Three Phases of Design in Compensatory Mitigation Projects

ASWM Webinar # 6: An Ecological Framework for Compensatory Mitigation: Conceptual to Final Design
May 15, 2019
Phases of a Mitigation Project Design

- **Conceptual Design** – Initial ideas and concepts at the Feasibility phase for developing a mitigation project that involves selecting a “Preferred” concept that may or may not be moved into the last phases of Design.

- **Preliminary Design** – Beginning of engineering efforts in developing the plans and details of a mitigation project.

- **Final Design** – Final efforts to formalize the plans and specifications for contractor bidding and construction activities. Ready to build.
Conceptual Designs

• Initial ideas and concepts towards development of a mitigation plan.
• Simply pen to paper with little engineering or design components. A GIS exercise usually prepared on an aerial photograph or a topographic map.
• Development of several concepts that may result in the selection of “Preferred” or “Hybrid” concept to move into design.
• Need to know potential credit yields for the various types of mitigation.
• Determining costs/benefits of a project.
One of six mitigation concept plans developed for the Schriever Meadows mitigation site near Libby Montana. Project included wetland and stream restoration.
Final constructed Schrieber Meadows mitigation site near Libby Montana. This was a “Hybrid” Design that incorporated designs from several concepts.
Conceptual Designs

- Opportunity for Interagency Review Team (IRT) to review Concepts early. **Site visits a must.**
- Early coordination allows for early input from IRT.
- Need for IRT and Project proponents to sit down prior to a formal submission to flesh out concepts.
- Provides a decision point for a “Preferred”, “Hybrid” or “No Build” concept design.
Parameters Needed for Conceptual Design

- Geomorphic / Topographic position of site.
- Type of Mitigation Project to be undertaken:
  - Establishment, Re-Establishment, Rehabilitation, Enhancement, Preservation, Stream Restoration
- Target Aquatic Resource Communities:
- Sources of Water and seasonality –
  - Groundwater, Surface Water, Irrigation
  - Water rights
  - Durations
  - Flood frequency
- USACE and IRT review and input on various concepts.
Early conceptual mitigation credit scheme developed for a proposed project involving stream and wetland restoration.
Parameters Needed for Conceptual Design

• Credit development
  – How many acres of different mitigation types?
  – What are proposed vegetation communities?
  – How many acres of upland buffer?

• Constructability – What will it take to construct, or is it even feasible to construct?

• BUDGET$$

• COSTS of project:
  – Design
  – Right of Way or Land Costs
  – Construction Costs

• Cost/Benefit Analysis – What are the costs per wetland/stream credit?
Example Concept #1 of an Establishment conceptual design in Montana.
Example Concept # 2 of an Establishment conceptual design in Montana.
Example Concept #3 of an Establishment conceptual design in Montana.
DECISION POINT

- Cost/benefit analysis prepared for each concept for selecting the “Preferred” or “Hybrid” concept.
  - Wetland credits per type and Concept
  - $$$ per wetland credit acre / functional unit
- Comparison of costs between each Concept to determine the “Preferred” alternative.
- May result in a “Hybrid” version of the various Concepts.
- Decision point as to whether or not it is economically feasible to pursue a project before getting into Preliminary Design efforts.
## 6.0 SUMMARY OF WETLAND DEVELOPMENT CONCEPTS

Table 5 provides a brief comparison of the major components, targeted mitigation types, estimated construction costs, and potential credits for each development concept.

### Table 5: Comparison of Wetland Development Concepts

<table>
<thead>
<tr>
<th>Design Component</th>
<th>Concept 1 - Maximize Wetland Development</th>
<th>Concept 2 - Expand Bouchard SE</th>
<th>Concept 3 - Expand Bouchard SW and SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Description</td>
<td>Excavate 3 wetland cells, wetland/upland planting and seeding</td>
<td>Excavate 2 wetland cells, wetland/upland planting and seeding</td>
<td>Excavate 3 wetland cells, wetland/upland planting and seeding</td>
</tr>
<tr>
<td></td>
<td>3.18 acres</td>
<td>3.17 acres</td>
<td>2.77 acres</td>
</tr>
<tr>
<td>Excavated Area on Bouchard</td>
<td>6.36 acres</td>
<td>4.82 acres</td>
<td>5.14 acres</td>
</tr>
<tr>
<td>Wetland Creation</td>
<td>9.57 acres</td>
<td>7.99 acres</td>
<td>7.91 acres</td>
</tr>
<tr>
<td>Upland Buffer</td>
<td>3.60 acres</td>
<td>2.61 acres</td>
<td>3.10 acres</td>
</tr>
<tr>
<td>Schlummer Access Road</td>
<td>Obliterate road along northern boundary of property.</td>
<td>Obliterate road along northern boundary of property.</td>
<td>Obliterate road along northern boundary of property.</td>
</tr>
<tr>
<td>Provide new US 93 Approach and Access Easement to CSKT Mitigation Parcel</td>
<td>Develop new approach at US Hwy 93 and provide new gate for access to Schlummer Property.</td>
<td>Develop new approach at US Hwy 93 and provide new gate for access to Schlummer Property.</td>
<td>Develop new approach at US Hwy 93 and provide new gate for access to Schlummer Property.</td>
</tr>
<tr>
<td></td>
<td>Retain existing approach/parking area and gate east of US Hwy 93 at NE corner of Schlummer property.</td>
<td>Retain existing approach/parking area and gate east of US Hwy 93 at NE corner of Schlummer property.</td>
<td>Retain existing approach/parking area and gate east of US Hwy 93 at NE corner of Schlummer property.</td>
</tr>
<tr>
<td>Fencing Revisions</td>
<td>Remove and obliterate existing fence between Bouchard and Schlummer properties.</td>
<td>Remove and obliterate existing fence between Bouchard and Schlummer properties.</td>
<td>Remove and obliterate existing fence between Bouchard and Schlummer properties.</td>
</tr>
<tr>
<td></td>
<td>Install new wildlife-friendly farm fence along south and east boundary of Schlummer Property.</td>
<td>Install new wildlife-friendly farm fence along south and east boundary of Schlummer Property.</td>
<td>Install new wildlife-friendly farm fence along south and east boundary of Schlummer Property.</td>
</tr>
<tr>
<td></td>
<td>Remove existing L-W cross-fencing on Schlummer property.</td>
<td>Remove existing L-W cross-fencing on Schlummer property.</td>
<td>Remove existing L-W cross-fencing on Schlummer property.</td>
</tr>
<tr>
<td></td>
<td>Install new dual-tubular steel barrier gates at SW and SE corners of Schlummer property for access easement to CSKT mitigation parcel.</td>
<td>Install new dual-tubular steel barrier gates at SW and SE corners of Schlummer property for access easement to CSKT mitigation parcel.</td>
<td>Install new dual-tubular steel barrier gates at SW and SE corners of Schlummer property for access easement to CSKT mitigation parcel.</td>
</tr>
<tr>
<td>Utilities/Miscellaneous.</td>
<td>Remove or abandon buried PVC waterline along eastern fence line of Schlummer property.</td>
<td>Remove or abandon buried PVC waterline along eastern fence line of Schlummer property.</td>
<td>Remove or abandon buried PVC waterline along eastern fence line of Schlummer property.</td>
</tr>
<tr>
<td></td>
<td>Consider retaining waterline and negotiating agreement with Schall to water planted woody shrubs for initial one or two seasons.</td>
<td>Consider retaining waterline and negotiating agreement with Schall to water planted woody shrubs for initial one or two seasons.</td>
<td>Consider retaining waterline and negotiating agreement with Schall to water planted woody shrubs for initial one or two seasons.</td>
</tr>
</tbody>
</table>

### Proposed Credits

- **Concept 1:** $237,817
- **Concept 2:** $213,239
- **Concept 3:** $204,907

### Attributes in all Concepts

- Retain existing approach/parking area and gate east of US Hwy 93 at NE corner of Schlummer property.
- Maintain room for parking inside highway R/W fence.

### Estimated Construction Costs

- **Concept 1:** $237,817
- **Concept 2:** $213,239
- **Concept 3:** $204,907

### Potential CofC Credits

- **Concept 1:** 10.29
- **Concept 2:** 8.55
- **Concept 3:** 8.53

### Potential CSKT Credits

- **Concept 1:** 4.09
- **Concept 2:** 3.37
- **Concept 3:** 3.41
Schriever Lake aquatic mitigation credit Hybrid design concept showing the modifications for proposed wetland mitigation types and stream locations after agency review and comments.
Preliminary Design Plan Development

• Topographic surveys critically important for developing wetland designs at 6” to 1 foot contours.
• Hydraulic design analysis:
  – Direction of water flows through property
  – Groundwater elevations (GW Wells, depths, durations, seasonality)
  – Water budget for wetlands to evaluate sources of water for wetland
  – Quantities of consumptive water needed for water rights.
• Design parameters (slopes/depths/area), # of wetlands, islands, water control structures, berms, habitat structures, borrow/fill/material quantities, construction costs, etc.
• Cross-sections, typical details, erosion/control, and initial seeding/planting plans.
Drawing of Existing Topography
Sportsman’s Campground – Preliminary Design showing proposed excavated depressions, preserved wetlands and shrubs, and limits of borrow excavation.
Development of Preliminary Typical Cross-Section designs for agency review and comment.
Sportsman’s Campground – Changes in Design made at concept level created channels around islands for low water refugia as seasonal groundwater recedes for aquatic organisms.
View of flooded Sportsman’s Campground mitigation site in June 2018. Seasonally inundated and emergent and woody scrub/shrub vegetation communities developing rapidly.

Don’t judge books by the Cover!!
Sportsman’s Campground site in late August 2017, showing emergent and scrub/shrub habitat after water draws down from spring.
Preliminary Design with cross-section, size of excavated wetlands, water elevations, water volumes, streambank work, etc.
Final Design

• Major components should include:
  – design plans
  – cross-sections
  – earthwork and material quantities
  – project plan details – water controls, habitat structures, etc.
  – special provisions
  – plan /site overview
  – planting/seeding plans
  – final crediting plan

• No major changes at this phase. If major changes are required, delays will occur to project schedule and construction windows.

• Review focus on plan details, coordinates, elevations, plan sheets, quantities, specifications, and construction cost estimates.
Final Mitigation Design overview drawing of the Schrieber Lake mitigation project.
Wetland cell excavations, cross-sections and coordinates /elevations for contractor for Schrieber Lake wetland cells.
Proposed Seeding and Planting plans for contractor. May change after construction due to areas of disturbance.
Final Design Continued

- Finalizing project plans and specifications for construction.
- Permit applications – Submission to regulatory agencies for approvals.
- Preparing final engineering estimates and quantities for bid package.
- Addition of Approved Permit conditions to specifications.
- Let to Bid for Construction.
- To Construction
Final mitigation credit plan sheet for submission to USACE.
Listing of Special Provisions for the project. Example:

15. REVEGETATION

A. DESCRIPTION. All disturbed areas associated with the completion of this project are to be seeded as specified below; including any and all haul roads, former homestead area and the former access road into the Schrieber Lake site.

B. MATERIALS. Use the following seed mixture and rates.
1) Use the following seed mixture and rates around the perimeter of all wetland cells.

WETLAND SEED MIXTURE

<table>
<thead>
<tr>
<th>Species</th>
<th>kgs of PLS per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tufted hairgrass</td>
<td>1.0</td>
</tr>
<tr>
<td>American sloughgrass</td>
<td>6.0</td>
</tr>
<tr>
<td>American managrass</td>
<td>3.0</td>
</tr>
<tr>
<td>Bromar Mountain brome</td>
<td>6.0</td>
</tr>
</tbody>
</table>

Special Provisions should include Permit information and quantities of materials needed for project.
Quantities for Construction Bid Items for the Schrieber Lake Mitigation project (Note Metric measurements).
Completed Schrieber Lake Mitigation Site 8 months after construction,
• Restored two streams
• Created 10 shallow wetland cells
• Allows for flood inundation during spring runoff from adjacent streams.
• Preserved unique wetland communities on site.
Schrieber Lake mitigation site 3 years after completion August 2018.
Biological sampling of restoration projects.

Lawrence J. Urban  
Wetland Mitigation Specialist  
Environmental Services Bureau  
Montana Department of Transportation  
2701 Prospect Avenue  
P.O. Box 201001  
Helena, MT  59620-1001  
e-Mail: Lurban@mt.gov  

Phone: (406) 444-6224