



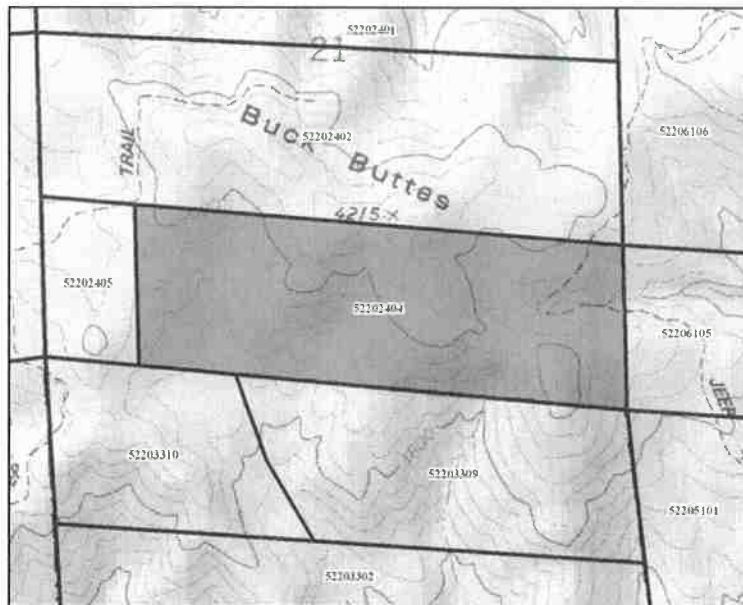
**Site Management Plan Technical Report**  
**Order WQ 2019-0001-DWQ**  
*For*



**RGI Farms**  
**APN 522-024-004**

*Located off*  
**New Three Creeks Road**  
**Willow Creek, California**

**December 2021**



RGI Farms  
WDID #1\_12CC418042  
Humboldt County APN: 522-024-004  
Willow Creek, CA

---

Prepared by:  
Jack Skeahan, Project Geologist  
jacks@pacificwatershed.com  
Pacific Watershed Associates Inc.  
P.O. Box 4433, Arcata, CA 95518  
(707) 839-5130

**TABLE OF CONTENTS**

**I. INTRODUCTION AND PROJECT SUMMARY**..... 1

**II. CERTIFICATIONS, LIMITATIONS AND CONDITIONS**..... 2

**III. SITE MANAGEMENT PLAN – ORDER WQ 2019-0001-DWQ REQUIREMENTS**..... 5

**1.0 SEDIMENT DISCHARGE BPTC MEASURES**..... 5

    1.1 SITE CHARACTERISTICS..... 5

        1.1.1 Site Map..... 5

        1.1.2 Access, Maintenance, and Storm Water..... 5

        1.1.3 Stream Crossings..... 8

            1.1.3.1 Legacy Waste Discharge Issues for Region 1..... 9

    1.2 SEDIMENT EROSION PREVENTION AND SEDIMENT CAPTURE..... 9

        1.2.1 Erosion Prevention and Sediment Control Measures: BPTCs, Schedule, and Map..... 10

        1.2.2 Maintenance Activities – Erosion Prevention and Sediment Control..... 10

            1.2.2.1 Monitoring and Maintenance..... 10

            1.2.2.2 Captured Sediment..... 11

        1.2.1 Erosion Control BPTC Measures – Interim and Long-term..... 12

**2.0 FERTILIZER, PESTICIDE, HERBICIDE, & RODENTICIDE BPTC MEASURES**... 12

    2.1 SUMMARY TABLE..... 12

    2.2 SITE MAP..... 13

    2.3 BULK FERTILIZERS AND CHEMICAL CONCENTRATES..... 13

    2.4 SPILL PREVENTION AND CLEANUP..... 13

**3.0 PETROLEUM PRODUCT BPTC MEASURES**..... 13

    3.1 SUMMARY TABLE..... 14

    3.2 SITE MAP..... 14

    3.3 HANDLING..... 14

    3.4 SPILL PREVENTION AND CLEANUP..... 14

**4.0 TRASH/REFUSE, AND DOMESTIC WASTEWATER BPTC MEASURES**..... 15

    4.1 TYPES, CONTAINMENT, AND DISPOSAL OF TRASH/REFUSE..... 15

        4.1.1 Site Map..... 15

    4.2 DOMESTIC WASTEWATER GENERATION AND DISPOSAL..... 15

        4.2.1 Domestic Wastewater Generation..... 15

        4.2.2 Domestic Wastewater Disposal..... 15

            4.2.2.1 Permitted onsite wastewater treatment system (e.g., septic tank and leach lines)..... 15

            4.2.2.2 Chemical toilets or holding tank. If so, provide the name of the servicing company and the frequency of service..... 16

4.2.2.3 Outhouse, pit privy, or similar. Use of this alternative requires approval from the Regional Water Board Executive Officer; include the approval from the Executive Officer and any conditions imposed for use of this alternative.	16
4.2.3 Site Map	16
<b>5.0 WINTERIZATION BPTC MEASURES</b>	<b>16</b>
5.1 WINTERIZATION ACTIVITIES	16
5.2 MAINTENANCE OF DRAINAGE OR SEDIMENT CAPTURE FEATURES	17
5.3 REVEGETATION	17
5.4 BPTC MEASURES THAT CANNOT BE COMPLETED BEFORE ONSET OF WINTER	17
5.5 LEGACY WASTE DISCHARGE ISSUES FOR SPECIFIC REGIONS	17
<b>IV. LANDOWNER/LESSEE CERTIFICATION/SIGNATURES</b>	<b>19</b>
<b>LIST OF FIGURES</b>	
Figure 1. Site Management Plan Location Map for APN 522-024-004, located near Willow Creek, Humboldt County, California	4
Figure 2. Site Management Plan Site Map for APN 522-024-004, located near Willow Creek, Humboldt County, California	18
<b>LIST OF TABLES</b>	
Table 1. Prioritized Implementation Schedule for Best Practicable Treatment or Controls (BPTC)	6
Table 2. Stream Crossings – Drainage Areas and Culvert Sizing Recommendations	9
Table 3. Fertilizer and Amendment Product List	12
Table 4. Petroleum Product List	14
<b>LIST OF APPENDICES</b>	
Appendix A. Water Resources Protection Plan (WRPP) for RGI Farms, Humboldt County APN 522-024-004	at end of report.

## I. INTRODUCTION AND PROJECT SUMMARY

Tier 1 and Tier 2 Dischargers enrolled in the State Water Resources Control Board (SWRCB) Cannabis Cultivation Policy Order WQ 2019-0001-DWQ, General Waste Discharge Requirements and Waiver of Waste Discharge Requirements for Discharges of Waste Associated with Cannabis Cultivation Activities (General Order) shall submit and implement a Site Management Plan (Plan) that describes how the Discharger is implementing the Best Practical Treatment or Control (BPTC) measures listed in Attachment A of the State Water Resource Control Board's Cannabis Cultivation Policy (approved April 16, 2019). The Plan may include a schedule to achieve compliance, but all work must be completed by the onset of winter period each year. (The due date does not relieve a Discharger from implementing the interim soil stabilization BPTC measures described in Attachment A.)

This report documents Pacific Watershed Associate's (PWA) Site Management Plan (Plan) for Humboldt County APN 522-024-004, located near Willow Creek, CA, as shown on Figure 1. This property is located approximately 5.6 miles northwest of Willow Creek, Humboldt County, CA, and hereinafter is referred to as the "Project Site."

The Project Site cultivator ("Discharger") has transferred enrollment in the North Coast Regional Water Quality Control Board (NCRWQCB) Order R1-2015-0023 to the State Water Resources Control Board (SWRCB) Cannabis Cultivation Policy Order WQ 2019-0001-DWQ, General Waste Discharge Requirements and Waiver of Waste Discharge Requirements for Discharges of Waste Associated with Cannabis Cultivation Activities (General Order). A Water Resource Protection Plan (WRPP) was prepared by the Discharger and is included as a supplemental attachment to this document. Several remedial measures recommended in the WRPP to comply with the Standard Conditions of the Regional Water Quality Control Board's Order have already been implemented by the landowner.

Based on the total disturbance area, slopes of disturbed areas, and riparian setbacks, this Project Site was enrolled as a **Tier 1 High Risk** under the State Water Resources Control Board (SWRCB) Cannabis Cultivation Policy Order WQ 2019-0001-DWQ, General Waste Discharge Requirements and Waiver of Waste Discharge Requirements for Discharges of Waste Associated with Cannabis Cultivation Activities (General Order). Since the enrollment was submitted to the General Order the landowner removed the small items within the riparian setbacks and a request for reclassification of risk level to a **Low Risk** site will be submitted to the SWRCB. Properties that fall into Tier 1 or 2 of the General Order are required to develop a Site Management Plan (Plan). This Plan has been developed for the Discharger based on site inspections made by PWA on the Project Site and references the remedial actions identified in the existing WRPP pertaining to the Project Site. PWA's recommendations for any remediation or corrective actions are a result of water quality requirements under the General Order, including Best Practical Treatment or Control (BPTCs) designed to meet those requirements. This Plan documents the findings of a site visit and inspection conducted on August 22, 2018, by PWA Staff Geologists Jack Skeahan and Michelle Robinson, when a reconnaissance level investigation of the Project Site was conducted, and the conditions noted.

## II. CERTIFICATIONS, LIMITATIONS AND CONDITIONS

This Plan has been reviewed by a California licensed professional geologist at PWA and all information herein, including treatment recommendations, are based on observations, data, and information collected by PWA staff.

This Plan has been prepared to: 1) provide specific BPTC measures to be utilized on the Project Site to minimize potential threats to water quality, 2) provide itemized remedial actions to be taken on the Project Site to correct existing or potential water quality threats or impacts and meet the general waste discharge requirements of the General Order, 3) provide a revised schedule for the implementation of the itemized remedial actions, and 4) provide implementation schedules for all Winterization and BPTC measures. The analysis and recommendations submitted in this Plan and attached WRPP are based on PWA's evaluation of the Project Site and activities which fall under the General Order.

In this Plan we have described the recent and current conditions of the Project Site and any water resource and water quality risk factors we observed during our site inspections. PWA is not responsible for problems or issues we did not observe on our site inspections, or for changes that have naturally occurred or been made to the Project Site after our site review. The interpretations and conclusions presented in this Plan are based on reconnaissance level site investigations of inherently limited scope. Observations are qualitative, or semi-quantitative, and confined to surface expressions of limited extent and artificial exposures of subsurface materials. Interpretations of problematic geologic, geomorphic, or hydrologic features such as unstable hillslopes, erosional processes, and water quality threats are based on the information available at the time of our inspection and on the nature and distribution of existing features we observed on the Project Site.

A schedule of itemized remedial actions that are based on these observations is included with this Plan. The remedial actions provided in this Plan have been developed from professional opinions derived in accordance with current standards of professional practice and are valid as of the date of the most recent or most applicable field inspection. No other warranty, expressed or implied, is made. Furthermore, to ensure proper applicability to existing conditions, the information and remedial actions contained in this report shall be regularly reevaluated and it is the responsibility of the landowner and/or lessee operating under the General Order to ensure that no remedial actions or recommendations are inappropriately applied to conditions on the Project Site that have changed since the recommendations were developed.

If site conditions have changed for any reason, the Project Site should be reevaluated, and the Plan and associated recommendations revised and updated as required. These conditions include any changes in land management activities or Project Site conditions that have occurred since our site visit (regardless of what they are, how they occurred, or who performed them). Similarly, if the landowner/lessee uses portions of this Project Site not identified or covered under the current Plan, this Plan will need to be updated with the new information, including possible additions or changes to the recommended remedial or corrective actions and BPTCs.

The person, persons, business or other entity listed as the enrollee under the General Order is responsible for complying with all the requirements thereunder, including the WRPP and related recommendations and requirements, regardless of who is operating or cultivating on that Project Site. If the enrollee is not the sole landowner and fails to comply with the Order and its

requirements, the landowner or remaining landowners will automatically assume responsibility for the requirements therein, including all related penalties or actions brought by the SWRCB and/or NCRWQCB.

If at any time in the future the Project Site is to transfer ownership, it is the responsibility of the current owner(s), or their representative(s), to ensure that the information and recommendations contained herein are called to the attention of any future owner or agent for the Project Site. Unless this Plan is modified by the SWRCB or NCRWQCB, the findings and recommendations contained in this Plan shall be utilized as a tool while implementing the Plan remedial actions. Necessary steps shall be taken to see that contractor(s) and subcontractor(s) carry out such recommendations in the field in accordance with the most current Plan and BPTC standards.

PWA will be responsible for the data, interpretations and recommendations developed by PWA, but will not be responsible for the interpretation by others of that information, for implementation of corrective actions by others, or for additional or modified work arising out of those plans, interpretations, and recommendations. PWA assumes no liability for the performance of other workers or suppliers while following PWA's recommendations in the Plan, unless PWA is under contract to perform or oversee those activities. Additionally, PWA is not responsible for changes in applicable or appropriate standards beyond our control, such as those arising from changes in legislation or regulations, or the broadening of knowledge which may invalidate or alter any of our findings or recommended actions.

Any Plan review or construction management services that may be needed or identified in the recommendations sections of this Plan are separate tasks from the preparation of this Plan and are not a part of the contract under which this Plan was prepared. If requested, additional PWA field inspections, surveys, Plan revisions/updates, project layout, design, permitting, construction oversight/management, or other related services arising from tasks described and recommended in the Plan may be performed under separate agreements requiring advance notice and contracting.

PWA's services consist of professional opinions and recommendations made in accordance with generally accepted principles and practices. No warranty, expressed or implied, or merchantability or fitness, is made or intended in connection with our work, by the proposal for consulting or other services, or by the furnishing of oral or written reports or findings. This Plan, as written or as modified in writing, takes precedence over all other communication. If the client desires assurances against project failures, they shall obtain appropriate insurance through their own insurance broker or guarantor.

Prepared by:



---

Jack Skeahan, Project Geologist  
Pacific Watershed Associates, Inc.  
P.O. Box 4433, Arcata, California 95518  
Plan finalized on: 12/31/2021

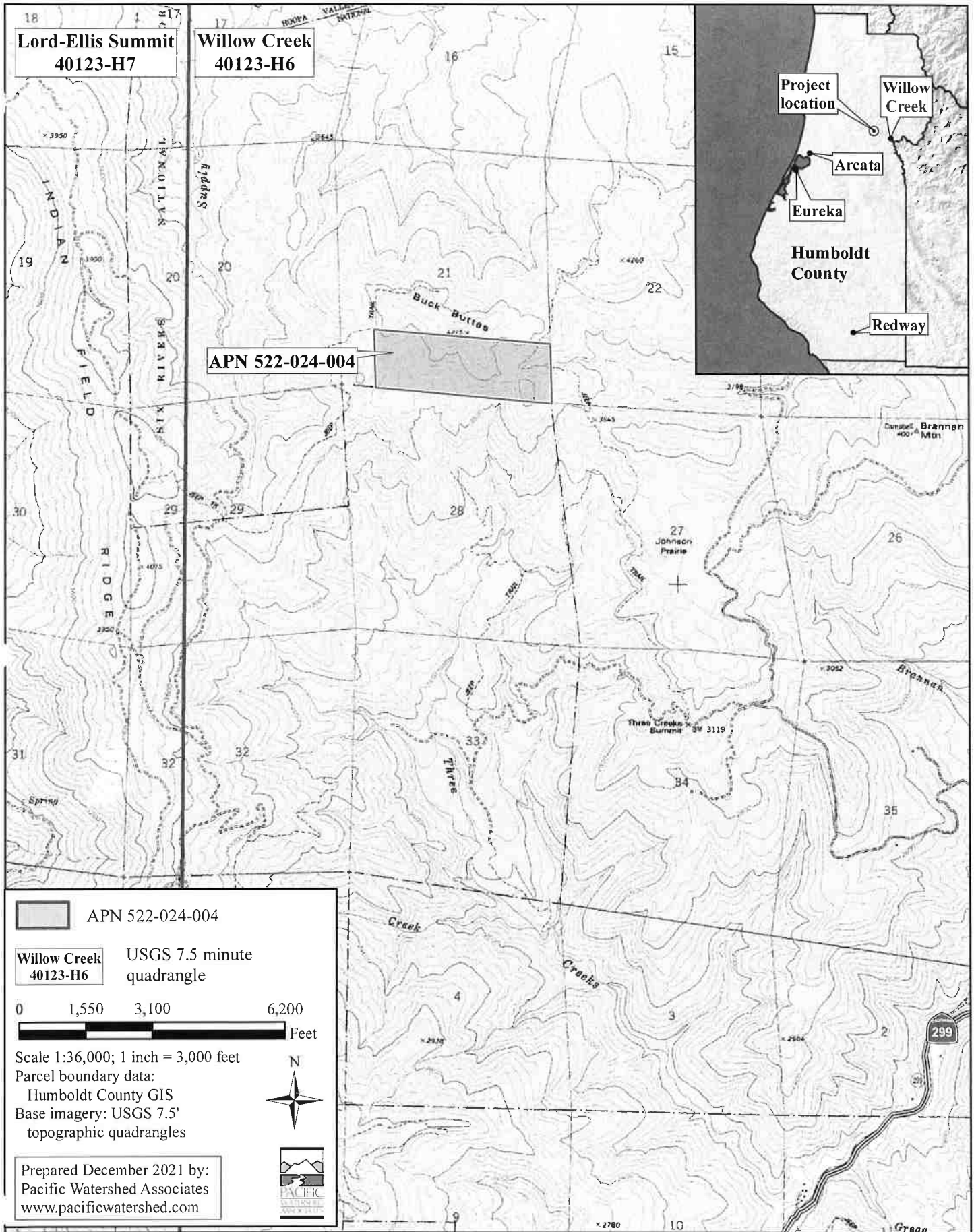


Figure 1. Site Management Plan Location Map for APN 522-024-004, located near Willow Creek, Humboldt County, California

### III. SITE MANAGEMENT PLAN – ORDER WQ 2019-0001-DWQ REQUIREMENTS

#### 1.0 SEDIMENT DISCHARGE BPTC MEASURES

##### 1.1 Site Characteristics

###### 1.1.1 Site Map

See the attached Site Map (Figure 2) showing access roads, vehicle parking areas, streams, stream crossings, cultivation site(s), disturbed areas, buildings, and other relevant site features as applicable which are listed below:

- for Region 1 dischargers: legacy waste discharge issues that exist on the Project Site
- erosion prevention BPTC measures
- sediment control BPTC measures
- winterization BPTC measures
- fertilizers and amendments storage locations
- petroleum product storage locations
- trash/refuse storage locations
- Onsite Wastewater Treatment System(s) (OWTS), including any domestic wastewater treatment, storage, or disposal area(s)

###### 1.1.2 Access, Maintenance, and Storm Water

*Describe the access road conditions including estimating vehicle traffic, road surface (e.g., paved, rocked, or bare ground), and maintenance activities. Describe how storm water is drained from the access road (e.g., crowned, out slope, armored ditch, culverts, rolling dips, etc.).*

There are a total of 1.62 miles of former logging road and 0.13 miles of skid road on the Project Site, with the majority constructed many decades ago and currently in use. The main access roads on the Project Site (New 3 Creeks Road and the Main Road) receive a low to moderate amount of vehicle traffic depending on the time of year while the remaining access roads (Access Road #1 - #4) receive a low amount of vehicle traffic. One ditch relief culvert (DRC) exists on the Main Road and although evidence of sediment delivery to surface waters was not observed this DRC will be monitored and maintained on a regular basis. If significant erosion or delivery to surface waters is observed appropriate BPTC measures will be implemented to protect water quality. There is one segment of skid road along a ridge used to access water storage features that lacks formal drainage structures although significant surface erosion and/or sediment delivery to surface waters had not been observed. Abandoned legacy road segments were not observed on the Project Site.

Multiple rolling dips are proposed for construction on the access roads on the Project Site at the locations shown on Figure 2 to disconnect concentrated



road runoff from nearby watercourses and decrease surface erosion (see Table 1, below, for specific BPTC measures). It is recommended that the skid road be regularly monitored and if significant surface erosion or sediment delivery to watercourses is observed appropriate BPTCs, such as water bars, straw mulch and a limited wet season vehicle use management plan, will be implemented to mitigate impacts on water quality.

Cleared and terraced areas on the Project Site are located a significant distance from streams and were not observed to show signs of significant erosion or sediment mobilization. Any disturbed areas at the cultivation areas or elsewhere on the Project Site will be treated with appropriate BPTC measures to protect water quality.

It is recommended that all water tanks on the Project Site be equipped with shut-off float valves, where applicable, to prevent overtopping and all plumbing infrastructure be inspected on a regular basis and repaired as needed to prevent leaks.

Table 1. Prioritized Implementation Schedule for Best Practicable Treatment or Controls (BPTC)

Schedule	Map Point or Location	Summary of Corrective Actions/Recommendations (see more detailed listing of corrective actions in Appendix A - WRPP)
<b>CA – Cultivation Area    DA – Disturbed Areas    OWTS – Onsite Wastewater Treatment System</b> <b>SC – Stream Crossing    RD – Rolling Dip    W – Winterization    W – Water Bar    GH - Greenhouse</b> <b>OD – Outdoor    DRC – Ditch Relief Culvert    &lt;E&gt; – Existing    &lt;P&gt; – Proposed</b>		
<b><u>Cultivation Areas</u></b>		
Nov 15 – Dec 15 Annually	<E> BPTC; <P> BPTC/W; GH #1 – GH #6 OD #2, OD #6	1) Plastic tarps will be removed from hoop houses over the winter season. 2) Plant cover crops, tarp, or otherwise cover any growing medium in beds, pots, or piles to prevent nutrient leaching and transport. 3) Unless areas are naturally revegetated, seed and mulch all bare soil areas with 1) barley or wheat-based erosion control seed that does not contain Annual or Perennial Ryegrass and 2) weed-free straw. 4) All erosion control measures will be monitored during and after each storm event that produces at least 0.5 in/day or 1.0 in/week of precipitation and repaired or replaced as needed.
<b><u>Stream Crossings</u></b>		
10/15/2023 and ongoing	<P> BPTC/W; SC #1	1) Upgrade SC #1 with a properly sized 48-inch diameter culvert installed in line with the natural stream alignment with the outlet at the base of the outboard fillslope. Install a single post trash rack upstream of the culvert inlet to reorient any woody debris in transport parallel to the culvert alignment and minimize the potential for plugging. Construct a critical dip on the right hinge line of the stream crossing to prevent diversion in the event of culvert plugging or hydraulic exceedance. 2) Stream Crossing #1 will be upgraded according to current standards (see LSAA Notification once developed and submitted). 3) Monitor and maintain the stream crossing and culvert inlet/outlet until upgrade treatments are implemented. After the culvert is installed monitor and maintain the culvert inlet/outlet and monitor SC #1 on a regular basis to ensure functionality and that erosion or sediment delivery to watercourses is not occurring.

Schedule	Map Point or Location	Summary of Corrective Actions/Recommendations (see more detailed listing of corrective actions in Appendix A - WRPP)
<b>CA – Cultivation Area    DA – Disturbed Areas    OWTS – Onsite Wastewater Treatment System</b> <b>SC – Stream Crossing    RD – Rolling Dip    W – Winterization    W – Water Bar    GH - Greenhouse</b> <b>OD – Outdoor    DRC – Ditch Relief Culvert    &lt;E&gt; – Existing    &lt;P&gt; – Proposed</b>		
10/15/2023 and ongoing	<P> BPTC/W; SC #2	<ol style="list-style-type: none"> <li>1) Upgrade SC #2 with a properly sized 42-inch diameter culvert installed in line with the natural stream alignment with the outlet at the base of the outboard fillslope. Install a single post trash rack upstream of the culvert inlet to reorient any woody debris in transport parallel to the culvert alignment and minimize the potential for plugging. Construct a critical dip on the right hinge line of the stream crossing to prevent diversion in the event of culvert plugging or hydraulic exceedance.</li> <li>2) Stream Crossing #2 will be upgraded according to current standards (see LSAA Notification once developed and submitted).</li> <li>3) Monitor and maintain the stream crossing and culvert inlet/outlet until upgrade treatments are implemented. After the culvert is installed monitor and maintain the culvert inlet/outlet and monitor SC #2 on a regular basis to ensure functionality and that erosion or sediment delivery to watercourses is not occurring.</li> </ol>
<b><u>Roads</u></b>		
10/15/2023 and ongoing	<E>/<P> BPTC; RD/DRC/WB	<ol style="list-style-type: none"> <li>1) &lt;P&gt;: Construct rolling dips along the roads to reduce hydrologic connectivity and sediment delivery to the stream network at the locations shown on Figure 2.</li> <li>2) If significant erosion of the skid road and fine-grained sediment delivery to watercourses is observed install water bars at adequate spacing intervals.</li> <li>3) Once constructed monitor and maintain rolling dips and water bars, if installed, replacing/reshaping as needed to maintain functionality.</li> <li>4) &lt;E&gt;: Continue to monitor and maintain the existing DRC inlet and outlet to prevent plugging, maintain functionality and mitigate erosion.</li> </ol>
<b><u>Disturbed Areas</u></b>		
10/15/2022 and Nov 15 – Dec 15 Annually	<P> BPTC/W; DA	<ol style="list-style-type: none"> <li>1) To reduce surface erosion, seed and mulch all bare soil areas with 1) barley or wheat-based erosion control seed that does not contain Annual or Perennial Ryegrass and 2) weed-free straw.</li> <li>2) All erosion control measures will be monitored during and after each storm event that produces at least 0.5 in/day or 1.0 in/week of precipitation and repaired or replaced as needed.</li> </ol>
<b><u>Fertilizer Storage</u></b>		
10/15/2022 and ongoing	<P> BPTC; Fertilizer storage	<ol style="list-style-type: none"> <li>1) Fertilizer containers will be stored under a roof (e.g., travel trailer, storage shed, etc.), off the ground, with adequate secondary containment. If stored or stockpiled outdoors, potting soils, compost, and fertilizers will be fully tarped or seeded in a stable location with runoff being diverted away from the storage area(s), so that there is no chance of nutrient leaching or delivery to surface waters. In addition, install a temporary perimeter sediment barrier (compost berms, temporary silt dikes, fiber rolls, silt fences, sandbags, gravel bags, or biofilter bags) surrounding the stockpile area.</li> </ol>
<b><u>Chemical Storage</u></b>		
10/15/2022 and ongoing	<P> BPTC; Chemical storage	<ol style="list-style-type: none"> <li>1) If brought onsite petroleum products and other non-cultivation related chemicals will be stored properly and equipped with adequate secondary containment basins capable of containing the entire stored volume.</li> </ol>

Schedule	Map Point or Location	Summary of Corrective Actions/Recommendations (see more detailed listing of corrective actions in Appendix A - WRPP)
<b>CA – Cultivation Area    DA – Disturbed Areas    OWTS – Onsite Wastewater Treatment System</b> <b>SC – Stream Crossing    RD – Rolling Dip    W – Winterization    W – Water Bar    GH - Greenhouse</b> <b>OD – Outdoor    DRC – Ditch Relief Culvert    &lt;E&gt; – Existing    &lt;P&gt; – Proposed</b>		
<b>Trash/Refuse, and Domestic Wastewater</b>		
10/15/2022 and ongoing	<E> BPTC; Trash/Refuse	1) Continue to collect and properly store household and cultivation-related wastes before disposing of these materials at an approved waste facility.
10/15/2022 for OWTS 10/15/2021 for portable toilet	<E>/<P> BPTC; OWTS and portable toilet	1) The Order requires one or more county-approved (permitted) OWTS on the Project Site. Proof of permitting through the Humboldt County Division of Environmental Health (HCDEH) is required. As no permitted OWTS currently exists on the Project Site continue working towards getting a complete OWTS permitted and installed on the Project Site. The OWTS will be designed to accommodate the number of people onsite during peak cultivation activities. 2) One portable toilet is currently in use on the Project Site. Maintain the portable toilet in easily accessible locations near activity areas and outside of riparian setbacks. Continue utilizing the portable toilet until the OWTS can be designed, permitted, and constructed. Keep records of the cleaning and maintenance schedule for the portable toilet onsite.
All BPTC measures will conform to the State Water Resources Control Board Order WQ 2019-0001-DWQ guidelines. All BPTC measures are outlined in Section 2 of Attachment A of the General Order.		

### 1.1.3 Stream Crossings

*Describe any vehicle stream crossing including the type of crossing (e.g., bridge, culvert, low water, etc.).*

There are two stream crossings on the Project Site (Figure 2), also see Table 2, below), both of which are located on the Main Road.

Stream Crossing #1 (SC #1) currently has a slightly undersized 42-inch diameter corrugated metal pipe (CMP) installed in an oblique orientation to the road alignment in the upper watershed reach of main stem Campbell Creek. The culvert is undersized for the expected 100-year peak stream flow and associated debris based on culvert sizing calculations. The culvert outlets onto placed rock armor and a rocky stream channel and no splash erosion was observed. This stream crossing has diversion potential down the right road approach due to lack of a critical dip.

This stream crossing will be upgraded with a minimum 48-inch diameter culvert in line with the natural stream alignment with the outlet at the base of the outboard fillslope. A single post trash rack will be installed upstream of the culvert inlet to reorient any woody debris in transport parallel to the culvert alignment and minimize the potential for plugging. A critical dip will be installed on the right hinge line of the stream crossing to prevent diversion in the event of culvert plugging or hydraulic exceedance.

Stream Crossing #2 currently has an undersized 15-inch diameter concrete culvert installed through a section of road with minimal fill depth. The culvert is undersized for the expected 100-year peak stream flow and associated debris based on culvert sizing calculations. The culvert has been installed high in the outboard fillslope with a 1 – 2-foot plunge below the outlet resulting in splash erosion. This stream crossing has diversion potential down the right road approach due to lack of a critical dip.

This stream crossing is proposed to be upgraded with a 42-inch diameter culvert in line with the natural stream alignment with the outlet at the base of the outboard fillslope. A single post trash rack will be installed upstream of the culvert inlet to reorient any woody debris in transport parallel to the culvert alignment and minimize the potential for plugging. A critical dip will be installed on the right hinge line of the stream crossing to prevent diversion in the event of culvert plugging or hydraulic exceedance.

Stream Crossing #1 and SC #2 will be upgraded as per the approved Lake or Streambed Alteration Agreement (LSAA) which is currently under development and once all other applicable permits are obtained.

Table 2. Stream Crossings – Drainage Areas and Culvert Sizing Recommendations<sup>1, 2, 3, 4</sup>

Stream crossing number	Existing culvert diameter (in)	Watershed area (acres)	Q100 – discharge estimate for 100-yr storm (cfs)	Recommended culvert diameter (in) using the 1.0 HW/D ratio	Recommended culvert diameter (in) using the 0.67 HW/D ratio
SC #1	42	35	55	48	72
SC #2	15	20	32	42	54

<sup>1</sup> Assumes mean annual precipitation of 54 inches and 0.35 runoff coefficient (C). A headwater depth ratio (HW/D) of 1.0 was used to determine culvert sizing based on field observations of the stream channel, current and proposed crossing design and sediment and woody debris in transport.

<sup>2</sup> The 100-year Return-Period precipitation data was sourced from: [http://hdsc.nws.noaa.gov/hdsc/pfds/pfds\\_map\\_cont.html?bkmrk=ca](http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ca)

<sup>3</sup> Methods for determining the 100-yr design discharge include the Rational Method for watersheds with areas less than 80 acres and the USGS Magnitude and Frequency Method for watersheds with areas greater than 80 acres.

<sup>4</sup> All of the stream crossings will be constructed according to standards provided in the "Handbook for Forest, Ranch and Rural Roads," (Weaver, Weppner, and Hagans, 2015), and the California Salmonid Stream Habitat Manual, Part X (Weaver, Hagans, and Weppner, 2006)."

### 1.1.3.1 Legacy Waste Discharge Issues for Region 1

*For Region 1 Dischargers, identify, discuss, and locate on the site map any legacy waste discharge issues that exist on the property.*

See Section 1.1.2., above.

## 1.2 Sediment Erosion Prevention and Sediment Capture

*Moderate risk Tier 1 or Tier 2 Dischargers are required to submit a Site Erosion and Sediment Control Plan. Those Dischargers may refer to that plan rather than repeat it here.*

The Project Site was enrolled as a **Tier 1 High Risk** Discharger with no disturbed areas

on slopes greater than 30% and a portion of disturbed areas within riparian setbacks. Since the enrollment was submitted to the General Order the landowner removed the small items within the riparian setbacks and a request for reclassification of risk level to a **Low Risk** site will be submitted to the SWRCB. Based on current site conditions a Disturbed Area Stabilization Plan (DASP) will not be developed for this Project Site and a Site Erosion and Sediment Control Plan (SESCP) is not required to be developed for this Project Site. Any disturbed or bare soil areas on the Project Site with the potential for erosion or sediment delivery which may threaten water quality will be addressed as a part of this Plan. Generalized treatment recommendations and BPTC measures for disturbed areas are included in Table 1, above.

#### 1.2.1 Erosion Prevention and Sediment Control Measures: BPTCs, Schedule, and Map

*The description shall address physical BPTC measures, (e.g., placement of straw mulch, plastic covers, slope stabilization, soil binders, culvert outfall armoring, placement of /silt fences, fiber rolls, or settling ponds/areas, etc.) and biological BPTC measures (vegetation preservation/replacement, vegetated outfalls, hydro seeding, etc.).*

Refer to Table 1, above, for a description of erosion prevention and sediment capture BPTC measures that have been or will be implemented to prevent or limit erosion and capture sediment that has been eroded. The table also includes an implementation schedule for BPTC measures that have not yet been implemented. Refer to Figure 2 for the location of erosion prevention and sediment control BPTC measures.

Specific erosion prevention and sediment control measures intended to prevent or limit erosion and capture sediment that has been eroded shall be implemented prior to the onset of each wet season and include the placement of straw mulch on bare soil areas as needed, planting of cover crops at cultivation areas, preservation/replacement of existing vegetative cover, indoor storage of bulk potting soil, slope stabilization, and culvert replacement. These measures are already in practice or will be implemented as needed prior to the wet season at the cultivation areas, stream crossings, road segments, and any additional areas on the Project Site with the potential to threaten water quality.

#### 1.2.2 Maintenance Activities – Erosion Prevention and Sediment Control

##### *1.2.2.1 Monitoring and Maintenance*

*Describe how the erosion prevention and sediment control BPTC measures will be monitored and maintained to protect water quality.*

In general, the Project Site needs to be monitored throughout the year to identify any problems that might arise and to monitor the effectiveness of corrective actions when completed. Refer to Table 1

for recommendations relating to existing and proposed BPTC measures that will require monitoring and/or maintenance.

The goal of the monitoring is to ensure the original problem/feature has been effectively treated and that the causal mechanisms (ineffective road drainage, improperly designed stream crossings, etc.) are not continuing to threaten or cause water quality degradation. If additional deficiencies develop, or individual problems arise, then corrective actions must be implemented immediately.

Periodic inspections will include visual inspection of the site, including any management measures/practices, to ensure they are being implemented correctly and are functioning as expected. Inspections include photographic documentation of any controllable sediment discharge sites, as identified on the site map, and a visual inspection of those locations on the site where pollutants or wastes, if uncontained, could be transported into receiving waters, and those locations where runoff from roads or developed areas drains into or towards surface water.

At a minimum, sites shall be inspected at the following times to ensure timely identification of changed site conditions and to determine whether implementation of additional management measures is necessary to prevent or minimize discharges of waste or pollutants to surface water:

- 1) Before and after any significant alteration or upgrade to a given stream crossing, road segment, or other controllable sediment discharge site. Inspection should include photographic documentation, if possible.
- 2) Prior to October 15 to evaluate site preparedness for storm events and stormwater runoff.
- 3) Following the accumulation of 3 inches cumulative precipitation (starting September 1st) or by December 15th, whichever is sooner.
- 4) Following storm events that produce 0.5 inches in 24 hours or 1 inch within seven consecutive days of precipitation (Cannabis Cultivation Policy: Attachment A). Precipitation data can be obtained from the National Weather Service by entering the site zip code at <http://www.srh.noaa.gov/forecast>; Pick the nearest or most relevant zip code and then select the 3-day history that will also show precipitation totals.

#### *1.2.2.2 Captured Sediment*

*Describe how any captured sediment will be either stabilized in place, excavated and stabilized on-site, or removed from the site.*

In the event that any excess sediment is generated, all captured sediment will be stabilized and stored in a stable location onsite with no threat of delivery to surface waters. All applicable BPTC measures will be implemented to prevent sediment mobilization and encourage revegetation and stabilization.

1.2.3 Erosion Control BPTC Measures – Interim and Long-term

*Describe the interim soil stabilization, if applicable and long-term BPTC measures implemented to prevent sediment transport at each identified disturbed area(s) and improperly constructed features.*

Please refer to Table 1, above, for more information regarding interim and long-term erosion control BPTC measures and implementation schedules.

**2.0 FERTILIZER, PESTICIDE, HERBICIDE, & RODENTICIDE BPTC MEASURES**

2.1 Summary Table

*Provide a summary table that identifies the products used at the site, when they are delivered to the site, how they are stored, and used at the site. If products are not consumed during the growing season, describe how they are removed from the site or stored to prevent discharge over the winter season.*

See the summary in Table 3 that identifies the products utilized onsite for cultivation purposes, when they are delivered to the site, and how they are stored and used at the site. Table 3 also describes how products are removed from the site or stored to prevent discharge if they are not consumed before the winter season. The landowner reported no pesticide, herbicide or rodenticide use on the Project Site.

Table 3. Fertilizer and Amendment Product List

Product		When Delivered	How Stored	How Used	How Products Are Removed from the Site or Stored to Prevent Discharge If They Are Not Consumed Before the Winter Season
FERTILIZERS	Ascent Grow	Purchased and delivered to Project Site as needed per landowner.	Kept in original containers inside plastic secondary containment bins and stored at the location shown on Figure 2.	Applied as directed on product labels.	If there is any unused product left at the end of the season, it is removed from the Project Site or properly stored at the location shown on Figure 2.
	Ascent Bloom				
	Plant Amp				
	Mag Amp				
	Humtea				
	Sugaree				
	Sourdee				

## 2.2 Site Map

The site map, Figure 2, identifies the locations of fertilizer and amendment use and storage.

## 2.3 Bulk Fertilizers and Chemical Concentrates

*Describe how bulk fertilizers and chemical concentrates are stored, mixed, applied, and how empty containers are disposed.*

When cultivation activities are occurring fertilizer, soil amendments, or any plant-related chemical not directly being used will continue to be properly stored at the location shown on Figure 2. Potting soil is amended and reused each year, stored in place at the cultivation areas and either planted with cover crops, mulched with straw or covered with tarps or plastic sheeting prior to the wet season.

According to the landowner, all amendments are applied at the manufacturer recommended rate or less. If fertilizers and amendments contain ammonium nitrate, they will be stored in separate locations away from petroleum products.

Nutrient containing amendments and all chemical materials will be stored indoors or completely tarped outdoors during the rainy season. If tarped outdoors, chemicals will not be stored directly on the ground surface and surface runoff from precipitation will be diverted away from the storage area. At the completion of harvesting activities, all potting soil will be planted with a winter cover crop or consolidated as much as feasible and covered with plastic sheeting or tarps to prevent mobilization and leaching of any residual chemicals during the wet season.

## 2.4 Spill Prevention and Cleanup

The likelihood of chemical spills will be minimized by storing all fertilizers and other cultivation-related chemicals off the ground, in designated secondary containment, and at the storage location shown on Figure 2. In the event of a spill, cleanup will be initiated as quickly as possible after occurrence. In the event of spills on pavement or concrete, solid materials will be removed utilizing a broom/brush and pan or vacuum. Affected paved surfaces will be decontaminated using a mild detergent and water. Liquid chemical spills on pavement or concrete will be captured using absorbent materials. Spills of solid or liquid materials on soil will be cleaned by removal of the spilled materials and contaminated soil using a shovel and/or absorbent materials. Contaminated soil will be stored in a labeled sealed container and disposal of contaminated materials will be conducted in accordance with manufacturer's instructions and local regulations. A spill kit will be brought onsite and will be stored at the fertilizer storage location shown on Figure 2.

## **3.0 PETROLEUM PRODUCT BPTC MEASURES**



### 3.1 Summary Table

Table 4, below, identifies the petroleum products utilized onsite for cultivation and other purposes, when they are delivered to the site, and how they are stored and used at the site.

### 3.2 Site Map

The site map, Figure 2, identifies petroleum product storage and use locations.

### 3.3 Handling

*Describe how fuels, lubricants, and other petroleum products are stored, mixed, applied, and empty containers are disposed.*

Petroleum products are only minimally used on the Project Site due to the installation of solar power system. When petroleum products are brought onsite, they are stored in secondary containment basins but due to infrequent use of these products on the Project Site there is no specific storage location. Petroleum products brought onsite are taken offsite the same day. When petroleum products are onsite ensure that these items are equipped with secondary containment basins with sufficient capacity to contain the full volume of petroleum products in the event of a spill or leak. Metal secondary containment basins are recommended for any gas-powered item with a motor that may generate heat for fire prevention. Ensure any items that may generate heat, flames, or sparks are located a sufficient distance away from combustible materials.

For more information regarding storage, application, and disposal of full and empty containers of petroleum products, see Table 4, below.

Table 4. Petroleum Product List

<b>Product Name</b>	<b>When Delivered</b>	<b>How Stored</b>	<b>How Used</b>	<b>How Products Are Removed from the Site or Stored to Prevent Discharge If They Are Not Consumed Before the Winter Season</b>
Gasoline	Purchased and delivered to Project Site as needed by landowner.	Gasoline and motor oil is equipped with secondary containment. There is no specific storage location on the Project Site.	Various garden equipment when needed.	Unused petroleum products are stored in secondary containment and removed from the Project Site the same day they are brought onsite. There is no specific storage location on the Project Site.
Motor oil				

### 3.4 Spill Prevention and Cleanup

The likelihood of chemical spills will be minimized by storing all petroleum products off the ground, in designated secondary containment and in enclosed structures. In the event of a spill, cleanup will be initiated as quickly as possible after occurrence. Liquid petroleum spills on pavement or concrete will be captured using absorbent materials.

Spills of liquid materials on soil will be cleaned by removal of the spilled materials and contaminated soil using a shovel and/or absorbent materials. Contaminated soil will be stored in a labeled sealed container. Disposal of contaminated materials will be conducted in accordance with manufacturer's instructions and local regulations. A spill kit will be brought onsite and will be stored at the fertilizer storage location shown on Figure 2.

#### **4.0 TRASH/REFUSE, AND DOMESTIC WASTEWATER BPTC MEASURES**

##### **4.1 Types, Containment, and Disposal of Trash/Refuse**

*Describe the types of trash/refuse that will be generated at the site. Describe how the material is contained and properly disposed of.*

Trash and refuse typically includes domestic waste such as general household trash and organic materials. Cultivation-related waste material includes organic wastes (cannabis stems, leaves, roots, etc.), and may include plastic pots and planting materials, plastic containers, and degraded plastic tarps, although these materials are reused as much as possible. Tarps, if used, are rolled up and stored indoors prior to the wet season or used to cover the cultivation areas over the wet season. Waste is stored in a lidded steel trash can located next to the fertilizer storage location. Waste is removed on a regular basis as needed and taken offsite to be disposed of through a trash and recycling collection service or taken to the transfer station in McKinleyville, California.

##### **4.1.1 Site Map**

The site map, Figure 2, shows the trash/refuse storage location.

##### **4.2 Domestic Wastewater Generation and Disposal**

##### **4.2.1 Domestic Wastewater Generation**

*Describe the number of employees, visitors, or residents at the site [per unit time].*

*Describe the types of domestic wastewater generated at the site (e.g., household generated wastewater or chemical toilet).*

According to the landowner, there are no permanent residents onsite, only the landowner and two seasonal family members onsite from April/May to October/November and occasionally 1 – 2 visitors per month during the cultivation season.

Household wastewater is generated onsite (cooking, cleaning, etc.) along with use of the existing portable toilet by the seasonal family members and any visitors.

##### **4.2.2 Domestic Wastewater Disposal**

*4.2.2.1 Permitted onsite wastewater treatment system (e.g., septic tank and leach lines).*

There is no permitted Onsite Wastewater Treatment System (OWTS) currently on the Project Site. An OWTS will need to be permitted through the Humboldt County Division of Environmental Health (HCDEH). A portable toilet is currently in use on the Project Site. Use of the portable toilet will be continued on the Project Site until a complete OWTS is permitted and installed (see Section 4.2.2.2, below). Once permitted, proof of permitting through the HCDEH is required for the OWTS on the Project Site.

*4.2.2.2 Chemical toilets or holding tank. If so, provide the name of the servicing company and the frequency of service.*

There is one portable toilet currently in use on the Project Site. Additional portable toilets will be delivered to the Project Site as needed based on the number of people onsite during the cultivation season. Portable toilets will be easily accessible and located near activity areas and outside of riparian setbacks. Continue utilizing the serviced portable toilet until the OWTS can be designed, permitted, and constructed. Keep records of cleaning, maintenance and disposal procedure and schedule for the portable toilet onsite.

*4.2.2.3 Outhouse, pit privy, or similar. Use of this alternative requires approval from the Regional Water Board Executive Officer; include the approval from the Executive Officer and any conditions imposed for use of this alternative.*

There are no outhouses, pit privies, or other OWTS alternatives on the Project Site except for the portable toilet.

**4.2.3 Site Map**

The site map, Figure 2, identifies the locations of any domestic wastewater treatment, storage, or disposal area(s).

## **5.0 WINTERIZATION BPTC MEASURES**

### **5.1 Winterization Activities**

*Describe activities that will be performed to winterize the site and prevent discharges of waste. The description should address all the issues listed above.*

The landowner will implement appropriate BPTCs to adequately contain any stockpiled potting soil or waste material and prevent mobilization and delivery to surface waters or groundwater.

Winterization measures applied to bare soil areas, garden areas, and cultivation areas include the following: 1) removal of plastic covers on greenhouses; 2) mulching bare soil areas and applying native erosion control seed; 3) planting of cover crops; 4) planting of winter crops; and 5) disconnecting water lines not in use. Amendments will

be brought inside during the wet season and stored indoors or under tarps such that they are protected from the elements.

Please refer to Table 1 for more information regarding winterization activities and implementation schedules.

#### 5.2 Maintenance of Drainage or Sediment Capture Features

*Describe maintenance of all drainage or sediment capture features (e.g., drainage culverts, drainage trenches, settling ponds, etc.) to remove debris, soil blockages, and ensure adequate capacity exists.*

Please refer to Table 1 for more information regarding maintenance of drainage and sediment capture feature BPTCs and implementation schedules.

#### 5.3 Revegetation

*Describe any revegetation activities that will occur either at the beginning or end of the precipitation season.*

No land disturbance activities requiring winter revegetation are planned or anticipated with the exception of any application of native erosion control seed or implementation of additional erosion or sediment control BPTCs as needed to protect water quality. Please refer to Table 1 for more information regarding revegetation activities.

#### 5.4 BPTC Measures That Cannot Be Completed Before Onset of Winter

*If any BPTC measure cannot be completed before the onset of winter period, contact the Regional Water Board to establish a compliance schedule.*

All BPTC measures are scheduled to be completed before the onset of the winter period provided all applicable permits from regulatory agencies are obtained. If any BPTC measures cannot be implemented prior to the start of the winter season (installation of properly sized culverts at stream crossings or a permitted OWTS for example) the Regional Water Board will be contacted, and a compliance schedule established. Refer to Table 1, above, for information regarding a BPTC implementation schedule.

#### 5.5 Legacy Waste Discharge Issues for Specific Regions

*For Region 1 Dischargers, describe any activities that will be performed to address legacy waste discharge issues. Region 6 Dischargers should consult with Regional Water Board staff to confirm if any other activities in addition to BPTCs are necessary to address legacy waste discharge issues.*

See Section 1.1.2. Access, Maintenance and Storm Water, for more information regarding any legacy waste discharge issues.

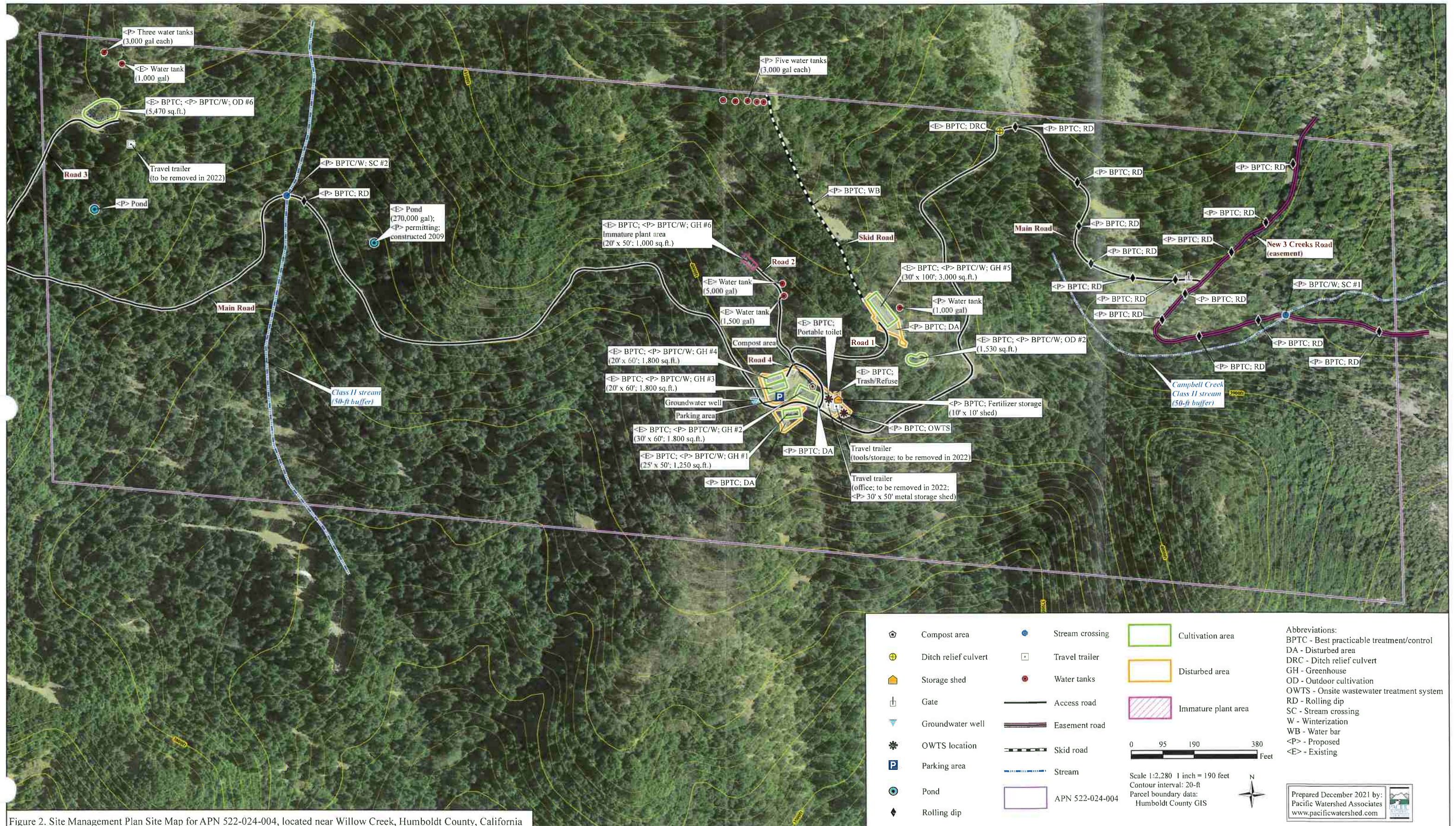
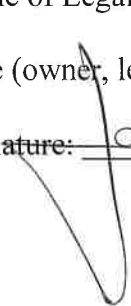


Figure 2. Site Management Plan Site Map for APN 522-024-004, located near Willow Creek, Humboldt County, California

#### IV. LANDOWNER/LESSEE CERTIFICATION/SIGNATURES

This Site Management Plan has been prepared by Pacific Watershed Associates on behalf of the Discharger.

“I have read and understand this Site Management Plan, including Section II – Certifications, Conditions and Limitations, and the associated attachments. I agree to comply with the requirements of the State Water Resources Control Board (SWRCB) Cannabis Cultivation Policy Order WQ 2019-0001-DWQ, General Waste Discharge Requirements and Waiver of Waste Discharge Requirements for Discharges of Waste Associated with Cannabis Cultivation Activities (General Order), including the recommendations and actions listed in this Site Management Plan.”

Name of Legally Responsible Person (LRP): John Piccirilli Rgi farms  
Title (owner, lessee, operator, etc.): John Piccirilli OWNER  
Signature:  Date: 12/31/2021

## **APPENDIX A**

Water Resources Protection Plan (WRPP) for

Humboldt County 522-024-004



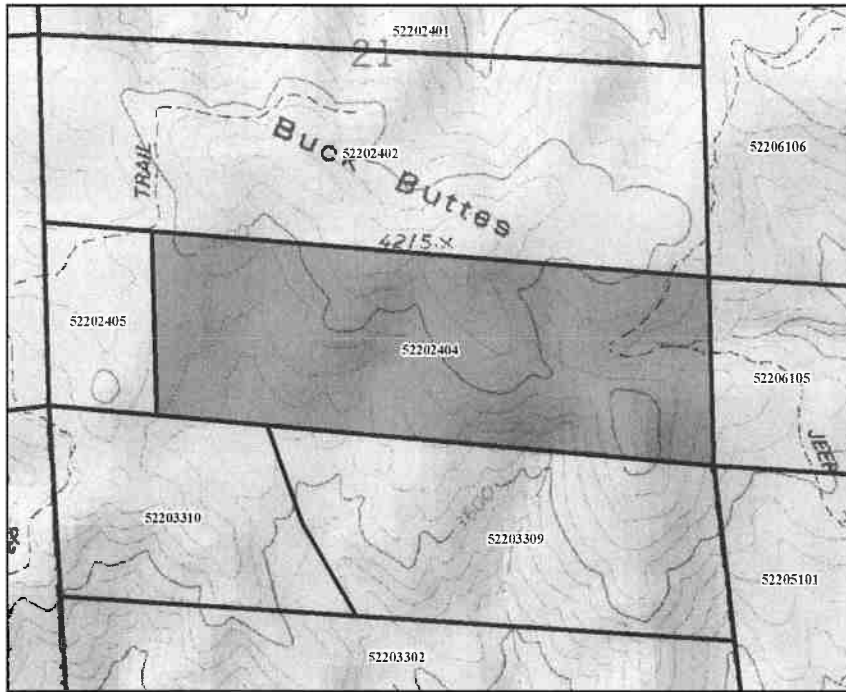
# Water Resource Protection Plan (WRPP)

*for*

**APN 522-024-004**

*Located on*  
**New 3 Creeks Road  
Willow Creek, California**

**May, 2017**



*Prepared for:*  
WD ID #1B16875CHUM  
PWA ID #180102111201-5155/180102111205-5155/180102111206-5155  
New 3 Creeks Road  
Willow Creek, California

---

*Prepared by:*  
Jack Skeahan, Staff Geologist, [jacks@pacificwatershed.com](mailto:jacks@pacificwatershed.com)  
Thomas H Leroy, C.E.G. #2593, [toml@pacificwatershed.com](mailto:toml@pacificwatershed.com)  
Pacific Watershed Associates Inc.  
P.O. Box 4433, Arcata, CA 95518  
(707) 839-5130



**TABLE OF CONTENTS**

**1.0 PROJECT SUMMARY .....3**

**2.0 CERTIFICATIONS, LIMITATIONS AND CONDITIONS.....3**

**3.0 INTRODUCTION .....7**

**4.0 STANDARD CONDITIONS CHECKLIST FOR APN 522-024-004 AS OF 6/13/2016.....7**

4.1 STANDARD CONDITION #1. SITE MAINTENANCE, EROSION CONTROL AND DRAINAGE FEATURES.....9

4.2 STANDARD CONDITION #2. STREAM CROSSING MAINTENANCE.....11

4.3 STANDARD CONDITION #3. RIPARIAN AND WETLAND PROTECTION AND MANAGEMENT .....13

4.4 STANDARD CONDITION #4. SPOILS MANAGEMENT .....14

4.5 STANDARD CONDITION #5. WATER STORAGE AND USE .....14

4.6 STANDARD CONDITION #6. IRRIGATION RUNOFF .....18

4.7 STANDARD CONDITION #7. FERTILIZERS AND SOIL AMENDMENTS .....19

4.8 STANDARD CONDITION #8. PESTICIDES/HERBICIDES .....20

4.9 STANDARD CONDITION #9. PETROLEUM PRODUCTS AND OTHER CHEMICALS.....21

4.10 STANDARD CONDITION #10. CULTIVATION-RELATED WASTES .....23

4.11 STANDARD CONDITION #11. REFUSE AND HUMAN WASTE .....23

4.12 STANDARD CONDITION #12. REMEDIATION/CLEANUP/RESTORATION .....25

**5.0 PRIORITIZED CORRECTIVE ACTIONS AND SCHEDULE TO REACH FULL COMPLIANCE.....26**

**6.0 MONITORING AND INSPECTION PLAN .....32**

**7.0 WATER USE PLAN .....33**

**8.0 LIST OF CHEMICALS.....34**

**9.0 LANDOWNER/LESSEE CERTIFICATION/SIGNATURES.....36**

**LIST OF FIGURES**

- Figure 1. General Location Map
- Figure 2A and 2B. Site Map

**LIST OF TABLES**

- Table 1. Features Needing Improvement or Action Items (Prioritized implementation schedule for corrective actions)

**LIST OF APPENDICES**

- Appendix A.** Best Management Practices (BMPs) – NCRWQCB
- Appendix B.** Monitoring Plan and Photo Logs
- Appendix C.** Photo Documentation of Monitoring Points
- Appendix D1, D2, D3.** Water Use Plan and Log Forms
- Appendix E.** Fertilizer and Amendment Use Plan and Log Forms
- Appendix F.** Pesticide, Herbicide, and Fungicide Use Plan and Log Forms
- Appendix G.** Hazardous Materials Storage Guidelines
- Appendix H.** Typical Drawings

**Water Resource Protection Plan (WRPP)  
APN 522-024-004  
New 3 Creeks Road  
Willow Creek, California**

## **1.0 PROJECT SUMMARY**

This report documents Pacific Watershed Associate's (PWA)<sup>1</sup> Water Resource Protection Plan (WRPP) for APN 522-024-004 located on New 3 Creeks Road, Willow Creek, California as shown on Figure 1. This property is located approximately 5.6 miles northwest of Willow Creek, Humboldt County, CA, and hereinafter is referred to as the "Project Site." Based on either site conditions and/or total cultivation area, this Project Site falls within **Tier 2** of the North Coast Regional Water Quality Control Board's (NCRWQCB) Order No. 2015-0023, Waiver of Waste Discharge and General Water Quality Certification for Discharges of Waste Resulting from Cannabis Cultivation and Associated Activities or Operations with Similar Environmental Effects ("Order"). Properties that fall into Tier 2 of the Order are required to develop a WRPP. Therefore, as required, this WRPP has been developed for you based on site inspections made by PWA on your property. PWA's recommendations for any remediation or corrective actions are a result of water quality requirements under the Order, including Best Management Practices (BMPs) designed to meet those requirements (Appendix A). This WRPP documents the findings of a site visit conducted on June 13, 2016 by PWA Certified Engineering Geologist Tom Leroy and Staff Geologist Jack Skeahan.

## **2.0 CERTIFICATIONS, LIMITATIONS AND CONDITIONS**

This WRPP has been prepared by, and under the responsible charge of a California licensed geologist or certified licensed professional in erosion and sediment control at PWA and all information herein, including treatment recommendations, are based on observations, data and information collected by PWA staff.

This WRPP has been prepared to: 1) describe the general conditions of the property at the time of our inspection; 2) summarize the site conditions and how they relate to the NCRWQCB twelve (12) Standard Conditions of the Order; 3) provide recommendations for remediation and/or correction of existing or potential water quality threats or impacts; and 4) recommend work to be conducted on this property to meet the 12 Standard Conditions of the Order. The analysis and recommendations submitted in this WRPP are based on PWA's evaluation of the Project Site and your activities which fall under the Order.

In this WRPP we have described the current conditions of the property and any water resource and water quality risk factors we observed at the time of our site inspection. PWA is not responsible for problems or issues we did not observe on our site inspection, or for changes that have naturally occurred or been made to the property after our site review. The interpretations and conclusions presented in this WRPP are based on a reconnaissance level site investigation of inherently limited scope. Observations are qualitative, or semi-quantitative, and confined to surface expressions of

---

<sup>1</sup> PWA is an approved Third Party Program for the North Coast Regional Water Quality Control Board's (NCRWQCB) Order No. 2015-0023, Waiver of Waste Discharge and General Water Quality Certification for Discharges of Waste Resulting from Cannabis Cultivation and Associated Activities or Operations with Similar Environmental Effects ("Order").

limited extent and artificial exposures of subsurface materials. Interpretations of problematic geologic, geomorphic or hydrologic features such as unstable hillslopes, erosional processes and water quality threats are based on the information available at the time of our inspection and on the nature and distribution of existing features we observed on the property.

We have also included recommendations for remediation and/or correction that are based on these observations. The recommendations included in this WRPP are professional opinions derived in accordance with current standards of professional practice, and are valid as of the date of field inspection. No other warranty, expressed or implied, is made. Furthermore, to ensure proper applicability to existing conditions, the information and recommendations contained in this report shall be regularly reevaluated and it is the responsibility of the landowner and/or lessee operating under the Order to ensure that no recommendations are inappropriately applied to conditions on the property that have changed since the recommendations were developed.

If site conditions have changed for any reason, the site should be reevaluated and the WRPP revised and updated as required. These conditions include any changes in land management activities or property conditions that have occurred since our site visit (regardless of what they are, how they occurred or who performed them). Similarly, if the landowner/lessee uses portions of this property not identified or covered under the current WRPP, this WRPP will need to be updated with the new information, including possible additions or changes to the recommended remedial or corrective actions and BMPs (Appendix A).

If the property owner has enrolled their property under the Order, they are responsible for complying with all the requirements thereunder, regardless of who is operating or cultivating on that property. If the property is being formally or informally leased to an operator, and the lessee has enrolled under the Order, then the lessee is responsible for complying with the Order's requirements, including the WRPP and related recommendations and requirements. If the lease expires or the lessee is not otherwise available or does not respond to information requests by the NCRWQCB or PWA, then the landowner automatically assumes responsibility under the Order for the requirements therein and for all related penalties or actions brought by the NCRWQCB.

If at any time in the future the property is to transfer ownership, it is the responsibility of the current owner, or their representatives, to ensure that the information and recommendations contained herein are called to the attention of any future owner or agent for the property. Unless this WRPP is modified by the NCRWQCB, or another approved Third Party Program representative, the findings and recommendations contained in this WRPP shall be utilized as a tool while implementing the recommendations made within this WRPP. Necessary steps shall be taken to see that contractor(s) and subcontractor(s) carry out such recommendations in the field in accordance with the most current WRPP and BMP standards.

As a Third Party Program, PWA will be responsible for the data, interpretations and recommendations developed by PWA, but will not be responsible for the interpretation by others of that information, for implementation of corrective actions by others, or for additional or modified work arising out of those plans, interpretations and recommendations. PWA assumes no liability for the performance of other workers or suppliers while following PWA's recommendations in the WRPP, unless PWA is under contract to perform or oversee those activities. Additionally, PWA is not responsible for changes in applicable or appropriate standards

beyond our control, such as those arising from changes in legislation or regulations, or the broadening of knowledge which may invalidate or alter any of our findings or recommended actions.

Any WRPP plan review or construction management services that may be needed or identified in the recommendations sections of this report are separate tasks from the preparation of this WRPP, and are not a part of the contract under which this WRPP was prepared. If requested, additional PWA field inspections, surveys, WRPP revisions/updates, project layout, design, permitting, construction oversight/management, or other related services arising from tasks described and recommended in the WRPP may be performed under separate agreements requiring advance notice and contracting.

PWA's services consist of professional opinions and recommendations made in accordance with generally accepted principles and practices. No warranty, expressed or implied, or merchantability or fitness, is made or intended in connection with our work, by the proposal for consulting or other services, or by the furnishing of oral or written reports or findings. If the client desires assurances against project failures, they shall obtain appropriate insurance through their own insurance broker or guarantor.

This WRPP is considered a living document and shall be updated at least annually, or sooner if conditions have changed or land management actions have been undertaken after our site inspection. As an official part of the Waiver Program, this WRPP (including all its text, appendices, maps and photos) shall remain onsite and available for NCRWQCB staff to inspect and review upon request.

Prepared by:



---

Tom Leroy  
Certified Engineering Geologist #2593  
Pacific Watershed Associates, Inc.  
P.O. Box 4433, Arcata, California 95518

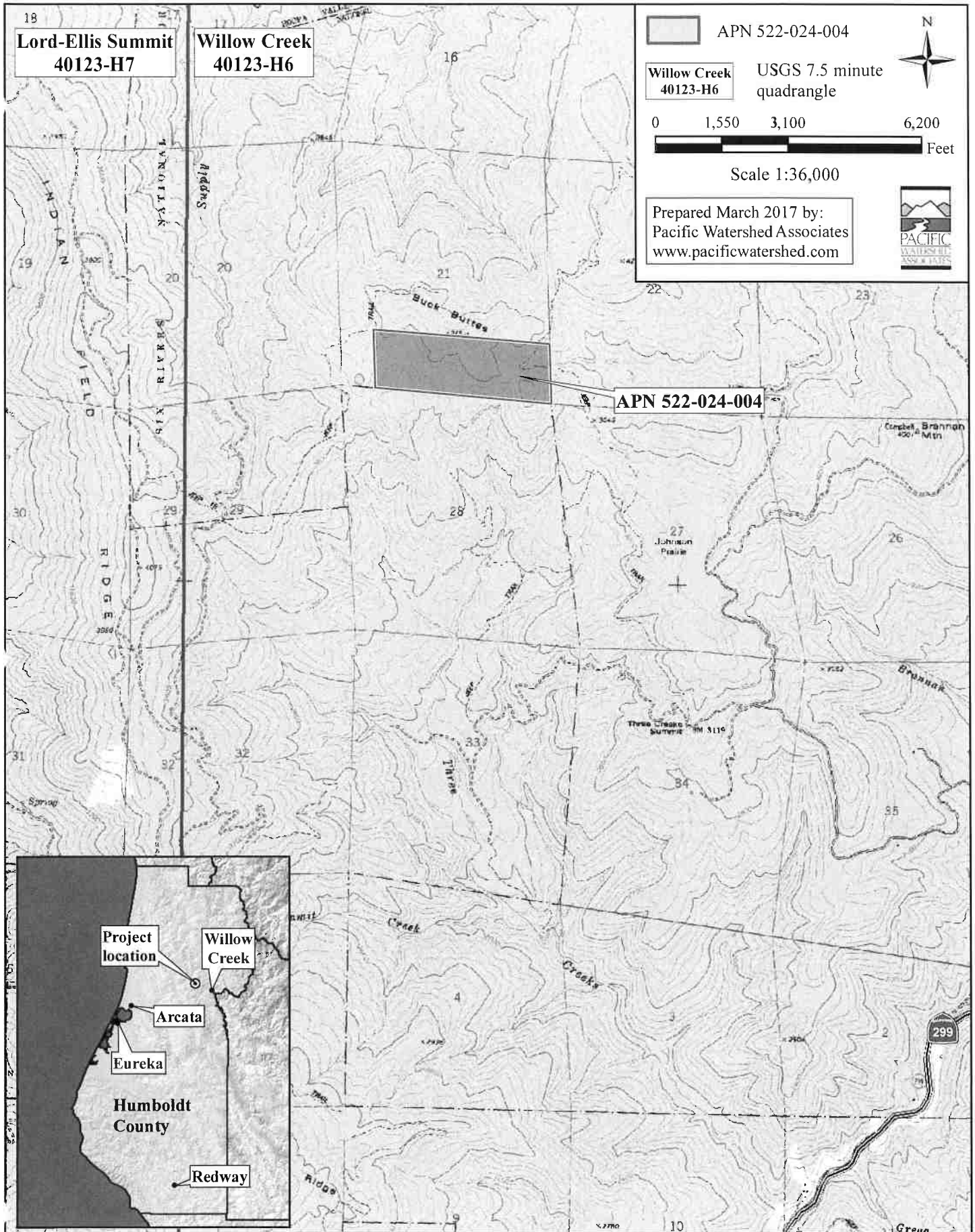


Figure 1. Location map for WDID #1B16875CHUM, APN 522-024-004, New Three Creeks Road, Willow Creek, Humboldt County, California.

### 3.0 INTRODUCTION

This Water Resources Protection Plan (WRPP) summarizes the results of Pacific Watershed Associate's (PWA) site visit and subsequent analysis and documentation of site conditions on APN 522-024-004 located on New 3 Creeks Road, Willow Creek, California, as shown on Figure 1 and hereinafter referred to as the "Project Site." The WRPP describes and addresses the required elements and compliance with the 12 Standard Conditions established by the North Coast Regional Water Quality Control Board's (NCRWQCB) Order No. 2015-0023 to protect water quality from cannabis cultivation and related activities (Order). PWA has identified certain areas where the Project Site does not fully meet all 12 of the Standard Conditions of the Order. Section 4, below, identifies and discusses each of the 12 Standard Conditions as related to your property with regard to compliance with the NCRWQCB's Order.

The WRPP contains the following required sections:

1. Legible map (Figure 2A and 2B) depicting the required site elements and features associated with the 12 Standard Conditions of the Order;
2. Description of current site conditions, compliance with the 12 Standard Conditions, and prioritized remediation or corrective actions needed to bring the site into compliance with the requirements of the Order;
3. A monitoring and inspection plan to ensure BMPs used to protect and prevent impacts to water quality are being implemented as recommended by PWA (implementation monitoring), and that they are effective (effectiveness monitoring);
4. A water use plan, including water sources, water use and storage rights documentation, monthly water use documentation (quantity), and water conservation measures that are employed to prevent adverse impacts to water quality and water quantity in the watershed;
5. List of fertilizers and chemicals stored and used onsite, including a log of the frequency and quantity of these materials used.

### 4.0 STANDARD CONDITIONS CHECKLIST FOR APN 522-024-004 as of 6/13/2016

The NCRWQCB has developed a set of 12 Standard Conditions that shall be followed and implemented to protect and improve water quality as required under the NCRWQCB's Order. For a property to become compliant with the Order, all 12 Standard Conditions must be fully satisfied.

The following section details the specific requirements listed and described in the Order for each of the 12 Standard Conditions. Each Standard Condition has from 1 to 6 sub-requirements (*listed in italic type*), each of which must be satisfied to protect water quality and comply with the Order. The checklist developed by PWA for your property indicates: 1) whether the Standard Condition or Standard Condition sub-requirement was adequately met as of the date of PWA's field inspection, 2) PWA's observations and comments related to the Standard Condition or Standard Condition sub-requirement, 3) whether a relevant photo has been taken and included in the WRPP, and 4) recommended corrective or remedial actions that need additional work to meet the requirements of the Order.



Figure 2A. Site map for WDID #1B16875CHUM, APN 522-024-004, New Three Creeks Road, Willow Creek, Humboldt County, California.

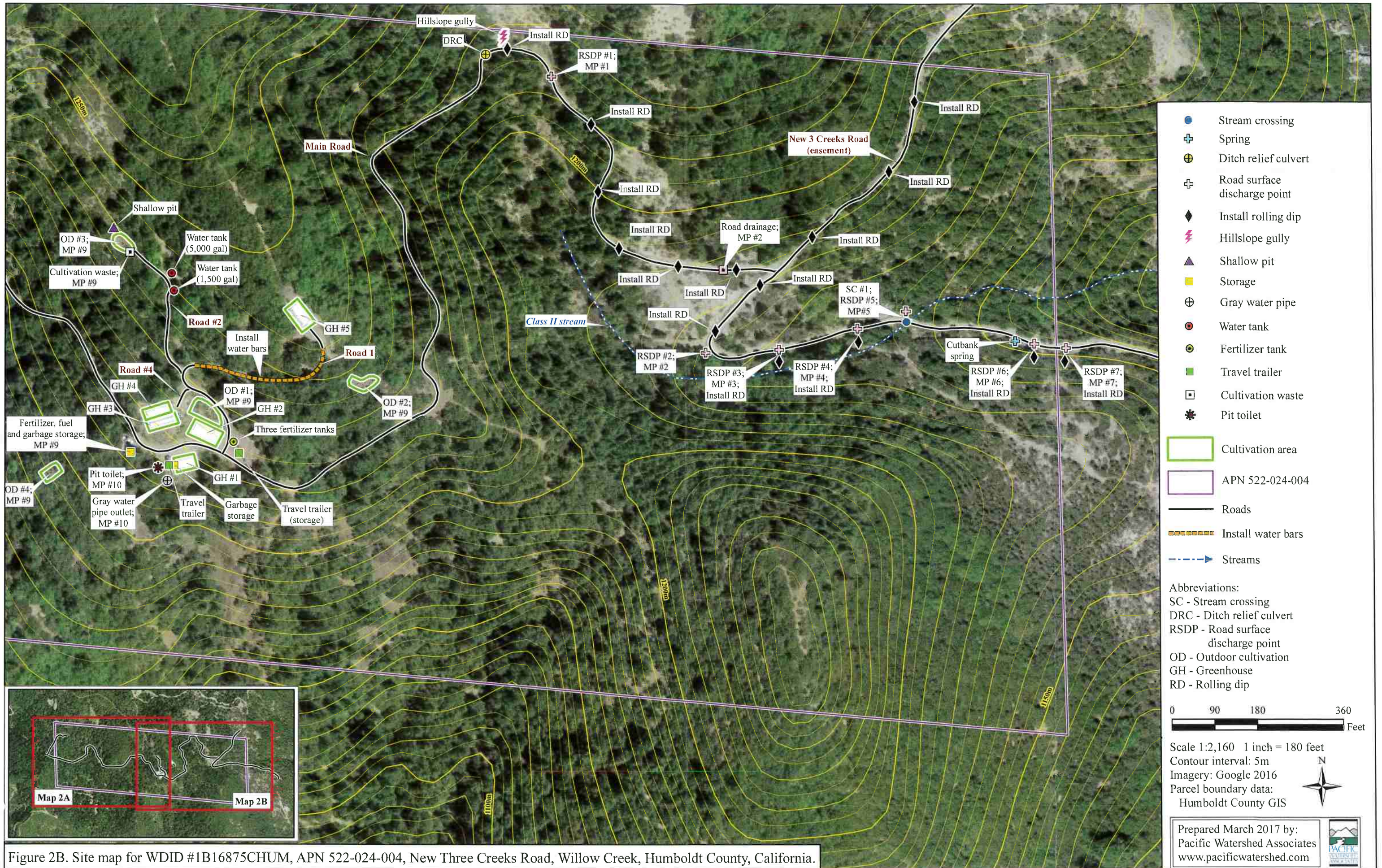


Figure 2B. Site map for WDID #1B16875CHUM, APN 522-024-004, New Three Creeks Road, Willow Creek, Humboldt County, California.



In Section 5 of this WRPP, PWA has provided a summary prioritized list (Table 1) of the recommended treatments and actions to be implemented by you to meet the requirements of the Order. PWA will consult with you to review the WRPP document and findings, and to set a preliminary schedule for implementation of the recommended measures for achieving compliance with the Order. Please note that some of the PWA recommended actions are based on regulatory requirements and deadlines, while others can be scheduled to fit the needs of both you and your property.

#### **4.1 Standard Condition #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.*

**Meets condition?** No

**Observations/Comments:** Roads on the Project Site have ruts and gullies due to road segments lacking appropriate drainage features such as adequate outsloping, rolling dips and ditch relief culverts (DRC). New 3 Creeks Road and the Main Road have several sections of undrained road that concentrates runoff and causes surface erosion and sediment delivery to surface waters. Minor gullying has been observed on other roads on the Project Site however sediment delivery to surface waters was not observed. The landowner will need to determine responsibility for road maintenance on New 3 Creeks Road and coordinate with that entity, if necessary, to implement the recommended road drainage treatments.

**Photos:** MP #1: Photo 1. MP #2: Photo 2a, 2b and 2c. MP #3: Photo 3. MP #4: Photo 4. MP #5: Photo 5a and 5b. MP #6: Photo 6. MP #7: Photo 7.

**Corrective or remedial actions needed:** The Main Road requires the installation of multiple road drainage features to disconnect surface runoff and address surface erosion. Install a rolling dip not connected to the inboard ditch or cutbank to drain road surface runoff at the hillslope gully left of the DRC. Ensure any flow in the inboard ditch is conveyed to the spring crossing at Road Surface Discharge Point #1 (RSDP #1) Install a broad dip at RSDP #1 and armor the outboard fillslope with 0.5-1.5 foot diameter rock (Figure 2B). Install five rolling dips on the Main Road to the left of the spring crossing at 125-150 foot spacing intervals.

Install three rolling dips on New 3 Creeks Road to the left of the intersection with the Main Road at 150-175 foot spacing intervals. Install two rolling dips to the right of the intersection spaced 150 feet apart with the lower rolling dip located approximately 50 feet up the road from RSDP #2. Install one rolling dip at RSDP #3 and one rolling dip at RSDP #4 spaced 150-175 feet apart. Install rolling dips at RSDP #6 and RSDP #7. Location references to left and right are when facing downstream or downslope.

Although minor surface erosion was occurring on other roads on the Project Site, sediment delivery to surface waters was not observed. The installation of these rolling dips is intended to disconnect concentrated surface runoff that results in sediment delivery to surface waters. The inboard edge of the rolling dip should be connected to the base of the cutbank to fully disconnect road surface runoff and inboard ditch flow,

where present, unless otherwise stated. Ensure that the construction and outlet location of the rolling dips allow dispersal and infiltration of collected road runoff. Armoring of the outboard fillslope at rolling dip outlets may be necessary to prevent further erosion where hillslope gullies previously exist. Install additional rolling dips with adequate spacing intervals at any location where concentrated road runoff and gullying is observed. PWA also recommends installing water bars on the steep section of Road #1 leading to Greenhouse #5 at 50 foot spacing intervals prior to each winter season. Typical drawings included in Appendix H will provide guidance for proper rolling dip and water bar construction.

- 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.*

**Meets condition?** No

**Observations:** See Standard Condition 4.1a observations and comments, above.

**Photos:** See Standard Condition 4.1a Monitoring Points and photos, above.

**Corrective or remedial actions needed:** See Standard Condition 4.1a corrective actions, above.

- 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.*

**Meets condition?** Yes

**Observations/Comments:** Concentrated road surface runoff was not observed to drain toward any potentially unstable slopes or earthen fills.

**Photos:** No

**Corrective or remedial actions needed:** None

- 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, as feasible, from surface waters, including wetlands, ephemeral, intermittent and perennial streams.*

**Meets condition?** No

**Observations:** See Standard Condition 4.1a observations and comments, above.

**Photos:** See Standard Condition 4.1a Monitoring Points and photos, above.

**Corrective or remedial actions needed:** See Standard Condition 4.1a corrective actions, above.

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

**Meets condition?** No

**Observations/Comments:** The one DRC on the Project Site (Figure 2B) has been set high in the fill resulting in splash erosion at the outlet. Also see Standard Condition 4.1a observations and comments, above.

**Photos:** See Standard Condition 4.1a Monitoring Points and photos, above.

**Corrective or remedial actions needed:** PWA recommends installing a full-round downspout on the existing DRC with the downspout outlet at the base of the fillslope. Five cubic yards of rock armor should be placed at the downspout outlet to prevent further erosion. Also see Standard Condition 4.1a corrective actions, above.

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

**Meets condition?** Yes

**Observations/Comments:** No stockpiled construction materials were observed on the Project Site with delivery potential to receiving waters.

**Photos:** No

**Corrective or remedial actions needed:** None

**Standard Condition #1. - General comments and recommendations:** Approximately 1.77 miles of road was inspected on the Project Site, comprised of a mid-slope access road, a segment of New 3 Creeks Road and multiple short access roads. All roads occupy a mid-watershed location and exhibit surface erosion issues caused by a lack of road drainage structures and inadequate maintenance.

#### 4.2 Standard Condition #2. Stream Crossing Maintenance

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

**Meets condition?** No

**Observations/Comments:** There is one stream crossing (SC #1) on the Project Site (Figure 2B) that has an undersized 36-inch diameter culvert that should be upgraded to a 48-inch diameter culvert based on drainage area calculations.

**Photos:** MP #5: Photo 5a – 5d.

**Corrective or remedial actions needed:** PWA recommends upgrading SC #1 with a properly sized culvert that is designed to pass the expected 100-year peak stream flow, as well as the other stream crossing construction standards required by the Order (e.g., minimized hydrologic connectivity, correct orientation, no diversion potential, etc.). Due to the minimal amount of road fill at this stream crossing, other alternatives to a round culvert, such as an arched or oval culvert, may be needed to avoid importing of fill to rebuild the crossing or significantly increasing elevation of the road bed. The landowner will need to determine responsibility for the stream crossing on New 3 Creeks Road and coordinate with that entity, if necessary, to implement the recommended stream crossing upgrade treatments and conduct regular maintenance. Methods for determining culvert sizes to address the 100-year peak streamflow include the Rational Method, USGS Magnitude and Frequency Method and Flow Transference Method. All of the stream crossing upgrades will be constructed according to standards provided in the "Handbook for Forest, Ranch and Rural Roads," (Weaver, Weppner, and Hagans, 2015), and the California Salmonid Stream Habitat Manual, Part X (Weaver et al., 2006).

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

**Meets condition?** No

**Observations/Comments:** The one stream crossing on the Project Site is undersized to pass debris associated with the expected 100-year peak streamflow.

**Photos:** See Standard Condition 4.2a Monitoring Point and photos, above.

**Corrective or remedial actions needed:** PWA recommends upgrading SC #1 with a properly sized 48-inch diameter culvert that is designed to address debris associated with the expected 100-year peak stream flow. Due to the amount of woody debris and riparian vegetation observed upslope of the crossing a trash rack should be installed upstream of the culvert inlet to minimize plug potential. Typical drawings included in Appendix H will provide guidance for proper trash rack installation.

- 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.*

**Meets condition?** Yes

**Observations/Comments:** The one stream crossing on the Project Site has been installed slightly high in the road fill with an armored fillslope below the outlet. Due to the position of the outlet relative to the channel and outboard fillslope, this stream crossing does not appear to impede passage of aquatic organisms.

**Photos:** MP #5: Photo 5d.

**Corrective or remedial actions needed:** None

- 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.*

**Meets condition?** Yes

**Observations/Comments:** There was minimal erosion observed at the stream crossing on the Project Site and it appears adequate maintenance was being performed.

**Photos:** No

**Corrective or remedial actions needed:** Monitor and perform adequate maintenance on SC #1 to prevent or minimize erosion following appropriate BMPs listed in Appendix A.

- e) *Culverts shall align with the stream grade and natural stream channel at the inlet and outlet where feasible.*

**Meets condition?** No

**Observations/Comments:** The culverted stream crossing on the Project Site is not installed at grade but appears to be horizontally aligned with the natural stream channel.

**Photos:** MP #5: Photo 5d.

**Corrective or remedial actions needed:** Upgrade SC #1 with a properly installed culvert that aligns with the natural channel grade and stream alignment where possible. An additional 10 feet of culvert length when replacing the culvert will allow for better horizontal alignment with the natural stream channel. The installation of five cubic yards of rock armor on the outside banks of the channel at both the inlet and the outlet

will help to prevent erosion (10 cubic yards total). Rock armor at the inlet can also help to create a half-flared inlet and increase culvert capacity.

- 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.*

**Meets condition?** No

**Observations/Comments:** The one stream crossing on the Project Site (SC #1) has diversion potential down the right road approach.

**Photos:** MP #5: Photo 5d.

**Corrective or remedial actions needed:** When the culvert at SC #1 is upgraded, ensure that the rebuilt crossing is constructed to prevent stream diversion in case of a plugged culvert or exceptionally high flood flow by installing a critical dip on the right hinge line.

**Standard Condition #2. - General comments and recommendations:** Obtain all necessary agreements and permits prior to commencing work in any watercourse or at any stream crossing. These may include, but not be limited to: California Department of Fish and Wildlife (CDFW) Lake and Streambed Alteration Agreement (LSAA) 1602 and Army Corps of Engineers (ACOE) 404 Permit.

#### 4.3 Standard Condition #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 1 or 2 watercourse or within 50 feet of any Class 3 water course or wetlands.*

**Meets condition?** Yes

**Observations/Comments:** PWA did not observe any impacts to riparian areas as part of cultivation activities on this parcel.

**Photos:** No

**Corrective or remedial actions needed:** None

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

**Meets condition?** Yes

**Observations/Comments:** See Standard Condition 4.3a comments, above.

**Photos:** No

**Corrective or remedial actions needed:** None

- 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.*

**Meets condition?** Yes

**Observations/Comments:** See Standard Condition 4.3a comments, above.

**Photos:** No

**Corrective or remedial actions needed:** None

- 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.*

**Meets condition?** Yes

**Observations/Comments:** See Standard Condition 4.3a comments, above.

**Photos:** No

**Corrective or remedial actions needed:** None

**4.4 Standard Condition #4. Spoils Management**

- a) *Spoils shall not be stored or placed in or where they can enter any surface water.*

**Meets condition?** Yes

**Observations/Comments:** No spoils were observed to be stored with the potential to enter surface waters.

**Photos:** No

**Corrective or remedial actions needed:** None

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

**Meets condition?** Yes

**Observations/Comments:** See Standard Condition 4.4a comment, above.

**Photos:** No

**Corrective or remedial actions needed:** None

- 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.*

**Meets condition?** Yes

**Observations/Comments:** No spoils generated through development or maintenance of roads with the potential for delivery to surface waters were observed on the Project Site.

**Photos:** No

**Corrective or remedial actions needed:** None

**4.5 Standard Condition #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 operations, instream flow requirements and/or needs in the watershed, defined at the scale of a HUC 12 watershed or at a smaller hydrologic watershed as determined necessary by the Regional Water Board Executive Officer.*

**Meets condition?** Unknown

**Observations/Comments:** The client uses water from a spring fed off-stream pond (Figure 2A). Based on the 20,325 ft<sup>2</sup> cultivation area and the amount of water storage currently available (88,762 gallons) in water tanks, water bladders, an off-stream pond and a shallow pit it appears that water storage generated during the rainy season may not be sufficient for the landowner to forbear (not divert surface water) during the dry season. Due to a lack of water use data it is not definitively known if the operation impacts water quality. A Water Budget needs to be developed and refined by water monitoring to determine if additional storage is needed.

**Photos:** No

**Corrective or remedial actions needed:** A Water Budget should be developed to determine if sufficient water storage volumes are currently available on the Project Site for cultivation and other uses during the dry season from May 15<sup>th</sup> through October 31<sup>st</sup>. A Water Monitoring Plan will also need to be implemented (see comments below) in which surface water diversion, storage and use for irrigation and other purposes is closely monitored and recorded. This water data will help you refine the water budget and the data will be reported annually to the State Water Resources Control Board no later than March 31<sup>st</sup> for the preceding calendar year.

- 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.*

**Meets condition?** Yes

**Observations/Comments:** A drip irrigation system with timers and water retaining biodynamic soil is used on the Project Site for water conservation.

**Photos:** No

**Corrective or remedial actions needed:** Additional water conservation measures should continue to be investigated and employed to minimize surface water diversion and use. These include volume-limited drip irrigation systems, incorporating water holding amendments and native soil during the initial soil preparation at the start of the season, surface mulching or planting in beds to minimize evaporation, and planting plants in the ground instead of above ground pots. Additional rainwater harvesting during the wet season should be evaluated and employed to limit or completely eliminate surface water diversion during the dry season.

- c) *For Tier 2 Dischargers, if possible, develop off-stream storage facilities to minimize surface water diversion during low flow periods.*

**Meets condition?** No

**Observations/Comments:** At the present time it is not known whether adequate storage exists on the Project Site to completely forbear (not divert) during the dry season. Additional water storage requirements will be determined after the Water Budget has been developed and refined. A deep groundwater well is scheduled to be installed on the Project Site in 2017.

**Photos:** No

**Corrective or remedial actions needed:** See Standard Condition 4.5a corrective actions, above.

- d) *Water is applied using no more than agronomic rates.*

**Meets condition?** Unknown

**Observations/Comments:** According to the cultivator, water is applied sparingly due to water scarcity, though application was not observed during the Project Site inspection.

**Photos:** No

**Corrective or remedial actions needed:** To verify conformance with this Standard Condition, start measuring and recording your water usage using flow meters on a per plant basis, based on type and size of plant pot, full term versus short season (light deprivation) plant, and type of irrigation. This data will help you refine a Water Budget for your operation and determine agronomic rates of watering.

- 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.*

**Meets condition?** No

**Observations/Comments:** Appropriate water rights have not been filed for the surface water diversions occurring on the Project Site.

**Photos:** No

**Corrective or remedial actions needed:** Water diversion and water storage requires valid water rights documentation. If you plan to continue surface water diversions for your agricultural water needs, you need to file and obtain water rights for your parcel, or provide other documentation of your legal water rights. Appropriate water rights applications to be filed with the State Water Resources Control Board (SWRCB) include:

- Initial Statement of Diversion and Use (ISDU)  
[http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/diversion\\_use/docs/intl\\_stmnt\\_form.pdf](http://www.waterboards.ca.gov/waterrights/water_issues/programs/diversion_use/docs/intl_stmnt_form.pdf)

**Note:** the SWRCB is currently developing a small irrigation appropriation for this region. PWA recommends that you apply for this small irrigation water right as soon as it becomes available.

- 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.*

**Meets condition?** No

**Observations/Comments:** The two water bladders on the Project Site were located on stable ground however there are no secondary containment structures in place to prevent delivery to waters of the state in the event of a containment failure. The water storage tanks on this Project Site are located on stable slopes far from any streams making it unlikely that water storage structure failures could result in delivery of runoff and eroded sediment to the stream network. The off-stream pond was located in a stable location and showed no signs of instability during the Project Site inspection. The pond spillway is not armored and shows minimal surface erosion although the potential for sediment delivery to surface waters was not observed. The pond spillway may need to be armored with rock to prevent further incision, however the pond



spillway is located on stable, low gradient native ground and the potential for undermining of the pond embankment is unlikely.

**Photos:** MP #8: Photo 8a and 8b.

**Corrective or remedial actions needed:** Construct an engineered containment berm around the perimeter of each water bladder to prevent discharge into waters of the state in the event of a containment failure. PWA recommends transitioning away from use of the water bladders and into more stable and secure water storage features, such as additional rigid plastic tanks and/or off-stream ponds. PWA recommends having the off-stream pond and embankment inspected by a certified engineer to determine stability of the embankment, likelihood for catastrophic containment failure and to prescribe recommended treatments if needed. Monitor the off-stream pond, embankment and spillway for further signs of instability or potential future erosion. If pond upgrading or engineered berm construction is to occur, obtain all necessary permits prior to commencement of construction activities.

**Standard Condition #5 - General comments and recommendations:** Currently, the only sources of water for both irrigation and domestic use are a spring fed pond and a shallow spring fed pit (Figure 2A). There is 88,762 gallons of water storage capacity in water tanks, water bladders, an off-stream pond and a shallow pit. At this time it appears that the water storage capacity contained within this Project Site may not fully satisfy the demand that would be expected from the cultivation area (20,325 ft<sup>2</sup>) during the dry season (May 15<sup>th</sup> through October 31<sup>st</sup>). A Water Budget will be developed and refined by water monitoring to determine if water storage is adequate. Based on water use estimates from the Humboldt County Planning and Building Department, adequate storage does not currently exist on the Project Site. These estimates suggest that 27 gallons of water is needed for every square foot of cultivation to observe the forbearance period. Based on the existing cultivation area of 22,325 ft<sup>2</sup>, 602,775 gallons of storage would be needed to observe the 150 day forbearance period. Using these estimates, the current amount of water storage (88,762 gallons) is not adequate for the size of the operation. If water storage is not sufficient for current operations and needs, then additional storage will need to be added so the landowner can completely forbear (not divert) during the dry season. In this way, as per the Order, it can then be assumed that water use will not impact downstream water quality or beneficial uses. The stability of the off-stream pond embankment is not known at this time and should be inspected by a certified engineer. The pond embankment and spillway should be monitored annually to ensure no future erosion is occurring and the embankment is not being undermined.

A LSAA will need to be submitted to the CDFW for the surface water diversion and prior to any stream crossing upgrading work.

Lake and Streambed Alteration Agreement (LSAA).

<https://www.wildlife.ca.gov/Conservation/LSA>

PWA highly recommends, and state agencies may require, that you install flow meters on your surface water diversion infrastructure, water storage features, and/or on your distribution lines, to accurately document the timing and volume of your surface water diversion and use. The client will need to document the amount of surface water that is

diverted, stored in the off-stream pond, water tanks and water bladders, and used for irrigation and other purposes through time. PWA has created a simple log sheet to help you monitor your water usage (see Appendix D).

#### 4.6 Standard Condition #6. Irrigation Runoff

- a) *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.*

**Meets condition?** Yes

**Observations/Comments:** No evidence of irrigation runoff to nearby watercourses was observed on the Project Site. Because irrigation is limited to a drip system and precise hand watering, there is a high degree of control. Cultivation areas are located greater than 100 feet away from the nearest stream or surface water. Any runoff that theoretically may occur at these locations could not travel far due to the low gradient topography and adequate vegetative buffer.

**Photos:** No

**Corrective or remedial actions needed:** None

**Standard Condition #6 - General comments and recommendations:** According to the Order, irrigation and fertilization shall occur at agronomic rates and chemicals shall be applied according to the label instructions and specifications. Agronomic rates are those rates of application of water, fertilizers and other amendments that are sufficient for utilization by the crop being grown, but not at a rate that would result in surface runoff or infiltration below the root zone of the crop being grown.

In the event that irrigation runoff occurs or could occur, you shall ensure that contaminated runoff does not enter nearby watercourses. This can be accomplished by constructing or designing containment measures, including sediment basins, berms, infiltration ditches and/or other Best Management Practices (BMPs), as needed, to contain and control surface runoff (see Appendix A).

#### 4.7 Standard Condition #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.*

**Meets condition?** No

**Observations/Comments:** Potting soil at Outdoor Cultivation Area #3 (OD #3) is in close proximity to the shallow pit (Figure 2A) with potential to leach into groundwater if left uncovered or if cover crops are not planted over the wet season. Potting soil and fertilizers at other outdoor cultivation areas or storage locations, or exposed to the elements anywhere on the Project Site, also has the potential for leaching into groundwater. The majority of fertilizers and amendments are stored inside storage trailers or tarped during the wet season, however some fertilizer containers were stored outdoors without adequate secondary containment.

**Photos:** MP #9: Photo 9a, 9b and 9c.

**Corrective or remedial actions needed:** Potting soil at OD #3 should be tarped or have cover crops planted to prevent nutrient mobilization over the wet season. Potting soil located at other outdoor cultivation areas, or exposed to the elements anywhere on the Project Site, should be tarped or have cover crops planted to prevent nutrient mobilization or leaching over the wet season. Store all fertilizers and soil amendments on the Project Site under a roof or tarped during the wet season and equipped with adequate secondary containment where applicable.

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

**Meets condition?** Yes

**Observations/Comments:** Based on verbal communication with the cultivator, the recommended application rates are being followed.

**Photos:** No

**Corrective or remedial actions needed:** To confirm compliance with this Standard Condition, you should keep detailed records of any fertilizers and/or other soil amendments you use in your operations. They can be recorded on log sheets such as those provided in Appendix E or by using another accurate record keeping method. Observe and monitor soil moisture so watering, fertilizer and chemical applications are made only when necessary and overwatering and excess infiltration is avoided.

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

**Meets condition?** No

**Observations/Comments:** See Standard Condition 4.7a observations and comments, above.

**Photos:** MP #9: Photo 9b.

**Corrective or remedial actions needed:** To prevent nutrient mobilization, you should: 1) keep new or spent potting soils and amendments inside or under a roof or 2) tarp or cover crop any soils or amendments that are kept outside over the wet season to prevent mobilization or leaching of nutrients. You should also plant cover crops in

spent pots and planting holes to enrich soil and lock up nutrients over the wet season. Also see Standard Condition 4.7a corrective or remedial actions, above.

**Standard Condition #7 - General comments and recommendations:** Most of the fertilizers, potting soil and soil amendments on the Project Site were observed to be either stored indoors or covered when stored outdoors. Potting soil in above ground pots and stored on the ground surface, if left uncovered, has the potential for mobilization or leaching of nutrients over the wet season. Fertilizers and amendments were applied according to packaging instructions, and usage is diminished or eliminated toward the end of the growing season.

Under the Order, you are required to keep track of the timing and volume of fertilizers and other soil amendments that are applied. This can be done using a simple log form we have provided in Appendix E.

Plant cover crops in spent pots and holes to enrich soil and lock up nutrients. If you plan to burn the plant stalks, you'll first need to obtain burn permits from CAL FIRE and the North Coast Unified Air Quality Management District (or relevant jurisdiction for your area). You can then incorporate the ash into the pots or planting holes prior to planting the cover crop to add minerals and recycle the ash.

Do not store fertilizers and/or soil amendments with petroleum products. See guidelines for hazardous material storage in Appendix G.

#### **4.8 Standard Condition #8. Pesticides/Herbicides**

- a) *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 labelling 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.*

**Meets condition?** Unknown

**Observations/Comments:** Pesticides and/or herbicides were not observed on the Project Site at the time of our inspection.

**Photos:** No

**Corrective or remedial actions needed:** All pesticides, herbicides and related materials (e.g., fungicides) must be used and applied consistent with product labeling. When present, these chemicals should be stored within enclosed buildings in such a way they cannot enter or be released into surface or ground waters. To verify conformance with this Standard Condition, you are required to keep track of the type,

timing and volume of pesticides, herbicides and related chemicals that are applied your operations. This can be done using a simple log form, such as the one included in Appendix F.

Additionally, for any pesticide use you must comply with any Pesticide Registration Requirements. See Appendix E2 included in the NCRWQCB Order, or on their web site at:

[http://www.waterboards.ca.gov/northcoast/board\\_decisions/adopted\\_orders/pdf/2015/150728\\_Appendix\\_E2\\_DPR\\_MJ%20Pesticide%20Handout.pdf](http://www.waterboards.ca.gov/northcoast/board_decisions/adopted_orders/pdf/2015/150728_Appendix_E2_DPR_MJ%20Pesticide%20Handout.pdf)

**Standard Condition #8 - General comments and recommendations:** For the health of the environment and your workers, you are encouraged to utilize organic or biologic controls, rather than highly toxic petro-chemicals, to prevent pest and mildew problems. Several safe alternatives are available.

All pesticides, herbicides and related materials (e.g., fungicides) must be used and applied consistent with product labeling. When present, these chemicals should be stored within enclosed buildings in such a way they cannot enter or be released into surface or ground waters.

Do not store pesticides/herbicides with petroleum products. See guidelines for hazardous material storage in Appendix G.

#### **4.9 Standard Condition #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.*

**Meets condition?** No

**Observations/Comments:** There are multiple small fuel cans, gas powered water pumps and generators on the Project Site that lack adequate secondary containment. Note that when petroleum products are onsite they will need to be stored under cover, off the ground and in a secondary containment basin (tote, tub, etc.) capable of containing the entire stored volume.

**Photos:** MP #8: Photo 8c. MP #9: Photo 9a.

**Corrective or remedial actions needed:** Place all small fuel cans, gas powered water pumps and generators in adequate secondary containment basins and store in a safe and secure location out of the elements where possible.

- 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.*

**Meets condition?** No

**Observations/Comments:** See Standard Condition 4.9a observations and comments, above.

**Photos:** See Standard Condition 4.9a Monitoring Points and photos, above.

**Corrective or remedial actions needed:** See Standard Condition 4.9a corrective or remedial actions, above.

- c) *Dischargers shall ensure that diked areas are sufficiently impervious to contain discharged chemicals.*

**Meets condition?** Not applicable

**Observations/Comments:** No diked areas were observed on the Project Site.

**Photos:** No

**Corrective or remedial actions needed:** None

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

**Meets condition?** No

**Observations/Comments:** No spill prevention cleanup kit is kept onsite to help clean up small spills.

**Photos:** No

**Corrective or remedial actions needed:** Obtain one or more spill prevention cleanup kits and keep readily available to clean up small spills. Spill kits should be located where fuel is stored and refueling occurs.

- 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.*

**Meets condition?** Not applicable

**Observations/Comments:** No underground storage tanks were observed on the Project Site.

**Photos:** No

**Corrective or remedial actions needed:** None

**Standard Condition #9 - General comments and recommendations:** Place all small fuel cans, gas powered water pumps and generators in adequate secondary containment basins. Note that when petroleum products are onsite they will need to be stored under cover, off the ground and in a secondary containment basin (tote, tub, etc.).

The State of California requires an owner or operator of a facility to complete and submit a Hazardous Material Business Plan (HMBP) if the facility handles a hazardous material or mixture containing a hazardous material that has a quantity at any one time during the reporting year equal to or greater than: 55 gallons (liquids), 500 pounds (solids), or 200 cubic feet for compressed gas (propane) used for the cultivation operations. If at any time during the year your operations exceed any one of these quantities, you need to prepare and file a HMBP for your operation. Information regarding HMBPs can be found at <http://ca-humboldtcounty.civicplus.com/DocumentCenter/Home/View/3224>.

Additionally, while it is not explicitly stated in the Order, please note that the Humboldt County Division of Environmental Health (HCDEH) also requires that anyone that has

over 55 gallons or more of any petroleum liquid at any time of the year, including fuels and waste oil, develop a HMBP.

Do not store petroleum products and/or chemicals with fertilizers, soil amendments and/or pesticides/herbicides. See guidelines for hazardous material storage in Appendix G.

#### 4.10 Standard Condition #10. Cultivation-Related Wastes

- a) *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 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.*

**Meets condition?** No

**Observations/Comments:** Cultivation-related waste material was stored at OD #3 with the potential to enter or be blown into surface waters. Plant waste from cultivation activities is properly stored and burned or composted on the Project Site.

**Photos:** MP #9: Photo 9b.

**Corrective or remedial actions needed:** Collect and properly dispose of or cover all cultivation-related waste material located at OD #3 to eliminate mobilization potential to surface waters. Properly store all future cultivation-related waste material located on the Project Site where there is no threat of delivery to surface waters and dispose of appropriately by either burning, shredding, composting or taking material to an appropriate waste disposal facility.

**Standard Condition #10 - General comments and recommendations:** We encourage you to chip or shred your plant stalks and compost them after harvest. If you burn the stalks, you must first obtain burn permits from CAL FIRE and the North Coast Unified Air Quality Management District (or other relevant jurisdiction for your area). You can then recycle the ash and add minerals to the soil by mixing the ash into your spent pots and plant holes prior to planting a cover crop at the end of the season. Any additional cultivation-related waste can be easily contained by keeping soils and garbage greater than 200 feet from drainage areas and on gentle slopes, tarping or otherwise covering soil piles, and/or by placing straw wattles or other containment structures around the perimeter of spoil piles.

#### 4.11 Standard Condition #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.*

**Meets condition?** No

**Observations/Comments:** The existing Onsite Wastewater Treatment System (OWTS) consists of an unpermitted pit toilet and gray water pipe located near

Greenhouse #1. The pit toilet is located in a stable area, although it is close to a break in slope, and is functioning properly according to the landowner. The gray water pipe outlets onto the hillslope southeast of the pit toilet, however the nearest surface water appears to be located far downslope based on field observations and topographic interpretation. Although the pit toilet and gray water system are unpermitted, these items are not used during the wet weather season and there did not appear to be a direct threat to surface waters or groundwater at the time of the Project Site inspection.

**Photos:** MP #10: Photo 10a and 10b.

**Corrective or remedial actions needed:** Since the existing pit toilet and gray water system are unpermitted, PWA recommends you conduct wet weather testing and onsite investigations to site, design and install a permitted OWTS for the Project Site. The system must be designed to serve the number of residents and workers that will be present on the Project Site when your cultivation-related operations are at their peak. The existing gray water system, and any future system, should be incorporated into the new OWTS. PWA also recommends the use of portable toilets suitable for the number of residents and workers that will be present on the Project Site until the permitted OWTS is installed.

- 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.*

**Meets condition?** Yes

**Observations/Comments:** The majority of garbage and refuse was observed to be stored properly and securely at the time of the Project Site inspection. Some garbage and refuse on the Project Site was not stored properly, however the potential for delivery to receiving waters was not observed.

**Photos:** MP #9: Photo 9a.

**Corrective or remedial actions needed:** Collect and properly store all garbage and refuse on the Project Site not already adequately contained until such time as this material can be properly disposed of. Continue to store all garbage and refuse in lidded cans or other adequate containers in a safe and secure location where the threat to waters of the state does not exist. PWA recommends you dispose of existing garbage and refuse in a timely manner at an approved waste disposal facility.

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

**Meets condition?** Yes

**Observations/Comments:** According to the client the garbage and refuse generated onsite is disposed of at an appropriate waste disposal location.

**Photos:** No

**Corrective or remedial actions needed:** PWA recommends that the client continue to dispose of existing garbage and refuse in a timely manner and at an approved waste disposal facility.

**Standard Condition #11 - General comments and recommendations:** At the current time the existing pit toilet and gray water system are unpermitted. PWA recommends conducting wet weather testing and site investigations to site, design and install a permitted system that incorporates gray water. Collect and properly store all garbage and refuse not



already adequately stored until this material can be disposed of appropriately. Continue to store garbage and refuse in lidded cans or other adequate containers at a safe and secure location and dispose of in a timely manner at an approved waste disposal facility.

#### **4.12 Standard Condition #12. Remediation/Cleanup/Restoration**

- a) *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 A accompanying the NCRWQCB Order, (and Appendix A in your WRPP), 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.*

*These protection and mitigation measures have been developed to prevent or reduce the environmental impacts and represent minimum, enforceable standards by which cleanup activities shall be conducted under this Order.*

**Meets condition?** Yes

**Observations/Comments:** See general comments below.

**Photos:** No

**Corrective or remedial actions needed:** None

**Standard Condition #12 - General comments and recommendations:** It is PWA's opinion that the Project Site is currently compliant with this condition. All needed corrective actions are addressed in Standard Conditions 1 through 11.

**5.0 PRIORITIZED CORRECTIVE ACTIONS AND SCHEDULE TO REACH FULL COMPLIANCE**

The following check list should be followed to become fully compliant with the Order. Please see the detailed comments and recommendations above for a more complete description of the problems and the needed corrective actions and monitoring requirements.

**Table 1. Features Needing Improvement or Action Items (Prioritized implementation schedule for corrective actions)**

Standard Condition Requiring Action	Treatment Priority	Schedule	Summary of Corrective Actions/Recommendations (see more detailed listing of corrective actions in Section 4, above)	Monitoring Point and Photo #	Estimated Cost	Date Completed
1 – Site Maintenance, Erosion Control and Drainage Features	High	October 15, 2019	<ul style="list-style-type: none"> <li>- Install a rolling dip not connected to the inboard ditch or cutbank to drain road surface runoff at the hillslope gully left of the DRC. Ensure any flow in the inboard ditch is conveyed to the spring crossing at Road Surface Discharge Point #1 (RSDP #1)</li> <li>- Install a broad dip at RSDP #1 and armor the outboard fillslope with 0.5-1.5 foot diameter rock (Figure 2B).</li> <li>- Install five rolling dips on the Main Road to the left of the spring crossing at 125-150 foot spacing intervals.</li> <li>- Install three rolling dips on New 3 Creeks Road to the left of the intersection with the Main Road at 150-175 foot spacing intervals.</li> <li>- Install two rolling dips to the right of the intersection spaced 150 feet apart with the lower rolling dip located approximately 50 feet up the road from RSDP #2.</li> <li>- Install one rolling dip at RSDP #3 and one rolling dip at RSDP #4 spaced 150-175 feet apart.</li> <li>- Install rolling dips at RSDP #6 and RSDP #7.</li> <li>- Location references to left and right are when facing downstream or downslope.</li> </ul>	<p>MP #1, Photo 1  MP #2, Photo 2a, 2b, 2c  MP #3, Photo 3  MP #4, Photo 4  MP #5, Photo 5a, 5b  MP #6, Photo 6  MP #7, Photo 7</p>		

**Table 1. Features Needing Improvement or Action Items (Prioritized implementation schedule for corrective actions)**

Standard Condition Requiring Action	Treatment Priority	Schedule	Summary of Corrective Actions/Recommendations (see more detailed listing of corrective actions in Section 4, above)	Monitoring Point and Photo #	Estimated Cost	Date Completed
1a, b, d, e	High	October 15, 2019	<ul style="list-style-type: none"> <li>- The installation of these rolling dips is intended to disconnect concentrated surface runoff that results in sediment delivery to surface waters. The inboard edge of the rolling dip should be connected to the base of the cutbank to fully disconnect road surface runoff and inboard ditch flow, where present, unless otherwise stated. Ensure that the construction and outlet location of the rolling dips allow dispersal and infiltration of collected road runoff. Armoring of the outboard fillslope at rolling dip outlets may be necessary to prevent further erosion where hillslope gullies previously exist. Install additional rolling dips with adequate spacing intervals at any location where concentrated road runoff and gullying is observed.</li> <li>- PWA also recommends installing water bars on the steep section of Road #1 leading to Greenhouse #5 at 50 foot spacing intervals prior to each winter season. Typical drawings included in Appendix H will provide guidance for proper rolling dip and water bar construction.</li> </ul>	MP #1, Photo 1 MP #2, Photo 2a, 2b, 2c MP #3, Photo 3 MP #4, Photo 4 MP #5, Photo 5a, 5b MP #6, Photo 6 MP #7, Photo 7		
1e	High	October 15, 2019	PWA recommends installing a full-round downspout on the existing DRC with the downspout outlet at the base of the fillslope. Five cubic yards of rock armor should be placed at the downspout outlet to prevent further erosion.	--		
2 -- Stream Crossing Maintenance	High	October 15, 2020	Upgrade SC #1 with a properly sized culvert that is designed to pass the expected 100-year peak stream flow, as well as the other stream crossing construction standards required by the Order (e.g., minimized hydrologic connectivity, correct orientation, no diversion potential, etc.). Due to the minimal amount of road fill at this stream crossing, other alternatives to a round culvert, such as an arched or oval culvert, may be needed to avoid importing of fill to rebuild the crossing or significantly increasing elevation of the road bed. The landowner will need to determine responsibility for the stream crossing on New 3 Creeks Road and coordinate with that entity, if necessary, to implement the recommended stream crossing upgrade treatments and conduct regular maintenance.	MP #5, Photo 5a – 5d		

**Table 1. Features Needing Improvement or Action Items (Prioritized implementation schedule for corrective actions)**

Standard Condition Requiring Action	Treatment Priority	Schedule	Summary of Corrective Actions/Recommendations (see more detailed listing of corrective actions in Section 4, above)	Monitoring Point and Photo #	Estimated Cost	Date Completed
2b	Moderate	October 15, 2020	<p>Upgrade SC #1 with a properly sized 48-inch diameter culvert that is designed to address debris associated with the expected 100-year peak stream flow.</p> <ul style="list-style-type: none"> <li>- Due to the amount of woody debris and riparian vegetation observed upslope of the crossing a trash rack should be installed upstream of the culvert inlet to minimize plug potential. Typical drawings included in Appendix H will provide guidance for proper trash rack installation.</li> <li>- Upgrade SC #1 with a properly installed culvert that aligns with the natural channel grade and stream alignment where possible. An additional 10 feet of culvert length when replacing the culvert will allow for better horizontal alignment with the natural stream channel.</li> <li>- The installation of five cubic yards of rock armor on the outside banks of the channel at both the inlet and the outlet will help to prevent erosion (10 cubic yards total). Rock armor at the inlet can also help to create a half-flared inlet and increase culvert capacity.</li> </ul>	MP #5, Photo 5a – 5d		
2e	Moderate	October 15, 2020	<ul style="list-style-type: none"> <li>- The installation of five cubic yards of rock armor on the outside banks of the channel at both the inlet and the outlet will help to prevent erosion (10 cubic yards total). Rock armor at the inlet can also help to create a half-flared inlet and increase culvert capacity.</li> </ul>	MP #5, Photo 5d		
2f	High	October 15, 2020	<p>When the culvert at SC #1 is upgraded, ensure that the rebuilt crossing is constructed to prevent stream diversion in case of a plugged culvert or exceptionally high flood flow by installing a critical dip on the right hinge line.</p>	MP #5, Photo 5d		
2	High	Prior to any stream crossing work	<p>Obtain all necessary agreements and permits prior to commencing work in any watercourse or at any stream crossing. These may include, but not be limited to: California Department of Fish and Wildlife (CDFW) Lake and Streambed Alteration Agreement (LSAA) 1602 and Army Corps of Engineers (ACOE) 404 Permit.</p>	--		
5a	Moderate	November 31, 2017	<p>Develop a Water Budget to determine if sufficient water storage volumes are currently available on the Project Site for cultivation and other uses during the dry season from May 15th through October 31st.</p>	--		

**Table 1. Features Needing Improvement or Action Items (Prioritized implementation schedule for corrective actions)**

Standard Condition Requiring Action	Treatment Priority	Schedule	Summary of Corrective Actions/Recommendations (see more detailed listing of corrective actions in Section 4, above)	Monitoring Point and Photo #	Estimated Cost	Date Completed
5a	Moderate	2017 and then annually	<p>Implement a Water Monitoring Plan on the Project Site:</p> <ul style="list-style-type: none"> <li>- Install float valves on storage tanks and bladders to prevent overflow.</li> <li>- Install water monitoring meters on your surface water diversion infrastructure and water storage vessels.</li> <li>- Monitor and record the timing and volume of surface water diversion, water storage and water use using the log sheets provided in Appendix D.</li> <li>- Increase the use of water saving strategies, such as volume-limited drip irrigation systems, incorporating water holding amendments and native soil during the initial soil preparation at the start of the season, surface mulching or planting in beds to minimize evaporation, and planting plants in the ground instead of above ground pots.</li> <li>- Additional rainwater harvesting during the wet season should be evaluated and employed to limit or completely eliminate surface water diversion during the dry season.</li> </ul>	--		
5b	Moderate	2017 and then annually	<ul style="list-style-type: none"> <li>- Develop a Water Budget to determine adequate off-stream storage requirements to eliminate surface water diversion during the dry season.</li> </ul>	--		
5c	Moderate	November 31, 2017	<ul style="list-style-type: none"> <li>- Start measuring and recording your average water usage on a per plant basis, based on type and size of plant pot, full term versus short season (light deprivation) plant, and type of irrigation, in order to develop and refine a Water Budget for your operation.</li> </ul>	--		
5d	Moderate	May 31, 2017	<ul style="list-style-type: none"> <li>- File an Initial Statement of Diversion and Use (ISDU) application for the surface water diversion with the NCRWQCB.</li> </ul>	--		
5e	High	June 30, 2017		--		

**Table 1. Features Needing Improvement or Action Items (Prioritized implementation schedule for corrective actions)**

Standard Condition Requiring Action	Treatment Priority	Schedule	Summary of Corrective Actions/Recommendations (see more detailed listing of corrective actions in Section 4, above)	Monitoring Point and Photo #	Estimated Cost	Date Completed
5f	Moderately high	October 15, 2018	<ul style="list-style-type: none"> <li>- Construct an engineered containment berm around the perimeter of each water bladder to prevent discharge into waters of the state in the event of a containment failure. PWA recommends transitioning away from use of the water bladders and into more stable and secure water storage features, such as additional rigid plastic tanks and/or off-stream ponds.</li> <li>- PWA recommends having the off-stream pond and embankment inspected by a certified engineer to determine stability of the embankment, likelihood for catastrophic containment failure and to prescribe recommended treatments if needed.</li> <li>- Monitor the off-stream pond, embankment and spillway for further signs of instability or potential future erosion.</li> <li>- If pond upgrading or engineered berm construction is to occur, obtain all necessary permits prior to commencement of construction activities.</li> </ul>	MP #8, Photo 8a, 8b		
5	High	October 31, 2017	<ul style="list-style-type: none"> <li>- Submit a LSAA to the CDFW for the surface water diversion and prior to any stream crossing upgrading work.</li> </ul>	--		
7a, c	High	October 31, 2017 and annually	<ul style="list-style-type: none"> <li>- Potting soil at OD #3 should be tarped or have cover crops planted to prevent nutrient mobilization over the wet season.</li> <li>- Potting soil located at other outdoor cultivation areas, or exposed to the elements anywhere on the Project Site, should be tarped or have cover crops planted to prevent nutrient mobilization or leaching over the wet season.</li> <li>- Store all fertilizers and soil amendments on the Project Site under a roof or tarped during the wet season and equipped with adequate secondary containment where applicable.</li> </ul>	MP #9, Photo 9a, 9b, 9c		
7b	Moderate	2017 and then annually	<ul style="list-style-type: none"> <li>- Keep detailed records of the timing and volume of fertilizers and/or other soil amendments you use in your operations on log sheets provided in Appendix E.</li> </ul>	--		
7c	Moderate	October 31, 2017 and annually	<ul style="list-style-type: none"> <li>- To prevent nutrient mobilization, you should: 1) keep new or spent potting soils and amendments inside or under a roof or 2) tarp or cover crop any soils or amendments that are kept outside over the wet season to prevent mobilization or leaching of nutrients.</li> <li>- You should also plant cover crops in spent pots and planting holes to enrich soil and lock up nutrients over the wet season.</li> </ul>	MP #9, Photo 9b		

7 - Fertilizer and Amendment Use

**Table 1. Features Needing Improvement or Action Items (Prioritized implementation schedule for corrective actions)**

Standard Condition Requiring Action	Treatment Priority	Schedule	Summary of Corrective Actions/Recommendations (see more detailed listing of corrective actions in Section 4, above)	Monitoring Point and Photo #	Estimated Cost	Date Completed
8 – Pesticides and Herbicides	Moderate	2017 and then annually	Keep detailed records of the timing and volume of any pesticides, herbicides or other chemicals you use in your operations on log sheets provided in Appendix F.	--		
9 – Petroleum Products and Other Chemicals	High	June 30, 2017	Place all small fuel cans, gas powered water pumps and generators in adequate secondary containment basins and store in a safe and secure location out of the elements where possible.	MP #8, Photo 8c MP #9, Photo 9a		
	High	June 30, 2017	Obtain and make available one or more spill prevention cleanup kits to clean up small spills. Spill kits should be located where fuel is stored and refueling occurs.	--		
10 – Cultivation-Related Waste	High	June 30, 2017	<ul style="list-style-type: none"> <li>- Collect and properly dispose of or cover all cultivation-related waste material located at OD #3 to eliminate mobilization potential to surface waters.</li> <li>- Properly store all future cultivation-related waste material located on the Project Site where there is no threat of delivery to surface waters and dispose of appropriately by either burning, shredding, composting or taking material to an appropriate waste disposal facility.</li> </ul>	MP #9, Photo 9b		
11 – Refuse and Human Waste	Moderately high	October 15, 2020	<ul style="list-style-type: none"> <li>- Conduct wet weather testing and onsite investigations to site, design and install a permitted OWTS for the Project Site. The system must be designed to serve the number of residents and workers that will be present on the Project Site when your cultivation-related operations are at their peak.</li> <li>- The existing gray water system, and any future system, should be incorporated into the new OWTS.</li> <li>- PWA also recommends the use of portable toilets suitable for the number of residents and workers that will be present on the Project Site until the permitted OWTS is installed.</li> </ul>	MP #10, Photo 10a, 10b		

## 6.0 MONITORING AND INSPECTION PLAN

Under the Order, sites are required to be monitored and inspected periodically to ensure conformance with the 12 Standard Conditions. In most cases, inspections and records of inspections identify conditions that have been corrected and are now in compliance; conditions that remain in compliance; and conditions that have changed and may no longer be in compliance with the Order. An inspection and monitoring plan is used to document these conditions, identify problems and make corrections using best management practices (BMPs) to protect water quality (Appendix A).

Monitoring Plan – Please refer to Appendix B and Figure 2A and 2B to review the monitoring plan and specific monitoring points for which you are responsible.

Monitoring guidelines and reporting standards have been created by the NCRWQCB as part of the Order. Monitoring of the Project Site includes visual inspection and photographic documentation of each feature of interest listed on the Project Site map, with new photographic documentation recorded with any notable changes to the feature of interest.

Site inspection schedule - According to the NCRWQCB, periodic inspections should include visual inspection of the site, including any management measures/practices, to ensure they are being implemented correctly and are functioning as expected. Inspections include photographic documentation of any controllable sediment discharge sites, as identified on the site map, and a visual inspection of those locations on the site where pollutants or wastes, if uncontained, could be transported into receiving waters, and those locations where runoff from roads or developed areas drains into or towards surface water.

At a minimum, sites shall be inspected at the following times to ensure timely identification of changed site conditions and to determine whether implementation of additional management measures is necessary to prevent or minimize discharges of waste or pollutants to surface water:

- 1) Before and after any significant alteration or upgrade to a given stream crossing, road segment, or other controllable sediment discharge site. Inspection should include photographic documentation, with photo records to be kept onsite.
- 2) Prior to October 15<sup>th</sup> to evaluate site preparedness for storm events and stormwater runoff.
- 3) Following the accumulation of 3 inches cumulative precipitation (starting September 1<sup>st</sup>) or by December 15<sup>th</sup>, whichever is sooner.
- 4) Following any rainfall event with an intensity of 3 inches precipitation in 24 hours. Precipitation data can be obtained from the National Weather Service by entering the site zip code at <http://www.srh.noaa.gov/forecast>; Pick the nearest or most relevant zip code and then select the 3 day history that will also show precipitation totals.

Inspection and Monitoring Checklist – Appendix B contains a checklist data form that will be used by the landowner and/or operator to: 1) document inspection dates, 2) document visual and photographic inspection results, 3) describe remediation and management measures that are being applied, 4) identify new problems and their treatments, and 5) document the progress and effectiveness of implementing remedial and corrective measures that are needed to meet the 12 Standard Conditions, as outlined in this WRPP. Appendix C contains photo documentation of your



monitoring points and will need to be updated as corrective treatments are implemented and treatments are monitored and evaluated over time.

Annual Reporting – An Annual Report is to be submitted directly to the NCRWQCB or to PWA (through our 3<sup>rd</sup> Party Program). The information in the annual reporting form must be submitted by March 31<sup>st</sup> of each year. The reported information is to be reflective of current site conditions, and includes monitoring data and tasks accomplished to protect water quality. Among other things, the report includes such items as the reporting of monthly monitoring data collected during the year (e.g., chemical use, water diversions, water storage, water use, etc.), management measures (BMPs) applied during the year and their effectiveness, and tasks accomplished during the year towards meeting each of the 12 Standard Conditions identified as deficient in this WRPP.

## 7.0 WATER USE PLAN

Requirements - According to the Order, a Water Use Plan (WUP) shall record water source, relevant water right documentation, and amount used monthly. All water sources shall be recorded, including alternative sources such as rain catchment and groundwater, and/or hauled water. Other elements of the WUP will include:

- Developing a Water Budget for determining the timing and volume of actual water use on the site. Water related data will be summarized monthly for the preceding month.
- Designing and implementing water conservation measures to reduce water diversion and water use.
- Calculating water storage requirements needed to support cultivation activities during the dry season, and implementing those required storage measures.

The Water Use Plan must also describe water conservation measures and document your approach to ensure that the quantity and timing of water use is not impacting water quality objectives and beneficial uses (including cumulative impacts based on other operations using water in the same watershed). Water use will only be presumed to not adversely impact water quality under one of the following scenarios:

- No surface water diversions occur from May 15<sup>th</sup> to October 31<sup>st</sup>.
- Water diversions are made pursuant to a local plan that is protective of instream beneficial uses.
- Other options that may affect water quality: (e.g., percent of flow present in stream; minimum allowable riffle depth; streamflow gage at bottom of Class I stream; AB2121 equations; CDFW instream flow recommendations; promulgated flow objective in Basin Plan; etc.).

Site Water Use Plan -The record of activities, accomplishments and water monitoring results for the Water Use Plan for this site will be logged and recorded in data tables and site records (data forms) included in Appendix D of this WRPP. These will be tracked and kept up-to-date by the landowner or cultivator of the site.

*Water Storage and Forbearance* – There is 88,762 gallons of water storage, in water tanks, water bladders, an off-stream pond and a shallow groundwater pit, currently on the Project Site. Based on the size of the cultivation area (20,325 ft<sup>2</sup>) it does not appear that there is adequate storage to avoid surface water diversion during the dry season from May 15<sup>th</sup> through October 31<sup>st</sup>. Water use estimates from the Humboldt County Planning and Building Department also suggest that adequate storage does not currently exist on the Project Site. These estimates suggest that 27 gallons of water is needed for every square foot of cultivation and, based on the existing cultivation area of 22,325 ft<sup>2</sup>, 602,775 gallons of storage would be needed to observe the 150 day forbearance period. A Water Budget will need to be developed and refined to determine if additional storage is needed for your operations to forbear (not extract) during this period.

*Water Conservation* - Water conservation measures currently practiced include the use of a drip irrigation system and controlled hand watering. We suggest growing many of the plants in-ground (as compared to above ground pots) and watering late in the afternoon or evening to minimize water loss through evaporation and maximize water up-take by the plants. Starting this year, new water conserving techniques and equipment will be utilized and tested to evaluate their effectiveness and efficiency. Test and deploy volume limited drip emitters and incorporating water holding amendments and native soil during the initial soil preparation at the start of the season.

*Water sources and use* – A rain and spring fed off-stream pond located on the Project Site is the water source used for irrigation activities (Figure 2A). Additional rainwater harvesting should be evaluated and employed where possible to limit surface water diversion during the dry season. When and if new ponds are approved and constructed, they should be designed to be off-stream and rainwater-fed so your operations will have minimal or no impact on downstream water quality and aquatic habitat, especially during the dry summer months.

At this time, the client has a rough estimate of water that is used monthly or annually on this Project Site for irrigation purposes. Therefore, it will be important for you to keep accurate records of your surface water diversion, storage and use so that it can be reported each year, as required by the DWR. The more frequently and accurately water use is recorded, the better you will understand the water uses and needs of your farm, the value of water conservation, and the volume of water storage that is needed for you to forbear (not divert) during the dry summer growing season.

Therefore, over the course of the current and future season, water use should be documented using the log forms supplied to you by PWA, attached in Appendix D, or by some other equally accurate method. Annual reporting of diversion and use rates are required to be submitted annually to the State Water Resource Control Board (Division of Water Rights) no later than March 31 for the preceding calendar year. As more accurate data is gathered, refined targets can be made to ensure adequate storage exists to protect downstream water quality and beneficial uses during the driest time of the year.

## **8.0 LIST OF CHEMICALS**

The WRPP must contain a list of chemicals being stored onsite, in addition to quantities used and frequency of application. These include fertilizers/soil amendments, pesticides, herbicides,

fungicides, petroleum products and other chemicals used in, or associated with, your cultivation activities and related operations.

Because this is the first year of enrollment, information regarding chemical use and storage is deficient or anecdotal. Appendixes E and F contain monitoring forms that should be used to list the chemical inventory record over time, as supplies are added to the site and used during the growing season. The landowner or operator will use these forms to track the types, storage volumes, timing of application, and volume of use of these products throughout the year. The initial chemicals and amendment list that may be used and stored onsite include:

Fertilizers and amendments:

Micro  
Grow  
Bloom  
Plant Amp  
Uncle John's Blend  
Mag Amp  
Sugaree and Sourdee  
Humtea  
G-rex  
T-rex

Petroleum and Other Chemicals:

Gasoline  
Motor oil  
Propane  
Solar batteries

Pesticides, Herbicides, and Fungicides:

None

**9.0 LANDOWNER/LESSEE CERTIFICATION/SIGNATURES**

This Water Resource Protection Plan (WRPP) has been prepared by Pacific Watershed Associates, an approved Third Party Program acting on behalf of the North Coast Regional Water Quality Control Board (NCRWQCB).

“I have read and understand this WRPP, including Section 2.0 – Certifications, Conditions and Limitations. I agree to comply with the requirements of the California Regional Water Quality Control Board North Coast Region Order No. 2015-0023 (Waiver of Waste Discharge Requirements and General Water Quality Certification for Discharges of Waste Resulting from Cannabis Cultivation and Associated Activities or Operations with Similar Environmental Effects in the North Coast Region), including the recommendations and actions listed in this WRPP.”

Name of Legally Responsible Person (LRP): \_\_\_\_\_

Title (owner, lessee, operator, etc.): Owner \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

WRPP prepared by (if different from LRP): **Pacific Watershed Associates, Inc.**

WRPP prepared and finalized on (date): \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

# 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<sup>1</sup> of rain shall be the trigger for temporary cessation of project activities and winterization/erosion protection of the work site.

---

<sup>1</sup> 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.

---

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 Poned 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<sup>2</sup> 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.

---

<sup>2</sup> A Primer on Stream and River Protection for the Regulator and Program Manager: Technical Reference Circular 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/streamprotectionircular.pdf](http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stream_wetland/streamprotectionircular.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<sup>3</sup>, armored fills with culverts<sup>3</sup>, and bridges<sup>3</sup>.
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<sup>2</sup>. 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

---

<sup>3</sup> 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](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 culverts, 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<sup>4</sup>.
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.

---

<sup>4</sup> 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<sup>5</sup>.

---

<sup>5</sup> Available at: [http://www.waterboards.ca.gov/water\\_issues/programs/owts/docs/owts\\_policy.pdf](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](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](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](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](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](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](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](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](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](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](http://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmcpu116.pdf)

151028\_RV6\_of\_AppendixA\_EMP

## **APPENDIX B: MONITORING PLAN AND PHOTO LOGS**

Monitoring Plan – In general, the entire road network, cultivation area and associated facilities need to be monitored throughout the year to identify any problems that might arise and to monitor the effectiveness of corrective actions which are completed. Refer to Figure 2 for the general location of monitoring points that you are responsible for tracking. However, the entire Project Site needs to be monitored to ensure that the site achieves and maintains compliance with the 12 Standard Conditions. If additional deficiencies develop, or individual problems arise, then corrective actions must be implemented immediately and these problem areas will be further monitored according to the WRPP.

For this Project Site, 10 monitoring points have been identified. Most are related to inadequate road drainage, water bladders lacking secondary containment and fertilizer, soil, petroleum and cultivation-related waste storage. MP #1 - MP #7 show the effects of inadequate road drainage and sediment delivery to surface waters. MP #5 shows an undersized culvert installed slightly high in the road fill. MP #8 shows two water bladders lacking secondary containment berms and gas powered water pumps lacking secondary containment. MP #9 shows improper storage of fertilizer, potting soil, petroleum products and cultivation-related waste at multiple locations on the Project Site. MP #10 shows the unpermitted pit toilet and gray water system currently in use.

The goal of the monitoring is to ensure the original problem/feature has been effectively treated and that the causal mechanism (undersized culverts or improperly stored fertilizers and petroleum products) isn't continuing to threaten surface waters or groundwater. Consult with PWA if a problem is detected at any of these monitoring locations or elsewhere on the property, or if you would like our assistance. Please also report to PWA when one or more of the corrective actions in the WRPP have been implemented, and include photos and descriptions of the actions taken.

Site inspection schedule - According to the NCRWQCB, periodic inspections should include visual inspection of the site, including any management measures/practices, to ensure they are being implemented correctly and are functioning as expected. Inspections include photographic documentation of any controllable sediment discharge sites, as identified on the site map, and a visual inspection of those locations on the site where pollutants or wastes, if uncontained, could be transported into receiving waters, and those locations where runoff from roads or developed areas drains into or towards surface water.

At a minimum, sites shall be inspected at the following times to ensure timely identification of changed site conditions and to determine whether implementation of additional management measures is necessary to prevent or minimize discharges of waste or pollutants to surface water:

- 1) Before and after any significant alteration or upgrade to a given stream crossing, road segment, or other controllable sediment discharge site. Inspection should include photographic documentation, with photo records to be kept on-site.
- 2) Prior to October 15 to evaluate site preparedness for storm events and stormwater runoff.
- 3) Following the accumulation of 3 inches cumulative precipitation (starting September 1<sup>st</sup>) or by December 15<sup>th</sup>, whichever is sooner.
- 4) Following any rainfall event with an intensity of 3 inches precipitation in 24 hours. Precipitation data can be obtained from the National Weather Service by entering the site zip code at <http://www.srh.noaa.gov/forecast>; Pick the nearest or most relevant zip code and then select the 3 day history that will also show precipitation totals.

**Photo Log of features of interest and monitoring points before, during, and/or after treatment**

<b>Photo #</b>	<b>Monitoring Point</b>	<b>Feature</b>	<b>Date</b>	<b>Pre-, during, or post-treatment</b>	<b>Description</b>
1	MP #1	Road Surface Discharge Point #1	6/13/16	Pre-treatment	View of a spring crossing and surface erosion due to a lack of road drainage structures looking up the right road approach.
2a	MP #2	Road Surface Erosion	6/13/16	Pre-treatment	View of surface erosion due to a lack of road drainage structures with sediment delivery to surface waters looking down the road.
2b	MP #2	Road Surface Discharge Point #2	6/13/16	Pre-treatment	View of surface erosion in the inboard ditch due to a lack of road drainage structures and sediment delivery to a Class II stream looking up the road.
2c	MP #2	Road Surface Discharge Point #2	6/13/16	Pre-treatment	View of the outlet of the inboard ditch discharging sediment in close proximity to a Class II stream looking down the outboard fillslope.
3	MP #3	Road Surface Discharge Point #3	6/13/16	Pre-treatment	View of surface erosion due to a lack of road drainage structures and sediment delivery to a Class II stream looking up the road.
4	MP #4	Road Surface Discharge Point #4	6/13/16	Pre-treatment	View of the point of sediment delivery in close proximity to a Class II stream from road surface erosion due to a lack of road drainage structures looking towards the outboard fillslope.
5a	MP #5	Road Surface Discharge Point #5	6/13/16	Pre-treatment	View of the inboard ditch delivering sediment to the outlet of SC #1 due to a lack of road drainage structures looking down the road.
5b	MP #5	Road Surface Discharge Point #5	6/13/16	Pre-treatment	View of the inboard ditch delivering sediment to the outlet of SC #1 due to a lack of road drainage structures looking up the road.
5c	MP #5	Stream Crossing #1	6/13/16	Pre-treatment	View of the inlet of an undersized 36-inch diameter culvert installed slightly high in the fillslope.



<b>Photo Log of features of interest and monitoring points before, during, and/or after treatment</b>					
<b>Photo #</b>	<b>Monitoring Point</b>	<b>Feature</b>	<b>Date</b>	<b>Pre-, during, or post-treatment</b>	<b>Description</b>
5d	MP #5	Stream Crossing #1	6/13/16	Pre-treatment	View of the outlet of an undersized 36-inch diameter culvert installed slightly high in the fillslope and lacking an adequate critical dip to prevent diversion.
6	MP #6	Road Surface Discharge Point #6	6/13/16	Pre-treatment	View of a pile of plant stalks disposed of within the riparian buffer zone of a Class III stream east of the proposed water tank relocation area.
7	MP #7	Road Surface Discharge Point #7	6/13/16	Pre-treatment	View of surface erosion due to a lack of road drainage structures and sediment delivery to a Class II stream looking up the road.
8a	MP #8	Water bladder	6/13/16	Pre-treatment	View of a 20,000 gallon water bladder located near the off-stream pond lacking a secondary containment berm.
8b	MP #8	Water bladder	6/13/16	Pre-treatment	View of a 10,000 gallon water bladder located near the off-stream pond lacking a secondary containment berm.
8c	MP #8	Fuel storage	6/13/16	Pre-treatment	View of a small fuel can and two gas powered water pumps located near the 20,000 gallon water bladder lacking adequate secondary containment.
--	MP #8	Pond embankment	--	Pre-treatment	No photo.
--	MP #8	Pond spillway	--	Pre-treatment	No photo.
9a	MP #9	Storage area	6/13/16	Pre-treatment	View of improperly stored fertilizer, fuel and household garbage located near the pit toilet.
9b	MP #9	Outdoor Area #3	6/13/16	Pre-treatment	View of potting soil and cultivation-related waste with the potential for leaching into groundwater if left uncovered over the wet season.



**APPENDIX C: PHOTO DOCUMENTATION OF MONITORING POINTS**



MP #1, Photo 1



MP #2, Photo 2a



MP #2, Photo 2b



MP #2, Photo 2c



MP #3, Photo 3



MP #4, Photo 4



MP #5, Photo 5a



MP #5, Photo 5b



MP #5, Photo 5c



MP #5, Photo 5d



MP #6, Photo 6



MP #7, Photo 7





MP #8, Photo 8a



MP #8, Photo 8b



MP #8, Photo 8c



MP #9, Photo 9a



MP #9, Photo 9b



MP #9, Photo 9c



MP #10, Photo 10a



MP #10, Photo 10b

# Total Surface Water Diversion - Log Sheet -

<b>WD ID:</b>		<b>PWA ID:</b>		<b>Watershed:</b>										
<b>Location:</b>		Sheet <u>    </u> of <u>    </u>		Year: <u>    </u>										
Water Diversion Source <small>(e.g., stream, in-stream pond, spring, etc.)</small>		Amount diverted per month (gallons or acre feet)												
		Water unit <small>(gallons or acre feet)</small>	January	February	March	April	May	June	July	August	September	October	November	December
<b>Monthly Totals</b>														
<b>Comments:</b>														

## Water Input to Storage - Log Sheet -

		WD ID:		PWA ID:		Watershed:											
		Location:		Sheet ___ of ___		Year: _____											
Water Source (e.g., rainwater catchment, stream diversion, spring diversion, well, water delivery, etc.)	Water unit (gallons or acre feet)	Amount input to storage per month (gallons or acre feet), by source															
		January	February	March	April	May	June	July	August	September	October	November	December				
<b>Monthly Totals</b>																	

**Comments: As per NCRWQCB:** "Report water volume input to storage, listing each source separately. This may include inputs from rainfall catchment, surface water diversions

# Water Use by Source - Log Sheet -

<b>WD ID:</b>	<b>PWA ID:</b>	<b>Watershed:</b>
<b>Location:</b>		<b>Sheet</b> <input type="text"/> <b>of</b> <input type="text"/> <b>Year:</b> <input type="text"/>

Water Source <i>(tank, bladder, pond, well, delivered, other )</i>	Water unit <i>(gallons or acre feet)</i>	Amount utilized from storage per month (gallons or acre feet), by type														
		January	February	March	April	May	June	July	August	Sept	October	November	December			
<b>Monthly Totals</b>																

**Comments: As per NCRWQCB:** "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"

# Fertilizer and Amendment Application Log Sheet

WD ID: _____			PWA ID: _____			Watershed: _____		
Product name	Fertilizer or Amendment (circle one)	Type (circle type)	Nutrient content (N-P-K ratio)	Year: _____			Initials	Comments
				Recommended application amount from product label (e.g. # of ounces per application)	Application units (grams, ounces, liters, gallons, etc.)	Recommended application schedule (daily, weekly, etc.)		
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						
	Fert./Amend.	liquid/solid						



# Pesticide and Herbicide Application Log Sheet

WD ID:		PWA ID:		Watershed:					
Location:		Year:		Sheet #: _____ of _____					
Product name	Pesticide or Herbicide (circle one)	Product type (circle type)	Recommended application amount from product label (e.g. # of ounces per application)	Application units (grams, ounces, liters, gallons, etc.)	Recommended application schedule (daily, weekly, etc.)	Actual amount (in same units) used per application	Date applied (mo/day)	Initials	Comments
	Pest./Herb.	liquid/solid							
	Pest./Herb.	liquid/solid							
	Pest./Herb.	liquid/solid							
	Pest./Herb.	liquid/solid							
	Pest./Herb.	liquid/solid							
	Pest./Herb.	liquid/solid							
	Pest./Herb.	liquid/solid							
	Pest./Herb.	liquid/solid							
	Pest./Herb.	liquid/solid							
	Pest./Herb.	liquid/solid							
	Pest./Herb.	liquid/solid							
	Pest./Herb.	liquid/solid							

## LEGAL PEST MANAGEMENT PRACTICES FOR MARIJUANA GROWERS IN CALIFORNIA

### PESTS OF MARIJUANA IN CALIFORNIA

Marijuana pests vary according to cultivar (variety), whether the plants are grown indoors or outdoors, and where the plants are grown geographically. The pests included in this review are based on two sources: a presentation given in 2013 by Whitney Cranshaw, an extension entomologist at Colorado State University, and a review article by John M. McPartland, a professor of family medicine at the University of Vermont.

### HOW TO INTERPRET THE TABLES

**Table 1** lists active ingredients not illegal to use on marijuana and the pests that these active ingredients target.

These active ingredients are exempt from **residue tolerance requirements**<sup>1</sup> and either exempt from **registration requirements**<sup>2</sup> or registered for a use that's broad enough to include use on marijuana. Residue tolerance requirements are set by U.S. EPA for each pesticide on each food crop and is the amount of pesticide residue allowed to remain in or on each treated crop with "reasonable certainty of no harm." Some pesticides are exempted from the tolerance requirement when they're found to be safe. Some of these pesticides are bacterial-based insect pathogens (e.g., *Bacillus thuringiensis*) or biofungicides (e.g., *Bacillus subtilis*, *Gliocladium virens*).

Active ingredients exempt from registration requirements are mostly food-grade essential oils such as peppermint oil or rosemary oil.

**Tables 2 and 3** list pests of marijuana grown outdoors and indoors, and **Table 3** shows pests arranged by the portion of the plant they attack. An explanation of the column labels for **Tables 2 and 3** follow.

**PESTS.** The tables show the most likely pests in California based on Cranshaw's presentation and McPartland's list and gleaned from California-based web sites and blogs. Some pests that drew attention on several blogs (e.g., hemp russet mite) may be

worse during drought years. Many have cyclic population fluctuations and others are mainstays of general greenhouse cultivation (e.g., whiteflies, thrips, and fungus gnats). We'll add weeds to this compendium when we have more information.

**DAMAGE.** For damage caused by greenhouse pests, we derived information from Cranshaw's presentation; for that of outdoor pests when there wasn't any overlap, McPartland's list was used and information from UC IPM for various crops. Accounts of damage by rodents is anecdotal.

**IPM PRACTICES.** Most of these are standard practices for pests on hosts other than marijuana. For more detailed explanations, see information compiled by the University of California Statewide IPM Program (UC IPM) at [www.ipm.ucdavis.edu](http://www.ipm.ucdavis.edu). You can enter a pest name in the search box (e.g., cutworm) and read about IPM practices for the pest on crops other than marijuana. For marijuana grown indoors, go to the UC IPM [home page](#), click on [Agricultural Pests](#) and scroll down the alphabetical list until you reach [ornamental nurseries](#).

Some practices were excluded because they apply to nearly all of the pests. For example, when targeting aphids, whiteflies, and thrips, growers can attract predaceous and parasitic arthropods by planting cover crops (e.g., California buckwheat) and insectary plants—especially those in the carrot, mustard, and sunflower families.

**LEGAL PESTICIDES.** These are covered above in the **Table 1** description and are exempt from **residue tolerance requirements** and either exempt from **registration requirements** or registered for a use that is broad enough to include use on marijuana.

**Table 4** shows marijuana pests by plant part. Not all of these pests are important, but their collective damage may affect the overall health of the plant.

### REFERENCES

Cranshaw, Whitney. 2013. Challenges and opportunities for pest management of medical marijuana in Colorado. Presentation.

McPartland, J.M. 1996. *Cannabis* pests. J. Internatl. Hemp Assoc. 3(2): 49, 52–55.

<sup>1</sup> 40 CFR (Code of Federal Regulations)

<sup>2</sup> under FIFRA section 25(b) and 3 CCR section 6147

**Table 1. Active ingredients that are exempt from residue tolerance requirements<sup>a</sup> and either exempt from registration requirements<sup>b</sup> or registered for a use broad enough to include use on marijuana.**

ACTIVE INGREDIENT	PEST OR DISEASE
azadirachtin <sup>a</sup>	aphids, whiteflies, fungus gnats, leafminers, cutworms
<i>Bacillus subtilis</i> QST <sup>a1</sup>	root diseases, powdery mildew
<i>Bacillus thuringiensis</i> <sup>a2</sup> subsp. <i>aizawai</i> or <i>kurstaki</i>	moth larvae (e.g., cutworms, budworms, hemp borer)
<i>Bacillus thuringiensis</i> <sup>a2</sup> subsp. <i>israelensis</i>	fly larvae (e.g., fungus gnats)
<i>Beauveria bassiana</i> <sup>a3</sup>	whiteflies, aphids, thrips
cinnamon oil <sup>b</sup>	whiteflies
<i>Gliocladium virens</i> <sup>a1</sup>	root diseases
horticultural oils <sup>a</sup> (petroleum oil)	mites, aphids, whiteflies, thrips; powdery mildew
insecticidal soaps <sup>a</sup> (potassium salts of fatty acids)	aphids, whiteflies, cutworms, budworms
iron phosphate <sup>a</sup> ; sodium ferric EDTA <sup>a</sup>	slugs and snails
neem oil <sup>a</sup>	mites; powdery mildew
potassium bicarbonate <sup>a</sup> ; sodium bicarbonate <sup>a</sup>	powdery mildew
predatory nematodes <sup>a</sup>	fungus gnats
rosemary + peppermint essential oils <sup>b</sup>	whiteflies
sulfur <sup>a</sup>	mites, hemp flea beetles
<i>Trichoderma harzianum</i> <sup>a1</sup>	root diseases

<sup>a</sup> 40 CFR (Code of Federal Regulations)

<sup>b</sup> FIFRA §25(b) and 3 CCR §6147 [FIFRA = the Federal Insecticide, Fungicide, and Rodenticide Act; CCR = California Code of Regulations]

<sup>1</sup> Biofungicides

<sup>2</sup> Bacterial-based insect pathogen

<sup>3</sup> Fungal-based insect pathogen

**Table 2. PEST MANAGEMENT PRACTICES FOR MARIJUANA GROWN OUTDOORS**

PEST	DAMAGE	IPM PRACTICES (monitoring; cultural, physical, mechanical, biological)	PESTICIDES
<b>MITES &amp; INSECTS</b>			
<b>two-spotted spider mites</b> <i>Tetranychus urticae</i>	Suck plant sap; stipple <b>leaves</b>	<ul style="list-style-type: none"> <li>▪ Keep dust down by hosing off plants (if dust is a problem)</li> <li>▪ Release predatory mites</li> </ul>	neem oil, horticultural oil, sulfur
<b>hemp russet mites</b> <i>Aculops cannabicola</i>	Suck plant sap; kill <b>leaves and flowers</b>	<ul style="list-style-type: none"> <li>▪ Release predatory mites</li> </ul>	neem oil, horticultural oil, sulfur
<b>crickets</b> (field & house) <i>Gryllus desertus</i> , <i>G. chinensis</i> , <i>Acheta domesticus</i>	Eat <b>seedlings</b>	<ul style="list-style-type: none"> <li>▪ Use floating row covers or cones on individual plants</li> </ul>	—
<b>termites</b>	Eat <b>roots</b>	<ul style="list-style-type: none"> <li>▪ Flood nests</li> </ul>	—
<b>leafhoppers</b>	Suck plant sap; weaken plants	<ul style="list-style-type: none"> <li>▪ Encourage natural enemies by planting nectar sources</li> </ul>	horticultural oil or insecticidal soaps for nymphs
<b>aphids</b> <i>Phorodon cannabis</i> , <i>Myzus persicae</i> , <i>Aphis fabae</i>	Suck plant sap; weaken plants <i>P. cannabis</i> (bhang aphid) vectors tobacco mosaic virus	<ul style="list-style-type: none"> <li>▪ Hang up yellow sticky cards (alates)</li> <li>▪ Hose off plants</li> </ul>	azadirachtin, horticultural oil, insecticidal soaps, <i>Beauveria bassiana</i>
<b>whiteflies</b> <i>Trialeurodes vaporariorum</i> , <i>Bemisia tabaci</i> , <i>B. argentifolii</i>	Suck plant sap; weaken plants	<ul style="list-style-type: none"> <li>▪ Hang up yellow sticky cards</li> <li>▪ Reflective plastic mulch</li> </ul>	azadirachtin, horticultural oil, insecticidal soaps, rosemary + peppermint oils, <i>Beauveria bassiana</i>
<b>leafminers</b> <i>Liriomyza</i> spp.	Bore into <b>roots and leaves</b>	<ul style="list-style-type: none"> <li>▪ Remove older infested leaves</li> <li>▪ Use biocontrol: release <i>Diglyphus</i> parasitoids</li> </ul>	azadirachtin

PEST		DAMAGE	IPM PRACTICES (monitoring; cultural, physical, mechanical, biological)	PESTICIDES
LEPIDOPTERA	<b>cutworms</b> <i>Agrotis ipsilon</i> , <i>A. segetum</i> , <i>Spodoptera litura</i> , <i>S. exigua</i> , <i>Mamestra brassicae</i> (Noctuidae)	Eat <b>seedlings</b>	<ul style="list-style-type: none"> <li>▪ Use pheromone traps to detect adults.</li> <li>▪ Remove weeds, which serve as a reservoir for cutworms and other noctuids</li> </ul>	Vegetative stage only: Use <i>Bacillus thuringiensis kurstaki</i> if egg-laying adults found, insecticidal soap; azadirachtin
	<b>budworms</b> <i>Helicoverpa armigera</i> , <i>H. zea</i> (Noctuidae)	Eat flowering <b>buds</b>	<ul style="list-style-type: none"> <li>▪ Shake plants to dislodge larvae</li> <li>▪ Remove infested buds</li> <li>▪ Plant corn as trap crop</li> </ul>	Vegetative stage only: Use <i>Bacillus thuringiensis kurstaki</i> , insecticidal soap
	<b>hemp borers</b> (= hemp moth) <i>Grapholita delineana</i> (Tortricidae)	Bore through <b>stalks</b> (caterpillars)	<ul style="list-style-type: none"> <li>▪ Plow crop under in fall; remove plants still standing; remove nearby hemp and hop plants</li> <li>▪ Use light traps at night for monitoring</li> <li>▪ Use biocontrol: <i>Trichogramma</i></li> </ul>	<i>Bacillus thuringiensis kurstaki</i>
COLEOPTERA	<b>hemp flea beetles</b> <i>Psylliodes attenuata</i> (Chrysomelidae)	Bore into <b>stems</b> (grubs); feed on seedlings and <b>leaves</b> of larger plants (beetles)	<ul style="list-style-type: none"> <li>▪ Use reflective mulches</li> <li>▪ Plant trap crops (e.g., radish or Chinese mustard)</li> </ul>	sulfur
	<b>scarab grubs</b> (possibly other beetles)	Bore into <b>stems</b>	<ul style="list-style-type: none"> <li>▪ Use parasitic nematodes</li> </ul>	—
<b>MAMMALS</b>				
<b>mice</b> (e.g., house mice)		Eat <b>young sprouts</b> and <b>seeds</b>	<ul style="list-style-type: none"> <li>▪ Double wrap a 3'-tall chicken wire fence around plants</li> <li>▪ Trap (minus rodenticides)</li> <li>▪ Mount barn owl boxes</li> </ul>	Rodenticides (see footnote below)
<b>roof rats</b> , <i>Rattus rattus</i> <b>wood rats</b> , <i>Neotoma</i> spp.		Strip bark from <b>stems</b> to build nests		
<b>pocket gophers</b> , <i>Thomomys</i> spp.		Tunnel through planting areas; feed on plants; gnaw on irrigation lines		
<b>Columbian black-tailed deer</b> , <i>Odocoileus hemionus columbianus</i>		Knock over plants; leave dander, droppings, and ticks behind	<ul style="list-style-type: none"> <li>▪ Install deer fencing</li> </ul>	—
<b>black bears</b> , <i>Ursus americana</i>		Knock over plants	<ul style="list-style-type: none"> <li>▪ Install electric fencing</li> </ul>	—

Rodenticides that are not DPR-restricted materials or federally restricted use pesticides *and* are registered for a broad enough use to include use in or around marijuana cultivation sites. If using a rodenticide always read and follow the label and check to make sure that the target rodent is listed. Second-generation anticoagulant products are DPR-restricted materials not labeled for field use and as such, should never be used in or around marijuana cultivation sites.

**Table 3. PEST MANAGEMENT PRACTICES FOR MARIJUANA GROWN INDOORS**  
(e.g., greenhouses, sheds, and grow rooms)

PEST	DAMAGE	IPM PRACTICES (monitoring; cultural, physical, mechanical, biological)	PESTICIDES
<b>DISEASES</b>			
<b>powdery mildew</b> <i>Sphaerotheca macularis</i>	Grow on <b>leaves</b> as white and gray powdery patches	<ul style="list-style-type: none"> <li>Use fans to improve air circulation</li> </ul>	horticultural oil; neem oil; sodium bicarbonate, potassium bicarbonate; <i>Bacillus subtilis</i>
<b>pythium root rots</b> <i>Pythium</i> spp.	Attack root tips and worsens when plants grow in wet soil	<ul style="list-style-type: none"> <li>Avoid hydroponic production or wet soil conditions</li> </ul>	Incorporate biocontrol agents into root-growing media (e.g., <i>Gliricium virens</i> , <i>Trichoderma harzianum</i> , <i>Bacillus subtilis</i> )
<b>MITES &amp; INSECTS</b>			
<b>two-spotted spider mite</b> <i>Tetranychus urticae</i>	Suck plant sap; stipple <b>leaves</b>	<ul style="list-style-type: none"> <li>Disinfest cuttings before introducing to growing area</li> <li>Release predatory mites</li> </ul>	neem oil, horticultural oil, sulfur
<b>leafhoppers</b>	Suck plant sap; weaken plants	<ul style="list-style-type: none"> <li>Encourage natural enemies by planting nectar sources</li> </ul>	horticultural oil or insecticidal soaps for nymphs
<b>whiteflies</b> <i>Trialeurodes vaporariorum</i> , <i>Bemisia tabaci</i> , <i>B. argentifolii</i>	Suck plant sap; weaken plants	<ul style="list-style-type: none"> <li>Hang up yellow sticky cards</li> <li>Use biocontrol: <i>Encarsia formosa</i></li> </ul>	azadirachtin, <i>Beauveria bassiana</i> , cinnamon oil, horticultural oil
<b>thrips</b> <i>Heliothrips haemorrhoidalis</i> , <i>Frankliniella occidentalis</i> , <i>Thrips tabaci</i>	Stipple <b>leaves</b> and vector viruses	<ul style="list-style-type: none"> <li>Hang up yellow or blue sticky cards</li> </ul>	
<b>dark-winged fungus gnats</b> (Diptera: Sciaridae) <i>Bradysia</i> spp.	Damage <b>roots</b> and stunt plant growth	<ul style="list-style-type: none"> <li>Avoid overwatering</li> <li>Use growing media that deters gnat development</li> <li>Hang up yellow sticky cards</li> <li>Use biocontrol: soil-dwelling predatory mites</li> </ul>	<i>Bacillus thuringiensis israelensis</i> (BTI); predatory nematodes; azadirachtin soil drenches

**Table 4. PESTS OF MARIJUANA BY PLANT PART**

Seedlings	Flower & Leaf (grown outdoors)	Flower & Leaf (grown indoors)	Stalk & Stem	Root
cutworms	<b>hemp flea beetle</b>	<b>spider mites</b>	<b>hemp borer</b>	<b>hemp flea beetle</b>
birds	<b>hemp borer</b>	aphids	rats	<b>white root grubs</b>
<b>hemp flea beetle</b>	<b>budworms</b>	<b>whiteflies</b>		root maggots
crickets	leafminers	thrips		<b>termites &amp; ants</b>
slugs		leafhoppers		<b>fungus gnats</b>
rodents				wireworms

## Appendix G. Hazardous Materials Storage Guidelines

Proper storage of hazardous materials (e.g., flammable liquids or gasses, many agricultural chemicals, oxidizers, acids, caustic substances) is essential for maintaining safe operations and for protection of the environment. Commercial operations that store hazardous materials are required to prepare a Hazardous Materials Business Plan (HMBP) and maintain Material Safety Data Sheets (MSDS) for each hazardous chemical that they store or use. County health agencies may require HMBPs to be submitted for their review. The HMBP information must be communicated to employees annually and be kept in a location that is readily accessible by employees. MSDSs explain how to medically treat a person that has been exposed to a hazardous substance and how to safely cleanup a spill.

Generally, incompatible hazardous materials must be stored in separate locations, with distinct secondary containment vessels for each type of material. Secondary containment is required for hazardous liquids and must be sized to contain a spill volume equivalent to the largest hazardous material container or 10% of the total volume, whichever is greater. Flammable and combustible hazardous materials must be separated from oxidizers by a distance of no less than 20 feet. The following guidelines should be followed when handling and storing hazardous materials.

Always label containers with the substance inside for both hazardous and non-hazardous materials. For flammable hazardous materials, make certain that an appropriate fire extinguisher is available nearby the storage area. Dry powder fire extinguishers are the most versatile. Water filled fire extinguishers should not be used on certain types of hazardous material fires (e.g. water-reactive metals, strong acids, petroleum).

**Acids** (e.g., hydrochloric acid, pool cleaner, citric acid) must be segregated from:  
Reactive metals such as sodium, potassium, magnesium, etc.  
Flammable and combustible materials.  
Chemicals which could generate toxic or flammable fumes when mixed.  
Bases.

**Bases** (e.g., Portland cement, lime, lye, or drain cleaner) must be segregated from:  
Acids, metals, organic peroxides and easily ignitable materials.  
Solvents.  
Oxidizing acids and oxidizers.

**Oxidizers** (e.g. ammonium nitrate, ammonium phosphate, oxygen gas) must be segregated from:  
Combustible and flammable liquids and gasses (e.g. oxygen-acetylene torches) by at least 20 feet of separation.  
Reducing agents such as zinc, alkali metals, and formic acid.

**Flammable materials** (e.g., gasoline, fuses, gunpowder, acetylene cylinders) must be segregated from:

Oxidizers, caustic materials, acids, and bases.

It is good housekeeping practice to store compatible hazardous materials exclusively away from agricultural chemicals. Although uncommon, some organic agricultural amendments may be caustic, ignitable, or corrosive. Segregation of hazardous materials from non-hazardous materials eliminates the potential for cross-contamination of materials and exposure of workers to hazardous fumes or residues.

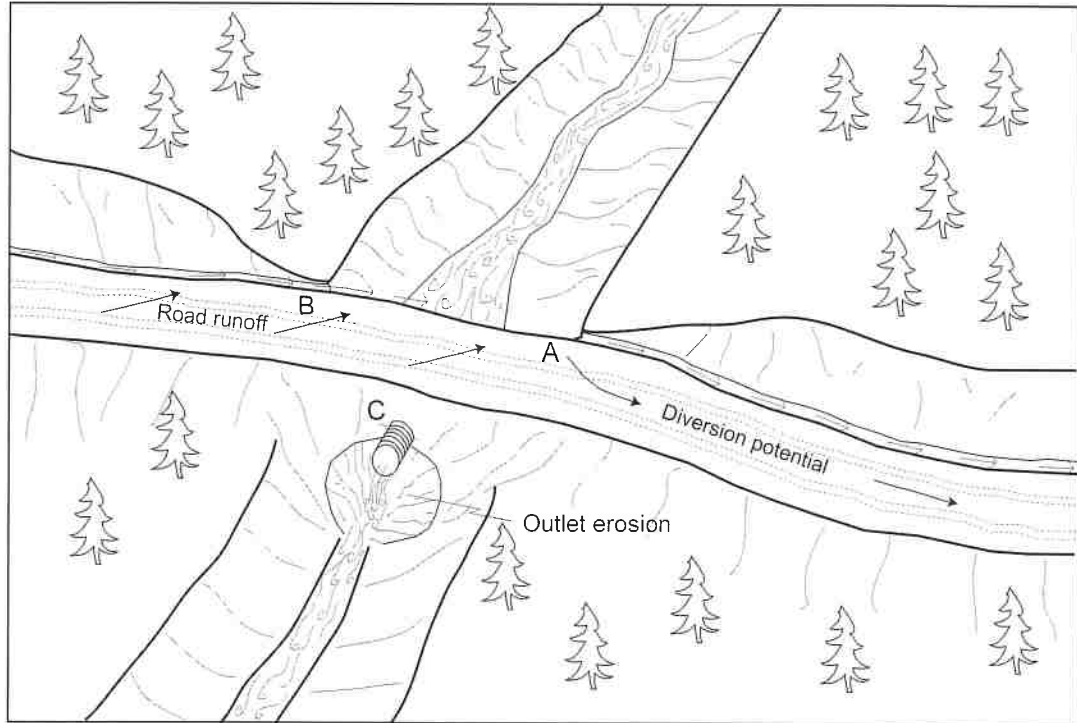
Guidelines for proper storage of hazardous materials and regulatory oversight (California Code of Regulations Title 22) are provided by the California Department of Toxic Substances Control (DTSC). The regulations are located in Social Security, Division 4.5, Environmental Health Standards for the Management of Hazardous Waste.



# Typical Problems and Applied Treatments for a Non-fish Bearing Upgraded Stream Crossing

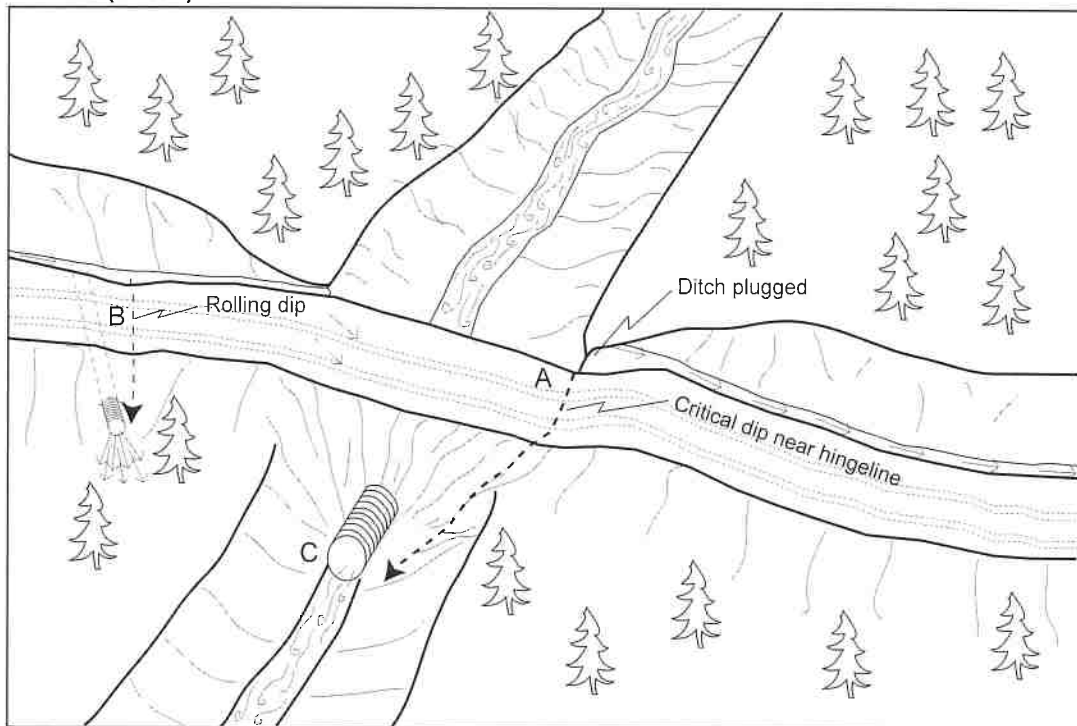
## Problem condition (before)

- A - Diversion potential
- B - Road surface and ditch drain to stream
- C - Undersized culvert high in fill with outlet erosion



## Treatment standards (after)

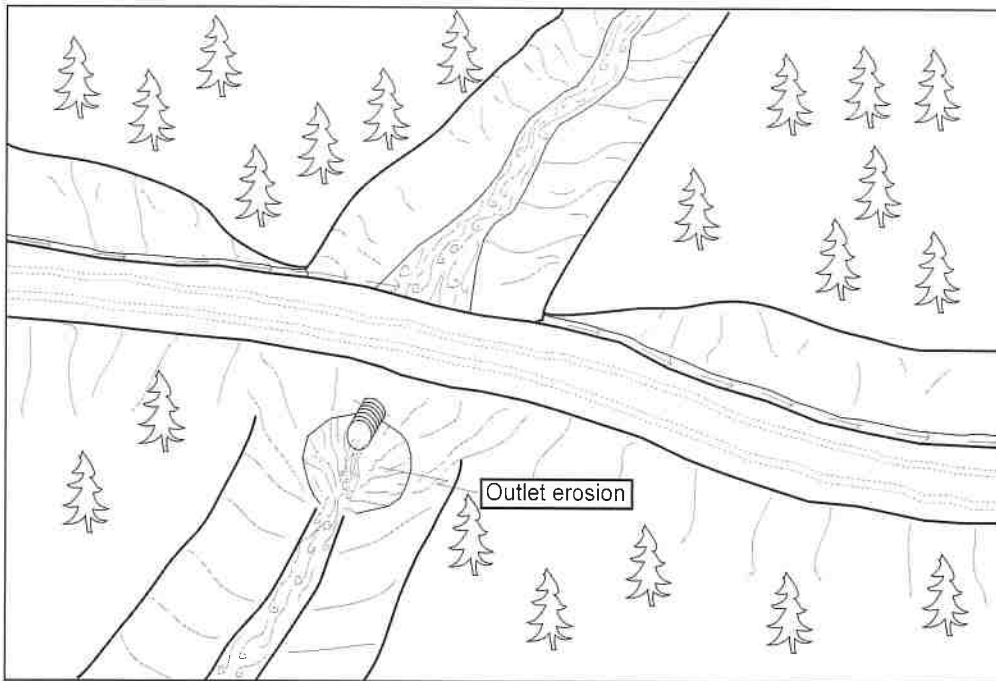
- A - No diversion potential with critical dip installed near hingeline
- B - Road surface and ditch disconnected from stream by rolling dip and ditch relief culvert
- C - 100-year culvert set at base of fill



Pacific Watershed Associates Inc.

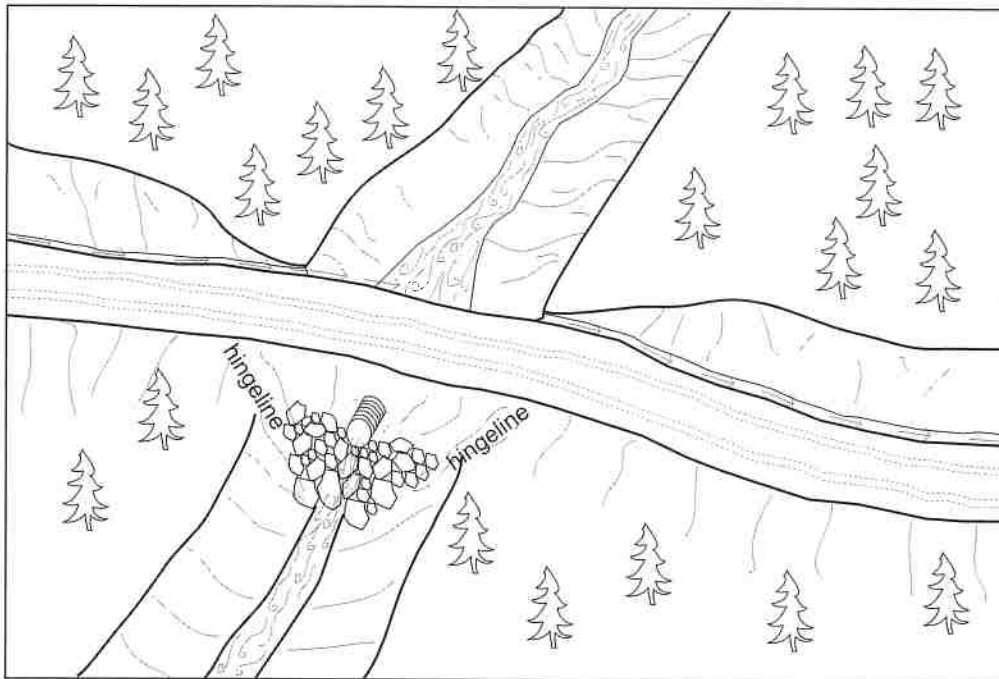
Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
 PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / www.pacificwatershed.com

## Armoring Fill Faces to Upgrade Stream Crossings



**Problem:** Culvert set high in outboard fill has resulted in scour of the outboard fill face and natural channel.

**Conditions:** The existing stream crossing has a culvert sufficient in diameter to manage design stream flows and has a functional life.



**Action:** The area of scour is backfilled with rip-rap to provide protection in the form of energy dissipation for the remaining fill face and channel.

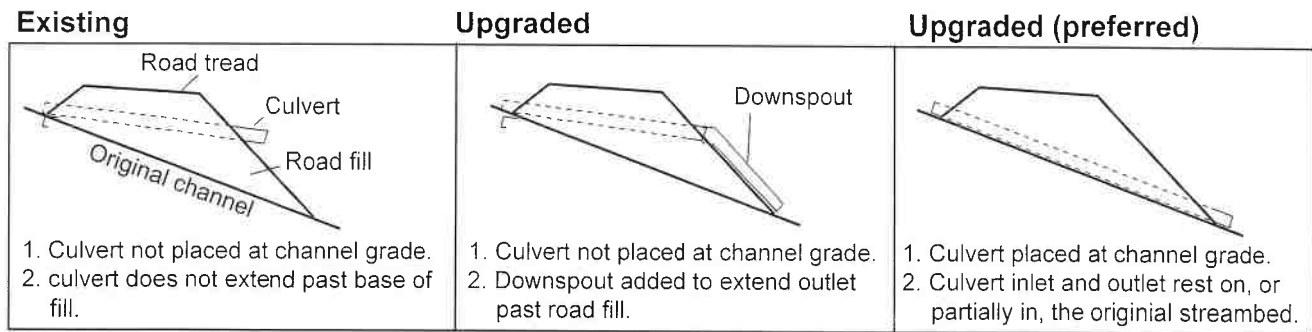
### **Treatment Specifications:**

- 1) Placement of rip-rap should be between the left and right hingelines and extend from a keyway excavated below the existing channel base level at the base of the fill slope up and under the existing culvert.
- 2) Rock size and volume is determined on a site by site basis based on estimated discharge and existing stream bed particle size range (See accompanying road log).

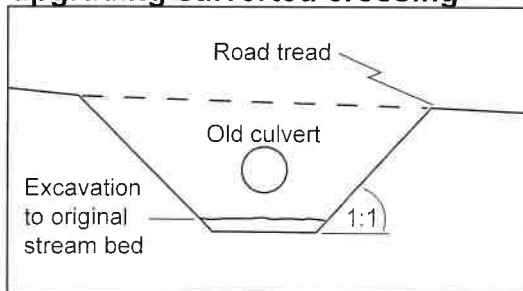
Pacific Watershed Associates Inc.

Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / www.pacificwatershed.com

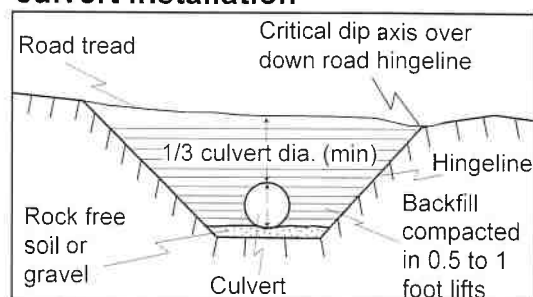
# Typical Design of a Non-fish Bearing Culverted Stream Crossing



## Excavation in preparation for upgrading culverted crossing



## Upgraded stream crossing culvert installation



### Note:

Road upgrading tasks typically include upgrading stream crossings by installing larger culverts and inlet protection (trash barriers) to prevent plugging. Culvert sizing for the 100-year peak storm flow should be determined by both field observation and calculations using a procedure such as the Rational Formula.

## Stream crossing culvert Installation

1. Culverts shall be aligned with natural stream channels to ensure proper function, and prevent bank erosion and plugging by debris.
2. Culverts shall be placed at the base of the fill and the grade of the original streambed, or downspouted past the base of the fill.
3. Culverts shall be set slightly below the original stream grade so that the water drops several inches as it enters the pipe.
5. To allow for sagging after burial, a camber shall be between 1.5 to 3 inches per 10 feet culvert pipe length.
6. Backfill material shall be free of rocks, limbs or other debris that could dent or puncture the pipe or allow water to seep around pipe.
7. First one end then the other end of the culvert shall be covered and secured; The center is covered last.
8. Backfill material shall be tamped and compacted throughout the entire process:
  - Base and side wall material will be compacted before the pipe is placed in its bed.
  - Backfill compacting will be done in 0.5 - 1 foot lifts until 1/3 of the diameter of the culvert has been covered. A gas powered tamper can be used for this work.
9. Inlets and outlets shall be armored with rock or mulched and seeded with grass as needed.
10. Trash protectors shall be installed just upstream from the culvert where there is a hazard of floating debris plugging the culvert.
11. Layers of fill will be pushed over the crossing until the final designed road grade is achieved, at a minimum of 1/3 to 1/2 the culvert diameter.

## Erosion control measures for culvert replacement

Both mechanical and vegetative measures will be employed to minimize accelerated erosion from stream crossing and ditch relief culvert upgrading. Erosion control measures implemented will be evaluated on a site by site basis. Erosion control measures include but are not limited to:

1. Minimizing soil exposure by limiting excavation areas and heavy equipment disturbance.
2. Installing filter windrows of slash at the base of the road fill to minimize the movement of eroded soil to downslope areas and stream channels.
3. Retaining rooted trees and shrubs at the base of the fill as "anchor" for the fill and filter windrows.
4. Bare slopes created by construction operations will be protected until vegetation can stabilize the surface. Surface erosion on exposed cuts and fills will be minimized by mulching, seeding, planting, compacting, armoring, and/or benching prior to the first rains.
5. Excess or unusable soil will be stored in long term spoil disposal locations that are not limited by factors such as excessive moisture, steep slopes greater than 10%, archeology potential, or proximity to a watercourse.
6. On running streams, water will be pumped or diverted past the crossing and into the downstream channel during the construction process.
7. Straw bales and/or silt fencing will be employed where necessary to control runoff within the construction zone.

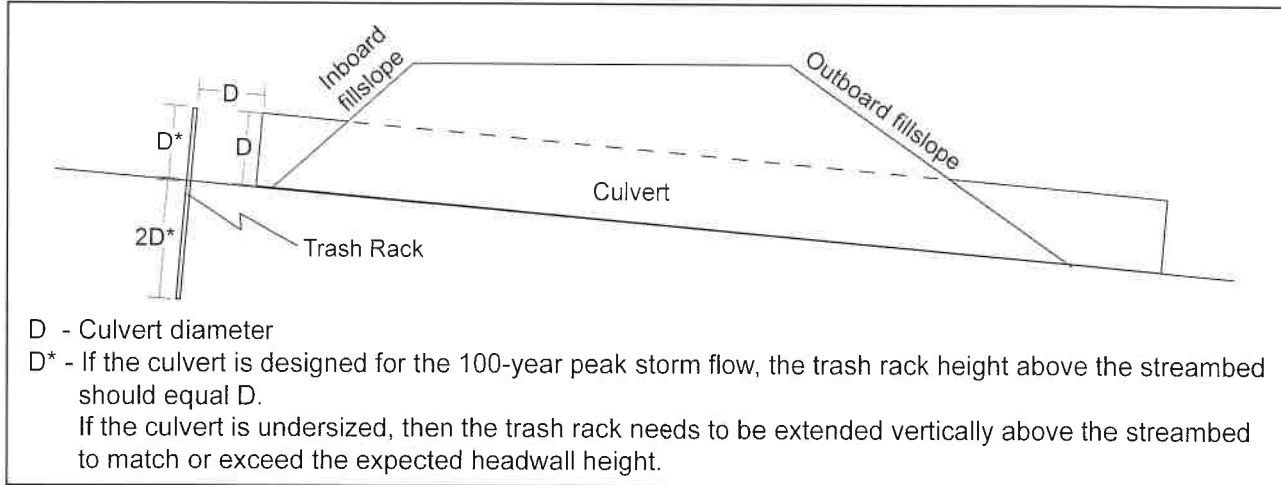
Pacific Watershed Associates Inc.

Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / www.pacificwatershed.com

Typical Drawing #2

# Typical Design of a Single-post Culvert Inlet Trash Rack

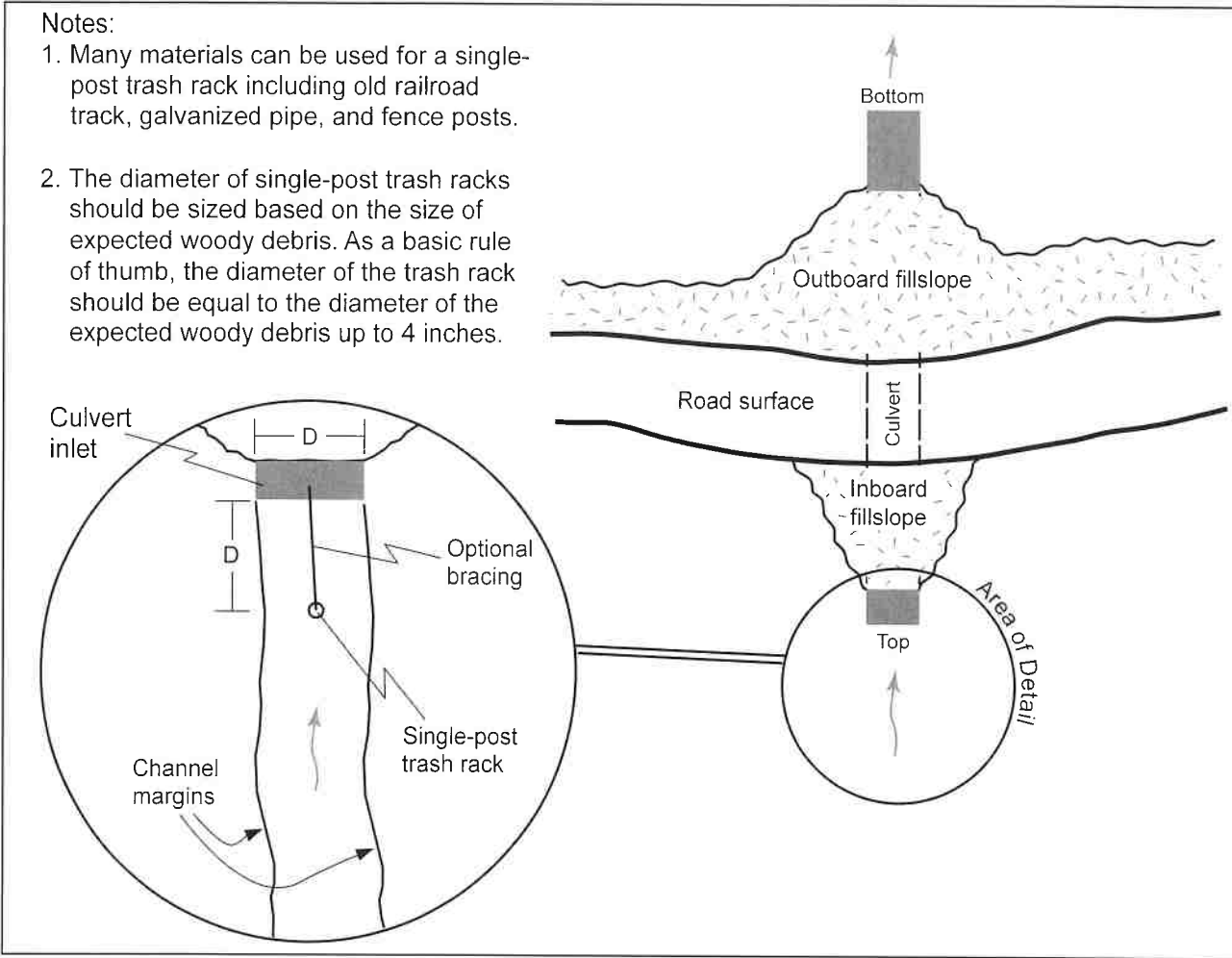
## Cross section view



## Plan view

### Notes:

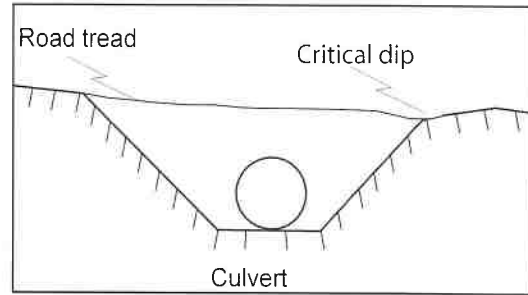
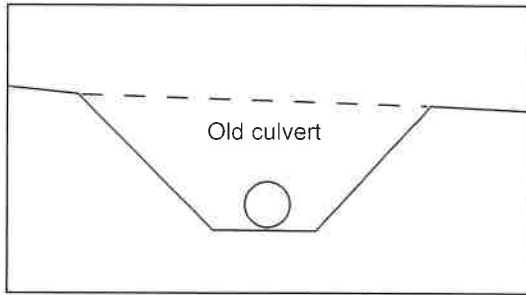
1. Many materials can be used for a single-post trash rack including old railroad track, galvanized pipe, and fence posts.
2. The diameter of single-post trash racks should be sized based on the size of expected woody debris. As a basic rule of thumb, the diameter of the trash rack should be equal to the diameter of the expected woody debris up to 4 inches.



Pacific Watershed Associates Inc.

Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
 PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / www.pacificwatershed.com

## Typical Design of Upgraded Stream Crossings



### Stream crossing culvert Installation

1. Culverts shall be aligned with natural stream channels to ensure proper function, and prevent bank erosion and plugging by debris.
2. Culverts shall be placed at the base of the fill and the grade of the original streambed or downspouted past the base of the fill.
3. Culverts shall be set slightly below the original stream grade so that the water drops several inches as it enters the pipe.
5. To allow for sagging after burial, a camber shall be between 1.5 to 3 inches per 10 feet culvert pipe length.
6. Backfill material shall be free of rocks, limbs or other debris that could dent or puncture the pipe or allow water to seep around pipe.
7. First one end and then the other end of the culvert shall be covered and secured. The center is covered last.
8. Backfill material shall be tamped and compacted throughout the entire process:
  - Base and side wall material will be compacted before the pipe is placed in its bed.
  - backfill compacting will be done in 0.5 - 1 foot lifts until 1/3 of the diameter of the culvert has been covered. A gas powered tamper can be used for this work.
9. Inlets and outlets shall be armored with rock or mulched and seeded with grass as needed.
10. Trash protectors shall be installed just upstream from the culvert where there is a hazard of floating debris plugging the culvert.
11. Layers of fill will be pushed over the crossing until the final designed road grade is achieved, at a minimum of 1/3 to 1/2 the culvert diameter.

**Note:**

Road upgrading tasks typically include upgrading stream crossings by installing larger culverts and inlet protection (trash barriers) to prevent plugging. Culvert sizing for the 100-year peak storm flow should be determined by both field observation and calculations using a procedure such as the Rational Formula.

### Armoring fill faces

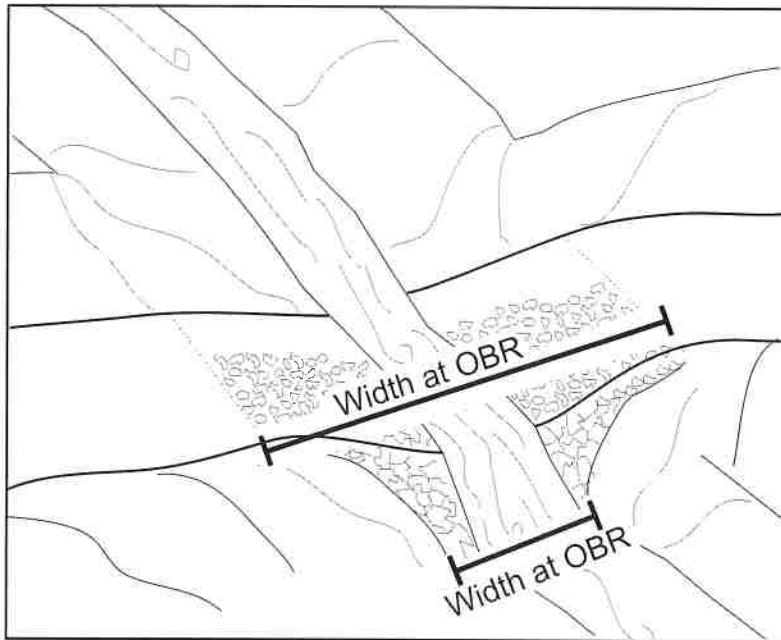
Fill angles $\leq 2:1$	Fill angles (between 2:1 & 1.5:1)	Fill angles steeper than 1.5:1

Pacific Watershed Associates Inc.

Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
 PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / www.pacificwatershed.com

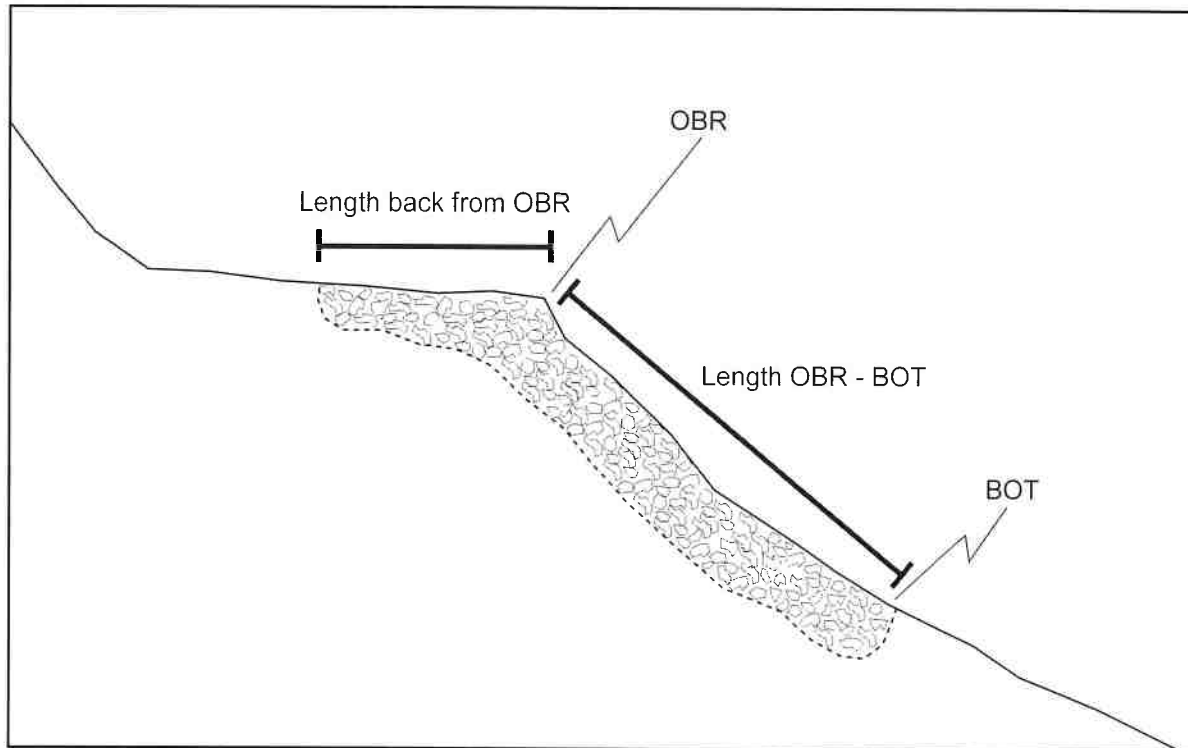
# Typical Dimensions Referred to for Armored Fill Crossings

## Widths in oblique view



OBR - Outboard edge of road

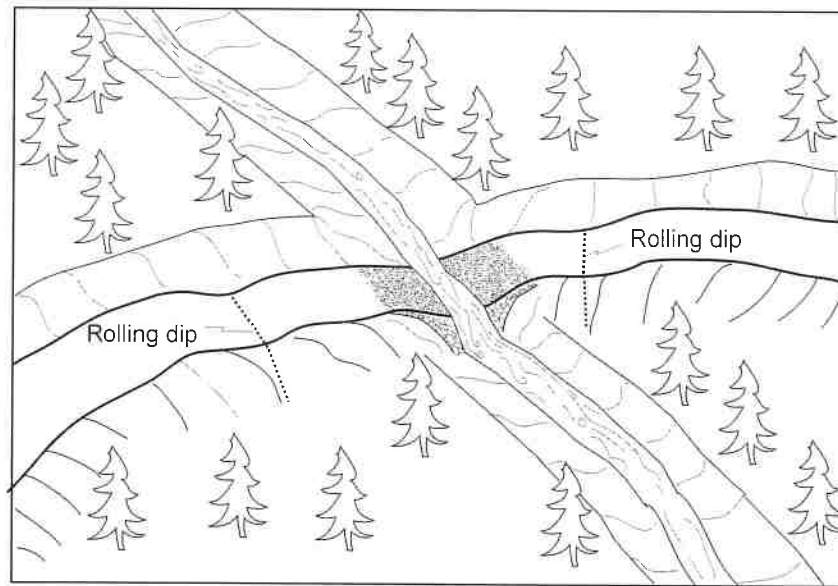
## Lengths in profile view



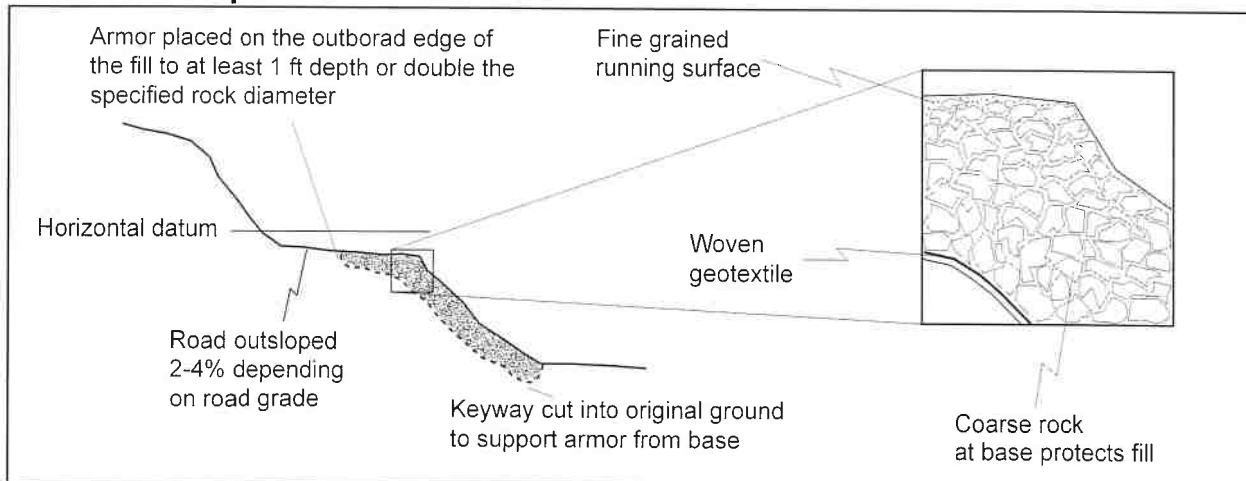
Pacific Watershed Associates Inc.

Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / [www.pacificwatershed.com](http://www.pacificwatershed.com)

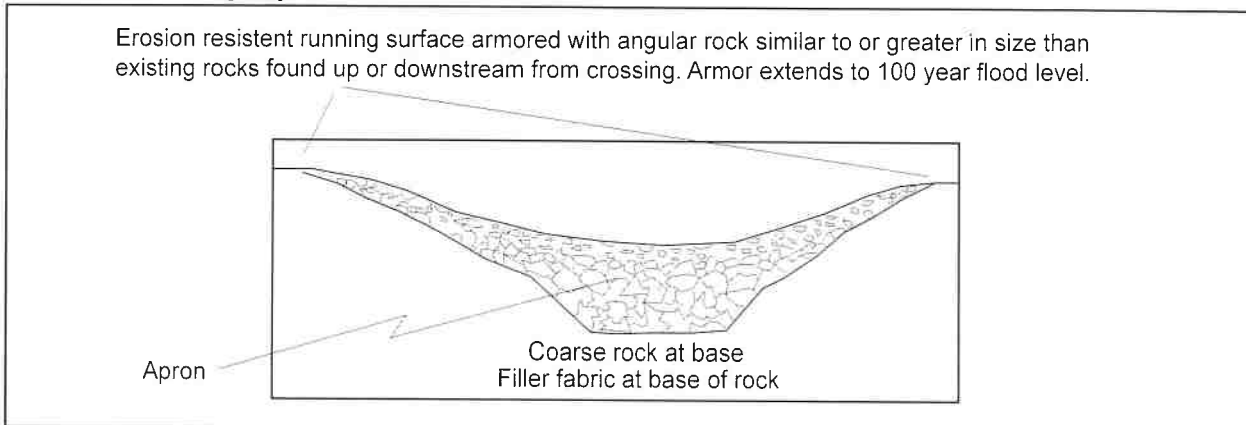
# Typical Armored Fill Crossing Installation



## Cross section parallel to watercourse



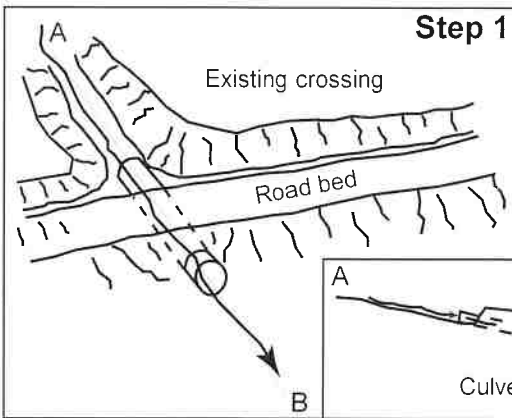
## Cross section perpendicular to watercourse



Pacific Watershed Associates Inc.

Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
 PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / www.pacificwatershed.com

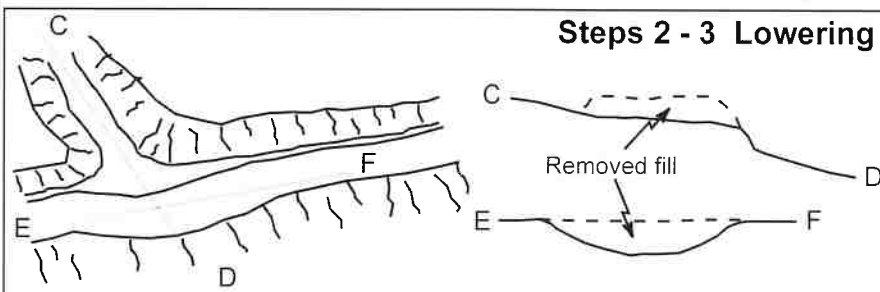
# Ten Steps for Constructing a Typical Armored Fill Stream Crossing



## Step 1

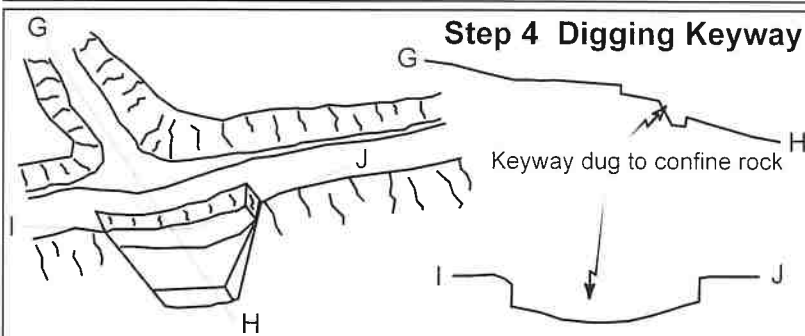
1. The two most important points are:

- A) **The rock must be placed in a "U" shape across the channel to confine flow within the armored area.** (Flow around the rock armor will gully the remaining fill. Proper shape of surrounding road fill and good rock placement will reduce the likelihood of crossing failure).
- B) **The largest rocks must be used to buttress the rest of the armor in two locations:** i) The base of the armored fill where the fill meets natural channel. (This will buttress the armor placed on the outboard fill face and reduce the likelihood of it washing downslope). ii) The break in slope from the road tread to the outer fill face. (This will buttress the fill placed on the outer road tread and will determine the "base level" of the creek as it crosses the road surface).



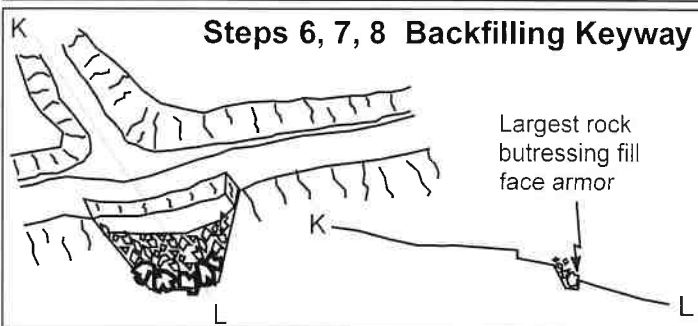
## Steps 2 - 3 Lowering

2. **Remove any existing drainage structures** including culverts and Humboldt logs.
3. **Construct a dip** centered at the crossing that is large enough to accommodate the 100-year flow event and prevent diversion (C-D, E-F).



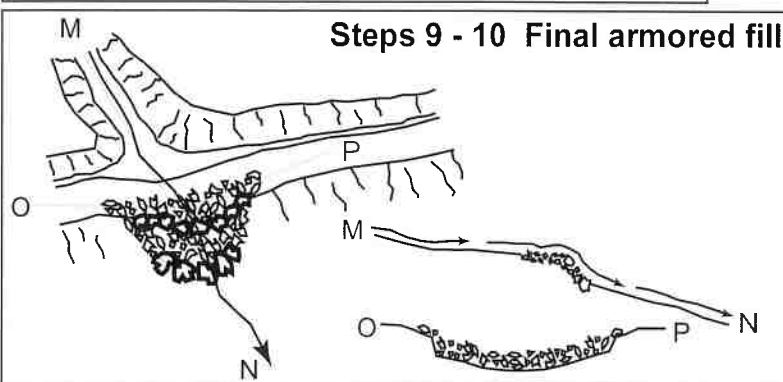
## Step 4 Digging Keyway

4. **Dig a keyway** (to place rock in) that extends from the outer 1/3 of the road tread down the outboard road fill to the point where outboard fill meets natural channel (up to 3 feet into the channel bed depending on site specifics) (G-H, I-J).
5. **Install geofabric (optional)** within keyway to support rock in wet areas and to prevent winnowing of the crossing at low flows.



## Steps 6, 7, 8 Backfilling Keyway

6. **Put aside the largest rock** armoring to create 2 buttresses in the next step.
7. **Create a buttress using the largest rock** (as described in the site treatments specifications) at the base of fill. (This should have a "U" shape to it and will define the outlet of the armored fill.)
8. **Backfill the fill face** with remaining rock armor making sure the final armored area has "U" shape that will accommodate the largest expected flow (K-L).



## Steps 9 - 10 Final armored fill

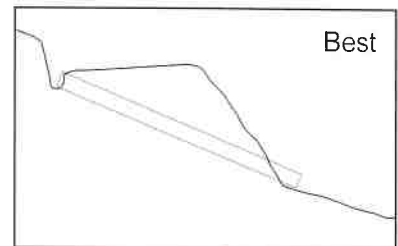
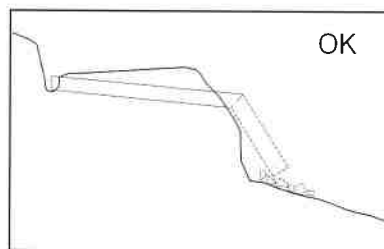
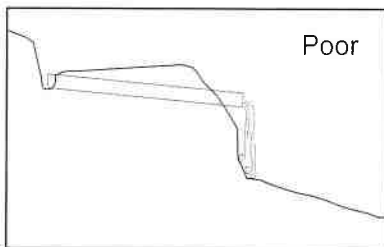
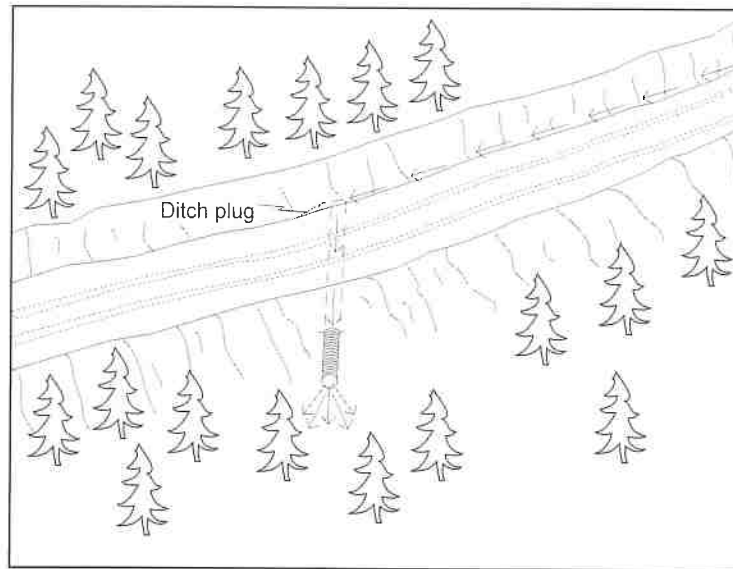
9. **Install a second buttress** at the break in slope between the outboard road and the outboard fill face. (This should define the base level of the stream and determine how deep the stream will backfill after construction) (M-N).
10. **Back fill the rest of the keyway** with the unsorted rock armor making sure the final armored area has a "U" shape that will accommodate the largest expected flow (O-P).

Pacific Watershed Associates Inc.

Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
PO Box 4433 Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / www.pacificwatershed.com



## Typical Ditch Relief Culvert Installation



### Ditch relief culvert installation

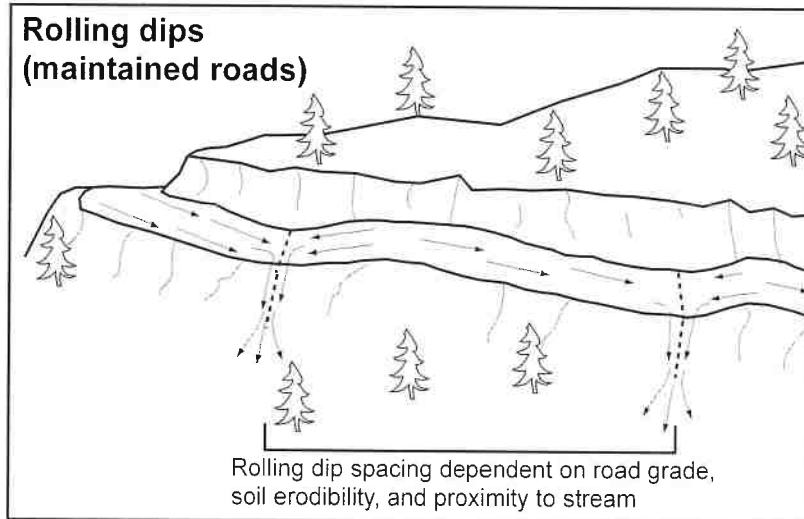
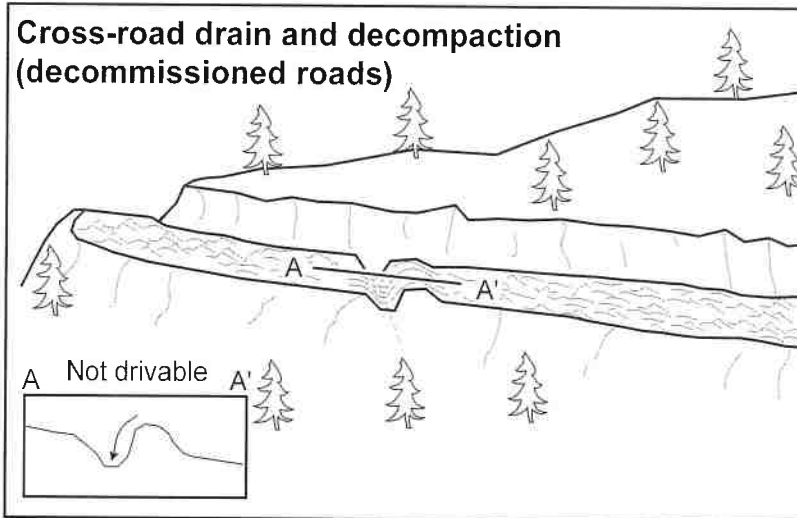
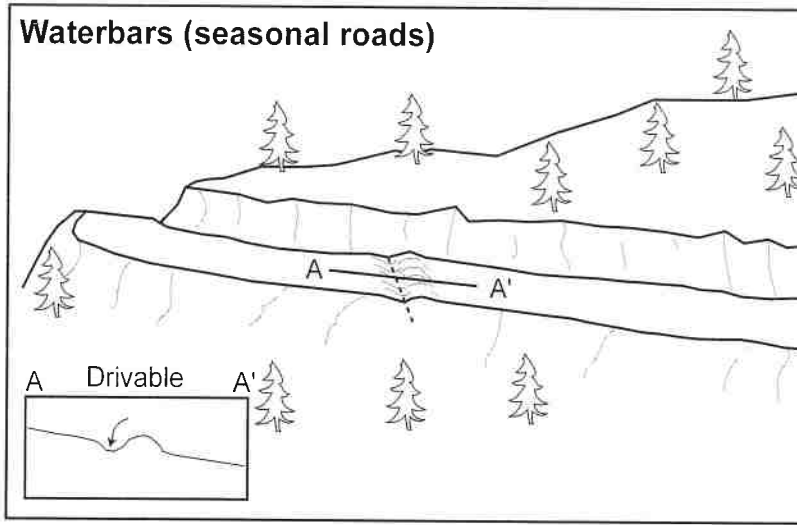
- 1) The same basic steps followed for stream crossing installation shall be employed.
- 2) Culverts shall be installed at a 30 degree angle to the ditch to lessen the chance of inlet erosion and plugging.
- 3) Culverts shall be seated on the natural slope or at a minimum depth of 5 feet at the outside edge of the road, whichever is less.
- 4) At a minimum, culverts shall be installed at a slope of 2 to 4 percent steeper than the approaching ditch grade, or at least 5 inches every 10 feet.
- 5) Backfill shall be compacted from the bed to a depth of 1 foot or 1/3 of the culvert diameter, whichever is greater, over the top of the culvert.
- 6) Culvert outlets shall extend beyond the base of the road fill (or a flume downspout will be used). Culverts will be seated on the natural slope or at a depth of 5 feet at the outside edge of the road, whichever is less.

Pacific Watershed Associates Inc.

Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / [www.pacificwatershed.com](http://www.pacificwatershed.com)

**Typical Drawing #8**

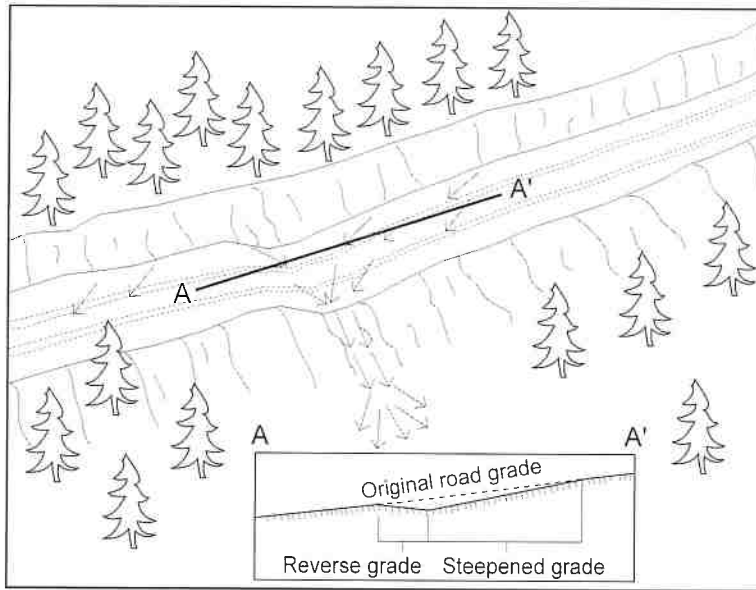
# Typical Methods for Dispersing Road Surface Runoff with Waterbars, Cross-road Drains, and Rolling Dips



Pacific Watershed Associates Inc.

Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
 PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / www.pacificwatershed.com

## Typical Road Surface Drainage by Rolling Dips



### Rolling dip installation:

1. Rolling dips will be installed in the roadbed as needed to drain the road surface.
2. Rolling dips will be sloped either into the ditch or to the outside of the road edge as required to properly drain the road.
3. Rolling dips are usually built at 30 to 45 degree angles to the road alignment with cross road grade of at least 1% greater than the grade of the road.
4. Excavation for the dips will be done with a medium-size bulldozer or similar equipment.
5. Excavation of the dips will begin 50 to 100 feet up road from where the axis of the dip is planned as per guidelines established in the rolling dip dimensions table.
6. Material will be progressively excavated from the roadbed, steepening the grade until the axis is reached.
7. The depth of the dip will be determined by the grade of the road (see table below).
8. On the down road side of the rolling dip axis, a grade change will be installed to prevent the runoff from continuing down the road (see figure above).
9. The rise in the reverse grade will be carried for about 10 to 20 feet and then return to the original slope.
10. The transition from axis to bottom, through rising grade to falling grade, will be in a road distance of at least 15 to 30 feet.

**Table of rolling dip dimensions by road grade**

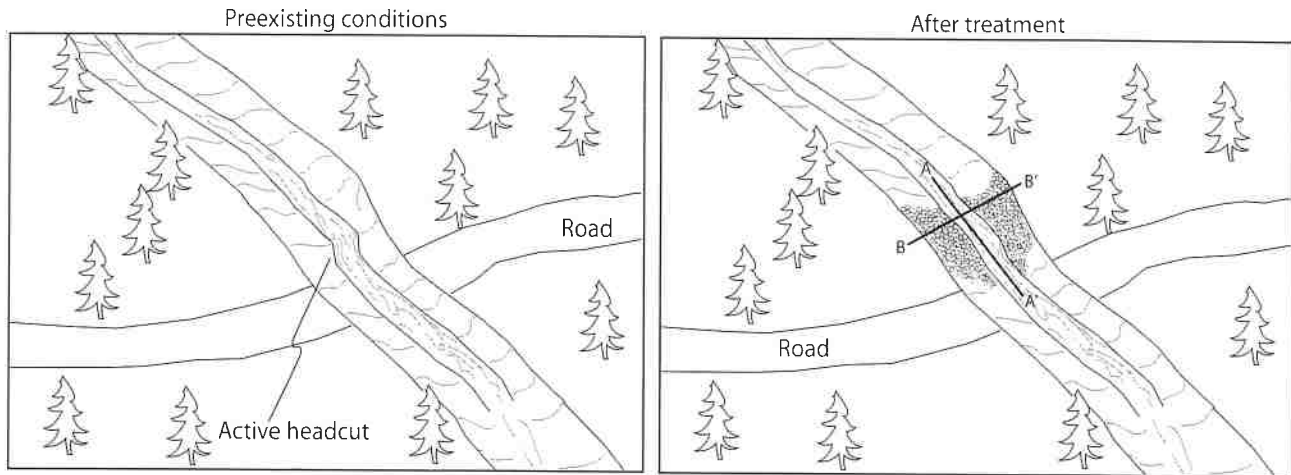
Road grade %	Upslope approach distance (from up road start to trough) ft	Reverse grade distance (from trough to crest) ft	Depth at trough outlet (below average road grade) ft	Depth at trough inlet (below average road grade) ft
<6	55	15 - 20	0.9	0.3
8	65	15 - 20	1.0	0.2
10	75	15 - 20	1.1	0.01
12	85	20 - 25	1.2	0.01
>12	100	20 - 25	1.3	0.01

Pacific Watershed Associates Inc.

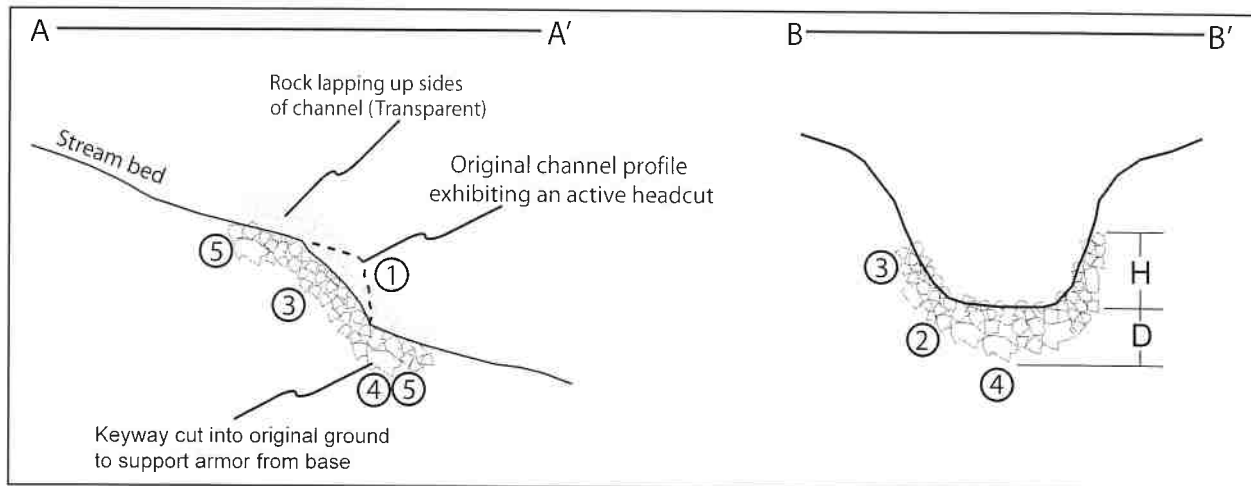
Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / www.pacificwatershed.com

**Typical Drawing #11**

# Typical Rock Grade Control Structure Installation at man-made headcuts/knickpoints in a non-fish bearing stream channel



## Cross section parallel and perpendicular to watercourse



## Notes

The main objective is to create a structure that will not be flanked, undercut, or eroded by the stream.

The critical elements of a successful grade control structure are:

- 1) Excavating the headcut to a gentler channel gradient over a distance of stream  
(See road log for details)
- 2) rock selection- rock should be selected that is resistant to transport during design flows, and has a bell shaped distribution of sizes with the median diameter equivalent to the D50 particle size of the stream at the site of installation (See road log for range of rock diameters).
- 3) The rock must be placed in a "U" shape that will contain the 100 yr. return interval stream flow, won't constrict the channel cross sectional area, and be flush with the streambed and not deflect flow.
- 4) The rock must be imbedded into the channel at least two rock diameters in thickness.
- 5) The largest rock should be used at the base and top of the grade control structure to buttress the other rock

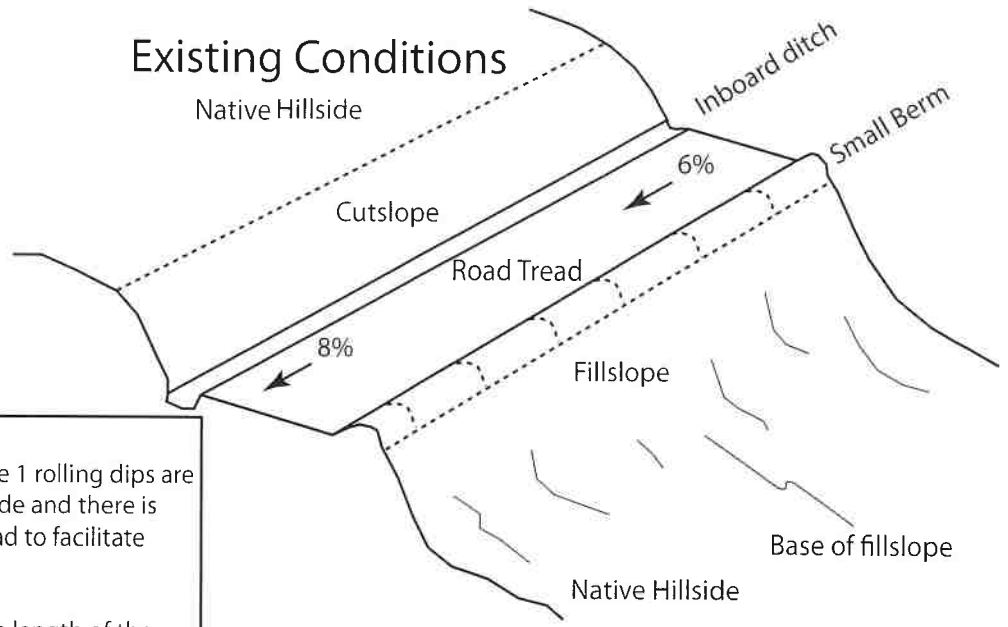
Pacific Watershed Associates Inc.

Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / www.pacificwatershed.com

PWA Typical Drawing #18

# Standard (Type 1) Rolling Dip Construction

## Existing Conditions



### Notes

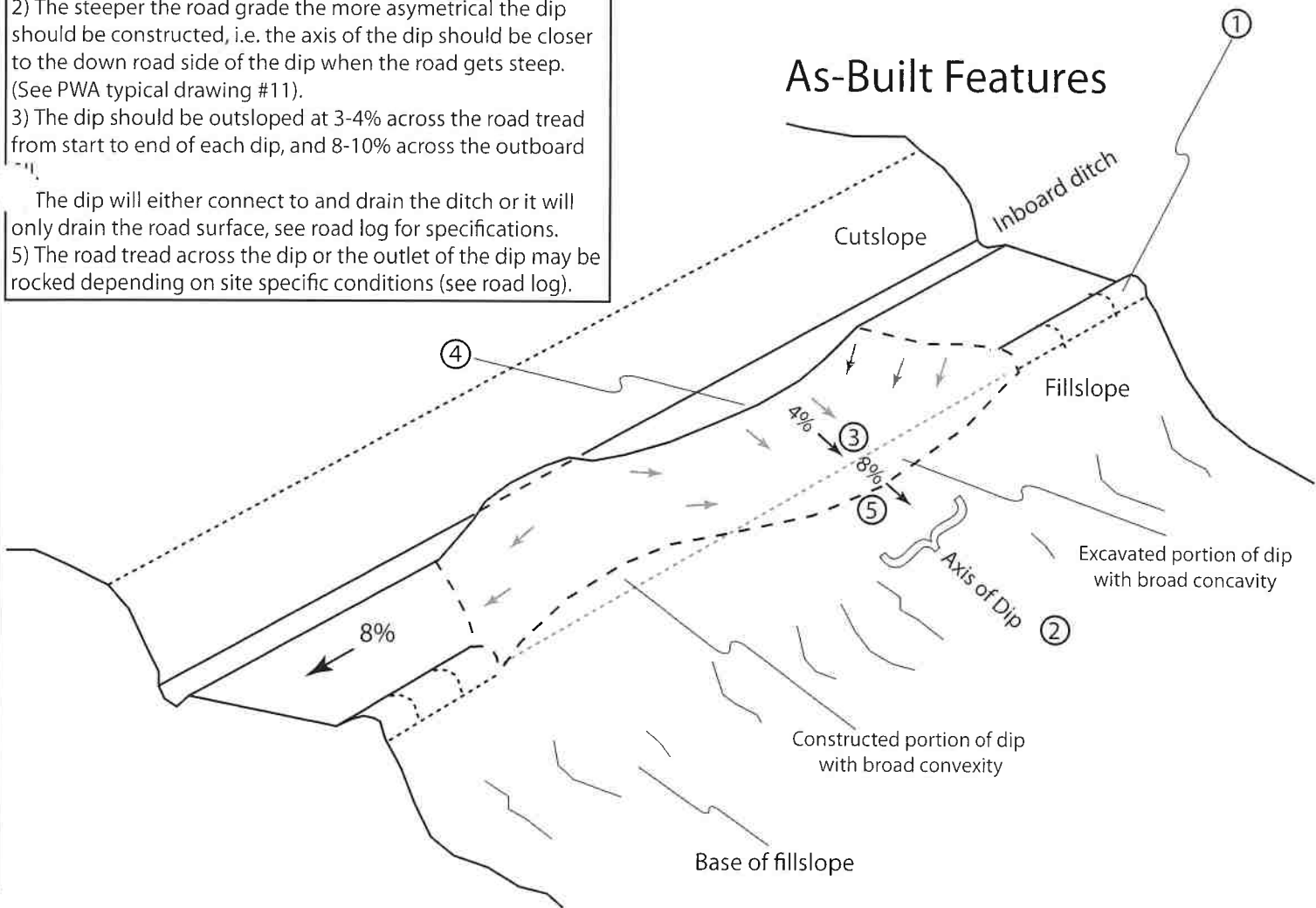
**Rolling dip type 1 existing conditions:** Type 1 rolling dips are utilized when roads are less than 12-14% grade and there is proximal outfall adjacent to the outboard road to facilitate road drainage.

### Design Notes:

- 1) The berm should be removed for the entire length of the dip.
- 2) The steeper the road grade the more asymmetrical the dip should be constructed, i.e. the axis of the dip should be closer to the down road side of the dip when the road gets steep. (See PWA typical drawing #11).
- 3) The dip should be outsloped at 3-4% across the road tread from start to end of each dip, and 8-10% across the outboard

- 4) The dip will either connect to and drain the ditch or it will only drain the road surface, see road log for specifications.
- 5) The road tread across the dip or the outlet of the dip may be rocked depending on site specific conditions (see road log).

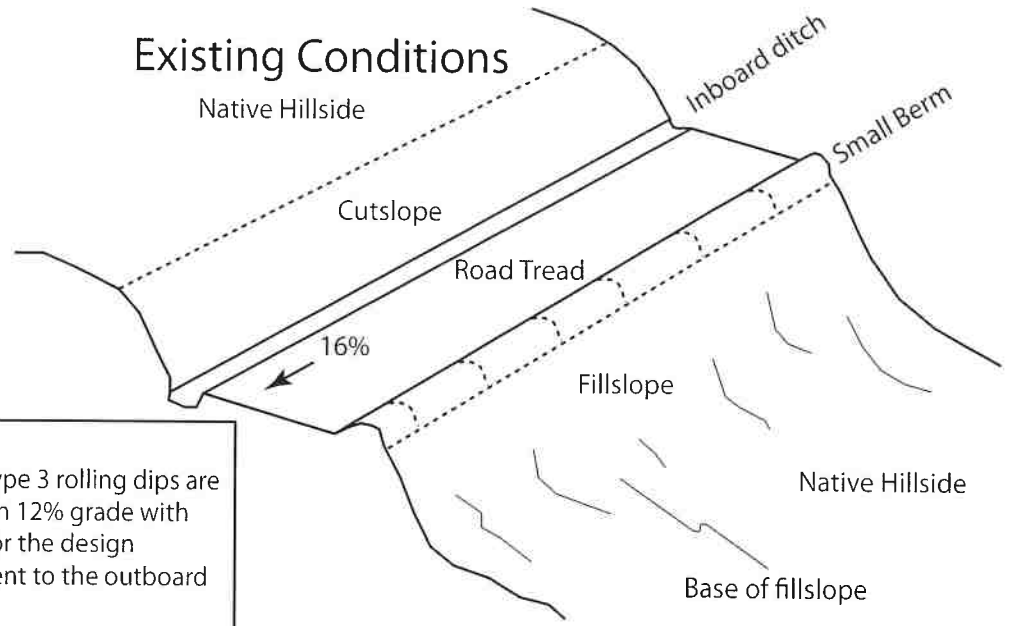
## As-Built Features



Pacific Watershed Associates Inc.

Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / www.pacificwatershed.com

# Type 3 Rolling Dip Construction (steep slope outslope)

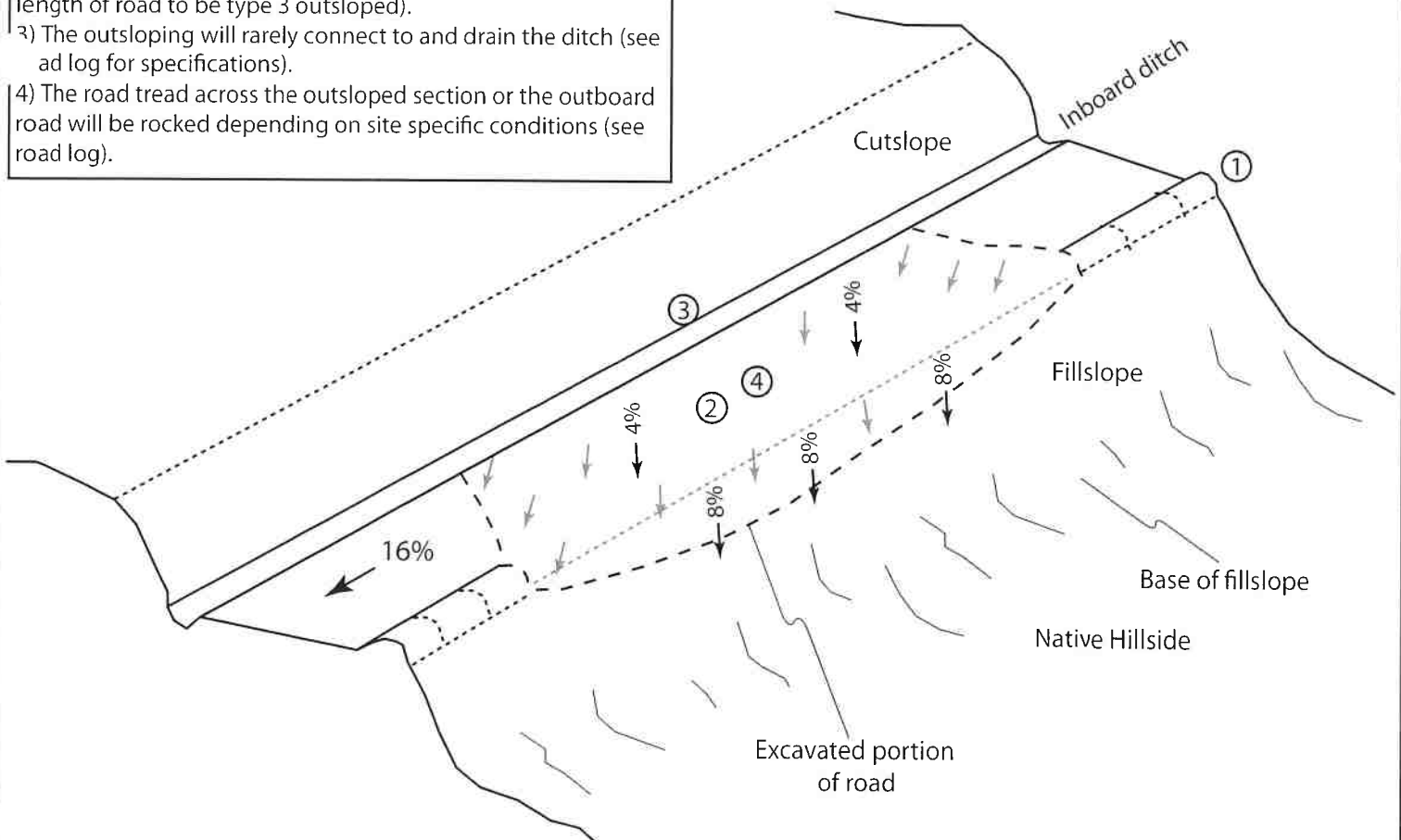


## Notes

**Rolling dip type 3 existing conditions:** Type 3 rolling dips are utilized when roads grades are steeper than 12% grade with little opportunity to create reverse grade for the design vehicle, and there is proximal outfall adjacent to the outboard road to facilitate road drainage.

### Design Notes:

- 1) The berm should be removed for the entire length of the outsloped section.
- 2) The dip should be outsloped at 2-4% across the road tread and 4-8% across the outboard fill. (The road log will specify the length of road to be type 3 outsloped).
- 3) The outsloping will rarely connect to and drain the ditch (see ad log for specifications).
- 4) The road tread across the outsloped section or the outboard road will be rocked depending on site specific conditions (see road log).

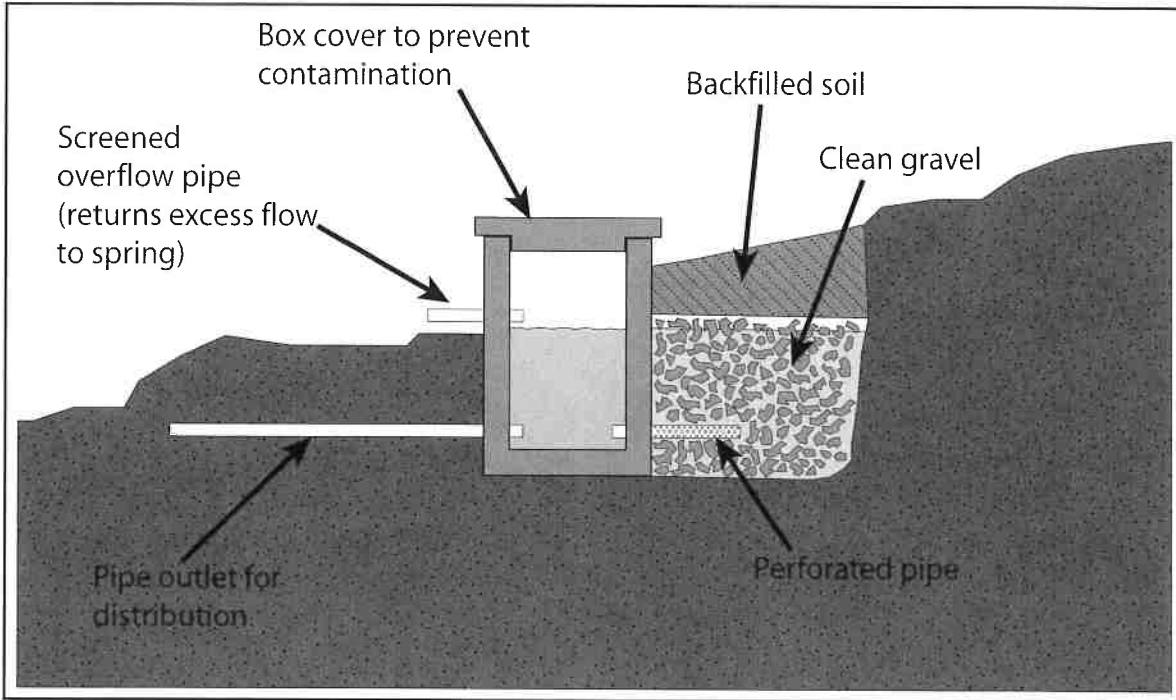


Pacific Watershed Associates Inc.

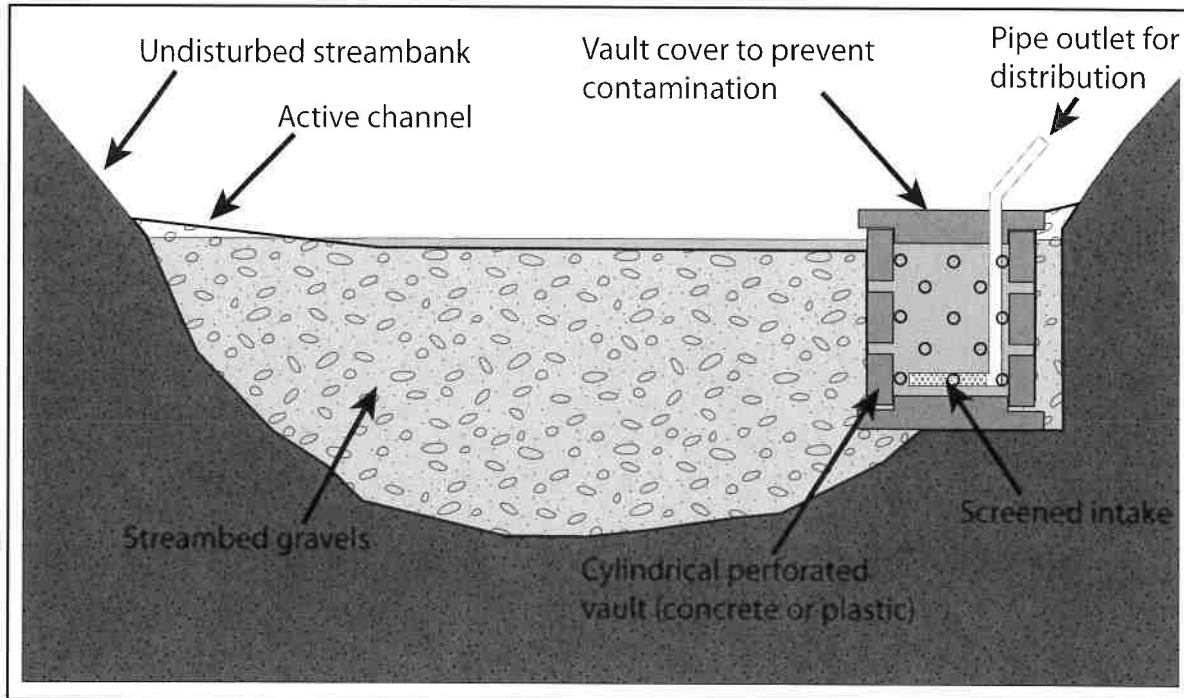
Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / www.pacificwatershed.com

# Typical design drawings of spring box and vaulted screened intake gravity diversion infrastructure

## Piped spring box - gravity system



## Vaulted screened intake - gravity system



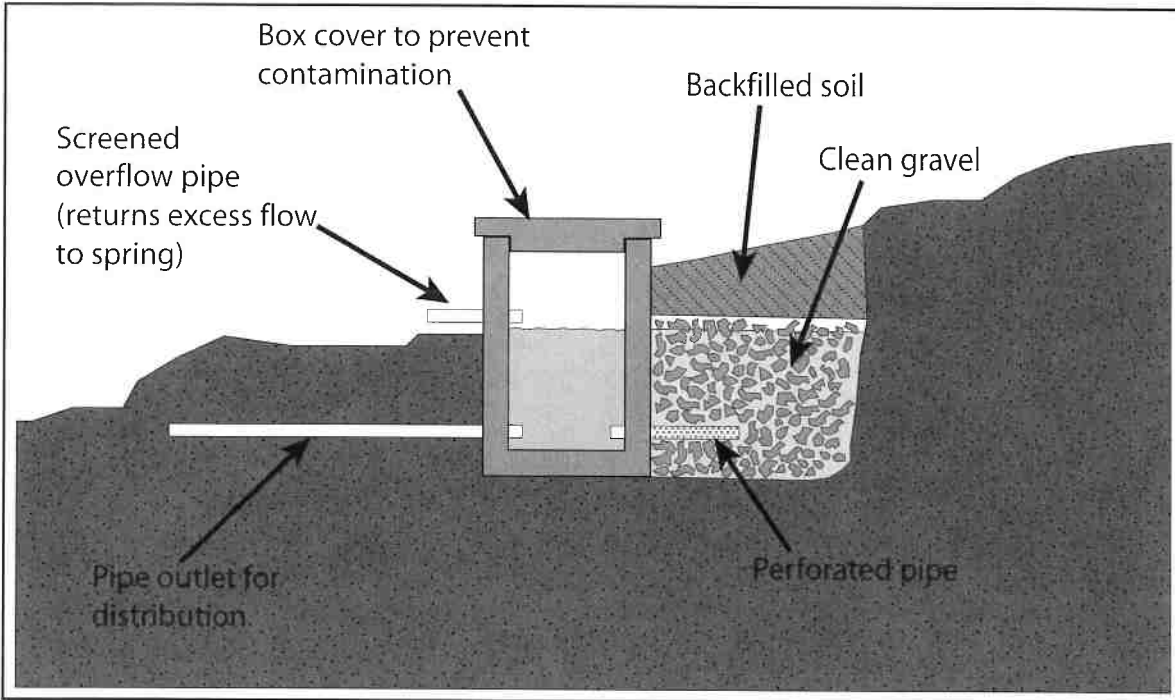
Pacific Watershed Associates Inc.

Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
 PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / www.pacificwatershed.com

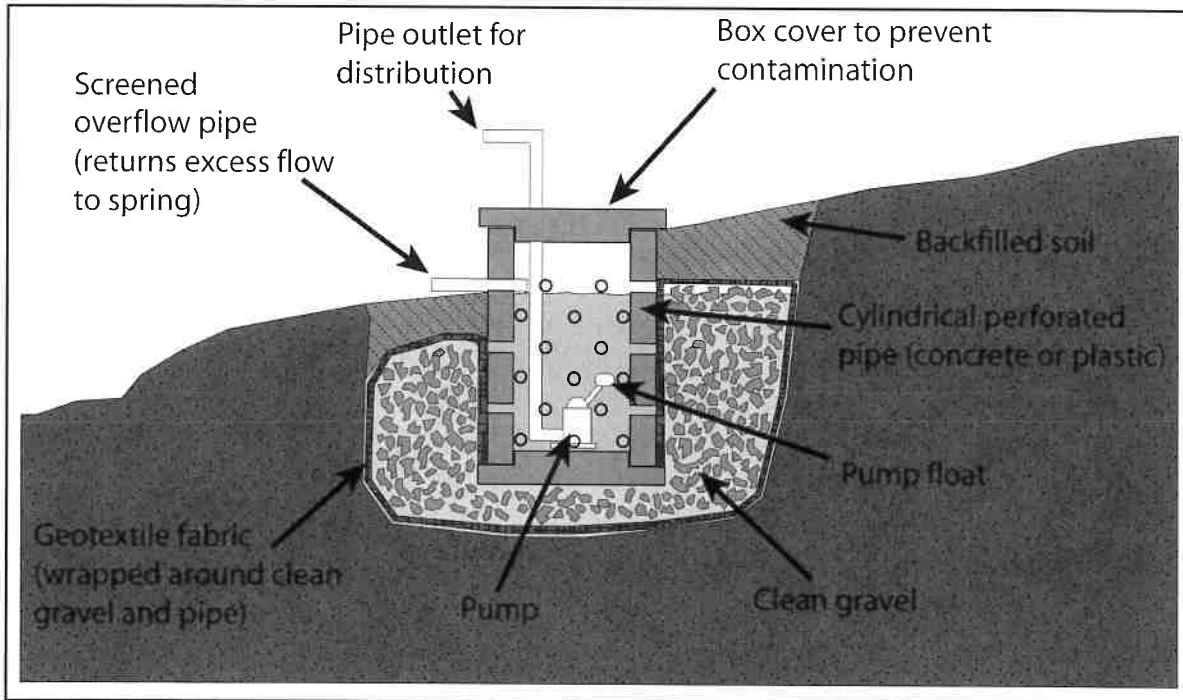
PWA Typical Drawing #21

## Typical design drawings of spring boxes

### Piped spring box - gravity system



### Perforated spring box - pumped system



Pacific Watershed Associates Inc.

Geologic and Geomorphic Studies • Watershed Restoration • Wildland Hydrology • Erosion Control • Environmental Services  
PO Box 4433, Arcata, CA 95518 / Ph: 707-839-5130 / FAX: 707-839-8168 / [www.pacificwatershed.com](http://www.pacificwatershed.com)

PWA Typical Drawing #20