Shasket Creek Road System: Maintenance Specification for Emergency Timber Sale Activities

Reference: DOI-BLM-ORWA-W030-2013-0001-EA (Attachment A)

1.0 General

This list of specifications applies to permanent roads only and does not have applicability to temporary/short-term roads created for the intent and operations of the timber sale. This document shall serve as overarching guidance for mitigating detrimental loss of resources, post-fire exposure. Terrain types are noted to be steep, dry, and void of vegetation that might otherwise control erosion, compaction, moisture retention and drainage volume/velocity. It is imperative that sound judgement is used when applying the following: this area is at high risk of erosion and all attempts shall be made to ensure further damage is not resultant due to timber sale operations, the preparation for, or the lack of completion/follow-up road maintenance functions. Per the *Republic Forest Health EA* (DOI-BLM-ORWA-W030-2013-0001-EA), the on-site cognizant construction authority shall use right-of-way width of "no more than 40 feet on both sides of centerline" to accomplish the maintenance and/or reconstruction functions outlined here in. Road reconstruction and/or maintenance functions shall be performed before, periodically/ad-hoc (during), and after timber sale traffic presence.

2.0 Road Surface Geometries

All restored, non-temporary roads shall have a minimum road-surface width of 12 feet as measured in the following figure. The following list (and figure) of road cross-section types are to serve as guidance on the applicability of the geometry to be used as it pertains to the conditions (i.e. side slope, grade, surface runoff) found in the field. In-lieu of constant monitoring, the on-site cognizant construction authority/activity shall use best judgement practices when applying each of the following cross-section types as they apply to grade and drainage for each specific road section encountered. **Unless otherwise specified by the cognizant BLM Engineering Authority, these road surface types shall be used as denoted:**

- 2.1 Crowned Fill
  - 2.1.1 Use on flat ground where standing water on road surface may occur.
  - 2.1.2 Cover shall consist of 6" depth (minimum) crushed base course.
- 2.2 Crowned Turnpike
  - 2.2.1 Only use where additional fill material is not feasible and/or required due to natural soil type/composition available on-site.
- 2.3 Out-sloped
  - 2.3.1 Use on moderate slopes for low traffic volume roads, if soil is stable enough to accommodate; **winter season logging-functions shall preclude this road geometry.**
- 2.4 In-sloped w/Ditch
  - 2.4.1 Use on steep hills/slopes, areas with fine soils and where drainage will be difficult to control. **This surface geometry shall be used if winter season logging functions occur.**
- 2.5 Crowned & Ditched
  - 2.5.1 Use only in extreme cases and only as necessary: high volume traffic on steep side slopes.

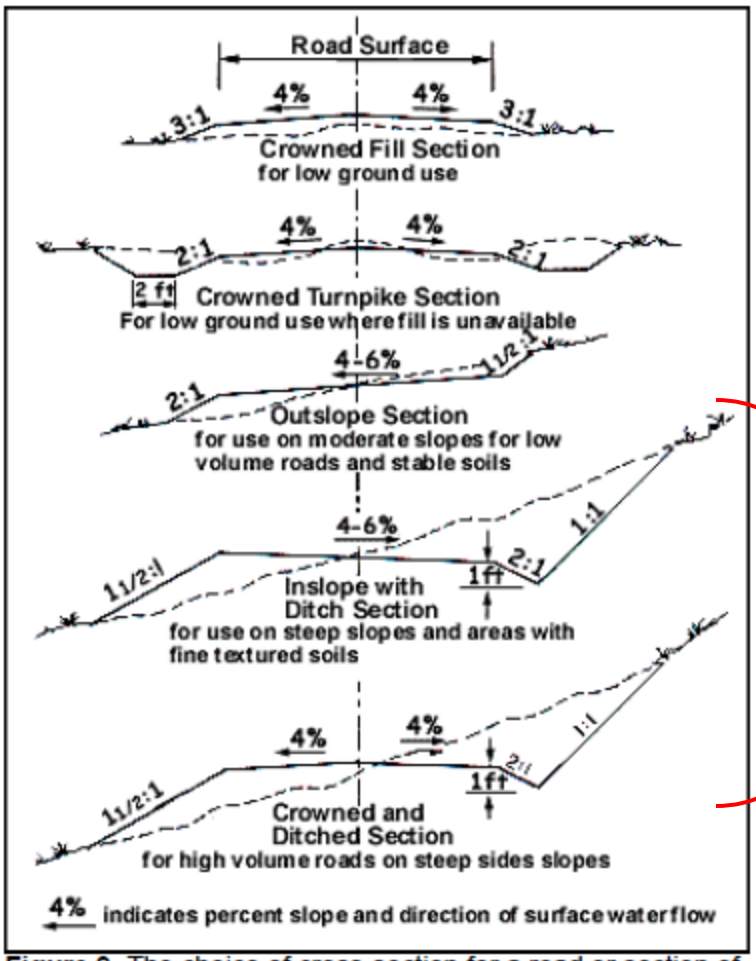


Figure 9. The choice of cross-section for a road or section of a road depends on drainage needs, soil stability, slope, and expected traffic volume. Dashed lines indicate natural land contours, and solid lines indicate constructed road. (Redrawn and adapted from Michigan Department of Natural Resources 1994, p. 23)

3.0 Road Drainage Geometries - Back Slopes, Ditching, Water Bars & Drainage Dips

Until revegetation can be successfully established, back-slopes shall be cut to a shallower angle than the soil-type's natural angle of repose.

Example: If natural angle of repose is 1:1 (45 deg.), decrease slope angle to 1.5:1 (34 deg.).

This slope change shall be fully applied in road sections in extreme natural side-slopes to mitigate road wash-out, promote maximum erosion control, and reduce runoff velocity. If unforeseen circumstances arise, which inhibit this slope alteration, ensure ditching and sloping of the road surface are adequate to control runoff to the next logical down-stream crossing location (drainage dip or culvert).

Ditching shall be utilized to the maximum extent feasible; use dimensions from previous figure as guidance. Increase ditch depths as necessary in steeper grades and backslopes to accommodate rain shed runoff.

Tie ditches with ditch blocking (boulders, riprap) to water bars per the spacing and dimensions shown in the following figures. If a "Deep Water Bar" (per figure below; excess of 24" peak to trough) is to be utilized, the on-site cognizant construction authority shall consider constructing Drainage Dips if water-bar spacing intervals become excessive and road grades permit construction.

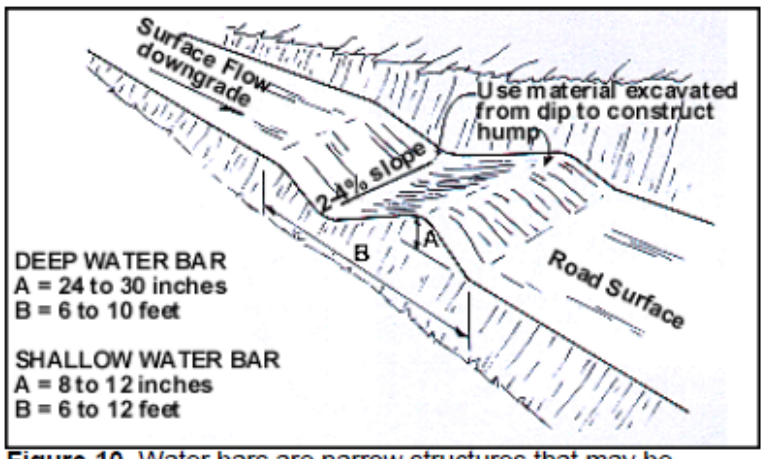


Figure 10. Water bars are narrow structures that may be shallow or deep. Deep water bars are usually used on roads that will be closed for extended periods.

Table 6. Distance needed between water bars

Road grade (percent)	Distance (feet)
2	250
5	135
10	80
15	60
20	45
25	40
30	35

Source: Kochenderfer 1970, p. 28

Drainage Dips shall be used as last resort, only if logging activities demand this form of drainage control due to vehicle wheelbase constraints. The on-site cognizant construction authority shall not construct a Drainage Dip in road sections with a grade greater than 10%; refer to the figure below for dimensions and spacing. Ensure adequate crushed base course material is applied and compacted to prevent washout and rutting conditions from developing.

Table 7. Distance needed between water bars

Road grade (percent)	Distance (feet)
2 - 4	300 - 200
5 - 7	180 - 160
8 - 10	150 - 140

Source: Kochenderfer 1970, p. 19, 25

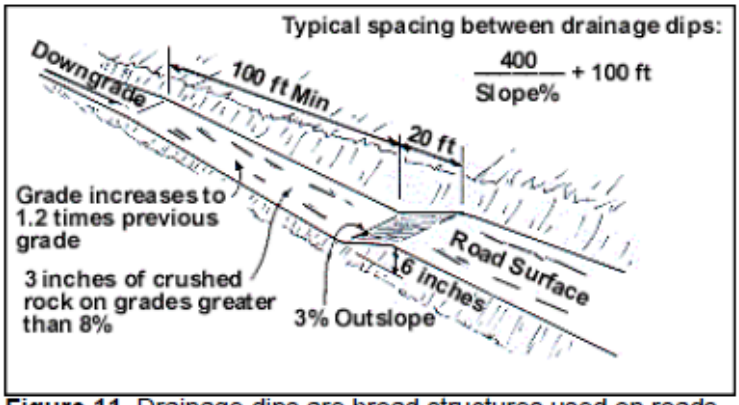


Figure 11. Drainage dips are broad structures used on roads with grades of 10 percent or less.

4.0 Aggregate Schedule

4.1 Base Course

4.1.1 All road surface base course shall be ¾" crushed aggregate (with fines) and applied to a minimum of 3" thickness compacted, unless otherwise specified. ¾" crushed with fines shall be applied as the final base course on top of any sub base remedial fill.

4.2 Sub Base

4.2.1 As required, sub base remedial fill/reconstruction shall use 3/4" - 1-1/2" crushed aggregate. ¾" crushed with fines shall be applied as the final base course on top of any sub base remedial fill as noted in 4.1.1.

4.3 Riprap

4.3.1 4"-6" riprap shall be used in extreme instances where road sub base reconstruction/remediation is required; use in conjunction with 3/4"-1-1/2" crushed aggregate as needed/required to reestablish sub base structure.

4.3.2 4"-6" riprap shall be used as culvert bedding material to the extent required/determined by the on-site cognizant construction authority.

4.3.3 6-8" riprap shall be placed to a depth of 1.5 times the aggregate size at all culvert locations/instances as described in Sections 5.1, 5.2 and 5.3 below.

5.0 Culverts

All culverts in the affected area shall be replaced with typical 18" diameter, galvanized & corrugated culvert pipes. Pipe section lengths shall be determined by the activity's on-site cognizant construction authority and placed in a manner in accordance with general best practices for each site's specific features. All culverts shall be bedded with riprap and top-covered with 12 inches minimum of cover material consisting of six (6) inches (minimum) of sub base aggregate, and six (6) inches (minimum) of base course aggregate.

5.1 All upstream pipe entries (headwalls) and drainage ditch tie-in locations shall be riprap armored as to slow water velocity and serve as silt-trapping locations. Minimum extension length (upstream) from culvert headwalls shall be 25 feet in all incoming directions.

5.2 All upstream pipe entries shall be elevated to a height to accommodate 1.5x riprap average diameter stone. (ex. 4" stone requires 6" elevation). Riprap shall be placed flush with pipe entry and result in pipe entries level with the top of riprap armor.

5.3 Downstream pipe exits/discharges shall be riprap armored unless heavy natural vegetation exists within the pipe exit/discharge streambed. If heavy natural vegetation is not present, riprap armor shall be placed for a length of not less than 20 feet, and width not less than six (6) feet centered within the channel (3 feet both left/right as measured from stream channel center).

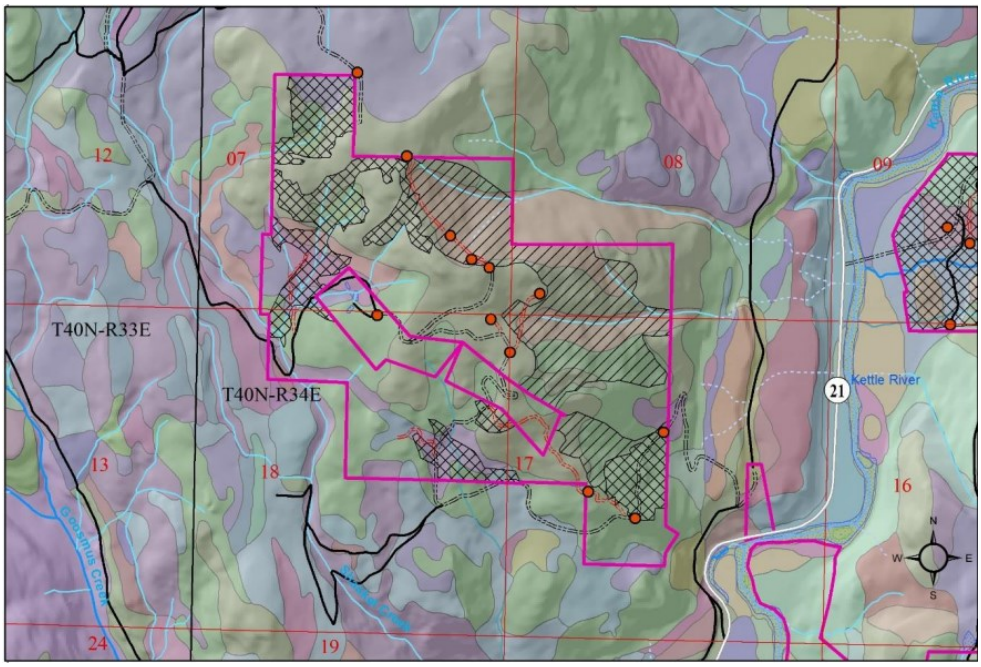
5.4 All culvert downstream exits/discharges that are equal-to or greater than 18 inches height, when measured from the bottom of the pipe to the streambed, riprap armor shall be placed at the discharge location IAW dimensions outlined in 5.3.

5.5 Skew angles across roads shall place upstream (headwall) entries and downstream exits/discharges in their respective stream channel centers.

6.0 Natural Soil Types

The following shall serve for informational and on-site decision-making purposes. The intent of this information is to allow the on-site cognizant construction authority to make informed decisions when applying the specifications previously outlined in this document.

The map below denotes soil types presently found within the prescribed region; this map is incorporated within document DOI-BLM-ORWA-W030-2013-0001-EA (Appendix 1, pg. 160). Refer to the full EA document for comprehensive description of soils composition; hazard conditions are outlined below as they pertain to each soil type found within the plot boundary.



Republic Forest Health Project Environmental Assessment

Legend

- Landing Pile Locations
- Roads

Inventoried Roads

- Existing Road
- Temporary Road
- Township
- Section
- Republic Forest Health PF PC DWR
- Republic Forest Health Planning Boundary

Republic Forest Health Commercial Harvest

Harvest Type

- Cable
- Tractor

Washington Streams

- Fish bearing
- Non-fish bearing
- Shorelines of the State
- Unknown
- Waters with no type designation

Waterbody

- Lake/pond
- Marsh
- Stream/river
- Unknown

Soil Type

AnC	MtB
BsD	MvB
CeF	MvC
DrE	MvD
GdB	MwD
HuE	MxE
KoB	MyE
KoC	NlD
KoD	NlE
KoE	NnD
McC	NnF
Mo	Rv
Mp	VrE
Ms	W
	WgE

1:24,000

0 0.1 0.2 0.4 0.6 0.8 Miles

Map 20: Shasket Creek Soil Types

7/16/2015

Shasket Creek Soil Types (Specific to Harvest Plot Area)			
Map Unit Name	Soil Series Name	Hazard Considerations	Slope
AnC	Anglen loam	Potential for damage by fire: Low Fire Damage Susceptibility: Highly Susceptible (wind erosion, sand content) Harvest Equipment Operability: Moderately Suited (low strength, dusty) Erosion Hazard (Off-Road, Off-Trail): Slight Runoff: slow to rapid Wind Erosion: High	0-15%
BsD	Bisbee loamy sand, dark surface variant	Potential for damage by fire: High (texture/ rock fragments) Fire Damage Susceptibility: Not Rated Harvest Equipment Operability: Well Suited Erosion Hazard (Off-Road, Off-Trail): Slight Runoff: Medium to rapid Wind erosion: High	0-25%
CeF	Chesaw gravelly loamy sand	Potential for damage by fire: High (texture/ rock fragments) Fire Damage Susceptibility: Highly Susceptible (wind erosion, water erosion, sand content, rock fragments) Harvest Equipment Operability: Poorly Suited (sandiness, slope) Erosion Hazard (Off-Road, Off-Trail): Very Severe	45-65%
HuE	Hunters silt loam	Potential for damage by fire: Low Fire Damage Susceptibility: Moderately Susceptible (water erosion) Harvest Equipment Operability: Moderately Suited (low strength, dusty, slope) Erosion Hazard (Off-Road, Off-Trail): Moderate Runoff: Slow to rapid Water erosion: Moderate	15-45%
KoB	Koepke loam	Potential for damage by fire: Low Fire Damage Susceptibility: Highly Susceptible (wind erosion, sand content) Harvest Equipment Operability: Moderately Suited (low strength, dusty) Erosion Hazard (Off-Road, Off-Trail): Slight	0-8%
KoC		Potential for damage by fire: Low	8-15%

	Koepke loam	Fire Damage Susceptibility: Highly Susceptible (wind erosion, water erosion, sand content) Harvest Equipment Operability: Moderately Suited (low strength, dusty) Erosion Hazard (Off-Road, Off-Trail): Moderate	
KoD	Koepke loam	Potential for damage by fire: Low Fire Damage Susceptibility: Highly Susceptible (wind erosion, water erosion, sand content) Harvest Equipment Operability: Moderately Suited (low strength, dusty, slope) Erosion Hazard (Off-Road, Off-Trail): Moderate	15-25%
KoE	Koepke loam	Potential for damage by fire: Low Fire Damage Susceptibility: Highly Susceptible (wind erosion, water erosion, sand content) Harvest Equipment Operability: Moderately Suited (low strength, dusty, slope) Erosion Hazard (Off-Road, Off-Trail): **Severe**	25-45%
McC	Manley silt loam	Potential for damage by fire: Low Fire Damage Susceptibility: Slightly Susceptible Harvest Equipment Operability: Moderately Suited (low strength) Erosion Hazard (Off-Road, Off-Trail): Slight	0-15%
Mo	Mires loam	Potential for damage by fire: Low Fire Damage Susceptibility: Highly Susceptible (wind erosion, sand content) Harvest Equipment Operability: Well Suited	None Listed
Mp	Mires gravelly loam	Potential for damage by fire: Low Fire Damage Susceptibility: Highly Susceptible (wind erosion, sand content) Harvest Equipment Operability: Well Suited Erosion Hazard (Off-Road, Off-Trail): Slight	None Listed
MtB	Molcal silt loam	Potential for damage by fire: Low Fire Damage Susceptibility: Moderately Susceptible (wind erosion) Harvest Equipment Operability: Moderately Suited (low strength, slope)	0-8%
MvB	Molson loam	Potential for damage by fire: Low Fire Damage Susceptibility: Highly Susceptible (wind erosion, sand content) Harvest Equipment Operability: Moderately Suited (low	0-8%

		strength, dusty)	
MvC	Molson loam	Potential for damage by fire: Low Fire Damage Susceptibility: Highly Susceptible (wind erosion, sand content) Harvest Equipment Operability: Moderately Suited (low strength, dusty)	8-15%
MvD	Molson loam	Potential for damage by fire: Low Fire Damage Susceptibility: Highly Susceptible (wind erosion, sand content, water erosion) Harvest Equipment Operability: Moderately Suited (low strength, dusty, slope)	15-25%
MwD	Molson gravelly loam	Potential for damage by fire: Low Fire Damage Susceptibility: Moderately Susceptible (wind erosion, sand content, rock fragments) Harvest Equipment Operability: Well Suited	0-25%
MxE	Molson stony loam	Potential for damage by fire: Low Fire Damage Susceptibility: Moderately Susceptible (wind erosion, sand content) Harvest Equipment Operability: Moderately Suited (low strength, dusty, slope)	25-40%
MyE	Molson-Rock land	Potential for damage by fire: Low Fire Damage Susceptibility: Moderately Susceptible (wind erosion, sand content) Harvest Equipment Operability: Moderately Suited (low strength, dusty, slope)	15-50%
NlD	Nevine loam	Potential for damage by fire: Low Fire Damage Susceptibility: Moderately Susceptible (sand content, water erosion) Harvest Equipment Operability: Moderately Suited (low strength, dusty)	0-30%
NnF	Nevine stony loam	Potential for damage by fire: Low Fire Damage Susceptibility: Highly Susceptible (sand content, water erosion) Harvest Equipment Operability: Poorly Suited (low strength, dusty, slope)	25-65%