Agenda for Today

- Highlights from the new rules
- Process to develop the Stream Mitigation Guidelines
- Highlights from the 2019 Stream Mitigation Guidelines
- Overview of the TN Debit Tool
- Compensatory Mitigation webpage
- Questions
ACKNOWLEDGEMENTS-2019 SMG, TN SQT and Debit Tool

Why Update the Stream Mitigation Guidelines?

• **Improve** explanation of **what** activities **constitute a loss of resource value** and when is mitigation required.

• Provide a **quantitative and scientifically defensible** framework for how the amount of mitigation required to ensure no net loss will be evaluated.

• **Modernize** what type of activities are eligible for offsetting lost resource value.

• Provide mitigation **site selection** evaluation guidance.

• **Improve** **performance standards and monitoring.**

Inform us on how to calculate debits and credits.
2004 TN Stream Mitigation Guidelines

- **Ratio Based**
  - Broad ranges of ratios for credits
  - Describes *activity based crediting-pattern, profile, and dimension*

- **Narrative Criteria**
  - Does not require baseline information
  - Subjective
  - Creates *crediting drift*
  
- **Debits**
  - Encapsulation 1:1
  - Riprap 0.75:1 for double bank
Realized deficiencies in the 2004 mitigation guidelines; qualitative/subjective

- Wanted to be consistent with USACE requirements
- Wanted to align state guidelines with the 2008 Final Rule to the extent practical for TN
- Wanted to establish **functional lift**
- Move away from linear footage/ratio based system

**Shortcomings**

- Received significant comment on efficacy of functional assessment parameters and methods
- Division lacked capacity to create a robust functional assessment
• Engage our stakeholders
• Evaluate potential assessment methods
• Establish parallel pathways
  – Education and outreach
  – Incremental and iterative document development
  – Data gathering
  – Tool development
  – Tools to policy
Long Term Goals

• Update
  – Stream Mitigation Guidelines
  – *TDEC rules* on mitigation

• Develop Tools
  – Stream functional assessment to capture function lift of compensatory mitigation
  – Companion debit calculator

Short Term Goals

• **Streamline Process**
  – Bring consistency
    • Banking templates
    • Land Use Protection documents
    • Checklists
    • Mitigation crosswalk

• **Communicate changes**
  – Series of joint education and outreach events over several years
  – Training, webinars and workshops
Develop Tools: Build Consensus and Foundation

- **Measurable. Transparent. Predictable. Repeatable**
- Partner with USACE and IRT to develop/adopt functional assessment guidance tools
- Based on known stream functions
- Inherent relationships in stream channel metrics
- Incorporate TDEC biological and water quality data
- Regionalize as information becomes available
Develop Regionalized Data From Across TN

- Over 120 sites across the state with multiple levels of data.
- Over 60% of those sites have reference data for all five stream categories.
TDEC and the USACE developed a series of workshops, delivered across the state for all stakeholders focused on small changes, introduce concepts on big changes and keep an open line of communication. Three years of “Joint Education Outreach Events” from 2015-2018.
Communicate Change - In the Classroom

- Provided webinars with national experts
- In house workshops
- Conferences
- Seminars
Communicate Change - Field Training
**Preferred Quantitative Method**

- Benefits of the Stream Quantification Tool
- Determine numerical existing condition score for impact sites.
- Determine numerical difference between existing and proposed conditions of a stream for mitigation (functional lift).
- Links restoration activities to function-based parameters.
- Incentivize high-quality stream mitigation.
- Inform stream mitigation site selection
- Developing success criteria and a monitoring plan.
The basic framework, underlying logic, and technical aspects of a Functional-Foot methodology is laid out in detail in the recently published *Tennessee Stream Quantification Tool*, available on the Division’s mitigation web site.
Develop Tools: The TN SQT

- **TN SQT User Manual**
  - How to use the SQT Workbook.
- **Rapid Data Collection Methods Manual**
  - How to rapidly collect data without surveying equipment.
- **Detailed Data Collection and Analysis Manual**
  - Explains thorough data collection.
- **Science Support and Rationale (Coming Soon)**
Stream Mitigation Guidelines = interprets rules, establishes performance standards, align with USACE

Aquatic Resource Alteration Rules = defines mitigation requirements

Water Quality Standards = ensures all features maintain classified uses, flow, and use quantitative methods
• any appreciable permanent loss of resource values associated with the proposed impact is offset by mitigation sufficient to result in no overall net loss of resource values from existing conditions
• Mitigation for impacts to streams must be developed in a scientifically defensible manner approved by the Division that demonstrates a sufficient increase in resource values to compensate for permitted impacts.
• At a minimum, all new or relocated streams must include a vegetated riparian zone, demonstrate lateral and vertical channel stability, and have a natural channel bottom.
• All mitigation watercourses must maintain or improve flow and classified uses after mitigation is complete.
• **Existing Conditions**- means the biological, chemical, bacteriological, radiological, and physical conditions of a stream or wetland at the time the project is proposed as measured by a quantitative assessment tool or other defensible scientific method as approved or determined by the Division.

• Because all streams and wetlands serve important functions, the determination of existing conditions shall ensure at least **minimal protection** for all streams and wetlands notwithstanding prior degradation

• The Division will evaluate resource value compensation through the use of an appropriate **quantitative assessment** or other defensible scientific method

• Mitigation for impacts to Tennessee streams and wetlands shall occur in Tennessee.
Rules-Minimum Existing Condition Score

- **Minimum Mitigation Requirement:** “Because all streams and wetlands serve important functions, the determination of existing conditions shall ensure at least minimal protection for all streams and wetlands not withstanding prior degradation”

Even currently degraded streams (including many in urban areas) have resource values outside of those addressed in the functional quantification evaluation that must be offset if lost.

Therefore the Guidelines establish a **minimum Existing Condition Score** for all streams, to ensure overall net mitigation is sufficient to maintain classified uses and water quality standards.
Significant Changes - Assessment

• Movement from a **qualitative, narrative, more generalized evaluation** of lift and loss (e.g. ratio-based categories of credits and debits), to a more **quantitative, data-driven, site-specific assessment** of lift and loss (e.g. functional-foot calculation of credits and debits)

• **Approved** quantitative assessments base credits on the actual lift produced, regardless of the type or extent of “work”
Factors Used to Determine Loss

- **Temporal Loss**: Should complete mitigation prior to or concurrent with impacts, and the Division may “account for temporal loss of resource value” with additional required mitigation.

- **Proximity**: “Mitigation should occur as close to the impact location as practical”. Guidelines propose multipliers for proximity, based on existing USACE methodology.

- **Unique or Exceptional Waters**: Not all standard mitigation practices may be adequate to address sites with special resource value.
Requirements

• **Stream Fill and Replacement (relocation) projects**
  – Minimum requirements based on scale and current condition

• **12-point Mitigation Plan**
  – Matches USACE requirements (level of detail based on scale)

• **Permittee-Responsible Mitigation vs. Third-Party Providers**
  – Most of the same standards apply (based on scale & complexity)

• **Performance Standards and Monitoring Requirements**
  – Most align with USACE requirements, see joint guidance document

• **“Commonly Encountered Variants” (Frequently Encountered Scenarios)** - section expanded with more examples
Clarification

• **Preservation Crediting**
  – Allowed under certain circumstances – may be credited up to 10% of the Existing Condition Score

• **Urban Mitigation Sites**
  – May be incentivized up to 15% additional credits (TDEC only)

• **Perpetual Site Protection**
Stream Relocations that Offset Themselves

- Meet the minimum requirements in rule
- Proposed condition must meet or exceed existing condition
- Demonstrate success through monitoring
- Laterally and vertically stable
- Riparian vegetation
- Natural substrate
- **Maintain** status as a stream *(flow)*
- **Maintain use support** if supporting

No additional credit is generated AND no additional loss is debited
Stream Relocations that Generate Credit

- Relocation must demonstrate they meet requirements from previous slide AND
- Demonstrate a **sufficient increase in resource values** to compensate for permitted impacts

- Must meet the minimum expectations of a credit generating compensatory mitigation project
- Functioning in the “Big 4” Stream Functional Categories of the TN SQT
  - Floodplain Connectivity
  - Riparian Vegetation
  - Lateral Migration
  - Bedform Diversity
How can we quantify functional loss?
Develop- TN Debit Tool a Companion to TNSQT

- Impacts to Waters of the State and WOTUS range from **minimal** to **significant**
- Debit Tool determines the amount of loss based on specific impact type and existing stream condition (ECS)
- Objective, consistent, transparent method for evaluating debits, or amount of compensatory mitigation required for impacts
<table>
<thead>
<tr>
<th>Impact Tier</th>
<th>Description of Resource Value Loss</th>
<th>Road Crossings</th>
<th>Impact Type</th>
<th>Impact Factor</th>
<th>Percent Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Total permanent loss of all resource value (stream function).</td>
<td>Stream Length Loss: filled for relocation or stream length loss due to culverts, fill, channelization, or similar.</td>
<td>0</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Significant permanent loss of resource value (stream function). Affects biology, water quality, floodplain connectivity, bedform and habitat and large woody debris, eliminates riparian vegetation, limits planform and lateral migration. Removal of all aquatic functions except for hydrology.</td>
<td>Pipe or 4-Sided Box Culvert: Includes wingwalls, any energy dissipation device, u-shaped endwalls. All components attached to the pipe structure itself. Does not include riprap.</td>
<td>0.1</td>
<td>90%</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Permanent loss of most of resource value (stream function). Impacts to riparian vegetation, lateral migration, bedform diversity, and floodplain connectivity. Limitations to planform and large woody debris. Significant impacts to water quality and macroinvertebrate and fish communities.</td>
<td>3-Sided Box Culvert, Arch Culvert, Single or Multi-Span Bridges with Bents and/or Abutments: includes wingwalls and all components attached to the crossing structure. These box culverts (bents, abutments or similar) affect the channel walls, have footers that were dug into bank/bed interface, or otherwise disrupted or disturbed the natural channel wall during and/or after construction. Riprap (not to exceed the length of the culvert) may be placed along banks beneath the crossing in association with these structures. Riprap along bents and abutments (or similar) is permissible. Riprap lining the bed in conjunction with these culverts would make the impact a Tier 5</td>
<td>0.34</td>
<td>66%</td>
<td></td>
</tr>
</tbody>
</table>
Impact Severity Tiers

<table>
<thead>
<tr>
<th>Impact Severity</th>
<th>Impact Factors</th>
<th>Percent Functional Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 0</td>
<td>1.00</td>
<td>0%</td>
</tr>
<tr>
<td>Tier 1</td>
<td>0.89</td>
<td>11%</td>
</tr>
<tr>
<td>Tier 2</td>
<td>0.8</td>
<td>20%</td>
</tr>
<tr>
<td>Tier 3</td>
<td>0.52</td>
<td>48%</td>
</tr>
<tr>
<td>Tier 4</td>
<td>0.32</td>
<td>68%</td>
</tr>
<tr>
<td>Tier 5</td>
<td>0.12</td>
<td>88%</td>
</tr>
<tr>
<td>Tier 6</td>
<td>0.00</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Proposed Impact Factors and Activity Modeling:**

The graph below represents combined data from modeling individual activities and the impact these actions have on stream resources. The table has established tiers, percent functional loss and the impact factors used to determine debits. The Impact Factors were developed from linear regression equations of modeled impact scenarios using a simplified version of the SQT. Each impact type was described in detail and evaluated for stream functional loss by the proposed activities. Using a simplified SQT, an individual impact factor was developed for each impact type. These types were grouped based on % functional loss (in clusters) and graphed in “tiers”. A trendline was drawn and the slope of that line became the combined impact factor representing all activities within a given tier.

**Activity Modeling**

![Activity Modeling Graph]
Table 1: Impact Severity Tiers and descriptions. *Function-based parameters being impacted are in bold.

<table>
<thead>
<tr>
<th>Tier</th>
<th>Functional Loss Description (Impacts to stream resource values)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No appreciable permanent loss of stream functions individually or cumulatively at any scale.</td>
</tr>
<tr>
<td>1</td>
<td>Minimal loss of stream functions. Impacts to reach runoff, lateral migration and/or riparian vegetation. Minor impacts to water quality, and macroinvertebrate and fish communities. <strong>Activities in this tier represent an 11% functional loss.</strong></td>
</tr>
<tr>
<td>2</td>
<td>Partial loss of stream functions. Impacts to reach runoff, lateral migration, bed form diversity, and riparian vegetation. Minor impacts to water quality, and macroinvertebrate and fish communities. <strong>Activities in this tier represent a 20% functional loss.</strong></td>
</tr>
<tr>
<td>3</td>
<td>Permanent loss of some of stream functions. Impacts to reach runoff, floodplain connectivity, lateral migration, riparian vegetation, and bed form diversity. May also include impacts to large woody debris. Minor impacts to water quality and moderate Impacts to macroinvertebrate and fish communities. <strong>Activities in this tier represent an 48% functional loss.</strong></td>
</tr>
<tr>
<td>4</td>
<td>Permanent loss of most stream functions. Impacts to reach runoff, floodplain connectivity, lateral migration, riparian vegetation, and bed form diversity. May also include impacts to plan form and/or large woody debris. Significant impacts to water quality and macroinvertebrate and fish communities. <strong>Activities in this tier represent an 68% functional loss.</strong></td>
</tr>
<tr>
<td>5</td>
<td>Permanent loss of most of stream functions. Removal of all aquatic functions except for hydrology. <strong>Activities in this tier represent an 88% functional loss.</strong></td>
</tr>
<tr>
<td>6</td>
<td>Total and permanent loss of all stream functions. <strong>Activities in this tier represent a 100% functional loss.</strong></td>
</tr>
</tbody>
</table>
Impact Severity Tier 0

- Vegetative bank stabilization
Impact Severity Tier 1

- Span bridge
- Half bank riprap
Impact Severity Tier 2

- Span bridge w/ pier in stream
- Single bank riprap, gabion baskets, Turf Reinforced Mat
Impact Severity Tier 3

- Bottomless culvert
- Double bank riprap
- Grade control
Impact Severity Tier 4

- Bed and bank armoring
- Bottomless culvert w/ impact to channel walls
Impact Severity Tier 5

- Box or pipe culvert
- Channelization
Debit Tool – Creating a Companion to the SQT

- Spreadsheet based **calculator** and written guidance
- **Existing Condition Score (ECS)**
  - Option 1: Applicant completes ECS field assessment for all parameters
  - Option 2: Applicant completes ECS field assessment for some parameters
  - Option 3: Standard Existing Condition Score
    - Applicant uses standard ECS (1.0, 0.8, or 0.32)
  - No **ECS** can be lower than 0.4, except for relocations
- **Impact Severity Tier**
  - Applicant determines severity tier based on impact type and description
  - Tier 0 (no functional loss) to Tier 6 (100% functional loss)
Option 1 and Option 2 require field visits and stream assessment.

Option 3 does not require field visits; standard ECS used:

- ECS = 1.0: ETW/ONRWs
- ECS = 0.8: intermittent/perennial
- ECS = 0.32 ephemeral
Calculating Loss

- **ECS** = Existing Condition Score
- **PCS** = Proposed Condition Score
- **EFF** = Existing Functional Feet
- **PFF** = Proposed Functional Feet
- **PCS = Impact Severity Tier x ECS**
- **PCS x proposed stream length = PFF**
- **Debits = PFF - EFF**

### Table 3: PCS Equations

<table>
<thead>
<tr>
<th>Impact Severity Tier</th>
<th>PCS Equation</th>
<th>Percent Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>PCS = 1.0 * ECS</td>
<td>0%</td>
</tr>
<tr>
<td>1</td>
<td>PCS = 0.89 * ECS</td>
<td>11%</td>
</tr>
<tr>
<td>2</td>
<td>PCS = 0.80 * ECS</td>
<td>20%</td>
</tr>
<tr>
<td>3</td>
<td>PCS = 0.52 * ECS</td>
<td>48%</td>
</tr>
<tr>
<td>4</td>
<td>PCS = 0.32 * ECS</td>
<td>68%</td>
</tr>
</tbody>
</table>
Workbook Tabs

- Project Assessment
- Debit Tool Calculator
- Measurement Selection Guide
- Existing Condition Worksheets
- Photos by Reach
Measuring Existing Condition Scores
### Reach Information and Reference Standard Stratification

- Important component of tools
- Frequent cause of errors
- Determines which reference curves to use in calculations.
- Always use pull down menu if available; do not type into the boxes.
- Unique stratification

<table>
<thead>
<tr>
<th>Reach Information and Reference Standard Stratification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name:</td>
</tr>
<tr>
<td>Reach ID:</td>
</tr>
<tr>
<td>Upstream Latitude:</td>
</tr>
<tr>
<td>Upstream Longitude:</td>
</tr>
<tr>
<td>Downstream Latitude:</td>
</tr>
<tr>
<td>Downstream Longitude:</td>
</tr>
<tr>
<td>Existing Stream Type:</td>
</tr>
<tr>
<td>Proposed Stream Type:</td>
</tr>
<tr>
<td>Ecoregion:</td>
</tr>
<tr>
<td>Drainage Area (sqmi):</td>
</tr>
<tr>
<td>Proposed Bed Material:</td>
</tr>
<tr>
<td>Existing Stream Length (feet):</td>
</tr>
<tr>
<td>Proposed Stream Length (feet):</td>
</tr>
<tr>
<td>Proposed Stream Slope (%):</td>
</tr>
<tr>
<td>Proposed Flow Type:</td>
</tr>
<tr>
<td>Data Collection Season:</td>
</tr>
<tr>
<td>Macro Collection Method:</td>
</tr>
<tr>
<td>Valley Type:</td>
</tr>
</tbody>
</table>
# Existing Condition Worksheet

## Reach Information and Reference Standard Stratification

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Reach ID</td>
<td>Drainage Area (sqmi)</td>
<td>Upstream Latitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Existing Stream Type</td>
<td>Existing Bed Material</td>
<td>Data Collection Season</td>
<td>Upstream Longitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Reference Stream Type</td>
<td>Existing Stream Slope (%)</td>
<td>Macro Collection Method</td>
<td>Downstream Latitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ecoregion</td>
<td>Flow Type</td>
<td>Valley Type</td>
<td>Downstream Longitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Existing Condition Assessment

### Functional Category: Hydrology
- **Catchment Hydrology**
  - Watershed Land Use Runoff Score: Field Value, Index Value, Parameter, Category
- **Reach Runoff**
  - Stormwater Infiltration: Field Value, Index Value, Parameter, Category

### Functional Category: Hydraulics
- **Floodplain Connectivity**
  - Bank Height Ratio: Field Value, Index Value, Parameter, Category
  - Entrenchment Ratio: Field Value, Index Value, Parameter, Category

### Functional Category: Lateral Migration
- **Large Woody Debris**
  - Woody Debris Index: Field Value, Index Value, Parameter, Category

### Functional Category: Geomorphology
- **Lateral Migration**
  - Erosion Rate (ft/yr): Field Value, Index Value, Parameter, Category
  - Dominant REH/NESS: Field Value, Index Value, Parameter, Category

### Functional Category: Riparian Vegetation
- **Bed Material Characterization**
  - Size Class Pebble Count Analyzer (p-value): Field Value, Index Value, Parameter, Category
- **Bed Form Diversity**
  - Pool Spacing Ratio: Field Value, Index Value, Parameter, Category
  - Pool Depth Ratio: Field Value, Index Value, Parameter, Category
  - Percent Riffle (%): Field Value, Index Value, Parameter, Category
  - Aggradation Ratio: Field Value, Index Value, Parameter, Category

### Functional Category: Physicochemical
- **Bacteria**
  - E. coli (CFU/100 mL): Field Value, Index Value, Parameter, Category
- **Organic Enrichment**
  - Percent Nutrient Tolerant Macroinvertebrates (%): Field Value, Index Value, Parameter, Category

### Functional Category: Biology
- **Macroinvertebrates**
  - Tennessee Macroinvertebrate Index: Field Value, Index Value, Parameter, Category
  - Percent Oligochaetes (%): Field Value, Index Value, Parameter, Category
  - Percent EPT-Chaetoptera (%): Field Value, Index Value, Parameter, Category
  - Percent Cladocera and Chironomidae (%): Field Value, Index Value, Parameter, Category

- **Fish**
  - Native Fish Score Index: Field Value, Index Value, Parameter, Category
  - Catch per Unit Effort Score: Field Value, Index Value, Parameter, Category

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Department of Environment & Conservation
• **Index Values** are averaged to get parameter Scores

• **Parameter Scores** are averaged to get functional category scores.

• **Category Scores** are multiplied by 0.2 (1/5) and summed to get the overall ECS or PCS.
Scoring system for each stream category, parameter, measurement method, and overall score is based on a range of 0-1.0.

THE SAME SCORING SYSTEMS AS THE TN SQT
Mitigation Guidelines

- Improved explanation of what activities constitute a loss of resource value and when is mitigation required.

- Provides a quantitative and scientifically defensible framework for how the amount of mitigation required to ensure no net loss will be evaluated.

- Modernizes what type of activities are eligible for offsetting lost resource value.

- Provides mitigation site selection evaluation guidance.

- Improves performance standards and monitoring.

- Changes the currency to Functional Feet with the use of the TN Debit Tool and the TN SQT

- This allows Credits and Debits to be evaluated using the same scientifically defensible methodology (functional-feet), as required to defend no net loss.
Preferred Quantitative Assessment Methods


- Credits and debits evaluated using same scientifically defensible methodology to defend no net loss.

- The currency of credits and debits has changed
Other scientifically defensible method

- Ensure at least minimal protection for all streams notwithstanding prior degradation
- Utilize an appropriate quantitative assessment or other defensible scientific method
- Demonstrate a sufficient increase in resource values to compensate for permitted impacts
- Result in no overall net loss of resource values from existing conditions
- Accurately evaluate both resource loss and resource lift using similar methodologies
- Is based on valid reference data, regionalized to stream type and ecologic setting where appropriate
- Accurately and precisely assess stream resource value and condition, allowing evaluation the resource function's degree of departure from reference
- Provides repeatable and consistent assessment results
- Assesses a sufficient range of conditions or metrics to evaluate overall resource function
- Allows for a consistent and accurate prediction of post-impact resource loss
- Has transparency sufficient to be subject to external review if needed
TN Debit Tool and TN SQT Spreadsheets

- **TN Debit Tool**
  - Used for permitted impacts to estimate functional loss.

- **TN Stream Quantification Tool**
  - Calculates functional change (existing, proposed, and monitoring years)

- **List of Metrics**
  - List of all parameters, measurement methods, reference standards, stratification methods, and references

**All of this supports the Stream Mitigation Guidelines**
Additional Resources on TDEC Website

- TN Stream Quantification Tool and supporting manuals
- Regional Curves – statewide by Level III ecoregion
- Stream Bank and In-Lieu Fee Draft Prospectus Checklist
- Stream Bank and In-lieu Fee Draft MBI Guidance
- Permittee-Responsible Mitigation Guidance
- Links to RIBITS, TDOT Mitigation Program
- Overview of the 2008 Federal Rule for Compensatory Mitigation
- Perpetual Protection Templates

google: TDEC compensatory mitigation
• TN SQT documents can be found at: TDEC’s mitigation website, USACE website, and the 1-mitigation folder

2019 Stream Mitigation Guidelines
Questions?

Strategic Planning for the Future:

• Build a process for:
  • Version control of tools
  • Version updates
  • Parameter or measurement method substitutions specific to a project
• MOU with USACE on process

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