Stream Mitigation & the Michigan Stream Quantification Tool MiSQT

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EGLE | MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Presentation Overview

- Stream mitigation: why, when, how, where, and what – including:
  - Project alternatives – minimizing impacts to avoid mitigation
  - When stream mitigation is likely to be needed (and when it's not)
  - Mitigation plans, Performance Standards, & Monitoring
  - Site protection & Financial Assurances
  - Stream mitigation permit process
- The MiSQT and assessment of stream functions
- New proposed MP category for roadside ditch stream realignments
- New EGLE websites for stream mitigation and the MiSQT

Stream Mitigation: Why

- The 2008 Federal Mitigation Rule requires compensatory mitigation for unavoidable impacts to aquatic resources, including compensating for loss of stream functions.
- For Michigan to be compliant with the Federal 404 Program, and continue to maintain our Federal 404 authority, EGLE must be able to require compensation for loss of stream functions.
- Some proposed projects still have adverse impacts to stream resources even after attempts to avoid and minimize those impacts.

Stream Mitigation: Why

- Under Part 301 permit review criteria, EGLE cannot issue a permit that will adversely impact stream resources.
- Part 301 Administrative Rules stipulates that EGLE may consider a mitigation plan offered by the applicant. *Rule 281.813(6)*
- If EGLE determines the plan will offset losses resulting from the proposed project, then a permit can be issued.

Stream Mitigation: When

- Mitigation is ONLY considered after all steps have been taken to first avoid and then minimize impacts to aquatic resources.
- If adverse impacts to aquatic resources remain after avoiding and minimizing, then EGLE will determine if the losses can be offset by mitigation.
- This generally applies to larger projects with significant impacts.
- Does NOT apply to projects with minimal impacts – such as MP/GPs
- Examples of project types that can sometimes have significant impacts are stream relocations, enclosures, dredging, armoring, channelization, filling, etc.

Avoid & Minimize: Alternatives Analysis

A significant step in avoiding and minimizing stream impacts is a thorough investigation of *feasible and prudent alternatives*.

- Look to MP/GP Category Criteria, if available – identifies BMPs
- Locations/configurations – identifying and avoiding sensitive areas
- Designs – types of culverts, end treatments, side slopes, guardrail, etc.
- Materials – example: wood or field stone in place of rip rap or broken concrete
- Size and Scope – example: footprint could be reduced and still meet project goals

- Part 301 administrative rules state that a permit shall not be issued unless EGLE determines that a feasible and prudent alternative is NOT available.

Stream Mitigation: What

- Improvement of stream functions within a section of stream channel
- Components similar to wetland mitigation: mitigation plan, financial assurance, site protection instrument (e.g., conservation easement), performance standards, and monitoring
- Examples of mitigation project elements that can improve stream functions:
  - Bankfull benches
  - Creating riffles and pools
  - Adding wood
  - Natural bank stabilization
  - Preservation and enhancement of vegetated riparian buffers
  - Stormwater runoff reduction or treatment
  - Removing culverts or small dams
  - Improving fish passage and channel stability at road stream crossings

Stream Mitigation: When

Stream Mitigation

Needed

- New enclosures of 300 ft or more
- Stream relocations of 1000 ft or more
- These are Red File projects

Stream Mitigation

NOT Needed

- New enclosures 100 ft or less that meet MP criteria
- Stream relocations 50 ft or less that include BMPs
- Daylighting
- Restoration projects
- Natural Channel Design in-stream structures

Stream Mitigation

MAY Be Needed

- New enclosures between 100-300 ft
- Stream relocations between 50 – 1000 ft
- Deepening/widening
- Non-traditional engineered in-stream structures (drop structures, baffles, etc.)

Stream Mitigation: When

Stream Mitigation

MAY Be Needed

- New enclosures between 100-300 ft
- Stream relocations between 50 – 1000 ft
- Deepening/widening
- Non-traditional engineered in-stream structures (drop structures, baffles, etc.)

- Factors EGLE considers when determining the need for stream mitigation include:
  - Quality of stream being impacted
  - Whether impacts are temporary or permanent
  - Severity of impacts (functions lost or reduced)
  - Length of stream impacted
  - Presence of sensitive species or habitats
  - Public benefits of proposed project
  - Use of BMPs in the project design
  - Net change in resource functions
- Stream evaluation may be needed to help determine potential significant impacts

New Proposed MP Category: Roadside ditch stream realignments

- Specifically for Public Transportation Agencies
- Realignments < 1,000 ft
- Existing roadside stream must generally be of lower quality
- Realignment must increase aquatic resource functions
- Goal is to allow regulated roadside ditches with lower stream quality to be moved to accommodate minor public safety upgrades
- Proposed changes to MP/GP categories will be placed on public notice in the coming months

New Proposed MP Category:
Roadside ditch stream realignments

Specific criteria included in the MP

EXISTING STREAM:

1. Runs parallel to the road and serves as a roadside ditch
2. Lacks sinuosity, floodplain connection, and riffles/pools

REALIGNED STREAM:

1. Must share a portion of its cross-section with the original roadside stream cross-section
2. Must have a properly sized bankfull channel with floodplain shelves
3. Must retain a length, slope, and bed features consistent with the existing roadside stream
4. Must have a similar depth and bottom width as the existing roadside stream

Major Components of Stream Mitigation

Similar process and requires same mitigation plan components as wetland mitigation:

- Mitigation plan submittal and approval by EGLE
- Financial Assurance (LOC or surety bond)
- Performance Standards (based on MiSQT)
- Monitoring (typically 5 years)
- Long term protection and management (conservation easement and/or drain agreement)

Financial Assurances

Letter of Credit or Surety Bond

- Stream specific documents
- Will be included on Stream Mitigation web page
- Contact myself or Mike Pennington for a copy

Amount

- $250 per linear foot of mitigation

Example:

- Length of stream mitigation is 730 feet
- Financial assurance amount would be 730 x $250 = $182,500

Performance Standards

- Performance standards will track with the Michigan Stream Quantification Tool (MiSQT)
- Necessary for all metrics that are providing mitigation credit
- Typically include floodplain connectivity, lateral migration, bed form diversity, and riparian vegetation

Monitoring for Stream Mitigation

- 5 years of monitoring
- Monitor to show achievement of performance standards
- Use MiSQT excel workbook to show progress over time
- As-built condition assessment
- Year 1 begins the year following completion of planting
- Reports cover Jan. 1 to Dec. 31
- Reports due by Jan. 31st of following year

Mitigation Site Protection

Permanent site protection is necessary for all mitigation projects.

Types of site protection:

1. Conservation Easement
   - Used for almost all stream mitigation projects
2. Drain Agreement
   - Agreement between EGLE and the County Drain Commissioner to protect mitigation performed on a county drain
   - Used *in addition to* a conservation easement

Stream Mitigation Process

- Potential need for stream mitigation should be discussed at the pre-application meeting or during the initial application review.
- Applicant is responsible for proposing an acceptable mitigation plan to compensate for unavoidable adverse impacts.
- Use the Michigan Stream Quantification Tool (MiSQT) to evaluate stream functions at the impact site and the mitigation site.
  - Losses at the impact site must be offset by improvements at the mitigation site.
- Submit a conceptual Stream Mitigation Plan with the permit application.

Conceptual Stream Mitigation Plan

- Applicant should provide a conceptual stream mitigation plan that includes:
  - Map of mitigation location
  - Baseline assessments (MiSQT) – impact site and mitigation site
  - How the mitigation will compensate for the functions lost - including linear feet and type of improvements (MiSQT)
  - Basis of Design document – outlines development of stream channel design
  - Plan view of channel design – does not have to be engineered at this point
  - Discussion of site protection including site ownership information
    - If mitigation is on a county drain, written affirmation from the DC that they are willing to enter into a drain agreement

Conceptual Stream Mitigation Plan

- Enough information must be provided so that EGLE has reasonable assurance that the mitigation project:
  1. Can be done
  2. Provides adequate compensation
- An application that does not include these materials may be considered incomplete.

Amount of Mitigation

- Must be sufficient to replace the stream functions lost as a result of the proposed project
- The MiSQT should be used to determine how much mitigation is required
- Minimum of a 1:1 functional replacement
- The rationale for the amount must be documented in the final mitigation plan.
- An increase in mitigation may be necessary to address:
  - Likelihood of success – difficulty of restoring the resource type
  - Differences in the functions lost and replaced (out of kind mitigation)
  - Temporal loss of functions
  - Distance between the impact and mitigation site

Stream Mitigation: Where

- Located at the project site or preferably within the same HUC 10 watershed.
- Secondary preference is an adjacent HUC 10 watershed.
- Within the same HUC 8 watershed

Stream Mitigation: Where

- Site protection is achievable (conservation easement).
- Where it is most likely to successfully replace lost functions and services.
- Choose a degraded system to get the most functional lift
- Things to consider:
  - Compatibility with existing and future land use
  - Effects on adjacent wetlands
  - Relative locations of the impact and mitigation sites in the stream network

Stream Mitigation Permit Process

1. **Pre application meeting**
   - Potentially significant impacts to streams are identified
   - Need for avoidance and minimization and a strong alternatives analysis is discussed
   - Potential need for stream mitigation is introduced

2. **Application submitted - Completeness Review period**
   - Thorough alternatives analysis
   - Conceptual mitigation plan submitted including a well-documented basis for design
   - EGLE has a reasonable assurance that mitigation can be done and will adequately compensate for lost functions
   - Site can be protected with a conservation easement

Stream Mitigation Permit Process

3. **Application review period**
   - EGLE reviews alternatives analysis and works with applicant on changes to project to avoid and minimize impacts
   - If EGLE determines stream mitigation is acceptable, applicant works on details of final stream mitigation plan
   - Basis of design is reviewed and the mitigation design is typically discussed with applicant and changes are often requested
   - Meetings with the applicant to discuss details of the design and mitigation plan are usually necessary
   - EGLE reviews drafts of the final mitigation plan until all concerns are satisfactorily addressed by the applicant

Final Stream Mitigation Plan

Based on Federal Mitigation Rule, a Mitigation Plan must include:

1. Goals and objectives
2. Site location and selection
3. Baseline conditions (MiSQT)
4. Determination of impacts and functional replacement (MiSQT)
5. Site designs and work plan
6. Performance standards
7. A monitoring and maintenance plan
8. A completion schedule
9. Conservation easement and management
10. Financial assurances

Stream Mitigation Permit Process

4. **Permit Issuance**
   - Permit conditions to address:
     - Amount of mitigation required,
     - Site protection instrument,
     - Financial assurance and release schedule,
     - Performance standards,
     - Monitoring requirements
     - Reporting schedule
     - Final sign off

Stream Mitigation Permit Process

5. **Monitoring period**
   - Applicant monitors mitigation site according to mitigation plan and permit conditions (using MiSQT);
   - Submits annual reports for review and approval;
   - Performs corrective actions if needed;
   - Partial release of financial assurance (2 yrs and 2 bankfull flow events)
6. **Site close out**
   - Final monitoring report shows that all substantive performance standards are met and mitigation goals are achieved
   - Final release of financial assurance

New EGLE Stream Mitigation web page!

- www.mi.gov/lakesandstreams
- Stream Mitigation Plan Checklist
- Info on Financial Assurance and Conservation Easement models coming soon

Stream Mitigation

Stream Mitigation Plans

If stream mitigation is required, applicants must submit an acceptable mitigation plan before a permit is issued.

Stream Mitigation Checklist

A site protection instrument is necessary to protect the stream mitigation and the functions and values it provides in perpetuity. EGLE typically requires site protection in the form of a conservation easement from the property owner, and financial assurance to guarantee compliance with permit conditions. Contact Michael Pennington at penningtonm@michigan.gov for a copy of the appropriate conservation easement model for stream mitigation and financial assurance documents.

CHECKLIST FOR STREAM MITIGATION PLANS

DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

WATER RESOURCES DIVISION

www.Michigan.gov/LakesandStreams

In accordance with the administrative rules for Part 301, Inland Lakes and Streams, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, and upon approval by the Department of Environment, Great Lakes, and Energy (EGLE), a mitigation plan may be submitted by the permit applicant when stream mitigation is necessary to offset resource losses resulting from a proposed project. The following items must be submitted in the stream mitigation plan:

Section I. Objectives

A description of the objectives of stream mitigation, including:

- The linear feet of channel to be restored, created, enhanced, or preserved by stream order and flow type (i.e., perennial, intermittent, or ephemeral)
- The stream order, flow type, hydrology, and riparian area of the streams to be impacted.
- Using the Michigan Stream Quantification Tool (MiSQT), or a comparable functional assessment methodology approved by EGLE, show how stream functions impacted or lost due to the proposed project will be replaced at the stream mitigation site (functional lift).

Section II. Site Selection

A description of the factors considered during the site selection process, including:

- How the site selected for mitigation exhibits stream functions that can be improved (assessment of the mitigation site).
- A map showing the location of the mitigation site in relationship to the impact site – include information on the HUC 8 and 10 watersheds.
- A map showing the location of the mitigation site in relation to surrounding roads and other landmarks.
- Catchment assessment form in the MiSQT

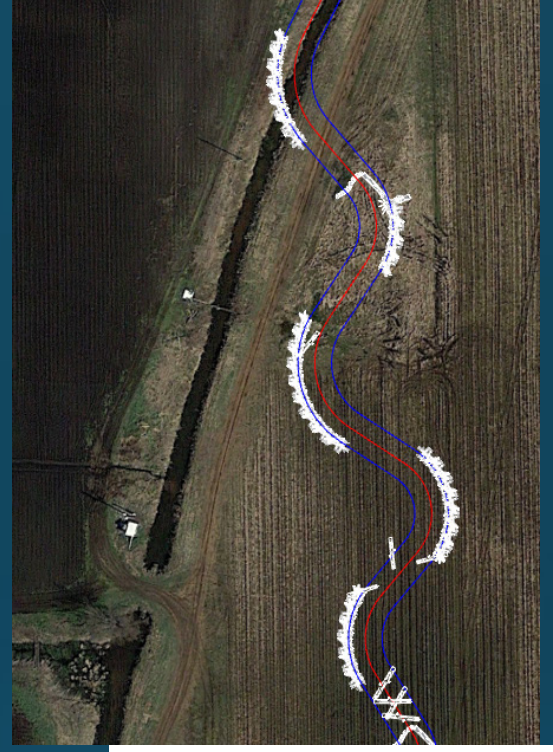
Section III. Site Protection Instrument

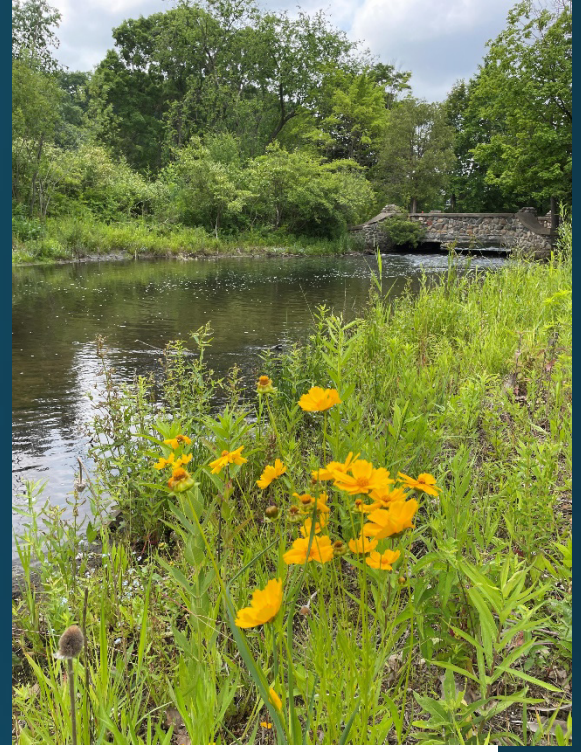
A description of the legal arrangements and instrument that will be used to ensure the long-term protection of the compensatory mitigation project site, which shall include the stream channel and associated riparian buffer area.

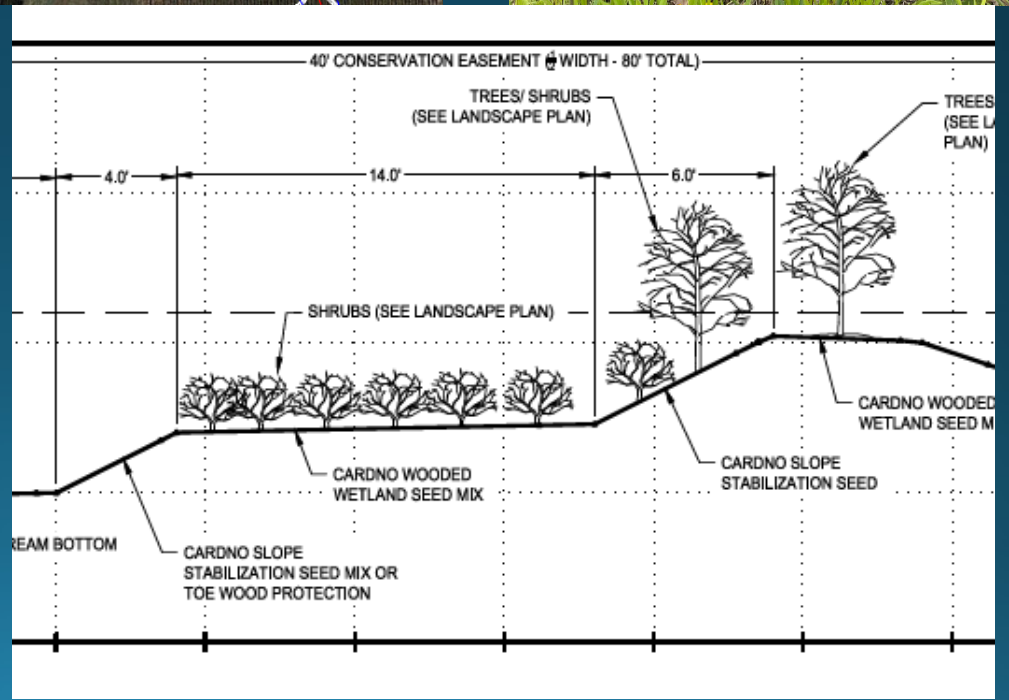
- Information on current site ownership and any other easements.
- The conservation easement, drain agreement, and/or any other provisions for the long-term protection of the site. For stream mitigation performed on designated county drains, the applicant will be required to secure a drain agreement from the local agency with jurisdiction over the county drain (typically the county drain commissioner) in addition to a conservation easement from the landowner.

Stream Mitigation Plan Checklist *--- new!*

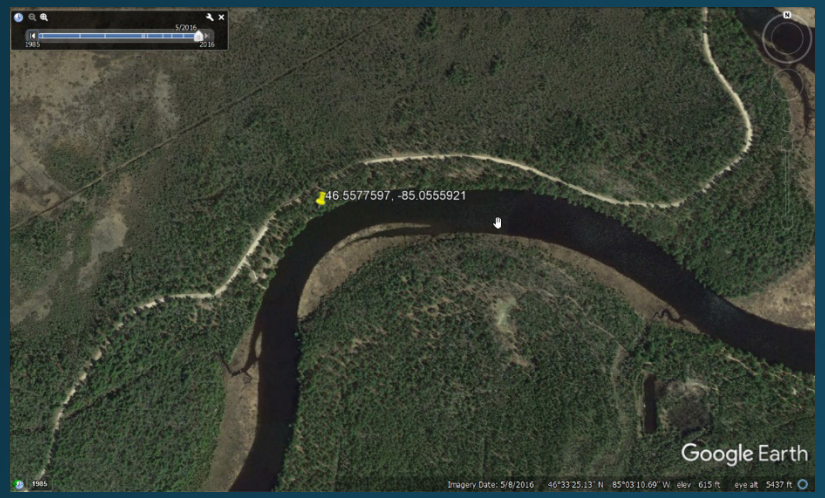
1) Site Selection
2) Site Protection Instruments and Financial Assurances
3) Baseline Assessment Information (MiSQT) for the Impact and Mitigation sites
4) Functional lift at the Mitigation Site (MiSQT)
5) Design plans including vegetation plan
6) Monitoring and Performance Standards
7) Adaptive Management







MiSQT: Assessing Stream Functions



Michigan Stream Quantification Tool

Data Collection and Analysis Manual

EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

StreamMechanics
EPR ECOSYSTEM PLANNING & RESTORATION

MiSQT Functional Assessment

- A functional assessment is needed for:
  - The impacted stream channel and the mitigation stream channel
    1. Existing condition (measured in field)
    2. Proposed condition (estimated from design plans)
- Impact Site:
  - Existing condition - Proposed condition = FUNCTIONAL LOSS
- Mitigation Site:
  - Proposed condition – Existing condition = FUNCTIONAL LIFT

Michigan Stream Quantification Tool (MiSQT)

- The MiSQT was developed to be able to:
  - Quantitatively and objectively assess stream function
  - Show the functional lift from stream mitigation projects
- A main goal of the SQT is to produce objective, verifiable, and repeatable results.
- The MiSQT is:
  - A calculator to determine numerical differences between an existing (degraded) stream condition and the proposed (restored) stream condition. This difference is known as functional lift.
  - a science based, technical spreadsheet tool

Purposes of the MiSQT

- Determine stream mitigation "credits" (functional lift) by calculating numerical differences between an existing and proposed stream condition.
- Link restoration activities (e.g., two-stage channel, bank stabilization, vegetated buffer, etc.) to increases in stream function.
- Link restoration goals to restoration potential.
- Incentivize high-quality stream mitigation.
- Assist with site selection

Stream Functions Assessed in the MiSQT

- Reach Runoff
- Floodplain Connectivity
- Large Woody Debris
- Lateral Migration
- Riparian Buffer (size and quality)
- Bedform Diversity (riffles and pools)
- Water Quality
- Biology

MiSQT Scoring

Not Functioning	Functioning-At-Risk	Functioning
0.0 - 0.29	0.3 – 0.69	0.7 – 1.0

The MiSQT scores stream functions on a scale of 0.0 to 1.0

MiSQT Workbook

EXISTING CONDITION ASSESSMENT					Roll Up Scoring			
Functional Category	Function-Based Parameters	Metric	Field Value	Index Value	Parameter	Category	Category	Overall
Hydrology	Reach Runoff	Land Use Change Coefficient	64	0.46	0.23	0.23	Not Functioning	
		Concentrated Flow Points (#/1000 LF)	3.39	0.00				
Hydraulics	Floodplain Connectivity	Bank Height Ratio	2	0.00	0.25	0.25	Not Functioning	
		Entrenchment Ratio	1.3	0.50				
Geomorphology	Large Woody Debris	LWD Index	0	0.00	0.00	0.24	Not Functioning	0.14
	Lateral Migration	Dominant BEHI/NBS	M/M	0.50	0.68			
		Percent Streambank Erosion (%)	10	0.70				
		Percent Streambank Armoring (%)	5	0.83				
	Riparian Vegetation	Buffer Width (ft)	27	0.31	0.28			
		Average DBH (Inches)	5.8	0.48				
		Tree Density (#/Ac)	9.4	0.10				
		Native Shrub/Sapling Density (#/Ac)	21.4	0.21				
		Native Herbaceous Cover (%)						
	Bed Form Diversity	Pool Spacing Ratio	100	0.00	0.00			
		Pool Depth Ratio	0	0.00				
		Percent Riffle (%)	0	0.00				
		Aggradation Ratio						
Physicochemical	Temperature	July Mean Temperature (°F)						
	Bacteria	E. Coli (cfu/100 ml)						
	Nutrients	Total Phosphorus (mcg/L)						
	Dissolved Oxygen	DO Concentration (mg/L)						
Biology	Macroinvertebrates	Macroinvertebrate P51 Index Score						
		Macroinvertebrate P22 Index Score						
	Fish	Fish P51 Index Score						

MiSQT Workbook

FUNCTION-BASED PARAMETER SUMMARY			
Functional Category	**Function-Based Parameters**	**Existing Parameter**	**Proposed Parameter**
Hydrology	Reach Runoff	0.23	0.40
Hydraulics	Floodplain Connectivity	0.25	1.00
Geomorphology	Large Woody Debris	0.00	0.00
	Lateral Migration	0.68	1.00
	Riparian Vegetation	0.28	0.51
	Bed Form Diversity	0.00	0.80
Physicochemical	Temperature		
	Bacteria		
	Nutrients		
	Dissolved Oxygen		
Biology	Macroinvertebrates		
	Fish		

FUNCTIONAL CHANGE SUMMARY	
Existing Condition Score (ECS)	0.14
Proposed Condition Score (PCS)	0.40
Change in Functional Condition (PCS - ECS)	0.26
Percent Condition Change	186%
Existing Stream Length (ft)	2363
Proposed Stream Length (ft)	2363
Additional Stream Length (ft)	0
Existing Functional Foot Score (FFS)	331
Proposed Functional Foot Score (FFS)	945
Proposed FFS - Existing FFS (ΔFF)	**614.4 P1**
Yield (ΔFF/Proposed LF)	0.26

Differences between existing and proposed scores multiplied by the stream lengths shows the amount of functional lift or functional improvement in the mitigation project.

New EGLE MiSQT web page!

- www.mi.gov/lakesandstreams
- MiSQT workbooks and field manuals
- Field methodologies and calculators
- Introductory webinar recordings

Thank You!

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