# Post-Permit Project Inspection and Verification

*Moderator:* David Wood

*Panelists:*

- Tom Schueler, CSN,
- Tim Schueler, Hazen and Sawyer
- Kathy Hoverman, KCI

# Key Topics on Verification

- Basics of CBP verification
- Can we standardize as-builts to assist in future verification
- Objectives for verification guidance on stream restoration projects
- A proposed framework and some initial reaction
- Perspectives from the field

Thanks to Tim, Kathy, Kip, Joe and Others for their initial feedback, but all errors, omissions or over-simplifications are Tom Schueler's fault

# Need for BMP Verification



Chesapeake Bay Program
A Watershed Partnership

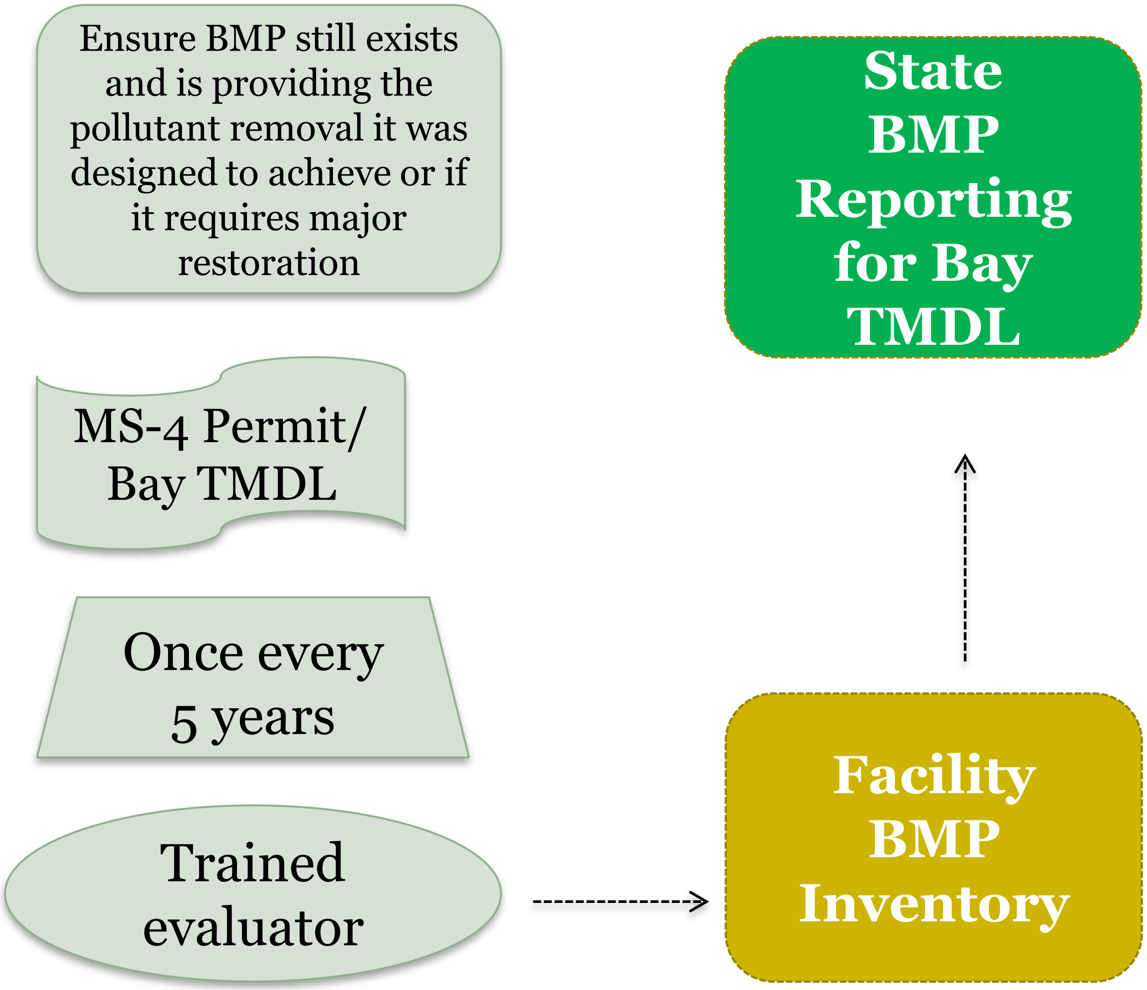
Need to ensure that the practices we are claiming for pollutant reduction credit in the Bay (1) actually exist (2) are working as intended, and (3) are maintained properly over their design life

# Credit Duration Depends on BMP Type



| | |
|---|---|
| Stream Restoration | 5 yrs |
| Stormwater Retrofits | 10 yrs |
| New LID Practices | 10 yrs |
| Individual Nutrient Discharges | 10 yrs |
| Homeowner BMPs | 5 yrs |
| UNM Plans | 3 yrs |
| Street Cleaning | 1 yr |

# Performance Verification



# Verification of Stream Restoration Credit *

- Duration for the removal credits is 5 years
- Can be renewed based on a field performance inspection
- Duration of the credit is shorter than other urban BMPs, as these projects are:
  - subject to catastrophic damage from extreme flood events
  - have requirements for 3 to 5 years of post-construction monitoring to satisfy permit conditions
- If a project does not pass inspection, there is 1 year to take corrective action prior to loss of credit

* Based on original 2013 expert panel report

# Post Construction Practice Certification *

- Prior to submitting the load reduction to the state tracking database, the installing agency will need to provide a post-construction certification that the stream restoration project:

  - was installed properly,
  - meets or exceeds its functional restoration objectives
  - hydraulically and vegetatively stable,

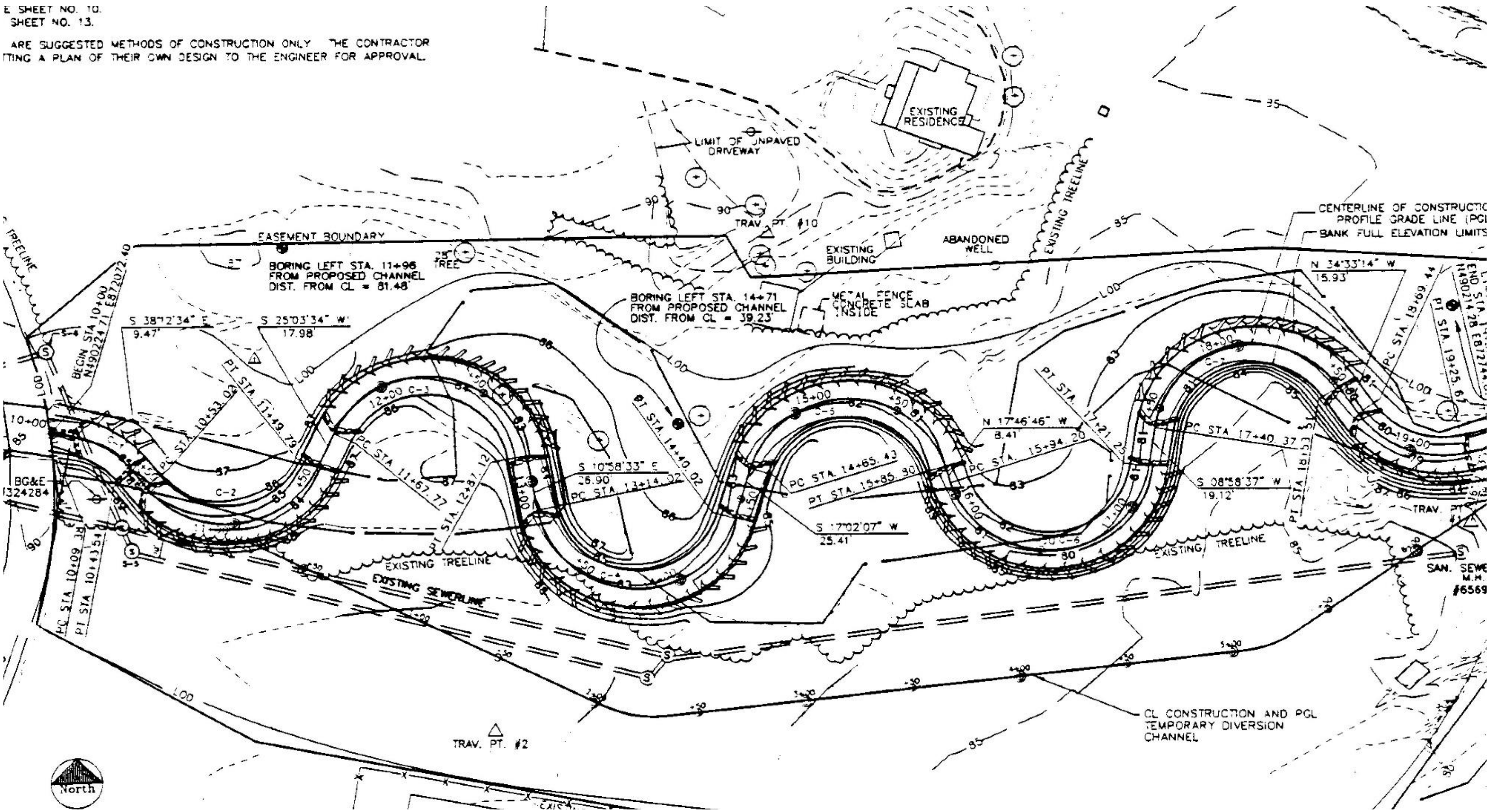
- Post-construction inspection is done by designer or local inspector, subject to approval by state permit authority

* Based on original 2013 expert panel report

# Challenges

- Post construction monitoring is typically required for 3-5 years to satisfy permits – mostly for channel stability.
- To ensure projects are operating as designed, field inspections are needed to renew the credit 5 years after the permit expires
- No specific guidance exists on how to inspect and verify projects going forward

# Is there a standard for project as-builts that could better support future verification efforts?



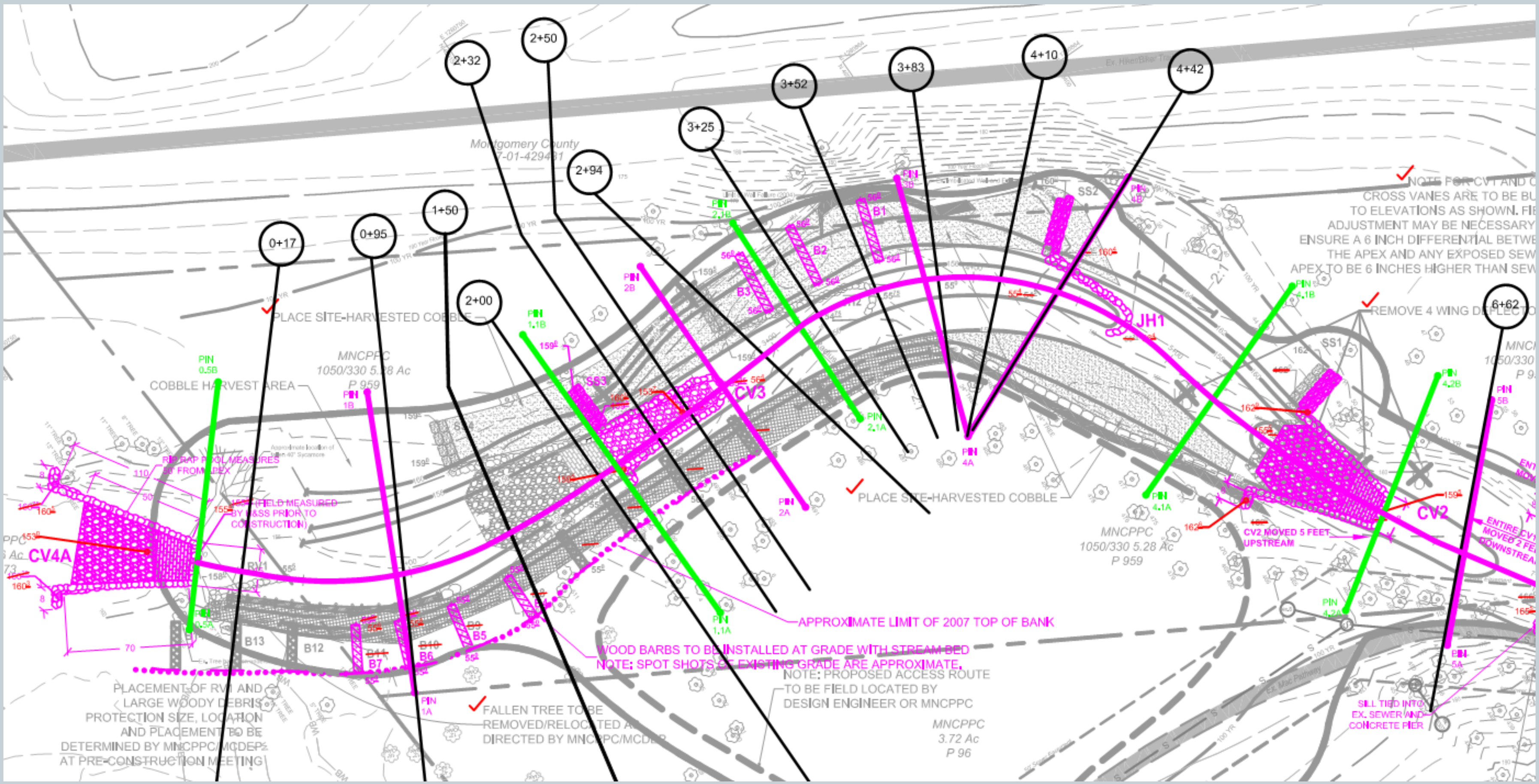
# Stream as-built plans fall into 3 categories

- No as-built: projects without any sort of "as-built" or other construction documentation rely on original design drawings.

- "Red line" Copy of design plans w/ info pertaining to installation of actual work documented by the contractor, engineer, third party or some combination thereof.

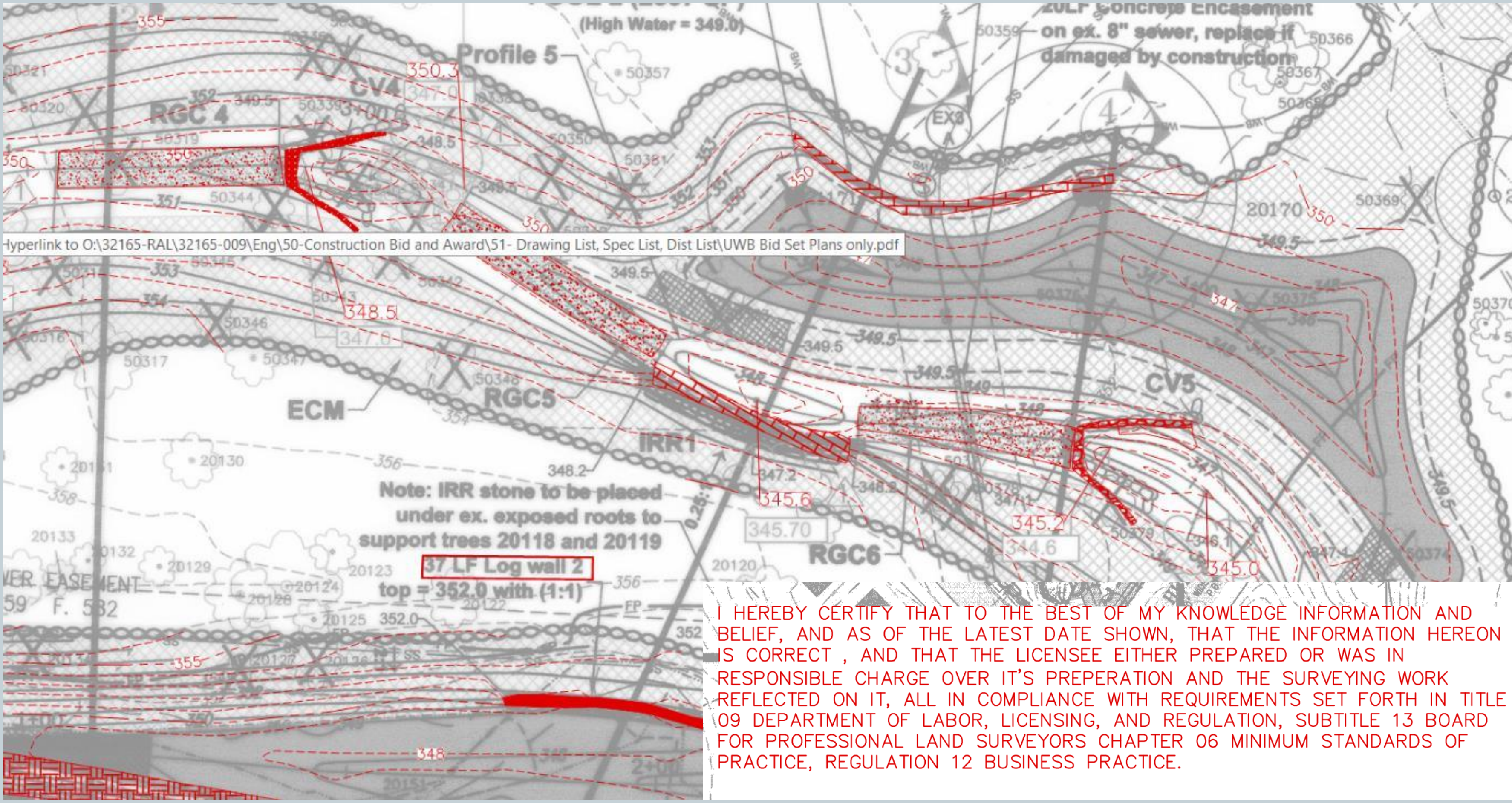
- Professionally surveyed as-built: Surveyor does a topographic survey for the completed project, tied to the original design datum

# Redline



0+17
0+95
1+50
2+00
2+32
2+50
2+94
3+25
3+52
3+83
4+10
4+42
6+62
Montgomery County
PLACE SITE-HARVESTED COBBLE
COBBLE HARVEST AREA
MNCPPC
1050/330 5.28 Ac
P 959
CV4A
CV3
CV2
JH1
SS1
SS2
SS3
B1
B2
B3
B5
B6
B7
B9
B10
B12
B13
RIP RAP POOL MEASURES
APPROXIMATE LIMIT OF 2007 TOP OF BANK
WOOD BARBS TO BE INSTALLED AT GRADE WITH STREAM BED
NOTE: SPOT SHOTS OF EXISTING GRADE ARE APPROXIMATE.
NOTE: PROPOSED ACCESS ROUTE TO BE FIELD LOCATED BY DESIGN ENGINEER OR MNCPPC
FALLEN TREE TO BE REMOVED/RELOCATED AS DIRECTED BY MNCPPC/MCDEP
PLACEMENT OF RW AND LARGE WOODY DEBRIS PROTECTION SIZE, LOCATION AND PLACEMENT TO BE DETERMINED BY MNCPPC/MCDEP AT PRE-CONSTRUCTION MEETING
REMOVE 4 WING DEFLECTO
CV2 MOVED 5 FEET UPSTREAM
SILL TIED INTO EX. SEWER AND CONCRETE PIER
MNCPPC
3.72 Ac
P 96

# As-built



(High Water = 349.0)
20LF Concrete Encasement on ex. 8" sewer, replace if damaged by construction
Profile 5
CV4
RGC 4
Hyperlink to O:\32165-RAL\32165-009\Eng\50-Construction Bid and Award\51- Drawing List, Spec List, Dist List\UWB Bid Set Plans only.pdf
ECM
RGC5
IRR1
CV5
RGC6
Note: IRR stone to be placed under ex. exposed roots to support trees 20118 and 20119
37 LF Log wall 2
top = 352.0 with (1:1)
I HEREBY CERTIFY THAT TO THE BEST OF MY KNOWLEDGE INFORMATION AND BELIEF, AND AS OF THE LATEST DATE SHOWN, THAT THE INFORMATION HEREON IS CORRECT , AND THAT THE LICENSEE EITHER PREPARED OR WAS IN RESPONSIBLE CHARGE OVER IT'S PREPERATION AND THE SURVEYING WORK REFLECTED ON IT, ALL IN COMPLIANCE WITH REQUIREMENTS SET FORTH IN TITLE 09 DEPARTMENT OF LABOR, LICENSING, AND REGULATION, SUBTITLE 13 BOARD FOR PROFESSIONAL LAND SURVEYORS CHAPTER 06 MINIMUM STANDARDS OF PRACTICE, REGULATION 12 BUSINESS PRACTICE.

# As-Built Preparation Staff Level

| As-built Level | Surveyor (S) | Engineer (E) | Technician (T) |
| --- | --- | --- | --- |
| No as-built | NA | NA | NA |
| Redline | NA | optional | optional |
| Topographic survey | required | Usually required | optional |

SPECIALISTS, SUCH AS RLA's, Geologists, etc are considered as E's for this table

# Tools for Possible Wider Application

| As-built Tool | Detailed Description | NCD | LSR | RSC | Effort | Skill |
|---|---|---|---|---|---|---|
| Sample | Particle Counts | optional | optional | optional | Medium | T |
| Dimension | Floodplain bank height | required | required | optional | Low | T |
| Count | Riparian vegetation (counts or coverage) | required | required | required | Medium | T |
| Count | Vegetation (detailed sampling) | optional | optional | optional | High | E |
| Count | GPS structure location | required | optional | required | Medium | T |
| Count | Biologic survey | optional | optional | optional | High | E |
| Evaluation | Modeling based on surveys | optional | optional | optional | High | E |
| Evaluation | BANCS or other erosion estimates | required | required | required | High | E |
| Witness | Photographs | optional | optional | optional | Low | T |

SPECIALISTS, SUCH AS RLA's, Geologists, etc. are considered as E's for this table

# Objectives for SR Verification Guidance



- Craft a technically sound field method to assess pollutant reduction function of restoration projects over time
- Account for inherent differences in restoration design strategies and the three crediting protocols
- Establish an industry standard for project as-builts and supporting materials
- Provide numeric triggers for management actions for projects (e.g., confirm/reduce/eliminate credits)
- Enable a crew to inspect a 1000 ft project reach in 2-4 hours or less
- Provide useful data to inform design of future projects
- Impose reasonable and predictable costs for project sponsors in the long run

# Defining Water Quality Function Loss for Protocol 1 (Prevented Sediment)

| **Criteria for Function Loss** | **Key Visual Indicators** |
|---|---|
| Evidence of bank or bed instability such that the project delivers more sediment downstream than designed | • Migration of incision through the project reach<br>• Vertical bank instability<br>• Lateral bank instability<br>• Flanking of individual structures<br>• Downstream scour of in-channel structures |
| **Feedback:**<br>Keep the list short…Focus on known cross-sections and/or pre-established photo stations to reduce observation bias… Some optional indicators may include riparian plant community, stream substrate composition and stream channel form diversity | |

# Minor headcut migration

# Structure Flanking

# Minor Erosion and Lateral Migration

# Major Migration

# Defining Water Quality Function Loss for Protocol 2 Hyporheic Box

| Criteria for Function Loss | Key Visual Indicators |
|---|---|
| Evidence that the reach is no longer fully meeting design assumptions for expanding the hyporheic box. | • Incision or obstructions preventsghts to sharply depart from increase ratios above 1<br>• Lack of carbon source evident in the streambed<br>• Bed sedimentation, embeddedness, loss of riffles |
| **Feedback:** This is the hardest protocol to define a "visual indicator" since the box is below the floodplain and stream and cannot be seen w/o digging a well | |

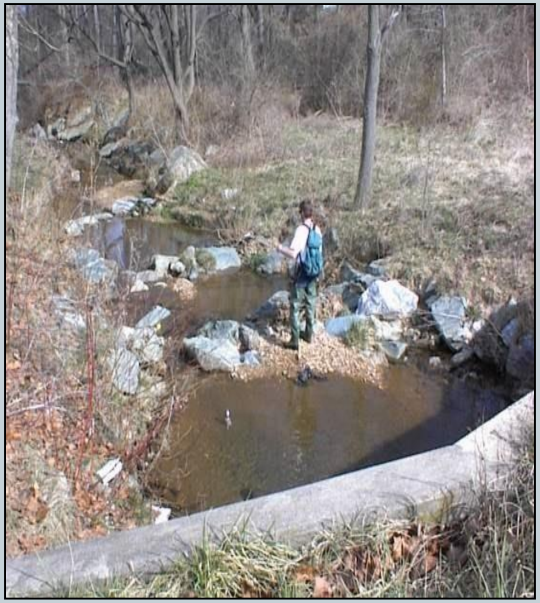
# Defining Water Quality Function Loss for Protocol 3 Floodplain Reconnection

| **Criteria for Function Loss** | **Key Visual Indicators** |
|---|---|
| Channel incision or floodplain sediment deposition increases effective bank height, thereby reducing intended annual stream flow volume diverted to floodplain | • Evidence of stream/floodplain disconnection<br>• No evidence of floodplain sediment deposition<br>• Increased bank heights due to channel incision<br>• Upland plant species dominate wetland areas |
| **Feedback So Far:** More work needed for this protocol**.** | |

# Possible Standard Resources to Use for Project Inspections

Parts of some off-the shelf stream assessment resources could be very helpful:

- Rapid Stream Restoration Monitoring Protocol (USFWS, 2014)
- Stream Corridor Assessment (SCA)
- Elements of Rapid Bioassessment Protocol (RBP)
- Stream Visual Assessment Protocol
- Others?



# Verifying Streamside Plant Community?

- How useful is it to track the success of the original planting plans ?
- How do we account for factors like invasive species, beaver colonization and water table changes ?
- While we can set numeric targets for the success of the original project planting plan, should we bother ?
- The long term trajectory of the plant community is often hard to predict or control

# Framework for Relating Reach Conditions to Management Decisions

| Status | % of Reach Failing | Inspections | Re-testing ? |
|---|---|---|---|
| *Functioning Well* | less than 5% | Re-inspect in 5 years | None Needed<br>Credit Renewed for 5 Years |
| *Showing Minor Compromise* | 5 to 10% | Re-inspect reach in next three years | None, Credit renewed until next inspection |
| *Showing Major Compromise* | 11 to 30% | Conduct immediate forensic investigation to ID cause(s) | Re-do BANCs or floodplain analysis and reduce credit accordingly |
| *Project Failure* | 31% or more | Drop credit, decide whether to reconstruct or abandon the project | |

**Feedback so Far**: Like the framework, but reach percentages seem really conservative, not sure how % would be computed in the field, how do they reconcile w/ 50% efficiency for Protocol 1?