Reconnecting Waterways

Managing Sediment on Construction Sites

VT DEC Watershed Management Division
Rivers Program – River Management Section

December 2024

Topics to Discuss – Presentation Agenda

<u>Regulatory Requirements for Sediment Management</u>

Stream Alteration Permitting

Water Quality Monitoring and Standard Conditions

Phasing and Sequencing Plans

Dewatering and Flow Controls

Bed Restoration and ANR E-stone

Starting Construction on Projects

<u>Lessons Learned – Crossing Replacement</u>

Hermitage Club SC-3

<u>Lessons Learned – Dam Removal and Stream Restoration</u>

Pelletier Dam, Castleton

List of Bureaucratic Acronyms

Vermont Department of Environmental Conservation (VT DEC)

Stormwater Construction General Permit (CGP)

Stream Alteration General Permit (SAGP)

Wetlands Non-Reporting General Permit (NRGP)

Individual Permit (IP)

Bankfull Channel Width (Wbkf)

Bankfull Channel Depth (Dbkf)

Environmental Stone, i.e. placed stream bed material (E-stone)

Environmental Notice Bulletin (ENB)

Water Quality (WQ)

VT DEC Stream Alteration General Permit (SAGP)

Permits for Stream Crossing and Dam Removal Projects

VT DEC Stream Alteration General Permit (SAGP) Types

Registration – low risk projects (structure replacement) processed as 'Registrations' then authorization posted on the Environmental Notice Bulletin (ENB), i.e. no public comments

Application - moderate or higher risk projects processed as 'Applications' which include a 14-day public notice and comment period on the ENB of the draft permit authorization

Individual Permit (IP) - 'unique' projects which deviate from SAGP design standards or have post-construction monitoring requirements for water quality, channel evolution, or sediment transport concerns; include a 30-day public notice and comment period on ENB

Water Quality Monitoring and Standard Conditions

Vermont Water Quality Standards

VT DEC Stream Alteration General Permit (SAGP)

B.3.3. Stream Alteration Erosion and Sediment Control Requirements -
All activities authorized under this General Permit shall comply with the following requirements to ensure compliance with the Vermont Water Quality Standards:

B.3.3.5. The method and duration of construction shall be that which presents the least disturbance of stream flow and results in minimal turbidity and minimal discharge of sediment.

B.3.3.6. Work must be isolated from stream flow with appropriate sediment controls to the maximum extent practicable. Pumping from excavation areas shall be discharged to an overland area or off-stream settling basins such that the effluent shall be essentially clarified before reentering the stream flow.

Stream Alteration permitting does NOT require water quality monitoring, other permits do

SAGP Authorization Standard Conditions

B.3.3. Stream Alteration Erosion and authorized under this General Permit sha compliance with the Vermont Water Qua

B.3.3.1. The permittee shall comply construction stormwater p

B.3.3.2. All equipment shall be cle and gear oil leaks.

B.3.3.3. There shall be no discharg watercourse.

B.3.3.4. All areas of streambank di shaped and stabilized with tion of the project. Stream vegetation shall be minimi

B.3.3.5. The method and duration disturbance of stream flow charge of sediment.

B.3.3.6. Work must be isolated from stream flow with appropriate sediment controls to the maximum extent practicable. Pumping from excavation areas shall be discharged to an overland area or off-stream settling basins such that the effluent shall be essentially clarified before reentering the stream flow.

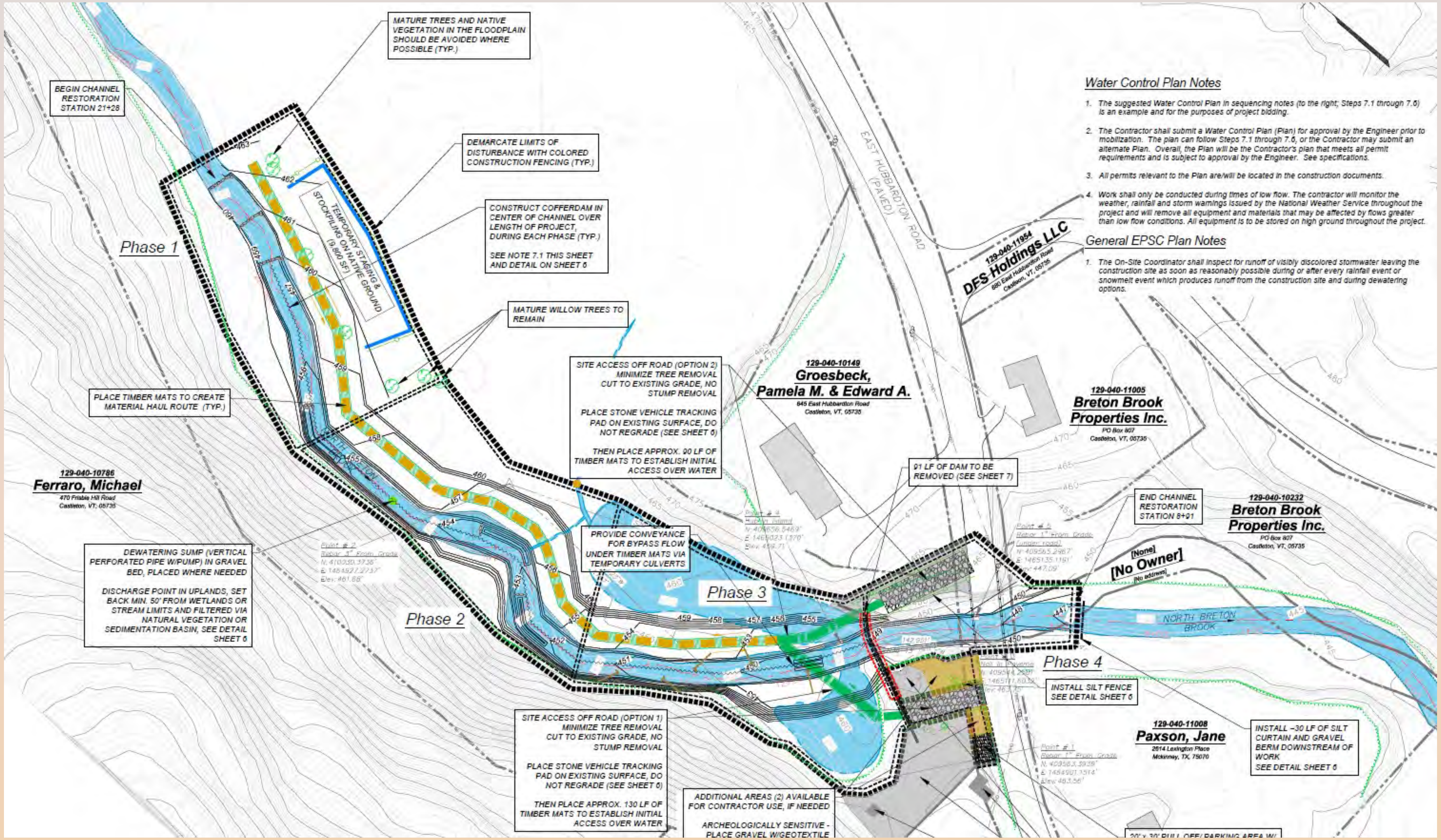
B.3.3.7. If a permittee cannot comply with the foregoing requirements of Section B.3.3. of this General Permit, the permittee must propose alternative methods to avoid discharges of sediment and receive prior approval from the River Management Engineer before proceeding with work.

B.3.3.8. For those activities requiring reporting, governed by section C.2.2., C.2.3. and C.2.4 of this document, permittee must submit a water control plan detailing instream controls to the regional River Management Engineer, no less than 7 days prior to the start of construction and receive approval prior to the start of construction. Changes to an approved water control plan must be notified to the regional River Management Engineer for written approval.

Phasing and Sequencing Plans

Submittals for Dam Removal / Stream Restoration Projects

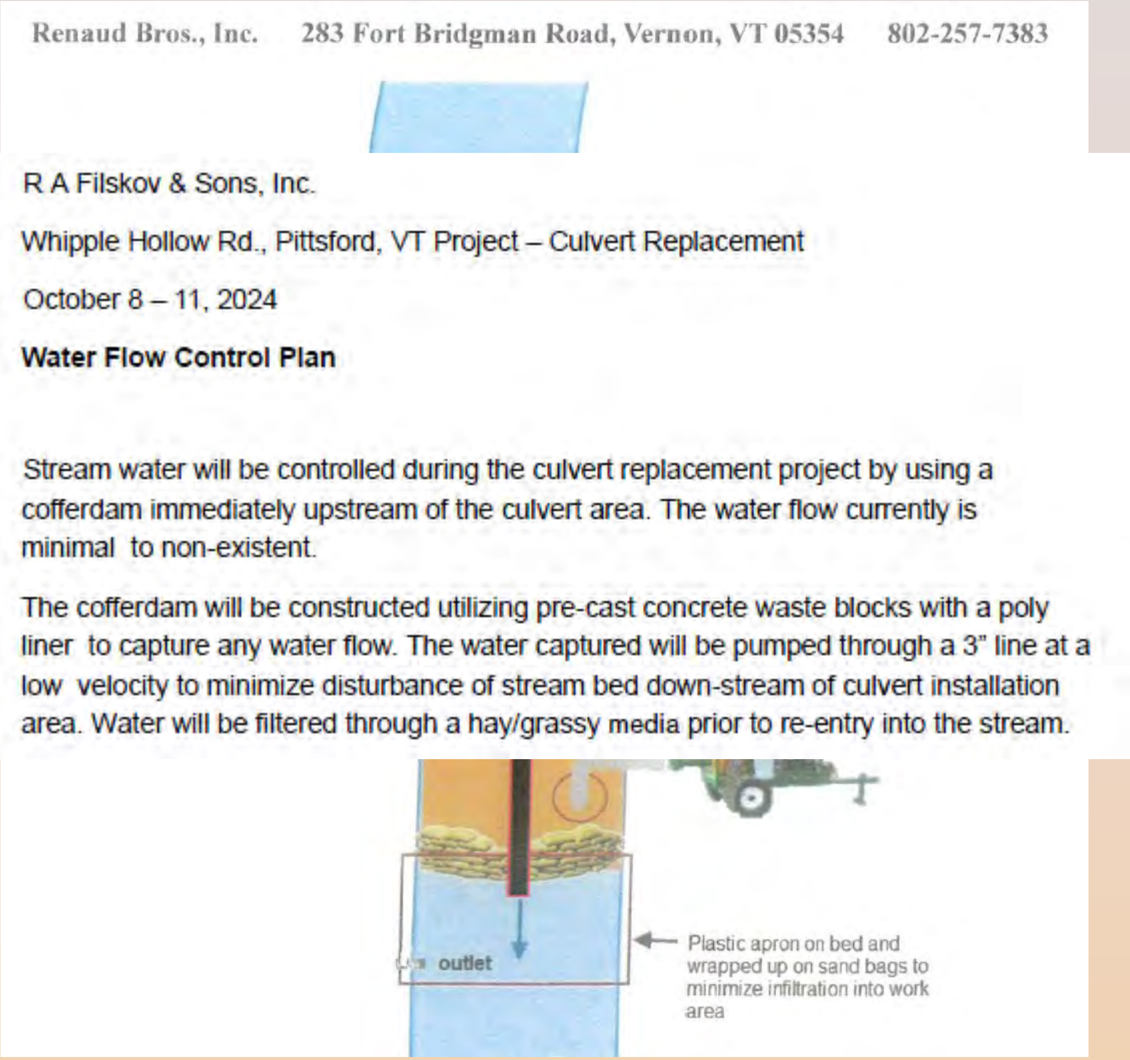
<u>Phasing / Sequencing Plans</u> – Prescriptive vs Descriptive, allow for contractor's input



Dewatering and Flow Control Plans

Submittal of Flow Control and Dewatering Plan

From contractor: illustration/description with sufficient detail to communicate control methods



R A Filskov & Sons, Inc.

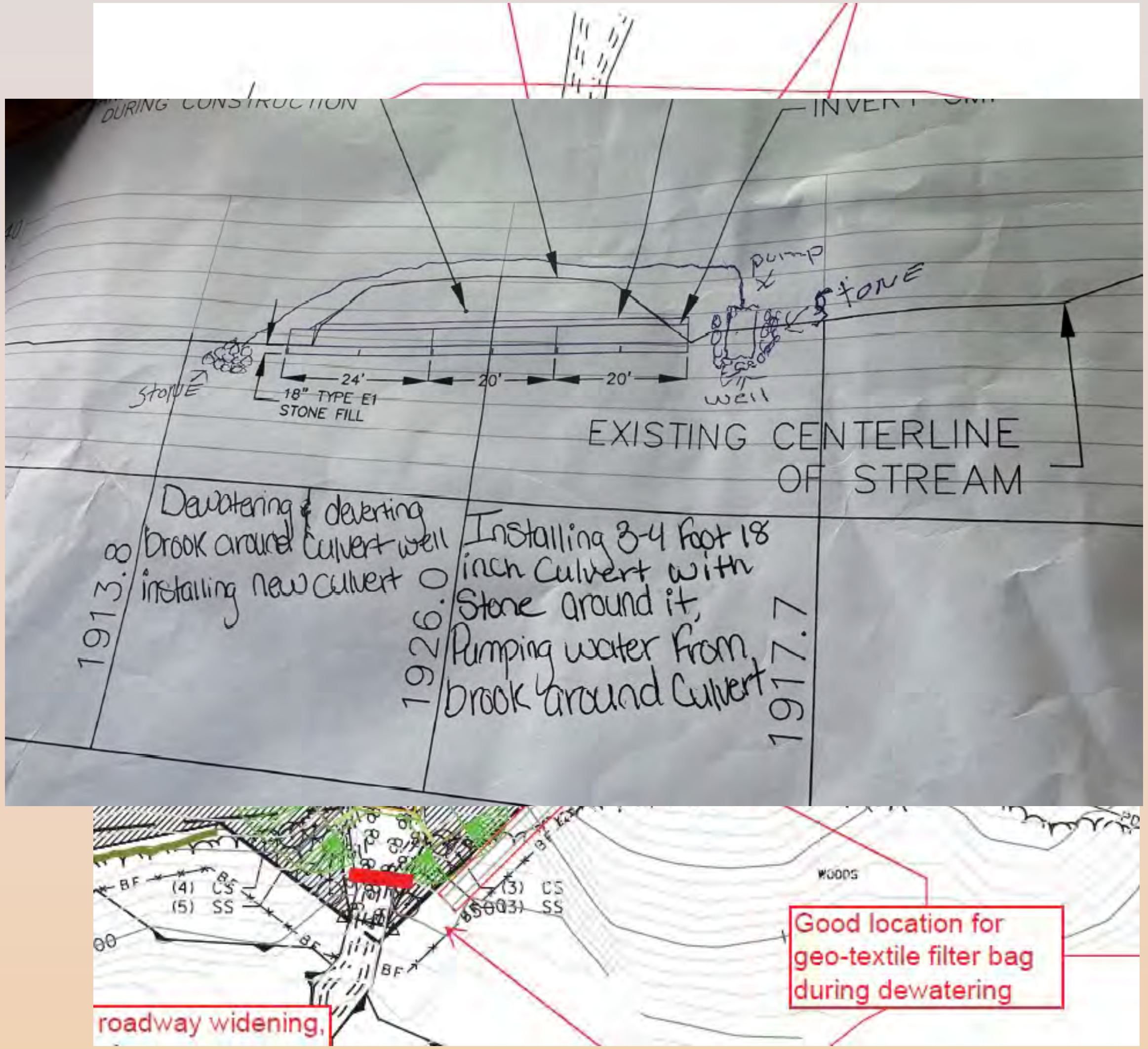
Whipple Hollow Rd., Pittsford, VT Project – Culvert Replacement

October 8 – 11, 2024

Water Flow Control Plan

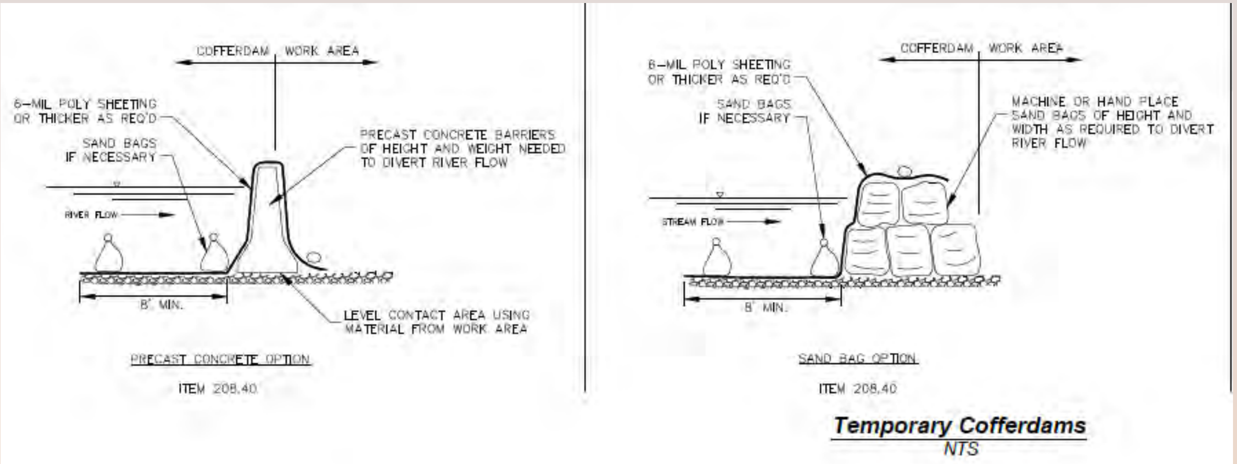
Stream water will be controlled during the culvert replacement project by using a cofferdam immediately upstream of the culvert area. The water flow currently is minimal to non-existent.

The cofferdam will be constructed utilizing pre-cast concrete waste blocks with a poly liner to capture any water flow. The water captured will be pumped through a 3" line at a low velocity to minimize disturbance of stream bed down-stream of culvert installation area. Water will be filtered through a hay/grassy media prior to re-entry into the stream.

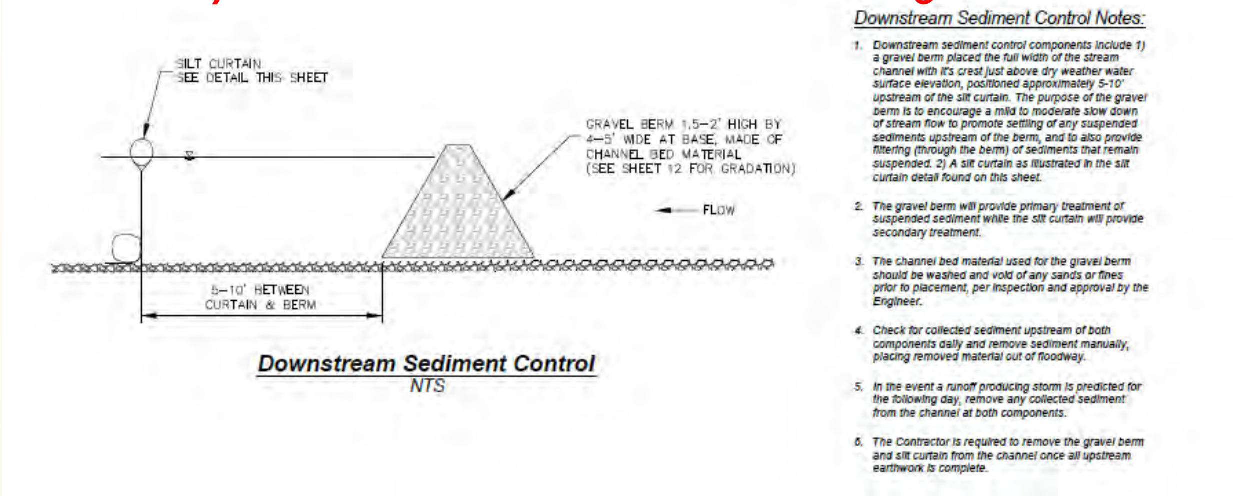


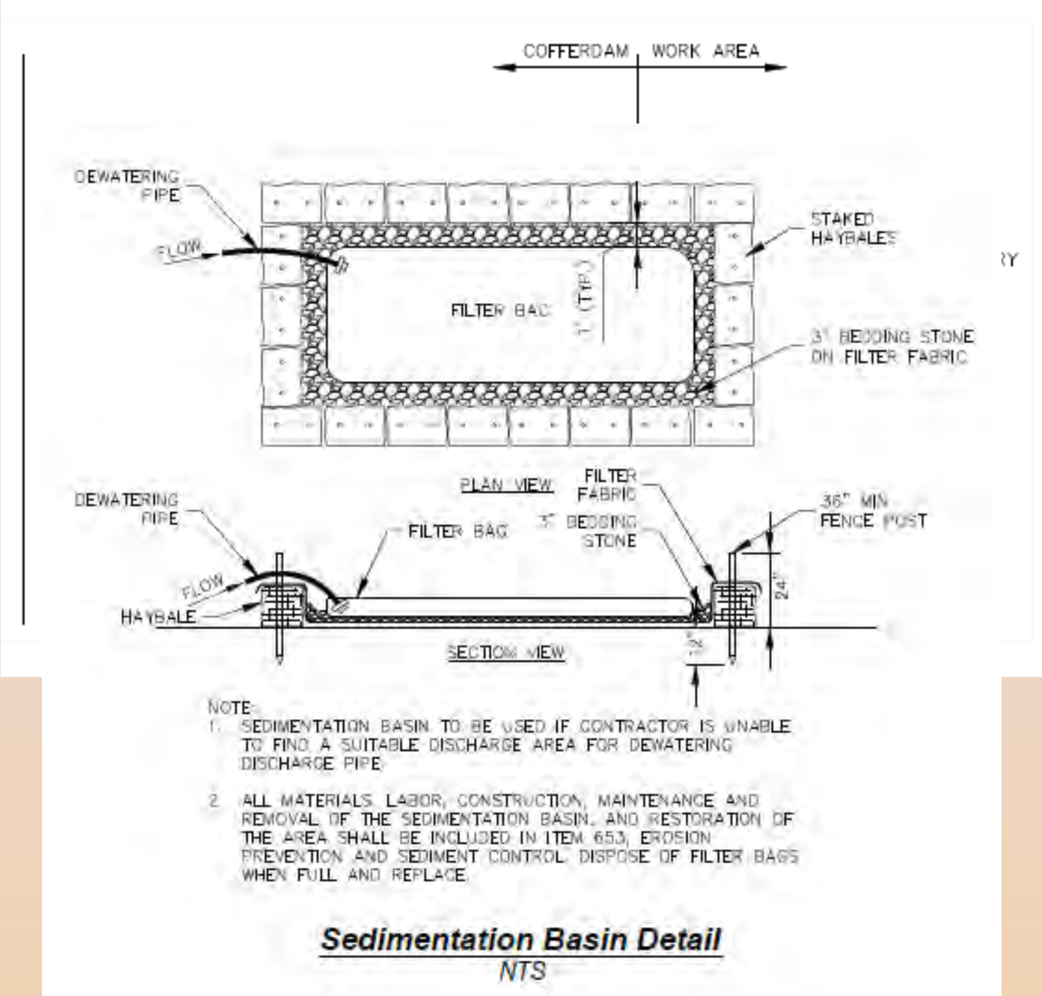
Submittal of Flow Control and Dewatering Plan

On Design Plans by the Engineer: – show standards details for intent of proposed control measures; Flexibility is critical to allow the contractor to adapt to changing site conditions



** Turbidity curtains do not function in flowing water*





Typical Flow Controls and Dewatering Methods

Low point sump with stone for dewatering

Temporary bypass culvert for stream low flows

Cofferdam used to isolate the active work area

Bed Restoration and E-stone

Bed Armoring Layer vs Bed Restoration with E-stone

<u>**Final Stream Channel:**</u>

<u>Ideal</u> – excavate down to bed armoring layer; known depth from soil probing/borings or when the excavator is digging into sediments

<u>Likely</u> – If no armoring layer discovered then ANR E-stone used to create and restore a stable stream channel within the project limits

MOBILE AND STATIC ARMOR IN GRAVEL-BED STREAMS

Whereas sand-bed rivers often show dunes on the surface of their beds, gravel-bed streams often show a surface armor layer. That is, the surface layer is coarser than the substrate. In addition, the surface layer is usually coarser than the mean annual load of transported gravel (e.g. Lisle, 1995).

The surface of even an equilibrium gravel-bed stream must be coarser than the gravel load because larger material is somewhat harder to move than finer material. The river renders itself able to transport the coarse half of its gravel load at the same rate as its finer half by overrepresenting coarse material on its surface, where it is available for transport.

Bed sediment of the River Wharfe, U.K., showing a pronounced surface armor. Photo courtesy D. Powell.

E-Stone Gradation and Specifications

E-stone: a custom mix of salvaged streambed material OR bank run with large quarry stone

Streambed Stone Fill Design Guidance

Type	Q50 Velocity (fps)*	Embeddedness (in)	Sug
E1	V < 9	18	0.0
E2	9 < V < 11	24	0.0
E3	11 < V < 13	36	0.0
E4	13 < V < 15	48	0.0

*Maximum velocity should be based on a minimum 50-yea
flow rate (AEP 2% or Q50) and calculated at the structure o

Item xxx.xxx CY Streambed Stone Fill Specification

Type E1. The longest dimension of the stone shall be at least 18 inches, and at least 50 percent of the volume of the stone in place shall have a least dimension of 12 inches, and at least 25 percent of the particles shall have a maximum dimension of 2 inches and be well graded material.

Type E2. The longest dimension of the stone shall be at least 24 inches, and at least 50 percent of the volume of the stone in place shall have a least dimension of 18 inches, and at least 25 percent of the particles shall have a maximum dimension of 2 inches and be well graded material.

Type E3. The longest dimension of the stone shall be at least 36 inches, and at least 50 percent of the volume of the stone in place shall have a least dimension of 24 inches, and at least 25 percent of the particles shall have a maximum dimension of 2 inches and be well graded material.

at least 48 inches, and at least 50 percent of the
ion of 36 inches, and at least 25 percent of the
s and be well graded material.

Notes

- The streambed stone fill shall be hard, blasted, angular rock other than serpentine rock containing the fibrous variety chrysotile (asbestos). Similar sized river sediment is an acceptable alternative as is a mixture of angular material and river sediment.
- Stone placed inside of a closed structure shall be placed such that the structure is not damaged.
- Care shall be taken to limit segregation of the materials.
- Add sand borrow item as needed to seal the bed and prevent subsurface flow.
- There shall be no subsurface flow upon final inspection.

*** Finer portion of E-stone helps seal the void spaces of the larger stone to keep stream flows on the surface**

E-Stone Placement and Wetting Techniques

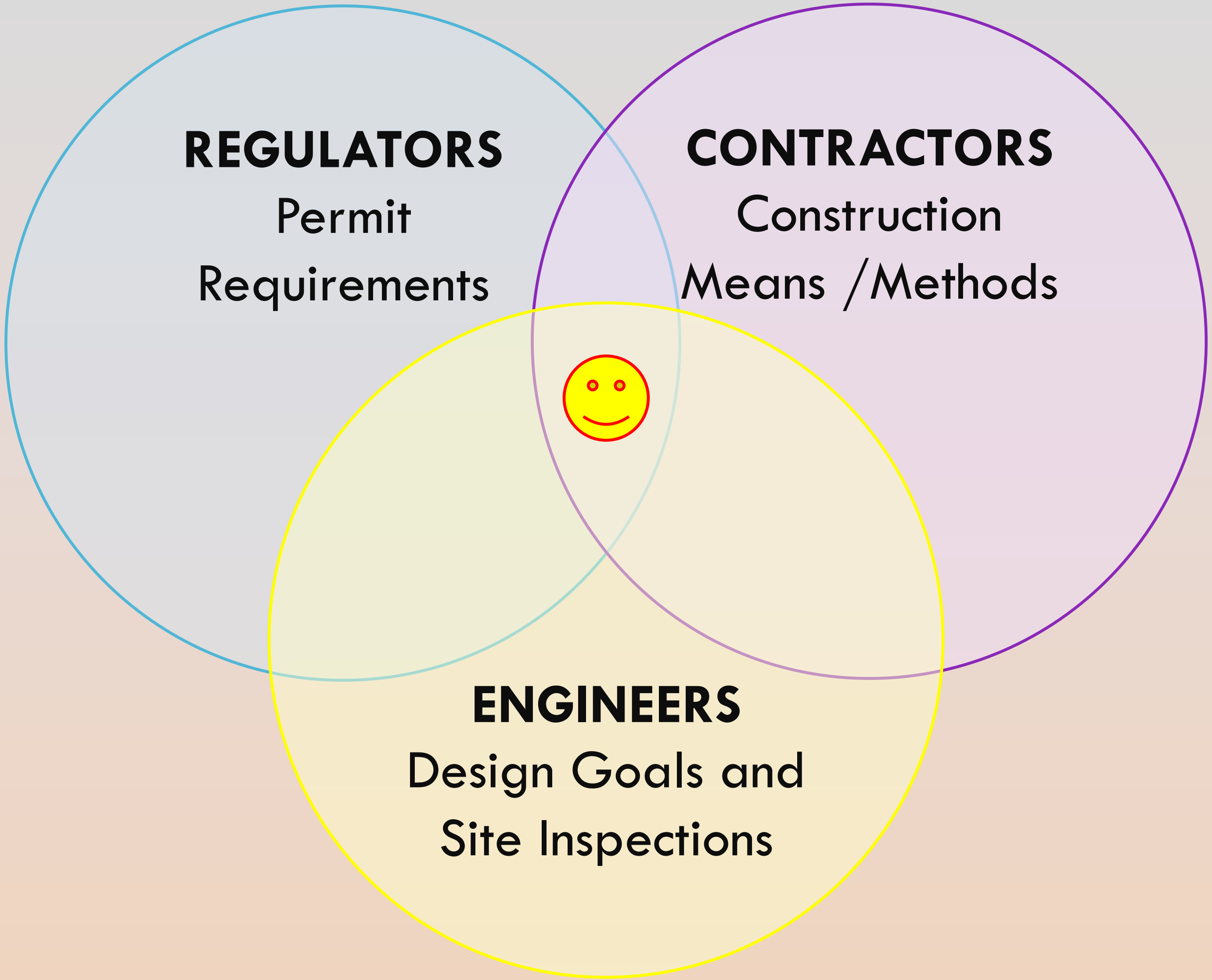
Salvaging the excavated bed material on site

Placement of the mixture larger stone and fines

Wetting the E-stone layer with dewatering pump

Closed structures need ‘level pad’ for placement

Starting Construction on Projects



Communication - Collaboration - Compliance

Starting Construction on Projects

Required under the VT DEC SAGP

Pre-Construction Meeting

Meeting at the site with the RME, contractor, engineer, project sponsors, and landowner(s)

No set schedule based on SAGP requirements (project specific)

Site Inspections by Project Engineer

Important Stages of Construction - installed flow controls, major milestones, bed features

Regular Site Meetings - meet to discuss issues, upcoming work, and proposed changes

Compliance Reports - description of work completed/photos of site, send to regulators!

Punch List - walk through with contractor, review remaining issues needing to be corrected

Closure Inspection - final inspection documenting site conditions of the completed project

As-Built Survey - field survey and cross-section locations, if long term monitoring required

Case Studies

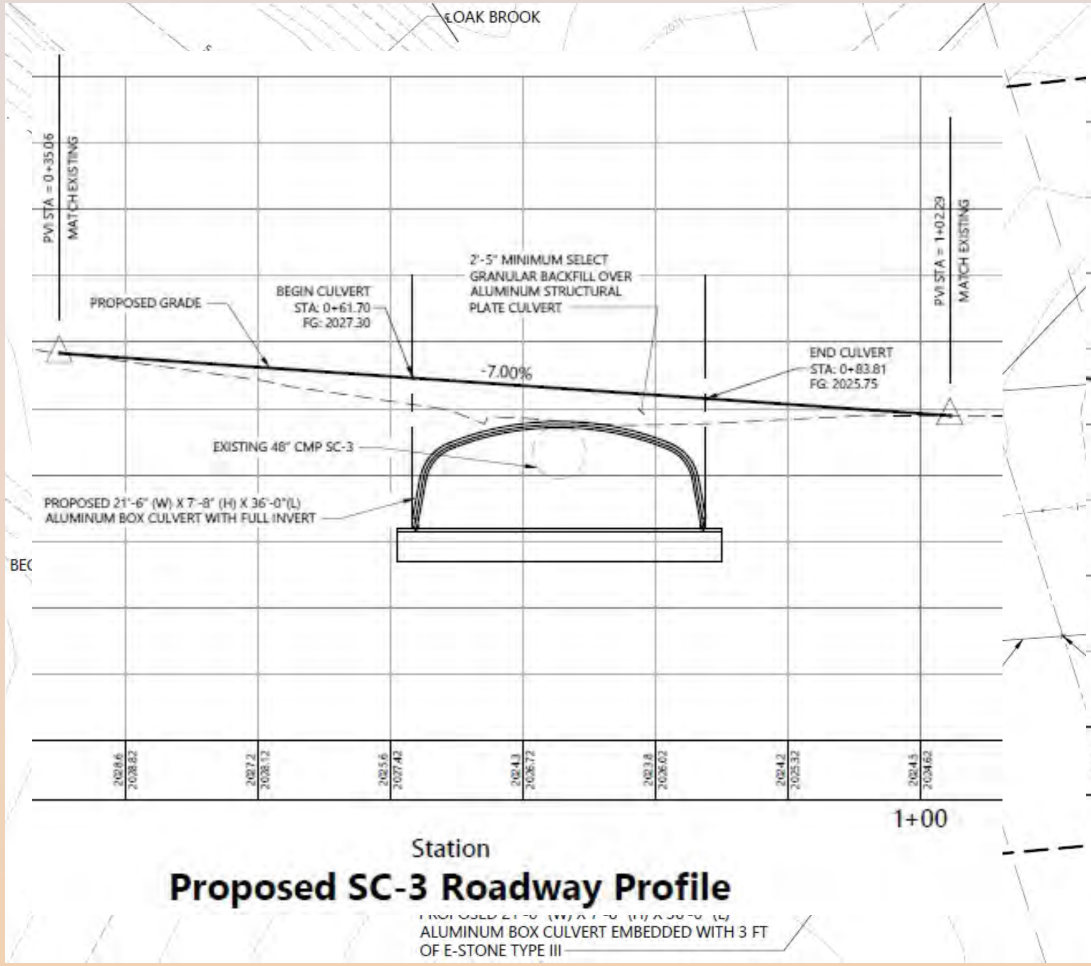
Lessons learned from Crossing Replacement

Case Study – Hermitage Club SC-3, Wilmington

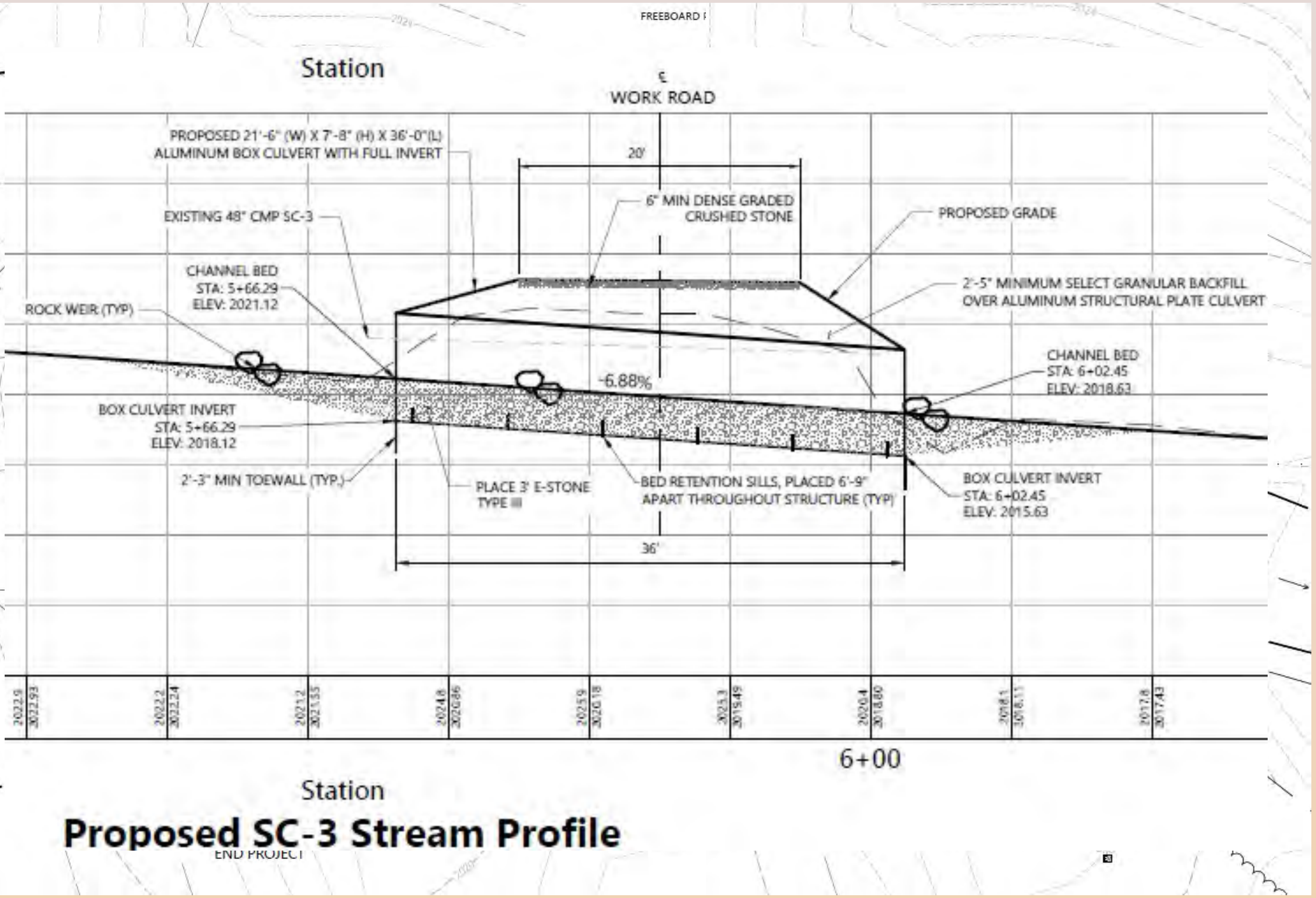
Existing Metal Culvert: 48” diameter with perch at outlet; Wbkf of 15’, Dbkf of 1.2’, Slope of 3.6%

Case Study – Hermitage Club SC-3, Wilmington

New Metal Box Culvert: 21’6” x 7’8” Aluminum Box Culvert (exceeds bankfull dimensions for Q100, Slope = 6.88%, provides AOP with E-2 stone (24” embedment and 24” max); installed embedment of 3’



Proposed SC-3 Roadway Profile



Proposed SC-3 Stream Profile

Case Study – Submitted Flow Control Plan

Contractor developed: Notes sequencing and location of each practices to be installed, temporary pipe sizing, dewatering and sediment filtering methods, timing of removal.

1. Build sandbag berm (approximately 4 feet high), key-in with poly-liner (approximately 50-80 feet upstream from the existing culvert inlet)
2. Excavate a 4 or 5 foot deep trench across the work road, approximately 10-15 feet north of proposed culvert
3. A 36-inch ADS pipe will be placed in trench to gravity bypass Oak Brook
4. Outlet of 36-inch bypass culvert shall be located on stable vegetated or rock surface to prevent stream bank erosion
5. Contractor will have a pump on site for dewatering the work area as ground water seeps in
6. Work area dewatering will be pumped to a filter bag located on a flat, stable, preferably vegetated surface outside of the stream
7. Following project completion, 36-inch bypass culvert will be removed and trench will be backfilled with ¾-inch stone

Case Study – Implementing Dewatering/Flow Controls

1) Clearing trees in limits; accessible staging area

2) Sandbag cofferdam; flows in/out of temp pipe

4) Clean stone and sump with float and generator

3) Upstream sump for expected leaks and seeps

Case Study – Building Structure and Salvaging E-stone

1) Building metal structure within staging area

2) Sediment retention baffles spaced every 8-10 ft

4) Larger boulders below bed in excavation limits

3) Stream bed surface smaller than E-2 stone size

Case Study – Installing E-stone in Structure and Bed

1) Dingo or mini track loader used to load E-stone

2) Excavator dumps E-stone then dingo places it

4) Placement of uniform mixture of stone/fines

3) 'Level pad' installed in infill for ease of access

Case Study – Wetting E-stone then releasing flows

1) Wetting of E-stone layer settles fines into voids

2) OR pool water with cofferdams to soak E-stone

4) Wetted E-stone in structure with surface flows

3) Up and downstream bed restored with E-stone

Case Studies

Lessons learned from Dam Removal Projects

Case Study – Pelletier Dam Removal, Castleton

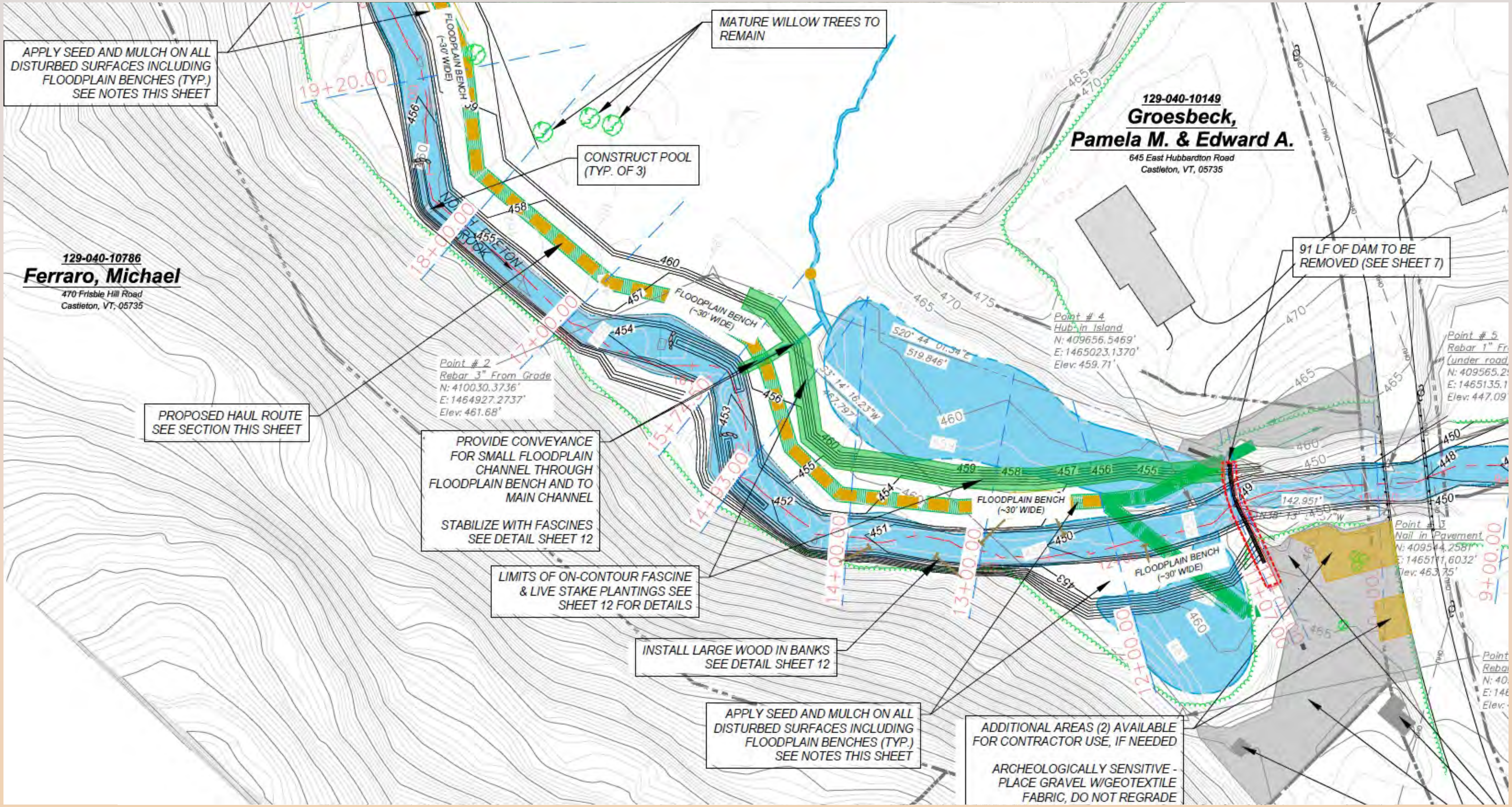
Dam Removal and Stream Restoration: DA = 13.5 sm, Wbkf = 29’, Dbkf = 2.5’, Slope = 0.7%

Owner: VT DFW, Engineer: Stone Environmental Inc., Sponsor: VNRC, Contractor: Belden Construction, LLC

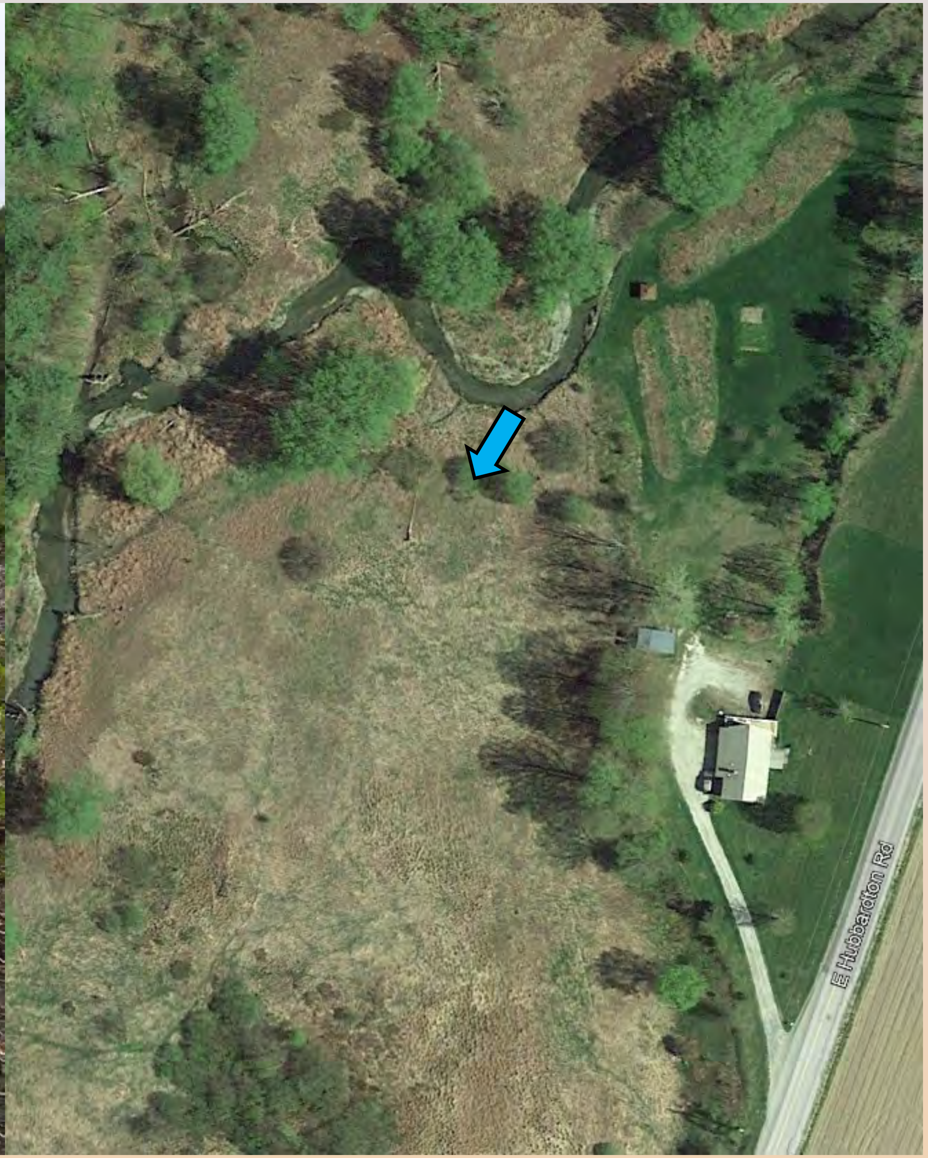
Project Vicinity
Scale: 1" = 4000'

Project Location
Scale: 1" = 400'

Case Study – Existing and Proposed Conditions



Case Study – Design Plans, Bidding, and Beavers

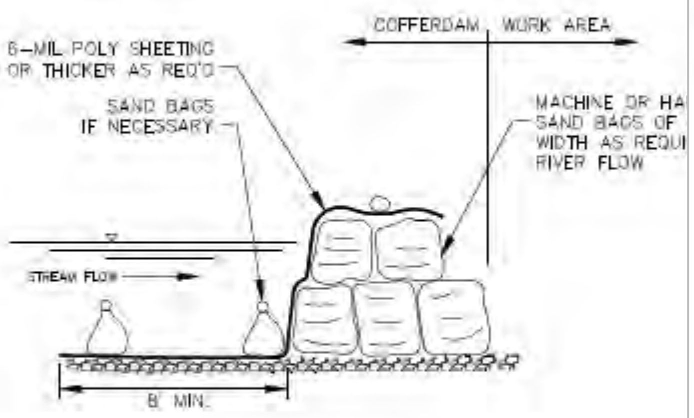


Case Study – Drone Video

Case Study – Phasing/Sequencing/Flow Control Plan

Water Control Plan Notes

1. The suggested Water Control Plan in sequencing notes is an example and for the purposes of project bidding.
2. The Contractor shall submit a Water Control Plan (Plan mobilization. The plan can follow Steps 7.1 through 7.(alternate Plan. Overall, the Plan will be the Contractor requirements and is subject to approval by the Enginee
3. All permits relevant to the Plan are/will be located in th
4. Work shall only be conducted during times of low flow.



SAND BAG OPTION

ITEM 208.40

Temporary Cofferdams

NTS

Belden

Belden Construction LLC 15 Belden Road Rutland, Vermont 05701-3827 ▪ 802 773-9004 ▪ FAX 802 773-1599

Pelletier Dam Removal

At North Breton Brook

7/10/22

Overview: The project involves the removal of the Pelletier dam with sediment excavation and stream reconstruction.

Bypass Plan/Phases

Phase 1:

- First step of the project will be to construct a sediment bern downstream of the river. This will minimize the impacts of the dam removal as it is done in sections.
- At roughly station 25+00 there is a beaver dam located at the bend in the brook. With the permission of River Management and Fish and Wildlife, the plan is to remove the beaver dam and allow the stream to flow into the wetland. We will place sandbags by hand as well to get the river flowing into the wetland area. Water flowing into the wetland area will then work its way towards the dam through the bypass channel and eventually back into Breton brook while bypassing our work area.
- In addition to the beaver dam removal, we will construct a berm with stream bed material at roughly station 21+25, the end of our work area. This will further deter water from entering the work zone. Using a 3" pump we will pump any additional water and discharge the clean water into the wetland area, therefore also bypassing the work zone.
- For the stream channel excavation, we will place a 60" diameter HDPE culvert for haul road access road. This culvert will be +-4' above the stream level. We will begin stream channel excavation just above this culvert and work our way upstream. This will create a "ponding" effect that will also act as a settling area for a discolored water before it is discharged back into the brook. We will continue to excavate the stream channel while also excavating any floodplain benches on the west side.
- The next phase is to install the stone steps and pools as detailed in the contract plan drawings.
- Once they are completed, we will lower the 60" culvert down to the stream level and let the stream run as normal. There will be minor disruptions of discolored water during the switchover.

tion and Wetland Restoration Sequence:

nstruction sequence is for demolition of the dam and restoration of the nks and floodplains. This sequence assumes that the dam will be by restoration of the channel and floodplains, working from upstream to Contractor backs out of the site. Alternate construction sequences Contractor may be submitted for consideration by the Engineer.

be installed per this sheet for Principal Earthwork Activities include the .1). Contractor to also continue to maintain controls installed per the -Construction activities, including the silt curtain, timber mats and silt

quires that the following steps be taken in order to minimize the erosion diment within the limits of work during construction. These measures are site.

vork Activities]

rior to any earth moving activity that will y, install silt curtain and gravel berm in channel of construction entrance and at staging area

site access point, establishing stable access to needed to meet the requirements of the oleted.

ute (see note this sheet regarding avoidance ation).

a (adjacent to approx. stream station 20+00)

Earthwork Activities]

as needed and breach dam to elevation that long river left and river right of dam.

ow) to both ponded wetlands immediately once te quick stabilization of fine sediments.

ERM USING RIVER BED OF HEIGHT AND WIDTH ED TO DIVERT W

AL INCLUDES FINES, MAY NOT BE NECESSARY

NTRACTOR MAY OPOSE OTHER METHODS MATERIALS FOR FFERDAMS

FFERDAMS MUST BE SIGNED TO RESIST THE YR STORM EVENT

Case Study – Plan Implementation and Modification

Case Study – Dam Lowering and Haul Road

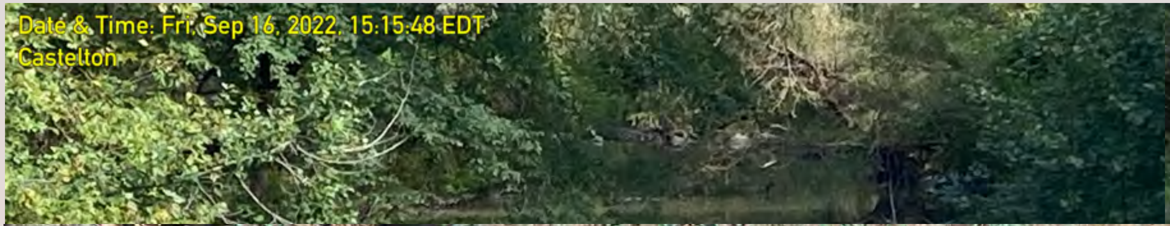
Case Study – Channel Excavation from Haul Road

Case Study – Flood Bench and Bed Roughness

Case Study – Haul Road Removal and Stabilization

Case Study – Dropping Water Level at Lower End

Case Study – Site Inspections and Soil Stabilization

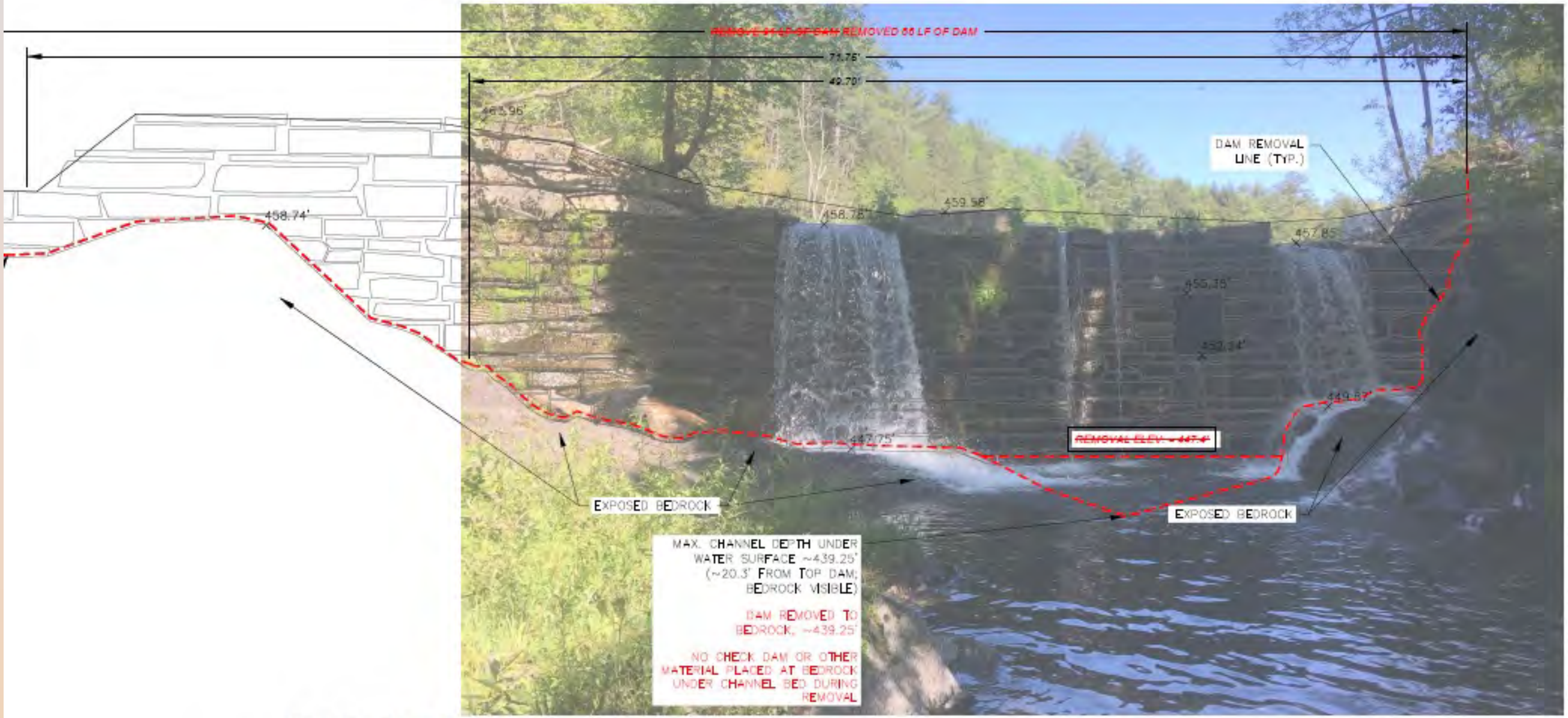


Case Study – Removal of Remaining Dam and Culvert

Case Study – Rainfall Event equals Flood Evaluation

Case Study – Project Completion and Continued Rains

Case Study – As-Builts and Monitoring



Existing Dam Profile - Looking Upstream

Horizontal Scale: 1" = 4'

FOR PERMITTING PURPOSES ONLY
NOT FOR CONSTRUCTION

Case Study – Site Conditions the Following Year

Case Study – Site Conditions the Following Year

Case Study – Site Conditions the Following Year

Case Study – History of Ortho Photos

Case Studies

Wainwright Mill Dam Removal, Salisbury