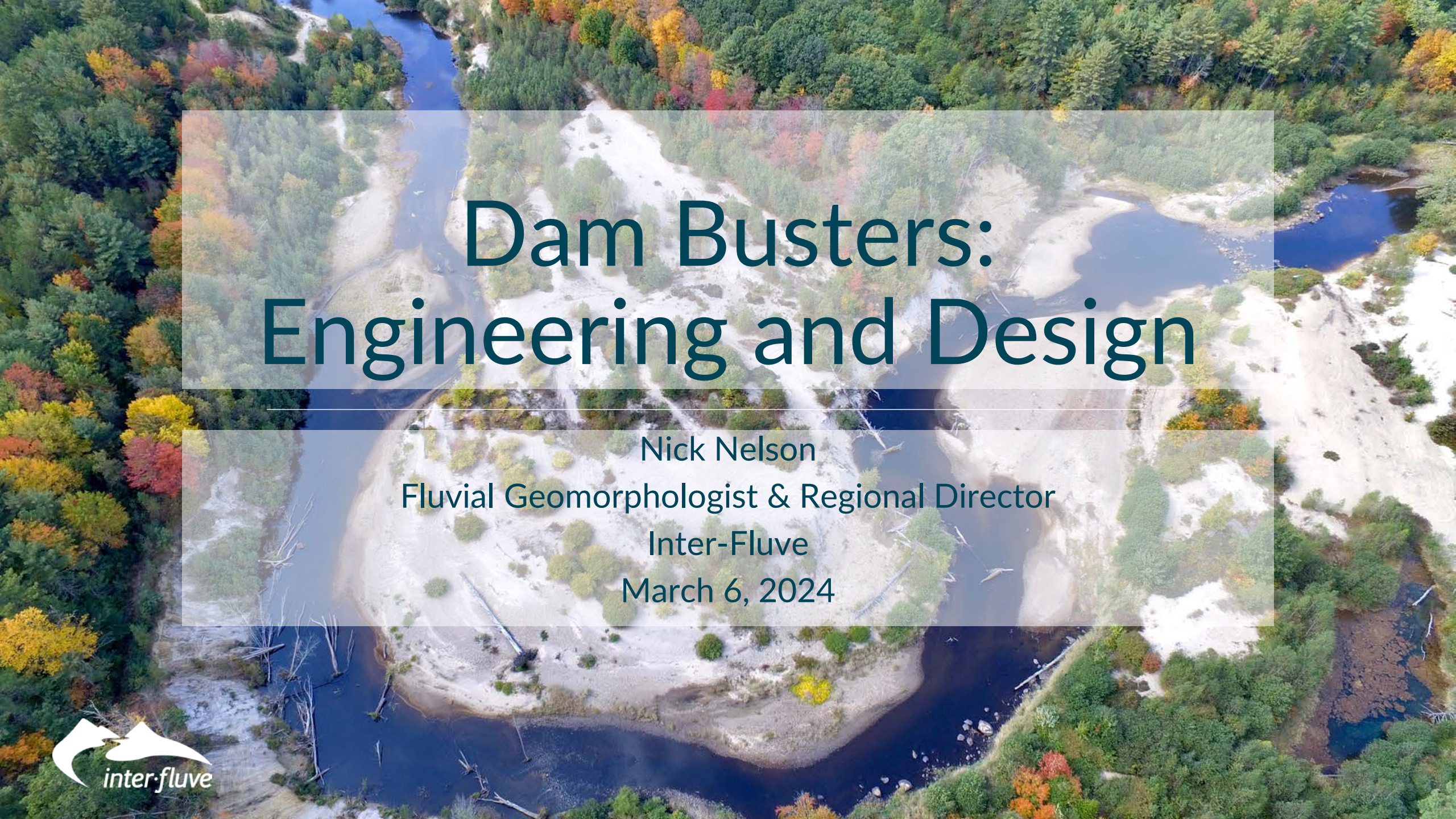


Dam Busters: Engineering and Design

Nick Nelson
Fluvial Geomorphologist & Regional Director
Inter-Fluve
March 6, 2024

inter·fluve


Rivers Connect
Longitudinally
Laterally
Culturally/Spiritually

Our Place, Our Time, Our Responsibility

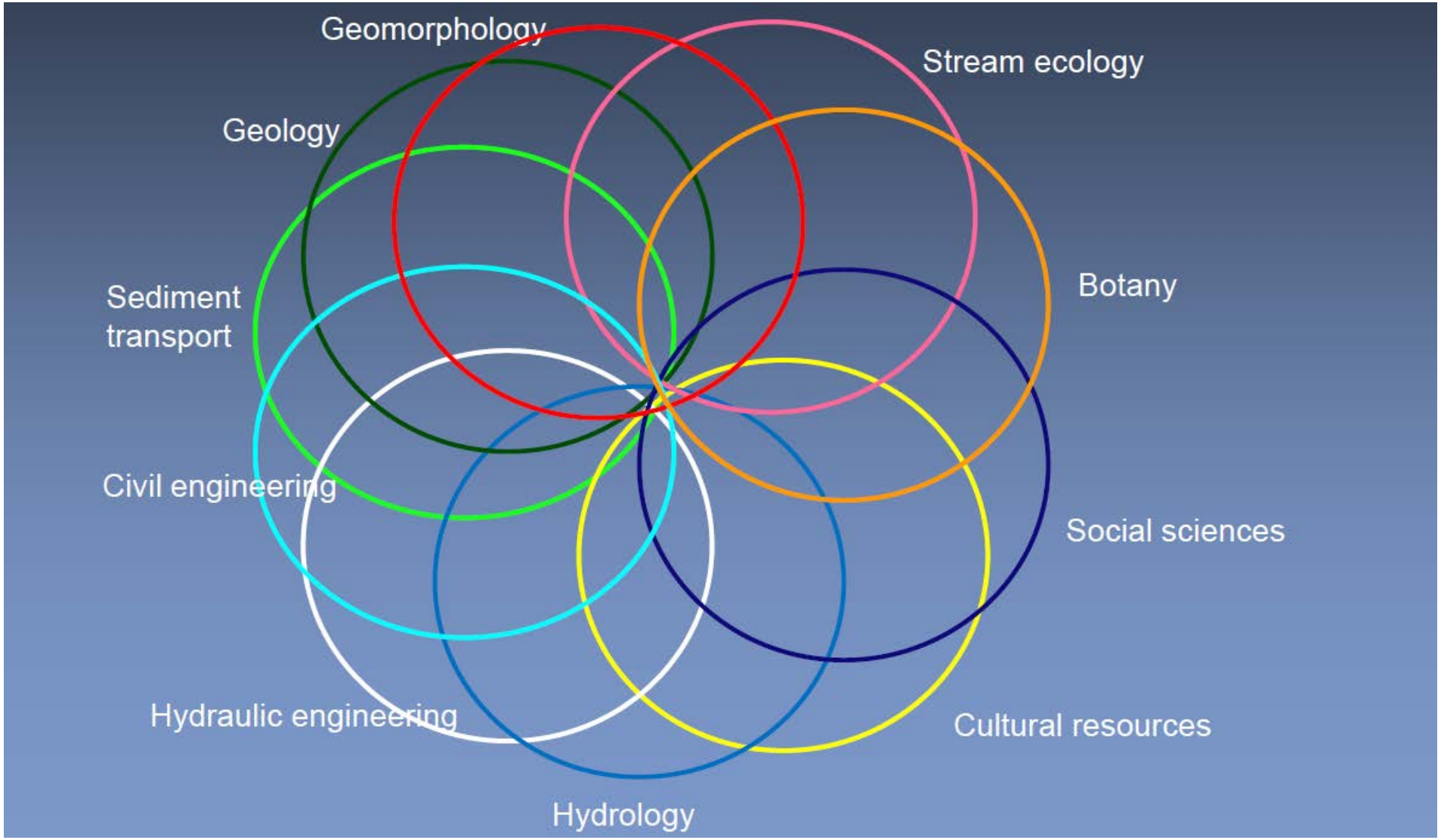

1. Assessment and Data Collection
2. Data Analyses
3. Designs
4. Dam Removal Construction

Take Home Messages

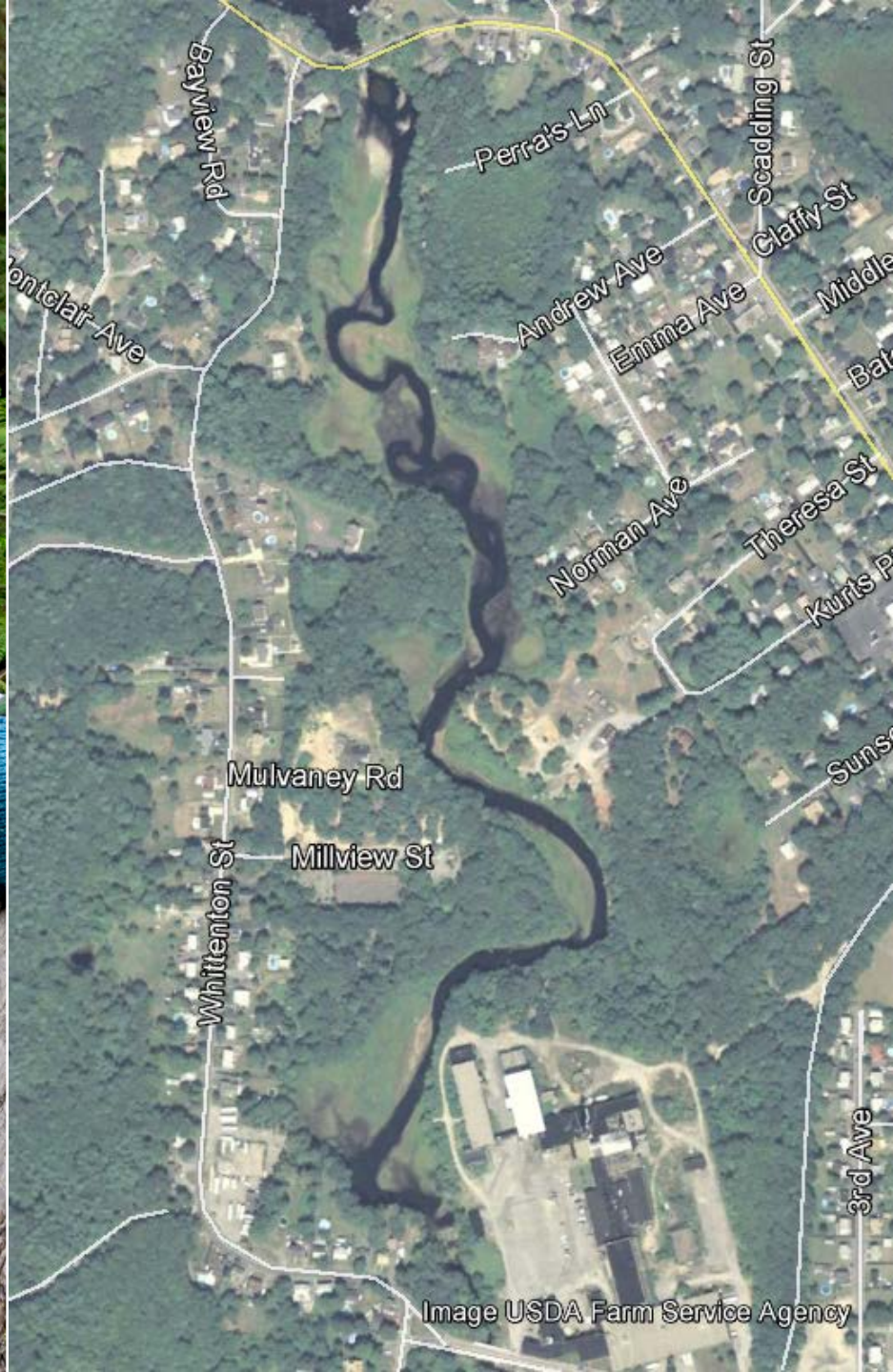
- Rivers and dam removals are complex
- Due-diligence is critical
- Uncertainty is real
- End of construction is the beginning of restoration/recovery

Marland Place Dam Removal: Shawsheen River, Andover, MA

Rivers are complex, requiring an understanding of many disciplines



Assessment and Data Collection: Forensic Geomorphology, Habitat Assessment



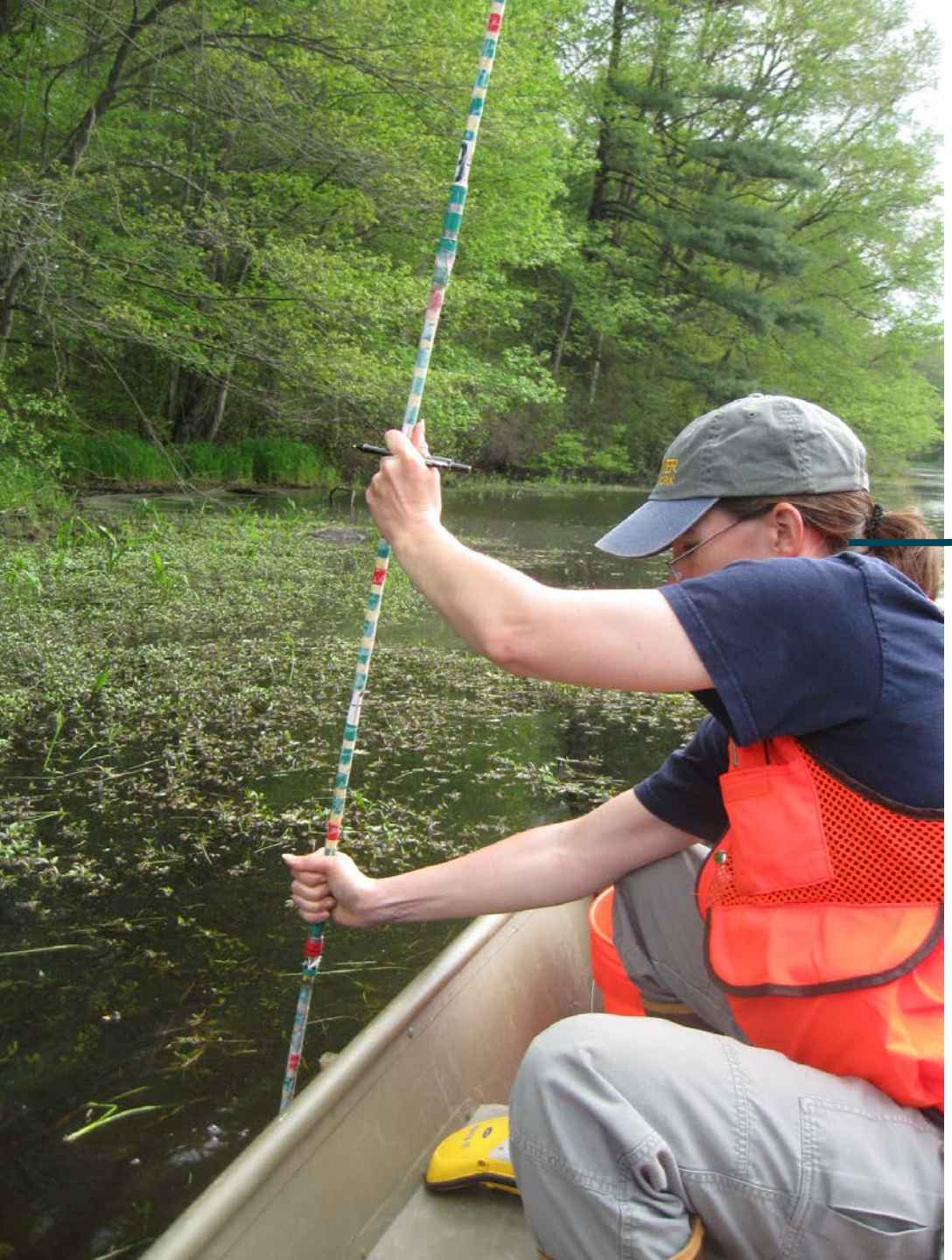
Assessment and Data Collection: Survey

Whittenton Dam, Mill River, Taunton, MA

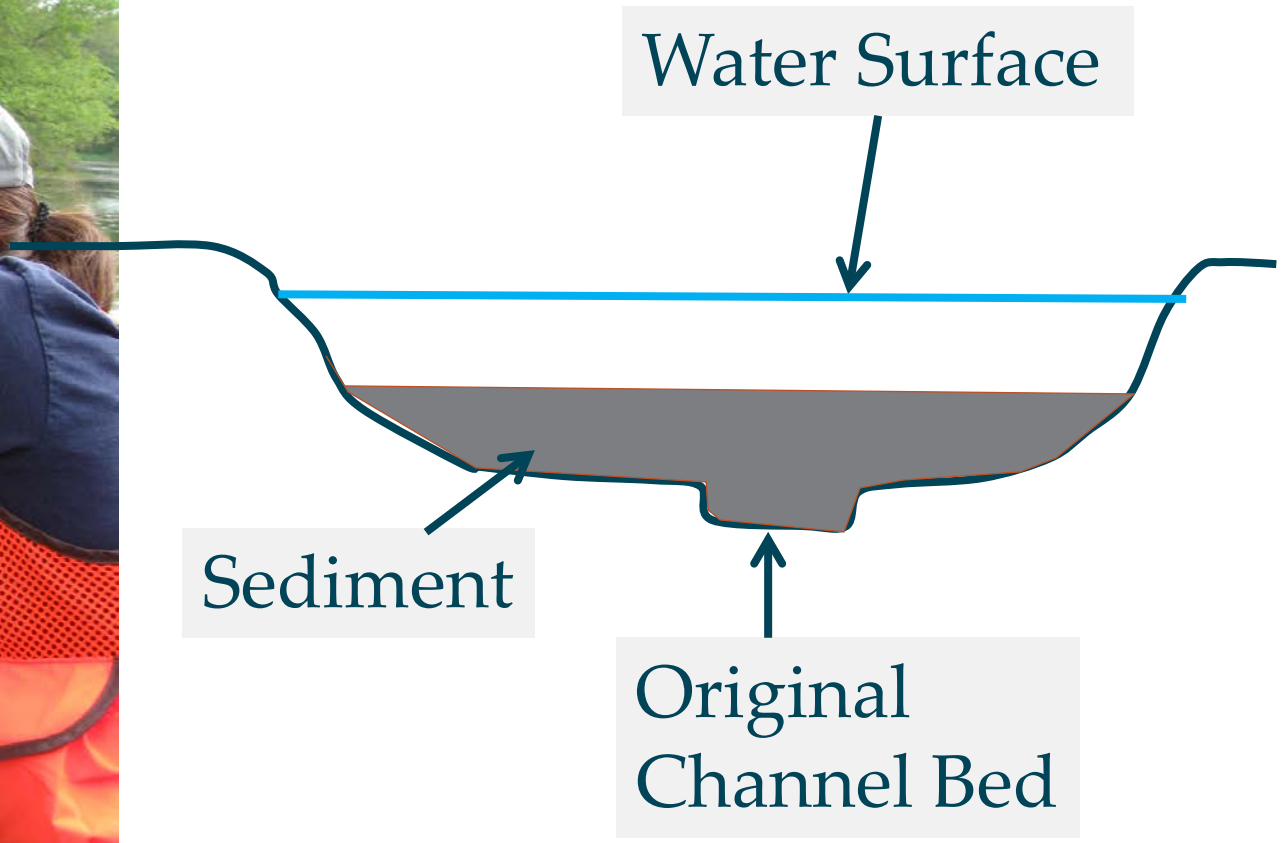
Assessment and Data Collection: Impounded Sediment

- Quantity
- Quality

Hopewell Mills Dam, Mill River, Taunton, MA

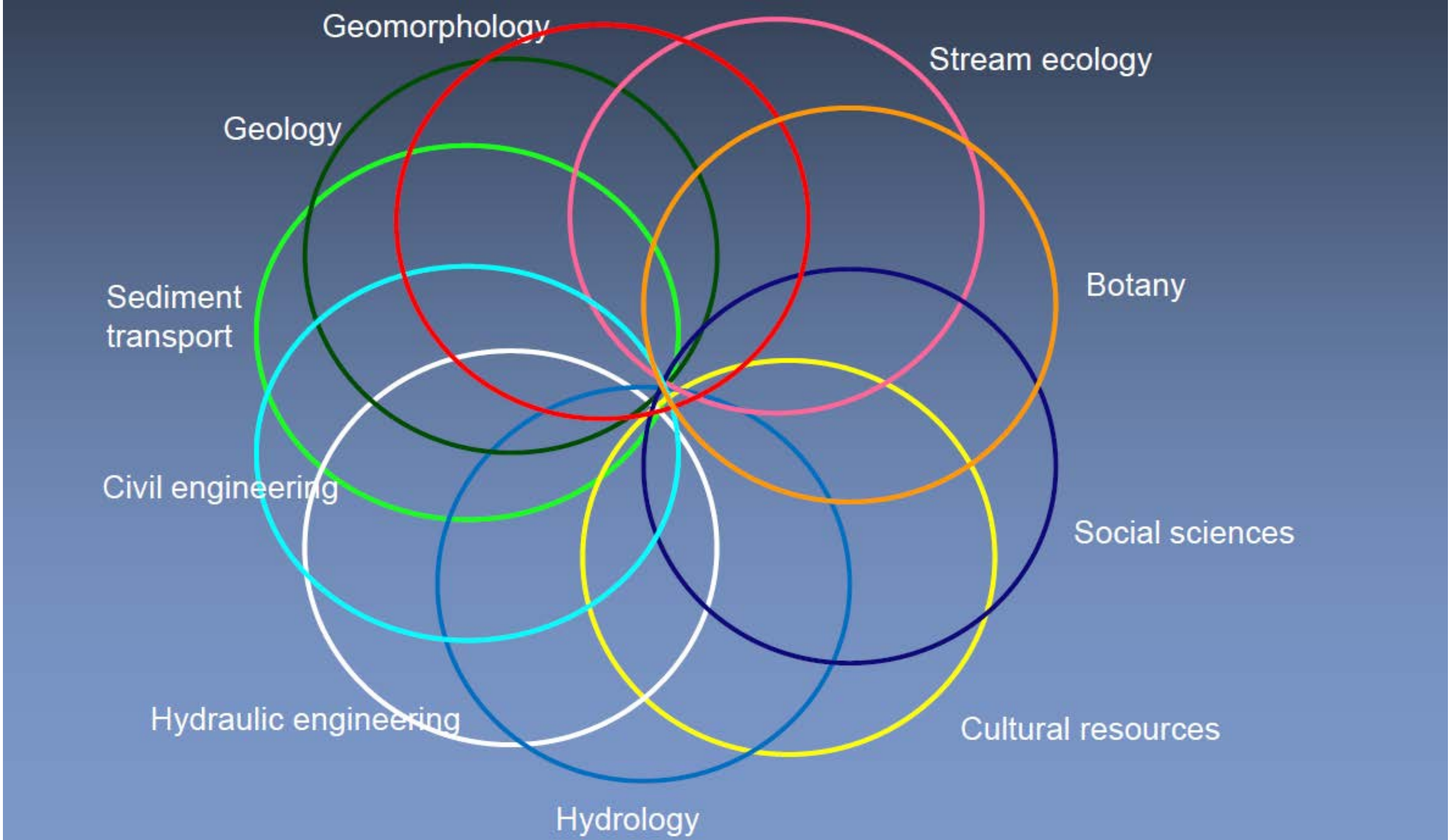


Impounded Sediment: Estimating Volume

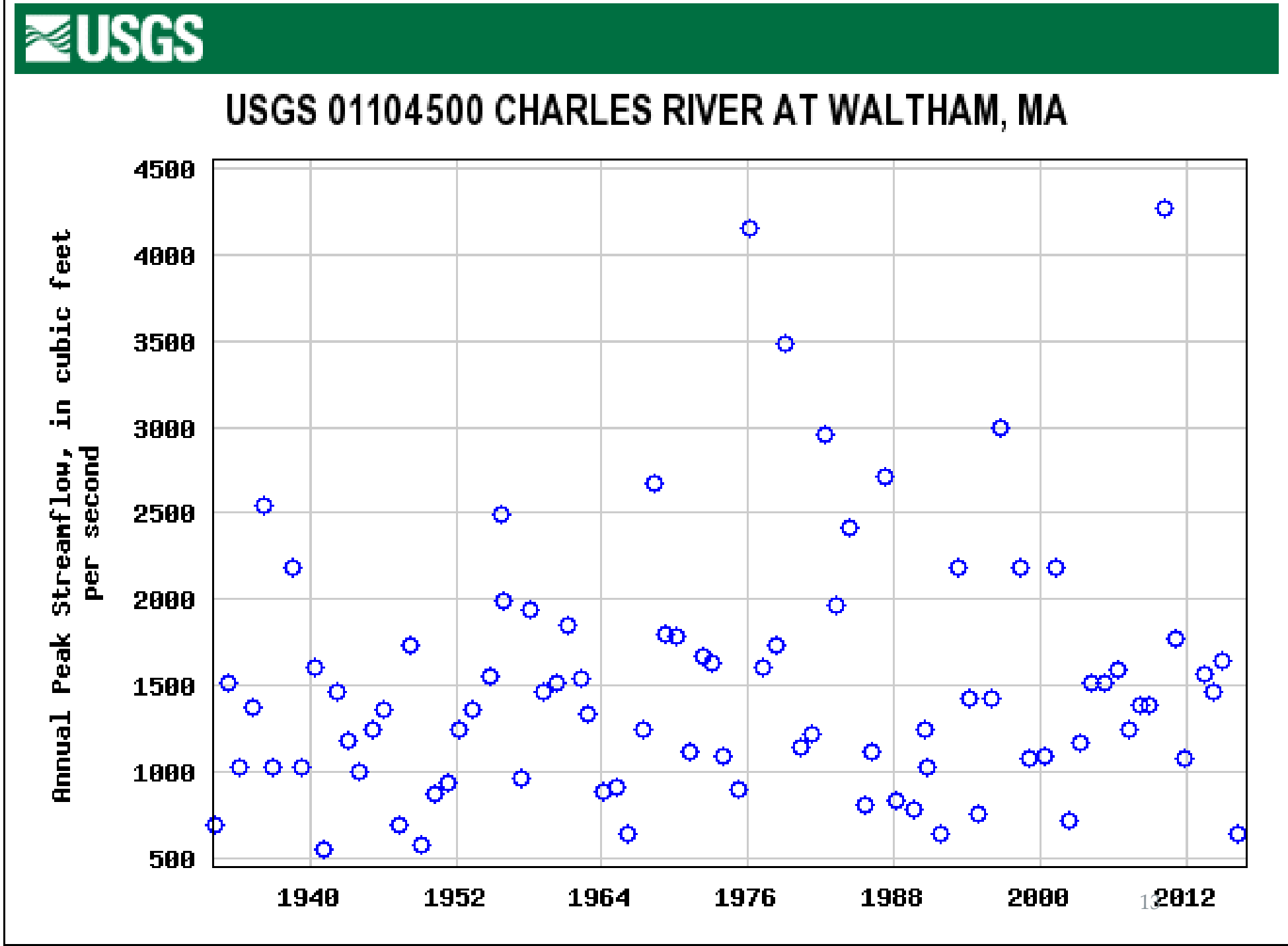


Impounded Sediment: Contaminant Testing

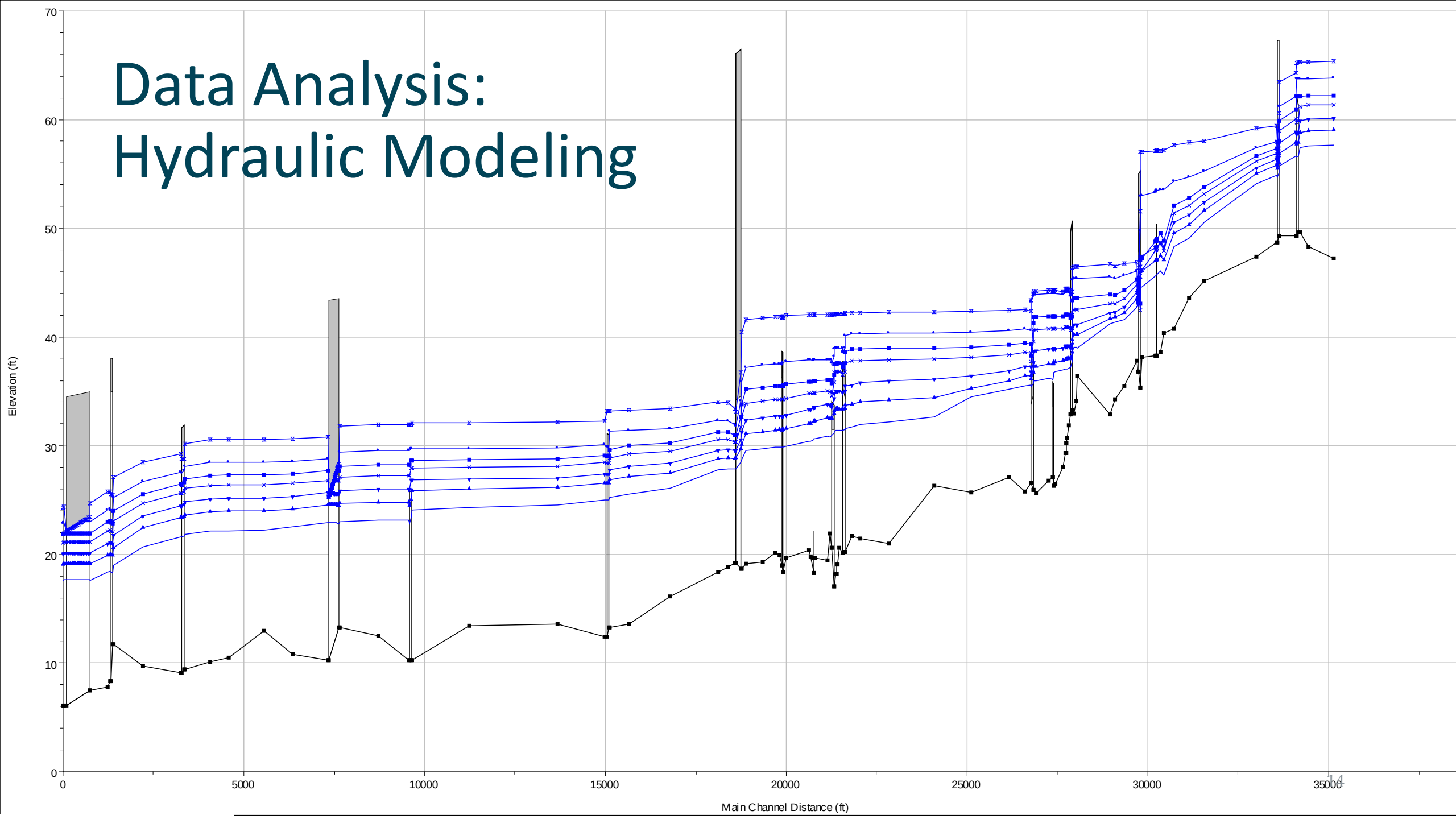
Tidmarsh Farms, Plymouth, MA


Geomorphology
Stream ecology
Geology
Botany
Sediment transport
Civil engineering
Social sciences
Hydraulic engineering
Cultural resources
Hydrology

Data Analyses: Hydrology



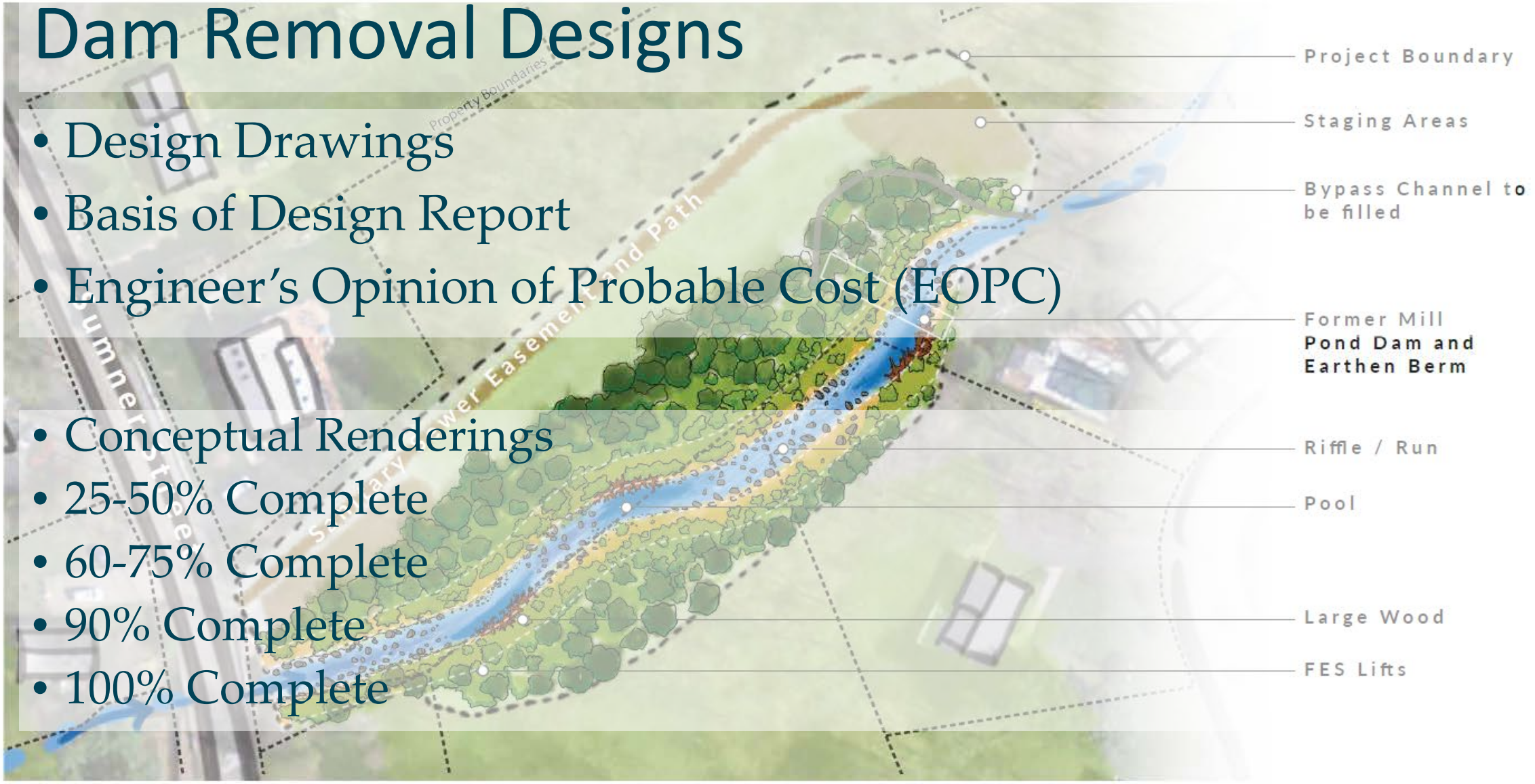
Data Analysis: Hydraulic Modeling



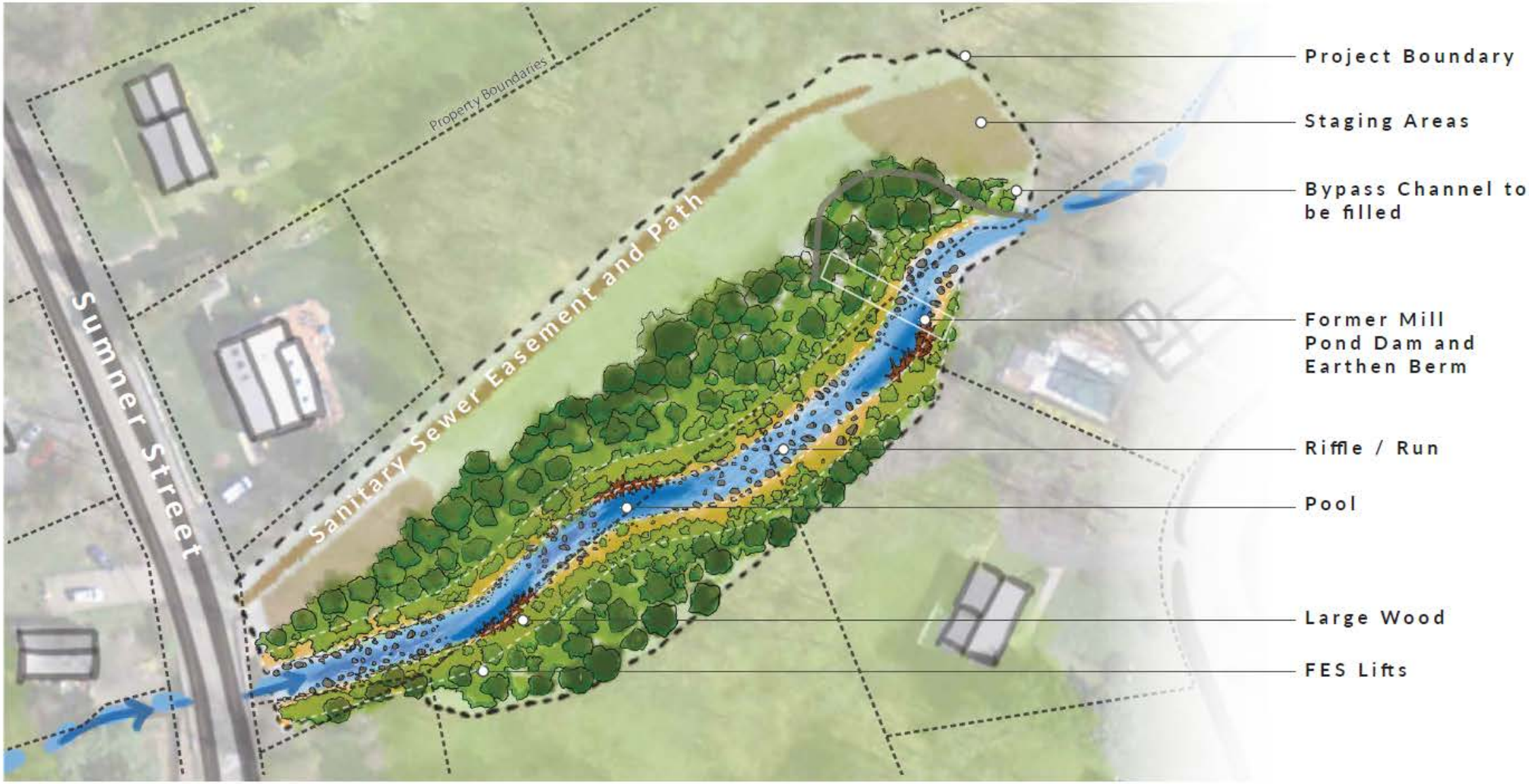
Data Analyses and Dam Removal Design Studies/Calculations

Dam Removal Designs

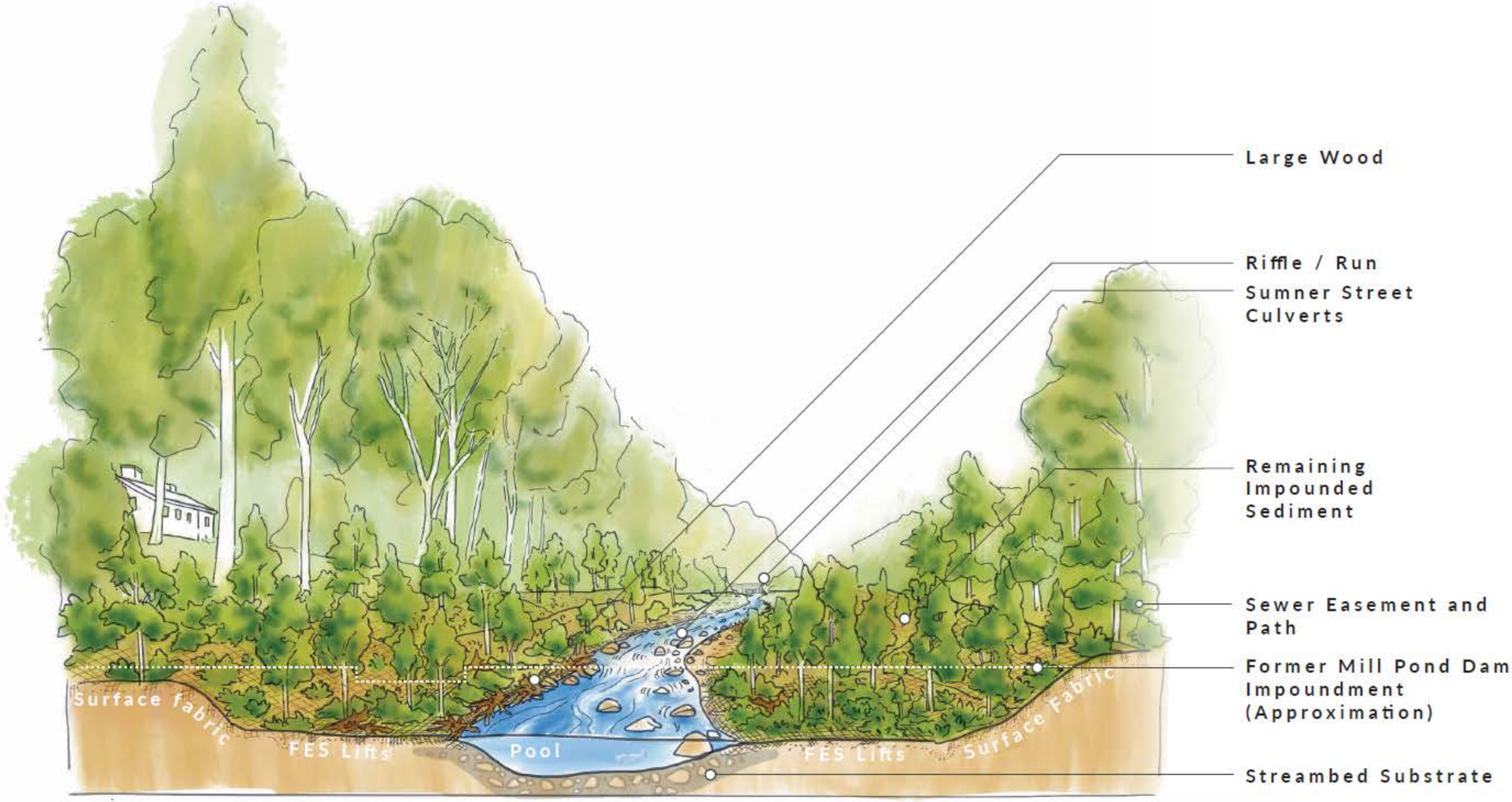
- Design Drawings
- Basis of Design Report
- Engineer's Opinion of Probable Cost (EOPC)
- Conceptual Renderings
- 25-50% Complete
- 60-75% Complete
- 90% Complete
- 100% Complete



Millpond Dam Removal, Traphole Brook, Norwood, MA

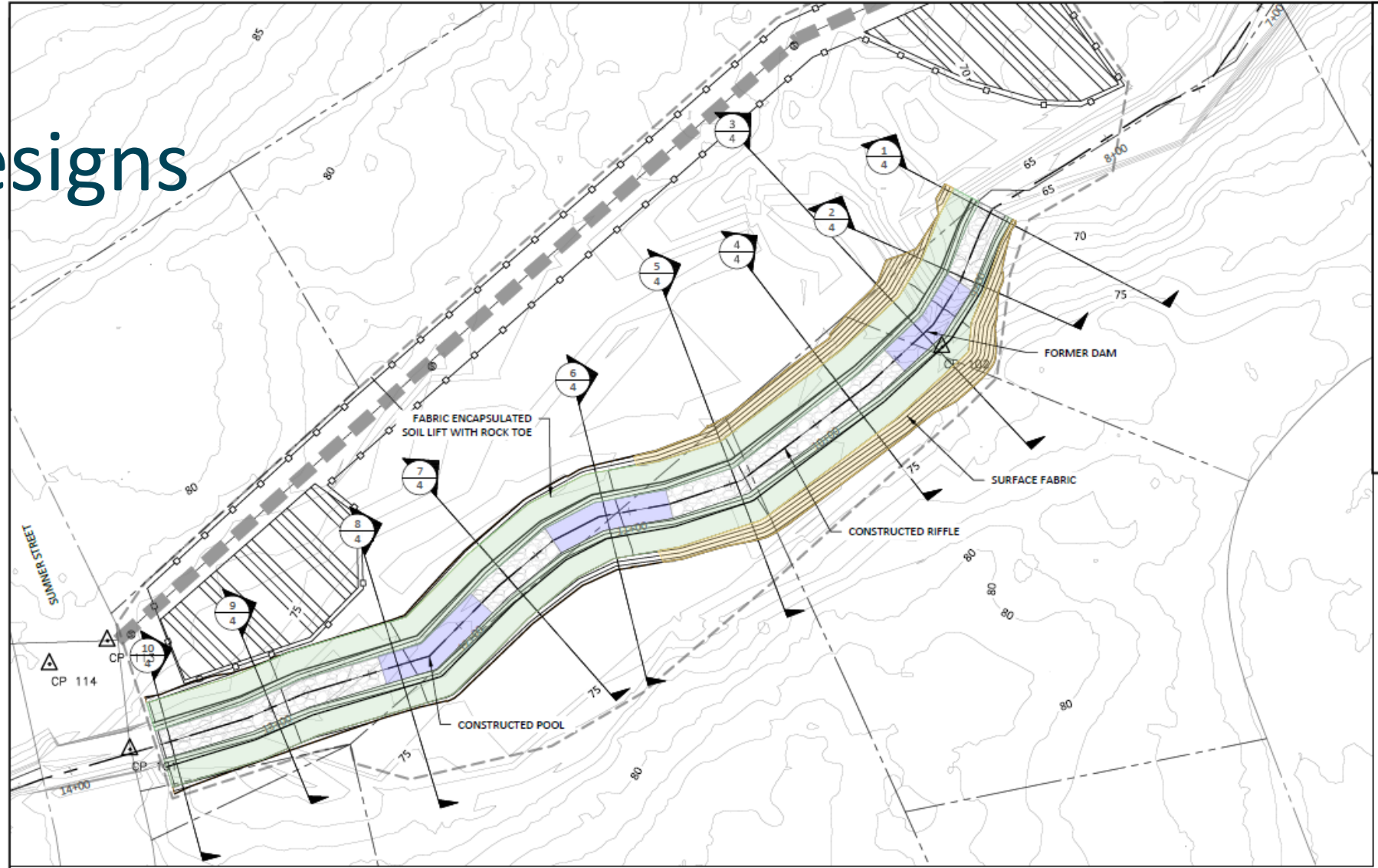


Millpond Dam Removal, Traphole Brook, Norwood, MA



Millpond Dam Removal, Traphole Brook, Norwood, MA

40% Designs



NO.	DATE	REVISION DESCRIPTION

DRAWN	DESIGNED	CHECKED
SL	SW, SL	SW
APPROVED	DATE	PROJECT
----	19-10-25	19-05-06

Town of Norwood
Norwood, MA
Mill Pond Dam Removal and Traphole Brook Restoration Project

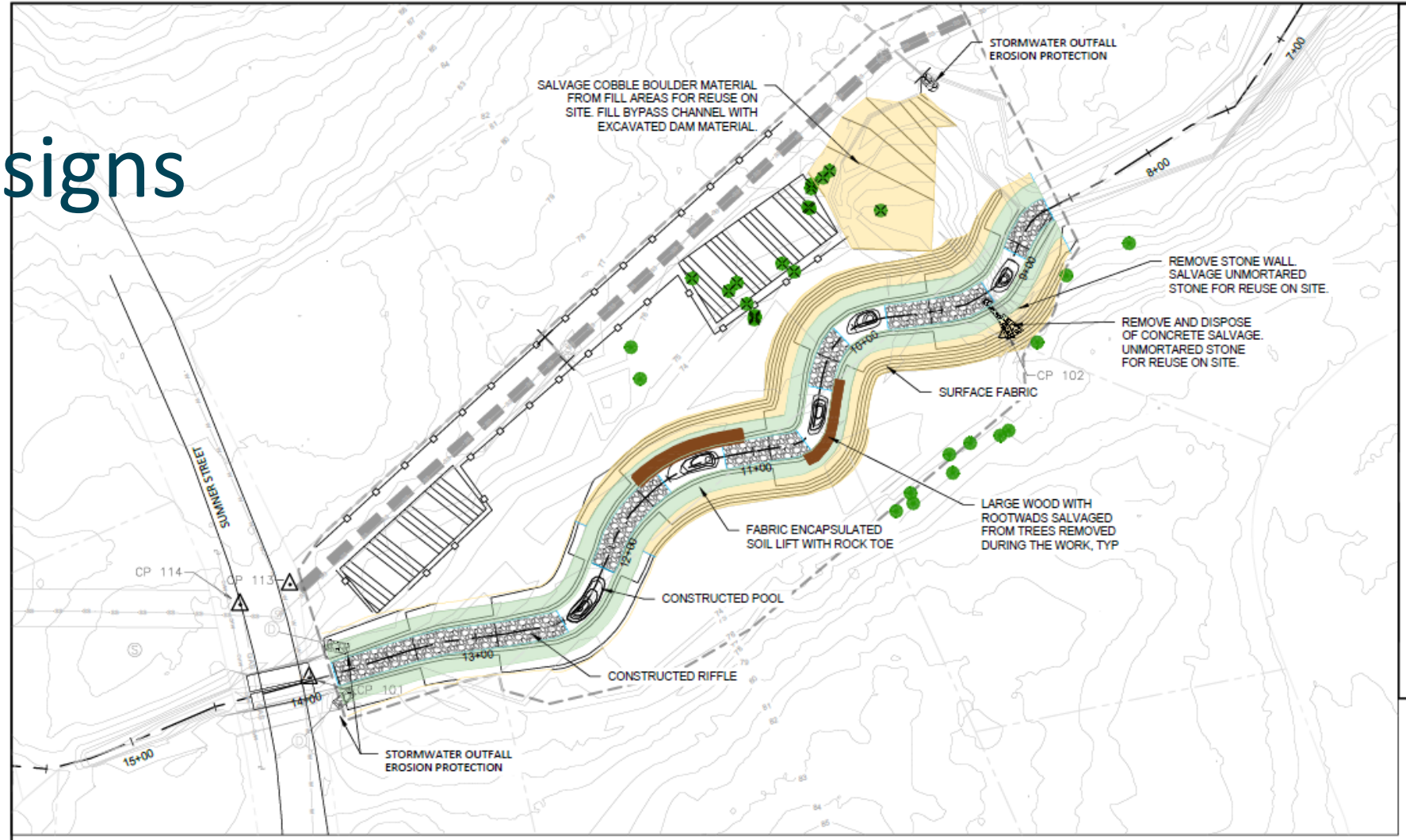
inter-fluve
220 Concord Avenue, 2nd Floor
Cambridge, MA 02138
617.714.5537
www.interfluve.com

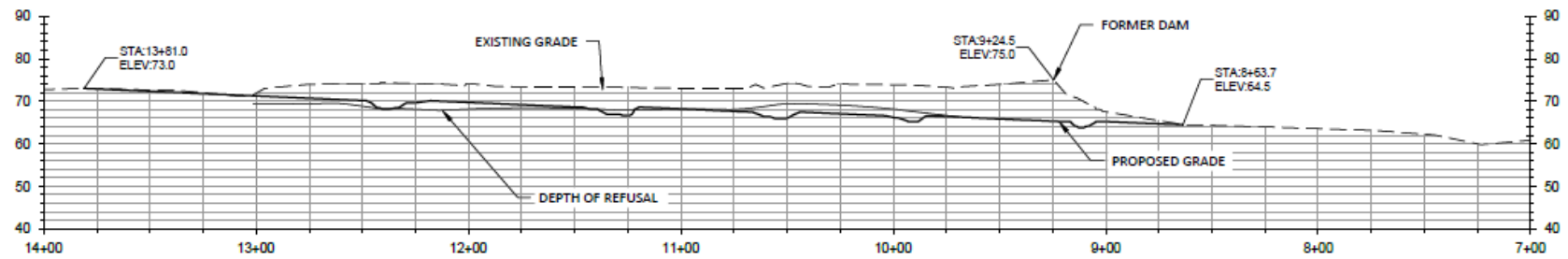
Proposed Grading
Plan & Profile

SHEET
3 OF 7

DRAFT

75% Designs





NO.	DATE	REVISION DESCRIPTION

DRAWN	DESIGNED	CHECKED
SL	SW, SL	
APPROVED	DATE	PROJECT
---	06/30/2020	19-05-06

TOWN OF NORWOOD
NORWOOD, MA
MILL POND DAM REMOVAL AND TRAPHOLE BROOK RESTORATION

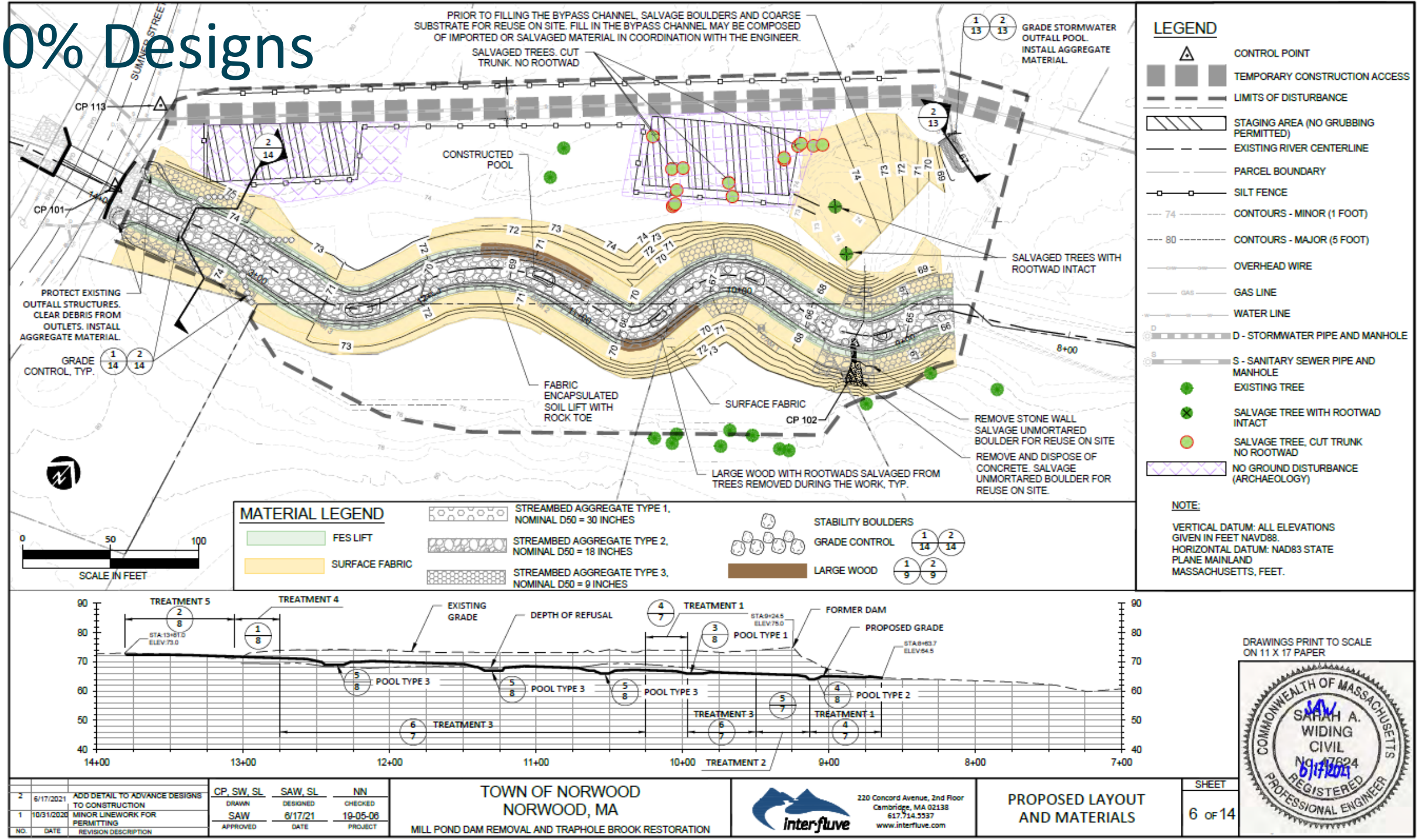
inter-fluve
220 Concord Avenue, 2nd Floor
Cambridge, MA 02138
617.714.5537
www.interfluve.com

PROPOSED LAYOUT AND MATERIALS

SHEET 5 OF 11

DRAFT

100% Designs



DRAWINGS PRINT TO SCALE ON 11 X 17 PAPER

COMMONWEALTH OF MASSACHUSETTS
SARAH A. WIDING
CIVIL
No. 47624
6/17/2021
REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION
2	6/17/2021	ADD DETAIL TO ADVANCE DESIGNS TO CONSTRUCTION
1	10/31/2020	MINOR LINEWORK FOR PERMITTING

CP, SW, SL	SAW, SL	NN
DRAWN	DESIGNED	CHECKED
SAW	6/17/21	19-05-06
APPROVED	DATE	PROJECT

TOWN OF NORWOOD
NORWOOD, MA
MILL POND DAM REMOVAL AND TRAPHOLE BROOK RESTORATION

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PROPOSED LAYOUT AND MATERIALS

SHEET
6 OF 14

Construction Cost Estimates

Traphole Brook Restoration Cost Estimate
2021 dollars; escalation not included

Item #	Item	Qty	Type	Unit Price	Total Price	Note
1	Mobilization	1	LS	$ 77,393	$ 77,393	10% of remaining items
2	Erosion and Sediment Control	1	LS	$ 15,000	$ 15,000	
3	Clearing and Grubbing	1	LS	$ 10,000	$ 10,000	
4	Diversion and Dewatering	1	LS	$ 50,000	$ 50,000	
5	Earthwork: Excavation (Off-Site Disposal)	3830	yd^3	$ 70	$ 268,100	
6	Earthwork: Excavation (On-Site Disposal)	212	yd^3	$ 18	$ 3,816	
7	Boulders (owner supplied)	16	Each	$ 75	$ 1,200	3-4ft in diameter; install only
8	Boulders (contractor supplied)	26	Each	$ 150	$ 3,900	3-4ft in diameter
9	Streambed Aggregate (Type 1)	270	tons	$ 75	$ 20,250	
10	Streambed Aggregate (Type 2)	3300	tons	$ 75	$ 247,500	
11	Streambed Aggregate (Type 3)	280	tons	$ 75	$ 21,000	
12	Fabric Encapsulated Soil Lift	1030	FF	$ 60	$ 61,800	
13	Surface Fabric	2450	SY	$ 15	$ 36,750	
14	Large Wood Logs/Snags (salvage/owner supplied)	26	Each	$ 200	$ 5,200	Either salvaged during clearing and grubbing or delivered by the Town
15	Large Wood Rootwads (salvage/owner supplied)	16	Each	$ 200	$ 3,200	Either salvaged during clearing and grubbing or delivered by the Town
16	Potted Plants (5 gallon)	52	Each	$ 150	$ 7,800	
17	Potted Plants (1 gallon)	172	Each	$ 30	$ 5,160	
18	Live stakes	520	Each	$ 10	$ 5,200	
19	Zone 1: Wetland Seed	0.6	acre	$ 7,000	$ 4,200	
20	Zone 2: Transitional Seed	0.4	acre	$ 7,000	$ 2,800	
21	Zone 3: Upland Seed	0.15	acre	$ 7,000	$ 1,050	
	SUBTOTAL				**$ 851,319**	
	Contingency				$ 85,132	10% of Subtotal
	Total				**$ 936,450**	

Condit Dam Removal, White Salmon River, WA

Elwha Dam Removal: Elwha River, WA

West Britannia Dam Removal: Mill River, MA

Common Design and Construction Challenges: Access

Balmoral Dam, Shawsheen River, Andover, MA. Photo Credit: Kris Houle, MA DER

Common Design and Construction Challenges: Water Control

Hopewell Mills Dam, Mill River, Taunton, MA

Balmoral Dam, Shawsheen River, Andover, MA

Common Construction Challenges: People

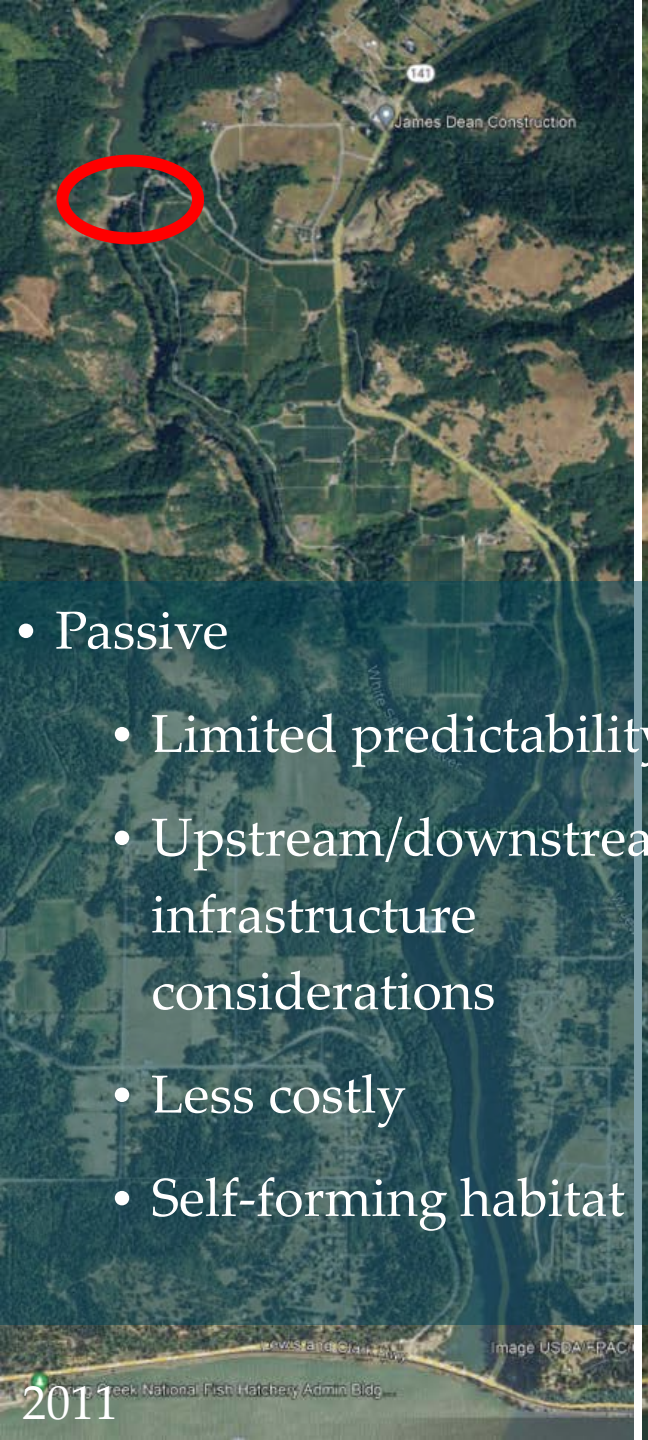
Sediment Management: Active vs Passive

- Active
  - Active channel construction
  - Extensive design and bio-engineering
  - Can be costly
  - Instant habitat is possible
  - Species-specific complex habitat

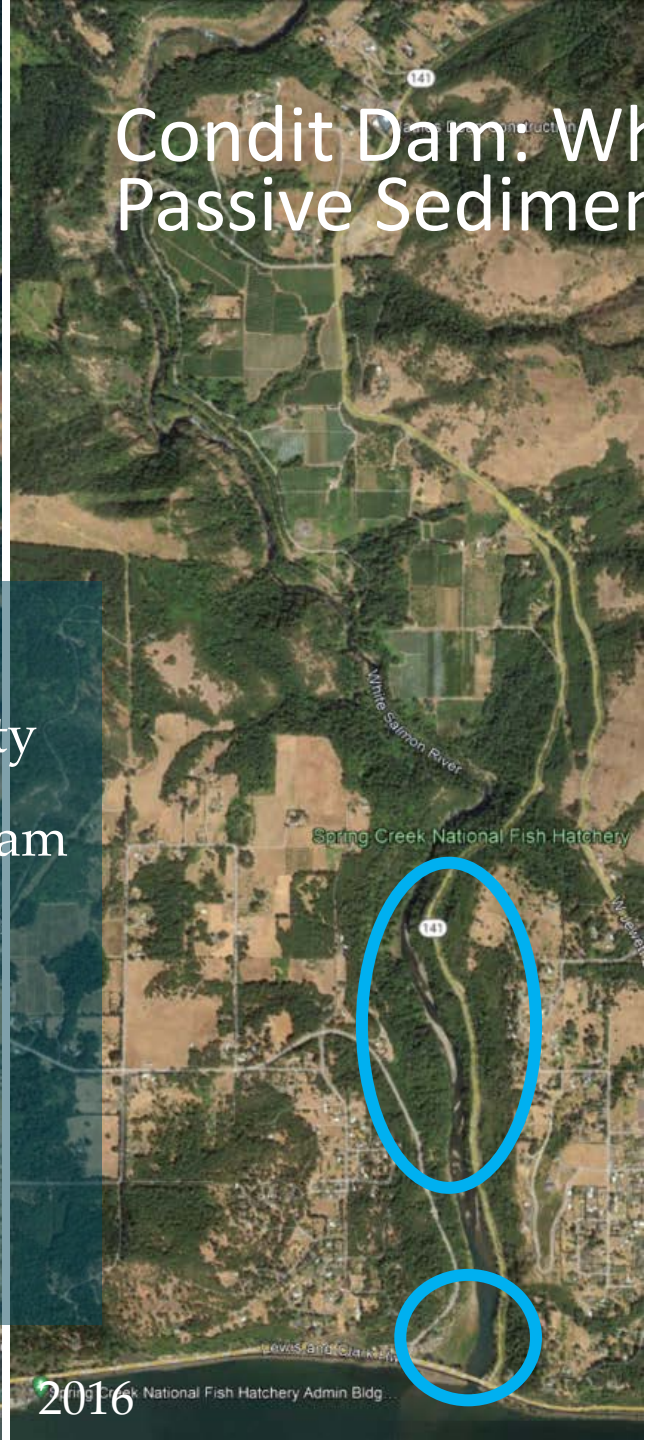
Hopewell Mills Dam, Mill River, Taunton, MA

Condit Dam: White Salmon River, Washington
Passive Sediment Management

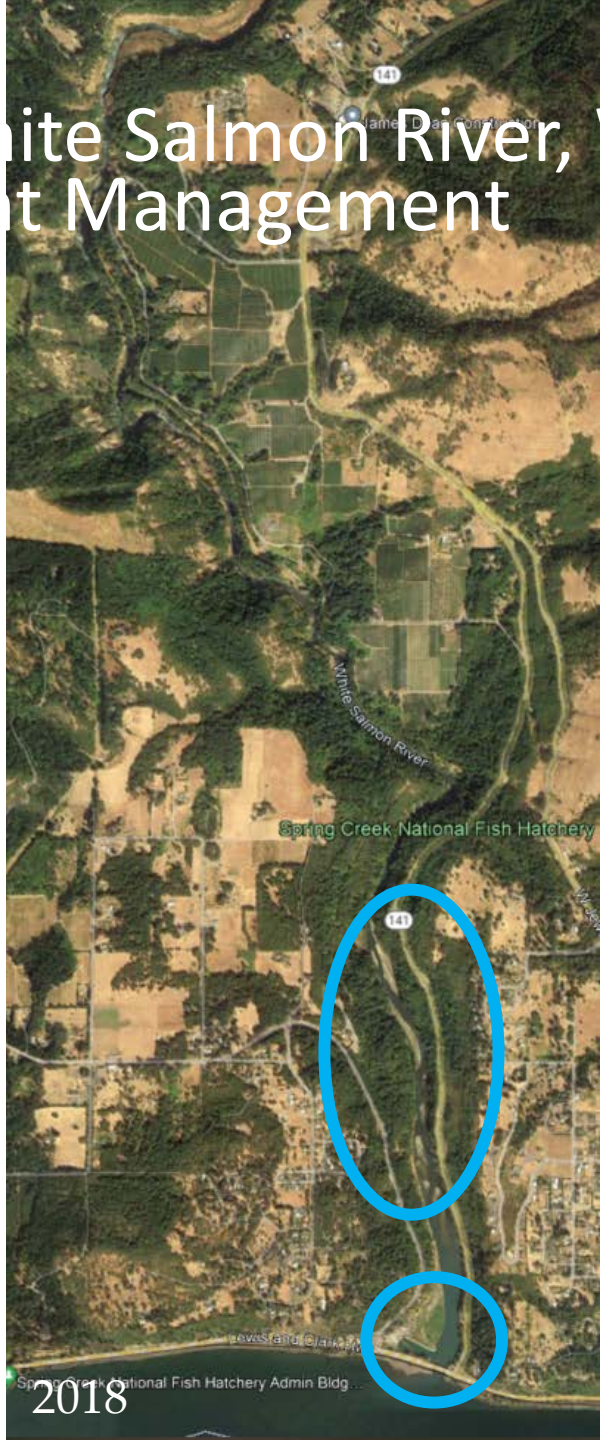
- Passive
  - Limited predictability
  - Upstream/downstream infrastructure considerations
  - Less costly
  - Self-forming habitat



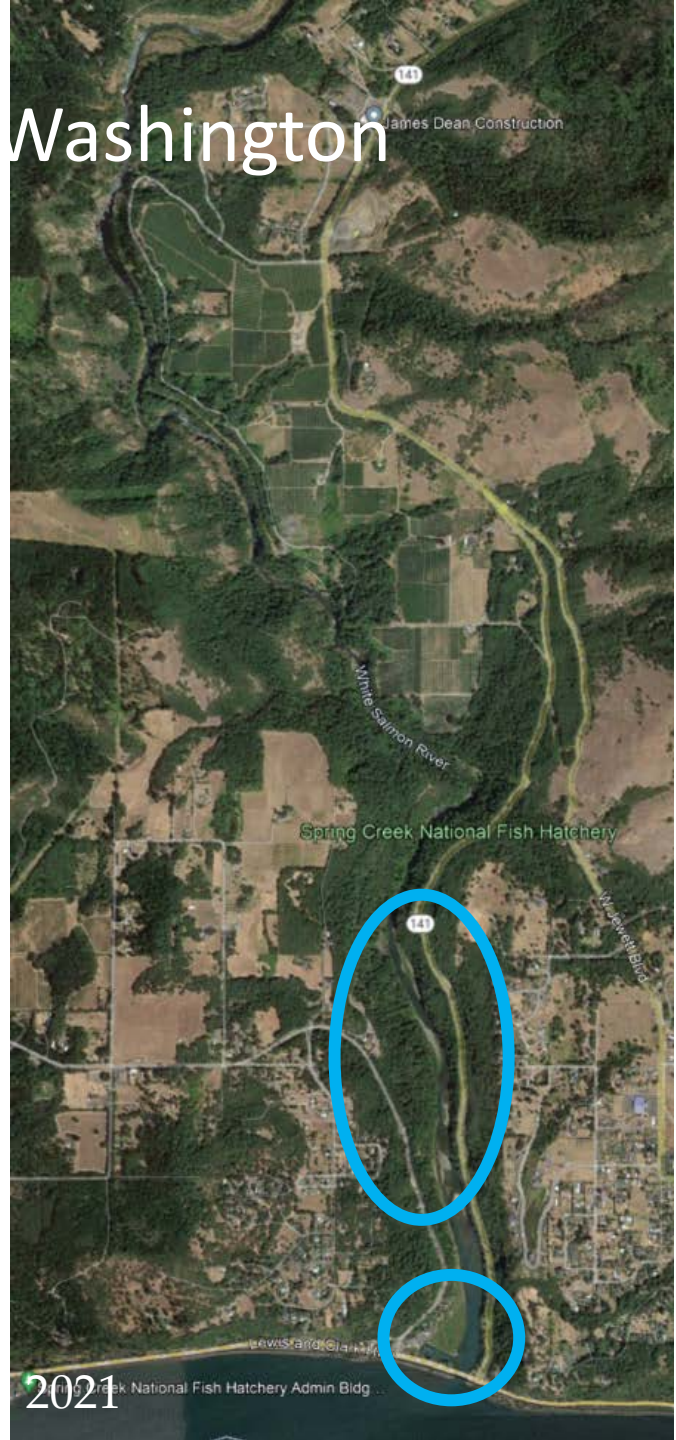
2011



2016

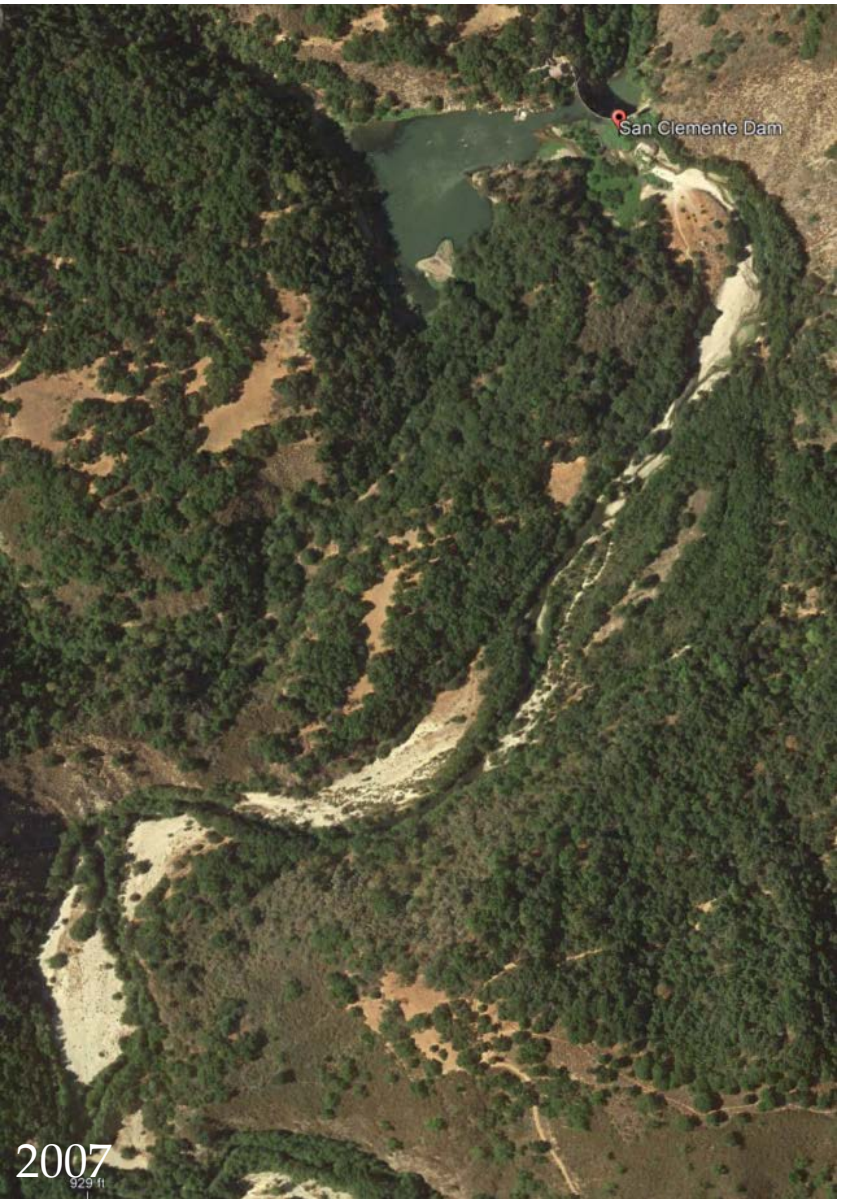


2018



2021

Creative Solutions



Construction Observation

Image: Waterfront Toronto

Dam Removal – doesn’t have to look engineered

Thank you

Nick Nelson

Fluvial Geomorphologist

(617) 852-7744

nnelson@interfluve.com

www.interfluve.com

inter·fluve