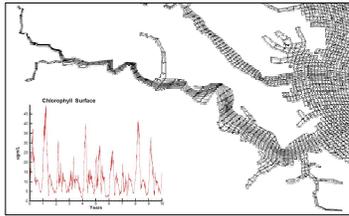


Overview of Modeling Work Plan

James River Science Panel –
October 14, 2011



Modeling Subcommittee

- Clifton Bell, ARCADIS
- Brian Benham, VT
- Arthur Butt, DEQ
- Eileen Hofmann, ODU
- Winston Lung, UVA
- Peter Tango, EPA CBP
- Harry Wang, VIMS

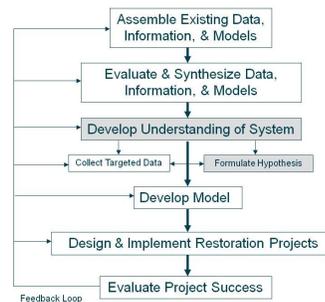
2

Modeling Objective

“A site-specific James River water quality/phytoplankton model capability of predicting attainability of revised chlorophyll-a criteria and/or alternate criteria under various nutrient loading scenarios.”

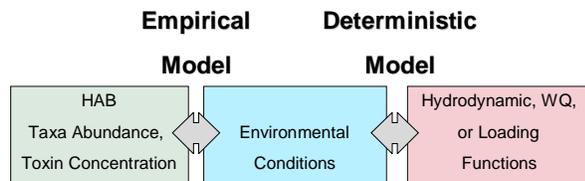
3

Atkins' Flow Chart for Process



4

Potential linkage between empirical and deterministic models



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Key Questions

- What data are available to support modeling?
- Is it possible to empirically model HABs?
- What is the best modeling approach?
- What is the feasibility of modeling top-down controls?

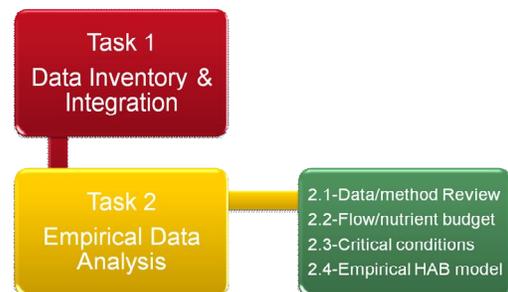
6

Key Questions (cont.)

- What information is required to support the preferred modeling approach?
- What is the sensitivity and uncertainty of the model?
- What are the attainability/management implications of alternative criteria?

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Understanding the System



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Some Potentially Useful Outcomes of Empirical Modeling

Useful empirical relations

- $P(\text{HAB}) = f(x,y,z)$

%Variance in HABs that is explained by manageable variables

% Variance in HABs that is unexplained

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For Discussion

Task 1
Data Inventory & Integration

Task 2
Empirical Data Analysis

- Who is best suited to perform the empirical analysis?
- Overlap with upper/lower James tasks?

- 2.1-Data/method Review
- 2.2-Flow/nutrient budget
- 2.3-Critical conditions
- 2.4-Empirical HAB model

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Selecting a Modeling Approach

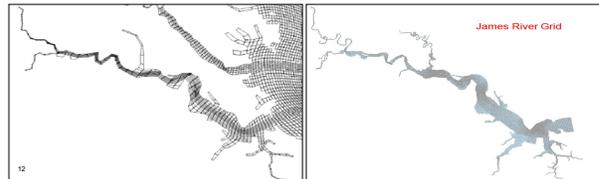
Task 3
Model Review & Selection

- 3.1 - Watershed loading
- 3.2 - Receiving water
- 3.3 - Data requirements

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Important Decisions

- Model code
- Hydrodynamic grid
- Algal function groups
- New HAB algorithms
- Deterministic-empirical model linkages
- Top-down controls
- Relation to USEPA TMDL framework



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Data Needed to Support Modeling Work

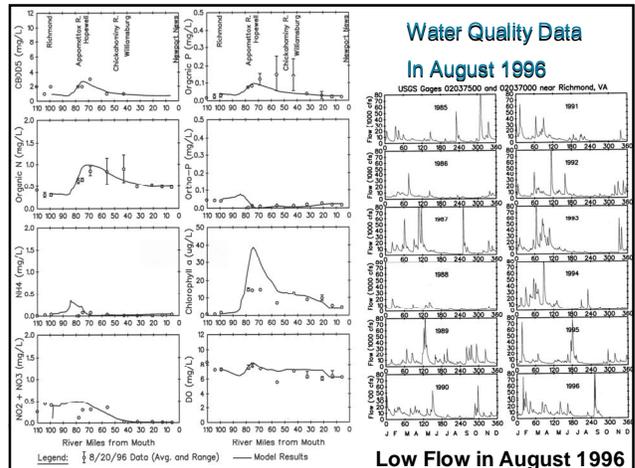
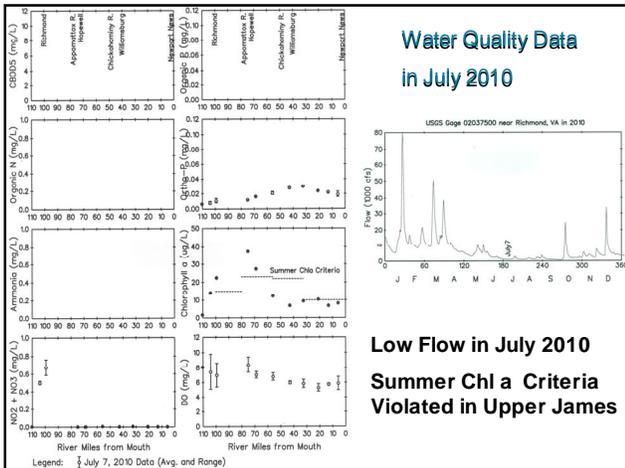
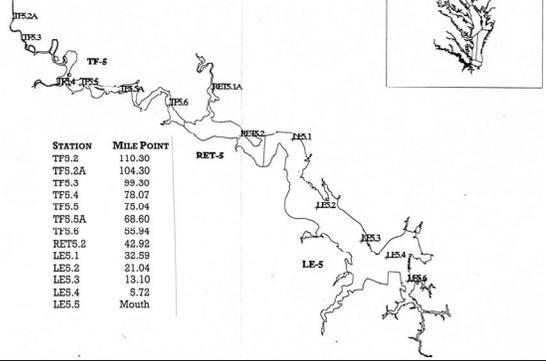
Hydrological Data: USGS Gages at 02037000 in Richmond and Gage near Petersburg on the Appomattox

Ambient Water Quality Data in the James See Station Map

Point Source Loads: See Table of Major Municipal Wastewater And Industrial Plants

HAB Data

James River Monitoring Stations



Major Point Sources to the James

Table 1. Point Source Flows, Nutrient and CBOD₅ Loads in August 1996

Discharger	Flow (mgd)	Org N (lb/day)	NH ₄ (lb/day)	NO ₃ (lb/day)	Org P (lb/day)	PO ₄ (lb/day)	CBOD ₅ (lb/day)
Richmond	54.60	473.6	255.0	3870.0	180.0	184.4	3096.0
DuPont2	27.99	184.5	25.6	60.7	6.5	7.0	2241.0
RICOG	1.55	2.0	164.0	3.0	0.0	0.0	34.0
DuPont3	5.08	116.3	53.0	26.8	36.0	0.0	0.0
Falling Creek	8.30	0.0	19.8	801.6	7.0	28.0	772.2
Proctors Creek	22.90	0.0	98.8	418.4	67.9	68.0	1284.0
Reynolds Metal	0.40	8.0	2.0	5.0	3.0	1.0	100.0
VP004	8.70	8.0	6.0	157.0	3.0	1.0	189.0
Henrico	31.14	446.7	4259.0	46.7	103.9	207.8	4674.0
American Tobacco	1.35	86.3	3.9	12.4	5.7	5.7	135.0
ICI	0.16	9.0	0.6	5.0	1.0	1.0	30.0
Phillip Morris	1.90	381.9	14.3	396.2	12.3	13.0	427.8
Allied Chemical	15.74	223.9	1010.0	269.8	14.0	28.0	2886.0
Allied Hopewell	135.16	1106.0	2403.0	493.0	6.0	6.0	6875.0
Hopewell	31.10	1556.0	6484.0	1226.0	139.0	196.0	15822.0
Petersburg	11.69	19.5	390.0	175.5	92.6	92.6	1950.0
HEVIL	0.09	6.3	6.0	0.9	6.6	0.6	46.9
BWMAN	0.06	4.5	6.0	0.0	3.0	0.5	31.5
REDGE	0.04	1.3	2.0	5.0	2.0	0.3	33.4
BURCO	0.98	49.0	2.9	14.0	14.0	12.0	309.0
Williamsburg	12.57	97.4	280.0	606.0	125.0	84.7	229.0
James River	15.70	32.0	400.0	1623.0	187.0	336.7	198.0
Boat Harbor	16.74	340.0	2592.0	14.0	167.0	531.0	410.0
Army Base	13.49	393.0	1744.0	5.6	144.0	306.0	2802.0

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Building & Testing the Model(s)



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Develop Potential Management Scenarios



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Develop Potential Management Scenarios



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Communication & Reporting Tasks

Task 8
Comm. w/
Panel



Task 9
Draft Report



Task10
Final Report