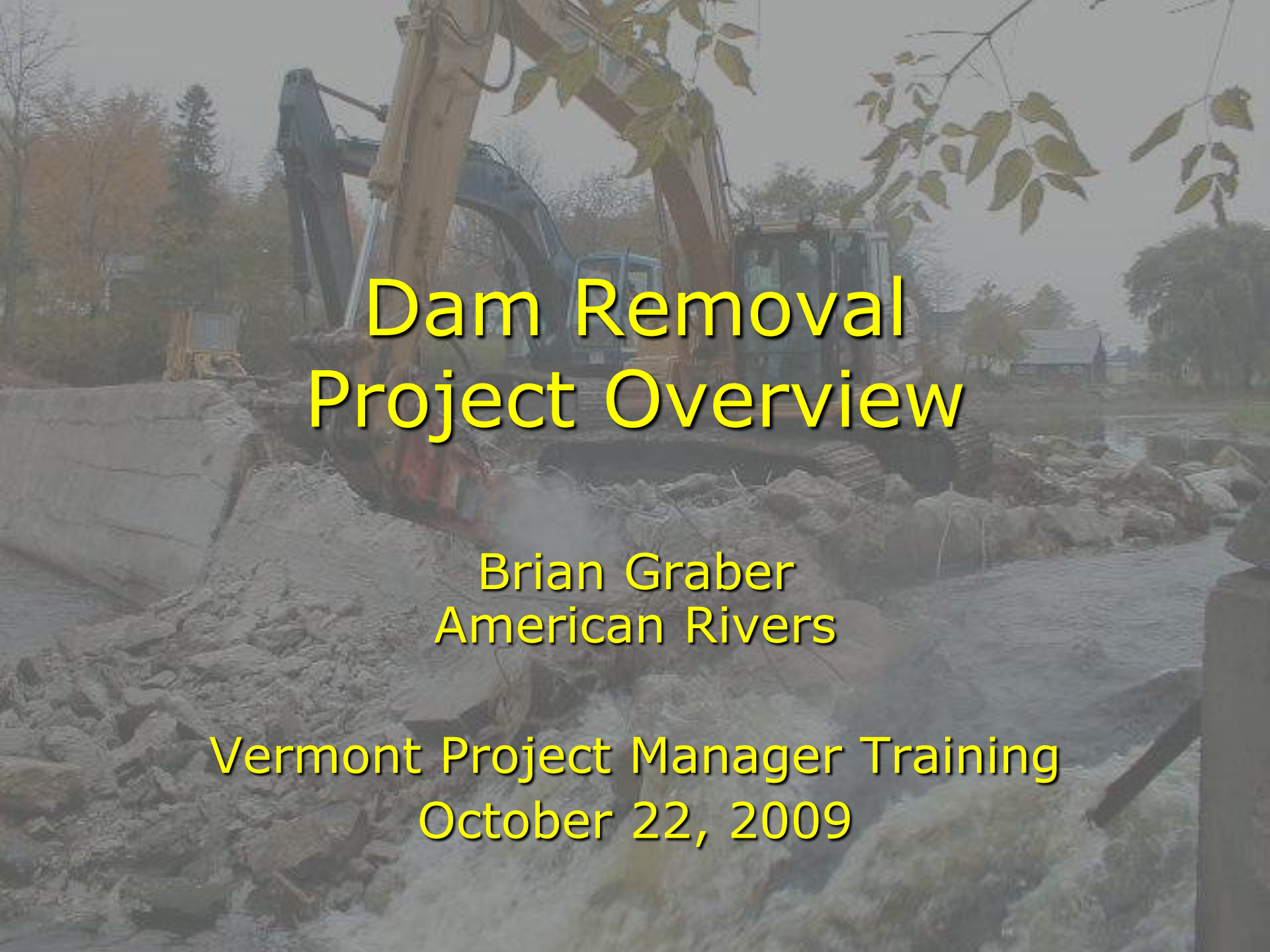


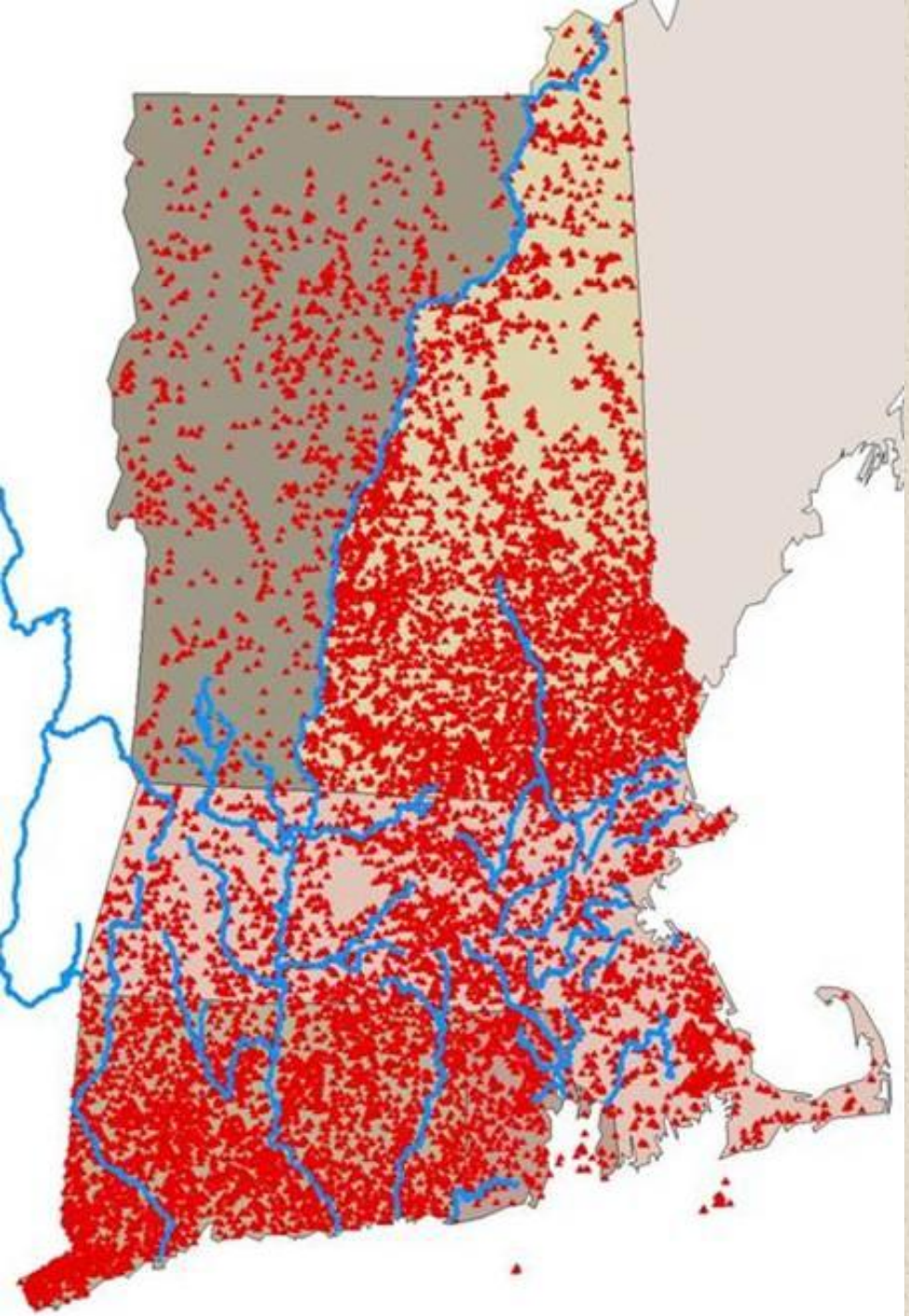
Dam Removal Project Overview

Brian Graber
American Rivers

Vermont Project Manager Training
October 22, 2009

American Rivers
Thriving By Nature

More than 740 dams have been removed around the country



More than 13,126 dams in CT, RI, MA, VT, NH (databases)

Goals:

1) Understand the dam removal process

2) Be able to scope out the components of a project

Understand the overall dam removal process and components

Dam Components

Determine the challenges specific to your project

- Sediment quantity
- Sediment quality
- Dam size
- Dam condition

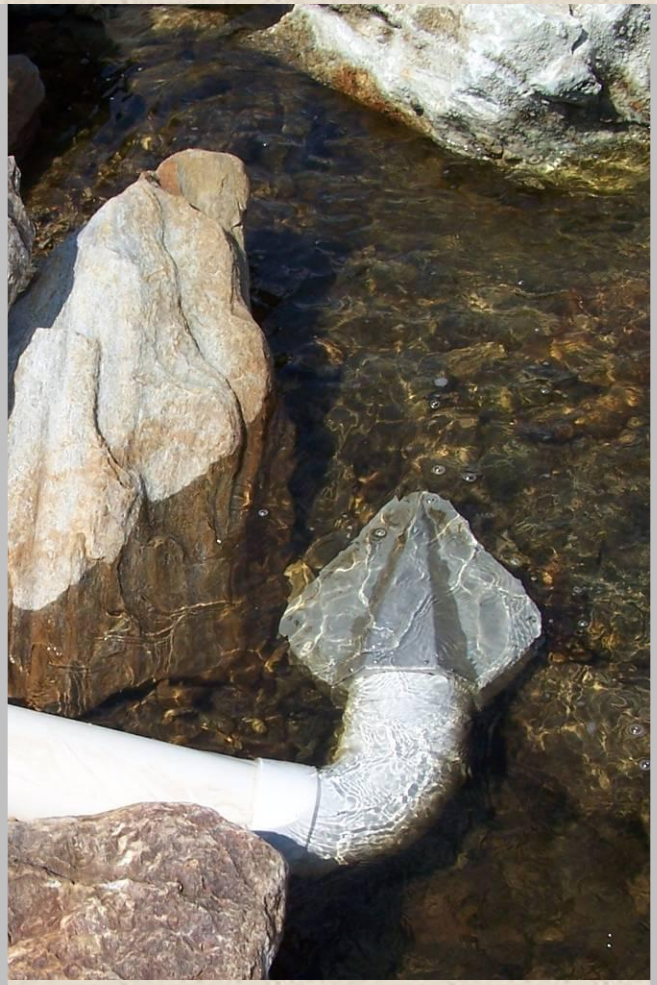
- Impoundment size
- Impoundment shape
- Surrounding infrastructure
- Surrounding environment

The depth of analysis should reflect the scale of the project: make easy projects easy and complex projects complex

Step 1: The dam owner must be on board with the project

Several factors separate easy projects from difficult projects

Land ownership



Current dam uses

Public interest

Several factors separate easy projects from difficult projects

Contaminants

T & E species

Infrastructure

Overall Process: Initial Reconnaissance

Funding hooks

Diadromous Fish

Brook Trout

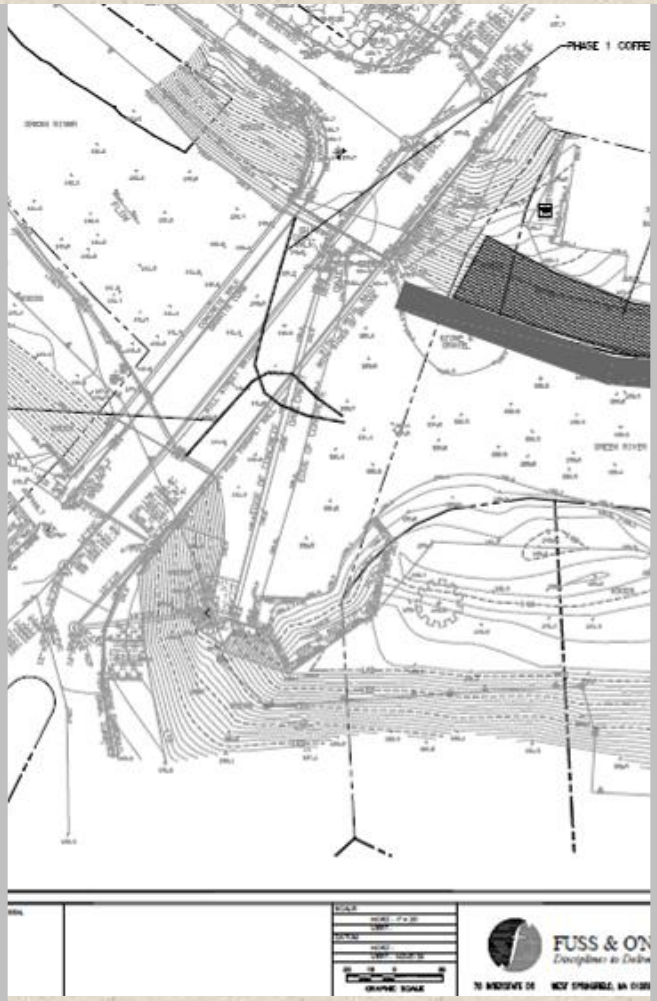
Listed Species

Overall Process: Initial Reconnaissance

The project manager’s role is to coordinate

Expect that projects will take 3 years to complete

Year 1: Recon. and Prelim. Design



Year 2: Design and Permitting

Year 3: Implementation

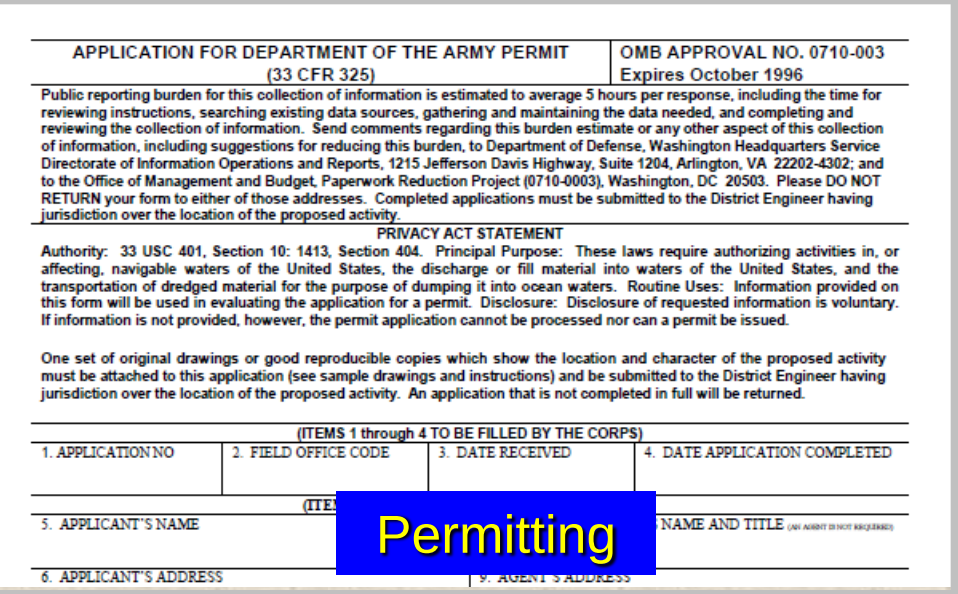
Overall Process: Project Manager Role

Dam removal projects have several steps

1. Initial Reconnaissance
2. Fundraising
3. Preliminary/Concept Design
4. Community/Stakeholder Involvement
5. Permitting (and pre-permitting)
6. Engineering and Restoration Design
7. Construction
8. Monitoring

Who does the work?

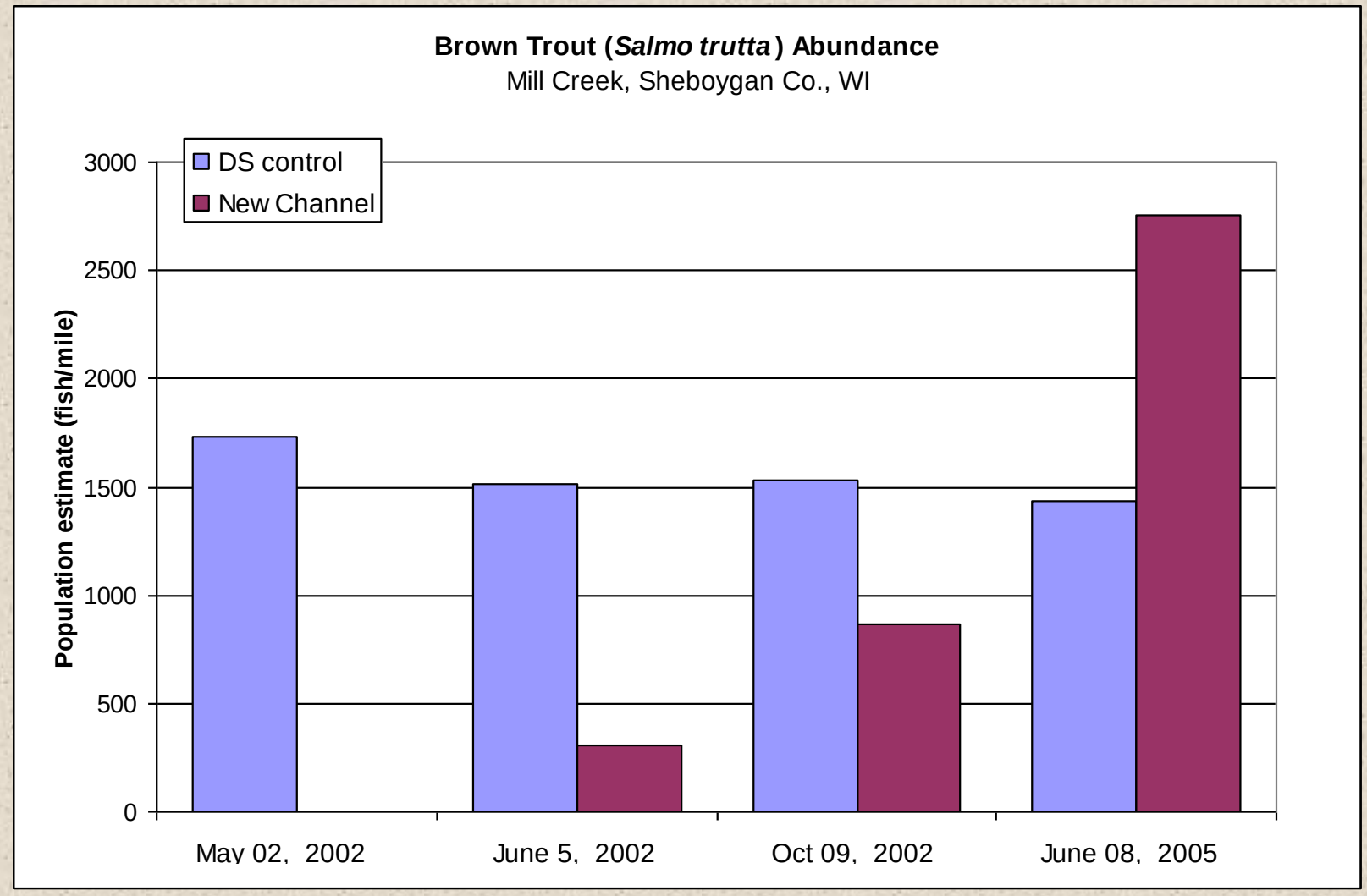
The basic steps cover 4 major topics



Overall Process: Project Manager Role

Consider long-term benefits vs. short-term impacts

Removing the structure alone will provide most of the restoration



Overall Process: Long-Term Benefits/Short-Term Impacts

Some *short-term* impacts occur during construction

Sediment movement

Construction access

Habitat change

Overall Process: Long-Term Benefits/Short-Term Impacts

There are 3 potential long-term impacts if not managed well

Contaminants

T & E species

Infrastructure

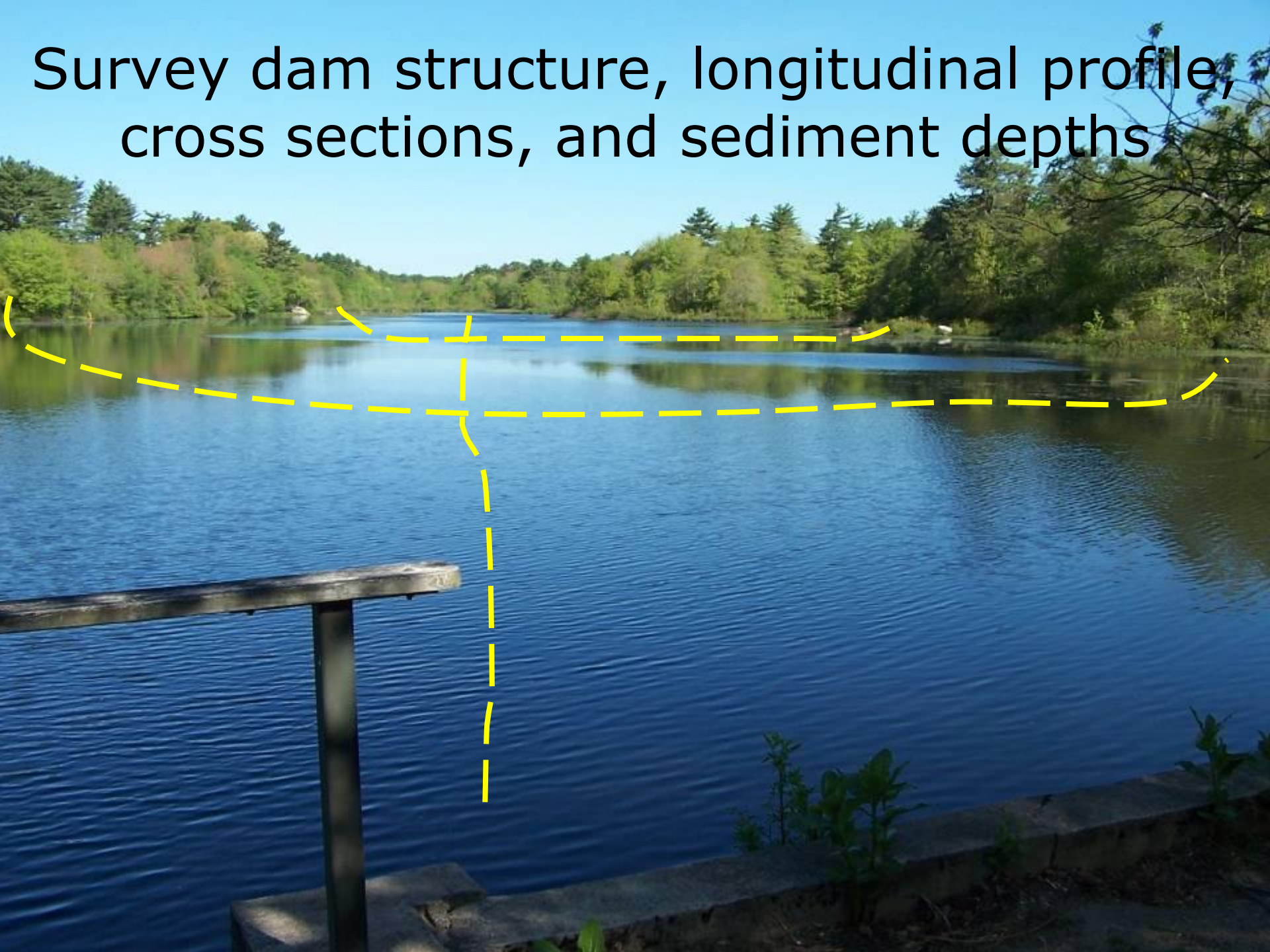
Overall Process: Long-Term Benefits/Short-Term Impacts

Understand the components of designing a dam removal

Data Collection and Surveying

Find existing data on the dam and the river

- Past Dam Inspections (state dam safety)
- FEMA - FIS, profiles, plans, and computer model (state, town library or engineer), or
  http://www.msc.fema.gov
- Aerial or orthophotographs (web or order)
  http://maps.google.com
  http://earth.google.com
- USGS topographic mapping
- Local topographic mapping (town, state, web)
- Sanborn mapping (commercial properties to 1867):
  http://www.edrnet.com/sanborn.htm
- Historic topo maps: http://historical.maptech.com
  For northeast:
  http://docs.unh.edu/nhtopos/nhtopos.htm
- Tax Assessors Mapping (town)
- Geological mapping
- GIS Data (town, region, or state)
- State Rare & Endangered Species Mapping
- Wetland Mapping
- EPA Watershed Mapping & Info
  http://www.epa.gov/surf/
- USGS Gauge Data (flow & sediment)
  http://water.usgs.gov/
- Additional Flow Data (state, web, ACOE, local group, old reports)
- Fisheries Data (state)
- Past Plans (of dam, site, or nearby construction) (DOT, town engineer, state)
- Permit applications (town, state, feds, or web)
- Old Reports (environmental, historic, engineering, planning, state studies, etc.)
- Photographs (current and historic) (town, neighbors)
- Historic Records (town, state)
- FERC Reports: http://elibrary.ferc.gov
- Utility Information (town or state)
- Web pages for local recreation


Survey dam structure, longitudinal profile,
cross sections, and sediment depths

Survey long profile through impoundment; survey cross sections to capture change

Hydrology/Hydraulics

What's the difference between hydrology and hydraulics?

Hydrology:

Magnitudes and probabilities of flows

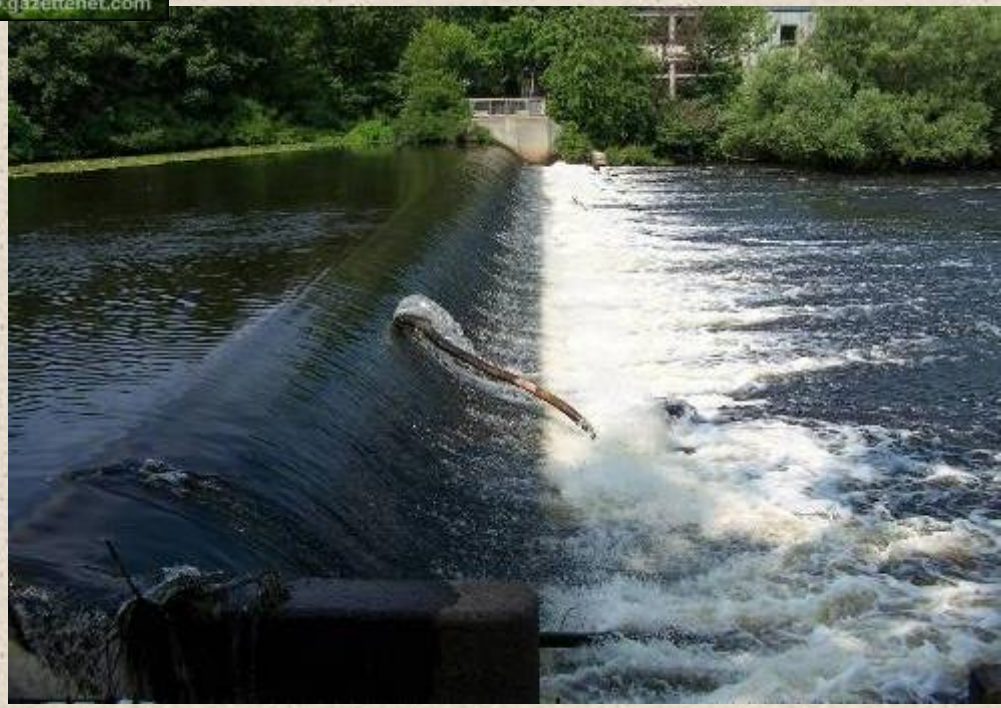
Hydraulics:

Depths and velocities of flows

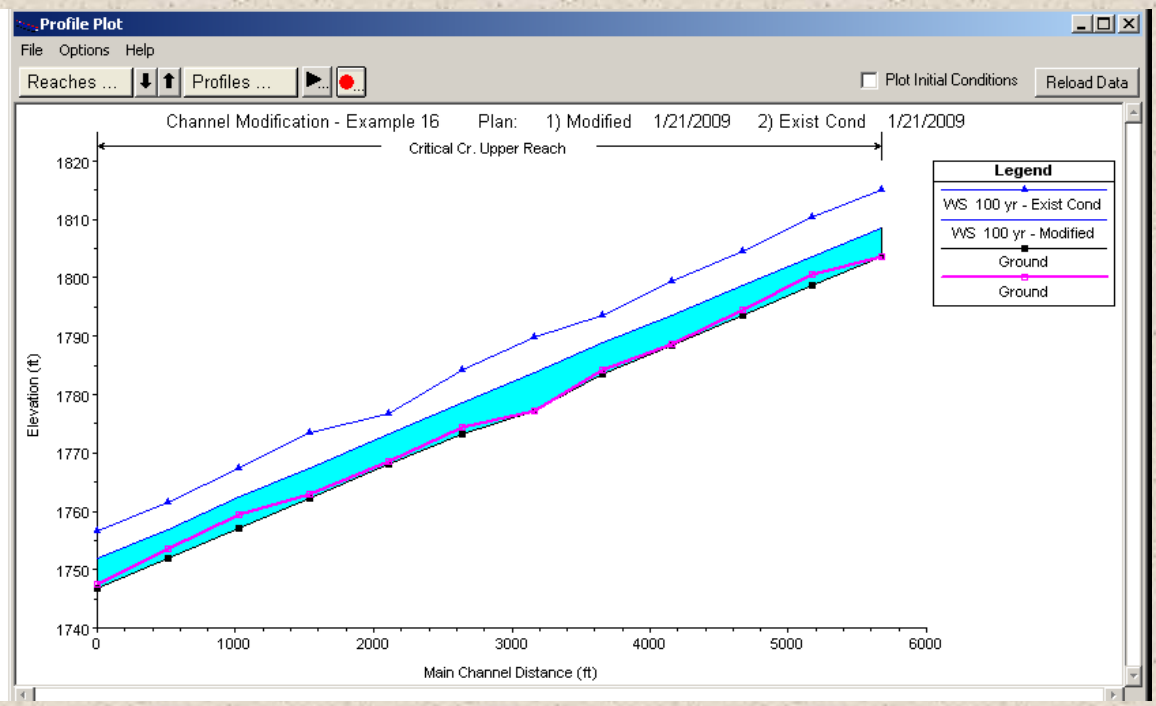
Does your dam provide flood control? Probably not

No Flood Storage Potential: has full impoundment and constant flow over spillway

Flood Storage Potential: has storage volume and flow through a controlled outlet



What's a HEC-RAS and when do you need one?



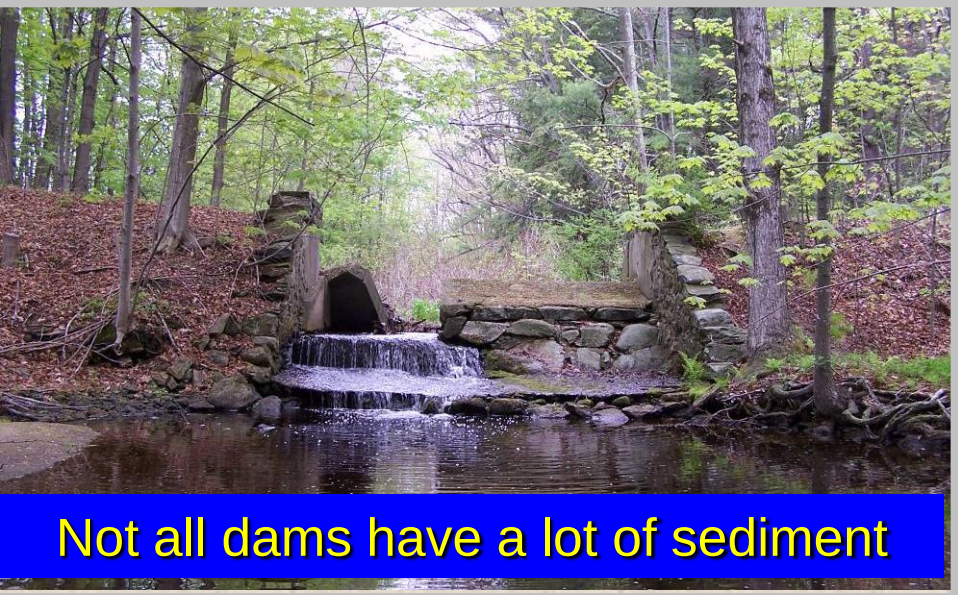
- Infrastructure protection
- To prove fish passage
- Post-project water levels for stakeholders
- Advanced sediment transport modeling
- To prove no flood control?

Sediment Management

Some general sediment thoughts

Consider background yield

Sediment can be beneficial or harmful

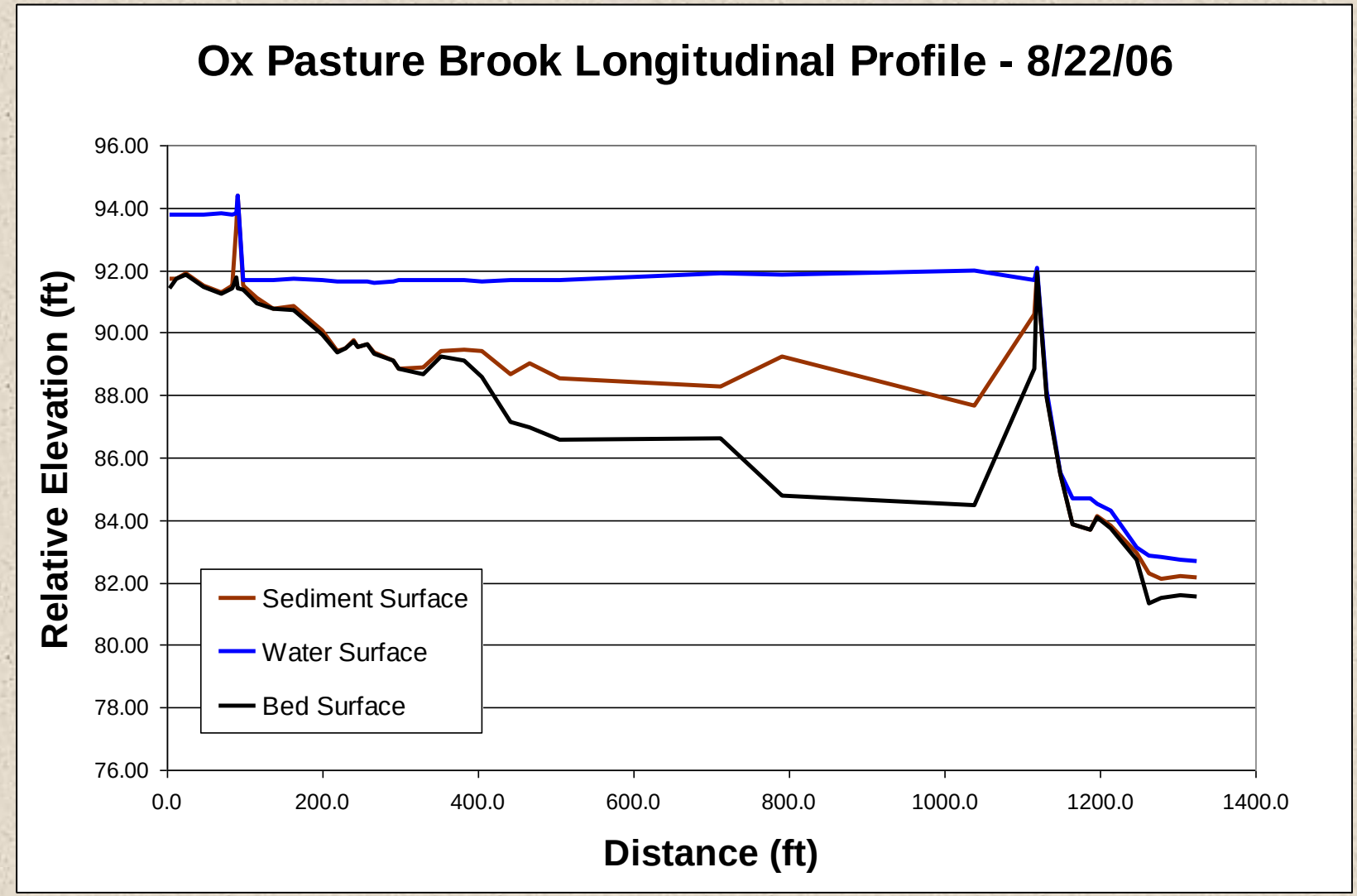


Not all dams have a lot of sediment

Not all sediment moves

Assess the quantity, particle sizes, quality, and potential mobility of impounded sediment

The longitudinal profile is a fundamental sediment analysis tool



Test sediment for contaminants and compare to ecological and human risk thresholds

- Complete ‘due diligence’
- Assess quantity of sediment
- Collect sediment cores (not grabs)
- Test for organics and heavy metals
- Compare test concentrations to human risk and ecological thresholds

There are several approaches to managing clean sediment (depending on quantity and particle sizes)

- Natural erosion
- Sediment removal (dredging)
- Stabilize in place
  - Open dam gates
  - Remove dam slowly
  - Remove dam in stages
- Combined approaches

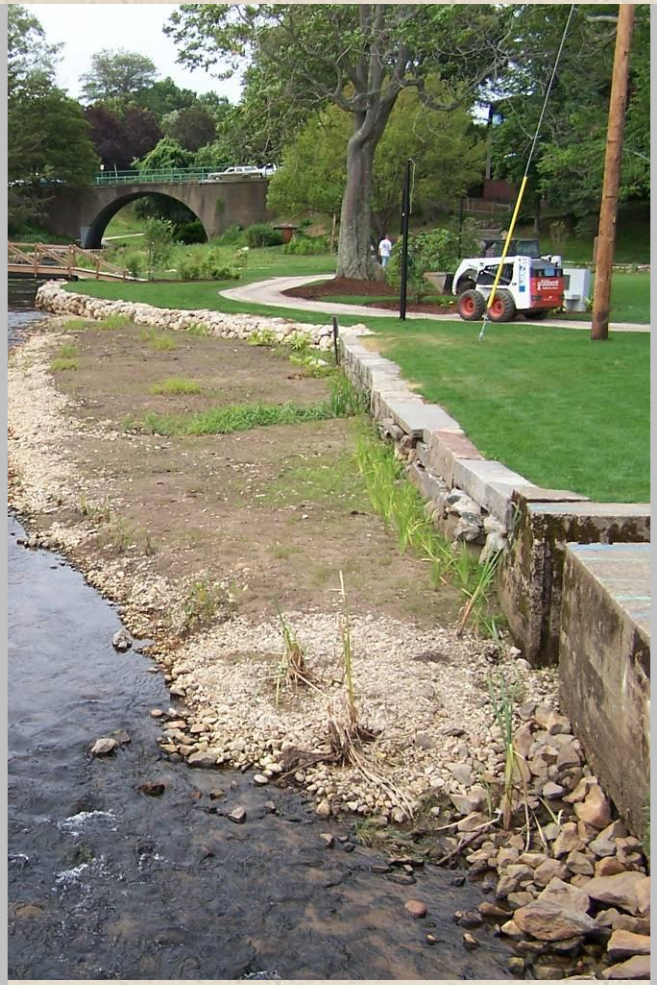
There are fewer approaches to managing contaminated sediment

- Management options
  - Remove and dispose
  - Isolate and cap
- If contaminant management is necessary, can greatly add to cost of project
- Conundrum: dams are not good hazardous waste containment facilities

Protecting Infrastructure

Consider whether any infrastructure is at risk

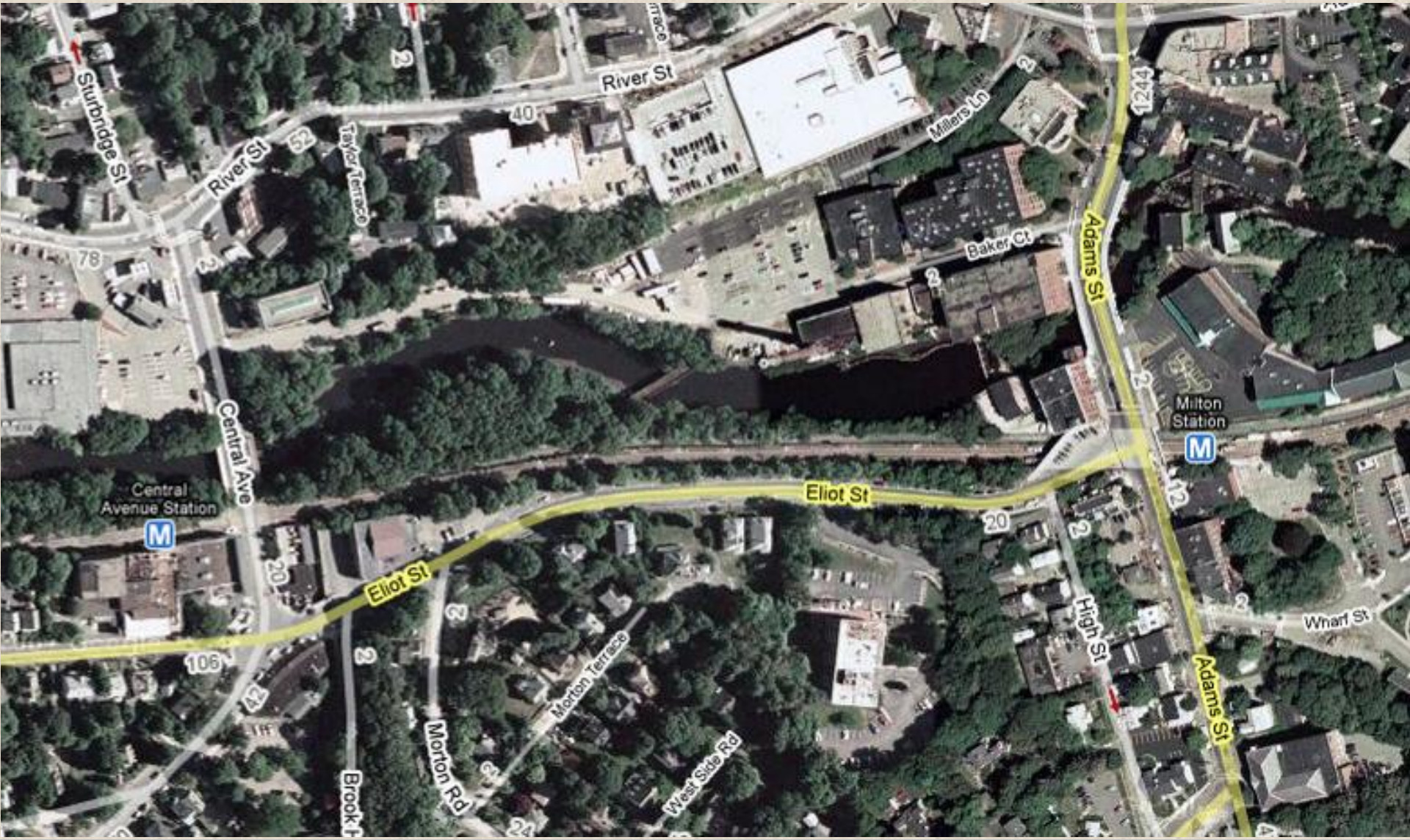
Bridges



Retaining walls

Utilities

Look in and along impoundment and in the dam for at-risk bridges, retaining walls, or utilities



Management approaches: always consider if infrastructure can be moved first; next consider direct stabilization

Bridges

Retaining walls

Utilities

Species Protection and Additional Restoration (beyond structure removal)

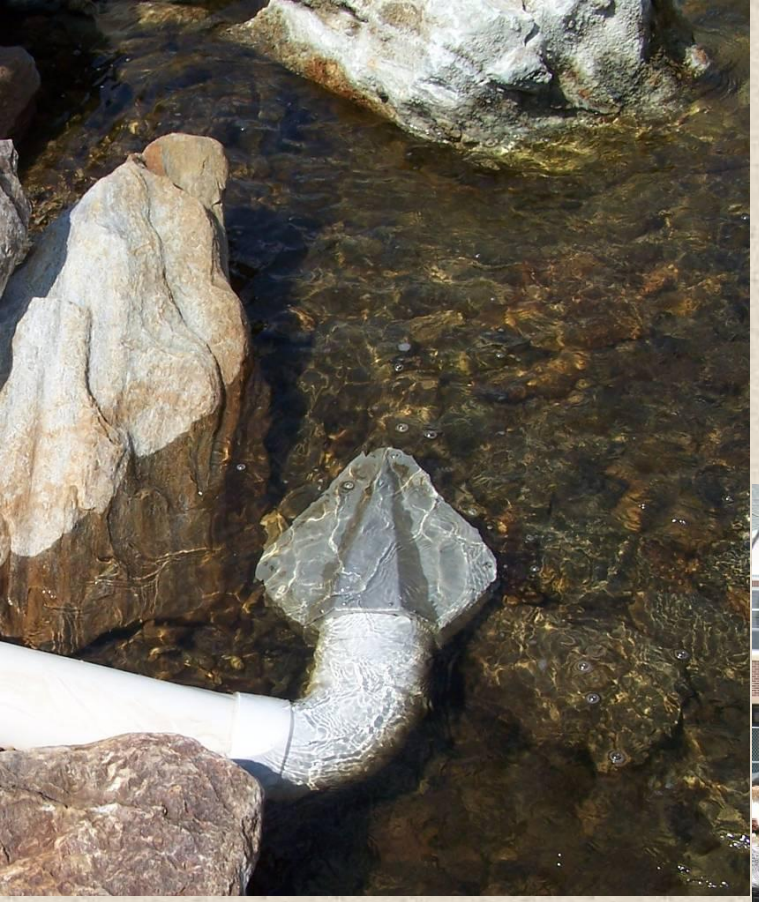
Identify if species of concern could be affected by dam removal

- Contact the Nongame and Natural Heritage Program
- Maps are available at: (http://maps.vermont.gov/imf/sites/anr_natresviewer/jsp/launch.jsp)

Manage for Aquatic Species

Revegetate and consider multiple species and multiple life stages in additional restoration plans

Site-Specific Issues

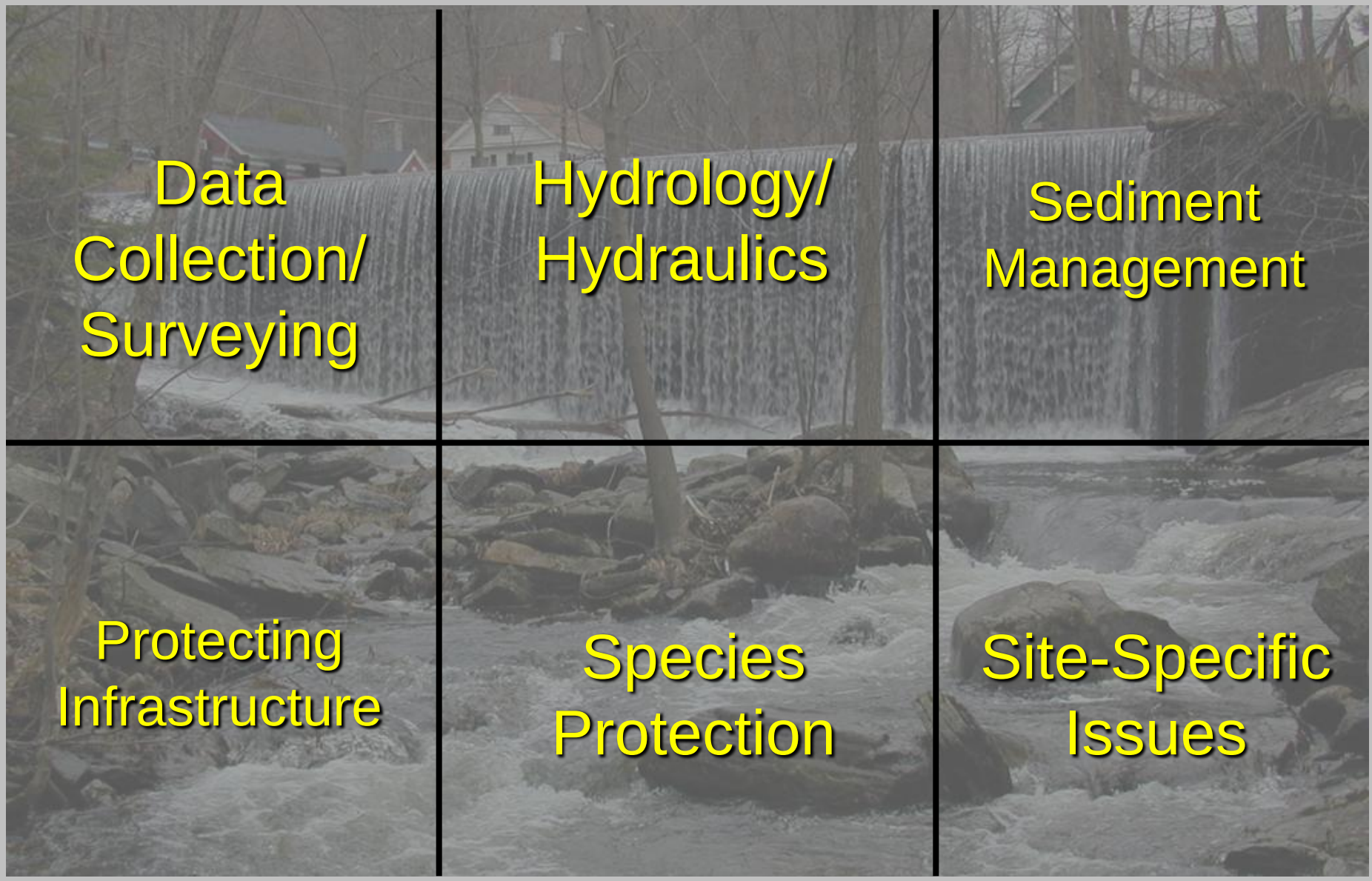


Dam uses can often be replaced

Other site-specific issues:

well impacts, ice jams, parks, walking trails, renderings, etc.

You now have the basis for writing a scope of work



Understand the components of (de)construction

First, slowly drain the impoundment

There are several approaches to removing a structure

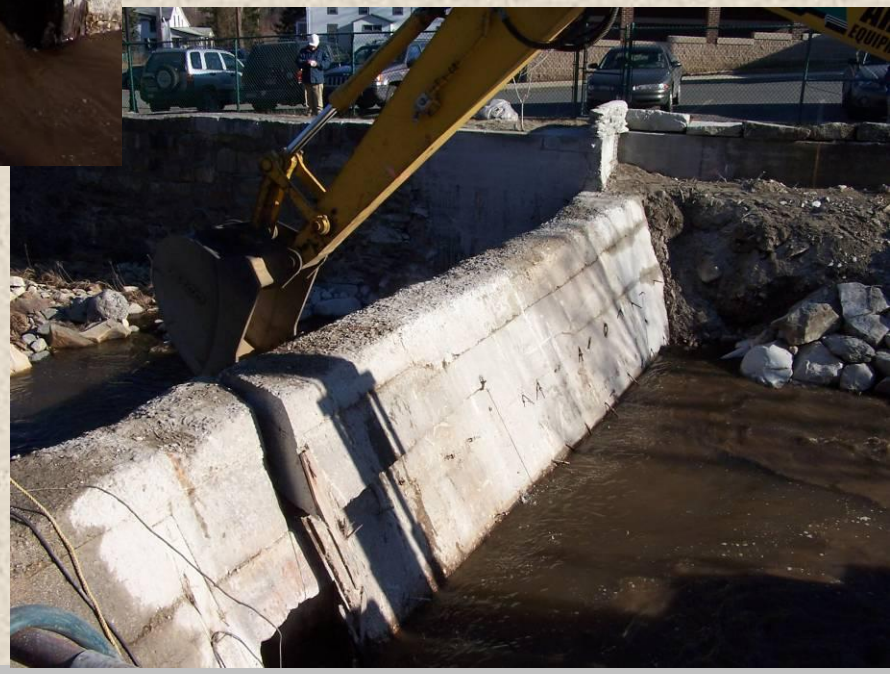
Explosives

Heavy Machinery

By Hand

We almost never use explosives in the northeast

Most commonly a backhoe with a hydraulic hammer will breach one side and then move across



We have also used more careful construction approaches

Dam Removal Clearinghouse:
http://www.lib.berkeley.edu/WRCA/damremoval/index.html

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American Rivers
Thriving By Nature

Initial Reconnaissance:

Is My Project Easy or Complex?

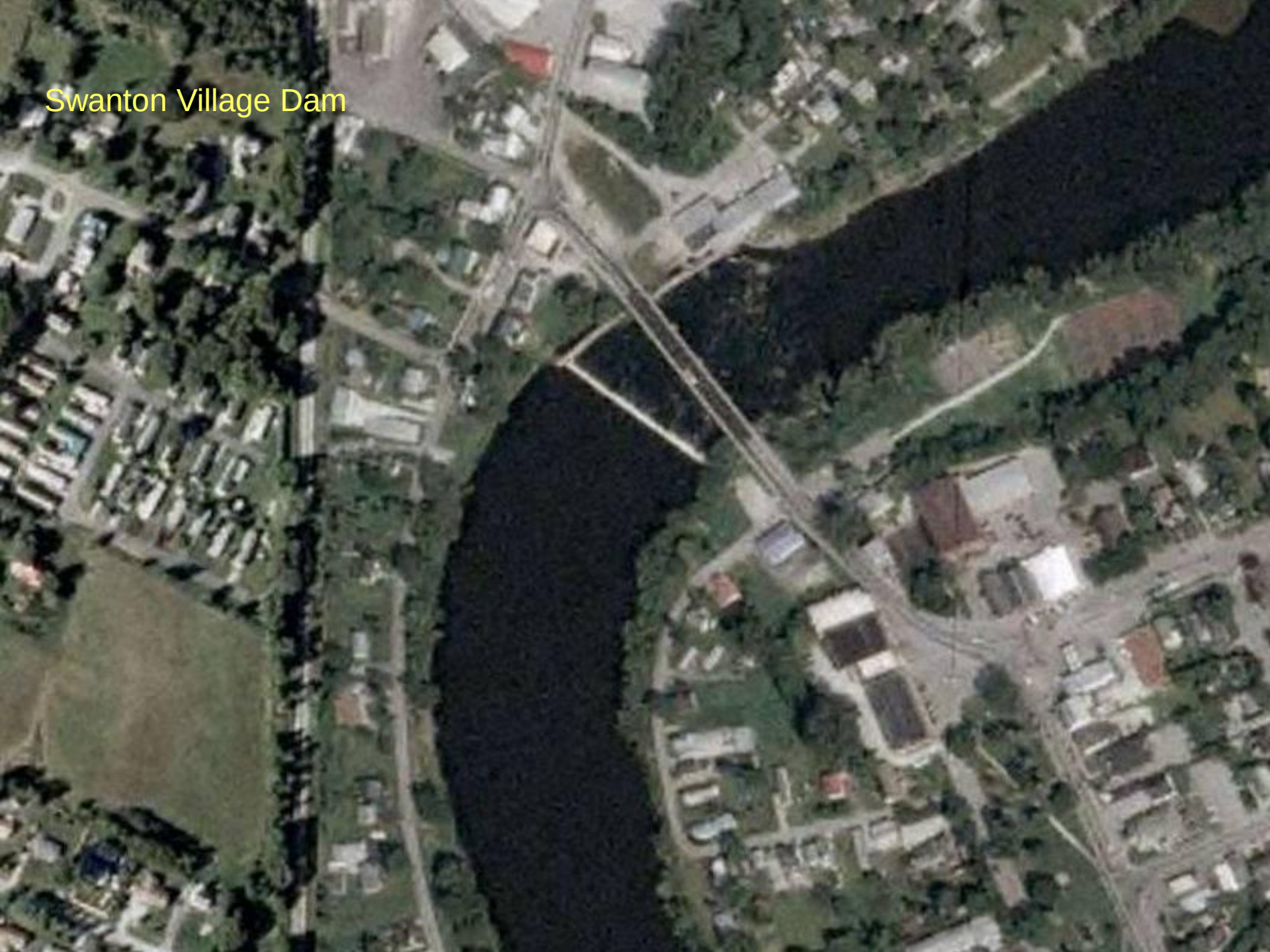
Dam name Marshfield-8 Dam	Location Winooski River, Marshfield, VT
Dam owner	Land ownership around impoundment
Ecological benefits	Community benefits

Existing dam uses	Infrastructure issues
Rare species	Sediment quality
Community concerns	Funding possibilities

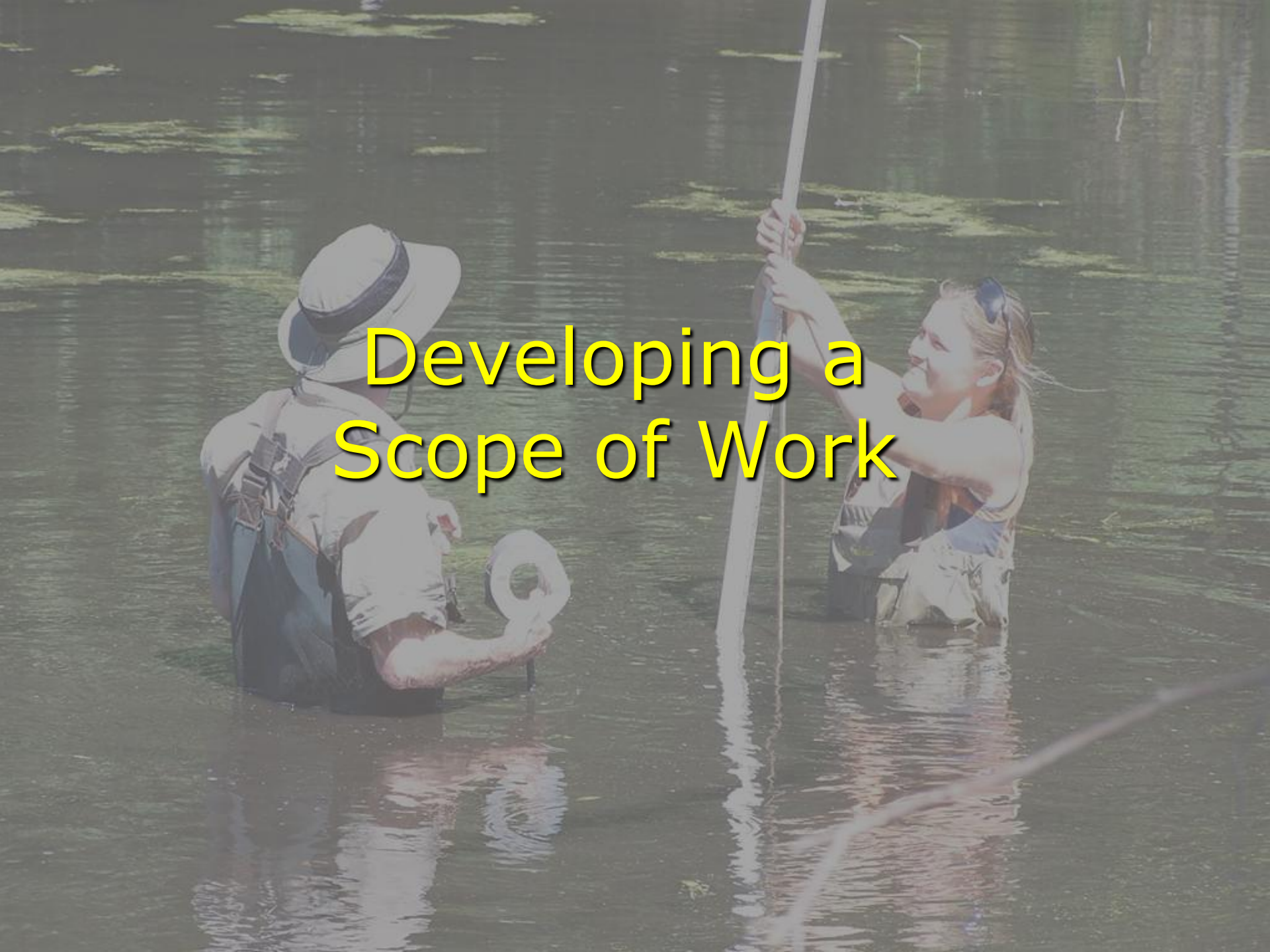
Marshfield- 8 Dam

Dam name Swanton Dam	Location Missisquoi River, Swanton Village, VT
Dam owner	Land ownership around impoundment
Ecological benefits	Community benefits

Existing dam uses	Infrastructure issues
Rare species	Sediment quality
Community concerns	Funding possibilities


Swanton Village Dam

Swanton Village Dam


Developing a
Scope of Work

Consultant Hiring Process

One approach:

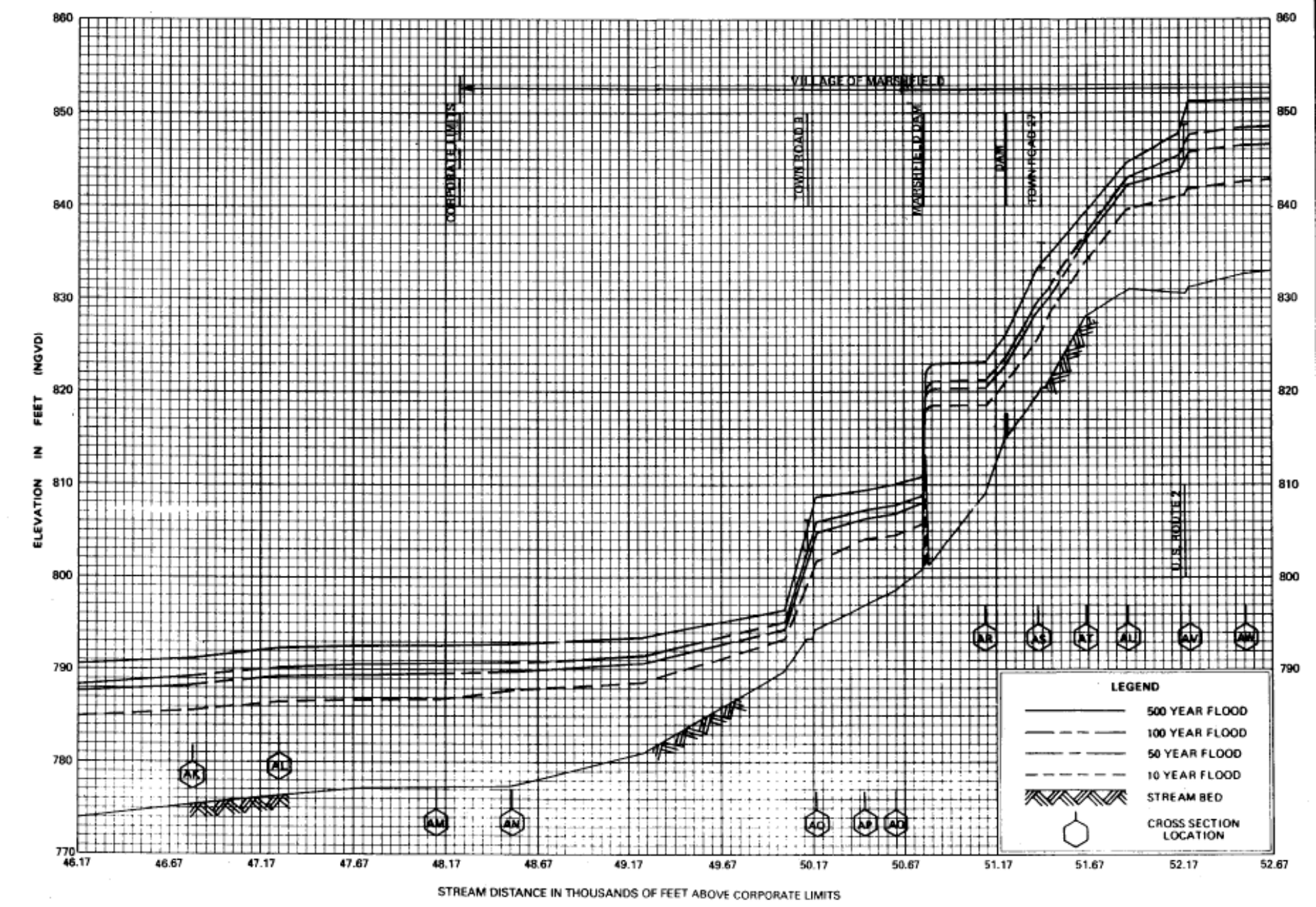
- Simple bid request
  - Express goals of project, but not details
  - Consultants give details in their proposal

- Detailed scope of work
  - Negotiated between hiring entity and consultant
  - Covers both hiring entity and consultant for exact performance

Scope of Work Potential Topics

- Data Collection
- Survey and Mapping
- Sediment Assessment
- Hydrology/Hydraulics
- Structure Removal
- Channel/Riparian Restoration
- Species Assessment/Protection
- Site-specific Issues
- Monitoring
- Drawings
- Permitting
- Reports
- Meetings

Marshfield- 8 Dam



Developing a Scope of Work: Marshfield-8 Dam

Scope of Work Potential Topics

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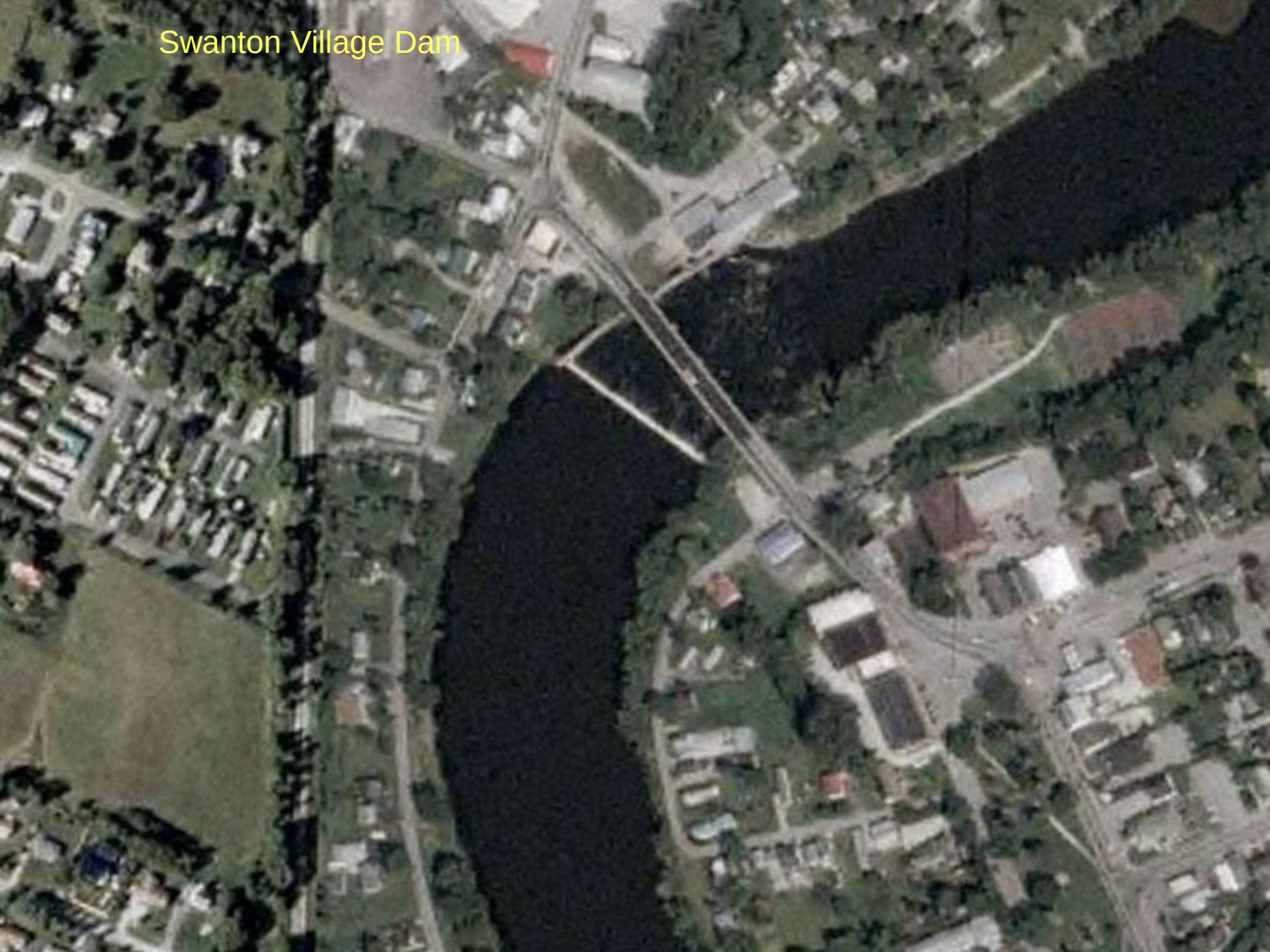
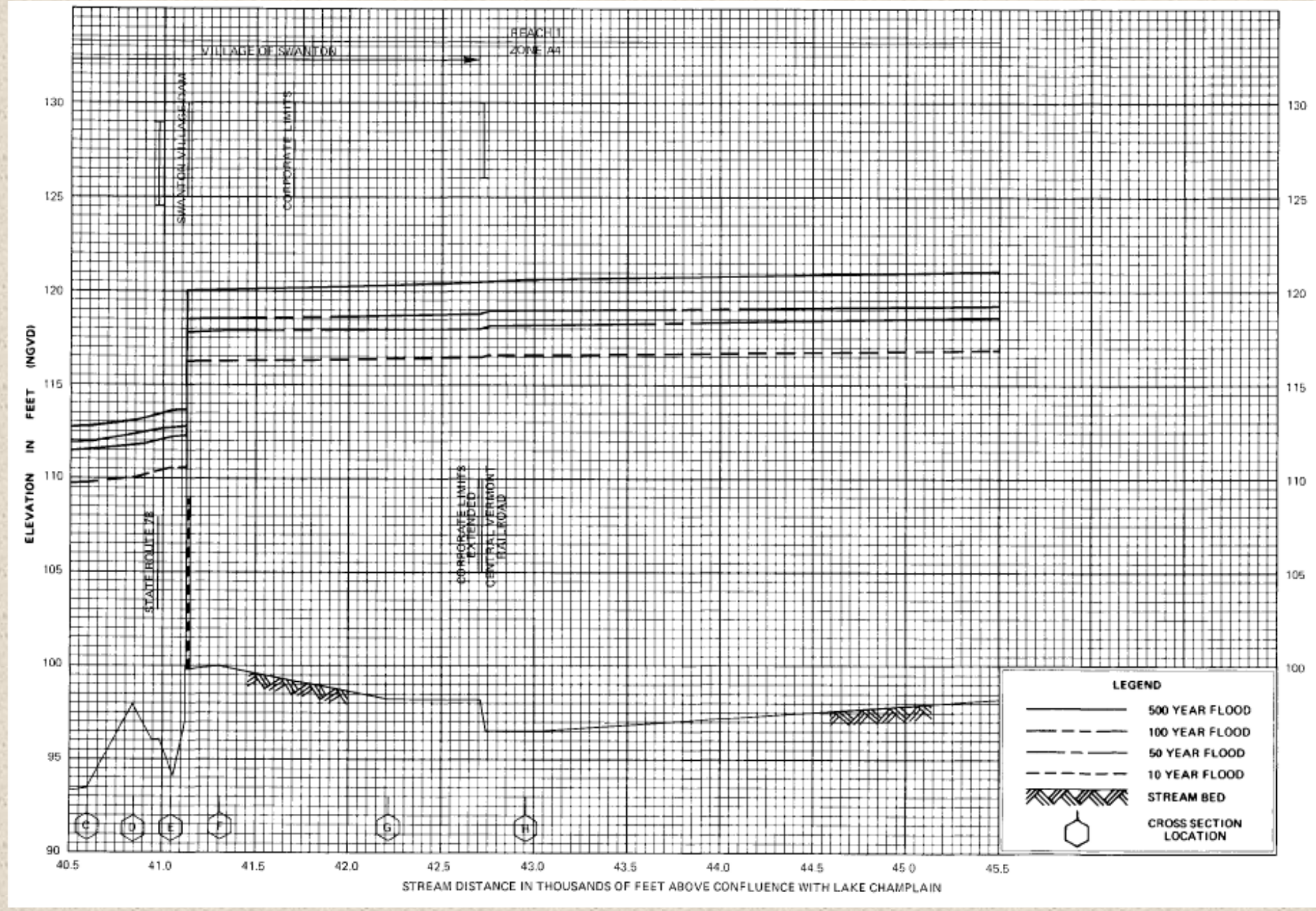
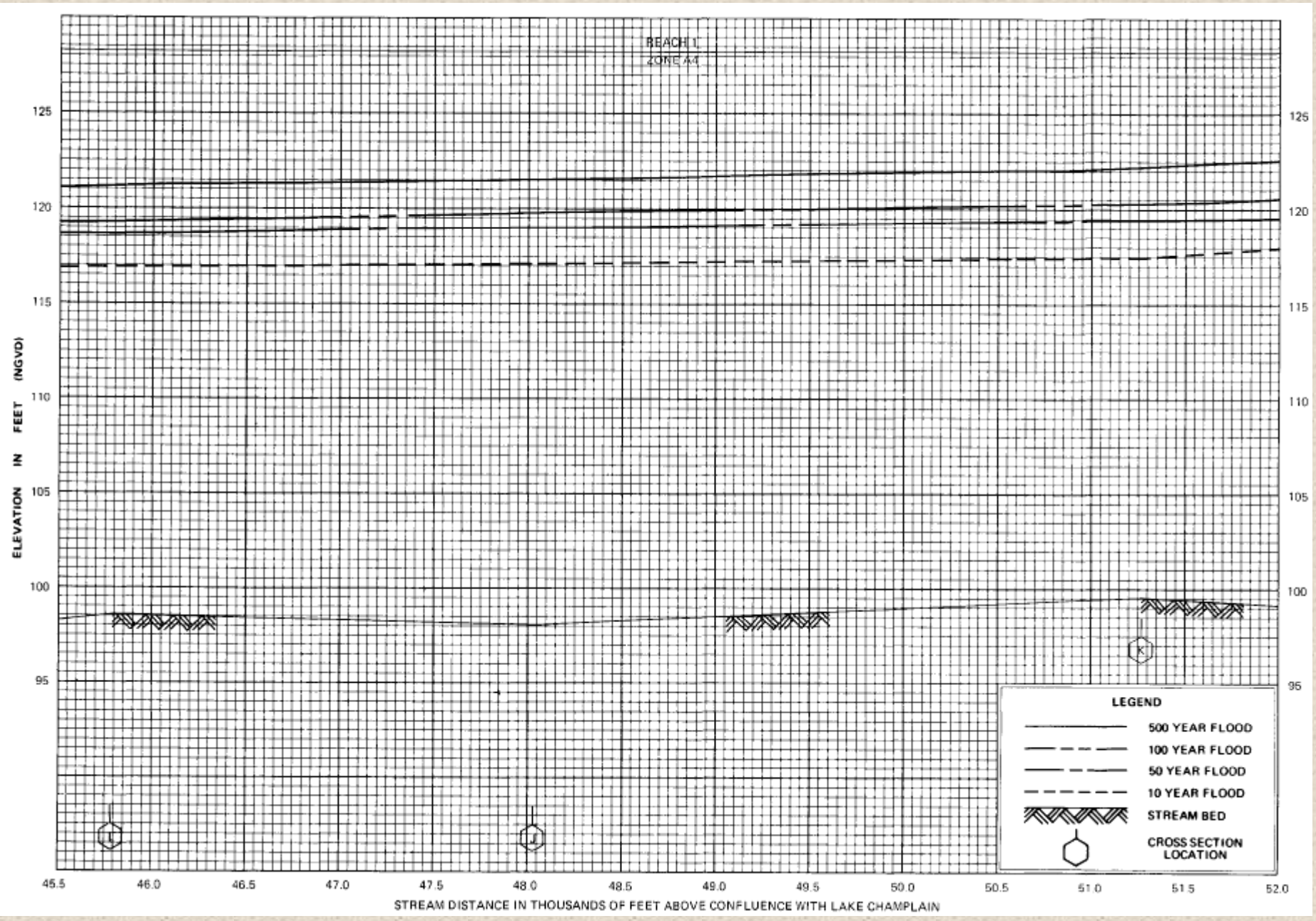

Swanton Village Dam

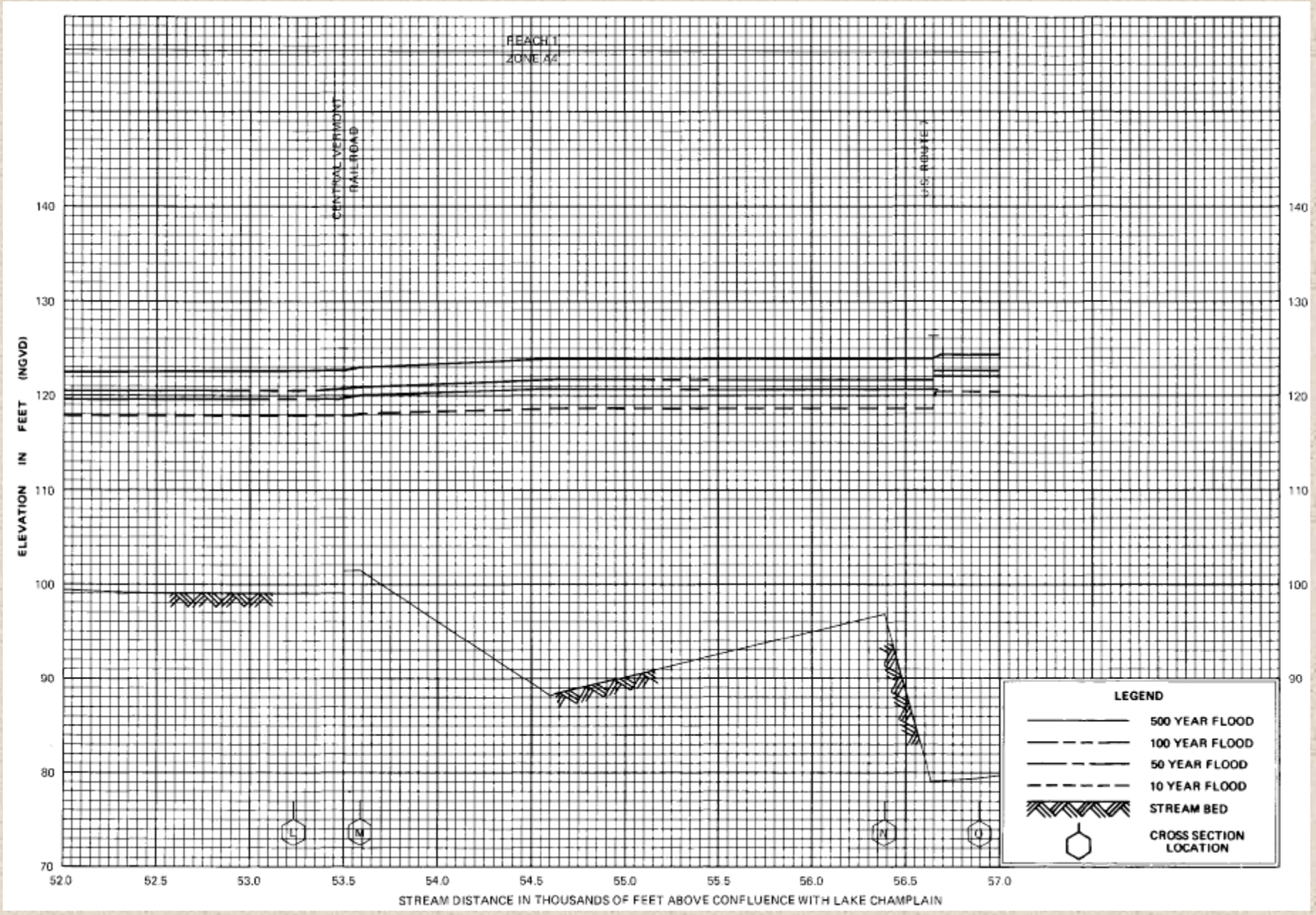
Swanton Village Dam



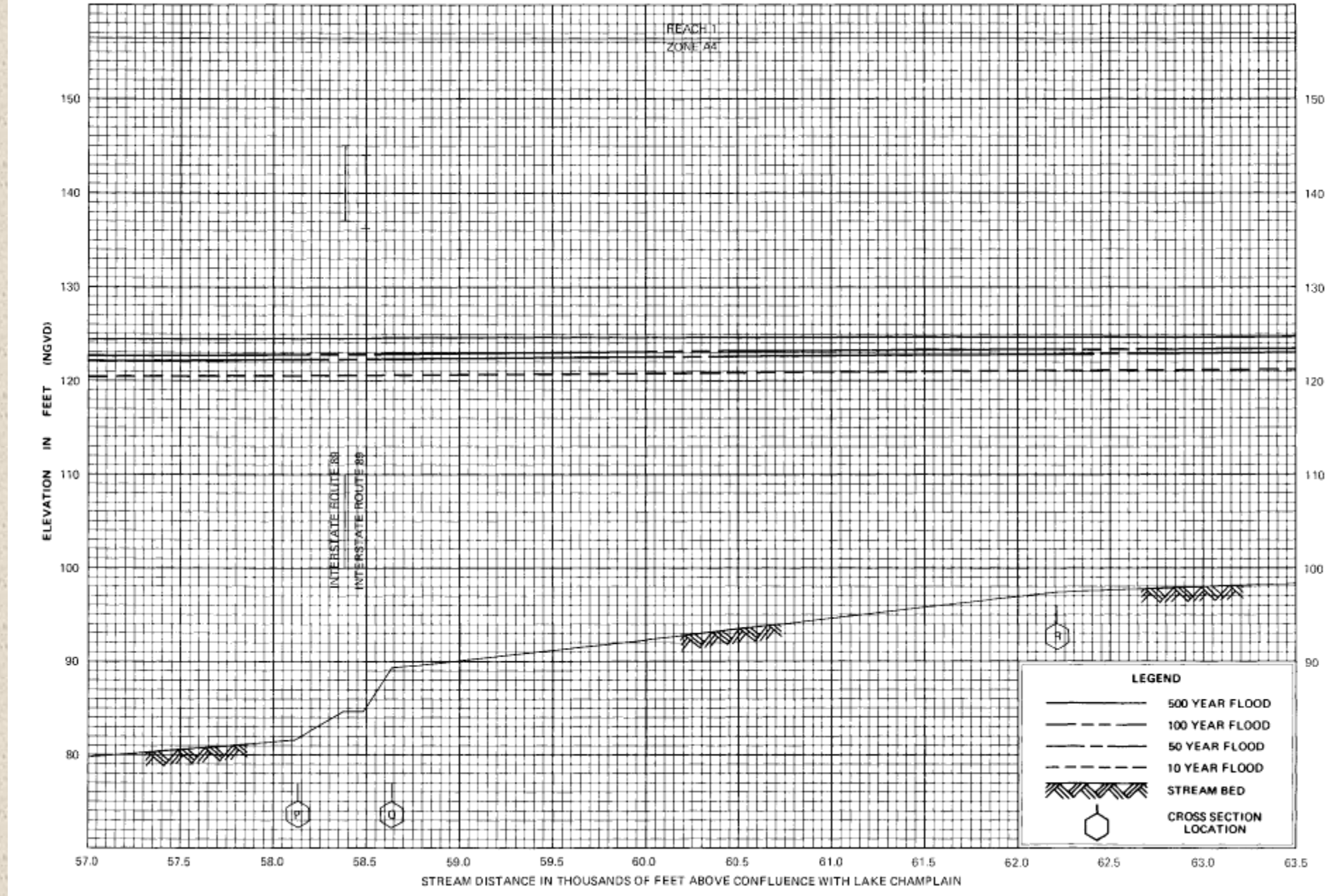
Developing a Scope of Work: Swanton Dam



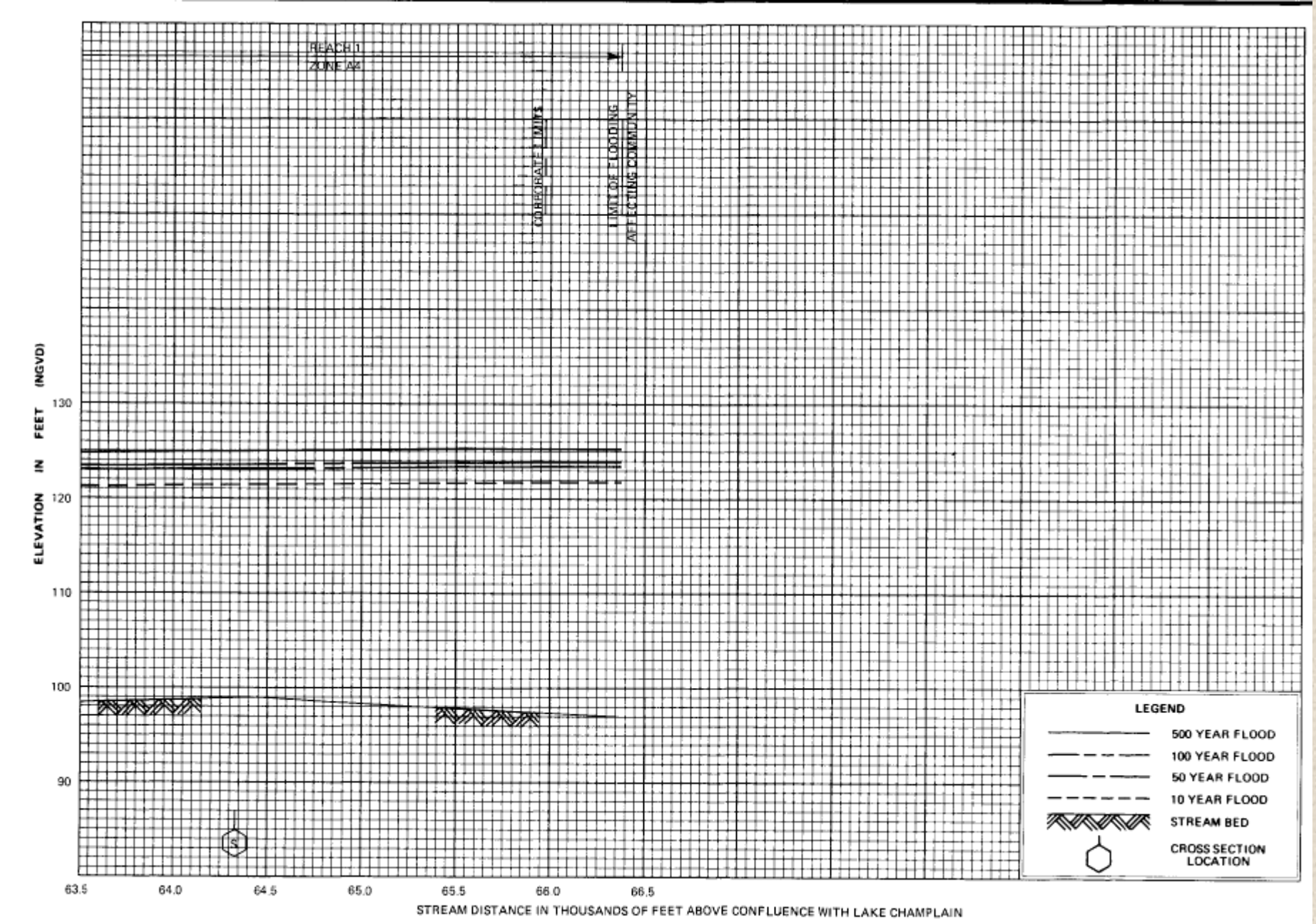
Developing a Scope of Work: Swanton Dam



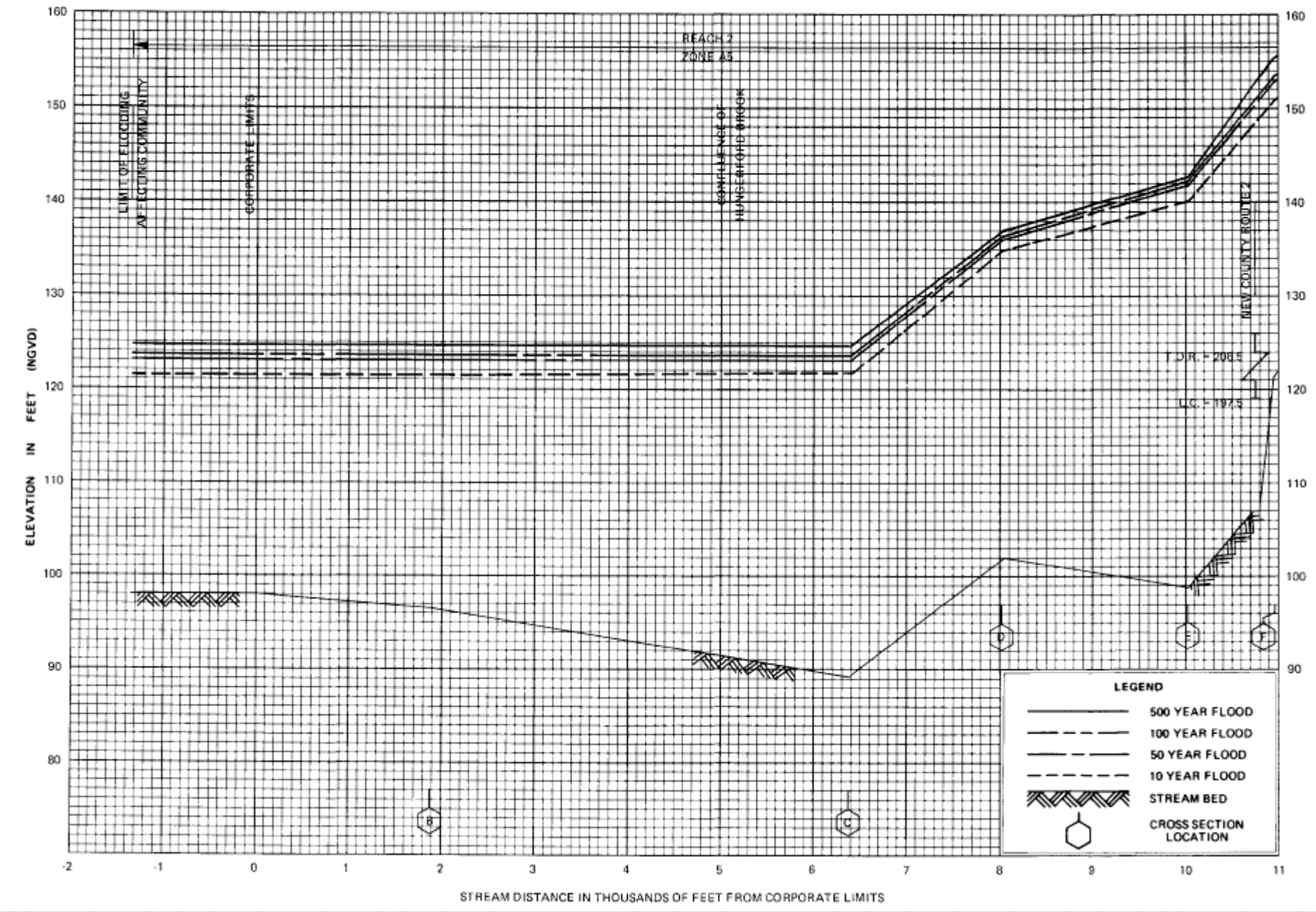
Developing a Scope of Work: Swanton Dam



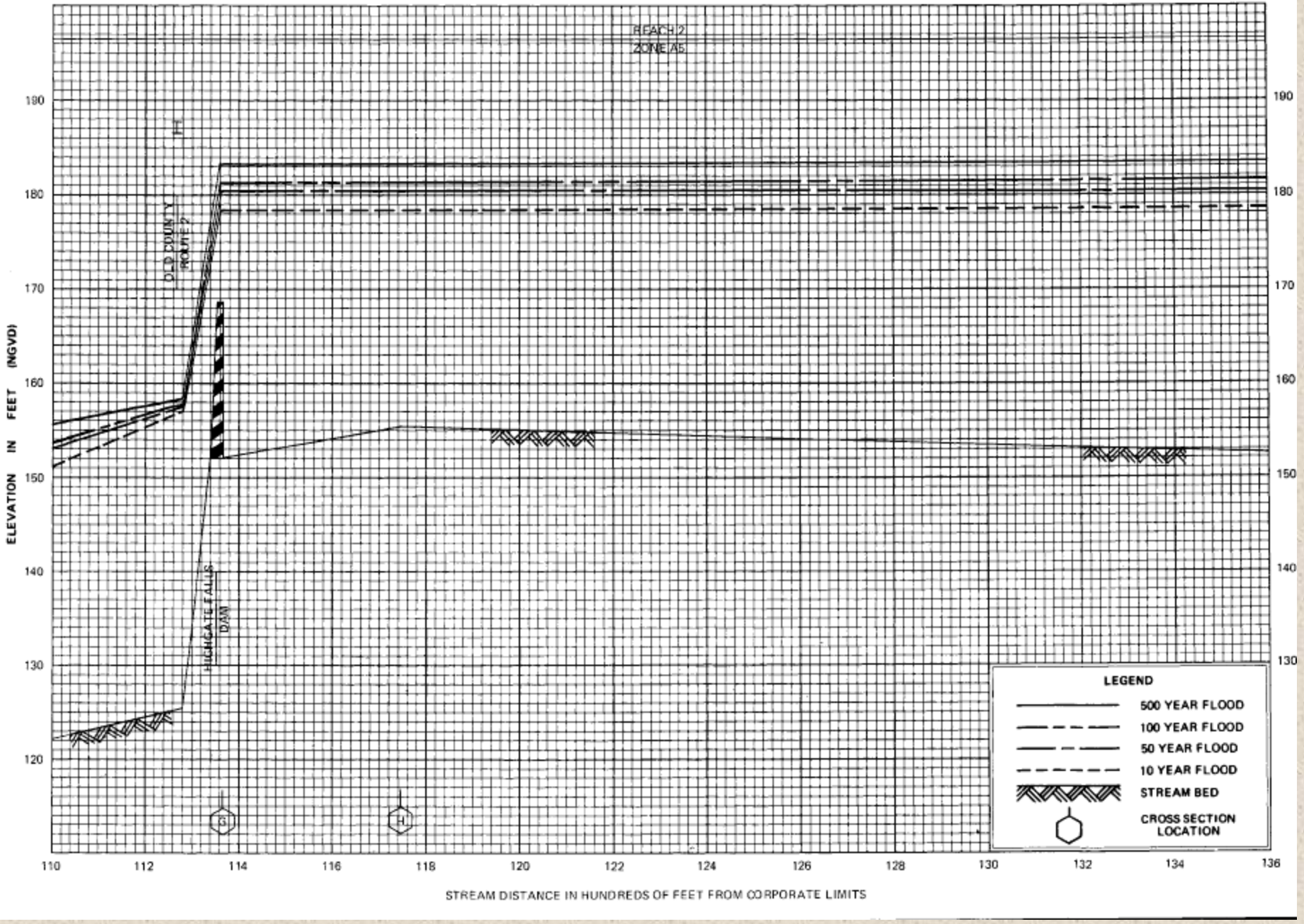
Developing a Scope of Work: Swanton Dam



Developing a Scope of Work: Swanton Dam



Developing a Scope of Work: Swanton Dam



Developing a Scope of Work: Swanton Dam

Things that Go Wrong
(And How to Make Them Go Right)

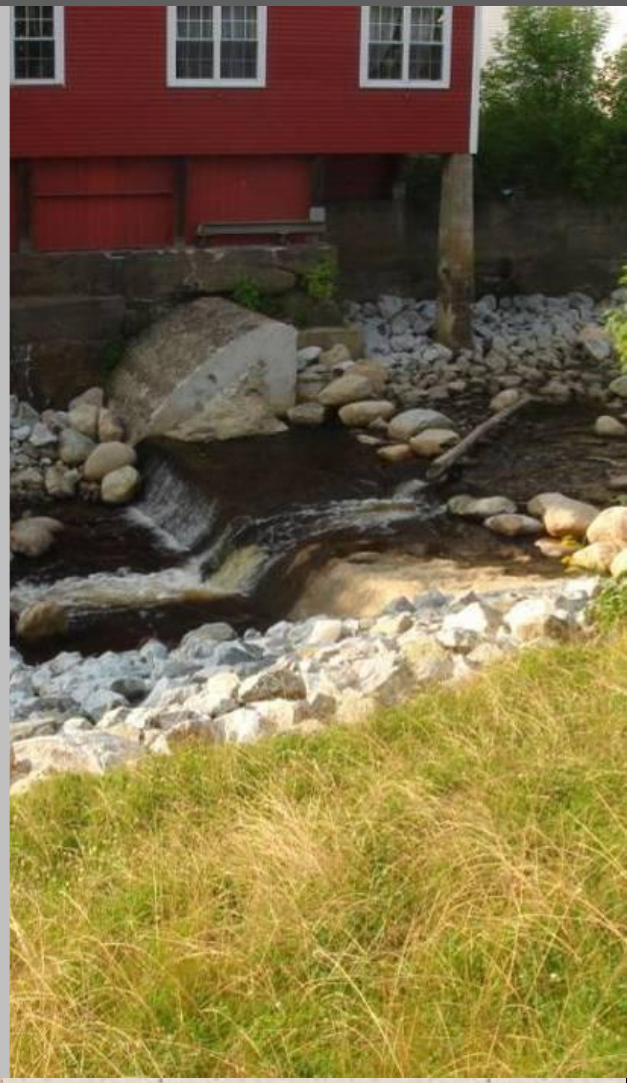
What to Look for in a Consultant

- Integration of skills
  - Engineering, geomorphology, ecology (and experience with this integration)
  - Permitting
  - Presentation skills
  - Responsiveness and project management
  - No one firm is truly good at all of these
    - Consider requiring subconsultants

A Traditional Engineering Approach

Blending Skills: Engineers, Geomorphologists, Biologists

Remove the full vertical extent of the dam (and as much of the lateral extent as possible)

Construction oversight is critical

Be cautious/skeptical with structural approaches