FORMER KOPPERS INC. FACILITY – SUPERIOR, WI
OFF-PROPERTY CORRECTIVE ACTION EVALUATIONS

Project Meeting with WDNR and USEPA in Madison, WI

November 19-20, 2015

Meeting Goals

1. Establish common understanding of Site conditions and basis for prior remedy evaluations
2. Discuss key technical issues related to a possible feasibility study GLLA project:
   - Corrective action objectives
   - Corrective action areas/limits
   - Corrective action alternatives
3. Discuss path forward and timing

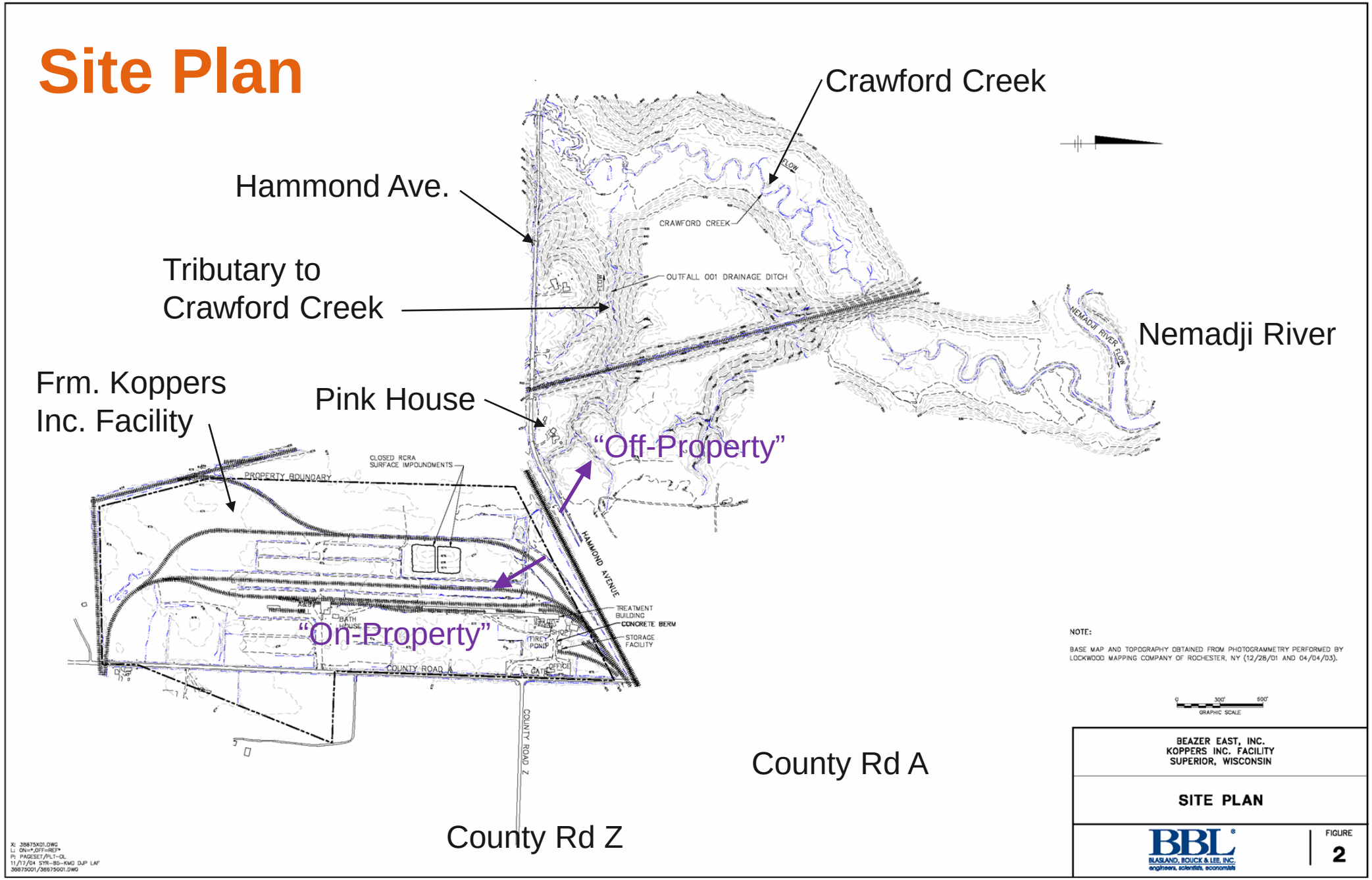
Presentation Outline

- Review of Conceptual Site Model and Nature/Extent of Impacts
- Overview of 2009 Human Health and Ecological Risk Assessment (HHERA)
- Overview of 2014 Focused Corrective Measures Study (FCMS)
  - Corrective action objectives
  - Corrective action areas/limits
  - Corrective action technology screening
  - Corrective action alternatives
- Discussion of key issues

Review of Conceptual Site Model (CSM) and Nature/Extent of Impacts

- Area A – Tributary Upstream of Crawford Creek Floodplain
- Area B – Tributary Within Crawford Creek Floodplain
- Area C – Crawford Creek from Tributary to RR Embankment
- Area D – Crawford Creek from RR Embankment to Nemadji River

Site Plan


Crawford Creek
Hammond Ave.
Tributary to
Crawford Creek
Nemadji River
Frm. Koppers
Inc. Facility
Pink House
"Off-Property"
"On-Property"
County Rd A
County Rd Z
CRAWFORD CREEK
OUTFALL 001 DRAINAGE DITCH
NEMADJI RIVER FLOW
CLOSED RCRA
SURFACE IMPOUNDMENTS
PROPERTY BOUNDARY
HAMMOND AVENUE
TREATMENT
BUILDING
CONCRETE BERM
STORAGE
FACILITY
BATH
HOUSE
FIRE
POND
SHOP
OFFICE
GATE
COUNTY ROAD A
COUNTY ROAD Z
NOTE:
BASE MAP AND TOPOGRAPHY OBTAINED FROM PHOTOGRAMMETRY PERFORMED BY LOCKWOOD MAPPING COMPANY OF ROCHESTER, NY (12/28/01 AND 04/04/03).
GRAPHIC SCALE
BEAZER EAST, INC.
KOPPERS INC. FACILITY
SUPERIOR, WISCONSIN
SITE PLAN
BBL
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists
FIGURE
2

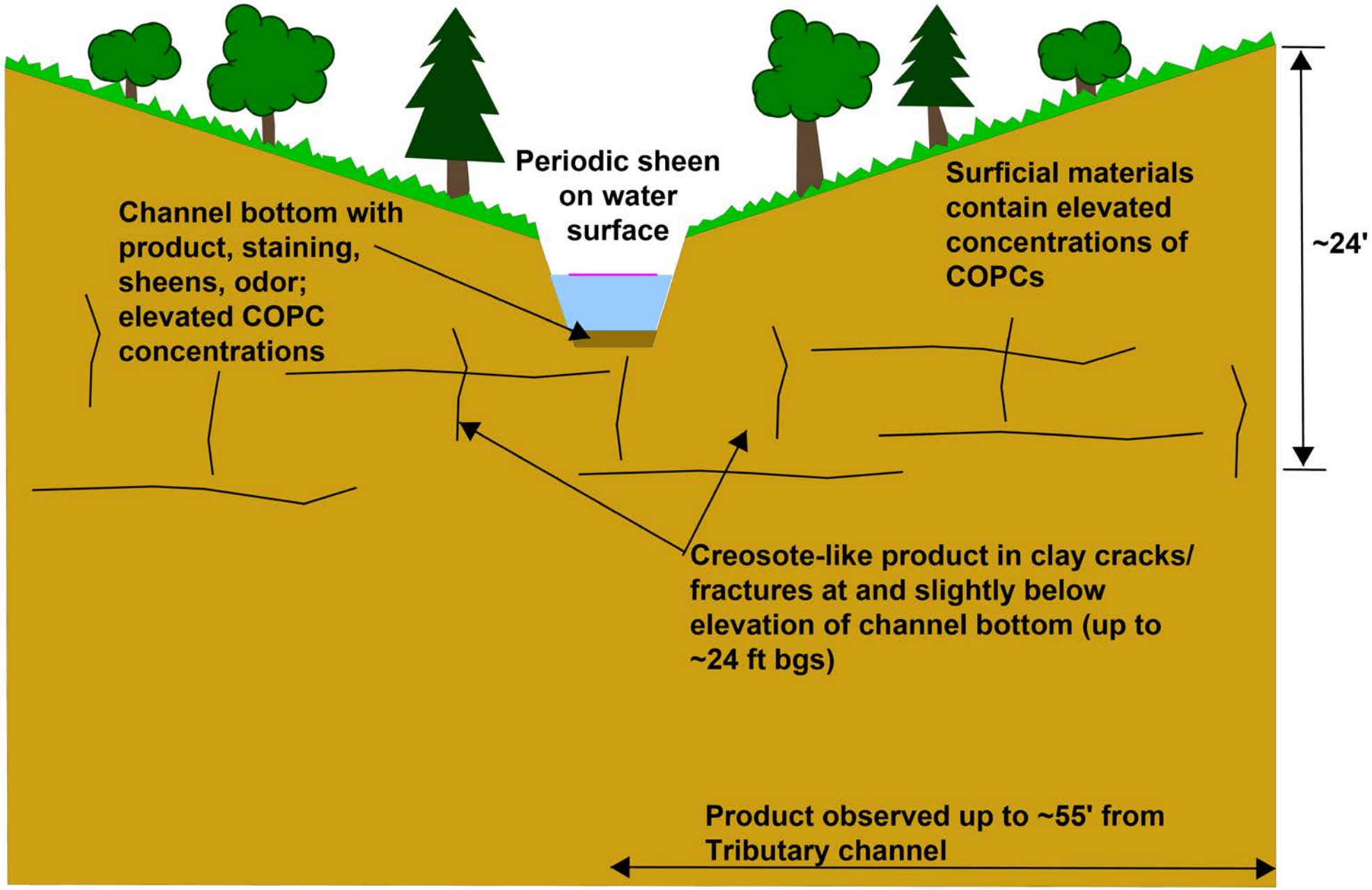
CSM and Nature/Extent of Impacts – Area A

Photograph showing steep Tributary banks

CSM and Nature/Extent of Impacts – Area A

Photograph showing steep Tributary banks and vegetation

Area A – Conceptual Site Model



CSM and Nature/Extent of Impacts – Area A

Visual observations from:

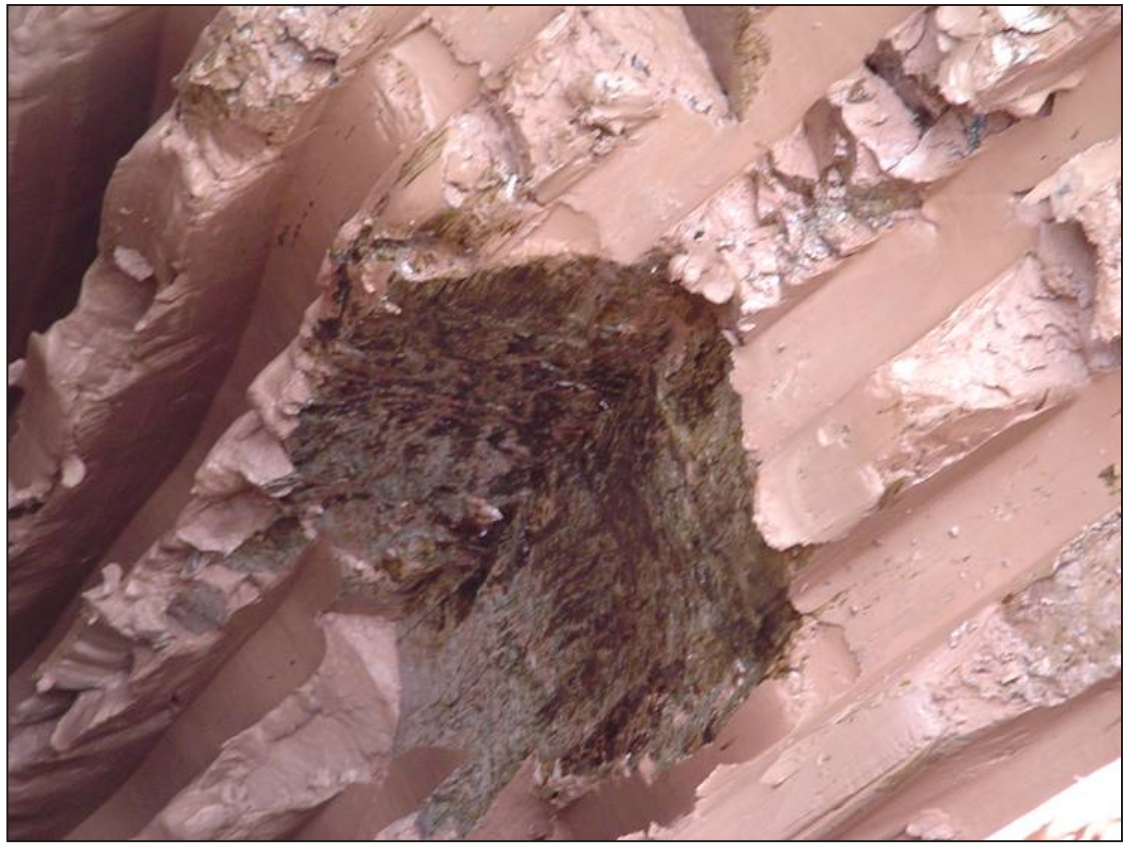
- 39 channel bottom cores along 14 transects (1999)
- 48 borings along 10 transects (2003)
- 26 channel bottom probing locations (2005)
- 3 test pits and 35 borings along 8 transects (2005)

Visual classifications:

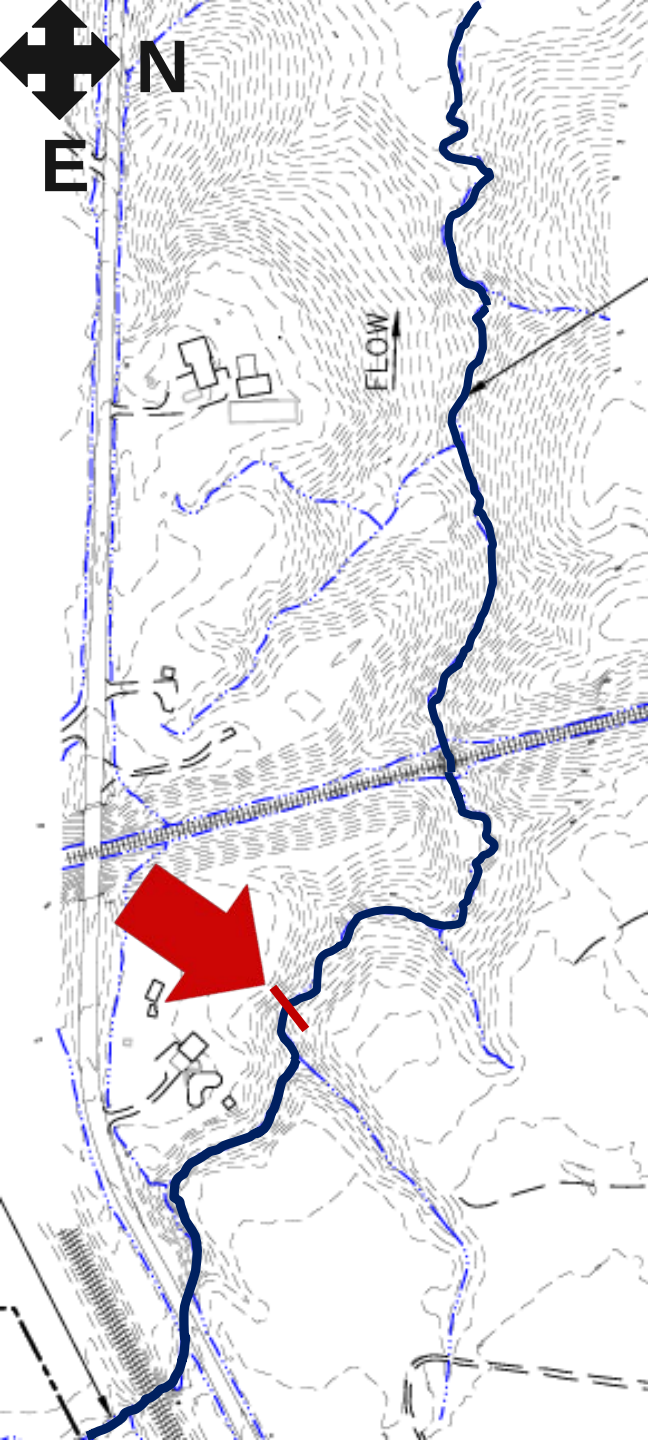
- Creosote-like product
- Odor, staining and/or sheens, but no product
- No odor, staining, sheens or product

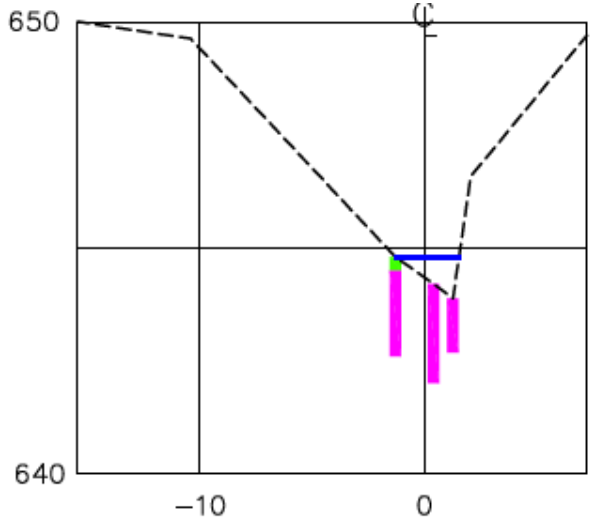
CSM and Nature/Extent of Impacts – Area A

Photographs of creosote-like product in clay cracks/fractures (2005 test pit)

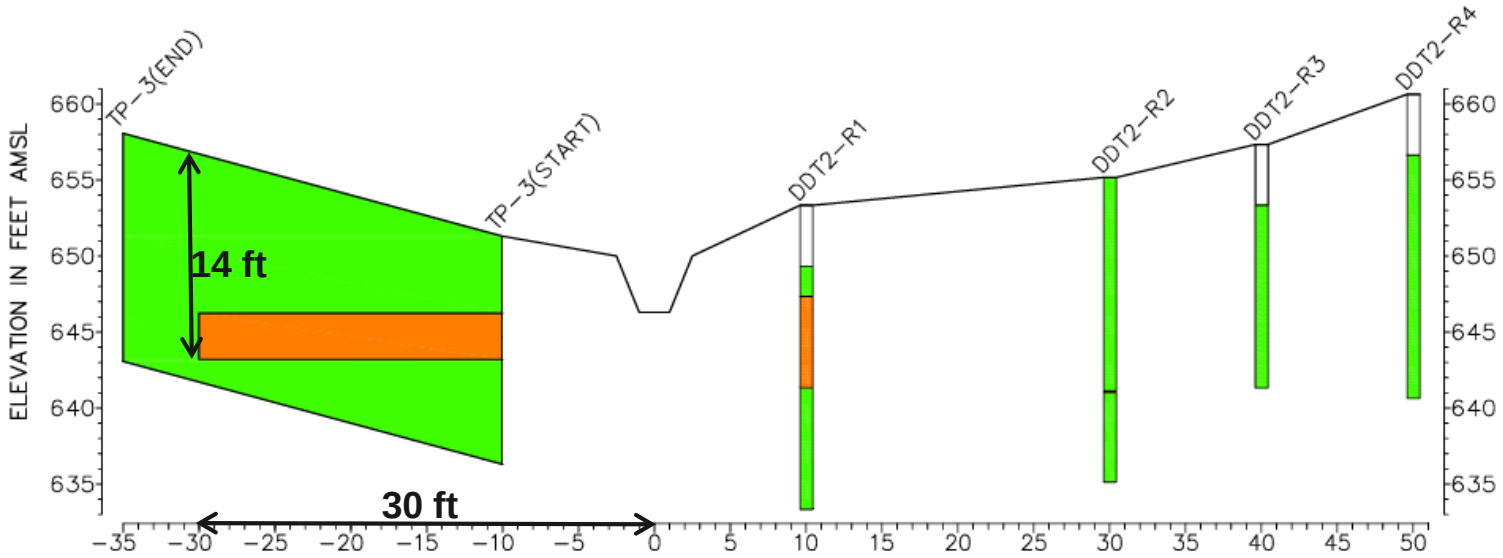


Area A – Example Cross-Sections



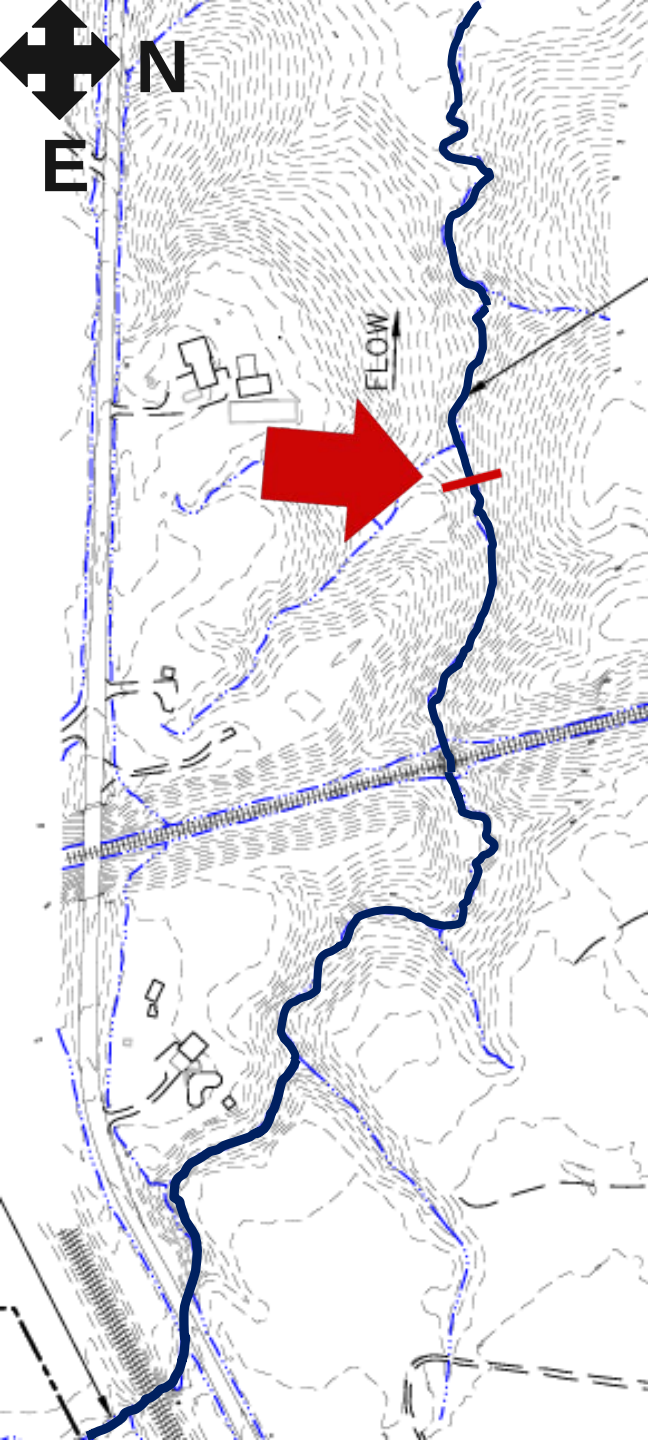


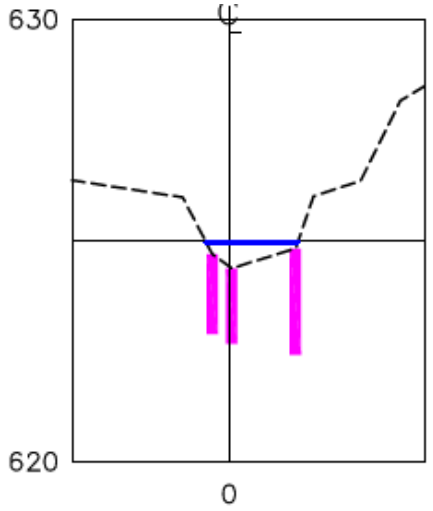
1999 Probing/Coring Transect 6



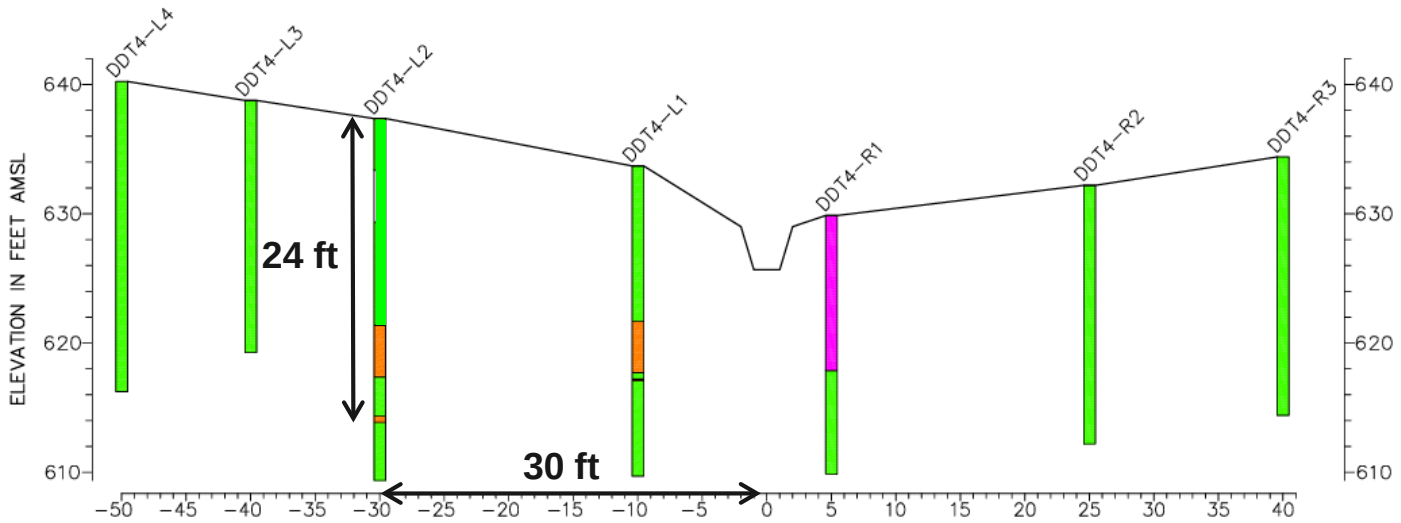
2005 Test Pit/Boring Transect 2
(looking downstream)

Area A – Example Cross-Sections



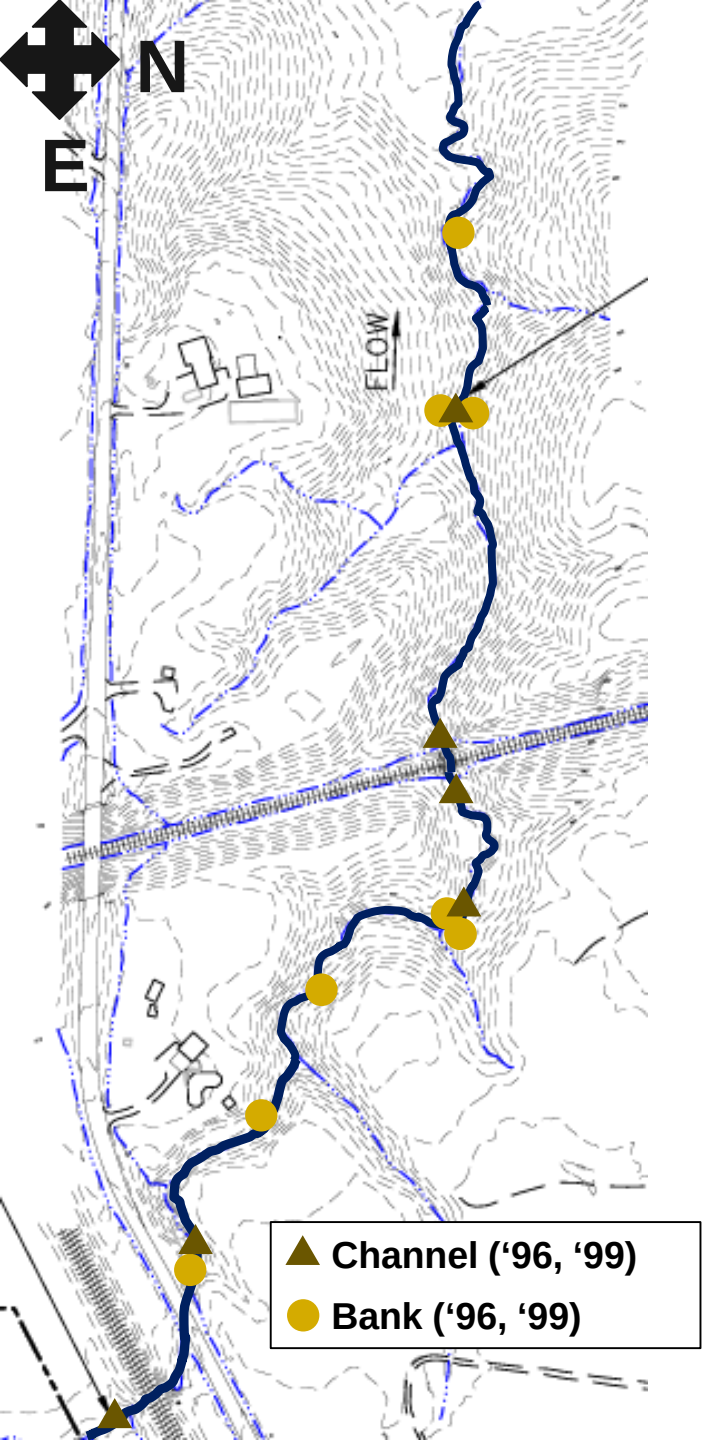


1999 Probing/Coring Transect 11
(looking downstream)



2005 Boring Transect 4
(looking downstream)

Area A – Analytical Data Summary



23 channel bottom samples, 6 locations ('96, '99):

Average Concentrations - Channel Bottom Samples						
	tPAHs		Penta		TCDD-TEQ	
	#	(mg/kg)	#	(mg/kg)	#	(ug/kg)
All samples	21	180	21	0.021	4	0.25
Samples <1 ft	15	243	15	0.029	4	0.25
Samples >1 ft	6	23	6	ND	0	--

15 bank samples, 8 locations ('96, '99):

Average Concentrations - Bank Samples						
	tPAHs		Penta		TCDD-TEQ	
	#	(mg/kg)	#	(mg/kg)	#	(ug/kg)
All samples	13	3,480	13	14	4	0.89
Samples <1 ft	11	4,113	11	17	4	0.89
Samples >1 ft	2	0.10	2	ND	0	--

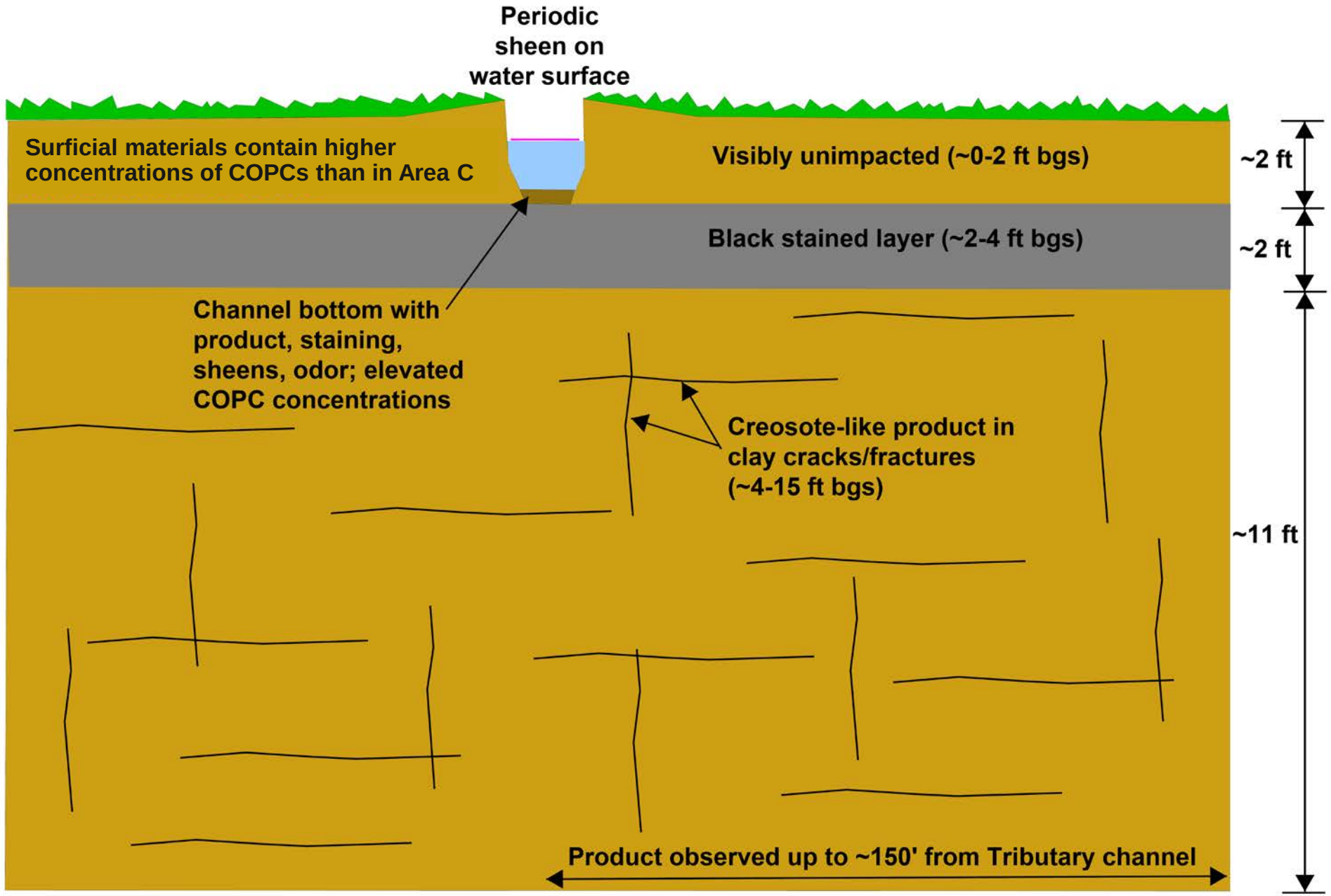
- Limited analytical data relative to other areas, as Beazer identified intent for remediation based on existing data and observations

CSM and Nature/Extent of Impacts – Area B

CSM and Nature/Extent of Impacts – Area B

Photograph showing steep Tributary in floodplain

Area B – Conceptual Site Model



CSM and Nature/Extent of Impacts – Area B

Visual observations from:

- 48 channel bottom/floodplain cores along 4 transects (1999)
- 26 test pits along 5 transects (2003)
- 4 channel bottom probing locations (2005)

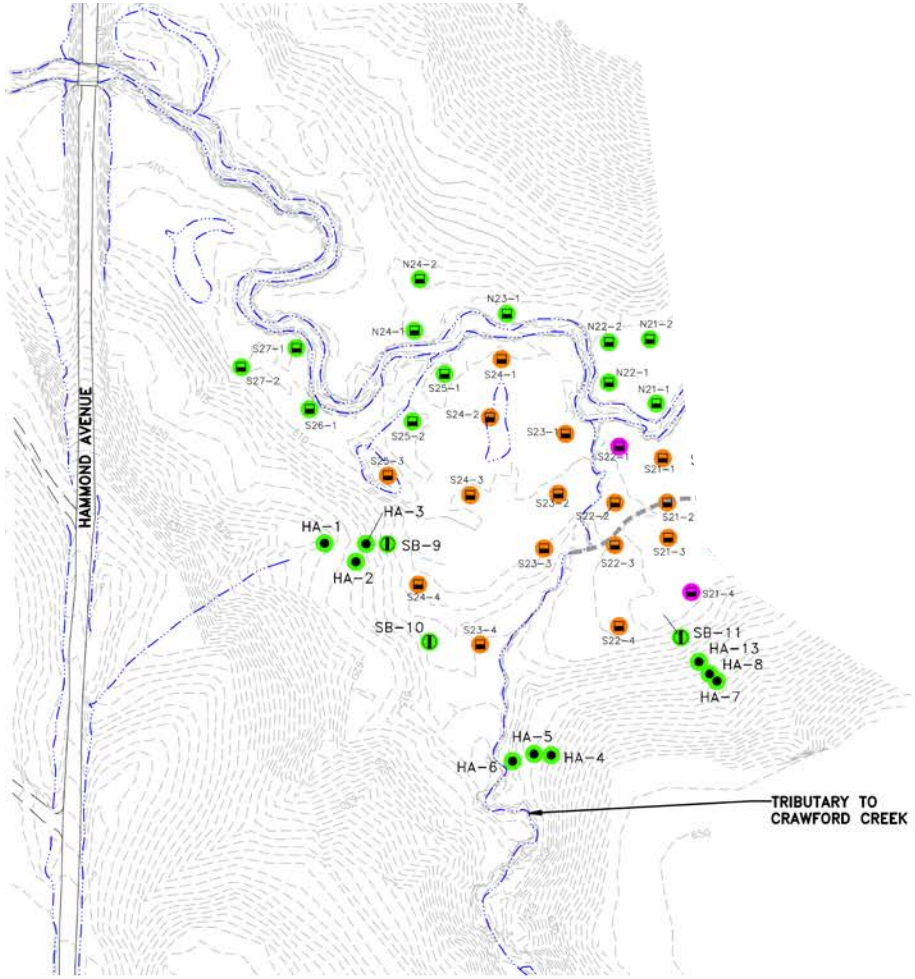
Visual classifications:

- Creosote-like product
- Odor, staining and/or sheens, but no product (including “black stained layer”)
- No odor, staining, sheens or product

CSM and Nature/Extent of Impacts – Area B

Photograph of “black stained layer” (2003 test pit)

CSM and Nature/Extent of Impacts – Area B

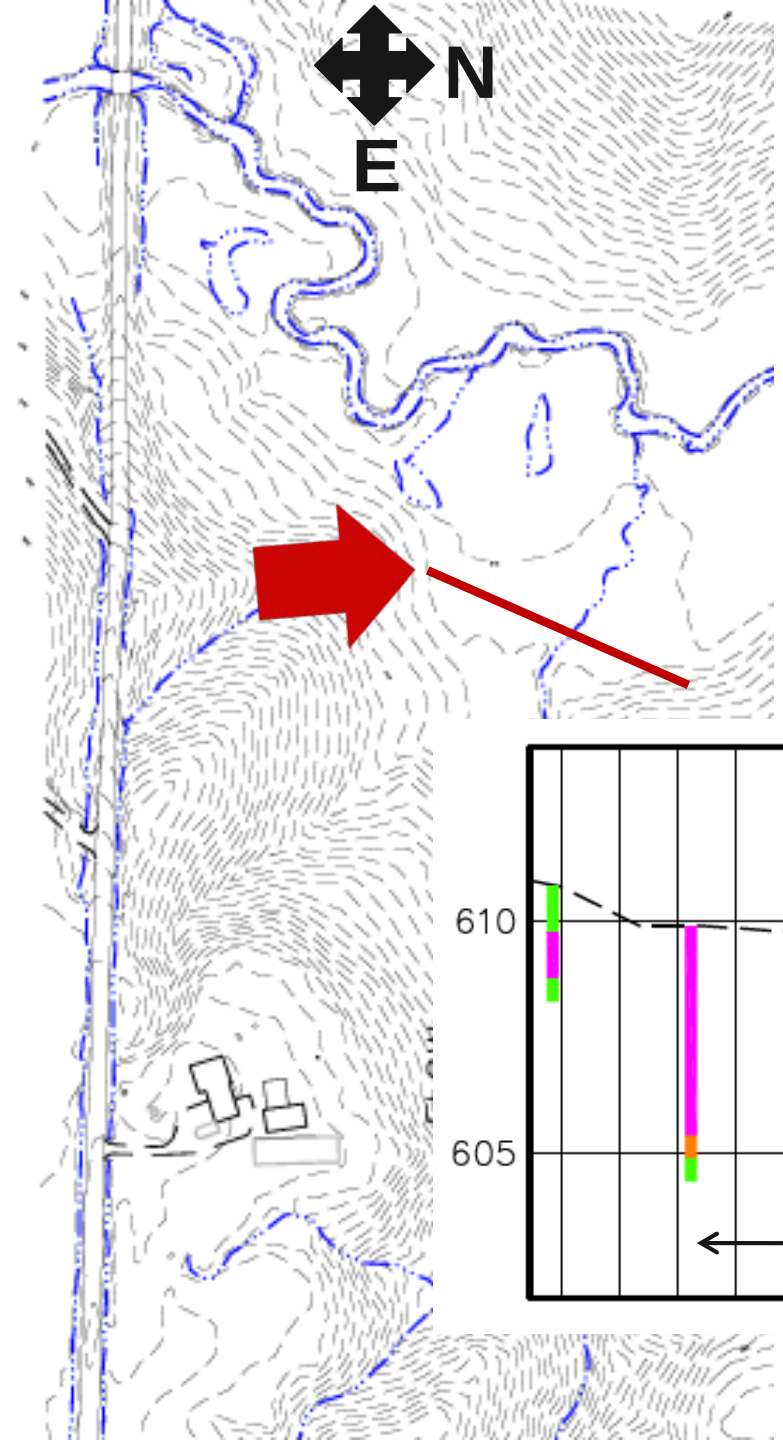


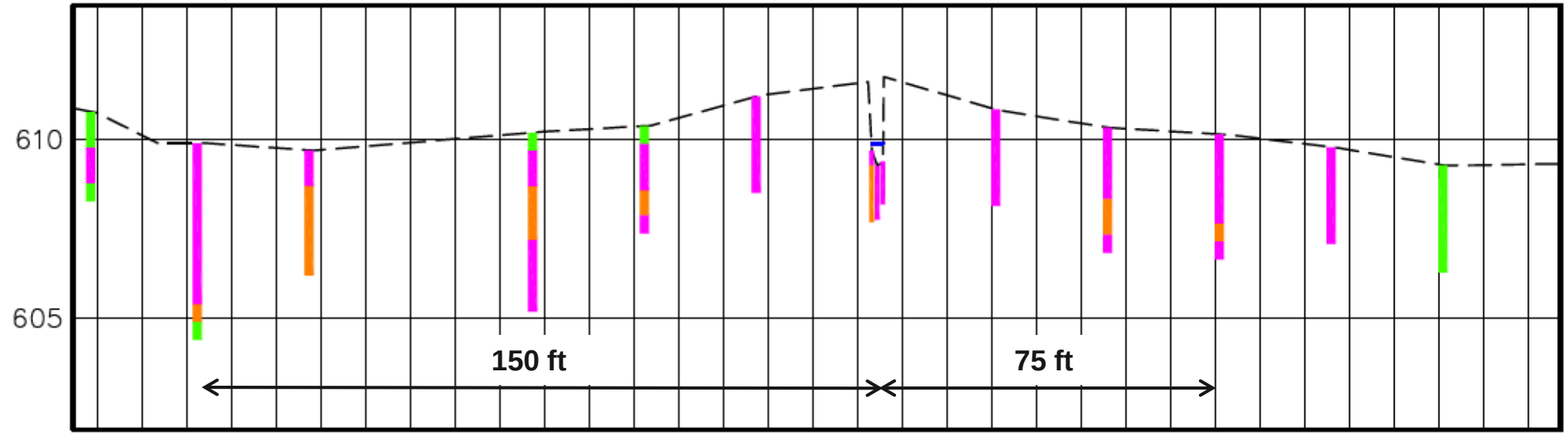
TYPE 1 CONTAINS CREOSOTE–LIKE PRODUCT (TYPICALLY IN CLAY FRACTURES OR SAND/ORGANIC SEAMS)

TYPE 2 EXHIBITS A CREOSOTE–LIKE ODOR, STAINING AND/OR SHEEN, BUT DOES NOT CONTAIN CREOSOTE–LIKE PRODUCT

TYPE 3 DOES NOT EXHIBIT VISUAL EVIDENCE OF IMPACTS (i.e., NO STAINING, SHEENS OR PRODUCT) OR CREOSOTE–LIKE ODOR

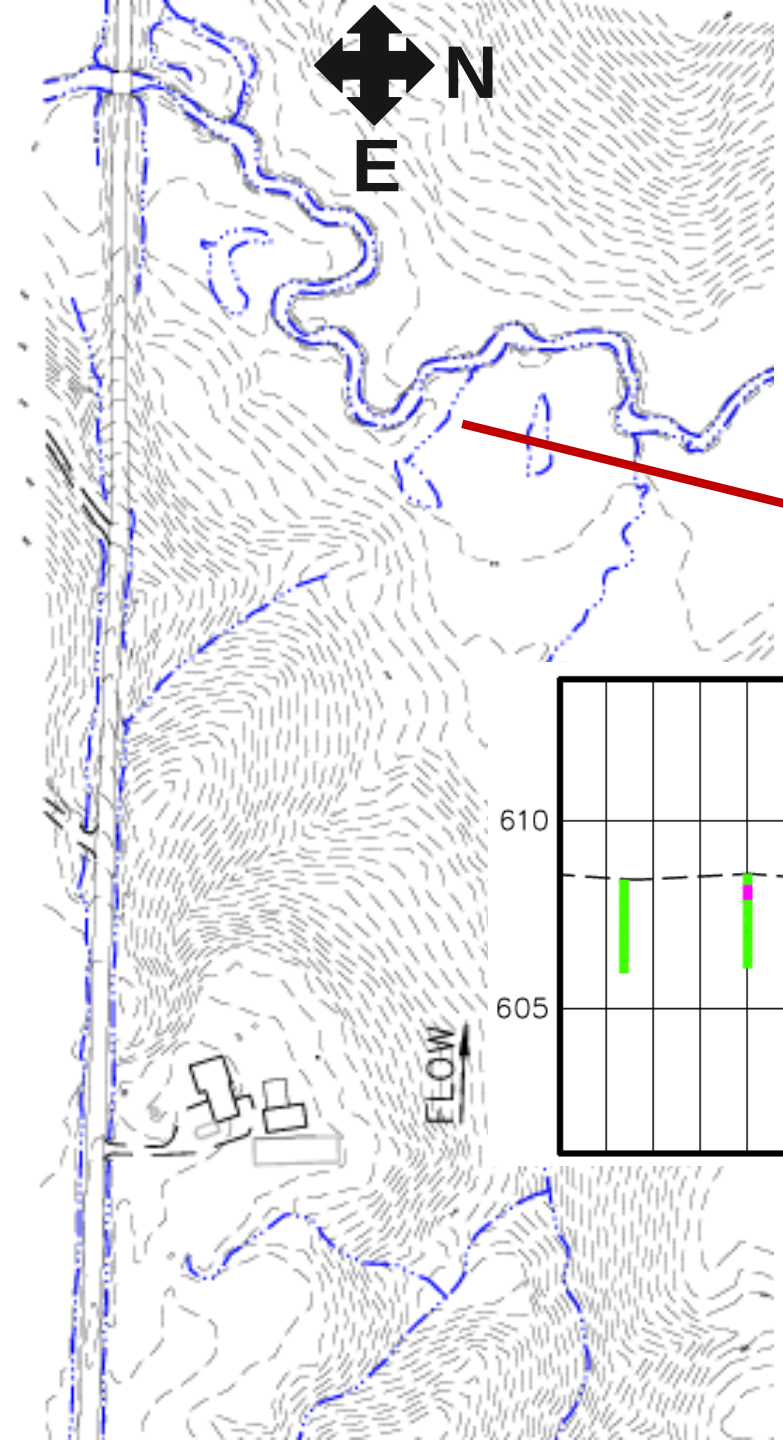
Area B – Example Cross-Sections

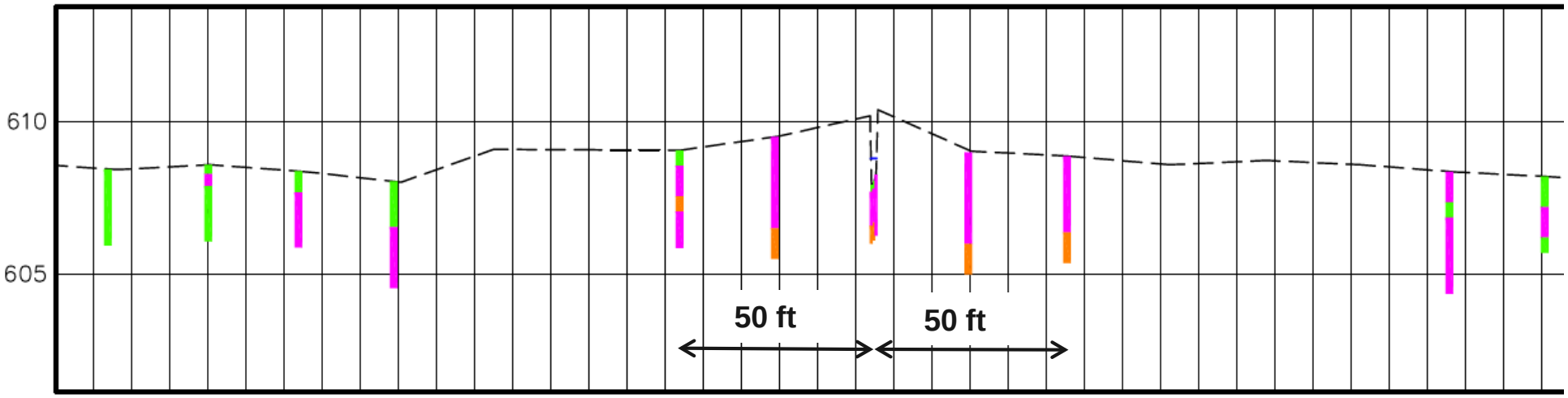




1999 Probing/Coring Transect 15
(looking downstream)

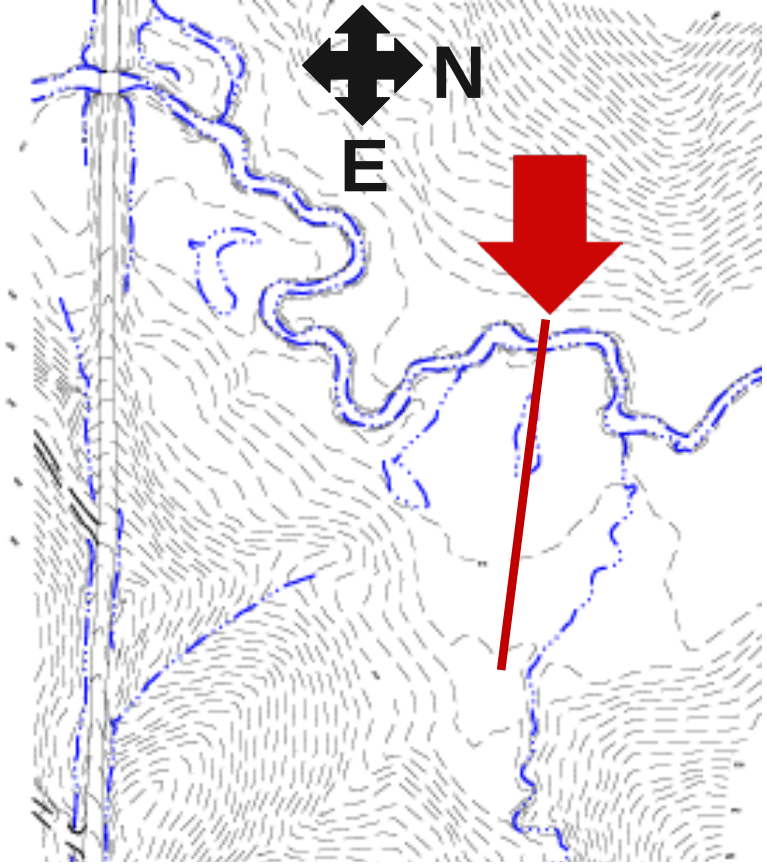
Area B – Example Cross-Sections

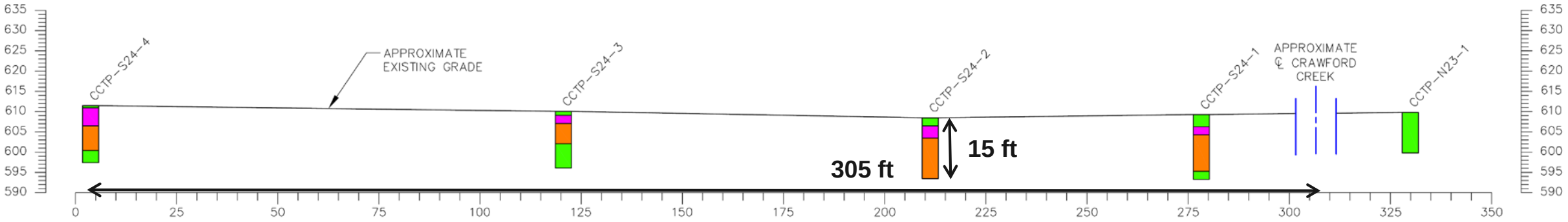


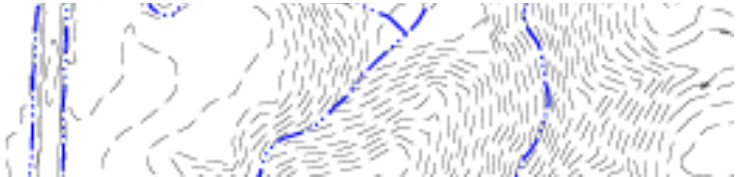


1999 Probing/Coring Transect 16
(looking downstream)

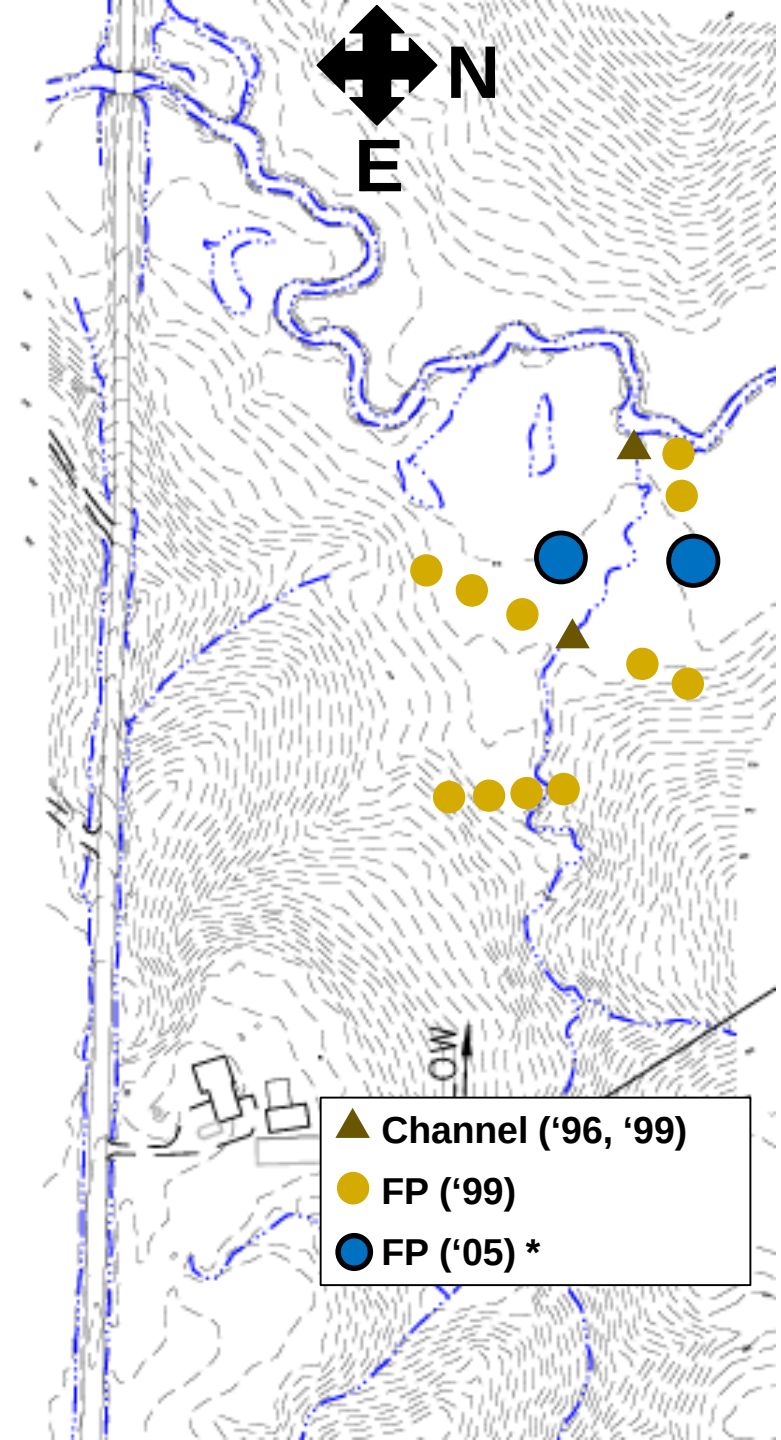
Area B – Example Cross-Sections







2003 Test Pit Transect 24
(looking upstream – Crawford Creek)



Area B – Analytical Data Summary

6 channel bottom samples, 2 locations ('96, '99):

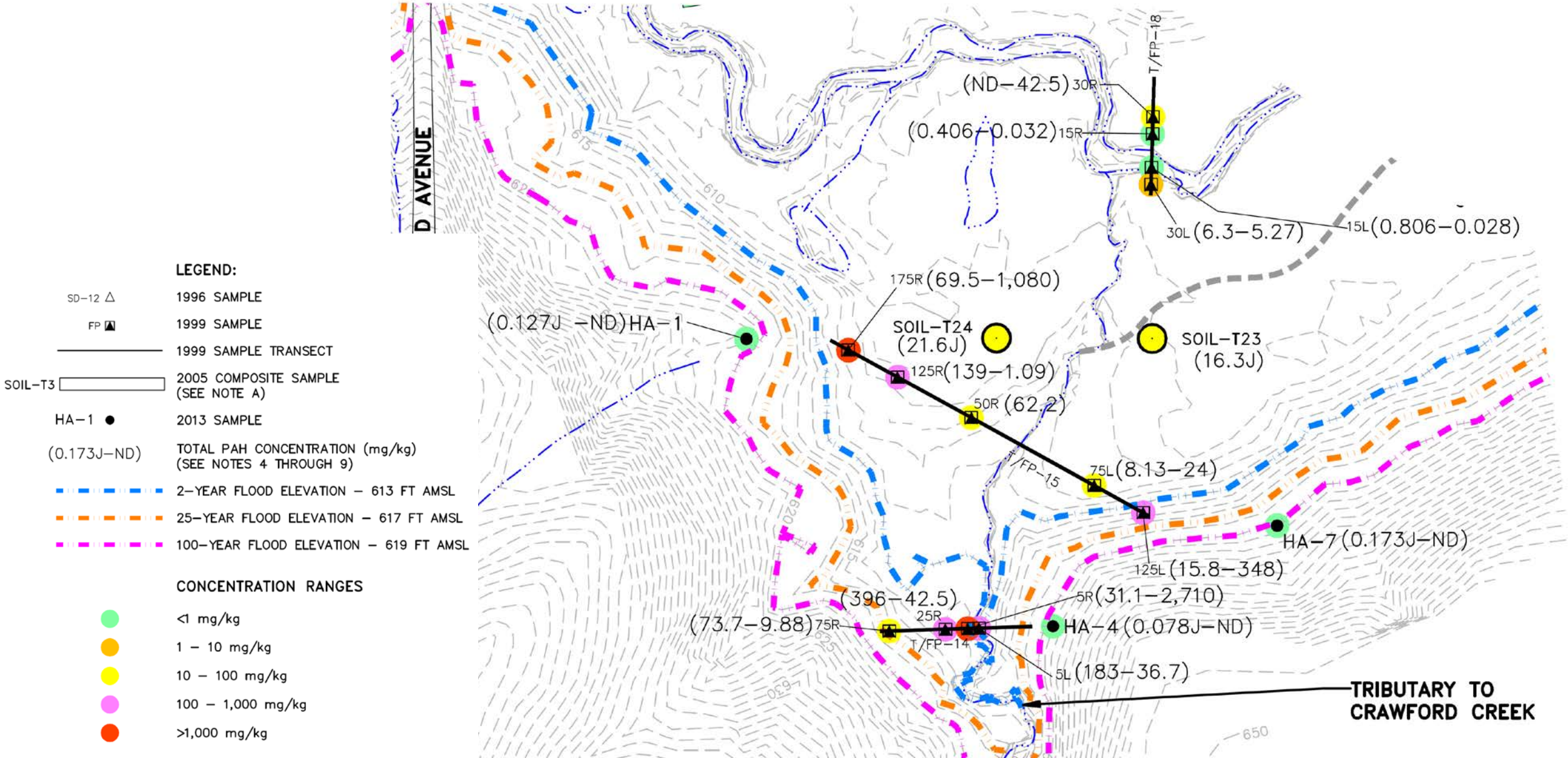
Average Concentrations - Channel Bottom Samples						
	tPAHs		Penta		TCDD-TEQ	
	#	(mg/kg)	#	(mg/kg)	#	(ug/kg)
All samples	6	3,700	6	0.088	0	--
Samples <1 ft	4	2,860	4	0.13	0	--
Samples >1 ft	2	5,380	2	ND	0	--

34 floodplain samples, 13 locations ('99, '05):

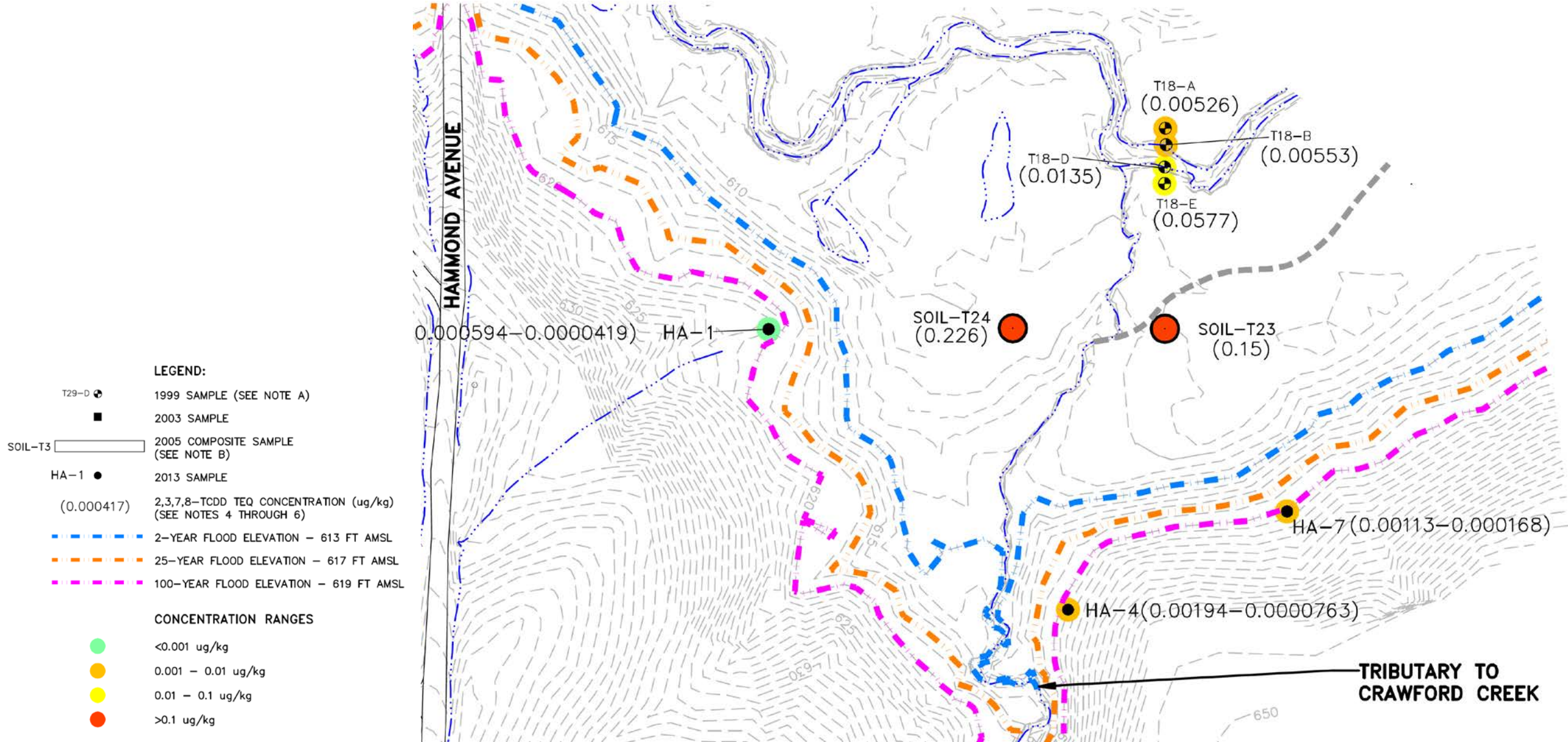
Average Concentrations - Floodplain Samples						
	tPAHs		Penta		TCDD-TEQ	
	#	(mg/kg)	#	(mg/kg)	#	(ug/kg)
All samples	34	2,000	34	0.089	6	0.085
Samples <1 ft	23	229	23	0.13	5	0.10
Samples >1 ft	11	5,703	11	ND	1	0.0003

* 2005 samples are composites; each comprised of 4 discrete sample locations – most recent and spatially distributed dataset

Area B – Analytical Data Summary (2013 Step-Outs) tPAHs



Area B – Analytical Data Summary (2013 Step-Outs) TCDD-TEQ



CSM and Nature/Extent of Impacts – Area C

CSM and Nature/Extent of Impacts – Area C

Photograph showing “typical” Crawford Creek flow conditions

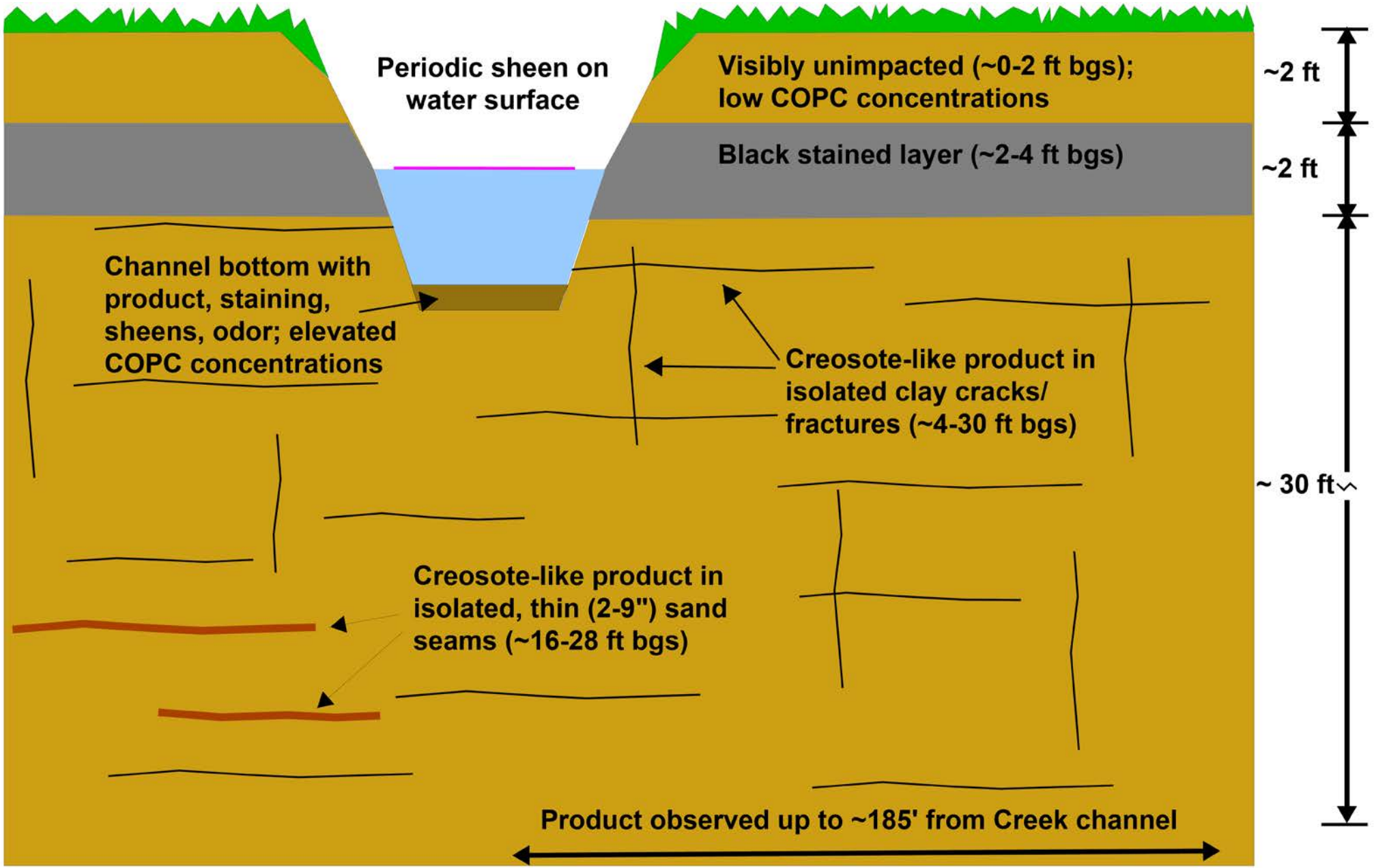
CSM and Nature/Extent of Impacts – Area C

Photograph showing “bank full” Crawford Creek flow conditions

CSM and Nature/Extent of Impacts – Area C

Photograph showing flooded Crawford Creek flow conditions

Area C – Conceptual Site Model



CSM and Nature/Extent of Impacts – Area C

Visual observations from:

- 89 channel bottom/floodplain cores along 18 transects (1999)
- 84 test pits along 20 transects (2003)
- 29 soil borings (2013)

Visual classifications:

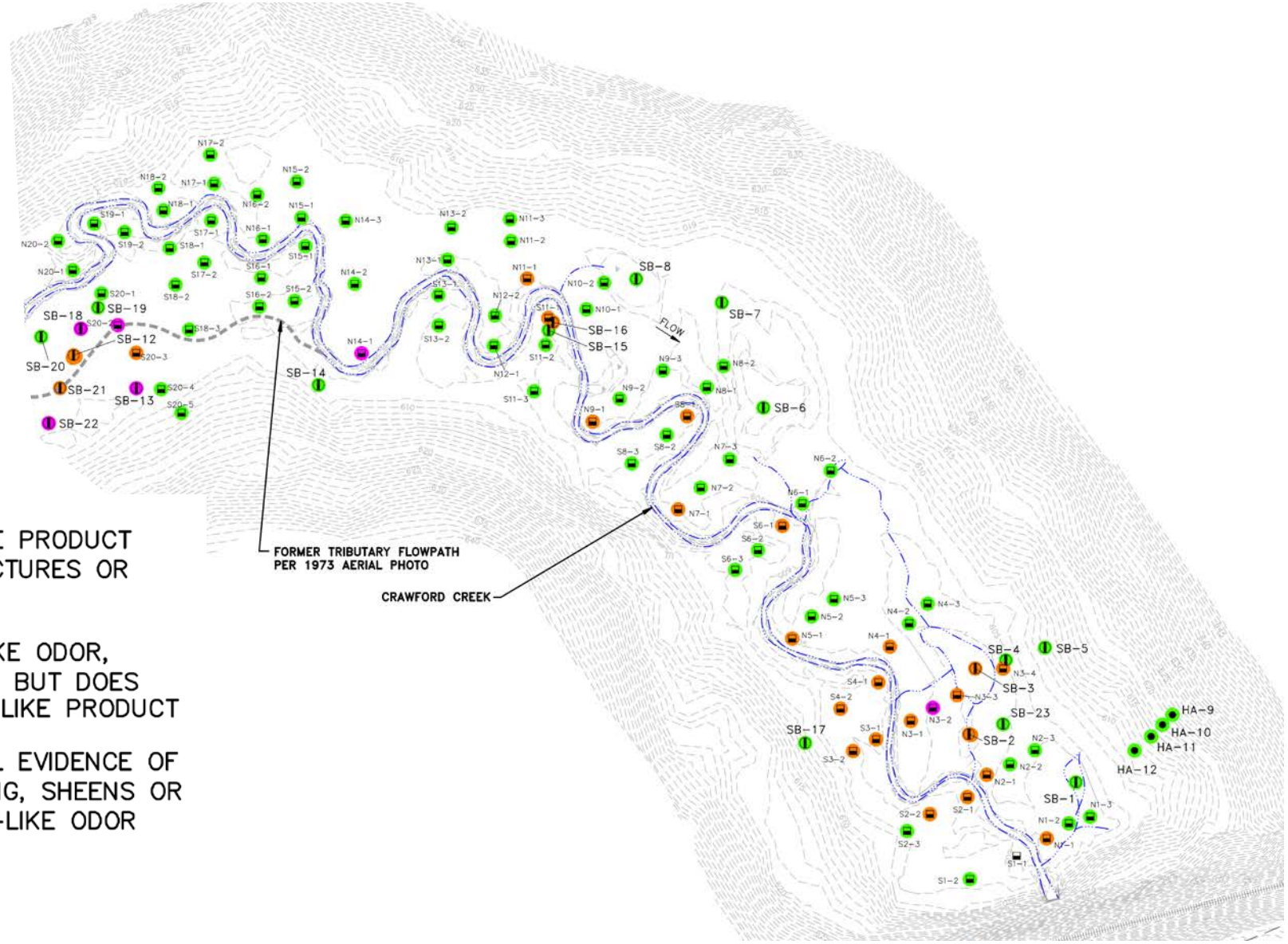
- Creosote-like product
- Odor, staining and/or sheens, but no product (including “black stained layer”)
- No odor, staining, sheens or product

CSM and Nature/Extent of Impacts – Area C

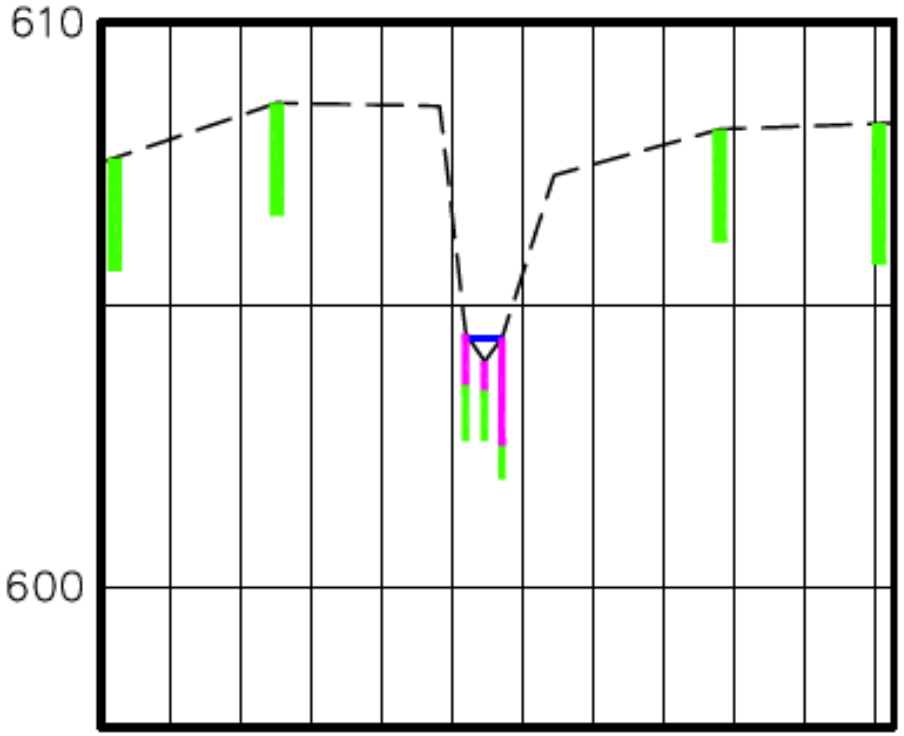
Photographs of creosote-like product in clay cracks/fractures (2003 test pits)

CSM and Nature/Extent of Impacts – Area C

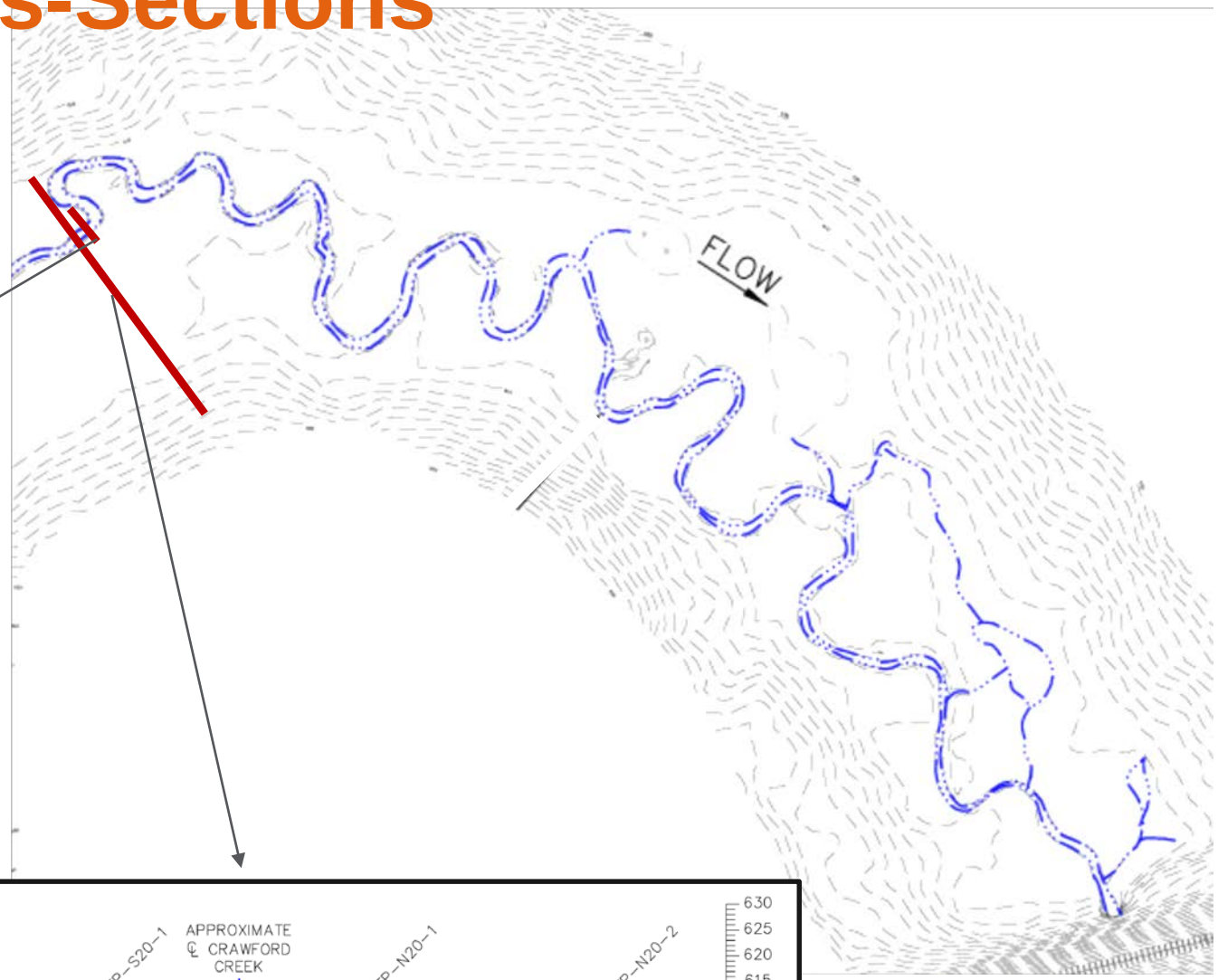
- TYPE 1 CONTAINS CREOSOTE–LIKE PRODUCT (TYPICALLY IN CLAY FRACTURES OR SAND/ORGANIC SEAMS)
- TYPE 2 EXHIBITS A CREOSOTE–LIKE ODOR, STAINING AND/OR SHEEN, BUT DOES NOT CONTAIN CREOSOTE–LIKE PRODUCT
- TYPE 3 DOES NOT EXHIBIT VISUAL EVIDENCE OF IMPACTS (i.e., NO STAINING, SHEENS OR PRODUCT) OR CREOSOTE–LIKE ODOR

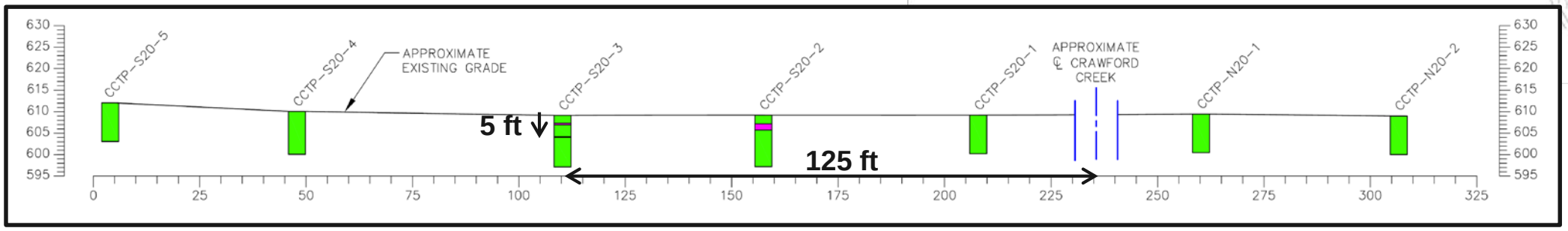


Area C – Example Cross-Sections



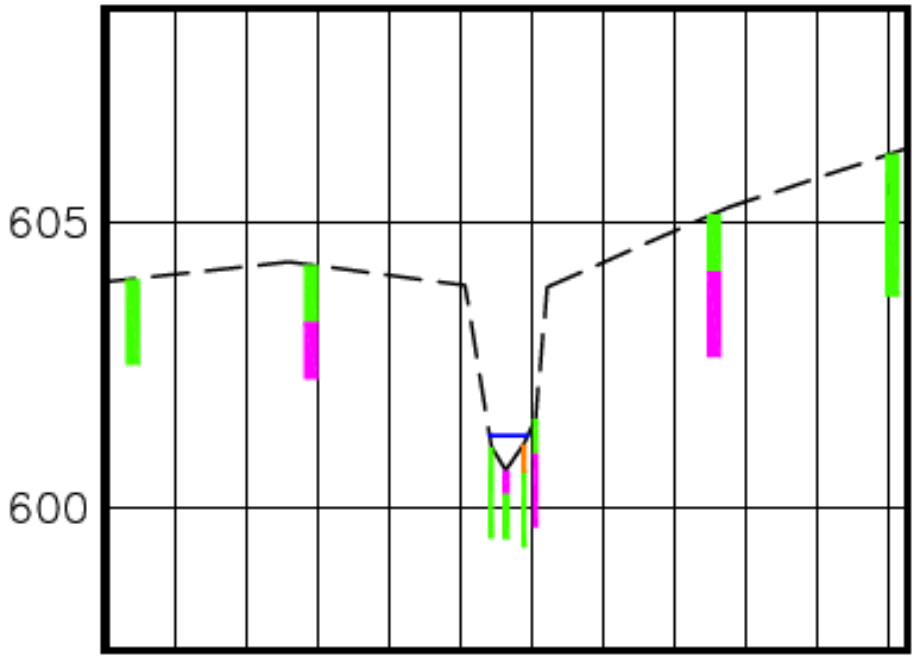
1999 Probing/Coring Transect 19
(looking downstream)



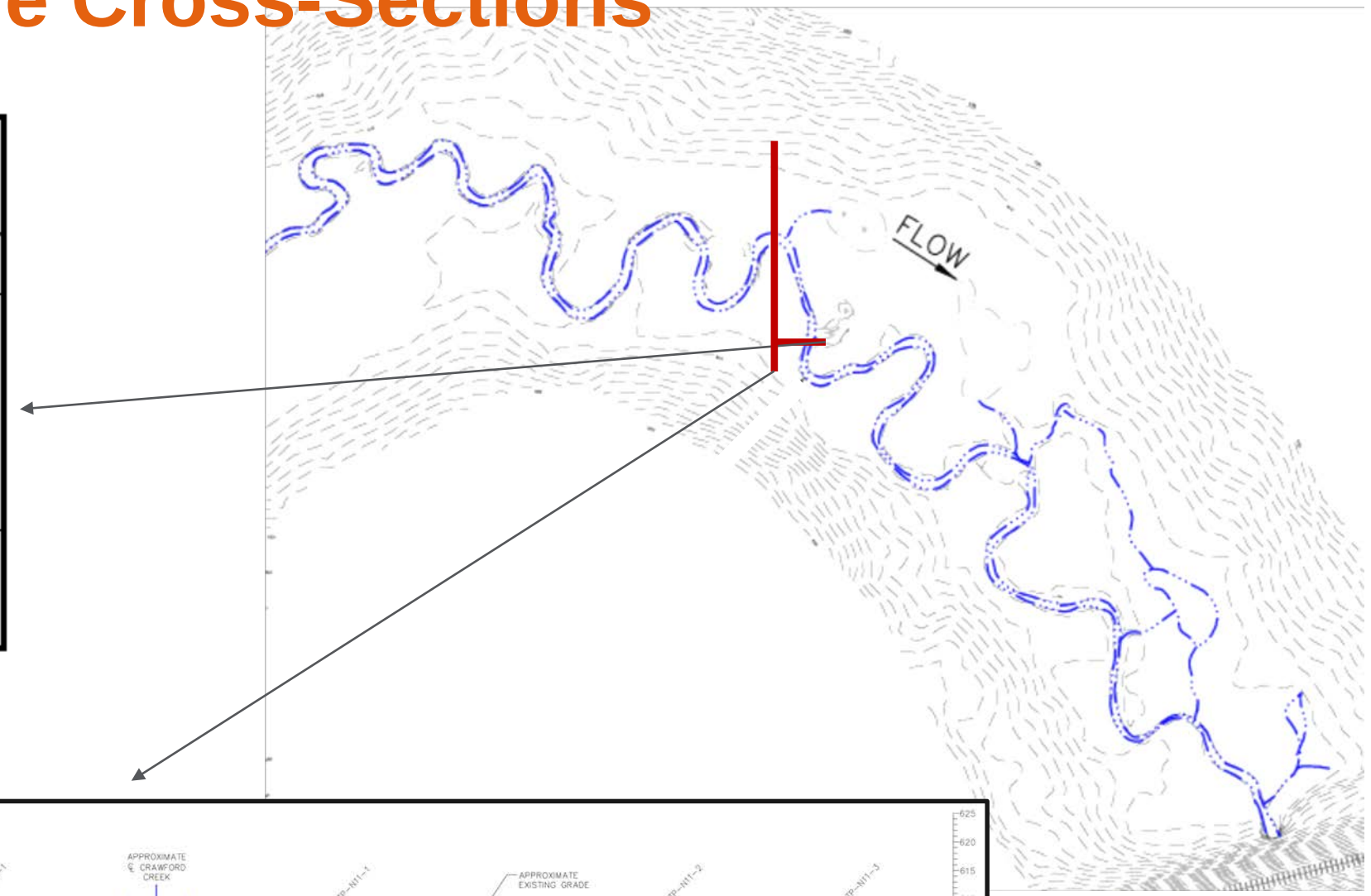


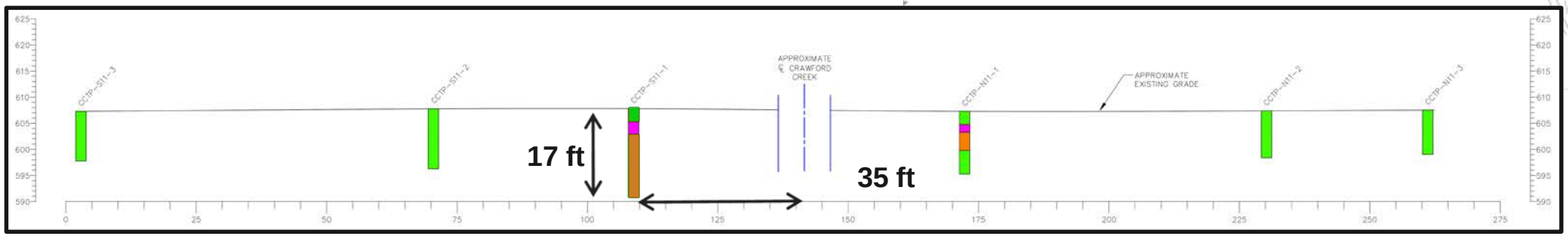
2003 Test Pit Transect 20
(looking upstream)

Area C – Example Cross-Sections



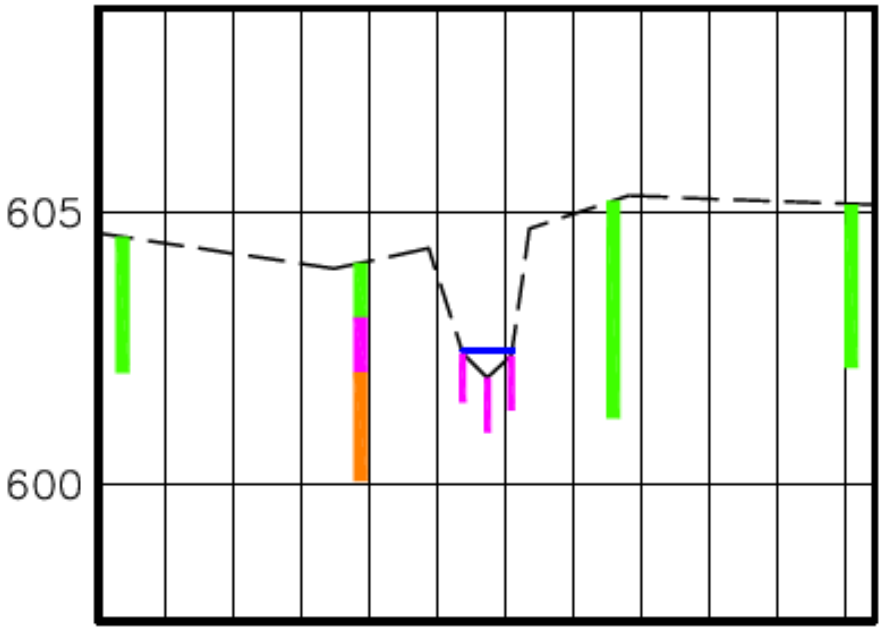
1999 Probing/Coring Transect 27
(looking downstream)



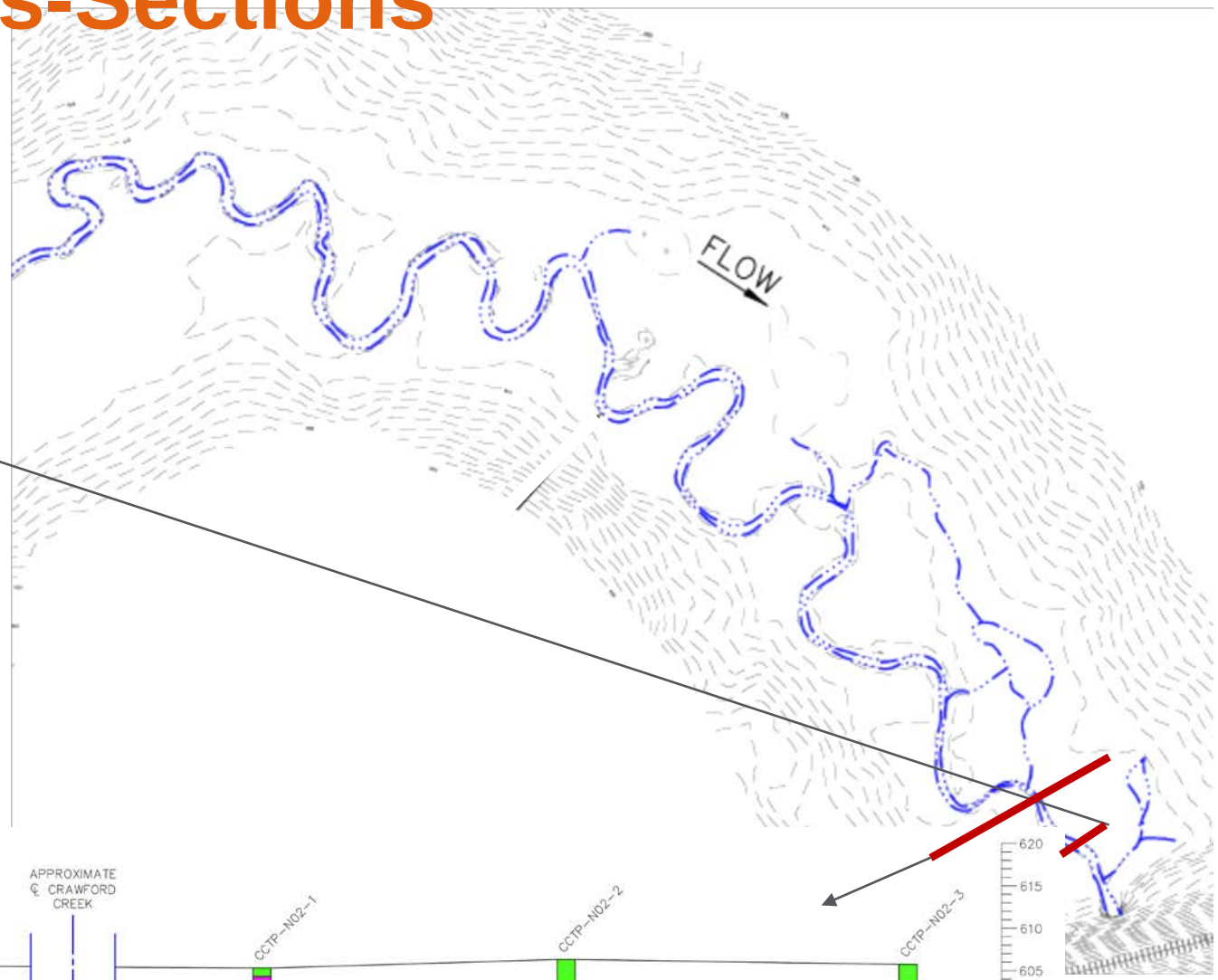


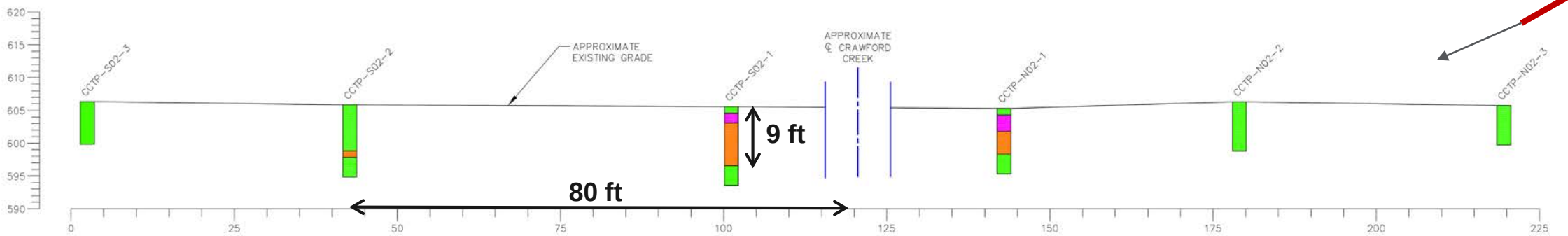
2003 Test Pit Transect 11
(looking upstream)

Area C – Example Cross-Sections



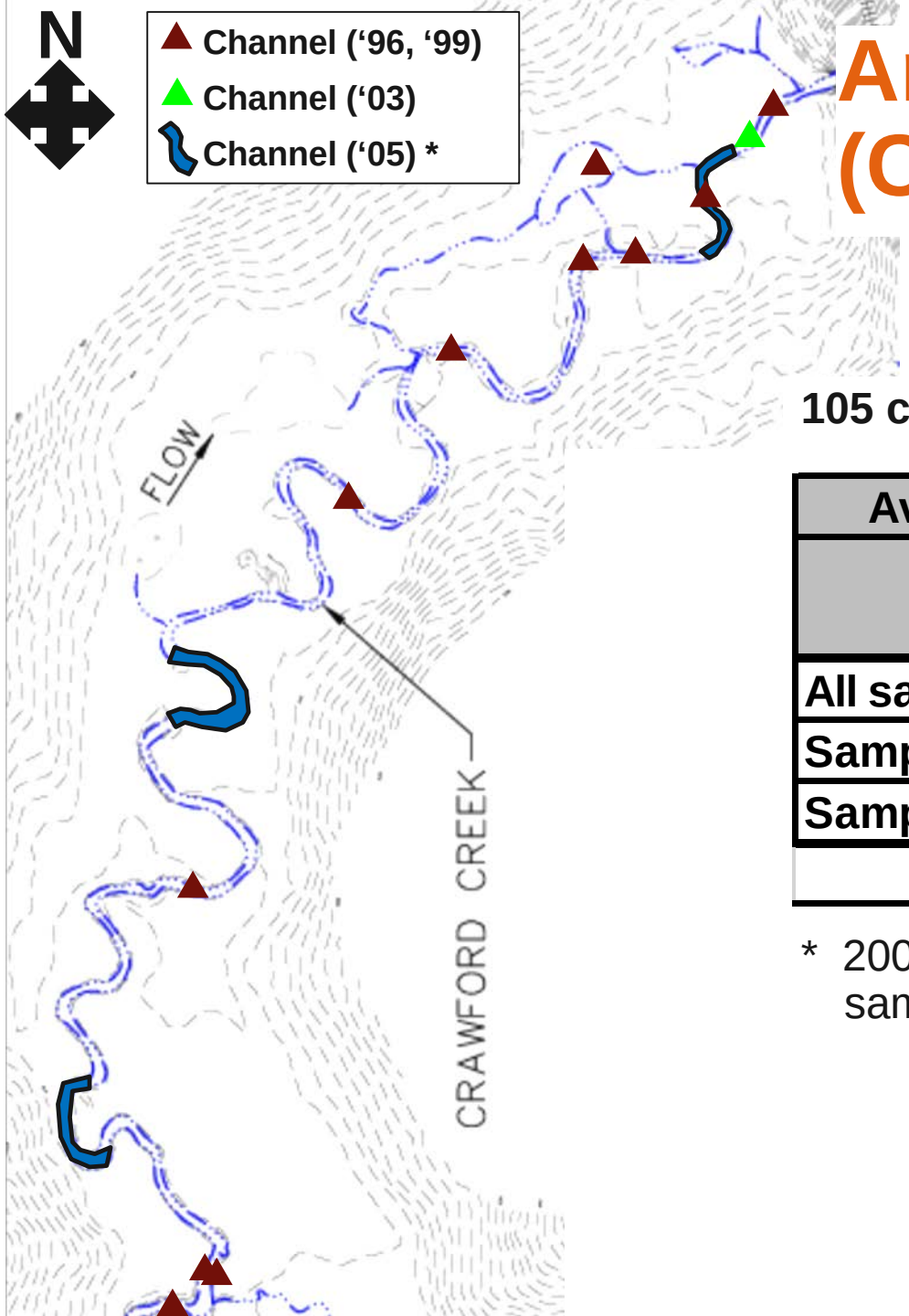
1999 Probing/Coring Transect 35
(looking downstream)





2003 Test Pit Transect 2
(looking upstream)

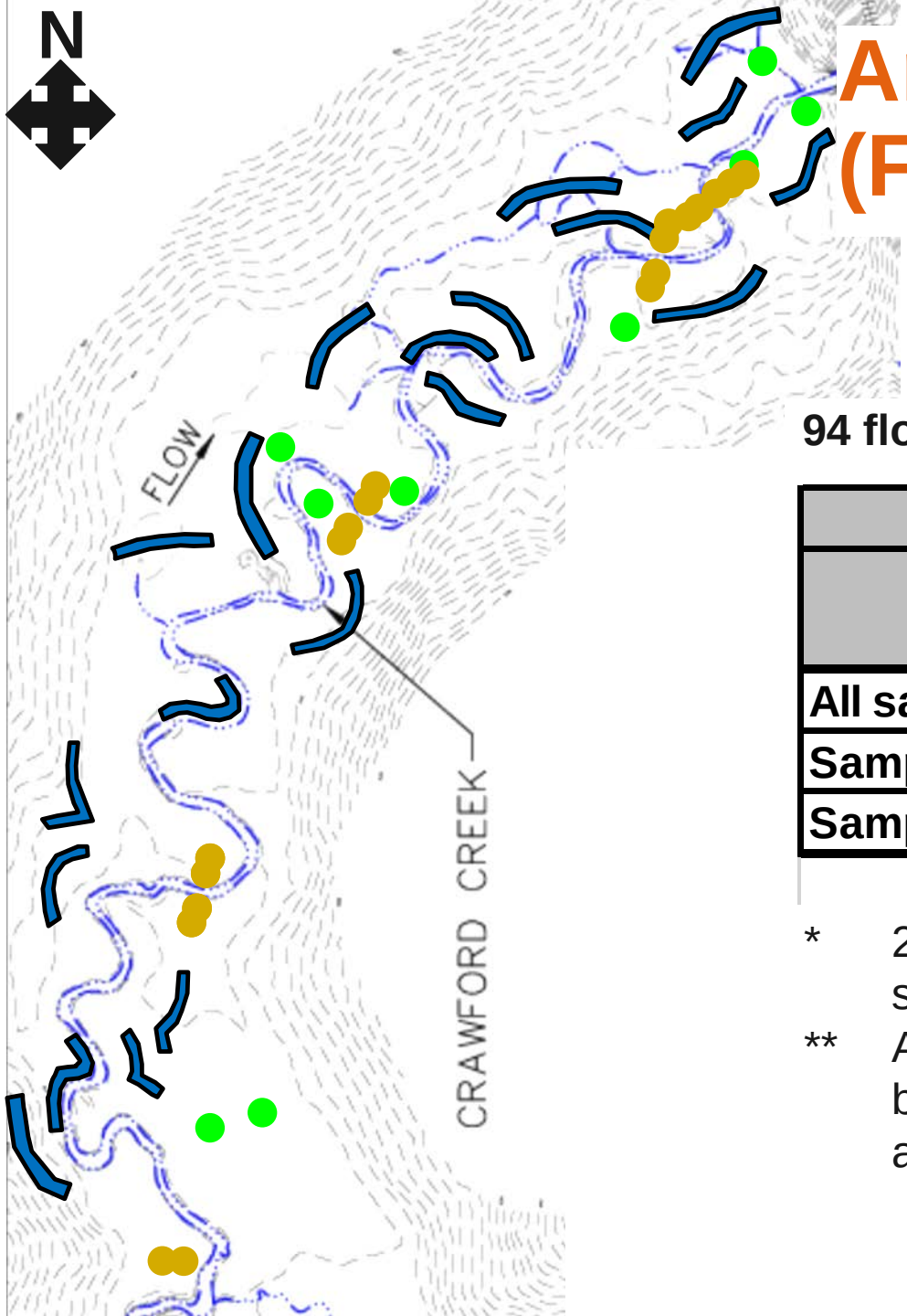
Area C – Analytical Data Summary (Creek Channel Sediment Samples)



105 channel bottom samples, 18 locations ('96, '99, '03, '05):

Average Concentrations - Channel Bottom Samples						
	tPAHs		Penta		TCDD-TEQ	
	#	(mg/kg)	#	(mg/kg)	#	(ug/kg)
All samples	101	1,870	101	0.002	7	0.014
Samples <1 ft	71	2,681	71	0.003	7	0.014
Samples >1 ft	30	201	30	ND	0	--

* 2005 samples are composites; each comprised of 9 discrete sample locations – most recent and spatially distributed dataset



Area C – Analytical Data Summary (Floodplain Samples)

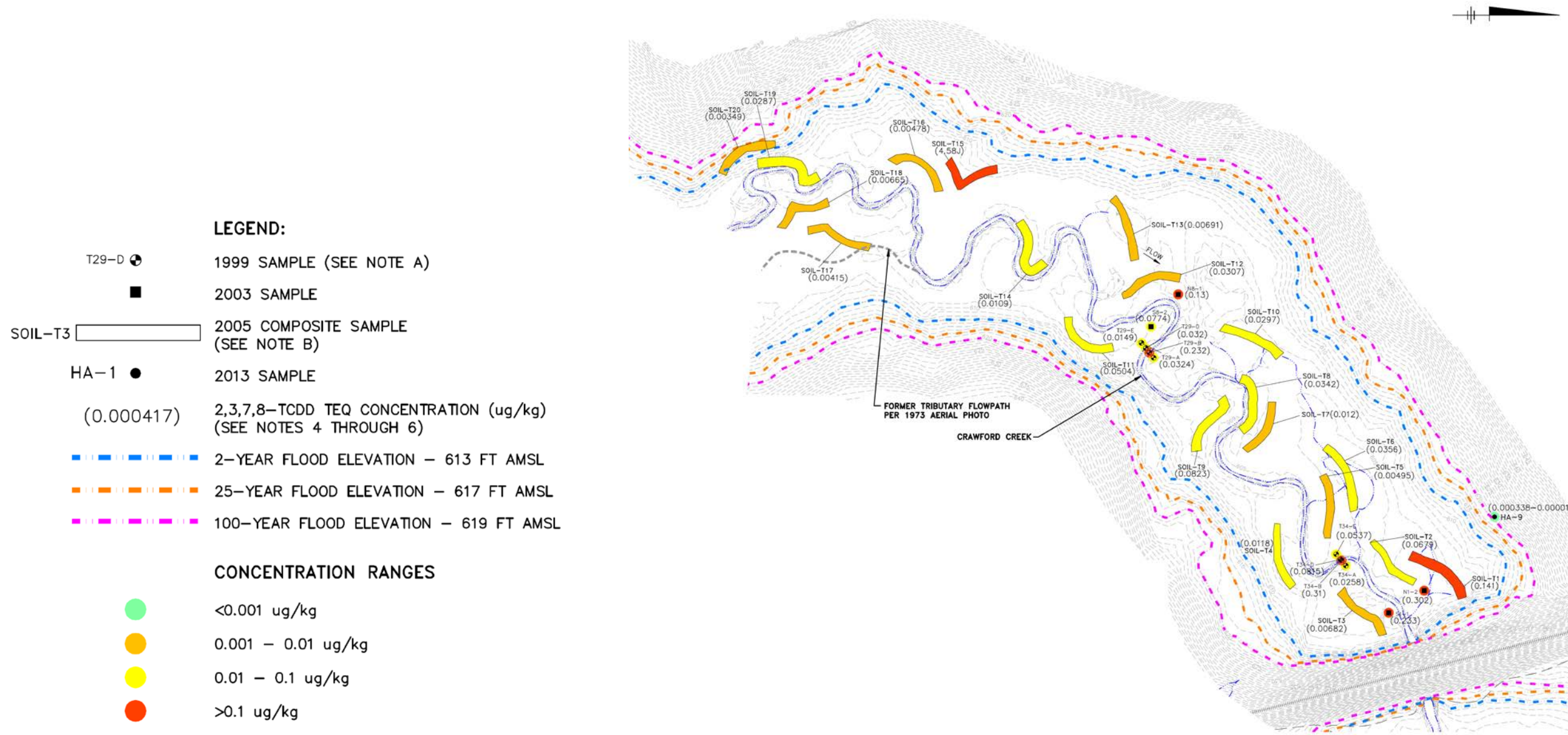
94 floodplain samples from 58 locations ('99, '03, '05):

Average Concentrations - Floodplain Samples						
	tPAHs		Penta		TCDD-TEQ	
	#	(mg/kg)	#	(mg/kg)	#	(ug/kg)
All samples	75	1,262**	75	0.012	40	0.051
Samples <1 ft	56	3.8	56	0.009	34	0.059
Samples >1 ft	19	4,970**	19	0.019	6	0.007

* 2005 samples are composites; each comprised of 5 discrete sample locations – most recent and spatially distributed dataset

** All samples and >1ft samples average tPAH concentrations driven by single sample (89,000 mg/kg) – excluding that sample, averages go down to 79 mg/kg and 313 mg/kg, respectively

Area C – Analytical Data Summary (2013 Step-Outs) TCDD-TEQ



CSM and Nature/Extent of Impacts – Area D

CSM and Nature/Extent of Impacts – Area D

Visual observations from:

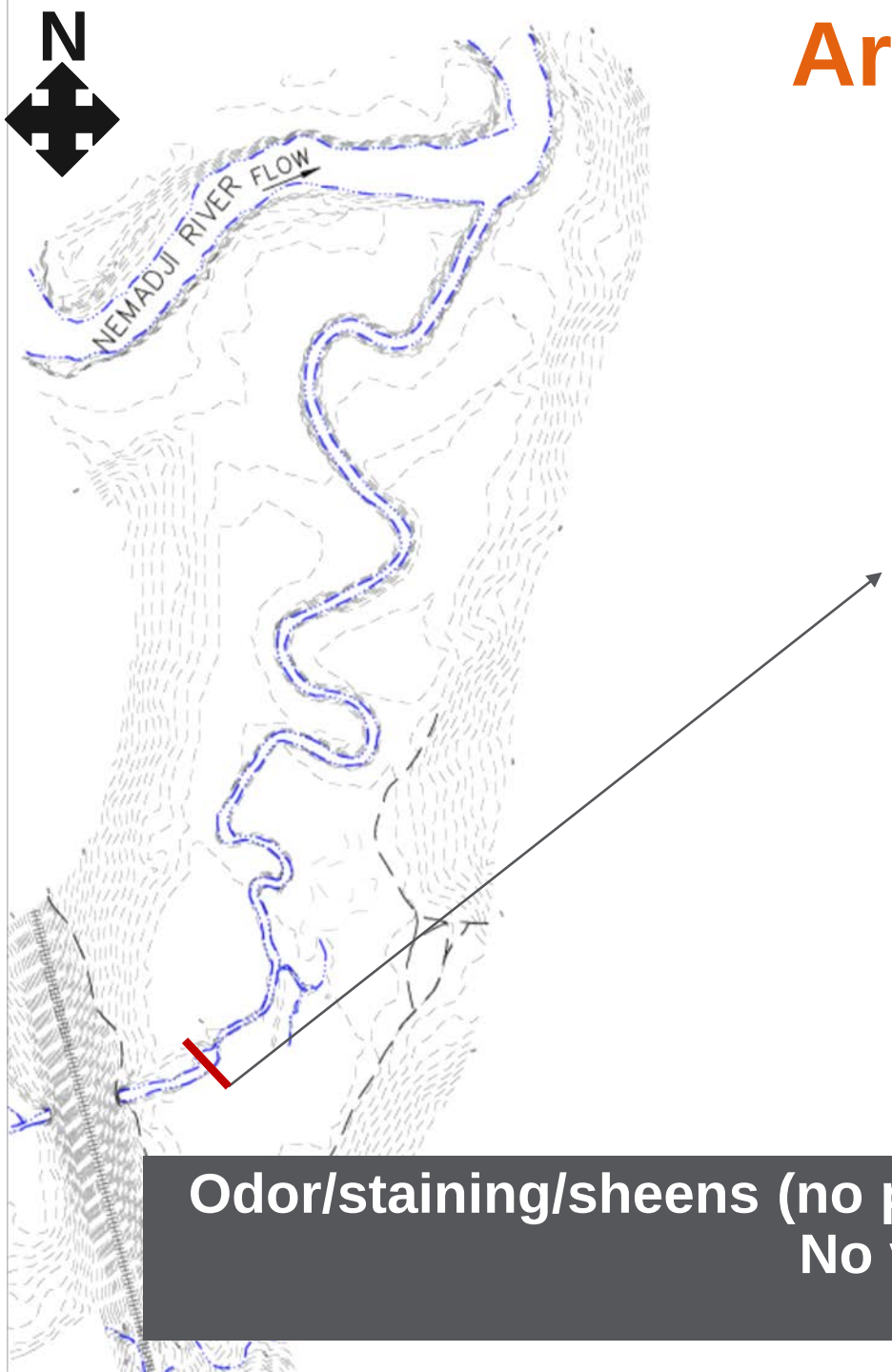
- 105 channel bottom/floodplain cores along 16 transects (1999 - Beazer)
- 91 channel bottom probing locations along 30 transects (2014 – GLNPO)
- 41 floodplain probing locations along 10 transects (2014 – GLNPO)

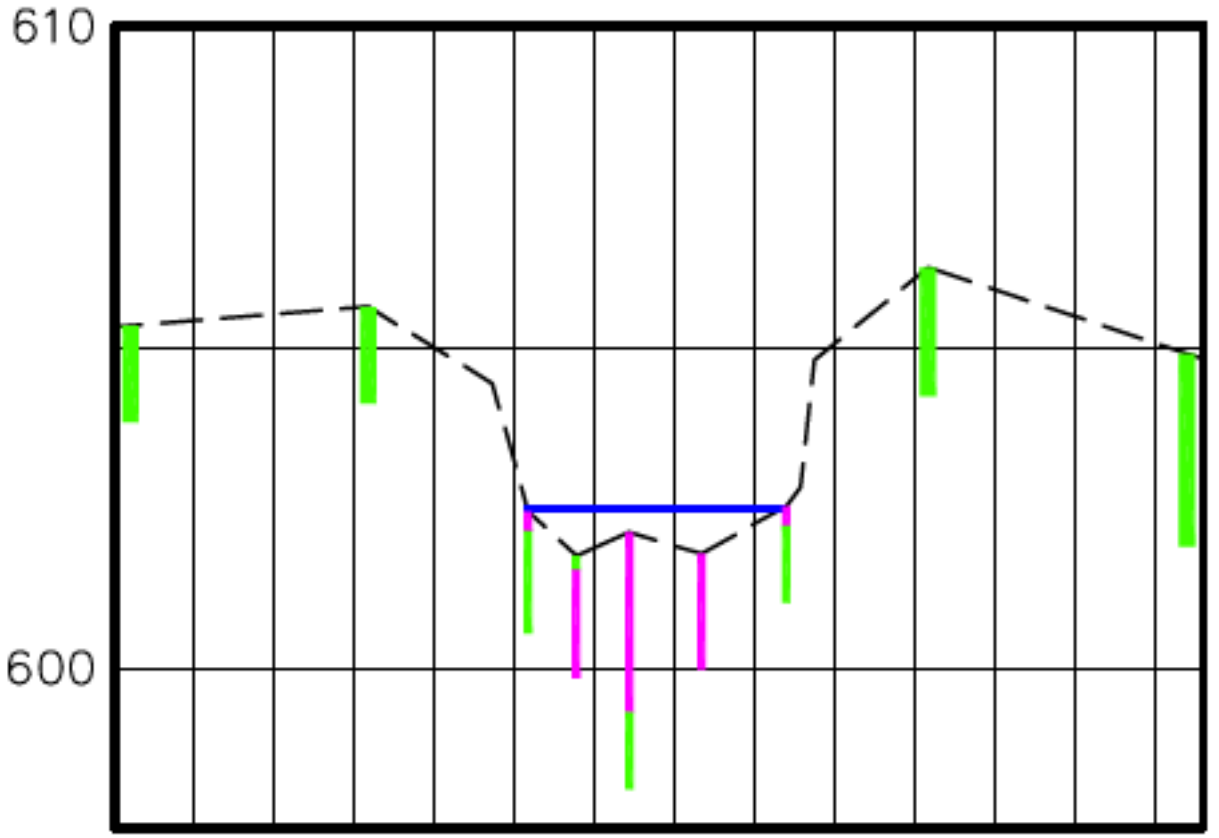
Visual classifications*:

- Creosote-like product
- Odor, staining and/or sheens, but no product (including “black stained layer”)
- No odor, staining, sheens or product

* Applies to Beazer dataset only

Area D – Example Cross-Sections

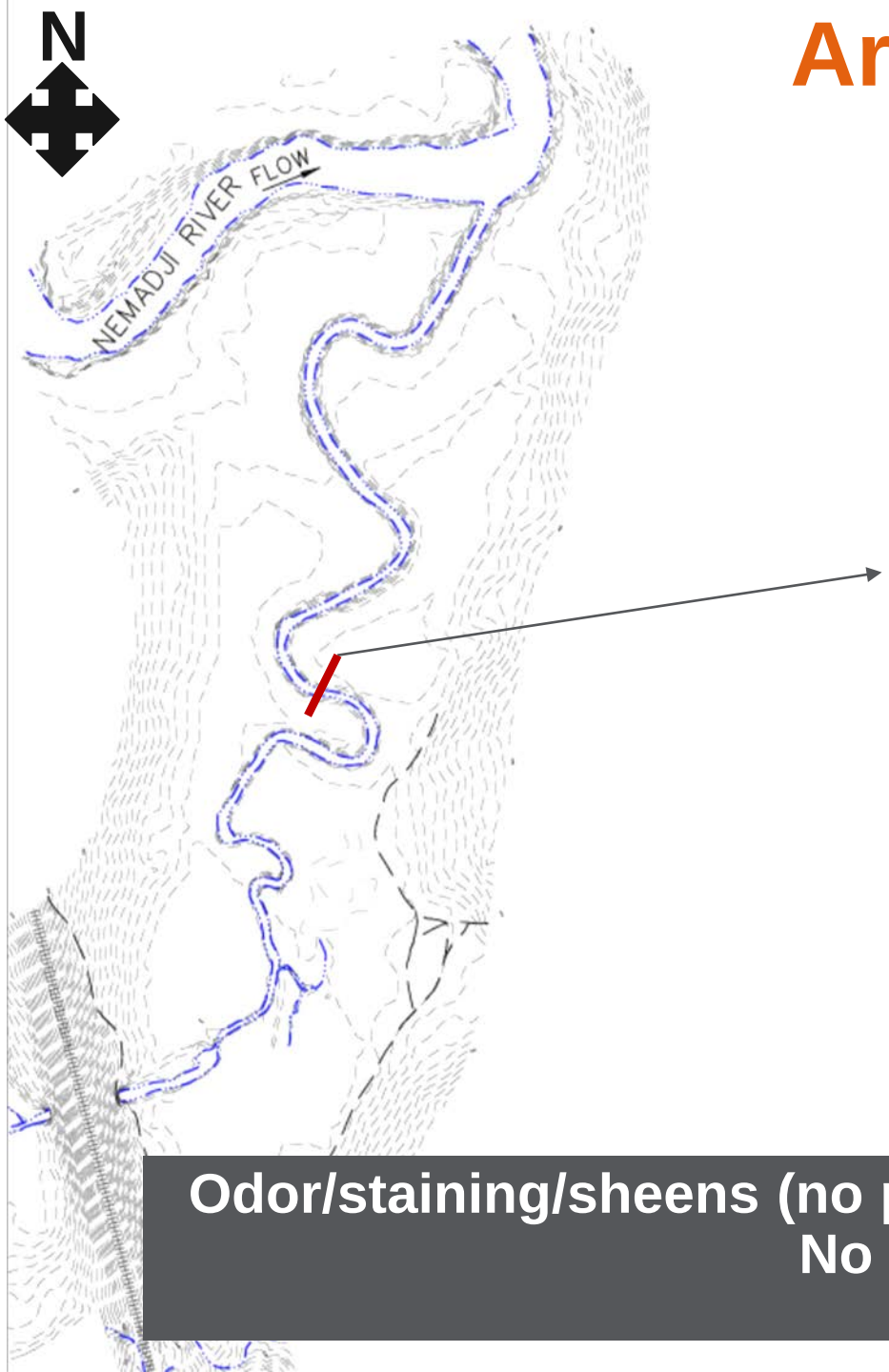


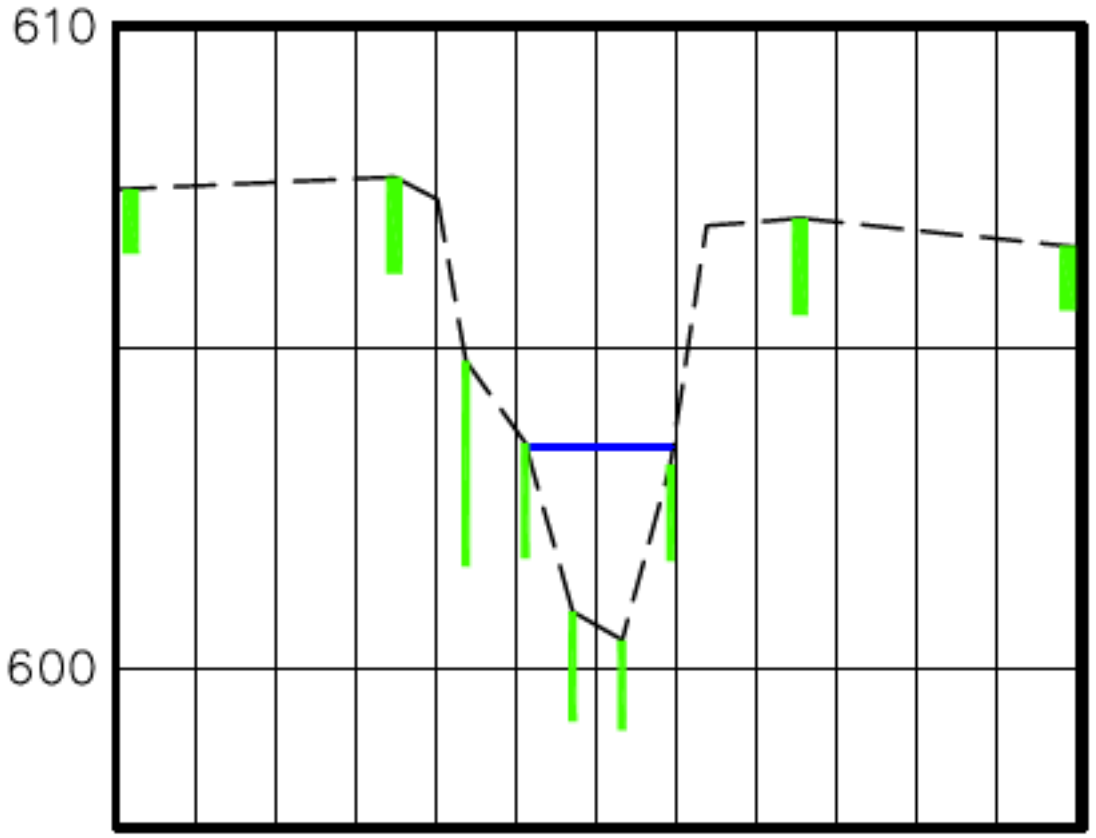


1999 Beazer Probing/Coring Transect 37
(looking downstream)

Odor/staining/sheens (no product) in channel immediately downstream of RR
No visible impacts in floodplain

Area D – Example Cross-Sections

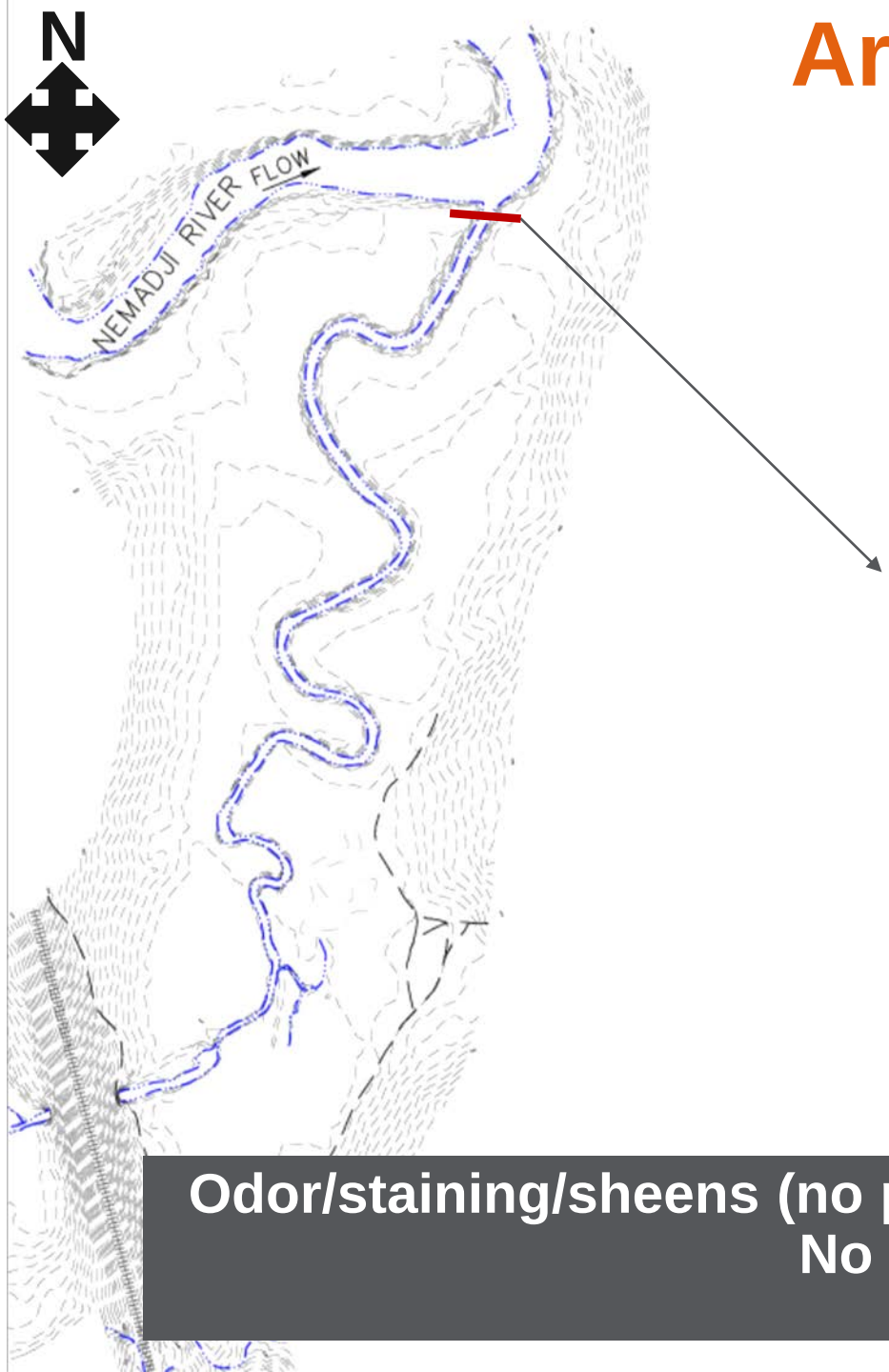


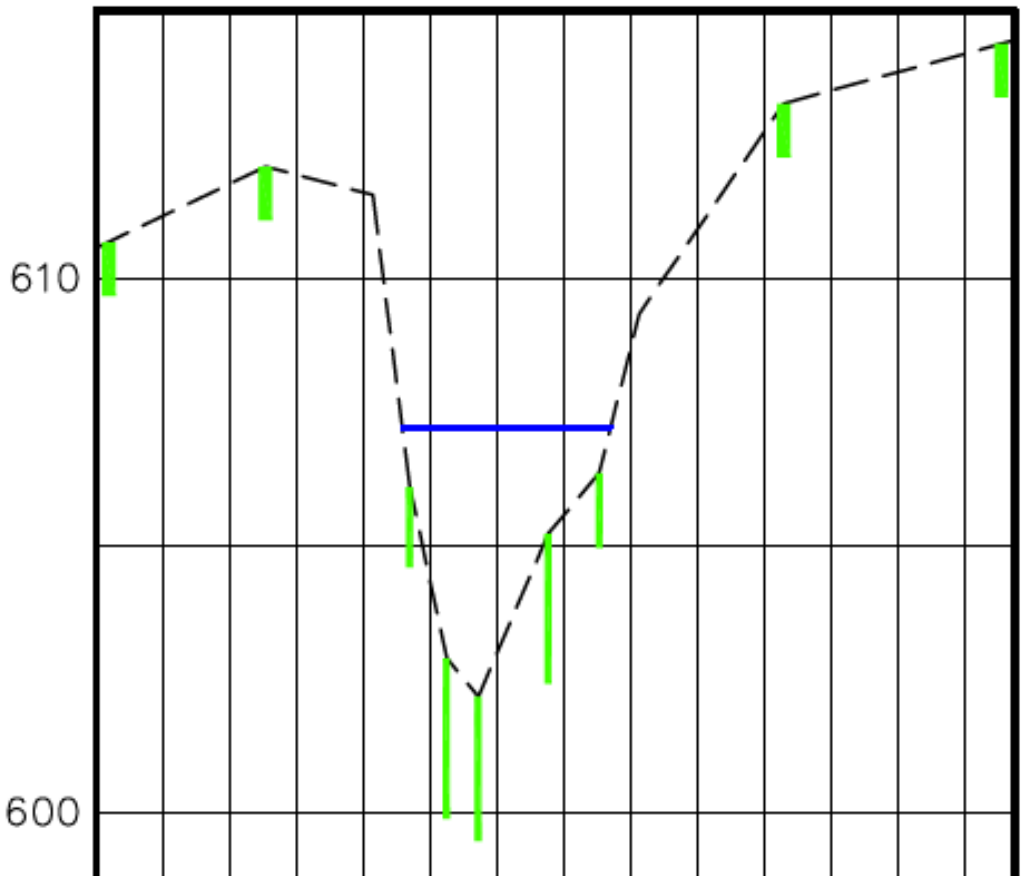


1999 Beazer Probing/Coring Transect 43
(looking downstream)

Odor/staining/sheens (no product) in channel immediately downstream of RR
No visible impacts in floodplain

Area D – Example Cross-Sections

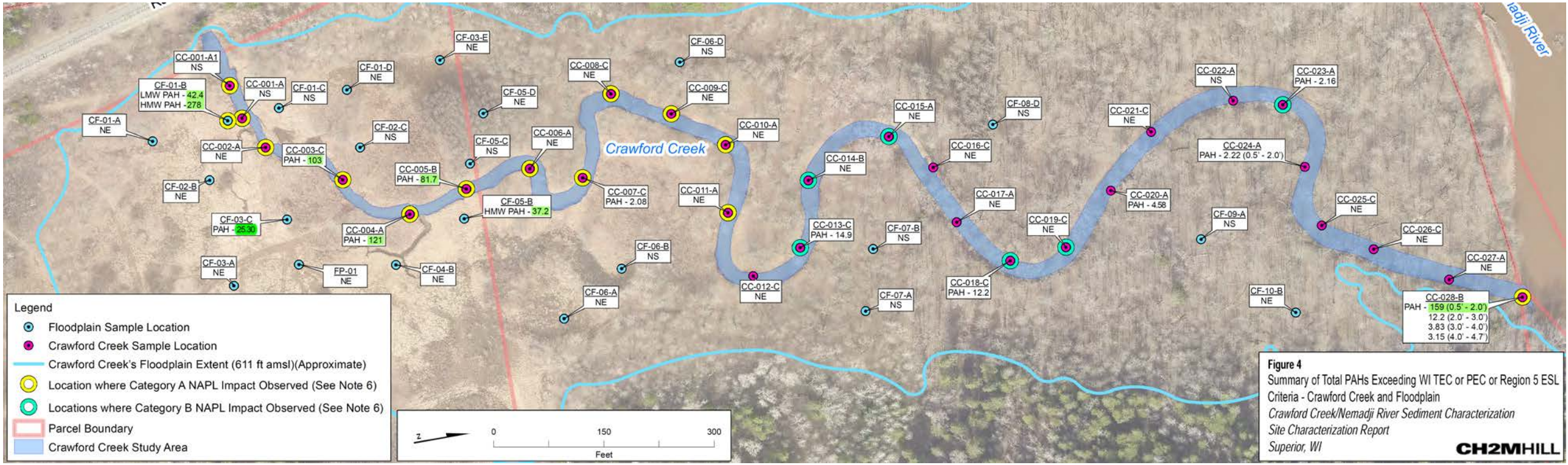




1999 Beazer Probing/Coring Transect 51
(looking downstream)

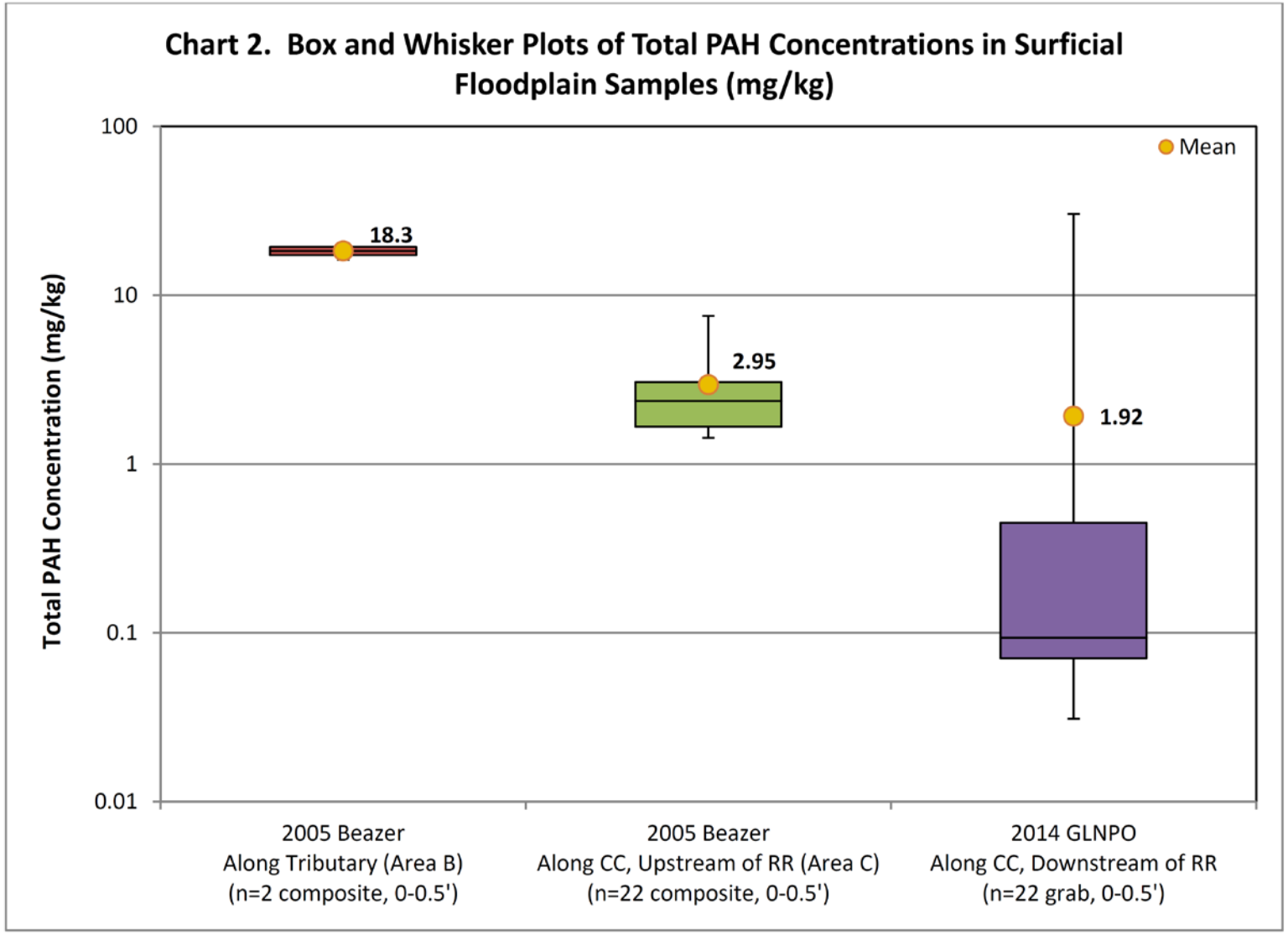
Odor/staining/sheens (no product) in channel immediately downstream of RR
No visible impacts in floodplain

Area D – 2014 GLNPO Visual Observations



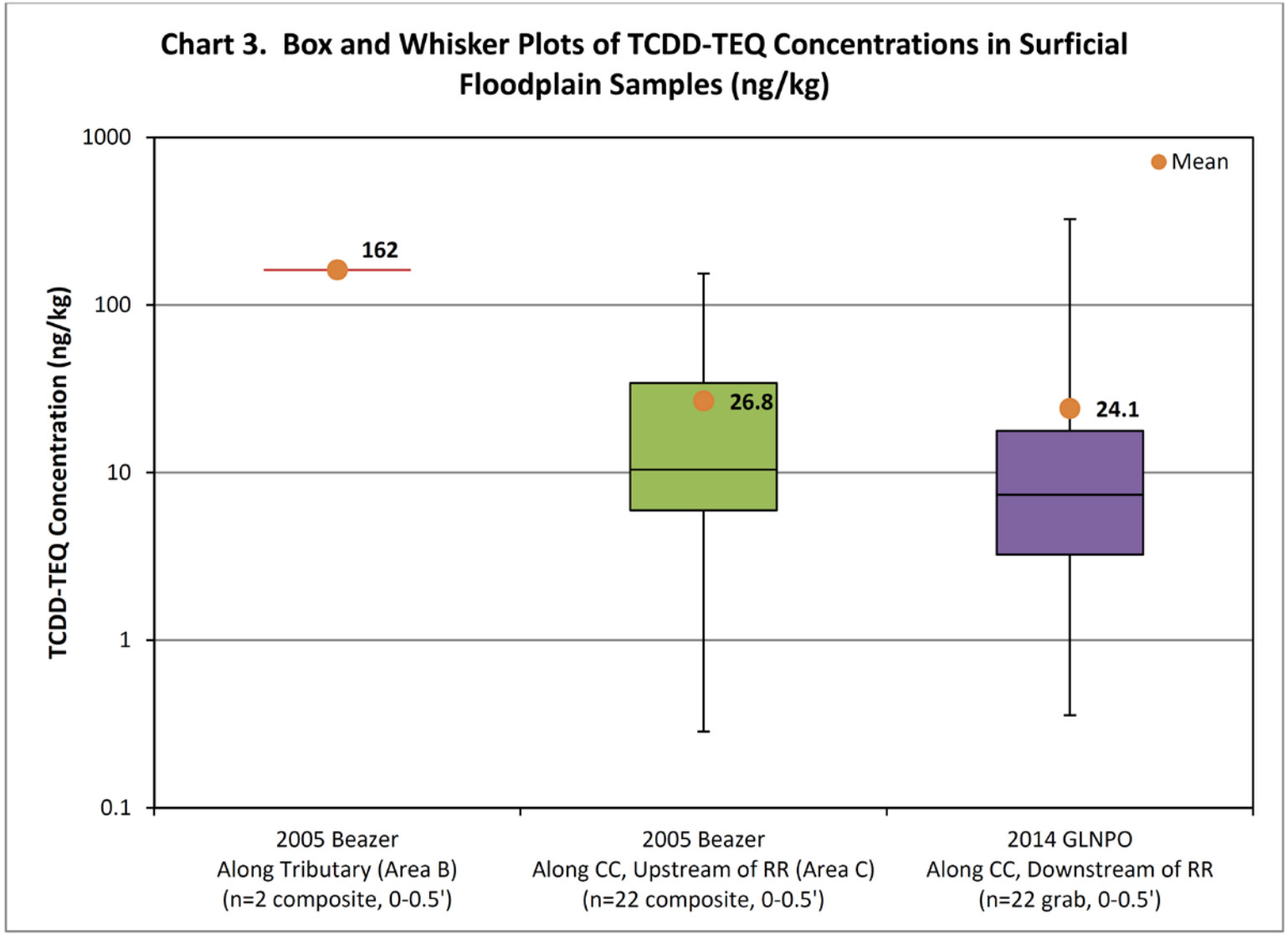
6. Category A NAPL Impact - Staining, Creosote like product (NAPL), chunks of coal-tar like material, strong creosote like Odor, NAPL wetted fibers observed in the sediment matrix.
Category B NAPL Impact - Sheens, Mild Odor, trace NAPL observed in the sediment matrix.

Comparison of 2005 Beazer to 2014 GLNPO Data (Floodplain Samples – tPAHs)



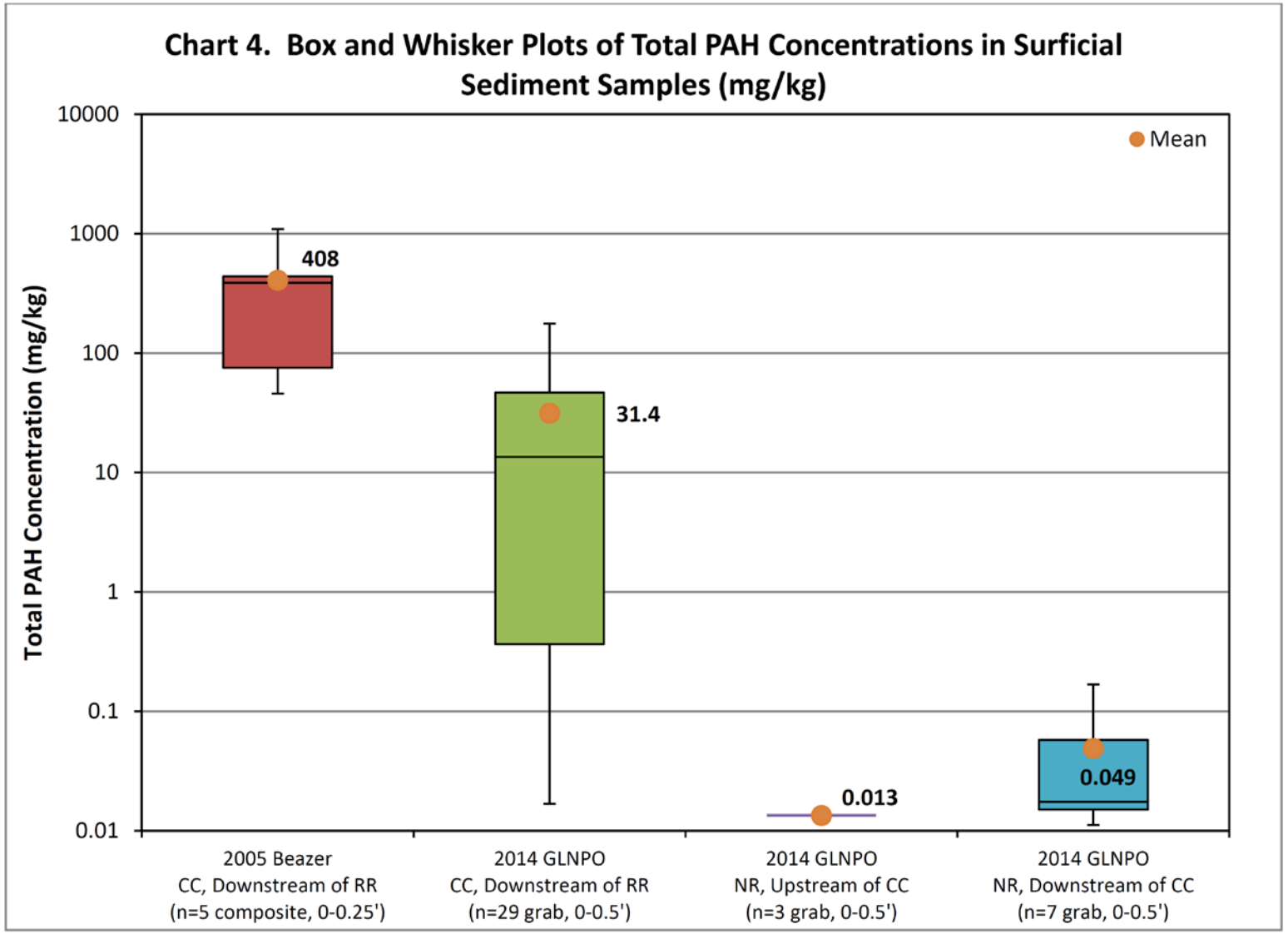
Notes:
CC=Crawford Creek, RR=Railroad Embankment
Total PAH calculations assume non-detects = ½ detection limit

Comparison of 2005 Beazer to 2014 GLNPO Data (Floodplain Samples – TCDD-TEQ)



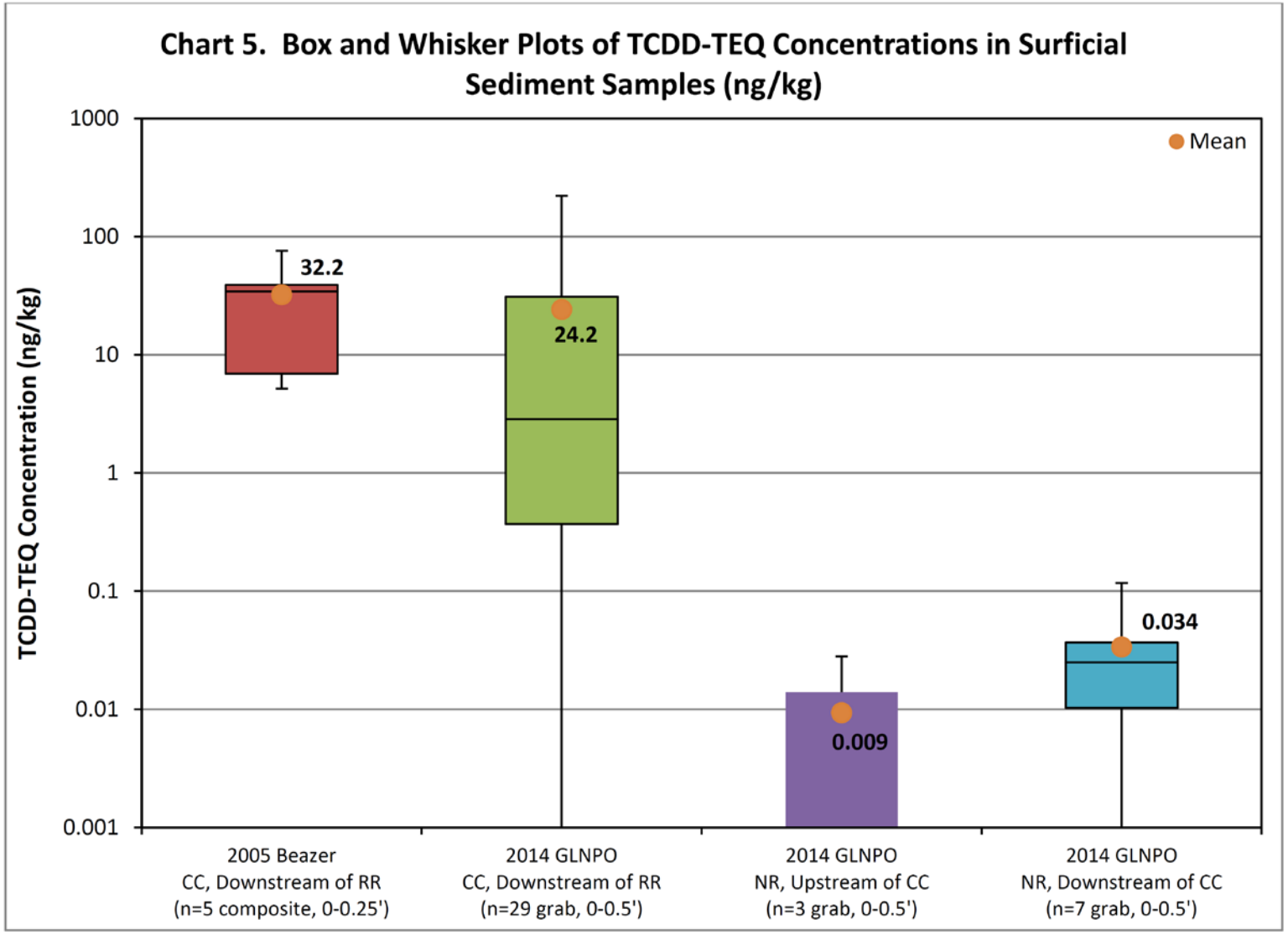
Notes:
CC=Crawford Creek, RR=Railroad Embankment
TCDD-TEQ calculations use WHO 2005 TEFs and assume non-detects = zero

Comparison of 2005 Beazer to 2014 GLNPO Data (Channel Sediment Samples – tPAHs)



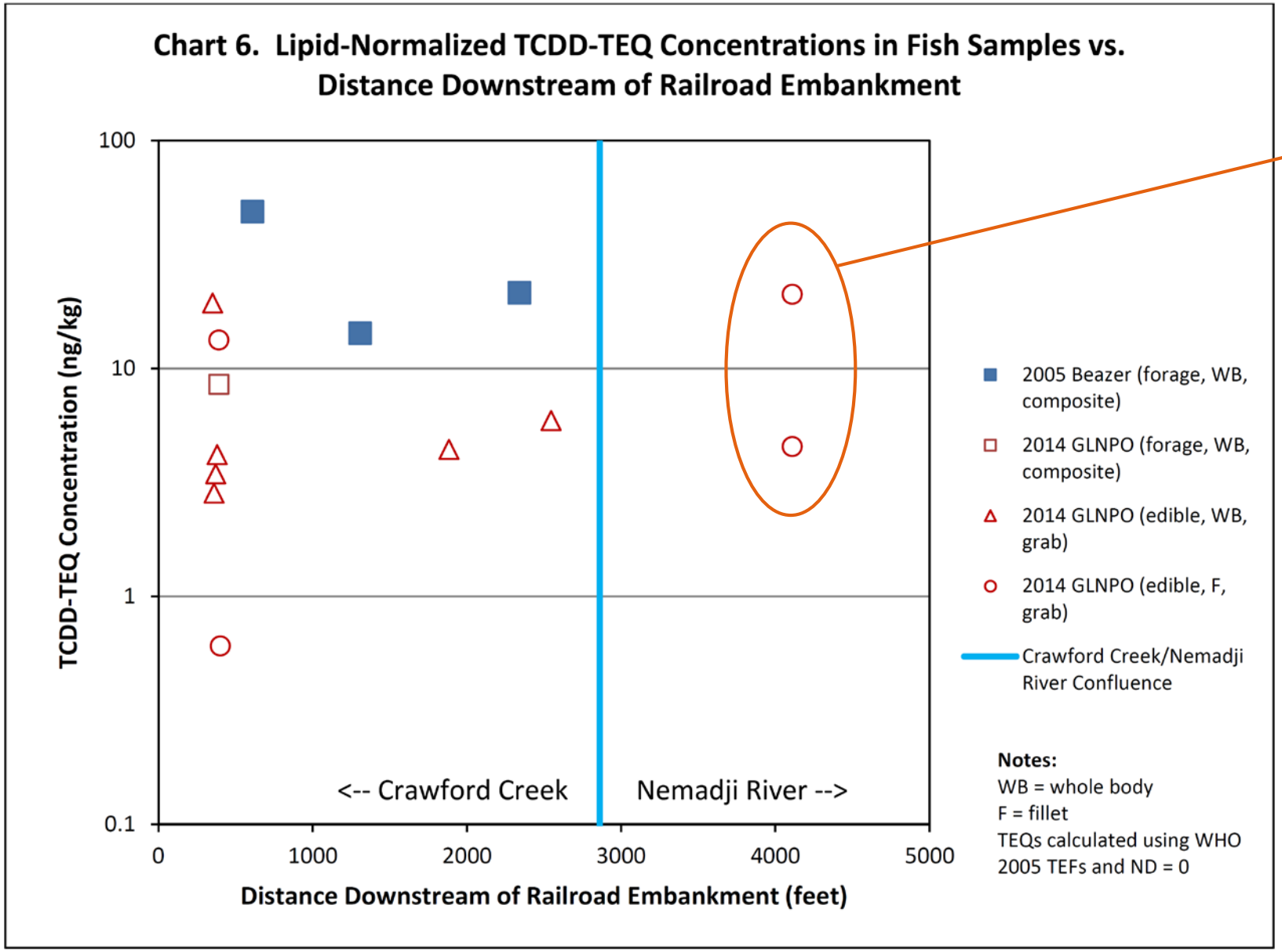
Notes:
CC=Crawford Creek, NR=Nemadji River, RR=Railroad Embankment
Total PAH calculations assume non-detects = ½ detection limit

Comparison of 2005 Beazer to 2014 GLNPO Data (Channel Sediment Samples – TCDD-TEQ)



Notes:
CC=Crawford Creek, NR=Nemadji River, RR=Railroad Embankment
TCDD-TEQ calculations use WHO 2005 TEFs and assume non-detects = zero

Comparison of 2005 Beazer to 2014 GLNPO Data (Fish Tissue Samples – TCDD-TEQ)



Fingerprinting evaluation indicates different source of dioxins/furans in Nemadji River fish tissue samples, compared to Crawford Creek fish tissue samples

Human Health and Ecological Risk Assessment (HHERA)

HHERA Summary – Outline

- Human Health and Ecological Risk Assessment (HHERA) Timeline
- HHERA Exposure Areas
- Human Health Risk Assessment (HHRA) Summary
  - Scope, Results, Responses to Agency Comments
- Ecological Risk Assessment (ERA) Summary
  - Scope, Results, Responses to Agency Comments
- Assessment of 2014 GLNPO Dataset for Portion of Crawford Creek Downstream of the Railroad Embankment
- Overall HHERA Conclusions

HHERA Summary – Timeline

2006
- AMEC submits HHRA/ERA approach memos #1
- WDNR comments

2007
- Add'l WDNR comments and AMEC responses
- AMEC submits HHRA/ERA approach memos #2

2008
- WDNR comments and AMEC responses

2009
- AMEC submits HHERA

2011
- WDHS comments on HHRA

2012
- USEPA comments on ERA

2014
- Responses to WDHS and USEPA comments (submitted with FCMS)

HHERA scope of work was developed in collaboration with WDNR

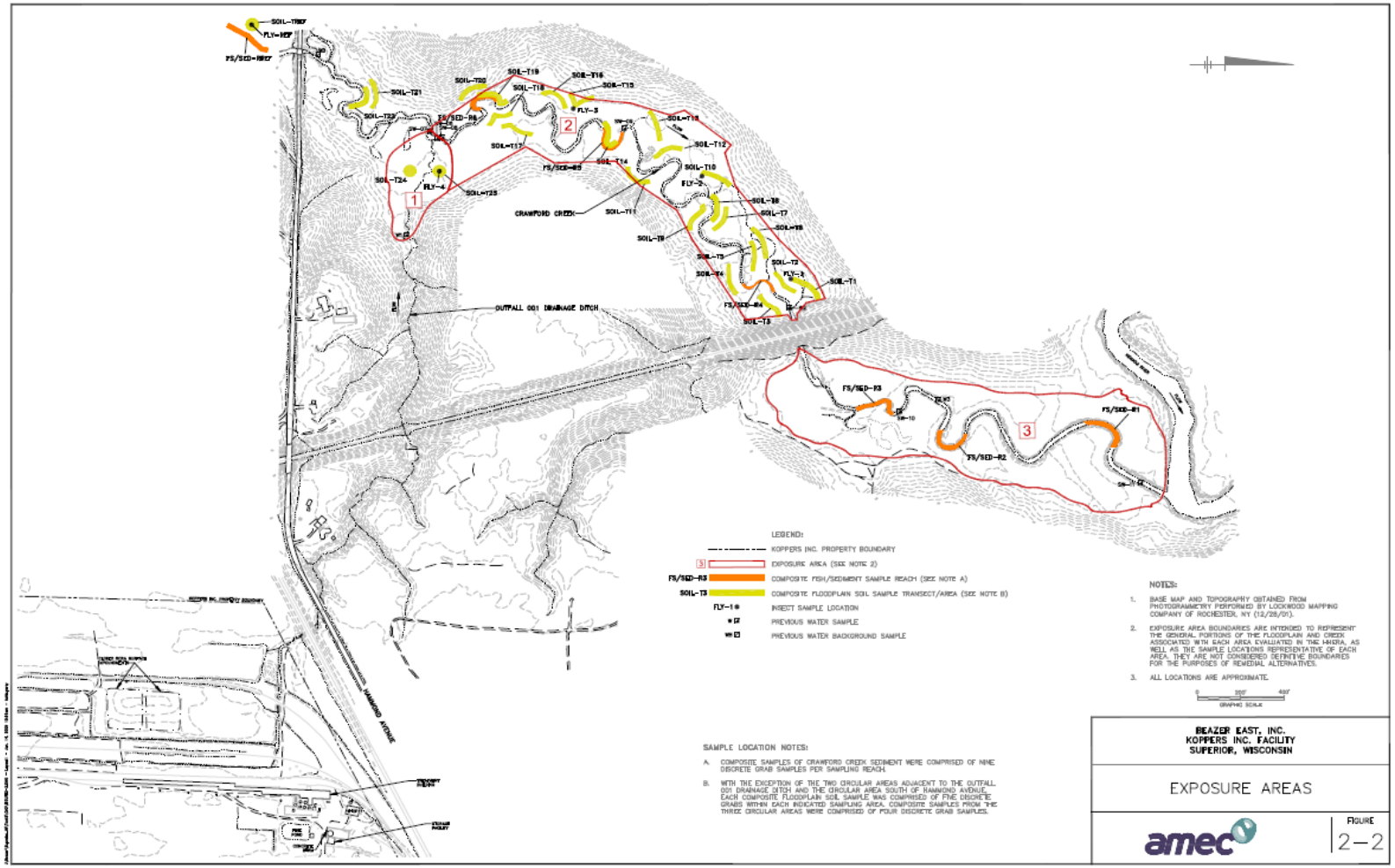
HHERA Summary – Exposure Areas

Areas Evaluated in HHERA*:

- “Area 1” – Tributary within Crawford Creek floodplain (“Area B” in FCMS)
- “Area 2” – Crawford Creek from Tributary to RR embankment (“Area C” in FCMS)
- “Area 3” – Crawford Creek from RR embankment to Nemadji River (not included in FCMS)

* Tributary upstream of Crawford Creek floodplain (FCMS Area A) was not evaluated in HHERA, as Beazer had previously committed to remediation of this area.

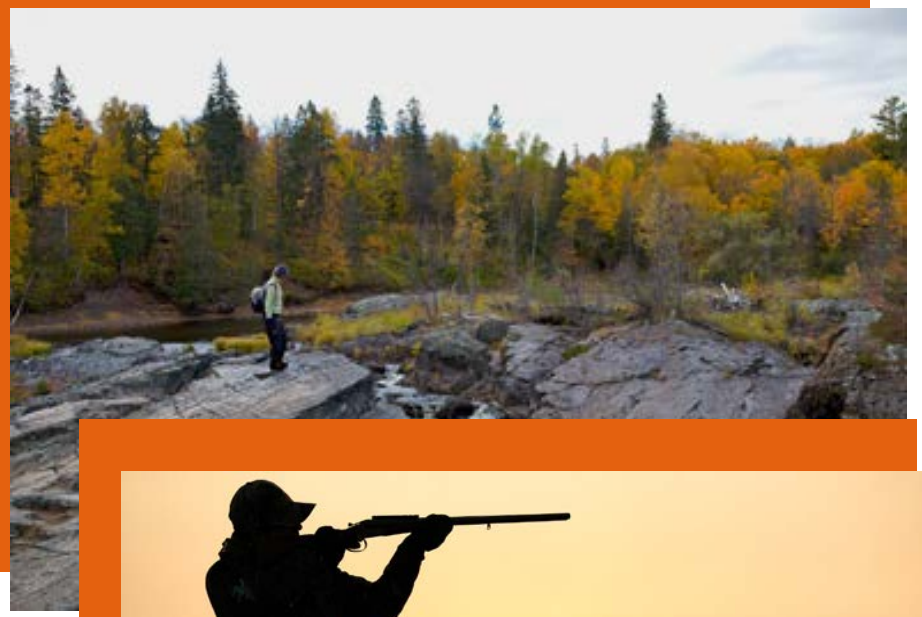
HHERA Summary – Exposure Areas



HHERA Summary – HHRA Media and COPCs

- Floodplain soils
  - PAHs, pentachlorophenol, dioxin/furans
- Sediment
  - PAHs, dioxins/furans
- Surface water
  - PAHs, pentachlorophenol

HHERA Summary – HHRA Receptors



- Recreational visitor (child and adult)
- Hunter (child and adult)
- Trapper (WDNR scenario only)

HHERA Summary – HHRA Exposure Assumptions

- AMEC Exposure Assumptions
  - COPC-specific dermal absorption adjustment factors (AAFs)
  - Exposure assumptions representative of reasonable maximum exposures (RMEs), as recommended by USEPA guidance
- WDNR Exposure Assumptions
  - Default AAFs recommended by WDNR
  - WDNR-recommended exposure frequencies and durations

HHERA Summary – HHRA Exposure Assumptions

AMEC and WDNR Scenarios

Receptor	Parameter (Units)	Floodplain Soil		Sediment		Surface Water	
		AMEC	WDNR	AMEC	WDNR	AMEC	WDNR
Recreational Visitor (Child)	Age Range (y) ET (hr/d) EF (d/y) ED (y) BW (kg) AT - NC (d) CR (mg/d or mL/d)	12-18 2 12 6 56 2190 50	7-18 2 365 11 48 4015 100	12-18 2 12 6 56 2190 50	7-18 2 365 11 48 4015 100	12-18 1 12 6 56 2190 10	7-18 2 365 11 48 4015 10
Recreational Visitor (Adult)	ET (hr/d) EF (d/y)	2 12	2 120	2 12	2 120	1 12	2 120
Hunter (Child)	Age Range (y) ED (y) BW (kg) AT - NC (d) CR (mg/d or mL/d)	12-18 6 56 2190 50	7-18 11 48 4015 100	12-18 6 56 2190 50	7-18 11 48 4015 100	12-18 6 56 2190 10	7-18 11 48 4015 10

AF = Adherence factor (milligrams/centimeter^2)
AT – Lifetime = Averaging time, cancer (days)
AT - NC = Averaging time, chronic noncancer (days)
BW = Body Weight (kilograms)
CR = Contact rate (milligrams/day or milliliters/day)
ED = Exposure duration (years)
EF = Exposure frequency (days/year)
ET = Exposure time (hours/day)
NA = Not applicable
SA = Surface area exposed (centimeter^2/day)
y = years

HHERA Summary – HHRA Exposure Assumptions

AMEC and WDNR Scenarios, Cont.

Receptor	Parameter (Units)	Floodplain Soil		Sediment		Surface Water	
		AMEC	WDNR	AMEC	WDNR	AMEC	WDNR
Hunter (Adult)	(Exposure parameters identical in AMEC and WDNR scenarios)						
Trapper (Adult)	ET (hr/d)	NA	2	NA	2	NA	2
	EF (d/y)	NA	150	NA	150	NA	150
	ED (y)	NA	24	NA	24	NA	24
	BW (kg)	NA	71.8	NA	71.8	NA	71.8
	AT – Lifetime (d)	NA	25,550	NA	25,550	NA	25,550
	AT – NC (d)	NA	8,760	NA	8,760	NA	8,760
	CR (mg/d or mL/d)	NA	50	NA	50	NA	10
	Fraction from Site (unitless)	NA	0.08	NA	0.08	NA	NA
	SA (cm^2/d)	NA	2,518	NA	3,341	NA	3,341
	AF (mg/cm^2)	NA	0.14	NA	0.18	NA	NA

AF = Adherence factor (milligrams/centimeter^2)

AT – Lifetime = Averaging time, cancer (days)

AT - NC = Averaging time, chronic noncancer (days)

BW = Body Weight (kilograms)

CR = Contact rate (milligrams/day or milliliters/day)

ED = Exposure duration (years)

EF = Exposure frequency (days/year)

ET = Exposure time (hours/day)

NA = Not applicable

SA = Surface area exposed (centimeter^2/day)

y = years

HHERA Summary – HHRA Conclusions

For both AMEC and WDNR exposure scenarios:

- Potential Excess Lifetime Cancer Risks (PELCRs) fall within or are less than USEPA's acceptable risk range of 10^{-4} to 10^{-6}, and are below Wisconsin's target risk of 10^{-5}
- All hazard indices (HIs) are less than 1.0

No adverse cancer or non cancer health risks are expected to occur

HHERA Summary – WDHS Comment on HHRA

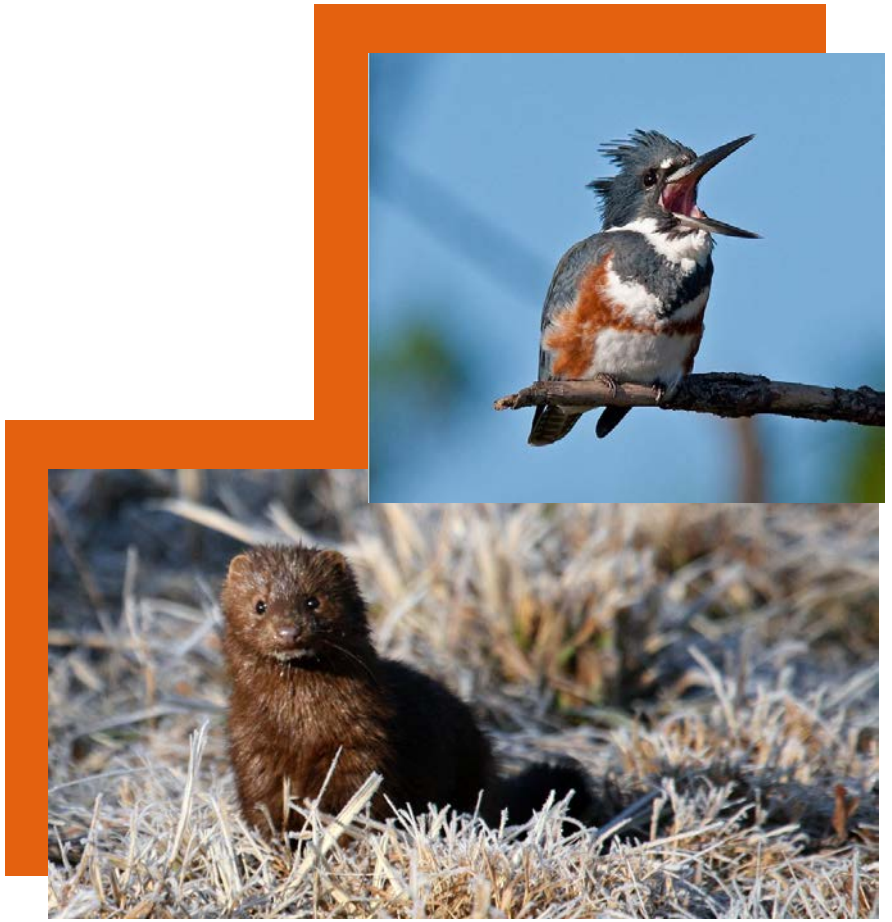
- WDHS Comment: *"The corrective action determination by the HHERA does not include corrective actions for floodplain soils within Area 2. Prior DNR investigations indicated floodplain soils in this area may have substantial contaminant impacts from creosote product. I recommend that the corrective actions ensure that contamination is addressed for floodplain soils throughout Area 2."*
- Beazer Response:
  - Potential human health risks associated with exposures to surficial floodplain materials in Area 2 were evaluated in the HHERA, and **concluded to be within acceptable limits**
  - Creosote product has not been observed in surficial floodplain materials in HHERA Area 2 (including 2013/14 supplemental investigations targeting the former "beaver pond" and other areas identified by WDNR as "data gaps")

HHERA Summary – ERA Media and COPCs

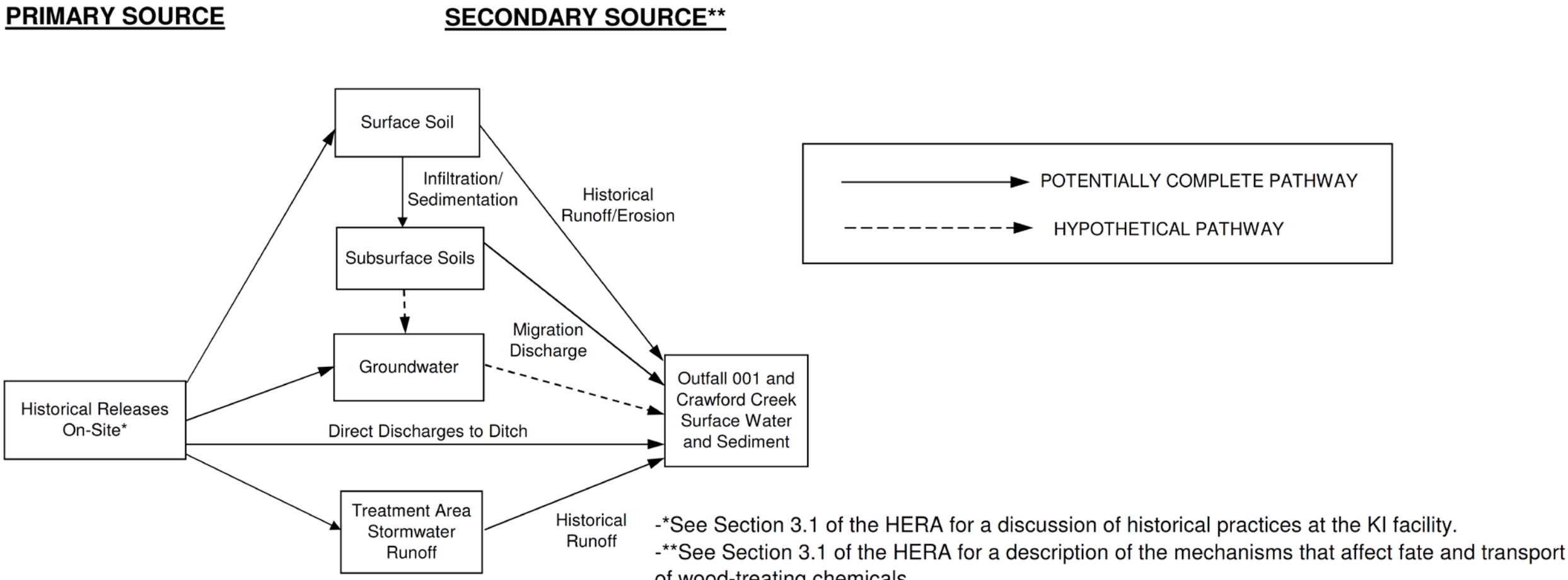
- Floodplain soils
  - PAHs, pentachlorophenol, dioxin/furans
- Sediment
  - PAHs, pentachlorophenol, dioxin/furans
- Forage fish
  - PAHs, pentachlorophenol, dioxins/furans
- Surface water
  - PAHs, pentachlorophenol
- Flying insects
  - PAHs, dioxins/furans

HHERA Summary - Potential Ecological Receptors

- Benthic macroinvertebrates
- Fish
- Higher trophic level receptors:
  - Meadow vole
  - Little brown bat
  - Tree swallow
  - American robin
  - Mink
  - Belted kingfisher

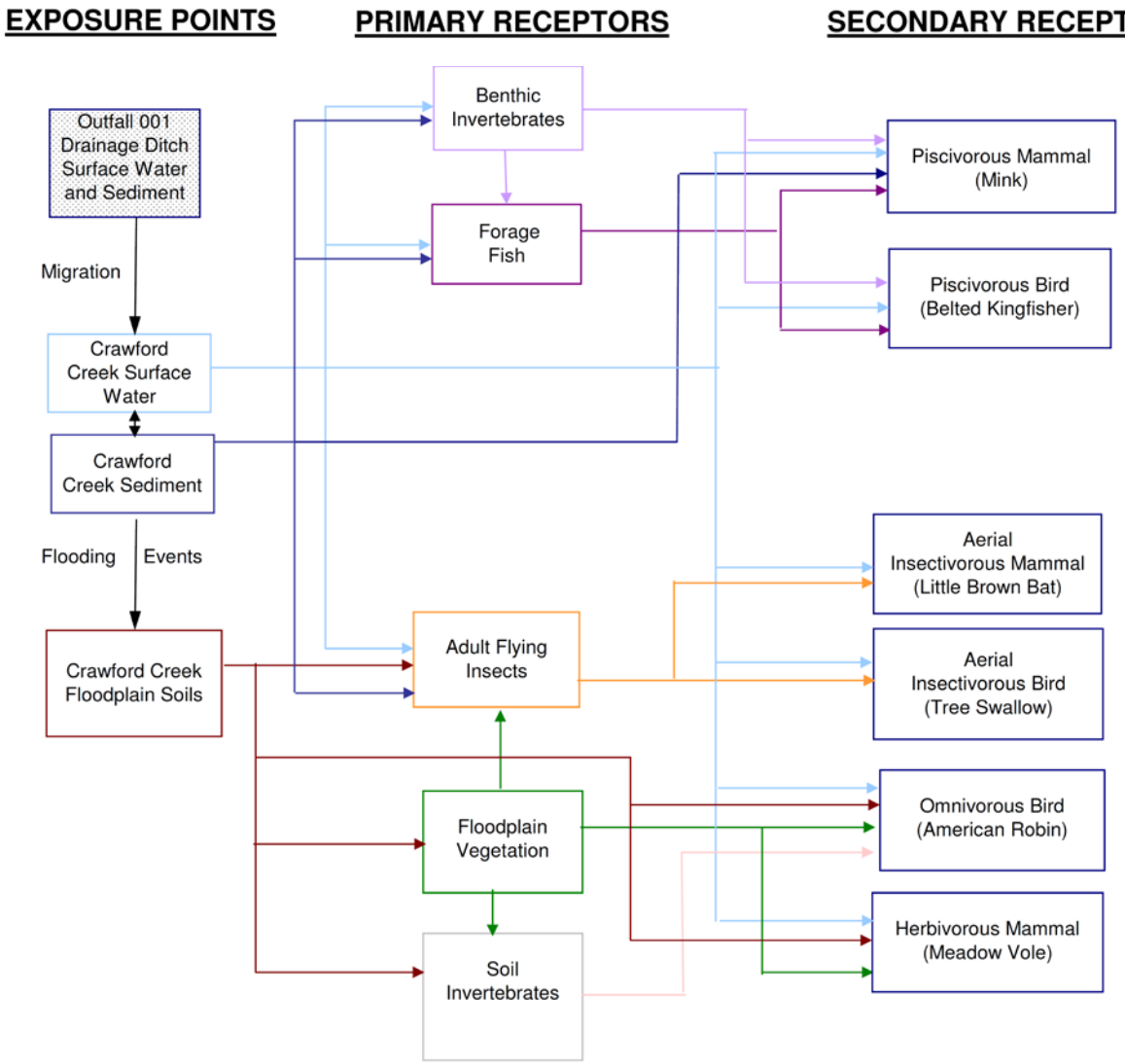


HHERA Summary – ERA Conceptual Site Model



-*See Section 3.1 of the HERA for a discussion of historical practices at the KI facility.
-**See Section 3.1 of the HERA for a description of the mechanisms that affect fate and transport of wood-treating chemicals

HHERA Summary – ERA CSM, Cont.



Outfall 001 Drainage Ditch Surface Water and Sediment - Drainage Ditch not quantitatively assessed as an aquatic habitat

HHERA Summary – ERA Conclusions

1. Higher Trophic Level Receptors
   - All LOAEL-based Hazard Quotients (HQs) <1.0
   - All NOAEL-based HQs range from <1.0 to <5.0

Area	Driver	Medium	Receptors (NOAEL-based HQs >1)
Area 1	Potential food chain exposures to PAHs	Sediments in tributary to Crawford Creek	Kingfisher (HQ = 4.6) Mink (HQ = 1.1) Swallow (HQ = 1.7)
Area 1	Dioxin exposure in soil	Floodplain Soil	Vole (HQ = 1.2) American robin (HQ = 1.5)
Area 2	PAH concentrations in Crawford Creek sediment	Fish Benthic invertebrates Insects	Kingfisher (HQ = 4.6) Mink (HQ = 1.1)
Area 3	No NOAEL or LOAEL-based HQs >1.0. No potential risks to individual upper trophic level receptors or populations of upper trophic level receptors expected.		

HHERA Summary – ERA Conclusions

2. Fish in Crawford Creek
   - No adverse effects to the fish community expected; however, a firm conclusion is precluded by:
     a. The absence of available criteria for several COPECs
     b. Changes observed in the downstream fish community in Crawford Creek
3. Benthic macroinvertebrates
   - Existing data preclude a firm conclusion about the presence or absence of COPECs in the macroinvertebrate community.

HHERA Summary – ERA Conclusions, Cont.

4. ERA incorporates conservative assumptions:
   - Use of NOAEL vs. LOAEL to derive toxicity reference values (TRVs)
   - TRVs incorporate uncertainty factors
   - Upper-trophic level receptors are unlikely to forage in a single exposure area
5. Based on uncertainty, and presence of sheens, recommend development of corrective actions objectives:
   - Tributary channel sediment within HHERA Area 1 (FCMS Area B)
   - Floodplain materials within HHERA Area 1 (FCMS Area B)
   - Crawford Creek channel sediments within HHERA Area 2 (FCMS Area C)

HHERA Summary – USEPA Comments on ERA

- General Comment 1a and Specific Comment 1: Add woodcock and shrew to receptor list

- Response: Woodcock and shrew incorporated with assumed diet of 100% earthworms
  - All woodcock HQs < 1.0
  - Low potential risk to shrews in Area 1 only
    - LOAEL-based HQs = 1.5 for tPAHs and HMW PAHs
    - LOAEL-based HQ = 1.7 for TCDD TEQ
  - All HQs < 1.0 when more representative shrew diet of <100% earthworms is assumed

No change to ERA conclusions

HHERA Summary – USEPA Comments on ERA

- General Comment 1b: Include USEPA Ecological Soil Screening Levels (EcoSSL) as soil benchmarks

- Response:
  - Surficial floodplain samples < EcoSSLs for soil invertebrates and plants
  - Food web model results for higher trophic level receptors supersede screening benchmark comparisons for those receptors

No change to ERA conclusions

HHERA Summary – USEPA Comments on ERA

- General Comment 1c: Address PAH toxicity in terms of HMW and LMW compounds

- Response: Food-web dose model was updated
  - HMW NOAEL-based HQs > 1.0: mink (Areas 1, 2), shrew (Areas 1, 2, 3), and American robin (Area 1)
  - HMW LOAEL-based HQs > 1.0: shrew (Area 1)
  - All LMW HQs < 1.0

No change to ERA conclusions

HHERA Summary – USEPA Comments on ERA

- Specific Comment 2: Conduct a line of evidence analysis if turtle TRV data are unavailable

- Response: A single wood turtle was observed in the Crawford Creek floodplain during a 1999 field survey.

No change to ERA conclusions

HHERA Summary – USEPA Comments on ERA

- Specific Comment 3: Account for contaminant transport from sediments to aerial feeding insectivores; use a bioaccumulation factor (BAF) of 5.4

- Response: BAF of 5.4 is not necessary to estimate emergent insect concentrations, because actual emergent insect tissue concentrations are available, and are utilized in the risk assessment

No change to ERA conclusions

HHERA Summary – USEPA Comments on ERA

- Specific Comment 4a: Revise plant and earthworm pentachlorophenol BAFs
- Specific Comment 4b: Revise earthworm dioxin BAF
- Specific Comment 4c: Revise plant and earthworm PAH BAFs, revise mammal and avian PAH TRVs
- Specific Comment 5a: Remove “indirect effect” discussion
- Specific Comment 5b: Revise discussion regarding PAH bioaccumulation
- Specific Comment 6a/b: Use Eco-SSL TRVs; remove allometric scaling from food-web model

- Response: Revisions made as requested, do not change ERA conclusions

No change to ERA conclusions

HHERA Summary – 2014 GLNPO Data (Area 3)

- **Crawford Creek floodplain samples**:
  - Average Total PAHs and TCDD-TEQs in surficial floodplain samples collected by GLNPO in 2014 (downstream of RR embankment) are slightly lower than in samples collected by Beazer in 2005 (upstream of RR embankment)
- **Crawford Creek sediment samples**:
  - Average Total PAHs in surficial sediment samples collected by GLNPO in 2014 are 1 order of magnitude lower than in samples collected from the same reach by Beazer in 2005
  - Average TCDD-TEQs in surficial sediment samples collected by GLNPO in 2014 are slightly lower than in samples collected from the same reach by Beazer in 2005
- **Crawford Creek fish tissue samples:**
  - TCDD-TEQs in Crawford Creek fish samples collected by GLNPO in 2014 are generally lower than in samples collected from the same reach by Beazer in 2005

2014 GLNPO data do not change HHERA conclusions for Area 3

HHERA Summary – Overall Conclusions

- Human health and ecological risks evaluated for sediment and floodplain materials in three areas:
  - Area 1 – Tributary within Crawford Creek floodplain (FCMS Area B)
  - Area 2 – Crawford Creek from Tributary to RR embankment (FCMS Area C)
  - Area 3 – Crawford Creek from RR embankment to Nemadji River
- HHERA conducted in accordance with WDNR-approved plans
- No human health cancer or non-cancer risks
- Potential ecological risks for Area 1 (sediment and floodplain; FCMS Area B) and Area 2 (sediment only; FCMS Area C)
- WDHS and USEPA comments do not change 2009 HHERA conclusions
- 2014 GLNPO data for Area 3 do not change 2009 HHERA conclusions

Corrective Action Objectives

Corrective Action Objectives

From 2014 Off-Property FCMS:

1. Mitigate the potential for exposure by ecological receptors to COPC-impacted media*
   - Area A (Tributary upstream of floodplain): channel sediments and bank materials
   - Area B (Tributary within floodplain): channel sediments and bank/floodplain materials*
   - Area C (Crawford Creek between Tributary and railroad embankment): channel sediments*
2. Mitigate the generation of COPC-related surface water sheens

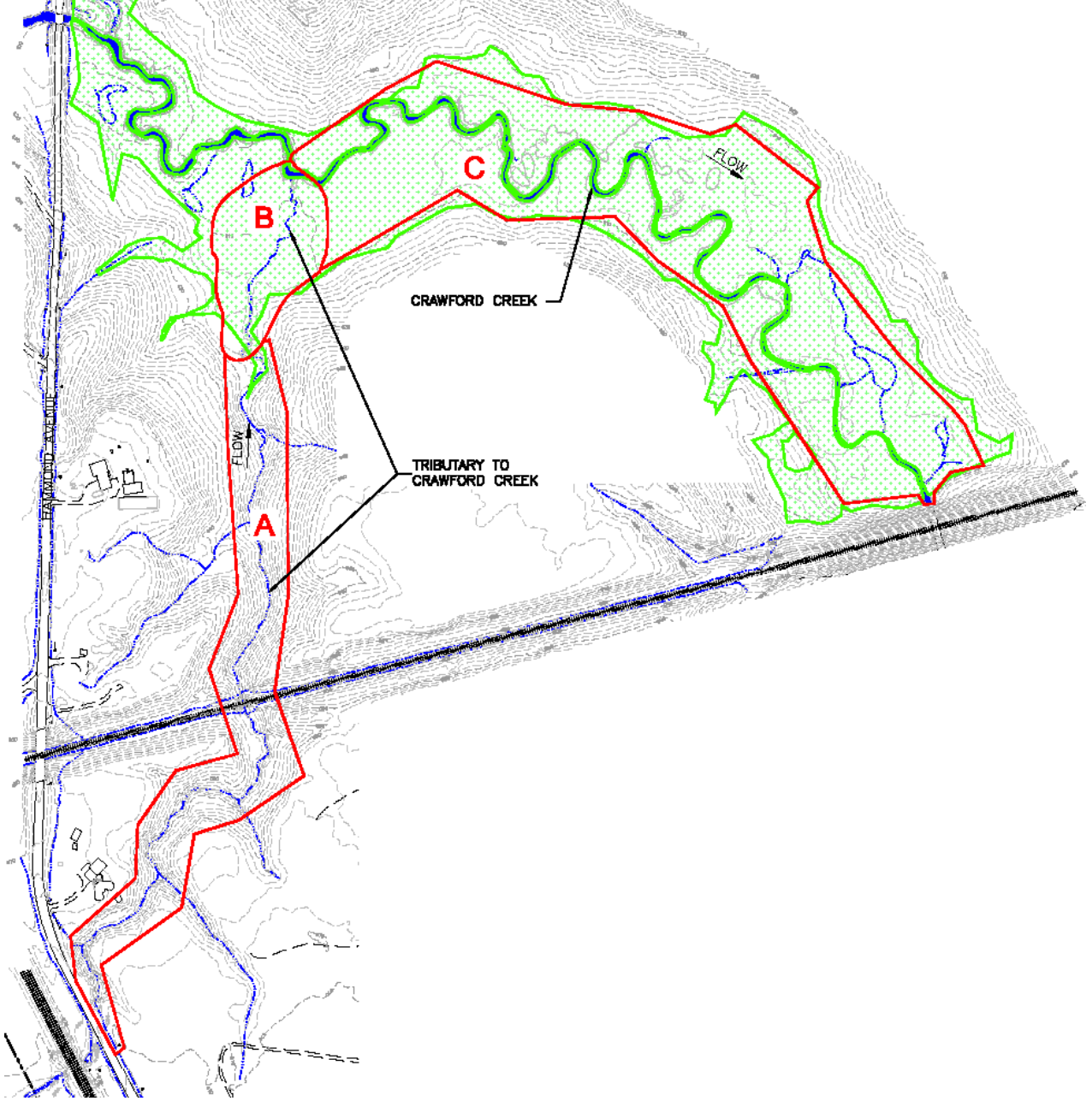
* Based on HHERA conclusions

Corrective Action Areas/Limits

Corrective Action Areas/ Limits

Areas Evaluated in 2014 FCMS:

- **Area A** – Tributary channel bottom sediments and adjacent bank materials located upstream of Crawford Creek floodplain
- **Area B** – Tributary channel bottom sediments and adjacent bank/floodplain materials located within Crawford Creek floodplain (HHERA Area 1)
- **Area C** – Crawford Creek channel bottom/bank sediments between Tributary and railroad embankment (HHERA Area 2)



Corrective Action Technology Screening

Corrective Action Technology Screening

Technologies evaluated in 2014 Off-Property FCMS:

- Institutional Controls (land/groundwater use restrictions) – Retained
- Monitoring (field observation, sampling/analysis) – Retained
- Removal (mechanical excavation) – Retained
- In-Situ Containment (capping) – Retained
- In-Situ Containment (channel relocation) – Retained
- In-Situ Containment (culverting, enhanced sedimentation, impoundment) – Not retained
- In-Situ and Ex-Situ Treatment (biodegradation, stabilization/solidification, chemical oxidation, thermal remediation, etc.) – Not retained
- Disposal (on-site consolidation in a CAMU) – Retained
- Disposal (off-site T&D at a commercial facility) – Retained

Corrective Action Technology Screening

Site-specific evaluation of thermal desorption technology:

Site-Specific Characteristics	Implications for Applicability/Effectiveness of Thermal Desorption
Clay Dioxins/Furans High TOC (surficial) Shallow Water Table Heterogeneity	• High temperatures and long residence times required to treat predominantly clay materials with dioxin/furan impacts, high TOC, and high water content, resulting in significantly increased costs. • Heterogeneous nature of materials (ranging from unimpacted to sorbed-phase impacts to product in clay fractures, along with differing levels of TOC and moisture) would require pre-mixing to produce a homogeneous admixture. Pre-mixing would be difficult for clay. • Potential off-gas emission issues associated with dioxins/furans.
Remote Site Location	• Remote, floodplain setting in vicinity of residential areas not suitable for a thermal treatment system. No ideal space with required footprint located nearby.
Wetland Restoration	• Thermal treatment would destroy most of the natural organics, making it unusable as backfill for re-creating wetlands.

Ex-Situ thermal treatment was not retained for further evaluation in FCMS

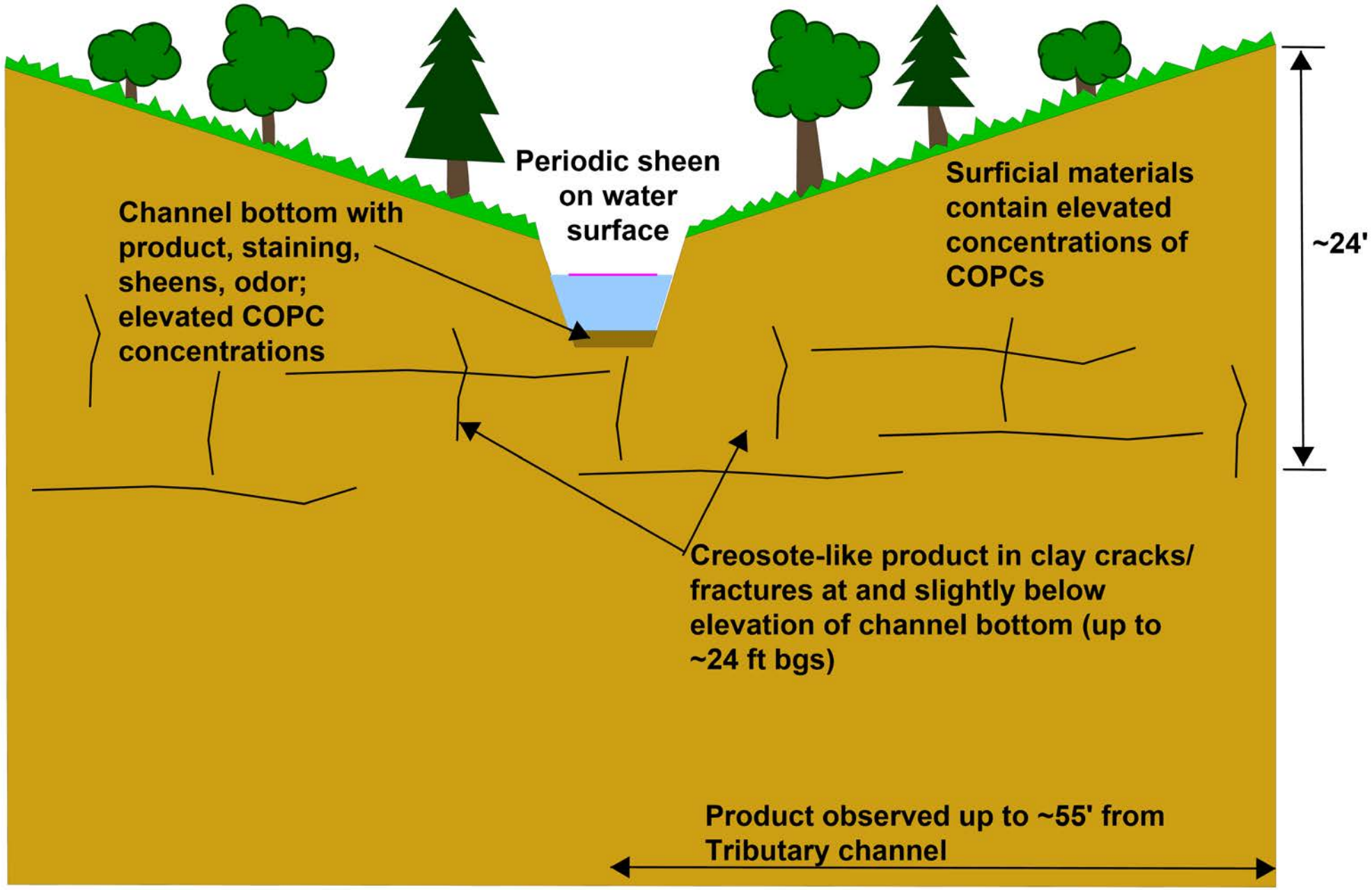
Corrective Action Alternatives

Corrective Action Alternatives – Area A

Key Considerations:

- Elevated COPC concentrations in Tributary channel bottom sediments and adjacent bank materials; surface water sheens
- Complete removal of impacts impracticable, expensive
  - Broad extent (up to 55’ from channel) and depth (up to 24’ bgs) of visible impacts
  - Large volume, expensive disposal, on-Site CAMU capacity limitation
  - Low percentage of soil matrix impacted (product in fractures)
- Fractures with product at or below channel bottom elevation
  - Raising channel bottom minimizes recontamination potential
- Topography and gradients support “raised bed” remedy

Area A – Conceptual Site Model

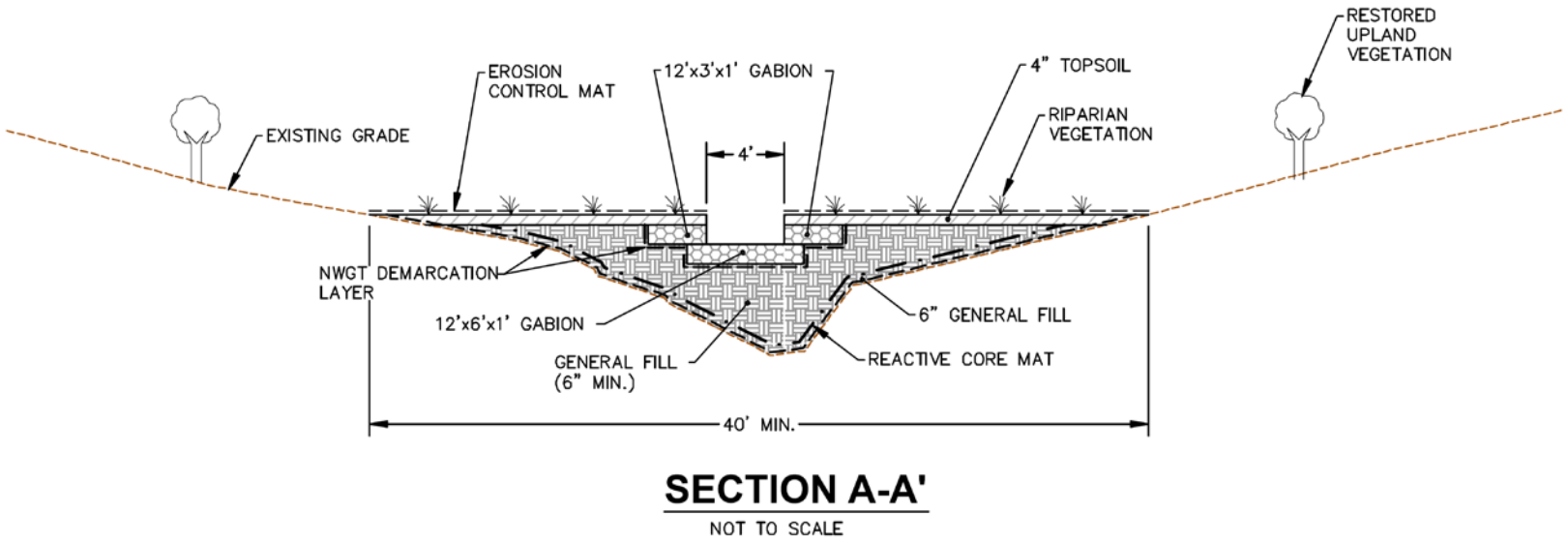


Corrective Action Alternatives – Area A

Proposed Remedy – Channel and Bank Cover, with DNAPL Collection Provisions (FCMS Alternative A2):

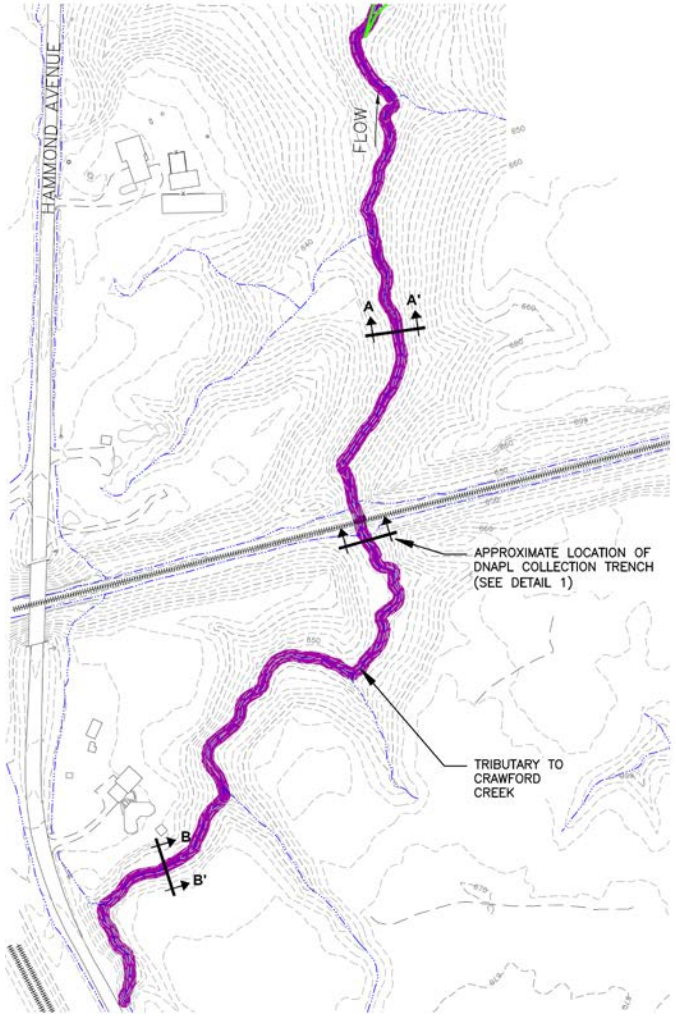
- In-situ containment approach
- Raise channel bottom above elevation of product in fractures
- Engineered cover (with RCM) over impacted Tributary sediments and bank materials
- Channel restoration:
  - Baseline channel (sized for 2-yr flood) with “soil-choked”, stone-filled gabions to reduce potential for future channel incision
  - Secondary channel (sized for 25-yr flood) with topsoil and riparian vegetation
  - Velocity control structures (wedge dams, rock weirs)
  - DNAPL collection trench upgradient of railroad crossing
- Post-remediation monitoring/maintenance, institutional controls (e.g., GIS registry and land/groundwater use restrictions)

Corrective Action Alternatives – Area A

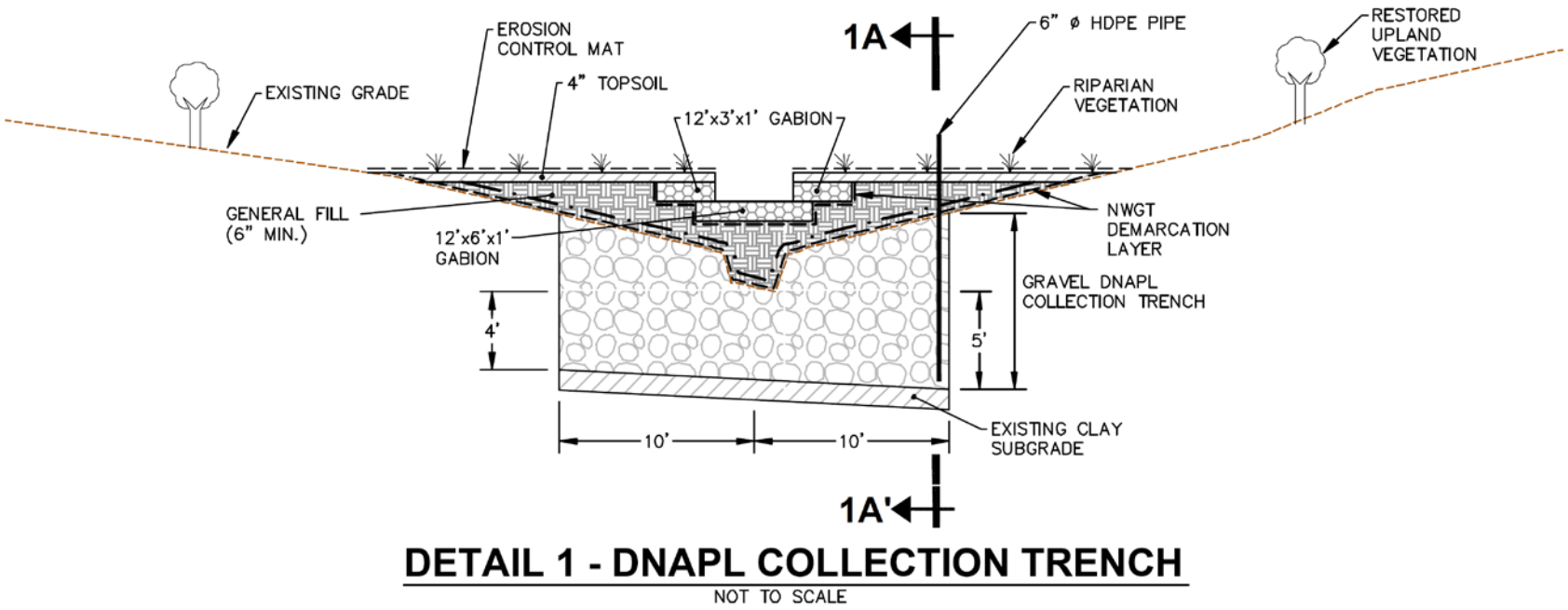


SECTION A-A'

NOT TO SCALE

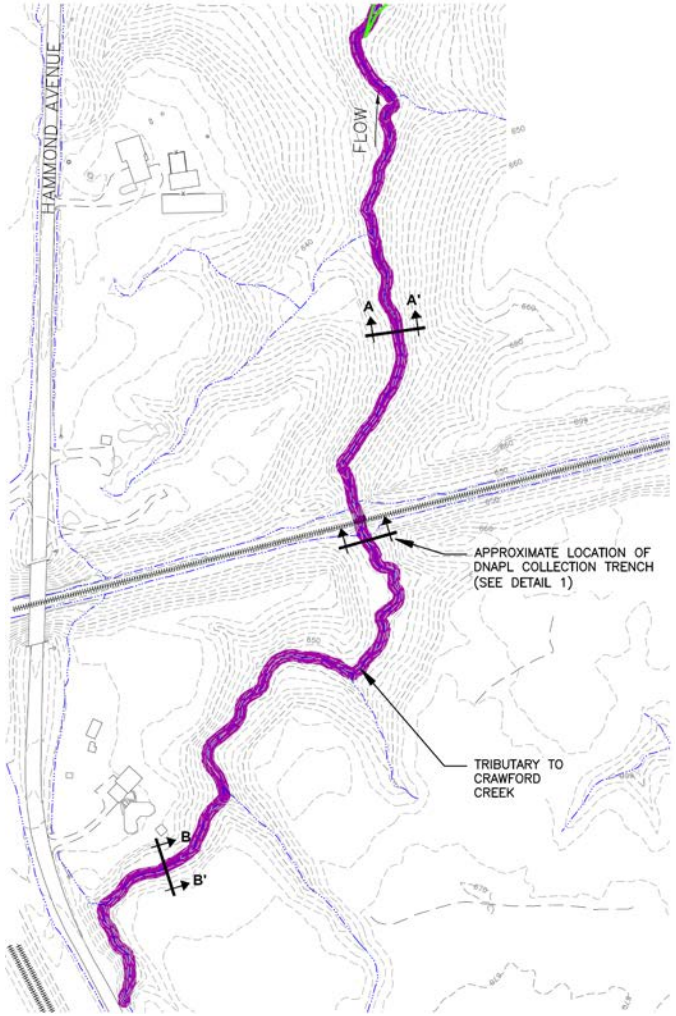


Corrective Action Alternatives – Area A



DETAIL 1 - DNAPL COLLECTION TRENCH

NOT TO SCALE



Corrective Action Alternatives – Area A

Prior WDNR feedback addressed in proposed remedy:

- Modified channel restoration approach to allow for a more “natural” channel
- Added DNAPL collection provisions for portion of Tributary on Pink House property

Other alternatives evaluated in FCMS:

- Alt. A1 – Channel and bank cover
  - Originally proposed remedy
  - No baseline/secondary flow channels
  - No DNAPL collection provisions
- Alt. A3 – Extended channel and bank excavation/backfill
  - Removal limits and depths based on extent of impacts observed in 2005 test pits and soil borings (60,700 cy)

Corrective Action Alternatives – Area A

Estimated costs of FCMS alternatives:

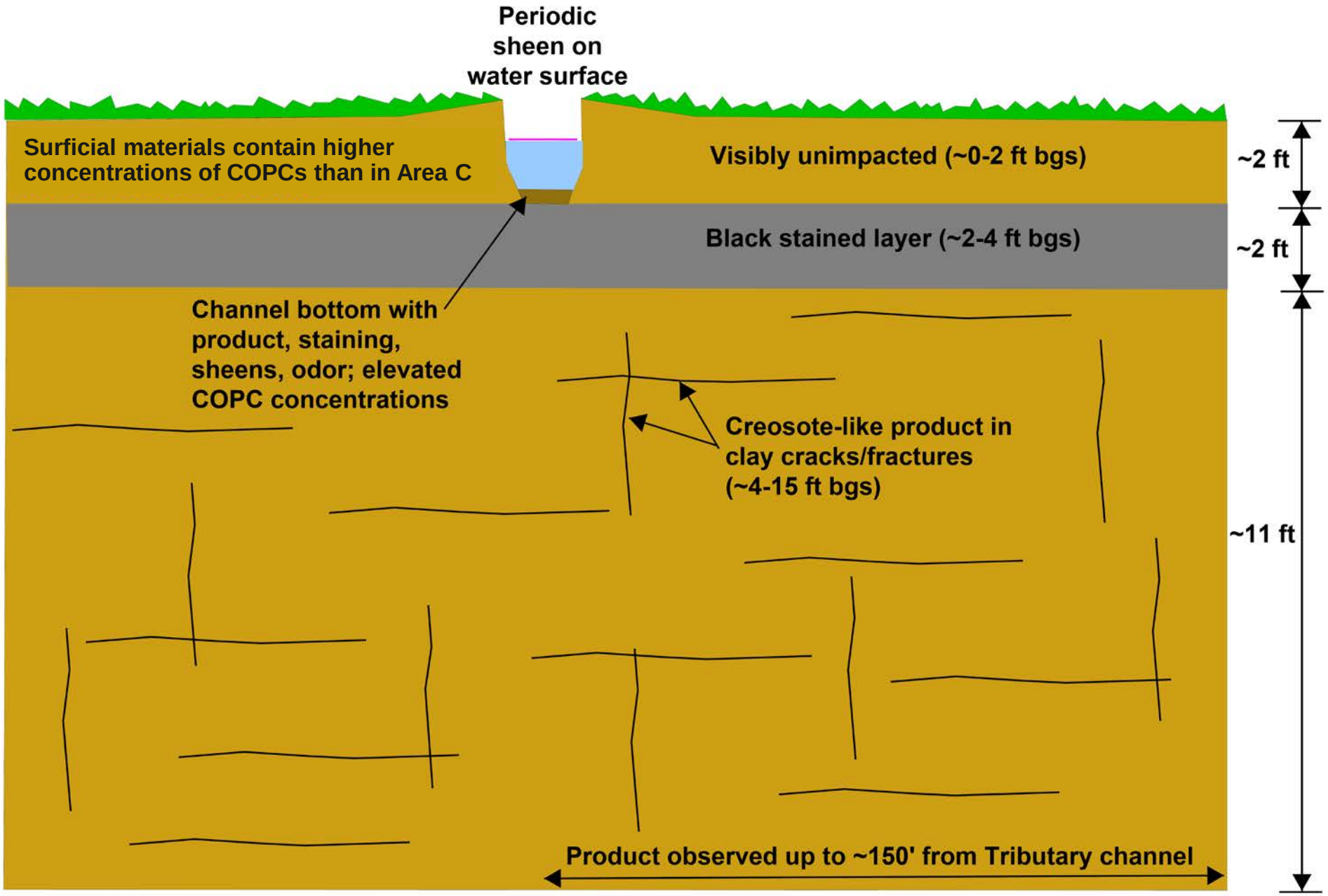
Cost Components	Alt. A1 Channel and Bank Cover	Alt. A2 Channel and Bank Cover, with DNAPL Collection Provisions	Alt. A3 Extended Channel and Bank Excavation/ Backfill
Indirect	$0.4M	$0.3M	$3.0M
Construction/Capital	$2.2M	$1.9M	$19.8M
O&M	$0.1M	$0.1M	$0.1M
On-Site CAMU Disposal	--	--	$6.0M
Off-Site T&D	$0.5M	$0.5M	$59.3M
Total (CAMU)	--	--	$28.9M
Total (Off-Site T&D)	$3.2M	$2.8M	$82.2M

Corrective Action Alternatives – Area B

Key Considerations:

- Elevated COPC concentrations and potential ecological risks in Tributary channel bottom sediments and adjacent bank/floodplain materials; surface water sheens
- Complete removal of impacts impracticable, expensive
  - Broad extent (up to 150’ from channel) and depth (up to 15’ bgs) of visible impacts
  - Large volume, expensive removal/disposal, on-Site CAMU capacity limitations
  - Low percentage of soil matrix impacted (product in fractures)
  - Constructability/flooding issues
- Removal and containment of surficial impacts are viable

Area B – Conceptual Site Model

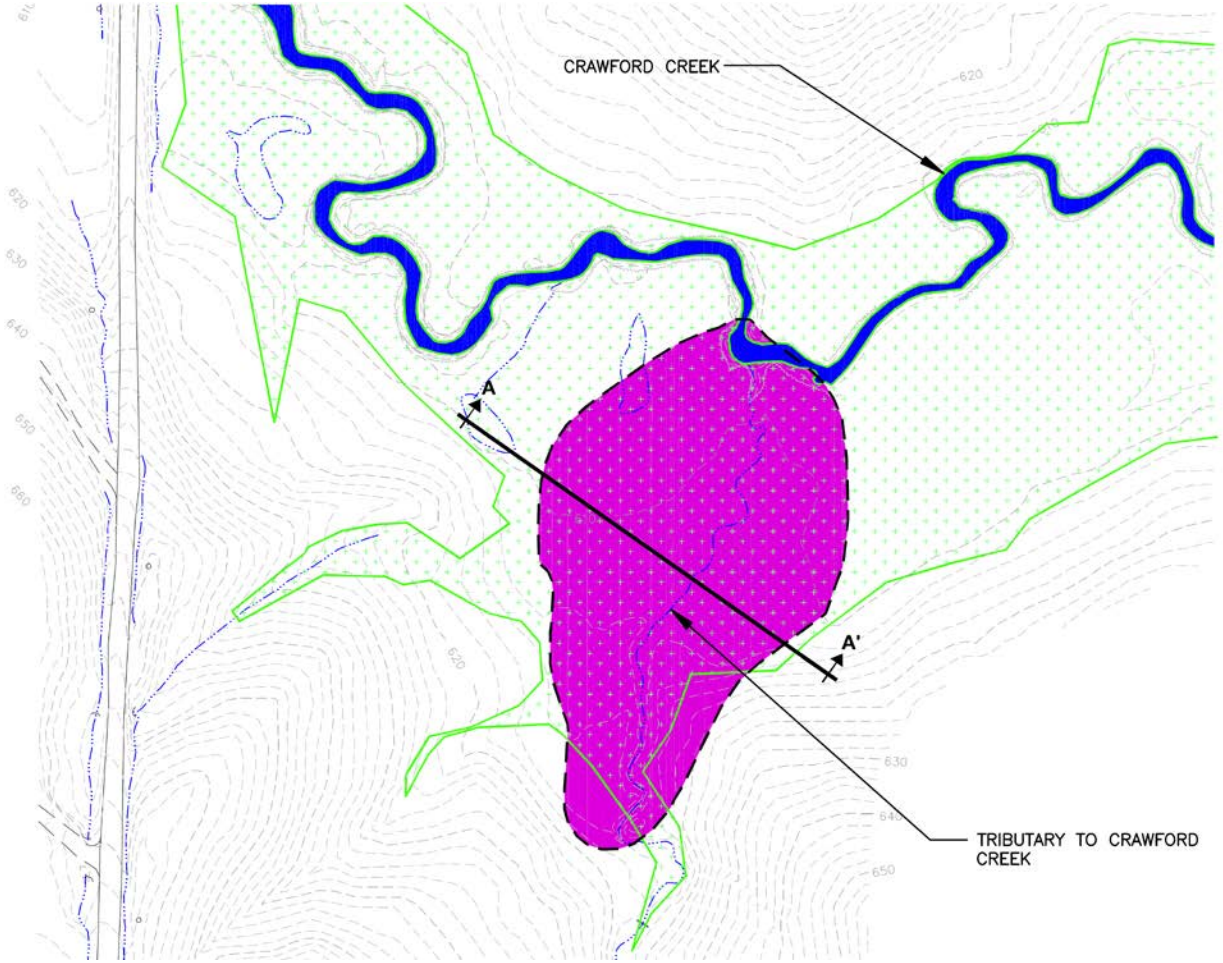


Corrective Action Alternatives – Area B

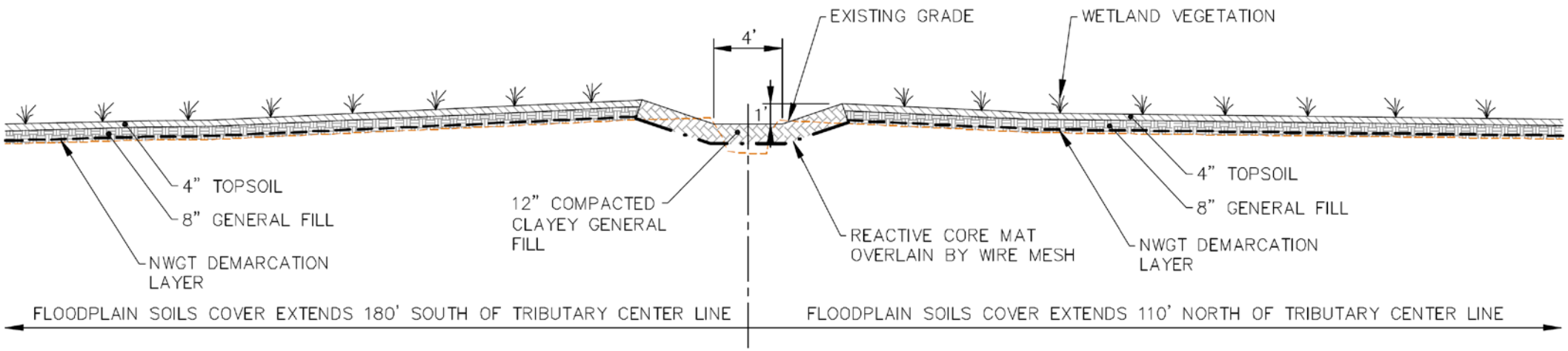
Proposed Remedy – Partial Channel Excavation/Backfill, 1-Foot Floodplain Cover (FCMS Alternative B1):

- Combination removal and in-situ containment approach
- Excavate impacted Tributary channel sediments; CAMU or off-Site disposal
- New channel 4’ wide base, 1’ depth, 3H:1V sideslopes
- Restore channel excavation with RCM and 1 foot of compacted clay
- Engineered cover over impacted floodplain materials outside of the excavation area
  - Geotextile demarcation layer
  - 8” general fill
  - 4” vegetated topsoil
- Post-remediation monitoring/maintenance, institutional controls (e.g., GIS registry and land/groundwater use restrictions)

Corrective Action Alternatives – Area B



Corrective Action Alternatives – Area B



SECTION A-A'

NOT TO SCALE

Corrective Action Alternatives – Area B

Prior WDNR feedback addressed in proposed remedy:

- Modified channel restoration approach to allow for a more “natural” channel (RCM/clay instead of RCM/riprap)
- CAMU or off-Site disposal of excavated channel material, rather than spreading across adjacent floodplain beneath engineered cover

Other alternatives evaluated in FCMS:

- Alt. B2 – Partial Channel Excavation/Backfill, 1’ Floodplain Excavation/Backfill
  - Same as proposed remedy, except for excavation/backfill of floodplain (5,200 cy) instead of capping (CAMU or off-Site disposal)
- Alt. B3 – Extended Channel and Floodplain Excavation/Backfill
  - Removal limits and depths based on extent of impacts observed in 2003 test pits (55,700 cy)

Corrective Action Alternatives – Area B

Estimated costs of FCMS alternatives:

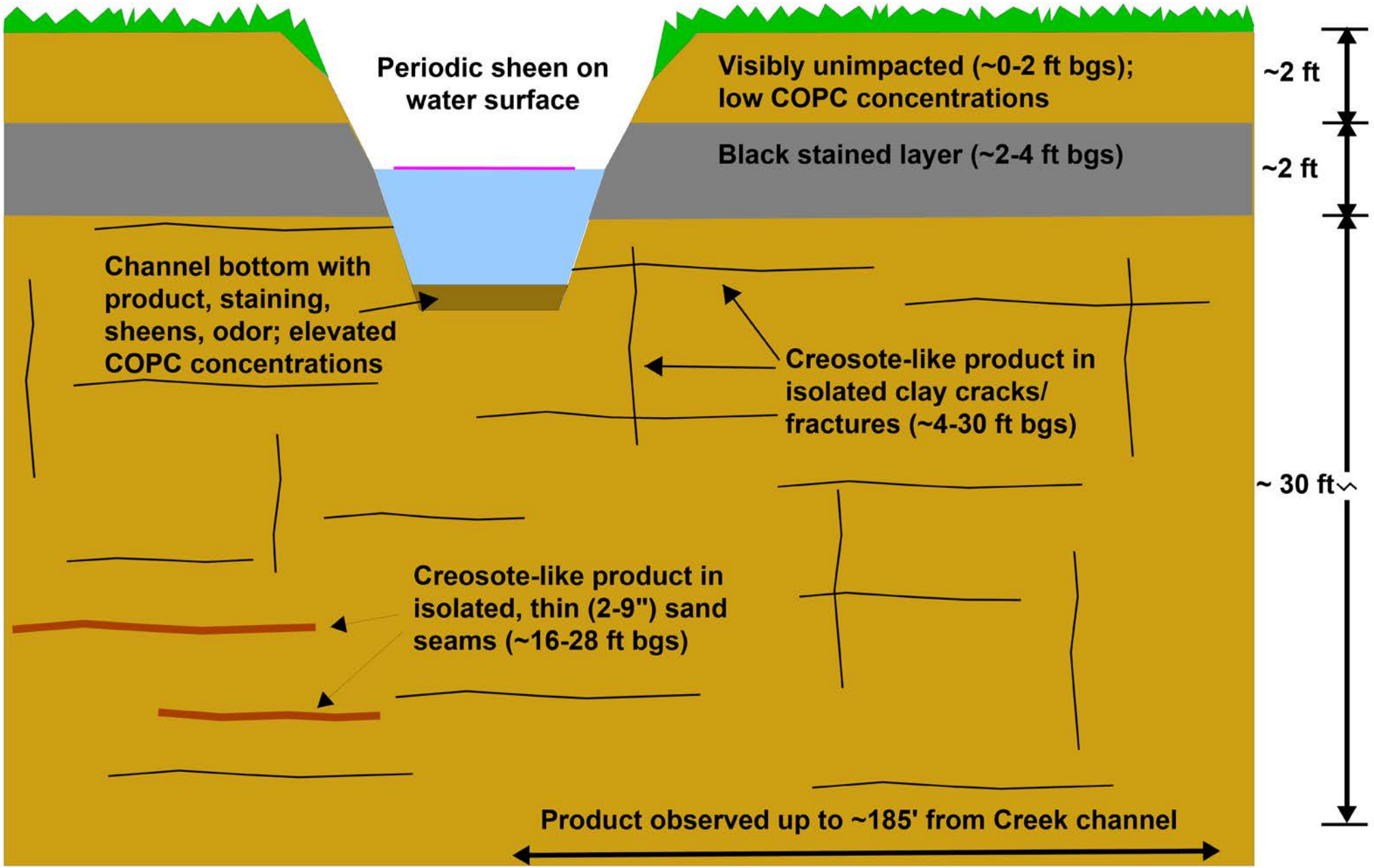
Cost Components	Alt. B1 Partial Channel Excavation/ Backfill, 1' Floodplain Cover	Alt. B2 Partial Channel Excavation/ Backfill, 1' Floodplain Excavation/ Backfill	Alt. B3 Extended Channel and Floodplain Excavation/ Backfill
Indirect	$0.2M	$0.2M	$2.3M
Construction/Capital	$0.8M	$1.4M	$14.9M
O&M	$0.1M	$0.1M	$0.1M
On-Site CAMU Disposal	--	$1.5M	$5.5M
Off-Site T&D	$0.1M	$5.4M	$54.5M
Total (CAMU)	--	$3.2M	$22.8M
Total (Off-Site T&D)	$1.2M	$7.1M	$71.8M

Corrective Action Alternatives – Area C

Key Considerations:

- Elevated COPC concentrations and potential ecological risks in Crawford Creek channel bottom sediments; surface water sheens
- Complete removal of impacts impracticable, expensive
  - Broad extent (up to 185’ from channel) and depth (up to 30’ bgs) of visible impacts
  - Large volume, expensive removal/disposal, on-Site CAMU capacity limitations
  - Low percentage of soil matrix impacted (product in fractures)
  - Constructability/flooding issues
- Partial removal and containment potentially viable
- Channel relocation offers greatest degree of long-term protection/certainty

Area C – Conceptual Site Model

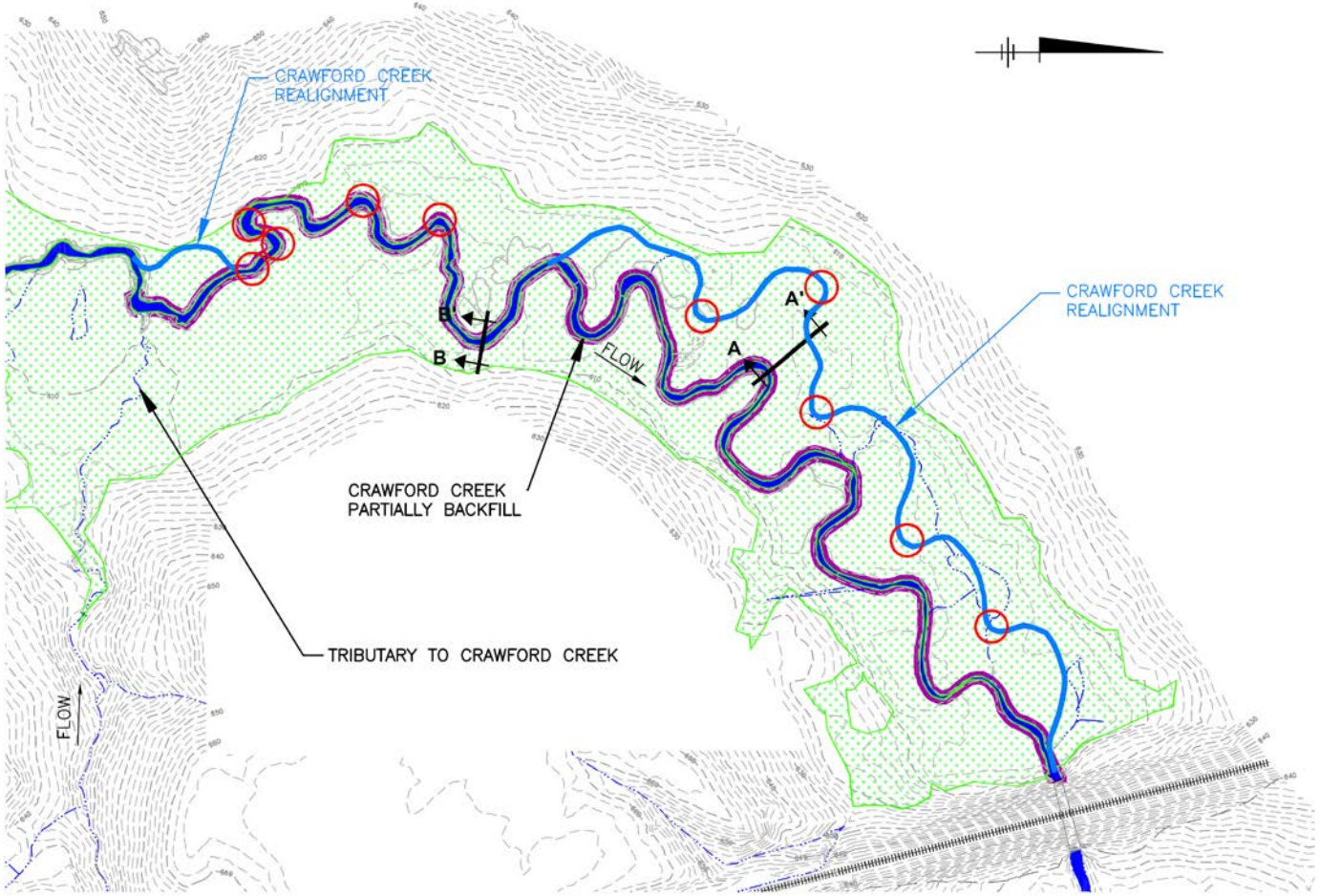


Corrective Action Alternatives – Area C

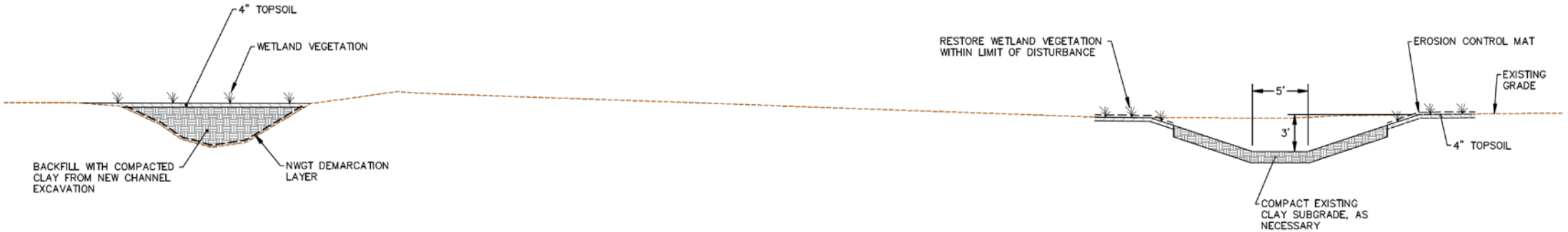
Proposed Remedy – Channel Relocation with Clay-Lined Channel (FCMS Alternative C2):

- In-situ containment approach
- Construct new channel for a portion of Crawford Creek in an unimpacted area located west/northwest of the existing channel location
  - Sinuosity and length of the relocated channel would be consistent with the natural characteristics and generally match that of the existing channel
  - New channel bottom/banks would be clay, with erosion control/habitat features added
  - Line new channel with RCM where it connects with existing channel
- Backfill a portion of the existing channel with clean materials excavated from the new channel
- Excavate/backfill remaining portions of existing channel
- Post-remediation monitoring/maintenance, institutional controls (e.g., GIS registry and land/groundwater use restrictions)

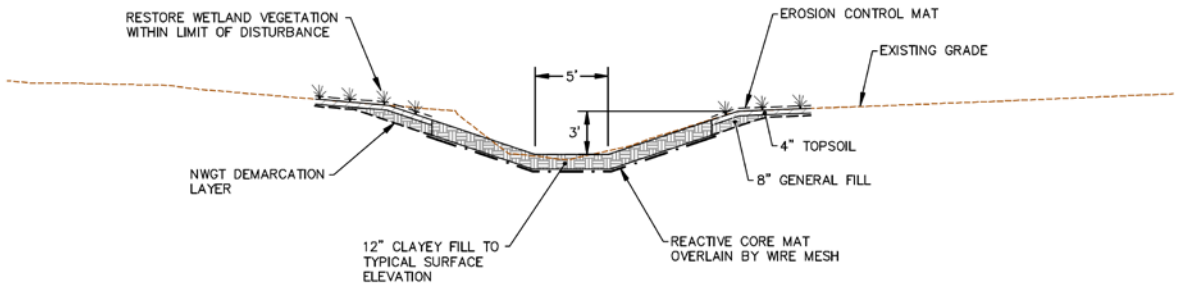
Corrective Action Alternatives – Area C



Corrective Action Alternatives – Area C



SECTION A-A'
NOT TO SCALE



SECTION B-B'
NOT TO SCALE

Corrective Action Alternatives – Area C

Prior WDNR feedback addressed in proposed remedy:

- In-place excavation/restoration of existing channel in certain locations (i.e., less relocation and more re-use of existing channel segments)
- Added sinuosity of relocated channel
- New channel lined with clay instead of riprap
- Added woody habitat at selected creek bends

Corrective Action Alternatives – Area C

Other alternatives evaluated in FCMS:

- Alt. C1 – Channel Relocation with Armored Channel
  - Originally proposed remedy
  - Limited excavation/re-use of existing channel
  - Limited sinuosity of new channel
  - Riprap lining of new channel
- Alt. C3 – Partial Channel Excavation/Backfill
  - Excavate sediment from channel bottom/banks as necessary for new channel (5’ wide base, 3’ depth, 3H:1V sideslopes – 3,200 cy)
  - Restore channel with RCM and clay fill
- Alt. C4 – Extended Channel and Floodplain Excavation/Backfill
  - Removal limits and depths based on extent of impacts observed in 2003 test pits and 2013 soil borings (90,300 cy)

Corrective Action Alternatives – Area C

Estimated costs of FCMS alternatives:

Cost Components	Alt. C1 Channel Relocation with Armored Channel	Alt. C2 Channel Relocation with Clay-Lined Channel	Alt. C3 Partial Channel Excavation/ Backfill	Alt. C3 Extended Channel and Floodplain Excavation/ Backfill
Indirect	$0.5M	$0.4M	$0.3M	$4.3M
Construction/Capital	$2.9M	$2.1M	$1.8M	$28.6M
O&M	$0.1M	$0.1M	$0.1M	$0.1M
On-Site CAMU Disposal	--	$1.3M	$1.3M	$8.8M
Off-Site T&D	$0.5M	$2.7M	$3.1M	$93.1M
Total (CAMU)	--	$3.9M	$3.5M	$41.8M
Total (Off-Site T&D)	$4.0M	$5.3M	$5.3M	$126.1M

Discussion of Key Issues

Areas of Perceived Agreement between Beazer and WDNR

1. Corrective action needed for Area A tributary channel sediments and adjacent bank materials
2. WDNR in agreement with proposed FCMS Alternative A2 (Channel and Bank Cover, with DNAPL Collection Provisions)
3. Corrective action needed for Area B tributary channel sediments and adjacent floodplain materials
4. Corrective action needed for Area C creek channel sediments
5. Corrective actions that involve large-scale removal are impracticable and technically infeasible

Areas Requiring Resolution

1. Corrective action approach for Area B floodplain materials
   - Beazer believes a 1-foot floodplain cover (FCMS Alt. B2) is a protective and technically feasible remedy
   - WDNR prefers a removal-based remedy instead of a cover
2. Corrective action approach for Area C creek channel sediments
   - Beazer believes partial channel relocation (FCMS Alt. C2) is a protective and technically feasible remedy, and offers more long-term protection than a partial removal remedy
   - WDNR prefers a removal-based remedy instead of relocation
3. Need for (and basis for determining the need for) corrective actions for Area C floodplain materials and Area D creek channel sediments and adjacent floodplain materials
   - Based on the HHERA, Beazer believes no action is required for these areas/media
   - WDNR prefers non-risk-based approach for determining need for corrective action

Corrective Action Objectives

- If need for corrective action not based on HHERA, then what?
  - NR 720 Residual Contaminant Levels (RCLs)
  - USEPA Ecological Screening Values
    - Region 5 Sediment Ecological Screening Levels (ESLs)
    - Region 5 Soil ESLs
    - Ecological Soil Screening Levels (Eco-SSLs)
  - Wisconsin Consensus Based Sediment Quality Guidelines (CBSQGs)
  - Visual (e.g., remove black stained layer, remove visually impacted creek sediments)
  - Other?

NR 720 Residual Contaminant Levels (RCLs)

- RCLs are calculated using USEPA Regional Screening Level Web Calculator and default exposure assumptions
- Only two exposure scenarios: “Industrial” and “Non-Industrial”, neither are a good fit for a remote floodplain setting
- Non-Industrial RCL for TCDD-TEQ is 4.4 ppt
- RCLs for individual PAHs, not total PAHs

➢ **NR 720.12(2) allows WDNR to approve alternate exposure assumptions (e.g., assumptions used in the HHERA)**

USEPA Ecological Screening Values

Constituent	Region 5 Sediment ESL	Region 5 Soil ESL	Eco-SSL
LMW PAHs (mg/kg)	--	--	29 (soil inverts) 100 (mammals)
HMW PAHs (mg/kg)	--	--	18 (soil inverts) 1.1 (mammals)
TCDD-TEQ (ng/kg)	0.12	0.199	--

Wisconsin CBSQGs

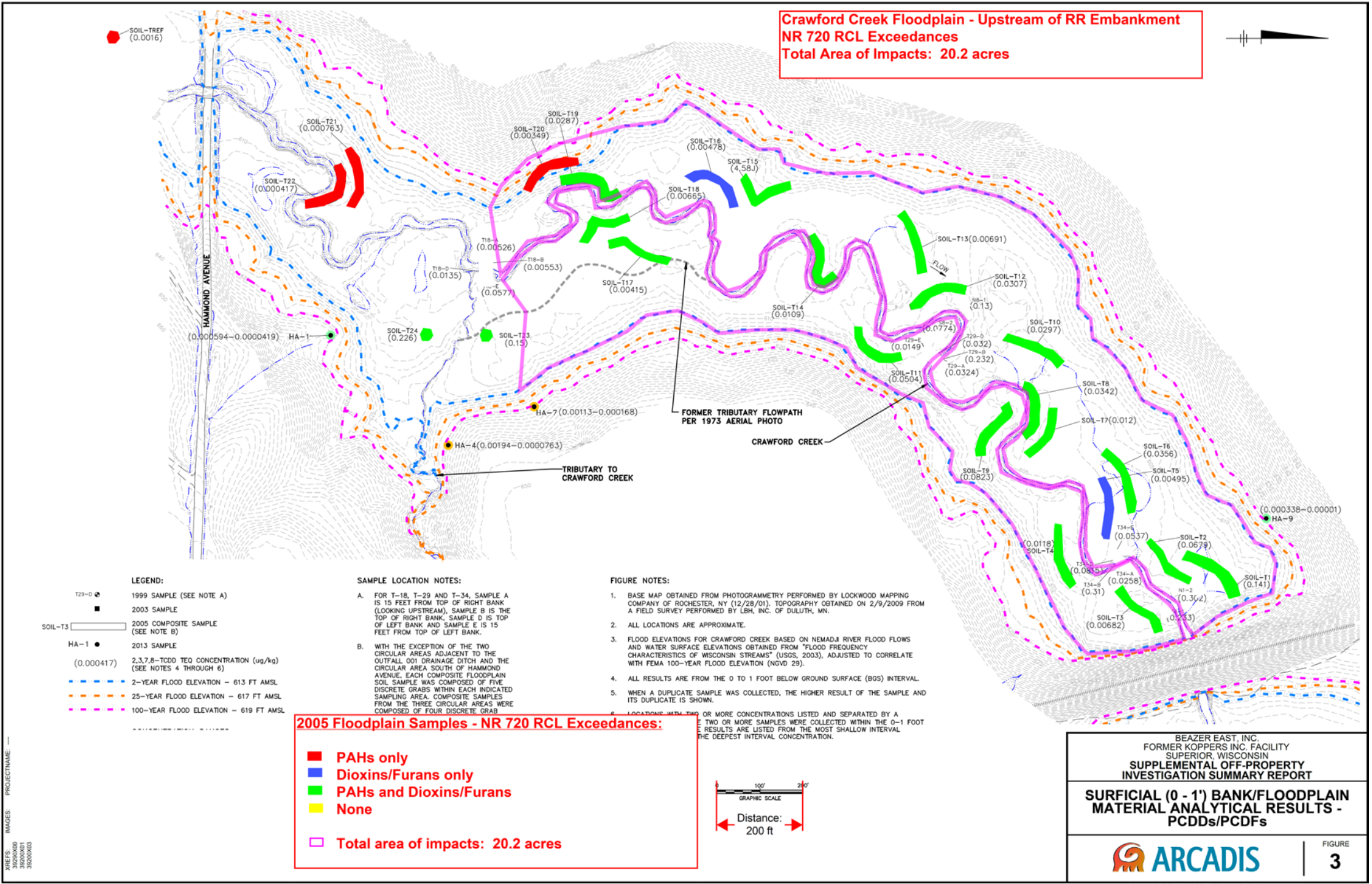
Constituent	TEC	MEC	PEC
Total PAHs (mg/kg at 1% TOC)	1.61	12.2	22.8
TCDD-TEQ (ng/kg at 1% TOC)	0.85	11.2	21.5

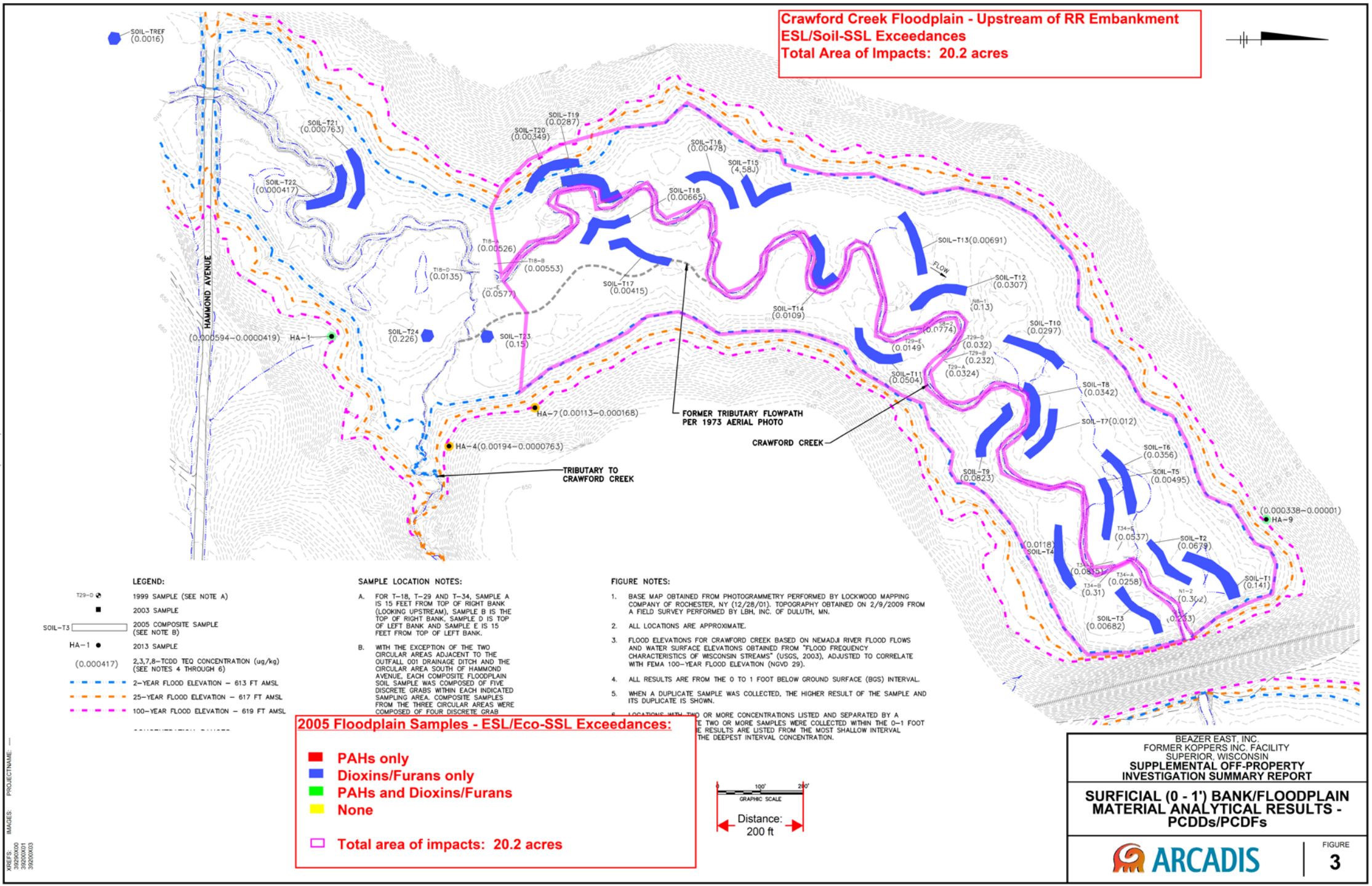
Implications of Clean-Up Goal for Area C Floodplain*

CUG	Area/Volume of Impacts	Est. Cost for 1' Soil Cover	Est. Cost for Removal/ Backfill (CAMU)	Est. Cost for Removal/ Backfill (Off-Site T&D)
NR 720 ESLs/Eco-SSLs	20.2 acres 32,600 cy (1')	$3.1M	$11.0M (1')	$45.3M (1')
Remove black stained layer (and overlying visibly clean materials)	7.2 acres * 45,400 cy * (1.9' visibly clean, 2' black stained layer)	N/A	$13.3M	$61.8M

* Black stained layer removal area/volume includes both Areas B and C.

** All costs considered preliminary.


Crawford Creek Floodplain - Upstream of RR Embankment
NR 720 RCL Exceedances
Total Area of Impacts: 20.2 acres
SOIL-TREF (0.0016)
SOIL-T21 (0.000763)
SOIL-T22 (0.000417)
SOIL-T20 (0.00349)
SOIL-T19 (0.0287)
SOIL-T16 (0.00478)
SOIL-T15 (4,58J)
SOIL-T18 (0.00665)
T18-A (0.00526)
T18-B (0.00553)
T18-D (0.0135)
T18-E (0.0577)
SOIL-T17 (0.00415)
SOIL-T13(0.00691)
FLOW
SOIL-T12 (0.0307)
N8-1 (0.13)
SOIL-T14 (0.0109)
N8-2 (0.0774)
SOIL-T10 (0.0297)
T29-E (0.0149)
T29-D (0.032)
T29-B (0.232)
T29-A (0.0324)
SOIL-T11 (0.0504)
SOIL-T8 (0.0342)
SOIL-T7(0.012)
SOIL-T6 (0.0356)
SOIL-T5 (0.00495)
SOIL-T9 (0.0823)
HAMMOND AVENUE
(0.000594-0.0000419) HA-1
SOIL-T24 (0.226)
SOIL-T23 (0.15)
HA-7(0.00113-0.000168)
FORMER TRIBUTARY FLOWPATH PER 1973 AERIAL PHOTO
CRAWFORD CREEK
HA-4(0.00194-0.0000763)
TRIBUTARY TO CRAWFORD CREEK
(0.000338-0.00001) HA-9
T34-C (0.0537)
SOIL-T2 (0.0679)
(0.0118) SOIL-T4
T34-A (0.0258)
T34-B (0.31)
N1-2 (0.302)
SOIL-T1 (0.141)
SOIL-T3 (0.00682)
LEGEND:
T29-D 1999 SAMPLE (SEE NOTE A)
2003 SAMPLE
SOIL-T3 2005 COMPOSITE SAMPLE (SEE NOTE B)
HA-1 2013 SAMPLE
(0.000417) 2,3,7,8-TCDD TEQ CONCENTRATION (ug/kg) (SEE NOTES 4 THROUGH 6)
2-YEAR FLOOD ELEVATION - 613 FT AMSL
25-YEAR FLOOD ELEVATION - 617 FT AMSL
100-YEAR FLOOD ELEVATION - 619 FT AMSL
SAMPLE LOCATION NOTES:
A. FOR T-18, T-29 AND T-34, SAMPLE A IS 15 FEET FROM TOP OF RIGHT BANK (LOOKING UPSTREAM), SAMPLE B IS THE TOP OF RIGHT BANK, SAMPLE D IS TOP OF LEFT BANK AND SAMPLE E IS 15 FEET FROM TOP OF LEFT BANK.
B. WITH THE EXCEPTION OF THE TWO CIRCULAR AREAS ADJACENT TO THE OUTFALL 001 DRAINAGE DITCH AND THE CIRCULAR AREA SOUTH OF HAMMOND AVENUE, EACH COMPOSITE FLOODPLAIN SOIL SAMPLE WAS COMPOSED OF FIVE DISCRETE GRABS WITHIN EACH INDICATED SAMPLING AREA. COMPOSITE SAMPLES FROM THE THREE CIRCULAR AREAS WERE COMPOSED OF FOUR DISCRETE GRAB
FIGURE NOTES:
1. BASE MAP OBTAINED FROM PHOTOGRAMMETRY PERFORMED BY LOCKWOOD MAPPING COMPANY OF ROCHESTER, NY (12/28/01). TOPOGRAPHY OBTAINED ON 2/9/2009 FROM A FIELD SURVEY PERFORMED BY LBH, INC. OF DULUTH, MN.
2. ALL LOCATIONS ARE APPROXIMATE.
3. FLOOD ELEVATIONS FOR CRAWFORD CREEK BASED ON NEMADJI RIVER FLOOD FLOWS AND WATER SURFACE ELEVATIONS OBTAINED FROM "FLOOD FREQUENCY CHARACTERISTICS OF WISCONSIN STREAMS" (USGS, 2003), ADJUSTED TO CORRELATE WITH FEMA 100-YEAR FLOOD ELEVATION (NGVD 29).
4. ALL RESULTS ARE FROM THE 0 TO 1 FOOT BELOW GROUND SURFACE (BGS) INTERVAL.
5. WHEN A DUPLICATE SAMPLE WAS COLLECTED, THE HIGHER RESULT OF THE SAMPLE AND ITS DUPLICATE IS SHOWN.
2005 Floodplain Samples - NR 720 RCL Exceedances:
PAHs only
Dioxins/Furans only
PAHs and Dioxins/Furans
None
Total area of impacts: 20.2 acres
0 100' 200'
GRAPHIC SCALE
Distance: 200 ft
BEAZER EAST, INC.
FORMER KOPPERS INC. FACILITY
SUPERIOR, WISCONSIN
SUPPLEMENTAL OFF-PROPERTY INVESTIGATION SUMMARY REPORT
SURFICIAL (0 - 1') BANK/FLOODPLAIN MATERIAL ANALYTICAL RESULTS - PCDDs/PCDFs
ARCADIS
FIGURE 3
XREFS:
IMAGES:
PROJECTNAME:
392000X00
392000X01
392000X03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Total Area of Impacts: 20.2 acres
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T34-D (0.0815)
T34-A (0.0258)
T34-B (0.31)
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LEGEND:
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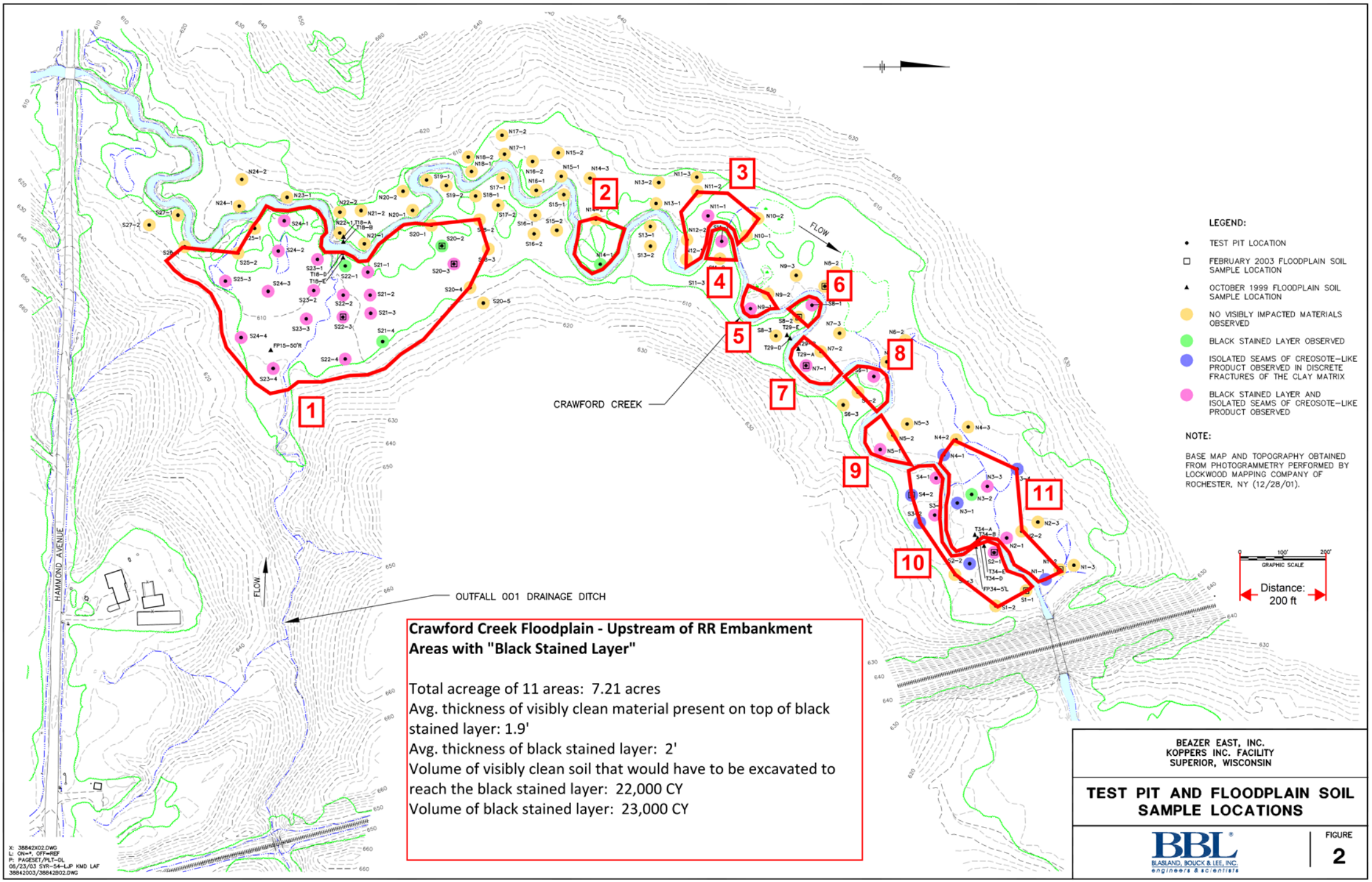
SURFICIAL (0 - 1') BANK/FLOODPLAIN MATERIAL ANALYTICAL RESULTS - PCDDs/PCDFs
ARCADIS
FIGURE 3
XREFS: 39200X00 39200X01 39200X03
IMAGES:
PROJECTNAME: ---



Crawford Creek Floodplain - Upstream of RR Embankment
Areas with "Black Stained Layer"

Total acreage of 11 areas: 7.21 acres
Avg. thickness of visibly clean material present on top of black stained layer: 1.9'
Avg. thickness of black stained layer: 2'
Volume of visibly clean soil that would have to be excavated to reach the black stained layer: 22,000 CY
Volume of black stained layer: 23,000 CY

BEAZER EAST, INC.
KOPPERS INC. FACILITY
SUPERIOR, WISCONSIN

TEST PIT AND FLOODPLAIN SOIL SAMPLE LOCATIONS

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 2

X: 38842X02.DWG
L: ON=*, OFF=REF
P: PAGESET/PLT-OL
06/23/03 SYR-54-LJP KMD LAF
38842003/38842B02.DWG

Implications of Clean-Up Goal for Area D Floodplain

CUG	Area/Volume of Impacts	Est. Cost for 1' Soil Cover	Est. Cost for Removal/ Backfill (CAMU)	Est. Cost for Removal/ Backfill (Off-Site T&D)
NR 720	20.6 acres 33,300 cy (1') 96,400 cy (2.9')	$3.8M	$11.8M (1') $27.3M (2.9')*	$46.7M (1') $132M (2.9')*
ESLs/ Eco-SSLs	22 acres 35,600 cy (1') 103,100 cy (2.9')*	$4M	$12.4M (1') $29.1M (2.9')*	$49.9M (1') $141M (2.9')*

* Removal depth of 2.9 feet based on average core refusal depth in floodplain reported in 2014 GLNPO Report.

** All costs considered preliminary.

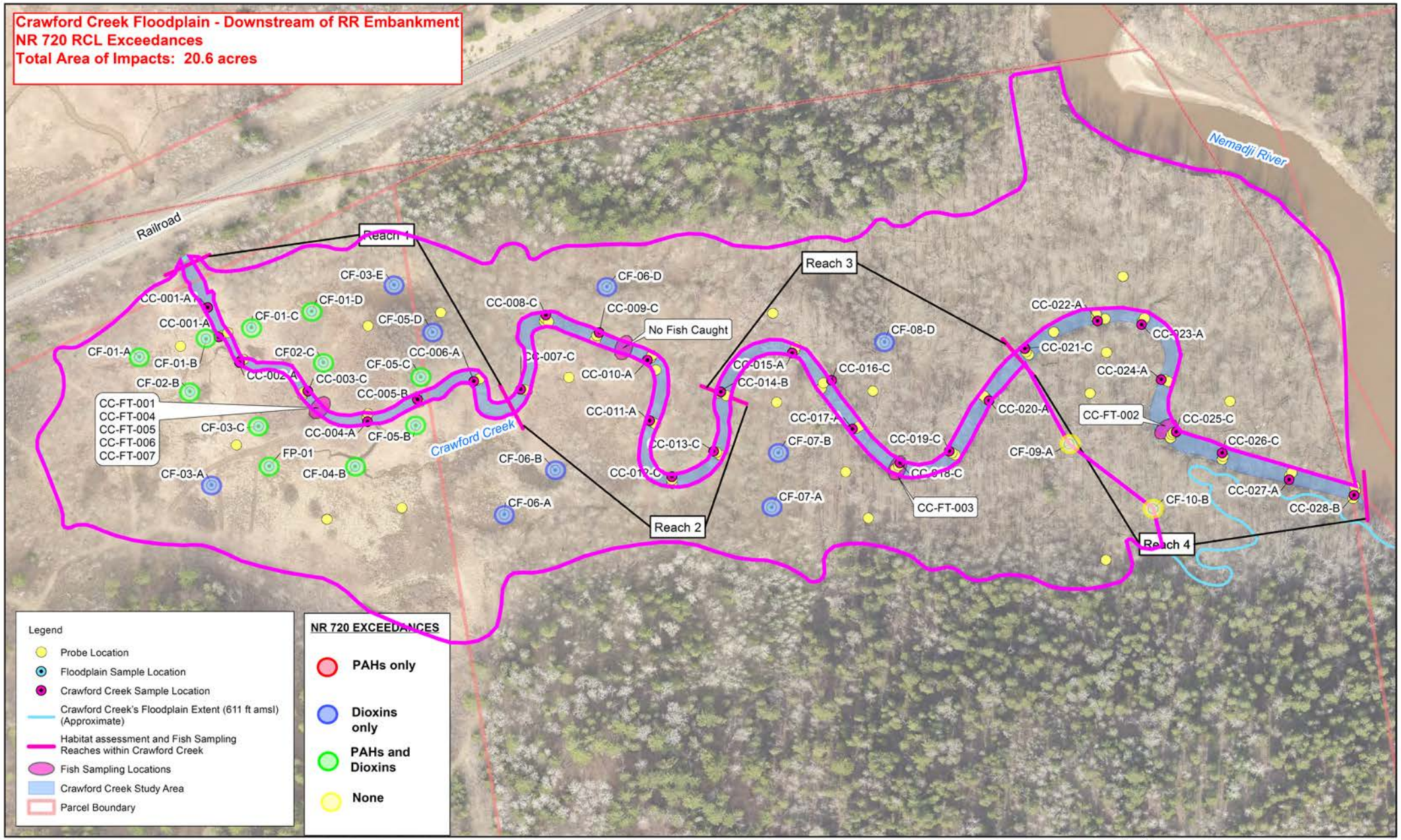


Figure 2
Sediment Sampling, Probing and Fish Sampling Location Map - Crawford Creek and Floodplain
Crawford Creek/Nemadji River Sediment Characterization Site Characterization Report
Superior, WI

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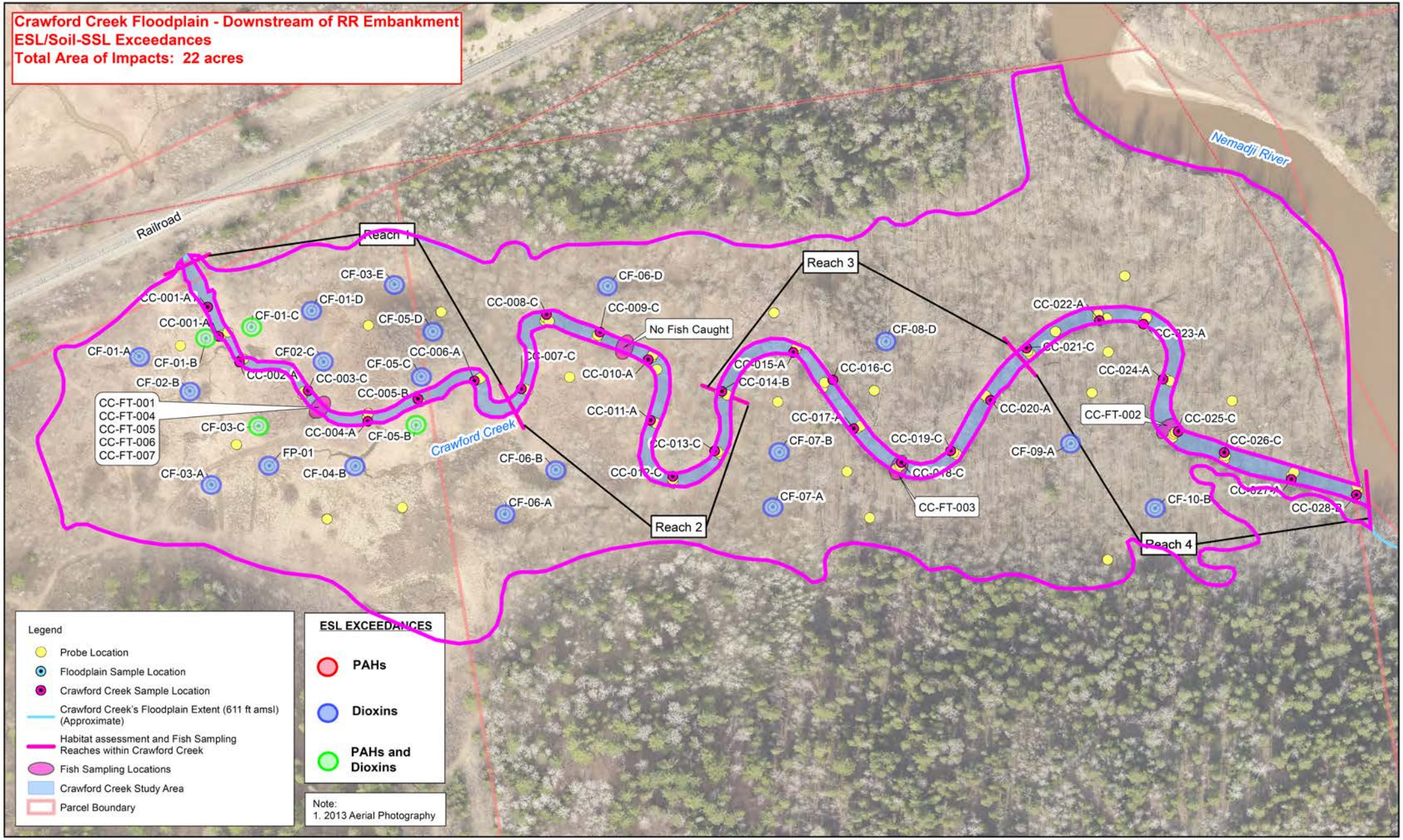
MKE \\LAKEFRONT\PROJ\GLAES\CRAWFORDCREEKSUPERIORWI\MAPFILES\SITECHARACTERIZATIONREPORT2014\FIGURE 02 - SED SAMPLING, PROBING AND FISH SAMPLING LOCATION MAP - CC AND FP.MXD JHANSEN1 12/2/2014 12:16:47 PM



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Implications of Clean-Up Goal for Area D Creek Channel Sediment

CUG	Area/Volume of Impacts	Est. Cost for Removal/ Backfill (CAMU)	Est. Cost for Removal/ Backfill (Off-Site T&D)
CBSQGs/ ESLs	1.2 acres (entire 2,800' length of creek) 1,900 cy (1') 4,200 cy (2.2')	$3.4M (1') $4.0M (2.2')*	$3.7M (1') $6.9M (2.2')*
"Class A NAPL Impacts"	0.5 acres (first 1,200' of creek) 800 cy (1') 1,800 cy (2.2')*	$2.8M (1') $3.0M (2.2')*	$2.0M (1') $3.3M (2.2')*

* Removal depth of 2.2 feet based on average core refusal depth in creek channel reported in 2014 GLNPO Report.

** All costs considered preliminary.