Sediment Discharge and Erosion Assessment Report

CAWELO WATER DISTRICT COALITION
17207 Industrial Farm Road
Bakersfield, CA 93308

May 20, 2015

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EXECUTIVE SUMMARY

The Cawelo Water District Coalition (CWDC) has prepared a Sediment Discharge and Erosion Assessment Report (SDEAR) as required by the Waste Discharge Requirements General Order for Growers within the Tulare Lake Basin Area that are Members of a Third-Party Group, R5-2013-0120 (General Order).

The General Order requires third-party groups or coalitions to prepare and submit a SDEAR to determine which CWDC irrigated lands are subject to erosion and may discharge sediment into surface streams and potentially could impact the quality of the surface waters of the State. The SDEAR will also determine which irrigated lands will be required to prepare a Sediment and Erosion Control Plan.

To determine which CWDC irrigated lands are subject to potential sediment discharge into the natural surface waterways, an estimated annual soil loss calculation was performed using the Revised Universal Soil Loss Equation (RUSLE) for parcels within 500 meters of the natural surface waterways in the CWDC area. Then the annual soil loss values were evaluated for the level of risk to impact water quality of the waters of the State.

Poso Creek and Little Creek are the only two natural water courses within the CWDC area. Poso creek is an intermittent stream with an annual average flow of approximately 18,245 acre-feet entering the CWDC area. Little Creek is a small drainage that is a tributary to Poso Creek and enters the CWDC area from the east on the north side of Poso Creek passing through approximately 2 miles of irrigated agriculture inside the CWDC area. Little Creek rarely provides surface water flows with flows only present in 3 of the last 33 years.

The 500 meter assessment zone includes 118 different parcels that were evaluated using the RUSLE. Using the Regional Water Quality Control Board's (Regional Board) guidelines for the sediment risk factor scale provided in the Regional Board's Sediment Risk Factor Worksheet, the annual soil loss value (A) is categorized into the following categories:

Erosion Estimates	
< 15 tons per acre per year	=Low Risk
15 – 75 tons per acre per year	=Medium Risk
≥ 75 tons per acre per year	=High Risk

Member parcels evaluated as part of the assessment zone with a Low Risk (≤ 15 tons per acre per year) to discharge sediment would not be required to prepare a Sediment and Erosion Control Plan as determined by this SDEAR. Member parcels determined to be in the Medium or High Risk category (>15 tons per acre per year) are required to prepare a Sediment and Erosion Control Plan as specified by the General Order.

The calculated annual soil loss value for evaluated parcels ranged from 0.48 to 7.881 tons per acre per year. All parcels evaluated within the assessment zone fall within the Low Risk category as described by the SWRCB Sediment Risk Factor Worksheet and are summarized below:

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No. Parcels	Annual Soil Loss (tons/acre/year)
43	0.480
48	1.554
27	7.881
Total 118	< 15 = Low Risk

All 118 parcels are roughly 50% below the 15 tons per acre per year upper threshold of the Low Risk category. All parcels considered Low Risk will not be required to submit a Sediment and Erosion Control Plan as determined by this SDEAR however, all members will be required to perform a self-assessment regarding their potential to discharge sediment into waterways as part of the Farm Evaluation.

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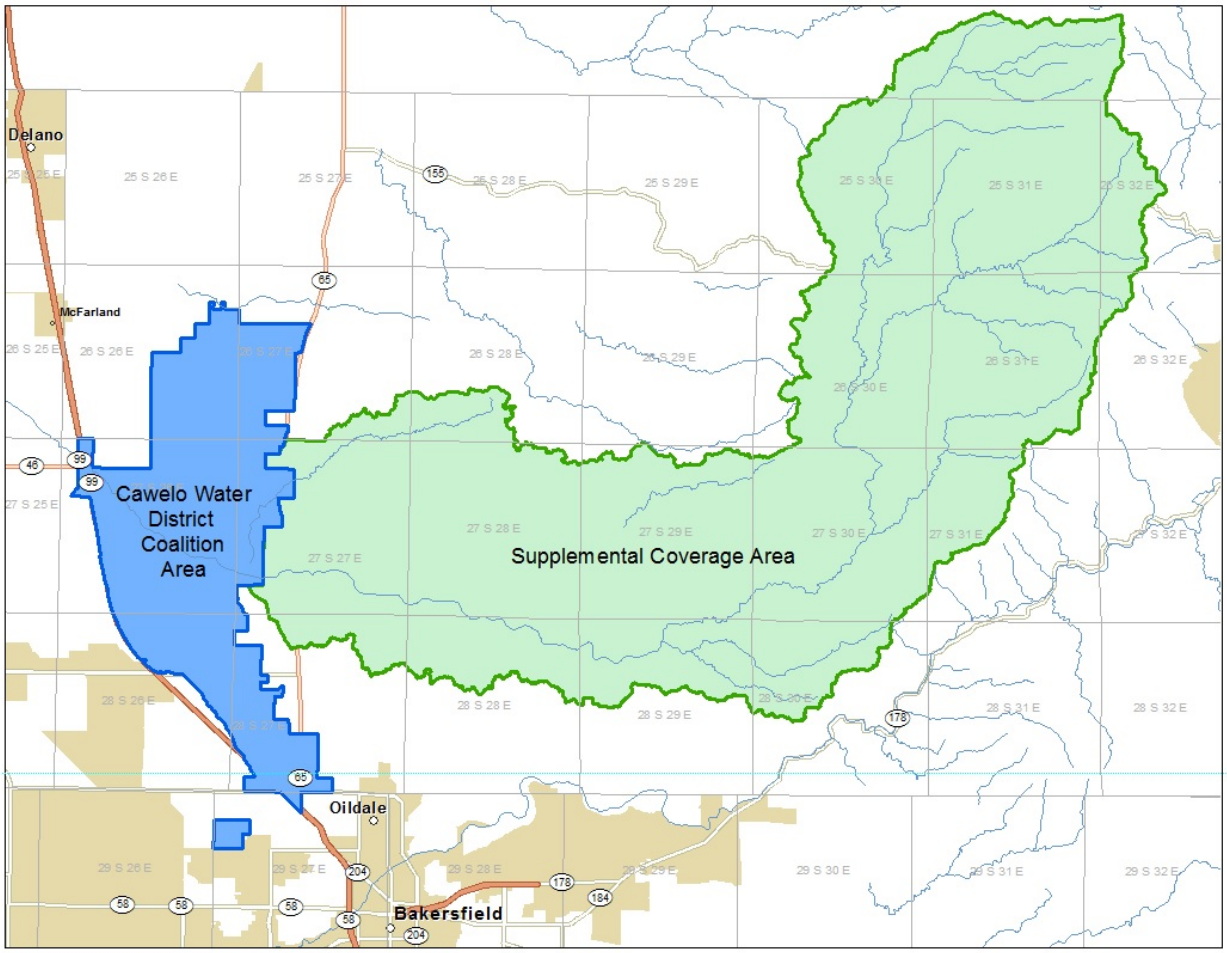
1. General Information

The CWDC received a Notice of Applicability dated April 25, 2014 from the Regional Board authorizing CWDC to act as the third-party group or coalition representing growers of Cawelo Water District (District) for compliance under the General Order.

The CWDC coverage area is essentially the District boundary and encompasses roughly 45,000 acres. CWDC area is located in the north-central portion of Kern County, with U.S. Highway 99 to the west, State Highway 65 to the east, the community of Oildale to the south and the community of McFarland to the north. Poso Creek crosses the CWDC coverage area bifurcating it into approximately two halves creating a northern and southern area. The CWDC also provides coverage for growers in an additional Supplemental Coverage Area (SCA) which encompasses the upstream portion of the Poso Creek watershed to the east of the CWDC area. The SCA is approximately 200,000 acres with very little irrigated agriculture. The coverage area boundaries are presented in **Figure 1.**

For the purposes of this SDEAR, the evaluation of parcels and their potential of sediment discharge impacting waters of the State will focus on the CWDC area.

Figure 1 - Cawelo Water District Coalition and Supplemental Coverage Area



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A. Poso Creek Watershed

The Poso Creek Watershed covers more than 250,000 acres and drains southwest into the Central Valley near Famoso in Kern County and then northwesterly towards the old Tulare lakebed. The terrain in the upper watershed area ranges from deep v-shape canyons with steep rugged terrain to moderate slopes at the lower elevations.

Poso Creek is an intermittent stream that traverses CWDC and enters the Kern River Watershed Coalition Authority (KRWCA) coverage area. There are several Poso Creek tributaries upstream of the CWDC area including Angel Creek, Cedar Creek, Little Poso Creek, Rattlesnake Creek, and Little Creek.

Within the CWDC area, the elevations can range from approximately 430 feet above sea level in the western areas of CWDC to approximately 800 feet above sea level in the northeastern portion of CWDC. The surface generally slopes from east to west with most of the significant elevation transitions occurring on the eastern side of CWDC. Generally, the majority of CWDC is considered relatively flat.

B. Hydrology

The average annual precipitation in the CWDC area is approximately 6” dating back to 1998 as reported by the California Irrigation Management Information System station ID No. 138, Famoso Station. The average annual flow entering the CWDC area is approximately 18,245 acre-feet and the annual total flows are presented in **Figure 2.**

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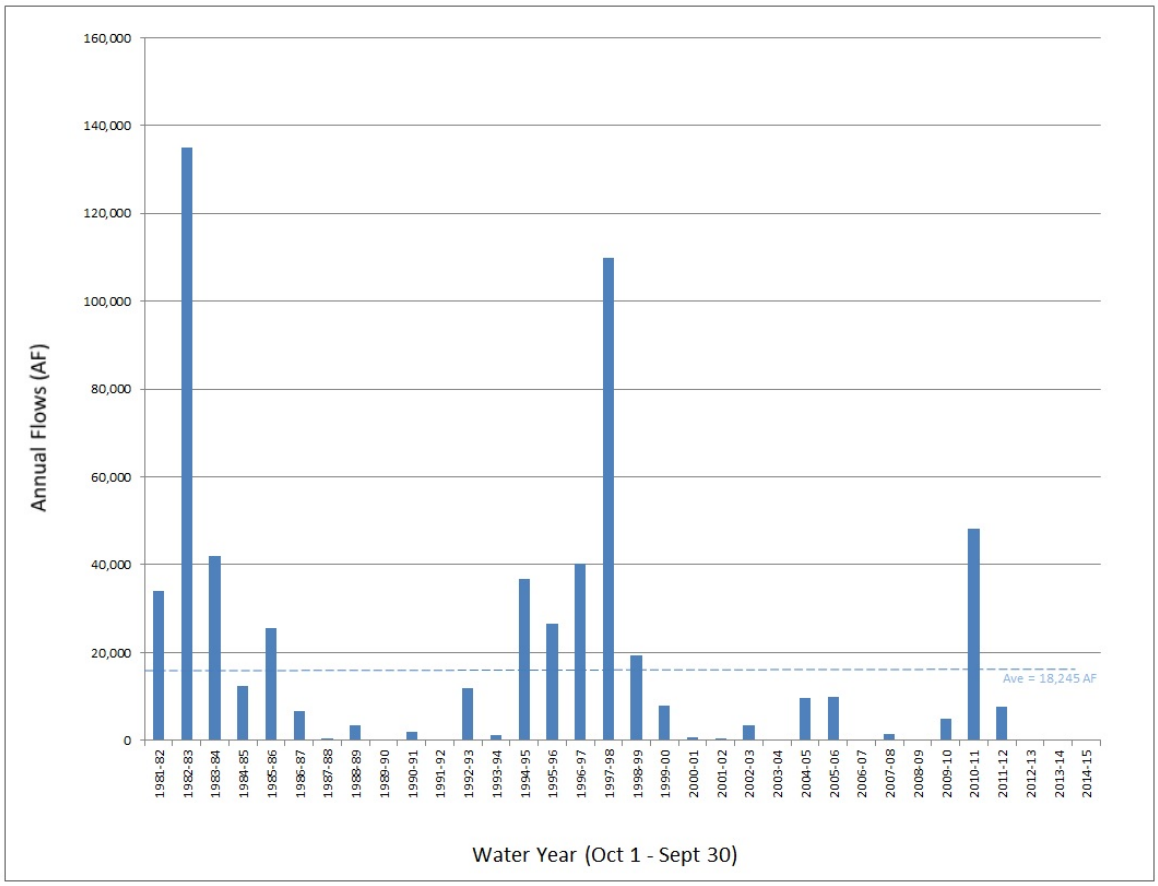
Figure 2 – Poso Creek Annual Flows



C. Climate

The climate of the region is semi-arid with summers that are typically hot and dry with no significant precipitation. The winters are cooler and characterized by fog and minor precipitation with an annual average of 6 inches in the CWDC area. As the elevation increases heading to the east leaving the CWDC area and into the foothills and upper Poso Creek watershed area in the Sierra Nevada Mountains, the precipitation increases ranging from 6 to 30 inches.

During the summer months the high temperatures average in the high 90's with lows averaging in the high 60's. During the winter months the high temperatures generally drop between the high 50's to the low 60's with the lows averaging around 40 degrees Fahrenheit. The monthly average temperatures and precipitation are summarized in **Table 1**.

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Table 1 - Average Monthly Temperatures and Precipitation for the CWDC Area

Average Monthly Temperatures and Precipitation for CWDC Area													
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Average High (°F)	56.2	62.8	68.7	75.0	83.5	90.9	97.1	95.8	90.0	79.4	65.7	56.6	76.8
Average Low (°F)	39.3	42.4	46.5	50.2	57.5	64.2	70.5	69.0	64.0	55.0	44.6	39.0	53.5
Precipitation (Inches)	1.2	1.2	1.2	0.5	0.2	0.1	0.0	0.0	0.1	0.3	0.6	1.0	6.47

Source: National Weather Service, Bakersfield Data

D. Geology

The San Joaquin Valley represents the southern portion of the Great Central Valley of California. The San Joaquin Valley is a structural trough up to 200 miles long and 70 miles wide filled with up to 32,000 feet of marine and continental sediments deposited during periodic inundation by the Pacific Ocean and by erosion of the surrounding mountains, respectively. Continental deposits shed from the surrounding mountains form an alluvial wedge that thickens from the valley margins toward the axis of the structural trough. This depositional axis is below to slightly west of the series of rivers, lakes, sloughs, and marshes that mark the current and historic axis of surface drainage in the San Joaquin Valley (DWR, 2003).

Within the CWDC area, there are over 20 different soil types and are described by the Soil Survey of Kern County Northwestern Part (CA666) and the Soil Survey of Kern County, California Northeastern Part and Southeastern Part of Tulare County, California (CA668). Geographic Information System (GIS) soil survey data was downloaded from the USDA, NRCS Web Soil Survey to map the soil types and locations within the CWDC area and are presented in **Figure 3**. The Map Unit Key is provided **in Figure 4**.

The map units represent the various soil types in the CWDC area and are described in **Appendix A – NRCS Soil Survey, Map Unit Descriptions.** The provided descriptions were obtained from the Soil Survey of Kern County Northwestern Part and the Soil Survey of Kern County, California Northeastern Part and Southeastern Part of Tulare County, California.

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Figure 3 – NRSC Soil Survey

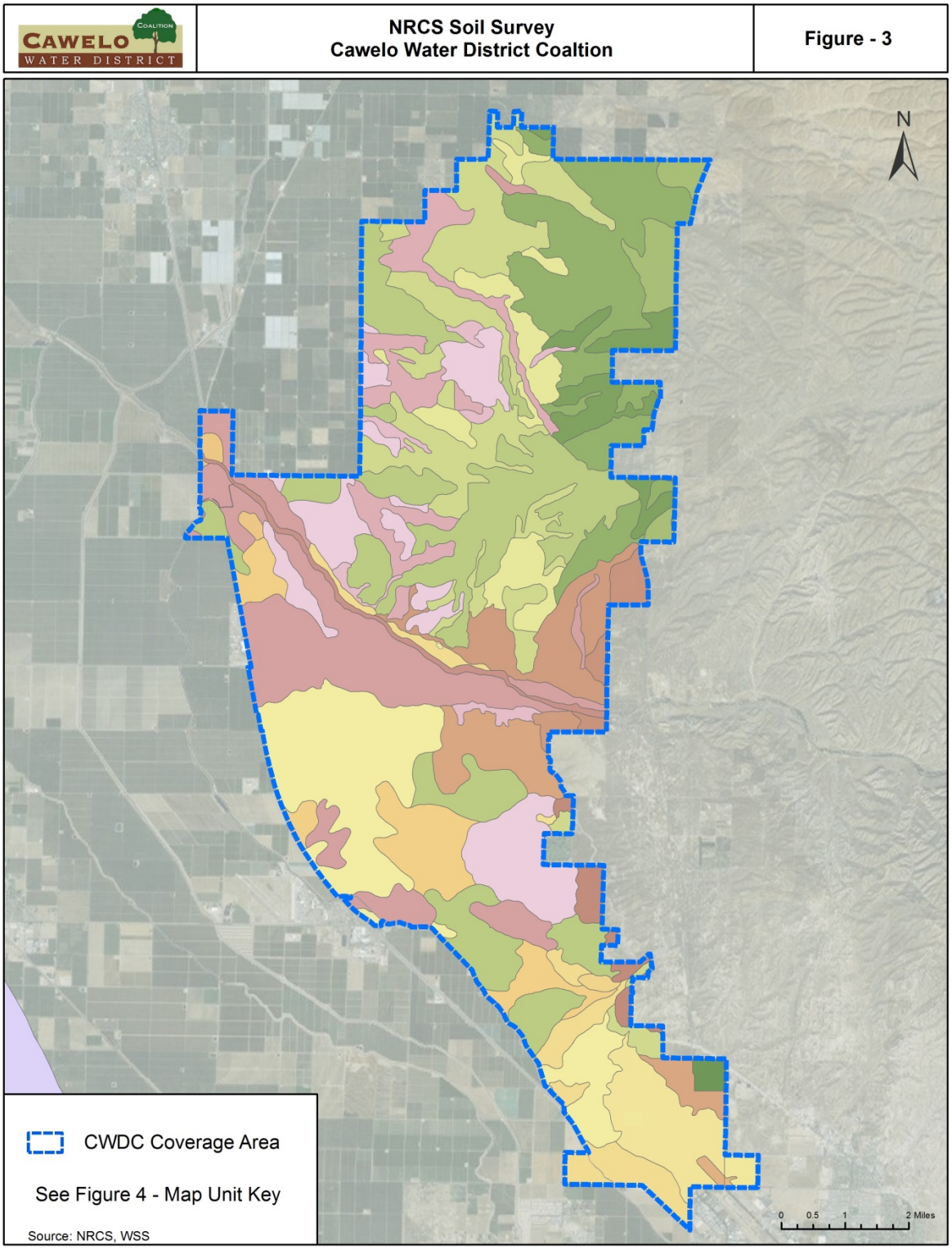

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Figure 4 – NRCS Soil Survey, Map Unit Key

NRCS Soil Survey, Map Unit Key, Figure 4
Soil Survey of Kern County, Northwestern Part (CA666)

128ne	Capay silty clay, 2 to 9 percent slopes
130	Chanac clay loam, 2 to 9 percent slopes
131	Chanac clay loam, 9 to 15 percent slopes
132	Chanac clay loam, 15 to 30 percent slopes
138	Delano sandy loam, 0 to 2 percent slopes
139	Delano sandy loam, 2 to 5 percent slopes
140	Delano sandy loam, 5 to 9 percent slopes
145	Driver coarse sandy loam, 0 to 2 percent slopes
146	Delano sandy loam, 1 to 5 percent slopes (CA668)
146ne	Elkhills sandy loam, 9 to 50 percent slopes, eroded
154	Exeter sandy loam, 0 to 2 percent slopes
174	Kimberlina fine sandy loam, 0 to 2 percent slopes
175	Kimberlina fine sandy loam, 2 to 5 percent slopes
184	Lewkalb sandy loam, 0 to 2 percent slope
192	McFarland loam
200	Urban land –Delano complex, 0 to 2 percent slopes (CA668)
200ne	Millsholm Variant-Montara complex, 15 to 30 percent slopes
222	Premier coarse sandy loam, 2 to 5 percent slopes
223	Premier coarse sandy loam, 5 to 9 percent slopes
224	Premier coarse sandy loam, 9 to 15 percent slopes
225	Premier-Durothids association, 9 to 15 percent slopes
229	Riverwash
243	Wasco sandy loam
254	Zerker loam, 2 to 5 percent slopes
255	Zerker loam, 5 to 9 percent slopes
256	Zerker sandy clay loam, 02 to 2 percent slopes

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2. Assessment Zone

Poso Creek and Little Creek are the only two natural water courses within the CWDC area. Poso creek is an intermittent stream with an annual average flow of approximately 18,245 acre-feet entering the CWDC area. Little Creek is a small drainage that is a tributary to Poso Creek and enters the CWDC area from the east on the north side of Poso Creek passing through approximately 2 miles of irrigated agriculture inside the CWDC area. Little Creek rarely provides surface water flows with flows only present in 3 of the last 33 years.

To determine which CWDC irrigated lands are subject to potential sediment discharge into the natural surface waterways, parcels within 500 meters of the centerline of Poso Creek were evaluated for potential discharge. Additionally, any parcels within 500 meters of Little Creek were also evaluated for potential discharge. **Figure 5** presents the 500 meter assessment zones in the CWDC area. All parcels with any portion of the parcel located within 500 meters of the centerline of a natural waterway were included in the evaluation as described in this report

3. Methodology

The methodology used to evaluate and determine the potential erosion and sediment discharge from member parcels that may impact surface waters of the State is to use the Revised Universal Soil Loss Equation to determine the estimated annual soil loss for each parcel and compare those values to the State Water Resources Control Board's Sediment Risk Factor Worksheet. The worksheet provides guidelines that determine risk level of a sediment discharge based on potential annual soil loss and the worksheet is provided in **Appendix B – SWRCB Sediment Risk Factor Worksheet**.

Each parcel with any portion of the parcel located within the assessment zones will be included in the evaluation and a corresponding annual soil loss value will be calculated to establish the risk level as determined by the Sediment Risk Factor guidelines.

Geographical Information Systems (GIS) tools were used to apply factors necessary to calculate the estimated annual soil loss for each parcel in the assessment zone and results were summarized in a table.

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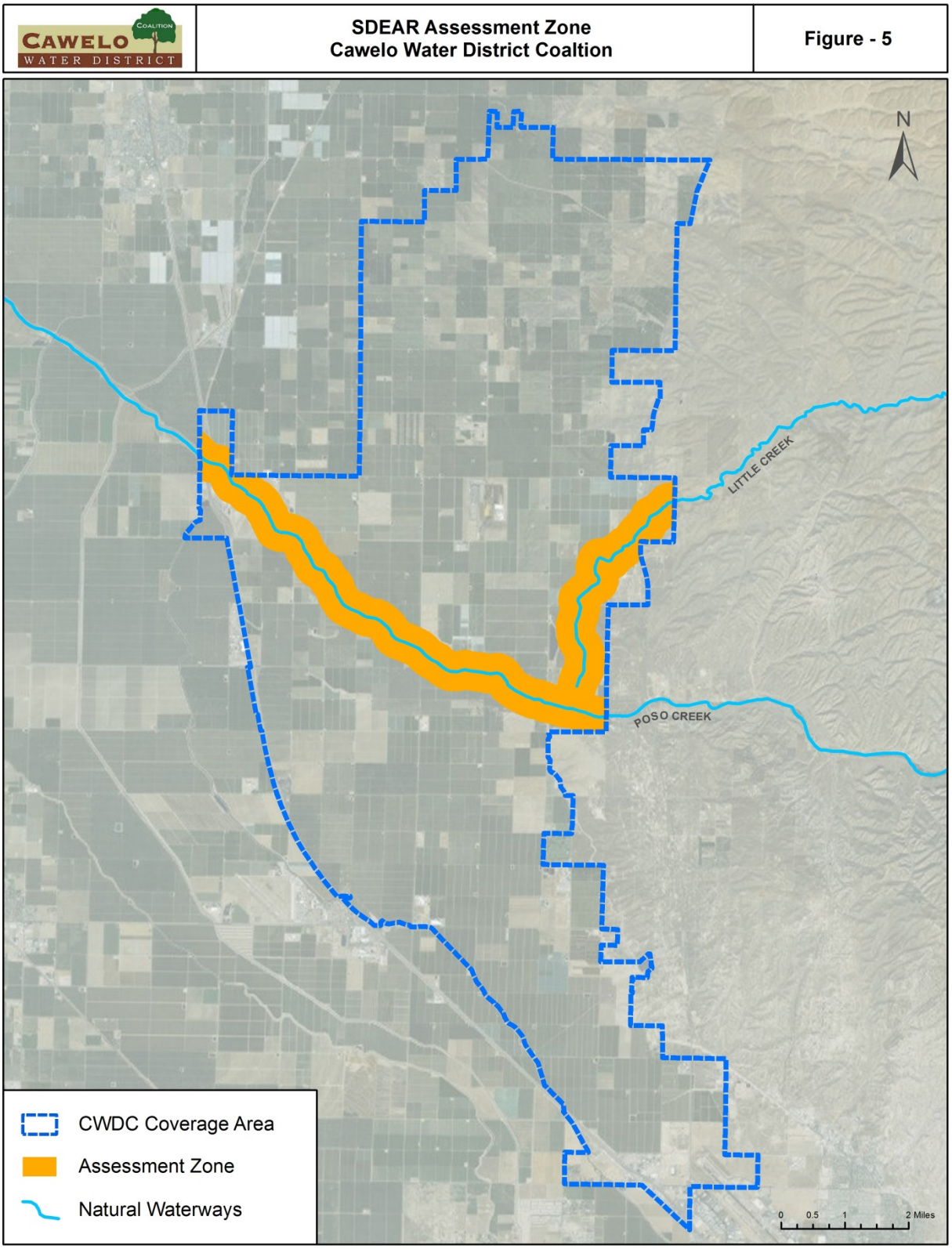
Figure 5 – SDEAR Assessment Zone



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4. Revised Universal Soil Loss Equation for Erosion Potential

Water erosion and sediment discharge rates are affected by rainfall, soil properties, slope, slope length, ground cover, and land management practices.

These factors are used in the Revised Universal Soil Loss Equation (RUSLE), an empirical formula widely used to predict soil loss in sheet and rill erosion from agricultural fields, primarily cropland and pasture, and construction sites (EPA, 2003).

RUSLE

A = R x K x LS x C x P = tons/acre/year

A	Estimated average annual soil loss (tons/acre/year)
R	Rainfall/runoff factor
K	Soil erodibility factor
LS	Slope/slope length factor
C	Ground cover/management factor
P	Practice factor

A. Estimated Average Annual Soil Loss (**A**)

The estimated average annual soil loss in tons per acre per year was calculated for each parcel that is part of the assessment zone. Each of the factors used to calculate the soil losses are described in the following sections.

B. Runoff Erosivity (R Factor)

The R Factor represents the intensity of the mechanism responsible for the detachment of the soil particle by rainfall. It quantifies the effect of raindrop impact and the amount and rate of runoff associated with the rain based on a long term rainfall record. Considered on a yearly basis, its value is equal to the total number of erosion-index units in a normal year's rain (EPA, 2003 and USDA, 1991)

The R Factor is the applied Erosion Index (EI) percentage of the isoerodent index value. Both EI and isoerodent values are provided by the U.S. Environmental Protection Agency's (EPA) Stormwater Phase II Final Rule, EPA 833-F-00-014 and is provided in **Appendix C**. The SDEAR provides an assessment on an annual basis and therefore the EI percentage is 100%. The isoerodent index value for the CWDC area is 10. These two factors apply to the entire CWDC area and therefore the R Factor for the CWDC area is 10 (R = 100% x 10).

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C. Soil Erodability (K Factor)

The soil-erodibility K Factor represents: (1) the susceptibility of soil or surface material to erosion, (2) the transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff, although these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high runoff rates and large runoff volumes (RWCQB, 2010).

The State Water Resources Control Board has developed and made available a GIS shapefile providing the K Factors for the State of California. This data was downloaded and overlaid on the 500 meter assessment zone to provide K Factor values for the purposes of this report. K Factor values are presented in **Figure 6.**

D. Slope Length and Gradient (LS Factor)

Generally, as the slope length and/or the slope gradient increases, soil loss increases. As slope length increases, total soil loss and soil loss per unit area increases due to the progressive accumulation of runoff in the downslope direction. As the slope gradient increases, the velocity and erosivity of the runoff increases (SWRCB, 2010)

The State Water Resources Control Board has developed and made available a GIS shapefile providing the LS Factors for the State of California. This data was downloaded and overlaid on the 500 meter assessment zone to provide LS Factor values for the purposes of this report. LS Factor values are presented in **Figure 7**.

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Figure 6 – Assessment Zone, K Factor

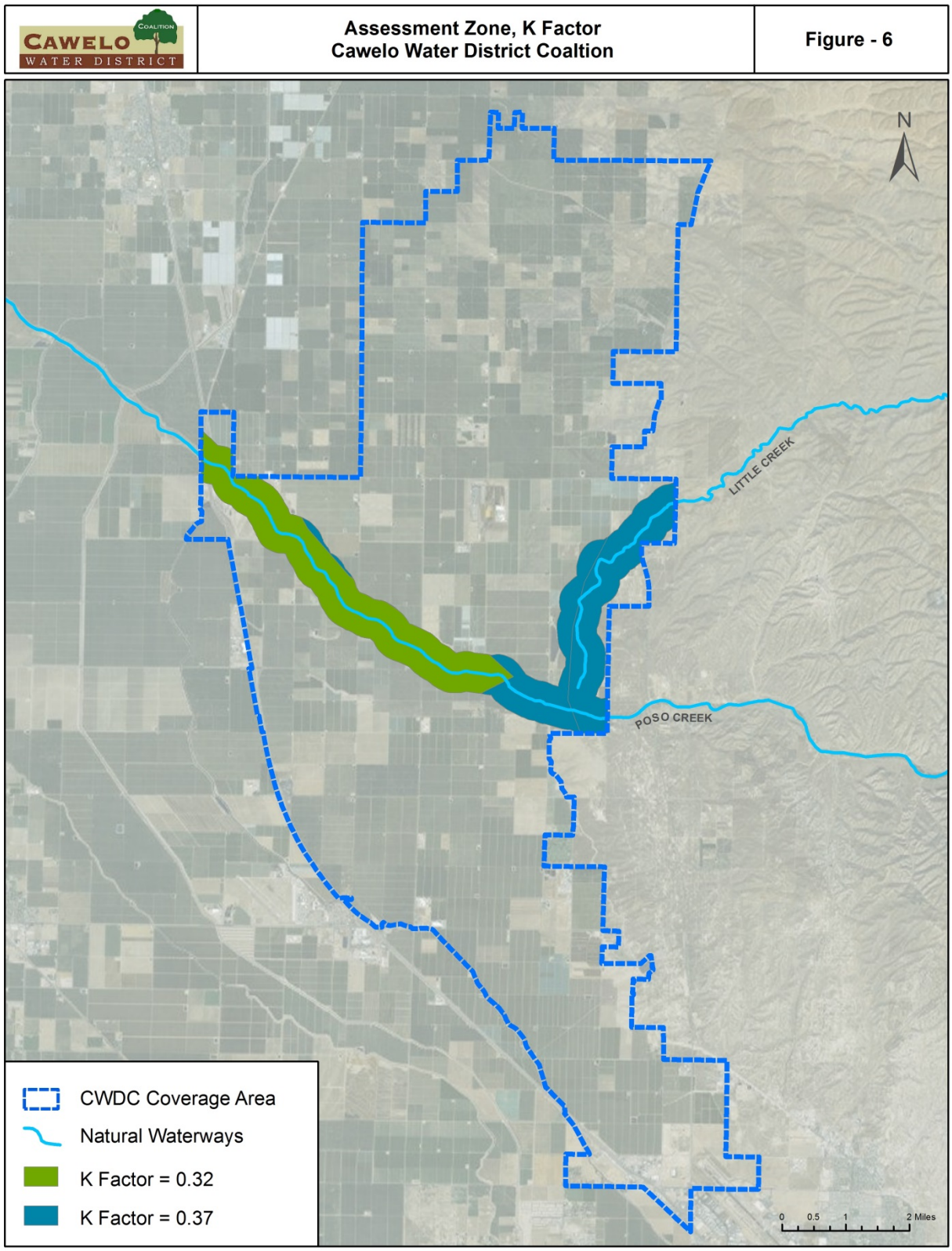

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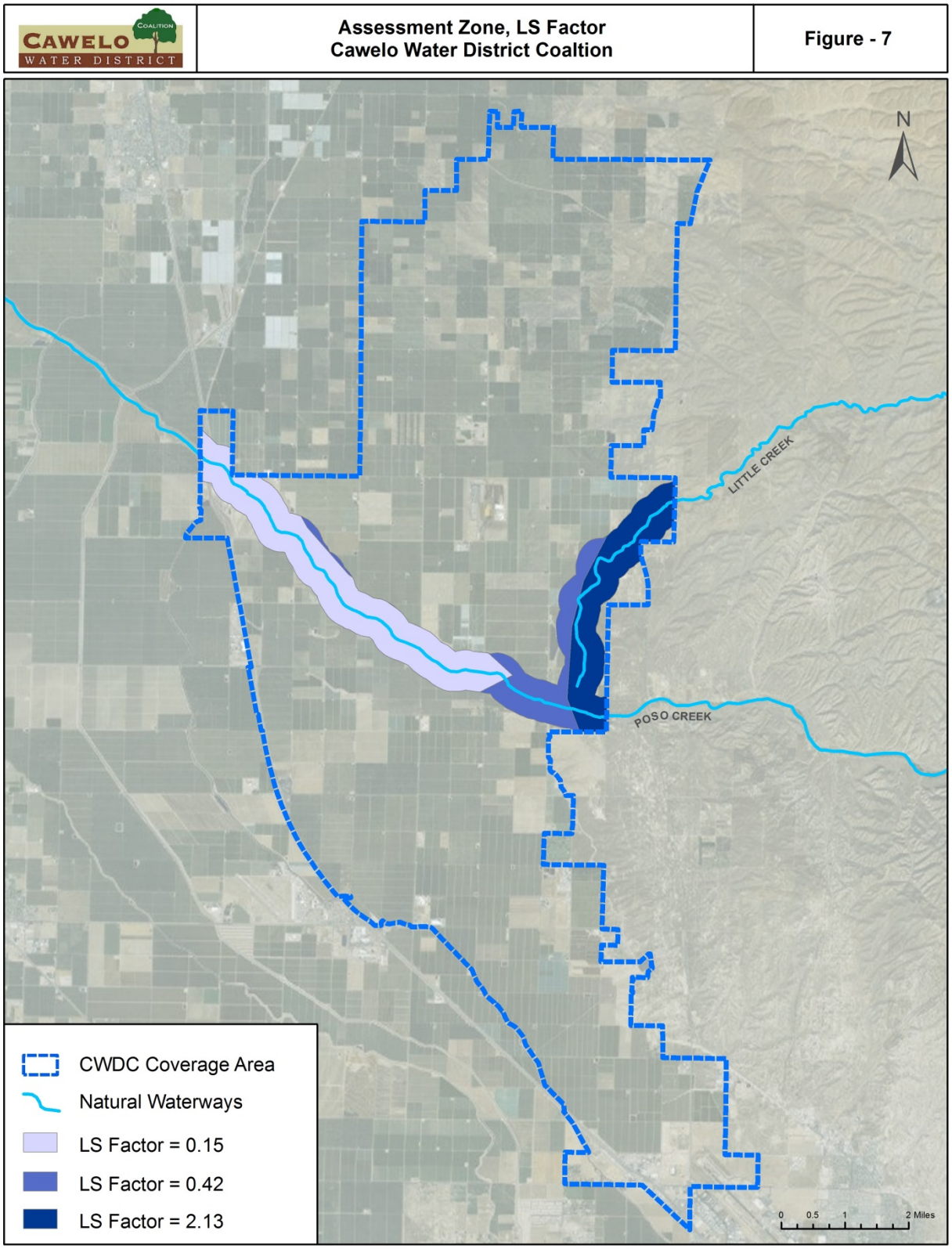
Figure 7 - Assessment Zone, LS Factor



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E. Soil Cover, Management and Practices (C and P Factors)

The Soil Cover and Management C Factor and the Practice P Factor are unknown for the assessment zone in the CWDC area. These factors reflect plant cover and management practices and their effect on erosion rates. The most conservative value for both factors is 1 and was applied to the RUSLE calculations.

F. Average Annual Soil Loss Calculation

The values for each factor of the RUSLE were applied to generate the Average Annual Soil Loss (A). The following RUSLE formula was used to calculate A:

$$\mathbf{A} = R \times K \times LS \times C \times P = \text{tons/acre/year}$$

A	Estimated average annual soil loss (tons/acre/year)
R	Rainfall/runoff factor
K	Soil erodibility factor
LS	Slope/slope length factor
C	Ground cover/management factor
P	Practice factor

The following is an example calculation of **A**:

R = 10
K = 0.32
LS = 0.15
C = 1
P = 1

A = 10 x 0.32 x 0.15 x 1 x 1 = 0.48

5. Sediment Risk Factor Assessment

A sediment risk factor scale provided by the State Water Resources Control Board's Sediment Risk Factor Work Sheet was used to determine the relative sediment erosion and discharge risk to the natural waterways within CWDC. The worksheet categorized the annual soil loss value (A) into the following categories:

<u>Erosion Estimates</u>

< 15 tons per acre per year	=Low Risk
15 – 75 tons per acre per year	=Medium Risk
≥ 75 tons per acre per year	=High Risk

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Member parcels evaluated as part of the assessment zone with a Low Risk (< 15 tons per acre per year) to discharge sediment are not required to prepare a Sediment and Erosion Control Plan (SECP) as determined by this SDEAR. Member parcels determined to be Medium or High Risk (≥15 tons per acre per year) are required to prepare a SECP as specified in the General Order.

6. Member Parcel Evaluation

Member parcel information available in a GIS shapefile was overlaid onto the assessment zone and the corresponding calculated annual soil loss values (A) were applied to determine the final soil loss values for each parcel**. Figure 8** presents the parcels evaluated as part of the assessment zone.

There were 118 parcels evaluated for potential sediment discharge into Poso Creek and Little Creek. If an individual parcel was determined to have multiple annual soil loss values due to variations in a RUSLE factor values then the most conservative value was selected for that parcel. Calculations were performed for all 118 parcels and are provided in a table in **Appendix D – Annual Soil Loss Calculations for Parcels in the Assessment Zone**. **Figure 9** presents the parcels and their corresponding annual soil loss values. All parcels are roughly at 50% of the 15 tons per acre per year upper threshold of the Low Risk category. All parcels considered Low Risk are not be required to submit a SECP as determined by this SDEAR but all members will be required to perform a self-assessment regarding their potential to discharge sediment as part of the Farm Evaluation.

7. Schedule

Within 30 days of the Regional Board's approval of the SDEAR, CWDC will notify all members of the accepted SDEAR evaluation and provide the sediment and erosion risk level values associated with each assessed parcel.

This methodology to evaluate potential risk of sediment discharge to natural waterways determined that all evaluated parcels were well within the Low Risk category of the State Water Resources Control Board's guidelines.

The General Ordered specified that members required to prepare a SECP shall complete their plans according to the following schedule:

Small Farming Operations –	SECP due 1 year after SDEAR approval
All other Farming Operations –	SECP due 180 days after SDEAR approval

As provided by this SDEAR, CWDC members within the assessment zone are not required to prepare a SECP.

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Figure 8 – Assessment Zone Parcels

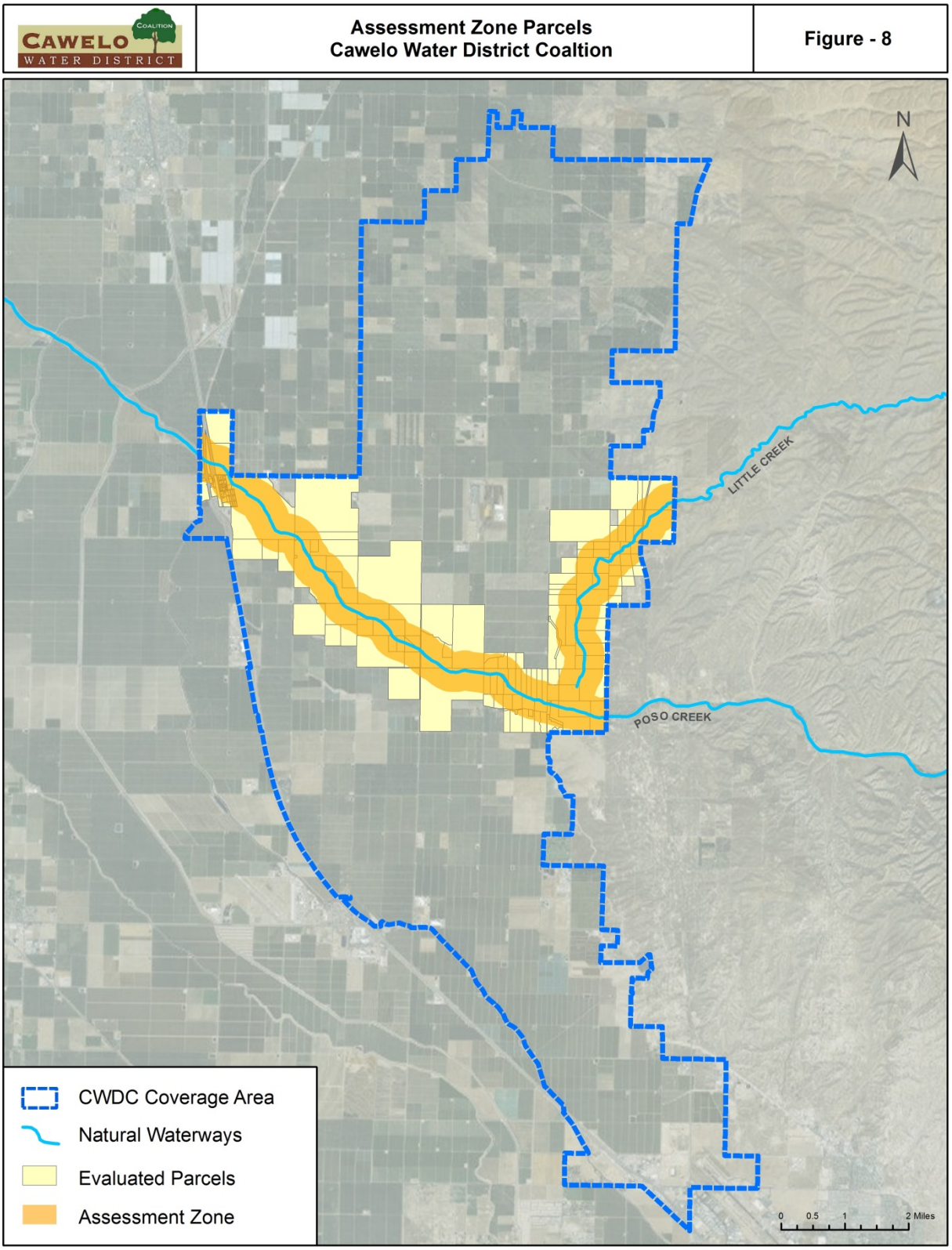

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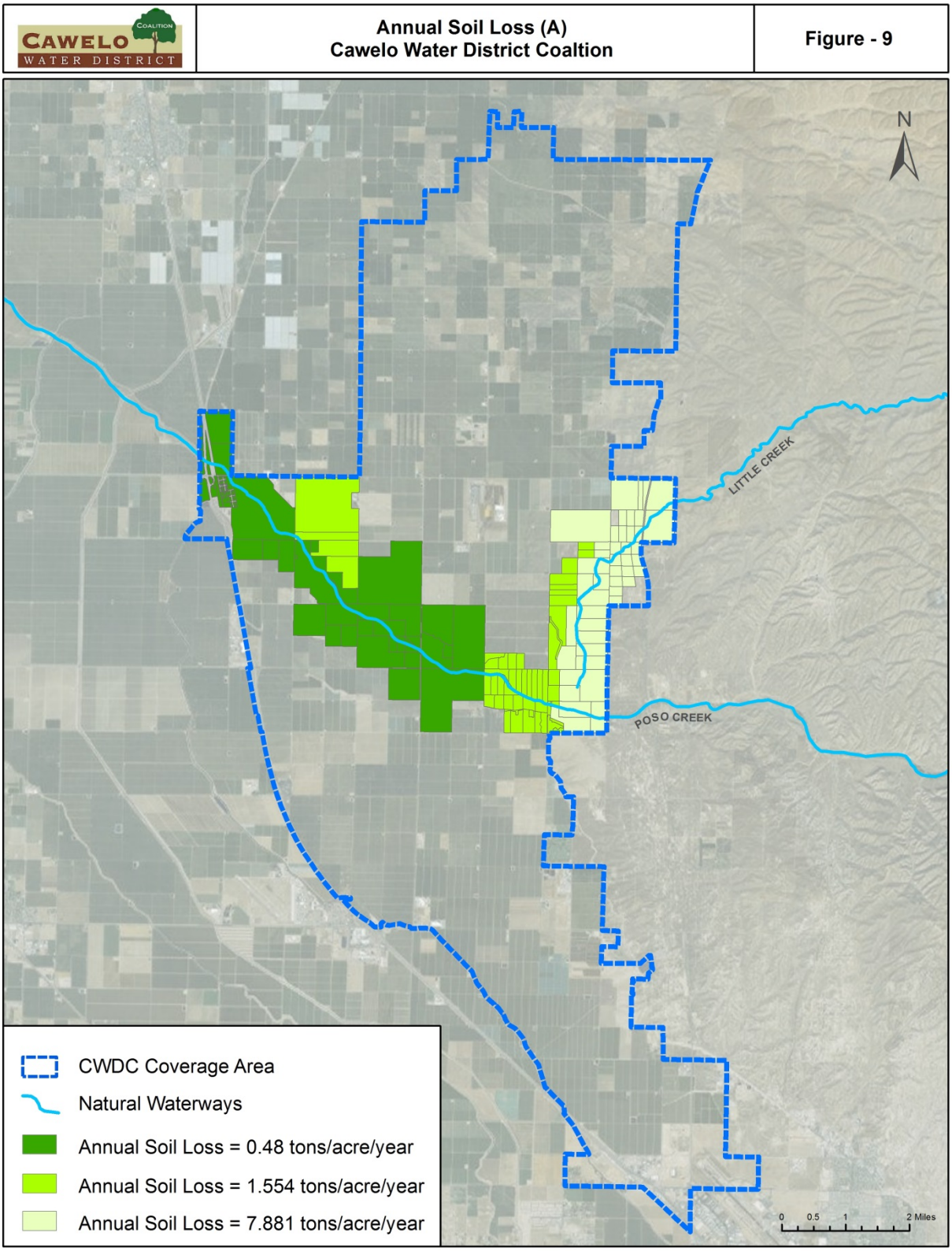
Figure 9 – Annual Soil Loss



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8. References

DWR, 2003, Department of Water Resources, Groundwater Basins in California, DWR Bulletin 118, Update 2003, Sacramento, CA

EPA, 2003, United States Environmental Protection Agency, National Management Measures to Control Nonpoint Source of Pollution from Agriculture, EPA 841-B-03-004

SWRCB, 2010, State Water Resources Control Board, Construction General Permit, Risk Assessment Map Reference, K Factor Map

USDA, 1991, United States Department of Agriculture Natural Resources Soil Conservation Service, Guides for Erosion and Sediment Control in California, Davis, CA

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Appendix A

NRCS Soil Survey, Map Unit Descriptions

The map unit descriptions below were obtained from the Soil Survey of Kern County, California Northwestern Part document (CA666) for the Cawelo Water District Coalition area. Where noted, certain map unit descriptions were obtained from the Soil Survey of Kern County, Northeastern Part, and Southeastern Part of Tulare County, California document (CA668).

128[ne]-Capay silty clay, 2 to 9 percent slopes. This deep, moderately well drained soil is on alluvial plains and in narrow mountain valleys. It formed in alluvium derived dominantly from shale. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 1,400 to 2,100 feet. The average annual precipitation is about 10 inches, the average annual temperature is about 60 degrees F, and the average frost-free season is 200 to 240 days. Typically, the surface layer is very dark grayish brown silty clay about 23 inches thick. The underlying material to a depth of 64 inches is dark brown and brown silty clay. In some areas the surface layer is clay loam or clay. Included in this unit are small areas of Nacimiento silty clay loam and Aido clay. Included areas make up about10 percent of the total acreage. Permeability of this Capay soil is slow. Available water capacity is high. Runoff is medium, and the hazard of water erosion is slight. Effective rooting depth is 60 inches or more. Most areas of this unit are used for dryfarmed grain. This unit is poorly suited to dryfarmed grain. It is limited mainly by low rainfall and the fine texture of the soil. Use of a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases water infiltration. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Because precipitation is not sufficient for annual cropping, a cropping system of grain, fallow, and then volunteer pasture is most suitable. Plants that tolerate drought are best suited because the available moisture is not adequate for good growth of most other plants.

130-Chanac clay loam, 2 to 9 percent slopes. This deep, well drained soil is on older alluvial fans and terraces. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 575 to 900 feet. The average annual precipitation is about 9 inches, the average annual temperature is about 64 degrees F, and the average frost-free season is 225 to 275 days. Typically, the surface layer is brown clay loam about 18 inches thick. The subsoil is brown sandy clay loam and sandy loam about 28 inches thick. The substratum to a depth of 60 inches or more is light brown sandy loam. In some areas the surface layer is loam or sandy loam. Included in this unit are small areas of Zerker loam and soils that are similar to this Chanac soil but do not have a subsoil. Included areas make up about 20 percent of the total acreage. Permeability of this Chanac soil is moderately slow. Available water capacity is high. Runoff is medium, and the hazard of water erosion is moderate. Effective rooting depth is 60 inches or more. Most areas of this unit are used for irrigated crops, mainly almonds, lemons, oranges, and pistachios. Among the other crops grown are dryfarmed barley and wheat. Some areas are used for livestock grazing. This unit is suited to irrigated crops. It is limited mainly by undulating to rolling slopes and the moderate hazard of erosion. Use of a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases fertility and the water intake rate. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Erosion can be reduced by planting a close growing cover crop. Diversions and grassed waterways may be needed. Because of the slope, sprinkler or drip irrigation is most suitable for orchard crops. Use of these methods permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that ensures optimum production without increasing deep percolation, runoff, and erosion. This unit is suited to dryfarmed grain. The main limitations are low rainfall and the hazard of erosion. Because precipitation is not sufficient for annual cropping, a cropping system of grain, fallow, and then volunteer pasture is most suitable. All tillage should be on the contour or across the slope to reduce the hazard of erosion. This unit is well suited to livestock grazing. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases; therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community. Proper grazing use increases the water intake rate, promotes plant growth early in the season, and protects the soil from erosion.

131-Chanac clay loam, 9 to 15 percent slopes. This deep, well drained soil is on older alluvial fans and terraces. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 575 to 1,000 feet. The average annual precipitation is about 9 inches, the average annual temperature is about 64 degrees F, and the average frost-free season is 225 to 275 days. Typically, the surface layer is brown clay loam about 18 inches thick. The subsoil is brown sandy clay loam and sandy loam about 28 inches thick. The substratum to a depth of 60 inches or more is light brown sandy loam. In some areas the surface layer is loam or sandy loam. Included in this unit are small areas of Delano Variant clay loam, Cuyama loam, and soils that are similar to this Chanac soil but do not have a subsoil. Included areas make up about 15 percent of the total acreage. Permeability of this Chanac soil is moderately slow. Available water capacity is high. Runoff is medium, and the hazard of water erosion is moderate. Effective rooting depth is 60 inches or more. Most areas of this unit are used for irrigated crops, mainly almonds, lemons, oranges, and pistachios. Among the other crops grown are dryfarmed barley and wheat. Some areas are used for livestock grazing. This unit is suited to irrigated crops. It is limited by the strongly sloping and rolling slopes and the moderate hazard of erosion. Use of a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases fertility and the water intake rate. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Erosion can be reduced by planting a close growing cover crop. Diversions and grassed waterways may be needed. Because of the slope, sprinkler or drip irrigation is most suitable for orchard crops. Use of these methods permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that ensures optimum production without increasing deep percolation, runoff, and erosion. This unit is suited to dryfarmed grain. The main limitations are low rainfall and the moderate hazard of erosion. Because precipitation is not sufficient for annual cropping, a cropping system of grain, fallow, and then volunteer pasture is most suitable. All tillage should be done on the contour or across the slope to reduce the hazard of erosion. This unit is well suited to livestock grazing. If the range is overgrazed, the proportion of preferred

forage plants decreases and the proportion of less preferred forage plants increases; therefore, livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Proper grazing use increases the water intake rate, promotes plant growth early in the season, and protects the soil from erosion. Uniform distribution of grazing can be achieved by the proper placement of salt and livestock watering facilities. This map unit is in capability unit IVe-1 (17), irrigated and nonirrigated. Uniform distribution of grazing can be achieved by the proper placement of salt and livestock watering facilities.
This map unit is in capability units IIIe-1 (17), irrigated, and IVe-1, nonirrigated.

132-Chanac clay loam, 15 to 30 percent slopes. This deep, well drained soil is on alluvial fans and terraces. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 575 to 1,000 feet. The average annual precipitation is about 9 inches, the average annual temperature is about 64 degrees F, and the average frost-free season is 225 to 275 days. Typically, the surface layer is brown clay loam about 18 inches thick. The subsoil is brown sandy clay loam and sandy loam about 28 inches thick. The substratum to a depth of 60 inches or more is light brown sandy loam. In some areas the surface layer is loam or sandy loam. Included in this unit are small areas of Delano Variant clay loam, Cuyama loam, and soils that are similar to this Chanac soil but do not have a subsoil. Included areas make up about 15 percent of the total acreage. Permeability of this Chanac soil is moderately slow. Available water capacity is high. Runoff is rapid, and the hazard of water erosion is moderate. Effective rooting depth is 60 inches or more. Most areas of this unit are used for irrigated crops, mainly almonds, lemons, oranges, and pistachios. Among the other crops grown are dryfarmed barley and wheat. Some areas are used for livestock grazing. This unit is suited to irrigated crops. It is limited mainly by the moderately steep and hilly slopes and the moderate hazard of erosion. Use of a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases fertility and the water intake rate. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Erosion can be reduced by planting a close growing cover crop. Diversions and grassed waterways may be needed. Because of the slope, sprinkler or drip irrigation is most suitable for orchard crops. Use of these methods permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that ensures optimum production without increasing deep percolation, runoff, and erosion. If this unit is used for dryfarmed grain, the main limitations are low rainfall and the moderate hazard of erosion. Because precipitation is not sufficient for annual cropping, a cropping system of grain, fallow, and then volunteer pasture is most suitable. This unit is suited to livestock grazing. Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Cross-fencing and correctly placing livestock watering facilities help to distribute livestock grazing and to reduce overgrazing of the lower slopes. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If the plant cover is overgrazed, the soil becomes more susceptible to erosion. Proper grazing use improves water infiltration, promotes plant growth early in the season, and protects the soil from erosion. Livestock grazing should be managed to protect the soil from erosion. This map unit is in capability unit IVe-1 (17), irrigated and nonirrigated.

138-Delano sandy loam, 0 to 2 percent slopes. This deep, well drained soil is on alluvial plains and terraces. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 300 to 700 feet. The average annual precipitation is about 7 inches, the average annual temperature is about 64 degrees F, and the average frost-free period is 260 to 290 days. Typically, the surface layer is brown and pale brown sandy loam about 11 inches thick. The subsoil is light brown clay loam and sandy clay loam about 31 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown sandy loam. In some areas the surface layer is loam. Included in this unit are small areas of Cuyama loam, Exeter sandy loam, Wasco sandy loam, Kimberlina fine sandy loam, and Zerker sandy clay loam. Included areas make up about 15 percent of the total acreage. Permeability of this Delano soil is moderately slow. Available water capacity is high. Runoff is slow, and the hazard of water erosion is slight. Effective rooting depth is 60 inches or more. This unit is used mainly for irrigated crops such as alfalfa, cotton, grapes, and oranges. It is also used for urban development. This unit is suited to irrigated row and orchard crops. It has few limitations. Use of a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases fertility and the water intake rate. Furrow, border, drip, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. For the efficient application and removal of irrigation water, leveling is needed in sloping areas. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. If this unit is used for urban development, the main limitation is rare periods of flooding. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Septic tank absorption fields do not function properly during rainy periods because of wetness and the moderately slow permeability. The limitation of moderately slow permeability can be overcome by increasing the size of the absorption field. This map unit is in capability class I (17), irrigated, and capability subclass VIc, nonirrigated.

139-Delano sandy loam, 2 to 5 percent slopes. This deep, well drained soil is on alluvial plains and terraces. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 300 to 700 feet. The average annual precipitation is about 7 inches, the average annual temperature is about 64 degrees F, and the average frost-free season is 260 to 290 days. Typically, the surface layer is brown and pale brown sandy loam about 11 inches thick. The subsoil is light brown clay loam and sandy clay loam about 31 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown sandy loam. In some areas the surface layer is loam. Included in this unit are small areas of Cuyama loam, Zerker loam, and Premier coarse sandy loam. Included areas make up about 10 percent of the total acreage. Permeability of this Delano soil is moderately slow. Available water capacity is moderate or high. Runoff is medium, and the hazard of water erosion is moderate. Effective rooting depth is 60 inches or more. This unit is used mainly for irrigated crops such as alfalfa, almonds, cotton, and oranges. Other crops grown are

barley, olives, and pistachios. The unit is also used for urban development. This unit is suited to irrigated row and orchard crops. It has few limitations. Use of a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases fertility and the water intake rate. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. For the efficient application and removal of irrigation water, leveling is needed in sloping areas. Furrow, border, drip, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown. If furrow irrigation systems are used, runs should be on the contour or across the slope. Irrigation water needs to be applied at a rate that ensures optimum production without increasing deep percolation, runoff, and erosion. If this unit is used for urban development, the main limitation is rare periods of flooding. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Septic tank absorption fields do not function properly during rainy periods because of wetness and the moderately slow permeability. The limitation of moderately slow permeability can be overcome by increasing the size of the absorption field. This map unit is in capability unit lle-1 (17), irrigated, and capability subclass VIe, nonirrigated.

140-Delano sandy loam, 5 to 9 percent slopes. This deep, well drained soil is on alluvial plains and terraces. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 300 to 700 feet. The average annual precipitation is about 7 inches, the average annual temperature is about 64 degrees F, and the average frost-free season is 260 to 290 days. Typically, the surface layer is brown and pale brown sandy loam about 11 inches thick. The subsoil is light brown clay loam and sandy clay loam about 31 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown sandy loam. In some areas the surface layer is loam. Included in this unit are small areas of Cuyama loam, Zerker loam, and Premier coarse sandy loam. Included areas make up about 15 percent of the total acreage. Permeability of the Delano soil is moderately slow. Available water capacity is moderate or high. Runoff is medium, and the hazard of water erosion is moderate. Effective rooting depth is 60 inches or more. This unit is used mainly for irrigated crops such as alfalfa, almonds, cotton, and oranges. Other crops grown are barley, olives, and pistachios. This unit is suited to irrigated row and orchard crops. It is limited mainly by moderate slopes and the moderate hazard of erosion. Use of a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases fertility and the water intake rate. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Erosion can be reduced by planting a close growing cover crop. Because of the slope, sprinkler or drip irrigation is most suitable. Use of these methods permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that ensures optimum production without increasing deep percolation, runoff, and erosion. This map unit is in capability unit lle-1 (17), irrigated, and capability subclass VIe, nonirrigated.

145-Drlver coarse sandy loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 400 to 525 feet. The average annual precipitation is about 7 inches, the average annual temperature is about 64 degrees F, and the average frost-free season is 250 to 300 days. Typically, the surface layer is yellowish brown coarse sandy loam about 16 inches thick. The subsoil is yellowish brown loam about 11 inches thick. The upper 10 inches of the substratum is brown, weakly cemented coarse sandy loam, and the lower part to a depth of 65 inches is yellowish brown and pale brown, stratified loam and loamy coarse sand. In some areas the surface layer is sandy loam. Included in this unit are small areas of Lewkalb sandy loam and Wasco sandy loam. Also included are small areas of soils that have a strongly cemented pan below a depth of 20 inches or a brittle layer below a depth of 40 inches. Included areas make up about 15 percent of the total acreage. Permeability of the Driver soil is moderately slow in the subsoil and slow in the weakly cemented substratum. Available water capacity is moderate or high. Runoff is very slow, and the hazard of water erosion is slight. Effective rooting depth is 60 inches or more, but it is somewhat restricted by the weakly cemented substratum. This unit is used for irrigated crops, mainly cotton and alfalfa. This unit is suited to irrigated crops. Ripping and shattering the weakly cemented layer improves internal drainage and eases root penetration. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Using a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases fertility and the water intake rate. Furrow, border, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown. Irrigation water needs to be applied at a rate that ensures optimum production without increasing deep percolation, runoff, and erosion. This map unit is in capability unit lls-8 (17), irrigated, and capability subclass VIIs, nonirrigated.

146—Delano sandy loam, 1 to 5 percent slopes (CA668)

Map unit setting
General location: The east side of the southern part of the San Joaquin Valley
MLRA: 17—Sacramento and San Joaquin Valleys
Landscape: Valleys
Elevation: 495 to 695 feet (152 to 213 meters)
Mean annual precipitation: 7 to 9 inches (178 to 229 millimeters)
Mean annual air temperature: 64 to 66 degrees F (18 to 19 degrees C)
Frost-free period: 260 to 290 days

Map unit composition
Delano—80 percent
Minor components—20 percent

Characteristics of Delano and similar soils
Slope: 0 to 2 percent
Landform: Fan remnants
Parent material: Alluvium derived from granitoid rocks
Typical vegetation: Irrigated crops and, in a few nonirrigated areas, annual grasses, forbs, and shrubs
Percentage of the surface covered by rock fragments: 0 to 10 percent by coarse, subangular gravel
Restrictive feature: None noted
Available water capacity to a depth of 60 inches: About 7.9 inches (high)

Hydrologic properties
Present annual flooding: Rare Present annual ponding: None
Surface runoff class: Low Current water table: None noted
Natural drainage class: Well drained
Hydrologic soil group: B

Land capability classification
Irrigated areas: 2e-1
Nonirrigated areas: 6e

Typical profile
A—0 to 18 inches; sandy loam
Btk1—18 to 37 inches; sandy clay loam
Btk2—37 to 60 inches; sandy loam

Minor components

Hesperia and similar soils
Extent: About 7 percent of the map unit
Slope: 0 to 2 percent
Landform: Inset fans

Pleito and similar soils
Extent: About 5 percent of the map unit
Slope: 0 to 3 percent
Landform: Fan remnants

Arents, loamy, and similar soils Extent: About 3 percent of the map unit Slope: 1 to 3 percent
Landform: Alluvial fans

Calicreek and similar soils
Extent: About 2 percent of the map unit
Slope: 0 to 2 percent
Landform: Flood plains

Oil waste land
Extent: About 1 percent of the map unit
Slope: 1 to 3 percent
Landform: Alluvial fans and depressions

Riverwash
Extent: About 1 percent of the map unit
Slope: 0 to 1 percent
Landform: Drainageways

Urban land
Extent: About 1 percent of the map unit
Slope: 0 to 1 percent
Landform: Alluvial fans

146[ne]-Elkhills sandy loam, 9 to 50 percent slopes, eroded. This deep, well drained soil is primarily on uplifted, dissected old areas of valley fill. It formed in alluvium derived dominantly from sedimentary and granitic rock. The vegetation in areas not cultivated is mainly annual grasses, forbs, and scattered shrubs. Elevation is 600 to 1,800 feet. The average annual precipitation is about 7 inches, the average annual temperature is about 63 degrees F, and the average frost-free season is about 240 to 300 days. Typically, the surface layer is pale brown sandy loam about 7 inches thick. The subsurface layer is light yellowish brown fine sandy loam about 22 inches thick. The upper 20 inches of the underlying material is very pale brown coarse sandy loam, and the lower part to a depth of 65 inches or more is light gray, stratified gravelly coarse sand, sand, and loamy sand. In some areas the surface layer is loam or gravelly sandy loam. Included in this unit are small areas of Torriorthents; stratified, very sandy soils; and soils that have loam or clay loam in the underlying

material. Included areas make up about 20 percent of the total acreage. Each included area is less than 15 percent of the total inclusions. Permeability of this Elkhills soil is moderately rapid. Available water capacity is moderate or high. Runoff is medium, and the hazard of water erosion is moderate. Effective rooting depth is 60 inches or more. Road building, petroleum construction activities, and past sheep grazing have disturbed the vegetation and surface layer in parts of this unit. These activities have exposed highly erodible soil material and increased the rate of erosion. Recently eroded soil material has accumulated in drainageways. In some areas erosion is more extensive on south-facing slopes. A few areas of this unit are used for livestock grazing. Oil wells are common on the unit. This unit is suited to livestock grazing. The production of forage is limited by low rainfall and steepness of slope. If the plant cover is overgrazed, the soil becomes more susceptible to soil erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce forage. Reestablishment of vegetation may be difficult if erosion has exposed material that is high in content of salt. Cross-fencing and correctly placing livestock watering facilities help to distribute livestock grazing and to reduce overgrazing of the lower slopes. This unit is limited for livestock watering ponds and other water impoundments because of the moderately rapid permeability of the soil. This map unit is in capability subclass *VIIe* (17), nonirrigated.

154-Exeter sandy loam, 0 to 2 percent slopes. This moderately deep, well drained soil is on alluvial terraces. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 300 to 600 feet. The average annual precipitation is about 8 inches, the average annual temperature is about 63 degrees F, and the average frost-free season is 250 to 300 days. Typically, the surface layer is pale brown sandy loam about 17 inches thick. The subsoil is brown loam about 7 inches thick. The next layer is a strongly lime- and silica-cemented layer about 14 inches thick. Stratified layers are below the pan. In some areas the surface layer is loam. Included in this unit are small areas of Delano sandy loam and Zerker loam. Included areas make up about 15 percent of the total acreage. Permeability of this Exeter soil is moderate. Available water capacity is very low to moderate. Runoff is slow, and the hazard of water erosion is slight. Effective rooting depth is 20 to 40 inches. Most areas of this unit are used for irrigated crops, mainly cotton, almonds, grapes, and oranges. Among the other crops grown are barley, alfalfa, and figs. This unit is suited to irrigated row and orchard crops. It is limited mainly by the moderate depth to the cemented layer. Use of a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases fertility and the water intake rate. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Ripping and shattering the cemented layer increases the effective rooting depth and improves internal drainage. Furrow, border, drip, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown. Irrigation water needs to be applied at a rate that ensures optimum production without increasing deep percolation, runoff, and erosion. This map unit is in capability units IIIs-8 (17), irrigated, and IVs-8, nonirrigated.

174-Kimberllna fine sandy loam, 0 to 2 percent slopes. This deep, well drained soil is on alluvial fans and plains. It formed in alluvium derived dominantly from granitic and sedimentary rock. The vegetation in areas not cultivated is mainly annual grasses and forbs with few scattered shrubs. Elevation is 250 to 1,000 feet. The average annual precipitation is about 6 inches, the average annual temperature is about 64 degrees F, and the average frost-free season is 250 to 300 days. Typically, the surface layer is brown fine sandy loam about 9 inches thick. The upper 36 inches of the underlying material is pale brown fine sandy loam, and the lower part to a depth of 71 inches is pale brown silt loam. In some areas the surface layer is sandy loam or coarse sandy loam. Included in this unit are small areas of Wasco sandy loam, Milham sandy loam, and Cajon loamy sand. Also included are small areas of soils that are similar to this Kimberlina soil but have a sandy clay loam surface layer. Included areas make up about 15 percent of the total acreage. Permeability of this Kimberlina soil is moderate. Available water capacity is high. Runoff is slow, and the hazard of water erosion is slight. Effective rooting depth is 60 inches or more. Most areas of this unit are used for irrigated crops, mainly almonds, alfalfa, cotton, and grapes. Among the other crops grown are potatoes, sugar beets, pistachios, and onions. Some areas are used for irrigated pasture, limited livestock grazing, and urban development. This unit is suited to irrigated crops. It has few limitations. Furrow, border, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Use of a cropping system that includes crop rotation, growing a cover crop, return of crop residue, and proper tillage improves soil tilth and increases fertility and the water intake rate. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. This unit is suited to hay and pasture. It has few limitations. Border and sprinkler irrigation systems are suited to this unit. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Proper grazing practices, weed control, and fertilizer are needed to ensure maximum quality of forage. If this unit is used for urban development, the main limitation is rare periods of flooding. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding.
This map unit is in capability class **I** (17), irrigated, and capability subclass VIIe, nonirrigated.

175-Kimberllna sandy loam, 2 to 5 percent slopes. This deep, well drained soil is on alluvial fans and plains. It formed in alluvium derived dominantly from granitic and sedimentary rock. The vegetation in most areas not cultivated is mainly annual grasses and forbs with scattered shrubs. Elevation is 250 to 1,000 feet. The average annual precipitation is about 6 inches, the average annual temperature is about 64 degrees F, and the average frost-free season is 250 to 300 days. Typically, the surface layer is brown sandy loam about 9 inches thick. The upper 36 inches of the underlying material is pale brown fine sandy loam, and the lower part to a depth of 71 inches is pale brown silt loam. In some areas the surface layer is fine sandy loam or coarse sandy loam. Included in this unit are small areas of Wasco sandy loam, Milham sandy loam, and Panache clay loam. Included areas make up about 15 percent of the total acreage.

Permeability of this Kimberlina soil is moderate. Available water capacity is high. Runoff is slow, and the hazard of water erosion is moderate. Effective rooting depth is 60 inches or more. This unit is used mainly for livestock grazing. It is also used for irrigated crops, urban development, and recreation. This unit is suited to irrigated crops. It has few limitations. Furrow, border, drip, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. For the efficient application and removal of irrigation water, leveling is needed in sloping areas. Salt tolerant crops should be grown while the soil is being reclaimed. Some areas are slightly saline-alkali in the native state. Use of a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases fertility and the water intake rate. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Erosion can be reduced by planting a close growing cover crop. This unit is suited to livestock grazing. The production of forage is limited by low rainfall. If the plant cover is overgrazed, the soil becomes more susceptible to erosion. Proper grazing use increases the water intake rate, promotes plant growth early in the season, and protects the soil from erosion. Uniform distribution of grazing can be achieved by the proper placement of salt and livestock watering facilities. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. This unit is suited to recreation. It has few limitations for this use. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Areas used for recreation can be protected from erosion by maintaining plant cover. If this unit is used for urban development, it has few limitations. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems. This map unit is in capability unit IIe-1 (17), irrigated, and capability subclass VIIe, nonirrigated.

184-Lewkalb sandy loam, 0 to 2 percent slopes. This deep, well drained soil is on low terraces. It formed in alluvium derived dominantly from granitic rock. The native vegetation is mainly annual grasses and forbs. Elevation is 300 to 600 feet. The average annual precipitation is about 6 inches, the average annual temperature is about 64 degrees F, and the average frost-free season is 250 to 300 days.

Typically, the surface layer is light brownish gray and pale brown sandy loam about 23 inches thick. The upper 17 inches of the underlying material is weakly silica- cemented light gray sandy loam, and the lower part to a depth of 65 inches is light gray loamy sand. In some areas the surface layer is gravelly sandy loam or loam. Included in this unit are small areas of Wasco sandy loam and soils that have a weakly silica-cemented layer below a depth of 48 inches. Included areas make up about 15 percent of the total acreage. Permeability of this Lewkalb soil is moderately rapid in the surface layer and slow in the underlying cemented layer. Available water capacity is moderate. Runoff is very slow, and the hazard of water erosion is slight. Effective rooting depth is 60 inches or more but is somewhat limited by the weakly silica-cemented layer. This unit is used for irrigated crops, mainly cotton, potatoes, and alfalfa. This unit is suited to irrigated row crops. It is limited mainly by the weakly silica-cemented layer. Use of a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases fertility and the water intake rate. Ripping and shattering the weakly cemented layer improve drainage. Furrow, border, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown. Irrigation water needs to be applied at a rate that ensures optimum production without increasing deep percolation, runoff, and erosion. This map unit is in capability unit IIs-8 (17), irrigated, and capability subclass VIIs, nonirrigated.

192-McFarland loam. This deep, well drained soil is on alluvial fans and flood plains. It formed in alluvium derived dominantly from granitic rock. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 285 to 400 feet. The average annual precipitation is about 6 inches, the average annual temperature is about 64 degrees F, and the average frost-free period is 250 to 275 days. Typically, the surface layer is grayish brown and brown loam about 24 inches thick. The upper 31 inches of the underlying material is pale brown and brown loam, and the lower part to a depth of 64 inches or more is light gray loam. In some areas the surface layer is clay loam and the lower part of the underlying material is fine sandy loam or sandy loam. Included in this unit are small areas of Wasco sandy loam, Kimberlina fine sandy loam, and Panoche clay loam. Included areas make up about 15 percent of the total acreage. Permeability of this McFarland soil is moderate. Available water capacity is high. Runoff is slow, and the hazard of water erosion is slight. Effective rooting depth is 60 inches or more. Most areas of this unit are used for irrigated crops, mainly alfalfa, cotton, and grapes. Among the other crops grown are milo, walnuts, and roses. Some areas are used for homesite developments. This unit is suited to irrigated crops. It has few limitations. Use of a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases fertility and the water intake rate. Maintaining crop residue on or near the surface reduces runoff and helps to maintain soil tilth and organic matter content. Furrow, border, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. If this unit is used for homesite development, the main limitation is rare periods of flooding. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems. This map unit is in capability class I (17), irrigated, and capability subclass VIIe, nonirrigated.

200—Urban land-Delano complex, 0 to 2 percent slopes (CA668)

Map unit setting

General location: The east side of the southern part of the San Joaquin Valley
MLRA: 17—Sacramento and San Joaquin Valleys

Landscape: Valleys
Elevation: 495 to 695 feet (152 to 213 meters)
Mean annual precipitation: 7 to 9 inches (178 to 229 millimeters)
Mean annual air temperature: 64 to 66 degrees F (18 to 19 degrees C)
Frost-free period: 260 to 300 days

Map unit composition
Urban land—60 percent
Delano—25 percent
Minor components—15 percent

Characteristics of Urban land
Slope: 0 to 1 percent
Landform: Alluvial fans and fan remnants Typical vegetation: None
assigned Hydrologic properties
Surface runoff class: Very high
Hydrologic soil group: D
Land capability classification
Nonirrigated areas: 8

Characteristics of Delano and similar soils
Slope: 0 to 2 percent
Landform: Fan remnants
Parent material: Alluvium derived from granitoid rocks
Typical vegetation: Irrigated crops and, in a few nonirrigated areas, annual grasses, forbs, and shrubs
Percentage of the surface covered by rock fragments: 0 to 10 percent by coarse, subangular gravel
Restrictive feature: None noted
Available

Hydrologic properties
Present annual flooding: Rare Present annual ponding: None
Surface runoff class: Low Current water table: None noted
Natural drainage class: Well drained
Hydrologic soil group: B

Land capability classification
Irrigated areas: 2e-1
Nonirrigated areas: 6e

Typical profile
A—0 to 18 inches; sandy loam
Btk1—18 to 37 inches; sandy clay loam
Btk2—37 to 60 inches; sandy loam

Minor components

Arents, loamy, and similar soils Extent: About 9 percent
of the map unit Slope: 1 to 3 percent
Landform: Fan remnants

Hesperia and similar soils
Extent: About 5 percent of the map unit
Slope: 0 to 2 percent
Landform: Inset fans

Oil waste land
Extent: About 1 percent of the map unit
Slope: 1 to 3 percent
Landform: Fan remnants

200[ne]-MIIlsholm Variant-Montara complex, 15 to 30 percent slopes. This map unit is on hills and mountains. The present vegetation in most areas is mainly annual grasses, forbs, and shrubs. Elevation is 1,500 to 2,800 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free season is about 200 to 250 days. This unit is 45 percent Millsholm Variant sandy loam and 40 percent Montara clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used. Included in this unit are small areas of Nacimiento silty clay loam and Ayar silty clay. Included areas make up about 15 percent of the total acreage. The Millsholm Variant soil is shallow and well drained. It formed in residuum derived dominantly from sandstone or shale. Typically, the surface layer is light brownish gray sandy loam about 5

inches thick. The subsoil is pale brown sandy loam about 6 inches thick. Fractured shale is at a depth of 11 inches. The soil is about 5 to 15 percent gravel. In some areas the surface layer is loam or clay loam. Permeability of the Millsholm Variant soil is moderate. Available water capacity is very low. Runoff is rapid, and the hazard of water erosion is moderate. Effective rooting depth is 10 to 20 inches. The Montara soil is shallow and well drained. It formed in residuum derived dominantly from serpentine. Typically, the soil is gray and grayish brown clay loam about 14 inches thick over serpentine. Permeability of the Montara soil is moderately slow. Available water capacity is very low or low. Runoff is rapid, and the hazard of water erosion is moderate. Effective rooting depth is 10 to 20 inches. This unit is used for livestock grazing. This unit is poorly suited to livestock grazing. The production of forage on the Millsholm Variant soil is limited by the very low available water capacity and shallow depth to bedrock. Production on the Montara soil is limited by a calcium to magnesium imbalance and the restricted available water capacity. This unit supports sparse stands of plants that are suitable for grazing. The herbaceous plant cover readily deteriorates if it is overgrazed. Proper grazing use increases the water intake rate, promotes plant growth early in the season, and protects the soil from erosion. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. This map unit is in capability subclass VIIe (15), nonirrigated.

222-Premler coarse sandy loam, 2 to 5 percent slopes. This deep, well drained soil is on terraces. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 500 to 650 feet. The average annual precipitation is about 8 inches, the average annual temperature is about 63 degrees F, and the average frost-free season is 250 to 300 days. Typically, the surface layer is grayish brown and pale brown coarse sandy loam about 2 inches thick. The underlying material to a depth of 60 inches or more is light yellowish brown and brown coarse sandy loam. In some areas the surface layer is sandy loam or loam. Included in this unit are small areas of Delano sandy loam and Zerker loam. Included areas make up about 5 percent of the total acreage. Permeability of this Premier soil is moderately rapid. Available water capacity is moderate. Runoff is slow, and the hazard of water erosion is slight. Effective rooting depth is 60 inches or more. Most areas of this unit are used for livestock grazing. Oil wells are common on this unit. A few areas are used for irrigated crops such as citrus fruit, almonds, and cotton and for homesite development. This unit is suited to irrigated row and orchard crops. It is limited mainly by undulating slopes. Use of a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases the fertility and water intake rate. Growing a cover crop in nontilled areas increases the water intake rate and reduces runoff and erosion. Because of the slope, sprinkler or drip irrigation is best suited to this unit. Irrigation water needs to be applied at a rate that ensures optimum production without increasing deep percolation, runoff, and erosion. This unit is suited to livestock grazing. It has no major limitations. Proper grazing use increases the water intake rate, promotes plant growth early in the season, and protects the soil from erosion. Correct placement of salt and supplemental feed helps to distribute livestock grazing and prevent overgrazing. This unit is limited for livestock watering ponds and other water impoundments because of the moderately rapid permeability of the soil. If this unit is used for homesite development, it has few limitations. Preserving the existing plant cover during construction helps to control erosion. Plant cover can be established and maintained through proper fertilizing, seeding, mulching, and shaping of the slopes. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees. This map unit is in capability units IIe-(17), irrigated, and IVe-1, nonirrigated.

223-Premler coarse sandy loam, 5 to 9 percent slopes. This deep, well drained soil is on terraces. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 500 to 700 feet. The average annual precipitation is about 8 inches, the average annual temperature is about 63 degrees F, and the average frost-free season is 250 to 300 days. Typically, the surface layer is grayish brown and pale brown coarse sandy loam about 2 inches thick. The underlying material to a depth of 60 inches or more is light yellowish brown and brown coarse sandy loam. In some areas the surface layer is sandy loam or loam. Included in this unit are small areas of Delano sandy loam and Zerker loam. Included areas make up about 15 percent of the total acreage. Permeability of this Premier soil is moderately rapid. Available water capacity is moderate. Runoff is medium, and the hazard of water erosion is moderate. Effective rooting depth is 60 inches or more. Most areas of this unit are used for livestock grazing. A few areas are used for irrigated crops such as almonds or citrus fruit. Oil wells are common on this unit. This unit is suited to orchard crops. It is limited mainly by gently rolling slopes. Use of a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases the fertility and water intake rate. Growing a cover crop in nontilled areas increases water infiltration and reduces runoff and erosion. Because of the slope, sprinkler or drip irrigation is best suited to this unit. Irrigation water needs to be applied at a rate that ensures optimum production without increasing deep percolation, runoff, and erosion. This unit is suited to livestock grazing. It has no major limitations. Proper grazing use increases the water intake rate, promotes plant growth early in the season, and protects the soil from erosion. Correct placement of salt and supplemental feed helps to distribute livestock grazing and prevent overgrazing. This unit is limited for livestock watering ponds and other water impoundments because of the seepage potential. If this unit is used for homesite development, it has few limitations. Excavation for roads and buildings increases the hazard of erosion. Revegetating disturbed areas around construction sites as soon as possible helps to control erosion. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees. The map unit is in capability units IIIe-1 (17), irrigated, and IVe-1, nonirrigated.

224-Premler coarse sandy loam, 9 to 15 percent slopes. This deep, well drained soil is on terraces. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 600 to 700 feet. The average annual precipitation is about 8 inches, the average annual temperature is about 62 degrees F, and the average frost-free season is 250 to 300 days. Typically, the surface layer is grayish brown and pale brown coarse sandy loam about 12 inches thick. The underlying material to a depth of 60 inches or more is light yellowish brown and brown coarse sandy loam. In some areas the surface layer is sandy loam or loam. Included in this unit are small

areas of Delano sandy loam and Zerker loam. Included areas make up about 15 percent of the total acreage. Permeability of this Premier soil is moderately rapid. Available water capacity is moderate. Runoff is medium, and the hazard of water erosion is moderate. Effective rooting depth is 60 inches or more. Most areas of this unit are used for livestock grazing. A few areas are used for irrigated crops such as almonds or oranges. Oil wells are common on this unit. This unit is suited to irrigated orchard crops. It is limited mainly by rolling slopes. Use of a cropping system that includes growing a cover crop, return of crop residue, and proper tillage is needed to improve soil tilth and to increase fertility and the water intake rate. Growing a cover crop in nontilled areas increases water infiltration and reduces runoff and erosion. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Because of the slope, sprinkler or drip irrigation is best suited to this unit. Irrigation water needs to be applied at a rate that ensures optimum production without increasing deep percolation, runoff, and erosion. This unit is suited to livestock grazing. It has no major limitations. Proper grazing use increases the water intake rate, promotes plant growth early in the season, and protects the soil from erosion. Correct placement of salt and supplemental feed helps to distribute livestock grazing and prevent overgrazing. This unit is limited for livestock watering ponds and other impoundments because of the moderately rapid permeability of the soil. This map unit is in capability unit IVe-1 (17), irrigated, and IVe-1, nonirrigated.

225-Premler-Durorthlds association, 9 to 15 percent slopes. This map unit is on alluvial terraces. The vegetation in areas not cultivated is mainly annual grasses and forbs with scattered shrubs. Elevation is 500 to 800 feet. The average annual precipitation is about 8 inches, the average annual temperature is about 62 degrees F, and the average frost-free season is about 250 to 300 days. This unit is about 60 percent Premier coarse sandy loam and about 30 percent Durorthids. The Premier soils are on side slopes, and the Durorthids are on ridgetops. Included in this unit are small areas of Delano sandy loam and a soil that is similar to this Premier soil but has a cemented layer at a shallow depth. Included areas make up about 10 percent of the total acreage. The Premier soil is deep and well drained. It formed in alluvium derived dominantly from granitic rock. Typically, the surface layer is grayish brown and pale brown coarse sandy loam about 12 inches thick. The underlying material to a depth of 60 inches or more is light yellowish brown and brown coarse sandy loam. In some areas the surface layer is sandy loam or loam. Permeability of the Premier soil is moderately rapid. Available water capacity is moderate. Runoff is slow, and the hazard of water erosion is moderate. Effective rooting depth is 60 inches or more. The Durorthids are moderately deep and well drained. They formed in alluvium derived dominantly from granitic rock. The surface layer is coarse sandy loam, sandy loam, and loam about 20 to 40 inches thick. The next layer is a lime- and silica-cemented layer about 18 to 40 inches thick. Below this to a depth of 60 inches or more is sandy loam or fine sandy loam. Gravel content throughout the profile is 0 to 15 percent. Permeability of the Durorthids is moderately rapid. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight. Effective rooting depth is 20 to 40 inches. Most areas of this unit are used for livestock grazing. A few areas are used for irrigated almonds and oranges orchards. Oil wells are common on this unit. This unit is suited to irrigated orchard crops. The Premier soil is limited mainly by rolling slopes. The Durorthids are limited mainly by shallow depth to a cemented layer, rolling slopes, and low available water capacity. Use of a cropping system that includes growing a cover crop, return of crop residue, and proper tillage is needed to improve soil tilth and to increase the fertility and water intake rate. Growing a cover crop in nontilled areas increases water infiltration and reduces runoff and erosion. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Ripping and shattering the cemented layer in the Durorthids increases the effective rooting depth and improves internal drainage. Because of the slope, sprinkler or drip irrigation is best suited to this unit. Irrigation water needs to be applied at a rate that ensures optimum production without increasing deep percolation, runoff, and erosion. This unit is suited to livestock grazing. It has no major limitations. If the plant cover is overgrazed, the unit becomes more susceptible to erosion. Proper grazing use increases the water intake rate, promotes plant growth early in the season, and protects the soil from erosion. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. This unit is limited for livestock watering ponds and other water impoundments because of the moderately rapid permeability of the soil. The Premier soil is in capability unit IVe-1 (17), irrigated, and IVe-1, nonirrigated. The Durorthids are in capability unit IVe-8 (17), irrigated, and IVe-8, nonirrigated.

229-Riverwash. Riverwash consists of areas of sand and gravel that are adjacent to or occur as islands within the Kern River and small intermittent streams. During periods when the water level is normal, parts of these areas are inundated. Under flood conditions, nearly all of these areas are flooded. At present, however, floods on the Kern River generally are controlled by a large dam. Riverwash supports little if any vegetation, but in places there are a few scattered annual grasses, forbs, and willows and some brushy plants. This unit has limited value for livestock grazing and has no value for farming. The unit has its greatest value as recreational sites and as a source of aggregate material for roadbuilding or general construction. This map unit is in capability subclass VIIIw (17).

243-Wasco sandy loam. This deep, well drained soil is on recent alluvial fans and flood plains. It formed in alluvium derived dominantly from granitic rock. Slope is 0 to 2 percent. Before this unit was cultivated, the vegetation was annual grasses, forbs, and scattered shrubs. Elevation is 250 to 500 feet. The average annual precipitation is about 6 inches, the average annual temperature is about 64 degrees F, and the average frost-free season is 250 to 300 days. Typically, the surface layer is brown and yellowish brown sandy loam about 15 inches thick. The underlying material to a depth of 60 inches or more is brown and pale brown sandy loam. In some areas the surface layer is fine sandy loam. Included in this unit are small areas of Kimberlina fine sandy loam, Milham sandy loam, Panache clay loam, and Lewkalb sandy loam. Included areas make up about 20 percent of the total acreage. Permeability of this Wasco soil is moderately rapid. Available water capacity is moderate. Runoff is slow, and the hazard of water erosion is slight. Effective rooting depth is 60 inches or more. Most areas of this unit are used for a wide variety of irrigated crops, mainly cotton, alfalfa, grapes, potatoes, onions, almonds, pistachios, sugar beets, walnuts, and blackeye beans. Some areas are used for specialty crops, ornamentals, and homesite development. This unit is suited to irrigated crops. It has few limitations. A cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases the fertility and water intake rate. Maintaining crop residue on or near the surface reduces runoff and helps to maintain soil tilth and organic

matter content. Furrow, border, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. If this unit Wasco soil is used for homesite development, the main limitation is rare periods of flooding. Flooding can be controlled only by use of major flood control structures. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems. This map unit is in capability unit IIs-4 (17), irrigated, and capability subclass VIIs, nonirrigated.

254-Zerker loam, 2 to 5 percent slopes. This deep, well drained soil is on terraces and alluvial fans. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly annual grasses, forbs, and scattered shrubs. Elevation is 475 to 550 feet. The average annual precipitation is about 8 inches, the average annual temperature is about 62 degrees F, and the average frost-free season is 250 to 300 days. Typically, the surface layer is dark yellowish brown and brown loam about 17 inches thick. The upper 11 inches of the underlying material is brownish yellow clay loam, and the lower part to a depth of 62 inches is yellowish brown and light yellowish brown sandy clay loam. In some areas the surface layer is sandy loam or sandy clay loam. Included in this unit are small areas of Delano sandy loam, Premier coarse sandy loam, and Lewkalb sandy loam. Included areas make up about 10 percent of the total acreage. Permeability of this Zerker soil is moderately slow. Available water capacity is high. Runoff is slow, and the hazard of water erosion is slight. Effective rooting depth is 60 inches or more. This unit is used mainly for irrigated orchard crops such as almonds and oranges. It is also used for dryfarmed grain. This unit is suited to irrigated crops. It has few limitations. A cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage improves soil tilth and increases the fertility and water intake rate. Maintaining crop residue on or near the surface reduces runoff and helps to maintain soil tilth and organic matter content. Furrow, border, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. This map unit is in capability unit IIe-1 (17), irrigated, and capability subclass VIe, nonirrigated.

255-Zerker loam, 5 to 9 percent slopes. This deep, well drained soil is on terraces and alluvial fans. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly annual grasses, forbs, and scattered shrubs. Elevation is 450 to 800feet. The average annual precipitation is about 8 inches, the average annual temperature is about 62 degrees F, and the average frost-free season is 250 to 300 days. Typically, the surface layer is dark yellowish brown and brown loam about 17 inches thick. The upper 11 inches of the underlying material is brownish yellow clay loam, and the lower part to a depth of 62 inches is yellowish brown and light yellowish brown sandy clay loam. In some areas the surface layer is sandy loam or sandy clay loam. Included in this unit are small areas of Delano sandy loam, Premier coarse sandy loam, and Lewkalb sandy loam. Also included are small areas of a soil that is similar to this Zerker soil but has a subsoil below a depth of 60 inches. Included areas make up about 15 percent of the total acreage. Permeability of this Zerker soil is moderately slow. Available water capacity is high. Runoff is medium, and the hazard of water erosion is moderate. Effective rooting depth is 60 inches or more. This unit is used mainly for irrigated orchard crops such as almonds and oranges. This unit is suited to irrigated crops. It is limited mainly by the steepness of slope. Use of a cropping system that includes growing a cover crop, return of crop residue, and proper tillage improves soil tilth and increases the fertility and water intake rate. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Because of the slope, sprinkler or drip irrigation is most suitable. Irrigation water needs to be applied at a rate that ensures optimum production without increasing deep percolation, runoff, and erosion. The map unit is in capability unit IIIe-1 (17), irrigated, and capability subclass VIe, nonirrigated.

256-Zerker sandy clay loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces and alluvial fans. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly annual grasses, forbs, and scattered shrubs. Elevation is 475 to 550 feet. The average annual precipitation is about 8 inches, the average annual temperature is about 62 degrees F, and the average frost-free season is 250 to 300 days. Typically, the surface layer is dark yellowish brown and brown sandy clay loam about 17 inches thick. The upper 11 inches of the underlying material is brownish yellow clay loam, and the lower part to a depth of 62 inches is yellowish brown and light yellowish brown sandy clay loam. In some areas the surface layer is sandy loam or loam. Included in this unit are small areas of Delano sandy loam and Premier coarse sandy loam. Included areas make up about 15 percent of the total acreage. Permeability of this Zerker soil is moderately slow. Available water capacity is high. Runoff is slow, and the hazard of water erosion is slight. Effective rooting depth is 60 inches or more. This unit is used for irrigated crops such as alfalfa, cotton, almonds, and oranges. This unit is suited to irrigated crops. It has few limitations. Use of a cropping system that includes crop rotation or a cover crop, return of crop residue, and proper tillage is needed to improve soil tilth and to increase the fertility and water intake rate. Furrow, border, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. This map unit is in capability class I (17), irrigated, and capability subclass VIc, nonirrigated.

Appendix B

SWRCB Sediment Risk Factor Worksheet

	A	B	C
1	**Sediment Risk Factor Worksheet**		**Entry**
2	**A) R Factor**		
3	Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	**R Factor Value**		10
6	**B) K Factor (weighted average, by area, for all site soils)**		
7	The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.		
8	Site-specific K factor guidance		
9	**K Factor Value**		0.32
10	**C) LS Factor (weighted average, by area, for all slopes)**		
11	The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
12	LS Table		
13	**LS Factor Value**		0.15
14			
15	**Watershed Erosion Estimate (=RxKxLS) in tons/acre**	0.48	
16	**Site Sediment Risk Factor**	**Low**	
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			
21			
22			
23	**GIS Map Method:**		
24	**1.** The R factor for the project is calculated using the online calculator at:		
25	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
26			
27	**2**. The K and LS factors may be obtained by accessing the GIS maps located on the State Water Board FTP website at:		
28	ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/Risk/		
29			

Appendix C

EPA Stormwater Phase II Final Rule, EPA 833-F-00-014

United States Environmental Protection Agency
Office of Water (4203)
EPA 833-F-00-014
Revised March 2012
Fact Sheet 3.1[1]

Stormwater Phase II Final Rule

Construction Rainfall Erosivity Waiver

Stormwater Phase II Final Rule Fact Sheet Series

Overview

1.0 – Stormwater Phase II Proposed Rule Overview

Small MS4 Program

2.0 – Small MS4 Stormwater Program Overview

2.1 – Who's Covered? Designation and Waivers of Regulated Small MS4s

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Minimum Control Measures

2.3 – Public Education and Outreach

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2.6 – Construction Site Runoff Control

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2.9 – Permitting and Reporting: The Process and Requirements

2.10 – Federal and State-Operated MS4s: Program Implementation

Construction Program

3.0 – Construction Program Overview

3.1 – Construction Rainfall Erosivity Waiver

Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

The 1972 amendments to the Federal Water Pollution Control Act, later referred to as the Clean Water Act (CWA), prohibit the discharge of any pollutant to navigable waters of the United States unless the discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. Because construction site stormwwater runoff can contribute significantly to water quality problems, the Phase I Stormwater Rule imposed a requirement that all construction sites with a planned land disturbance of 5 acres or more obtain an NPDES permit and implement stormwater runoff control plans. Phase II extends the requirements of the stormwater program to sites of between 1 and 5 acres. The Rainfall erosivity waiver allows permitting authorities to waive those sites that do not have adverse water quality impacts.

What is Erosivity?

Erosivity is the term used to describe the potential for soil to wash off disturbed, devegetated earth during storms. The potential for erosion is in part determined by the soil type and geology of the site. For instance, dense, clay-like soils on a glacial plain will erode less readily when it rains than will sandy soils on the side of a hill. Another important factor is the amount and force of precipitation expected during the time the earth will be exposed. While it is impossible to predict the weather several months in advance of construction, for many areas of the country, there are definite optimal periods, such as a dry season when rain tends to fall less frequently and with less force. When feasible, this is the time to disturb the earth, so that the site can be stabilized by the time the seasonal wet weather returns. There are many other important factors to consider in determining erosivity, such as freeze/thaw cycles and snow pack.

How Is Site Erosivity Determined?

The Universal Soil Loss Equation (USLE) was developed by the U.S. Department of Agriculture (USDA) in the 1950s to help farmers conserve their valuable topsoil. The methodology for determining if a site qualifies for the erosivity waiver provided in this guide is based on the *USDA Handbook 703 - Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, dated January 1997. (Note that a more updated version of USLE, the Revised USLE, Version 2 (RUSLE2), is available and can be used as an alternative method for determining if a site qualifies for the erosivity waiver. Information about the RUSLE2 computer program is provided later in this fact sheet.)

Using a computer model supported by decades' worth of soil and rainfall data, USDA established estimates of annual erosivity values (R factors) for sites throughout the country. These R factors are used as surrogate measures of the impact that rainfall had on erosion from a particular site. They have been mapped using isoerodent contours, as shown in Figures 2 through 5.

USDA developed the Erosivity Index Table (EI Table, provided here in Table 1), to show how the annual erosivity factor is distributed throughout the year in two-week increments. Table 1 is based on 120 rainfall distribution zones for the continental U.S. Detailed instructions for calculating a project R factor are provided later in this fact sheet.

[1] This revised fact sheet corrects errors identified in calculating the R factor from the 2001 version, and includes updated information about the USLE.

The Stormwater Phase II rule allows permitting authorities to waive NPDES requirements for small construction sites if the value of the rainfall erosivity factor is less than 5 during the period of construction activity (see § 122.26(b)(15)(i)(A)). Note that the permitting authority has the option to not allow waivers for small construction activity.

If the R factor for the period of construction calculates to less than 5, and the permitting authority allows the use of the waiver, the site owner may apply for a waiver under the low rainfall erosivity provision of the applicable EPA or State NPDES regulations. When applying, owners are encouraged to consider other site-specific factors, such as proximity to water resources and the sensitivity of receiving waters to sedimentation impacts. The small construction operator must certify to the permitting authority that the construction activity will take place during a period when the rainfall erosivity factor is less than 5.

The start and end dates used for the construction activity will be the initial date of disturbance and the anticipated date when the site will have achieved final stabilization as defined by the permit, respectively. If the construction continues beyond this period, the operator will need to recalculate the Erosivity Index for the site based on this new ending date (but keeping the old start date) and either resubmit the certification form or apply for NPDES permit coverage.

What Other Factors Can Affect Waiver Availability and Eligibility?

EPA has established the R factor of less than 5 as the criteria for determining waiver eligibility. However, since the intent is to waive only those construction activities that will not adversely impact water quality, State and Tribal permitting authorities have considerable discretion in determining where, when, and how to offer it. They can establish an R factor threshold lower than 5, or they can suspend the waiver within an area where watersheds are known to be heavily impacted by, or sensitive to, sedimentation. They can also suspend the waiver during certain periods of the year. They may opt not to offer the waiver at all. NOTE: This waiver is not available to sites that will disturb more than 5 acres of land (large construction).

What if My Site Is Not Eligible?

If your site is not eligible for a waiver, you must submit a Notice of Intent, or whichever type of application is required, to obtain coverage under the applicable NPDES construction stormwater permit, and comply with its requirements. For information about EPA's Construction General Permit (CGP), see http://www.epa.gov/npdes/stormwater/cgp. State program information is available at http://cfpub.epa.gov/npdes/contacts.cfm?program_id=6&type=STATE.

Examples

1. Construction started and completed in one calendar year.

Find the R factor value of a construction site in Denver, Colorado. Assume the site will be disturbed from March 10 to May 10 of the same year.

The EI distribution zone is 84 (Figure 1). Referring to Table 1, the project period will span from March 1 (from Table 1, the closest date prior to the actual March 10 start date) to May 15 (from Table 1, the closest date after the actual May 10 end date). The difference in values between these two dates is 9.7% (9.9 - 0.2 = 9.7). Since the annual erosion index for this location is about 45 (interpolated from Figure 2), the R factor for the scheduled construction project is 9.7% of 45, or 4.4.

Because 4.4 is less than 5, the operator of this site would be able to seek a waiver under the low rainfall erosivity provision.

2. Construction spanning two calendar years.

Find the R factor value for a construction site in Pittsburgh, Pennsylvania. Assume the site will be disturbed from August 1 to April 15.

The EI distribution zone is 111 (Figure 1). Referring to Table 1, the project period will span from July 29 (from Table 1, the closest date prior to the actual August 1 start date) to April 15. The difference in values between July 29 and December 31 is 35% (100 - 65.0 = 35.0). The difference between January 1 and April 15 is 8%. The total percentage EI for this project is 43% (35 + 8 = 43). Since the annual erosion index for this location is 112 (interpolated from Figure 2), the R factor for the scheduled construction is 43% of 112, or 48.

Since 48 is greater than 5, the operator of this site would not be able to seek a waiver under the low rainfall erosivity provision.

How Do I Compute the R factor for My Project?

1. Estimate the construction start date. This is the day you expect to begin disturbing soils, including grubbing, stockpiling, excavating, and grading activities.
2. Estimate the day you expect to achieve final stabilization, as defined by your permitting authority's regulations or NPDES construction stormwater permit, over all previous disturbed areas. This is your construction end date.
3. Refer to Figure 1 to find your Erosivity Index (EI) Zone based on your geographic location.

4. Refer to Table 1, the Erosivity Index (EI) Table. Find the number of your EI Zone in the left column. Locate the EI values for the dates that correspond to the project start and end dates you identified in Steps 1 and 2. If your specific date is not on the table, either interpolate between dates to obtain your %EI value, or use the closest date prior to your proposed start date and the closest date after your proposed end date. Subtract the start value from the end value to find the % EI for your site. The maximum annual EI value for a project is 100%. NOTE: If your project lasts for one year or more, your EI value is 100%.
5. Refer to the appropriate Isoerodent Map (Figures 2 through 5). Interpolate the annual isoerodent value for your area. This is the annual R factor for your site.
6. Multiply the percent value obtained in Step 4 by the annual isoerodent value obtained in Step 5. This is the R factor for your scheduled project.

Can I Use a Personal Computer to Calculate the R factor?

The computer program used by USDA to evaluate erosion potential is called the Revised Universal Soil Loss Equation, or RUSLE. The current version of RUSLE (RUSLE2) is a Windows-based model that uses extensive databases that are geographically-linked. RUSLE2 can be used to calculate the R factor for a proposed construction site; however, RUSLE2 can require a large investment of time to set up. RUSLE2 can be downloaded free of charge from the Internet at http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm. Note that RUSLE2 is an upgrade of RUSLE, and contains more detailed data. Therefore, your calculated R factor may differ based on whether you calculate your R factor using the methods specified above, which utilizes data from *USDA Handbook 703 - Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, January 1997, or whether you calculate your R factor using the more updated RUSLE2. EPA notes that either method of calculation is acceptable for determining eligibility for the construction rainfall erosivity waiver.

Where Can I Get Help?

- A copy of "Chapter 2, Rainfall-Runoff Erosivity Factor (R)" from the *USDA Handbook 703 - Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, January 1997, is available on EPA's web site at http://www.epa.gov/npdes/pubs/ruslech2.pdf.
- Information about RUSLE2, and a download of the program, is available at http://fargo.nserl.purdue.edu/rusle2_dataweb/.
- Your local USDA Service Center may be able to provide assistance with calculating R factors and other conservation-related issues. To find the office nearest you, go to http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/contact/local.

For Additional Information

Reference Documents

Stormwater Phase II Final Rule Fact Sheet Series
- Internet: cfpub.epa.gov/npdes/stormwater/swfinal.cfm

Stormwater Phase II Final Rule (64 *FR* 68722)
- Internet: www.epa.gov/npdes/regulations/phase2.pdf
- Contact the U.S. EPA Water Resource Center (Phone: (202) 564-9545)

Agricultural Handbook Number 703, Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE), Chapter 2, pp. 21-64, January 1997.
- Internet: www.epa.gov/npdes/pubs/ruslech2.pdf

Figure 1. Erosivity Index Zone Map

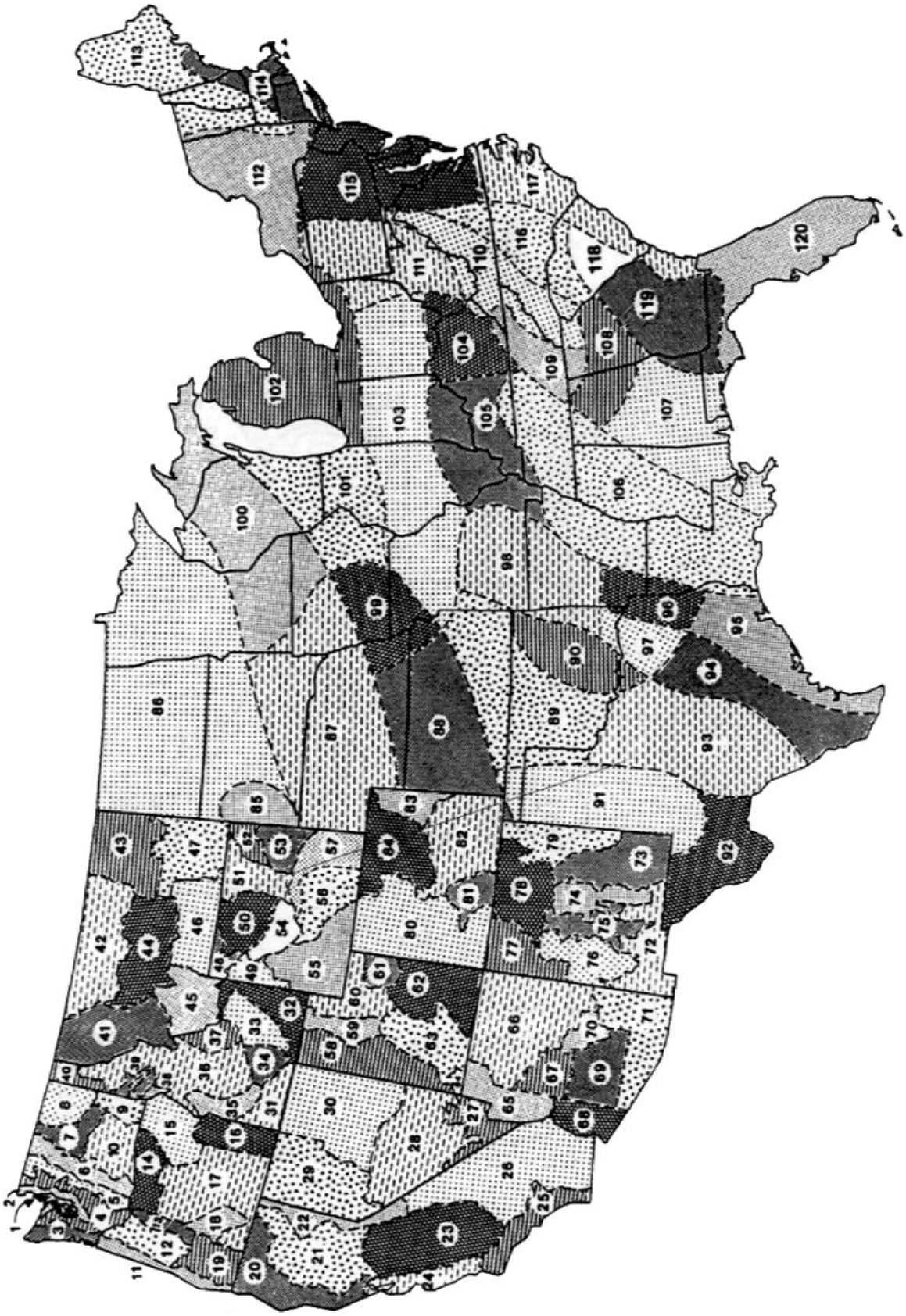
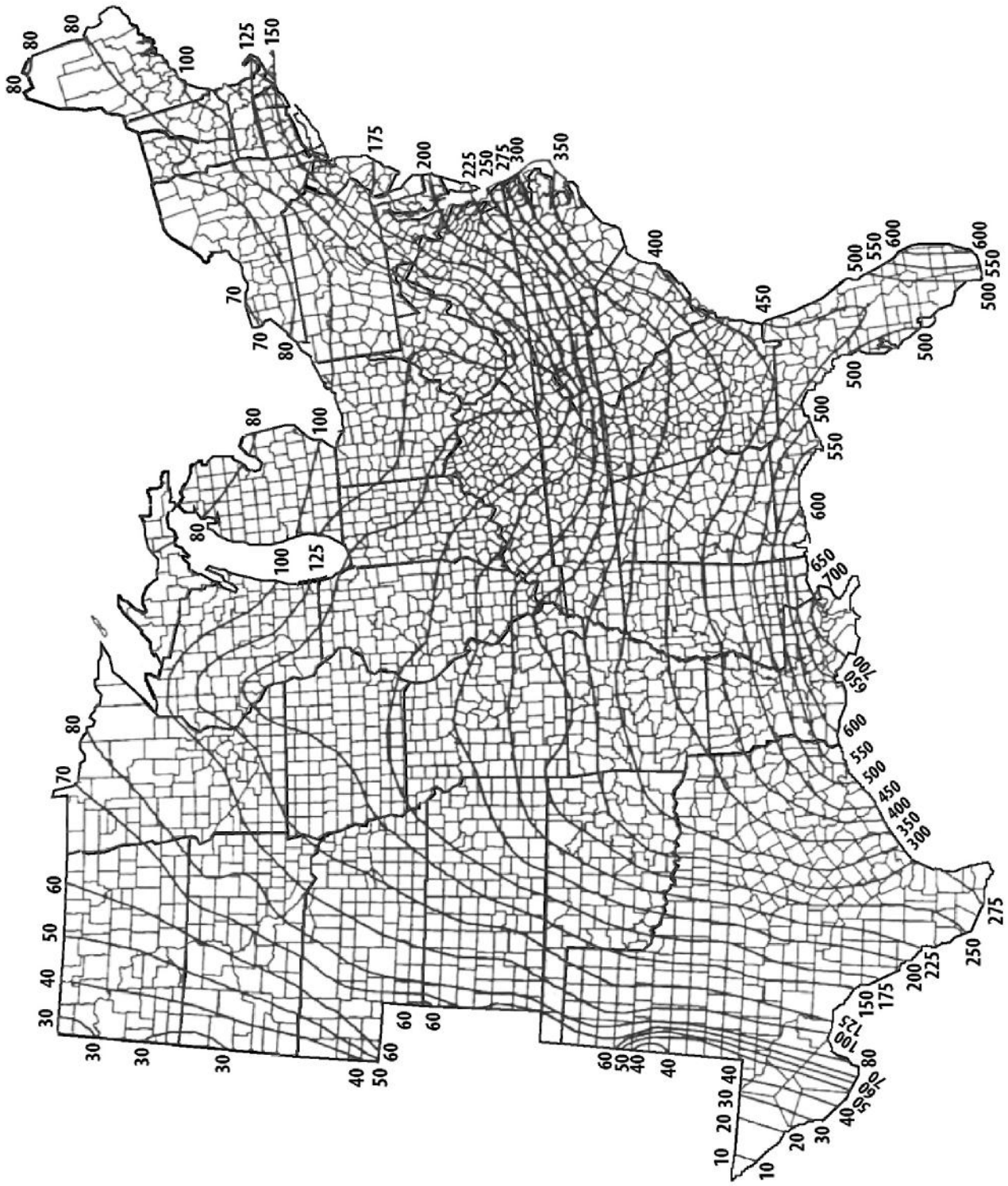


Figure 2. Isoerodent Map of the Eastern U.S.

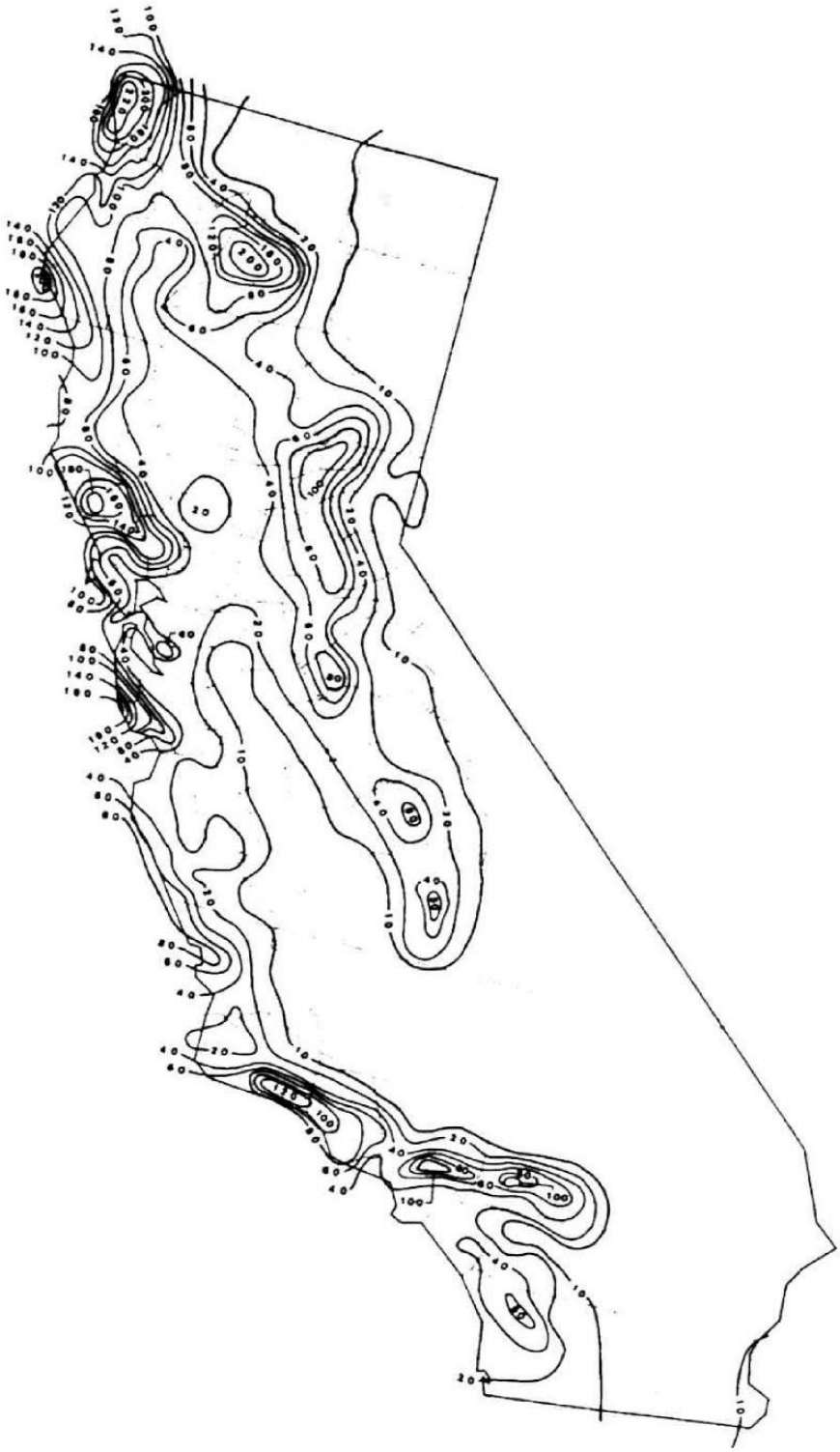


Note: Units for all maps on this page are hundreds ft•tonf•in(ac•h•yr)$^{-1}$

Figure 3. Isoerodent Map of the Western U.S.

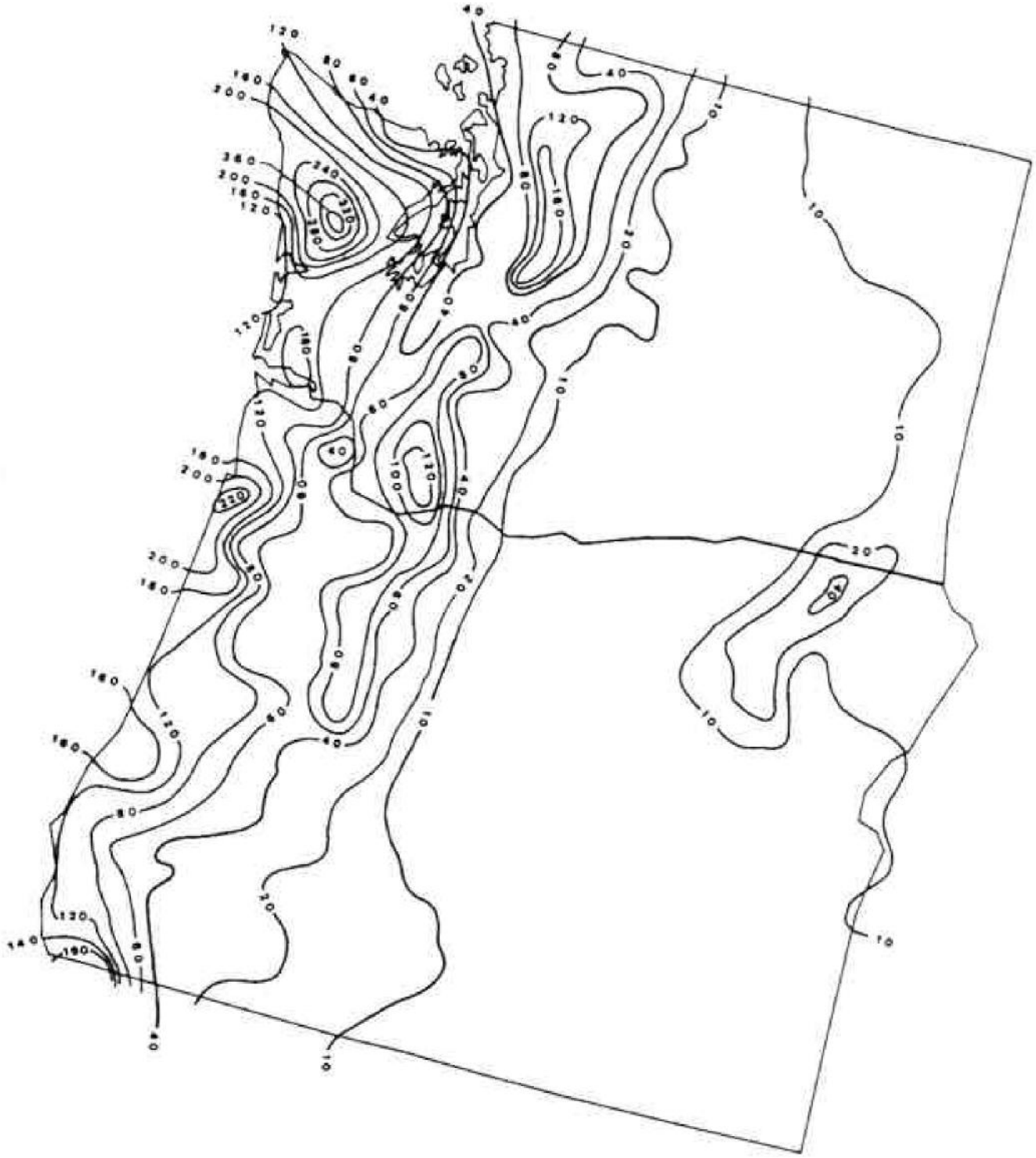
Note: Units for all maps on this page are hundreds ft•tonf•in(ac•h•yr)$^{-1}$

Figure 4. Isoerodent Map of California



Note: Units for all maps on this page are hundreds ft•tonf•in(ac•h•yr)$^{-1}$

Figure 5. Isoerodent Map of Oregon and Washington



Note: Units for all maps on this page are hundreds ft•tonf•in(ac•h•yr)$^{-1}$

Table 1. Erosivity Index (%EI Values extracted from USDA Manual 703)

All values are at the end of the day listed below - Linear interpolation between dates is acceptable.
EI as a percentage of Average Annual R Value Computed for Geographic Areas Shown in Figure 1

Month	Jan	Jan	Jan	Feb	Mar	Mar	Mar	Apr	Apr	May	May	Jun	Jun	Jul	Jul	Aug	Aug	Sept	Sept	Oct	Oct	Nov	Nov	Dec	Dec
Day	1	16	31	15	1	16	31	15	30	15	30	14	29	14	29	13	28	12	27	12	27	11	26	11	31
EI Zone																									
1	0	4.3	8.3	12.8	17.3	21.6	25.1	28	30.9	34.9	39.1	42.6	45.4	48.2	50.8	53	56	60.8	66.8	71	75.7	82	89.1	95.2	100
2	0	4.3	8.3	12.8	17.3	21.6	25.1	28.0	30.9	34.9	39.1	42.6	45.4	48.2	50.8	53.0	56.0	60.8	66.8	71.0	75.7	82.0	89.1	95.2	100
3	0	7.4	13.8	20.9	26.5	31.8	35.3	38.5	40.2	41.6	42.5	43.6	44.5	45.1	45.7	46.4	47.7	49.4	52.8	57.0	64.5	73.1	83.3	92.3	100
4	0	3.9	7.9	12.6	17.4	21.6	25.2	28.7	31.9	35.1	38.2	42.0	44.9	46.7	48.2	50.1	53.1	56.6	62.2	67.9	75.2	83.5	90.5	96.0	100
5	0	2.3	3.6	4.7	6.0	7.7	10.7	13.9	17.8	21.2	24.5	28.1	31.1	33.1	35.3	38.2	43.2	48.7	57.3	67.8	77.9	86.0	91.3	96.9	100
6	0	0.0	0.0	0.5	2.0	4.1	8.1	12.6	17.6	21.6	25.5	29.6	34.5	40.0	45.7	50.7	55.6	60.2	66.5	75.5	85.6	95.9	99.5	99.9	100
7	0	0.0	0.0	0.0	0.0	1.2	4.9	8.5	13.9	19.0	26.0	35.4	43.9	48.8	53.9	64.5	73.4	77.5	80.4	84.8	89.9	96.6	99.2	99.7	100
8	0	0.0	0.0	0.0	0.0	0.9	3.6	7.8	15.0	20.2	27.4	38.1	49.8	57.9	65.0	75.6	82.7	86.8	89.4	93.4	96.3	99.1	100.0	100.0	100
9	0	0.8	3.1	4.7	7.4	11.7	17.8	22.5	27.0	31.4	36.0	41.6	46.4	50.1	53.4	57.4	61.7	64.9	69.7	79.0	89.6	97.4	100.0	100.0	100
10	0	0.3	0.5	0.9	2.0	4.3	9.2	13.1	18.0	22.7	29.2	39.5	46.3	48.8	51.1	57.2	64.4	67.7	71.1	77.2	85.1	92.5	96.5	99.0	100
11	0	5.4	11.3	18.8	26.3	33.2	37.4	40.7	42.5	44.3	45.4	46.5	47.1	47.4	47.8	48.3	49.4	50.7	53.6	57.5	65.5	76.2	87.4	94.8	100
12	0	3.5	7.8	14.0	21.1	27.4	31.5	35.0	37.3	39.8	41.9	44.3	45.6	46.3	46.8	47.9	50.0	52.9	57.9	62.3	69.3	81.3	91.5	96.7	100
13	0	0.0	0.0	1.8	7.2	11.9	16.7	19.7	24.0	31.2	42.4	55.0	60.0	60.8	61.2	62.6	65.3	67.6	71.6	76.1	83.1	93.3	98.2	99.6	100
14	0	0.7	1.8	3.3	6.9	16.5	26.6	29.9	32.0	35.4	40.2	45.1	51.9	61.1	67.5	70.7	72.8	75.4	78.6	81.9	86.4	93.6	97.7	99.3	100
15	0	0.0	0.0	0.5	2.0	4.4	8.7	12.0	16.6	21.4	29.7	44.5	56.0	60.8	63.9	69.1	74.5	79.1	83.1	87.0	90.9	96.6	99.1	99.8	100
16	0	0.0	0.0	0.5	2.0	5.5	12.3	16.2	20.9	26.4	35.2	48.1	58.1	63.1	66.5	71.9	77.0	81.6	85.1	88.4	91.5	96.3	98.7	99.6	100
17	0	0.0	0.0	0.7	2.8	6.1	10.7	12.9	16.1	21.9	32.8	45.9	55.5	60.3	64.0	71.2	77.2	80.3	83.1	87.7	92.6	97.2	99.1	99.8	100
18	0	0.0	0.0	0.6	2.5	6.2	12.4	16.4	20.2	23.9	29.3	37.7	45.6	49.8	53.3	58.4	64.3	69.0	75.0	86.6	93.9	96.6	98.0	100.0	100
19	0	1.0	2.6	7.4	16.4	23.5	28.0	31.0	33.5	37.0	41.7	48.1	51.1	52.0	52.5	53.6	55.7	57.6	61.1	65.8	74.7	88.0	95.8	98.7	100
20	0	9.8	18.5	25.4	30.2	35.6	38.9	41.5	42.9	44.0	45.2	48.2	50.8	51.7	52.5	54.6	57.4	58.5	60.1	63.2	69.6	76.7	85.4	92.4	100
21	0	7.5	13.6	18.1	21.1	24.4	27.0	29.4	31.7	34.6	37.3	39.6	41.6	43.4	45.4	48.1	51.3	53.3	56.6	62.4	72.4	81.3	88.9	94.7	100
22	0	1.2	1.6	1.6	1.6	1.6	1.6	2.2	3.9	4.6	6.4	14.2	32.8	47.2	58.8	69.1	76.0	82.0	87.1	96.7	99.9	99.9	99.9	99.9	100
23	0	7.9	15.0	20.9	25.7	31.1	35.7	40.2	43.2	46.2	47.7	48.8	49.4	49.9	50.7	51.8	54.1	57.7	62.8	65.9	70.1	77.3	86.8	93.5	100
24	0	12.2	23.6	33.0	39.7	47.1	51.7	55.9	57.7	58.6	58.9	59.1	59.1	59.2	59.2	59.3	59.5	60.0	61.4	63.0	66.5	71.8	81.3	89.6	100
25	0	9.8	20.8	30.2	37.6	45.8	50.6	54.4	56.0	56.8	57.1	57.1	57.2	57.6	58.5	59.8	62.2	65.3	67.5	68.2	69.4	74.8	86.6	93.0	100
26	0	2.0	5.4	9.8	15.6	21.5	24.7	26.6	27.4	28.0	28.7	29.8	32.5	36.6	44.9	55.4	65.7	72.6	77.8	84.4	89.5	93.9	96.5	98.4	100
27	0	0.0	0.0	1.0	4.0	5.9	8.0	11.1	13.0	14.0	14.6	15.3	17.0	23.2	39.1	60.0	76.3	86.1	89.7	90.4	90.9	93.1	96.6	99.1	100
28	0	0.0	0.0	0.0	0.2	0.5	1.5	3.3	7.2	11.9	17.7	21.4	27.0	37.1	51.4	62.3	70.6	78.8	84.6	90.6	94.4	97.9	99.3	100.0	100
29	0	0.6	0.7	0.7	0.7	1.5	3.9	6.0	10.5	17.9	28.8	36.6	43.8	51.5	59.3	68.0	74.8	80.3	84.3	88.8	92.7	98.0	99.8	99.9	100
30	0	0.0	0.0	0.0	0.0	0.2	0.8	2.8	7.9	14.2	24.7	35.6	45.4	52.2	58.7	68.5	77.6	84.5	88.9	93.7	96.2	97.6	98.3	99.6	100
31	0	0.0	0.0	0.0	0.0	0.2	1.0	3.5	9.9	15.7	26.4	47.2	61.4	65.9	69.0	77.2	86.0	91.6	94.8	98.7	100.0	100.0	100.0	100.0	100
32	0	0.1	0.1	0.1	0.1	0.6	2.2	4.3	9.0	14.2	23.3	34.6	46.3	54.2	61.7	72.9	82.5	89.6	93.7	98.2	99.7	99.9	99.9	99.9	100
33	0	0.0	0.0	0.0	0.0	0.6	2.3	4.2	8.8	16.1	30.0	46.9	57.9	62.8	66.2	72.1	79.1	85.9	91.1	97.0	98.9	98.9	98.9	98.9	100
34	0	0.0	0.0	0.0	0.0	1.8	7.3	10.7	15.5	22.0	29.9	35.9	42.0	48.5	56.9	67.0	76.9	85.8	91.2	95.7	97.8	99.6	100.0	100.0	100
35	0	0.0	0.0	0.0	0.0	2.5	10.2	15.9	22.2	27.9	34.7	43.9	51.9	56.9	61.3	67.3	73.9	80.1	85.1	89.6	93.2	98.2	99.8	99.8	100

Month	Jan	Jan	Jan	Feb	Mar	Mar	Mar	Apr	Apr	May	May	Jun	Jun	Jul	Jul	Aug	Aug	Sept	Sept	Oct	Oct	Nov	Nov	Dec	Dec
Day	1	16	31	15	1	16	31	15	30	15	30	14	29	14	29	13	28	12	27	12	27	11	26	11	31
El Zone																									
36	0	0.0	0.0	0.0	0.0	0.9	3.4	6.7	12.7	18.5	26.6	36.3	46.0	53.5	60.2	68.3	75.8	82.6	88.3	96.3	99.3	99.9	100.0	100.0	100
37	0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	3.9	9.1	19.1	26.7	36.3	47.9	61.4	75.1	84.5	92.3	96.0	99.1	100.0	100.0	100.0	100.0	100
38	0	0.0	0.0	1.1	4.3	7.2	11.0	13.9	17.9	22.3	30.3	43.1	55.1	61.3	65.7	72.1	77.9	82.6	86.3	90.3	93.8	98.4	100.0	100.0	100
39	0	0.0	0.0	0.0	0.0	1.6	6.5	11.0	17.8	24.7	33.1	42.8	50.3	54.9	59.7	68.9	78.1	83.6	87.5	93.0	96.5	99.2	100.0	100.0	100
40	0	0.0	0.0	0.0	0.0	1.5	6.2	10.1	16.3	23.3	32.5	42.2	50.1	55.6	60.5	67.5	74.3	79.4	84.1	91.1	95.8	99.1	100.0	100.0	100
41	0	0.1	0.2	0.2	0.2	0.2	0.2	0.4	1.1	6.8	22.9	40.1	54.9	63.8	70.7	81.5	89.8	96.3	98.7	99.2	99.3	99.4	99.4	99.7	100
42	0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.9	5.2	17.3	33.8	53.2	66.5	75.9	87.6	93.7	97.5	99.0	99.7	100.0	100.0	100.0	100.0	100
43	0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	2.7	9.5	21.9	42.7	58.6	71.1	84.6	91.9	97.1	99.0	99.8	100.0	100.0	100.0	100.0	100
44	0	1.7	2.3	2.4	2.4	2.4	2.4	2.7	3.5	7.6	18.5	34.3	52.5	64.0	72.3	83.3	90.0	95.1	97.3	98.5	98.9	98.9	98.9	99.2	100
45	0	0.2	0.2	0.3	0.3	0.4	0.6	0.8	1.4	3.7	10.2	22.6	41.8	54.0	64.5	78.7	88.4	96.0	98.7	99.4	99.7	99.7	99.8	99.9	100
46	0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.6	7.5	19.6	32.9	48.9	63.0	73.5	83.3	89.5	95.6	98.3	99.6	100.0	100.0	100.0	100.0	100
47	0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.6	5.8	17.0	33.0	52.5	66.4	75.7	85.5	91.3	96.5	98.8	100.0	100.0	100.0	100.0	100.0	100
48	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	8.1	15.4	27.8	40.7	52.6	61.1	69.3	82.6	92.0	98.0	100.0	100.0	100.0	100.0	100
49	0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	2.7	8.3	20.0	27.5	35.6	44.6	46.0	70.2	81.3	89.2	93.6	98.5	100.0	100.0	100.0	100.0	100
50	0	0.0	0.0	0.0	0.0	0.1	0.4	2.4	8.2	13.7	23.8	38.8	55.1	66.1	73.6	81.8	87.7	93.8	97.0	99.4	100.0	100.0	100.0	100.0	100
51	0	0.0	0.0	0.0	0.0	0.3	1.0	3.1	8.7	18.8	35.8	49.6	60.4	70.2	77.0	84.0	88.8	93.8	96.6	99.1	100.0	100.0	100.0	100.0	100
52	0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.5	6.8	17.5	29.8	46.1	60.5	72.7	86.0	92.8	96.8	98.4	99.7	100.0	100.0	100.0	100.0	100
53	0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	3.0	9.5	24.2	35.3	48.0	63.1	76.1	87.7	93.5	97.2	98.6	99.5	99.8	99.9	100.0	100.0	100
54	0	0.0	0.0	0.0	0.0	0.2	0.7	2.4	7.2	14.7	27.2	37.2	47.3	58.8	67.6	74.0	79.2	86.7	92.6	97.9	99.8	99.9	100.0	100.0	100
55	0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	5.4	13.3	25.5	31.6	38.8	52.5	66.8	75.5	81.2	87.9	92.8	98.3	100.0	100.0	100.0	100.0	100
56	0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	5.1	11.4	22.3	29.5	38.5	51.1	65.2	77.8	85.6	91.7	95.0	98.7	100.0	100.0	100.0	100.0	100
57	0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	3.5	9.2	21.5	31.0	43.5	60.4	75.1	86.1	91.6	96.2	98.1	99.4	99.9	99.9	100.0	100.0	100
58	0	0.0	0.0	0.0	0.0	0.2	0.9	2.9	8.0	13.2	21.0	29.1	38.0	45.9	54.5	65.4	74.8	82.1	87.5	95.4	98.8	99.7	100.0	100.0	100
59	0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	8.9	15.6	24.2	31.1	38.3	46.0	54.9	64.2	73.2	81.9	88.5	95.7	98.6	99.4	99.7	99.7	100
60	0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.5	4.0	9.5	13.3	20.5	33.6	52.8	66.5	76.7	88.1	94.2	98.6	100.0	100.0	100.0	100.0	100
61	0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	5.0	8.5	15.5	29.8	41.8	46.0	49.2	56.0	65.1	71.6	78.6	91.1	97.3	99.3	100.0	100.0	100
62	0	0.0	0.0	0.1	0.3	0.8	2.1	3.6	6.5	9.7	13.7	16.5	20.8	27.3	40.1	56.9	72.6	83.4	89.4	95.5	98.1	99.6	100.0	100.0	100
63	0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	3.7	7.8	13.3	15.8	19.9	29.0	46.8	64.7	78.3	88.8	93.9	98.5	100.0	100.0	100.0	100.0	100
64	0	0.0	0.0	0.7	2.8	7.4	12.4	14.4	15.6	17.3	19.4	21.0	24.4	32.3	48.0	61.4	72.1	81.9	87.0	90.1	92.4	98.1	100.0	100.0	100
65	0	3.6	7.0	9.6	11.4	13.0	14.4	16.3	17.7	18.4	19.3	20.5	23.6	32.0	50.0	66.2	77.2	85.4	88.8	90.4	91.3	92.7	94.8	97.0	100
66	0	0.0	0.0	0.0	0.0	0.1	0.5	1.1	2.2	3.6	6.0	7.6	11.1	19.8	38.9	59.7	74.4	83.2	88.1	94.6	97.7	99.4	100.0	100.0	100
67	0	0.0	0.0	0.0	0.0	0.1	0.4	0.9	1.6	1.9	2.4	5.0	12.1	24.8	48.3	73.6	86.5	92.0	94.3	96.6	97.9	99.5	100.0	100.0	100
68	0	2.3	4.5	7.8	10.4	12.0	13.3	16.3	17.7	18.1	18.2	18.3	18.4	19.9	24.5	35.0	54.4	69.4	78.6	85.7	89.2	91.9	93.9	97.0	100
69	0	2.0	3.7	5.7	7.8	10.5	12.4	13.7	14.3	14.7	15.1	15.7	17.1	22.7	36.7	50.4	63.6	75.0	81.8	87.8	90.8	93.2	94.9	97.5	100
70	0	0.5	0.7	1.0	1.3	1.7	2.2	2.8	3.4	3.9	4.7	5.4	7.4	15.7	36.5	55.8	70.3	80.9	86.4	90.9	93.4	96.4	98.1	99.4	100
71	0	0.7	1.2	1.6	2.1	2.8	3.3	3.6	4.0	4.5	5.6	6.5	9.1	18.5	40.6	59.7	74.0	86.3	91.7	94.7	96.0	96.7	97.3	98.8	100
72	0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.7	0.8	1.3	3.5	9.9	24.7	51.4	71.5	83.6	93.8	97.7	99.2	99.8	99.9	99.9	100.0	100
73	0	0.0	0.1	0.1	0.2	0.2	0.3	0.6	1.3	4.1	11.5	18.1	28.3	40.2	54.1	67.0	77.2	87.7	93.3	97.5	99.1	99.6	99.8	100.0	100
74	0	0.0	0.0	0.0	0.0	0.1	0.2	0.5	1.2	2.7	6.4	10.2	18.4	31.0	50.7	68.7	81.2	91.6	96.1	98.4	99.2	99.8	100.0	100.0	100
75	0	0.1	0.1	0.1	0.2	0.5	1.3	1.9	3.0	4.1	6.6	10.0	17.6	28.3	44.7	59.4	71.6	83.9	90.3	94.7	96.7	98.8	99.6	99.9	100

Month	Jan	Jan	Jan	Feb	Mar	Mar	Mar	Apr	Apr	May	May	Jun	Jun	Jul	Jul	Aug	Aug	Sept	Sept	Oct	Oct	Nov	Nov	Dec	Dec
Day	1	16	31	15	1	16	31	15	30	15	30	14	29	14	29	13	28	12	27	12	27	11	26	11	31
El Zone																									
76	0	0.0	0.0	0.0	0.0	0.1	0.2	0.6	1.3	2.0	3.5	4.9	8.4	17.4	37.3	57.5	72.9	83.7	89.5	95.8	98.4	99.6	100.0	100.0	100
77	0	0.2	0.3	0.3	0.4	0.8	1.5	2.0	2.8	3.9	5.9	7.2	10.3	21.5	46.5	66.3	78.3	86.5	90.8	96.0	98.2	99.1	99.5	99.8	100
78	0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	1.6	3.8	8.9	13.2	21.8	35.8	56.6	75.4	86.0	92.9	95.9	98.2	99.2	99.8	100.0	100.0	100
79	0	0.0	0.0	0.0	0.0	0.2	0.7	1.3	2.7	5.8	12.7	18.8	28.8	41.6	58.4	75.7	86.5	94.2	97.3	98.9	99.5	99.9	100.0	100.0	100
80	0	0.6	1.2	1.6	2.1	2.5	3.3	4.5	6.9	10.1	15.5	19.7	26.6	36.4	51.7	67.5	79.4	88.8	93.2	96.1	97.3	98.2	98.7	99.3	100
81	0	0.1	0.1	0.2	0.4	0.5	0.8	0.9	1.5	3.9	9.9	12.8	18.2	30.7	54.1	77.1	89.0	94.9	97.2	98.7	99.3	99.6	99.7	99.9	100
82	0	0.0	0.1	0.1	0.2	0.2	0.5	1.2	3.1	6.7	14.4	20.1	29.8	44.5	64.2	83.1	92.2	96.4	98.1	99.3	99.7	99.8	99.8	99.9	100
83	0	0.0	0.1	0.1	0.1	0.3	0.9	1.6	3.5	8.3	19.4	30.0	44.0	59.2	72.4	84.6	91.2	96.5	98.6	99.5	99.8	99.9	100.0	100.0	100
84	0	0.0	0.1	0.1	0.2	0.3	0.6	1.7	4.9	9.9	19.5	27.2	38.3	52.8	68.8	83.9	91.6	96.4	98.2	99.2	99.6	99.8	99.8	99.9	100
85	0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	3.0	6.0	11.0	23.0	36.0	49.0	63.0	77.0	90.0	95.0	98.0	99.0	100.0	100.0	100.0	100.0	100
86	0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	3.0	6.0	11.0	23.0	36.0	49.0	63.0	77.0	90.0	95.0	98.0	99.0	100.0	100.0	100.0	100.0	100
87	0	0.0	0.0	0.0	1.0	1.0	2.0	3.0	6.0	10.0	17.0	29.0	43.0	55.0	67.0	77.0	85.0	91.0	96.0	98.0	99.0	100.0	100.0	100.0	100
88	0	0.0	0.0	0.0	1.0	1.0	2.0	3.0	6.0	13.0	23.0	37.0	51.0	61.0	69.0	78.0	85.0	91.0	94.0	96.0	98.0	99.0	99.0	100.0	100
89	0	1.0	1.0	2.0	3.0	4.0	7.0	12.0	18.0	27.0	38.0	48.0	55.0	62.0	69.0	76.0	83.0	90.0	94.0	97.0	98.0	99.0	100.0	100.0	100
90	0	1.0	2.0	3.0	4.0	6.0	8.0	13.0	21.0	29.0	37.0	46.0	54.0	60.0	65.0	69.0	74.0	81.0	87.0	92.0	95.0	97.0	98.0	99.0	100
91	0	0.0	0.0	0.0	1.0	1.0	1.0	2.0	6.0	16.0	29.0	39.0	46.0	53.0	60.0	67.0	74.0	81.0	88.0	95.0	99.0	99.0	100.0	100.0	100
92	0	0.0	0.0	0.0	1.0	1.0	1.0	2.0	6.0	16.0	29.0	39.0	46.0	53.0	60.0	67.0	74.0	81.0	88.0	95.0	99.0	99.0	100.0	100.0	100
93	0	1.0	1.0	2.0	3.0	4.0	6.0	8.0	13.0	25.0	40.0	49.0	56.0	62.0	67.0	72.0	76.0	80.0	85.0	91.0	97.0	98.0	99.0	99.0	100
94	0	1.0	2.0	4.0	6.0	8.0	10.0	15.0	21.0	29.0	38.0	47.0	53.0	57.0	61.0	65.0	70.0	76.0	83.0	88.0	91.0	94.0	96.0	98.0	100
95	0	1.0	3.0	5.0	7.0	9.0	11.0	14.0	18.0	27.0	35.0	41.0	46.0	51.0	57.0	62.0	68.0	73.0	79.0	84.0	89.0	93.0	96.0	98.0	100
96	0	2.0	4.0	6.0	9.0	12.0	17.0	23.0	30.0	37.0	43.0	49.0	54.0	58.0	62.0	66.0	70.0	74.0	78.0	82.0	86.0	90.0	94.0	97.0	100
97	0	1.0	3.0	5.0	7.0	10.0	14.0	20.0	28.0	37.0	48.0	56.0	61.0	64.0	68.0	72.0	77.0	81.0	86.0	89.0	92.0	95.0	98.0	99.0	100
98	0	1.0	2.0	4.0	6.0	8.0	10.0	13.0	19.0	26.0	34.0	42.0	50.0	58.0	63.0	68.0	74.0	79.0	84.0	89.0	93.0	95.0	97.0	99.0	100
99	0	0.0	0.0	1.0	1.0	2.0	3.0	5.0	7.0	12.0	19.0	33.0	48.0	57.0	65.0	72.0	82.0	88.0	93.0	96.0	98.0	99.0	100.0	100.0	100
100	0	0.0	0.0	0.0	1.0	1.0	2.0	3.0	5.0	9.0	15.0	27.0	38.0	50.0	62.0	74.0	84.0	91.0	95.0	97.0	98.0	99.0	99.0	100.0	100
101	0	0.0	0.0	1.0	2.0	3.0	4.0	6.0	9.0	14.0	20.0	28.0	39.0	52.0	63.0	72.0	80.0	87.0	91.0	94.0	97.0	98.0	99.0	100.0	100
102	0	0.0	1.0	2.0	3.0	4.0	6.0	8.0	11.0	15.0	22.0	31.0	40.0	49.0	59.0	69.0	78.0	85.0	91.0	94.0	96.0	98.0	99.0	100.0	100
103	0	1.0	2.0	3.0	4.0	6.0	8.0	10.0	14.0	18.0	25.0	34.0	45.0	56.0	64.0	72.0	79.0	84.0	89.0	92.0	95.0	97.0	98.0	99.0	100
104	0	2.0	3.0	5.0	7.0	10.0	13.0	16.0	19.0	23.0	27.0	34.0	44.0	54.0	63.0	72.0	80.0	85.0	89.0	91.0	93.0	95.0	96.0	98.0	100
105	0	1.0	3.0	6.0	9.0	12.0	16.0	21.0	26.0	31.0	37.0	43.0	50.0	57.0	64.0	71.0	77.0	81.0	85.0	88.0	91.0	93.0	95.0	97.0	100
106	0	3.0	6.0	9.0	13.0	17.0	21.0	27.0	33.0	38.0	44.0	49.0	55.0	61.0	67.0	71.0	75.0	78.0	81.0	84.0	86.0	90.0	94.0	97.0	100
107	0	3.0	5.0	7.0	10.0	14.0	18.0	23.0	27.0	31.0	35.0	39.0	45.0	53.0	60.0	67.0	74.0	80.0	84.0	86.0	88.0	90.0	93.0	95.0	100
108	0	3.0	6.0	9.0	12.0	16.0	20.0	24.0	28.0	33.0	38.0	43.0	50.0	59.0	69.0	75.0	80.0	84.0	87.0	90.0	92.0	94.0	96.0	98.0	100
109	0	3.0	6.0	10.0	13.0	16.0	19.0	23.0	26.0	29.0	33.0	39.0	47.0	58.0	68.0	75.0	80.0	83.0	86.0	88.0	90.0	92.0	95.0	97.0	100
110	0	1.0	3.0	5.0	7.0	9.0	12.0	15.0	18.0	21.0	25.0	29.0	36.0	45.0	56.0	68.0	77.0	83.0	88.0	91.0	93.0	95.0	97.0	99.0	100
111	0	1.0	2.0	3.0	4.0	5.0	6.0	8.0	11.0	15.0	20.0	28.0	41.0	54.0	65.0	74.0	82.0	87.0	92.0	94.0	96.0	97.0	98.0	99.0	100
112	0	0.0	0.0	1.0	2.0	3.0	4.0	5.0	7.0	12.0	17.0	24.0	33.0	42.0	55.0	67.0	76.0	83.0	89.0	92.0	94.0	96.0	98.0	99.0	100
113	0	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	13.0	17.0	22.0	31.0	42.0	52.0	60.0	68.0	75.0	80.0	85.0	89.0	92.0	96.0	98.0	100
114	0	1.0	2.0	4.0	6.0	8.0	11.0	13.0	15.0	18.0	21.0	26.0	32.0	38.0	46.0	55.0	64.0	71.0	77.0	81.0	85.0	89.0	93.0	97.0	100
115	0	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	14.0	19.0	26.0	34.0	45.0	56.0	66.0	76.0	82.0	86.0	90.0	93.0	95.0	97.0	99.0	100

Month	Jan	Jan	Jan	Feb	Mar	Mar	Mar	Apr	Apr	May	May	Jun	Jun	Jul	Jul	Aug	Aug	Sept	Sept	Oct	Oct	Nov	Nov	Dec	Dec
Day	1	16	31	15	1	16	31	15	30	15	30	14	29	14	29	13	28	12	27	12	27	11	26	11	31
EI Zone																									
116	0	1.0	3.0	5.0	7.0	9.0	12.0	15.0	18.0	21.0	25.0	29.0	36.0	45.0	56.0	68.0	77.0	83.0	88.0	91.0	93.0	95.0	97.0	99.0	100
117	0	1.0	2.0	3.0	4.0	5.0	7.0	9.0	11.0	14.0	17.0	22.0	31.0	42.0	54.0	65.0	74.0	83.0	89.0	92.0	95.0	97.0	98.0	99.0	100
118	0	1.0	2.0	3.0	5.0	7.0	10.0	14.0	18.0	22.0	27.0	32.0	37.0	46.0	58.0	69.0	80.0	89.0	93.0	94.0	95.0	96.0	97.0	97.0	100
119	0	2.0	4.0	6.0	8.0	12.0	16.0	20.0	25.0	30.0	35.0	41.0	47.0	56.0	67.0	75.0	81.0	85.0	87.0	89.0	91.0	93.0	95.0	97.0	100
120	0	1.0	2.0	4.0	6.0	7.0	9.0	12.0	15.0	18.0	23.0	31.0	40.0	48.0	57.0	63.0	72.0	78.0	88.0	92.0	96.0	97.0	98.0	99.0	100
121	0	8.0	16.0	25.0	33.0	41.0	46.0	50.0	53.0	54.0	55.0	56.0	56.5	57.0	57.8	58.0	58.8	60.0	61.0	63.0	66.5	72.0	80.0	90.0	100
122	0	7.0	14.0	20.0	25.5	33.5	38.0	43.0	46.0	50.0	52.5	54.5	56.0	58.0	59.0	60.0	61.5	63.0	65.0	68.0	72.0	79.0	86.0	93.0	100
123	0	4.0	8.0	12.0	17.0	23.0	29.0	34.0	38.0	44.0	49.0	53.0	56.0	59.0	62.0	65.0	69.0	72.0	75.0	79.0	83.0	88.0	93.0	96.0	100
124	0	4.0	9.0	15.0	23.0	29.0	34.0	40.0	44.0	48.0	50.0	51.0	52.0	53.0	55.0	57.0	60.0	62.0	64.0	67.0	72.0	80.0	88.0	95.0	100
125	0	7.0	12.0	17.0	24.0	30.0	39.0	45.0	50.0	53.0	55.0	56.0	57.0	58.0	59.0	61.0	62.0	63.0	64.0	66.0	70.0	77.0	84.0	92.0	100
126	0	9.0	16.0	23.0	30.0	37.0	43.0	47.0	50.0	52.0	54.0	55.0	56.0	57.0	58.0	59.0	60.0	62.0	64.0	67.0	71.0	77.0	86.0	93.0	100
127	0	8.0	15.0	22.0	28.0	33.0	38.0	42.0	46.0	50.0	52.0	53.0	53.0	53.0	53.0	54.0	55.0	57.0	59.0	63.0	68.0	75.0	83.0	92.0	100
128	0	8.0	15.0	22.0	29.0	34.0	40.0	45.0	48.0	51.0	54.0	57.0	59.0	62.0	63.0	64.0	65.0	66.0	67.0	69.0	72.0	76.0	83.0	91.0	100
129	0	9.0	16.0	22.0	27.0	32.0	37.0	41.0	45.0	48.0	51.0	53.0	55.0	56.0	57.0	57.0	58.0	59.0	61.0	64.0	68.0	73.0	79.0	89.0	100
130	0	10.0	20.0	28.0	35.0	41.0	46.0	49.0	51.0	53.0	55.0	56.0	56.0	57.0	58.0	59.0	60.0	61.0	62.0	65.0	69.0	74.0	81.0	90.0	100
131	0	8.0	15.0	22.0	28.0	33.0	38.0	41.0	44.0	47.0	49.0	51.0	53.0	55.0	56.0	58.0	59.0	60.0	63.0	65.0	69.0	75.0	84.0	92.0	100
132	0	10.0	18.0	25.0	29.0	33.0	36.0	39.0	41.0	42.0	44.0	45.0	46.0	47.0	48.0	49.0	51.0	53.0	56.0	59.0	64.0	70.0	80.0	90.0	100
133	0	8.0	16.0	24.0	32.0	40.0	46.0	51.0	54.0	56.0	57.0	58.0	58.0	59.0	59.0	60.0	60.0	61.0	62.0	64.0	68.0	74.0	83.0	91.0	100
134	0	12.0	22.0	31.0	39.0	45.0	49.0	52.0	54.0	55.0	56.0	56.0	56.0	56.0	57.0	57.0	57.0	57.0	58.0	59.0	62.0	68.0	77.0	88.0	100
135	0	7.0	15.0	22.0	30.0	37.0	43.0	49.0	53.0	55.0	57.0	58.0	59.0	60.0	61.0	62.0	63.0	65.0	67.0	70.0	74.0	79.0	85.0	92.0	100
136	0	11.0	21.0	29.0	37.0	44.0	50.0	55.0	57.0	59.0	60.0	60.0	60.0	60.0	61.0	61.0	61.0	62.0	63.0	64.0	67.0	71.0	78.0	89.0	100
137	0	10.0	18.0	25.0	30.0	39.0	46.0	51.0	54.0	57.0	58.0	59.0	59.0	60.0	60.0	60.0	61.0	62.0	63.0	64.0	67.0	72.0	80.0	90.0	100
138	0	11.0	22.0	31.0	39.0	46.0	52.0	56.0	58.0	59.0	60.0	61.0	61.0	61.0	61.0	62.0	62.0	62.0	63.0	64.0	66.0	71.0	78.0	89.0	100
139	0	8.0	14.0	20.0	25.0	32.0	37.0	42.0	47.0	50.0	53.0	55.0	56.0	58.0	59.0	61.0	63.0	64.0	66.0	68.0	71.0	76.0	85.0	93.0	100
140	0	13.0	18.0	43.0	56.0	65.0	69.0	69.4	69.7	70.1	70.4	70.8	71.1	71.5	71.9	72.2	72.6	73.0	73.3	73.6	74.0	76.0	81.0	89.0	100

Appendix D

Annual Soil Loss Calculations for Parcels in the Assessment Zone

Annual Soil Loss Calcualtions for Parcels in the Assessment Zone
Cawelo Water District Coalition, May 2015

No.	APN	R Factor	K Factor	LS Factor	C Factor	P Factor	A Annual Soil Loss (tons/acre/year)
1	073-040-14	10	0.32	0.15	1	1	0.48
2	073-040-15	10	0.32	0.15	1	1	0.48
3	073-040-16	10	0.32	0.15	1	1	0.48
4	073-040-26	10	0.32	0.15	1	1	0.48
5	073-050-19	10	0.32	0.15	1	1	0.48
6	073-060-14	10	0.32	0.15	1	1	0.48
7	073-112-04	10	0.32	0.15	1	1	0.48
8	073-113-01	10	0.32	0.15	1	1	0.48
9	073-113-02	10	0.32	0.15	1	1	0.48
10	073-114-01	10	0.32	0.15	1	1	0.48
11	073-114-02	10	0.32	0.15	1	1	0.48
12	073-115-02	10	0.32	0.15	1	1	0.48
13	073-122-02	10	0.32	0.15	1	1	0.48
14	073-123-01	10	0.32	0.15	1	1	0.48
15	073-123-04	10	0.32	0.15	1	1	0.48
16	073-140-02	10	0.37	0.42	1	1	1.554
17	073-140-06	10	0.37	0.42	1	1	1.554
18	073-150-01	10	0.37	0.42	1	1	1.554
19	073-150-02	10	0.32	0.15	1	1	0.48
20	073-150-03	10	0.37	0.42	1	1	1.554
21	073-180-09	10	0.32	0.15	1	1	0.48
22	073-180-10	10	0.32	0.15	1	1	0.48
23	073-180-38	10	0.32	0.15	1	1	0.48
24	073-180-39	10	0.32	0.15	1	1	0.48
25	073-200-01	10	0.32	0.15	1	1	0.48
26	073-200-02	10	0.32	0.15	1	1	0.48
27	073-200-03	10	0.32	0.15	1	1	0.48
28	073-220-01	10	0.32	0.15	1	1	0.48
29	073-220-03	10	0.32	0.15	1	1	0.48
30	073-220-04	10	0.32	0.15	1	1	0.48
31	073-220-08	10	0.32	0.15	1	1	0.48
32	073-220-09	10	0.32	0.15	1	1	0.48
33	073-220-11	10	0.32	0.15	1	1	0.48
34	073-220-12	10	0.32	0.15	1	1	0.48
35	073-220-13	10	0.32	0.15	1	1	0.48

Annual Soil Loss Calcualtions for Parcels in the Assessment Zone
Cawelo Water District Coalition, May 2015

No.	APN	R Factor	K Factor	LS Factor	C Factor	P Factor	A Annual Soil Loss (tons/acre/year)
36	073-220-17	10	0.32	0.15	1	1	0.48
37	073-220-18	10	0.32	0.15	1	1	0.48
38	073-220-19	10	0.32	0.15	1	1	0.48
39	073-220-20	10	0.32	0.15	1	1	0.48
40	073-220-23	10	0.32	0.15	1	1	0.48
41	073-220-24	10	0.32	0.15	1	1	0.48
42	073-230-02	10	0.32	0.15	1	1	0.48
43	073-230-10	10	0.32	0.15	1	1	0.48
44	073-230-13	10	0.32	0.15	1	1	0.48
45	073-230-14	10	0.32	0.15	1	1	0.48
46	073-230-22	10	0.37	0.42	1	1	1.554
47	073-230-24	10	0.37	0.42	1	1	1.554
48	073-230-25	10	0.37	0.42	1	1	1.554
49	073-230-26	10	0.37	0.42	1	1	1.554
50	073-230-27	10	0.37	0.42	1	1	1.554
51	073-240-01	10	0.32	0.15	1	1	0.48
52	073-240-07	10	0.37	0.42	1	1	1.554
53	073-240-08	10	0.37	0.42	1	1	1.554
54	073-240-09	10	0.37	0.42	1	1	1.554
55	073-240-10	10	0.37	0.42	1	1	1.554
56	073-240-11	10	0.37	0.42	1	1	1.554
57	073-240-12	10	0.37	0.42	1	1	1.554
58	073-240-13	10	0.37	0.42	1	1	1.554
59	073-240-14	10	0.37	0.42	1	1	1.554
60	073-240-15	10	0.37	0.42	1	1	1.554
61	073-240-16	10	0.37	0.42	1	1	1.554
62	073-240-17	10	0.37	0.42	1	1	1.554
63	073-240-18	10	0.37	0.42	1	1	1.554
64	073-240-19	10	0.37	0.42	1	1	1.554
65	073-240-20	10	0.37	0.42	1	1	1.554
66	073-240-21	10	0.37	0.42	1	1	1.554
67	073-240-22	10	0.37	0.42	1	1	1.554
68	073-240-23	10	0.37	0.42	1	1	1.554
69	073-240-24	10	0.37	0.42	1	1	1.554
70	073-240-33	10	0.37	0.42	1	1	1.554

Annual Soil Loss Calcualtions for Parcels in the Assessment Zone
Cawelo Water District Coalition, May 2015

No.	APN	R Factor	K Factor	LS Factor	C Factor	P Factor	A Annual Soil Loss (tons/acre/year)
71	073-240-34	10	0.37	0.42	1	1	1.554
72	073-240-39	10	0.37	0.42	1	1	1.554
73	073-240-40	10	0.37	0.42	1	1	1.554
74	073-240-46	10	0.37	0.42	1	1	1.554
75	073-240-47	10	0.37	0.42	1	1	1.554
76	073-250-15	10	0.32	0.15	1	1	0.48
77	074-020-39	10	0.37	2.13	1	1	7.881
78	074-020-46	10	0.37	2.13	1	1	7.881
79	074-041-05	10	0.37	2.13	1	1	7.881
80	074-041-06	10	0.37	0.42	1	1	1.554
81	074-041-09	10	0.37	0.42	1	1	1.554
82	074-041-10	10	0.37	2.13	1	1	7.881
83	074-041-11	10	0.37	2.13	1	1	7.881
84	074-041-12	10	0.37	0.42	1	1	1.554
85	074-041-13	10	0.37	0.42	1	1	1.554
86	074-041-16	10	0.37	0.42	1	1	1.554
87	074-041-17	10	0.37	0.42	1	1	1.554
88	074-041-18	10	0.37	2.13	1	1	7.881
89	074-041-19	10	0.37	2.13	1	1	7.881
90	074-041-21	10	0.37	0.42	1	1	1.554
91	074-041-23	10	0.37	2.13	1	1	7.881
92	074-041-26	10	0.37	2.13	1	1	7.881
93	074-041-27	10	0.37	0.42	1	1	1.554
94	074-041-28	10	0.37	2.13	1	1	7.881
95	074-041-30	10	0.37	2.13	1	1	7.881
96	074-041-31	10	0.37	2.13	1	1	7.881
97	074-041-33	10	0.37	0.42	1	1	1.554
98	074-041-34	10	0.37	2.13	1	1	7.881
99	074-041-35	10	0.37	2.13	1	1	7.881
100	074-041-36	10	0.37	0.42	1	1	1.554
101	074-042-42	10	0.37	2.13	1	1	7.881
102	074-061-01	10	0.37	0.42	1	1	1.554
103	074-061-02	10	0.37	0.42	1	1	1.554
104	074-061-03	10	0.37	2.13	1	1	7.881
105	074-061-04	10	0.37	2.13	1	1	7.881

Annual Soil Loss Calcualtions for Parcels in the Assessment Zone
Cawelo Water District Coalition, May 2015

No.	APN	R Factor	K Factor	LS Factor	C Factor	P Factor	A Annual Soil Loss (tons/acre/year)
106	074-061-05	10	0.37	0.42	1	1	1.554
107	074-061-06	10	0.37	0.42	1	1	1.554
108	074-061-07	10	0.37	0.42	1	1	1.554
109	074-061-10	10	0.37	2.13	1	1	7.881
110	074-061-39	10	0.37	2.13	1	1	7.881
111	074-042-25	10	0.37	2.13	1	1	7.881
112	074-042-27	10	0.37	2.13	1	1	7.881
113	074-042-29	10	0.37	2.13	1	1	7.881
114	074-042-31	10	0.37	2.13	1	1	7.881
115	074-042-32	10	0.37	2.13	1	1	7.881
116	074-042-33	10	0.37	2.13	1	1	7.881
117	074-042-35	10	0.37	2.13	1	1	7.881
118	074-042-36	10	0.37	2.13	1	1	7.881