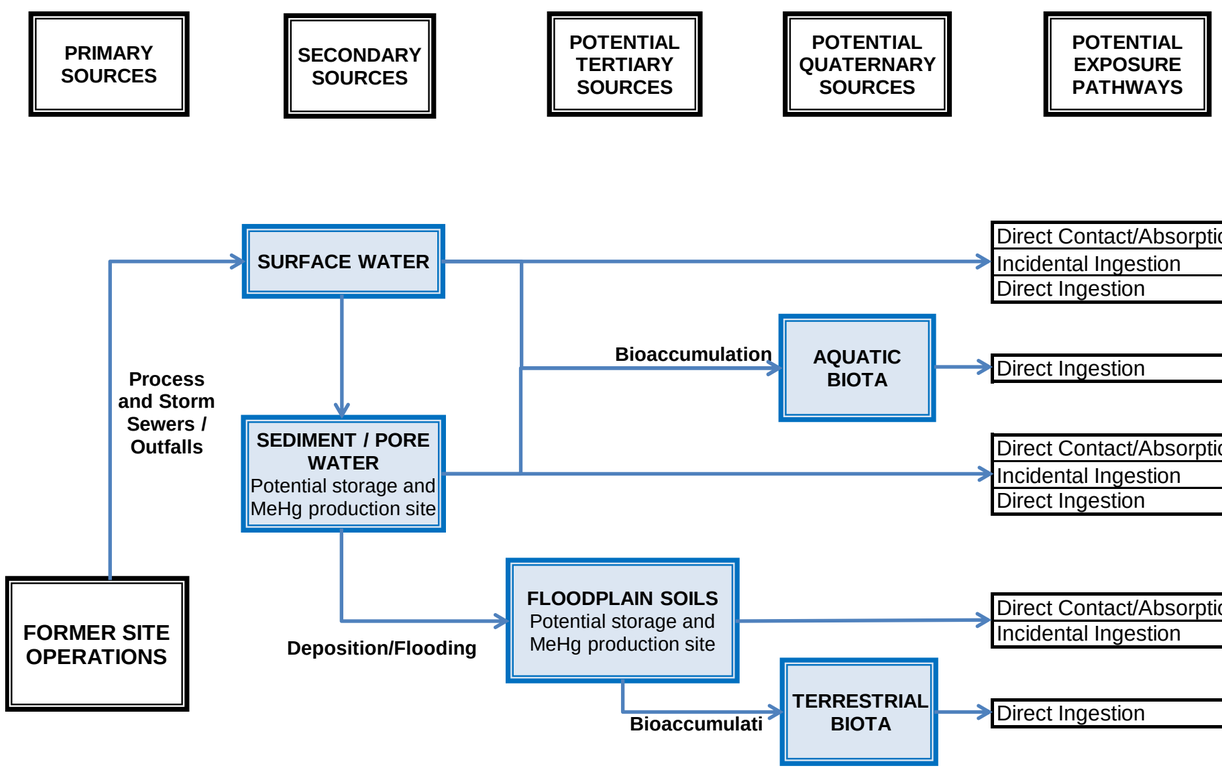
Former DuPont Waynesboro Site, Area of Concern 4

South River and a Segment of the South Fork Shenandoah River, VA

1/27/2014

Figure 2-3b

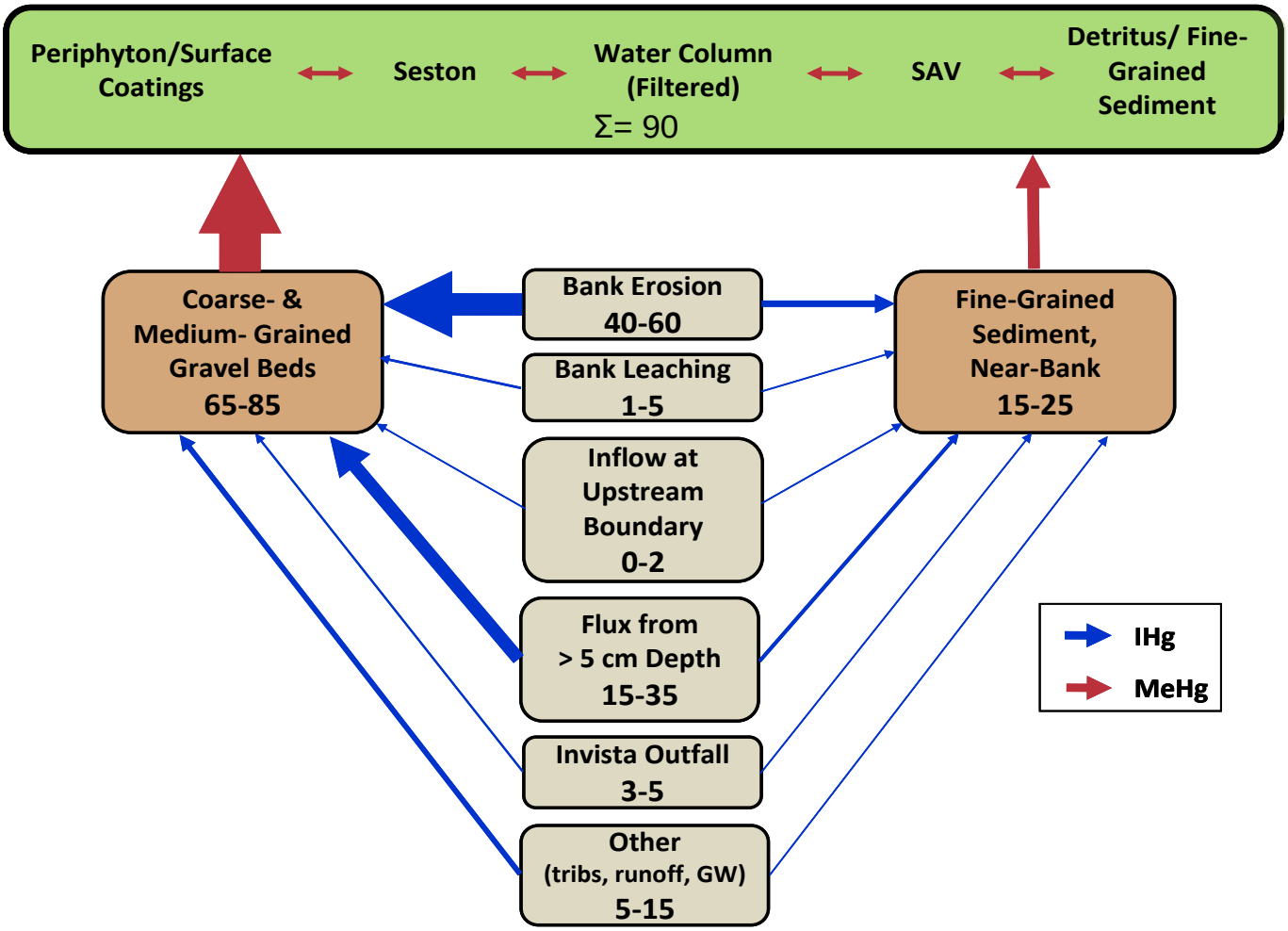
Figure 2-4
Ecological Conceptual Site Model
AOC 4 Remediation Selection Process
Former DuPont Waynesboro Site, Area of Concern 4
South River and a Segment of the South Fork Shenandoah River, VA



	Potential Receptors															
	Aquatic			Semi-Aquatic					Terrestrial							
	Benthic Macroinvertebrates	Fishes	Submerged Aquatic Vegetation	Amphibians	Reptiles	Piscivorous Birds	Omnivorous Birds	Piscivorous Mammals	Terrestrial Vegetation	Soil Invertebrates	Insectivorous Birds (Aerial)	Insectivorous Birds (Terrestrial)	Carnivorous birds	Aerial Insectivorous Mammals	Invertivorous Mammals	Herbivorous Mammals
Direct Contact/Absorption	●	●	●	●	●	--	--	--			--	--	--	--		
Incidental Ingestion	○	○		○	○	●	●	●			--	--	--	--	--	--
Direct Ingestion	--	--				●	●	●			●	●	●	●	●	●
Direct Ingestion	○	●		●	●	●	●	●			●		●	●		
Direct Contact/Absorption	●	○	●	●	●	--	--	--					--			
Incidental Ingestion	○	○		○	○	●	●	●					●			
Direct Ingestion																
Direct Contact/Absorption				○	○	--	--	--	●	●	--		--		--	--
Incidental Ingestion				○	○	●	●	●		○	--		●		●	●
Direct Ingestion		○		●	●	--	●	●		○	●		●	●	●	●

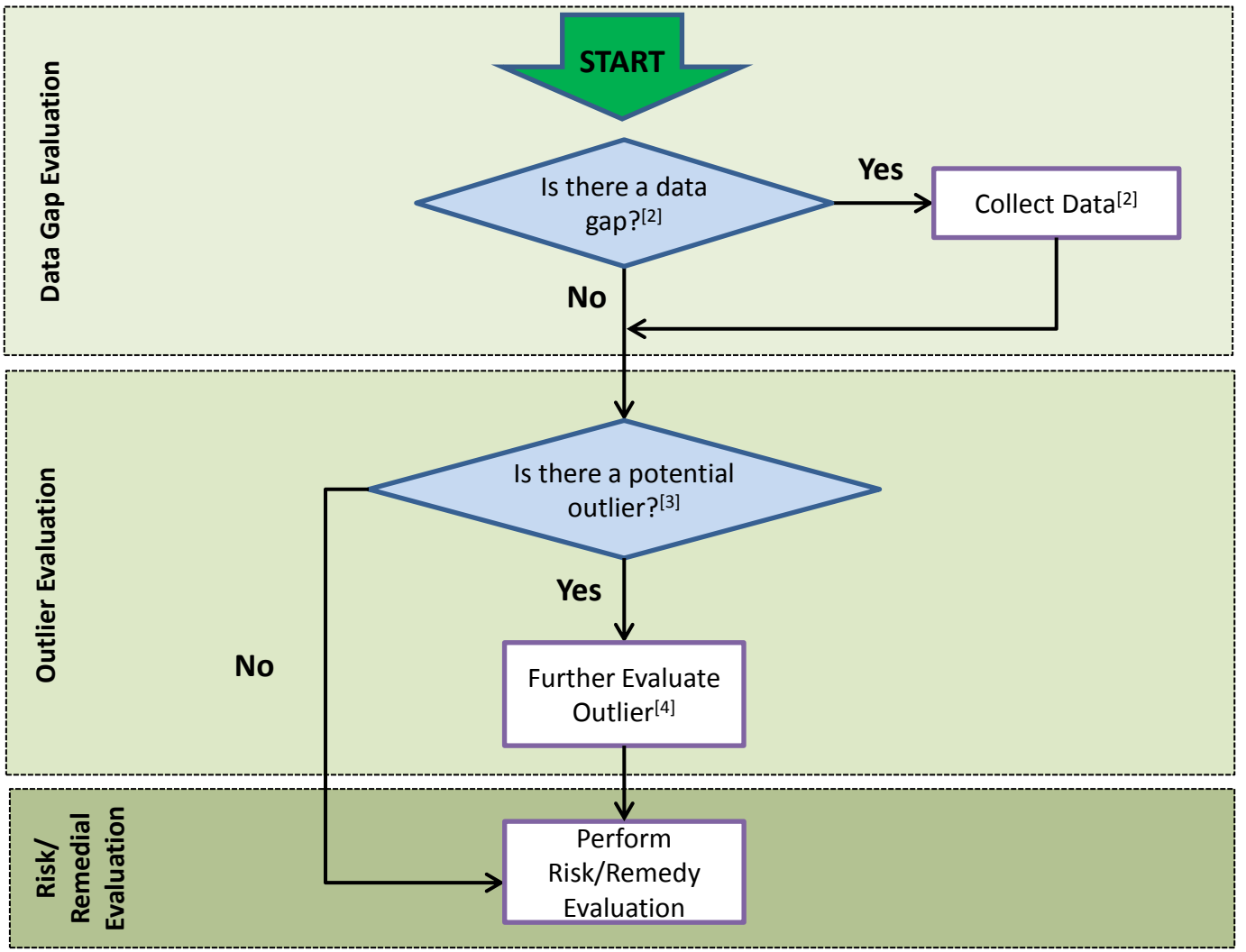
Notes:
→ CONTAMINANT MIGRATION PATHWAY
● POTENTIALLY COMPLETE EXPOSURE PATHWAY
○ SECONDARY EXPOSURE PATHWAY; NOT DIRECTLY QUANTIFIED
-- EXPOSURE PATHWAY IS POTENTIALLY COMPLETE BUT INSIGNIFICANT
BLANK = INCOMPLETE EXPOSURE PATHWAY
INCIDENTAL INGESTION OF SURFACE WATER DURING FEEDING IS NOT AN APPLICABLE PATHWAY

Figure 3-1
Sources of Inorganic Mercury under Baseflow Conditions
AOC 4 Remediation Selection Process
Former DuPont Waynesboro Site, Area of Concern 4
South River and a Segment of the South Fork Shenandoah River, VA



Notes: The schematic depicts the movement of inorganic mercury (IHg; blue arrows) from the sources (gray boxes) in the South River to areas of mercury methylation (brown boxes); the red arrows show the movement of methylmercury from areas of methylation to the base of the food web (green box). The thickness of the arrow and the range of values within each box represents the magnitude of the IHg or MeHg flux. This schematic describes the important sources between RRM 0 and 10 under baseflow conditions.
Source: Figure 6-21 in Ecological Study Report (URS, 2012)

Figure 4-1a
Surficial Soil Strategy
AOC 4 Remediation Selection Process
Former DuPont Waynesboro Site, Area of Concern 4
South River and a Segment of the South Fork Shenandoah River, VA[1]



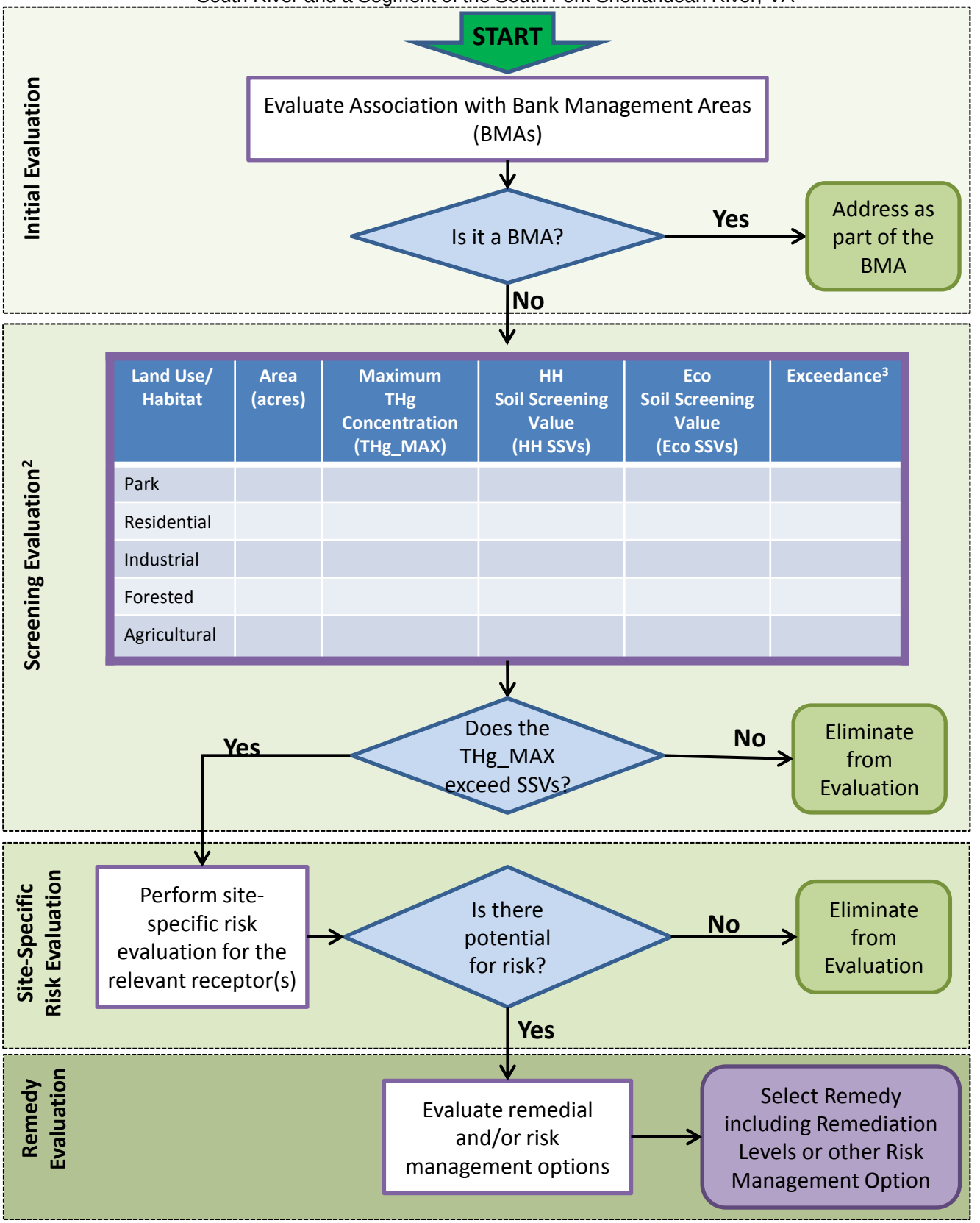
Notes:

[1] Process will be applied to discrete exposure areas as defined by potential exposure associated with current land use.

[2] Data gap evaluation will be based on data density, and spatial and temporal representativeness of the existing data; If a data gap is identified, additional data will be collected in consultation with VDEQ.

[3] Potential for outliers will be based on the magnitude of observed concentrations.

Figure 4-1b
Surficial Soil Strategy
AOC 4 Remediation Selection Process
Former DuPont Waynesboro Site, Area of Concern 4
South River and a Segment of the South Fork Shenandoah River, VA[1]



Notes:

[1] Process will be applied to discrete areas as defined by potential exposure associated with current future potential use.

[2] Exposure area to be categorized based on current land use and available habitats (Eco) and current and future use (HH)

[3] The outcome of the Screening Evaluation will be either NA (not applicable), No [i.e., Maximum THg Concentration (THg_MAX) < Applicable Soil Screening Value (SSV)] or Yes (i.e., THg_MAX > Applicable SSV).

[4] Site-specific Risk Evaluation only for the relevant receptors (human or ecological) for which the THg_MAX exceeds applicable SSVs.

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