

Water Resource Protection Plan

180101060405TRC383

WDID: 1B171720CHUM

APN: 212-311-002



Prepared by:
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165 South Fortuna Blvd
Fortuna, California 95540

4/02/2018
Revised 10/02/2018

Purpose

This Water Resource Protection Plan (WRPP) has been prepared on behalf of the property owner, for the Humboldt county property identified as parcel number 212-311-002 by agreement and in response to the California Water Code Section 13260(a), which requires that any person discharging waste or proposing to discharge waste within any region that could affect the quality of the waters of the state, other than into a community sewer system, shall file with the appropriate regional water board a Report of Waste Discharge (ROWD) containing such information and data as may be required by the Regional Water Board. The Regional Water Board may waive the requirements of Water Code section 13260 for specific types of discharges if the waiver is consistent with the Basin Plan and in the public interest. Any waiver is conditional and may be terminated at any time. A waiver should include monitoring requirements to verify the adequacy and effectiveness of the waiver's conditions. Order R1-2015-0023 conditionally waives the requirement to file a ROWD for discharges and associated activities described in finding 4.

Scope of Report

Order No. R1-2015-0023 states that "Tier 2 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 of this Order."

Methods

The methods used to develop this WRPP include both field and office components. The office component consisted of aerial photography review and interpretation, existing USGS quad map review, GIS mapping of field data, review of on-site photography points, streamflow calculations, and general planning. The field component included identifying and accurately mapping all watercourses, wet areas, and wetlands located downstream of the cultivation areas, associated facilities, and all appurtenant 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, Finding 4a-j. The field assessment also included an evaluation and determination of compliance with the Standard Conditions per Provision I.B of Order No. R1-2015-0023. The water resource protection plans required under Tier 2 are meant to describe the specific measures a discharger implements to achieve compliance with standard conditions. Therefore, all required components of the water resource protection plan per Provision I.B of Order No. R1-2015-0023 were physically inspected and evaluated. A comprehensive summary of each Standard Condition as it relates to the subject property is appended.

Spring

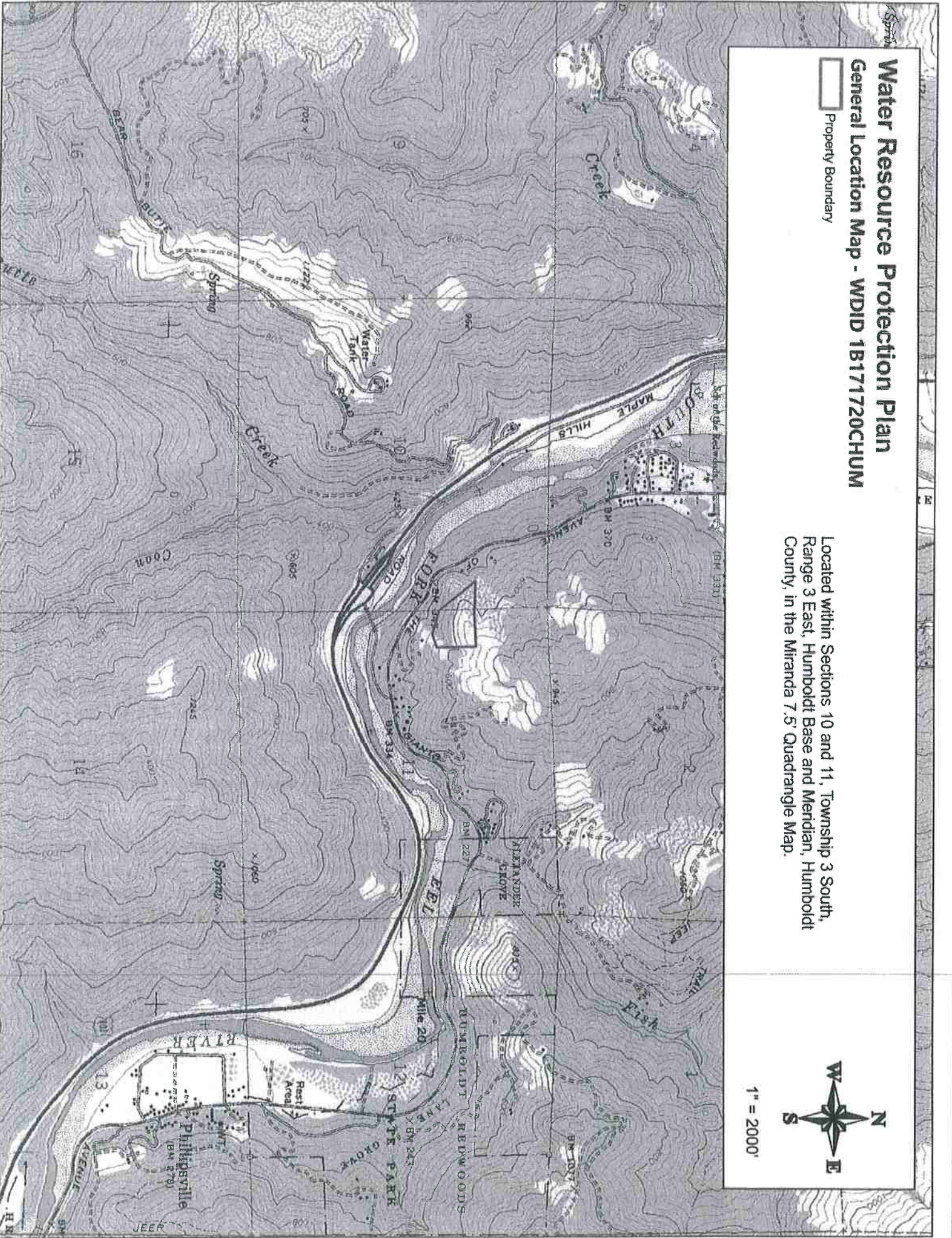
Water Resource Protection Plan

General Location Map - WDID 1B171720CHUM

 Property Boundary

Located within Sections 10 and 11, Township 3 South, Range 3 East, Humboldt Base and Meridian, Humboldt County, in the Miranda 7.5' Quadrangle Map.

1" = 2000'



Property Description

The property assessed consists of one parcel totaling approximately 162 acres. Vegetation on the property consists of Douglas-fir timberland. Slopes on the ownership average 25%. The property is located within Section 10 and 11, Township 3 South, Range 3 East, Humboldt Base and Meridian, on the USGS Miranda 7.5' Quadrangle Map. This property is approximately 1 mile south of Miranda, CA, accessed via Highway 254, Avenue of the Giants. One unnamed watercourse is located on the property. These un-named watercourses drain into the South Fork Eel River.

Project Description

Cultivation on the property currently consists of two areas, referenced as Cultivation Area A and B on the site map. Cultivation Area A consists of two 120'X30' greenhouses. Cultivation Area B consists of one 120'X30' greenhouse. Water for domestic and agricultural purposes is sourced from a well of unknown depth. There is approximately 26,861ft² of disturbed area.

Cultivation Site	Areal (ft ²)	Adjoining Hillslopes (% Grade)	Distance from a Watercourse (ft.)
A	19,230	25	220 [CIII]
B	7,631	20	80 [CIII]

¹ Area refers to the total land disturbance area. The total cannabis canopy area may vary considerably than the disturbance area. Further details can be found under Item 1 below.

Monitoring Plan

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

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

Monitoring Plan Reporting Requirements

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

Assessment of the Standard Conditions

Assessment of Standard Conditions consisted of field examinations in the summer of 2018. The examination evaluated areas near, and areas with the potential to directly impact, watercourses for sensitive conditions including, but not limited to, existing and proposed roads, skid trails and landings, unstable and erodible watercourse banks, unstable upslope areas, debris, jam potential, inadequate flow capacity, changeable channels, overflow channels, flood prone areas, and riparian zones. Field examinations also evaluated all roads and trails on the property, developed areas, cultivation sites, and any structures and facilities appurtenant to cultivation on the property. Anywhere the Standard Conditions are not met on the property, descriptions of the assessments and the prescribed treatments are outlined following each associated section below.

Summary of Standard Conditions Compliance

1. Site Maintenance, Erosion Control, and Drainage Features Y/N
2. Stream Crossing Maintenance Y/N
3. Riparian and Wetland Protection and Management Y/N
4. Spoils Management Y/N
5. Water Storage and Use Y/N
6. Irrigation Runoff Y/N
7. Fertilizers and Soil Amendments Y/N
8. Pesticides and Herbicides Y/N
9. Petroleum Products and Other Chemicals Y/N
10. Cultivation-Related Wastes Y/N
11. Refuse and Human Waste Y/N

Assessment of the Standard Conditions (Cont.)

1. Site maintenance, erosion control, and drainage features:

Roads are being classified as "permanent" (being used year-round) and "seasonal" (being used primarily during summer months). This property has approximately 0.9 miles of road with grades ranging from 1-15%.

The permanent road is used to access the primary residence, an agricultural storage structure, Cultivation Area A, and Cultivation Area B. The permanent road was well rocked with appropriate and adequately spaced drainage structures. It has been recommended to install drainage structures at Site 01 and 02.

See General Recommendation #1

There is approximately .4 miles of seasonal use, legacy ranch road existing on the property. This road appeared to have limited use by vehicles and was stable with little to no signs of erosion. This section of road is utilized to access the well on the property. No site maintenance or erosion control features were identified for this section of road.

An unstable area was identified to the south of the graded area of Cultivation Area B. This area is defined as an unstable area on the site map and referenced as Site 04 in the attached Mitigation Report. The unstable area is approximately 8,371 square feet. There are multiple vertical scarps of approximately 2-3 feet. There is a Class III watercourse approximately 90 feet away. There was no observed hydrological connectivity due to the unstable area being caught in a swale feature. There is a graded flat above this unstable area that will require improved drainage to prevent saturation of this unstable area during storm events. As an interim measure it has been recommended to install staked straw wattles around the entire eastern and southern edge of the graded flat. Additionally, drainage of this area shall be re-constructed to drain towards a grass hillside to the south west in effort to minimize saturation of the unstable area. See pictures for more details. The installation of straw wattles shall be implemented prior to 10/15/2018 and reconstruction of the drainage of the graded area shall be implemented prior to 10/15/2019.

Current cultivation activities consist of two active areas.

Cultivation Area A consists of a graded area that accommodates two 120'X30' greenhouses. Slopes within the cultivation area are 1-5% with surrounding slopes of approximately 25%. No site maintenance or erosion control features were identified for this cultivation area.

Cultivation Area B consists of an area that has been graded in the past to accommodate one 120'X30' greenhouse. Slopes within the cultivation area range from 1-5% with surrounding slopes averaging approximately 20%. It has been recommended to seed and mulch all of the exposed soils within this cultivation area due to an unstable area to the south.

2. Stream crossing maintenance:

There are no stream crossings located on the property.

3. Riparian and wetland protection and management:

Assessment of the property concluded that all Cultivation Areas are outside of the riparian buffer zones as defined by the California Regional Water Quality Control Board. Cultivation Area A is 140ft from a Class III watercourse. Cultivation Area B is 370ft from a Class III watercourse.

Assessment of the Standard Conditions (Cont.)

4. Spoils management:

No spoils were noted on the property. If spoiling material is required, such as from road grading, the discharger shall follow the BMPs in Appendix B or the Order, under Spoil Management. Spoil sites shall be located outside any standard width riparian area (50' for Class III and 100' for Class II) and shall be stabilized and contained as per the BMPs. Any/all spoils are adequately contained or stabilized to prevent sediment delivery to surface waters. Any/all spoils generated through development or maintenance of roads, driveways, earthen fill pads, or other cleared or filled areas have not been side cast in any location where they can enter or be transported to surface waters. Any/all future spoils generated as a result of any future construction projects that are to be stored on the property shall be done so in accordance with the BMP's.

5. Water storage and use:

This property currently utilizes a permitted well as the source of agricultural irrigation and domestic water. The total amount of water storage on this property is 3000 gallons of hard tank storage. Due to this property utilizing a well as the source of water the forbearance period is not applicable. It is being recommended to install a water meter at the well in effort to acquire accurate water usage data.

See General Recommendation #2

This property does not currently utilize any water conservation techniques. To improve water conservation, it is recommended to implement applicable water conservation techniques per the Best Management Practices in Appendix B, Section F., Items 114-122 of the Order. These techniques include drip systems, watering early in the morning (before 10a.m) or later in the evening (after 6 p.m.), mulching the base of plants, installing safety valves in the event of a leak, and replacing old and worn out irrigation components.

Water Input to Storage (gallons) Well

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
0	0	14,250	15,750	17,500	17,500	21,000	21,000	17,500	15,750	0	0	140,250

6. Irrigation runoff:

During the field assessments, no evidence of irrigation runoff was observed, nor was there evidence that it had occurred in the past. Water conservation techniques have been recommended in the water storage and use section. These techniques will minimize the potential for overwatering and ensure that irrigation is occurring at agronomic rates. This standard condition is currently being met.

7. Fertilizers and soil amendments:

The property was well maintained with fertilizers and soil amendments stored in an appropriate structure. Fertilizers, potting soils, compost, and other soils and soil amendments are stored in structures on the property in a manner in which they will not enter or be transported into surface waters and so that nutrients or other pollutants will not be leached into groundwater. Fertilizers and soil amendments are applied and used per the manufacturers guidelines. Cultivation areas are currently maintained so as to prevent nutrients from leaving the site during the growing season and post-harvest. **See General Recommendation #3 and #4.**

Assessment of the Standard Conditions (Cont.)

8. Pesticides and herbicides:

The use of pesticide products is consistent with product labeling and all products on the property are currently used, and stored in closed structures to ensure that they do not enter or are released into surface or ground waters.

9. Petroleum products and other chemicals:

At the time of inspection, no bulk liquid fuel storage was located on the property at the time of survey. If bulk fuel storage is acquired the discharger was informed that secondary containment and cover is required. Propane is currently being utilized for domestic use.

10. Cultivation related wastes:

Trash/refuse that will be generated on site includes plastic containers, plastic pots, and other cultivation related wastes. The trash/refuse is stored in lidded trash bins, which are emptied weekly. Recyclables are separated and recycled. Plant wastes are composted. No 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, are stored at locations where they can enter or be blown into surface waters, or in a manner that could result in residues and pollutants within such materials to migrate or leach into surface water or groundwaters.

There were multiple locations on the property that had legacy cultivation waste consisting of plastic bags and smart pots. The discharger has intentionally left these in effort to prove pre-existing cultivation area for Humboldt County permitting purposes. During the property inspection these areas were georeferenced and pictures were taken of the areas. It has been recommended to clean these areas up prior to 10/15/2019. None of these cultivation waste areas are located within riparian buffers.

11. Refuse and human waste:

This property currently utilizes a septic system attached to the residence. The discharger relayed that the residence and septic system are permitted.

Remediation/Cleanup/Restoration:

Currently, one of the Standard conditions is not being met. The Standard Condition that is not in compliance is 1. Site Maintenance, Erosion Control, and Drainage Features. The Mitigation Report following this section details the site-specific practices required to comply with the Standard Conditions. The Mitigation Report also contains numerous preventative measures designed to prevent future erosion sites from developing during operations. These sites will be treated in accordance with regulations, following approval of any and/or all necessary permits, and done in accordance with the BMP's listed in Appendix B of the Order.

General Recommendations

1. Existing or newly installed road surface drainage structures such as water bars, rolling dips, ditch relief culvers, and intentionally in/out-sloped segments of road shall be maintained to ensure continued function of capturing and draining surface runoff.
2. Water meters shall be installed immediately. Water use shall be designed and metered such that water used for the irrigation of cannabis will be recorded. Water use for the irrigation of cannabis is to be recorded monthly for annual reporting.
3. Fertilizer, soil amendments, and pesticide use it to be recorded in such a manner that cumulative annual totals are recorded for annual reporting.
4. Fertilizers shall be stored in an enclosed structure to ensure they do not leech. Empty fertilizer containers should be contained and disposed of in a timely manner.

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

Prepared by **Timberland Resource Consultants**

1. This Water Resource Protection Plan has been prepared for the property within APN 212-311-002 in Humboldt County, at the request of the Client.
2. Timberland Resource Consultants does not assume any liability for the use or misuse of the information in this Water Resource Protection Plan.
3. The information is based upon conditions apparent to Timberland Resource Consultants at the time the inspection was conducted. Changes due to land use activities or environmental factors occurring after this inspection have not been considered in this Water Resource Protection Plan.
4. Maps, photos, and any other graphical information presented in this report are for illustrative purposes. Their scales are approximate, and they are not to be used for locating and establishing boundary lines.
5. The conditions presented in this Water Resource Protection Plan may differ from those made by others or from changes on the property occurring after the inspection was conducted. Timberland Resource Consultants does not guarantee this work against such differences.
6. Timberland Resource Consultants did not conduct an investigation on a legal survey of the property.
7. Persons using this Water Resource Protection Plan are advised to contact Timberland Resource Consultants prior to such use.
8. Timberland Resource Consultants will not discuss this report or reproduce it for anyone other than the Client named in this report without authorization from the Client.



Austin Theriault

Timberland Resource Consultants

Photographs



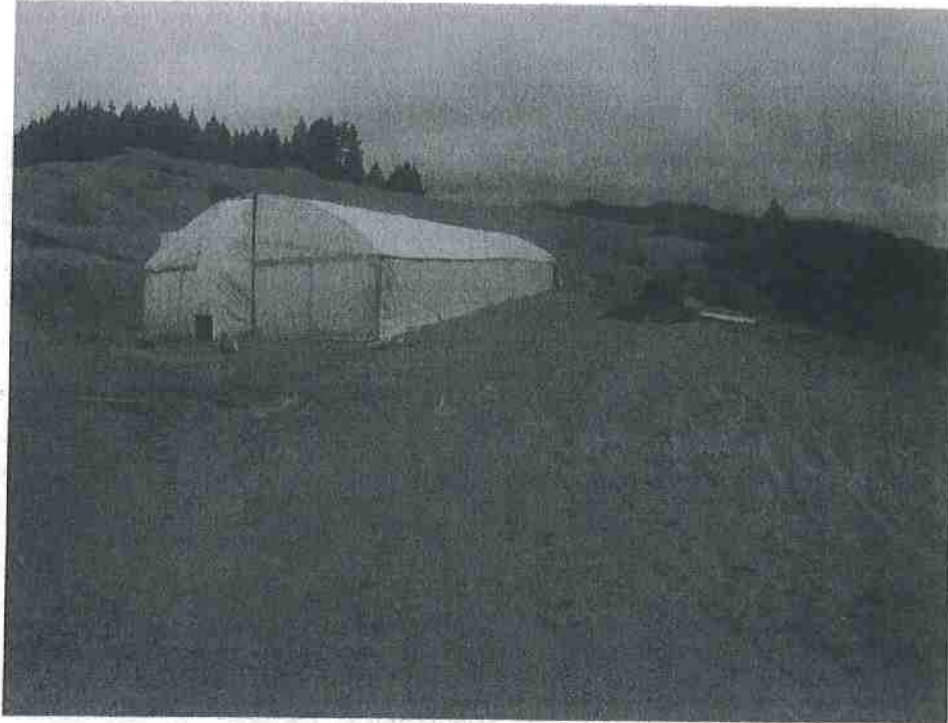
Primary residence: This residence has a permitted septic system.



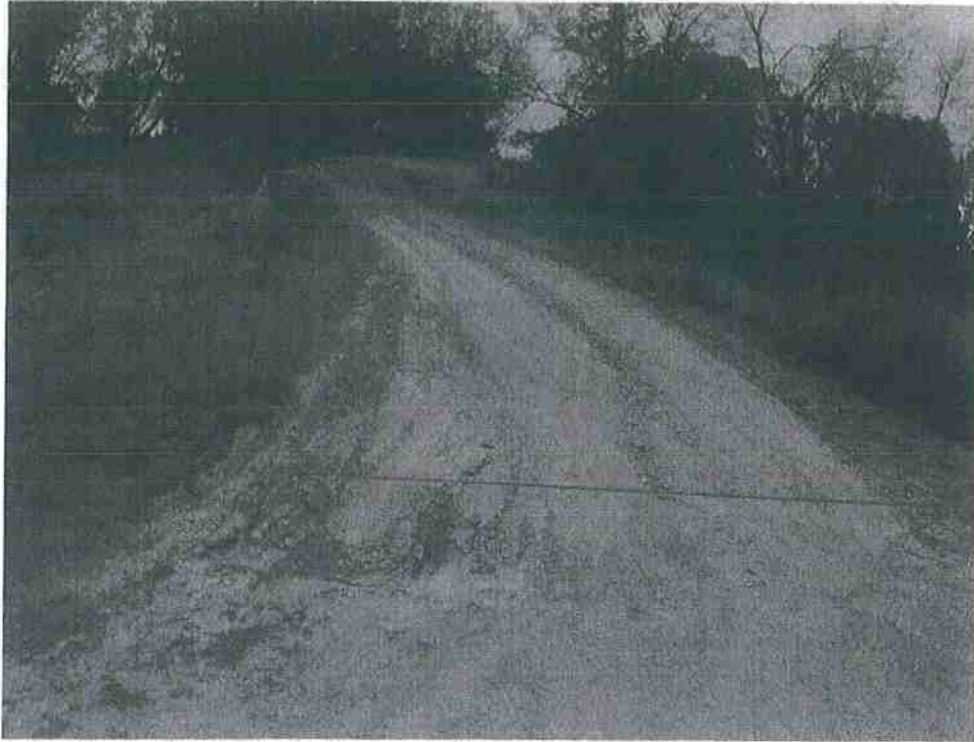
Well: Sole source of water for domestic and agricultural uses.



Cultivation Area A: Two greenhouses located on a graded flat.



Cultivation Area B: One greenhouse located on a graded flat.



Sites 01 and 02: Install rolling dips in these locations. Install an inside ditch between these proposed rolling dips.



Site 04: Unstable area with multiple vertical scarps of 2-3ft.



Site 04: alternate view.

Water Resource Protection Plan

Site Map - W DID 1B171720CHUM

- Site
- Ⓜ Residence
- Water Tank
- ▲ Well
- ▭ Property Boundary
- Cultivation Area
- ░ Unstable Area

- Road
- Permanent
- Seasonal
- Trail

- Watercourse
- Class I
- Class III



Water Resource Protection Plan

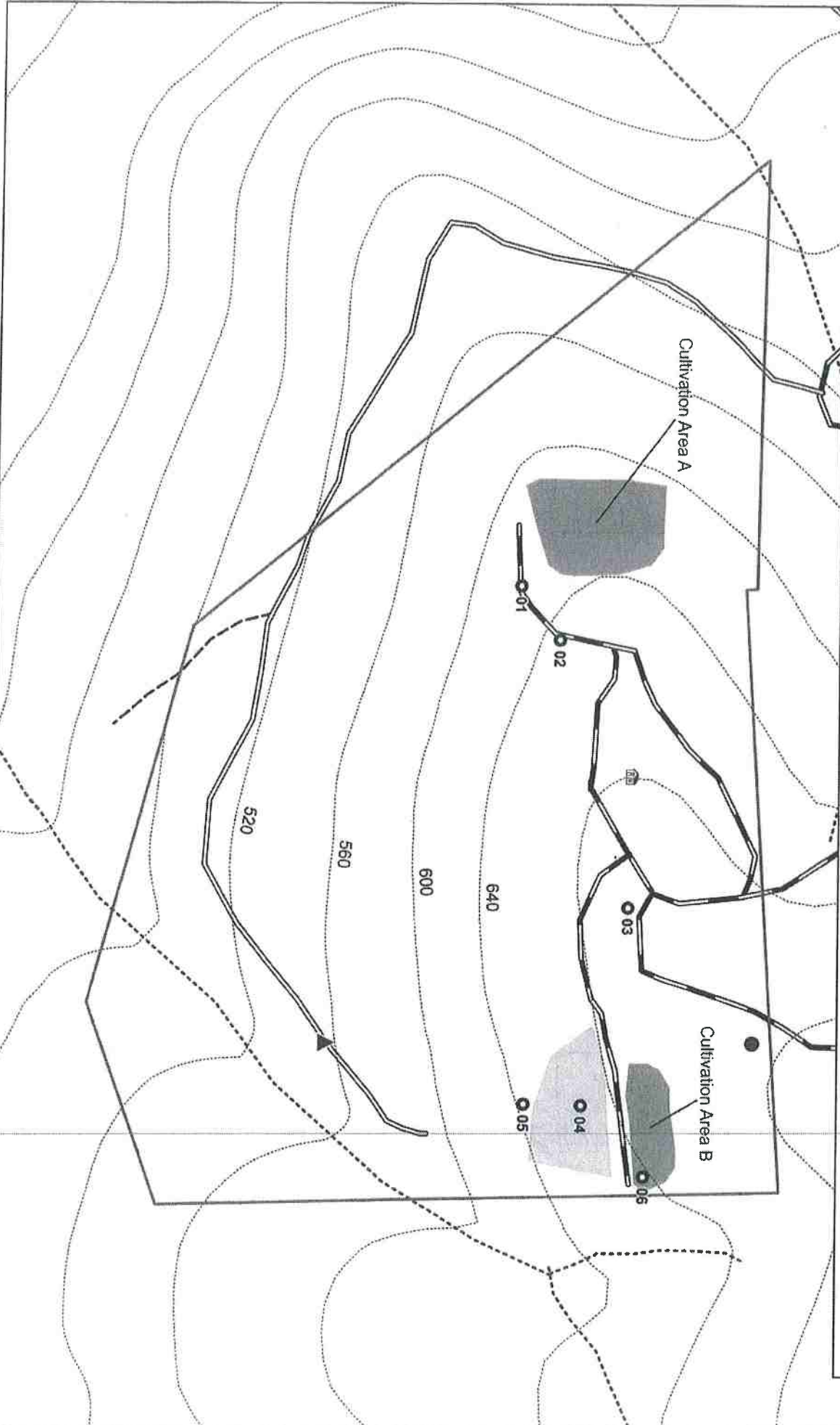
Site Map - WDID 1B171720CHUM

- Property Boundary
- Cultivation Area
- Unstable Area
- Site
- Residence
- Water Tank
- Well

- Road
- Permanent
- Seasonal
- Trail
- Watercourse
- Class I
- Class III



1" = 150'





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WRPP - Mitigation Report

WDID# -1B171720CHUM

Unique Point	Lat-Long NAD 83	Road Type	Mitigation Planned	Monitor	1600	Standard Conditions	Treatment Priority	Date Completed
1	-123.817 40.2223	Permanent	X	X	-	A.1.	Prior to 10/15/19	
Current Condition: Existing rolling dip is not functioning adequately. This drainage feature has become beaten down due to year around vehicle use.						Prescribed Action: Install a Type 1 rocked rolling dip in this location per the specifications of the attached BMP's.		
Unique Point	Lat-Long NAD 83	Road Type	Mitigation Planned	Monitor	1600	Standard Conditions	Treatment Priority	Date Completed
2	-123.817 40.2224	Permanent	X	X	-	A.1.	Prior to 10/15/19	
Current Condition: Existing rolling dip is not functioning adequately. This drainage feature has become beaten down due to year around vehicle use.						Prescribed Action: Install a Type 1 rocked rolling dip in this location per the specifications of the attached BMP's.		
Unique Point	Lat-Long NAD 83	Road Type	Mitigation Planned	Monitor	1600	Standard Conditions	Treatment Priority	Date Completed
3	-123.816 40.2227	Permanent	X	X	-	A.1.	Prior to 10/15/19	
Current Condition: Bulk fuel storage consisting of a 500 gallon propane tank.						Prescribed Action: None.		
Unique Point	Lat-Long NAD 83	Road Type	Mitigation Planned	Monitor	1600	Standard Conditions	Treatment Priority	Date Completed
4	-123.815 40.2225	-	X	X	-	A.1.	Prior to 10/15/20 pending the approval of any required permits	
Current Condition: Fill slope settling. An area that is approximately 8,371 square feet. There are multiple vertical scarps of approximately 2-3 feet. There is a Class III watercourse approximately 90 feet away. There was no observed hydrological connectivity. There is a graded flat above this unstable area that will require improved drainage to prevent saturation of this unstable area during storm events.						Prescribed Action: A berm or staked wattle shall be installed around the eastern and southern edge of Cultivation Area B. Run-off shall be dispersed on the the grass hillslope to the west of this cultivation area. The unstable area shall be seeded and mulched. This recommendation is in effort to reduce surface run-off from hydrologically connecting to an adjacent Class III watercourse and or saturating an unstable hillside to the south.		
Unique Point	Lat-Long NAD 83	Road Type	Mitigation Planned	Monitor	1600	Standard Conditions	Treatment Priority	Date Completed
5	-123.815 40.2224	-	X	X	-	A.1.	Prior to 10/15/19	
Current Condition: Legacy cultivation "smart pots" and plastic soil bags were dispersed throughout this area and other areas on the property. These areas containing legacy cultivation related waste pose no risk to water quality due to being contained and out of the preferred riparian buffers.						Prescribed Action: The land owner has requested to leave these pots as proof of pre-existing square footage for the Humboldt County Permitting process. After this property has been approved for the pre-existing square footage these cultivation related waste will be disposed of prior to 10/15/2019.		



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WRPP - Mitigation Report

WDID# -1B171720CHUM

Unique Point	Lat-Long NAD 83	Road Type	Mitigation Planned	Monitor	1600	Standard Conditions	Treatment Priority	Date Completed
6	-123.815 40.2227	-	X	X	-	A.1.	Prior to 10/15/19	

Current Condition: The edge of this cultivation area is approximately 63.5ft from a Class III watercourse. This graded area drains away from this watercourse.

Prescribed Action: It has been recommended to install a berm or staked straw waddle around the entire eastern and southern edge of this cultivation area. Additionally all exposed soils within this Cultivation Area shall be seeded and mulched.

BMP: General BMPs

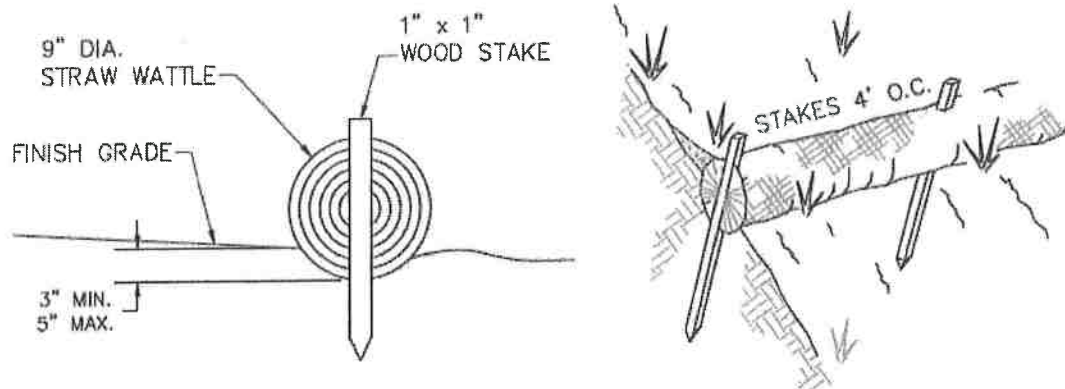
- If operations require moving of equipment across a flowing stream, such operations shall be conducted without causing a prolonged visible increase in stream turbidity. For repeated crossings, the operator shall install a bridge, culvert, or rock-lined crossing.
- During construction in flowing water, which can transport sediment downstream, the flow shall be diverted around the work area by pipe, pumping, temporary diversion channel or other suitable means. When any dam or artificial obstruction is being constructed, maintained, or placed in operation, sufficient water shall at all times be allowed to pass downstream to maintain fish life below the dam. Equipment may be operated in the channel of flowing live streams only as necessary to construct the described construction.
- Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. The disturbed portion of any stream channel shall be restored to as near their original condition as possible. Restoration shall include the mulching of stripped or exposed dirt areas at crossing sites prior to the end of the work period.
- Structures and associated materials not designed to withstand high seasonal flow shall be removed to areas above the high-water mark before such flows occur.
- No debris, soil, silt, sand, bark, slash, sawdust, rubbish, cement or concrete washing, oil or petroleum products, or other organic or earthen material from any logging, construction, or associated activity of whatever nature shall be allowed to enter into or be placed where it may be washed by rainfall or runoff into waters of the State. When operations are completed, any excess materials or debris shall be removed from the work area. No rubbish shall be deposited within 150 feet of the high-water mark of any stream.

BMP: General Erosion Control

- Timing for soil stabilization measures within the 100 feet of a watercourse or lake: For areas disturbed from May 1 through October 15, treatment shall be completed prior to the start of any rain that causes overland flow across or along the disturbed surface. For areas disturbed from October 16 through April 30, treatment shall be completed prior to any day for which a chance of rain of 30 percent or greater is forecast by the National Weather Service or within 10 days, whichever is earlier.
- Within 100 feet of a watercourse or lake, the traveled surface of logging roads shall be treated to prevent waterborne transport of sediment and concentration of runoff that results from operations. Treatment may consist of, but not limited to, rocking, out sloping, rolling dips, cross drains, water bars, slope stabilization measures, or other practices appropriate to site-specific conditions.
- The treatment for other disturbed areas within 100 feet of a watercourse or lake, including: (A) areas exceeding 100 contiguous square feet where operations have exposed bare soil, (B) approaches to road watercourse crossings out to 100 feet or the nearest drainage facility, whichever is farthest, (C) road cut banks and fills, and (D) any other area of disturbed soil that threatens to discharge sediment into waters in amounts deleterious to the quality and beneficial uses of water, shall be grass seeded and mulched with straw or fine slash. Grass seed shall be applied at a rate exceeding 100 pounds per acre. Straw mulch shall be applied in amounts sufficient to provide at least 2- 4-inch depth of straw with minimum 90% coverage. Slash may be substituted for straw mulch provided the depth, texture, and ground contact are equivalent to at least 2 – 4 inches of straw mulch. Any treated area that has been subject to reuse or has less than 90% surface cover shall be treated again prior to the end of operations.
- Within 100 feet of a watercourse or lake, where the undisturbed natural ground cover cannot effectively protect beneficial uses of water from operations, the ground shall be treated with slope stabilization measures described in #3 above per timing described in #1 above.
- Side cast or fill material extending more than 20 feet in slope distance from the outside edge of a landing which has access to a watercourse or lake shall be treated with slope stabilization measures described in #3 above. Timing shall occur per #1 above unless outside 100 feet of a watercourse or lake, in which completion date is October 15.
- All roads shall have drainage and/or drainage collection and storage facilities installed as soon as practical following operations and prior to either (1) the start of any rain which causes overland flow across or along the disturbed surface within 100 feet of a watercourse or lake protection, or (2) any day with a National Weather Service forecast of a chance of rain of 30 percent or more, a flash flood warning, or a flash flood watch.

BMP: General Erosion Control (Cont.)

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

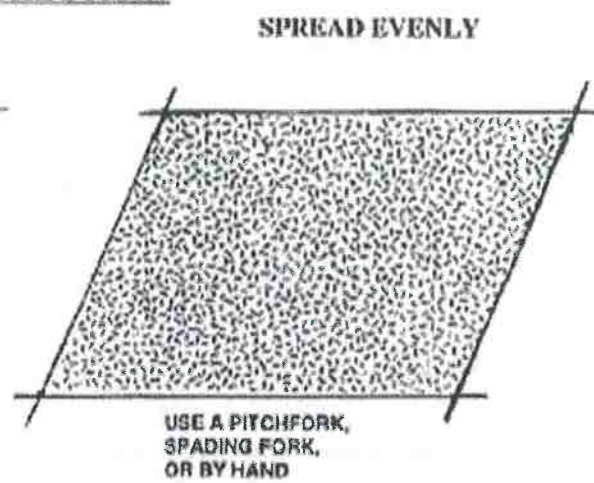
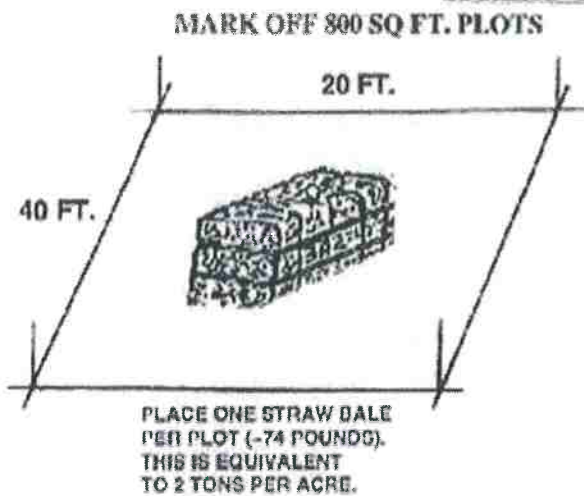


BMP: General Erosion Control (Cont.)

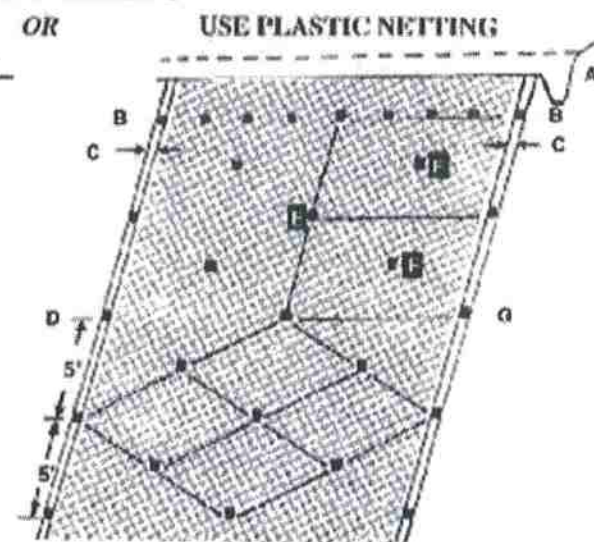
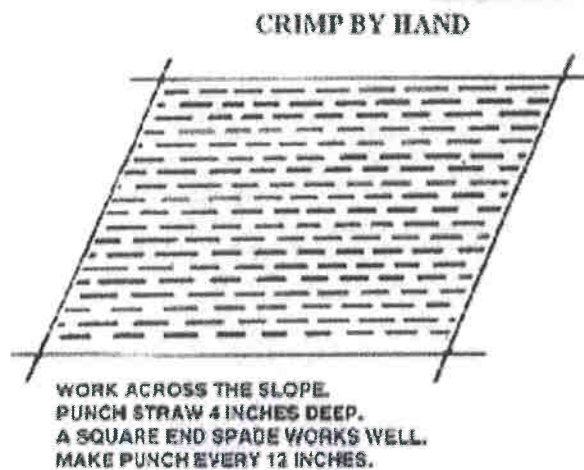


BMP: General Erosion Control (Cont.)

SPREAD THE STRAW



ANCHOR THE STRAW

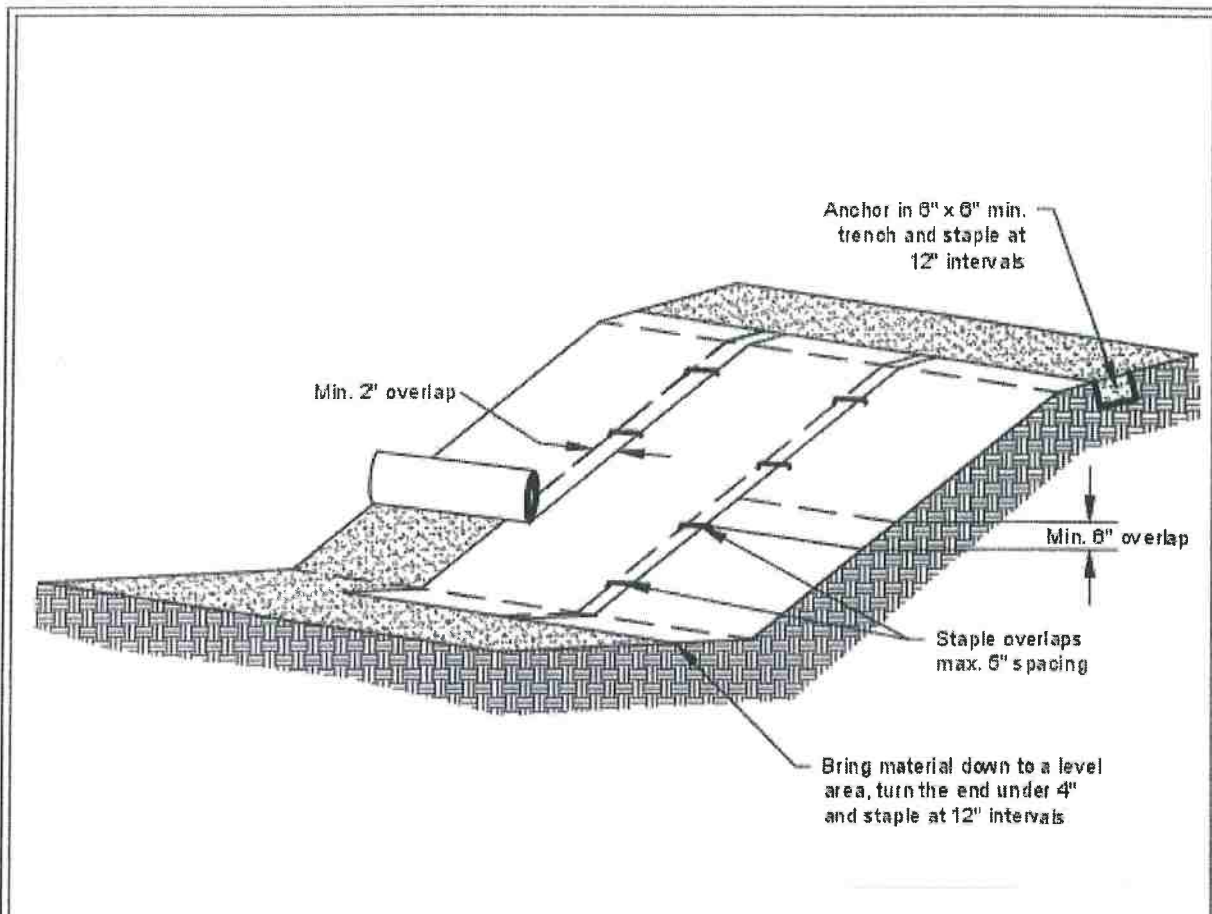


- A. LAY BIRD CONTROL NETTING OR SIMILAR MATTING IN STRIPS DOWN THE SLOPE OVER THE STRAW. BURY UPPER END IN 6-8 INCH DEEP AND WIDE TRENCH.. MOST NETTING COMES IN 14 TO 17 FT. WIDE ROLLS.
- B. SECURE THE UPPER END WITH STAKES EVERY 2 FEET.
- C. OVERLAP SEAMS ON EACH SIDE 4-5 INCHES.
- D. SECURE SEAMS WITH STAKES EVERY 5 FEET.
- E. STAKE DOWN THE CENTER EVERY 5 FEET.

- F. STAKE MIDDLES TO CREATE DIAMOND PATTERN THAT PROVIDES STAKES SPACED 4-5 FEET APART.
- G. USE POINTED 1X2 INCH STAKES 8 TO 9 INCHES LONG. LEAVE 1 TO 2 INCH TOP ABOVE NETTING, OR USE "U" SHAPED METAL PINS AT LEAST 9 INCHES LONG.

NOTE: WHEN JOINING TWO STRIPS, OVERLAP UPPER STRIP 3 FEET OVER LOWER STRIP AND SECURE WITH STAKES EVERY 2 FEET LIKE IN "B" ABOVE

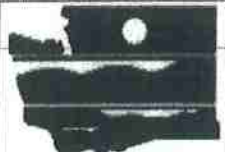
BMP: General Erosion Control (Cont.)



Notes:

1. Slope surface shall be smooth before placement for proper soil contact.
2. Stapling pattern as per manufacturer's recommendations.
3. Do not stretch blankets/matting tight - allow the rolls to mold to any irregularities.
4. For slopes less than 3H:1V, rolls may be placed in horizontal strips.
5. If there is a berm at the top of the slope, anchor upslope of the berm.
6. Lime, fertilize, and seed before installation. Planting of shrubs, trees, etc. should occur after installation.

NOT TO SCALE



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State of Washington

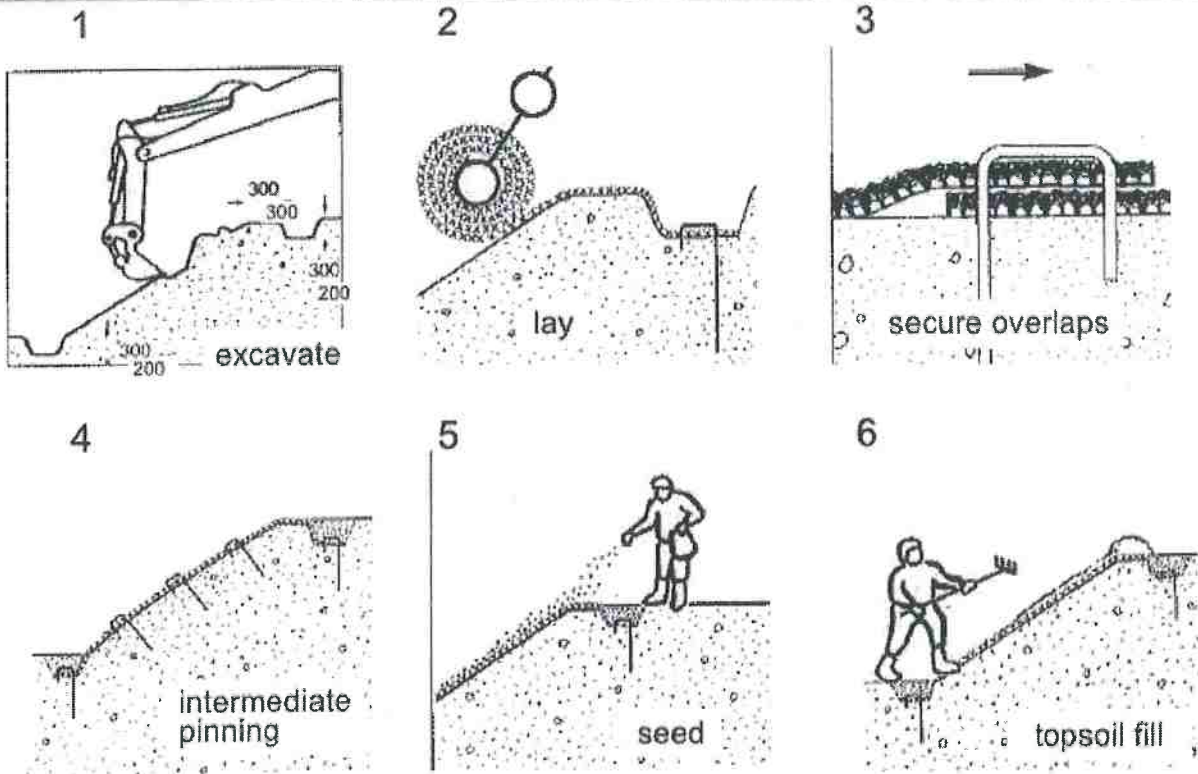
Slope Installation

Revised June 2016

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BMP: General Erosion Control (Cont.)

Installation of a geosynthetics mat - Enkamat



BMP: General Erosion Control Techniques

TABLE 34. Guidelines for erosion and sediment control application

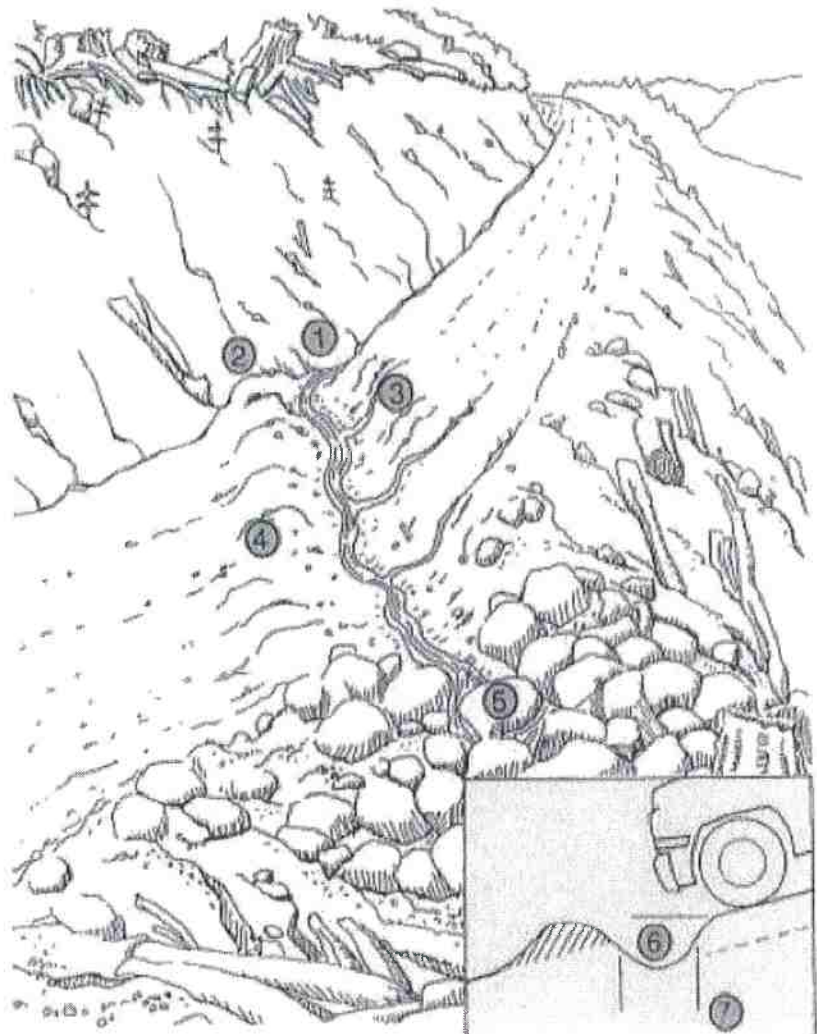
Timing of application	Technique	Portion of road and construction area treated
Erosion control during construction	Hydromulching, hydroseeding	Road fill slopes, cut slopes, bare soil areas
	Dry seeding	Road fill slopes, cut slopes, bare soil areas
	Wood chip, straw, Excelsior or tackified mulch	Road fill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

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BMP: Waterbar Construction

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

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BMP: Rolling Dip

- Rolling dips are drainage structures designed to capture and discharge surface water collected on road surfaces and in inside ditches at a specific location.
- The road shall dip into and out of the rolling dip to eliminate the possibility of water flowing along the road surface or in an inside ditch to bypass the dip structure.
- The rolling dip shall be constructed with clean native materials.
- The rolling dips outlet may be armored to resist downcutting and erosion.
- Do not discharge rolling dips into swales that show signs of instability or active landsliding.
- If the rolling dip is designed to divert both road surface and ditch runoff, block the down-road ditch with compacted fill.

BMP: Rocked Rolling Dip

- Rocked Rolling dips are drainage structures designed to capture and discharge surface water collected on road surfaces and in inside ditches at a specific location.
- The road shall dip into and out of the rolling dip to eliminate the possibility of water flowing along the road surface or in an inside ditch to bypass the dip structure.
- The rocked rolling dips inlet and outlet shall be armored to resist downcutting and erosion.
- The entire length of the rocked rolling dip shall be rock armored to a minimum of 5-feet from the centerline of the dip.
- If a keyway is necessary, the rocked rolling dip keyway shall be constructed at the base of the dip and shall be of sufficient size, depth, and length to support materials used in the rocked rolling dip construction back up to the road crossing interface.
- Do not discharge rolling dips into swales that show signs of instability or active landsliding.
- If the rolling dip is designed to divert both road surface and ditch runoff, block the down-road ditch with compacted fill.
- The rolling dip must be drivable and not significantly inhibit traffic and road use.

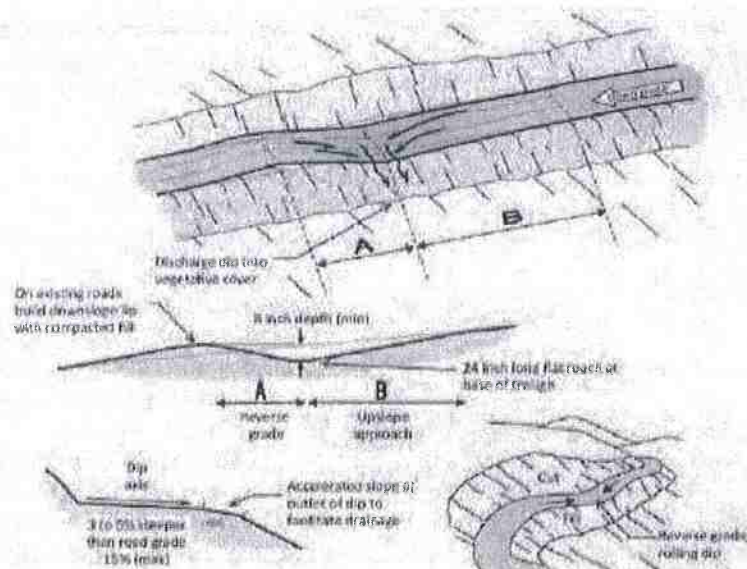
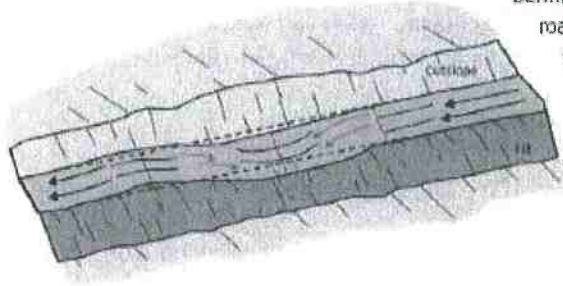


FIGURE 34. A classic Type I rolling dip, where the excavated up-road approach (B) to the rolling dip is several percent steeper than the approaching road and extends for 60 to 80 feet to the dip axis. The lower side of the structure reverses grade (A) over approximately 15 feet or more, and then falls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

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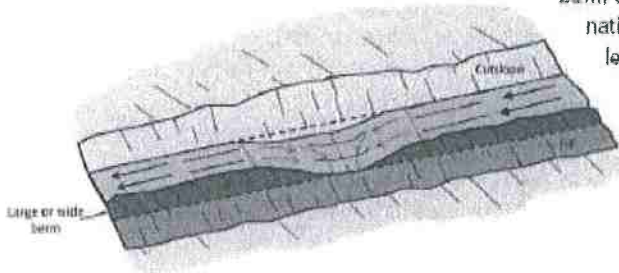
BMP: Rolling Dip and Rocked Rolling Dip (Cont.)

Type 1 Rolling Dip (Standard)



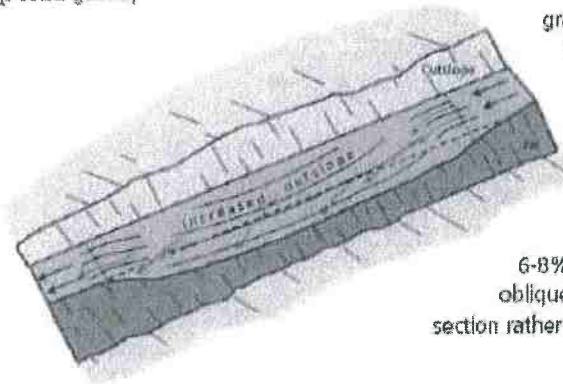
Type 1 rolling dips are used where road grades are less than about 12-14% and road runoff is not confined by a large through cut or berm. The axis of the dip should be perpendicular to the road alignment and sloped at 3-4% across the road tread. Steep roads will have longer and more abrupt dip dimensions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

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



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

Type 3 Rolling Dip (Steep road grade)



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

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

FIGURE 36. Rolling dip types

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BMP: Lead out ditch

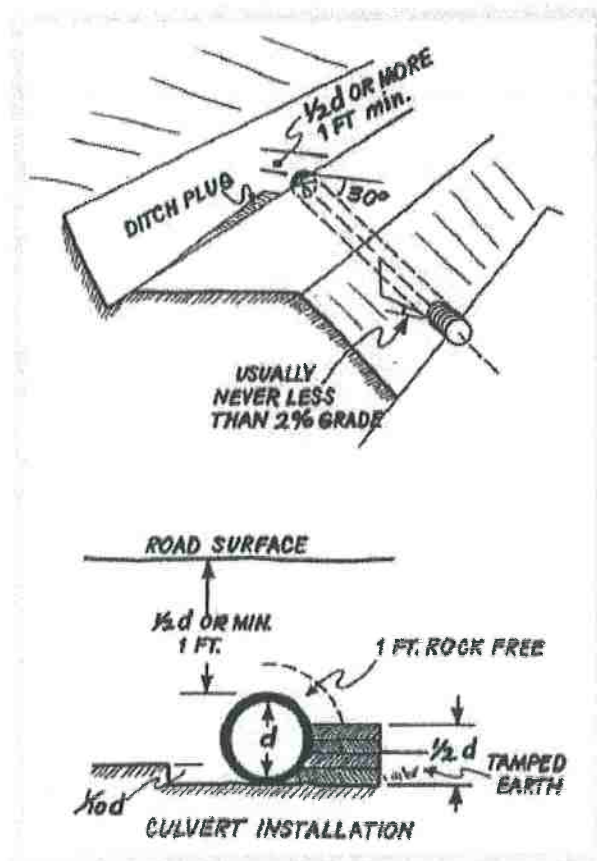


FIGURE 55. Steep roads that go straight up or down a hillside are very difficult to drain. This steep, fall line road developed a through cut cross section that was drained using lead out ditches to direct runoff off the road and onto the adjacent, vegetated hillside. The road was "outsloped" to drain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

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BMP: Ditch Relief Culvert

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



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FIGURE 4B. The elements of a properly installed ditch relief culvert. The culvert is angled at about 30 degrees to the road alignment to help capture flow and prevent culvert plugging or erosion of the inlet area. It is set at the base of the fill (ideally) or with a grade slightly steeper than the grade of the contributing ditch (but never with a grade less than 2 percent) (USDA-SCS, 1983). At a minimum, the grade of the ditch relief culvert should be sufficient to prevent sediment accumulation at the inlet or deposition within the culvert itself (it should be self-cleaning) (USDA-SCS, 1983).

BMP: Ditch Relief Culvert (Cont.)**FIGURE 39.**

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

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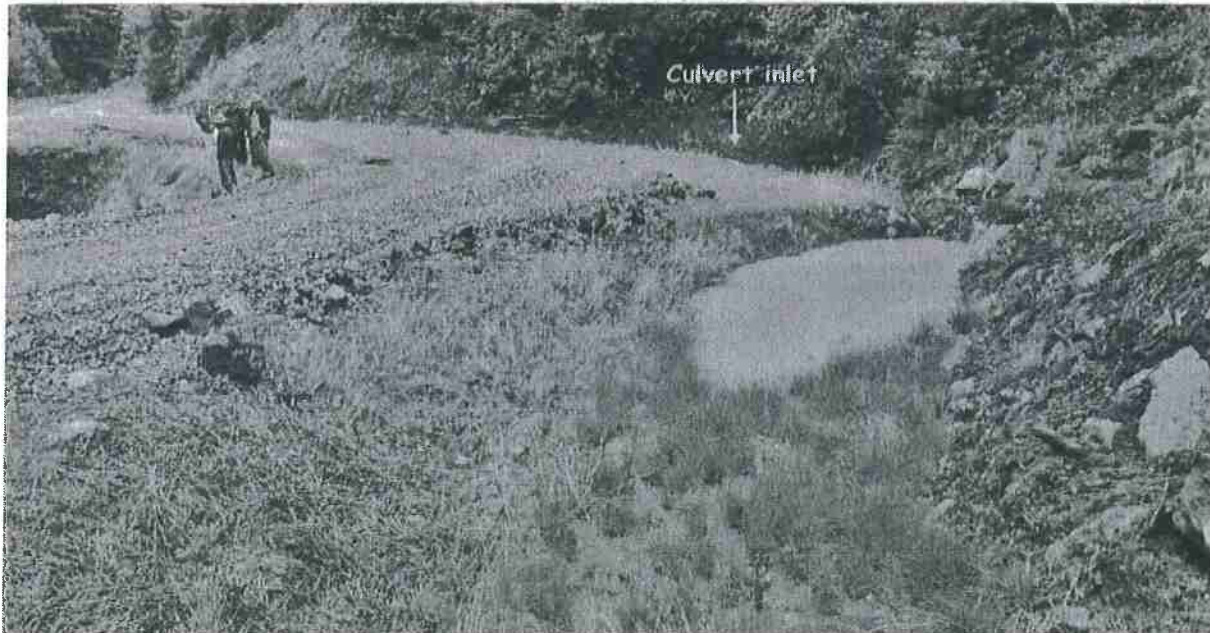


FIGURE 238. Traffic and surface runoff from graveled roads often produces surface erosion, turbid runoff and fine sediment transport that can be delivered to streams. Where ditches can't be eliminated, sediment traps and roadside settling basins can be installed to capture and remove most of the eroded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

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BMP: Storage Bladders

- Storage bladders shall be located and designed to minimize the potential for impacts due to rolling and/or failure. Storage bladders should be stored on flat slopes where stability will not be affected.
- Storage bladders shall be located to minimize the potential for water to flow into a watercourse in the event of a catastrophic failure.
- Bladders shall not be used unless the bladder is safely contained within a secondary containment system with sufficient capacity to capture 110 percent of a bladders maximum volume in the vent of bladder failure.
- Secondary containment is recommended in the form of a dirt berm, containment pit, combination of both, or impermeable material with skeletal support. The containment should be capable of holding 110 percent of the bladders volume.
- Secondary containment systems shall be of sufficient strength and stability to withstand the forces of released contents in the event of catastrophic bladder failure.
- Secondary containment systems that are exposed to precipitation shall be designed and maintained with sufficient capacity to accommodate precipitation and storm water inputs from a 25-year, 24-hour storm event.
- Bladders and containment systems shall be periodically inspected to ensure integrity.



This is an example of a containment pit which will assist in mitigating the impacts if this storage bladder failed.

BMP: Cultivation Site Restoration

- Remove all cultivation and associated materials from designated cultivation site.
 - This includes plant mass, root balls, potting containers, cultivation medium and any materials associated with the preparation, cultivation, and harvest of commercial cannabis.
 - Cultivation medium removed from the site shall be stored/disposed of in compliance with Order conditions related to spoils management.
- All disturbed and/or unstable slopes shall be stabilized and returned to pre-project conditions.
 - Slopes shall be contoured as close as feasible to natural grade and aspect.
 - Temporary erosion control shall be applied to prevent sediment run-off.
- Soil exposed as a result of project work, soil above rock riprap, and interstitial spaces between rocks shall be revegetated with native species by live planting, seed casting, or hydroseeding prior to the rainy season of the year work is completed.
 - 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.
 - Native forbes and graminoids shall be planted to replace sediment stabilization, sediment filtration and nutrient filtration
 - Native trees and shrubs shall be planted to replace bank stabilization, inputs of large woody debris and temperature control within riparian areas.
 - Restoration of the quality/health of the riparian stand shall 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.