

## Re-vegetation of Riprap- Summary of Findings Meeting

January 21, 2010

### Attendees:

Kevin Christensen- Construction Engineer  
Jim Walther- Preconstruction Engineer  
Paul Jagoda- Construction Engineering Services Engineer  
Lisa Durbin- Construction Administration Services Engineer  
Kent Barnes- Bridge Bureau Chief  
Tom Martin- Environmental Services Bureau Chief  
Phil Johnson- Reclamation Specialist  
Devin Roberts- Bridge Construction Reviewer  
Mark Kurokawa- Engineering Project Manager, Glendive District  
Sue Sillick- Research Programs Manager  
Kris Christensen- Research

This meeting was requested by Paul Jagoda to answer original questions involving re-vegetation of riprap and to summarize the information from the November 24, 2009 technical panel meeting and October 8, 2009 site visits.

Phil Johnson gave an overview of the history for this topic and how it has evolved during the past ten years. A special provision was written for riprap several years ago to re-vegetate areas covered by riprap placed on bridge ends and stream banks up and downstream from bridge openings. The purpose was to establish riparian vegetation in these areas for habitat restoration for sensitive/T&E species, aesthetics, and bank stability concerns. The special provision was first inserted in bridge projects in the eastern part of the state on smaller streams where the consequences of failure [loss of topsoil covering the riprap] was seen as tolerable. In addition, two different technical panels have been formed to address this topic; one was for a proposed research project submitted by Kathy Chase from Colorado and again at the request of the Construction Bureau. Each time it has been determined by the technical panel that a research project is not needed.

The general time line/history of events involving re-vegetation of riprap is as follows:

- ~1999- A special provision is written and used.
- 2001- Colorado submits a planted riprap research topic statement.
- 2002- The technical panel meets and concludes to wait on moving forward on possible research project after re-vegetated riprap sites are visited and monitored.
- 2003- Current re-vegetated riprap sites visited, approximately 15 sites.
- 2003- Technical panel meets again and the consensus is that the original special provision is working, made minor changes to the provision to address panel concerns, and panel decides not to move forward with Colorado's research submittal.
- 2007- Concerns were voiced from field construction crews regarding re-vegetated riprap. Questions included impeding drainage from the bank, decreasing slope stability, issues with constructability, cost effectiveness, and does it really serve its purpose.
- 2008- Second technical panel formed to address construction concerns- panel decides to wait before moving forward with a research project until re-vegetated riprap sites are visited and documented.

- 2009- Sites are visited and technical panel meets. A detail drawing is developed and the special provision is modified to reflect lessons learned from successful sites.

Both Jim Walther and Phil explained the importance of planted riprap; reasons include the following:

- Minimizes environmental impacts of construction
- Lessens impacts to water quality and endangered species
- Makes it a more natural and functional area for wildlife
- Considers mitigation strategies before construction starts
- Preparation for the new stream mitigation requirements being developed by the US Army Corp of Engineers
- Encourages wildlife to use the stream bank for movement instead of going over the top and potentially being hit

One of the more compelling reasons for placing riprap involves the Corp of Engineer's draft stream mitigation process. This process was required on the Kalispell Bypass projects and is expected to be implemented on future projects. The stream mitigation process is a debit-credit scoring process and planted riprap is one way to achieve onsite mitigation credit. Planted riprap is seen by permitting agencies and the Corp of Engineers as a good will effort and most times makes the permitting process easier. Lastly, even though planted riprap is time consuming and can be expensive, it is less expensive than performing off-site stream mitigation.

The meeting concluded with the group agreeing that planted riprap does work and will be used in a case-by-case consideration. Paul Jagoda prepared written responses to questions developed by individuals in the field and will distribute this information to crews in the districts (see attachment A-Riprap Re-vegetation Construction Information). Phil has photos, the special provision, and detail drawing available on the Department's share drive at <\\astro\PCCOMMON\ENV\RIPRAP>. Research will also post this information on its website.

**Attachment A**  
**Riprap Re-vegetation Construction Information**  
1-28-10

Following is information to help understand why we use Riprap Re-vegetation:

1. Why do we do riprap re-vegetation? What is the goal of re-vegetation of riprap?
  - Minimizes environmental impacts of construction
  - Considers mitigation strategies planned before construction starts
  - Lessen impacts to water quality and endangered species
  - Prepare for the new stream mitigation requirements that being developed by US Army Corp of Engineers.
  - Make it a more natural and functional area for wildlife
  - Encourages wildlife to use the stream bank for movement instead of going over the top and potentially getting hit.
  
2. Where do these requirements come from? Is it a requirement in the permits from the resource agencies?
  - It is not a permit requirement but it makes it easier to get a permit, it shows we are trying to minimize impacts
  
3. What is the cost and benefits of riprap re-vegetation?
  - Riprap re-vegetation is one tool we can use to so we do not have to mitigate offsite, which is expensive
  - Stream mitigation credits are expensive
  - One of the more compelling reasons for placing riprap involves the Corp of Engineer's draft stream mitigation process. This process was required on the Kalispell Bypass projects and is expected to be implemented on future projects. The stream mitigation process is a debit-credit scoring process and placing riprap is one way to achieve onsite mitigation credit. Placing riprap is seen by permitting agencies and the Corp of Engineers as a good will effort and most times makes the permitting process easier. Lastly, even though placed riprap is time consuming and can be expensive, it is less expensive than performing off-site stream mitigation.
  
4. Is the intent of this procedure working?
  - Yes, it has evolved and we are still looking at ways to improve it
  
5. Determine what the negatives are, i.e. constructability, cost, adding siltation to the waters, causing additional damage to the vegetation in the area, etc.
  - These are understood and each bridge will be reviewed on a case-by-case basis to determine if riprap re-vegetation will be added to that project
  - Areas that may not use it are areas with high velocities like the Yellowstone River and Gallatin River.

6. Review past projects that had this procedure conducted to see the status of the re-vegetation and learn from them.
  - This is what the research completed the last couple of years
7. Is there something else that will work that will fulfill its goal?
  - This is being reviewed. Some examples that are being reviewed are the use of turf reinforcement mat or other materials that could replace riprap to use a “softer approach.”
  - From the Corp of Engineers, synthetics (plastics) cannot be used below the high water mark.
8. Revisit the detail.
  - The project specific detail and special provision is being revised to incorporate “lessons learned”.
  - See the attached links to the new detail, special provision and photos:
  - [ASTRO\PCCOMMON\ENV\RIPRAP\RIPRAP REVEG STANDARD DRAWING](#)
  - [ASTRO\PCCOMMON\ENV\RIPRAP\RIPRAP REVEG SPECIAL PROVISION](#)
  - [ASTRO\PCCOMMON\ENV\RIPRAP\RIPRAP REVEG PHOTOS](#)
9. Are we going to do it on all bridge projects? If not, what guidance will we be used to place it into contracts of specific projects?
  - It will be determined on a case-by-case basis usually at the Scope of Work time frame.
  - See the attached bulleted list of items that are reviewed to determine if riprap re-vegetation will be used.
  - See the attached link for photos of examples of installed riprap revegetation
  - [ASTRO\PCCOMMON\ENV\RIPRAP\RIPRAP REVEG PHOTOS](#)
10. The installation of re-vegetation riprap can be a challenge and proper installation/construction procedures are a key to make riprap re-vegetation a success. Following are some items to keep an eye on:
  - Riprap contours should blend into the fill slopes. Riprap slopes should be as smooth as possible, this allows for even distribution of topsoil. Ensure that there is more than adequate coverage of topsoil over the top of the rocks. The finished product should not have rock showing through and surface. It makes it easier to seed, rake in the seed and install the erosion blanket if the surface is relatively smooth.
  - Be generous with seed and fertilizer in these areas. Ensure the seeds are raked into the topsoil so that it's covered with ¼ to ½ inch of soil.
  - Place straw matting over these areas to help eliminate erosion and allow vegetation to start.
  - Place additional erosion control such as waddles at the bottom of the topsoil near waterline, this will also help anchor the straw matting and prevent soils and seed from washing out from under mat during higher flows.

- We've modified the design so that the voids between the rocks are first filled with No. 2 filter aggregate. This material should "flow" easier than topsoil, so that we can reduce the voids left between the individual rocks. The elimination of voids encourages the development of willow and alder.

**NOTE:**

**List of Items that are reviewed to help determine the use of Riprap Re-vegetation**

- **Expected water velocities-** If high flows will likely "clean" the soil out from the interior of the rock during spring runoff, there's little value to placing the soil in the first place. In the 30 to 40 locations where the practice has been implemented, it was only documented one bridge where flood waters completely removed the topsoil/plant cover.
- **Pre-construction bank conditions-** There's little incentive to establish vegetation where none existed before construction.
- **Risk of bank failure due to hydraulic pressures behind the riprap-** Though this should be mitigated with the use of the No. 2 filter aggregate that is used to fill the voids before the placement of topsoil.
- **Post-construction land use objectives-** In some cases the resource agencies or tribal governments may require the development of woody riparian vegetation as part of an individual permit condition.
- If the amount of riprap to be placed is minor, or only a few feet from the bridge ends, reestablishing plant cover in those areas would provide minimal benefit. Then again, it probably wouldn't be difficult to infill with soil if it's a small installation.