

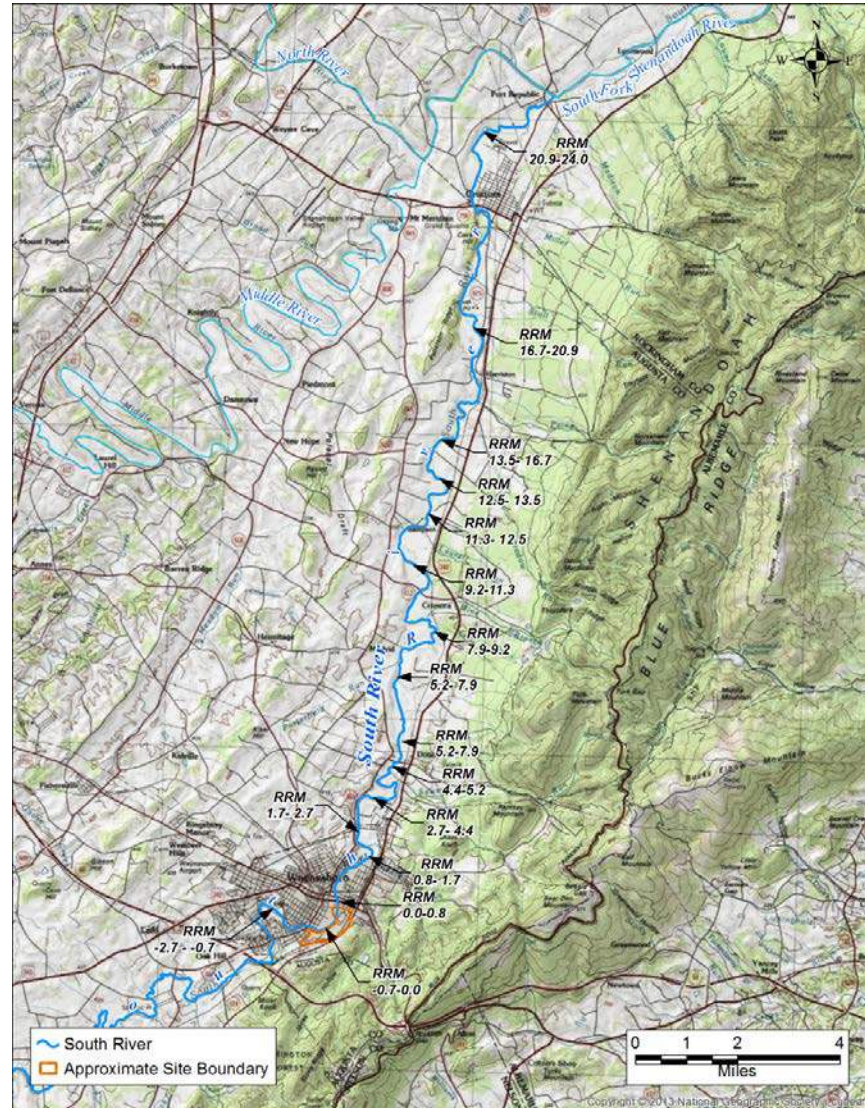
AOC 4 RCRA Status

Former DuPont Waynesboro Site, Virginia

South River Science Team Meeting
October, 21, 2015

Agenda

- Background
- RCRA Facility Investigation (RFI)
- Ecological Risk Assessment (ERA)
- Human Health Risk Assessment (HHRA)
- Path Forward



Background



1929:
Mercuric sulfate
use in acetate
rayon fiber
production begins

1929

1950:
Mercuric sulfate
use stops

1950

1976-1984

1976-1984:
Discovery and
investigation
culminating in 100-year
monitoring program



1999

1999:
Fish tissue levels
not decreasing as
predicted

2001

2001:
DuPont and VDEQ
launch collaborative
effort



2005:
Consent Decree

2005-2013

2005-2013:
Investigations (2005-2008)
Ecological Study Report (2012)
Remediation Proposal (2013)

2001-Present:
SRST Studies

1985-1998:
State agencies
collaborate to
implement the 100-
year monitoring

2014-Now

2014:
RCRA Permit
Modification

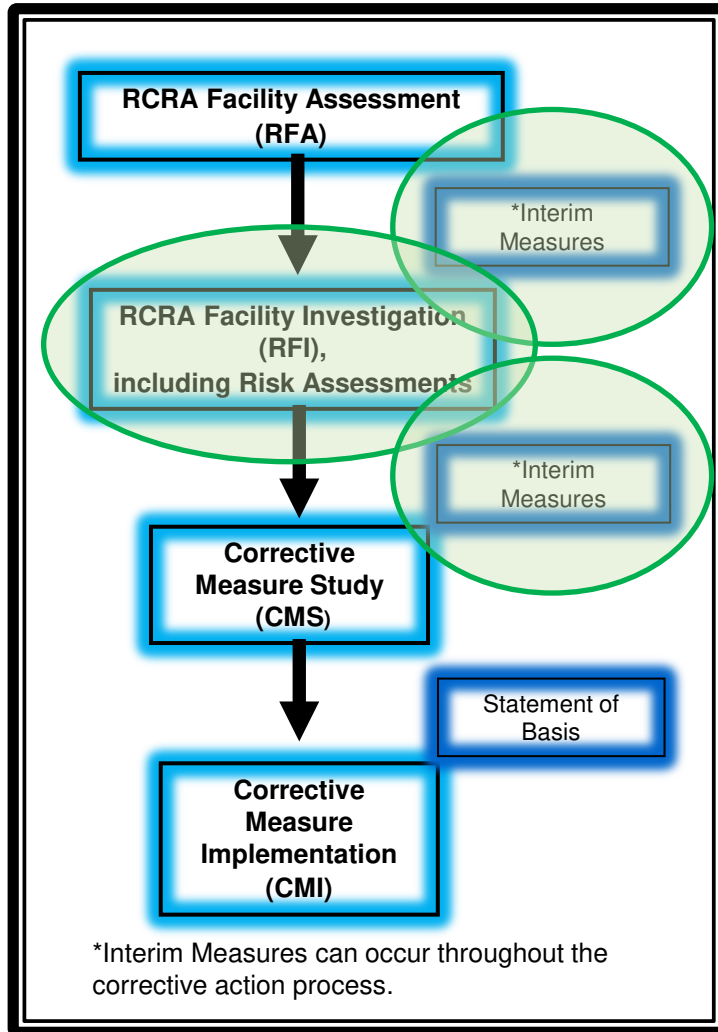
2015:
Prelim
Design/Permit

2015



Background

APPROVED
DATE: 04 FEB 2014



- VDEQ approved Class 2 Permit Modification to include AOC 4 for site-wide corrective action
- Triggered typical RCRA requirements

Deliverables	Approval
RFI Report	Pending
ERA Report	July 13, 2015
HHRA Report	Pending

Regulatory Oversight and Collaboration

- DEQ Project Manager:
 - Full-time oversight due to nature and scope of unique project
- Other DEQ Staff
 - Support Project Manager as needed
- Contracted Oversight Support
 - Provide oversight support for ERA and engineering review similar to Superfund site



- Typical RCRA Approach
 - More rigid than collaborative approach
 - Less collaboration and review prior to formal document submittal
- Collaborative Approach continues, with additions...
 - Assure that RCRA requirements are met
 - Refine process as lessons are learned

RCRA Facility Investigation (RFI)

- 37,000 samples collected:
 - Surface water ~ 9,200 samples;
 - Soil ~ 4,900 samples;
 - Sediment ~ 2,300 samples; and
 - Biota ~ 20,900 samples



RFI – Media-Specific Findings

- Floodplain Soils:
 - THg decreased away from the banks and downstream
 - THg highest in the 2- and 5-year floodplains and within forested areas
 - 93% of soil samples < 23 mg/kg
- Bank Soils:
 - THg varied spatially, but highest concentrations occurred between RRM 0 and 11.6
- In-Channel Sediment:
 - THg highly variable in the channel margin deposits
 - THg generally increased in interstitial sediment between RRM 0 and 8.7 and declined farther downstream

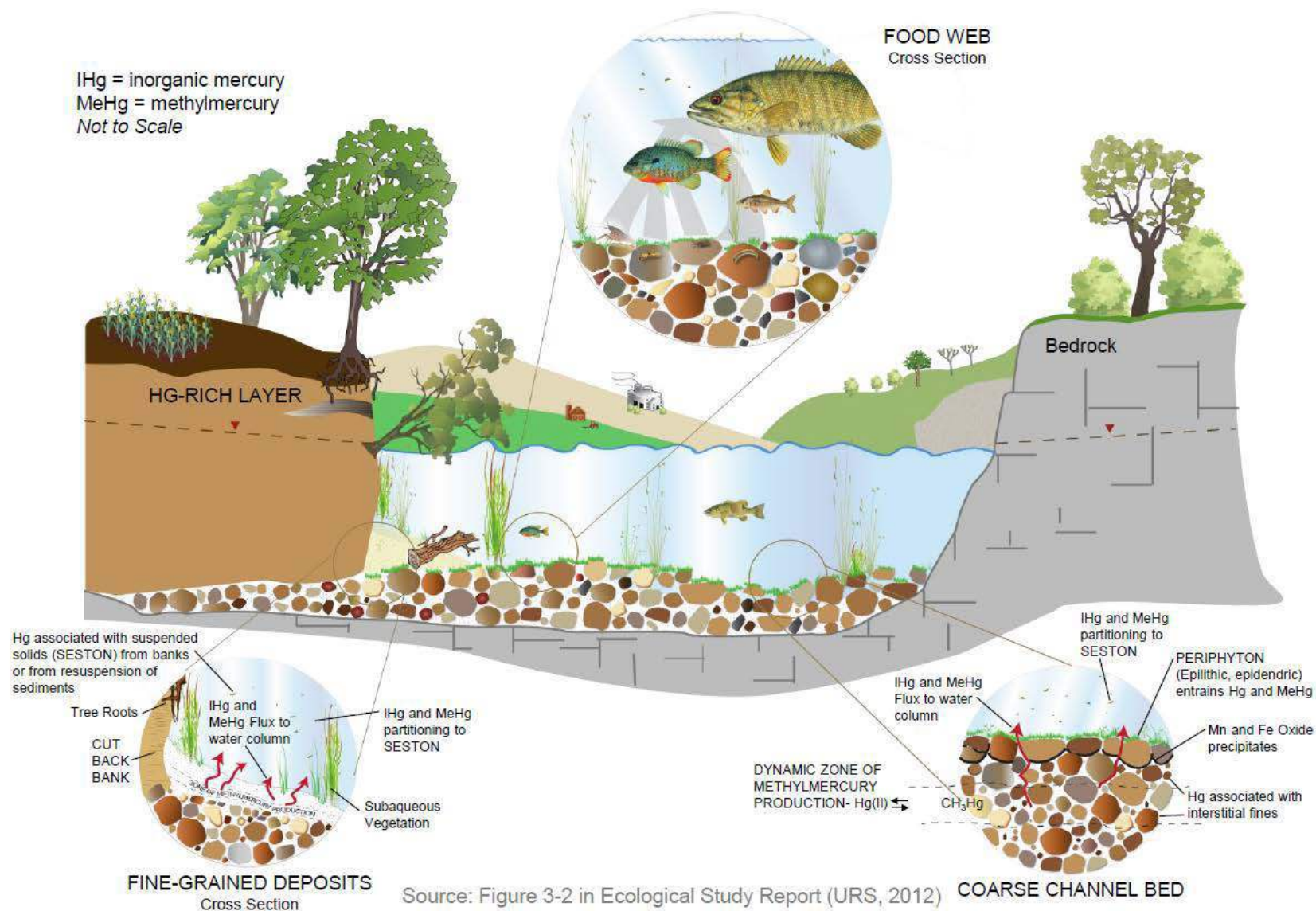
RFI – Media-Specific Findings

- Surface Water:
 - Under baseline conditions, particulate IHg generally increase immediately downstream of RRM 0, reach a maximum at RRM 5.2, remain relatively constant until ~ RRM 12, and then decrease
 - Areas of the highest MeHg widely dispersed, but generally the highest between RRM 10 and 12
 - Strong seasonality in MeHg concentrations and loadings, suggesting a role of methylation
- Biological Tissue:
 - Tissue MeHg higher in higher trophic level species (e.g., smallmouth bass)
 - Relatively high tissue MeHg observed in areas beyond RRM 12

RFI – Key Findings

- Greatest mercury sources occur primarily in the first 12 river miles:
 - River banks
 - Outfalls from the former facility
 - In-stream sediment
- Elevated tissue mercury downstream of RRM 12 and the upper segment of the SFS

RFI – Conceptual System Model



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

Ecological Risk Assessment (ERA)

- Assessed potential ecological risks to support remedial/risk decision-making for AOC 4
- Followed Ecological Risk Assessment Guidelines for the Superfund (ERAGS; EPA, 1997)
- Relied on Retrospective Data Quality Assessment (RDQA) and Conceptual Site Model (CSM)
- Considered 16 Assessment Reaches:
 - A reference reach (RRM -2.7 to -0.7)
 - A buffer reach (RRM -0.7 to 0)
 - 13 reaches between RRM 0 and 24
 - A segment of the SFSR downstream of RRM 24
- Applied a Weight-of-Evidence (WoE) Approach

ERA – Receptors



- Aquatic Receptors:

- Benthic macroinvertebrates
- Larval and emergent aquatic invertebrates
- Fish species [largemouth bass (*Micropterus salmoides*) and smallmouth bass (*Micropterus dolomieu*)]
- Aquatic plants

- Semi-Aquatic Receptors:

- Amphibians
- Piscivorous birds [belted kingfisher (*Megaceryle alcyon*)]
- Omnivorous birds [mallard duck (*Anas platyrhynchos*)]
- Piscivorous mammals [river otter (*Lontra canadensis*)]

- Terrestrial Receptors:

- Plants
- Invertebrates (earthworms)
- Invertivorous birds [Tree swallow (*Tachycineta bicolor*) and American robin (*Turdus migratorius*)]
- Carnivorous birds [Eastern screech owl (*Megascops asio*)]
- Invertivorous mammals [Big brown bat (*Eptesicus fuscus*), short-tailed shrew (*Blarina brevicauda*)]
- Herbivorous mammal [white-tailed deer (*Odocoileus virginianus*)]

ERA – Key Findings

- Aquatic Receptors:
 - No potential risks via the direct contact pathways
 - Potential risks via the *bioaccumulation* pathway (by invertebrates and fish species)
- Semi-Aquatic Receptors:
 - Uncertainties generally biased toward overestimation of potential risks
 - Potential risks not ruled out for amphibians and piscivorous birds due to *bioaccumulation and/or dietary exposures* to methylmercury
- Terrestrial Receptors:
 - Uncertainties generally biased toward overestimation of potential risks
 - Potential risks not ruled out for carnivorous birds, invertivorous songbirds, and bats due to *dietary exposures* to methylmercury

Human Health Risk Assessment (HHRA)

- Evaluated potential exposure of human receptors to mercury
- Relied on data assessed as part of RDQA
- Findings provide risk information sufficient for remedial decisions consistent with EPA and VDEQ requirements



HHRA – Approach

- Conceptual site models (CSMs) developed collaboratively with VDEQ
- Evaluated mercury in:
 - South River sediment and fish
 - Floodplain area soil and pond fish
 - Floodplain area potential food sources (such as livestock, poultry, garden crops or wildlife)
- Potential receptors included:
 - Recreational users of floodplain area parks and the river
 - Residents, workers, hunters, farmers
- Exposures via ingestion, inhalation, and dermal contact in all exposure scenarios

HHRA – Key Findings

- Under current land uses, potential health hazards to mercury in floodplain soil identified in few forested, agricultural or commercial/industrial areas where direct human contact is infrequent
- Fish consumption advisory: People should continue not to eat fish from the South River
- Waterfowl, game, and other animals may be safely eaten to some degree over the course of a year
- Livestock and poultry (muscle) and garden crops also safe to eat to some degree



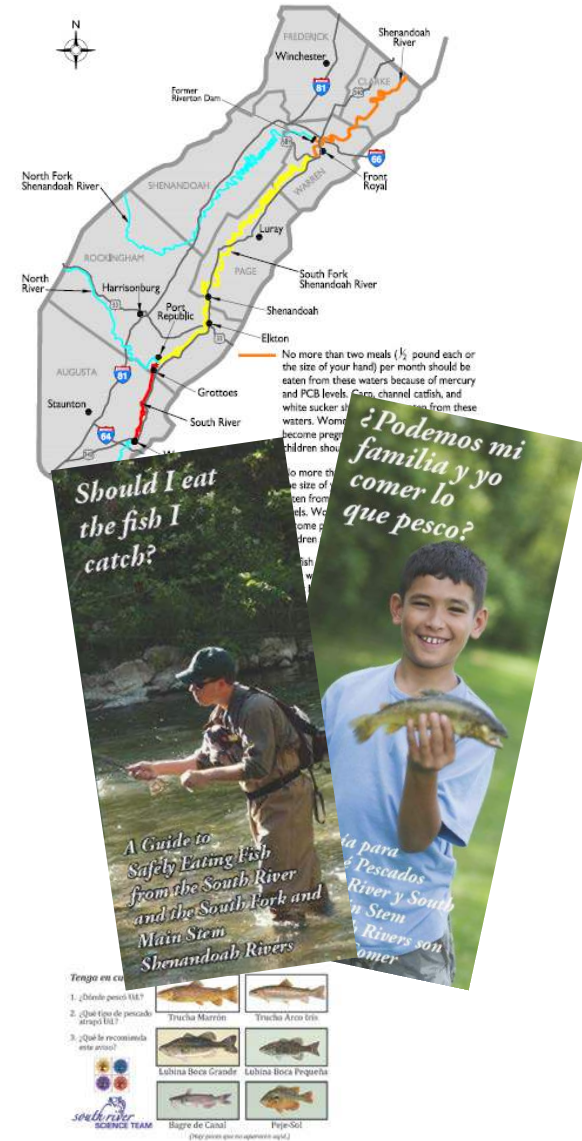
Although mercury is present in fish and other animals from the South River watershed, research conducted by the South River Science Team indicates that these animals (other than fish) may be safely eaten in the amounts shown each year without being a health concern.

Key RFI Findings

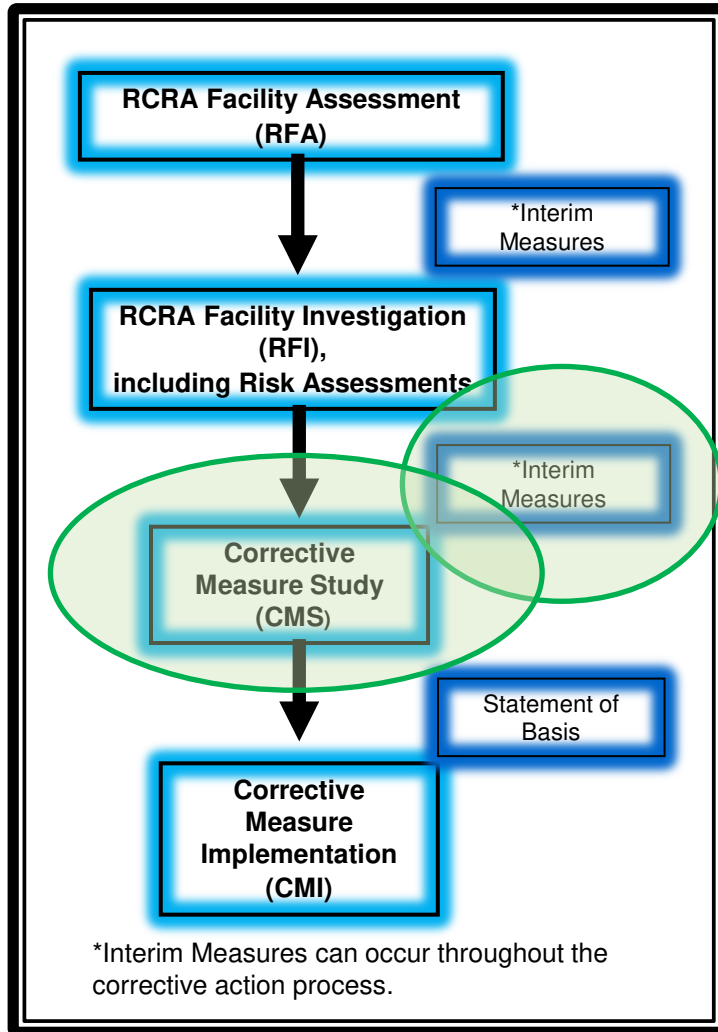
- Primary contributor to mercury loading via bank erosion, in the upper reaches (RRM 0 to 12)
- **Key ecological concern:** *trophic transfer of MeHg* up the aquatic and through the aquatic-terrestrial food webs
- **Key human health concern:** *dietary exposure pathway* – primarily via fish consumption

Recommendations

- Enhanced Adaptive Management (EAM) Framework:
 - Magnitude, complexity, and uniqueness
 - Ongoing refinement/revision of the CSM
 - Flexibility and opportunity to learn and adapt
- Combination of Corrective Actions:
 - Interim measures – Bank management
 - Fish advisory and community outreach
 - Ecological/biota monitoring



Path Forward



- Implementation of Further Interim Measures
- Development of CMS Report

Questions?

