



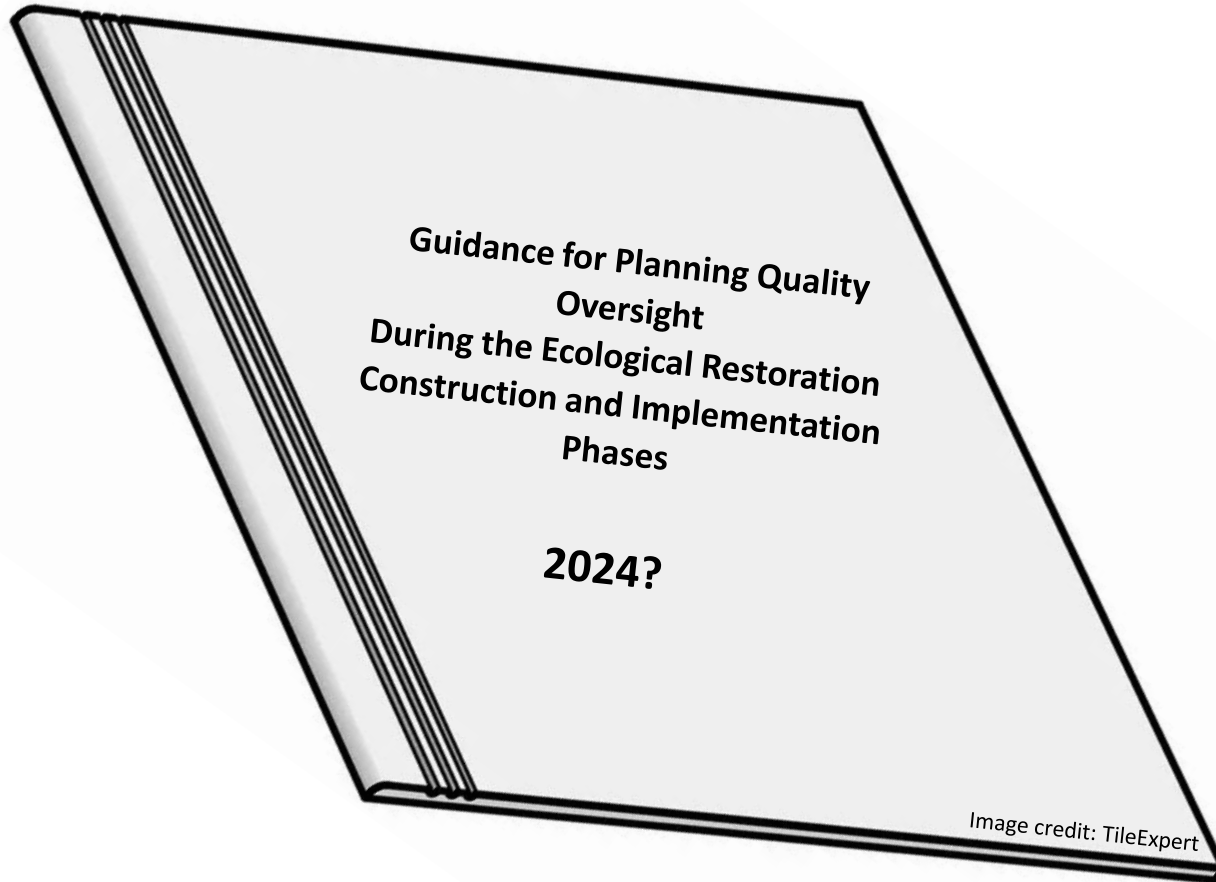
Build It And They Will Come
IF It's Built Correctly:

Quality Control During Construction of Restoration Projects

Tim Lewis, Craig Palmer, Molly Middlebrook, and Brick Fevold,
General Dynamics Information Technology

Lou Blume

U.S. Environmental Protection Agency, Chicago, IL





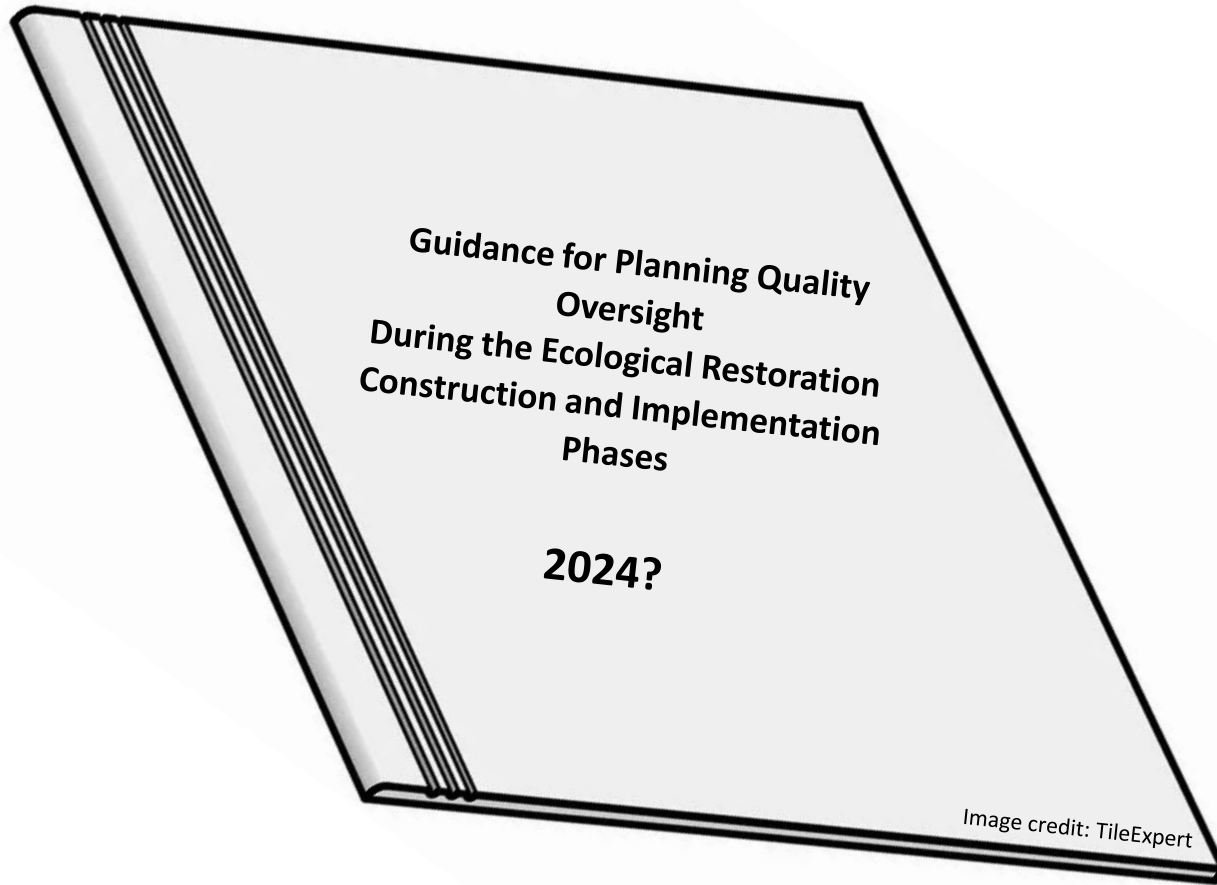
Remediation





Restoration





Implementation Monitoring



Effectiveness Monitoring

Implementation

Implementation monitoring involves tracking and assessing the activities and processes carried out during the restoration project.



Effectiveness

Effectiveness monitoring involves assessing the outcomes and impacts of the restoration efforts on the ecosystem.



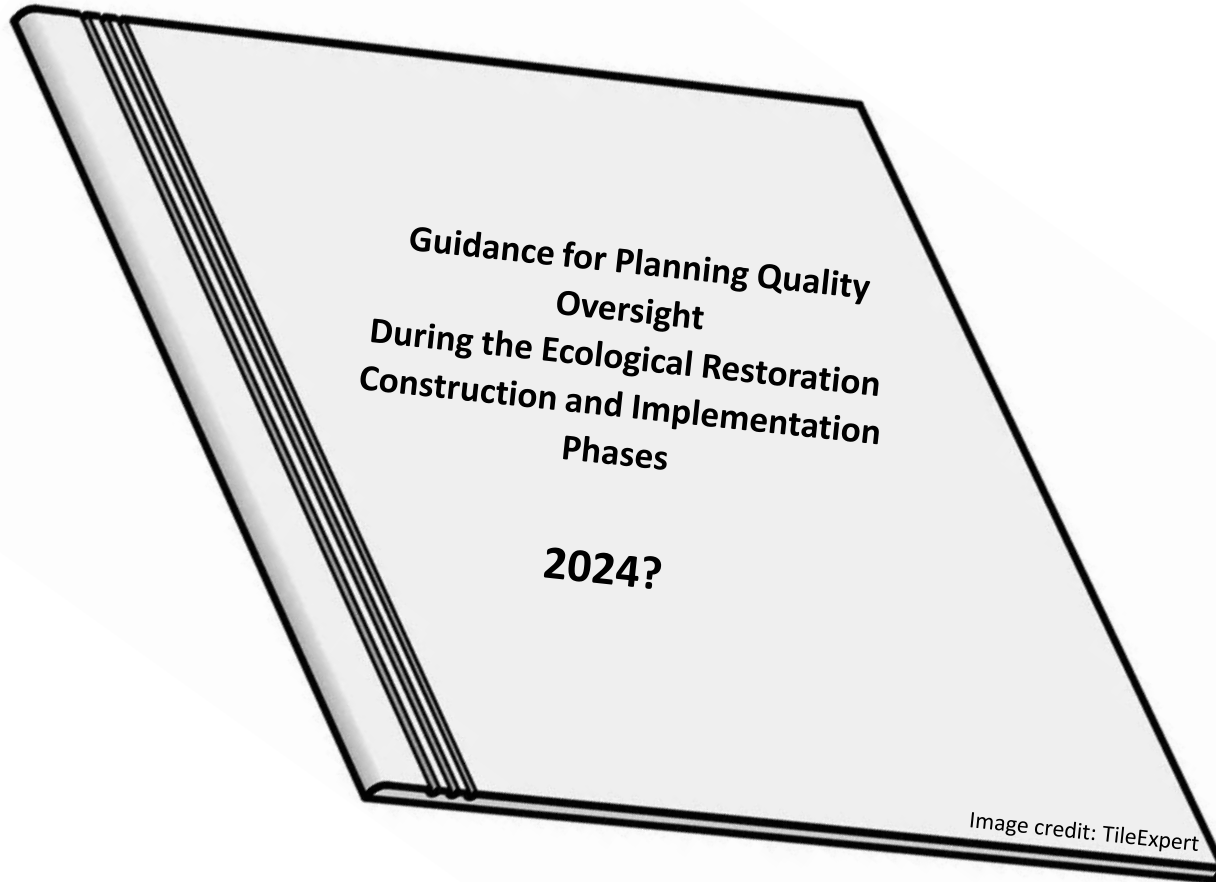
QA

Quality assurance ensures that the results come out as expected since it aims to improve processes in order to prevent things from going wrong in the future

QC

Quality control ensures that the right things are being done as it focuses on detecting issues and correcting them







Project Management

Inspection, Testing, Control,
and Tracking

Assessment and Reporting

Verification/Validation and
Acceptance of Completed
Project

Image credit: Shutterstock

Project Management

- Roles and Responsibilities
- Communication and Lines of Authority
- Organization Chart and QD Map
- List the DFOWs and Conceptual Model
- Permits
- Project Schedule



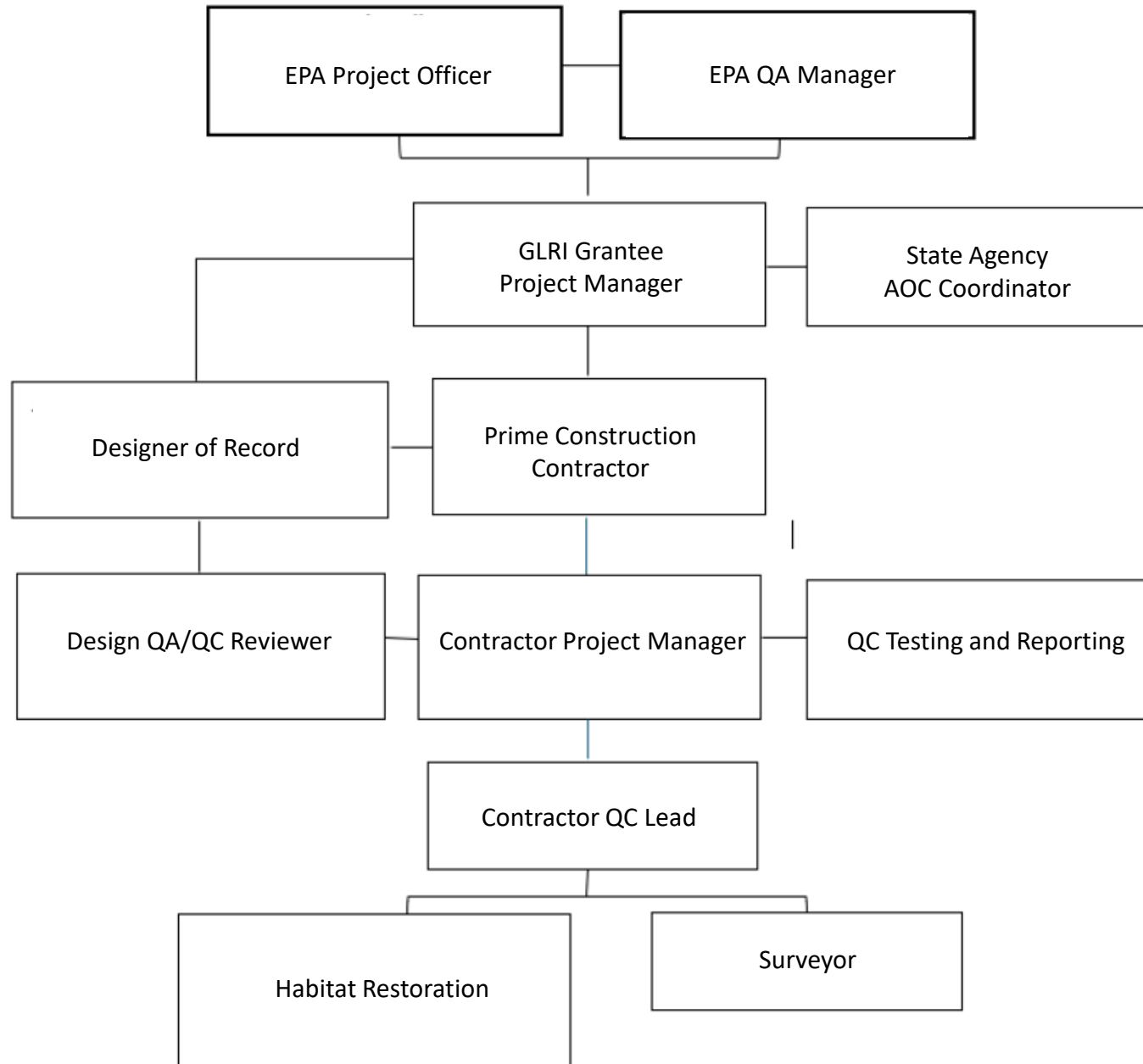
Image credit: W. Edwards Deming Institute

“Quality is everyone's responsibility.”

W. Edwards Deming

“Everybody, somebody, nobody”.

Source: Somebody



Project Management

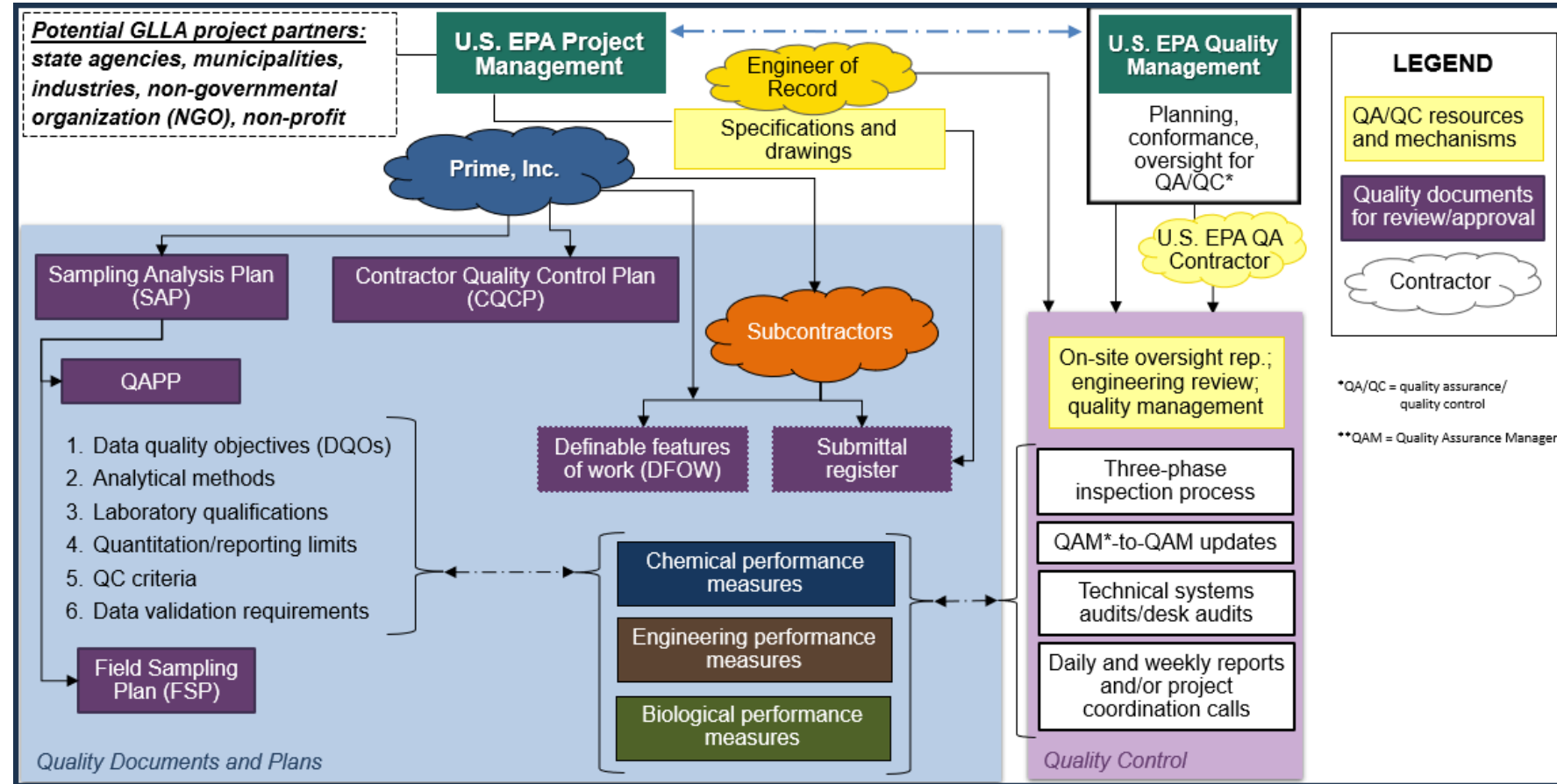
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Project Management

- Roles and Responsibilities
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Quality Document Map

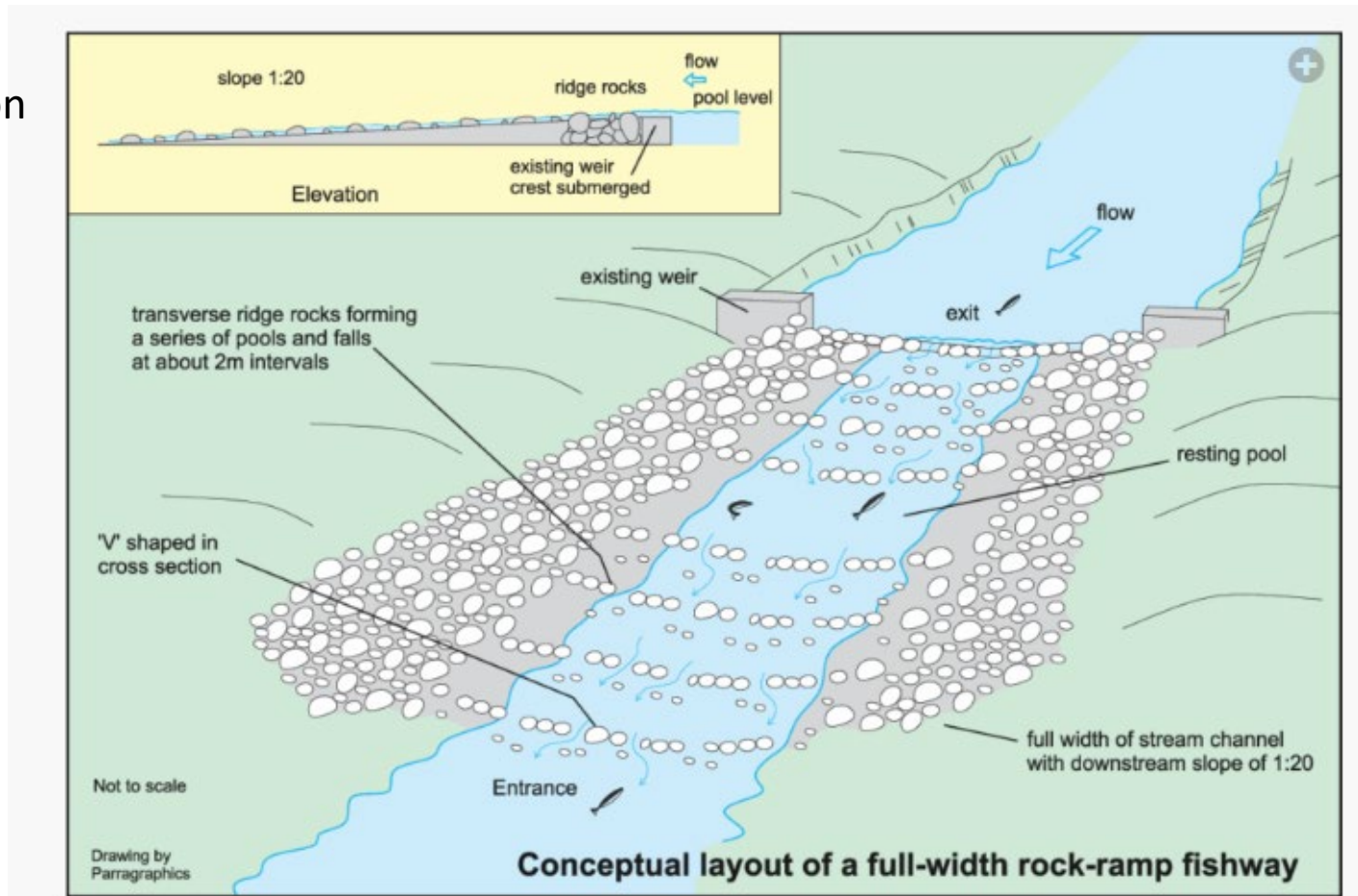


Definable Features of Work (DFOW)

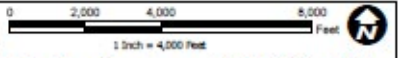
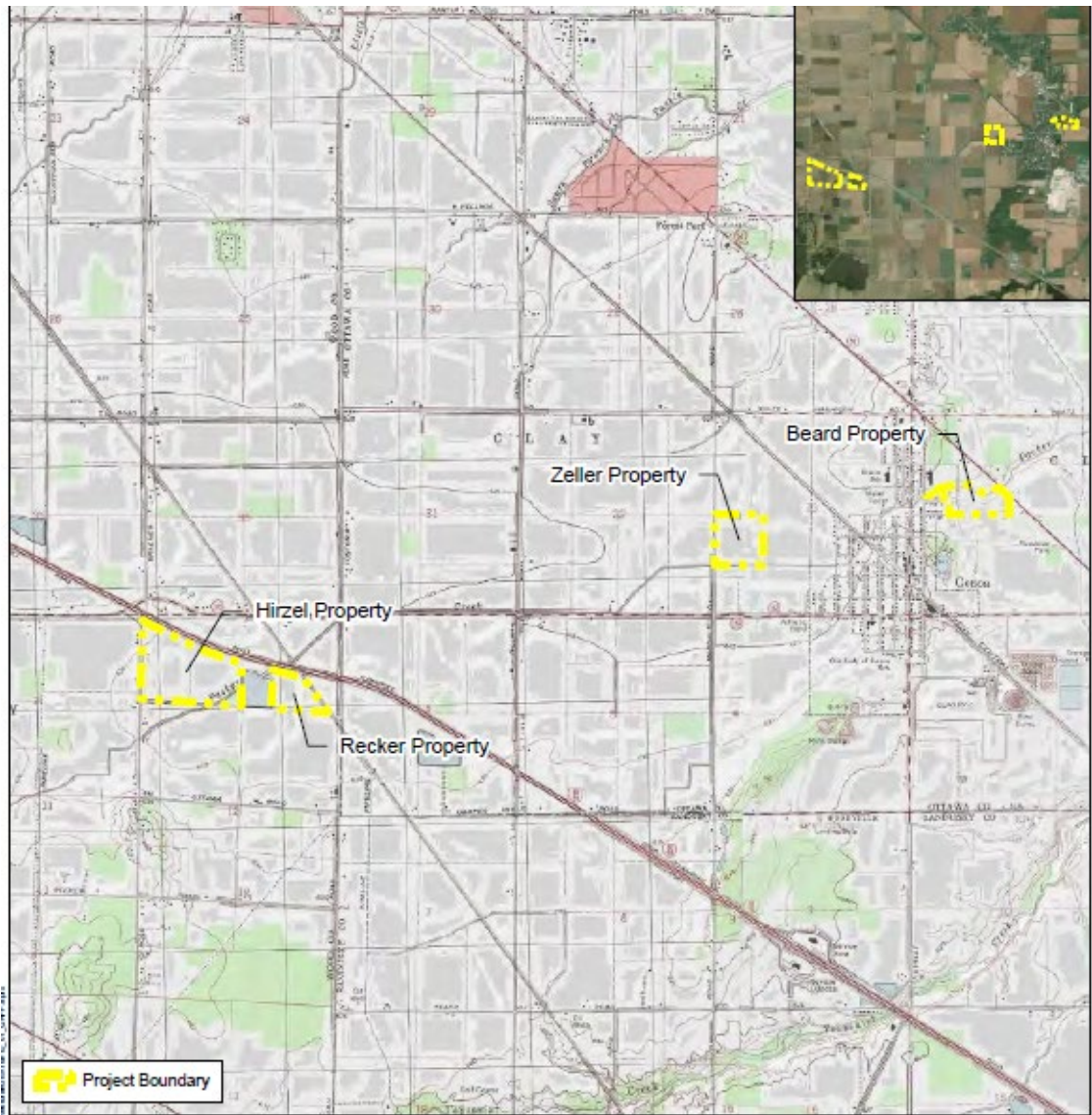
- Mobilization
- Clearing and Grubbing
- Mass Grading – 1:20 downstream slope
- Placement of ridge rocks
- Create rearing pool
- Planting native riparian vegetation
- Demobilization

Project Management

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Source: Philadelphia Water Department



Quadrangles: Genoa & Walbridge, Ohio

Source: The topographic map was acquired through the National Geographic Society Web Service.

The aerial photo in the inset was acquired through the Esri Imagery Web Service. Aerial photography dated 2020 and 2021.



Definable Features of Work (DFOW)

- Mobilization
- Clearing and Grubbing
- Mass Grading – Water Quality Ponds
- Green Bulkhead Fabrication
- Green Bulkhead Installation
- Wetland / Water Quality Pond Establishment
- Irrigation and Plantings
- Site Restoration
- Demobilization

Project Management

- Roles and Responsibilities
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- Permits
- **Project Schedule**

Irishtown Bend - Green Bulkhead Schedule GREEN BULKHEAD	2021					2022												2023												2024												
	August-21	September-21	October-21	November-21	December-21	January-22	February-22	March-22	April-22	May-22	June-22	July-22	August-22	September-22	October-22	November-22	December-22	January-23	February-23	March-23	April-23	May-23	June-23	July-23	August-23	September-23	October-23	November-23	December-23	January-24	February-24	March-24	April-24	May-24	June-24	July-24	August-24	September-24				
Design																																										
100% Bidding Documents Completed																																										
Permitting and Plan Development(QAPP)																																										
Bid and Award																																										
Project Bidding																																										
Recommend/Approve/Award GMP																																										
Construction																																										
Mobilization																																										
Clearing & Grubbing																																										
Mass Grading - WQ Ponds																																										
BULKHEAD CONSTRUCTION [NOT GLRI]																																										
Green Bulkhead Fabrication																																										
Green Bulkhead Installation																																										
Wetland/WQ Ponds																																										
Irrigation and Plantings																																										
Site Restoration [NOT GLRI]																																										

Inspection, Testing, Control, and Tracking

Establish tech specs and error tolerances

- Materials
 - Certified
 - Testing
- Constructed features
 - Design specs – tolerance limits
 - Confirmatory measurements
 - Direct observations
- Daily inspections and audits
- Corrective actions

Existing Data



Image credit: Meta AI

Establish tech specs and error tolerances

- ☐ Materials
 - Certified
 - Testing

State of Utah
DEPARTMENT OF AGRICULTURE AND FOOD
220 West 4000 East, Salt Lake City, Utah 84114-6000

Issued Date: 2/23/2018
Division of Plant Industry
Phone: 801-225-1100
Fax: 801-225-1100

OFFICIAL SEED ANALYSIS REPORT No. 6298

SAMPLED AT: MOUNTAIN VALLEY SEED
175 W 2100 S
SALT LAKE CITY, UT 84115

Person Supplying Material: JERRY SAWYER
Shipped/Received Date:
Invoice No.:
Inspection Requested No.:
Kinds and Variety: SUCROHEAL SPROUTING ORGANICS
Lot No.:
No. Bags: Sample: 1
Sample Weight: 1
No. On Hand: 20412
Inspector No.: 20412
Wholesale to Sampling: JERRY SAWYER
Wholesale to Consumer: JERRY SAWYER
Net Weight: 4 cwt
Designation No.:
Grade: 2018

DESCRIPTION OF SHIPMENT:
No. Containers:
Container:
Crate:
No. Bags Described: 1000
Inspection Method: SPOCKETS
Sampling Or Lot No. Stenciled on Bags Or Other Description of Containers: 1000
Labeling Method: Yes No

DESCRIPTION OF LABELING:
Similar Labels on All Bags? Yes No

Dealer: HANBY PLANTVY
175 W 2100 S
SALT LAKE CITY, UT 84115
No. 11000
Sample Received by Lab: 1/31/2018

Seed Test Result

Pure Seed %	Net Seed %	Germination %	Meaningful Weight (g)	Test Date	Origin
98.0	98.0	98.0	113.0 (90)	2/23/2018	MA
98.0	98.0	98.0	113.0 (90)	2/23/2018	MA
98.0	98.0	98.0	113.0 (90)	2/23/2018	MA
98.0	98.0	98.0	113.0 (90)	2/23/2018	MA
98.0	98.0	98.0	113.0 (90)	2/23/2018	MA

FOUND BY STATE LAB
Word Search: MA

Field and Variety:
Cultivar: SUCROHEAL SPROUTING ORGANICS
Test: BUCKWHEAT
Contract Number: Word Search: MA

Program Manager: Terry Freeman

trueleafmarket.com

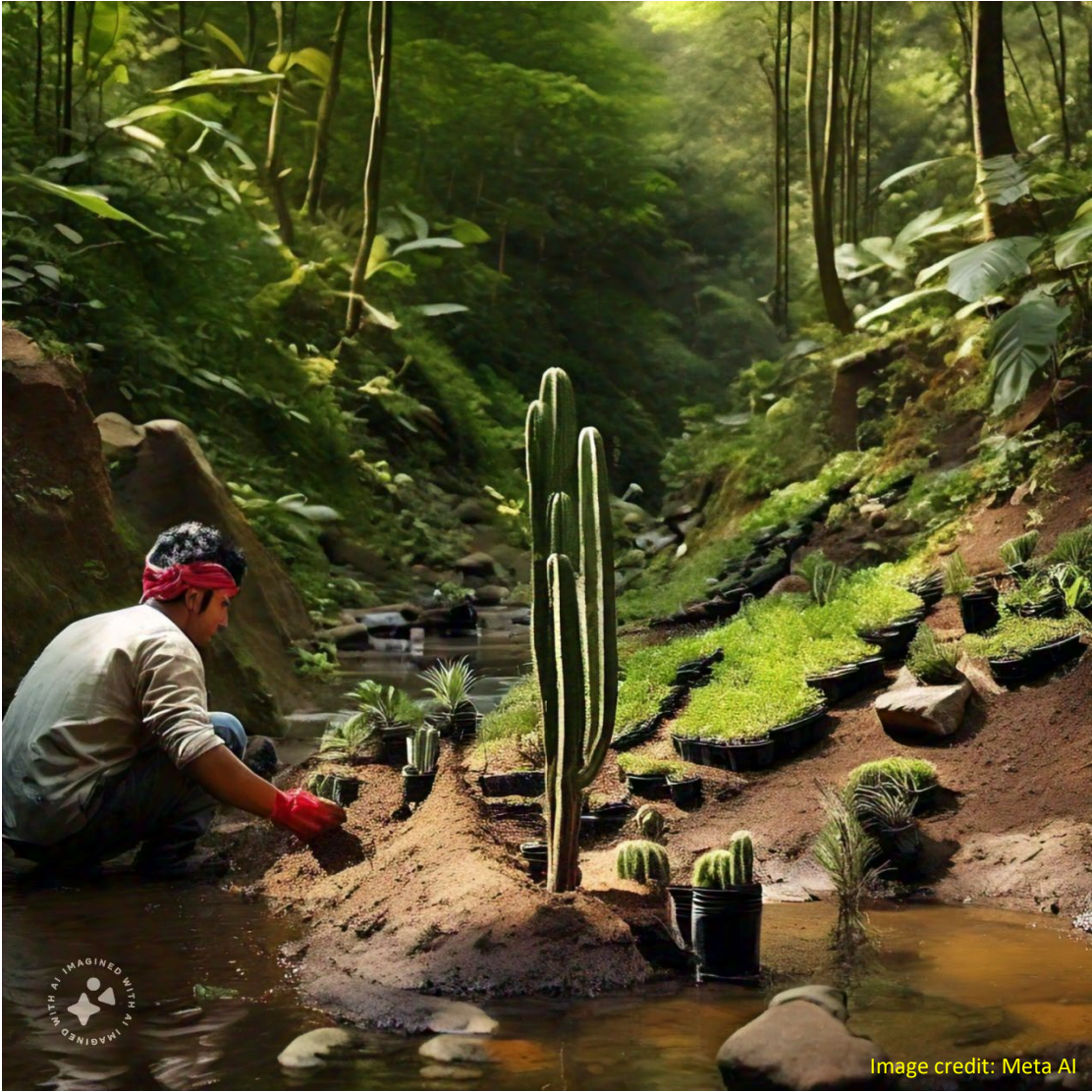


Image credit: Meta AI

Establish tech specs and error tolerances

- ❑ Materials
 - Certified
 - Testing



Image credit: Meta AI

Establish tech specs and error tolerances

☐ Materials

Certified Testing

Sample Description	Type 1 (25mm)	Type 2 (19mm)	Type 3 (9.5mm)	ASTM C 33-03		Check with standard ASTM
	Coarse Aggregate Mix Of Aggregate			min	max	
SIEVE SIZE mm	% Passing			% Passing	% Passing	
37.5	100	100	100	100	100	OK
25	100	100	100	100	100	OK
19	83.3	90	100	90	100	NOT OK
12.5	41.2	35	80	35	80	
9.5	28.2	20	55	20	55	OK
4.75	8.6	0	10	0	10	OK
2.63	3.2	0	5	0	5	OK



Image credit; Meta AI

❑ Constructed features

Design specs – tolerance limits

Confirmatory measurements

Direct observations

Pepper ... And Salt

THE WALL STREET JOURNAL



*"Try to stay within
the margin of error, Sam."*



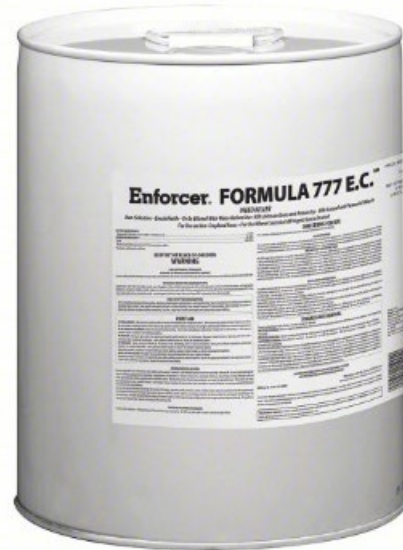
Image credit: Meta AI

❑ Constructed features

Design specs – tolerance limits

Confirmatory measurements

Direct observations



❑ Deconstructed features

Design specs – tolerance limits

Confirmatory measurements

Direct observations



Image credit: EnviroScience, Inc.

- ❌ Daily inspections and audits
- ❌ Corrective actions



Image credit: Meta AI

Inspection, Testing, Control, and Tracking



Assessment and Reporting

Examples of independent QA assessments of QC inspections:

- Confirm all QC tests were performed
- Check results of QC tests for meeting tech specs
- Verify that complete records are maintained of all QC tests and inspections
- Assess whether proper M&TE were used and calibrated
- Confirm that all corrective actions were implemented and nonconformances resolved
- Compare verification test results to QC test results and reconcile discrepancies

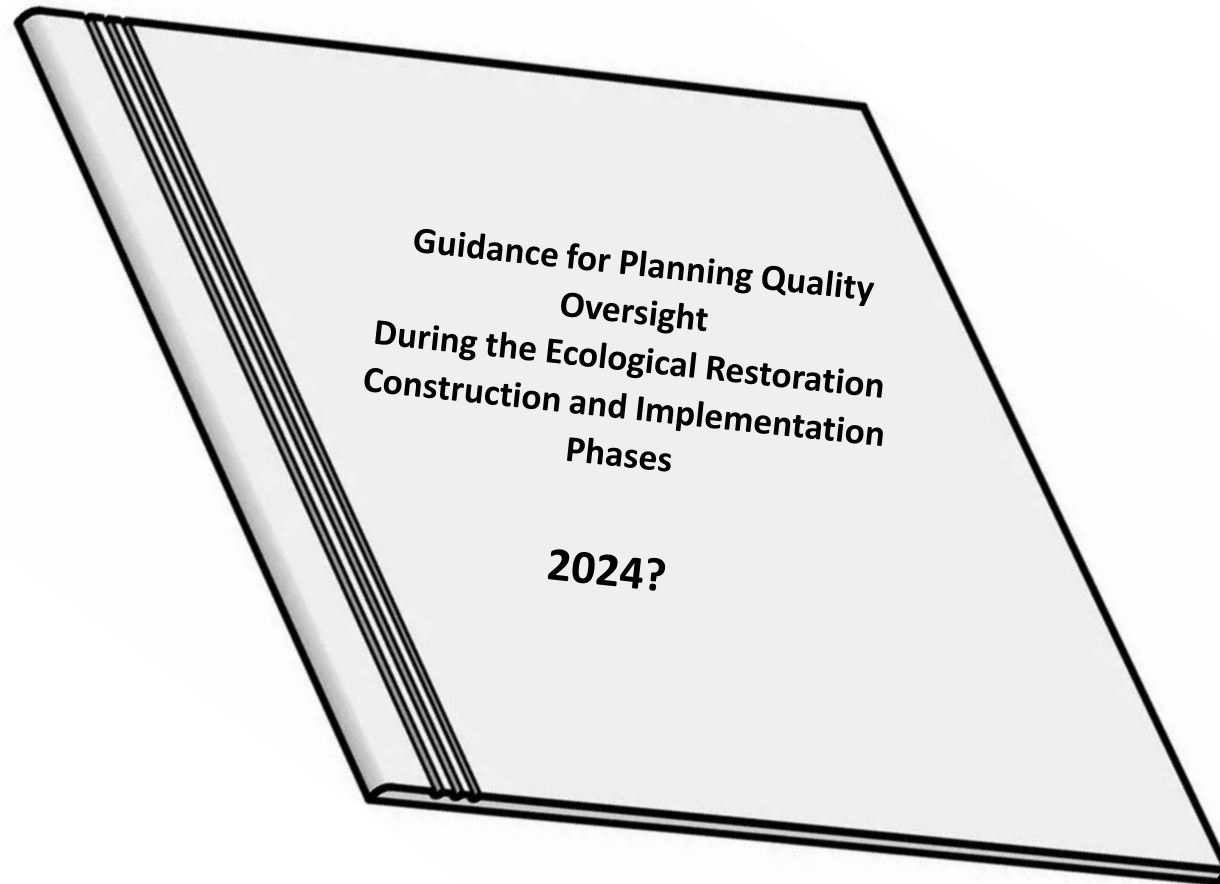


Verification/Validation and Acceptance of Completed Project

- Methods for analyzing QC data (QC charts, Pareto charts, etc.)
- Project closeout – as-built records, project documentation, project verification statement
- Maintenance requirements and warranties
- Long-term effectiveness monitoring and adaptive management



Summary





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U.S. Environmental Protection Agency, Chicago, IL

Acknowledgments

Technical Reviewer	Affiliation
<ul style="list-style-type: none">• Danielle Algazi• Kelly Krock• Michael Mansolino	U.S. EPA Region 3
<ul style="list-style-type: none">• Caroline Keson• Leah Clark• Dana Strouse	Michigan Department of Environment, Great Lakes, and Energy (EGLE)
<ul style="list-style-type: none">• Joshua Unghire• Kathleen Lewis• Brian Steils	U.S. Army Corps of Engineers (USACE)
<ul style="list-style-type: none">• Donalea Dinsmore	Wisconsin Department of Natural Resources (WI DNR)
<ul style="list-style-type: none">• Zachary Jorgenson	Bureau of Indian Affairs
<ul style="list-style-type: none">• Peter C. Smiley Jr.	U.S. Department of Agriculture, Agricultural Research Service (USDA ARS)

Thank You

