7. Armstrong Road Improvement Grant Application

Project ranking criteria for (Project Title):_____

1. Does proposed project include one or more stream crossings and corrective grading within and close to a stream channel?

   ☐ Yes ☐ No

   If yes: Number of stream crossings:_____

   Corrective grading within and close to a stream channel:_____

2. Are improvements to roads in priority sub watersheds?

   ☐ Yes ☐ No

   If yes: Which priority sub watershed:_____

   ☐ Refuge sub watershed ☐ Critical sub watershed

3. Is the proposed project maintained by a Road Maintenance Association?

   ☐ Yes ☐ No

   If yes: Name of Road Maintenance Association:_____

   Is the proposed project a cultivation sites approved under the 2016 Commercial Medical Marijuana Land Use Ordinance (CMMLUO) AND will the improvements bring the road into compliance with the standards?

   ☐ Yes ☐ No

   If yes: What are the required standards/Conditions of Approval: _____

4. Is the proposed project located in an area of highly erodible soils, steep slopes, proximity to a watercourse(s), and have the presence of impacted fisheries?

   ☐ Yes ☐ No

   If yes, check all that apply:

   ☐ Highly erodible soils ☐ Steep slopes
   ☐ Proximity to a watercourse ☐ Presence of impacted fisheries

   Provide additional notes, if needed, based on boxes checked above:_____

   _____

   _____

After evaluating the above, provide the following points (not to exceed one hundred total) based on the proposed project's:

• Project Design and Expected Outcomes – up to a total of 80 Points, based upon the project's alignment with the Program requirements and criteria set forth in these Guidelines.

Total score:_____

• Project Budget – up to a total of 10 Points, based on the applicant's ability to perform the work necessary to implement the project in a cost-efficient manner.

Total score:_____

• Experience and Capacity – up to 10 Points, based on the applicant's experience and capacity to perform the work necessary to implement the project.

Total score:_____

Total Final Ranking Score (out of 100 points):_____

APPLICATION PACKET CHECKLIST

Please check below to ensure you have a complete application. Once complete, email the following documents, in pdf format with the text "Application for Remediation Grant Program Funding" in the subject line to mrichardson@co.humboldt.ca.us.

- ☑Signed Application Submission Form
- ☑Project Description – Summary of the Project, up to 2 pages.
- ☑Plot Plan
- ☑Plot Plan Checklist – Attached
- ☑Cross sections of proposed work including topographic elevations
- ☑Scope of Work – Detailed Description of Work
- ☑Schedule for Completion – Identify Milestones
- ☑Erosion Control Plan and Monitoring Plan
- ☑Budget – Be as specific as possible – sample attached
- ☑Project Maps and Figures
- ☐Letter(s) of Support (optional)

APPLICATION FORM - Commercial Cannabis Land Use Ordinance Mitigation and Remediation Fund Program

Project Title: **Armstrong Sediment Reduction and Road Improvement Project**

Date of Application: **October 29, 2021**

Applicant Name: **April Armstrong**

Project APN: **316-086-017, 316-086-011, and 316-086-023**

Contact Person Name and Title: **April Armstrong**

Contact Phone: **707-616-4404**

Contact Email: **aprilalison@gmail.com**

Contact Address: **600 F Street Ste #3 PMB #521**

Amount Requested: **$230,000** Total Budget: **$261,000**

Project Timeline: Start Date: **June 15, 2022** End Date: **October 15, 2022**

Signature of Applicant: DocuSigned by: April Armstrong 3A5BE3E5D7D3431... 10/30/2021

PLOT PLAN AND TENTATIVE MAP CHECKLIST

The following information must be shown on your plot plan or tentative map. Please check ✓ the box to the left of the items shown on the plot plan or tentative map. If any item is not on your site to your knowledge, write "N/A" next to the box. Plot plans shall be drawn on a minimum size sheet of 8-1/2" x 11", and tentative subdivision maps on a minimum size sheet of 18" x 26". ***Note: This Checklist must be completed by the applicant and submitted with your application.***

Applicant's Name _April Armstrong____APN____ 316- 086-017, 316-086-011, 316-086-023

FOR ALL PROJECTS

- ☑ 1. Name of applicant(s)
- ☑ 2. Location or vicinity map (on or attached to the plot plan)
- ☑ 3. The subject parcel (show entire parcel with dimensions)
- ☑ 4. Date, north arrow and scale
- ☑ 5. Name, County road numbers, and width of all existing and proposed access roadways adjacent to or within the subject parcel (indicate width of traveled way, grade (in % slope), and surface)
- ☑ 6. Existing and proposed improvements (label as "existing" and "proposed" with dimensions and distance to nearest two (2) property lines)
  - ☐ a. Structures and buildings (include floor area, height and proposed use)
  - ☑ b. Driveways and turnaround areas (indicate width, grade (in % slope) and surface)
  - ☐ c. Utility lines (electric, gas, telephone, sewer, water, and cable TV)
  - ☑ d. Septic tanks and leachfields (label primary/reserve areas and test holes)
  - ☑ e. Wells
  - ☑ f. Parking and loading areas (show individual parking spaces, including handicapped parking and ramps)
  - ☑ g. Storm drains, curbs and gutters
  - ☐ h. Emergency water storage tanks and fire hydrants
  - ☐ i. Landscaped areas (include proposed exterior lighting)
  - ☐ j. Major vegetation (identify mature trees (12" dbh or larger) to be removed)
  - ☐ k. Diked areas
  - ☐ l. Proposed grading and fill (estimate volume)
  - ☐ m. Signs (indicate size, illuminated, and design (e.g., monument, pylon, etc.))
  - ☐ n. Other - specify _____
    _____
- ☑ 7. Direction of surface water runoff
- ☑ 8. Location and width of all existing and proposed easements of record
- ☐ 9. Hazardous areas (indicate on map if on the project site or within 400 feet of the project site):
  - ☐ a. Areas subject to inundation or flooding
  - ☐ b. Steep or unstable slopes
  - ☐ c. Expansive (clay) soils
  - ☐ d. Earthquake faults
  - ☐ e. Hazardous waste or substance sites
  - ☐ f. Other - specify _____
- ☑ 10. Sensitive habitat areas (indicate on map if on project site or within 400 feet of the project site):
  - ☑ a. Creeks, rivers, sloughs and other drainage courses
  - ☑ b. Lakes, ponds, marshes, or "wet" meadows
  - ☐ c. Beaches
  - ☐ d. Sand dunes
  - ☐ e. Other - specify _____
- ☐ 11. Historical buildings or known archaeological or paleontological resources
- ☐ 12. Land use and buildings on adjacent parcels, and approximate distances to closest property lines

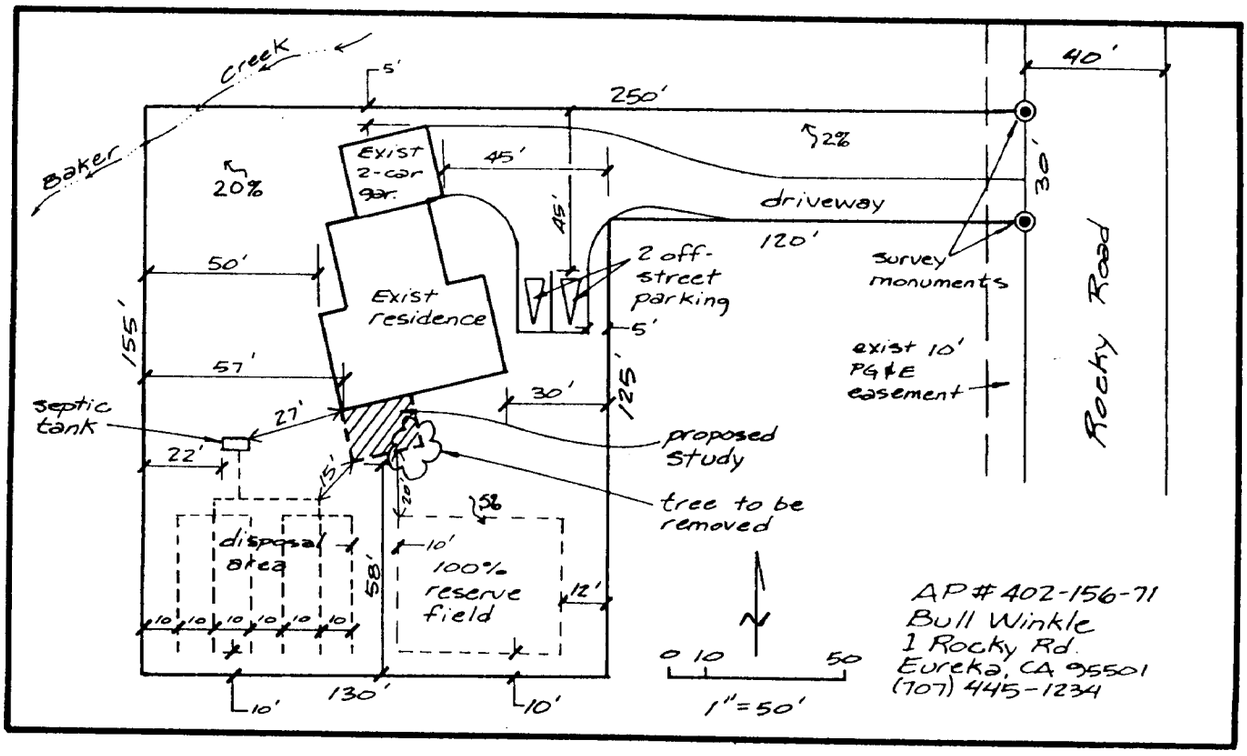
FOR LOT LINE ADJUSTMENT PLOT PLANS ONLY

- ☐ 13. Proposed new lines and lines to be eliminated (show lines to be eliminated as dashed)
- ☐ 14. Areas (in square footage or acreage) of the initial and resulting parcels

FOR TENTATIVE SUBDIVISION MAPS ONLY

- ☐ 16. Approximate dimensions and areas of all proposed lots
- ☐ 17. A statement that "All easements of record are shown on the tentative map and will appear on the recorded subdivision map"
- ☐ 18. Contour lines (at _____ intervals)
- ☐ 19. For major subdivisions (5 or more parcels): proposed drainage improvements, details of any grading to be performed, approximate radii of all roadway curves, areas for public use, and typical sections of all streets, highways, ways and alleys
- ☐ 20. Names and assessor's parcel numbers of all contiguous ownerships

NOTE: THE SUBMITTAL OF INCOMPLETE OR ILLEGIBLE PLOT PLANS OR TENTATIVE MAPS WILL CAUSE DELAYS IN THE PROCESSING OF YOUR APPLICATION

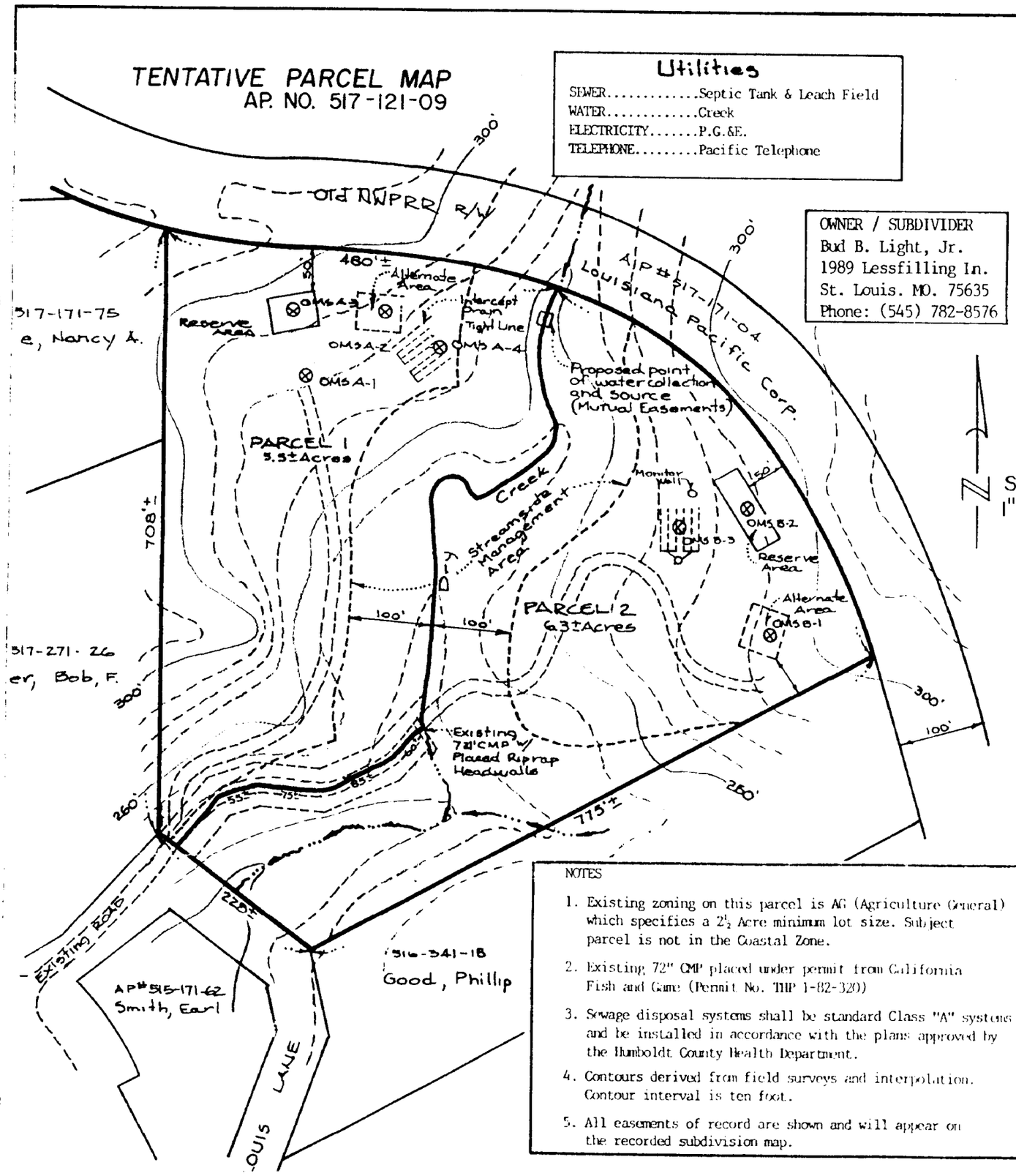


TENTATIVE PARCEL MAP
AP. NO. 517-121-09

Utilities

SEWER.....Septic Tank & Leach Field
WATER.....Creek
ELECTRICITY.....P.G.&E.
TELEPHONE.....Pacific Telephone

OWNER / SUBDIVIDER
Bud B. Light, Jr.
1989 Lessfilling In.
St. Louis. MO. 75635
Phone: (545) 782-8576



NOTES

1. Existing zoning on this parcel is AG (Agriculture General) which specifies a 2½ Acre minimum lot size. Subject parcel is not in the Coastal Zone.
2. Existing 72" CMP placed under permit from California Fish and Game (Permit No. THP 1-82-320)
3. Sewage disposal systems shall be standard Class "A" systems and be installed in accordance with the plans approved by the Humboldt County Health Department.
4. Contours derived from field surveys and interpolation. Contour interval is ten foot.
5. All easements of record are shown and will appear on the recorded subdivision map.

Commercial Cannabis Land Use Ordinance Mitigation and Remediation Fund Grant Application

Armstrong Road Improvement
and
Sediment Reduction Project
APNs: 316-086-017, 316-086-011, and 316-086-023

October 2021

Prepared for:
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1 PROJECT DESCRIPTION

The project area is located in the Redwood Creek watershed and the Minor Creek sub watershed in Humboldt County approximately 10 miles east of Blue Lake, California. The project area is located downslope of Highway 299 at 30000 and 30500 Old Highway 299 Blue Lake, California, on Humboldt County Assessor Parcel Numbers (APN) 316-086-017, 316-086-011, and 316-08-023.

The Armstrong Road Improvement and Sediment Reduction Project will improve approximately 2.3 miles of privately owned accessed road in the upper Redwood Creek Watershed, roughly 1.3 miles of access road consists of Old Highway 299 which is the primary access road on the property. Based on historical air photos, the road was constructed before 1958 and abandoned sometime after 1962 by Caltrans and it was never remediated. The landowner is committed to improving the land and preserving the natural resources. Implementation of the proposed stream crossing improvements would improve water quality and prevent approximately 2,100 cubic yards of sediment from entering the Redwood Creek watershed.

The purpose of this project is to reduce erosion potential and sediment discharge to surface waters within the Redwood Creek watershed by reducing hydrologic connectivity through appropriately sizing culverted stream crossings to accommodate 100-year stream flow and debris, decommissioning stream crossings with no intended future use, and storm-proofing the road network.

This application includes a total of fourteen (14) projects: decommissioning/removal of three (3) stream crossings; and upgrade/replacement of eleven (11) culverted stream crossings. Implementation of the project will also disconnect hydrologically connected road reaches to the greatest degree feasible through the installation of rolling dips and waterbars. A detailed scope of work and description of each project is provided in Appendix A Table 1. All stream crossings and road treatments have been designed by qualified professionals at Mother Earth Engineering (MEE) and Pacific Watershed Associates (PWA) and will allow for the unrestricted passage of water and shall be designed to accommodate the 100-year stream flow and associated debris (See Appendix A Table 3 for culvert sizing recommendations and methods). Typical drawings and design specifications for project sites and road treatments are provided in Appendix D of this application.

Additionally, 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, Hagans and Weppner, 2006). MEE will provide construction layout, oversight, and support. Additionally, the landowner and MEE are in the process of collecting bids from experienced and licensed contractors to implement the project as designed.

A project map of the project area displaying roads, watercourses, project locations, and proposed road drainage treatments is attached to this application (Figure 1). Photo documentation of all projects is attached to this application (Appendix B).

All stream crossings will be dry during construction and all disturbed areas capable of delivering sediment to a watercourse will be seeded with native seed and mulched with weed free straw. Any spoils generated during construction will be stored in a stable location and mulched to prevent surface erosion.

Work will only occur during the period of June 15 through October 15 (or first significant rainfall) to limit and avoid impacts to aquatic habitat and salmonids. Vegetation will only be removed form sites where it is growing on anthropogenically placed fill material, where erosion is likely to deliver to active watercourses, or where necessary for the implementation of storm-proofing treatments.

The project will serve to make the road more accessible, reduce sediment delivery to surface waters, and bring the broader cultivation business into compliance with both the State Water Resources Control Board (SWRCB) and the

California Department of Fish and Wildlife (CDFW). The project parcels are enrolled in the State Water Board Cannabis General Order (WDID 1_12CC417682) which requires compliance with environmental regulations intended to minimize detrimental impacts by implementing best management practices. No trees will be removed during project construction and permanent impacts to existing native channel bed, channel, watercourse banks, and associated riparian habitat will be negligible and avoided. Incidental destruction of small areas of riparian vegetation growing on existing road fill or in disturbed channel areas is expected at the stream crossing upgrades during remediation.

The costs of the proposed road improvement project remain a challenge. Funding for this project is a crucial element for achieving and maintaining compliance but also serves as a critical point connected to the implementation and success of a sustainable cannabis cultivation business.

If approved, the funds will go directly towards improving the road network and the construction of stream crossing improvements and stream restoration. Funding the road improvements will help achieve environmental compliance with CDFW and SWRCB and support a fully operational, woman-owned business that will contribute to the tax base of the community, provide employment, and protect water quality in the Redwood Creek watershed.

2 SCHEDULE FOR COMPLETION

All work shall be confined to the work period between June 15 and October 15. SWRCB approval is required before project initiation, if approval is not granted on the date noted in the table below, then the project start date may change and construction will begin once approval is granted. A Lake or Streambed Alteration Agreement (LSAA) has been issued for APNs 316-086-017 and 316-086-011. A separate LSAA was submitted on August 27, 2021, for APN 316-08-023 and is pending approval. Once approval is granted, the project typically must be completed within 5 years of the executed LSAA. MEE will collaborate directly with the contractor to go over the project design prior to project implementation. MEE will also provide construction oversight during project construction to ensure the plans are implanted as proposed. Project monitoring shall occur twice annually at the start of the winter period (November 15) and at the end (April 1) or if conditions change on the project site. Project monitoring will focus on the effectiveness of erosion and sediment control measures to determine if any additional treatments are required. Both CDFW and SWRCB require Project Completion Reports after the project is complete, these reports are typically required within 30 days of project completion.

Proposed Schedule for Completion		
Milestone	**Start Date**	**End Date**
Contractor Bidding and Contracting	In progress	5/1/2022
CDFW LSAA Project Approval	In progress	TBD
SWRCB 401 Water Quality Certification Permit Application Submission	In progress	3/1/2022
Project Layout and Initiation	6/1/2022	6/15/2022
Project Implementation	6/15/2022	10/15/2022 (or first significant rainfall)
Post Construction Monitoring	10/15/2022 (or upon project completion)	11/15/2022 (start of winter period)
Project Completion Report for CDFW and SWRCB	10/15/2022	11/15/2022
Annual Monitoring	November 15 of each year	April 1 of each year

3 EROSION CONTROL AND MONITORING PLAN

Erosion control measures shall be implemented upon completion of construction operations and before the winter period (November 15). The goal of implementing winterization and erosion control measures is to limit erosion or sediment transport during rainfall events. Erosion control measures may include and shall not be limited to the following:

1) Disturbed areas will be treated with native seed and weed-free straw mulch. Native seed will be applied at a rate no less than 50 pounds per acre. Seeded areas shall be covered with weed-free straw mulch at a rate of two tons per acre and provide 100% ground cover. Straw mulch will be evenly distributed on the ground surface.
2) All stockpiled materials (i.e., spoils) must either be properly disposed of or fully contained and weatherproofed before the winter period. All spoil areas shall be seeded and mulched following the guidelines mentioned above.
3) Any seasonal roads shall be blocked off and no heavy equipment will be used during the winter period. All disturbed areas must be stabilized, and erosion control measures must be applied to the ground surface to prevent sediment discharge.

Post-construction monitoring will begin when the project is complete. Upon which time all project sites including roads and stockpiled materials will be assessed for adequate erosion and sediment control application. If additional erosion and sediment control measures are required, then they shall be installed prior to the onset of the winter period (November 15). Following project implementation, all project sites will be monitored twice per

year (November 15 or shortly after, and April 1) by a qualified professional to ensure proper installation and determine if any additional erosion or sediment control measures are needed.

4 REFERENCES

Google Earth. (1993). Image U.S. Geological Survey Image NASA.

SWRCB (State Water Resources Control Board). (2019). Order WQ 2019-0001-DWQ. General Waste Discharge Requirements for Discharges of Waste Associated with Cannabis Cultivation Activities.

SWRCB (State Water Resources Control Board). (2019). Order WQ 2019-0001-DWQ. General Waste Discharge Requirements for Discharges of Waste Associated with Cannabis Cultivation Activities. Attachment A: Cannabis Cultivation Policy Attachment A.

SWRCB (State Water Resources Control Board). (2019). Order WQ 2019-0001-DWQ. General Waste Discharge Requirements for Discharges of Waste Associated with Cannabis Cultivation Activities. Attachment B: Monitoring and Reporting Program.

USGS. (1973). Lord-Ellis Summit, CA. 7.5 Minute Series Quadrangle Map.

Weaver, W.E., Weppner, E.M. and Hagans, D.K. (2015). Handbook for Forest, Ranch and Rural Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Upgrading, Maintaining and Closing Wildland Roads (Rev. 1st ed.), Mendocino County Resource Conservation District, Ukiah, California.

Appendix A

Project Scope and Description

Table. 1 Project Scope with Descriptions

MAP/SITE ID	Figure Number	Photo Numbers	Latitude	Longitude	Site Information	Treatment Recommendations	Materials
SC-2 Big Oak (BO) APN 316-086-023	1 and 4	1-3	40.8993	-123.7838	A Class III watercourse with an 18-inch diameter plastic culvert. The culvert is not sized for 100-year flows and debris. The culvert is installed at channel grade but is not in line with the natural channel.	1. Replace the existing culvert and install a 30-inch diameter x 30-foot-long metal culvert sized for 100-year stream flows and debris. The new culvert shall be installed in line with the natural stream channel, at channel grade and at the base of fill. 2. Raise the road to accommodate a new culvert, with the required minimum 12-inches of fill over the culvert inlet to safely withstand vehicular loading. 3. Reuse any large woody debris (LWD) to protect bare soil areas. 4. Seed and mulch any bare soil areas to prevent surface erosion. 5. Install one rolling dip 75 feet up the right road approach to reduce runoff and sediment delivery. 6. Rock the immediate road approaches to the stream crossing to the nearest drainage structure (i.e., rolling dip). 7. Any excess material (spoils) generated during construction will be end hauled to a stable location far from surface waters. To prevent surface erosion, spoil locations will be covered with native seed at a rate no less than 50 lbs./acre of seed. Seeded areas will be covered with weed-free straw mulch at a rate of two tons per acre and provide 100% ground cover. Straw mulch will be evenly distributed on the ground surface.	1. 30” dia. X 30’ long CMP 2. Road rock 3. Native seed and straw mulch

Table. 1 Project Scope with Descriptions

MAP/SITE ID	Figure Number	Photo Numbers	Latitude	Longitude	Site Information	Treatment Recommendations	Materials
SC-3 BO APN 316-086-023	1 and 4	4-5	40.9004	-123.7819	A Class III watercourse with a 15-inch diameter steel culvert. The culvert is not sized for 100-year flows and debris. The culvert inlet is 50% plugged with sediment and installed off center from the natural stream channel. The crossing is located on a paved road which is an abandoned section of Old Highway 299. The pavement is cracked and failing in several locations along the outboard road.	1. Decommission the stream crossing. This will require the removal of pavement- extending to SC-4. 2. Remove pavement and dispose of off-site at the appropriate waste disposal facility. 3. The road surface will be ripped 16 to 24 inches deep to increase road surface infiltration rates, de-compact the road surface, prevent concentrated runoff, and allow vegetation to reestablish and recover. 4. Remove the old culvert and excavate the crossing from the inlet to outlet. 5. Establish a minimum 3-foot-wide stream channel with 2:1 side slopes. 6. Seed and mulch all bare soil areas. 7. Any excess material (spoils) generated during construction will be spoiled locally at the base of cutbank and used to outslope the road surface to mimic the natural topography. To prevent surface erosion, spoil locations will be covered with native seed at a rate no less than 50 lbs./acre of seed. Seeded areas will be covered with weed-free straw mulch at a rate of two tons per acre and provide 100% ground cover. Straw mulch will be evenly distributed on the ground surface.	1. Native seed and straw mulch

Table. 1 Project Scope with Descriptions

MAP/SITE ID	Figure Number	Photo Numbers	Latitude	Longitude	Site Information	Treatment Recommendations	Materials
SC-4 BO APN 316-086-023	1 and 4	6-7	40.9000	-123.7808	A Class II watercourse with no formal drainage structure. The road is actively failing at the crossing and the road has been completely washed out east of the crossing due to a large landslide. The crossing is located at the terminus of a paved road which is an abandoned section of Old Highway 299.	1. Decommission the stream crossing. This will require the removal of pavement. 2. Remove pavement and dispose of off-site at the appropriate waste disposal facility. 3. The road surface will be ripped 16 to 24 inches deep to increase road surface infiltration rates, de-compact the road surface, prevent concentrated runoff, and allow vegetation to reestablish and recover. 3. Establish a minimum 4-foot-wide stream channel with 2:1 side slopes. 4. Seed and mulch all bare soil areas. 5. Any excess material (spoils) generated during construction will be spoiled locally to the west of the crossing at the base of cutbank and used to outslope the road surface to mimic the natural topography. To prevent surface erosion, spoil locations will be covered with native seed at a rate no less than 50 lbs./acre of seed. Seeded areas will be covered with weed-free straw mulch at a rate of two tons per acre and provide 100% ground cover. Straw mulch will be evenly distributed on the ground surface.	1. Native seed and straw mulch

Table. 1 Project Scope with Descriptions

MAP/SITE ID	Figure Number	Photo Numbers	Latitude	Longitude	Site Information	Treatment Recommendations	Materials
SC-1 RTR APN 316-086-017	1 and 2	8-10	40.911488	-123.791791	A Class III watercourse with a 36-inch diameter metal culvert on a paved section of Old Highway 299. The culvert is adequately sized for 100-year stream flows and associated debris; however, the 10-inch rust line suggests that the culvert is near the end of service life and should be replaced. The culvert lacks adequate barrel extension at the outlet, however erosion at the outlet is minimal. The culvert is installed at channel grade but is not in-line with the natural channel. Additionally, in the event the culvert becomes plugged or fails, diversion potential exists.	1. The existing culvert will be replaced with a 36-inch dia. x 40-foot-long culvert sized for 100-year stream flows and associated debris. The new culvert shall be installed in line with the natural stream channel, at channel grade, at the base of fill, and will allow for the passage of aquatic organisms. The road surface is paved at this location and may require repaving. 2. A flared inlet will be installed to reduce plugging and diversion potential. 3. The lower 75% of the outboard fillslope will be armored with 5 yd^3 of ½ -2-foot diameter riprap to provide slope protection. 4. If pavement is removed then, a critical dip may need to be installed after construction if diversion potential is present. In which case, the critical dip shall be installed on the down gradient side of the stream crossing and offset from the culvert and the centerline of the stream crossing. The critical dip will be approximately 20 feet wide and extend from the outboard road to the inboard ditch, 1 foot high to achieve reverse road grade, 40 feet long (linear road length), and will be constructed with earthen road fill material. The critical dip should convey flow over the crossing and back into the natural stream channel. 5. Any excess material (spoils) generated during construction will be endhauled to a stable location far from surface waters (See Figure 1 for spoil locations). To prevent surface erosion, spoil locations will be covered with native seed at a rate no less than 50 lbs/acre of seed. Seeded areas will be covered with weed-free straw mulch at a rate of two tons per acre and provide 100% ground cover. Straw mulch will be evenly distributed on the ground surface.	1. 36”x 40’ long CMP with a flared inlet 2. 5yd^3 of ½ -2-foot diameter riprap 3. Native seed and straw mulch

Table. 1 Project Scope with Descriptions

MAP/SITE ID	Figure Number	Photo Numbers	Latitude	Longitude	Site Information	Treatment Recommendations	Materials
SC-2 RTR APN 316-086-017	1 and 2	11-12	40.910481	-123.790495	A Class III watercourse with a 15-inch diameter steel culvert on a paved section of Old Highway 299. The culvert is installed at the base of fill and approximately 5 feet askew from the natural stream channel. The culvert outlet is rusted through the bottom, increasing erosion potential. The culvert is undersized for 100-year stream flows and associated debris and does not allow for the passage of aquatic organisms.	1. The existing culvert will be replaced with a 42-inch dia. x 60-foot-long culvert sized for 100-year stream flows and associated debris. The new culvert shall be installed in line with the natural stream channel, at channel grade, at the base of fill, and will allow for the passage of aquatic organisms. 2. The road will also be lowered as well as narrowed to reduce the volume of fill in the crossing, and the lower 75% of the outboard fillslope will be armored with 30 yd^3 of ½ -2-foot diameter riprap. 3. If pavement is removed then, a critical dip shall be installed after construction if diversion potential is present. In which case, the critical dip shall be installed on the down gradient side of the stream crossing and offset from the culvert and the centerline of the stream crossing. The critical dip will be approximately 20 feet wide and extend from the outboard road to the inboard ditch, 1 foot high to achieve reverse road grade, 40 feet long (linear road length), and will be constructed with earthen road fill material. The critical dip should convey flow over the crossing and back into the natural stream channel. 4. To hydrologically disconnect the road, the inboard ditch will be enhanced as well as the installation of a ditch relief culvert (DRC) up the road. 5. Any excess material (spoils) generated during construction will be endhauled to a stable location far from surface waters (See Figure 1 for spoil locations). To prevent surface erosion, spoil locations will be covered with native seed at a rate no less than 50 lbs/acre of seed. Seeded areas will be covered with weed-free straw mulch at a rate of two tons per acre and provide 100% ground cover. Straw mulch will be evenly distributed on the ground surface.	1. 42” dia. X 60’ CMP 2. 30yd^3 of ½ -2-foot diameter riprap 3. Native seed and straw mulch

Table. 1 Project Scope with Descriptions

MAP/SITE ID	Figure Number	Photo Numbers	Latitude	Longitude	Site Information	Treatment Recommendations	Materials
SC-4 RTR APN 316-086-017	1 and 2	13-14	40.909206	-123.789853	A Class III watercourse with a 24-inch diameter steel culvert located on a short spur road with no intended future use. The culvert is undersized for the 100-year peak streamflow and associated debris but does allow for the passage of aquatic organisms. The culvert has a 3-inch rust line and lacks adequate barrel extension to prevent outlet erosion.	1. Remove the existing culvert and dispose of at the appropriate waste disposal facility 2. Decommission the stream crossing, establish a minimum 4-foot-wide stream channel, restore the stream channel to the natural channel grade, and lay back the stream side slopes to a stable 2:1 (50%) side slopes. 3. All bare soils will be seeded and mulched. Any bare soils within the riparian buffer of the watercourse will also be planted with native riparian species. 4. Any excess material (spoils) generated during construction will be endhauled to a stable location far from surface waters (See Figure 1 for spoil locations). To prevent surface erosion, spoil locations will be covered with native seed at a rate no less than 50 lbs/acre of seed. Seeded areas will be covered with weed-free straw mulch at a rate of two tons per acre and provide 100% ground cover. Straw mulch will be evenly distributed on the ground surface.	1. Native seed and straw mulch

Table. 1 Project Scope with Descriptions

MAP/SITE ID	Figure Number	Photo Numbers	Latitude	Longitude	Site Information	Treatment Recommendations	Materials
SC-5 APN 316-086-017	1 and 2	15-16	40.909478	-123.789250	A near origin Class III watercourse with a 12-inch diameter steel culvert on a paved section of Old Highway 299. The culvert is undersized for the 100-year peak streamflow and associated debris. The culvert is rusted, installed high in the fill with a 2 1/2 –foot plunge at the outlet increasing erosion potential, and does not allow for the passage of aquatic organisms. Additionally, in the event the culvert becomes plugged or fails diversion potential exists to the right	1. The existing culvert will be replaced with a 24-inch dia. x 70-foot-long culvert sized for 100-year stream flows and associated debris. The new culvert shall be installed in line with the natural stream channel, at channel grade, at the base of fill, and will allow for the passage of aquatic organisms. 2. A flared inlet will be installed to reduce plugging and diversion potential. 3. 75% of the outboard fillslope will be armored with 15yd^3 of ½ -2-foot diameter riprap. (See PWA Typical Drawings 1a and 2). 4. Any excess material (spoils) generated during construction will be endhauled to a stable location far from surface waters (See Figure 1 for spoil locations). To prevent surface erosion, spoil locations will be covered with native seed at a rate no less than 50 lbs/acre of seed. Seeded areas will be covered with weed-free straw mulch at a rate of two tons per acre and provide 100% ground cover. Straw mulch will be evenly distributed on the ground surface.	1. 24” dia. X 70’ long CMP 2. 15yd^3 of ½ -2-foot diameter riprap 3. Native seed and straw mulch

Table. 1 Project Scope with Descriptions

MAP/SITE ID	Figure Number	Photo Numbers	Latitude	Longitude	Site Information	Treatment Recommendations	Materials
SC-6 APN 316-086-017	1 and 2	17	40.909114	-123.788847	A 36-inch diameter culvert on a Class III watercourse on a paved section of Old Highway 299. The culvert is located high in the fill, has a 7-foot plunge at the outlet, and does not allow for the passage of aquatic organisms. The culvert is adequately sized for the 100-year peak stream flow and associated debris however it is poorly installed. Additionally, in the event the culvert becomes plugged or fails, diversion potential exists to the right	1. The existing culvert will be replaced with a 36-inch dia. x 70-foot-long culvert sized for 100-year stream flows and associated debris. The new culvert shall be installed in line with the natural stream channel, at channel grade, at the base of fill, and will allow for the passage of aquatic organisms. 2. A flared inlet will be installed to reduce plugging and diversion potential. 3. The lower 25% of the outboard fillslope will be rocked with 5yd^3 of ½ -2-foot diameter riprap. (See PWA Typical Drawings 1a and 2). 4. Any excess material (spoils) generated during construction will be endhauled to a stable location far from surface waters (See Figure 1 for spoil locations). To prevent surface erosion, spoil locations will be covered with native seed at a rate no less than 50 lbs/acre of seed. Seeded areas will be covered with weed-free straw mulch at a rate of two tons per acre and provide 100% ground cover. Straw mulch will be evenly distributed on the ground surface.	1. 36” dia. X 70’ long CMP 2. 5yd^3 of ½ -2-foot diameter riprap 3. Native seed and straw mulch
SC-8 APN 316-086-011	1 and 3	18	40.906432	-123.784474	SC 8 is located on a Class III watercourse on a paved section of Old Highway 299. The stream flow is diverted approximately 80 feet down the inboard ditch to a plugged 18-inch diameter culvert. The culvert is installed high in the fill, with another plugged 15-inch diameter culvert below. The outboard fillslope is actively eroding into the road prism. The 18-inch culvert is not adequately sized for the 100-year peak streamflow and associated debris	1. The existing culvert will be replaced with a 42-inch dia. x 50-foot-long culvert sized for 100-year stream flows and associated debris. The new culvert shall be installed in line with the natural stream channel, at channel grade, at the base of fill, and will allow for the passage of aquatic organisms. 2. The lower 25% of the outboard fillslope will be armored with 5yd^3 of ½ -2-foot diameter riprap. (See PWA Typical Drawings 1a and 2).	1. 42” dia. X 50’ long CMP 2. 5yd^3 of ½ -2-foot diameter riprap 3. Native seed and straw mulch

Table. 1 Project Scope with Descriptions

MAP/SITE ID	Figure Number	Photo Numbers	Latitude	Longitude	Site Information	Treatment Recommendations	Materials
SC-9 APN 316-086-011	1 and 3	19	40.906147	-123.784249	A Class III watercourse with a 24-inch diameter plastic culvert on a paved section of Old Highway 299. The culvert outlet is installed high in the fill, has a 7-foot plunge at the outlet and does not allow for the passage of aquatic organisms. There is approximately 200 feet of inboard ditch on the left that delivers to the inlet. The culvert is undersized for the 100-year peak streamflow and associated debris, and the outboard fillslope is actively slumping. Additionally, if the culvert fails or become plugged diversion potential exists to the right	1. The existing culvert will be replaced with a 42-inch dia. x 60-foot-long culvert sized for 100-year stream flows and associated debris. The new culvert shall be installed in line with the natural stream channel, at channel grade, at the base of fill, and will allow for the passage of aquatic organisms. 2. The lower 75% of the outboard fillslope will be armored with 40yd^3 of ½ -2-foot diameter riprap. (See PWA Typical Drawings 1a and 2).	1. 42” dia. X 60’ long CMP 2. 40yd^3 of ½ -2-foot diameter riprap 3. Native seed and straw mulch
SC-10 APN 316-086-011	1 and 3	20	40.905358	-123.784184	An 18-inch diameter metal culvert on a Class III watercourse on a paved section of Old Highway 299. The culvert bottom is rusted though and is plugged at the inlet. The culvert is installed high in the fill, and not in line with the natural stream channel. Additionally, the culvert is undersized sized for the 100-year peak streamflow event nor associated debris and does not allow for the passage of aquatic organisms	1. The existing culvert will be replaced with a 60-inch dia. x 40-foot-long culvert sized for 100-year stream flows and associated debris. The new culvert shall be installed in line with the natural stream channel, at channel grade, at the base of fill, and will allow for the passage of aquatic organisms. 2. The lower 75% of the outboard fillslope will be armored with 10yd^3 of ½ -2-foot diameter riprap. (See PWA Typical Drawings 1a and 2)	1. 60” dia. X 40’ long CMP 2. 10yd^3 of ½ -2-foot diameter riprap 3. Native seed and straw mulch

Table. 1 Project Scope with Descriptions

MAP/SITE ID	Figure Number	Photo Numbers	Latitude	Longitude	Site Information	Treatment Recommendations	Materials
SC-11 APN 316-086-011	1 and 3	21	40.903825	-123.783703	An 18-inch diameter metal culvert on a steep, rocky Class III watercourse on a paved section of Old Highway 299. The culvert is installed high in the fill, has been exposed in areas through the roadbed which have rusted through, and in the event the culvert fails or becomes plugged diversion potential exists to the left. Flow from the outlet discharges onto an active landslide located along the outboard fill of the road. Additionally, the culvert is undersized for the 100-year peak streamflow event and associated debris and does not allow for the passage of aquatic organisms	1. The existing culvert will be replaced with a 48-inch dia. x 80-foot-long culvert sized for 100-year stream flows and associated debris. The new culvert shall be installed in line with the natural stream channel, at channel grade, at the base of fill, and will allow for the passage of aquatic organisms. 2. The lower 75% of the outboard fillslope will be armored with 40 yd^3 of ½ -2-foot diameter riprap (See PWA Typical Drawings 1a and 2).	1. 48" dia. X 80' long CMP 2. 40 yd^3 of ½ -2-foot diameter riprap 3. Native seed and straw mulch
SC-12 APN 316-086-011	1 and 3	22	40.902611	-123.783645	A Class III watercourse with no formal drainage structure on a section of Old Highway 299. The road surface is dipped through the crossing and some pavement exists at the outboard edge of the road.	1. The existing culvert will be replaced with a 48-inch dia. x 60-foot-long culvert sized for 100-year stream flows and associated debris. The new culvert shall be installed in line with the natural stream channel, at channel grade, at the base of fill, and will allow for the passage of aquatic organisms. PWA also recommends relocating the inlet 17 feet to the right of the existing culvert and to align the outlet accordingly. 2. Remove all pavement and dispose of at the appropriate waste disposal facility. 3. The lower 75% of the outboard fillslope will be armored with 35yd^3 of ½ -2-foot diameter riprap. Technical oversight is recommended prior to and during implementation due to the complexity of the crossing (See PWA Typical Drawings 1a and 2).	1. 48" dia. X 60' long CMP 2. 35 yd^3 of ½ -2-foot diameter riprap 3. Native seed and straw mulch

Table. 1 Project Scope with Descriptions

MAP/SITE ID	Figure Number	Photo Numbers	Latitude	Longitude	Site Information	Treatment Recommendations	Materials
SC-13 APN 316-086-011	1 and 3	23	40.901216	-123.784635	An 18-inch plastic culvert is located on a Class III watercourse with both the inlet and outlet obscured by vegetation, and both are approximately 8 feet offset to the right of the natural channel. The outlet is installed high in the fill, has a 1½ foot plunge and is actively eroding the outboard fill slope. There is no diversion potential at this crossing as the road is adequately dipped. The culvert undersized sized for the 100-year peak streamflow event and associated debris and does not allow for the passage of aquatic organisms	1.The existing culvert will be replaced with a 24-inch dia. x 40-foot-long culvert sized for 100-year stream flows and associated debris. The new culvert shall be installed in line with the natural stream channel, at channel grade, at the base of fill, and will allow for the passage of aquatic organisms. 2.The lower 25% of the outboard fillslope will be armored with 5yd^3 of ½ -2-foot diameter riprap. Treatment immediacy is low due to the small drainage area and minimal amounts of erosion. (See PWA Typical Drawings 1a and 2)	1. 24” dia. X 40’ long CMP 2. 5yd^3 of ½ -2-foot diameter riprap 3. Native seed and straw mulch

Table 2. Permanent and Temporary Impacts Associated with Construction

Site ID	Temporary Impacts			Permanent Impacts			Comments on Impacts
	Square Feet	Cubic Yards	Linear Feet	Square Feet	Cubic Yards	Linear Feet	
SC-2 Big Oak	130	17	20	0	0	0	The new culvert will be the same length is the existing culvert. There will be no permanent impacts outside the existing fill prism.
SC-3 Big Oak	1,600	133	40	0	0	0	All impacts will be temporary the crossing will be decommissioned, and the stream channel restored to its "natural" configuration. Temporary disturbance will also include the removal of the surrounding pavement (old Highway 299) to allow for revegetation Approx. 40 x 20).
SC-4 Big Oak	875	117	35	0	0	0	All impacts will be temporary the crossing will be decommissioned, and the stream channel restored to its "natural" configuration. Temporary disturbance will also include the removal of the surrounding pavement (old Highway 299) to allow for revegetation Approx. 280 x 20).
SC-1	350	182	50	0	0	0	Disturbance within the bed and banks of the stream will be limited to the road footprint of the crossing and new culvert installation area, measuring approximately 7-feet wide x 50-feet long= 350 ft^2.
SC-2	525	495	70	0	0	0	Disturbance within the bed and banks of the stream will be limited to the road footprint of the crossing and new culvert installation area, measuring approximately 7.5-feet wide x 70-feet long = 525 ft^2.
SC-4	195	26	30	0	0	0	Disturbance within the bed and banks of the stream will be limited to the length and width of channel excavated/decommissioned, measuring approximately 6.5-feet wide x 30-feet long = 195 ft^2.
SC-5	520	325	80	0	0	0	Disturbance within the bed and banks of the stream will be limited to the road footprint of the crossing and new culvert installation area, measuring approximately 6.5-feet wide x 80-feet long = 520 ft^2.
SC-6	520	265	80	0	0	0	Disturbance within the bed and banks of the stream will be limited to the road footprint of the crossing and new culvert installation area, measuring approximately 6.5-feet wide x 80-feet long = 520 ft^2.
SC-8	450	43	60	0	0	0	Disturbance within the bed and banks of the stream will be limited to the road footprint of the crossing and new culvert installation area, measuring approximately 7.5-feet wide x 60-feet long = 450 ft^2.
SC-9	525	248	70	0	0	0	Disturbance within the bed and banks of the stream will be limited to the road footprint of the crossing and new culvert installation area, measuring approximately 7.5-feet wide x 70-feet long = 525 ft^2.
SC-10	450	78	50	0	0	0	Disturbance within the bed and banks of the stream will be limited to the road footprint of the crossing and new culvert installation area, measuring approximately 9-feet wide x 50-feet long = 450 ft^2.
SC-11	720	229	90	0	0	0	Disturbance within the bed and banks of the stream will be limited to the road footprint of the crossing and new culvert installation area, measuring approximately 8-feet wide x 90-feet long = 720 ft^2.
SC-12	720	497	90	0	0	0	Disturbance within the bed and banks of the stream will be limited to the road footprint of the crossing and new culvert installation area, measuring approximately 8-feet wide x 90-feet long = 720 ft^2.
SC-13	300	24	50	0	0	0	Disturbance within the bed and banks of the stream will be limited to the road footprint of the crossing and new culvert installation area, measuring approximately 6-feet wide x 50-feet long = 300 ft^2.
Totals:	***7,880***	***2,679***	***815***	***0***	***0***	***0***	

Table 3. Culvert Sizing Recommendations for Upgraded Crossings Only to Accommodate 100-year stream flows and associated debris

Site ID	Existing Culvert Diameter (in)	Existing Culvert Length (ft)	Watershed Area (acres)	Q_{100} (cfs)[1, 2]	Recommended Culvert Diameter (in)	Recommended Culvert Length (ft)
SC-2 Big Oak	18	20	6	9	30	30
SC-1	36	40	7	10	36	40
SC-2	15	60	12	16	42	60
SC-5	12	70	4	6	24	70
SC-6	36	70	5	7	36	70
SC-8	12	50	11	16	42	50
SC-9	24	60	14	20	42	60
SC-10	18	40	33	49	60	40
SC-11	18	40	18	27	48	80
SC-12	12	40	20	30	48	60
SC-13	18	40	2	3	24	40

[1]Assumes mean annual precipitation of 79 inches, 0.35 runoff coefficient (C), 24-hour rainfall intensity of 4.15 in/hr., and a headwater to depth ratio of 0.67 was used to determine the culvert sizing.
[2]The 100-year Return-Period precipitation data was sourced from: http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ca

Hydrologic Study-Design Flow

The Rational Method was used to determine the 100-year design discharge for stream crossings where the culvert will be upgraded. The Rational Method is limited to watersheds less than 100 acres. The method is based on this equation:

$$Q_{100} = CIA$$

Where Q is the peak flow in cubic feet per second (cfs), C is the runoff coefficient, i is the intensity in inches/hour, and A is the watershed area in acres. The results of the analysis may be found tabulated in Table 1 below.

Culvert sizing recommendations were then determined using the culvert sizing nomograph developed by the Federal Highway Administration. A headwater depth (HW/D) of 0.67 was used to accommodate woody debris and reduce the potential for clogging and overtopping. Additionally, it was assumed that the culvert entrance type (inlet) would be projecting. Based on the calculated 100-year peak stream flow magnitudes, all stream crossings require new appropriately sized culverts.

Appendix B

MOTHER EARTH ENGINEERING

Project Photos

Photo 1	
March 2021	
Description: SC-2 Big Oak (BO), View of culvert inlet looking downstream. Culvert will be replaced with a 30" dia. culvert sized for 100-year stream flows.	

Photo 2	
March 2021	
Description: SC-2 BO, View of culvert outlet looking upstream. Culvert will be replaced with a 30" dia. culvert sized for 100-year stream flows.	

Photo 3	
March 2021	
Description: SC-2 BO, View of the crossing from the left road. Culvert will be replaced with a 30" dia. culvert sized for 100-year stream flows.	

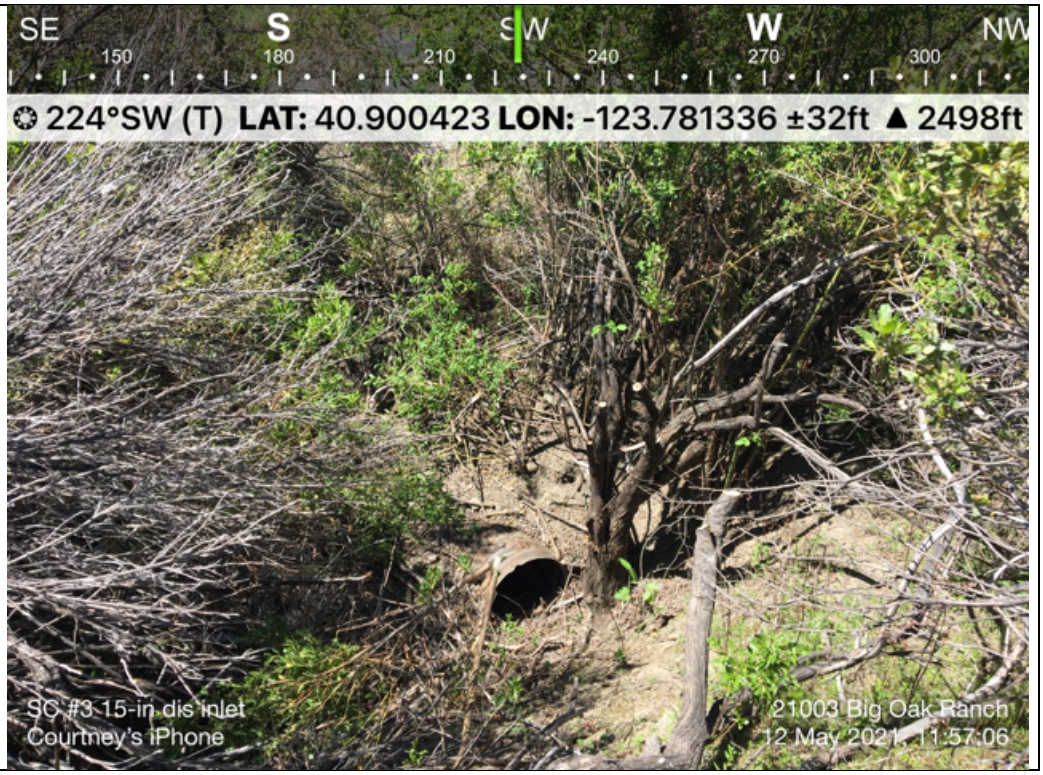
Photo 4	
March 2021	
Description: SC-3 BO, View of culvert inlet looking downstream. The crossing will be decommissioned, and the stream channel restored.	

Photo 5	
March 2021	
Description: SC-3 BO, View of crossing from the hillslope above. Crossing will be decommissioned, and the stream channel restored.	

Photo 6	
March 2021	
Description: SC-4 BO, View of the stream channel which is obscured by vegetation. The crossing will be decommissioned, and the stream channel restored.	

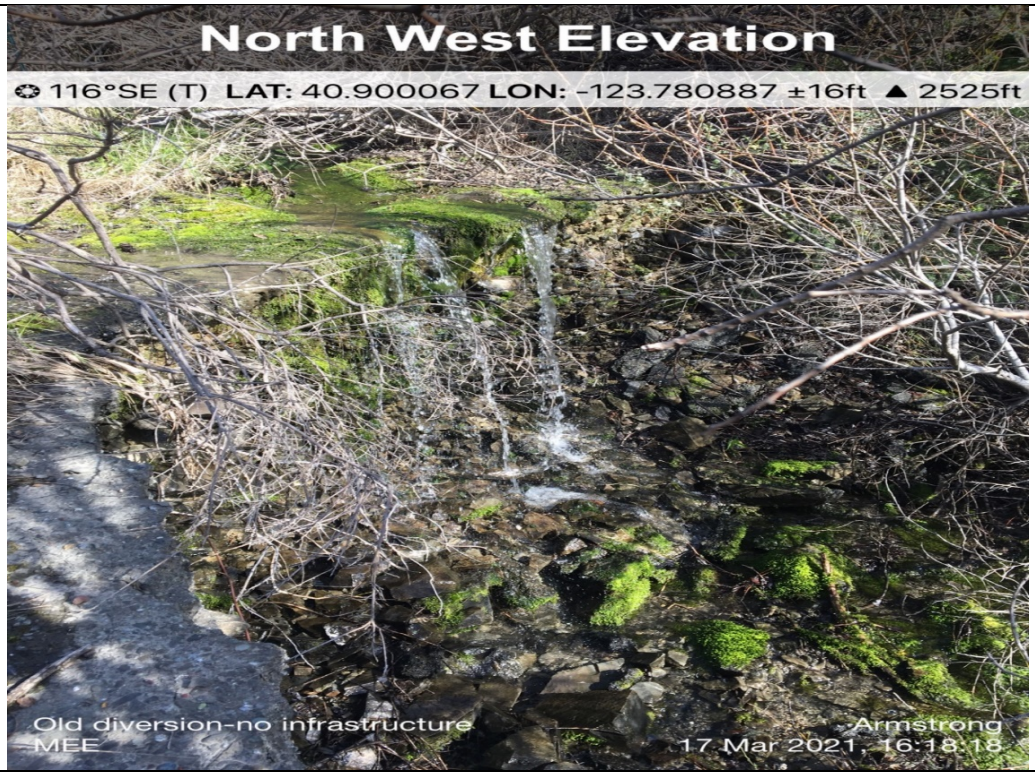
Photo 7	
March 2021	
Description: SC-4 BO, View of SC-4 the stream channel is obscured by vegetation. The crossing will be decommissioned, and the stream channel restored.	

Photo 8	
November 2018	
Description: SC-1 RTR, View of rusted 36" dia. Culvert inlet view looking downstream. Culvert will be replaced with a 36" dia. culvert sized for 100-year stream flows.	

Photo 9	
November 2018	
Description: SC-1 RTR, Looking upstream at rusted culvert outlet. Culvert will be replaced with a 36" dia. culvert sized for 100-year stream flows.	

Photo 10	
November 2018	
Description: SC-1 RTR, View from the left road approach. Culvert will be replaced with a 36" dia. culvert sized for 100-year stream flows.	

Photo 11	
November 2018	
Description: SC-2 RTR, View of rusted 15" dia. culvert inlet. Culvert will be replaced with a 42" dia. culvert sized for 100-year stream flows.	

Photo 12	
November 2018	
Description: SC-2 RTR, View of the culvert outlet installed high in the fill.	

Photo 13	
November 2018	
Description: SC-4 RTR, View of rusted 24" dia. culvert inlet. Crossing will be decommissioned, and the stream channel restored.	

Photo 14	
November 2018	
Description: SC-4 RTR, View of the crossing from the right road approach. Crossing will be decommissioned, and the stream channel restored.	

Photo 15	
November 2018	
Description: SC-5, View of rusted 12" dia. culvert inlet. Culvert will be replaced with a 24" dia. culvert sized for 100-year stream flows.	

Photo 16	
November 2018	
Description: SC-5, View looking upstream at culvert outlet. Culvert will be replaced with a 24" dia. culvert sized for 100-year stream flows.	

Photo 17	
November 2018	
Description: SC-6, View of rusted 36"dia. culvert inlet. Culvert will be replaced with a 36" dia. culvert sized for 100-year stream flows.	

Photo 18	
November 2018	
Description: SC-8, View of culvert outlets. Two culverts (15" and 18" dia.) culverts are exposed. Culvert will be replaced with a 42" dia. culvert sized for 100-year stream flows.	

Photo 19	
November 2018	
Description: SC-9, View of rusted 24" dia. culvert inlet. Culvert will be replaced with a 42" dia. culvert sized for 100-year stream flows.	

Photo 20	
November 2018	
Description: SC-10, View of plugged 18" dia. culvert inlet. Culvert will be replaced with a 60" dia. culvert sized for 100-year stream flows.	

Photo 21	
November 2018	
Description: SC-11, View of rusted 18" dia. culvert inlet. Culvert will be replaced with a 48" dia. culvert sized for 100-year stream flows.	

Photo 22	
September 2020	
Description: Downstream view of SC-12. Crossing will be upgraded with a 48" dia. culvert sized for 100-year stream flows.	

Photo 23	
November 2018	
Description: SC-13 downstream view of culvert inlet. Note the inlet is obscured by vegetation. Culvert will be replaced with a 24" dia. culvert sized for 100-year stream flows.	

Appendix C

Project Budget

Project Budget. Armstrong Road Improvement and Sediment Reduction Project

Project Expense Item		*Cost*	*Amount Requested from MRFP*	*Amount of Other Funding*	*Source of Other Funding*
Heavy Equipment for Road Improvements (includes move in/move out costs)	Excavator	$1,610	$1,610	$0	N/A
	Bulldozer	$4,080	$4,080	$0	
	Water Truck	$1,370	$1,370	$0	N/A
	Dump Truck (Assumes 2 dump trucks)	$15,680	$15,680	$0	N/A
	Truck/Trailer	$640	$640	$0	N/A
Heavy Equipment for Site Specific Treatments (i.e., stream crossing upgrade or decommission)	Excavator	$53,580	$53,580	$0	N/A
	Bulldozer	$44,650	$44,650	$0	N/A
	Water Truck	$6,050	$6,050	$0	N/A
	Dump Truck (Assumes 2 dump trucks)	$24,080	$24,080	$0	N/A
Labor Costs		$4,900	$4,900	$0	N/A
Materials	Rock	$31,040	$0	$31,040	Applicant
	Culverts	$50,350	$50,350	$0	N/A
	Erosion Control (seed and mulch)	$705	$705	$0	N/A
Permit Fees (401 WQC)		$2,066	$2,066	$0	N/A
Project Layout, Coordination, and Oversight (Conducted by Qualified Professional)		$15,000	$15,000	$0	N/A
Erosion Control and Monitoring Plan		$5,000	$5,000	$0	N/A
Total Project Costs		***$260,801***	***$229,761***	***$31,040***	

The Armstrong Road Improvement and Sediment Reduction Project Proposes to improve 2.3 miles of privately owned and accessed road in the Redwood Creek Watershed. The plan proposes to replace/upgrade eleven (11) undersized culverted stream crossings with culverts sized to accommodate 100-year stream flows and associated debris, re-rock the road surface, decommission three (3) stream crossings and restore the stream channel (two of which are on a paved section of Old Highway 299), and install seven (7) road drainage features (such as rolling dips and water bars) to reduce surface erosion and sediment delivery. Project costs also include the removal (disposal) and installation of pavement.

Heavy equipment expenses include move in and move out costs, logistics (moving from site to site), culvert installation, rock installation, rolling dip installation, water bar installation, dust abatement, pavement removal and disposal. Labor costs include time for culvert installation and application of erosion control seed and mulch. Rock costs include the cost of riprap and road base ($100/cubic yard of rock). Approximately 120 cubic yards of road rock will be applied on road reaches and 190 cubic yards of riprap will be installed for slope protection along stream crossing fillslopes. Culvert costs include the cost of steel culvert pipe, culvert couplers, and flared inlets. Project Layout, Coordination, and Oversight will be conducted by qualified professional and includes time materials. Project monitoring will be conducted for 5 years following project completion and will be conducted by a qualified professional and includes time and materials.

Appendix D

Typical Drawings and Design Specifications

Typical Drawings and Applied Treatments

#1a. Typical Problems and Applied Treatments for a Non-fish Bearing Upgraded Stream Crossing

#1b. Armoring Fill Faces to Upgrade Stream Crossings

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

#4. Typical Design of Upgraded Stream Crossing

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

#11. Typical Road Surface Drainage by Rolling Dips

#19a. Standard Type I Rolling Dip Construction

#19c. Type 3 Rolling Dip Construction

#14. Typical Problems and Applied Treatments for a Decommissioned Stream Crossing

#15. Typical Design for Road Decommission Treatments Employing Export and In-place Out slope Techniques

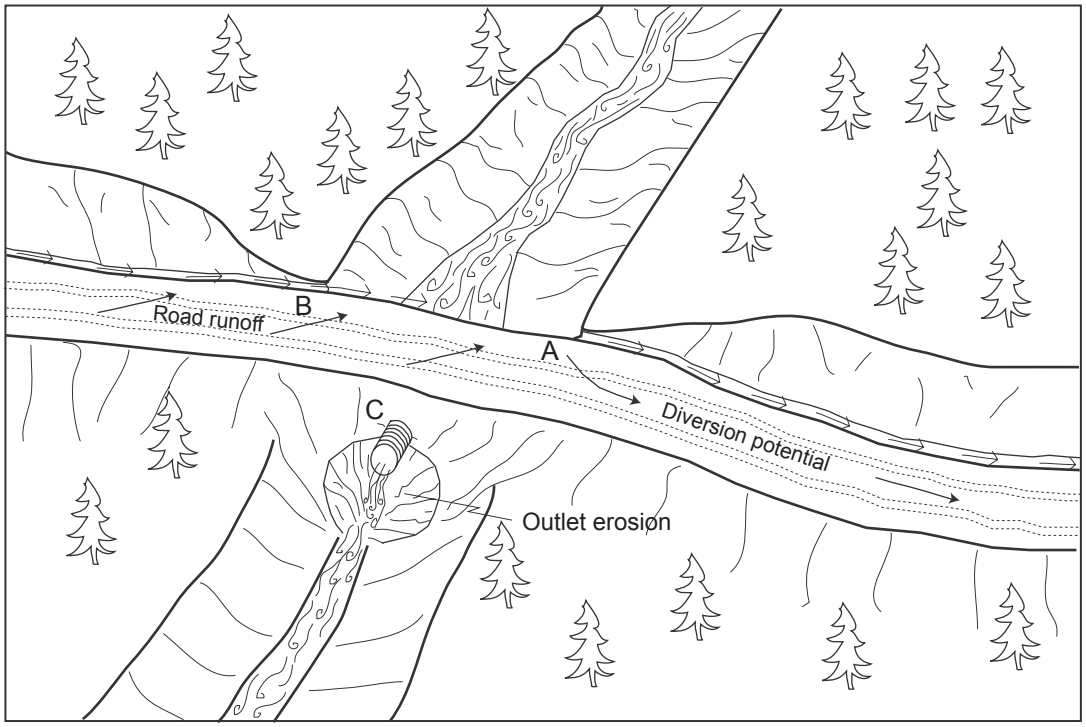
Typical Problems and Applied Treatments for a Non-fish Bearing Upgraded Stream Crossing

Problem condition (before)

A - Diversion potential

B - Road surface and ditch drain to stream

C - Undersized culvert high in fill with outlet erosion

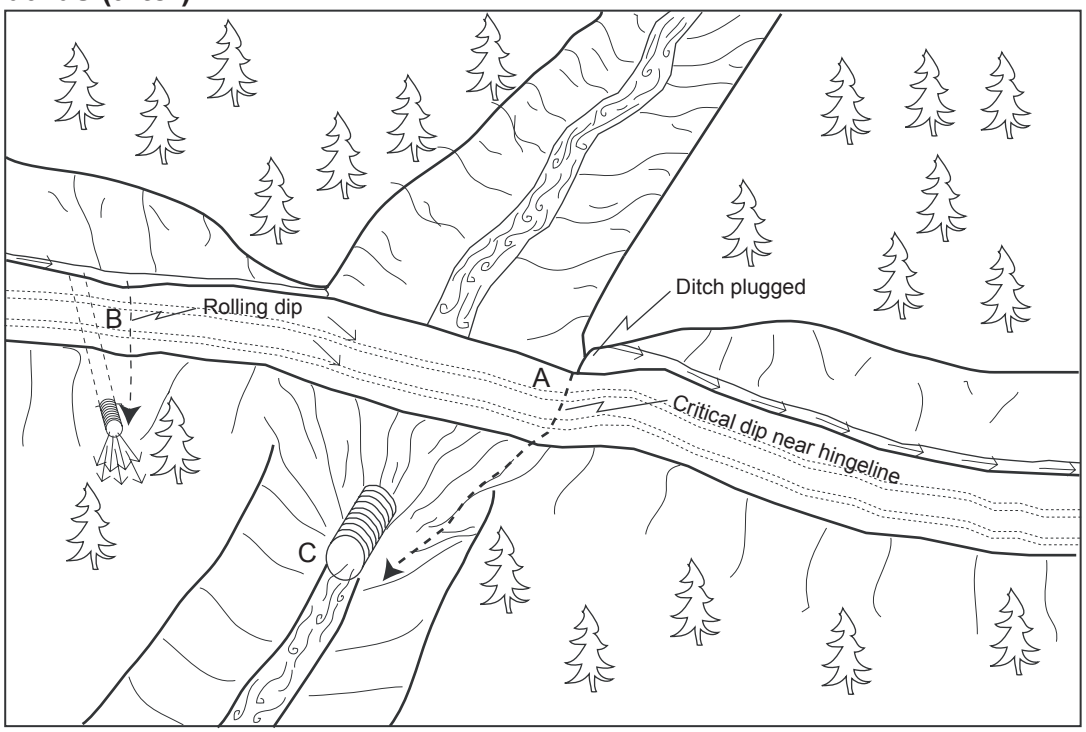


Treatment standards (after)

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



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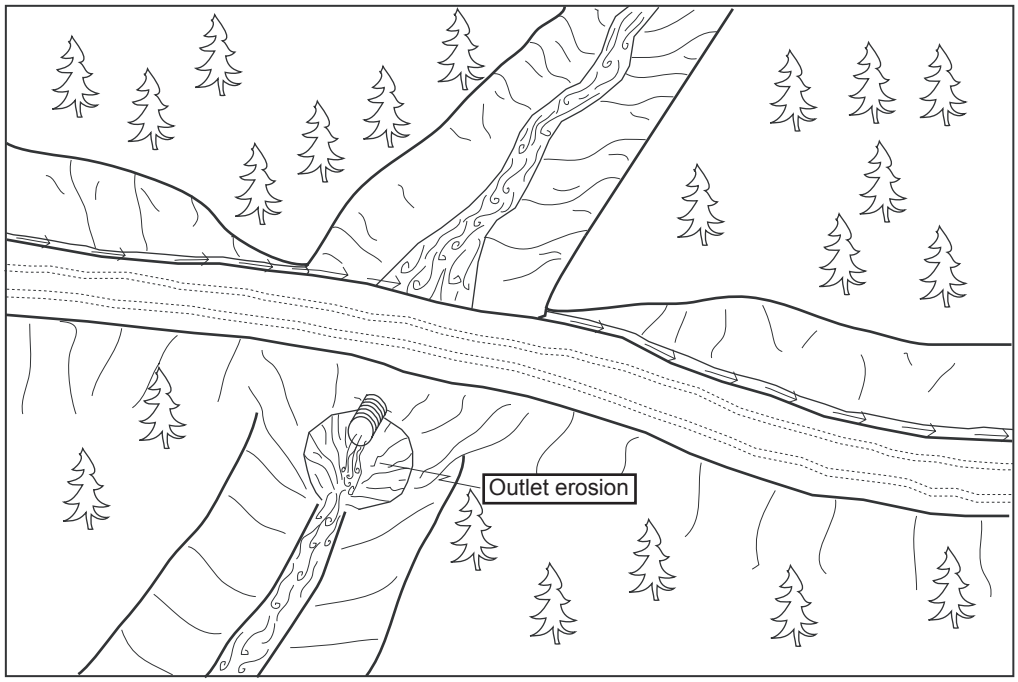
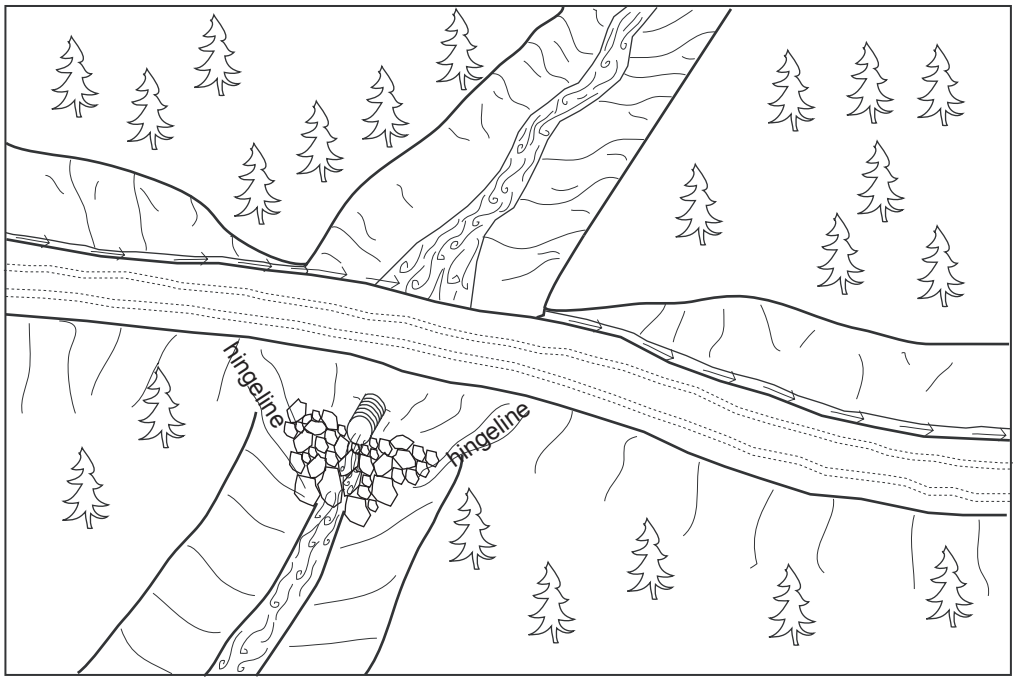
PWA Typical Drawing #1a

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).

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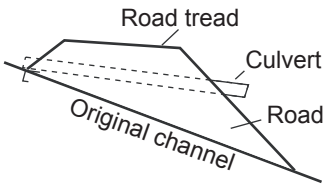
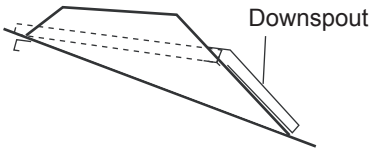
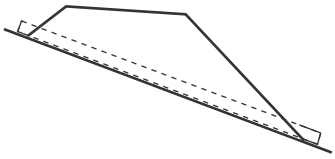
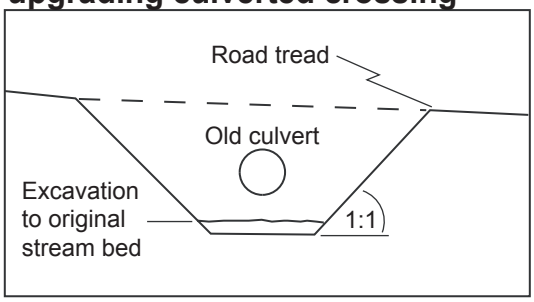
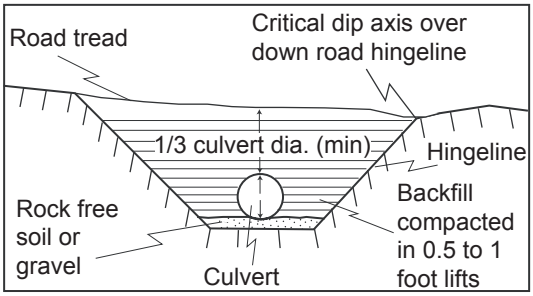
Typical Design of a Non-fish Bearing Culverted Stream Crossing

Existing	Upgraded	Upgraded (preferred)
		
1. Culvert not placed at channel grade. 2. culvert does not extend past base of fill.	1. Culvert not placed at channel grade. 2. Downspout added to extend outlet past road fill.	1. Culvert placed at channel grade. 2. Culvert inlet and outlet rest on, or partially in, the originial streambed.

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 calulations 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 incher 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 distrubance.
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.

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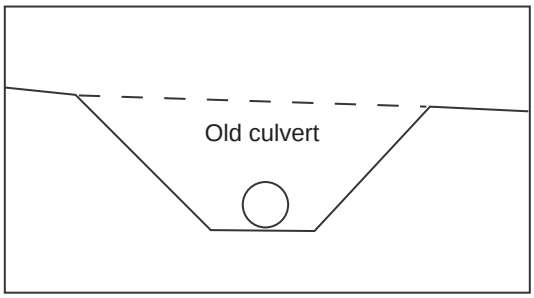
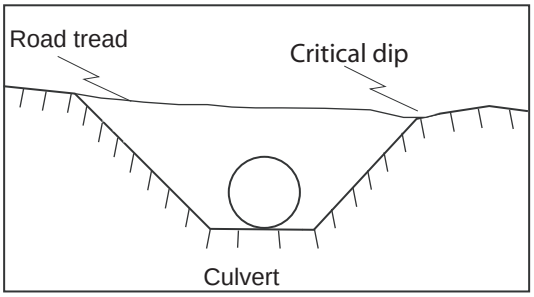
Typical Design of Upgraded Stream Crossings





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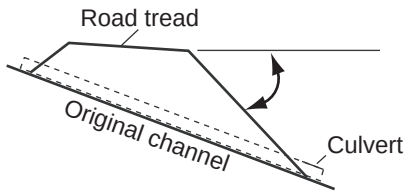
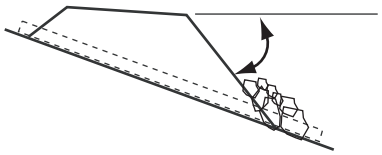
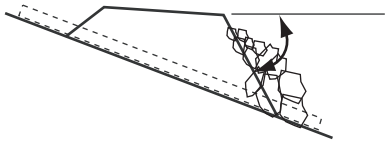
Note:
Road upgrading tasks typically include upgrading stream crossings by installing larger culverts and inlet protection (trash barriers) to prevent plugging. Culvert sizing for the 100-year peak storm flow should be determined by both field observation and calculations using a procedure such as the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

Armoring fill faces

Fill angles ≤ 2:1	Fill angles (between 2:1 & 1.5:1)	Fill angles (between 1.5:1 & 1:1)
 No rock armor needed	 Armor 1/4 up fill face	 Armor 3/4 way up fill face

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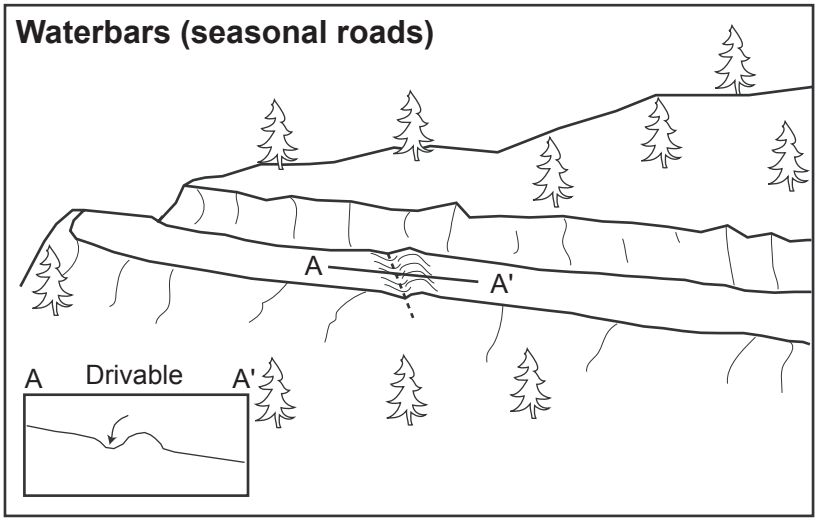
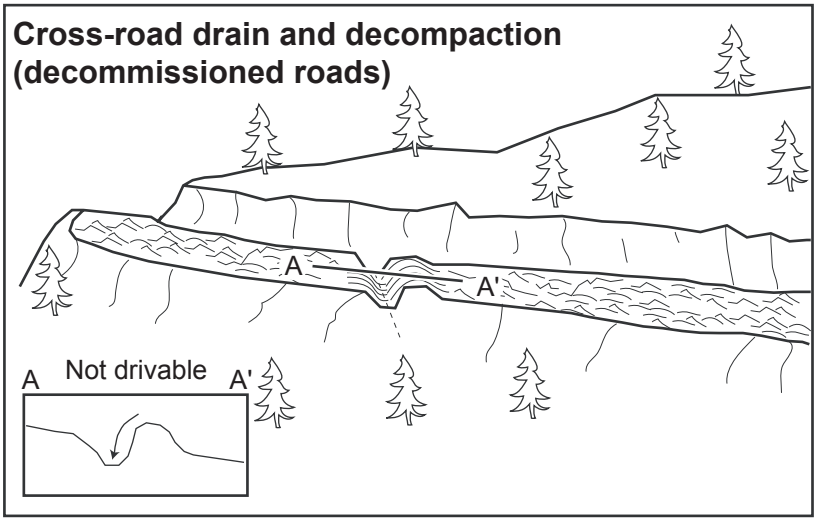
PWA Typical Drawing #4

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

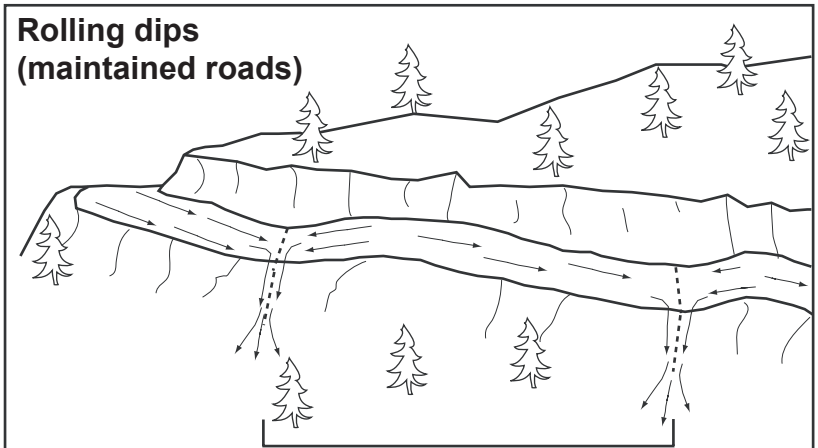
Waterbars (seasonal roads)



Cross-road drain and decompaction (decommissioned roads)



Rolling dips (maintained roads)



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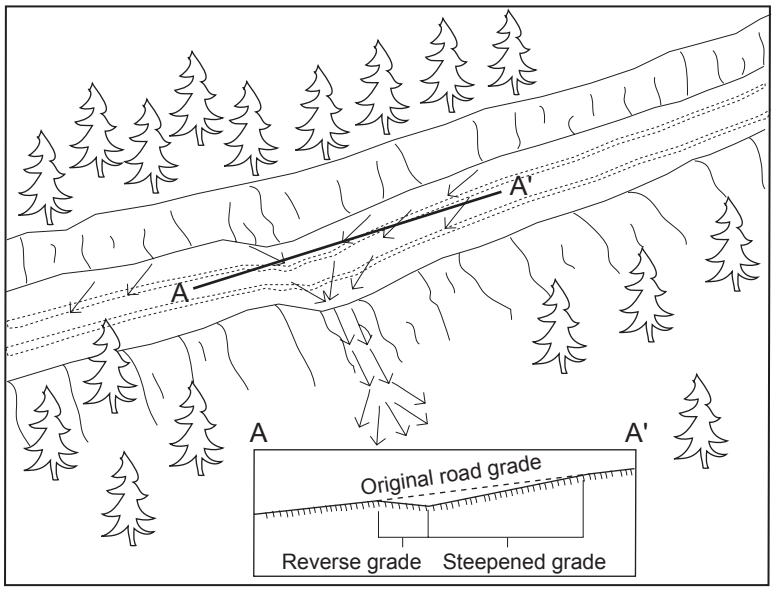
Typical Road Surface Drainage by Rolling Dips



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 unitl 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

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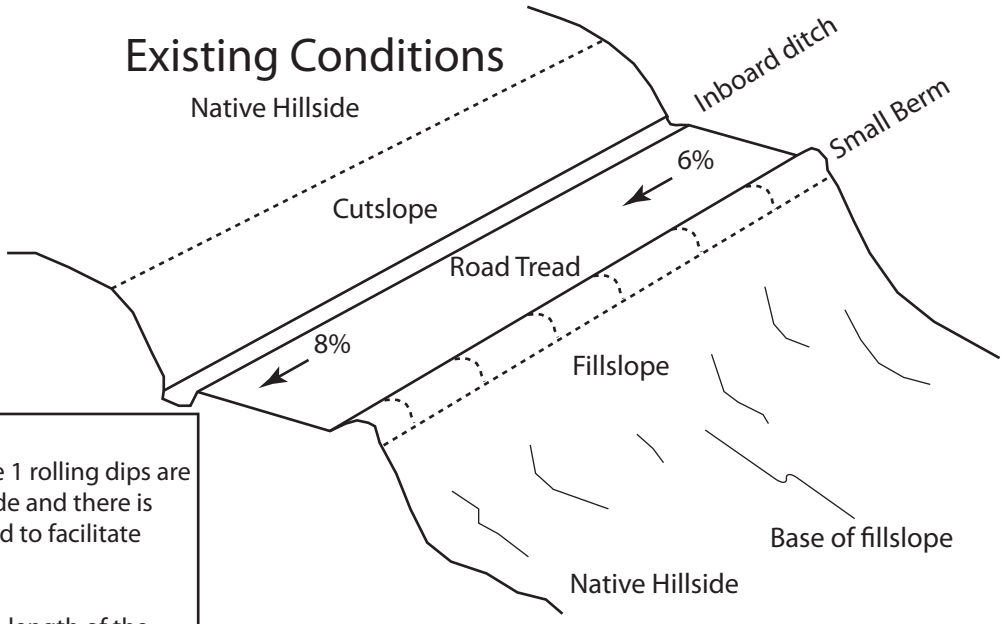
Standard (Type 1) Rolling Dip Construction



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:

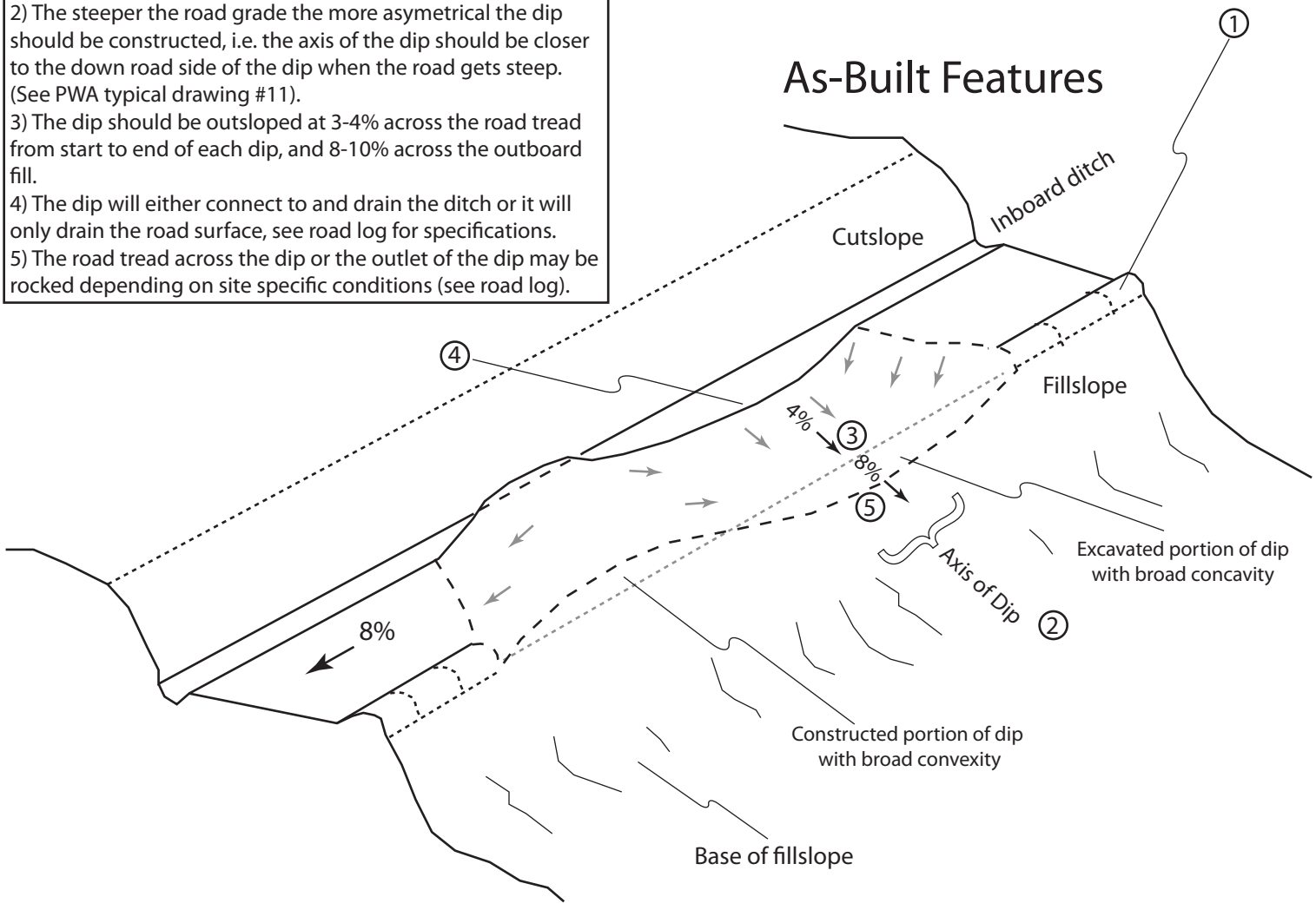
1) The berm should be removed for the entire length of the dip.

2) The steeper the road grade the more asymetrical 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 fill.

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).



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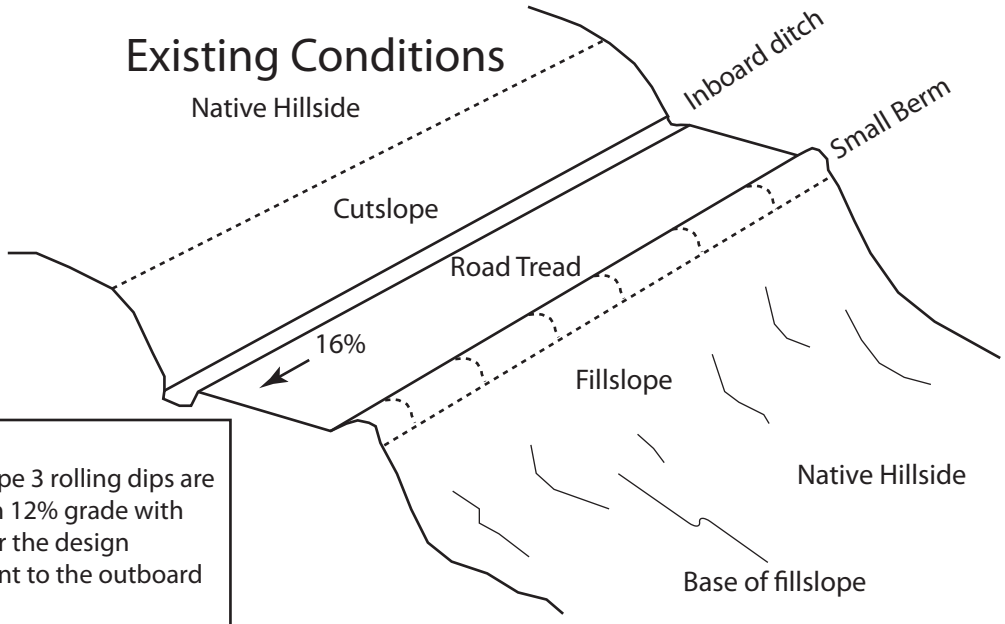
PWA Typical Drawing #19a

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.

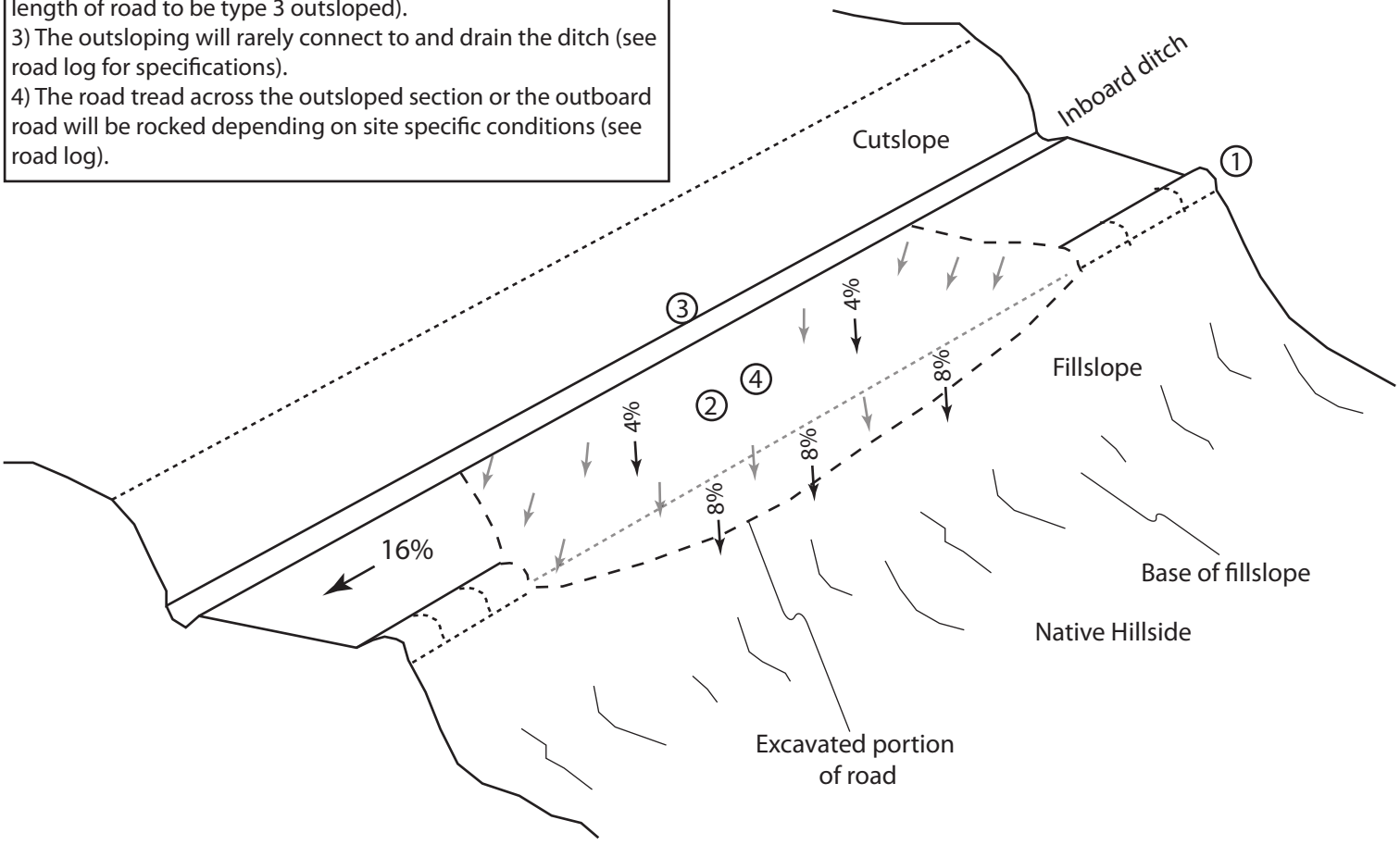
Design Notes:

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 road 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).



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PWA Typical Drawing #19c

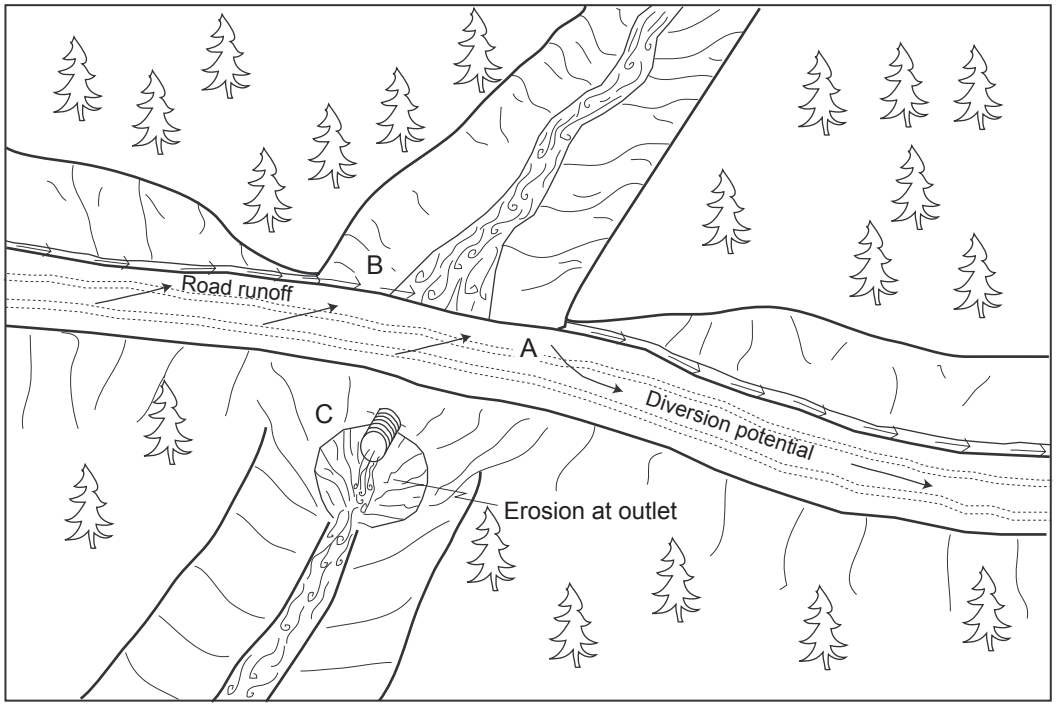
Typical Problems and Applied Treatments for a Decommissioned Stream Crossing

Problem condition (before)

A - Diversion potential

B - Road surface and ditch drain to stream

C - Undersized culvert high in fill with outlet erosion

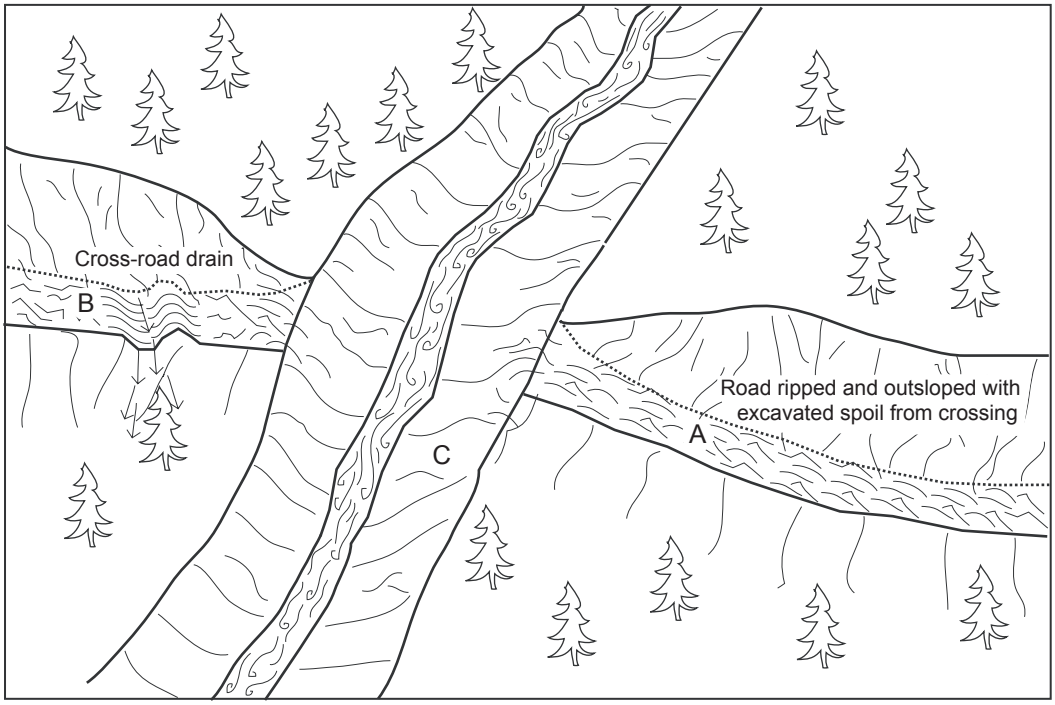


Treatment standards (after)

A - Diversion prevented by road surface ripping and outsloping using excavated spoils

B - Road surface and ditch disconnected from stream by road surface decompaction and cross-road drains

C - Stream crossing fill completely excavated



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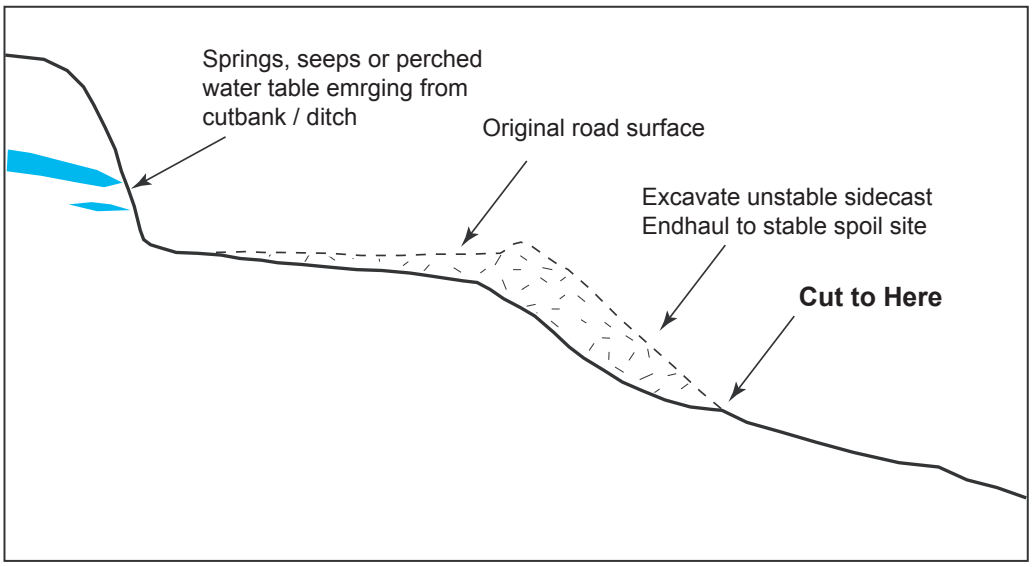
Typical Design for Road Decommisioning Treatments Employing Export and In-Place Outsloping Techniques

Export outslope (EPOS)



In-place outslope (IPOS)

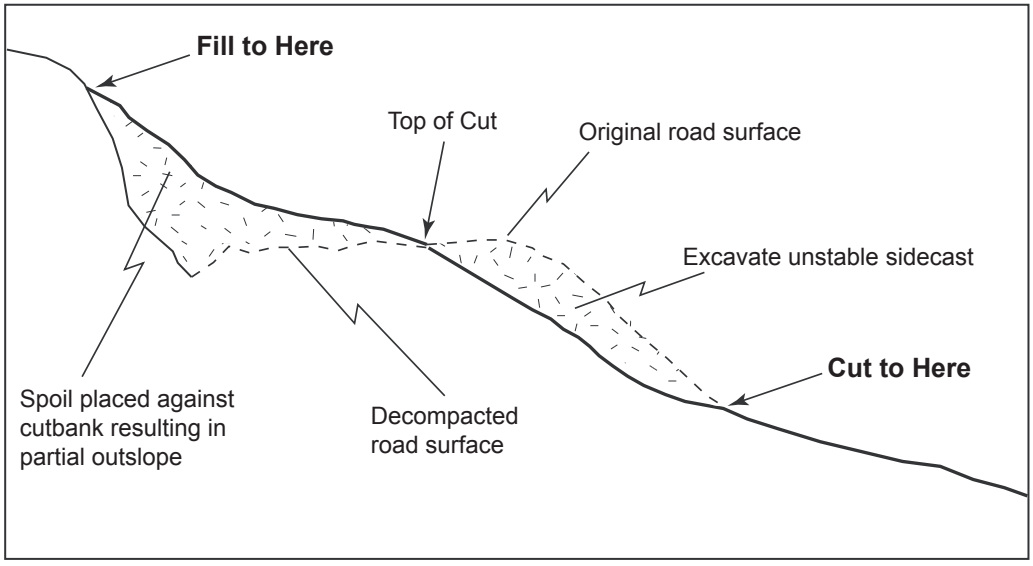


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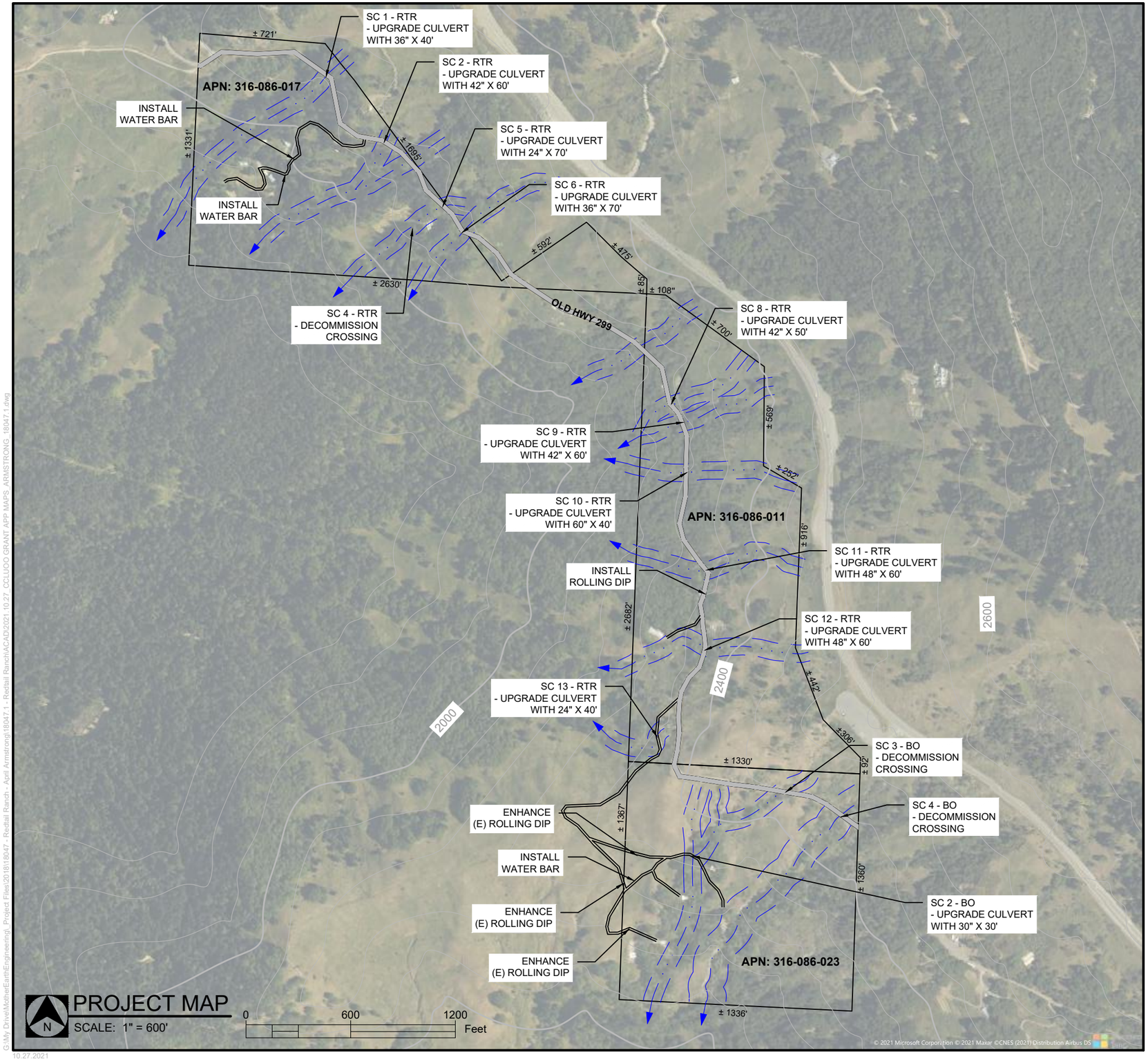
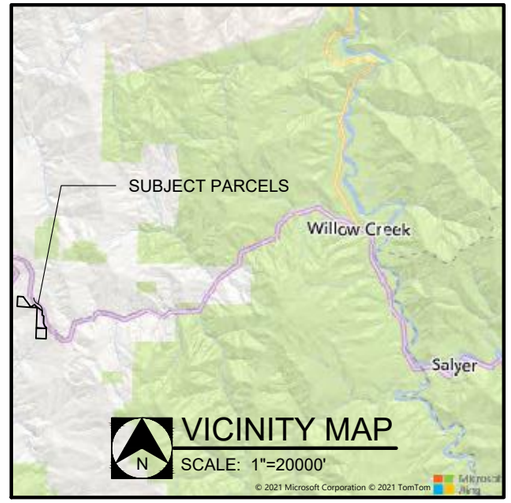
Figure 1

MOTHER EARTH
ENGINEERING

Project Map





DIRECTIONS TO SITE

FROM ARCATA, CA:

1. GO NORTH ON US HWY 101, TOWARDS CA-299 E EXIT, 2.0 MILES.
2. CONTINUE ON TO CA-299 E, 26.3 MILES.
3. TURN RIGHT ONTO OLD HWY 299, 1.5 MILES.
4. ARRIVED AT PROPERTY.

LEGEND

- PROPERTY LINE
- 2,000 — 80' CONTOURS (USGS)
- CLASS II WATERCOURSE WITH 100 FT STREAM SIDE MANAGEMENT AREA BUFFER
- CLASS III WATERCOURSE WITH 50 FT STREAM SIDE MANAGEMENT AREA BUFFER
- DIRECTION OF FLOW
- PUBLIC ROAD - AVG 22' WIDTH, AVG 4% GRADE
- ACCESS ROAD
- <E> EXISTING
- <P> PROPOSED

MOTHER EARTH ENGINEERING
425 I STREET
ARCATA, CA 95521, 707-633-8321

MEE JOB NO: 18047.1

REVISION SCHEDULE

#	DATE	BY	DESCRIPTION
0	10/27/21	DT	DRAFTED
1			
2			
3			
4			
5			

PROJECT MAP
APN: 316-086-017, 316-086-011, 316-086-023

CCLUO MITIGATION AND REMEDIATION FUND PROGRAM GRANT
APPLICANT: APRIL ARMSTRONG
MAILING ADDRESS: 695 T ST, SUITE 3 PMB #521, ARCATA, CA 95521
PHONE NUMBER: (707) 616-4404

SHEET NO: 1 OF 4

G:\My Drive\MotherEarthEngineering_Project Files\2018\18047 - Redtail Ranch - April Armstrong\18047.1 - Redtail Ranch\ACAD\2021 10.27 CCLUOO GRANT APP MAPS ARMSTRONG 18047.1.dwg
10.27.2021

Figure 2

Plot Plan APN 316-086-017

(E) DRC #1
- [40.9118, -123.7924]

SC 1 - RTR
- UPGRADE CULVERT
WITH 36" X 40'

EASEMENT
(OLD 299)

APN: 316-086-017

20' x 48' BARN, 960 SQ FT
- DRYING & HARVEST STORAGE
(EST. 2015)

(E) WATER STORAGE AREA
- (3) WATER TANKS, 14,100 GAL TOTAL
- EST. 2015
- [40.9106, -123.7927]

(E) WATER STORAGE AREA
- (10) WATER TANKS, 38,300 GAL TOTAL
- EST. 1987-2017
- [40.9110, -123.7920]

YURT 470 SQ FT

SC 2 - RTR
- UPGRADE CULVERT
WITH 42" X 60'

INSTALL
WATER BAR

10' x 10', 100 SQ FT
AGRICULTURAL CHEMICAL
STORAGE

HOUSE RESIDENCE
(EST. 1995)

(E) PERMITTED WELL
- IRRIGATION, DOMESTIC USE
- [40.9098, -123.7899]

EMERGENCY
VEHICLE TURNROUNDS

(E) WATER STORAGE AREA
- (13) WATER TANKS, 65,000 GAL TOTAL
- EST. 2017
- [40.9096, -123.7897]

SOLAR ARRAY

INSTALL
WATER BAR

DOMESTIC VEGETABLE
GARDEN

SC 5 - RTR
- UPGRADE CULVERT
WITH 24" X 70'

BARN (EST. 2002)
HARVEST STORAGE & ADMIN HOLD AREA 1ST STORY
PROCESSING/PACKAGING 2ND STORY
TOTAL 1,400 SQ FT, 20' x 36' EACH STORY

(E) WATER STORAGE AREA #3
- (3) WATER TANKS, 9,000 GAL TOTAL
- EST. 2012
- [40.9098, -123.7899]

(E) WATER STORAGE AREA
- (5) WATER TANK, 25,000 GAL TOTAL
- EST. 2016 & 2021
- [40.9091, -123.7888]

(E) STORAGE CONTAINER
- [40.9090, -123.7889]

(P) BARN (PROCESSING)
AT LOCATION OF WS AREA #4

SC 6 - RTR
- UPGRADE CULVERT
WITH 36" X 70'

SC 4 - RTR
- DECOMMISSION
CROSSING

(E) POND A
- 500,000 GAL TOTAL
- RAINWATER CATCHMENT,
FIRE SUPPRESSION USE
- EST. 2005, EXPANDED 2015
- [40.9095, -123.7932]

(E) DRC #2
- [40.9089, -123.7884]

(E) WETLAND AREA
- 0.007 ACRES
- [40.9091, -123.7894]

(E) DRC #3
- [40.9085, -123.7879]

2000

OLD HWY 299

GENERAL NOTES

1. LOCATIONS OF PROPERTY LINES, ROADS, FEATURE LOCATIONS, STRUCTURES AND POINTS SHOWN ON THE MAP ARE APPROXIMATE, UNLESS OTHERWISE NOTED.

2. ALL COORDINATES SHOWN REFERENCE THE WGS84 GEODETIC DATUM.

LEGEND

- PROPERTY LINE
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- CLASS III WATERCOURSE WITH 50 FT STREAM SIDE MANAGEMENT AREA BUFFER
- DIRECTION OF FLOW
- PUBLIC ROAD - AVG 22' WIDTH, AVG 4% GRADE
- ACCESS ROAD
- <E> EXISTING
- <P> PROPOSED

PARCEL INFORMATION:

ZONING: AGRICULTURAL GRAZING,
RESIDENTIAL AGRICULTURE
LOT SIZE: 49 ACRES (ASSESSED),
43 ACRES (GIS)

N

PLOT PLAN

SCALE: 1" = 200'

0 200 400 Feet

MOTHER EARTH ENGINEERING
425 I STREET
ARCATA, CA 95521, 707-633-8321

MEE JOB NO: 18047.1

REVISION SCHEDULE

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APN: 316-086-017

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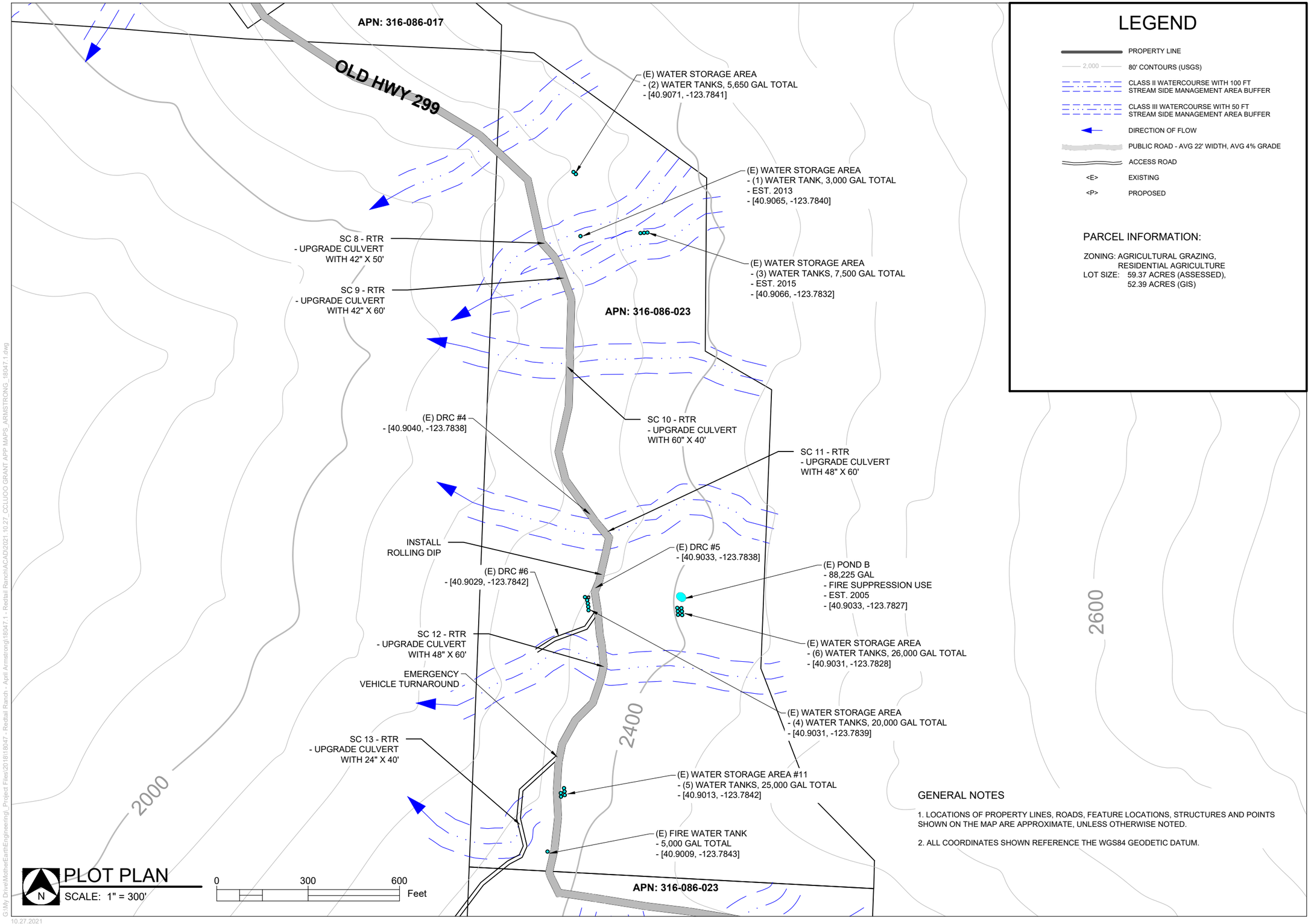
APPLICANT: APRIL ARMSTRONG
MAILING ADDRESS: 600 F ST, SUITE 3 PMB #521, ARCATA, CA 95521
PHONE NUMBER: (707) 616-4404

SHEET NO: 2 OF 4

Figure 3

Plot Plan APN 316-086-011



LEGEND

- PROPERTY LINE
- 2,000 — 80' CONTOURS (USGS)
- CLASS II WATERCOURSE WITH 100 FT STREAM SIDE MANAGEMENT AREA BUFFER
- CLASS III WATERCOURSE WITH 50 FT STREAM SIDE MANAGEMENT AREA BUFFER
- DIRECTION OF FLOW
- PUBLIC ROAD - AVG 22' WIDTH, AVG 4% GRADE
- ACCESS ROAD
- <E> EXISTING
- <P> PROPOSED

PARCEL INFORMATION:

ZONING: AGRICULTURAL GRAZING, RESIDENTIAL AGRICULTURE
LOT SIZE: 59.37 ACRES (ASSESSED), 52.39 ACRES (GIS)

GENERAL NOTES

1. LOCATIONS OF PROPERTY LINES, ROADS, FEATURE LOCATIONS, STRUCTURES AND POINTS SHOWN ON THE MAP ARE APPROXIMATE, UNLESS OTHERWISE NOTED.

2. ALL COORDINATES SHOWN REFERENCE THE WGS84 GEODETIC DATUM.

MOTHER EARTH ENGINEERING
425 I STREET
ARCATA, CA 95521, 707-633-8321

MEE JOB NO: 18047.1

REVISION SCHEDULE

#	DATE	BY	DESCRIPTION
0	10/27/21	DT	DRAFTED
1			
2			
3			
4			
5			

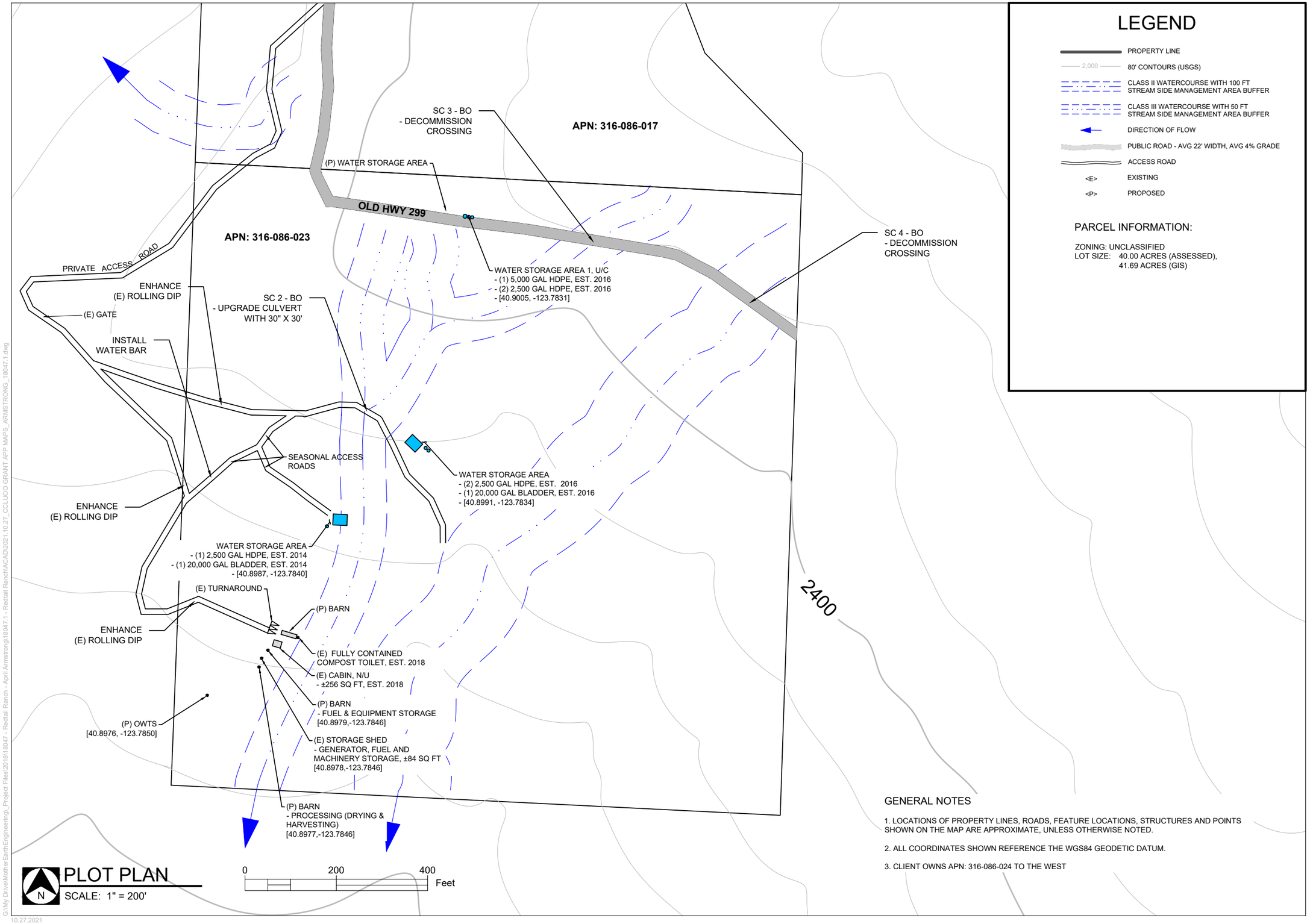
PLOT PLAN
APN: 316-086-011

CCLUO MITIGATION AND REMEDIATION FUND PROGRAM GRANT
APPLICANT: APRIL ARMSTRONG
MAILING ADDRESS: 600 F ST, SUITE 3 PMB #521, ARCATA, CA 95521
PHONE NUMBER: (707) 616-4404

SHEET NO: 3 OF 4

Figure 4

Plot Plan APN 316-086-023



PLOT PLAN

SCALE: 1" = 200'

LEGEND

- PROPERTY LINE
- 2,000 — 80' CONTOURS (USGS)
- CLASS II WATERCOURSE WITH 100 FT STREAM SIDE MANAGEMENT AREA BUFFER
- CLASS III WATERCOURSE WITH 50 FT STREAM SIDE MANAGEMENT AREA BUFFER
- DIRECTION OF FLOW
- PUBLIC ROAD - AVG 22' WIDTH, AVG 4% GRADE
- ACCESS ROAD
- <E> EXISTING
- <P> PROPOSED

PARCEL INFORMATION:

ZONING: UNCLASSIFIED
LOT SIZE: 40.00 ACRES (ASSESSED),
41.69 ACRES (GIS)

GENERAL NOTES

1. LOCATIONS OF PROPERTY LINES, ROADS, FEATURE LOCATIONS, STRUCTURES AND POINTS SHOWN ON THE MAP ARE APPROXIMATE, UNLESS OTHERWISE NOTED.

2. ALL COORDINATES SHOWN REFERENCE THE WGS84 GEODETIC DATUM.

3. CLIENT OWNS APN: 316-086-024 TO THE WEST

MOTHER EARTH ENGINEERING
425 I STREET
ARCATA, CA 95521, 707-633-8321

MEE JOB NO: 18047.1

REVISION SCHEDULE

#	DATE	BY	DESCRIPTION
0	10/27/21	DT	DRAFTED
1			
2			
3			
4			
5			

PLOT PLAN
APN: 316-086-023

CCLUO MITIGATION AND REMEDIATION FUND PROGRAM GRANT

APPLICANT: APRIL ARMSTRONG
MAILING ADDRESS: 6091 E ST, SUITE 3 PMB #521, ARCATA, CA 95521
PHONE NUMBER: (707) 616-4404

SHEET NO: 4 OF 4

Appendix A

Project Scope and Description

Appendix B

MOTHER EARTH ENGINEERING

Project Photos

Appendix C

Project Budget

Appendix D

Typical Drawings and Design Specifications

From: Courtney Sundberg <courtney@motherearthengineering.com>
Sent: Sunday, October 31, 2021 10:42 PM
To: Richardson, Michael <MRichardson@co.humboldt.ca.us>; April Armstrong <aprilalison@gmail.com>; Courtney Sundberg <courtney@motherearthengineering.com>
Subject: CCLUO Mitigation and Remediation Fund Program Application for April Armstrong

Hello Michael,

Hope this email finds you well. Thank you for the opportunity to apply for this grant. I think we have a great project and I hope you will think so too. I am writing on behalf of my client, April Armstrong. Please see the attached Application for the CCLUO Mitigation and Remediation Fund Program for Humboldt County APNs 316-086-017, 316-086-011, and 316-086-023. Due to the large file size the application packet is in three parts: 1) The Application and Project Description, 2) Project Figures, and 3) Project Appendices. Please let me know if you have any questions or if I need to submit anything on paper. We look forward to hearing from you. Thank you!

Sincerely,

--

COURTNEY SUNDBERG
Project Geologist

707.633.8321
courtney@motherearthengineering.com

425 I Street
Arcata, CA 95521
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DBE# 45884 | SB# 2010193
SUPPLIER ID # BID0059191