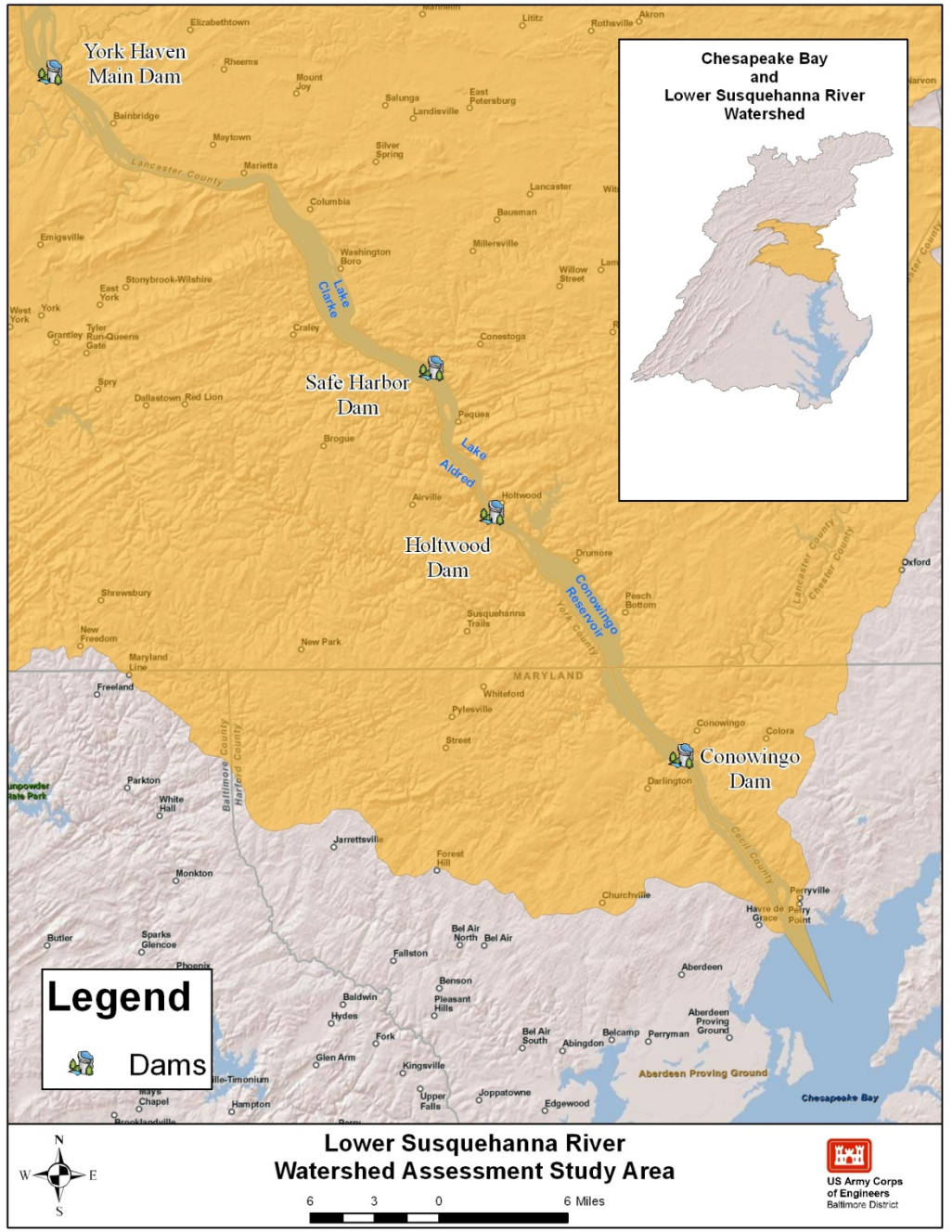
Lower Susquehanna River Watershed Assessment

Update

Maryland Department of Natural Resources

January 11, 2012



Assessment Initiation

- ✓ Funding from Congress to “restart” study – May ‘09
- ✓ Sediment Task Force Reconvened – Oct. ’09
- ✓ Scoping Kick-off meeting – June ‘10
- ✓ Scoping completed – April ‘11.
- ✓ Executed Project Management Plan/Cost-Sharing Agreement – September ‘11
- ✓ Federal funding of $250K secured – September ‘11
- ✓ Team Kick-off meeting – November ‘11

Assessment Partners

- Each agency will be providing funding and/or conducting specific tasks for the assessment.

Assessment Components

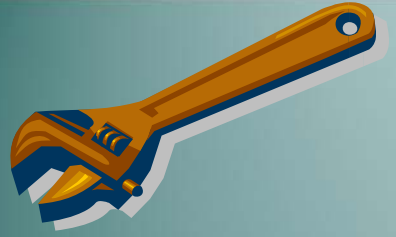
- **River Basin Assessment (Sec 729 of WRDA ‘86)**
- **Cost: $1.4 million**
- **Legal Cost-sharing sponsor: MDE**
- **75 Federal/25 Non-Federal Cost Share**
- **3 Years**

Assessment Components

- **Identification of sediment management strategies (Dredging? Innovative Re-use? By-passing? Alter Reservoir Operations? Other?).**
- **Use of models to link incoming sediment and associated nutrient projections to in-reservoir processes at the hydroelectric dams.**
- **Use of models to forecast impacts of sediment management strategies to living resources in Chesapeake Bay.**
- **Integration of the MD, PA, NY Watershed Implementation Plans.**
- **Concept-level designs and costs.**
- **Will *not* lead directly to construction.**

Lower Susquehanna River Watershed Assessment
Goals & Objectives

1. **Evaluate strategies to manage sediment and associated nutrient delivery to the Chesapeake Bay.**
   - **Strategies will incorporate input from Maryland, New York, and Pennsylvania TMDL WIPS.**
   - **Strategies will incorporate evaluations of sediment storage capacity at the four hydroelectric dams on the Lower Susquehanna River.**
   - **Strategies will evaluate types of sediment delivered and associated impacts to Chesapeake Bay.**
2. **Evaluate strategies to manage sediment and associated nutrients available for transport during high flow storm events to reduce impacts to the Chesapeake Bay.**
3. **Determine the effects to the Chesapeake Bay from the loss of sediment and nutrient storage from behind the hydroelectric dams on the Lower Susquehanna River.**



Modeling Tools

1. CBP Partnership-Watershed Model
   - Sediment and nutrient loads from the watershed at key locations into the reservoirs.
2. HEC-RAS 1D Model
   - Hydrologic conditions and sediment transport into Conowingo Reservoir (from upper 2 reservoirs)
3. 2D Adaptive Hydraulics Model (ADH)
   - Erosion/deposition within Conowingo Reservoir
   - Sediment transport out of reservoir
   - Response of reservoir and flats to various scenarios.
4. CBP Partnership - Chesapeake Bay Model
   - Impact of sediments and nutrients on light attenuation; SAV; chlorophyll; DO

Conowingo Reservoir: Is 2D Modeling Adequate or Are 3D Effects Potentially Significant?

- 2D ADH model Assumption: System is well mixed therefore 2D model is appropriate for all conditions that deliver significant sediment.
- What if reservoir is stratified? (Temperature and suspended sediment concentrations under warm weather low-flow conditions)
- What about operation of reservoir? (Hydropower gates draw off water ~ 90 feet below surface).
- What if sediment input to reservoir and bedform development is substantial during low-flow conditions?

Desktop Analysis of 2D Effects

- **Purpose-** To evaluate if 2D ADH model can adequately simulate long-term sedimentation processes in Conowingo Reservoir.
- **Tasks -**
  1. Conduct a desktop analysis of sediment transport/hydrologic conditions. Utilize existing data:
     a) Residence Time curve (Exelon Hydrologic data)
     b) Flow (USGS Historical Data)
     c) Sediment Rating Curve (1D HEC-RAS model)
  2. Determine if the fate of these sediments are significantly influenced by 3D effects and recommend 2D model applicability for simulating sediment transport in Conowingo Reservoir.

Assessment Analysis Approach

1.) 2D/3D effects desktop analysis plus building initial model mesh

2D ADH model

ERDC-$45K

2.)Sediment and nutrient loads from Lower Susquehanna Watershed into reservoirs

CBP Partnership Watershed Model

EPA

3.) Sediment loads divided into grain size fractions and routed through Lake Clark and Aldred

1D HEC-RAS model

USGS-$75K

4.) Sediment load by grain size routed through Conowingo Reservoir, Dam, and the Susquehanna Flats

2D ADH model

ERDC-$270K

5.) Run selected modeling scenario

ERDC/USGS /EPA

6.) Change in total sediment load by grain size passing Conowingo and Susquehanna flats

2D ADH model

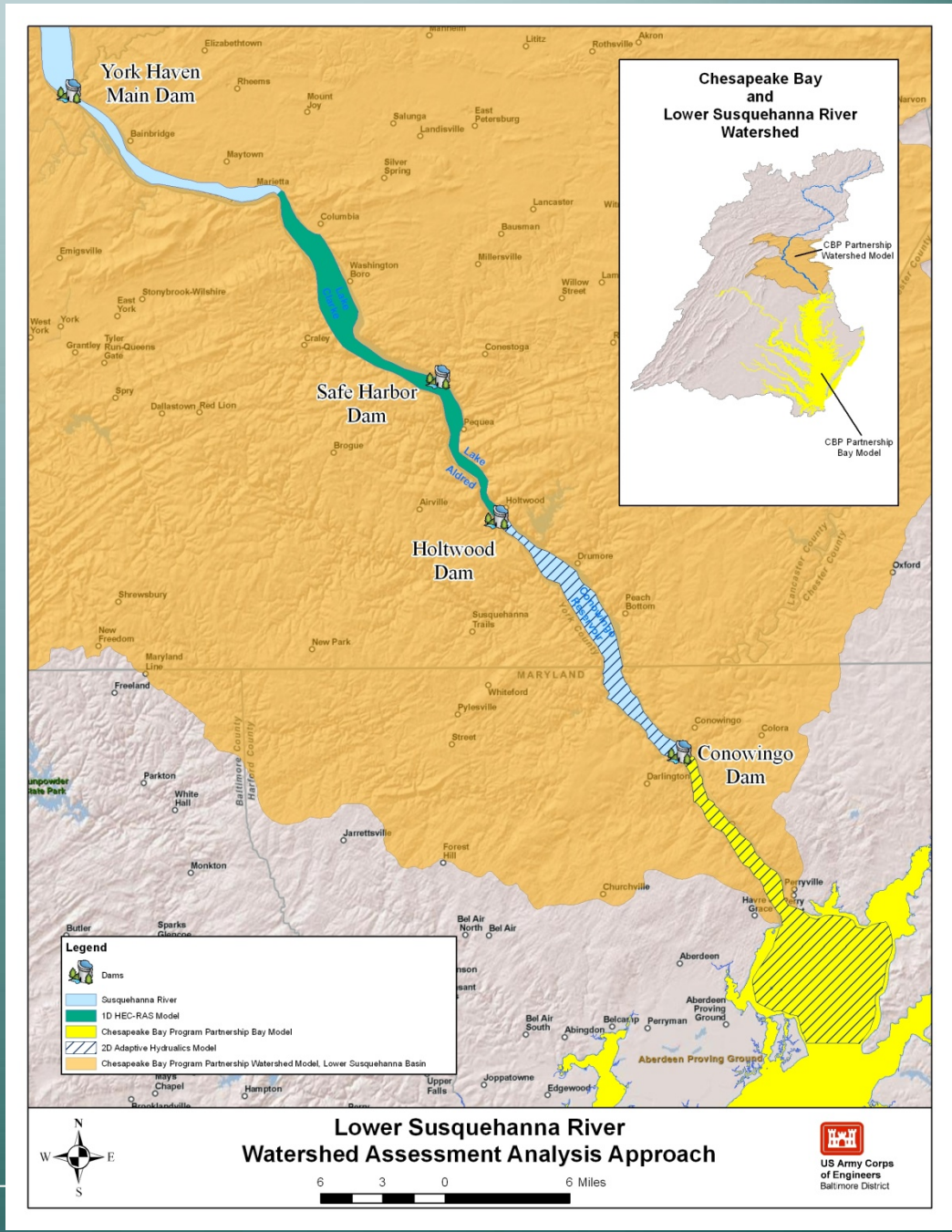
ERDC-(Costs included in Step 4)

7.) Impacts of altered sediment and associated nutrient loads on Bay

CBP Partnership Bay Model

$235.1K

Lower Susquehanna River Watershed Assessment Analysis Approach



Prospective Modeling Scenarios

1. **Base Condition** –

   WQ/sediment accumulation rate under existing conditions.

2. **Watershed Management** –

   WQ/sediment accumulation rate after implementation of TMDL's.

3. **What happens when the Reservoir Fills** –

   Impact on WQ/sediment accumulation rate to the Bay (assume TMDL's are being met).

4. **Effect of Scouring during Winter/Spring Runoff** –

   WQ/sediment accumulation rate with scouring of the bottom of a full reservoir (utilize Jan '96 event).

5. **Effect of Scouring from a Tropical Storm** –

   Same as Scenario 4 except event will occur in summer (substitute the Jan '96 event).

6. **Reservoir Bypass** –

   Impacts on WQ/sediment accumulation rates with a system bypassing sediment from behind Conowingo to below the dam.

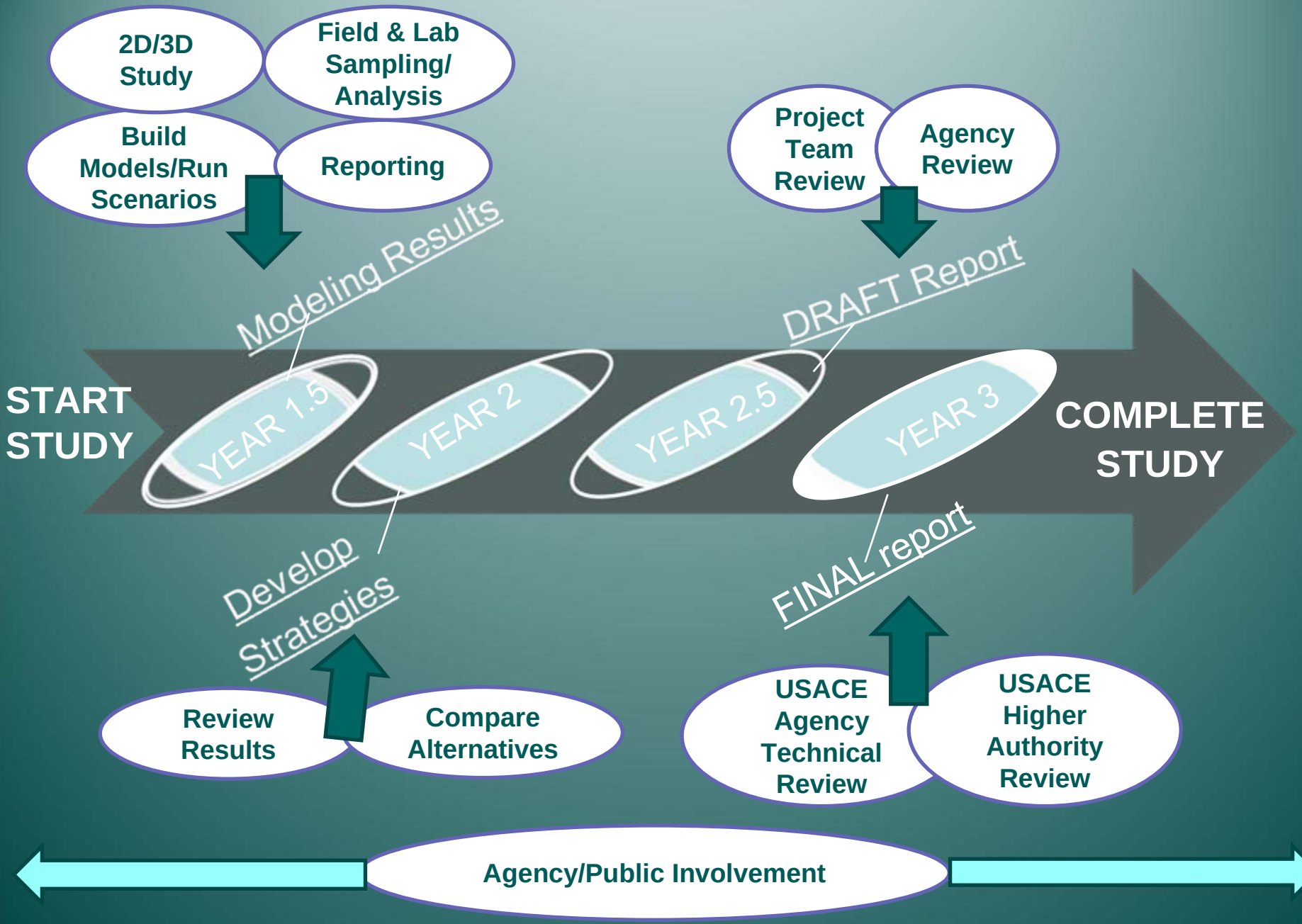
7. **Reservoir Strategic Dredging** –

   WQ/sediment accumulation rate impacts from dredging fines in potentially any reservoir.

8. **Modify Dam Operations** –

   Effects of altering the flow and/or the way the Conowingo is currently operated..

Assessment Timeline



Schedule of Upcoming Activities

2D/3D Study and Model Construction	Ongoing-Mar 2012
Data Assembly for Chesapeake Bay Model	Jan-Feb 2012
Sediment Grab Sample Collection	Feb-Mar 2012
Develop Project Website	Jan-Mar 2012
Chesapeake Bay Model Data Report	Mar 2012
Bathymetric Analysis and Data Collection	Jan-Mar 2012
Complete Initial HEC-RAS Hydraulic Model	Ongoing-Mar 2012
Sediment Characterization (SEDFlume)	Mar-May 2012
Model Proof	April-May 2012
Hydrodynamics Model Runs	April-May 2012

NOTES

Slide1 Federal funding received in May 2009 to restart and scope study
Issue of the long-term buildup of sediment behind the dams in the lower Susquehanna and the implications of these sediments and associated nutrients to the Chesapeake Bay

Slide 2 Sediment Task Force organized in 1999 by SRBC.
Federal Sponsor- USACE Non-Federal Sponsor(s)- MDE, MDE, MGS, MD DNR, MDE, SRBC, TNC, USGS also a contributing partner

Slide 3

Slide 4 River basin assessment (Sec 729 of WRDA 1986): What can we do to reduce problem? Where should work be done? Variety of recommendations implemented by different entities.

Slide 5
Slide 6

Slide 7 CBP- WSM model-Same model used for TMDL's; POC is EPA; however UMD may run scenarios. Partnership includes, Several Federal and state agencies an many NGO's and private parteners.
HEC-RAS-USGS will route sediment through upper 2 reservoirs providing boundary conditions for 2D ADH model.
Chesapeake Bay Model
computes water quality and living resources in the bay system;

Slide 8 the fate of these sediments may be significantly influenced by these 3D effects

Slide 9

Slide 10 1D modeling tasks for 75k: Build HECRAS models for Lake Clark and Lake Aldred; validate models to selected events; provide sediment loads to 2D model for 2D modeling simulations

2D modeling tasks for 335k: Determine erodibility of Conowingo sediments with the Sedflume (120K); build 2D model of Conowingo Reservoir and lower channel to Susquehanna Flats; perform simulations (215k)

Slide 11
Slide 12
Slide 13
Slide 14