Water Resource Protection Plan

APN 221-202-001

WDID# 1B161279CHUM

TRC# 180101070203TRC182

Submitted to:

Dimitar Zaykov

Prepared by:

Timberland Resource Consultants

165 South Fortuna Blvd

Fortuna, CA 95540

X/X/2017

Purpose

This Water Resource Protection Plan (WRPP) has been prepared on behalf of the property owner, Dimitar Zaykov, for Assessor's Parcel Number 221-202-001, by agreement and in response to the California Water Code Section 13260(a), which requires that any person discharging waste or proposing to discharge waste within any region that could affect the quality of the waters of the state, other than into a community sewer system, shall file with the appropriate regional water board a Report of Waste Discharge (ROWD) containing such information and data as may be required by the Regional Water Board. The Regional Water Board may waive the requirements of Water Code section 13260 for specific types of discharges if the waiver is consistent with the Basin Plan and in the public interest. Any waiver is conditional and may be terminated at any time. A waiver should include monitoring requirements to verify the adequacy and effectiveness of the waiver's conditions. Order R1-2015-0023 conditionally waives the requirement to file a ROWD for discharges and associated activities described in finding 4.

Scope of Report

Order No. R1-2015-0023 states that "Tier 2 Discharger's and Tier 3 Discharger's who intend to cultivate cannabis before, during, or following site cleanup activities shall develop and implement a water resource protection plan that contains the elements listed and addressed below. Discharger's must keep this plan on site, and produce it upon request by Regional Water Board staff. Management practices shall be properly designed and installed, and assessed periodically for effectiveness. If a management measure is found to be ineffective, the plan must be adapted and implemented to incorporate new or additional management practices to meet standard conditions. Discharger's shall certify annually to the Regional Water Board individually or through an approved third party program that the plan is being implemented and is effectively protecting water quality, and report on progress in implementing site improvements intended to bring the site into compliance with all conditions of this Order."

Methods

The methods used to develop this WRPP include both field and office components. The office component consisted of aerial photography review and interpretation, existing USGS quad map review, GIS mapping of field data, review of on-site photography points, streamflow calculations, and general planning. The field component included identifying and accurately mapping all watercourses, wet areas, and wetlands located downstream of the cultivation areas, associated facilities, and all appurtenant road's accessing such areas. An accurate location of the Waters of the State is necessary to make an assessment of whether potential and existing erosion sites/pollution sites have the potential to discharge waste to an area that could affect waters of the State (including groundwater). Next, all cultivation areas, associated facilities, and all appurtenant road's accessing such areas were assessed for discharges and related controllable water quality factors from the activities listed in Order R1-2015-0023, Finding 4a-j. The field assessment also included an evaluation and determination of compliance with the Standard Conditions per Provision I.B of Order No. R1-2015-0023. The water resource protection plans required under Tier 2 are meant to describe the specific measures a Discharger implements to achieve compliance with standard conditions. Therefore, all required components of the water resource protection plan per Provision I.B of Order No. R1-2015-0023 were physically inspected and evaluated. A comprehensive summary of each Standard Condition as it relates to the subject property is appended.

Property Description
The property assessed is an 80-acre parcel located on Crooked Prairie Road, near Ettersburg, CA. There is a residence and two workshops on the property. There are Class III and Class II watercourses on the property that are tributaries to an unnamed Class II watercourse and Blue Slide Creek. The property is located the NW ¼ of Section 5 of Township 4S, Range 2E, Humboldt Base & Meridian of the USGS Ettersburg 7.5' quadrangle map.

Monitoring Plan
Tier 2 Discharger's shall include a monitoring element in the water resource protection plan that at a minimum provides for periodic inspection of the site, checklist to confirm placement and efficacy of management measures, and document progress on any plan elements subject to a time schedule. Tier 2 Discharger's shall submit an annual report (Appendix C) by March 31 of each year that documents implementation and effectiveness of management measures during the previous year. Tier 2 annual reporting is a function that may be provided through an approved third party program.

Monitoring of the site includes visual inspection and photographic documentation of each feature of interest listed on the site map, with new photographic documentation recorded with any notable changes to the feature of interest. At a minimum, all site features must be monitored annually, to provide the basis for completion of the annual re-certification process. Additionally, sites shall be monitored at the following times to ensure timely identification of changed site conditions and to determine whether implementation of additional management measures is necessary to iteratively prevent, minimize, and mitigate discharges of waste to surface water: 1) just prior to October 15 to evaluate site preparedness for storm events and storm water runoff, 2) following the accumulation of 3" total precipitation or by November 15, whichever is sooner, and 3) following any rainfall event with an intensity of 3" precipitation in 24 hours. Precipitation data can be obtained from the National Weather Service Forecast Office (e.g. by entering the zip code of the parcel location at http://www.srh.noaa.gov/forecast).

Monitoring Plan Reporting Requirements
Order No. R1-2015-0023, Appendix C must be submitted to the Regional Water Board or approved third party program upon initial enrollment in the Order (NOI) and annually thereafter by March 31. Forms submitted to the Regional Water Board shall be submitted electronically to northcoast@waterboards.ca.gov. If electronic submission is infeasible, hard copies can be submitted to: North Coast Regional Water Quality Control Board, 5550 Skylane Boulevard, Suite A, Santa Rosa, CA 95403.

Assessment of Standard Conditions
Assessment of Standard Conditions consisted of field examinations on 3/31/2017 & 4/28/2017. The examination evaluated areas near, and areas with the potential to directly impact, watercourses for sensitive conditions including, but not limited to, existing and proposed road's, skid trails and landings, unstable and erodible watercourse banks, unstable upslope areas, debris, jam potential, inadequate flow capacity, changeable channels, overflow channels, flood prone areas, and riparian zones. Field examinations also evaluated all roads and trails on the property, developed areas, cultivation sites, and any structures and facilities appurtenant to cultivation on the property. Anywhere the Standard Conditions are not met on the property, descriptions of the assessments and the prescribed treatments are outlined following each associated section below.

Summary of Standard Conditions Compliance

1. Site maintenance, erosion control, and drainage features Y☐/N☒
2. Stream crossing maintenance Y☐/N☒
3. Riparian and wetland protection and management Y☒/N☐
4. Spoils management Y☐/N☒
5. Water storage and use Y☐/N☒
6. Irrigation runoff Y☒/N☐
7. Fertilizers and soil amendments Y☒/N☐
8. Pesticides and herbicides Y☒/N☐
9. Petroleum products and other chemicals Y☒/N☐
10. Cultivation-related wastes Y☒/N☐
11. Refuse and human waste Y☒/N☐

A. Standard Conditions, Applicable to All Discharger's

1. **Site maintenance, erosion control and drainage features (Compliance: Y☐/ N☒)**

a. Road's shall be maintained as appropriate (with adequate surfacing and drainage features) to avoid developing surface ruts, gullies, or surface erosion that results in sediment delivery to surface waters.

The main access road to the property is Crooked Prairie Road. Crooked Prairie Road is in good shape but lacking adequate drainage features and road surface rock. The driveway to the residence and cultivation site is in good shape with adequate drainage and road surface rock. The seasonal dirt road to the diversion is lacking drainage features for stream crossings and road surface rock below a hillside seep. The access road below Crooked Prairie Road is in good shape with adequate drainage features with no sign of surface erosion.

Crooked Prairie Road – The road's surface is forming potholes and ruts due to no road surface rock and poor drainage in several locations. To mitigate road surface sediment discharge on Crooked Prairie Road, the Discharger shall rock the road from 270' before Stream Crossing 2 to Road Point 11 by using 4 – 6" crushed angular rock as a road base and road surface rock as a cap.

Road Point 1 – An inside ditch is discharging into the inlet of a Class II watercourse crossing. It is infeasible to install a ditch relief culvert to reduce sediment discharge due to the short length of the inside ditch and the road's location above the road. The Discharger shall install five wattles or rock check dams in the inside ditch, and dispersal field of the inside ditch, leading up to the Class II watercourse.

Road Point 3 – Concentrated hillslope runoff is saturating the road's surface resulting in rutting of the soils surface. The Discharger shall rock armor the saturated section of road at this point with 4 – 6" angular road rock to prevent further rutting and erosion of the road's surface.

Road Point 2, 4, 5, 6 & 7 – Concentrated road surface runoff is not being drained off the road's surface at adequate intervals resulting in erosion of the road's surface and discharge, or potential discharge, of sediment into Class III watercourses. The road at Road Point 2 and 7 do not discharge into a watercourse, but the surface of the road is being eroded due to no drainage feature and may discharge into a watercourse if not addressed. The Discharger shall install waterbreaks per attached specifications to adequately drain the road and prevent further road surface erosion.

Road Point 8 – The road's fill slope is wasting down onto the stream flood plain below. The Discharger shall re-establish the road by installing an armored fill and rock armoring the fill slope.

Road Point 9 – The lead out ditch is too shallow to effectively capture road surface runoff and contain it along the edge of the road. Re-establish the leadout ditch so that is dug deeper into the road's surface and install three wattle check dams in the ditch and at the leadout ditches outflow above the watercourse to capture road surface runoff sediment.

Road Point 10 – Steep through cut segment of the road where the inside ditch has been filled in by soft road surface soil and rock. The Discharger shall clear and rock line the inside ditch and rock the adjacent road with 4 – 6" crushed angular rock approximately 120' above and below Road Point 10.

Road Point 11 & 12 – An inside ditch is discharging into a Class III watercourse at both points. Install five wattles or rock check dams in the inside ditch and dispersal field of the inside ditch leading up to the Class II watercourse.

b. Road's, driveways, trails, and other defined corridors for foot or vehicle traffic of any kind shall have adequate ditch relief drains or rolling dips and/or other measures to prevent or minimize erosion along the flow paths and at their respective outlets.

Ditch Relief Culvert 1 & 2 – An inside ditch is running too long without being drained and discharging into the inlet of a Class III watercourse crossing. The Discharger shall install an 18" diameter ditch relief culvert with a rock armored inlet and an energy dissipater per attached specifications.

Ditch Relief Culvert 3 – 12" diameter ditch relief culvert. The inlet is becoming plugged from road surface debris, mud and vegetation. The Discharger shall clear the inlet of mud, debris, and vegetation and rock armor the inlet and outlet per attached specifications. The Discharger shall also remove the metal sheet that is attached to the outlet of the culvert.

c. Road's and other features shall be maintained so that surface runoff drains away from potentially unstable slopes or earthen fills. Where road runoff cannot be drained away from an unstable feature, an engineered structure or system shall be installed to ensure that surface flows will not cause slope failure.

Physical reconnaissance of the property revealed two unstable areas. Unstable Area 1 is a naturally occurring land slide above a Class III watercourse. No roads or other features drain onto this unstable area nor is it the result of the Dischargers activities. Unstable Area 2 is on an access road where fissure cracks have formed in the road's pad and along the outboard edge of the road's hillslope. Mitigation measures for Unstable Area 2 to prevent the failure of the fill prism and hillslope are addressed below.

Unstable Area 2 – The cause of the fissure cracks appears to be occurring due to natural downhill soil creep of the outboard edge of the road into a Class II watercourse below. To clarify, the road's fill prism is not failing but rather the hillslope that the road was built onto is failing. Another contributing factor to the hillslope's downhill creep is the watercourses erosion of the toe of the downhill soil creep, and associated caving and slumping of the streambank into the watercourse. To prevent failure of the hillslope and to stabilize the road's pad, the Discharger shall remove the unstable soils along the outboard edge of the road and install a stabilization trench. To do this, the Discharger shall remove approximately 15' Wide x 80' Long x 20' Deep of the hillslope's and the road's earthen material where the fissure cracks are occurring. Once the unstable material is removed, dig a deep keyway trench along the outboard edge of where the unstable earthen material was removed. Backfill the keyway trench with large boulders. Once the keyway trench has been filled, backfill behind the keyway and compact the fill. Once this is done, the laid-back slope leading up to the road pad shall be rock armored from the top of the keyway trench to the roads pad. The Discharger shall also remove the defunct metal culvert that is directly adjacent to the unstable area.

There are no Geomorphic Features Map for the Ettersburg 7.5' Quadrangle, Humboldt County, California.

d. Road's, clearings, fill prisms, and terraced areas (cleared/developed areas with the potential for sediment erosion and transport) shall be maintained so that they are not hydrologically connected[1], as feasible, from surface waters, including wetlands, ephemeral, intermittent and perennial streams.

Clearings and terraced areas are not hydrologically connected to surface waters. The road's hydrologic connectivity is addressed under Standard Condition A.1.a. and A.2. Mitigation

[1] Connected roads are road segments that deliver road surface runoff, via the ditch or road surface, to a stream crossing or to a connected drain that occurs within the high delivery potential portion of the active road network. A connected drain is defined as any cross-drain culvert, water bar, rolling dip, or ditch-out that appears to deliver runoff to a defined channel. A drain is considered connected if there is evidence of surface flow connection from the road to a defined channel or if the outlet has eroded a channel that extends from the road to a defined channel. (http://www.forestsandfish.com/documents/Road_Mgmt_Survey.pdf)

measures will attempt to disconnect the road as much as feasibly possible from surface waters.

e. Ditch relief drains, rolling dip outlets, and road pad or terrace surfaces shall be maintained to promote infiltration/dispersal of outflows and have no apparent erosion or evidence of soil transport to receiving waters.

Terraced cultivation areas and developed areas on the property show no apparent sediment transport to receiving waters. Ditch relief drains and road pads do have apparent sediment transport to receiving waters. The road's hydrologic connectivity is addressed under Standard Condition A.1.a. & b. and A.2. Mitigation measures will attempt to disconnect the road as much as feasibly possible from surface waters.

f. Stockpiled construction materials are stored in a location and manner so as to prevent their transport to receiving waters.

No stockpiled construction materials are on the property where they can enter surface waters. In the future, all construction materials will be stored to prevent their transport to receiving waters.

2. <u>Stream Crossing Maintenance</u> **(Compliance: Y☐/ N☒)**

a. Culverts and stream crossings shall be sized to pass the expected 100-year peak streamflow.

b. Culverts and stream crossings shall be designed and maintained to address debris associated with the expected 100-year peak streamflow.

c. Culverts and stream crossings shall allow passage of all life stages of fish on fish-bearing or restorable streams, and allow passage of aquatic organisms on perennial or intermittent streams.

d. Stream crossings shall be maintained so as to prevent or minimize erosion from exposed surfaces adjacent to, and in the channel and on the banks.

e. Culverts shall align with the stream grade and natural stream channel at the inlet and outlet where feasible.[2]

f. Stream crossings shall be maintained so as to prevent stream diversion in the event that the culvert/crossing is plugged, and critical dips shall be employed with all crossing installations where feasible.[3]

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[2] At a minimum, the culvert shall be aligned at the inlet. If infeasible to align the culvert outlet with the stream grade or channel, outlet armoring or equivalently effective means may be applied.

[3] If infeasible to install a critical dip, an alternative solution may be chosen.

Work in the watercourse at Stream Crossing 6 & 7 has been approved by CDFW per Lake and Streambed Alteration agreement (LSA), 1600-2016-0396-R1. A major amendment to the Lake and Streambed Alteration agreement is needed for work in the watercourses at Stream Crossings 1 & 3.

Stream Crossing 1 – Class II watercourse crossing with a 24" diameter corrugated metal pipe (CMP) that is placed above the streambed. The culvert is adequately sized for 100-year storm flows per the Manning equation accounting for a slope of 7% and an n-value of 0.022. The crossings estimated 100-year storm flow is approximately 25.5-cfs and the culverts maximum rate is approximately 28-cfs. The culvert outlet is shot gunned and the inlet is lacking rock armoring. There is also an old defunct 12" diameter corrugated metal pipe that was left in the road's fill prism and never removed when the current 24" diameter culvert was installed. The old pipe is currently delivering water through the outlet with no exposed inlet. Currently there is a sink hole forming approximately 10' adjacent to the 24" inlet that appears to be forming due to surface flows percolating through the ground and into the inlet of the defunct 12" culvert. The Discharger shall remove both the 24" diameter CMP culvert and the 12" diameter CMP culvert and install a 36" diameter culvert per attached specifications.

Stream Crossing 2 – Class III watercourse crossing with a 36" diameter smooth-walled pipe placed in the streambed. The culvert is adequately sized for 100-year storm flows per the Manning equation accounting for a slope of 12% and an n-value of 0.012. The crossings estimated 100-year storm flow is approximately 9.8-cfs and the culverts maximum rate is approximately 198-cfs. The culvert has adequate rock armoring of the inlet and an adequate energy dissipater.

Stream Crossing 3 – Class III watercourse crossing with a 36" diameter smooth-walled pipe placed out of alignment of the watercourse. The Discharger shall install a minimum 24" culvert approximately 80' down the road in the natural historic channel as close as feasibly possible per attached specifications. The approximate location of the new crossing installation is represented as "NEW SC 3" on the attached maps.

Stream Crossing 4 – Class II watercourse crossing with a 48" diameter corrugated metal pipe placed in the streambed. The culvert is adequately sized for 100-year storm flows per the Manning equation accounting for an estimated slope of 8% and an n-value of 0.022. The crossings estimated 100-year storm flow is approximately 39.7-cfs and the culverts maximum rate is 189-cfs. The culvert has adequate rock armoring of the inlet and an adequate energy dissipater.

Stream Crossing 5 – Class II watercourse crossing with a 24" diameter corrugated metal pipe placed in the streambed. The culvert is adequately sized for 100-year storm flows per the Manning equation accounting for a slope of 6% and an n-value of 0.022. The crossings estimated 100-year storm flow is approximately 21-cfs and the culverts maximum rate is

25.8-cfs. The culvert does not have an adequate rock armored inlet and energy dissipater. The Discharger shall rock armor the inlet and install an energy dissipater at the outlet per attached specifications. The crossing also has the potential for diversion down the road's surface if the culvert becomes plugged. The Discharger shall install an armored dip per attached specifications to prevent flows from diverting out of the channel and traveling down the road's surface. An inside ditch drains into the inlet of stream crossing culvert. The Discharger shall install three wattles or rock check dams in the inside ditch to capture sediment per attached specifications.

Stream Crossing 6 – Class III watercourse dirt ford crossing. The Discharger shall install a rocked ford per attached specifications.

Stream Crossing 7 – Class III watercourse dirt ford crossing. The Discharger shall install a 24" diameter culvert per attached specifications.

Rational Method for 100-year flood flow (A < 200 acres)

$T_c = 60((11.9 \times L^3)/H)^{0.385}$				$Q_{100} = CIA$				
Stream Crossing (SC)	Channel length (to top of basin) (mi) L	Elevation difference (ft) H	Concentration time (min) Tc	Runoff coefficient C	100-year Return-Period Precipitation (in/hr) I*	Area (acres) A	100-yr flood flow (cfs) Q100	Culvert Max CFS
1				0.35	3.77	19.32	***25.5***	***28.0***
2				0.35	3.77	7.394	***9.8***	***198.0***
3				0.35	3.77	4.177	***5.5***	***128.0***
4				0.35	3.77	30.07	***39.7***	***189.0***
5				0.35	3.77	15.9	***21.0***	***25.8***
7				0.35	3.77	2	***2.6***	***N/A***
8				0.35	3.77	8.646	***11.4***	***18.0***

The Rationale Method was used to determine for 100-year flood flow utilizing methods recommended in "*Designing Watercourse Crossings for Passage of 100-year Flood Flows, Wood, and Sediment*". 2004 Peter Cafferata, Thomas Spittler, Michael Wopat, Greg Bundros, and Sam Flanagan. This report recommends that the rational method be limited to watersheds less than 100 acres. The 100-year Return-Period precipitation data is from: http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ca

For determining culvert size, the Manning equation spreadsheet was used with a Hydraulic Radius = More than Half Full Flow. To account for a 0.67 HW/D ratio (ensure the culvert will accommodate the 100-year flow and debris load), the equation used 67% of pipe diameter as "depth of flow". Slope variable was estimated in the field (conservatively) and the n-value was either 0.012 for smooth-walled pipes or 0.022 for corrugated pipes. The assumption for new pipe installations are smooth-walled pipes and culverts set to grade.

3. **Riparian and Wetland Protection and Management** (Compliance: Y☒/ N☐)

a. For Tier 1 Discharger's, cultivation areas or associated facilities shall not be located within 200 feet of surface waters. While 200 foot buffers are preferred for Tier 2 sites, at a minimum, cultivation areas and associated facilities shall not be located or occur within 100 feet of any Class I or II watercourse or within 50 feet of any Class III watercourse or wetlands. The Regional Water Board or its or its Executive Officer may apply additional or alternative[4] conditions on enrollment, including site-specific riparian buffers and other BMPs beyond those identified in water resource protection plans to ensure water quality protection.

The cultivation site is located approximately 80' away from a Class III watercourse to the west of the cultivation site and 70' away from a Class III watercourse to the east.

b. Buffers shall be maintained at natural slope with native vegetation.

Buffers are at natural slope, undeveloped, and vegetated with native trees and brush and are sufficiently wide enough to filter any discharges from production lands.

c. Buffers shall be of sufficient width to filter wastes from runoff discharging from production lands and associated facilities to all wetlands, streams, drainage ditches, or other conveyances. Riparian and wetland areas shall be protected in a manner that maintains their essential functions, including temperature and microclimate control, filtration of sediment and other pollutants, nutrient cycling, woody debris recruitment, groundwater recharge, streambank stabilization, and flood peak attenuation and flood water storage.

The cultivation site is located outside the minimum buffers for the respective nearest watercourses.

In order to remain in compliance with the Order, riparian buffers will continue to be excluded from operations and protected in a manner that maintains their essential functions. To see that this is achieved, the Discharger shall measure 50 feet from Class III watercourses, 100' from Class I or II watercourses, in the vicinity of future grading or terracing areas and keep future cultivation development outside of the 50' buffers for Class III watercourses. Alternatively, the Discharger can contact Timberland Resource Consultants for establishment of buffers prior to future development.

[4] Alternative site-specific riparian buffers that are equally protective of water quality may be necessary to accommodate existing permanent structures or other types of structures that cannot be relocated.

4. **Spoils Management** (Compliance: Y☐/ N☒)

a. Spoils[5] shall not be stored or placed in or where they can enter any surface water.

b. Spoils shall be adequately contained or stabilized to prevent sediment delivery to surface waters.

c. Spoils generated through development or maintenance of road's, driveways, earthen fill pads, or other cleared or filled areas shall not be sidecast in any location where they can enter or be transported to surface waters.

The Discharger has leveled a cultivation area adjacent to two Class III watercourses. The Discharger shall ensure that spoils generated from the construction and leveling of the cultivation sites and landings are not sidecast in any location where they can enter or be transported to these, or other surface waters. The Discharger shall also implement erosion control measures to prevent erosion and sediment discharge of the fill prisms of the landings and disturbed earth from entering the adjacent Class III watercourses.

Cultivation related soil spoils are currently being stored in a large pile with a tarp underneath to the south of the residence over winter, and show no sign of movement where they can enter a watercourse. The Discharger stated that he plans to remove the soils and contour them into the grass lawn around the residence a location where the soils cannot enter a watercourse. To prevent the migration of the soils from this pile or any newly created cultivation related soil spoil piles and remain in compliance with this Standard Condition, the Discharger shall tarp the soil pile and place fiber waddles around the entire pile during the wet season.

5. **Water Storage and Use** (Compliance: Y☐/ N☒)

a. Size and scope of an operation shall be such that the amount of water used shall not adversely impact water quality and/or beneficial uses, including and in consideration with other water use by operations, instream flow requirements and/or needs in the watershed, defined at the scale of a HUC-12[6] watershed or at a smaller hydrologic watershed as determined necessary by the Regional Water Board Executive Officer.

This project consists of one cultivation site totaling a proposed 22,000-square feet of cultivation area.

- **Proposed cultivation consists of five 120' x 35' mixed light greenhouses on a gradual hillside with an approximate 8% slope.**

[5] Spoils are waste earthen or organic materials generated through grading or excavation, or waste plant growth media or soil amendments. Spoils include but are not limited to soils, slash, bark, sawdust, potting soils, rock, and fertilizers.

[6] See definition and link to maps at: http://water.usgs.gov/GIS/huc.html

The Discharger did not cultivate during the 2016 cultivation season as the Discharger purchased the property in late 2016 from previous cultivators. The current Discharger plans to cultivate in a different way than the previous landowners and future water usage numbers are unknown. The Discharger shall install water meters to better document usage.

b. Water conservation measures shall be implemented. Examples include use of rainwater catchment systems or watering plants with a drip irrigation system rather than with a hose or sprinkler system.

To be in compliance with this Standard Condition, the Discharger shall implement water conservation measures according to the Water Board's water conservation better management practices 102, 106, 114 – 117, 119, 120, and 122; or the Dischargers own preferred water conservation measures. The more water the Discharger can conserve, the less the Discharger will have to obtain in water storage. The Discharger shall install float-valves on appropriate storage tanks to prevent overflow. The Discharger shall install water meters to better document usage.

c. For Tier 2 Discharger's, if possible, develop off-stream storage facilities to minimize surface water diversion during low flow periods.

The Discharger diverts surface waters for cultivation purposes. If the Discharger continues to use surface water diversion for cultivation purposes, the Discharger must develop off-stream storage facilities that provide adequate water resources, or a functioning well, for the 150-day forbearance period from surface water diversions from May 15th to October 15th. The Discharger currently has approximately 27,400-gallons of dedicated water storage for domestic and cultivation use (1 x 11,000-gallon concrete tank, 2 x 5,000-gallon tanks, 1 x 3,000-gallon tank, 2 x ~1,700-gallon tanks). The Discharger is planning on installing a one million gallon off-stream pond for water storage and rain catchment.

d. Water is applied using no more than agronomic rates.[7]

To be in compliance with this Standard Condition for future cultivation activates, the Discharger shall not irrigate at a greater rate than the growth medium can facilitate and no irrigation waters should leave the cultivation area and enter watercourses.

e. Diversion and/or storage of water from a stream should be conducted pursuant to a valid water right and in compliance with reporting requirements under Water Code section 5101.

The previous landowners have an approved Lake and Stream Bed Alteration (LSA) agreement with California Department of Fish and Wildlife for one diversion structures and jurisdictional

[7] "Agronomic rates" is defined as the rates of fertilizer and irrigation water that a plant needs to enhance soil productivity and provide the crop or forage growth with needed nutrients for optimum health and growth, without having any excess water or nutrient percolate beyond the root zone.

activities in watercourses (1600-2016-0396-R1). The Discharger must amend the LSA agreement so that the new landowner is the Permittee of the LSA Agreement and so that newly proposed work in jurisdictional waters are added. The Discharger shall also follow the requirements of the approved Lake and Stream Bed Alteration agreement with California Department of Fish and Wildlife.

The Discharger is currently diverting and storing surface water without an appropriative water right. If the Discharger continues to divert surface water for cultivation purposes, the Discharger will then need to apply for a Small Irrigation Use Registration once available. The Discharger cannot comply with Standard Condition A.5.e. until the Small Irrigation Use program is completed and made available by the State Water Control Board or the Discharger discontinues use of surface water diversions for cultivation purposes and uses a well or rain catchment as the only source of water.

Point of Diversion (POD): The POD is a spring located within the headwaters of a Class III watercourse. The diversion works is a 12-inch diameter concrete cistern set to grade in the stream channel. This POD provides drinking water to the residence on the property and has also been used for irrigation. The LSA agreement allows a maximum diversion rate of 3-gpm and no more than 200 gallons per day to be diverted from May 15th to October 15th.

f. Water storage features, such as ponds, tanks, and other vessels shall be selected, sited, designed, and maintained so as to insure integrity and to prevent release into waters of the state in the event of a containment failure.

Water storage tanks have been sited in secure locations to prevent their release into waters of the state.

6. **Irrigation Runoff (Compliance: Y☒/ N☐)**

Implementing water conservation measures, irrigating at agronomic rates, applying fertilizers at agronomic rates and applying chemicals according to the label specifications, and maintaining stable soil and growth media should serve to minimize the amount of runoff and the concentration of chemicals in that water. In the event that irrigation runoff occurs, measures shall be in place to treat/control/contain the runoff to minimize the pollutant loads in the discharge. Irrigation runoff shall be managed so that any entrained constituents, such as fertilizers, fine sediment and suspended organic particles, and other oxygen consuming materials are not discharged to nearby watercourses. Management practices include, but are not limited to, modifications to irrigation systems that reuse tailwater by constructing off-stream retention basins, and active (pumping) and or passive (gravity) tailwater recapture/redistribution systems. Care shall be taken to ensure that irrigation tailwater is not discharged towards or impounded over unstable features or landslides.

There are no signs of irrigation runoff within the cultivation sites. The Discharger shall irrigate at an agronomic rate that does not result in runoff. Irrigating at agronomic rates, combined

with the proximity of the cultivation areas from the watercourses, ensures there is little to no chance for any irrigation runoff to reach surface waters.

7. Fertilizers and Soil Amendments (Compliance: Y☒/ N☐)

a. Fertilizers, potting soils, compost, and other soils and soil amendments shall be stored in locations and in a manner in which they cannot enter or be transported into surface waters and such that nutrients or other pollutants cannot be leached into groundwater.

The Discharger stores bottles of fertilizers and amendments in a large storage shed next to the cultivation site. Cultivation related soil spoils are currently being stored in a large pile with a tarp underneath to the south of the residence over winter, and show no sign of movement where they can enter a watercourse. The soil pile is addressed under Standard Condition A.4.

In order to remain in compliance with Standard Condition 7, the Discharger shall store all fertilizers (bagged, boxed, and bottled), potting soils, composts, and soil amendments in sheds, covered areas, or placed on pallets and tarped if stored outside. They shall be stored in a manner in which they cannot be transported to surface waters or such that nutrients or other pollutants cannot be leached into groundwater.

b. Fertilizers and soil amendments shall be applied and used per packaging instructions and/or at proper agronomic rates.

The Discharger shall ensure that fertilizers and soil amendments are applied and used per packaging instructions and/or at proper agronomic rates.

c. Cultivation areas shall be maintained so as to prevent nutrients from leaving the site during the growing season and post-harvest.

Upon assessment, no cultivation soils are leaving the cultivation site that discharges into surface waters. The cultivation site is level and proposed cultivation soils will be contained in pots or beds within greenhouses during the growing season. The Discharger stated that he is having an engineered drainage system installed onto the landing where cultivation will take place. The drainage system is designed to capture any surface runoff, either rain or irrigation related, from the cultivation site landing and pipe the runoff to an off-stream pond for water storage.

8. **Pesticides/Herbicides** (Compliance: Y☒/ N☐)

At the present time, there are no pesticides or herbicides registered specifically for use directly on cannabis and the use of pesticides on cannabis plants has not been reviewed for safety, human health effects, or environmental impacts. Under California law, the only pesticide products not illegal to use on cannabis are those that contain an active ingredient that is exempt from residue tolerance requirements and either registered and labeled for a broad enough use to include use on cannabis or exempt from registration requirements as a minimum risk pesticide under FIFRA section 25(b) and California Code of Regulations, title 3, section 6147. For the purpose of compliance with conditions of this Order, any uses of pesticide products shall be consistent with product labeling and any products on the site shall be placed, used, and stored in a manner that ensures that they will not enter or be released into surface or ground waters.

Pesticides shall be applied per specifications included in the packaging. The Discharger shall ensure any pesticides or herbicides used are placed, used, and stored in a manner that ensures that they will not enter or be released into surface or ground waters.

9. **Petroleum products and other chemicals** (Compliance: Y☒/ N☐)

a. Petroleum products and other liquid chemicals, including but not limited to diesel, biodiesel, gasoline, and oils shall be stored so as to prevent their spillage, discharge, or seepage into receiving waters. Storage tanks and containers must be of suitable material and construction to be compatible with the substance(s) stored and conditions of storage such as pressure and temperature.

b. Above ground storage tanks and containers shall be provided with a secondary means of containment for the entire capacity of the largest single container and sufficient freeboard to contain precipitation.

c. Discharger's shall ensure that diked areas are sufficiently impervious to contain discharged chemicals.

d. Discharger(s) shall implement spill prevention, control, and countermeasures (SPCC) and have appropriate cleanup materials available onsite.

e. Underground storage tanks 110 gallons and larger shall be registered with the appropriate County Health Department and comply with State and local requirements for leak detection, spill overflow, corrosion protection, and insurance coverage.

Fuel is stored in small volume fuel canisters within the large storage shed.

In order to remain in compliance, any portable fuel cans and drums that contain fuel shall be stored indoors within garages or storage sheds, or if stored outdoors be contained within secondary containment vessels large enough for the entire capacity and be covered from

precipitation. Fuel storage tanks shall also have secondary containment vessels large enough for the entire capacity and be covered from precipitation. Also, the Discharger shall ensure that secondary containment tubs do not have water in them and that they are drained as fast as possible.

10. Cultivation-related wastes (Compliance: Y☒/ N☐)

Cultivation-related wastes including, but not limited to, empty soil/soil amendment/ fertilizer/pesticide bags and containers, empty plant pots or containers, dead or harvested plant waste, and spent growth medium shall, for as long as they remain on the site, be stored[8] at locations where they will not enter or be blown into surface waters, and in a manner, that ensures that residues and pollutants within those materials do not migrate or leach into surface water or groundwater's.

During the assessment, there were no non-organic or organic cultivation-related wastes found on the property where they can enter watercourses.

In order to remain in compliance with Standard Condition 10 above, all cultivation-related waste in the form of empty bags, containers, pots, and dead or harvested plant waste and spent growth medium shall be stored where they will not enter or be blown into surface waters, or removed from the site and disposed of properly. Cultivation-related wastes that contain residues or pollutants shall be stored in a manner that ensures that those materials do not leach into surface water or groundwater's. This can be achieved by following Items 137 and 139 in Appendix B of the Order.

11. Refuse and human waste (Compliance: Y☒/ N☐)

a. Disposal of domestic sewage shall meet applicable County health standards, local agency management plans and ordinances, and/or the Regional Water Board's Onsite Wastewater Treatment System (OWTS) policy, and shall not represent a threat to surface water or groundwater.

There is one septic system located on the property attached to the residence. The Onsite Wastewater Treatment System (OWTS) serving the residence appears to be functioning properly. No evidence of dispersal field failure was detected when inspected. It is likely that this system will fall under Tier O (existing systems that are properly functioning and do not meet the conditions of failing systems or otherwise require corrective action – as defined in the RWQCB OWTS Policy and Humboldt County Local Agency Management Plan).

b. Refuse and garbage shall be stored in a location and manner that prevents its discharge to receiving waters and prevents any leachate or contact water from entering or percolating to receiving waters.

[8] Plant waste may also be composted, subject to the same restrictions cited above for cultivation-related waste storage.

The Discharger stores garbage in sealed bags or covered garbage cans with lids. Garbage is stored under the awnings of the storage shed adjacent to the cultivation site or under the awnings attached to the residence.

c. Garbage and refuse shall be disposed of at an appropriate waste disposal location.

The Discharger stated they dispose of trash at the Eel River Resource Recovery Transfer Station in Redway, CA.

In order to remain in compliance with Standard Condition 11. b. and c. above, refuse and garbage shall be stored in a location and manner that prevents its discharge to receiving waters and prevents any leachate or contact water from entering or percolating to receiving waters. This can be accomplished by storing garbage in covered containers or keeping it tarped during the winter. Garbage and refuse shall be disposed of at an appropriate waste disposal location. See Appendix B. Item 141 of the Order.

12. Remediation/Cleanup/Restoration Remediation/cleanup/restoration activities may include, but are not limited to, removal of fill from watercourses, stream restoration, riparian vegetation planting and maintenance, soil stabilization, erosion control, upgrading stream crossings, road outsloping and rolling dip installation where safe and suitable, installing ditch relief culverts and overside drains, removing berms, stabilizing unstable areas, reshaping cutbanks, and rocking native-surfaced road's. Restoration and cleanup conditions and provisions generally apply to Tier 3 sites, however owners/operators of Tier 1 or 2 sites may identify or propose water resource improvement or enhancement projects such as stream restoration or riparian planting with native vegetation and, for such projects, these conditions apply similarly. Appendix B accompanying this Order includes environmental protection and mitigation measures that apply to cleanup activities such as: temporal limitations on construction; limitations on earthmoving and construction equipment; guidelines for removal of plants and revegetation; conditions for erosion control, limitations on work in streams, riparian and wetland areas; and other measures.

Mitigation measures are listed below in the Mitigation Report and also noted above in the document.

Mitigation Report (Identified Sites Requiring Remediation)

Unique Point(s)	Map Point Description	Associated Standard Condition	Temporary BMP	Permanent BMP	Priority for Action	Time Schedule for completion of Permanent BMP	Completion Date
Crooked Prairie Road	The roads surface is forming potholes and ruts due to no road surface rock and poor drainage in several locations.	A.1. a.	N/A	Rock armor the road from 270' before Stream Crossing 2 to Road Point 9, and approximately 120' above and below Road Point 10, by using 4 – 6" crushed angular rock as a road base and road surface rock as a cap.	3	2018	
RP 1	An inside ditch is discharging into the inlet of a Class II watercourse crossing.	A.1. a.	N/A	Install five wattles or rock check dams in the inside ditch and dispersal field of the inside ditch leading up to the Class III watercourse.	3	2018	
RP 3	Concentrated hillslope runoff is saturating the roads surface resulting in rutting of the roads surface.	A.1. a.	N/A	Rock armor the saturated section of road at this point with 4 – 6" angular road rock to prevent further rutting and erosion of the roads surface.	3	2018	
RP 2, 4, 5, 6 & 7	Concentrated road surface runoff is not being drained off the roads surface at adequate intervals resulting in erosion of the roads surface and discharge, or potential discharge, of sediment into Class III watercourses.	A.1. a.	N/A	Install waterbreaks per attached specifications to adequately drain the road and prevent further road surface erosion that delivers to watercourses.	3	2018	
RP 8	The roads fill slope is wasting down onto the stream flood plain below.	A.1. a.	N/A	Re-establish the road by installing an armored fill and rock armoring the fill slope.	3	2018	
RP 9	The lead out ditch is too shallow to effectively capture road surface runoff and contain it along the edge of the road.	A.1. a.	N/A	Re-establish the leadout ditch so that is dug deeper into the roads surface and install three wattle check dams in the ditch and at the leadout ditches outflow above the watercourse to capture road surface runoff sediment.	3	2018	
RP 10	Steep through cut segment of the road where the inside ditch has been filled in by soft road surface soil and rock.	A.1. a.	N/A	Clear and rock line the inside ditch and rock the adjacent road with 4 – 6" crushed angular rock approximately 120' above and below Road Point 10.	3	2018	
RP 11 & 12	An inside ditch is discharging into a Class III watercourse at both points.	A.1. a.	N/A	Install five wattles or rock check dams in the inside ditch and dispersal field of the inside ditch leading up to the Class III watercourse.	3	2018	

DRC 1 & 2	An inside ditch is running too long without being drained and discharging into the inlet of a Class III watercourse crossing.	A.1. b.	N/A	Install 18" diameter ditch relief culverts with a rock armored inlet and an energy dissipater per attached specifications at both locations.	3	2018	
DRC 3	12" diameter ditch relief culvert. The inlet is becoming plugged from road surface debris, mud and vegetation.	A.1. b.	N/A	Clear the inlet of mud, debris, and vegetation and rock armor the inlet and outlet per attached specifications. Also remove the metal sheet that is attached to the outlet of the culvert.	3	2018	
UA 2	Fissure cracks have formed in the roads pad and along the outboard edge of the roads hillslope.	A.1. b.	N/A	Remove the unstable soils along the outboard edge of the road and install a stabilization trench. Remove approximately 10' – 15' Wide x 80' Long x 20' Depth of the hillslope's and the road's earthen material where the fissure cracks are occurring. Once the unstable material is removed, dig a deep keyway trench along the outboard edge of where the unstable earthen material was removed. Backfill the keyway trench with large boulders. Once the keyway trench has been filled, backfill behind the keyway and compact the fill. Once this is done, the laid-back slope leading up to the road pad shall be rock armored from the top of the keyway trench to the roads pad. Also remove the defunct metal culvert that is directly adjacent to the unstable area.	4	Shortest time possible, but no later than the expiration of this Order (five years).	

SC 1	Class II watercourse crossing with a 24" diameter corrugated metal pipe placed above the streambed. The culvert outlet is shot gunned and the inlet is lacking rock armoring. There is also an old defunct 12" diameter corrugated metal pipe that was left in the roads fill prism and never removed when the current 24" diameter culvert was installed. The old pipe is currently delivering water through the outlet with no exposed inlet. Currently there is a sink hole forming approximately 10' adjacent to the 24" inlet that appears to be forming due to surface flows percolating through the ground and into the inlet of the defunct 12" culvert.	A.2.	N/A	Remove both the 24" diameter CMP culvert and the 12" diameter CMP culvert and install a 36" diameter culvert per attached specifications.	4	Shortest time possible, but no later than the expiration of this Order (five years).	
SC 3	Class III watercourse crossing with a 36" diameter smooth-walled pipe placed out of alignment of the watercourse.	A.2.	N/A	Install a minimum 24" culvert approximately 80' down the road in the natural historic channel per attached specifications. The approximate location of the new crossing installation is represented as "NEW SC 3" on the attached maps.	4	Shortest time possible, but no later than the expiration of this Order (five years).	
SC 5	Class II watercourse crossing with a 24" diameter corrugated metal pipe placed in the streambed. The culvert does not have an adequate rock armored inlet and an adequate energy dissipater. The crossing does have the potential for diversion down the roads surface. An inside ditch drains into the inlet of stream crossing culvert.	A.2.	N/A	Rock armor the inlet and install an energy dissipater at the outlet per attached specifications. Install an armored/critical dip per attached specifications. Install three wattles or rock check dams in the inside ditch to capture sediment per attached specifications.	4	Shortest time possible, but no later than the expiration of this Order (five years).	
SC 6	Class III watercourse dirt ford crossing.	A.2.	N/A	Install a rocked ford per attached specifications.	3	2018	
SC 7	Class III watercourse dirt ford crossing.	A.2.	N/A	Install a 24" diameter culvert per attached specifications.	4	Shortest time possible, but no later than the expiration of this Order (five years).	

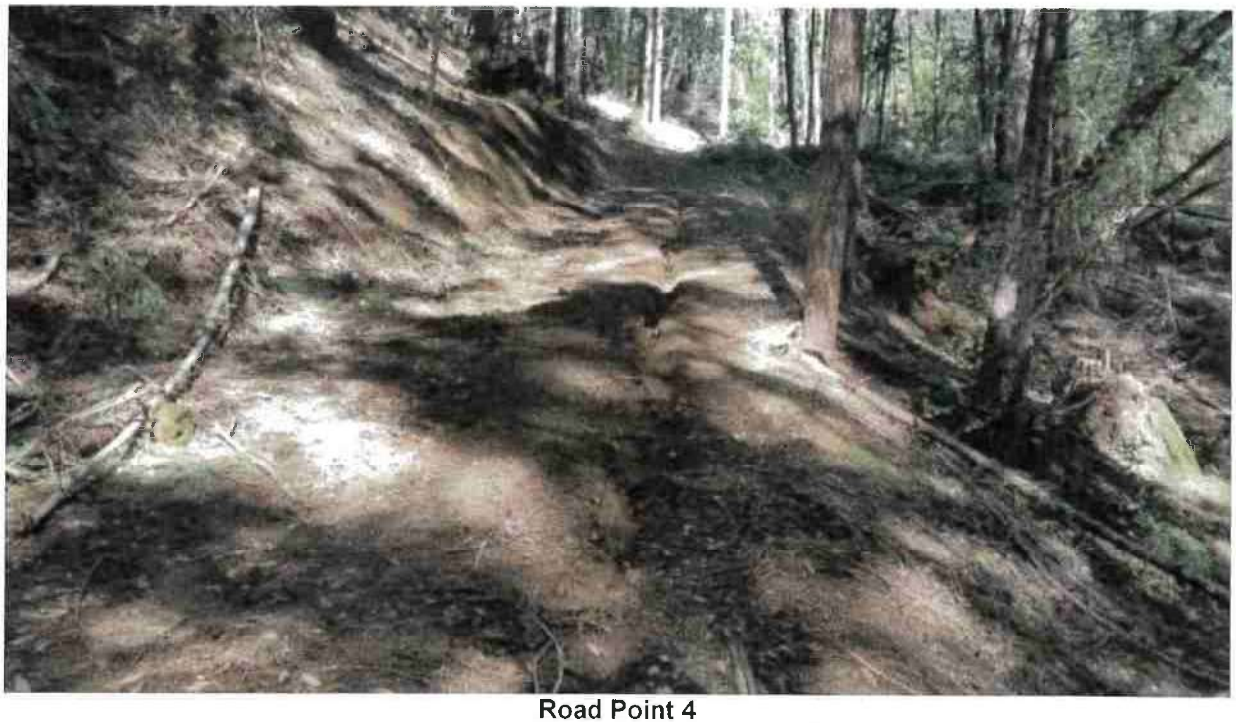
Soil piles	Cultivation related soil spoils are currently being stored in a large pile with a tarp underneath to the south of the residence over winter, and show no sign of movement where they can enter a watercourse.	A.4.	N/A	To prevent the migration of the soils from this pile or any newly created cultivation related soil spoil piles and remain in compliance with this Standard Condition, the Discharger shall tarp the soil pile and place fiber waddles around the entire pile during the wet season.	3	2018	
Point of Diversion, Water Storage	Water Storage and Use	A. 5.	N/A	-- Develop off-stream storage facilities that provide adequate water resources for the 150-day forbearance period from surface water diversions, or rely only on well water sources, from May 15th to October 15th. -- If the Discharger continues to divert and store surface waters for longer than 30 days, an Initial Statement of Water Diversion and Use shall be filed with the California State Water Resources Control Board while Discharger waits to apply for a Small Irrigation Use Registration, once available. --Install float valves on all appropriate tanks and water sources.	3	2018	

Treat Priority: Treatment Priority (1) indicates a very high priority with treatment being planned to occur immediately, (2) indicates a high priority site with treatment to occur prior to the start of the winter period (Oct. 15), (3) indicates a moderate priority with treatment being planned to occur within one year, or prior to the winter period (Oct. 15) of the 2nd season of operations, and (4) indicates a low priority with treatment being planned to occur in the shortest time possible, but no later than the expiration of this Order (five years).

Attached Photo's

Road Point 1: An inside ditch is discharging into the inlet of a Class II watercourse crossing. Install five wattles or rock check dams in the inside ditch and dispersal field of the inside ditch leading up to the Class II watercourse.

Road Point 2



Road Point 4

Road Point 5

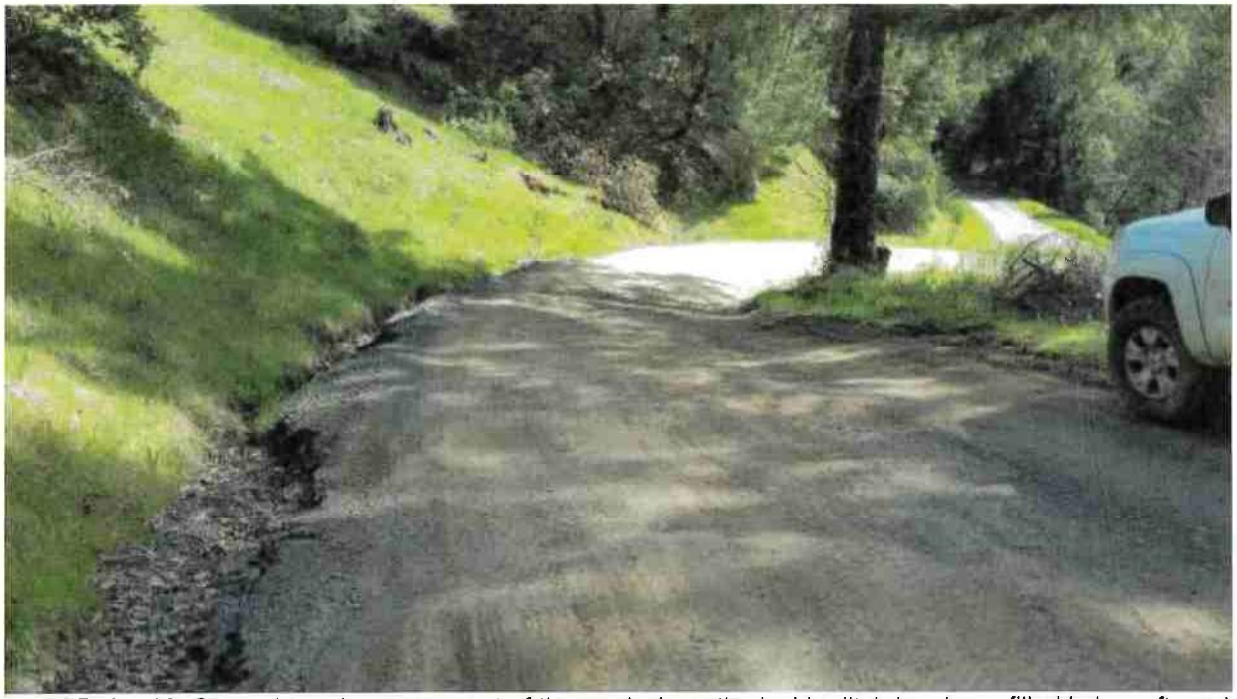
Road Point 6

Road Points 2, 4, 5, 6 & 7: Concentrated road surface runoff is not being drained off the roads surface at adequate intervals resulting in erosion of the roads surface and discharge, or potential discharge, of sediment into Class III watercourses. Install waterbreaks per attached specifications to adequately drain the road and prevent further road surface erosion that delivers to watercourses. (There are no photos for Road Points 3 & 7)

Road Point 3: Concentrated hillslope runoff is saturating the road's surface resulting in rutting of the road's surface. Rock armor the saturated section of road at this point with 4 – 6" angular road rock to prevent further rutting and erosion of the road's surface.

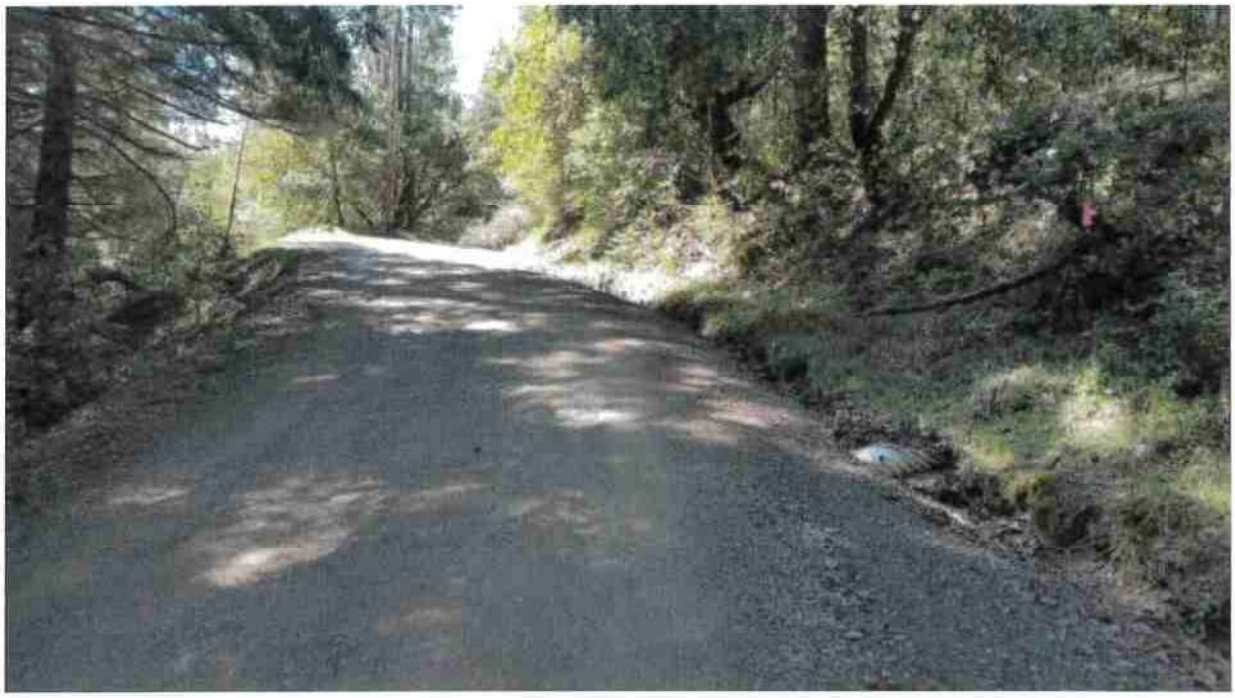
Road Point 8: The road's fill slope is wasting down onto the stream flood plain below. Re-establish the road by installing an armored fill and rock armoring the fill slope.

Road Point 9: The lead out ditch is too shallow to effectively capture road surface runoff and contain it along the edge of the road. Re-establish the leadout ditch so that is dug deeper into the road's surface and install three wattle check dams in the ditch and at the leadout ditches outflow above the watercourse to capture road surface runoff sediment.



Road Point 10: Steep through cut segment of the road where the inside ditch has been filled in by soft road surface soil and rock. Clear and rock line the inside ditch and rock the adjacent road with 4 – 6" crushed angular rock approximately 120' above and below Road Point 10.

Road Point 11 & 12: Two inside ditches are discharging into a Class III watercourse. Install five wattles or rock check dams in the inside ditch and dispersal field of the inside ditch leading up to the Class III watercourse. (There is no photo for Road Point 11)



Ditch Relief Culvert 1

Ditch Relief Culvert 2

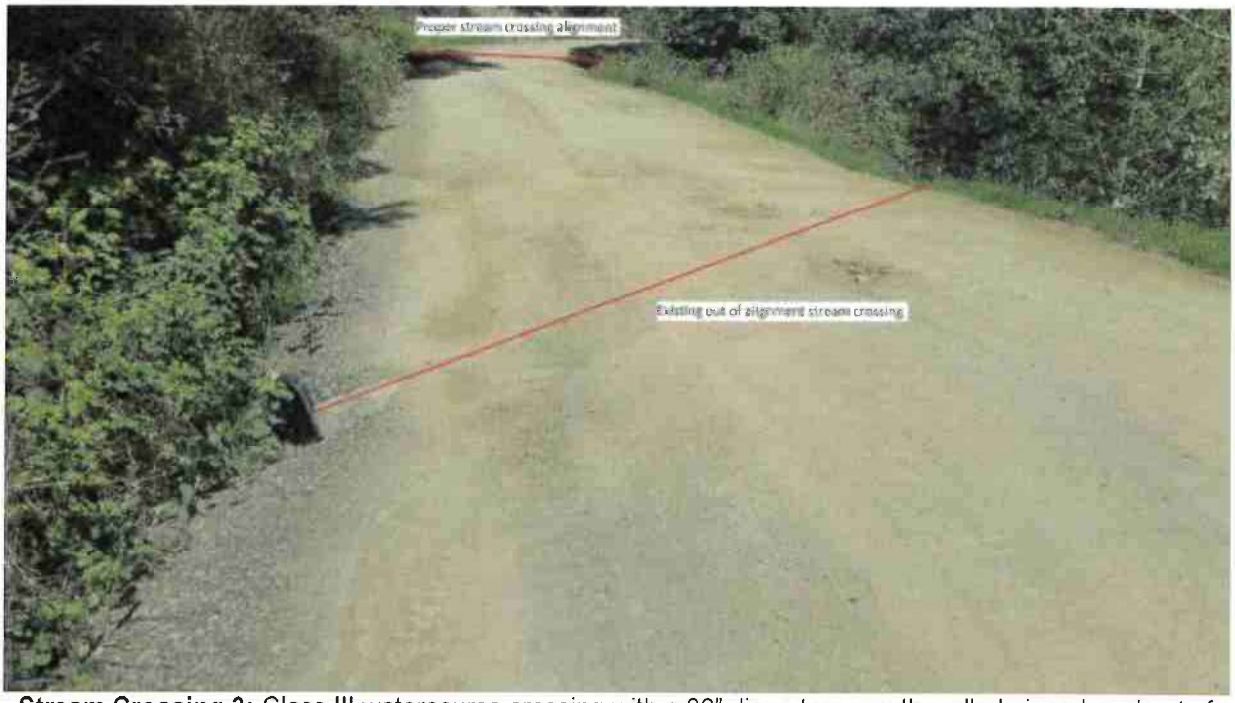
Ditch Relief Culvert 1 & 2: An inside ditch is running too long without being drained and discharging into the inlet of a Class III watercourse crossing. Install 18" diameter ditch relief culverts with a rock armored inlet and an energy dissipater per attached specifications at both locations.

Ditch Relief Culvert 3

Ditch Relief Culvert 3: 12" diameter ditch relief culvert. The inlet is becoming plugged from road surface debris, mud and vegetation. Clear the inlet of mud, debris, and vegetation and rock armor the inlet and outlet per attached specifications. Also remove the metal sheet that is attached to the outlet of the culvert.

Unstable Area 2: Fissure cracks have formed in the roads pad and along the outboard edge of the roads hillslope. Remove the unstable soils along the outboard edge of the road and install a stabilization trench. Remove approximately 10' – 15' Wide x 80' Long x 20' Depth of the hillslope's and the road's earthen material where the fissure cracks are occurring. Once the unstable material is removed, dig a deep keyway trench along the outboard edge of where the unstable earthen material was removed. Backfill the keyway trench with large boulders. Once the keyway trench has been filled, backfill behind the keyway and compact the fill. Once this is done, the laid-back slope leading up to the road pad shall be rock armored from the top of the keyway trench to the roads pad. Also remove the defunct metal culvert that is directly adjacent to the unstable area.

Stream Crossing 1: Class II watercourse crossing with a 24" diameter corrugated metal pipe placed above the streambed. The culvert outlet is shot gunned and the inlet is lacking rock armoring. There is also an old defunct 12" diameter corrugated metal pipe that was left in the road's fill prism and never removed when the current 24" diameter culvert was installed. The old pipe is currently delivering water through the outlet with no exposed inlet. Currently there is a sink hole forming approximately 10' adjacent to the 24" inlet that appears to be forming due to surface flows percolating through the ground and into the inlet of the defunct 12" culvert. Remove both the 24" diameter CMP culvert and the 12" diameter CMP culvert and install a 36" diameter culvert per attached specifications.



Stream Crossing 3: Class III watercourse crossing with a 36" diameter smooth-walled pipe placed out of alignment of the watercourse. Install a minimum 24" culvert approximately 80' down the road in the natural historic channel per attached specifications. The approximate location of the new crossing installation is represented as "NEW SC 3" on the attached maps.

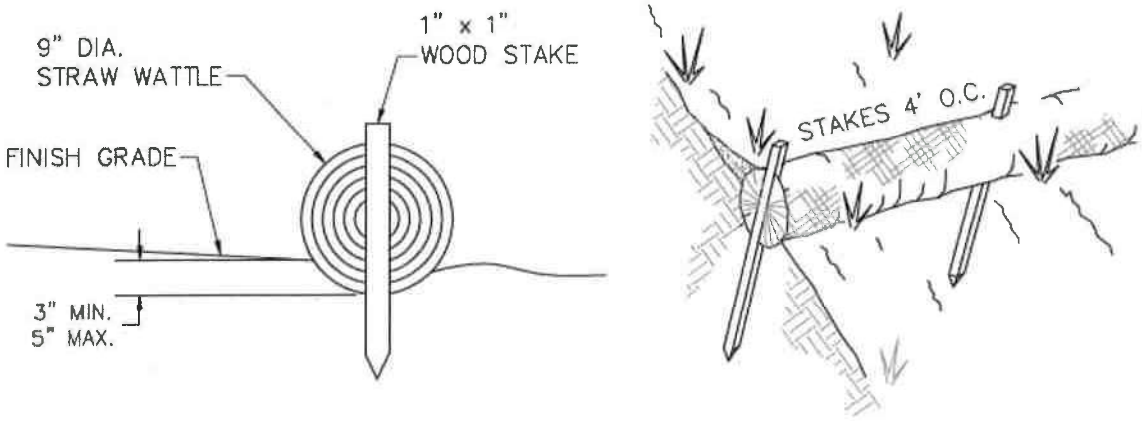
Stream Crossing 6: Class III watercourse dirt ford crossing. Install a rocked ford per attached specifications.

Stream Crossing 7: Class III watercourse dirt ford crossing. Install a 24" diameter culvert per attached specifications.

Attachments

BMP: Erosion Control

- Erosion control and sediment detention devices and materials shall be incorporated into the cleanup/restoration work design and installed prior to the end of project work and before the beginning of the rainy season. Any continuing, approved project work conducted after October 15 shall have erosion control works completed up-to-date and daily.
- Erosion control materials shall be, at minimum, stored on-site at all times during approved project work between May 1 and October 15.
- Approved project work within the 5-year flood plain shall not begin until all temporary erosion controls (straw bales or silt fences that are effectively keyed-in) are installed downslope of cleanup/restoration activities.
- Non-invasive, non-persistent grass species (e.g., barley grass) may be used for their temporary erosion control benefits to stabilize disturbed slopes and prevent exposure of disturbed soils to rainfall.
- Upon work completion, all exposed soil present in and around the cleanup/restoration sites shall be stabilized within 7 days.
- Soils exposed by cleanup/restoration operations shall be seeded and mulched to prevent sediment runoff and transport.
- Straw Wattles (if used) shall be installed with 18 or 24-inch wood stakes at four feet on center. The ends of adjacent straw wattles shall be abutted to each other snugly or overlapped by six inches. Wattles shall be installed so that the wattle is in firm contact with the ground surface.



BMP: General Erosion Control Techniques

TABLE 34. Guidelines for erosion and sediment control application

Timing of application	Technique	Portion of road and construction area treated
Erosion control during construction	Hydromulching, hydroseeding	Road fill slopes, cut slopes, bare soil areas
	Dry seeding	Road fill slopes, cut slopes, bare soil areas
	Wood chip, straw, Excelsior or tackified mulch	Road fill slopes, cut slopes, bare soil areas
	Straw wattles	Road fill slopes and cut slopes
	Gravel surfacing	Road, landing and turnout surfaces
	Dust palliative	Road surfaces
	Minimize disturbance (soil and vegetation)	All areas peripheral to construction
Sediment control during construction	Sediment basin	Roadside ditches, turnouts and small stream crossings
	Sediment traps (e.g., silt fences, straw bales barriers, woody debris barriers)	Road fill slopes, cutbanks, bare soil areas and ditches
	Straw bale dams	Ditches and small streams
	Sumps and water pumps	Stream channels and stream crossings
	Streamflow diversions (e.g., temporary culverts, flex pipe, etc.)	Stream channels and stream crossings
	Surface diversion and dispersion devices (pipes, ditches, etc.)	All disturbed bare soil areas
Permanent erosion control	Road shaping	Road and landing surfaces
	Gravel surfacing	Road, landing and turnout surfaces
	Bituminous or asphalt surfacing	Road surface
	Rolling dips	Road surface
	Ditch relief culverts	Roadbed and road fill
	Downspouts and berm drains	Road fill slopes
	Waterbars	Road and landing surfaces
	Berms	Road surface and roadside areas
	Ditches	Road and landing surfaces
	Riprap	Road fill slopes, stream crossing fills, cutbanks, stream and lake banks
	Soil bioengineering	Road fill slopes, cut slopes, stream crossings, streambanks
	Tree planting	Road fill slopes, cutbanks, bare soil areas, stream crossings, streambanks

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BMP: Waterbreaks

FIGURE 40. *Waterbars are constructed on unsurfaced forest and ranch roads that will have little or no traffic during the wet season. The waterbar should be extended to the cutbank to intercept all ditch flow (1) and extend beyond the shoulder of the road. A berm (2) must block and prevent ditch flow from continuing down the road during flood flows. The excavated waterbar (3) should be constructed to be self-cleaning, typically with a 30° skew to the road alignment with the excavated material bermed on the downhill grade of the road (4). Water should always be discharged onto the downhill side on a stable slope protected by vegetation. Rock (shown in the figure) should not be necessary if waterbars are spaced close enough to prevent serious erosion. (5) The cross ditch depth (6) and width (7) must allow vehicle cross-over without destroying the function of the drain. Several alternate types of waterbars are possible, including one that drains only the road surface (not the ditch), and one that drains the road surface into the inside ditch (BCMF, 1991).*

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BMP: Ditch Relief Culvert

- Install ditch relief culverts at an oblique (typically 30 degree) angle to the road so that ditch flow is not forced to make a sharp angle turn to enter the pipe. On low gradient roads (<5%), where ditch flow is slow, ditch relief culverts can be installed at right angles to the road.
- Install ditch relief culverts (DRC) to outlet at, and drain to, the base of the fill.
- If it cannot be installed at the base of the fill, install the DRC with a grade steeper than the inboard ditch draining to the culvert inlet, and install a downspout on the outlet to carry the culverted flow to the base of the fillslope.
- Downspouts longer than 20 feet should be secured to the hillslope for stability.
- Ditch relief culverts should not carry excessive flow such that downcutting of the ditchline or gullying below the outlet occur.
- Do not discharge flows from ditch relief culverts onto unstable fill or active landslides.
- If the ditch is on an insloped or crowned road, consider using outsloping to drain the road surface. The ditch and the ditch relief culvert would then convey only spring flow from the cutbanks and hillslope runoff, and not turbid runoff from the road surface.

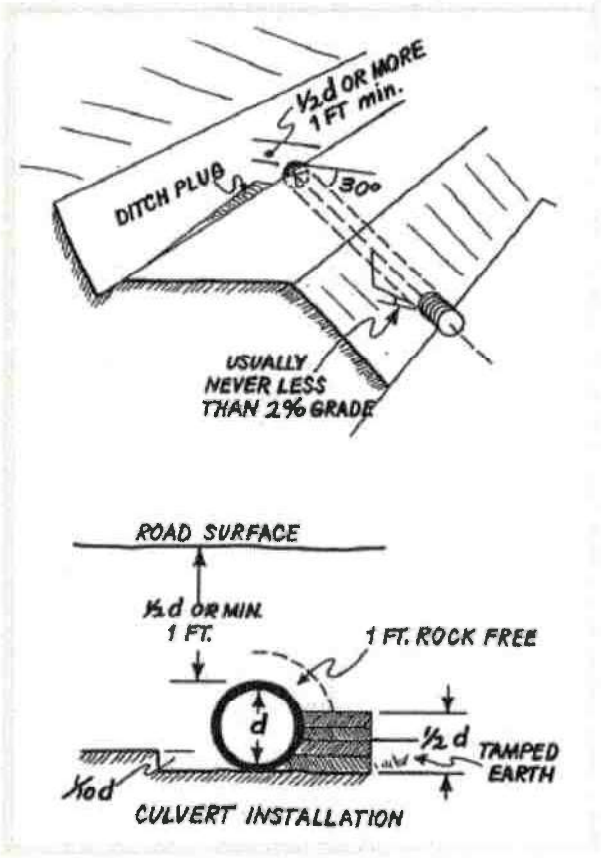

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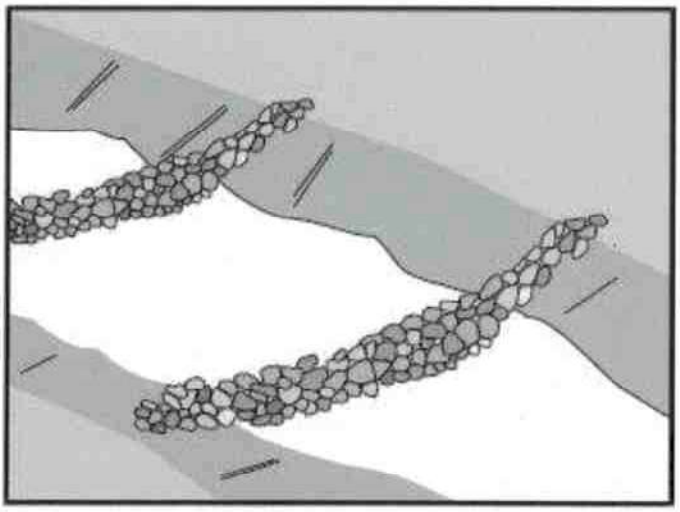
FIGURE 48. *The elements of a properly installed ditch relief culvert. The culvert is angled at about 30 degrees to the road alignment to help capture flow and prevent culvert plugging or erosion of the inlet area. It is set at the base of the fill (ideally) or with a grade slightly steeper than the grade of the contributing ditch (but never with a grade less than 2 percent) (USDA-SCS, 1983). At a minimum, the grade of the ditch relief culvert should be sufficient to prevent sediment accumulation at the inlet or deposition within the culvert itself (it should be self-cleaning) (USDA-SCS, 1983).*

Check Dams SE-4



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Category
☒ Secondary Category

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-14 Biofilter Bags

Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or other proprietary products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing scour and channel erosion by reducing flow velocity and increasing residence time within the channel, allowing sediment to settle.

Suitable Applications

Check dams may be appropriate in the following situations:

- To promote sedimentation behind the dam.
- To prevent erosion by reducing the velocity of channel flow in small intermittent channels and temporary swales.
- In small open channels that drain 10 acres or less.
- In steep channels where stormwater runoff velocities exceed 5 ft/s.
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.
- To act as a grade control structure.

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BMP: Ditch Relief Culvert (Cont.)

FIGURE 39.
Waterbars are often used to drain surface runoff from seasonal, unsurfaced roads. Because they are easily broken down by vehicles, waterbars are only used on unsurfaced roads where there is little or no wet weather traffic. In this photo, a waterbar and ditch relief culvert are used to drain all road surface and ditch runoff from the insloped road prism.

HANDBOOK FOR FOREST, RANCH AND RURAL ROADS

FIGURE 238. *Traffic and surface runoff from graveled roads often produces surface erosion, turbid runoff and fine sediment transport that can be delivered to streams. Where ditches can't be eliminated, sediment traps and roadside settling basins can be installed to capture and remove most of the eroded sediment. This settling basin has been constructed along the inside ditch just before a stream crossing culvert inlet (see arrow). Eroded sediment from the road and ditch are deposited in the basin before flow is released to the stream. Fine sediments have filled about 1/3 of this basin and vegetation is now growing. Sediment basins require periodic maintenance to maintain their storage capacity.*

HANDBOOK FOR FOREST, RANCH AND RURAL ROADS

BMP: Inlet and Outlet Armoring

- Inlets of culverts and associate fills shall be protected with rock armoring that extends at least as high as the top of the culvert.
- Outlets of culverts shall be provided a rocked energy dissipater at the outfall of the culvert.
- Outlets of culverts and associate fills shall be protected with rock armoring that extends at least as high as the top of the culvert if road fill sloughing into channel can occur.
- Prior to inlet and outlet rocking, the inlet and outlets shall be prepared. Preparation will include removal of vegetation and stored materials from the inlet and outlet.
- Inlets may require construction of an inlet basin.
- Slopes at the outlet should be shaped to a 2:1 or natural slope prior to placing rock armor.
- Rock used at culvert inlets and outlets should be a matrix of various sized rocks and rip-rap that range from a 3" dia. to a 2' dia.
- The largest rocks should be places at the base of the culvert or fill. Incrementally smaller rocks shall be placed over the larger rocks at the armoring extend up the slope. Voids and spaces shall be back filed with smaller gravels and rocks.

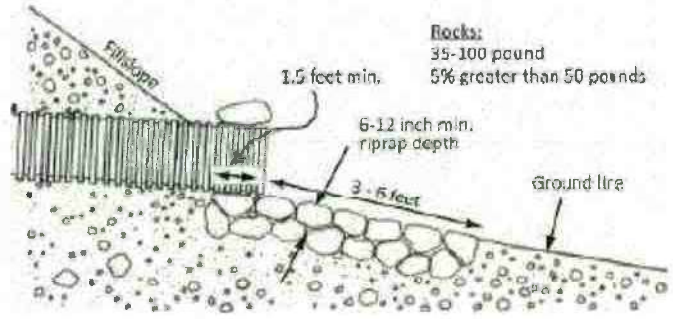


FIGURE 107A. *Riprap armor at culvert outlet (Modified from: Keller et al., 2011).*

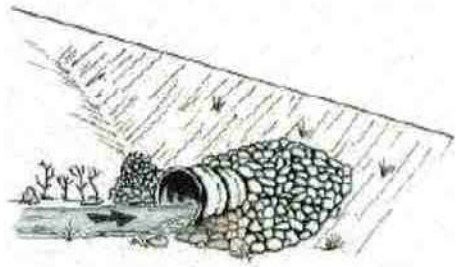


FIGURE 107B. *Riprap armor at culvert inlet (Keller and Sherar, 2003).*

HANDBOOK FOR FOREST, RANCH AND RURAL ROADS

BMP: Permanent Culvert Crossing

- New culvert installations shall be sized to accommodate flows associated with a 100-year storm event.
- If the new culvert is replacing a poorly installed old culvert, the crossing may need to be abandoned to the following standard:
  - When fills are removed, they shall be excavated to form a channel that is as close as feasible to natural watercourse grade and orientation, and that is wider than the natural channel.
  - Excavated banks shall be laid back to a 2:1 (50%) or natural slope.
- New culverts shall be placed at stream gradient, or have downspouts, or have energy dissipaters at outfall.
  - Align culverts with the natural stream channel orientation to ensure proper function, prevent bank erosion, and minimize debris plugging. See Figure 97 below.
  - Place culverts at the base of the fill and at the grade of the original streambed or install a downspout past the base of the fill. Downspouts should only be installed if there are no other options.
  - Culverts should be set slightly below the original stream grade so that the water drops several inches as it enters the pipe.
  - Culvert beds should be composed of rock-free soil or gravel, evenly distributed under the length of the pipe.
  - Compact the base and sidewall material before placing the pipe in its bed.
  - Lay the pipe on a well-compacted base. Poor basal compaction will cause settling or deflection in the pipe and can result in separation at a coupling or rupture in the pipe wall.
  - Backfill material should be free of rocks, limbs, or other debris that could dent or puncture the pipe or allow water to seep around the pipe.
  - Cover one end of the culvert pipe, then the other end. Once the ends are secure, cover the center.
  - Tamp and compact backfill material throughout the entire process, using water as necessary for compaction.
  - Backfill compacting will be done in 0.5 – 1.0 foot lifts until 1/3 of the diameter of the culvert has been covered.
  - Push layers of fill over the crossing to achieve the final design road grade, road fill above the culvert should be no less than one-third to one-half the culvert diameter at any point on the drivable surface.
- Critical dips shall be installed on culvert crossings to eliminate diversion potential. Refer to Figure 84 below.
- Road approaches to crossings shall be treated out to the first drainage structure (i.e. waterbar, rolling dip, or hydrologic divide) to prevent transport of sediment.
- Road surfaces and ditches shall be disconnected from streams and stream crossings to the greatest extent feasible. Ditches and road surfaces that cannot be feasible disconnected from streams or stream crossings shall be treated to reduce sediment transport to streams.
- If downspouts are used, they shall be secured to the culvert outlet and shall be secure on fill slopes.
- Culverts shall be long enough so that road fill does not extend or slough past the culvert ends.
- Inlet of culverts, and associate fill, shall be protected with appropriate measures that extend at least as high as the top of the culvert.
- Outlet of culverts shall be armored with rock if road fill sloughing into channel can occur.
- Armor inlets and outlets with rock, or mulch and seed with grass as needed (not all stream crossings need to be armored).
- Where debris loads could endanger the crossing, a debris catchment structure shall be constructed upstream of the culvert inlet.
- Bank and channel armoring may occur, when appropriate, to provide channel and bank stabilization.

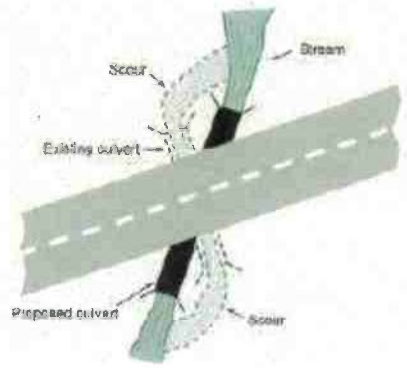


FIGURE 97. *Culvert alignment should be in relation to the stream and not the road. It is important that the stream enters and leaves the culvert in a relatively straight horizontal alignment so streamflow does not have to turn to enter the inlet or discharge into a bank as it exits. This figure shows a redesigned culvert installation that replaces the bending alignment that previously existed. Channel turns at the inlet increase plugging potential because wood going through the turn will not align with the inlet. Similarly, channel turns at the inlet and outlet are often accompanied by scour against the channel banks (Wisconsin Transportation Information Center, 2004).*

HANDBOOK FOR FOREST, RANCH AND RURAL ROADS

BMP: Permanent Culvert Crossing (cont.)

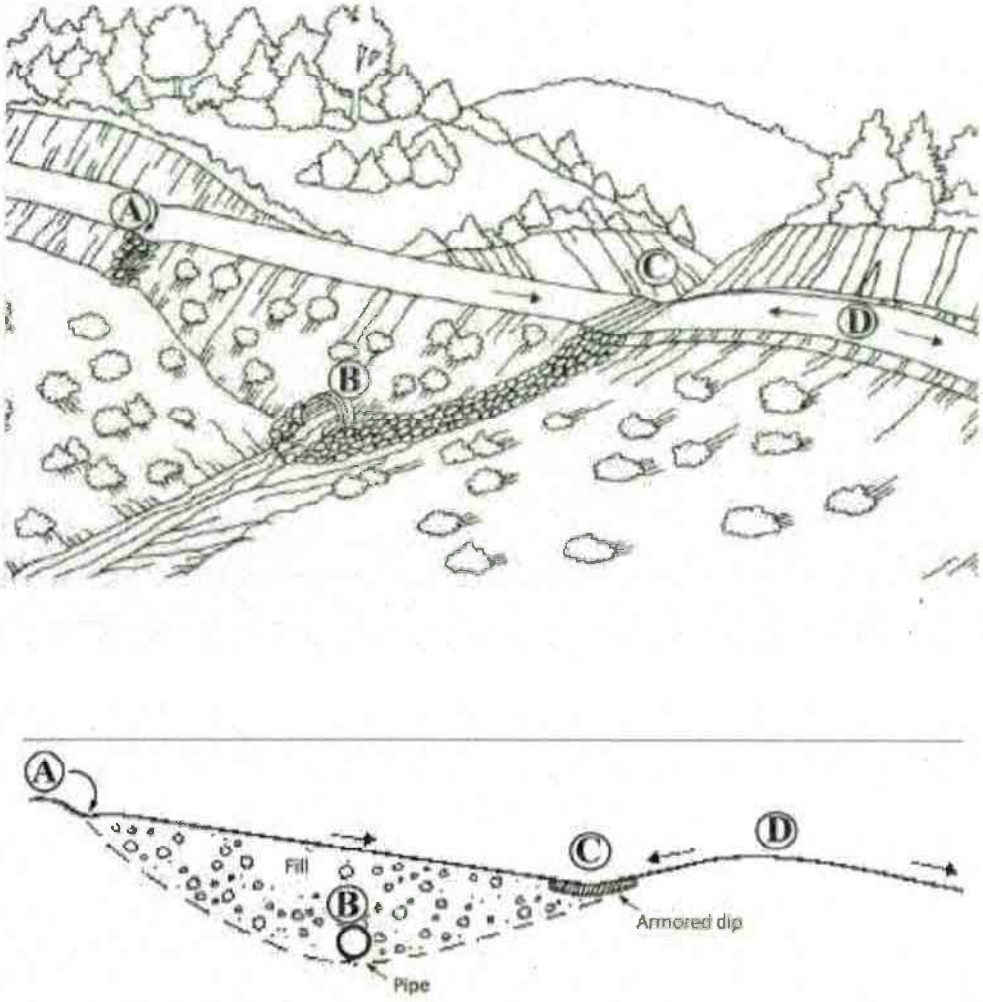
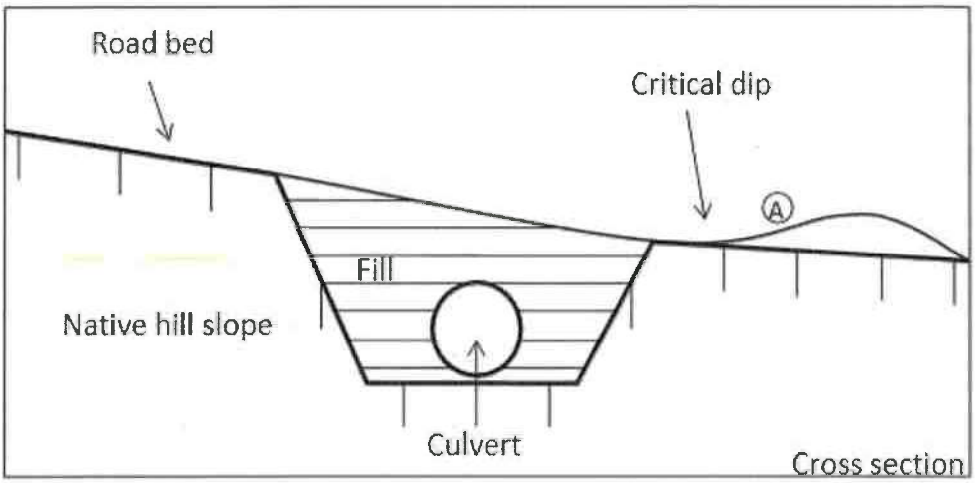
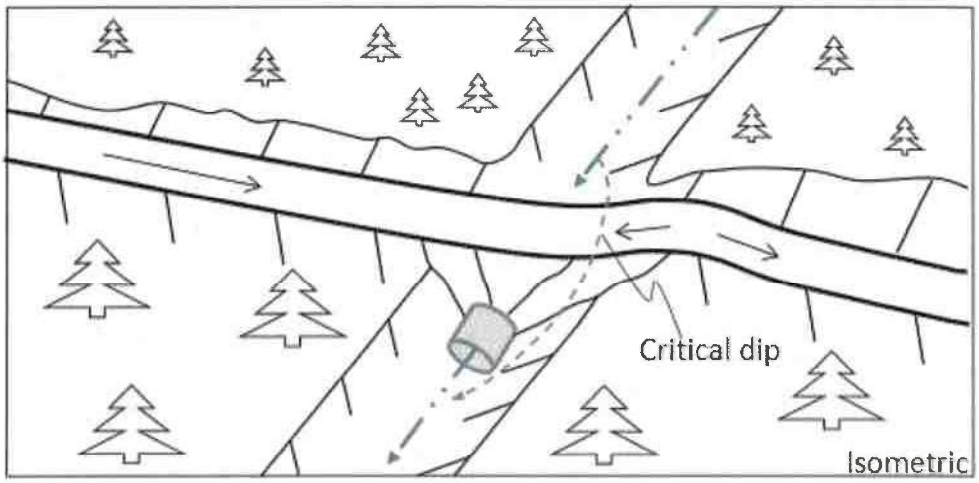


FIGURE 84. *Critical dips or dipped crossing fills should be centered near a stream crossing's down-road hingeline, not over the centerline of the crossing where overtopping could cause washout or severe erosion of the fill. If the stream crossing culvert (B) plugs, water will pond behind the fill until reaching the critical dip or low point in the crossing (C) and flowing back down into the natural stream channel. The down-road ditch must be plugged to prevent streamflow from diverting down the ditch line. For extra protection in this sketch, riprap armor has been placed at the critical dip outfall and extending downslope to the stream channel. This is only required or suggested on stream crossings where the culvert is highly likely to plug and the crossing fill overtopped. The dip at the hinge line is usually sufficient to limit erosional damage during an overtopping event. Road surface and ditch runoff is disconnected from the stream crossing by installing a rolling dip and ditch relief culvert just up-road from the crossing (A) (Keller and Sherar, 2003).*

Typical Critical Dip Design for Stream Crossings with Diversion Potential





Critical Dip Construction:

1. Critical dip will be constructed on the lower side of crossing.
2. Critical dip will extend from the cutbank to the outside edge of the road surface. Be sure to fill inboard ditch, if present.
3. Critical dip will have a reverse grade Ⓐ from cutbank to outside edge of road to ensure flow will not divert outside of crossing.
4. The rise in the reverse grade will be carried for about 10 to 20 feet and then return to original slope.
5. The transition from axis of bottom, through rising grade, to falling grade, will be in the road distance of at least 15 to 30 feet.
6. Critical dips are usually built perpendicular to the road surface to ensure that flow is directed back into the stream channel.

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BMP: Permanent Culvert Crossing (cont.)

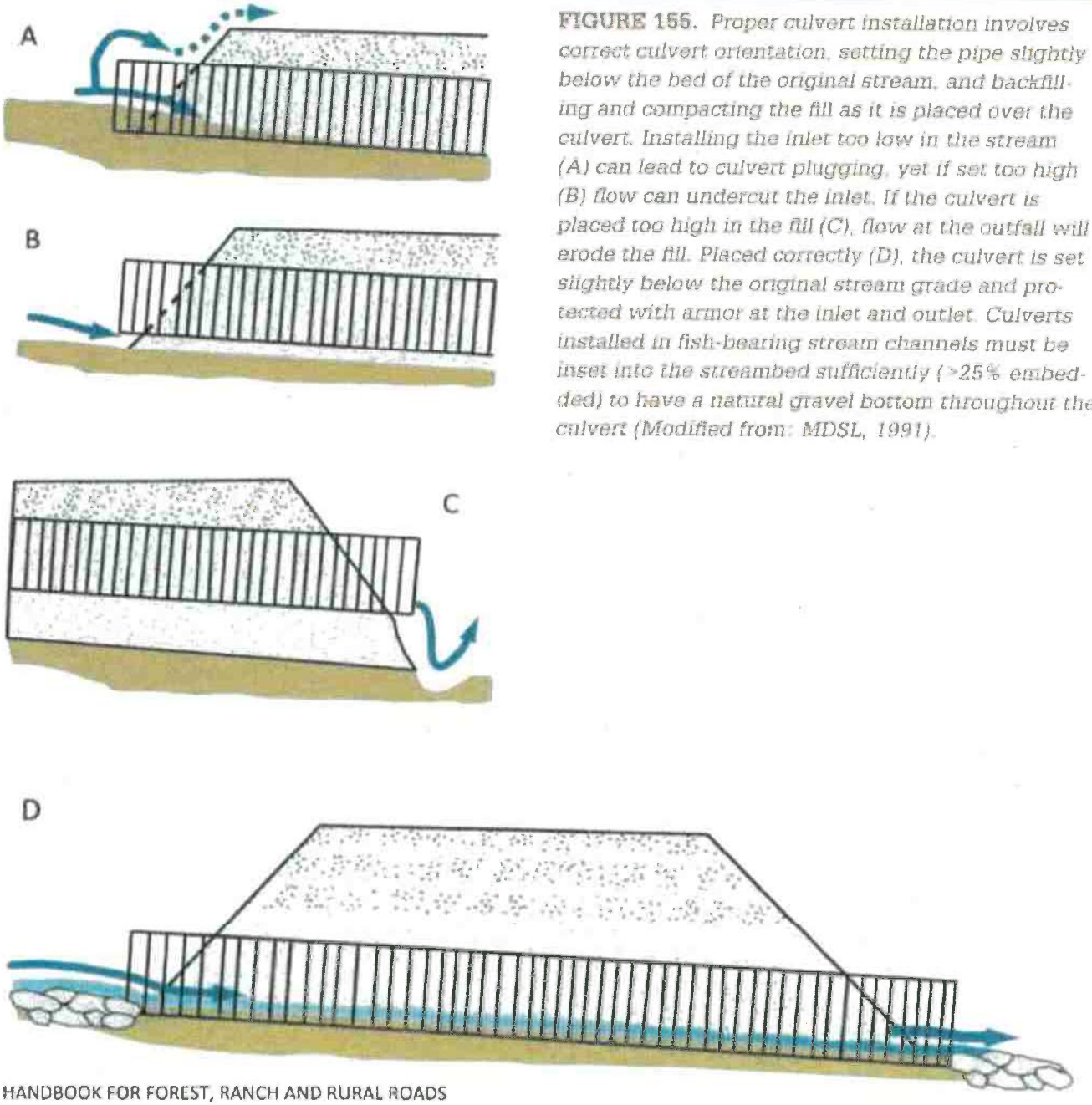
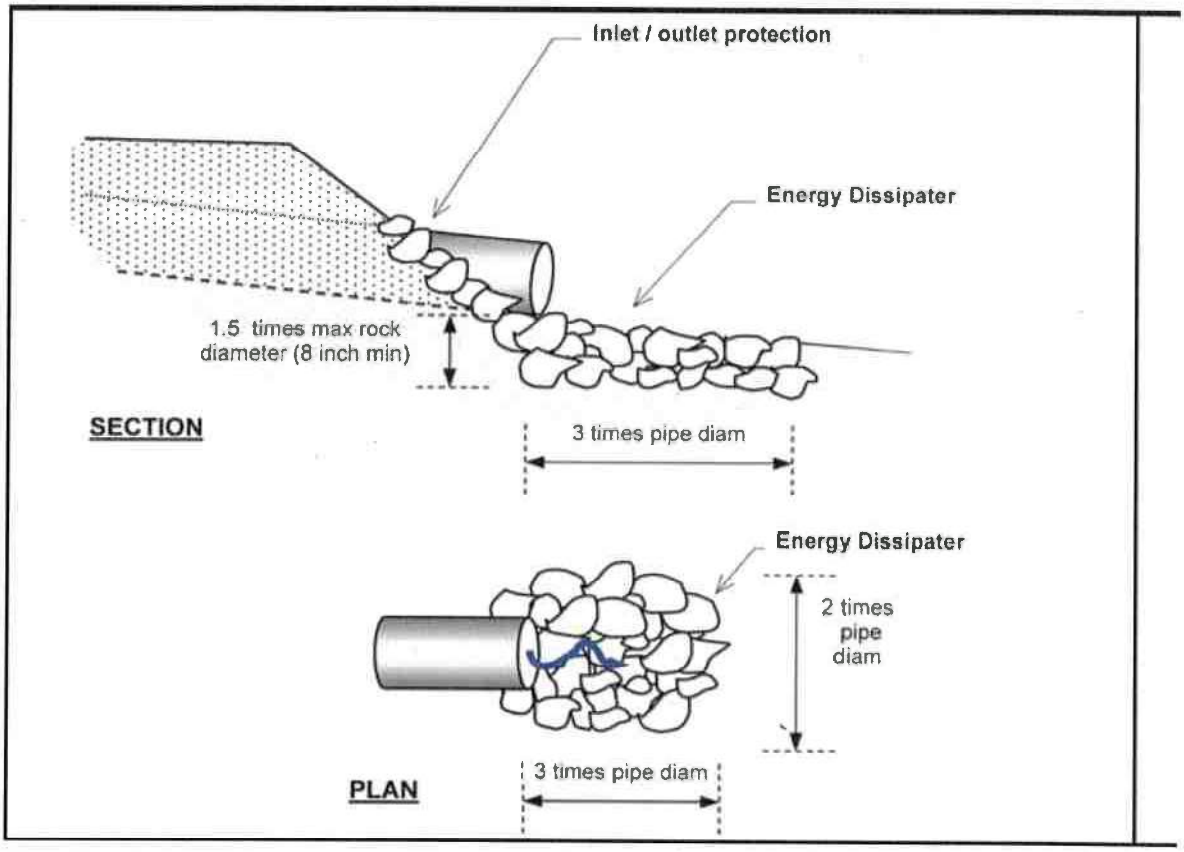
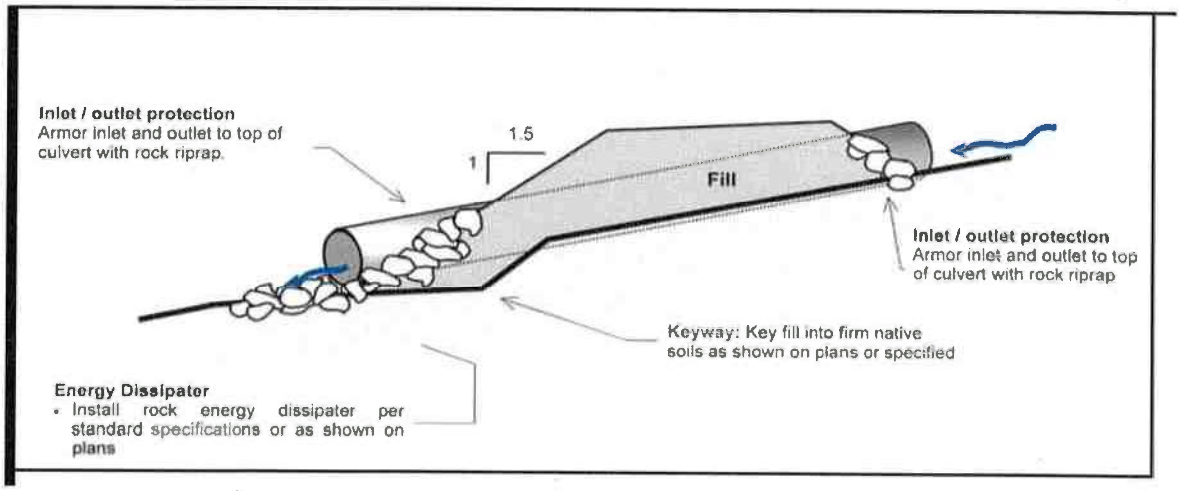


FIGURE 155. *Proper culvert installation involves correct culvert orientation, setting the pipe slightly below the bed of the original stream, and backfilling and compacting the fill as it is placed over the culvert. Installing the inlet too low in the stream (A) can lead to culvert plugging, yet if set too high (B) flow can undercut the inlet. If the culvert is placed too high in the fill (C), flow at the outfall will erode the fill. Placed correctly (D), the culvert is set slightly below the original stream grade and protected with armor at the inlet and outlet. Culverts installed in fish-bearing stream channels must be inset into the streambed sufficiently (>25% embedded) to have a natural gravel bottom throughout the culvert (Modified from: MDSL, 1991).*

HANDBOOK FOR FOREST, RANCH AND RURAL ROADS

BMP: Culvert Rock Armoring Specifications





Riprap installed to protect the inlet and outlet of a stream crossing culvert from erosion or for energy dissipation should be keyed into the natural channel bed and banks to an approximate depth of about 1.5x the maximum rock thickness. Riprap should be placed at least up to the top of the culvert at both the inlet and outlet to protect them from splash erosion and to trap any sediment eroded from the newly constructed fill slope above.

BMP: Armored Ford/Fill

- Armored fords are watercourse crossing fills comprised primarily of rock and designed to carry watercourses across roads without erosion or displacement of installed fill material.
- Armored fords shall have a U-shaped channel to create a drivable crossing.
  - The road shall dip into and out of the armored ford to minimize diversion potential. Construct a broad rolling dip across the roadbed, centered at the crossing, which is large enough to contain the expected 100-yr flood discharge while preventing flood flow from diverting down the road or around the rock armor.
- The road surface at the armored ford shall consist of rock small enough to be easily passable by vehicle, but large enough to not be transported during high flow storm events.
- The ford's inlet shall be rocked if a threat of head cutting exists.
  - *Excavate the keyway* - Excavate a one to three-foot-deep "bed" into the inboard edge of the road
  - *Armor the basal keyway* – place various sized rock in the constructed keyway to prevent head cutting. Use the largest rock armor to fill the keyway trench and create a buttress along the inboard edge of the road. This should have a "U" shape to it and it will define the inlet where flow leaves the natural channel and enters the road.
- The ford's outlet shall be rock armored to resist downcutting and erosion.
  - *Excavate the keyway and armored area* - Excavate a two to three-foot-deep "bed" into the dipped road surface and adjacent fillslope (to place the rock in) that extends from approximately the middle of the road, across the outer half of the road, and down the outboard road fill to where the base of the fill meets the natural channel. At the base of the fill, excavate a keyway trench extending across the channel bed.
  - *Armor the basal keyway* - Put aside the largest rock armoring to create the buttresses. Use the largest rock armor to fill the basal trench and create a buttress at the base of the fill. This should have a "U" shape to it and it will define the outlet where flow leaves the armored fill and enters the natural channel.
  - *Armor the fill* - Backfill the fill face with the remaining rock armor making sure the final armor is unsorted and well placed, the armor is two coarse-rock layers in thickness, and the armored area on the fill face also has a "U" shape that will accommodate the largest expected flow.
  - *Armor the top of the fill* - Install a second trenched buttress for large rock at the break-in-slope between the outboard road edge and the top of the fill face.
- Road approaches to armored fords shall be surface rocked out to the first drainage structure (i.e. waterbar, rolling dip, or hydrologic divide) to prevent transport of sediment using rock.
- Bank and channel armoring may occur when appropriate to provide channel and bank stabilization.
- Armored ford armoring shall be reapplied following use as needed to maintain a permanent crossing.

FIGURE 120. *This armored fill crossing of a steep, ephemeral stream was constructed to provide a low maintenance crossing. The crossing has been deeply dipped to reduce the volume of road fill and to eliminate the potential for stream diversion. The fill slope has been heavily armored through the axis of the crossing to contain flood flows and prevent down-cutting. Armored fills cannot be used on fish bearing streams.*

HANDBOOK FOR FOREST, RANCH AND RURAL ROADS

BMP: Armored Ford/Fill (cont.)

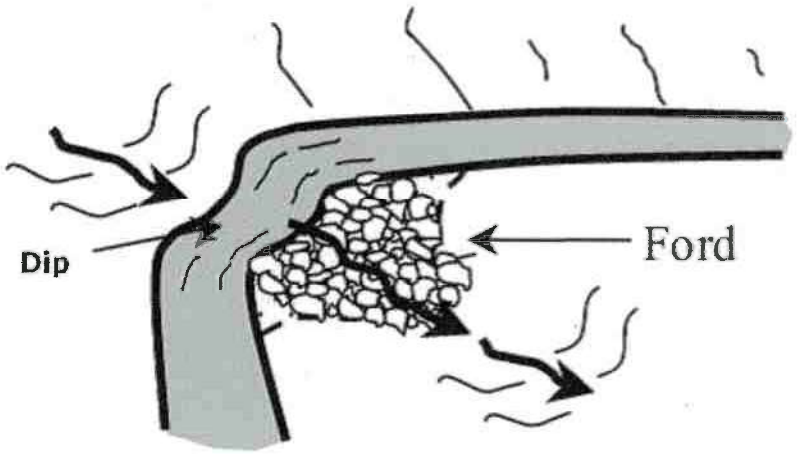
FIGURE 121D. *Well graded rock armor is then backfilled into the structure and spread across the breadth of the U-shaped stream crossing, and about one-third the way up the roadbed, so that streamflow will only flow over or come in contact with resistant armor material. The armor must be spread and compacted across the design width of the expected flood flow channel width so peak flows will not flank the armored structure.*

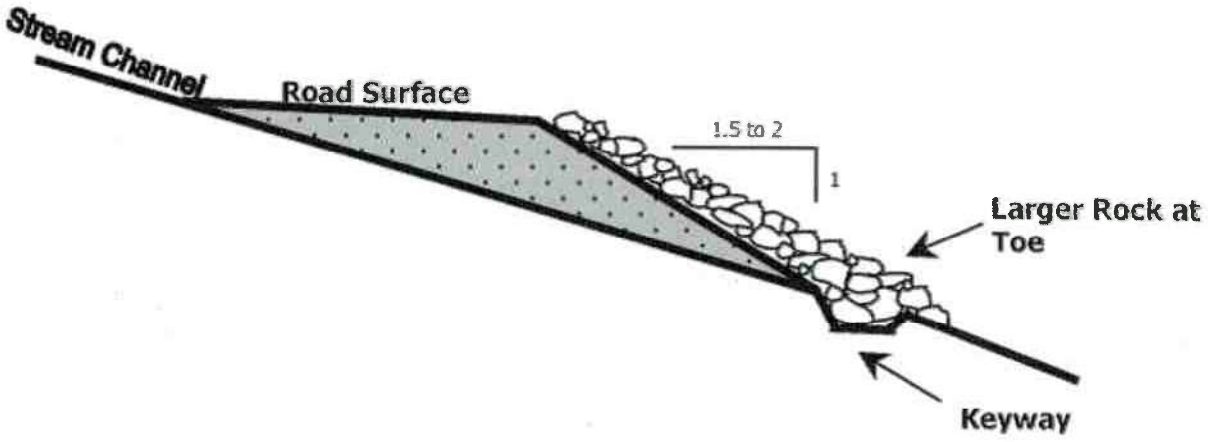
FIGURE 121E. *Two weeks after this armored fill was constructed, a storm flow event occurred and the structure maintained its function and integrity. The road approaches had not yet been compacted or surfaced with road rock.*

FIGURE 121F. *The same armored fill as it appeared after the first winter flood flows. No maintenance was required to reopen the road. It is also clear that no stream diversion is possible at this stream crossing site, and the volume of fill within the crossing has been reduced to the minimum amount needed to maintain a relatively smooth driving surface on this low volume road.*

BMP: Armored Ford/Fill (cont.)

FORD: A large dip is graded into the road at the axis of the stream channel. The outside fill face is dished out to form a spillway with large rock. On large watercourses, rock is keyed several feet into firm native soils. The road surface is rocked with 6" of minus rock .





BMP: Rocked Rolling Dip/Lead Out Ditch

FIGURE 55. *Steep roads that go straight up or down a hillside are very difficult to drain. This steep, fall line road developed a through cut cross section that was drained using lead out ditches to direct runoff off the road and onto the adjacent, vegetated hillside. The road was "outsloped" to drain runoff to the right side, and the lead out ditch was built slightly steeper than the road grade, to be self-cleaning. Four lead out ditches have been constructed at 100-foot intervals to the bottom of the hillside.*

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BMP: Rocked rolling dip (cont.)

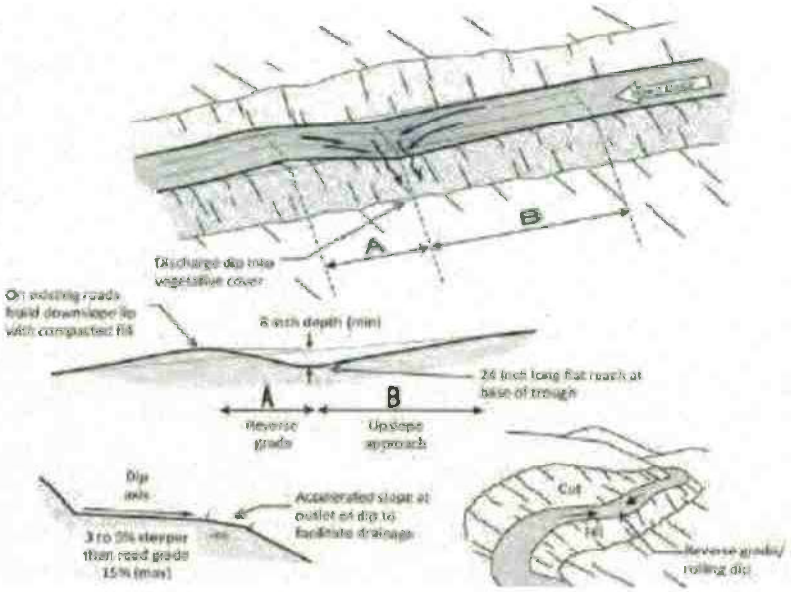
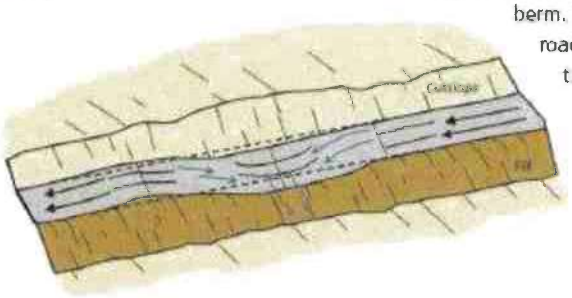


FIGURE 34. *A classic Type I rolling dip, where the excavated up-road approach (B) to the rolling dip is several percent steeper than the approaching road and extends for 60 to 80 feet to the dip axis. The lower side of the structure reverses grade (A) over approximately 15 feet or more, and then falls down to rejoin the original road grade. The dip must be deep enough that it is not obliterated by normal grading, but not so deep that it is difficult to negotiate or a hazard to normal traffic. The outward cross-slope of the dip axis should be 3% to 5% greater than the up-road grade (B) so it will drain properly. The dip axis should be out-sloped sufficiently to be self-cleaning, without triggering excessive downcutting or sediment deposition in the dip axis (Modified from: Best, 2013).*

HANDBOOK FOR FOREST, RANCH AND RURAL ROADS

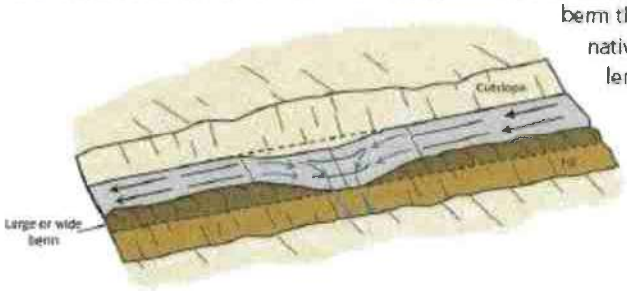
BMP: Rocked rolling dip (cont.)

Type 1 Rolling Dip
(Standard)



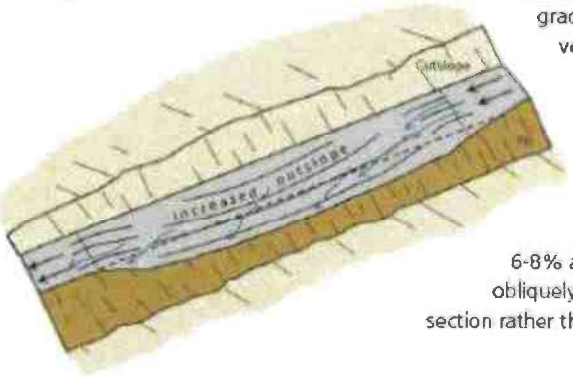
Type 1 rolling dips are used where road grades are less than about 12-14% and road runoff is not confined by a large through cut or berm. The axis of the dip should be perpendicular to the road alignment and sloped at 3-4% across the road tread. Steep roads will have longer and more abrupt dip dimensions to develop reverse grade through the dip axis. The road tread and/or the dip outlet can be rocked to protect against erosion, if needed.

Type 2 Rolling Dip
(Through-cut or thick berm road reaches)



Type 2 rolling dips are constructed on roads up to 12-14% grade where there is a through cut up to 3 feet tall, or a wide or tall berm that otherwise blocks road drainage. The berm or native through cut material should be removed for the length of the dip, or at least through the axis of the dip, to the extent needed to provide for uninterrupted drainage onto the adjacent slope. The berm and slope material can be excavated and endhauled, or the material can be sidecast onto native slopes up to 45%, provided it will not enter a stream.

Type 3 Rolling Dip
(Steep road grade)



Type 3 rolling dips are utilized where road grades are steeper than about 12% and it is not feasible to develop a reverse grade that will also allow passage of the design vehicle (steep road grades require more abrupt grade reversals that some vehicles may not be able to traverse without bottoming out).

Instead of relying on the dip's grade reversal to turn runoff off the roadbed, the road is built with an exaggerated outslope of 6-8% across the dip axis. Road runoff is deflected obliquely across the dip axis and is shed off the outsloped section rather than continuing down the steep road grade.

FIGURE 36. *Rolling dip types*

HANDBOOK FOR FOREST, RANCH AND RURAL ROADS

STATEMENT OF CONTINGENT AND LIMITING CONDITIONS CONCERNING THE PREPARATION AND USE OF WATER RESOURCE PROTECTION PLAN

Prepared by Timberland Resource Consultants

1. This Water Resource Protection Plan has been prepared for the property within APN 221-202-001 in Humboldt County, at the request of the Client.

2. Timberland Resource Consultants does not assume any liability for the use or misuse of the information in this Water Resource Protection Plan.

3. The information is based upon conditions apparent to Timberland Resource Consultants at the time the inspection was conducted, and as disclosed to Timberland Resource Consultants by the landowner and/or Discharger. Changes due to land use activities or environmental factors occurring after this inspection, have not been considered in this Water Resource Protection Plan.

4. Maps, photos, and any other graphical information presented in this report are for illustrative purposes. Their scales are approximate, and they are not to be used for locating and establishing boundary lines.

5. The conditions presented in this Water Resource Protection Plan may differ from those made by others or from changes on the property occurring after the inspection was conducted. Timberland Resource Consultants does not guarantee this work against such differences.

6. Timberland Resource Consultants did not conduct an investigation on a legal survey of the property.

7. Persons using this Water Resource Protection Plan are advised to contact Timberland Resource Consultants prior to such use.

8. Timberland Resource Consultants will not discuss this report or reproduce it for anyone other than the Client named in this report without authorization from the Client.

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Forrest Hansen
Timberland Resource Consultants