Section B
SURFACE AND POINT SOURCE EROSION (ROADS/SKID TRAILS)

INTRODUCTION

The surface and point source erosion module examines the past and present soil erosion from roads and skid trails of the Mendocino Redwood Company (MRC) ownership in the Northern Russian River watershed, the Northern Russian River watershed analysis unit (WAU). This module also provides a hazard assessment of the potential for future surface and point source erosion from roads in the Northern Russian River WAU. The potential erosion assessment is to assist in development of mitigation measures and actions to minimize future soil erosion from the road network. The road data that is the basis for most of this analysis was collected by MRC during a road inventory of the Northern Russian River WAU. The erosion estimates utilize a combination of field observations and the use of the surface erosion model presented in the Standard Methodology for Conducting Watershed Analysis (Version 4.0, Washington Forest Practices).

Surface erosion is defined as the removal of soil particles from the surface of the soil. Processes such as rill erosion, sheetwash, biogenic transport (animal burrows, treefall, etc.) and ravel are considered surface erosion. Gullies, road crossing wash-outs, and large erosion features created by erosion from overland flow of water are considered point source erosion. In contrast, the largest discrete erosion events, landslides, are considered mass wasting.

This report examines road and skid trail associated surface and point source erosion delivering sediment into watercourses. Excessive levels of fine sediments from surface and point source erosion can get trapped in porous streambed gravels; and can increase water turbidity and suspended sediment concentrations. Excessive coarse sediments from point source erosion can adversely affect stream channel morphology. These can reduce the survival of salmonids in their redds or affect habitat needs and physiological characteristics of rearing salmonids. Excessive surface and point source erosion when delivered to a watercourse can also affect other downstream uses such as water supplies, agricultural diversions and recreation users. It is important that best management practices be utilized in forest management operations to minimize the impacts of surface and point source erosion.

SURFACE AND POINT SOURCE EROSION FROM ROADS

Methods

Road Inventory

A road inventory of the roads with the Northern Russian River WAU was conducted. The road inventory consisted of traveling all roads with a Global Positioning System (GPS) unit and identifying, mapping and inventorying all major features of the road network. Some of the

features that are inventoried include watercourse-crossings and crossing structures (culverts, bridges, etc.), landings, erosion features and controllable erosion amounts (as defined below). Information relating to erosion and sediment delivery from the road inventory is analyzed in this report. Dimensions of the road network such as length, width and sediment contributing road lengths are also summarized. The road inventory collects information on the entire road infrastructure. This road infrastructure information allows for better management and tracking of the road network.

All road features (watercourse crossings, landings, road fill, etc.), during the road inventory, have the past deliverable point source erosion volume estimated for that feature. Deliverable point source erosion from a road is defined as major rills or gully erosion which is observed in close proximity to a watercourse or which showed evidence of eroding directly into a watercourse. These measurements were used to calculate the volume of point source erosion delivered from the road. The volume of erosion was converted to a weight (in tons) assuming a soil bulk density of 100 lbs/cubic foot. All observed sediment delivery from surface or point source erosion is assumed to have occurred within the past 10 years, unless there is information otherwise.

Estimating controllable erosion

Future or potential point source erosion (gully or road fill wash-outs, not sheetwash) observations were also collected during the road inventory. This potential future erosion is called controllable erosion, a term developed by the North Coast Regional Water Quality Control Board for Total Maximum Daily Load (TMDL) purposes. Controllable erosion is defined as soil that could potentially deliver to a watercourse in the next 40 years (the duration of a TMDL), is human created, and can be reasonably controlled by human actions. Typically, controllable erosion is a measure of the fill material from a road that could erode if a road feature is left un-maintained or fails in the next 40 years. The controllable erosion amount is the volume of soil that can be controlled with high design standards for a road feature (i.e. watercourse crossing, side-cast fill, etc.).

The controllable erosion sites are further designated by the potential for sediment delivery and the immediacy of treatment for the site. Both the sediment delivery potential and the treatment immediacy are ranked low, moderate, or high. The ranking of each controllable erosion site by these variables provides a hazard or risk assessment of the controllable erosion. This allows prioritization of road improvements and erosion control work based on potential point source erosion hazard.

Another important variable of potential future point source erosion from a road is the likelihood of diversion of water down the road prism. This diversion potential, as it is called, was evaluated for every watercourse crossing of every road in the Northern Russian River WAU. A site has a diversion potential if when the watercourse crossing plugged, dammed or failed water could be diverted out of the “natural” watercourse channel and down the road prism. Water diverted out of its “natural” channel would erode the road prism creating potentially high sediment delivery. Sites with a diversion potential can be engineered such that the diversion of water down a road prism does not occur if the watercourse crossing plugged, dammed, or failed.

A prioritization of potential point source erosion sites for the Northern Russian River WAU is presented (Appendix B). This prioritization is based on amount of controllable erosion of the site, the treatment immediacy, and a high diversion potential.

Culvert size analysis

Proper culvert sizing is another important characteristic for consideration of road erosion potential. Culverts that do not have the capacity to pass debris, water and sediment in high flow events can plug creating road prism failures with high sediment inputs. MRC currently designs all new culvert installations to pass the 100 year flood to ensure enough capacity in the pipe to pass water, debris and sediment in high flows. To determine if culvert sizing is appropriate for existing culverts the area behind each culvert inventoried was determined from topography data in the MRC Geographic Information System (GIS). The regression equation for the North Coast region (Waananen and Crippen, 1977) is used to predict the 50 and 100 year peak flow. A culvert sizing nomograph is used to determine the appropriate size for 50 and 100 year peak flow magnitudes and the predicted size are compared to the existing culvert sizing to determine if the culvert is large enough.

The culvert sizing analysis must be interpreted carefully as it was often difficult to tell what area of watershed drained to a culvert from a map based analysis. This culvert sizing analysis is only meant to be "first cut" at determining if a culvert is properly sized. From this analysis a field visit to the site will determine if indeed the appropriate watershed drainage area was used and the culvert is indeed under-sized. The results from the culvert sizing analysis are presented in Appendix B.

Road surface erosion modeling

Surface erosion (sheetwash and minor rills) from roads was not directly estimated in the field. The contributing length or extent of road that delivers erosion to a watercourse is measured in the field then used for surface erosion calculations. The contributing length of a road is the length of road prism that drains water and associated eroded soil into a watercourse. Thus it defines the length of surface erosion of any particular site on the road. The model used to calculate surface erosion from roads is from the Standard Methodology for Conducting Watershed Analysis (Version 4.0, Washington Forest Practices Board) and is described below.

Surface erosion from the road surface is influenced by the amount of road traffic (high use mainline, moderate use, active secondary, etc.), the type of road surface material, precipitation, width and size of road (the more surface area to erode, the more erosion), and vegetative cover (Reid, 1981). The Standard Methodology for Conducting Watershed Analysis (Version 4.0, Washington Forest Practices Board) provides relationships based on these factors to estimate the amount of surface erosion from different road types and conditions.

Field observations from the road inventory determined the length of the road delivering sediment to a watercourse (contributing length) from individual features of the road (culverts and crossings), the road width, the road surface material and the type of road (seasonal or temporary) to aid in the surface erosion calculations.

The road inventory lacked contributing road length for road segments adjacent to a watercourse but not associated with a culvert or crossing. Using an analysis from GIS, the amount of road within 50 feet, 50-100 feet and 100-200 feet of a watercourse was determined for all road segments not associated with a culvert or crossing. It was assumed that within 50 feet, 100 percent of erosion from the road delivers sediment to a watercourse. At 50-100 feet 35 percent and at 100-200 feet 10 percent of erosion from the road was assumed to deliver sediment to a watercourse. These assumptions were based on sediment delivery ratios used in a road erosion model called SEDMOD.

The following model parameters were used to calculate surface erosion from roads in the Northern Russian River WAU. All of the observed roads were assumed to be older than two years and a base erosion rate of 60 tons/acre/year was applied. This initial value was altered (multiplied) by the factors of traffic on the road, cut- and fill-slope vegetation cover, road surface type, annual precipitation, and road type in an attempt to model the actual sediment volume contributed by a given road segment. The road tread width was determined in the field during the road inventory and is assumed to be 40% of the road prism. The cut- and fill-slopes are assumed to 60% of the road prism; their dimensions for the surface erosion model were determined by multiplying the tread width by 1.5.

Road cut- and fill-slopes usually had approximately 50% vegetative cover, giving a cover factor of 0.37. The majority of hauling on roads occurs during drier times of the year (i.e. late spring, summer and early fall). Therefore the lowest annual precipitation category is used (<47 in. precipitation annually). In this annual precipitation category a road with at least a 6 inch rock surface is given a factor of 0.2, while a native surface road has a factor of 1.

There were 3 traffic factors used in surface erosion modeling:

1) *Mainline roads with moderate traffic* have a factor of 2; these roads are used for log haul traffic 2-3 times each decade.
2) *Seasonal roads* have a traffic factor of 1.2; these are tributary roads which receive moderate log haul traffic 1-2 years each decade and light traffic the remainder of the time.
3) *Temporary roads* receive a traffic factor of 0.61; these roads receive moderate log haul traffic 1-2 times per every 1-2 decades with little to no use in between.

The result of the surface erosion modeling is added to the total past point source erosion observed during the road inventory from a given road and presented as tons/year of sediment delivery (see Appendix B for erosion estimates of each road in the Northern Russian River WAU). For relative sediment contributions from each planning watershed for road-associated sediment input evaluation, the tons/year calculations for all roads was totaled by planning watershed and normalized by dividing by the MRC ownership, in square miles, for the planning watershed. The result is a tons/square mile of MRC ownership/year estimate of road surface and point source erosion.

Erosion Hazard Rating

Finally, with this information each road in the Northern Russian River WAU is assigned an erosion hazard class. The erosion hazard class is used to classify the roads in the Northern Russian River WAU by their current and potential erosion hazard. The erosion hazard class was determined by the amount of erosion a road produced and the likelihood for that erosion to be delivered to a watercourse. High levels of traffic, road surface, proximity to the stream, high past point source erosion, and high modeled surface erosion all were considered when ranking roads for their erosion hazard. The roads with the highest risk of sediment delivery and soil erosion were given a high erosion hazard classification. The roads with medium risk of sediment delivery and soil erosion were given a moderate erosion hazard classification. The roads with the lowest risk of sediment delivery and soil erosion were given a low erosion hazard classification. A description of what each erosion hazard classification means can be found in the results and discussion sub-section of this report.

Results and Discussion – Roads

Erosion Hazard Rating

The road erosion hazard rating for each road in the Northern Russian River WAU is presented on Map B-1 and for each individual road in Appendix B of this report. The categorizing of roads into hazard classes is intended to identify current problem areas, consider reconstruction and prioritize maintenance. The following are the definitions for each road erosion hazard class.

High Road Erosion Hazard Class - These roads have the highest amount of recent deliverable surface erosion to watercourses and a high potential for future deliverable erosion. These roads can be active, abandoned or closed. Often roads in this class are close to watercourses creating a high sediment delivery potential. Erosion is typically due to long contributing road lengths or road with native surfaces near watercourses: a result of too few waterbars and/or rolling dips or lack of rock surface. Erosion may also be a product of problem areas such as watercourse crossing wash-outs, poor road drainage, plugged road watercourse crossings, water diverted down the road surface, culverts not fitted with downspouts, etc. Active roads in this class should get the highest priority for maintenance or improvements. Closed roads in this class will need improvements before opening again. Opening abandoned roads in this class should be avoided.

Moderate Road Erosion Hazard Class - These roads have moderate amounts of recent deliverable surface erosion to watercourses and potential for future deliverable erosion. These roads can be active, abandoned or closed. Erosion problems on roads in this class can usually be handled with good road maintenance. Erosion is typically from problem areas such as poor road drainage, water diverted down the road surface, culverts not fitted with downspouts, and an occasional plugged culvert or watercourse crossing wash-out. Active roads in this class should be a priority for maintenance. Closed or abandoned roads in this class will need some improvements before opening again.

Low Road Erosion Hazard Class - These roads have low amounts of recent deliverable surface erosion to watercourses and low potential for future deliverable erosion. These roads can be active, abandoned or closed. Active roads in this class do not need to be a priority for maintenance. Closed or abandoned roads in this class will need only some improvements before opening again.

Road features from the road inventory

The mapped roads and road features (culverts, crossings, and landings) are presented in map B-2 for the Northern Russian River WAU. The associated treatment immediacy of the road feature is also shown on these maps. Potential controllable (point source) erosion sites were identified and prioritized in the Northern Russian River WAU. In the Northern Russian River WAU 107 controllable erosion sites have high treatment immediacy and 76 controllable erosion sites have moderate treatment immediacy. In addition to these controllable erosion sites 218 culverts or crossings in the Northern Russian River WAU have a diversion potential. These diversion potential sites need to be considered a high priority for road improvement as they can represent a significant potential point source erosion hazard. The site identification, treatment immediacy and amount of controllable erosion estimated are found in Appendix B of this report.

Culvert size analysis

The culvert size analysis has determined that, out of a total of 146 culverts, 43 (40%) are potentially too small to pass the 50 year flood and 45 culverts (42%) will not pass the 100-year flood. The analysis of culvert sizing is only an estimate based on culvert location from the MRC

road inventory and area draining to the culvert based on MRC GIS topographic data. A field review will be required at each site to validate the culvert size analysis results and determine if the culvert is indeed under-sized. However, the identification of these culverts as under-sized is a good hypothesis to work from and provides information to address potential road problems in Northern Russian River WAU. These culverts identified as potentially too small need to be a high priority for upgrade if after field review the culverts are determined to be under-sized. The culvert sizing results are found in Appendix B of this report.

Road density

It was determined that there are 62 miles of truck roads in the Northern Russian River WAU (skid trails not included). This represented an average road density of seven miles of road per square mile of property owned by MRC. Table B-1 breaks down the road lengths and densities by planning watershed for the Northern Russian River WAU.

Table B-1. Road Lengths and Density by Planning Watershed for the Northern Russian River WAU.

Planning Watershed	**Road Length (miles)**	**Contributing[1] Road Length (miles)**	**Road Density[2] (mi/mi^2)**
Jack Smith Creek	9.4	1.6	3.8
Lower Ackerman Creek	4.7	3.2	8.5
Mill Creek	2.3	0.4	7.1
Upper Ackerman Creek	44.4	10.5	8.0
Northern Russian River WAU Total	**61.6**	**15.7**	**6.9**

[1]Contributing road length is defined as the amount of road potentially draining to a watercourse that could lead to a deliverable amount of surface erosion. It is determined during the road inventory.
[2]Road density is calculated by dividing the road length by the amount of MRC-owned land within each planning watershed.

Road densities are something that should be managed for in the Northern Russian River WAU. Not all roads can be abandoned, but by converting many of these roads to a temporary status or putting them to bed after use, the amount of road that can contribute erosion at any given time is reduced.

Surface and point source erosion

The surface and point source erosion estimates by planning watershed are presented in Table B-2. The breakdown of estimated erosion, road lengths and hazard rating by individual roads is in Appendix B of this report. Roads in the MRC ownership in the Northern Russian River WAU are estimated to generate, on average, 412 tons/mi^2/yr of sediment from road-associated surface and point source erosion. This rate of erosion from roads within the Northern Russian River WAU is relatively moderate in comparison with other typical erosion rates on MRC land.

Table B-2 Road Associated Surface and Point Source Erosion Estimates by Planning Watershed for the Northern Russian River East Tract, Northern Russian River WAU.

Planning Watershed	MRC Owned (sq mi)	Surface Erosion (tons/sq mi/yr)	Point Source Erosion (tons/sq mi/yr)	Total (surface + point source) (tons/sq mi/yr)
Jack Smith Creek	2.5	222	56	278
Lower Ackerman Creek	0.6	350	360	710
Mill Creek	0.3	321	32	352
Upper Ackerman Creek	5.5	253	193	446
Northern Russian River WAU Total	***8.9***[a]	***253***[b]	***159***[b]	***412***[b]

[a]Sum of property ownership within the Northern Russian River WAU
[b]Weighted average by ownership

The Lower Ackerman Creek Planning Watershed has the highest relative rate of surface and point source erosion within the Northern Russian River WAU. This probably indicates older legacy roads that are having a high amount of culvert or landing failures or inappropriate drainage creating gully erosion. This planning watershed should be considered a top priority for erosion control work when considering work in a watershed context.

Controllable erosion

The future potential for point source erosion was evaluated in the Northern Russian River WAU. This potential erosion or controllable erosion was identified during the road inventory during 2000-2003. A total of 343,400 cubic yards of controllable erosion was identified in the Northern Russian River WAU (Table B-3). Approximately 290,000 cubic yards of this controllable erosion is associated with the Masonite Road in Ackerman Creek.

Table B-3. Controllable Erosion Estimates by Road Feature and Treatment Immediacy for the Northern Russian River WAU.

Road Feature	Controllable Erosion by Treatment Immediacy (yd^3)			
	High	Moderate	Low	Undetermined
Culverts	120000	54000	73000	0
Crossings	400	2900	15500	200
Landings	4200	2600	1400	0
Erosion Features	7600	1700	3400	0
Road slides	7000	38000	11500	0
Total	***139200***	***99200***	***104800***	***200***

The majority of controllable erosion sites are at culverts and road slides. There are a total of 78 controllable erosion sites at landings with a treatment immediacy of none (see Appendix B). The high treatment immediacy sites in the Northern Russian River WAU should be addressed first (Table B-4) with culverts comprising the bulk of the yardage.

Table B-4. Controllable Erosion by Treatment Immediacy for the Northern Russian River WAU.

PLWS Name	Treatment Immediacy	Culverts (yd^3)	Crossings (yd^3)	Landings (yd^3)	Erosion Sites (yd^3)	Road Slides (yd^3)	*Total (yd^3)*
Jack Smith Creek	High	750	0	0	0	0	***750***
Jack Smith Creek	Moderate	0	110	650	30	760	***1550***
Jack Smith Creek	Low	900	2760	490	650	340	***5140***
Jack Smith Creek	Undetermined	0	190	0	0	0	***190***
Lower Ackerman	High	97470	0	0	0	1800	***99270***
Lower Ackerman	Moderate	15580	0	0	0	1450	***17030***
Lower Ackerman	Low	27990	5220	0	0	7600	***40810***
Mill Creek	High	1300	0	0	0	0	***1300***
Mill Creek	Low	280	180	20	90	0	***570***
Upper Ackerman	High	16580	370	4140	7600	5200	***33890***
Upper Ackerman	Moderate	38200	2750	1930	1670	35320	***79870***
Upper Ackerman	Low	43590	7330	880	2600	3470	***57870***

Fish passage barriers in the Northern Russian River WAU

There are no identified barriers to fish passage in the Northern Russian River WAU.

Road Associated Erosion Control Measures for the Northern Russian River WAU 1998-2004

Since Mendocino Redwood Company's ownership in the Northern Russian River WAU (starting in 1998), MRC has conducted erosion control and road upgrade work to address and improve road erosion sites resulting in 43,650 cubic yards of sediment controlled. There is an estimated 343,000 cubic yards of erosion to be controlled within this watershed (of which 290,000 cubic yards can be attributed to the Masonite Road). Therefore, MRC has controlled 11% of the total sediment within the Northern Russian River Watershed since 1998 (including the Masonite Road). This percentage is calculated by dividing the amount of erosion controlled (43,650 cubic yards) by the sum of the amounts of controllable erosion and erosion controlled (343,000 plus 43,650 equals 386,650 cubic yards). Excluding the Masonite Road, MRC has controlled approximately 45% of the controllable erosion. Map B-3 displays erosion control associated road work completed since 2003.

Table B-5. Treated Controllable Erosion by Area for the Northern Russian River WAU, 1998-2003.

Year	Area Name	Brief Work Description	Controlled Erosion (yd^3)
1998	-NA-	No activity	0
1999	9.0 Mile Masonite Road	Culvert replacement.	1,200
2000	Charlie M THP	Class III crossing fixes	150
2001	5.25 Mile Masonite Road	Removal of fish barrier culvert & installation of flat car bridge, reshaping channel, installing of weirs, deer barrier fencing, creek tree planting.	11,000
2001	8.0 Mile Masonite Road	Removal of fish barrier culvert & installing of flat car bridge, reshaping of channel, installing of weirs.	4,000
2002	High Life THP	Class III Gully fix	200
2002	4.55 Mile, 5.9 Mile, 7.0 Mile, 10.5-10.7 Mile Masonite Road	Upgrade failing culverts, removed perched sidecast, repair large gully area, replaced failing culverts with double flatcar bridge.	27,100
2003	-NA-	No activity	0
2004	Harmonic Convergence THP	Bridge upgrade, road opening, removal of perched fill materials, rocking of rolling dips and crossings, road surface rock armoring.	600

Treated Controllable Erosion Total for Northern Russian River WAU 1998 = 0 cubic yards
Treated Controllable Erosion Total for Northern Russian River WAU 1999 = 1,200 cubic yards
Treated Controllable Erosion Total for Northern Russian River WAU 2000 = 150 cubic yards
Treated Controllable Erosion Total for Northern Russian River WAU 2001 = 15,000 cubic yards
Treated Controllable Erosion Total for Northern Russian River WAU 2002 = 27,300 cubic yards
Treated Controllable Erosion Total for Northern Russian River WAU 2003 = 0 cubic yards
Treated Controllable Erosion Total for Northern Russian River WAU 2004 = 600 cubic yards

Treated Controllable Erosion Total for Northern Russian River WAU 1998-2004 = 43,650 cubic yards

SURFACE AND POINT SOURCE EROSION FROM SKID TRAILS

Methods

Sediment delivery from surface and point source erosion from skid trails was determined from aerial photograph interpretation and sediment delivery estimates developed in previous MRC watershed analyses (MRC, 1998 and MRC, 2000). Aerial photographs were analyzed from 1972, 1981, 1988 and 2000 with scales of 1:20,000, 1:20,000, 1:20,000, and 1:13,000, respectively. The aerial photographs were used to identify skid trail activity. The 1972 through 1988 aerial photographs utilized were from the Mendocino County Assessor's Office in Ukiah. The 2000 aerial photographs were from Mendocino Redwood Company's collection.

The aerial photograph interpretation for skid trail activity consisted of determining the area harvested with ground based yarding by skid trail density (high, moderate, low) for each photo year. High-density skid trail activity is defined as having greater than 100 watercourse crossings per square mile. Moderate-density skid trail activity is defined as having between 50-100 watercourse crossings per square mile. Light skid trail density has less than 50 watercourse crossings per square mile or trails with significant re-vegetation observed in the aerial photograph.

The amount of sediment delivery from the various densities of skid trail activity was estimated from sediment delivery rates during previous watershed analyses by MRC (MRC, 1998 and MRC, 2000). A combination of surface erosion modeling and field observations of point source erosion from skid trails, from previous watershed analysis, was used to develop the skid trail estimates. High skid trail density is estimated to contribute 600 tons/square mile/year of sediment. Moderate skid trail density is estimated to contribute 400 tons/square mile/year of sediment, while low skid trail density contributing 100 tons/square mile/year. Results from the South Fork Caspar Creek in the early 1970's suggested that high density tractor logging, with practices used at that time, generated approximately 600 tons/square mile/year (Rice et. al., 1979).

For each photo year the area in each skid trail density category was multiplied by the sediment delivery rate for that density. The estimate was then divided by the MRC ownership in each Calwater planning watershed to provide a sediment rate (tons/square mile/year) for each planning watershed. The estimated rate was then assumed to represent the decade previous to the photo year observed (i.e. 1972 photos represent activity in the 1960s).

Results and Discussion - Skid Trail Erosion

The results by time period for the skid trail sediment delivery estimates are summarized in Table B-6. The estimates should be considered a minimum sediment delivery for skid trails constructed and used in the decade. Undoubtedly, some if not many, sediment delivering skid trails were vegetated enough to be overlooked during the inventory. In particular are those trails constructed or used greater than five years prior to aerial photograph reconnaissance.

Table B-6. Skid Trail Sediment Delivery Rates by Decade and Planning Watershed for Northern Russian River WAU, 1960s-1990s.

Skid Trial Erosion (tons/mi^2/yr)				
Planning Watershed	**1960s**	**1970s**	**1980s**	**1990s**
Jack Smith	0	40	0	40
Mill Creek	0	0	0	0
Upper Ackerman	20	20	20	20
Lower Ackerman	0	0	0	0

In the Northern Russian River WAU, there was little ground-based yarding observed in the aerial photographs. This low level of skid trail construction and use is estimated to contribute only low levels of sediment delivery (See Table B-6). In the Northern Russian River WAU, Jack Smith planning watershed had skid trail sediment delivery during the 1970s or 1990s (no data was evaluated prior to 1960s), no activity was observed during the 1960s and 1980s. In Upper Ackerman Creek planning watershed skid trail sediment delivery has been relatively low, but consistent through the past 4 decades.

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APPENDIX B
Surface and Point Source Erosion Module

Northern Russian River Watershed Analysis Unit

Map B-1
Road Erosion Hazard Classifications

This map presents an erosion hazard rating for the MRC roads. High erosion hazard roads have the highest amount of recent deliverable surface erosion to watercourses and a high potential for future deliverable erosion. Active roads in this class should get the highest priority for maintenance or improvements. Closed roads in this class will need improvements before opening again. Opening abandoned roads in this class should be avoided. Moderate erosion hazard roads have moderate amounts of recent deliverable surface erosion to watercourses and potential for future deliverable erosion. Active roads in this class should be a priority for maintenance. Closed or abandoned roads in this class will need some improvements before opening again. Low Erosion Hazard roads have low amounts of recent deliverable surface erosion to watercourses and low potential for future deliverable erosion. Roads in this class only need small improvements before use.

Erosion Hazard Rating
- Low
- Moderate
- High

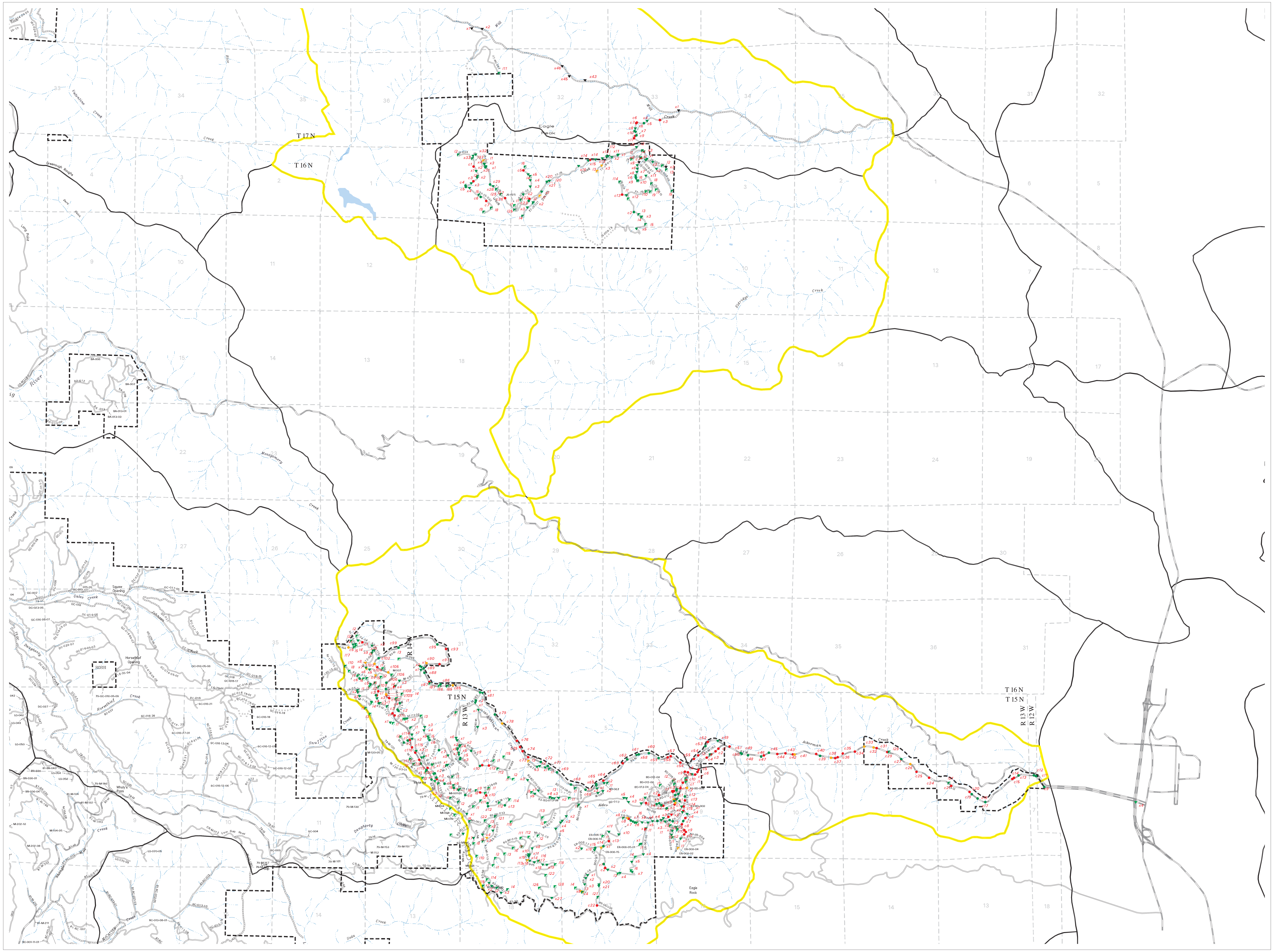
Transportation
- Paved Road
- Rocked Road
- Native Road
- Jeep Trail

- MRC Ownership
- Planning Watershed Boundary
- Northern Russian River Watershed Analysis Unit Boundary

Flow Class
- Class I
- Class II
- Class III

0 1/2 1 Mile

November 2004



Northern Russian River Watershed Analysis Unit

Map B-2 Road Feature Treatment Immediacy

This map presents select results from MRC's road inventory. The entire road network and road features were mapped using geographic positioning system (GPS) from 2000-2003. For each feature with the potential to create erosion (culverts, landings, crossings) the treatment immediacy for the feature was assigned. The treatment immediacy represents the level of concern for either upgrading or maintenance to the feature.

Culverts	Crossings	Landings
High	High	High
Moderate	Moderate	Moderate
Low	Low	Low
None	None	None
Undetermined	Undetermined	Undetermined

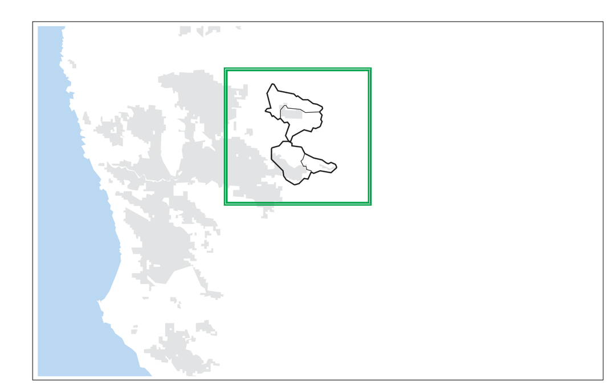
Transportation

- Paved Road
- Rocked Road
- Native Road
- Jeep Trail

- MRC Ownership
- Planning Watershed Boundary
- Northern Russian River Watershed Analysis Unit Boundary

Flow Class

- Class I
- Class II
- Class III



0 1/2 1 Mile

November 2004

Northern Russian River Watershed Analysis Unit

Map B-3
Road Work

This map presents road-associated erosion control work completed in the Northern Russian River WAU in 2004. This can include new road construction, road decommissioning, improvements to the road surface, or adjustments to the road prism. The road reconstruction category involves the re-opening of previously-used haul roads, whereas the major reconstruction category refers to roads that have been reconstructed from previously-used skid trails. Other road-associated erosion control work includes upgrades or replacements of major watercourse crossings such as bridge replacements or installations.

Road Work
- New Road Construction
- Major Reconstruction
- Road Reconstruction
- Road Surface Improvement
- Prism Alt./Drainage Structure Imprv.
- General Maintenance (2003)
- Road Decommissioned

Transportation
- Paved Road
- Rocked Road
- Native Road
- Jeep Trail

- MRC Ownership
- Planning Watershed Boundary
- Northern Russian River Watershed Analysis Unit Boundary

Flow Class
- Class I
- Class II
- Class III

0 1/2 1 Mile

November 2004

Road Number	Site Number	Mile Post	Culvert Type	Diversion Potential	Treatment Immediacy	Controllable Volume (yd^3)
83-ER-004	2	0.182	other	no div. potential	high	350
83-BD-013-08-02	1	0.103	dipped	no div. potential	high	15
83-ER-006-18	4	0.319	dipped	no div. potential	moderate	350
83-ER-006	8	0.696	other	undetermined	moderate	240
83-ER-006-15	1	0.03	other	already diverted	moderate	90
83-M-112-04	8	0.617	other	no div. potential	moderate	1000
77-JS-011	3	0.218	other	no div. potential	moderate	110
83-BD-013-21	3	0.279	other	no div. potential	moderate	250
83-ER-006-18	5	0.337	dipped	no div. potential	moderate	270
83-M-112-04	6	0.551	other	no div. potential	moderate	50
83-M-083-01	3	0.272	humboldt	undetermined	moderate	120
83-M-112-04	4	0.394	other	no div. potential	moderate	380
83-BD-013-08	2	0.246	other	no div. potential	low	150
83-BD-013-11	5	0.396	other	no div. potential	low	0
83-BD-013-11	4	0.309	dipped	no div. potential	low	110
83-BD-013-11	3	0.284	other	no div. potential	low	100
83-BD-013-11	2	0.22	humboldt	no div. potential	low	140
83-BD-013-09	1	0.051	other	no div. potential	low	30
83-BD-013-08-02	3	0.264	dipped	no div. potential	low	160
83-BD-013-08	5	0.512	dipped	no div. potential	low	40
77-JS-033	2	0.223	dipped	yes, road	low	80
83-BD-013-08	3	0.296	other	already diverted	low	300
83-BD-013-11	11	0.89	dipped	no div. potential	low	25
83-BD-013	5	0.359	dipped	no div. potential	low	60
83-BD-013	4	0.335	dipped	no div. potential	low	60
83-BD-013	3	0.287	other	already diverted	low	80
83-BD-013	2	0.12	other	already diverted	low	25
83-BD-013	1	0.043	dipped	yes, road	low	70
83-BD-009	1	0.031	ditch relief	yes, road	low	35
83-BD	5	0.504	bridge	undetermined	low	160
77-JS-033	4	0.421	dipped	yes, road	low	40
83-ER-006-05	1	0.076	low water (temp)	no div. potential	low	0
83-BD-013-08	4	0.318	other	no div. potential	low	230
83-ER-006	6	0.514	other	already diverted	low	170
83-ER-006-03-01	2	0.091	dipped	no div. potential	low	0
83-ER-006-03	3	0.188	dipped	no div. potential	low	30
77-JS	4	0.411	other	no div. potential	low	35
83-ER-006-03	1	0.022	low water (temp)	no div. potential	low	110
83-ER-006	21	2.02	other	already diverted	low	15
83-ER-006	20	2.004	dipped	no div. potential	low	70
83-ER-006	16	1.584	dipped	no div. potential	low	5
83-ER-006	11	1.143	dipped	yes, road	low	25
83-BD-013-11	8	0.799	other	no div. potential	low	65
83-ER-006	7	0.629	other	no div. potential	low	25
83-BD-013-11	10	0.878	other	no div. potential	low	20
83-ER-006	5	0.45	dipped	no div. potential	low	25
83-ER-006	4	0.399	low water (temp)	no div. potential	low	30
83-ER-006	3	0.306	other	no div. potential	low	10
83-ER-006	2	0.03	other	yes, road	low	15
83-ER-004	3	0.284	other	already diverted	low	35
83-ER-004	1	0.033	other	already diverted	low	12
83-ER	4	0.432	bridge	undetermined	low	80
83-BD-013-21	2	0.161	dipped	no div. potential	low	85
77-JS-033	1	0.144	dipped	no div. potential	low	100
83-ER-006	10	1.016	dipped	undetermined	low	8
77-JS	20	1.954	dipped	no div. potential	low	40
77-JS-009	8	0.575	ditch relief	yes, road	low	30
77-JS-009	7	0.536	ditch relief	yes, road	low	10

Road Number	Site Number	Mile Post	Culvert Type	Diversion Potential	Treatment Immediacy	Controllable Volume (yd^3)
77-JS-009	6	0.5	ditch relief	yes, road	low	10
77-JS-009	5	0.461	other	yes, road	low	15
77-JS-009	3	0.252	dipped	no div. potential	low	0
77-JS	33	3.318	other	no div. potential	low	50
77-JS	32	3.249	dipped	yes, road	low	80
77-JS	31	3.072	dipped	no div. potential	low	50
77-JS-033	3	0.314	dipped	no div. potential	low	40
77-JS	21	1.982	dipped	no div. potential	low	15
77-JS-009	11	0.745	other	yes, road	low	30
77-JS	16	1.576	other	yes, road	low	20
77-JS	15	1.446	dipped	yes, road	low	650
77-JS	14	1.366	other	yes, road	low	30
77-JS	13	1.286	dipped	yes, road	low	30
77-JS	12	1.236	dipped	no div. potential	low	40
77-JS	11	1.112	other	already diverted	low	20
77-JS	9	0.891	dipped	already diverted	low	120
77-JS	7	0.642	other	already diverted	low	100
77-JS	6	0.598	dipped	already diverted	low	40
77-JS	28	2.83	dipped	no div. potential	low	25
77-JS-011	2	0.07	other	no div. potential	low	200
77-JS-032	4	0.057	dipped	no div. potential	low	0
77-JS-032	3	0.052	dipped	no div. potential	low	50
77-JS-032	2	0.028	other	yes, road	low	25
77-JS-032	1	0.02	dipped	no div. potential	low	80
77-JS-025-02	5	0.46	dipped	no div. potential	low	65
77-JS-025-02	4	0.385	dipped	no div. potential	low	30
77-JS-025-02	3	0.314	dipped	no div. potential	low	20
77-JS-025-02	2	0.182	dipped	no div. potential	low	40
77-JS-021	3	0.252	other	no div. potential	low	4
77-JS-009	9	0.606	dipped	already diverted	low	0
77-JS-021	1	0.022	other	already diverted	low	30
77-JS-009	10	0.637	dipped	yes, road	low	20
77-JS-011	1	0.004	dipped	already diverted	low	60
77-JS-009-13	5	0.543	dipped	no div. potential	low	15
77-JS-009-13	3	0.334	dipped	no div. potential	low	30
77-JS-009-05	2	0.177	dipped	no div. potential	low	50
77-JS-009-05	1	0.027	dipped	yes, road	low	45
77-JS-009-03	2	0.103	other	no div. potential	low	30
77-JS-009-03	1	0.035	dipped	already diverted	low	260
77-JS-009	12	1.229	dipped	no div. potential	low	160
83-ER-006-03-01	1	0.039	dipped	no div. potential	low	90
77-JS-021	2	0.17	other	yes, road	low	20
83-M-112-04	7	0.564	other	no div. potential	low	100
83-M-091	3	0.341	dipped	no div. potential	low	40
83-M-117	3	0.337	other	yes, road	low	38
83-M-114	1	0.072	dipped	no div. potential	low	25
83-M-113-02	2	0.104	dipped	no div. potential	low	20
83-M-113-02	1	0.081	other	no div. potential	low	0
83-M-112-05	4	0.394	dipped	no div. potential	low	0
83-M-112-05	3	0.239	dipped	no div. potential	low	0
83-M-112-05	2	0.19	dipped	no div. potential	low	0
83-M-117	5	0.512	dipped	yes, road	low	66
83-M-112-04	9	0.775	dipped	no div. potential	low	30
83-M-117	9	0.886	other	already diverted	low	15
83-M-112-04	5	0.514	dipped	no div. potential	low	75
83-M-112	3	0.28	dipped	no div. potential	low	75
83-ER-006-03	2	0.164	dipped	undetermined	low	15
83-M-104-04	1	0.102	other	yes, road	low	40

Road Number	Site Number	Mile Post	Culvert Type	Diversion Potential	Treatment Immediacy	Controllable Volume (yd^3)
83-ER-006-05	4	0.351	dipped	yes, road	low	12
83-M-093	2	0.051	dipped	no div. potential	low	20
83-M-093	1	0.031	dipped	no div. potential	low	50
83-M-091	4	0.411	other	no div. potential	low	150
83-M-112-04	10	0.817	other	no div. potential	low	90
83-MI-007	4	0.386	dipped	no div. potential	low	0
83-MI-017	3	0.296	dipped	no div. potential	low	0
83-MI-017	2	0.169	dipped	no div. potential	low	180
83-MI-017	1	0.122	dipped	no div. potential	low	0
83-MI-015	27	2.665	dipped	no div. potential	low	0
83-MI-015	19	1.717	dipped	already diverted	low	50
83-MI-015	18	1.672	dipped	no div. potential	low	50
83-MI-015	17	1.551	dipped	yes, road	low	65
83-MI-015	16	1.5	bridge	no div. potential	low	0
83-M-117	4	0.373	dipped	yes, road	low	80
83-MI-015	14	1.424	dipped	no div. potential	low	0
83-M-104	2	0.16	other	yes, road	low	350
83-MI-005	1	0.034	other	no div. potential	low	0
83-MI	7	0.737	other	no div. potential	low	10
83-M-119-03	1	0.075	other	yes, road	low	70
83-M-119-01	1	0.09	dipped	no div. potential	low	0
83-M-117-08	1	0.076	other	yes, road	low	140
83-M-117-02	3	0.288	dipped	no div. potential	low	10
83-M-117-02	2	0.125	dipped	no div. potential	low	20
83-M-117-02	1	0.079	dipped	no div. potential	low	0
83-MI-015	15	1.443	dipped	no div. potential	low	0
83-ER-006-19	4	0.36	dipped	no div. potential	low	20
83-M-069	1	0.039	other	no div. potential	low	410
83-M-067	2	0.099	dipped	undetermined	low	25
83-M-067	1	0.012	dipped	undetermined	low	150
83-M-091	1	0.029	dipped	no div. potential	low	40
83-M	65	6.45	bridge	no div. potential	low	0
83-M-104-08	1	0.029	dipped	no div. potential	low	60
83-M	58	5.82	bridge	no div. potential	low	60
83-M-069	2	0.132	other	no div. potential	low	370
83-ER-008	1	0.021	dipped	undetermined	low	20
83-M	81	8.1	bridge	no div. potential	low	60
83-ER-006-19	2	0.217	dipped	no div. potential	low	20
83-ER-006-18	3	0.204	other	yes, road	low	300
83-ER-006-18	2	0.146	other	no div. potential	low	25
83-ER-006-18	1	0.11	other	yes, road	low	10
83-ER-006-17	2	0.193	dipped	undetermined	low	60
83-ER-006-05-01	1	0.017	dipped	undetermined	low	0
83-ER-006-05	7	0.667	other	yes, road	low	70
83-ER-006-05	5	0.505	dipped	yes, road	low	10
83-M	49	4.9	bridge	no div. potential	low	5220
83-M-083	6	0.645	humboldt	yes, road	low	2
83-M-083-06	2	0.084	dipped	undetermined	low	40
83-M-083-06	3	0.119	dipped	no div. potential	low	0
83-M-083-06	4	0.195	other	no div. potential	low	7
83-M-083-06	5	0.208	other	yes, road	low	0
83-M-069	3	0.187	other	no div. potential	low	300
83-M-083-01	1	0.086	other	no div. potential	low	180
83-M-083-06	1	0.021	other	yes, road	low	8
83-M-083	1	0.129	dipped	yes, road	low	25
83-M-073	3	0.187	dipped	undetermined	low	10
83-M-083-06	6	0.245	dipped	no div. potential	low	0
83-M-073	2	0.159	other	undetermined	low	260

Road Number	Site Number	Mile Post	Culvert Type	Diversion Potential	Treatment Immediacy	Controllable Volume (yd^3)
83-M-073	1	0.097	other	undetermined	low	200
83-M-083-06	7	0.267	other	undetermined	low	0
83-M	4	0.4	bridge	yes, road	none	0
83-M-119-02	1	0.035	dipped	no div. potential	none	0
83-M-119-02	2	0.113	dipped	no div. potential	none	0
77-JS-009	4	0.425	ditch relief	undetermined	undetermined	60
CR-M219	46	4.624	bridge	undetermined	undetermined	0
77-JS-009-03	3	0.259	other	undetermined	undetermined	130
CR-M219	1	0.004	bridge	undetermined	undetermined	0
CR-M219	2	0.14	bridge	undetermined	undetermined	0
CR-M219	43	4.315	bridge	undetermined	undetermined	0
CR-M219	45	4.495	bridge	undetermined	undetermined	0
77-RC-057	1	0.025	bridge	undetermined	undetermined	0

Road Number	Site Number	Mile Post	Perched Material	Fill Condition	Treatment Immediacy	Controllable Volume (yd^3)	Distance from Stream (ft)
83-M-091	4	0.43	no	failed-active	high	4000	0-50
83-ER-006-05	1	0.09	no	stable	high	140	0-50
83-M-073	3	0.3	no	stable	moderate	1200	50-200
77-JS-011	3	0.3	yes	failed-active	moderate	350	0-50
83-ER-008	1	0.13	no	failed-dormant	moderate	350	0-50
83-M-071	1	0.05	no	unstable	moderate	200	50-200
83-MI-015	13	1.25	no	failed-dormant	moderate	180	0-50
77-JS-021	1	0.07	no	failed-dormant	moderate	150	0-50
77-JS-032	1	0.09	no	failed-dormant	moderate	150	0-50
83-ER-006	7	0.74	no	stable	low	300	50-200
83-M-067	1	0.14	no	stable	low	300	0-50
83-BD-013-09	1	0.07	no	failed-dormant	low	250	0-50
77-JS-021	2	0.17	no	stable	low	130	0-50
77-JS-009	6	0.63	no	stable	low	120	0-50
77-JS-009	4	0.37	no	unstable	low	100	0-50
77-JS-033	8	0.76	yes	stable	low	60	>200
77-JS-009	14	1.42	yes	failed-dormant	low	50	>200
83-M-117-08	1	0.09	no	unstable	low	30	0-50
77-JS	25	2.48	yes	stable	low	25	50-200
77-RC-057	11	1.14	no	stable	low	15	50-200
77-JS	12	1.21	no	stable	low	0	50-200
77-JS	20	1.98	no	stable	low	0	0-50
77-JS	27	2.71	no	stable	low	0	50-200
77-JS	29	2.78	no	stable	low	0	50-200
77-JS	33	3.35	no	stable	low	0	>200
77-JS-009	2	0.23	no	stable	low	0	0-50
77-JS-009	8	0.85	no	stable	low	0	>200
77-JS-009-03	3	0.29	no	failed-dormant	low	0	>200
77-JS-009-05	5	0.47	no	stable	low	0	50-200
77-JS-009-13	3	0.29	no	stable	low	0	>200
77-JS-009-13	4	0.34	no	stable	low	0	>200
77-JS-009-13	5	0.43	no	stable	low	0	>200
77-JS-021	4	0.36	no	stable	low	0	0-50
77-JS-025-02	1	0.12	no	stable	low	0	50-200
77-JS-025-02	4	0.43	no	stable	low	0	>200
77-JS-025-02	6	0.57	no	stable	low	0	50-200
77-JS-033	2	0.21	no	stable	low	0	>200
77-JS-033	5	0.55	no	stable	low	0	>200
77-JS-033	9	0.86	no	stable	low	0	>200
77-JS-034	2	0.19	no	stable	low	0	>200
83-BD	2	0.19	no	stable	low	0	50-200
83-BD-013	21	2.06	no	stable	low	0	>200
83-BD-013	22	2.18	no	stable	low	0	>200
83-BD-013-08	3	0.34	no	stable	low	0	50-200
83-ER-006	21	2.15	no	failed-dormant	low	0	0-50
83-ER-006-18	3	0.32	no	stable	low	0	0-50
83-M	21	2.14	no	stable	low	0	>200
83-M	29	2.88	no	stable	low	0	>200
83-M	86	8.63	no	failed-dormant	low	0	0-50
83-M	87	8.73	no	failed-dormant	low	0	0-50

Road Number	Site Number	Mile Post	Perched Material	Fill Condition	Treatment Immediacy	Controllable Volume (yd^3)	Distance from Stream (ft)
83-M-073	1	0.05	no	stable	low	0	50-200
83-M-083	12	1.25	no	stable	low	0	>200
83-M-104-08	1	0	no	stable	low	0	>200
83-M-112	1	0.12	no	stable	low	0	>200
83-M-112	2	0.21	no	stable	low	0	>200
83-M-112	4	0.44	no	stable	low	0	>200
83-M-112	5	0.55	no	stable	low	0	>200
83-M-112-04	8	0.81	no	stable	low	0	0-50
83-M-112-05-01	1	0.02	no	stable	low	0	50-200
83-M-117	1	0.04	no	stable	low	0	>200
83-M-119	5	0.49	no	stable	low	0	>200
83-M-119	6	0.59	no	stable	low	0	0-50
83-M-119	8	0.81	no	stable	low	0	>200
83-M-119-01-01	1	0.02	no	stable	low	0	>200
83-M-119-05	1	0.1	no	stable	low	0	>200
83-MI	15	1.5	no	stable	low	0	>200
83-MI	5	0.54	no	stable	low	0	>200
83-MI-001	1	0.13	no	stable	low	0	>200
83-MI-001	2	0.23	no	stable	low	0	>200
83-MI-005	2	0.25	no	stable	low	0	>200
83-MI-007	5	0.46	no	stable	low	0	50-200
83-MI-015-13	2	0.16	yes	stable	low	0	>200
83-MI-017	2	0.23	yes	stable	low	0	>200
83-MI-017	4	0.37	yes	stable	low	0	>200
77-JS-009	10	0.99	no	stable	none	0	>200
77-JS-009	9	0.94	no	failed-dormant	none	0	>200
77-JS-009-03	2	0.22	no	stable	none	0	>200
77-JS-009-04	1	0.1	no	stable	none	0	50-200
77-JS-009-11	1	0.08	no	failed-dormant	none	0	>200
77-JS-009-13	1	0.07	no	stable	none	0	>200
77-JS-025	1	0.06	no	stable	none	0	>200
83-BD	7	0.69	no	stable	none	0	>200
83-BD-010-04	1	0.08	no	stable	none	0	>200
83-BD-010-04	2	0.12	no	stable	none	0	>200
83-BD-010-10	1	0.12	no	stable	none	0	>200
83-BD-013	13	1.29	no	stable	none	0	50-200
83-BD-013	18	1.78	no	stable	none	0	>200
83-BD-013-08	1	0.12	no	stable	none	0	>200
83-BD-013-08	5	0.55	no	stable	none	0	>200
83-BD-013-13	2	0.18	no	stable	none	0	>200
83-ER	1	0.07	no	stable	none	0	>200
83-ER-006	6	0.59	no	stable	none	0	>200
83-ER-006-03	1	0.1	no	stable	none	0	50-200
83-ER-006-03	2	0.2	no	stable	none	0	0-50
83-ER-006-03-01	1	0.12	no	failed-dormant	none	0	50-200
83-ER-006-05	4	0.44	no	stable	none	0	>200
83-ER-006-05	6	0.65	no	stable	none	0	50-200
83-ER-006-05-01	1	0.03	no	stable	none	0	>200
83-ER-006-12	1	0.06	no	stable	none	0	>200
83-ER-006-18	4	0.42	no	stable	none	0	>200

Road Number	Site Number	Mile Post	Perched Material	Fill Condition	Treatment Immediacy	Controllable Volume (yd^3)	Distance from Stream (ft)
83-ER-006-19	3	0.34	no	stable	none	0	>200
83-M	105	10.54	no	stable	none	0	>200
83-M	85	8.54	no	failed-dormant	none	0	50-200
83-M-083	15	1.53	no	stable	none	0	>200
83-M-083-04	1	0.08	no	stable	none	0	50-200
83-M-083-11	1	0.07	no	stable	none	0	>200
83-M-083-12	1	0.11	no	stable	none	0	>200
83-M-083-12	2	0.16	no	stable	none	0	>200
83-M-093	3	0.3	no	stable	none	0	50-200
83-M-104	4	0.38	no	stable	none	0	50-200
83-M-104	5	0.41	no	failed-dormant	none	0	50-200
83-M-104-04	2	0.16	no	stable	none	0	>200
83-M-104-08	2	0.07	no	stable	none	0	>200
83-M-105	1	0.02	no	stable	none	0	>200
83-M-111	1	0.03	no	stable	none	0	>200
83-M-112	6	0.59	no	stable	none	0	>200
83-M-112	7	0.66	no	failed-dormant	none	0	>200
83-M-112	8	0.76	no	stable	none	0	>200
83-M-112-04	1	0.11	no	stable	none	0	50-200
83-M-112-04	2	0.21	no	stable	none	0	>200
83-M-112-05	1	0.04	no	stable	none	0	>200
83-M-112-05	4	0.41	no	stable	none	0	50-200
83-M-113	4	0.38	no	stable	none	0	>200
83-M-113-02	1	0.07	no	unstable	none	0	50-200
83-M-113-02	3	0.26	no	stable	none	0	>200
83-M-114	1	0.04	no	stable	none	0	0-50
83-M-116	2	0.17	no	stable	none	0	>200
83-M-117	5	0.53	no	stable	none	0	50-200
83-M-119	1	0.15	no	stable	none	0	>200
83-M-119	12	1.21	no	stable	none	0	>200
83-M-119	14	1.35	no	stable	none	0	>200
83-M-119-02	2	0.16	no	stable	none	0	>200
83-M-119-03	1	0.09	no	stable	none	0	>200
83-M-119-09	1	0.09	no	stable	none	0	>200
83-M-120-02	2	0.08	no	stable	none	0	>200
83-MI	10	0.97	no	stable	none	0	>200
83-MI	14	1.42	no	stable	none	0	>200
83-MI	8	0.82	no	stable	none	0	>200
83-MI-005	1	0.15	no	stable	none	0	>200
83-MI-007	3	0.25	no	stable	none	0	>200
83-MI-015	1	0.05	no	stable	none	0	>200
83-MI-015	11	1.09	no	stable	none	0	>200
83-MI-015	12	1.2	no	stable	none	0	>200
83-MI-015	16	1.61	no	stable	none	0	>200
83-MI-015	18	1.82	no	stable	none	0	>200
83-MI-015	2	0.13	no	stable	none	0	>200
83-MI-015	22	2.24	no	stable	none	0	>200
83-MI-015	25	2.47	no	stable	none	0	>200
83-MI-015	28	2.83	no	stable	none	0	>200
83-MI-015	3	0.33	no	stable	none	0	>200

Road Number	Site Number	Mile Post	Perched Material	Fill Condition	Treatment Immediacy	Controllable Volume (yd^3)	Distance from Stream (ft)
83-MI-015	6	0.63	no	stable	none	0	>200
83-MI-015	9	0.94	no	stable	none	0	>200

Road Number	Site Number	Mile Post	Erosion Type	Treatment Immediacy	Controllable Volume (yd^3)
83-M	67	6.7	major rilling	high	3000
83-BD-013-08-02	3	0.301	gully	high	2200
83-BD-013-11	8	0.673	gully	high	1900
83-M	83	8.323	major rilling	high	500
83-M	87	8.713	gully	moderate	300
83-BD-013-11	7	0.655	gully	moderate	300
83-ER-006-15	1	0.018	gully	moderate	200
83-M	71	7.134	gully	moderate	200
83-M	85	8.47	gully	moderate	200
83-M-071	2	0.188	gully	moderate	200
83-M	107	10.734	gully	moderate	190
83-BD-010	1	0.061	gully	moderate	80
77-JS	20	1.954	gully	moderate	25
83-M-083	11	1.041	gully	moderate	0
83-M-083	2	0.193	gully	moderate	0
83-M-117	5	0.511	gully	moderate	0
83-BD-010	2	0.167	gully	low	300
77-JS-009	5	0.462	gully	low	250
83-BD-013-11	3	0.318	gully	low	220
83-BD-013-08	4	0.366	gully	low	200
77-JS-009-13	2	0.077	gully	low	200
83-BD-009	5	0.45	gully	low	180
83-ER-006	12	1.222	gully	low	180
83-BD-013-13	1	0.05	gully	low	150
83-BD-013-21	3	0.268	gully	low	140
83-BD-013-11	2	0.169	gully	low	130
83-BD-013	11	1.052	gully	low	100
83-ER-006-18	3	0.325	gully	low	90
83-ER-006	21	2.082	gully	low	89
83-M-119	12	1.178	gully	low	85
83-BD-013	3	0.331	gully	low	80
77-JS-011	2	0.164	gully	low	60
83-ER-006	13	1.254	gully	low	60
83-M	73	7.29	gully	low	55
77-JS-011	3	0.199	gully	low	50
77-JS-009	13	1.279	major rilling	low	50
83-M-091	1	0.077	gully	low	50
83-ER-006	22	2.105	gully	low	50
83-BD-013-11	1	0.076	gully	low	40
77-JS	8	0.807	major rilling	low	40
83-M-073	2	0.23	gully	low	40
83-ER-004	3	0.279	gully	low	40
77-JS	5	0.483	major rilling	low	30
83-ER-006	14	1.375	major rilling	low	30
83-BD-013	1	0.036	gully	low	30
83-M-067	1	0.043	gully	low	30
83-BD-013	4	0.448	gully	low	20
77-JS	7	0.656	major rilling	low	20
83-BD-013-11	9	0.677	gully	low	20

Road Number	Site Number	Mile Post	Erosion Type	Treatment Immediacy	Controllable Volume (yd^3)
77-JS	32	3.161	gully	low	20
83-BD-013	2	0.245	gully	low	20
83-BD-013-21	4	0.291	gully	low	20
83-M-091	2	0.147	gully	low	20
83-ER-004	1	0.069	gully	low	20
83-ER-006	3	0.267	gully	low	18
77-JS-011	4	0.28	gully	low	15
83-ER-006	19	1.89	gully	low	15
83-ER-006-14	1	0.082	gully	low	15
83-M-083	12	1.058	gully	low	10
83-M-071	1	0.024	gully	low	10
83-M-093	3	0.267	gully	low	10
83-ER-006	23	2.29	gully	low	10
83-ER-006	5	0.478	major rilling	low	8
83-ER-006-18	1	0.105	gully	low	8
83-M-083	10	0.951	major rilling	low	4
83-BD-013-08	3	0.29	gully	low	0
83-BD-013-21	2	0.243	gully	low	0
77-JS-009-13	9	0.866	major rilling	low	0
77-JS-009-13	1	0.011	major rilling	low	0
77-JS-009	8	0.838	major rilling	low	0
77-JS-009	6	0.529	gully	low	0
83-M-083-06	2	0.192	gully	low	0
83-M-083	3	0.207	gully	low	0
83-M-083	4	0.23	major rilling	low	0
83-M-083	6	0.314	major rilling	low	0
83-M-117	1	0.079	major rilling	low	0
83-MI	14	1.379	major rilling	low	0
83-MI-007	1	0.082	major rilling	low	0
83-M-083	5	0.275	major rilling	low	0
83-MI-007	2	0.107	major rilling	low	0

Road Number	Site Number	Mile Post	Culvert Type	Diversion Potential	Treatment Immediacy	Controllable Volume (yd^3)
83-M	40	3.7	ditch relief	yes, ditch	high	undetermined
83-M	21	2.1	watercourse	yes, ditch	high	29610
83-M	25	2.52	watercourse	yes, road	high	17930
83-M	402	4.84	watercourse	no div. potential	high	11000
83-M	24	2.4	watercourse	yes, ditch	high	9601
83-M	15	1.38	watercourse	yes, road	high	9020
83-M	34	3.2	watercourse	yes, ditch	high	7000
83-M	14	1.35	watercourse	yes, ditch	high	5320
83-M	104	10.4	watercourse	yes, ditch	high	4610
83-M	29	2.9	watercourse	yes, ditch	high	4040
83-M	403	8.17	watercourse	no div. potential	high	4000
83-M	110	10.8	watercourse	yes, ditch	high	2500
83-M	51	4.8	watercourse	yes, ditch	high	1500
83-M	43	4.1	watercourse	yes, ditch	high	1100
77-JS	7	0.54	watercourse	no div. potential	high	1000
83-ER-006-19	2	0.18	watercourse	no div. potential	high	700
83-M	87	8.7	watercourse	yes, ditch	high	600
83-M	404	5.87	watercourse	no div. potential	high	550
83-M	37	3.52	watercourse	yes, ditch	high	450
83-M	58	5.6	watercourse	yes, ditch	high	450
83-M	63	6.1	watercourse	yes, ditch	high	370
83-M	46	4.38	watercourse	yes, ditch	high	320
77-JS-025-02	5	0.52	watercourse	no div. potential	high	300
83-M-104-04	1	0.05	watercourse	no div. potential	high	230
77-JS-033	1	0.09	watercourse	no div. potential	high	200
83-M	76	7.5	watercourse	yes, ditch	high	200
83-M-083	12	1.14	watercourse	yes, road	high	190
83-BD	5	0.4	watercourse	yes, road	high	180
83-M	57	5.48	watercourse	yes, ditch	high	170
77-JS	6	0.53	watercourse	already diverted	high	160
83-ER-006	22	2.24	watercourse	no div. potential	high	150
83-M-119	10	0.94	watercourse	no div. potential	high	150
83-M	52	4.9	watercourse	yes, ditch	high	130
83-ER	4	0.27	watercourse	yes, ditch	high	120
83-M	20	1.9	watercourse	yes, ditch	high	100
83-M	31	3.06	watercourse	yes, ditch	high	100
83-M	35	3.4	ditch relief	yes, ditch	high	100
83-M	91	9.1	ditch relief	yes, ditch	high	100
83-M-083	11	1.07	watercourse	yes, road	high	100
83-M-112-04	2	0.06	watercourse	no div. potential	high	100
77-JS	26	2.65	watercourse	no div. potential	high	80
83-ER-004	2	0.22	watercourse	yes, road	high	75
83-M	56	5.4	ditch relief	yes, ditch	high	65
83-M-119	9	0.86	watercourse	yes, road	high	65
77-JS	14	1.43	watercourse	no div. potential	high	60
77-JS	22	2.25	watercourse	yes, ditch	high	60
77-JS	11	0.75	watercourse	yes, road	high	60
77-JS	3	0.26	watercourse	no div. potential	high	60
83-BD-010-06	2	0.01	ditch relief	yes, road	high	60

Road Number	Site Number	Mile Post	Culvert Type	Diversion Potential	Treatment Immediacy	Controllable Volume (yd^3)
83-M	64	6.4	ditch relief	yes, ditch	high	60
83-BD-009	1	0.11	ditch relief	no div. potential	high	50
83-BD-009	5	0.48	watercourse	already diverted	high	50
83-ER-006	13	1.3	watercourse	yes, road	high	50
83-M	73	7.3	ditch relief	yes, ditch	high	50
83-M-119	4	0.29	watercourse	already diverted	high	50
83-ER	10	0.68	watercourse	yes, ditch	high	40
83-M	54	5.2	watercourse	yes, ditch	high	40
83-M	75	7.45	watercourse	no div. potential	high	40
83-M	36	3.48	watercourse	yes, ditch	high	30
83-M	44	4.2	watercourse	yes, ditch	high	30
83-ER	11	0.71	watercourse	yes, ditch	high	30
83-ER-006	8	0.68	ditch relief	already diverted	high	30
83-M	55	5.3	watercourse	yes, ditch	high	30
83-M	93	9.3	ditch relief	yes, ditch	high	30
83-ER-006	1	0.01	watercourse	yes, road	high	26
83-BD	1	0.08	ditch relief	yes, ditch	high	25
83-BD	3	0.18	watercourse	yes, ditch	high	25
83-BD-010	3	0.22	ditch relief	already diverted	high	25
83-ER	8	0.57	ditch relief	yes, ditch	high	25
83-BD	2	0.12	ditch relief	yes, ditch	high	20
77-JS	10	0.7	watercourse	yes, road	high	20
83-ER	5	0.34	watercourse	yes, ditch	high	20
83-M-112	1	0	ditch relief	yes, ditch	high	20
77-JS-033	7	0.65	watercourse	no div. potential	high	15
83-ER	9	0.66	ditch relief	yes, ditch	high	15
83-M	74	7.4	ditch relief	yes, ditch	high	15
77-JS-009	13	1.29	watercourse	no div. potential	high	14
83-BD-010-06	1	0.01	ditch relief	yes, road	high	13
83-ER	6	0.49	ditch relief	yes, ditch	high	13
83-BD	8	0.55	ditch relief	yes, road	high	12
77-JS-033	3	0.28	watercourse	yes, road	high	11
83-BD	11	0.81	watercourse	yes, road	high	11
83-BD	15	1.1	downspout	yes, road	high	10
83-BD	6	0.43	watercourse	yes, road	high	10
83-BD-010	2	0.13	ditch relief	yes, ditch	high	10
83-BD-010-06	3	0.03	ditch relief	yes, road	high	10
83-BD	13	0.94	ditch relief	yes, road	high	9
83-BD	9	0.59	ditch relief	yes, road	high	9
83-M-112-04	1	0.01	watercourse	yes, road	high	9
83-M-119	1	0.13	watercourse	yes, road	high	8
83-BD	4	0.23	watercourse	yes, road	high	7
83-BD	10	0.75	ditch relief	yes, road	high	7
83-BD	7	0.47	watercourse	yes, road	high	7
77-JS-009	7	0.65	watercourse	yes, road	high	5
83-ER	1	0.05	ditch relief	yes, road	high	5
83-M	42	3.94	ditch relief	yes, ditch	high	3
83-M	38	3.55	watercourse	yes, ditch	moderate	undetermined
83-M	103	10.3	watercourse	yes, ditch	moderate	33000

Road Number	Site Number	Mile Post	Culvert Type	Diversion Potential	Treatment Immediacy	Controllable Volume (yd^3)
83-M	33	3.15	watercourse	yes, ditch	moderate	11130
83-M	41	3.9	watercourse	no div. potential	moderate	4350
83-M	105	10.5	watercourse	yes, ditch	moderate	3900
83-M	85	8.48	ditch relief	yes, ditch	moderate	310
83-M	78	7.8	watercourse	yes, ditch	moderate	300
83-M	90	8.9	watercourse	yes, ditch	moderate	200
83-BD-009-02	1	0.03	pond drain	yes, road	moderate	170
83-ER	2	0.14	watercourse	yes, ditch	moderate	150
83-M-104	5	0.47	watercourse	yes, road	moderate	150
83-M	26	2.6	ditch relief	yes, ditch	moderate	50
83-M	32	3.1	ditch relief	yes, ditch	moderate	50
83-BD-010-03	1	0.09	ditch relief	no div. potential	moderate	15
83-M	102	10.2	watercourse	yes, ditch	low	20860
83-M	17	1.7	watercourse	yes, ditch	low	11880
83-M	39	3.62	watercourse	yes, ditch	low	8600
83-M	106	10.6	watercourse	yes, ditch	low	6500
83-M	68	6.8	watercourse	yes, ditch	low	4000
83-M	19	1.85	watercourse	yes, ditch	low	3600
83-M	72	7.2	watercourse	yes, ditch	low	3080
83-M	18	1.8	watercourse	yes, ditch	low	1900
83-M	49	4.7	watercourse	no div. potential	low	1500
83-M-119	8	0.68	watercourse	no div. potential	low	1500
83-M	89	8.85	watercourse	no div. potential	low	930
83-M-119	12	1.08	watercourse	no div. potential	low	600
83-M-119	11	1.04	watercourse	no div. potential	low	440
83-M	69	6.9	watercourse	yes, ditch	low	370
77-JS-009	6	0.58	watercourse	yes, road	low	300
83-M-112	5	0.48	watercourse	yes, road	low	280
83-M-119	13	1.27	watercourse	no div. potential	low	280
77-JS-009-13	2	0.23	watercourse	no div. potential	low	270
83-M	50	4.72	watercourse	yes, ditch	low	260
83-M-113	2	0.18	watercourse	yes, road	low	260
83-BD-008	2	0.05	pond drain	yes, ditch	low	250
83-M-083	2	0.1	watercourse	no div. potential	low	250
83-BD-008	2	0.05	pond relief	yes, ditch	low	220
83-M	106	10.6	watercourse	yes, ditch	low	220
77-JS	23	2.27	watercourse	yes, road	low	200
77-JS	5	0.45	watercourse	no div. potential	low	200
83-ER-006	3	0.21	watercourse	yes, road	low	200
83-M-083-06	5	0.53	watercourse	no div. potential	low	180
83-M-117	7	0.73	watercourse	no div. potential	low	180
83-M-113	3	0.2	watercourse	yes, road	low	170
83-M-112	6	0.63	watercourse	no div. potential	low	160
83-M	59	5.7	ditch relief	yes, ditch	low	150
83-M	79	7.9	watercourse	yes, ditch	low	150
83-M-083	9	0.86	watercourse	yes, road	low	150
83-M	72	7.2	watercourse	no div. potential	low	140
83-M-116	2	0.1	watercourse	yes, road	low	140
83-M-083-06	3	0.3	watercourse	no div. potential	low	130

Road Number	Site Number	Mile Post	Culvert Type	Diversion Potential	Treatment Immediacy	Controllable Volume (yd^3)
83-ER-006	6	0.61	watercourse	yes, road	low	110
83-M	60	5.78	watercourse	yes, ditch	low	110
83-M-119	7	0.57	watercourse	already diverted	low	110
83-M	107	10.7	watercourse	yes, ditch	low	104
77-JS	29	2.87	watercourse	no div. potential	low	100
83-M	48	4.6	watercourse	yes, ditch	low	100
83-M	66	6.6	watercourse	yes, ditch	low	100
83-M-083	10	1.05	watercourse	yes, road	low	100
83-ER	3	0.23	watercourse	yes, ditch	low	80
83-M	86	8.6	watercourse	yes, ditch	low	80
83-M-113	4	0.28	watercourse	yes, road	low	80
83-M-117	6	0.55	watercourse	yes, road	low	75
83-M	71	7.1	watercourse	yes, ditch	low	70
83-ER-006	14	1.44	watercourse	yes, road	low	65
83-M	27	2.7	watercourse	yes, ditch	low	60
83-M-119	5	0.39	watercourse	yes, ditch	low	60
83-M	65	6.45	ditch relief	yes, ditch	low	50
83-M	88	8.8	ditch relief	yes, ditch	low	50
83-ER-006-19	1	0.14	watercourse	yes, road	low	45
83-M	13	1.3	watercourse	yes, ditch	low	40
77-JS	8	0.63	watercourse	yes, road	low	40
77-JS	9	0.69	watercourse	yes, road	low	40
83-ER-006	7	0.65	ditch relief	yes, road	low	40
83-M-083	1	0	ditch relief	no div. potential	low	40
83-BD	12	0.88	ditch relief	yes, road	low	35
83-BD-009	2	0.23	pond drain	no div. potential	low	35
83-BD-010-03	3	0.26	downspout	no div. potential	low	35
83-M	62	5.9	ditch relief	yes, ditch	low	35
83-M-119	6	0.52	watercourse	yes, road	low	32
83-BD-010-03	4	0.29	downspout	yes, ditch	low	30
83-M	61	5.8	ditch relief	yes, ditch	low	30
83-M	45	4.3	ditch relief	yes, ditch	low	25
83-M	47	4.4	watercourse	yes, ditch	low	25
83-BD-010-03	2	0.23	downspout	no div. potential	low	25
77-JS-033	5	0.38	watercourse	yes, road	low	20
83-BD-008	1	0.04	ditch relief	no div. potential	low	20
83-M	53	4.99	watercourse	yes, ditch	low	20
83-M	95	9.5	ditch relief	yes, ditch	low	20
83-M	99	9.9	ditch relief	yes, ditch	low	20
83-BD	14	0.97	ditch relief	yes, road	low	17
83-M-116	1	0.03	watercourse	yes, road	low	13
83-BD-009	3	0.24	pond drain	no div. potential	low	10
83-ER	7	0.53	ditch relief	yes, road	low	10
83-BD-010	1	0.05	ditch relief	yes, ditch	low	9
83-M-119	2	0.22	watercourse	yes, road	low	8
83-ER-006	4	0.35	watercourse	yes, road	low	6
77-JS-033	4	0.37	watercourse	yes, road	low	4
83-BD-009-01	1	0.04	pond drain	no div. potential	low	4
83-M-112	2	0.23	watercourse	yes, road	low	4

Road Number	Site Number	Mile Post	Culvert Type	Diversion Potential	Treatment Immediacy	Controllable Volume (yd^3)
83-M-112	3	0.32	watercourse	yes, road	low	4
83-M-119	3	0.28	ditch relief	yes, road	low	4
77-JS-033	6	0.57	watercourse	yes, road	low	3
83-ER-006	15	1.53	watercourse	yes, road	low	2
83-ER-006	2	0.18	watercourse	yes, road	low	2

Road Number	Site Number	Mile Post	Road Slide Type	Treatment Immediacy	Controllable Volume (yd^3)	Distance from Stream (ft)
83-M	104	10.067	deep seated	high	3000	>200
83-M	97	9.681	unknown	high	2200	>200
83-M	17	1.727	deep seated	high	1800	50-200
83-M	92	9.187	deep seated	moderate	7000	>200
83-M	107	10.669	unknown	moderate	3000	>200
83-M	55	5.544	deep seated	moderate	2900	0-50
83-M	67	6.651	streambank	moderate	2400	0-50
83-M	93	9.31	unknown	moderate	2000	>200
83-M	101	9.958	unknown	moderate	1900	>200
83-M	86	8.603	unknown	moderate	1600	50-200
83-M	103	10.017	deep seated	moderate	1500	>200
83-M	108	10.751	unknown	moderate	1500	50-200
83-M	99	9.835	deep seated	moderate	1500	>200
83-M-091	2	0.219	fill	moderate	1500	>200
83-M	78	7.825	deep seated	moderate	1300	50-200
83-M	95	9.459	unknown	moderate	1200	>200
83-M	77	7.711	deep seated	moderate	1100	50-200
83-M	100	9.919	unknown	moderate	900	>200
83-M	38	3.844	fill	moderate	900	>200
83-ER-006	11	1.107	cutbank	moderate	800	>200
83-M	105	10.492	unknown	moderate	670	50-200
83-M	52	5.236	deep seated	moderate	660	0-50
83-M	102	9.988	deep seated	moderate	600	>200
77-JS-025-02	6	0.521	streambank	moderate	400	50-200
83-M	28	2.795	unknown	moderate	370	>200
83-M-112-04	5	0.543	cutbank	moderate	300	0-50
83-M-112-04	6	0.627	fill	moderate	300	0-50
77-JS-032	1	0.042	streambank	moderate	210	0-50
83-BD-010-03	2	0.193	cutbank	moderate	200	>200
83-ER-006-03-01	2	0.158	streambank	moderate	180	0-50
83-M	45	4.513	fill	moderate	180	50-200
77-JS	23	2.215	streambank	moderate	150	0-50
83-BD-013-08-02	2	0.234	cutbank	moderate	150	50-200
83-M-093	2	0.242	streambank	moderate	140	0-50
83-ER	6	0.625	cutbank	moderate	11	50-200
83-MI-017	2	0.167	cutbank	moderate	8	0-50
83-M	30	2.956	cutbank	low	7400	>200
83-M	79	7.923	unknown	low	2000	>200
83-M	98	9.768	unknown	low	370	>200
83-BD-013-21	3	0.243	fill	low	300	>200
77-JS-009-05	5	0.412	streambank	low	180	0-50
83-M	13	1.348	streambank	low	160	50-200
83-ER-008	1	0.029	cutbank	low	150	0-50
83-M-117	4	0.347	fill	low	130	50-200
83-MI-017	1	0.011	cutbank	low	100	>200
77-JS	14	1.434	streambank	low	90	0-50
83-M-117	3	0.264	fill	low	90	>200
77-JS-009-05	4	0.37	cutbank	low	60	0-50
83-BD-013-11	4	0.365	streambank	low	60	0-50
83-BD-013-21	2	0.232	fill	low	60	>200

Road Number	Site Number	Mile Post	Road Slide Type	Treatment Immediacy	Controllable Volume (yd^3)	Distance from Stream (ft)
83-ER	1	0.128	fill	low	60	>200
83-M-083-06	7	0.702	fill	low	60	>200
83-M	11	1.134	cutbank	low	55	0-50
83-MI-015	17	1.719	cutbank	low	50	0-50
83-M	23	2.291	unknown	low	40	50-200
83-M-073	2	0.208	cutbank	low	40	0-50
77-JS-025-02	5	0.496	cutbank	low	5	0-50
77-JS-025-02	7	0.54	cutbank	low	5	>200
77-JS	22	2.168	fill	low	0	50-200
77-JS-011	3	0.258	cutbank	low	0	0-50
83-BD	12	1.161	fill	low	0	>200
83-M	22	2.249	unknown	low	0	50-200
77-JS	18	1.838	cutbank	none	0	0-50