Tierra Consulting

41212 California Highway 299, Willow Creek, CA 95573

Water Resource Protection Plan
For
WDID # 1B161707CHUM

Submitted to:

Jedediah Morris
Friday Ridge Road
Willow Creek, California
95573

APN: 524-075-023

Prepared by:

Tierra Consulting
P.O. Box 989
Willow Creek, California
95573

Purpose

This Water Resource Protection Plan (WRPP) has been prepared on behalf of the discharger, 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 be affect the quality of waters of the state, other than into a community sewer system, shall file with appropriate regional water board a Report of Waste Discharge (ROWD) contain 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 condition. Order R1-2015-0023 conditionally waives the requirement to file a ROWD for the discharges and associated activities described in Finding 4.

Scope of Report

Order No. R1-2015-0023 states that "Tier 2 Dischargers and Tier 3 Dischargers 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. Dischargers 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. Dischargers 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 reviewing available CGS Geomorphic Feature and Geology Maps, and historical aerial photography. The field component included identifying and accurately mapping all watercourses, wet areas, and wetlands located up- and downstream of cultivation areas, associated facilities, and all appurtenant roads 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 roads accessing such areas were assessed for discharges and related controllable water quality factors from the activities listed in Order R1-2015-0023, Findings 4a-j. The field assessment also included an evaluation and determination of compliance with Standard Conditions per Provision I.B of Order No. R1-2015-0023. The WRPP's 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 WRPP per Provision I.B of Order No. R1-2015-0023 were physically inspected and evaluated. A comprehensive summary of each Standard Conditions as it relates to the subject property is appended.

Identified Sites Requiring Remediation

Unique Map Point(s)	Map Point Description	Associated Standard Condition	Temporary BMP	Permanent BMP	Priority for Action	Time Schedule for completion of Permanent BMP	Completion Date
RS#1-2	Road Segment with sediment delivery potential	A(1)(a) A(1)(d)	N/A	Rock the road surfaces	2	11/15/17	
RS#3	Road Segment with sediment delivery potential	A(1)(a) A(1)(d)	N/A	Outslope	3	Need County Approval through Grading Plan	
WB#1-2	Proposed Water Bar(s)	A(1)(b)	Install Check Dams	Install Water Bar(s) with outsloping on RS#3	2	11/15/17	
RD#1-3	Proposed Rolling Dip(s)	A (1)(b)	N/A	Install Rolling Dip(s)	2	11/15/17	
RF#1	Proposed Rock Ford	A (1)(b)	N/A	Install Rock Ford	3	Need CDFW and NCRWQCB Approval	
ID#1	Inboard ditch on Road Segment #2	A (1)(b)	Check Dams	Rock Inboard Ditch and Check Dams	3	Need CDFW and NCRWQCB Approval	
CULV#1	Existing 24" Corrugated Metal Pipe	A (2)(d)	Remove debris by hand	Excavate to grade and armor inlet	3	Need CDFW and NCRWQCB Approval	
5	Groundwater Well	A(5)	N/A	Install Flow Meter	1	6/1/17	
6	Stockpiled Soil	A (7)(a)	Cover/Perimeter Control	-	1	6/1/17	
7	Portable Generators and Fuel	A (9)(a)	Move to Enclosed Area	Move to Containers	1	6/1/17	
8	Cultivation-related waste	A (10)	Removed Garbage	Create Holding Location	2	11/15/17	
9 (OWTS)	Onsite Wastewater Treatment System	A (11) (a)	B&B Portable Toilet	Install OWTS	3	Need County of Humboldt DEH Approval	

Treat Priority: Treatment Priority (1) indicates a very high priority with the treatment being planned to occur immediately, (2) indicates a high priority site with treatment to occur prior to the start of the winter period (Nov. 15), (3) indicates a moderate priority with treatment being planned to occur within one-year, or prior to the winter period (Nov. 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).

Monitoring Plan

Tier 2 Dischargers shall include a monitoring element in the WRPP 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 dischargers shall submit an annual report (Attachment C) by March 31 if each year that document 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 Forecast Office (e.g. by entering the zip code of the parcel location at http://www.srh.noaa.gov/forecast).

Inspection Personnel Contact Information:

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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 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.

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

Prepared by Tierra Consulting

1. This Water Resource Protection Plan has been prepared for the property within APN 524-075-023 at the request of the discharger.

2. Tierra Consulting does not assume any liability for the use or misuse of the information in the Water Resource Protection Plan.

3. The information is based upon conditions apparent to Tierra Consulting at the time the inspection was conducted. Changes due to land use activities or environmental factors occurring after this inspection, have not been considered in the 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 or 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. Tierra Consulting does not guarantee this work against such differences.

6. Tierra Consulting did not conduct an investigation on a legal survey of this property.

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

8. Tierra Consulting will not discuss this report or reproduce it for anyone other than the Client named in this report within authorization from the client.

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Christian Figueroa
Tierra Consulting

Water Resource Protection Plan

Assessment of Standard Conditions For APN 524-075-023 – WDID #1B161707CHUM

A. Standard Conditions, Applicable to All Dischargers

1. Site Maintenance, erosion control and drainage features

   a. Roads 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 driveway entrance from Friday Ridge Road is a dirt surfaced road (RS #1). The seasonal dirt surfaced road is located away from watercourses and does not have the potential to directly deliver sediment to surface waters (Four Mile Creek, a tributary of the South Fork Trinity River). During the assessment, the condition of the seasonal dirt surfaced road dry and dusty. There were short segments where ruts and pot holes had formed during the winter season. There was no evidence of direct discharge of sediment into a watercourse.

   The access road (RS #2) to the upper landing from the lower landing (cultivation area) is a seasonal dirt surfaced road. Surface ruts and gullies have been noted on this stretch of road. This road is within the streamside management area of a Class-III watercourse, where there is hydrological connectivity from the road to the watercourse. There is evidence of direct discharge of sediment into the watercourse from this road segment.

   The access road (RS#3) from the upper landing area to relict quarry sorting area is a dirt surfaced road that has seen little or no maintenance since the relict quarry was in operation. Both surface ruts and gullies have formed due to diverted overland flow along this segment, which has led to surface erosion due to concentrated runoff, introducing sediment to the Class-III watercourse.

   In order to be in compliance with Standard Condition A.1.a., both RS #1 and #2, both with potential for sediment delivery to a watercourse, as shown on the WRPP site map, shall be rocked. This road surface shall be rocked by 11/15/17, and maintained throughout the winter period and inspected in the spring period for any required maintenance. Road segment #3 shall be outsloped to discourage diversion of overland flow. Seed and straw shall be placed on this road to revegetate, stabilize, and discourage use. Please see section A(1)(b) for additional BMPs for RS#1-3.

   b. Roads, 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.

   Due to the nature of the existing road segments once used for rock quarry activities, certain segments have shown to be adequate, where other segments have gone into disrepair. In order to be in compliance with Standard Condition A.1.b., on RS #1, two (2) rolling dips (RD #1-2) are proposed in areas where surface water has demonstrated pooling. On RS #2, the existing in-board ditch (ID #1) shall be rocked and check dams installed to reduce flow velocity,

erosion and sedimentation. On RS#3, a rock ford crossing (RF #1) in order to maintain quad access to the water storage tanks, shall be installed at the location of where the Class-III watercourse crosses the RS #3. In addition, two (2) water bars (WB #1-2) shall be installed on the remaining portion of RS #3 as an additional measure to road outsloping to reduce concentration of overland flow originated upslope of this road segment. Please review *Attachment 2 – Best Management Practices* for further explanation of these measures. Both the rock ford and inboard ditch maintenance require further permitting with the NCRWQCB and CDFW.

c. Roads 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 has revealed unstable areas per 14 CCR 895.1 within this parcel. Developed area associated with the cultivation area are located within the moderately sloping topography. The steeper slopes associated with past quarry operations (above the cultivation area) contain roads to traverse the slope for such operations. Runoff from these roads have shown evidence of diversion and concentration of overland flow that hydrologically connect to the Class III watercourse that passes through the parcel. No instabilities were noted within these fill and disturbed areas. Efforts to mitigate to these challenges are outlined in Section A.1.b for RS #3 that intersects this area.

d. Roads, clearings, fill prisms, and terraced areas (cleared/developed areas with the potential for sediment erosion and transport) shall be maintained so that they are hydrologically disconnected[1], as feasible, from surface waters, including wetlands, ephemeral, intermittent and perennial streams.

In general, roads, fills, and terraced areas within this parcel due to the past operations of the quarry were designed to be hydrologically connected to the Class-III watercourse to encourage site drainage. As part of the efforts outlined in Section A.1.b. for all road segments, should encourage hydrologic disconnection, promoting dispersal and infiltration within the parcel.

The heavily accessed area around the cultivation area (greenhouses) will be rocked to discourage hydrologic connectivity and increase both dispersal and infiltration.

[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.forestandfish.com/documents/Road_Mgmt_Survey.pdf)

e. Ditch relief drains, rolling dips 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.

In general, once action is made to fulfilling requirements outlined in Sections A.1.a., A.1.b., and A.1.d. both infiltration/dispersal of outflow from proposed structures (RD #1-2; WB #1-2; RF #1; ID#1) must be maintained to be in compliance with Standard Condition A.1.e.

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

Due to nature of past operations at this site, stockpiled materials had been and are ubiquitous at this site. However, at this time, materials are stored in a location and manner where they present no immediate risk to receiving waters. In compliance at this time.

2. Stream Crossing Maintenance

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 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].

There is one Class-III watercourse stream crossing within the subject parcel. One (1) 24" corrugated metal pipe culvert passes through the landing that contains the cultivation area. Sedimentation was observed at the culvert inlet from erosion of upland areas associated with RS #2 and #3. Efforts outlined in the previous sections shall contribute to reduction of sedimentation the culvert inlet. In addition, no existing armoring of the culvert inlet is present. Area around the inlet shall be prepared to allow placement of 8" to ¼ ton RSP to arm the inlet to meet Standard Condition A.2.d. The outlet of the culvert has existing velocity dissipation in the form of ¼ ton RSP.

Upstream of the culvert on the Class-III watercourse, on RS #3, a proposed rock ford crossing (RF #1) will maintain access to water storage tanks located at the end of the road segment. This feature will reconnect any hydrologic disconnection that presently exists at this location, added benefit in reduction of erosion and sedimentation at this map point.

Trinity Valley Consulting Engineers (TVCE) has been contracted to prepare a grading plan to propose and illustrate these mitigated efforts that will be used in conjunction with additional CDFW and NCRWQCB permitting.

3. Riparian and Wetland Protection and Management

a. For Tier 1 Dischargers, 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 Ill 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.
b. Buffers shall be maintained at natural slope with native vegetation.
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.
d. 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 area (four (4) greenhouses) is located greater than 50 feet from the Class-III watercourse. Due to the existing site conditions, both RS #2 and #3 and a portion of the landing which the cultivation area occupies, have hydrologic connectivity the Class-III watercourse. Visual evidence of sedimentation from these sources have been observed. Proposed efforts outlined within the previous sections shall alleviate and provide riparian protection and management under site specific best management practices.

[2]At a minimum, the culvert shall be aligned at the inlet. If infeasible to align the culvert outlet with 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.
[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

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 roads, 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.

Due to nature of past operations at this site, stockpiled materials had been and are ubiquitous at this site. However, at this time, materials are stored in a location and manner where they present no immediate risk to receiving waters. In compliance at this time.

5. Water Storage and Use:

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.
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.
c. For Tier 2 Dischargers, if possible, develop off-stream storage facilities to minimize surface water diversion during low flow periods.
d. Water is applied using no more than agronomic rates[7].
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.
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.

The site has an existing permitted well. Existing water storage include one (1) 1,500-gallon tank at the top of the road segment #3 that acts as a gravity-fed system to the cultivation area. The discharger will install a flow meter at the groundwater well source to document water use for the existing ~10,000 SF cultivation operation.

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[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 soil, rock and fertilizers.
[6] See definition and link to maps at http://water.usgs.gov/GIS/huc.html
[7] "Agronomic rates" is defined as the rates of fertilizers 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.

6. Irrigation Runoff

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.

The landowner irrigates at an agronomic rate, which does not produce runoff. An inspection of the cultivation site revealed no sign of overwatering. Given the distance to the Class-III watercourse, there is no hydrologic connectivity via surface flow from irrigation runoff at the cultivation site.

7. Fertilizers and Soil Amendments

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.
b. Fertilizers and soil amendments shall be 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.

At the time of time of site visitation (03/28/17), the discharger has been storing both fertilizers and amendments in a conex container located on-site, as shown on the site map.

Stockpiled potting soil was observed near the entrance of the landing (near well site) that did not have perimeter controls or was covered.

To be in compliance with Standard Condition A.7.a, any stock piled materials or amendments to be used for immediate application must be covered and have perimeter controls as outlined in *Appendix B* of the Water Board order. See attachments to consult *Appendix B Best Management Practices.*

8. Pesticides/Herbicides

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.

There are no pesticides or herbicides administered on the property. If needed, only organic pesticides will be utilized (i.e. Neem Oil or Clean Greener).

9. Petroleum products and other chemicals

   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. Dischargers 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.

The discharger does use a diesel powered generator on the subject parcel. Fuel is stored in a compatible container (100-gallon steel transfer tank), where both the generator and fuel tank have secondary containment with absorbent and a structure to discourage interaction with rainfall and wildlife. A spill kit is located and available on the premises. Effort will be made to adapt to non-petroleum based power supplies, such solar and or connecting to the grid via PG&E for on-site operations.

10. Cultivation-related wastes

    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.

The discharge uses a combination of composting and burn piles to eliminate organic cultivation waste. Both of these activities occur outside of the riparian buffer of the Class-III watercourse.

Cultivation waste was observed adjacent to the location of the container and the greenhouses. This material shall be collected, contained, and disposed of at an appropriate facility, including recycling where available.

A containment area (covered and secured) for cultivation waste shall be determined and implemented by November 15, 2017.

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

11. Refuse and human waste

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

The discharger has contracted Trinity Valley Consulting Engineers (TVCE) for the design of an Onsite Wastewater Treatment System (OWTS). The temporary BMP until the installation of the OWTS will be a B&B Portable Toilet for on-site employees.

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 roads. 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 in the WRPP and also noted above within the document. Any mitigation measures that are within the riparian buffer of the Class-III watercourse will be in the Grading Plan prepared by TVCE and will require additional permitting from the NCRWQCB and CDFW.

Photographs

Picture 1: This is a photograph of the proposed Rolling Dip (RD #1) on Road Segment #1 (RS #1), near the site entrance from Friday Ridge Road. Photograph was taken 4/15/17.

Photographs

Picture 2: This is a photograph of the proposed Rolling Dip (RD #2) on Road Segment #1 (RS #1), between the access gate and cultivation area. Photograph was taken 4/15/17.

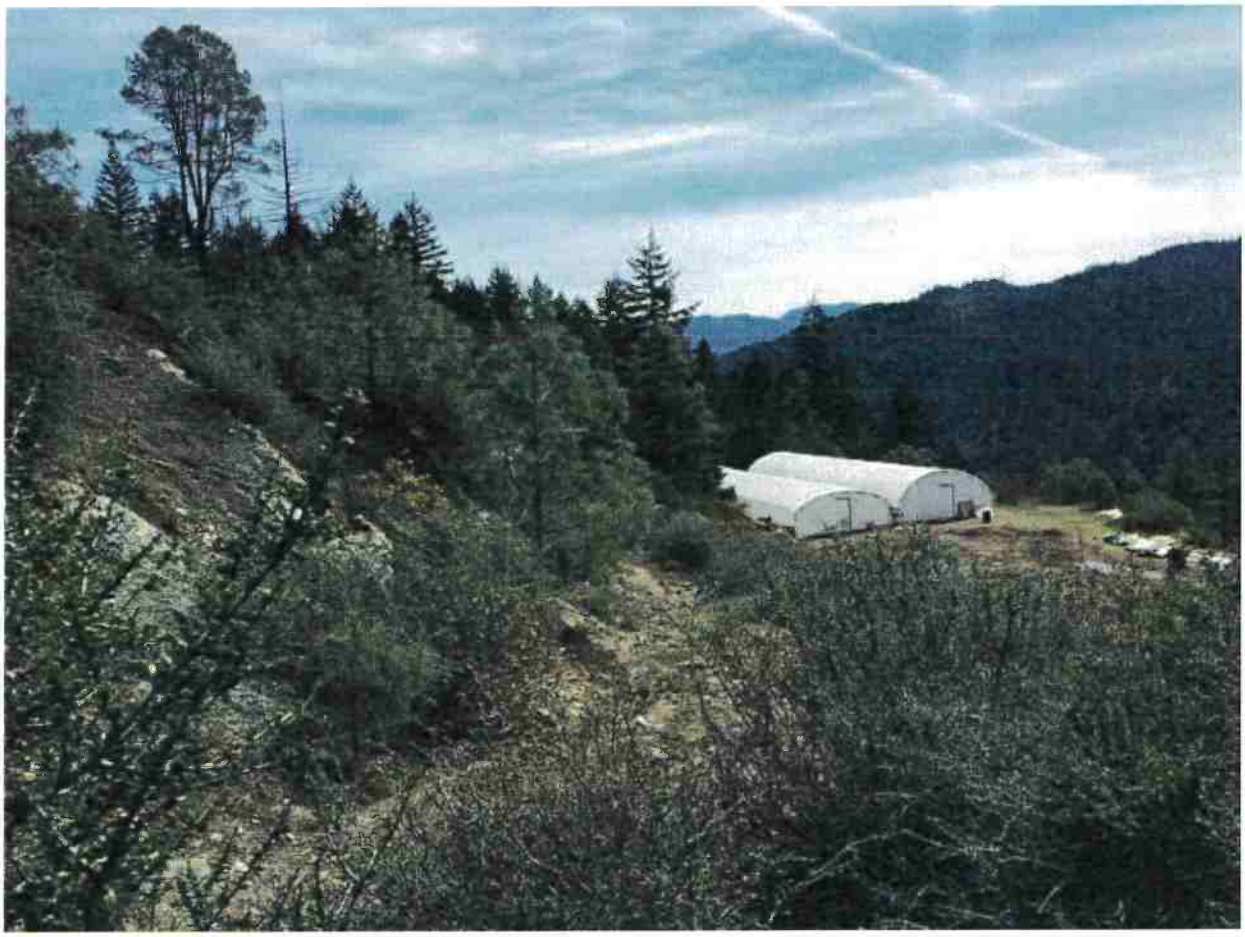
Photographs

Picture 3: This is a photograph of the proposed In-board Ditch (ID #1) on Road Segment #2 (RS #2), between the cultivation area and upper landing. Photograph was taken 4/15/17.

Photographs

Picture 4: This is a photograph of the proposed Rock Ford crossing (RF #1) on Road Segment #3 (RS #3), the location of the Class-III watercourse stream crossing near the Upper Landing. Photograph was taken 4/15/17.

Photographs



Picture 5: This is a photograph of Road Segment #3 (RS #3) looking towards the Upper Landing Access. Two (2) water bars (WB #1-2) are proposed along this segment. Photograph was taken 4/15/17.

Photographs

Picture 6: This is a photograph of the existing water storage on-site (1,500-gallon tank). Photograph was taken 4/15/17.

Photographs

Picture 7: This is a photograph of the existing permitted groundwater well on-site. Photograph was taken 4/15/17.

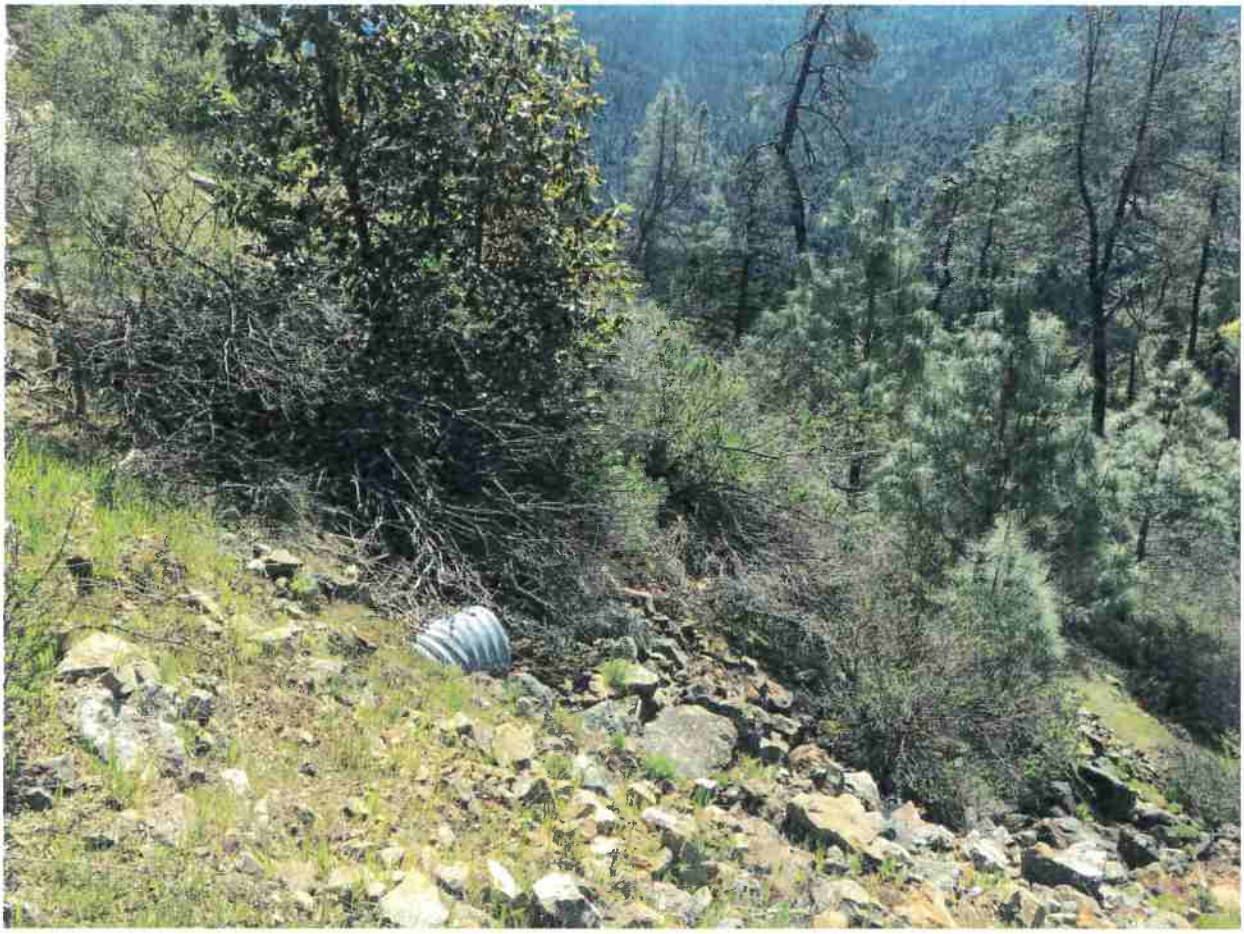
Photographs

Picture 8: This is a photograph of the conex container on the upper landing used for fertilizer/amendment storage and materials use for cultivation activities. Photograph was taken 4/15/17.

Photographs

Picture 9: This is a photograph of the existing 24" CMP culvert inlet with observed sedimentation. Photograph was taken 4/15/17.

Photographs



Picture 10: This is a photograph of the existing 24" CMP culvert outlet with RSP velocity dissipation. Photograph was taken 4/15/17.

Photographs

Picture 11: This is a photograph of the existing cultivation area landing and Road Segment #1 (RS #1). Photograph was taken 4/15/17.

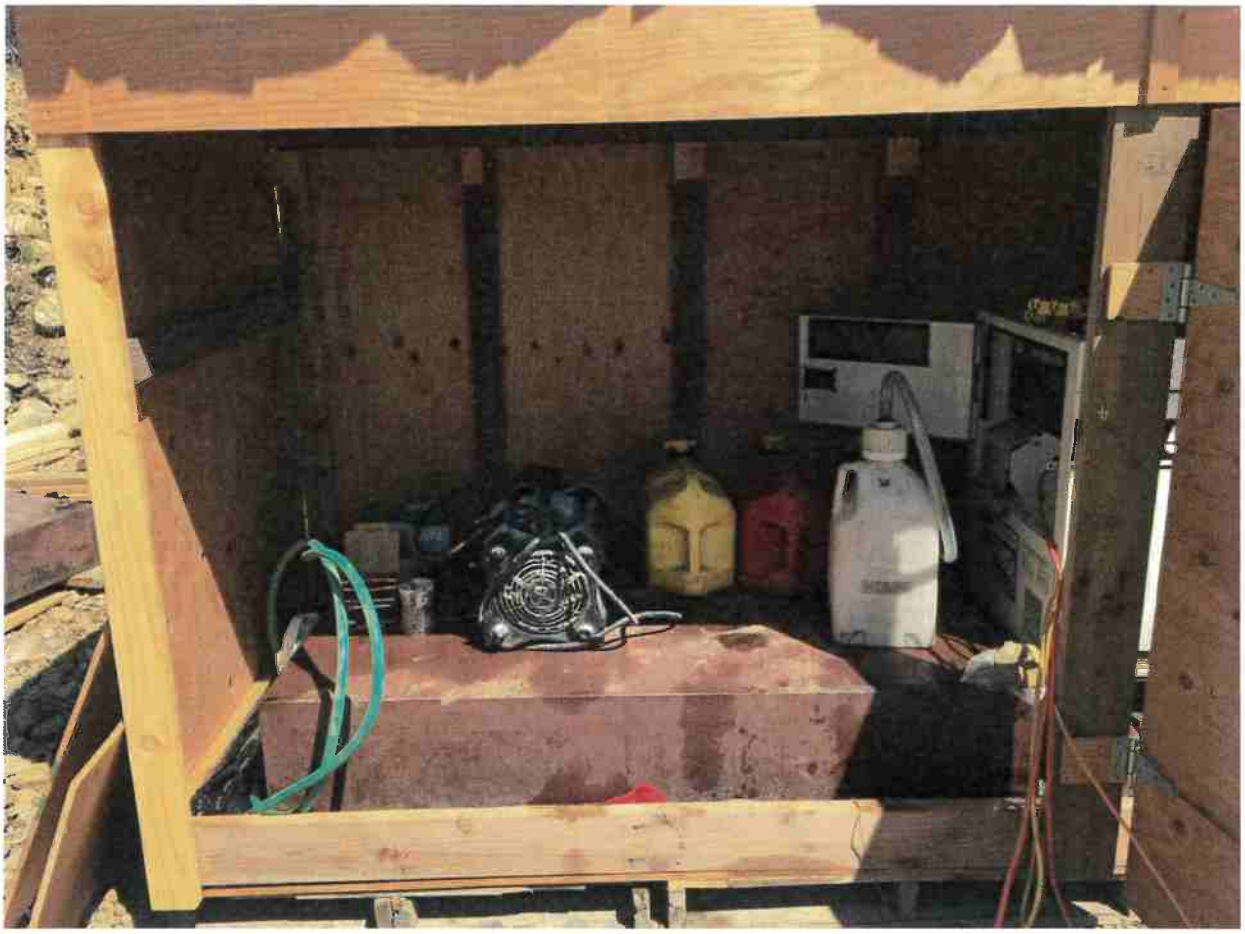
Photographs

Picture 12: This is a photograph of the existing worker's quarters. Photograph was taken 4/15/17.

Photographs

Picture 13: This is a photograph of the existing on-site diesel powered generator. Photograph was taken 4/15/17.

Photographs



Picture 14: This is a photograph of the existing generator and transfer fuel storage with secondary containment and liner. Photograph was taken 4/15/17.

Photographs

Picture 15: This is a photograph of the uncovered and no perimeter controls of soil stockpile. Photograph was taken 4/15/17.

Photographs

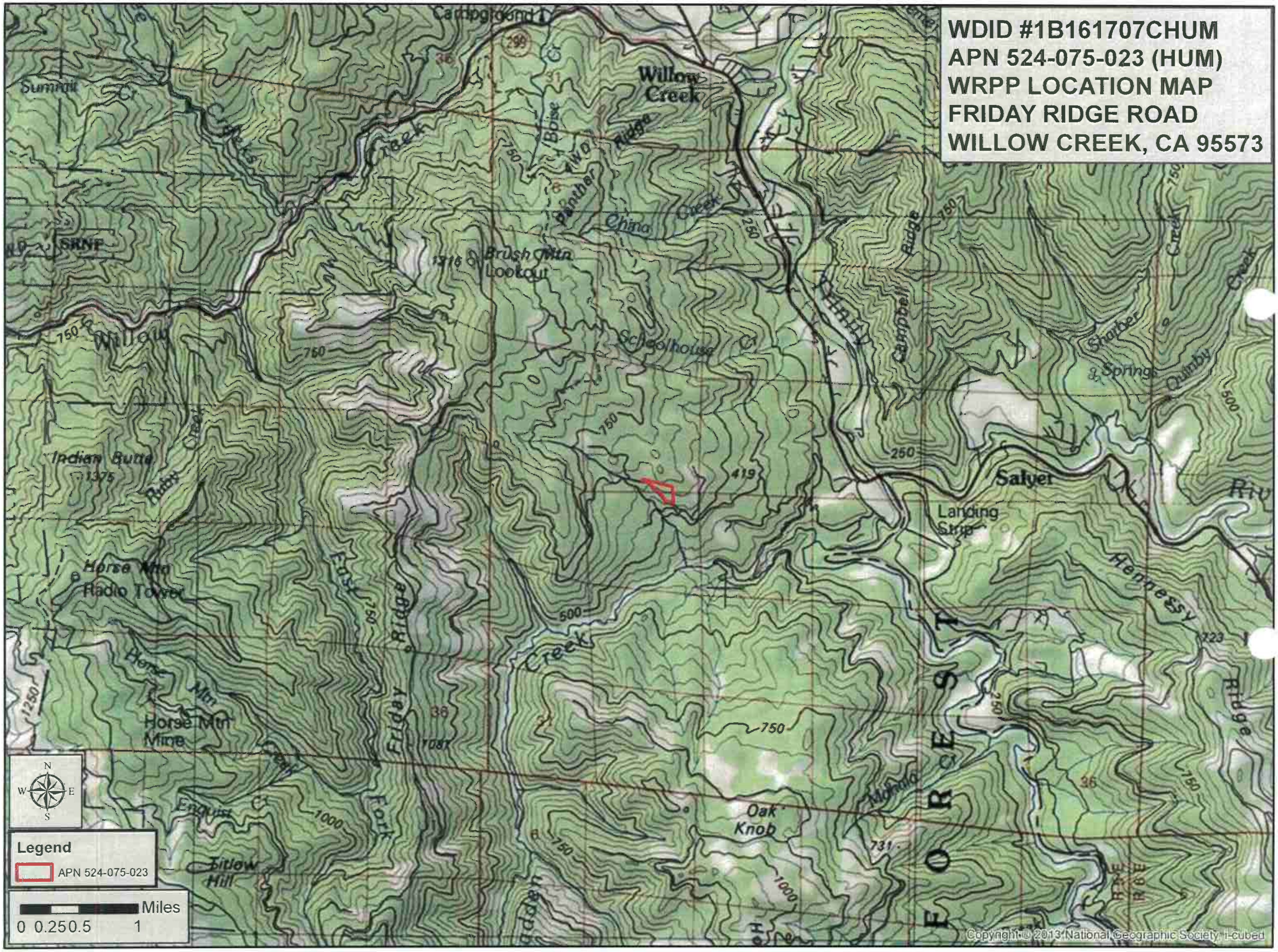
Picture 16: This is a photograph of on-site cultivation waste and non-contained amendments. Photograph was taken 4/15/17.

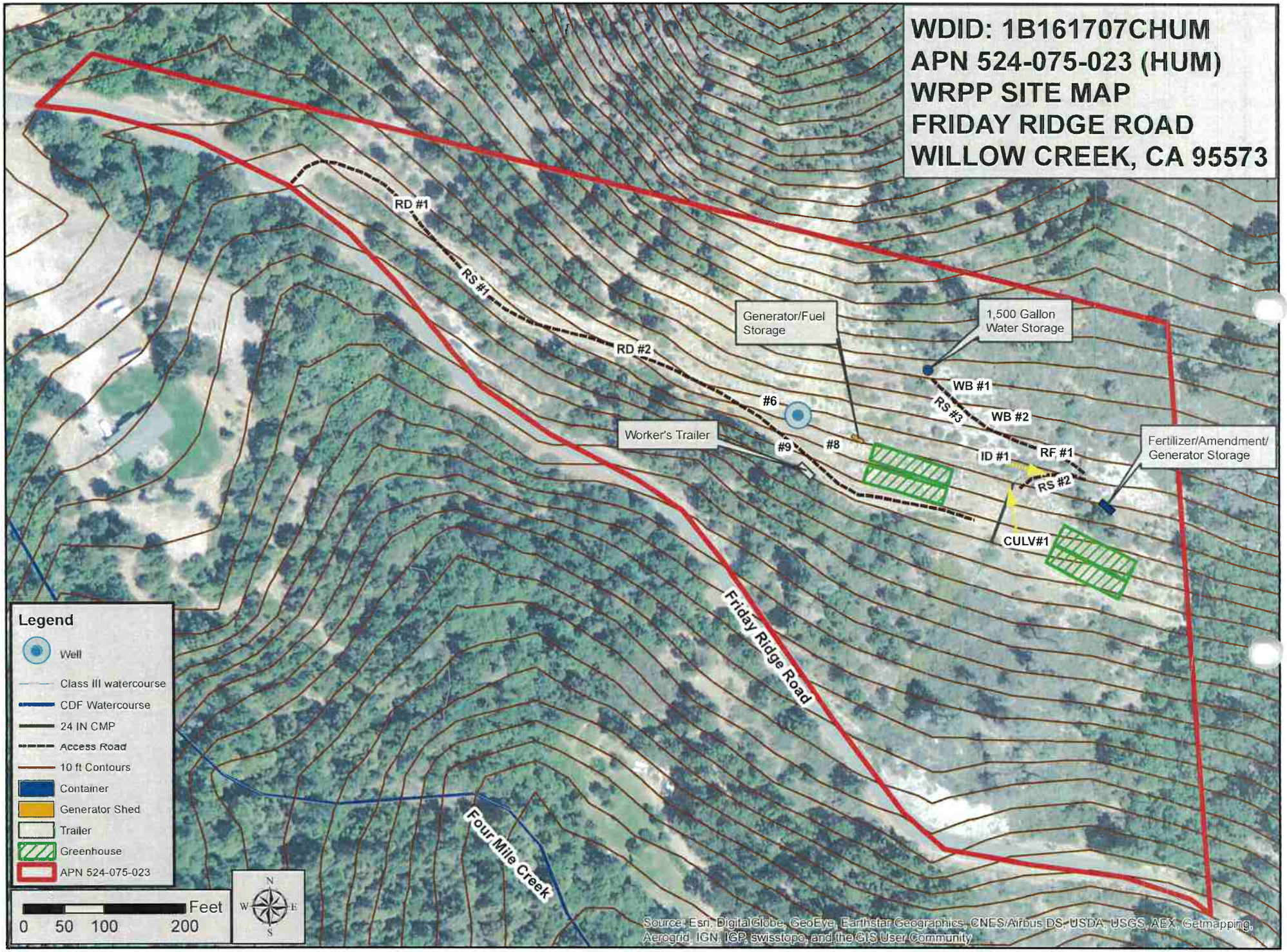
Photographs

Picture 17: This is a photograph of on-site cultivation waste. Photograph was taken 4/15/17.

Attachments

Maps




WDID: 1B161707CHUM
APN 524-075-023 (HUM)
WRPP SITE MAP
FRIDAY RIDGE ROAD
WILLOW CREEK, CA 95573
RD #1
RS #1
RD #2
Generator/Fuel Storage
1,500 Gallon Water Storage
WB #1
RS #3
WB #2
#6
Worker's Trailer
#9
#8
ID #1
RF #1
RS #2
Fertilizer/Amendment/ Generator Storage
CULV#1
Friday Ridge Road
Four Mile Creek
Legend
Well
Class III watercourse
CDF Watercourse
24 IN CMP
Access Road
10 ft Contours
Container
Generator Shed
Trailer
Greenhouse
APN 524-075-023
Feet
0 50 100 200
N
W E
S
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Additional Information

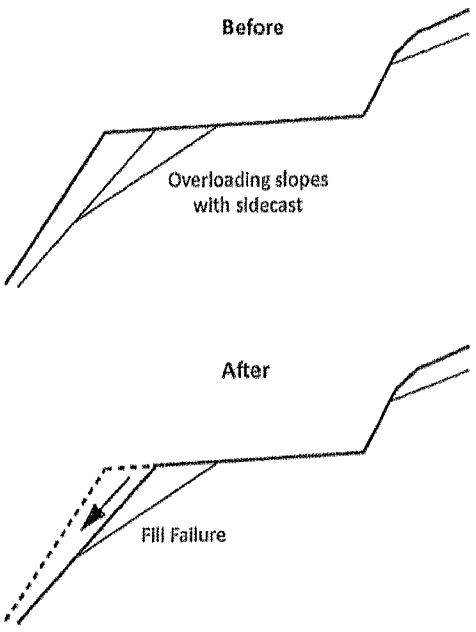


FIGURE 26. *Overloading steep slopes with uncompacted sidecast material can result in landsliding that damages streams hundreds of feet downslope (Modified from: BCMF, 1991).*

Stable road fills can be built on moderate and steep slopes by using benching, keyways and layered compaction methods. Here, a bench is excavated at the base of the proposed fill, and layers of moist, compacted soil are built up on this stable bench. The stability of the fill can be further increased by starting with an insloped bench that helps anchor the base of the fill into the native hillslope. A keyway is sometimes used to "lock" the fill into the denser or more stable underlying native soils or bedrock materials. Fill can then be compacted in lifts on top of this bench and steeper fill slope angles are possible. A keyed and benched fill depends on the fill being as strong as, or stronger than, the soil removed in the excavation. This bench and keyway locks the fill in place on the slope and prevents the fill from developing a failure plane where it is placed on the natural ground surface (Figure 26).

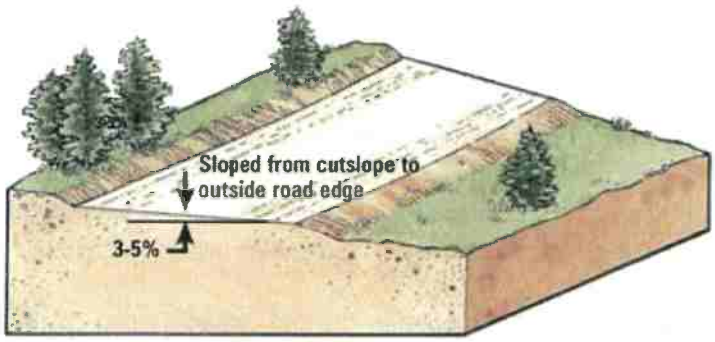
In critical areas, engineered fills that utilize reinforcing geotextiles or other internal supports can be constructed with nearly vertical faces. These are especially useful in short road sections where other fills would be unstable or erode and sediment could then enter a watercourse. In such cases, it may be necessary or prudent to employ a qualified, experienced geotechnical engineer or geologist to design a stable cut and fill road. Depending on the stability of the cut slope rock and soil materials, it may be simpler and cheaper to construct a full bench road where all the excavated material is simply endhauled off-site and deposited in a stable storage site.

2. ROAD SURFACE (SHAPE) DESIGN

Road surface design is really road surface drainage design, and should be chosen based on both maintaining safety for the intended uses, protecting the integrity of the road, and minimizing erosion and sediment pollution in streams. All three design standards should be met. Road surfaces can be designed as outsloped, crowned, or insloped (Figure 27). Often, more than one of these road surface designs is used along the road length. A road should never be graded with a flat road shape since this has no drainage. A flat road shape that does not drain to one side or the other is prone to puddling and pot holes in areas of no road grade, or to ruts and surface erosion if it is sloping up or down a hill. Flat, poorly drained roads often require a high level and frequency of maintenance.

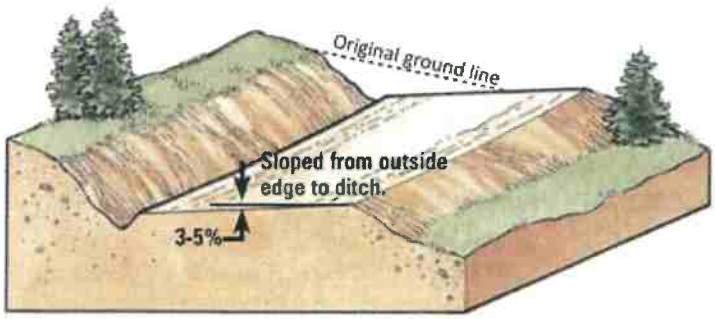
Outsloped roads are considered the best and most preferred road shape for most circumstances. Insloped and crowned roads require inside ditches, and ditches generally require regular maintenance. In addition to construction costs (ditched roads require considerably more excavation and construction costs—see Table 15), it is important to consider long term maintenance requirements and costs when deciding whether to construct an outsloped road or an insloped/crowned road.

Outsloped



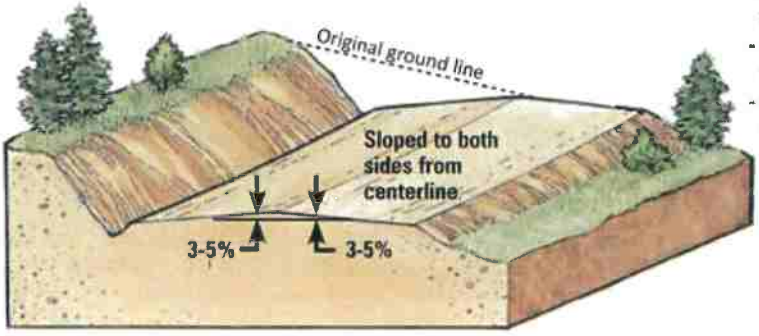
Outsloped roads are used:
- where road grades are gentle or moderate (≤8-12%)
- to minimize construction costs
- where cutslopes are dry
- with an inside ditch, where cutbanks are wet
- where road surface drainage is to be dispersed
- always in concert with rolling dips

Insloped



Insloped roads are used:
- where road grades are moderate to steep (≥8-12%)
- where road grades are moderate or steep and slippery (muddy, snowy or icy)
- where cutbanks are wet and ditches are used
- where ditches can be maintained
- where fillslopes are unstable or highly erodible

Crowned



Crowned roads are used:
- where road grades are gentle or moderate (≤8-12%)
- where ditches are maintained and can be drained frequently
- where roads are wide and two way traffic is common
- where commercial or high traffic use is common
- where slippery or icy conditions are common

FIGURE 27. *Road surface shapes include outsloped, insloped and crowned. The diagram depicts an outsloped road with no ditch (top), an insloped road with the inside ditch (center), and a crowned road with an inside ditch (bottom). Outsloped road shapes are generally preferred because of lower construction and maintenance costs. Where cutbanks are wet with spring flow an outsloped road shape can be combined with an inside ditch. Note that insloped and crowned roads generally require more hillslope cutting and have higher cutbanks than outsloped roads because of the extra width needed for a ditch (Modified from: Adams and Storm, 2011).*

Road shaping for proper drainage is not an all-or-nothing proposition. For example, roads which contour the landscape may alternate from outsloped to insloped as the road traverses the hillside. Roads that are outsloped for much of their length may also be locally insloped to deal with local conditions (e.g., a sharp outside curve). While some wet cutbanks may require the construction of an inside ditch (or French drain) for drainage, the roadbed itself may still be a worthy candidate for outsloping. **Ultimately, it is critical to properly design road surfaces to minimize erosion of the roadbed, ditch, cutbank and fill slope surfaces, while minimizing sediment delivery to streams.**

a. Outsloped roads, with or without an inside ditch

It is generally recommended that most forest, ranch and rural roads be constructed as single lane (minimum width), outsloped roads with minimal cut-and-fill, wherever conditions are suitable. Intervisible turnouts can be provided to allow passing. An outsloped road cross section is likely to cause the least disturbance and soil movement, create less environmental impact and have lower maintenance costs than other designs. Outsloped roads disperse and drain runoff along the entire outside edge of the road (Figure 28). They are less expensive to construct and less difficult and expensive to maintain than insloped roads, provided they are constructed in appropriate hillslope locations.

If hillslopes are dry, and cutbanks along existing roads display little or no evidence of emergent water (springs or seeps) during the wet season, there is no reason to construct or maintain an inboard ditch along a road. Analyzing cutbank and hillslope hydrologic characteristics will allow you to determine whether an inside ditch is necessary along your road.

Roads built wherever the surface can be kept dry and free draining should generally be outsloped to disperse runoff. Conditions that might limit road outsloping include: 1) steep road grades (≥20%) which may make adequate outsloping difficult; 2) winter use of

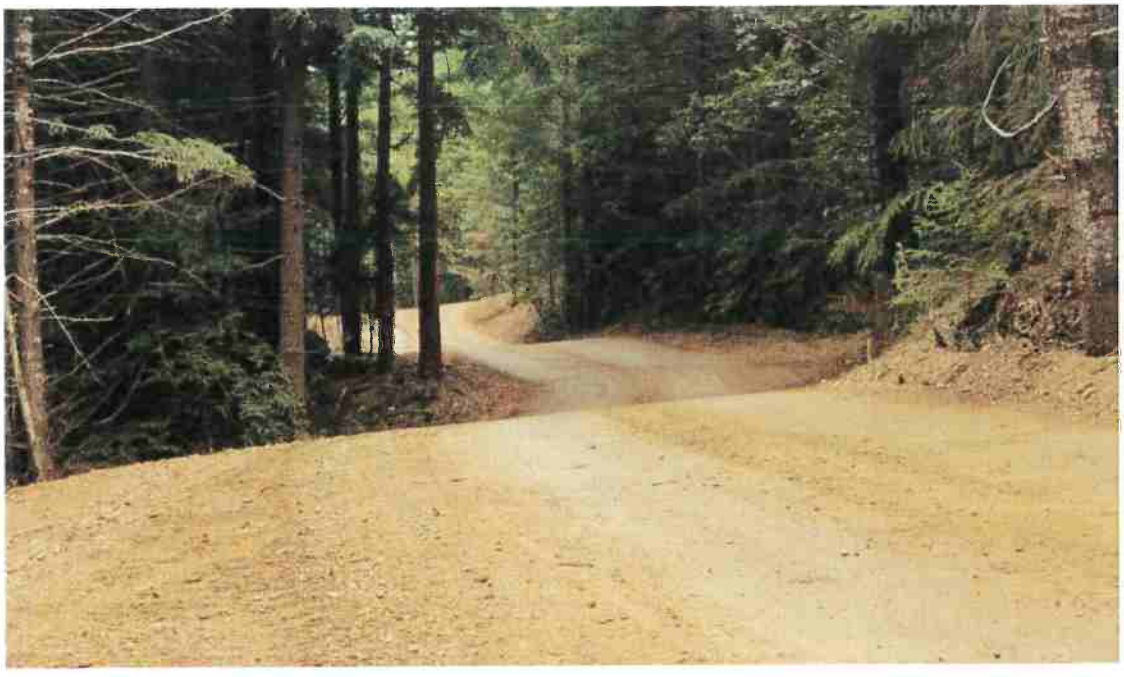


FIGURE 28. *Well built, outsloped road displaying minimum cut, smooth free draining surface, and no outside berm. The road contours the topography and its rolling grade and rolling dips disperse surface runoff.*

an unsurfaced road (snow or muddy conditions on a steep, outsloped road may be hazardous); or 3) upslope runoff or excessive spring-flow from the cutbank or roadbed (which might make an inside drainage ditch necessary).

However, many ditched roads are also candidates for surface outsloping, thereby draining surface runoff to the outside and not into the ditch. The inside ditch will carry relatively clear water flows from seeps and springs, while the outsloped road surface ensures that turbid road runoff and fine sediment eroded from the roadbed will be drained to the outside edge of the road where it can be safely discharged into vegetation and onto undisturbed soils. Outsloping thereby minimizes flows in the inside ditch and reduces the potential for erosion and sediment delivery from the road surface.

Clearly, if conditions permit, roads should be constructed with an outsloped surface, no ditch and no berms along the outside edge of the road. If berms are needed for safety, they should be frequently breached along their length to allow for dispersed road surface drainage. Table 18 shows design criteria for the degree of outsloping needed to drain road surfaces on differing grades. The design of outsloped road surfaces, especially on steeper road grades, should also consider safety where the road surface may be slippery (e.g., in rain or snow conditions) during parts of the year.

Where fill slopes are stable, roads should be designed and constructed with minimum width and with a mild, 3 to 5% outslope (Figure 29). However, on most roads, especially those with grades in excess of eight percent (8%), outsloping is not always enough to get surface runoff out of wheel ruts and off the road quickly. Here, in addition to outsloping, **waterbars (for seasonal or temporary roads) or rolling dips (for permanent and seasonal roads) are necessary to divert surface runoff off outsloped roads.**

Where an outsloped road turns on an outside curve the outslope is frequently tapered to a flat or insloped road shape, depending on the direction of the turn, and then back to an outslope in the following straight stretch. These safety measures are commonly called super-inslope (turning around a ridge) or super-outslope (turning around a depression or swale). The shape of the road keeps vehicles slightly "banking" around turns in the road and allows them to maintain constant speeds without increasing the risk of skidding off the turning road. The short sections of alternating road shape also allow for dispersed road surface drainage.

TABLE 18. Outsloping "pitch" for roads up to 8% grade[1]

Road grade	Outslope "pitch" for unsurfaced roads	Outslope "pitch" for surfaced roads
≤ 4%	3/8" per foot	1/2" per foot
5%	1/2" per foot	5/8" per foot
6%	5/8" per foot	3/4" per foot
7%	3/4" per foot	7/8" per foot
≥ 8%	1" per foot	1 ¼" per foot

[1]California Department of Forestry and Fire Protection (2008)

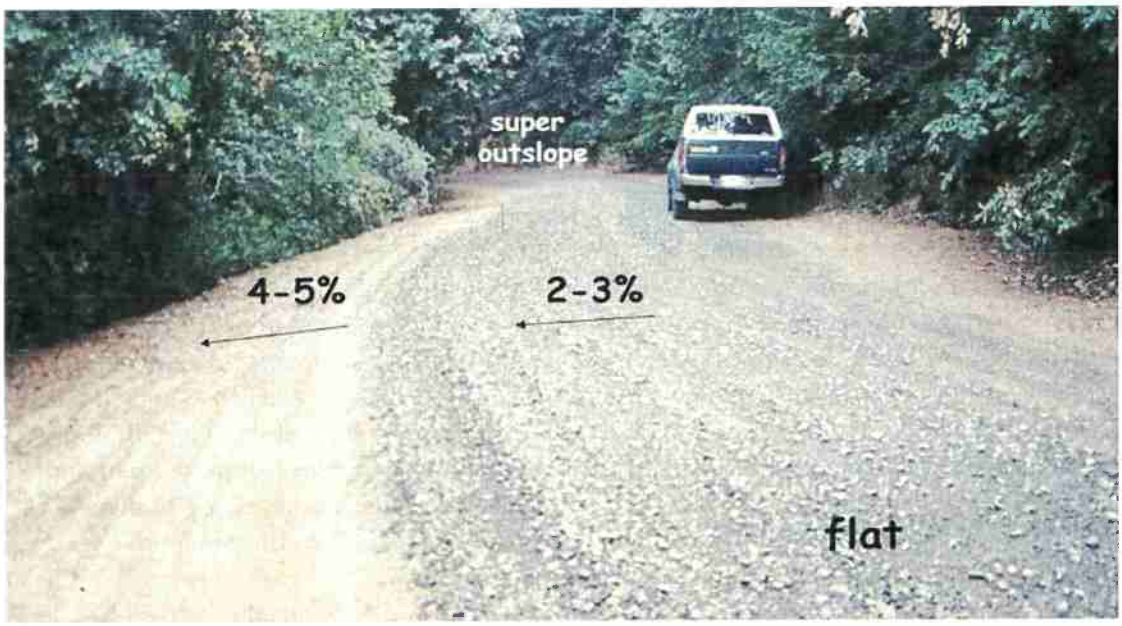


FIGURE 29. *Road shape changes as the road travels through the landscape. For example, an outsloped road will have a steep or "banked" outslope through inside curves, a consistent outslope through straight reaches and a flat or slightly insloped shape as it goes through an outside curve. The road may have an outslope of 2-3% across the travel surface while the shoulder is more steeply outsloped to ensure runoff and sediment will leave the roadbed.*

b. Crowned roads

A crowned road surface is one which traditionally slopes gently away from the centerline of the road and drains to both sides of the crown (Figure 30). Crowning is most commonly used where roads are wide enough for two lane traffic. Crowning may also be employed for safety purposes to keep traffic separated and where road grades are steep or snow is common; the crowned shape helps keep vehicles from sliding off the road.

The inside portion of a crowned road drains inward to the cutbank and ditch, while the outside portion drains out across the fill slope, thereby reducing the volume of road surface runoff (and fine sediment) that flows into the inside ditch. Crowning can be peaked at the center of the road, essentially dividing road surface drainage in half, or offset from the center so that more of the road surface drains to one side or the other. For example, crowning at the inside $^1/_3$ of the road surface results in most

FIGURE 30. *Crowned roads are peaked near the center of the roadbed and each side of the road surface drains to a ditch. This stable, crowned road reach is through cut into the hill and the ditches are drained frequently to prevent ditch erosion.*

ditches become blocked by cutbank slumps, they need to be cleaned. However, excessive maintenance of ditches (mostly grading) can cause continuing and persistent erosion, sediment transport and sediment pollution to local streams during storm runoff.

3. ROAD DRAINAGE STRUCTURES

Road drainage structures include those features of a road, other than road shape, designed to drain road surface and cutbank runoff off or away from the road prism. Road drainage structures include rolling dips, waterbars, drainage berms, ditches and ditch relief culverts (Table 20). The purpose of all drainage structures is to get water off of, and away from, the roadbed as quickly as possible so roadbed materials do not become saturated, and roadbed/ditch erosion is minimized.

a. Rolling dips

Rolling dips and a smooth, sloped road surface are critical to maintaining a well-drained, outsloped road. On climbing (or falling) roads, especially on outsloped road shapes, the road surface can be drained using rolling dips or waterbars. Unlike abrupt waterbars, rolling dips should be able to be driven at prevailing speeds on the road where they are installed. Rolling dips are smooth, angled depressions constructed in the roadbed (Figures 33a, 33b). Typical design dimensions for rolling dips are shown in Table 21. **It is important to use rolling dips, rather than waterbars, on roads with even infrequent use because traffic will quickly break down and/or breach**

TABLE 20. Comparison of drainage structures used on dirt and gravel roads

Structure type	Ditch relief culverts	Rolling dips	Water bars	Cross road drains
Purpose	Drains the road's inside ditch	Drains the road surface; Only drains the ditch if dip is deep and intersects the ditch	Drains the road surface	Drains road surface, ditch and springs on decommissioned or closed roads
Construction costs	High	Medium	Low	Low to Medium
Maintenance	Medium Needs frequent inspection and inlet cleaning	Low Needs occasional repair or reshaping	High Needs frequent cleaning, reshaping and replacement	None Should not need any maintenance
When to use	On all road grades On high or low traffic roads with frequent maintenance	On low and moderate grades On high or low traffic roads	On all road grades On low traffic roads or seasonal roads	On all closed or decommissioned roads, especially at springs and seeps
When not to use	On infrequently maintained roads; or wherever they would discharge to streams or onto unstable areas Below unstable or raveling cut slopes	On steep grades (>12% to 18%), depending on traffic type On curves	On high traffic roads	Where the cross road drain would feed water onto an unstable area or deliver eroded sediment to a stream

waterbars. Waterbars should be reserved for unsurfaced seasonal roads that are to have little traffic and/or no wet season use.

Rolling dips are usually used on outsloped roads to drain road surface runoff to the outside of the road, but may be built on either insloped, crowned or outsloped roads to drain runoff in either direction. However, keep in mind the goal of effective road drainage is to disperse rather than collect and concentrate road runoff. Drainage structures that drain to the inside of the road will likely require a greater number of ditch relief culverts to prevent ditch erosion and/or the formation of hillslope gullies.

***Rolling dip design*—In general, broad rolling-dips are usually built perpendicular to the road alignment, with a cross slope of 3 to 5 percent greater than the grade of the road.**

FIGURE 33A. *Rolling dip constructed on a rock surfaced rural road. The rolling dip represents a change-in-grade along the road alignment and acts to discharge water that has collected on, or is flowing down, the road surface. This road was recently converted from a high maintenance, insloped, ditched road to a low maintenance, outsloped road with rolling dips.*

FIGURE 33B. *This side view of an outsloped road shows that the rolling dip does not have to be deep or abrupt to reverse road grade and effectively drain the road surface. This outsloped forest road has rolling dips that allow all traffic types to travel the route without changing speed.*

TABLE 21. Table of rolling dip dimensions[1]

Road grade (%)	Upslope approach[2] (distance from up-road start of rolling dip to trough) (ft)	Reverse grade[2] (distance from trough to crest) (ft)	Depth below average road grade at discharge end of trough[2] (ft)	Depth below average road grade at upslope end of trough[2] (ft)
<6	55	15–20	0.9	0.3
8	65	15–20	1.0	0.2
10	75	15–20	1.1	0.1
12	85	20–25	1.2	0.1
>12	100	20–25	1.3	0.1

[1]USDA-SCS (1981)
[2]See also Figure 36

The cross grade slope ensures proper drainage to the outside of the dip. If the outslope in the axis of the rolling dip is insufficient, water will not drain, sediment will be deposited, and puddles and potholes will form. The morphology of the dip results in an up-and-down or slight rolling movement when driven. Some rolling dips are built at a 30 to 45 degree angle to the road alignment, but if the road is to receive commercial truck and trailer traffic (e.g., log trucks or cattle trailers) this angle can cause a significant rocking and twisting action to heavy truck loads and trailers that may not be acceptable.

Rolling dips are built with a long, shallow approach on their up-road side and a more abrupt rise or reverse grade on their down-road side (Figure 34, Table 21). Dips should be constructed deep enough into the road subgrade so that traffic and subsequent road grading will not obliterate them. Their length and depth should provide the needed drainage, but not be a driving hazard (Figure 35).

Rolling dips can be broken down into three types, depending on the existing road gradient and conditions of the outboard edge of the road. Figure 36 provides the general design characteristics of the three rolling dip types.

- A Type 1 rolling dip is the standard rolling dip design for roads that do not have a through cut or large berm that would prevent the dip from draining onto the adjacent outboard fill slope. Type 1 rolling dips are built on roads with road gradients less than 12–14%, and with or without a small outboard berm that can be easily removed. If an outboard berm is present make sure to remove the berm through the entire length of the dip.

- Type 2 rolling dips are designed for roads with gradients less than 12–14% within a small through cut, or that have a large (i.e. tall and/or wide) berm on the outboard edge of the road. This type of dip requires "breaching" or excavating the outboard through cut or large berm through the axis of the dip. The width of the breach is dependent on the road conditions (e.g., width of berm, road steepness, and road subgrade materials).

- Type 3 rolling dips are suggested for roads with gradients that exceed 12–14% where road steepness prevents the construction of a rolling dip with a reverse grade. Instead of building a dip with a reverse grade, a Type 3 rolling dip is constructed by building an aggressive 6–8% outslope from the inboard to the outboard edge of road to ensure that runoff travels obliquely across the road and exits the road within the rolling outslope. This outslope is developed by ripping the roadbed and pushing road fill from the outboard half to the inner half of the road.

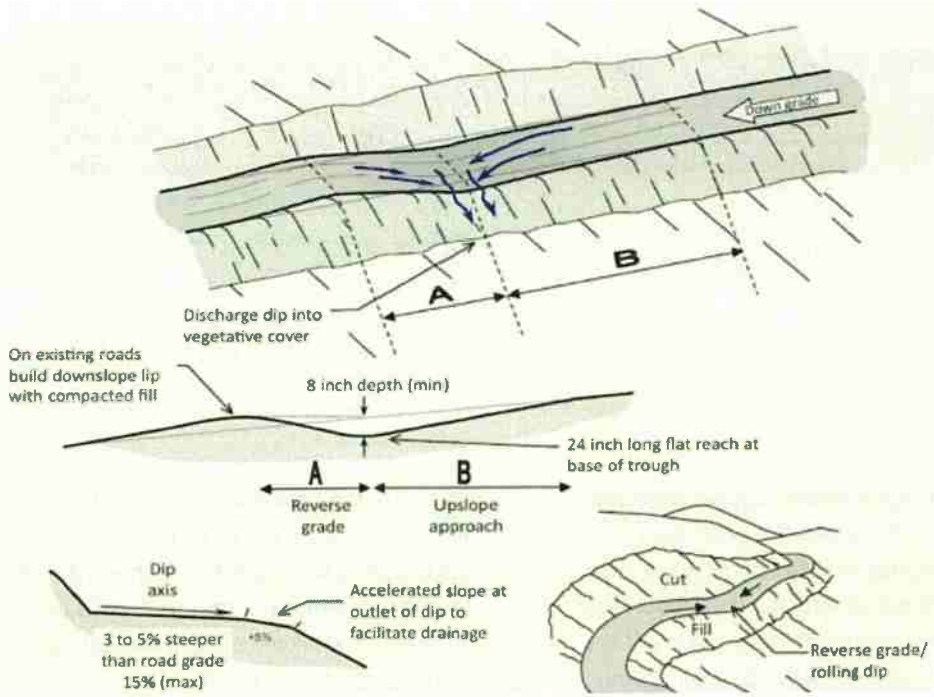
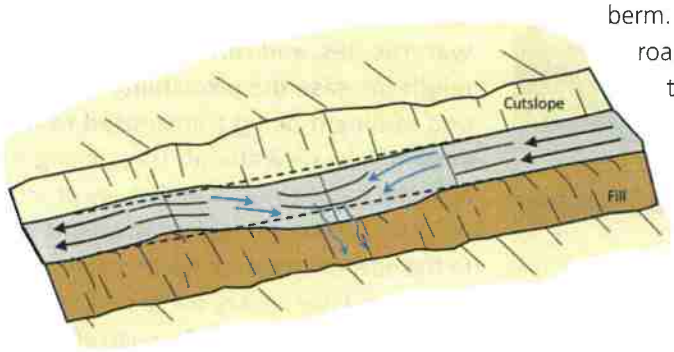


FIGURE 34. *A classic Type I rolling dip, where the excavated up-road approach (B) to the rolling dip is several percent steeper than the approaching road and extends for 60 to 80 feet to the dip axis. The lower side of the structure reverses grade (A) over approximately 15 feet or more, and then falls 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).*

FIGURE 35. *This outsloped forest road is used by commercial logging trucks and was constructed with frequent rolling dips to promote road surface drainage. The dips were built as a part of planned road construction for use by truck and trailer traffic. Note that the cut-banks are rocky, dry and stable, and there is no inside ditch.*

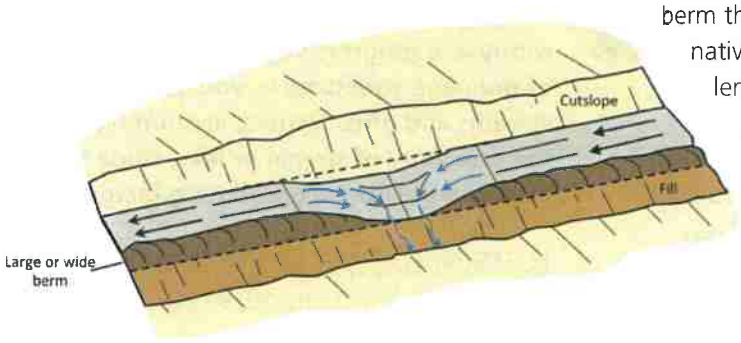
Type 1 Rolling Dip (Standard)

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.

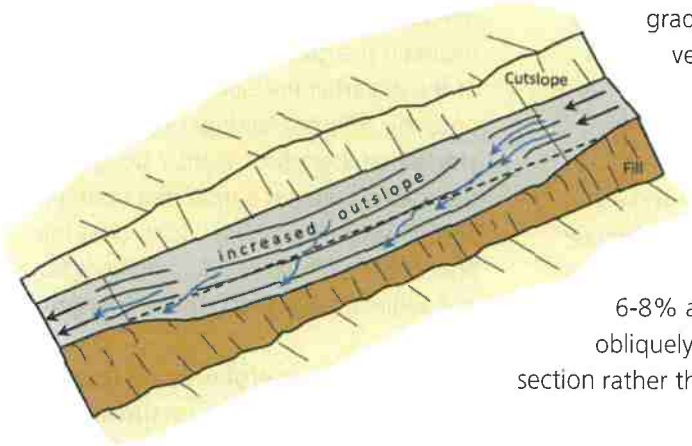


FIGURE 36. *Rolling dip types*

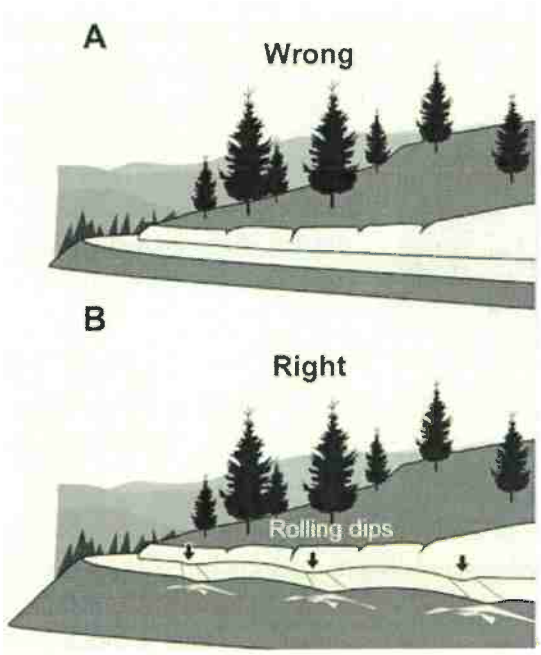


FIGURE 37.
Installing rolling dips, or "rolling the grade" of an outsloped road helps guarantee that surface runoff will not concentrate on the road surface and erode the roadbed, and that road runoff will be dispersed across the hillside. Spacing of rolling dips depends on road grade, soil erodibility and proximity to the nearest water body (Kramer, 2001).

Rolling dip spacing—The frequency or "spacing" of rolling dips and grade breaks (Figure 37), and the amount of "outsloping" needed to drain the road surface, depends on the grade of the road, as well as the road surfacing (Table 19). To design drainage structure spacing, it is useful to look at local roads to determine the maximum spacing that is likely to work for the soils and climate in your specific area. Example design criteria for drainage structure spacing to minimize road surface and ditch erosion (waterbars and rolling dips) are listed in Table 3 and, alternately, Table 19 (rolling dips and ditch relief culverts).

Drainage tables provide guidance and are common in the literature, but local observations are key to determining the most appropriate spacing in your particular area. In general, the spacing of road drainage structures is appropriate when you can observe minor rilling (incision) on the road fill slope where the road runoff is occurring, but hillslope rills and gullies are absent or do not extend continuously on native slopes below the drainage structure outlet (Figure 38).

The basic spacing guidance of Table 19 must be tempered by the proximity of the discharge points to streams and other waterbodies, and considering factors that might increase the probability of runoff and sediment being transported to the stream, lake or wetland. Those things that are likely to increase the probability of sediment delivery include such factors as: a short distance to the nearest stream or water body, steep slopes, unstable terrain, the presence of gullies or channels that could collect and efficiently transport road runoff and sediment, bare soils or low vegetation density, and shallow or clay rich soils with low infiltration rates. **To account for hydrologic connectivity in the suggested drainage spacing tables you must significantly and progressively reduce the spacing of drainage structures as you get closer to streams and other waters, accounting for the proximity of stream or lake, slope steepness and the other contributing factors.**

b. Waterbars, rubber waterbars and open top box culverts

Waterbars can also be used to drain a road surface. These are shallow, abrupt, excavated dips or troughs with an adjacent, downslope hump or mounded berm that are built at an oblique angle across the road (Figure 39). To maintain the greatest effectiveness, the axis of the waterbar (including where it drains onto the adjacent hillslope) should be constructed at a gradient slightly steeper than the road gradient it is intended to drain. This prevents deposition within or at the outlet of the structure and maintains flow and sediment transport along its length.

Waterbars are useful only on low standard seasonal or temporary, unsurfaced roads where winter or wet season use will not occur, because traffic easily cuts through the soft berm and fills the adjacent dip. Waterbars should be constructed at proper

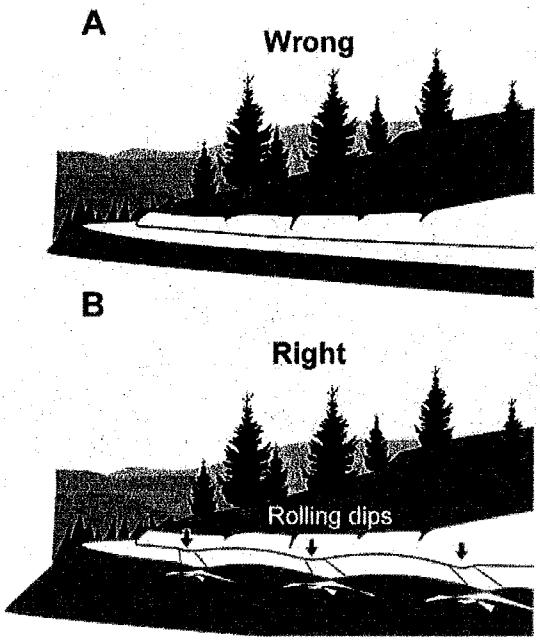


FIGURE 37. *Installing rolling dips, or "rolling the grade" of an outsloped road helps guarantee that surface runoff will not concentrate on the road surface and erode the roadbed, and that road runoff will be dispersed across the hillside. Spacing of rolling dips depends on road grade, soil erodibility and proximity to the nearest water body (Kramer, 2001).*

Rolling dip spacing—The frequency or "spacing" of rolling dips and grade breaks (Figure 37), and the amount of "outsloping" needed to drain the road surface, depends on the grade of the road, as well as the road surfacing (Table 19). To design drainage structure spacing, it is useful to look at local roads to determine the maximum spacing that is likely to work for the soils and climate in your specific area. Example design criteria for drainage structure spacing to minimize road surface and ditch erosion (waterbars and rolling dips) are listed in Table 3 and, alternately, Table 19 (rolling dips and ditch relief culverts).

Drainage tables provide guidance and are common in the literature, but local observations are key to determining the most appropriate spacing in your particular area. In general, the spacing of road drainage structures is appropriate when you can observe minor rilling (incision) on the road fill slope where the road runoff is occurring, but hillslope rills and gullies are absent or do not extend continuously on native slopes below the drainage structure outlet (Figure 38).

The basic spacing guidance of Table 19 **must be tempered by the proximity of the discharge points to streams and other waterbodies, and considering factors that might increase the probability of runoff and sediment being transported to the stream, lake or wetland.** Those things that are likely to increase the probability of sediment delivery include such factors as: a short distance to the nearest stream or water body, steep slopes, unstable terrain, the presence of gullies or channels that could collect and efficiently transport road runoff and sediment, bare soils or low vegetation density, and shallow or clay rich soils with low infiltration rates. **To account for hydrologic connectivity in the suggested drainage spacing tables you must significantly and progressively reduce the spacing of drainage structures as you get closer to streams and other waters, accounting for the proximity of stream or lake, slope steepness and the other contributing factors.**

b. Waterbars, rubber waterbars and open top box culverts

Waterbars can also be used to drain a road surface. These are shallow, abrupt, excavated dips or troughs with an adjacent, downslope hump or mounded berm that are built at an oblique angle across the road (Figure 39). To maintain the greatest effectiveness, the axis of the waterbar (including where it drains onto the adjacent hillslope) should be constructed at a gradient slightly steeper than the road gradient it is intended to drain. This prevents deposition within or at the outlet of the structure and maintains flow and sediment transport along its length.

Waterbars are useful only on low standard seasonal or temporary, unsurfaced roads where winter or wet season use will not occur, because traffic easily cuts through the soft berm and fills the adjacent dip. Waterbars should be constructed at proper

FIGURE 38. *Rolling dips should be spaced on outsloped roads so that the road surface is well drained and free from erosion, and the slopes below each dip show minimal erosion. Three broad rolling dips (see arrows) are visible in this upgraded road reach used by both commercial and residential traffic.*

spacing according to the grade of the road (Figure 40; Tables 3 and 19). Waterbars are usually regraded (smoothed out) at the beginning of each operating season in which the road is to be used and opened to traffic, and then reconstructed prior to the beginning of each winter or wet season period.

Waterbars are high maintenance drainage structures that are prone to failure if not properly built and maintained. Unauthorized winter traffic is likely to break down waterbars and result in serious road surface erosion and water pollution. Roads that are drained with waterbars should be restricted from most traffic, especially during the wet season when soils are softest.

On seasonal rocked roads and roads where waterbars cannot be built and maintained each year, thick rubber flaps or "rubber waterbars" are occasionally constructed into the roadbed. The rubber waterbar is most useful where frequent road grading is not necessary but the road surface needs better drainage.

These drainage diversion devices are sometimes made of thick rubber strips or salvaged conveyor belt fabrics, and are dug at least 12

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.

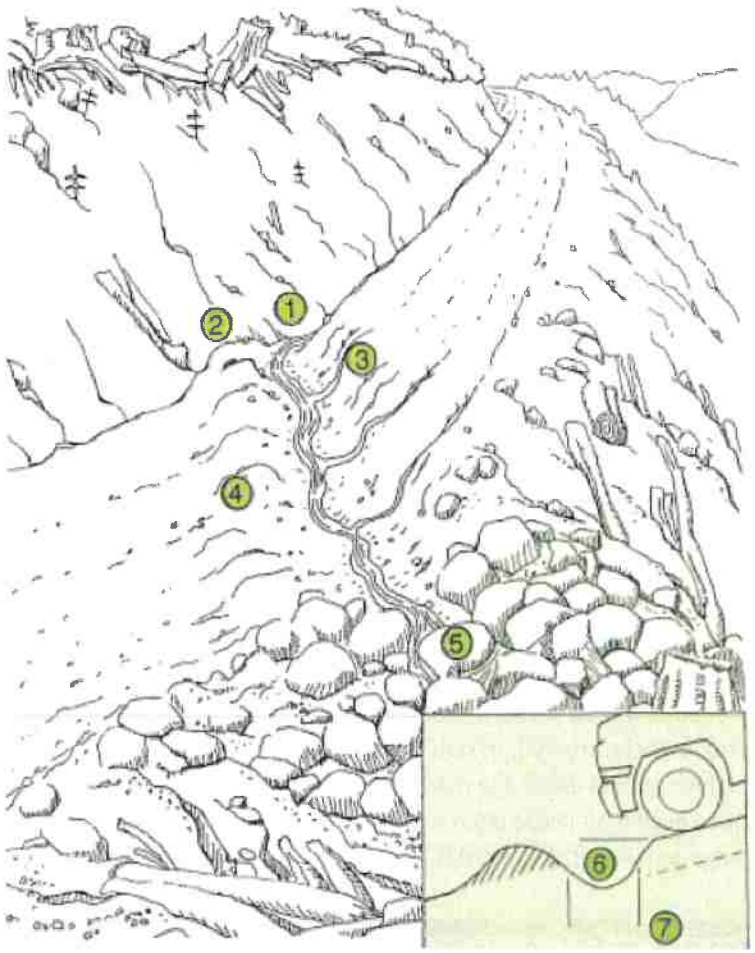


FIGURE 40. *Waterbars are constructed on unsurfaced forest and ranch roads that will have little or no traffic during the wet season. The waterbar should be extended to the cutbank to intercept all ditch flow (1) and extend beyond the shoulder of the road. A berm (2) must block and prevent ditch flow 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).*

inches into, and anchored in, the roadbed at an angle oblique to the road alignment, much like a waterbar. They stick up about 4 inches above the running surface and divert surface runoff to the side of the road. The flap bends down as vehicles pass over the waterbar and then immediately springs back to deflect runoff. Unlike waterbars, vehicles can drive over the flap without having to slow down; it folds over and pops back up when the vehicle passes.

The main shortcomings include the labor intensive installation required to build each diversion device, and the difficulty of grading the road surface that contains frequent rubber waterbars.

Open top box culverts (usually made of wood or metal) can also be used to drain the road surface, but they often fill with soil and rock, are difficult to grade over, and usually require higher levels of maintenance to keep open and functional. They should have a relatively steep grade so they self-clean during runoff events, and are often fitted with a surface grate on top to prevent large rocks from entering the top of the culvert and obstructing flow.

Like waterbars, and for maximum effectiveness and minimal maintenance, these less common road drainage structures should be constructed obliquely across the road such that their slope is slightly greater than the grade of the road they are draining.

c. Drainage berms

Road berms are generally defined as a continuous row of fill and/or aggregate,

- Depending on the slope steepness and proximity of the road to a stream, berms can be removed by excavation or sidecasting. Sidecasting should not be used if there is a possibility that spoil or eroded sediment could enter a watercourse and/or increase fill slope instability.

d. Ditches

Historically, many roads have been "automatically" constructed as insloped, with an inboard ditch. For decades, that was the default engineered design standard, whether or not hillslopes were wet and a ditch was really needed. Landowners should evaluate soil moisture, usually during the wet season, to determine what portion of the road actually requires a ditch for drainage and to maintain a firm and stable roadbed. Dry road sections should be constructed, or reconstructed, as outsloped, without a ditch. In wet areas, the road can still be outsloped even if an inside ditch is needed to drain emergent water (Figure 43).

Well-constructed and maintained ditches are important to the long-term stability of an insloped or crowned road. Backhoe and excavator constructed ditches are often superior to bladed ditches built by a bulldozer or grader because they can be cut out of the subgrade rather than gouged into the cutbank. However, they are more difficult and time consuming to construct and maintain. The ditch cross section should be designed to accommodate expected storm flows, with the base of the ditch at least 12 inches below the adjacent roadway in order to prevent water from entering and saturating the road surface material and reducing road strength. A relatively deep ditch also allows for faster drainage of the subgrade into the ditch and helps maintain high soil strength beneath the roadbed. If the cutbank and ditch are relatively dry for most of the year, the ditch can be shallower as roadbed saturation should not be an issue.

There are two types of roadside ditches; those that are hydrologically connected and delivering runoff and sediment to streams, and those that

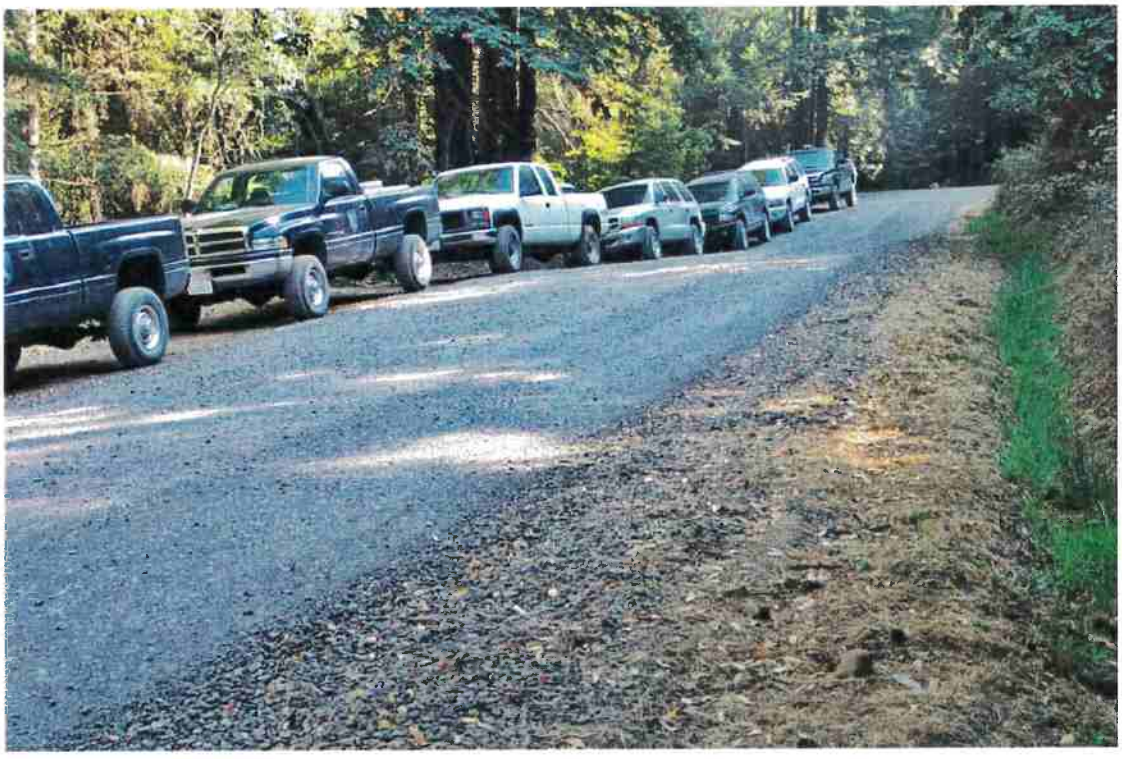


FIGURE 43. *This rural subdivision road has been converted from an insloped, ditched road to an outsloped road shape with rolling dips and an inside ditch. Broad rolling dips have been built at regular intervals to accommodate all traffic types. The ditch has been retained to drain clear spring flow from the small cutbank. The road surface no longer drains to the ditch.*

are not. **Road ditches that drain directly to stream crossing culvert inlets are typically the most common and important source of hydrologic connectivity between roads and streams.** During runoff events they act much like an ephemeral stream, and serve as "conveyor belts," transporting road runoff and fine sediment to the natural stream channel network. **Connected ditch lengths should be minimized, and the ditches themselves should be constructed and maintained to minimize the amount of sediment that is delivered to the stream crossing.** Broad, low gradient, vegetated ditches immediately adjacent to the stream crossing will encourage sediment deposition (Figure 44). Connected ditches should be graded as infrequently as possible, and then seeded and revegetated after grading. Ideally, the roads draining to connected ditches should be rock surfaced (or paved) to minimize surface erosion or they should be outsloped so their runoff does not drain to the ditch.

In contrast, ditches that are not hydrologically connected to streams, lakes or wetlands should be maintained to be as efficient as needed to rapidly drain runoff away from the road and into adjacent downslope buffer areas. Ditch gradients on insloped roads should be steep enough to prevent excessive sediment deposition and allow rapid drainage, but not so steep as to result in ditch erosion. The road gradient usually dictates the ditch gradient. Outsloped roads do not drain to the ditch, so sediment accumulation is not an issue.

On steep roads over about 10% grade, even small volumes of ditch flow may have high enough flow velocities to cause erosion of the ditch. In this case, it may be necessary to armor the ditch to prevent erosion, although armoring the ditch will make it more difficult to maintain. Any armoring of channels or ditches also has to follow specific design criteria to be effective. Dumping loose rock in the ditch will likely cause erosion rather than prevent it. The rock armor needs to be formed into a channel shape, with a bottom and sidewalls to contain the expected volume of flow.

When inside ditches are used along a road, frequent ditch relief culverts should be installed to minimize the concentration of runoff in the ditch and to disperse runoff to downslope

FIGURE 44. *This insloped, gravel surfaced road drains to a vegetated ditch. The ditch is connected to a stream crossing culvert, but the heavy vegetation in the ditch prevents sediment from being delivered to the stream*

FIGURE 45. *If ditches show excessive erosion, or long gullies form below the outlet of a ditch relief culvert, then the ditch is carrying too much flow and additional ditch relief culverts are needed up the road to break up the flow. Gullies below culvert outlets are a common source of hydrologic connectivity, delivering road runoff and eroded sediment to the downslope stream channel.*

areas. **If the ditch shows signs of erosion, it is likely that additional culverts are needed to break up and disperse the ditch flow. Likewise, if ditch relief culverts show extended scour at or below their outlets, that is a sign that there is too much flow being discharged onto the slope below the road and that one or more additional culverts are needed to drain the ditch and disperse ditch flow without causing erosion downslope from the road** (Figure 45).

e. Ditch relief culverts

Hydrologically connected ditches which drain directly to watercourse crossing culverts should be treated and protected from disturbance and erosion, just as is an ephemeral stream or Class III watercourse. Ditch relief culverts should be installed sufficiently before watercourse crossings so that water and sediment can be filtered through a vegetated slope before reaching the stream. They should also be installed at intervals along the road that are close enough to prevent significant erosion of the ditch and below the culvert outfall on the native hillslope, and at locations where collected water and sediment is not discharged directly onto unstable areas or into watercourses (Figure 46; Table 19).[2]

Spacing tables for ditch relief culverts that are often found in the literature, or even derived for your particular area, can provide guidance on how frequently to install road drainage structures to minimize erosion. **However, an inflexible spacing distance or frequency, derived from a spacing table, is not recommended because conditions along all roads change and some locations are more suitable for receiving runoff than others. The performance of the ditch, the ditch drain outlet and the receiving area (including the potential for hydrologic connectivity) are the**

2 California's Forest Practice Rules do not prescribe the maximum or proper distance between inside ditch relief drains. Instead, they state that adequate drainage must be provided. Table 19 provides examples of suggested spacings, although it is important to remember that actual spacing is dictated by local conditions and proximity to a watercourse, with closer spacing near the channel (see Appendix C: California Department of Forestry and Fire Protection Technical Rule Addendum No.5). Indicators of inadequate relief drain spacing include: 1) gullying of the inside ditch, 2) gullying or sliding of the slope below the culvert outlet of a cross drain, 3) direct transport of sediment along an inside ditch to a watercourse, or 4) direct transport of road runoff and sediment from a drainage structure outlet to a stream.

should only be used in low-gradient settings with low stream velocities, and minimal fill.

Vented fills—A porous rock fill crossing (a vented fill) is a specialized type of armored fill crossing that is useful in crossing steep stream channels that are prone to debris flows or torrents. They are constructed of coarse rock and transmit low water streamflows through embedded culverts and through their porous, coarse rock fills. Higher streamflows that exceed culvert and porous rock capacity are carried over the hardened top and downstream fill face of the armored fill.

The same basic steps are used to construct a vented fill, except that a porous rock fill crossing is usually excavated deeper into the road (e.g., ½ the road is excavated) and backfilled with the largest (D_{95}) angular, well graded rock available. This type of armored fill crossing is intended to be porous and pass water through the fill. Over time, the voids in the large rock armor will be silted-in so that it becomes impermeable and most flows are directed over the top of the structure. The road surface may be capped with concrete or other non-erodible material, and armor on the fill face grouted in place, so that overtopping will not seriously erode the road fill or the fill face during overtopping.

Even if the crossing washes out, the amount of fine sediment delivery would be minimal and have minimal impact on downstream fish habitat. It is important that porous rock fill crossings (vented fills) are installed in upslope or headwater locations where stream flows are lower and crossings are likely to remain intact and unlikely to wash out.

6. FORDS

Fords are stream crossings where vehicles drive on the bed of the stream channel (i.e., no man-placed fill in or on the streambed). Fords work well on small to medium sized streams where there is a stable stream bottom and traffic is light. However, "construction" of fords and other unimproved stream crossings on well-traveled roads should be avoided where water regularly flows because of their potential to impact water quality. In certain situations, where flash floods, high seasonal flood peaks or floating debris are problems, fords may be a practical answer for low volume roads.

FIGURE 122. *Wet ford on a Class II (non-fish) perennial stream. Coarse rock armor that has been grouted in place provides energy dissipation and protects the outer edge of the hardened roadbed. Fords should not be used if high wet season flows would cut off access to inspect and maintain drainage structures further out the road. Unvented, hardened fords may also obstruct fish passage.*

Fords of live streams, called "wet fords," are typically composed of streambed gravels or concrete structures built in contact with the streambed so that vehicles can cross the channel (Figure 122). If possible, a stable, rocky (or bedrock) portion of the channel should be selected for the ford location. **The simplest of fords are those on low volume roads where occasional traffic drives over a naturally hardened streambed composed of bedrock or cobbles.**

Where the streambed at the crossing site is not sufficiently hard, fords can also be fortified or constructed of permeable trench drains of coarse, imported cobbles and boulders. Low summer flows seep through the fill, and higher water discharges flow over the top without scouring or removing the armor layer. Some post-winter or post-wet season maintenance may be needed. During extreme events, however, the ford may be completely washed-out and need reconstruction. Permeable or concrete fords are likely to be a barrier to migrating juvenile or resident adult fish and should not be used in fish-bearing channels.

Paved (hardened) fords across live streams may be necessary to maintain water quality if there is to be regular traffic. These are sometimes called "Arizona Crossings" for their prevalent use as ford crossings of dry streambeds in the USA's desert southwest. Paving, if used, usually consists of a concrete, slightly dish-shaped slab built across the stream channel that extends sufficiently up each streambank to contain design flood flows (i.e., the wetted perimeter for the design (100-yr) flood flow).[13] These may sometimes contain enough fill material beneath the concrete to maintain a level driving surface. A discharge apron or energy dissipater is constructed on the downstream side of the ford to prevent scour and undermining during high flows and this must also extend the entire width of the 100-yr flood flow wetted perimeter (Figure 123).

Fords are designed to pass both sediment and debris during high flows. Unfortunately, concrete fords are often plagued by scour around their edges because of a lack of capacity (depth and width) or because armor was not placed to the full width of the flood flow channel, sometimes leaving the ford elevated and impassable. Hardened ford structures are sometimes even moved downstream by large flood flows after the outfall has been eroded and the structure undermined.

Vented fords can also be constructed with a culvert embedded in the concrete or hardened structure to handle low seasonal flows. Fords, particularly vented fords, can be constructed to pass large flows and large amounts of debris while still accommodating fish passage. On streams that contain fish during some part of the year, fish passage is frequently obstructed at low flows unless venting culverts have been embedded into the basal concrete. Unless the vent/area ratio is large (Figure 75), vented fords typically require regular maintenance to clear debris from the culvert inlets. The larger the venting culvert, as compared to the stream width, the less likely they will become plugged with debris.

Unless it has a bedrock foundation and hardened approaches, most ford crossings are vulnerable to erosion and can create pollution from several sources. High traffic levels and/or high water flows can cause erosion of both natural and artificial streambed materials (Figure 124). Material placed in the stream or moved about by vehicle traffic can create a barrier to fish migration. Vehicle passage through fords with fine sediment channel bottoms creates plumes of turbidity with every passage. Deep water ford

13 It is rare to observe a hardened ford that has been constructed to contain the 100-year flood flow, or even the 20-year flood flow. Most hardened fords are overtopped and flanked by large runoff events due to the lack of depth in the axis of the stream, and the limited width of the hardened, dipped crossing. Many such fords are found in valley bottoms and floodplain settings where channels are not deeply incised and floods may be valley-wide.

FIGURE 123. *Flow in this hardened ford is from right to left. Low flow energy dissipation has been built into the center of the structure, but high flood flows have scoured to the base of the concrete ford in the foreground. Both the hardened ford and the downstream energy dissipation must be broad enough to encompass and contain the expected 100-year design flood flow.*

FIGURE 124. *This unimproved ford crossing of an intermittent stream was poorly located in a channel reach that had a fine, erodible bed. Efforts to stabilize the channel bottom with rock and concrete chunks have been unsuccessful. A plume of turbidity is released in this fish bearing channel with each crossing.*

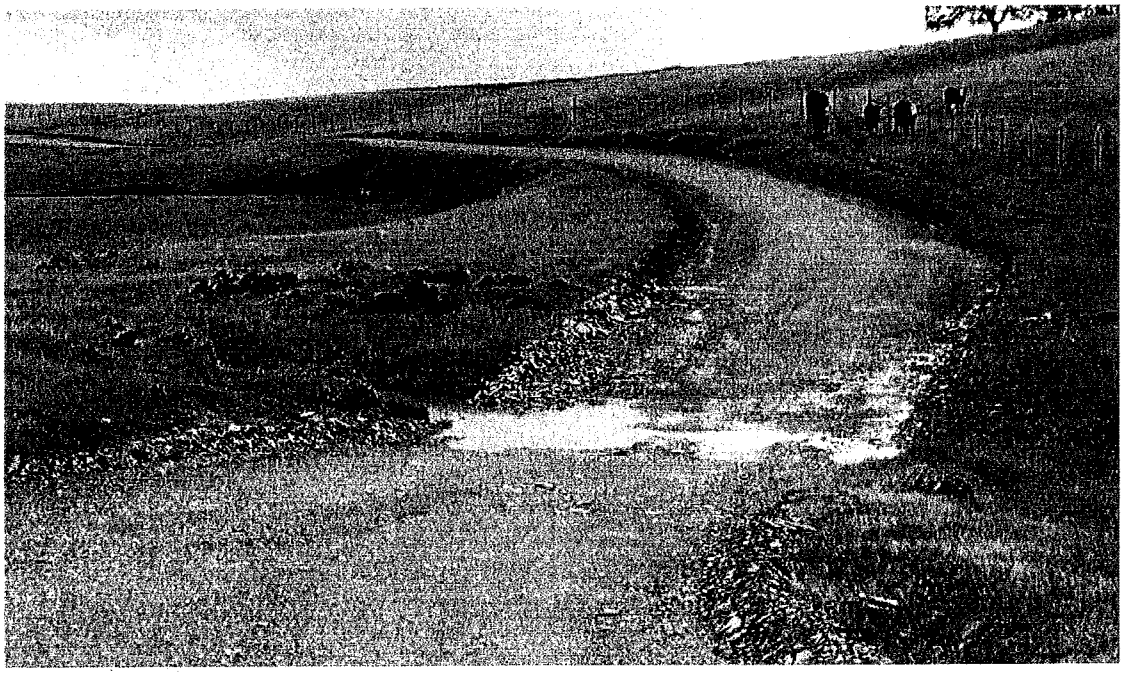


FIGURE 125. *In addition to the actual ford crossing, the road approaches also contribute to sediment pollution unless they are paved or heavily rock surfaced. Fords are always low points in the road, so runoff from the connected approaches is delivered directly to the stream channel.*

crossings can cause oil products to be released from vehicles as they pass through a wet ford.

Fords are always the low point in a road alignment, where each road approach drops into the channel and then climbs back out. Unless the approaches are heavily rocked or paved, and hydrologically disconnected, rainfall and runoff will erode the roadbed and deliver fine sediment directly to the stream at the crossing site (Figure 125). Incised stream channels with high streambanks require the excavation of substantial ramps to get vehicles down to the streambed. Unless they are similarly protected, these through cut ramps are often sites of substantial surface and rill erosion that causes eroded sediment and turbid runoff to enter the stream during periods of heavy rainfall.

On small, poorly incised, ephemeral or intermittent streams a ford may be needed if there is insufficient channel depth to install a culvert. In fact, a rock lined rolling dip with a rock apron face may be preferable to a permanent culvert on some swales and small watercourses. **Fords and armored fills have the advantage, over culverted fills, of never plugging.** Fords on small streams should be rock armored to prevent erosion of the road surface during runoff events. **What are sometimes referred to as "unimproved" fords, where a stream channel has been filled with a substantial quantity of soil and left unprotected by armor or rock surfacing, is a high maintenance crossing that is a hazard to water quality and should not be constructed.**

7. TEMPORARY STREAM CROSSINGS

Temporary stream crossings are used to provide short term access to an area. Temporary crossings should be installed wherever a proposed temporary road crosses a stream channel, regardless of its size. **Any stream channel or water source that would be fitted with a drainage structure on a permanent road should receive a temporary drainage structure on a temporary road.** The structure should be capable of passing the expected discharge of the channel during the season(s) that it is to remain in place. **If a stream crossing**

Appendix B

Best Management Practices

Best Management Practices for Discharges of Waste Resulting from Cannabis Cultivation and Associated Activities or Operations with Similar Environmental Effects

I. Introduction

Best management practices (BMPs) provided here may be applicable to prevent, minimize, and control the discharge of waste and other controllable water quality factors associated with site restoration/cleanup/remediation and site operations and maintenance. These BMPs are all considered enforceable conditions under the Order as applicable to a given site, and are referenced by and made conditions in the mitigated negative declaration (CEQA document) for the Order, as well.

This appendix to Order No. R1-2015-0023 includes section II. Standard BMPs for Construction, section III. BMPs for Site Maintenance and Operations (per standard conditions), and section IV. References. For additional BMP suggestions, staff encourage consultation of the various manuals listed in section IV. References, many of which are available online for free.

II. Standard BMPs for Construction

Where applicable during restoration, remediation, cleanup, or site maintenance activities, the following BMPs will be used.

A. General BMPs to Avoid or Minimize Adverse Impacts

Temporal Limitations on Construction

1. To avoid impacting migrating fish and causing erosion and sedimentation of the stream channel, the project work season shall be from May 1 to October 15. If operations are to be conducted during the winter period from October 15 to May 1, a winter period operating plan must be incorporated into the project work plan. This plan shall include specific measures to be taken in the winter operating period to avoid or substantially lessen erosion and sedimentation into surface waters.
2. A 2-day (48-hour) forecast[1] of rain shall be the trigger for temporary cessation of project activities and winterization/erosion protection of the work site.

[1] Any weather pattern that is forecasted by NOAA to have a 50% or greater probability of producing precipitation in the project area. The permittee shall obtain and keep for record likely precipitation forecast information from

Limitation on Earthmoving

3. Disturbance to existing grades and vegetation shall be limited to the actual site of the cleanup/remediation and necessary access routes.
4. Placement of temporary access roads, staging areas, and other facilities shall avoid or minimize disturbance to habitat.
5. Disturbance to native shrubs, woody perennials or tree removal on the streambank or in the stream channel shall be avoided or minimized. If riparian trees over six inches dbh (diameter at breast height) are to be removed, they shall be replaced by native species appropriate to the site at a 3:1 ratio. Where physical constraints in the project area prevent replanting at a 3:1 ratio and canopy cover is sufficient for habitat needs, replanting may occur at a lesser replacement ratio.
6. If shrubs and non-woody riparian vegetation are disturbed, they shall be replaced with similar native species appropriate to the site.
7. Whenever feasible, finished grades shall not exceed 1.5:1 side slopes. In circumstances where final grades cannot achieve 1.5:1 slope, additional erosion control or stabilization methods shall be applied as appropriate for the project location.
8. Spoils and excavated material not used during project activities shall be removed and placed outside of the 100-year floodplain, and stored/disposed of in compliance with Order conditions related to spoils management.
9. Upon completion of grading, slope protection of all disturbed sites shall be provided prior to the rainy season through a combination of permanent vegetative treatment, mulching, geotextiles, and/or rock, or equivalent.
10. Vegetation planting for slope protection purposes shall be timed to require as little irrigation as possible for ensuring establishment by the commencement of the rainy season.
11. Only native plant species shall be used with the exception of non-invasive, non-persistent grass species used for short-term vegetative cover of exposed soils.
12. Rock placed for slope protection shall be the minimum necessary to avoid erosion, and shall be part of a design that provides for native plant revegetation and minimizes bank armoring.

Limitations on Construction Equipment

13. Dischargers and/or their contractors shall ensure that chemical contamination (fuel, grease, oil, hydraulic fluid, solvents, etc.) of water and soils is prohibited during routine equipment operation and maintenance.
14. Heavy equipment shall not be used in flowing water. Please refer to BMPs 57 through 64 for dewatering of live streams.

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the National Weather Service Forecast Office (e.g. by entering the zip code of the project's location at http://srh.noaa.gov/forecast).

15. When possible, existing ingress or egress points shall be used or work shall be performed from the top of the creek banks.
16. Use of heavy equipment shall be avoided or minimized in a channel bottom with rocky or cobbled substrate.
17. If project work or access to the work site requires heavy equipment to travel on a channel bottom with rocky or cobbled substrate, wood or rubber mats shall be placed on the channel bottom prior to use by heavy equipment.
18. Heavy equipment shall not introduce chemicals or foreign sediment to the channel (e.g., remove mud from tracks or cover channel work area with plastic sheeting prior to heavy equipment entry).
19. The amount of time this equipment is stationed, working, or traveling within the channel shall be minimized.
20. When heavy equipment is used, any woody debris and stream bank or streambed vegetation disturbed shall be replaced to a pre-project density with native species appropriate to the site. If riparian trees over six inches dbh are to be removed, they shall be replaced by native species appropriate to the site at a 3:1 ratio per BMP 5.
21. The use or storage of petroleum-powered equipment shall be accomplished in a manner that prevents the potential release of petroleum materials into waters of the state (Fish and Game Code 5650). To accomplish this, the following precautionary measures shall be followed:
    - Schedule excavation and grading activities for dry weather periods.
    - Designate a contained area for equipment storage, short-term maintenance, and refueling. Ensure it is located at least 50 feet from waterbodies.
    - Inspect vehicles for leaks and repair immediately.
    - Clean up leaks, drips and other spills immediately to avoid soil or groundwater contamination.
    - Conduct major vehicle maintenance and washing offsite (except as necessary to implement BMP 18).
    - Ensure that all spent fluids including motor oil, radiator coolant, or other fluids and used vehicle batteries are collected, stored, and recycled as hazardous waste offsite.
    - Ensure that all construction debris is taken to appropriate landfills and all sediment disposed of in upland areas or offsite, beyond the 100-year floodplain.
    - Use dry cleanup methods (e.g., absorbent materials, cat litter, and/or rags) whenever possible. If necessary for dust control, use only a minimal amount of water.
    - Sweep up spilled dry materials immediately.

Revegetation and Removal of Exotic Plants

22. The work area shall be restored to pre-project work condition or better.

23. All exposed soil resulting from the cleanup/restoration activities shall be revegetated using live planting, seed casting or hydroseeding.
24. Any stream bank area left barren of vegetation as a result of cleanup/restoration activities shall be stabilized by seeding, replanting, or other means with native trees, shrubs, and/or grasses appropriate to the site prior to the rainy season in the year work was conducted.
25. Soil exposed as a result of project work, soil above rock riprap, and interstitial spaces between rocks shall be revegetated with native vegetation by live planting, seed casting, or hydroseeding prior to the rainy season of the year work is completed.
26. The spread or introduction of exotic plant species shall be avoided to the maximum extent possible by avoiding areas with established native vegetation during cleanup/restoration activities, restoring disturbed areas with appropriate native species, and post-project monitoring and control of exotic species.
27. Removal of invasive exotic species is strongly recommended. Mechanical removal (hand tools, weed whacking, hand pulling) of exotics shall be done in preparation for establishment of native perennial plantings.
28. Revegetation shall be implemented after the removal of exotic vegetation occurs. Erosion control implementation shall be timed in accordance with BMPs 1 and 2.
29. Native plants characteristic of the local habitat shall be used for revegetation when implementing and maintaining cleanup/restoration work in riparian and other sensitive areas. 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.
30. Annual inspections for the purpose of assessing the survival and growth of revegetated areas and the presence of exposed soil shall be conducted for three years following project work.
31. Dischargers and/or their consultant(s) or third party representative(s) shall note the presence of native/non-native vegetation and extent of exposed soil, and take photographs during each inspection.
32. Dischargers and/or their consultant(s) or third party representative(s) shall provide the location of each work site, pre- and post-project work photos, diagram of all areas revegetated and the planting methods and plants used, and an assessment of the success of the revegetation program in the annual monitoring report as required under the Order.

Erosion Control

33. 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.

34. Erosion control materials shall be, at minimum, stored on-site at all times during approved project work between May 1 and October 15.
35. 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.
36. 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.
37. Upon work completion, all exposed soil present in and around the cleanup/restoration sites shall be stabilized within 7 days.
38. Soils exposed by cleanup/restoration operations shall be seeded and mulched to prevent sediment runoff and transport.

Miscellaneous

39. During temporary stream crossing siting, locations shall be identified where erosion potential is low. Areas where runoff from roadway side slopes will spill into the side slopes of the crossing shall be avoided.
40. Vehicles and equipment shall not be driven, operated, fueled, cleaned, maintained, or stored in the wet or dry portions of a waterbody where wetland vegetation, riparian vegetation, or aquatic organisms may be impacted.
41. Riparian vegetation, when removed pursuant to the provisions of the work, shall be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation shall be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble shall be removed upon completion of project activities.
42. Avoidance of earthwork on steep slopes and minimization of cut/fill volumes, combined with proper compaction, shall occur to ensure the area is resilient to issues associated with seismic events and mass wasting. If cracks are observed, or new construction is anticipated, consultation with a qualified professional is appropriate.
43. Operations within the 100-year floodplain shall be avoided. Refuse and spoils shall not be stored within the hundred-year floodplain. If roads are located within the 100-year floodplain, they shall be at grade; bridges shall have vented approaches and bridge deck shall be above anticipated 100-year flood water surface elevations. Consultation with a qualified professional is required for project work within the floodplain. .
44. Project work-related dust shall be controlled. Dust control activities shall be conducted in such a manner that will not produce sediment-laden runoff. Dust control measures, including pre-watering of excavation/grading sites, use of water trucks, track-out prevention, washing down vehicles/equipment before leaving site, and prohibiting grading/excavation activities during windy periods, shall be implemented as appropriate.

45. Short term impacts from project work-related emissions can be minimized via retrofitting equipment and use of low emissions vehicles when possible.
46. Position vehicles and other apparatus so as to not block emergency vehicle access.

B. BMPs for Specific Activities

Critical Area Planting, Channel Vegetation and Restoration and Management of Declining Habitats

The following measures shall be employed:

47. Plant materials used shall be native to the site and shall be locally collected if possible.
48. Straw mulch shall be applied at a rate of 2 tons per acre of exposed soils and, shall be secured to the ground.
49. When implementing or maintaining a critical area planting above the high water line, a filter fabric fence, straw wattles, fiber rolls and/or hay bales shall be utilized to keep sediment from flowing into the adjacent water body.

Structure for Water Control and Stream Crossings

These practices shall be used generally to replace or retrofit existing culverts and to install culverts where water control is needed at a stream crossing or road ditch to restore natural hydrology, and to reduce potential diversions and road-related erosion. In addition to the general limitations set forth in the previous section, the following measures shall be employed for these types of projects:

50. Culvert fill slopes shall be constructed at a 2:1 slope or shall be armored with rock.
51. All culverts in fish-bearing streams and in streams where fish have historically been found and may potentially re-occur, shall be designed and constructed consistent with NMFS Southwest Region's Guidelines for Salmonid Passage at Stream Crossings (NMFS 2000) and CDFG's Culvert Criteria for Fish Passage (CDFG 2002).

Limitations on Work in Streams and Permanently Ponded Areas

52. If it is necessary to conduct work in or near a live stream, the work space shall be isolated to avoid project activities in flowing water.
53. Water shall be directed around the work site.
54. Ingress/egress points shall be utilized and work shall be performed from the top of the bank to the maximum extent possible.
55. Use of heavy equipment in a channel shall be avoided or minimized. Please refer to BMPs 57 through 64 for dewatering of live streams. The amount of time construction equipment is stationed, working or traveling within the creek bed shall be minimized.

56. If the substrate of a seasonal pond, creek, stream or water body is altered during work activities, it shall be returned to approximate pre-construction conditions after the work is completed.

Temporary Stream Diversion and Dewatering: All Live Streams

57. For project work in a flowing or pooled stream or creek reach, or where access to the stream bank from the channel bottom is necessary, the work area shall be isolated with the use of temporary cofferdams upstream and downstream of the work site and all flowing water shall be diverted around the work site throughout the project period.
58. Other approved water diversion structures shall be utilized if installation of cofferdams is not feasible.
59. Cofferdam construction using offsite river-run gravel and/or sand bags is preferred. If gravel materials for cofferdams are generated onsite, measures shall be taken to ensure minimal disturbance to the channel, such as careful extraction from elevated terraces. The upstream end of the upstream cofferdam shall also be reinforced with thick plastic sheeting to minimize leakage.
60. Gravity diversions are preferred to pumping as dewatering techniques. If pumping is required to supplement gravity diversions, care shall be taken to minimize noise pollution and prevent the pump or generator-borne pollution to the watercourse.
61. The diversion pipe shall consist of a large plastic HDPE or ADS pipe or similar material, of a sufficient diameter to safely accommodate expected flows at the site during the full project period.
62. The pipe shall be protected from project activities to ensure that bypass flows are not interrupted.
63. Continuous flow downstream of the work site shall be maintained at all times during project work.
64. When project work is complete, the flow diversion structure shall be removed in a manner that allows flow to resume with a minimum of disturbance to the substrate.

Protection of Sensitive Species

65. Sensitive species - Consult with federal, state and local agencies regarding location of rare, threatened or endangered species.
66. Prior to commencing work, designate and mark a no-disturbance buffer to protect sensitive species and communities.
67. All work performed within waters of the state shall be completed in a manner that minimizes impacts to beneficial uses and habitat. Measures shall be employed to minimize land disturbances that shall adversely impact the water quality of waters of the state. Disturbance or removal of vegetation shall not exceed the minimum necessary to complete Project implementation.

68. All equipment, including but not limited to excavators, graders, barges, etc., that may have come in contact with extremely invasive animals (e.g. zebra mussels or new Zealand mud snails) or plant (e.g., Arundo donax, scotch broom, pampas grass) or the seeds of these plants, shall be carefully cleaned before arriving on site and shall also be carefully cleaned before removal from the site, to prevent spread of these plants.
69. Vegetation shall be established on disturbed areas with an appropriate mix of California native plants and/or seed mix. All initial plantings and seed shall be installed prior to completion of the project work.

III. BMPs for Site Maintenance and Operations (per standard conditions)

The following BMPs are intended to address compliance with the standard conditions. Individual or multiple BMPS may be selected to address compliance with a given standard condition depending on site-specific conditions. BMPs are considered enforceable conditions as applicable to a given site.

A. Site Maintenance, Erosion Control, Drainage Features

70. Drainage of roads, clearings, fill prisms, and terraced areas is critical to ensuring their integrity and to prevent or minimize sediment discharges to watercourses. Proper design and location of roads and other features is critical to ensuring that a road or other feature be adequately drained and is best accomplished through consultation with a qualified professional. If inspection identifies surface rills or ruts, surfacing and drainage likely needs maintenance.
71. Surfacing of exposed/disturbed/bare surfaces can greatly reduce erosion associated with runoff. BMP features such as vegetative ground cover, straw mulch, slash, wood chips, straw wattles, fiber rolls, hay bales, geotextiles, and filter fabric fences may be combined and implemented on exposed/disturbed/bare surfaces as appropriate to prevent or minimize sediment transport and delivery to surface waters. Non-invasive, non-persistent grass species (e.g. barley grass) may be used for their temporary erosion control benefits to stabilize bare slopes and prevent exposure of bare soils to rainfall. If utilized, straw mulch shall be applied at a rate of 2 tons per acre of exposed soils and, if warranted by site conditions, shall be secured to the ground. Consultation with a qualified professional is recommended for successful site-specific selection and implementation of such surface treatments. Guidance literature pertaining to such BMPs is referenced in section IV. of this document.
72. Road surfacing, especially within a segment leading to a watercourse, is critical to prevent and minimize sediment delivery to a watercourse and maintain road integrity for expected uses. Road surfacing can include pavement, chip-seal, lignin, rock, or other material appropriate for timing and nature of use. Steeper sections of road require higher quality rock (e.g. crushed angular versus river-run) to remain in place.

73. Road shaping to optimize drainage includes out-sloping and crowning; shaping can minimize reliance on inside ditches. Drainage structures can include rolling dips and water bars within the road surface and ditch-relief culverts to drain inside ditches. Adequate spacing of drainage structures is critical to reduce erosion associated with runoff. Generally speaking, steep slopes require greater frequency of drainage structures. The drainage structures shall be maintained to ensure capture of and capacity for expected flow. The outlets of the structures shall be placed in such a manner as to avoid discharge onto fill, unstable areas, or areas that can enter a watercourse. If site conditions prohibit drainage structures at an adequate interval to avoid erosion, bioengineering techniques[2] are the preferred solution (e.g. live fascines), but other techniques may also be appropriate including armoring (i.e. rock of adequate size and depth to remain in place under traffic and flow conditions) and velocity dissipaters (e.g. gravel-filled "pillows" in an inside ditch to trap sediment). In the case that inside ditches need maintenance, grade ditches only when and where necessary, since frequent routine mechanical grading can cause erosion of the ditch, undermine banks, and expose the toe of the cutslope to erosion. Do not remove more leaves and vegetation than necessary to keep water moving, as vegetation prevents scour and filters out sediment.
74. Road drainage shall be discharged to a stable location away from a watercourse. Use sediment control devices, such as check dams, sand/gravel bag barriers, and other acceptable techniques, when it is neither practical nor environmentally sound to disperse ditch water immediately before the ditch reaches a stream. Within areas with potential to discharge to a watercourse (i.e. within riparian areas of at least 200 feet of a stream) road surface drainage shall be filtered through vegetation, slash, or other appropriate material or settled into a depression with an outlet with adequate drainage. Caution should always be exercised with catchment basins in the event of failure.
75. Any spoils associated with site maintenance shall be placed in a stable location where it cannot enter a watercourse. Sidecasting shall be minimized and shall be avoided on unstable areas or where it has the potential to enter a watercourse.
76. Do not sidecast when the material can enter the stream directly or indirectly as sediment. Sidecast material can indirectly enter the stream when placed in a position where rain or road runoff can later deliver it to a channel that connects with the stream.
77. Disconnect road drainage from watercourses (drain to hill slopes), install drainage structures at intervals to prevent erosion of the inboard ditch or gull formation at the hill slope outfall, outslope roads.

[2] A Primer on Stream and River Protection for the Regulator and Program Manager: Technical Reference Circulare W.D. 02-#1, San Francisco Bay Region, California Regional Water Quality Control Board (April 2003) http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stream_wetland/streamprotectioncircular.pdf

78. Ditch-relief culverts shall also be inspected regularly, and cleared of debris and sediment. To reduce plugging, 15 to 24-inch diameter pipes shall be the minimum size considered for ditch relief culverts and shall be informed by site-specific conditions.
79. Grade ditches only when and where necessary, since frequent routine mechanical grading can cause erosion of the ditch, undermine banks, and expose the toe of the cutslope to erosion. Do not remove more grass and weeds than necessary to keep water moving, as vegetation prevents scour and filters out sediment.
80. Use sediment control devices, such as check dams, sand/gravel bag barriers, and other acceptable techniques, when it is neither practical nor environmentally sound to disperse ditch water immediately before the ditch reaches a stream.

B. Stream Crossing Maintenance

81. Proper maintenance of stream crossings is critical to ensure support of beneficial uses of water. Regular inspection and maintenance is necessary to identify, in a timely manner, if problems are occurring. Crossings include rock fords[3], armored fills with culverts[3], and bridges[3].
82. Rock fords are appropriate when temporary and minor moisture or over-land flow is expected, not typically when a bed and bank is present; exceptions may be justified if warranted by site specific conditions. Additionally, rock fords are appropriate if aquatic life is not present. An adequate layer of crushed angular rock shall be maintained at rock fords such that soil compaction is minimized under expected traffic levels.
83. Stream crossings consisting of armored fills with culverts and bridges are appropriate for streams with defined bed and bank[2]. They shall be sized to ensure the 100-year streamflow event can pass unimpeded. Additionally, crossings shall allow migration of aquatic life during all life stages potentially supported by that stream reach; water depth and velocity can inhibit migration of adult and juvenile fish species.
84. Stream crossing design and installation is best accomplished with the assistance of a qualified professional. Site conditions can change over time (e.g. channel filling or incision); consultation with a qualified professional is appropriate to evaluate maintenance or replacement needs and opportunities.
85. Regular inspection of the stream crossing is appropriate to identify changed conditions within the stream channel (e.g., bank erosion, headward incision, and channel filling).
    - If large wood is accumulated upstream or within the crossing that could impede or deflect flow and result in erosion or debris capture, the wood

[3] Explanation of term, available within the following document (as of the date of the Order): http://www.pacificwatershed.com/sites/default/files/handbook_chapter_download_page.pdf

should generally be removed. In some cases, it may be appropriate to re-orient debris with the streamflow.

- If sediment or debris is accumulated within a culvert and limits flow capacity, the short term solution should generally be to clean out the culvert and place the debris and sediment in a stable location with no potential to discharge into a stream. In some cases a trash rack, post, or other deflection structure at the culvert inlet can reduce plugging.
- If sediment is accumulated in a culvert without other debris accumulation and limits flow capacity, the long term solution may generally involve changing the culvert's slope, diameter, or embedment in the streambed.

86. The roadway adjacent to and over the crossing is an area of potential discharge. All road surfaces approaching a crossing shall be drained before the crossing, adequately filtered through vegetation or other material, and not discharged to a watercourse. If turbid water is discharged at a stream crossing, additional measures to control erosion at the source(s) or to remove sediment prior to discharge shall be implemented. Road surfaces shall be of rock, pavement, or other material appropriate for type and level of use.
87. If a culvert is used, the approaches and fill slopes shall be properly compacted during installation and shall be stabilized with rock or other appropriate surface protection to minimize surface erosion and slumping to the receiving waters. If possible, the road surface over the culvert shall have a critical-dip to ensure that if the culvert becomes plugged, water can flow over the road surface without washing away the fill prism. If site-specific conditions do not allow for a critical dip, alternatives such as emergency overflow culverts, oversized culvers, flared inlets, and debris racks may be warranted.

C. Riparian and Wetland Protection and Management:

88. Buffer width will be in compliance with Tier category.
89. Trees within riparian areas shall be retained for natural recruitment to streams. Large woody debris (LWD) shall be retained in stream or within riparian areas. The size of wood that can be beneficial to the stream will vary depending on the size of the stream (i.e., larger pieces of wood are necessary to withstand flows in large streams). In the event that LWD or trees are disturbed during excavation, care shall be taken to separate the LWD from soil. The pieces shall be stockpiled separately until they can be replaced in appropriate locations to enhance instream or riparian conditions. Placement of instream wood for habitat enhancement should be done under the consultation of a qualified professional and in conformance with applicable regulatory permits.
90. Avoidance of disturbance in riparian areas (within 200 feet of a watercourse) should result in protection and restoration of the quality/health of the riparian stand so as to promote: 1) shade and microclimate controls; 2) delivery of wood to channels, 3) slope stability and erosion control, 4) ground cover, and 5) removal of excess nutrients. This recognizes the importance of the riparian zone

with respect to temperature protection, sediment delivery, its importance with respect to the potential for recruitment of large wood, and removal of nutrients transported in runoff. In the event that past disturbance has degraded riparian conditions, replanting with native species capable of establishing a multi-storied canopy will ensure these riparian areas can perform these important ecologic functions.

D. Spoils Management

To ensure spoil pile stability and to reduce the potential for spoil pile slope failure or transport to waters of the state, the following measures shall be implemented when placing or disposing of spoils onsite:

91. Rip compacted soils prior to placing spoils to prevent the potential for ponding under the spoils that could result in spoil site failure and subsequent sedimentation;
92. Compact and contour stored spoils to mimic the natural slope contours and drainage patterns to reduce the potential for fill saturation and failure;
93. Ensure that spoil materials are free of woody debris, and not placed on top of brush, logs or trees.
94. Spoils shall not be placed or stored in locations where soils are wet or unstable, or where slope stability could be adversely affected.
95. Do not locate spoil piles in or immediately adjacent to wetlands and watercourses.
96. Store spoil piles in a manner (e.g. cover pile with plastic tarps and surround base of pile with straw wattle) or location that would not result in any runoff from the spoil pile ending up in wetlands and watercourses.
97. Separate organic material (e.g., roots, stumps) from the dirt fill and store separately. Place this material in long-term, upland storage sites, as it cannot be used for fill.
98. Keep temporary disposal sites out of wetlands, adjacent riparian corridors, and ordinary high water areas as well as high risk zones, such as 100-year floodplain and unstable slopes.
99. After placement of the soil layer, track walk the slopes perpendicular to the contour to stabilize the soil until vegetation is established. Track walking creates indentations that trap seed and decrease erosion of the reclaimed surfaces.
100. Revegetate the disposal site with a mix of native plant species. Cover the seeded and planted areas with mulched straw at a rate of 2 tons per acre. Apply jute netting or similar erosion control fabric on slopes greater than 2:1 if site is erosive.

E. Water Storage and Use

WATER USE

101. Conduct operations on a size and scale that considers available water sources and other water use and users in the planning watershed.
102. Implement water conservation measures such as rainwater catchment systems, drip irrigation, mulching, or irrigation water recycling. (Also see BMPs for Irrigation, below)
103. Take measures to minimize water diversion during low flow periods.
104. Options for documentation of water diversions and/or water usage may include the use of water meter devices and date-stamped photographs of water meter readings.
105. Hauled water utilized for irrigation shall be documented via receipt or similar, and show the date, name, and license plate of the water hauler, and the quantity of water purchased.
106. Apply water at agronomic rates (do not overwater plants).

WATER STORAGE

107. If using a water storage tank, do not locate the tank in a flood plain or next to equipment that generates heat. Locate the tank so it is easy to install, access, and maintain.

108. Vertical tanks should be installed according to manufacturer's specifications and placed on firm, compacted soil that is free of rocks/sharp objects and capable of bearing the weight of the tank and its maximum contents. In addition, a sand or pea gravel base with provisions for preventing erosion is highly recommended. Installation sites for tanks 8,000 gallons or more must be on a reinforced concrete pad providing adequate support and enough space to attach a tank restraint system (anchor using the molded-in tie down lugs with moderate tension, being careful not to over-tighten), especially where seismic or large wind forces are present.

109. Horizontal tanks shall be secured with bands and/or hoops to prevent tank movement.
110. Design and construct storage ponds in properly sited locations, off-stream. Plant vegetation along the perimeter of the pond. Construct berms or excess freeboard space around the perimeter of the pond to allow for sheet flow inputs.
111. Provide adequate outlet drainage for overflow of ponds, including low impact designs, to promote dispersal and infiltration of flows.
112. Place proper lining or sealing in ponds to prevent water loss.

113. Storage bladders are not encouraged for long term water storage reliability. If they are utilized, ensure that they are designed to store water, and that they are sited to minimize potential for water to flow into a watercourse in the event of a catastrophic failure. Used bladders (e.g. military surplus bladders) shall be checked for interior residual chemicals and integrity prior to use. Inspect bladder and containment features periodically to ensure integrity.

F. Irrigation Runoff

114. Irrigate at rates to avoid or minimize runoff.
115. Regularly inspect for leaks in mains and laterals, in irrigation connections, or at the ends of drip tape and feeder lines. Repair any found leaks.
116. Design irrigation system to include redundancy (i.e., safety valves) in the event that leaks occur, so that waste of water is prevented and minimized.
117. Recapture and reuse irrigation runoff (tailwater) where possible, through passive (gravity-fed) or active (pumped) means.
118. Construct retention basins for tailwater infiltration; percolation medium may be used to reduce pollutant concentration in infiltrated water. Constructed treatment wetlands may also be effective at reducing nutrient loads in water. Ensure that drainage and/or infiltration areas are located away from unstable or potentially unstable features.
119. Regularly replace worn, outdated or inefficient irrigation system components and equipment.
120. Use mulches (e.g. wood chips or bark) in cultivation areas that do not have ground cover to prevent erosion and minimize evaporative loss.
121. Leave a vegetative barrier along the property boundary and interior watercourses to act as a pollutant filter.
122. Employ rain-triggered shutoff devices to prevent irrigation after precipitation.

G. Fertilizers, Soil Amendments, Pesticides, Petroleum Products, and Other Chemicals

123. Evaluate irrigation water, soils, growth media, and plant tissue to optimize plant growth and avoid over-fertilization.
124. Reference Department of Pesticide Regulations Guidance (see Attachments E-1 and E-2 of Order No. R1-2015-0023)
125. All chemicals shall be stored in a manner, method, and location that ensures that there is no threat of discharge to waters of the state.
126. Products shall be labeled properly and applied according to the label.
127. Use integrated pest management strategies that apply pesticides only to the area of need, only when there is an economic benefit to the grower, and at times when runoff losses are least likely, including losses of organic matter from dead plant material.

128. Periodically calibrate pesticide application equipment.
129. Use anti-backflow devices on water supply hoses, and other mixing/loading practices designed to reduce the risk of runoff and spills.
130. Petroleum products shall be stored with a secondary containment system.
131. Throughout the rainy season, any temporary containment facility shall have a permanent cover and side-wind protection, or be covered during non-working days and prior to and during rain events.
132. Materials shall be stored in their original containers and the original product labels shall be maintained in place in a legible condition. Damaged or otherwise illegible labels shall be replaced immediately.
133. Bagged and boxed materials shall be stored on pallets and shall not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials shall be covered during non-working days and prior to rain events.
134. Have proper storage instructions posted at all times in an open and conspicuous location.
135. Prepare and keep onsite a Spill Prevention, Countermeasures, and Cleanup Plan (SPCC Plan) if applicable[4].
136. Keep ample supply of appropriate spill clean-up material near storage areas.

H. Cultivation-Related Wastes

137. Cultivation-related waste shall be stored in a place where it will not enter a stream. Soil bags and other garbage shall be collected, contained, and disposed of at an appropriate facility, including for recycling where available. Pots shall be collected and stored where they will not enter a waterway or create a nuisance. Plant waste and other compostable materials be stored (or composted, as applicable) 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 groundwaters.
138. Imported soil for cultivation purposes shall be minimized. The impacts associated with importation of soil include, but are not limited to increased road maintenance and the increased need for spoils management. Use of compost increases the humic acid content and water retention capacity of soils while reducing the need for fertilizer application. In the event that containers (e.g. grow bags or grow pots) are used for cultivation, reuse of soil shall be maximized to the extent feasible.

[4] SPCC plans are required for over 1,320 gallons of petroleum stored aboveground or 42,000 gallons below ground. Additionally, any type of storage container requires an SPCC if it is larger than 20,000 gallons, or if the cumulative storage capacity on-site exceeds 100,000 gallons (Health and Safety Code section 25270-25270.13) A sample SPCC can be found here: http://www.calcupa.net/civica/filebank/blobdload.asp?BlobID=3186

139. Spent growth medium (i.e. soil and other organic medium) shall be handled to minimize discharge of soil and residual nutrients and chemicals to watercourses. Proper handling of spent soil could include incorporating into garden beds, spreading on a stable surface and revegetation, storage in watertight dumpsters, covering with tarps or plastic sheeting prior to proper disposal, and use of techniques to reduce polluted runoff described under Item F. Irrigation Runoff.
140. Other means of handling cultivation-related waste may be considered on a site-specific basis.

I. Refuse and Human Waste

141. Trash containers of sufficient size and number shall be provided and properly serviced to contain the solid waste generated by the project. Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers. Use lined bins or dumpsters to reduce leaking of liquid waste. Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater. Make sure trash container areas are screened or walled to prevent off-site transport of trash. Consider using refuse containers that are bear-proof and/or secure from wildlife. Refuse shall be removed from the site on a frequency that does not result in nuisance conditions, transported in a manner that they remain contained during transport, and the contents shall be disposed of properly at a proper disposal facility.
142. Ensure that human waste disposal systems do not pose a threat to surface or ground water quality or create a nuisance. Onsite treatment systems should follow applicable County ordinances for human waste disposal requirements, consistent with the applicable tier under the State Water Resources Control Board Onsite Waste Treatment System Policy[5].

[5] Available at: http://www.waterboards.ca.gov/water_issues/programs/owts/docs/owts_policy.pdf (as of the date of the Order).

IV. References

Handbook for Forest, Ranch, & Rural Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Upgrading, Maintaining, and Closing Wildland Roads
http://www.pacificwatershed.com/sites/default/files/handbook_chapter_download_page.pdf

A Water Quality and Stream Habitat Protection Manual for County Road Maintenance in Northwestern California Watersheds
http://www.5counties.org/roadmanual.htm

Construction Site BMP Fact Sheets
http://www.dot.ca.gov/hq/construc/stormwater/factsheets.htm

EPA Riparian/Forested Buffer
http://water.epa.gov/polwaste/npdes/swbmp/Riparian-Forested-Buffer.cfm

Creating Effective Local Riparian Buffer Ordinances
http://www.rivercenter.uga.edu/publications/pdf/riparian_buffer_guidebook.pdf

How to Install Residential Scale Best Management Practices (BMPs) in the Lake Tahoe Basin
http://www.tahoebmp.org/Documents/Contractors%20BMP%20Manual.pdf

Spoil Pile BMPs
http://michigan.gov/documents/deq/deq-wb-nps-sp_250905_7.pdf

Sanctuary Forest Water Storage Guide
http://agwaterstewards.org/images/uploads/docs/1213661598_Water_Storage_Guide.pdf

Natural Resources Conservation Service-USDA, "Ponds – Planning, Design, Construction", Agriculture Handbook
http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_030362.pdf

Division of Safety of Dams size requirements
http://www.water.ca.gov/damsafety/jurischart/

Water Tanks: Guidelines for Installation and Use
http://dnn7.snydernet.com/_pdf/_septic/Septic%20Catalog%202010.pdf

BEST MANAGEMENT PRACTICES (BMP's) University of California Cooperative Extension
http://www.waterboards.ca.gov/sandiego/water_issues/programs/wine_country/docs/updates081910/ucce_bmps.pdf

California Stormwater Quality Association
Section 4: Source Control BMPs
https://www.casqa.org/sites/default/files/BMPHandbooks/sd-12.pdf

CA DOT Solid Waste Management Plan
http://www.dot.ca.gov/hq/construc/stormwater/WM-05.pdf

State Water Resources Control Board Onsite Wastewater Treatment System (OWTS) policy
http://www.waterboards.ca.gov/water_issues/programs/owts/docs/owts_policy.pdf

California Stormwater Quality Association
Section 4: Source Control BMPs
https://www.casqa.org/sites/default/files/BMPHandbooks/sd-32.pdf

California Riparian Habitat Restoration Handbook
http://www.conservation.ca.gov/dlrp/watershedportal/InformationResources/Documents/Restoration_Handbook_Final_Dec09.pdf

The Practical Streambank Bioengineering Guide
http://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmcpu116.pdf

150728_KVG_ef_AppendixB_BMP

Appendix C
Monitoring and Reporting Program
Documents

Appl # 12708

NOTICE OF INTENT FORM
FOR ENROLLMENT UNDER
WAIVER OF WASTE DISCHARGE REQUIREMENTS
ORDER NUMBER R1-2015-0023

Submission of this Notice of Intent (NOI) to the North Coast Regional Water Quality Control Board (Regional Water Board) or an approved third party constitutes notice that a discharger, identified in Section I of this form, requests and receives authorization to discharge pursuant to the Waiver of Waste Discharge Requirements Order number R1-2015-0023 (Order). Upon submittal of the NOI, waste discharges are authorized pursuant to the conditions of the Order. Order coverage is required for existing Tier 1, 2, and 3 cultivation sites by February 15, 2016. Dischargers who begin operations after February 15, 2016, must file an NOI prior to commencement of cultivation activities.

To obtain authorization, dischargers must complete and submit this NOI form, encompassing sections I and II, complete and submit the reporting information required in Appendix C of the Order, and submit the appropriate fee. The reporting form in Appendix C must be submitted annually by March 31 thereafter and an annual fee is subject to a separate invoicing from the State Water Board. Any additional documentation required by the Order, such as a water resource protection plan, site map, and monitoring records must be completed and secured on-site, to be made available upon request by the Regional Water Board. This NOI form must be submitted upon enrollment and the discharger shall amend and resubmit the NOI within 30 days of changed site conditions that result in a change in Tier status.

Completed forms must be signed and submitted to the Regional Water Board or an approved third party.

Forms submitted to the Regional Water Board shall be submitted electronically to NorthCoast@waterboards.ca.gov or, 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.

Fee payments shall be made payable either to an approved third party or the State Water Resource Control Board (SWRCB) according to the schedule in section 2200.7 of the Water Code. Approved third parties that collect fees from their enrollees are required to submit the fees to the Regional Water Board. Initial payments shall be submitted to: North Coast Regional Water Quality Control Board 5550 Skylane Boulevard, Suite A, Santa Rosa, CA 95403. Invoices will be issued annually, thereafter.

I. Discharger Information

First Name, Middle Initial: JEDEDIAH

Last Name: MORRIS

Mailing Address:

Street: PO BOX 831

City: Willow Creek

State: CA ZIP: 95573 **Phone Number:** 707 - 496 - 4690

Email: humboldtscience@outlook.com

II. Site Information

Site Address:

Street: Friday Ridge Road

City: Willow Creek

State: CA ZIP: 95573

Subwatershed (HUC-12)

*12-digit HUC-12 code available at http://iaspub.epa.gov/apex/grts/f?p=110:95:::NO::APP_SHOW_HIDE:

180102120504

Assessor's Parcel Number (APN)

524-075-023

Please check one of the following boxes to indicate which Tier you are enrolling under:

☐ Tier 1 ☒ Tier 2 ☐ Tier 3

Under Tier 2, water resource protection plans must be developed within 180 days of submittal of this NOI form. Under Tier 3, cleanup and restoration plans must be submitted to the Regional Water Board within 45 days of submittal of this NOI form. Tier 3 enrollees that are cultivating must also be enrolled and comply with Tier 2 conditions.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision. The information contained in this document and all attachments is, to the best of my knowledge and belief, true, accurate, and complete. I agree to monitor and report on my site in compliance with the Order, including the Monitoring and Reporting Program (Appendix C) truthfully, accurately, and completely; complete Sections I and II, above; keep a copy of the Order, this NOI, the annual monitoring and reporting documents and, if applicable, the water resource protection plan and cleanup and restoration plan document(s) on site, and make them available to Water Board staff upon request. If there is a change in Tier status based on changed site conditions, the changes must be documented, appended to this document, and resubmitted to either the Regional Water Board or, if applicable, an approved third party.

Print name: Jedediah Morris

Signature: _____ **Date:** _____

Order No. R1-2015-0023
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A. Site WDID: Pending

B. Subwatershed (HUC-12)[2]: 180102120504

C. Enrollment date: 08/23/2016

D. Reporting date: TBD

E. Please check the box corresponding to the enrolled site's current tier (Tier 3 sites with cultivation must also check Tier 2).

☐ Tier 1 ☒ Tier 2 ☐ Tier 3

Has the site's tier status changed since the last reporting period? Y☐/N☒
If YES, briefly explain: _____

F. Check all fields that apply to the enrolled site:

i. Tier 1 sites:
(see Order at page 6 for details on Tier 1 characteristics)
- ☐ Average slope of each individual cultivation area is no more than 35% slope.
- ☐ Total cultivation area is no more than 5,000 square feet.
- ☐ No cultivation areas or associated facilities are located within 200 feet of a surface water. (Surface waters include wetlands and Class I, II, and III watercourses.)
- ☐ No surface water diversion from May 15 through October 31.
- ☐ The site is in compliance with all Standard Conditions under Order R1-2015-0023, section I.A.

ii. Tier 2 sites:

a. A Water Resource Protection Plan has been developed and is being implemented? Y☐/N☒

If NO, expected date when plan will be ready and implementation will begin: 11/01/2016

If YES, have there been changes to the implementation schedule since the prior year of reporting? Y☐/N☐

[2] 12-digit HUC-12 subwatershed codes are available online at http://iaspub.epa.gov/apex/grts/f?p=110:95:::NO::APP_SHOW_HIDE:

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ii. Tier 2 sites continued:

b. Check below as to whether or not the site meets Standard Conditions under Order R1-2015-0023, section I.A. If a standard condition is not yet met, please indicate the expected date of compliance as identified in the Water Resource Protection Plan. Upon initial enrollment, provide an estimated expected date of compliance.

Standard Condition Met	If NO, expected date of compliance
1. Site maintenance, erosion control, and drainage features Y☐/N☒	Spring 2017
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☐	

c. All management measures are being implemented as part of the Water Resource Protection Plan? Y☒/N☐

If YES, do management measures appear to be effective in preventing and minimizing discharges of waste to surface water? Y☐/N☐

If management measures do not appear to be effective, are additional measures being implemented iteratively to prevent and minimize discharges of waste to surface water? Y☐/N☐

If NO, describe management measures or practices that have not been effective in preventing and minimizing discharges of waste to surface water, if applicable. Describe plans for new or additional management measures to prevent and minimize discharges of waste, if applicable. Attach additional sheets as necessary.

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d. Will work to bring site into compliance with Standard Conditions require disturbance to a stream or wetland over the coming year? Y☐/N☒

If YES, indicate status of work authorization by Regional Water Board. Specifically, check one or more of the following and provide the date if/as applicable.

☐ I plan to submit my project plans to the Regional Water Board by the following date:_____

☐ I submitted my project plans to the Regional Water Board on the following date:_____

☐ The Regional Water Board Executive Officer authorized my project plans on the following date:_____

☐ I have elected to receive authorization for instream work under a different Regional Water Board permitting mechanism as follows:

_____

☐ Instream work anticipated to occur between the following dates: _____

iii. Tier 2* sites:

Total cultivation area is less than 10,000 square feet? Y☐/N☐

Water resource protection plan developed and fully implemented? Y☐/N☐

All Standard Conditions met? Y☐/N☐

Site was inspected and verified as Tier 2* by Regional Water Board staff (NAME)_____ or approved third party program (NAME): _____ on (DATE) _____.

iv. Tier 3 Sites:

☐ A Cleanup and Restoration Plan has been submitted to the Regional Water Board for approval.

☐ The Cleanup and Restoration Plan has been approved by the Regional Water Board.

☐ The timeline for the approved Cleanup and Restoration plan is being followed.

Will restoration work require disturbance to a stream or wetland in the coming year? Y☐/N☐

Instream work anticipated to occur between the following dates:_____

☐ Cannabis cultivation is occurring or will occur on the site over the coming year. (If this box is checked, ensure that Tier 2 portions of the reporting form are completed as well).

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v. For All Sites:

Annual Reporting Period (Calendar Year), or CHECK HERE ☒ if this is the report accompanying initial enrollment.

0	1	0	1			TO	1	2	3	1		
Month/Day/Year							Month/Day/Year					

(See Order at page 6 for details regarding cultivation area and slope measurements, and watercourse definitions).

Total cultivation area (square feet)	10,000
Distance to surface waters (feet) from nearest edge of each cultivation area or associated facility. Provide distance measurement for each cultivated area separately, as appropriate.	750 FT
Average slope (percent slope) of each cultivated area List each cultivated area separately, as appropriate.	Less than 15%
Total number of road crossings of surface waters Surface waters include wetlands and Class I, II, or III watercourses.	0
Annual soil amendment and chemical use (pounds or gallons). Total mass and/or volume of soil amendment and/or chemical usage by type, product name, and nutrient content such as N-P-K ratio, if applicable.*	1000 lbs
Total water storage capacity (gallons or acre feet)	4050 gal

Total surface water diversion by month (gallons or acre feet)* POD #1

Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
-	-	37200	36000	37200	36000	37200	37200	36000	37200	-	-

Water input to storage by source and month (gallons or acre-feet) Report water volume input to storage, listing each source separately. This may include inputs from rainfall catchment, surface water diversions, groundwater pumping, or water delivery. If water is delivered, list delivery date, delivery volume, and name and address of water purveyor.*

Source	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec

Water use by source and month (gallons or acre feet) Report water volume used, listing each source separately. This may include use of stored water, immediate use of pumped groundwater, diverted surface water, or delivered water. If water is delivered, list delivery date, delivery volume, and name and address of water purveyor*

Source	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
POD #1	-	-	37200	36000	37200	36000	37200	37200	36000	37200	-	-

* Upon initial enrollment only, a best estimate is acceptable for reporting annual soil amendment and chemical use, monthly water stored, and monthly water use. Attach additional sheets if more space is needed for your responses.

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision. The information contained in this document and all attachments is, to the best of my knowledge and belief, true, accurate, and complete.

Print name: Jed Morris

Signature: _____ **Date:** 3-31-17

Preparer: Complete if MRP was prepared by someone other than the discharger, including an approved third-party

Organization Name (if applicable):
Tierra Consulting

Prepared by:
First Name, Middle Initial
Christian | X

Last Name
Figueroa

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