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## Executive Summary

Title: Saturated Soil Water Quality Protection Plan

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### **1. Introduction**

This Saturated Soils Water Quality Protection Plan (Plan) has been developed by the El Dorado County, Department of Transportation (DOT) pursuant to Item 2 within the Clean-Up and Abatement Order (CAO) No. R5-2009-0030 issued to El Dorado County and the United States Department of Agriculture, Forest Service, Eldorado National Forest (ENF) on April 30, 2009.

### **2. Saturated Soil Water Quality Plan (SSWQP) Goal**

The main goal of the SSWQP is to comply with the CAO requirements under Item 2.

### **3. Plan Development Methodologies**

The DOT utilized the "Trail Condition Assessment, Phase 1, Rubicon Trail – East of Wentworth Springs Campground, El Dorado County, California, June 2009 as prepared by the California Geological Survey (CGS), the 2008 State Off-Highway Vehicle (OHV) Grant Soil Conservation Guidelines, the 2010 DOT Site Assessment, the 2010 Rubicon Trail Toolbox as developed by the Georgetown Divide Resource Conservation District, The DOT Standard Details for Erosion Control, and the United States Department of Agriculture Handbook for Forest and Ranch Roads as the main reference material to develop the proposed Best Management Practices (BMP's) within the Plan.

#### **A. Erosion and Sediment Problems**

In order to identify the solutions to the erosion and sedimentation problems along the trail the DOT used the 2008 Soil Conservation Guidelines, which provides a prioritization mythology by rating the trail problems as high, medium, low. Also, the DOT used a similar approach which is used in Tahoe as part of the Erosion Control Program pursuant to the California Tahoe Conservancy (CTC) Guidelines, which uses a prioritization based on the hierarchy of controlling sediment and erosion from a watershed perspective.

The State Parks OHV Division developed a Trail Conditions Evaluation system which utilizes various trail condition codes, trail geometric input parameters, and topographic feature input parameters to rate the trail under a Red, Yellow, and

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Green coding system. A trail rating of Red indicates the segment of the trail with the highest potential for soil loss, Yellow indicates medium potential for soil loss, and green represents a trail segment that is stable for the intended OHV use.

Within the Phase 1 portion of the Plan the 2009 CGS Assessment identified 6,123 feet of trail segment rated as RED, 7,877 feet of trail rated as Yellow, and 10,395 feet of trail rated as Green. The DOT is updating the trail rating for the Phase 1 and Phase 2 trail segments pursuant to the 2010 DOT Site Assessment and will be providing this information within the Technical Report.

As part of the 2010 DOT Field Assessment, the DOT completed an erosion problem category along the Phase 1 portion of the trail segment in accordance with the CTC Erosion Control Guidelines. The CTC Guidelines present three (3) main categories as follows:

(1) Source Control – Areas that exhibit uncontrolled erosion (i.e. eroding banks, shoulders, etc..). Source controls are measures that prevent erosion from the source.

(2) Hydrologic Design – Areas that have constricted flows from the upper watershed or from the trail as sheet flow that are captured within trail area. Hydrologic Design BMP's maintain or create distributed flow patterns (e.g., flows which discharge from the trail frequently, or from shoulders by un-concentrated "sheet flow") and avoid concentration or increases of flows where feasible.

(3) Treatment – Areas that don't capture the sediment prior to reaching a type 1 or 2 watercourse. Treatment BMP's emphasizing removal of sediments prior to reaching the Type 1 and 2 watercourses.

The main focus of this evaluation system is based on a basic principal of natural sediment transport processes. First control the erosion and sediment from the source, second provide for distributed flow paths to reduce natural erosive forces along the trail, and thirdly capture/infiltrate/treat the sediment at key natural outfall areas.

In many cases along the trail the erosion problems exhibited several characteristics within each of the CTC erosion problem categories. Therefore, the BMP solutions at these specific locations were designed to mitigate several categorical erosion problems (i.e. source control BMP with a Hydrologic Design BMP or a Hydrologic Design BMP outfall to a Treatment BMP, etc..).

Within the Phase 1 portion of the Plan, the DOT identified the following number of erosion problems in accordance with the CTC erosion problem categories:

Source Control – 133 sites

Hydrologic Design – 68 sites

#### Treatment – 63 sites

The number of site locations exhibiting the three (3) erosion problem categories compared well with the 2009 CGS Assessment.

#### B. Soil Characteristics

As part of the 2009 CGS assessment and 2010 DOT Site Assessment, various sections of the trail were evaluated based on soil conditions during saturation. The majority of the soil types within the Phase 1 area have been classified under the American Standard Testing Method (ASTM) Classification system as silty sand (SM), which in essence is decomposed granite. There are sections of the trail around the Wentworth Springs Campground and near perennial streams and floodplains that have a soil classification of poorly graded sand with silt. Each trail area exhibits different characteristics when the soil is considered saturated. For instance, within the majority of the trail segments, the silty sand material functions fairly well under saturated conditions and has an ability to resemble a standard gravel road for structural compaction during OHV use. However, in the areas that have poorly graded sand with silt and some organics the trail section shows signs of mechanical erosion from the OHV use (i.e. heavy rutting). There is large portion of the trail segment that travels over solid granite slab formations. In these areas there is no evident mechanical erosion problem, hence, no BMP's have been proposed within these areas.

#### C. Hydrology

Within the Phase 1 portion of the Plan the DOT has identified the following sub-watersheds within each major watershed that the trail section passes through:

Gerle Creek Watershed – Does not include Loon Lake

26 Sub-watersheds (1 acre to 60 acres)

Ellis Creek Watershed

17 Sub-watersheds (4 acres to 850 acres)

The majority of the watersheds drain directly into the trail section, which either captures the off-site run off during storm and snow melt events or pass through the trail sections at key sag points towards major ravine and/or creeks/streams.

The DOT has developed an extensive hydrologic analysis of these sub-watersheds to determine peak flows and volumes for the 2 year, 10 year, 25 year, average annual snow melt run-off, and 100 year (sub-watershed areas greater than 100 acres) pursuant to the County of El Dorado approved Drainage Manual. The peak flows and volumes from the 25 year -1 hour event were used to size the particular BMP's along the trail at key drainage outfall points related to the sections of the trail that are directly connected and in-directly connected to various Type 1 and 2 watercourses. Most of the BMP's that convey the trail run-off were designed to convey the 25 year, 1 hour event as well as the 10 year, 6 hour event. The key element within the analysis was to determine the existing conditions and post-BMP conditions using the same frequency storm in order to provide a quantitative differential for peak and volume mitigation which satisfies

the CAO requirements. The 25 year, 1 hour even as selected as the sediment transport storm which is the typical summer convective storm. This storm type happens on an annual basis, so the 25 year interval is somewhat misleading. The storm pattern exhibits a large cell burst over a small area with a very high rainfall intensity which typically produces the largest sediment concentration during the dry summer months. Even though the BMP's have been designed using this type of storm event for capturing run-off volumes, they will most likely continue to function through-out the water year (October to October) during various types of storms and during the spring snow melt season.

#### D. Erosion Potential Method – Soil Erosion Rates

In order to provide a qualitative/quantitative means to address the sediment differential from the existing trail conditions to the post-BMP trail conditions the DOT utilized a analytical model, which is based on a mathematical expression to predict erosion amounts a rates and is included within the State OHV 2008 Soil Conservation Guidelines. This analytical model is the Revised Universal Soil Loss Equation:

$$A = R * K * L * S * C * P$$

Where:

- A = annual soil loss in tons per acre per year
- R = rainfall erosivity factor
- K = soil erodibility factor
- L = slope length factor
- S = slope gradient factor
- C = cover management factor
- P = erosion control practice factor

This method has been used on many forest and OHV roads throughout the Country and is one of the most widely recognized methods to predict soil loss.

The key understanding in using this method to determine existing soil loss versus post-BMP soil loss is that, it is purely a comparison analysis to identify where the highest soil loss rates exist on the trail and what types of BMP's will be able to reduce the rate to amenable levels to comply with the CAO requirements.

## 4. Plan Overview

### A. Typical Trail Maintenance BMP's

The DOT has developed the proposed BMP's within the Plan in accordance with the 2009 CGS Assessment, the 2010 DOT Site Assessment, the 2010 Rubicon Trail Toolbox as developed by the Georgetown Divide Resource Conservation

District, The DOT Standard Details for Erosion Control, and the United States Department of Agriculture Handbook for Forest and Ranch Roads coupled with the hydrologic and sediment loss analysis. Each of the typical BMP's where categories in accordance with the CTC Erosion Control Guidelines (Source Control, Hydrologic Design, and Treatment) and where designed using specific topographic information on the trail and civil engineering judgment.

Typical BMP such as Rock Fill, Rock Slope Protection, and Rock Breast Walls are considered source control types of BMP's, where Rock Ditch and Check Xing's are considered hydrologic design type of BMP's, and Rock Outfall Protection and Rock Energy Dissipators are considered treatment types of BMP.

In sum total the Plan depicts up to 300 proposed BMP's within the Phase 1 portion of the trail. An additional 300+ BMP's are proposed within the Phase 2 portion of the trail, however, this section of the trail warrants a additional DOT site assessment which will be completed in late spring early summer.

#### **B. Season Closure**

As part of this analysis, the DOT considered an additional type of BMP for controlling sedimentation on the trail in the form a seasonal closure. Based on the minimal trail use during saturated soil conditions and the proactive maintenance strategies being programmed within the DOT Maintenance Division for trail maintenance, the DOT is not recommending at this time to include a seasonal closure component within the Plan.

### **5. Plan Education**

The DOT has been embarking on an extensive trail educational campaign that includes, but is not limited to, an educational video, a bandana campaign, trail signage, various trail committee meetings, and a County website.

### **6. Plan Enforcement**

In order to comply with the CAO of "an enforcement component" as part of the Plan, the DOT has been actively engaged with the following Law Enforcement Agencies:

El Dorado County Sheriff's Department

State Parks OHV Rangers

United States Forest Service Law Enforcement Division

During the 2010 season, the law enforcement efforts were increased substantially from previous years. State Parks OHV division launched a pilot program with Rangers camped at Spider Lake every weekend July 1st through Labor Day Weekend. This put officers on the trail during the overnight hours every weekend. El Dorado County Sheriff's Department had officers on the trail every weekend and

several overnights. The Forest Service had two Forest Patrol Officers on the trail every weekend.

This increased law enforcement was well received by the users and provided a good measure of the type of enforcement needed. El Dorado County is in discussions with State Parks regarding their continued presents on the trail. El Dorado County Sheriff's Department will be on the trail every weekend during the 2011 season. All rules of the road apply to this trail and will be cited. Officers will cite for resource damage and keep trail users on the trail and not creating new variant routes.

El Dorado County will hold two Law Enforcement Summit meetings a year, one at the end of the season to debrief and one in February to coordinate efforts in the upcoming season. The coordinated effort works for all agencies and ensures that enforcement needs are met on the Rubicon Trail.

## **7. Plan Implementation/Monitoring**

### **A. Budget**

The costs associated with the Plan and implementation thereof is estimated to cost approximately \$1.8 million, which will be funded by OHV Grants, In-Lieu funds, and the SMUD funds coupled with assistance from the various volunteer user groups.

### **B. Schedule**

The DOT anticipates completing all the proposed BMP's within Plan by the summer of 2012.

### **C. Monitoring**

The DOT will provide an annual Monitoring Report as part of the BMP evaluation efforts using photographic documentation and some field measurements of sediment captured within the treatment BMP's.

## **8. Plan Annual Maintenance**

As part of the annual BMP monitoring efforts, the DOT will evaluate the installed BMP's along the trail in the spring and fall. A BMP maintenance log will be created which will specify the location and maintenance needs at each of the BMP sites, which will be included within a Rubicon Trail maintenance work order. Most of the maintenance activities will be coordinated with ENF, private land owners, and user groups prior to initiating the work. It is anticipated that the routine maintenance work will cost approximately \$50,000/year which will be funded through OHV grants, In-Lieu funds, and the SMUD funds, with volunteer user groups assisting where appropriate.