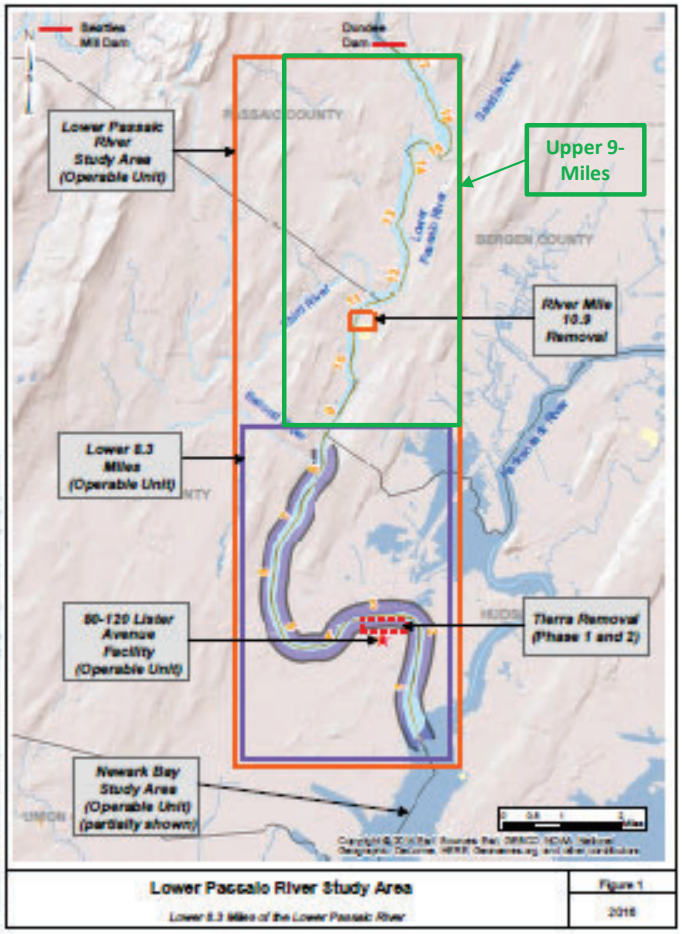
Lower Passaic River: A Plan to Expedite Cleanup of the Upper 9-Miles

November 22, 2017

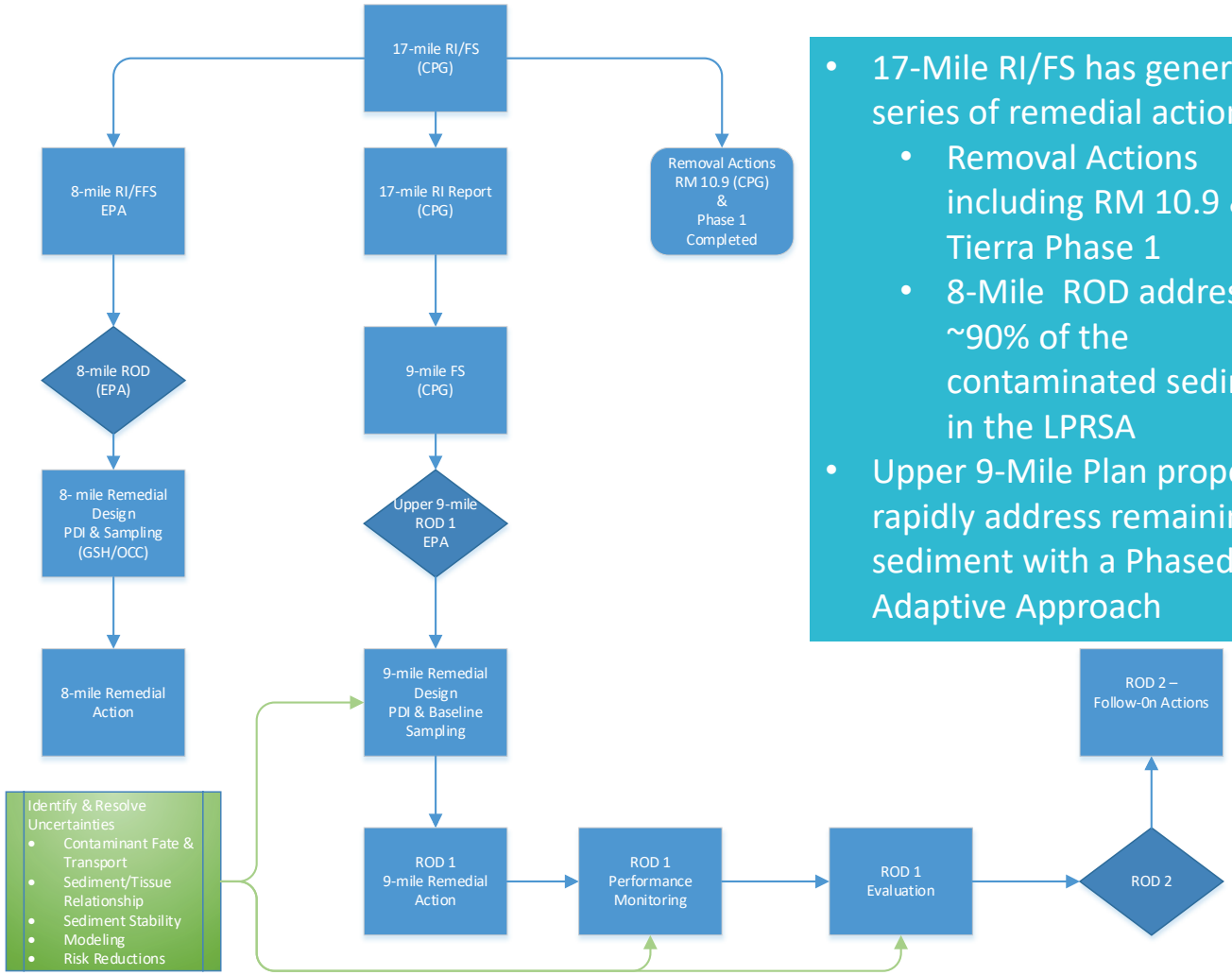
623528

Diamond Alkali Superfund Site



- OU1 – 80-120 Lister Avenue Facility
  - Addressed by the 1987 ROD; completed in 2004
  - Interim containment remedy, which consists of capping, subsurface slurry wall and flood wall, and a groundwater collection and treatment system
- OU2 - Lower 8.3 Miles of the Lower Passaic River Study Area
  - March 2016 ROD selected a remedy to address the sediments of the lower 8.3 miles
  - Most contaminated segment of the river and a primary ongoing contaminant source to the rest of the LPR and Newark Bay.
- OU3 – 17-Mile Lower Passaic River Study Area
  - Upper 9-mile Plan proposes a remedy to rapidly address sediment through a interim remedy that relies on adaptive management
  - Includes completing the 17-mile RI Report and an FS that evaluates Upper 9-mile remedial alternatives and acknowledges the Lower 8-mile ROD
- OU4 – Newark Bay Study Area RI/FS

How the Upper 9-Mile Plan Completes the 17-Mile LPRSA Remedial Actions



- 17-Mile RI/FS has generated a series of remedial actions
  - Removal Actions including RM 10.9 & Tierra Phase 1
  - 8-Mile ROD addresses ~90% of the contaminated sediment in the LPRSA
- Upper 9-Mile Plan proposes to rapidly address remaining sediment with a Phased Adaptive Approach

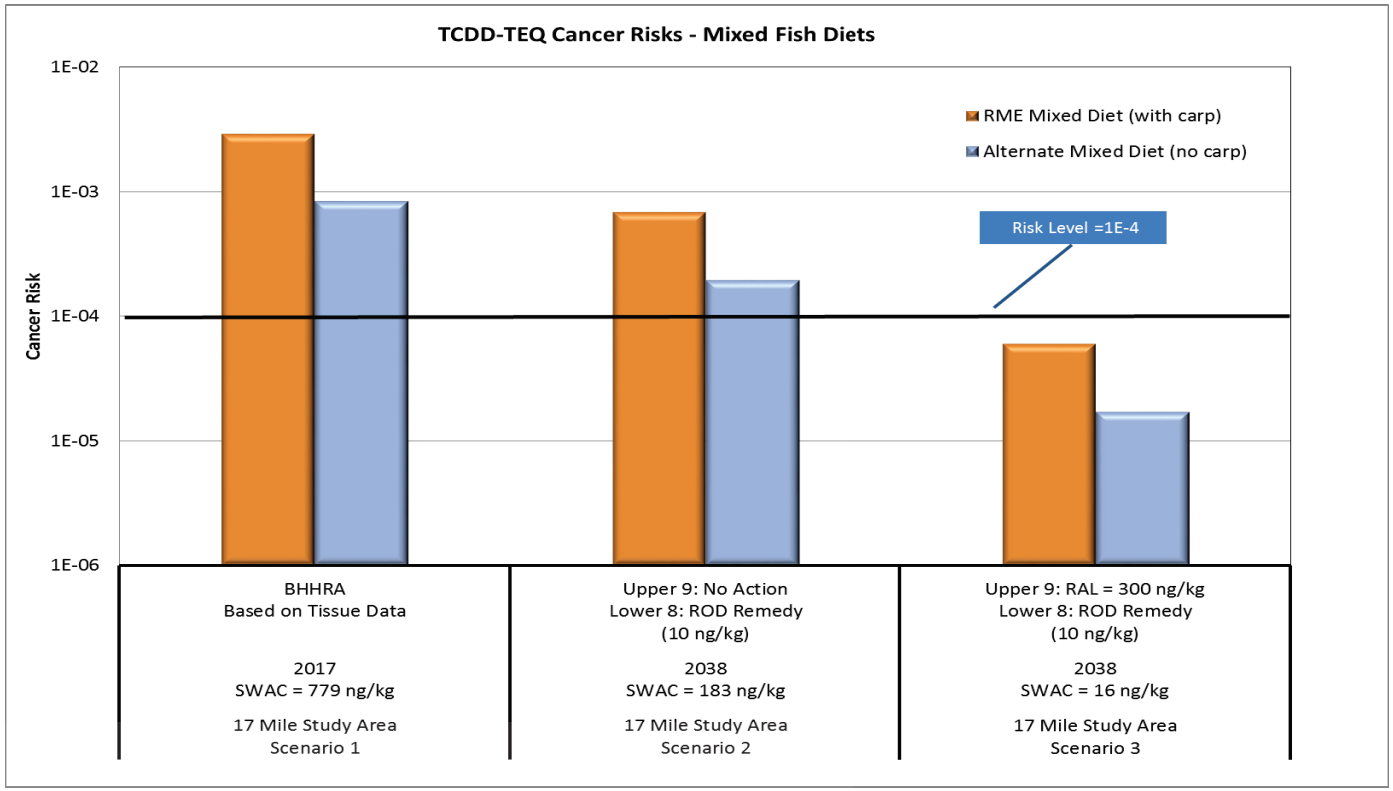
The CPG Plan: An Overview

Using Adaptive Management in the Upper 9-Miles

- ROD 1 - Clean up the remaining 10% of Sediment Posing the Greatest Risks or Preventing the Rest of the River from Recovering (ROD 1)
  - 2,3,7,8-TCDD Sediment SWAC reduced by ~90% following Phase 1
  - Total PCBs reduced below background
- Monitor Fish, Crab, Water and Sediment to Confirm the Cleanup is Working (Performance Monitoring)
  - Model projections suggest that fish consumption risks reduced to below 10^{-4} in ~10 years
  - Eco HQs reduced by 90% for fish and avian receptors
- ROD 2 - Go Back Into the River and Do More if Needed or Set Final Cleanup Levels if River is Recovering as Predicted

Threshold Issue: Phase 1 Interim Remedy will be Protective

TCDD Risks: Current versus Post-Lower 8-Mile Remedy & Upper 9-Mile Interim Remedy in 2038



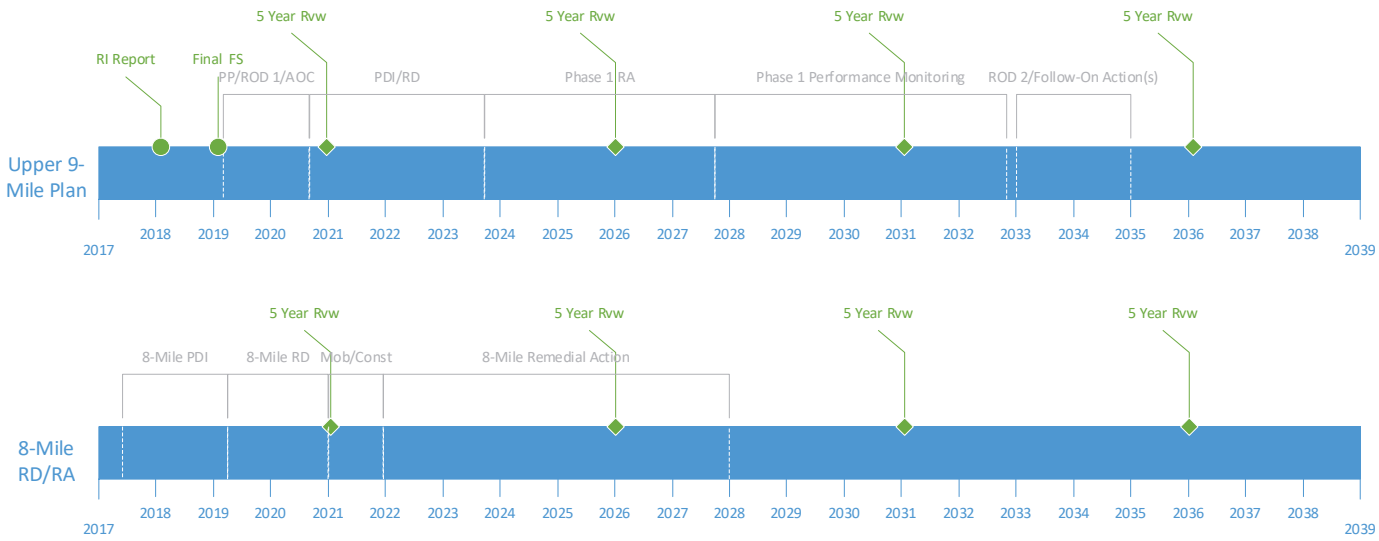
CPG's Proposal for an Upper 9-Mile Phase 1 Interim Remedy

- Phased approach to address the Upper 9-Miles using Adaptive Management
- Proposed RAL of 300 ppt (ng/kg) TCDD and 1 ppm (mg/kg) of Total PCBs
- Approximately 80 Acres from RM 8.3 to RM 14.7
- Remedial Footprint will be reassessed after the PDI
- RD will include refined modeling projections for sediment and tissue recovery
- Performance Monitoring will be used to determine whether additional actions are required to meet Remedial Goals or a final ROD can be issued

Results of the Upper 9-Mile Phase 1 Interim Remedy

- Proposed Remediation meets Risk Threshold.
- Adaptive Management provides certainty of meeting final risk goals
- Allows coordination with Lower 8-mile Remedial Action
- The Entire 17-miles will be addressed years sooner potentially completing the clean-up in the mid-to-late 2020s

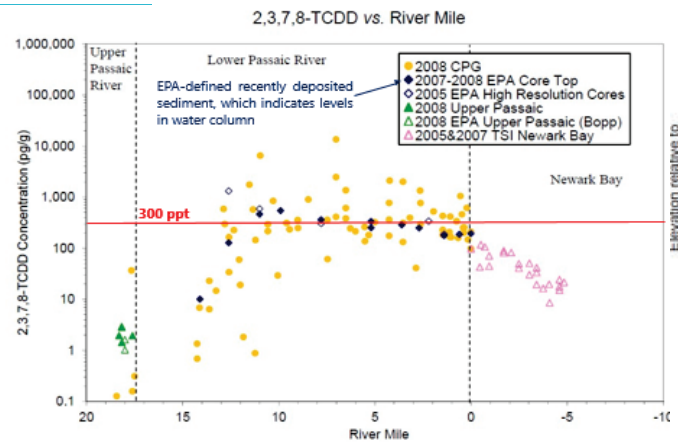
Upper 9-Mile RD/RA Coordinated with 8-Mile ROD Cleans Entire 17-Miles Sooner

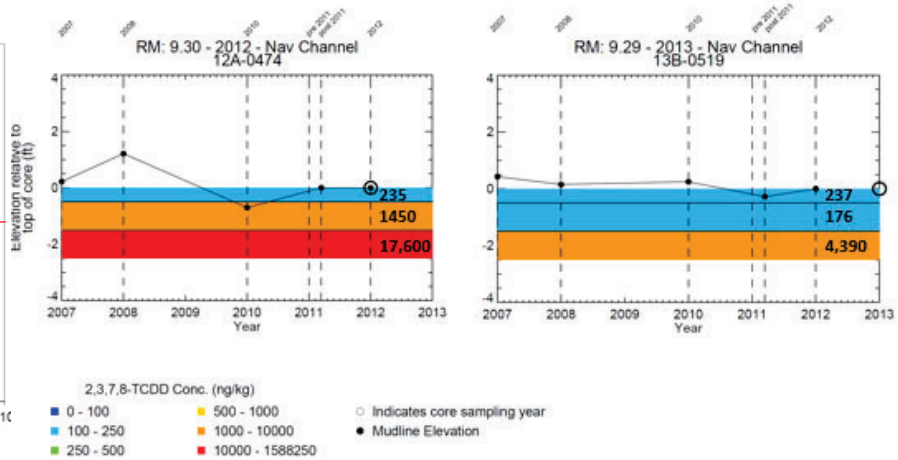


Upper 9-Mile Plan Phase 1 Remedy - Basis

- Actively remediate sediments that inhibit recovery
- Allow areas with good recovery potential to respond to the substantial reduction in concentrations achieved by remediating source areas
- Areas subject to significant net deposition and areas subject to cyclic erosion and deposition have the potential for recovery and have COPC concentrations that reflect the concentrations on recently deposited sediments originating from the water column

How the Plan was Developed & Refined Working with EPA





- Developed RALs to Address Sediment not recovering or inhibiting recovery of the rest of the river
  - Indicated by surface sediment concentrations greater than concentrations in the water column & recently deposited sediments
  - Results:
    - Inhibited recovery indicated by surface concentrations > 400 ppt
    - Sediments in 200-400 range keeping track with changes in water column
    - Sediments < 200 largely sandy or gravelly with some fine material that can be subject to erosion and replacement (thus recovering as water column drops)
- EPA demonstrated value of incorporating RM 12.5 to RM 14.7
  - Achieves greater SWAC reduction

Variable RALs Evaluated at EPA's Request: Range of Phase 1 Footprint based on Variable RALs

2,3,7,8-TCDD RAL (ng/kg)				RM 8-14.7 Acreage	
Limited Deposition/ Some Erosion	Erosion > 6 inches	Direct Contact Areas	Other Areas	CS 37	Range of All CS Runs
300	300	300	300	83	67 - 94
250	250	300	300	84	70 - 96
200	200	300	300	86	72 - 99
200	200	300	500	84	71 - 97
200	200	250	500	85	72 - 98
200	200	200	300	89	75 - 102

2,3,7,8-TCDD RAL (ng/kg)			RM 8-14.7 Acreage	
Shoals	Erosion > 6 inches	Other Areas	CS 37	Range of All CS Runs
200	300	300	87	73 - 99
200	200	300	87	73 - 100
200	200	500	85	71 - 96

Post-Remedy SWACs and Percent Reductions based on Variable RAL Evaluation

2,3,7,8-TCDD RAL (ng/kg)				RM 8 - 14.7				RM 8 – 17.4			
				2,3,7,8-TCDD		Total PCB		2,3,7,8-TCDD		Total PCB	
Limited Deposition/ Some Erosion	Erosion > 6 inches	Direct Contact Areas	Other Areas	SWAC	Percent Reduction	SWAC	Percent Reduction	SWAC	Percent Reduction	SWAC	Percent Reduction
300	300	300	300	84	91.5	0.30	79.7	62	91.5	0.29	74.7
250	250	300	300	82	91.7	0.30	80.0	60	91.7	0.29	75.0
200	200	300	300	79	92.0	0.29	80.4	62	91.5	0.29	74.7
200	200	300	500	87	91.2	0.30	79.8	64	91.2	0.29	74.8
200	200	250	500	82	91.7	0.29	80.2	60	91.7	0.29	75.2
200	200	200	300	71	92.8	0.28	81.2	52	92.8	0.28	76.2

2,3,7,8-TCDD RAL (ng/kg)			RM 8 - 14.7				RM 8 – 17.4			
			2,3,7,8-TCDD		Total PCB		2,3,7,8-TCDD		Total PCB	
Shoals	Erosion > 6 inches	Other Areas	SWAC	Percent Reduction	SWAC	Percent Reduction	SWAC	Percent Reduction	SWAC	Percent Reduction
200	300	300	70	92.9	0.28	81.1	52	92.9	0.28	76.0
200	200	300	70	92.9	0.28	81.1	51	92.9	0.28	76.1
200	200	500	74	92.6	0.29	80.6	54	92.6	0.28	75.6

All PCB results are below ROD background of >0.4 mg/kg

Variable RAL Analysis Found No Significant Difference Between Alternatives

- Analysis Supports Use of 300 ng/kg RAL
  - 300 ng/kg RAL reduces concentrations more than ten-fold
  - Reducing RAL to 200 ng/kg achieves little additional benefit at a significant increase in cost
    - Targets cores showing recovery potential
    - Produces unmeasurable changes in SWAC
      - mostly < 10 ng/kg
  - 300 ng/kg RAL is already conservative
    - Could raise to 400 ng/kg since water column concentrations 200 – 400 ng/kg

Current RI Data Limit the Ability of Identifying Flexible RALs

- Current RI data is insufficient to demonstrate the benefits of flexible RAL approach
- Flexible RAL options do little to reduce risk, but the increase in volume and cost are significant.
- PDI investigation will be designed to develop data set to improve models and allow a more robust evaluation of flexible RALs.
- Models suffice for FS level evaluation

Range of Post-Remediation SWACs Within Range of Data Uncertainties

- CS 37 is One of 100 Conditional Simulations
  - +/-25% for total footprint acreage
  - Final footprint will be based on PDI results
- Current data set and tools are not refined sufficiently to determine the difference between 40, 30, 20 or 10 ng/kg
- Numerous Uncertainties in Sediment to Tissue Relationships

- Post-Remediation/Recovery SWACs are equivalent within accuracy of data
- Only mechanism to evaluate effectiveness is to conduct Phase 1 Interim Remedy and monitor: Adaptive Management

EPA Evaluated Potential Recovery Following Phase 1 Removal

HDR Prediction Results - September 11, 2017

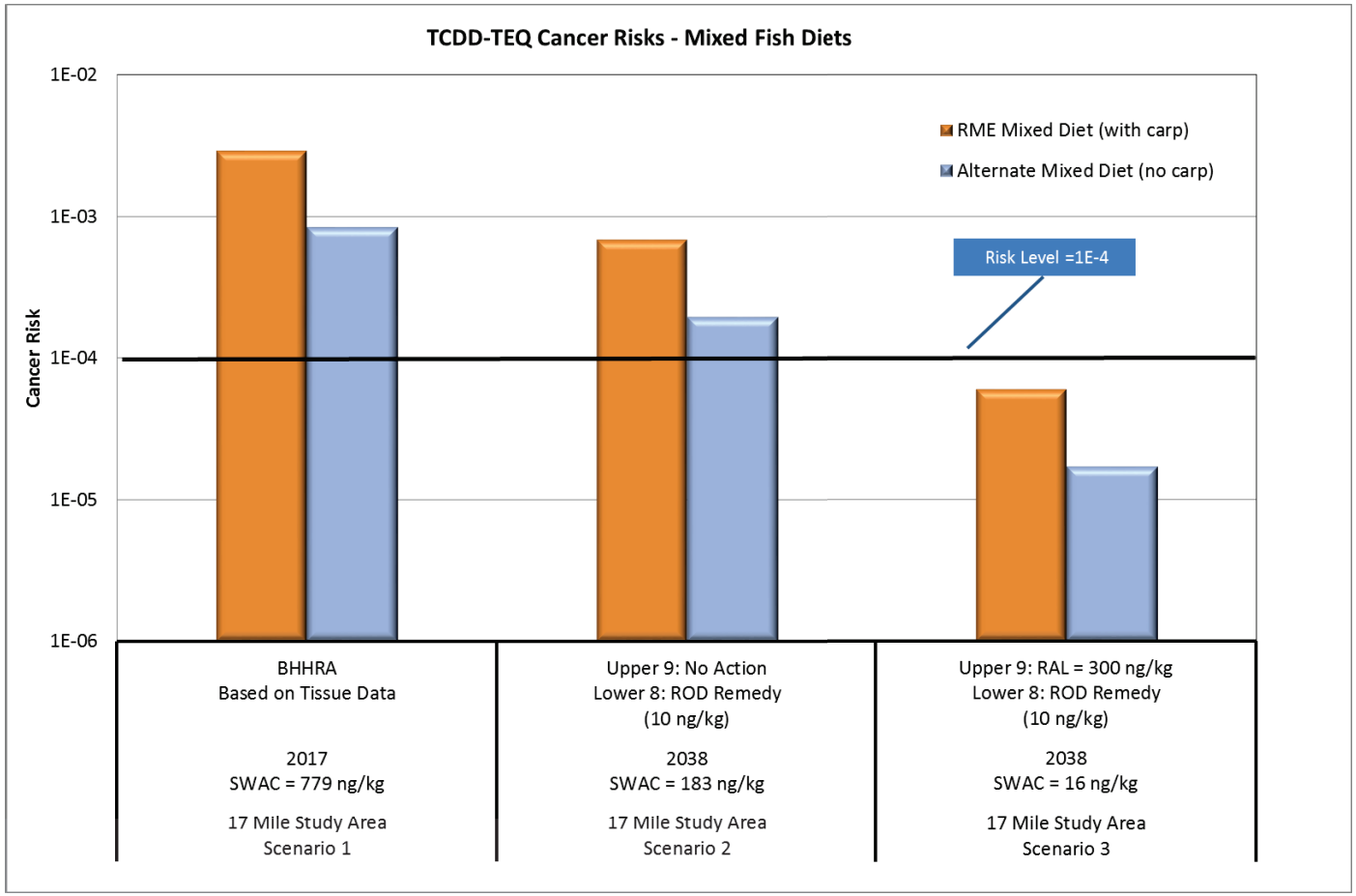
- RM8.3 – 17.4
  - 2038 TCDD concentration (after recovery): 27 ng/kg
  - **96% reduction**
- RM8.3 - 14.8
  - 2038 TCDD concentration: 36 ng/kg
  - **96% reduction**
- Shoals, RM8.3 – 14.8 and RM8.3 - 17.8
  - 2038 TCDD concentration: 31 ng/kg
  - **97.5% reduction**

- Results show that the Phase 1 removal is likely to provide a substantial benefit to the river
- Supports projections that the removal will be protective

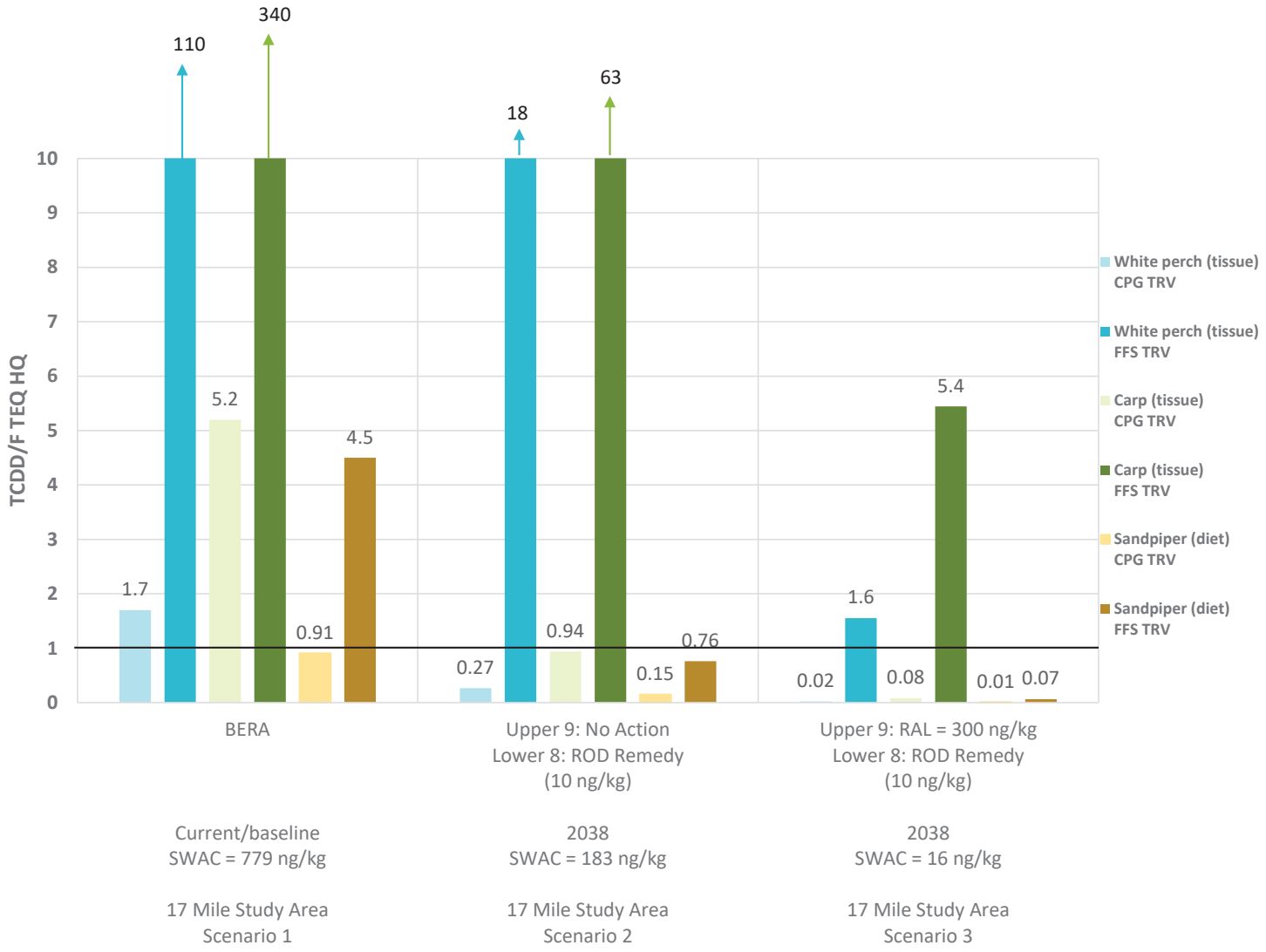
2,3,7,8-TCDD SWACs Used in Risk Reduction Calculations

Scenario Number	Scenario Description	2,3,7,8-TCDD SWAC (ng/kg)	Basis for SWAC Used
1	Current baseline conditions	779 ng/kg RM 0-17.4 SWAC	CPG Mapping of "2010" dataset (conditional simulation 37)
2	ROD remedy only (no action in the upper 9 miles)	183 ng/kg RM 0-17.4 SWAC	Area-weighted average of the following: • For lower 8 miles, EPA ROD model prediction for 2038 for preferred remedy, based on 2016 ROD report figures (10 ng/kg). • For upper 9 miles, EPA ROD model No Action simulation presented at the 9/11 Phase 1 meeting (511 ng/kg)
3	ROD remedy and Phase 1 remedy - Impact on site-wide risk	16 ng/kg RM 0-17.4 SWAC	Area-weighted average of the following: • For lower 8 miles, EPA ROD model prediction for 2038 for preferred remedy, based on 2016 ROD report figures (10 ng/kg). • For upper 9 miles, EPA ROD model 2038 prediction for a 300 ng/kg 2,3,7,8-TCDD RAL in the upper river, presented at the 9/11 meeting (27 ng/kg)

Cancer Risk Reductions – Adult & Child Angler



Ecological Risk Reductions – White perch (tissue) carp (tissue) & sandpiper (diet)



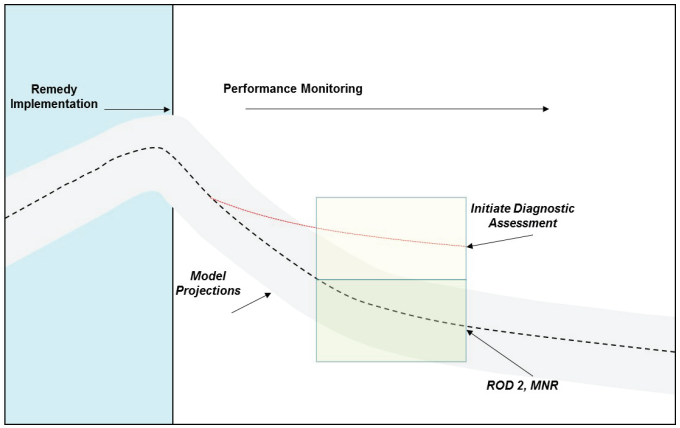
Upper 9-mile Adaptive Management Process

Remedial Design
- Perform baseline monitoring
- Investigate uncertainties
- Develop recovery projections using refined models
- Set triggers

→ Remedy Implementation → Long-term Performance Monitoring → Recovery progressing within expected range?

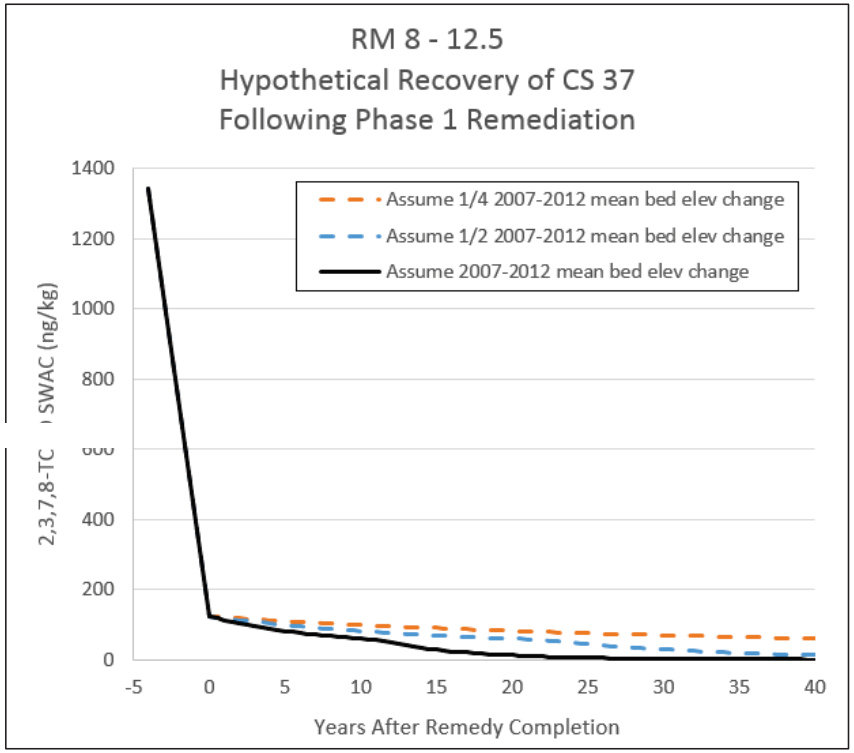
Yes →
- MNR final remedy
- Final cleanup goals
- Final ROD

No →
- Diagnostic assessment
- Additional monitoring to reduce uncertainty
- Evaluate/ implement additional actions
- Second interim ROD



Use of Models

- Complete current modeling effort to support FS
- Use additional data collected in PDI to refine Contaminant Fate and Bioaccumulation models
- Develop expected recovery trajectory and use Performance Monitoring data to assess if river is responding as predicted



Monitoring Elements of Phase 1 Adaptive Management

- Baseline monitoring
  - Establish pre-dredge conditions for comparison with post-remediation conditions
- Pre-Design Investigation (PDI)
  - Delineate remedial footprint
  - Support model refinement and updated recovery projections
- Performance monitoring
  - Interim monitoring to evaluate short-term system response during remedy implementation
  - Long-term monitoring of system response to support 5-year reviews, and adaptive management

Adaptive Management Approach

- Criteria and triggers for diagnostic assessment and/or additional action will be based on comparison of performance monitoring data with projected recovery rates
- If the diagnostic assessment identifies:
  - Lack of recovery due to identifiable factors – additional remedial actions will be evaluated/selected
  - Slower than projected but ongoing recovery – revisit CSM and model projections, re-evaluate risk reduction timeframes, continue monitoring or consider additional actions

Diagnostic measures could include:

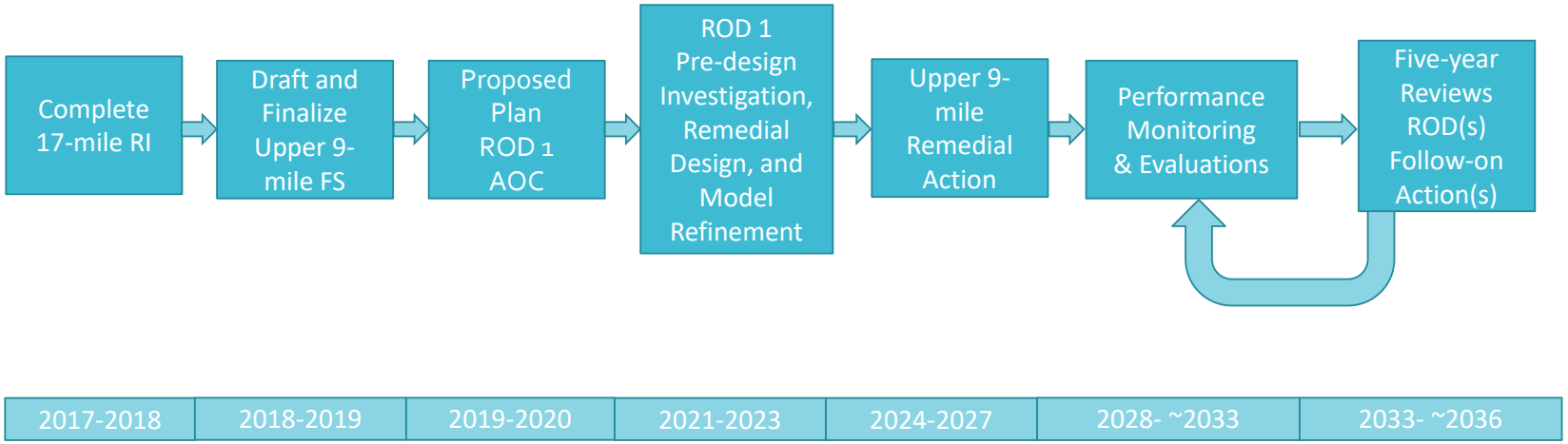
- Increased monitoring frequency to confirm conditions of concern
- Focused sampling to isolate area(s) of concern
- Bathymetric evaluation
- Model recalibration
- CSM refinement
- Source identification

Potential Monitoring in the Upper 9 Miles

		Bathymetry	Water Column	Biota	Sediment (Recovery Indicator Areas)
Baseline		√	√	√	√**
Remedy Implementation			√	√	
Year 0 Post Construction		√	√	√	√
Long-term	Primary*	√	√	√	
	Diagnostic		√	√	√

*Primary components are those identified as triggering metrics
**Sediment sampling will be performed in PDI

Upper 9-mile Plan – An Adaptive & Iterative Approach



The Interim Remedy is Completely Consistent with EPA Guidance

2005 Sediment Guidance

- Take other early or interim actions, followed by monitoring before deciding on a final remedy
- Use adaptive management at complex sediment sites…test hypotheses, reevaluating assumptions as new information is gathered
- Phase in remedy selection where F&T is not well understood or there are significant implementation issues
- Consider separating management of source area from other areas

2017 OLEM Directive

- Consider early actions during RI/FS
- Develop achievable risk reduction expectations
- Consider the limitations of models
- Consider a structured adaptive management approach
- Use monitoring data to evaluate remedial effectiveness

2017 Superfund TF

- Strategy 2: Promote the application of adaptive management at complex sites and expedite cleanup through use of early/interim rods and removal actions
- Recommendation 3: Broaden the use of adaptive management (AM) at Superfund Sites

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- Performance Monitoring will be used to determine whether additional actions to meet Remedial Goals are required or a final ROD can be issued

The Adaptive Remedy is Scientifically Supported and Certain to be Protective

- Certain:
  - Immediately reduces contaminant levels by an order of magnitude
  - Human Health & Ecological risks significantly & quickly reduced
  - Recovery will be accelerated
- Expected:
  - Meeting risk based cleanup goals in 20 years.
- Certain:
  - Post remediation monitoring will provide data needed to confirm recovery
  - If additional remediation is needed more will be done