5.11 Soils

5.11.1 Introduction

This section describes the potential effects of the construction and operation of the Carlsbad Energy Center Project (CECP) on soil resources. Section 5.11.2 presents the laws, ordinances, regulations, and standards (LORS) applicable to soils and their use. Section 5.11.3 describes the existing environment that could be affected, including mapped soil types and different uses (such as agriculture). Section 5.11.4 identifies potential environmental effects, if any, from project development. Section 5.11.5 discusses cumulative effects. Section 5.11.6 discusses mitigation measures. Section 5.11.7 describes potential conditions of certification. Section 5.11.8 describes the required permits and provides agency contacts. Section 5.11.9 provides a schedule for obtaining permits. Section 5.11.10 lists the references used to develop this section.

5.11.2 Laws, Ordinances, Regulations, and Standards

Federal, state, and local LORS applicable to soils are discussed below and summarized in Table 5.11-1.

5.11.2.1 Federal LORS

5.11.2.1.1 Federal Water Pollution Control Act of 1972 and the Clean Water Act of 1977

The Federal Water Pollution Control Act of 1972, commonly referred to as the Clean Water Act following an amendment in 1977, establishes requirements for discharges of storm water or wastewater from any point source that would affect the beneficial uses of waters of the United States. The federal Clean Water Act (CWA) effectively prohibits discharges of storm water from construction sites unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. The State Water Resources Control Board (SWRCB) is the permitting authority in California and has adopted a statewide general permit for storm water discharges associated with construction activity (General Construction Permit; SWRCB, 1999) that applies to projects resulting in one or more acres of soil disturbance. The CECP would result in disturbance of more than one acre of soil. Therefore, the project will require the preparation of a storm water management plan. The requirements are described in greater detail in Section 5.15, Water Resources.

The CWA's primary effect on soils within the project area consist of control of soil erosion and sedimentation during construction, including the preparation and execution of erosion and sedimentation control plans and measures for any soil disturbance during construction.

5.11.2.1.2 U.S. Department of Agriculture Engineering Standards

The U.S. Department of Agriculture, National Resources Conservation Service (NRCS), *National Engineering Handbook*, 1983, Sections 2 and 3, provides standards for soil conservation during planning, design, and construction activities. The CECP would need to conform to these standards during grading and construction to limit soil erosion.

TABLE 5.11-1
Laws, Ordinances, Regulations, and Standards Applicable to Soils

LORS	Purpose	Regulating Agency	Applicability (AFC Section Explaining Conformance)
Federal			
Federal Water Pollution Control Act of 1972: Clean Water Act of 1977 (including 1987 amendments)	Regulates storm water discharge from construction and industrial activities	San Diego Region, RWQCB Region 9 under State Water Resources Control Board. USEPA may retain jurisdiction at its discretion.	5.11.2.1.1
Natural Resources Conservation Service (1983), *National Engineering Handbook*, Sections 2 and 3	Standards for soil conservation	Natural Resources Conservation Commission	5.11.2.1.2
State			
Porter-Cologne Water Quality Control Act of 1972; Cal. Water Code 13260-13269: 23 CCR Chapter 9	Regulates storm water discharge	CEC and the San Diego Region, under State Water Resources Control Board	5.11.2.2.1
Local			
Carlsbad General Plan, rev. 2006	Describes local policies for soil resources	City of Carlsbad	5.11.2.3.1
Carlsbad Municipal Code: Grading Ordinance Ord. NS-385 § 4 (part), 1996	Requirements for grading, including clearing and grubbing of vegetation	Planning Department, City of Carlsbad	5.11.2.3.2
City of Carlsbad Engineering Standards: Grading and Erosion Control Standards	Discusses soils reports, slopes, site drainage, and erosion control	Engineering Department, City of Carlsbad	5.11.2.3.3
City of Carlsbad Landscape Manual: Policies and Requirements	Discusses policies towards landscaping	Planning Department, City of Carlsbad	5.11.2.3.4

5.11.2.2 State LORS

5.11.2.2.1 California Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act of 1972 is the state equivalent of the federal CWA, and its effect on the CECP would be similar. The California Water Code requires protection of water quality by appropriate design, sizing, and construction of erosion and sediment controls. The discharge of soil into surface waters resulting from land disturbance may require filing a report of waste discharge (see Water Code Section 13260a). The Regional Water Quality Control Board (RWQCB), which controls surface water discharges, may become involved indirectly if soil erosion threatens water quality.

5.11.2.3 Local LORS

The City of Carlsbad has established ordinances and standards for grading, erosion, and sediment control (O'Donnell, 2007, pers.com.). These ordinances establish permitting requirements and exemptions for general earthwork operations, sediment transport, and

erosion control activities that can cause the discharge of pollutants into storm water systems or watercourses. A preliminary soil investigation report and an erosion control plan are required prior to submittal of all grading plans. The City of Carlsbad Engineering Department reviews grading plans along with all associated reports and issues the grading permit.

5.11.2.3.1 City of Carlsbad General Plan

The City of Carlsbad (City) General Plan presents policies that provide for guidance and implementation of land use controls in and around the City's sphere of influence. Included in the general plan are provisions for controlling open space land uses, ranging from parks to agriculture. The goal of the Land Use Element of the City's General Plan is to "provide sufficient land to meet the needs of the community over a long-term period, while preserving the quantity and quality of the natural environment" (City of Carlsbad, 1994). One of the main objectives for development on industrial land is to minimize negative impacts to surrounding land uses and to protect these areas from encroachment (City of Carlsbad, 1994). The City's General Plan also indicates construction of all projects within the City will be monitored to ensure environmental conditions and mitigating measures are implemented and are successful.

5.11.2.3.2 City of Carlsbad Municipal Code

Prior to construction of the CECP, a grading permit will be required in accordance with City of Carlsbad Municipal Code (CMC 15.16.010). To obtain the grading permit, a Preliminary Soils Investigation Report must be submitted that evaluates soil bearing capacities of the project site, expansive characteristics of the soil, and summaries of field and laboratory testing (CMC, 2007). This report must be completed by a California certified civil or geotechnical engineer to address the site soil conditions. The grading plan must also include provisions for protective measures for control of urban pollutants and erosion and sedimentation in compliance with the Carlsbad Standard Urban Storm Water Mitigation Plan (SUSMP) (CMC, 2007).

An erosion control plan must accompany the application for the grading permit. This plan shall be designed to minimize the loss of soil from the project site to the maximum extent possible. The plan must also include erosion control measures for the site.

A geotechnical report is also required for approval of the grading plan. This report shall include a description of the geology of the site and any implications that may result from these geological conditions in regards to grading of the soil. In addition, specifications and engineering calculations must be included in the grading permit application.

Once the grading work has been completed, a written statement must be submitted by the responsible civil engineer indicating all grading work and drainage facilities were completed in conformance with the grading permit. The statement must also indicate that all embankments were constructed and compacted to city standards and in accordance with the earthwork specifications outlined in the preliminary report (CMC, 2007).

5.11.2.3.3 City of Carlsbad Engineering Standards

The City of Carlsbad Engineering Department has developed a set of standards and design criteria to ensure the success of all construction projects within Carlsbad. Within these standards, Volume One includes Grading and Erosion Control Standards (City of

Carlsbad, 2004). These standards provide details regarding the Preliminary Soils Report, slopes, site drainage, and the erosion control plan and mitigation measures. Volume Four includes Storm Water Best Management Practices for Construction Sites and information on the SUSMP (City of Carlsbad, 2003).

5.11.2.3.4 City of Carlsbad Landscaping Standards

A Landscaping Concept Plan must be submitted along with the grading permit application and must be approved by the Planning Department prior to construction. The City of Carlsbad has developed a Landscape Manual in order to "design and maintain landscape systems compatible with the natural environment" (City of Carlsbad, 1990). This manual provides guidance for slope revegetation and erosion control policies.

5.11.3 Environmental Setting

The CECP will be constructed on the northeast portion of the existing Encina Power Station site. The CECP is located in an area within the City of Carlsbad in San Diego County that is zoned for public utilities (U), which allows electrical generation and transmission facilities. The site bordered on the north by the Agua Hedionda Lagoon, which is an important component of the local watershed that provides a drainage pathway to the Pacific Ocean. The CECP site is bounded on the east by Interstate 5 (I-5) and on the west by an active commuter railway line. The south side of the CECP site is bordered by residential areas and the west side by Carlsbad Boulevard and the Pacific Ocean.

Surrounding land uses include residential use to the north and south. There are some residential properties near the CECP area, with the nearest ones located about 1,600 feet to the south directly south across the street along Cannon Road. Another nearby residential area is found approximately 1,750 feet northwest from the project site near the north side of the Agua Hedionda Lagoon.

The natural gas, water supply (fire suppression, reclaimed water, potable water), waste water discharge (sanitary and non-recyclable water), and electrical connections will be made to existing facilities within the site or along rights-of-way located immediately adjacent to the CECP site. These linears will be extended to the CECP from the nearest point of service with estimated lengths as follows: 18-inch-diameter gas line (1,100 feet); 12-inch-diameter reclaimed water line (3,700 feet); 10-inch potable water line (1,200 feet); and 12-inch-diameter sanitary sewer line (1,100 feet).

The CECP will be constructed on an area of about 11 acres within existing containment structures (soil berms) that currently contain above-ground fuel storage tanks. The tanks will be removed under a separate project prior to the CECP construction. CECP construction may occur in a single period spanning 19 months (Single Phase Construction) or be completed in a phased manner over a 25-month period (Phased Construction). The soil removed from the interior containment berms (approximately 46,700 cubic yards) will be used to construct another soil berm along the western side of the CECP site that will provide additional visual and sound screening (hereinafter, referred to as the "western berm"). The western berm will be about 1,050 feet in length and will range from 50 feet to 100 feet wide at its base for a total estimated area of 1.5 acres (including anticipated 1.5:1 slope grades). It will be compacted in place and stabilized to prevent subsequent water and wind erosion.

Soil types for the project area are identified on Figure 5.11-1. A description of the primary soil mapping unit upon which the CECP is located was developed from the *Soil Survey, San Diego Area, California* (NRCS, 1973). The CECP area includes the project site, various laydown areas (A through F) located within the CECP or Encina Power Station sites, and proposed linear features (electrical transmission, natural gas, reclaimed water, potable water, and sanitary sewer lines). Table 5.11-2 summarizes depth, texture, drainage, permeability, water runoff, and characteristics related to revegetation potential for the soil mapping units that will be potentially affected by CECP construction. Actual soil conditions in the project area could differ from what is described in the generalized soil descriptions because of the potential for local grading and imported fill in developed, urban areas.

TABLE 5.11-2
Soil Mapping Unit Descriptions and Characteristics

Map Unit	Description	
MIC	**Marina loamy coarse sand, 2 to 9 percent slopes:**	
	This soil unit covers the entire property:	
	Formation:	Eolian sand derived from mixed sources
	Typical profile:	Loamy coarse sand and loamy sand throughout
	Shrink-swell capacity:	Not given; expected as none due to dominance of sands
	Depth and drainage:	Very deep (> 60 inches deep) and somewhat excessively drained
	Permeability*:	Moderate to rapid
	Runoff*:	Slow to medium
	Erosion hazard:	Slight to moderate
	Capability class:	IIIs-4
	Taxonomic class:	Mixed, thermic, Lamellic Xeropsamments*

Notes:

Soil characteristics listed above are based on soil mapping descriptions provided in the published soil survey (NRCS, 1973) and the online soil survey (soildatamart.nrcs.usda.gov).

*Information for MIC map unit not available; information for the Marina series used instead.

The soil description provided above is limited to the only soil unit that would be affected by the CECP. Other soil mapping units that are outside of the project area but shown on Figure 5.11-1, include the following: **CbB** – Carlsbad gravelly loamy sand (5 to 9 percent slopes); **CbC** – Carlsbad gravelly loamy sand (5 to 9 percent slopes); **CbD** – Carlsbad gravelly loamy sand (9 to 15 percent slopes); **CbE** – Carlsbad gravelly loamy sand (15 to 30 percent slopes); **CgC –** Chesterton-Urban land complex (2 to 9 percent slopes); **Cr** – Coastal Beaches; **CsC** – Corralitos loamy sand (5 to 9 percent slopes); **GaF** – Gaviota fine sandy loam (30 to 50 percent slopes); **HrC** – Huerhuero loam (2 to 9 percent slopes); **HrE2** – Huerhuero loam, eroded (15 to 30 percent slopes); **LAGOON** – Lagoons of San Diego area; **LeE** – Las Flores loamy fine sand (15 to 30 percent slopes); **LeE3** – Las Flores loamy fine sand, eroded (15 to 30 percent slopes); **LfC** – Las Flores-Urban land complex (2 to 9 percent slopes); **LvF3** – Loamy alluvial land-Huerhuero complex, severely eroded (9 to 50 percent slopes); **Md** – Made land; **MIE** – Marina loamy coarse sand (9 to 30 percent slopes); **SbC** – Salinas clay loam (2 to 9 percent slopes); **Tf** – Tidal Flats

5.11.3.1 Agricultural Use

The soils mapped in the CECP and surrounding areas been developed primarily for industrial, commercial, and urban residential uses. Given the current land uses, most of these areas are now unsuitable for commercial crop production. Strawberry fields located to the east of I-5 and south of the Agua Hedionda Lagoon represent the only agricultural land uses within 1 mile of the CECP site.

5.11.3.2 Soil Types

Table 5.11-2 describes the properties of the soil mapping units that are found in the vicinity of the CECP site and onsite construction laydown areas. As indicated, the soil mapping units in the project area are gently sloping to moderately steep soils formed in old sand dunes near the coast. These soils are somewhat excessively-drained.

As shown on Figure 5.11-1, all of the CECP site lies within soil mapping unit [**MIC**] - Marina loamy coarse sand (2 to 9 percent slopes). Due to the developed nature of the project area and vicinity, it is expected that soil conditions would vary significantly from those mapped. Urban development often entails significant mixing of local soils from grading and the import of construction fill soils beneath foundations and roadways. These imported soils would necessarily have to be suitable for compaction to support structures and roadways, so they are expected to consist of a mixture with a wide range of coarse textured particle sizes (from silt to gravel sizes). They would not be expected to contain unsuitable materials such as organic debris or expansive clays. Based on the prior development of this area, it was assumed that the site slopes would generally be no greater than 2 percent (except for the slopes of the constructed above-ground storage tank containment berms).

5.11.3.3 Potential for Soil Loss and Erosion

The factors that have the largest effect on soil loss include steep slopes, lack of vegetation, and erodible soils composed of large proportions of fine sands. The soils found in the CECP area are gently sloping to moderately steep (the estimated average slope of the site is less than 2 percent based on the previous development of the property). In general, the CECP soil type, as indicated by the NRCS mapping (1973), is relatively coarse grained (loamy sand). These soils are expected to have relatively low water erosion potential and a moderately high wind erosion potential for the following reasons:

- There are nearly level conditions at the site and laydown areas and the soils are expected to have moderate permeability (and consequently, low runoff);
- The loamy sandy surface materials are expected to be readily transported by wind; however, it is expected that the laydown areas will be covered (by gravel or paving) immediately after grading to prevent subsequent wind erosion losses.

5.11.3.4 Other Significant Soil Characteristics

The mapped soil information does not indicate the potential for other significant soil characteristics that would pose a problem for construction. Previous soil remediation activities in proximity to one of the above-ground storage tanks (No. 7) within the CECP footprint (Fluor Daniel GTI, 1998) indicated that groundwater levels were 5 feet or greater below the existing ground surface in March 1998. While the report documents that soil contamination has been addressed near the tanks, it is possible that additional soil contamination could be revealed when the tanks are removed and the site is being graded.

The mapped soil has medium fertility and is very friable and easy to work, indicating that revegetation would be feasible, especially if soil amendments and irrigation were used to assure plant establishment. The soil also has moderate to rapid permeability, slow to medium runoff and a slight to moderate erosion hazard, indicating that plant irrigation should not be difficult to manage.

5.11.4 Environmental Analysis

The following sections describe the potential environmental effects on soils during the construction and operation phases of the CECP.

5.11.4.1 Significance Criteria

The potential for impacts to soils resources and their uses (such as agriculture) were evaluated with respect to the criteria described in the Appendix G checklist of the California Environmental Quality Act (CEQA). An impact is considered potentially significant if it would:

- Involve other changes in the existing environment which, because of their location or nature, could result in conversion of farmland to non-agricultural use
- Impact jurisdictional wetlands
- Result in substantial soil erosion
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (International Code Council, 1997), creating substantial risks to life or property

The following sections describe the anticipated environmental impacts on agricultural production and soils during CECP construction and operation.

5.11.4.2 Farmland Conversions

The CECP is not located on farmland and is not located within an area zoned for agricultural use or having a Williamson Act contract. The CECP will not result in the conversion of any agricultural land to a non-agricultural use.

5.11.4.3 Jurisdictional Wetlands

The Agua Hedionda Lagoon to the north of CECP site is a jurisdictional wetland (i.e., waters of the U.S.). There are also storm drainage channels within the Encina Power Station property that contain cattail (*Typha* sp.) vegetation that could be potentially considered as jurisdictional wetlands because of their direct connection to the Agua Hedionda Lagoon. However, none of these features will be directed impacted by the CECP facilities.

Previous soil remediation activities in proximity to one of the above-ground storage tanks (No. 7) within the CECP footprint (Fluor Daniel GTI, 1998) indicated that groundwater levels were 5 feet or greater below the existing ground surface in March 1998. This information indicates that wetland hydrology or soils are not likely to be found within the tank containment facilities. This would mean that none of the areas within the containment facilities upon which the CECP will be constructed would be considered as a jurisdictional wetland.

Based on this information, the CECP facilities will not impact any jurisdictional wetlands.

5.11.4.4 Soil Erosion During Construction

Construction impacts on soil resources can include increased soil erosion and soil compaction. Soil erosion causes the loss of topsoil and can increase the sediment load in surface receiving waters downstream of the construction site. The magnitude, extent, and

duration of construction-related impact depends on the erodibility of the soil, the proximity of the construction activity to the receiving water, and the construction methods, duration, and season.

Because the conditions that could lead to excessive soil erosion are not present at the CECP site and laydown area, very little soil erosion is expected during the construction period. In addition, Best Management Practices (BMPs) will be implemented during construction and the California Energy Commission (CEC) requires that project owners develop and implement an erosion and sediment control plan to reduce the impact of runoff from the construction site. Mandatory site monitoring will require inspections to ensure that the BMPs described in the erosion and sediment control plan are properly implemented and effective. Based on these conditions and requirements, impacts from soil erosion are expected to be less than significant.

Despite the low potential for soil erosion in the CECP area, estimates of erosion by water and wind are provided in the following sections.

5.11.4.4.1 Water Erosion

An estimate of soil loss during construction by water erosion is found below in Table 5.11-3. This estimate was developed using the Revised Universal Soil Loss Equation (RUSLE2) program using the following assumptions:

- The CECP site is a total of 23 acres of which 11 acres within the existing containment berms would be used to construct the CECP facilities. Under the Single Phase Construction period scenario, active soil grading would occur over an estimated 2-month period within the project site, after which, the soil would then be exposed for an additional 17-month construction period. Under the Phased Construction period scenario, active soil grading would occur over an estimated 3-month period within the project site, after which, the soil would then be exposed for an additional 22-month construction period. It is assumed for both construction scenarios that up to one quarter of the site soils could be exposed at any point during the construction period. The laydown areas (A-F) will be located in different areas of the CECP footprint and Encina Power Station site. It is expected that only minor grading will be required in these sites (estimated at 1 week each) after which the areas will be covered with gravel or other material to permit wet season use. Laydown Area A would be used to temporarily store soil excavated from the containment berms. It is estimated that approximately 4 acres (of the 4.3 acres total) would be covered with the soil spoil piles. As previously mentioned, soil excavated from the internal containment berms would be used to construct the western berm that would cover approximately 1.5 acres and be compacted in place to a 1.5:1 slope grade.
- Estimates of soil loss (in tons) were made for the site-specific soil mapping unit characteristics that were available within the RUSLE2 database.
- RUSLE2 rainfall erosivity conditions were estimated for the CECP site coordinates using site specific rainfall estimates from on-line National Weather Service Hydrometerological Design Studies Center (NOAA Atlas 2) at [http://www.nws.noaa.gov/ohd/hdsc/noaaatlas2.htm].

- Assumes a 100-foot slope length with a 2.0 percent slope (i.e., lowest slope of the 2 to 9 percent slope class) for the Marina soil unit.

Soil losses are estimated using the following RUSLE2 conditions:

Construction soil losses were approximated using Management as "bare ground, smooth surface;" Contouring: None, rows up and down hill; Diversion /terracing: None; and Strips and Barriers: None.

Active grading soil losses were approximated using Management as "bare ground, rough surface" soil conditions; Contouring: None, rows up and down hill; Diversion /terracing: None; and Strips and Barriers: None.

Construction soil losses **with implementation of construction BMPs** was approximated using Management as" Silt fence;" Contouring: Perfect, no row grade; Diversion/terracing: None; and Strips and Barriers: 2 fences, one at end of RUSLE2 slope.

A **"No Project"** soil loss estimate was also approximated using Management as "Dense grass – not harvested;" Contouring: None, rows up and down hill; Diversion /terracing: None; and Strips and Barriers: None.

With the implementation of appropriate BMPs that will be required under the NPDES permit, the total estimated project soil loss of 1.28 tons or 1.55 tons, depending on whether the project is constructed in a single or phased manor (see Table 5.11-3). These estimated amounts are relatively minor and would not constitute a significant impact. It should also be recognized that these estimates of accelerated soil loss by water are very conservative (overestimate of soil loss) because it assumes only a single BMP (i.e., silt fencing), whereas a Storm Water Pollution Prevention Plan (SWPPP) will require multiple soil erosion control measures. A draft SWPPP for construction of the CECP is included in Appendix 5.15A and storm water related project efforts are discussed in Section 5.15, Water Resources. Furthermore, because the CECP site would be located within the previously excavated containment basins for the aboveground storage tanks, this would effectively eliminate the potential for soil loss by water erosion from the CECP site.

TABLE 5.11-3
Estimate of Soil Loss by Water Erosion Using Revised Universal Soil Loss Equation (RUSLE2)

			Estimates Using Revised Universal Soil Loss Equation[a]		
Feature (acreage)[b]	**Activity**	**Duration (months)**	**Soil Loss (tons) without BMPs**	**Soil Loss (tons) with BMPs**	**Soil Loss (tons/yr) No Project**
Project Site – Single Phase Construction (10 acres)	Grading	2	7.0	0.09	0.5300
	Construction	17	26.9	0.75	—
Project Site – Phased Construction period (10 acres)	Grading	3	10.5	0.13	0.5300
	Construction	22	34.8	0.97	—
Laydown Areas (A-F) (7.00 acres)	Grading	0.25	0.6	0.01	0.3710
	Construction	12	13.3	0.4	—
Transmission Lines (4.62 acres for construction; 0.008 acre for pole footprints)	Grading	0.5	0.001	0.000	0.0000
	Construction	2	1.463	0.030	—
Reclaimed Water Line (4.21 acres for construction; 0.34 acre for trench)	Grading	2	0.236	0.0044	0.0000817
	Construction	2	1.334	0.025	—
Potable Water Line (1.38 acres for construction; 0.11 acre for trench)	Grading	1	0.039	0.0002	0.0000012
	Construction	1	0.200	0.001	—
Sanitary Sewer Line (1.26 acres for construction; 0.10 acre for trench)	Grading	1	0.035	0.0002	0.0000011
	Construction	1	0.200	0.0011	—
Gas Line (1.26 acres for construction; 0.10 acre for trench)	Grading	1	0.035	0.0002	0.0000011
	Construction	1	0.200	0.0011	—
Soil Loss Estimates – Single Phase Construction	All activities listed above	43.75	51.57	1.28	0.901
Project Soil Loss Estimates – Phased Construction period	All activities listed above	49.75	62.99	1.55	0.901

TABLE 5.11-3
Estimate of Soil Loss by Water Erosion Using Revised Universal Soil Loss Equation (RUSLE2)

			Estimates Using Revised Universal Soil Loss Equation[a]		
Feature (acreage)[b]	**Activity**	**Duration (months)**	**Soil Loss (tons) without BMPs**	**Soil Loss (tons) with BMPs**	**Soil Loss (tons/yr) No Project**

Notes:

[a] Soil losses (tons/acre/year) are estimated using RUSLE2 software available on line [http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_index.htm]. The soil characteristics were estimated using RUSLE2 soil profiles corresponding to the mapped soil unit.

Soil loss (R-factors) were estimated using 2-year, 6-hour point precipitation frequency amount for the site coordinates using the on line tools at http://www.nws.noaa.gov/ohd/hdsc/noaaatlas2.htm

Estimates of actual soil losses use the RUSLE2 soil loss times the duration and the affected area. The No Project Alternative estimate does not have a specific duration so loss is given as tons/year.

[b] Acreages assume a 50-ft construction corridor for the all linear features. The reclaimed and potable water lines and the sewer and gas lines will have a 4-ft wide trench and the transmission line will have 21 poles with each pole having a 4 by 4-foot excavation footprint.

Other Project Assumptions as follows:

It is assumed that the grading/excavation for all the poles will be completed within 2 weeks and the entire installation will be completed within an additional 2 months.

It is assumed that grading for the construction site will take 2 months (Single Phase Construction) or 3 months (Phased Construction period).

It is assumed that construction will take an additional 17 months (Single Phase Construction) or 22 months (Phased Construction period).

It is assumed that excavation for the reclaimed water line will take 2 months and that construction will take an additional 2 months.

It is assumed that excavation for the potable water, sanitary sewer and gas lines will take 1 month and that construction will take an additional 1 month.

RUSLE2 Assumptions as follows:

100-ft slope length. Estimated soil unit slope is the lower end of the unit slope class due to the fact that the project area was previously developed.

Construction soil losses assume the following inputs: Management - Bare ground; Contouring - None, rows up and down hill; Diversion/terracing - None; Strips and Barriers - None.

Grading soil losses assume the following inputs: Management - Bare ground/rough surface; Contouring - None, rows up and down hill; Diversion/terracing - None; Strips and Barriers - None.

Construction with BMP soil losses assume the following inputs: Management - Silt fence; Contouring - Perfect, no row grade; Diversion/terracing - None; Strips and Barriers - 2 fences, 1 at end of RUSLE slope.

No Project soil losses assume the following inputs: Management - Dense grass, not harvested; Contouring - None, rows up and down hill; Diversion/terracing - None; Strips and Barriers - None.

5.11.4.4.2 Wind Erosion

The potential for wind erosion of surface material was estimated by calculating the total suspended particulates that could be emitted as a result of grading and the wind erosion of exposed soil. The total site area and grading duration were multiplied by emission factors to estimate the total suspended particulate matter (TSP) emitted from the site. Fugitive dust from site grading was calculated using the default particulate matter less than 10 microns in equivalent diameter (PM_{10}) emission factor used in URBEMIS2002 and the ratio of fugitive TSP to PM_{10} published by the Bay Area Air Quality Management District (BAAQMD, 2005). Fugitive dust resulting from the wind erosion of exposed soil was calculated using the emission factor in AP-42 (USEPA, 1995; also in Table 11.9-4 in BAAQMD, 2005).

Table 5.11-4 summarizes the mitigated TSP predicted to be emitted from the site from grading and the wind erosion of exposed soil. Without mitigation, the maximum predicted erosion of material from the site is estimated between 4.5 and 5.1 tons over the course of the project construction cycle, depending on whether the project is constructed in a single or phased manner. This estimate is reduced to between 1.6 and 1.8 tons by implementing basic mitigation measures such as water application (see mitigation measures, below). These estimates are conservative because these estimates make use of emission rates for a generalized soil rather than for specific soil properties.

TABLE 5.11-4
Total Suspended Particulate Emitted from Grading and Wind Erosion with and without Mitigation

Emission Source	Duration (months)	Unmitigated TSP (tons)[a]	Mitigated TSP (tons)[b]
Grading Dust:			
CECP Site Area – Single Phase Construction (10 acres)	2	0.344	0.120
CECP Site Area – Phased Construction (10 acres)	3	0.516	0.180
Laydown Areas A-F (7.0 acres)	0.25	0.030	0.011
Transmission Line Poles (0.008 acre)	0.5	0.00007	0.00002
Gas Line Trench (0.101 acre)	1	0.0017	0.0006
Reclaimed Water Line Trench (0.337 acre)	2	0.0116	0.0041
Potable Water Line Trench (0.110 acre)	1	0.0019	0.0007
Sanitary Sewer Line Trench (0.101 acre)	1	0.0017	0.0006
Wind-Blown Dust:			
CECP Site Area – Single Phased Construction (10 acres)	17	1.35	0.471
CECP Site Area – Phased Construction (10 acres)	22	1.74	0.610
Laydown Area A (4.0 acres of 4.3 acres) and the Western Berm (1.5 acres)	12	2.09	0.732
Transmission Line Corridor (4.620 acres)	2	0.29	0.10
Gas Line Corridor (1.263 acres)	1	0.040	0.014
Reclaimed Water Line Corridor (4.213 acres)	2	0.27	0.09
Potable Water Line Corridor (1.377 acres)	1	0.044	0.015

TABLE 5.11-4
Total Suspended Particulate Emitted from Grading and Wind Erosion with and without Mitigation

Emission Source	Duration (months)	Unmitigated TSP (tons)[a]	Mitigated TSP (tons)[b]
Sanitary Sewer Line Corridor (1.263 acres)	1	0.040	0.014
Estimated Total – Single Phase Construction		**4.510**	**1.578**
Estimated Total – Phased Construction		**5.077**	**1.777**

Notes:

[a] Emission Factor Source: Jones and Stokes, 2003 URBEMIS2002 User's Guide. The PM_{10} emission factor for grading dust is 0.11 ton/acre/month and the TSP emission factor for wind-blown dust is 0.38 ton/acre/year.

[b] According to the South Coast Air Quality Management District (SCAQMD) CEQA Handbook, Table 11-4 (1993), the range in reduction of PM_{10} with standard mitigation measures (water spraying, etc.) applied is 30 to 74 percent. This analysis assumes an average efficiency of 65 percent, applied to TSP.

Project Assumptions:

Active site grading will last approximately 2 months (Single Phase Construction) or 3 months (Phased Construction) for the project site. Construction of the CECP will extend an additional 17 months (Single Phase construction period) or 22 months (Phased Construction) after grading and approximately 1/4th of the project site will have bare soil exposure during the length of the construction period.

Laydown Areas (A-F) will require 1 week for grading, then will be graveled (or otherwise covered). At Area A, 4 out of 4.3 acres will be used to stockpile soil. The Western Berm will cover an area of about 1.5 acres (including slopes).

Excavation of the 21 new transmission poles will take 2 weeks followed by a 2-month construction period. Each pole will impact a 4-by-4 foot area for a total impact area of 0.0077 acre.

All underground linears (gas, reclaimed water, potable water, and sanitary sewer lines) will have a 4-foot-wide trench and a 50-foot-wide construction corridor.

5.11.4.4.3 Compaction During Construction and Operation

Construction of the CECP would result in soil compaction during the construction of foundations and paved roadway and parking areas. Soil compaction would also result from vehicle traffic along temporary access roads and in the equipment staging (laydown) area. Soil compaction increases soil density by reducing soil pore space. This, in turn, reduces the ability of the soil to absorb precipitation and transmit gases for respiration of soil microfauna. Soil compaction can result in increased runoff, erosion, and sedimentation. The incorporation of BMPs during project construction will result in less-than-significant impacts from soil compaction during construction.

Prior to use as the construction laydown areas, minimal grading is expected since the CECP site and proposed laydown areas are already developed and relatively flat. After minor grading, runoff from the site and laydown area will either occur as overland flow or percolate to groundwater. However, the laydown areas will be graveled (or otherwise covered) to allow for wet season use and further minimize soil erosion potential. Heavy equipment stored onsite will be placed on dunnage to protect it from ground moisture. Once construction is completed, the gravel will either be removed from the site or incorporated into the site paving.

Because the CECP is being constructed in a previously developed area that has already been compacted to support the above-ground storage tanks and because the site will be protected after construction, the overall anticipated effects of compaction during construction are considered to be less than significant.

Operation of the CECP would not result in impacts to the soil from erosion or compaction. Routine vehicle traffic during plant operation will be limited to roadways adapted from existing roads or constructed as part of the CECP. Standard operational activities should not involve the disruption of soil. Therefore, impacts to soil from project operations would be less than significant.

5.11.4.5 Effects of Emissions on Soil-Vegetation Systems

There is a concern in some areas that emissions from a generating facility, principally NOx from the combustors or drift from the cooling towers, would have an adverse effect on soil-vegetation systems in the project vicinity. This is principally a concern where environments that are highly sensitive to nutrients or salts, such as serpentine habitats, are downwind of the project.

For the CECP, the dominant land use immediately around the project is residential and open space. In addition, CECP is a dry air cooled facility; therefore there is no draft from cooling towers. The local geologic maps do not indicate the presence of ultramafic (serpentine) bedrock in the project area. The addition of small amounts of nitrogen to the industrial and commercial areas would be insignificant because of the paucity of vegetation in these areas. Within the more vegetated residential or open space areas, the addition of small amounts of nitrogen would be insignificant within the context of fertilizers, herbicides, and pesticides typically used by homeowners or farmers.

5.11.5 Cumulative Effects

As previously described, the CECP would have no effect on agriculture because the project or linear facilities is proposed on previously developed lands that are not used for agriculture. The project's effects on soil erosion, sedimentation, and compaction would be negligible and insignificant, particularly with the application of onsite BMPs. The immediate site and surrounding area is developed for public utility and urban uses.

Cumulative projects are described in Section 5.6.7 and include the following:

- Carlsbad Seawater Desalination Project at Encina Power Station
- I-5 North Coast Corridor Improvements (new lanes and interchanges)
- City of Carlsbad facility improvements (three sewer interceptors segments and a lift station)
- Carlsbad Boulevard bridge over the Encina Power Station outlet channel
- A future development plan for the 300-acre Flower Fields Area (current strawberry fields)

It is expected that the cumulative projects would employ good engineering practices and comply with all applicable federal, state, and local LORS. Therefore, the potential for cumulative impacts of the CECP combined with other projects on soil loss and erosion is not expected to be significant.

5.11.6 Mitigation Measures

BMPs will be used to minimize erosion at the CECP site during construction. These measures typically include mulching, physical stabilization, dust suppression, berms, ditches, and sediment barriers. The actual BMPs would be developed during final design and would be included in the appropriate SWPPP. A copy of the draft construction SWPPP is provided in Appendix 5.15A. Water erosion will be mitigated through the use of sediment barriers and wind erosion potential will be reduced significantly by keeping soil moist or by covering soil piles with mulch or other wind protection barriers. These temporary measures would be removed from the site after the completion of construction and the site will paved or completely covered with facilities or other type of ground cover (e.g., gravel or landscape).

Erosion control measures would be required during construction to help maintain water quality, protect property from erosion damage, and prevent accelerated soil erosion or dust generation that destroys soil productivity and soil capacity.

5.11.6.1 Temporary Erosion Control Measures

Temporary erosion control measures would be implemented before construction begins, and would be evaluated and maintained during construction. These measures typically include revegetation, mulching, physical stabilization, dust suppression, berms, ditches, and sediment barriers. These measures would be removed from the site after the completion of construction.

During construction of the CECP, dust erosion control measures would be implemented to minimize the wind-blown loss of soil from the site. Water of a quality equal to or better than existing surface runoff would be sprayed on the soil in construction areas to control dust prior to completion of permanent control measures.

Sediment barriers slow runoff and trap sediment. Sediment barriers include straw bales, sand bags, straw wattles, and silt levees. They are generally placed below disturbed areas, at the base of exposed slopes, and along streets and property lines below the disturbed area. Sediment barriers are often placed around sensitive areas to prevent contamination by sediment-laden water near areas such as wetlands, creeks, or storm drains. For the CECP site, construction will occur inside of the old tank berms, creating a barrier around the site. This will help reduce the amount of runoff and erosion that results from construction activities. Also, some barriers would be placed in locations where offsite drainage could occur to prevent sediment from leaving the site. If used, sediment barriers would be properly installed (staked and keyed), then removed or used as mulch after construction. Runoff detention basins, drainage diversions, and other large-scale sediment traps are not considered necessary due to the level topography and surrounding paved areas. Any soil stockpiles, including sediment barriers around the base of the stockpiles, would be stabilized and covered.

Mitigation measures, such as watering exposed surfaces, are used to reduce PM_{10} emissions during construction activities. The PM_{10} reduction efficiencies are taken from the SCAQMD CEQA Handbook (1993) and were used to estimate the effectiveness of the mitigation measures. Table 5.11-5 summarizes the mitigation measures and PM_{10} reduction efficiencies.

TABLE 5.11-5
Mitigation Measures for Fugitive Dust Emissions

Mitigation Measure	PM_{10} Emission Reduction Efficiency (%)
Water active sites at least twice daily	34-68
Enclose, cover, water twice daily, or apply non-toxic soil binders, according to manufacturer's specifications, to exposed piles (i.e., gravel, sand, dirt) with 5 percent or greater silt content	30-74

Source: SCAQMD CEQA Handbook, Table 11-4 (1993)

5.11.6.2 Permanent Erosion Control Measures

Permanent erosion control measures on the site will include graveling, paving, and drainage systems.

5.11.6.3 Potential Soil Contamination Measures

It is possible that previously unidentified soil contamination could be revealed during the construction of the CECP. A contingency plan for contaminated soil management will be developed prior to construction. Such a plan would assure that the processes are in place for monitoring soil conditions (including testing, as needed) for response to this issue in a manner that is protective of onsite construction workers, future site workers, and the environment.

5.11.7 Proposed Conditions of Certification

While the potential impacts to soils from the construction and operation of the CECP are less than significant, the following conditions of certification are proposed for the CECP by the Applicant to ensure that such impacts remain below a level of significance.

SOIL-1: Prior to site mobilization, demolition, and/or construction related ground disturbance activities, including linear facilities, the Applicant shall develop a SWPPP for the project as required under the NPDES General Storm water Construction Activity Permit. A copy of the SWPPP and the Notice of Intent (NOI) submitted to the San Diego RWQCB as required under the NPDES General Storm water Construction Activity Permit regulations shall be provided to the Compliance Project Manager (CPM) for review and approval. The SWPPP shall include the actual drainage and facility design for all on- and offsite CECP facilities for construction, and shall be designed according to the most recent applicable guidelines and checklists set forth by the State Water Resources Control Board Division of Water Quality. The SWPPP shall demonstrate compliance with all applicable SUSMP requirements. The project owner shall submit the construction SWPPP to the City of Carlsbad for review and comment, and provide the CPM with a copy of a transmittal letter that requests the City provide copies of their comments to both the project owner and to the CPM.

Verification: Sixty days prior to the start of any site mobilization activities and/or ground disturbing activities associated with construction of the project or any linear element, the Applicant shall submit copies of the construction SWPPP, the NOI, and the transmittal letter

to the CPM for review and approval. The SWPPP must be approved, and the transmittal letter and NOI copies received by the CPM prior to the start of site mobilization activities**.**

SOIL-2: Prior to site mobilization and construction related ground disturbance activities, including linear facilities, the Applicant shall develop an Erosion and Sedimentation Control Plan (ESCP) for the construction phase of the project. A copy of the ESCP for construction shall be provided to the CPM for review and approval. The ESCP shall address the actual drainage and facility design for all on- and offsite CECP facilities for construction. The ESCP shall demonstrate compliance will all applicable SUSMP requirements. The Applicant shall submit the construction ESCP to the City of Carlsbad for review and comment, and provide the CPM with a copy of a transmittal letter that requests the City provide copies of their comments to both CECP and to the CPM.

Verification: Sixty days prior to the start of any site mobilization activities and/or ground disturbing activities associated with construction of the project or any linear element, the Applicant shall submit the ESCP and a copy of the transmittal letter to the CPM for review and approval. The ESCP must be approved, and the transmittal letter received by the CPM prior to the start of site mobilization activities**.**

SOIL-3: Prior to CECP operation, the Applicant shall develop a SWPPP as required under the NPDES storm water discharge permit for operation of the project. The SWPPP shall include the actual drainage and facility design for all on- and offsite CECP and linear facilities showing the details of the storm water and sediment run-off and run-on to the CECP facilities during operation. The SWPPP shall be designed according to most recent guidelines and checklists set forth by the State Water Resources Control Board Division of Water Quality. This plan shall document that the existing and project storm water facilities have adequate capacity as required by the City of Carlsbad. The SWPPP shall be consistent with all other permit and design documents, and shall demonstrate compliance with all applicable SUSUMP requirements. The Applicant shall include in this plan the installation of secondary containment for the entire site, excluding offsite and linear facilities. The containment design shall have design documentation and specifications for the berms or other walled structures. The Applicant shall submit the operational SWPPP to the City of Carlsbad for review and comment, and provide the CPM with a copy of a transmittal letter that requests the City provide copies of their comments to both the project applicant and to the CPM. The operational SWPPP shall be approved, and the transmittal letter received by the CPM prior to the start of operation.

Verification: Sixty days prior to the start of operation, the Applicant shall submit copies of the SWPPP and the transmittal letter to the CPM for review and approval. The SWPPP must be approved, and the transmittal letter received by the CPM prior to power plant operation.

SOIL-4: Prior to CECP operation, the Applicant shall develop an ESCP for the operational phase of the project. The ESCP shall include the actual drainage and facility design for all on- and offsite CECP and linear facilities showing all of the details of storm water and sediment runoff and run-on to the CECP facilities during operation. The ESCP shall be consistent with all other permit and design documents, and shall demonstrate compliance with all applicable SUSUMP requirements. The Applicant shall include in this plan the installation of secondary containment for the entire site, excluding offsite and linear facilities. The containment design shall have design documentation and specifications for

the berms or other walled structures. The Applicant shall submit the operational ESCP to the City of Carlsbad for review and comment, and provide the CPM with a copy of a transmittal letter that requests the City provide copies of their comments to both CECP and to the CPM. The operational ESCP shall be approved, and the transmittal letter received by the CPM prior to the start of operation.

Verification: Sixty days prior to the start of operation, the Applicant shall submit a copy of the ESCP and the transmittal letter to the CPM for review and approval. The ESCP must be approved, and the transmittal letter received by the CPM prior to power plant operation.

5.11.8 Involved Agencies and Agency Contacts

Permits required for the CECP along with agency contacts are shown in Table 5.11-6. A grading plan approval will be obtained from the CEC-assigned Chief Building Official before construction begins. An encroachment permit will also be obtained, if needed. Storm water discharge and NPDES permits will also be obtained from the San Diego RWQCB. Other required permits include an Industrial Wastewater Discharge Permit, as discussed in Section 5.15, Water Resources.

TABLE 5.11-6
Permits and Agency Contacts for Soils

Permit or Approval	Agency Contact	Applicability
Approval of Grading Plan	John O'Donnell, Senior Civil Engineer Carlsbad Engineering Department 1635 Faraday Avenue Carlsbad, CA 92008 (760) 602-2720 jodon@ci.carlsbad.ca.us	Grading of site surface Report approval required as part of grading permit
Landscaping Concept Plan	Mike Elliott, Department of Planning Landscape Consultant Carlsbad Planning Department Planning Division 1635 Faraday Avenue Carlsbad, CA 92008 (760) 944-8463 MikeElliott2@cox.net	Compliance with City landscaping manual for revegetation and erosion control. Required as part of grading permit.
Construction Activity, Storm water and NPDES Permit	David Gibson, Senior Environmental Scientist, San Diego RWQCB 9174 Sky Park Court, Suite 100 San Diego, CA 92123 (858) 467-4387 DGibson@waterboards.ca.gov Or Brian Kelley, Senior WRC Engineer, San Diego RWQCB 9174 Sky Park Court, Suite 100 San Diego, CA 92123 (858) 467-4254 BKelley@waterboards.ca.gov	Regulation of storm water discharge from site facilities during construction

5.11.9 Permits Required and Permit Schedule

It is anticipated that all the required permits and approvals pertaining to grading, landscaping, and erosion control can be obtained within six months of submittal of complete applications. These complete applications would, therefore, need to be submitted a minimum of six months prior to construction.

5.11.10 References

Bay Area Air Quality Management District (BAAQMD). 2005. http://www.baaqmd.gov/pmt/handbook/s12c03fr.htm.

Carlsbad Municipal Code. 2007. Grading Ordinance. Passed April 24, 2007. http://ci.carlsbad.ca.us/chall/ccodes.html

City of Carlsbad. 1990. Landscape Manual. City of Carlsbad Planning Department. http://ci.carlsbad.ca.us/pdfdocs.html?pid=349

City of Carlsbad. 1994. General Plan, Land Use Element, Amended November 7, 2006.

City of Carlsbad. 2003. Standard Urban Storm Water Mitigation Plan: Storm Water Standards. Public Works Department. http://ci.carlsbad.ca.us/pdfdocs.html?pid=360

City of Carlsbad. 2004. Engineering Standards, Volume 1: General Design Standards. http://ci.carlsbad.ca.us/pdfdocs.html?pid=360

Fluor Daniel GTI. 1998. Phase II Environmental Site Assessment, San Diego Gas and Electric, Encina Power Plant, Carlsbad, California. Final. July.

International Code Council. 1997. Uniform Building Code (International Building Code), 75th ed., published by the International Conference of Building Officials, April.

Jones and Stokes. 2003. *Software User's Guide: URBEMIS2002 for Windows with Enhanced Construction Module.* May.

Natural Resources Conservation Service (NRCS). 1983. *National Engineering Handbook.*

Natural Resources Conservation Service (NRCS). 1973. *Soil Survey, San Diego Area, California.*

O'Donnell, John. 2007. Senior Civil Engineer, Carlsbad Engineering Department, Carlsbad, California. Personal communication with CH2M HILL personnel on July 9, 2007.

South Coast Air Quality Management District (SCAQMD). 1993. *CEQA Air Quality Handbook*. November.

State Water Resources Control Board (SWRCB). 1999. General Construction Permit.

U.S Environmental Protection Agency (USEPA). 1995. *Compilation of Air Pollutant Emission Factors AP-42*. Volume I: Stationary Point and Area Sources. Fifth Edition. January.

Soil Legend

CbB	Carlsbad gravelly loamy sand – slope class (2 - 5 %)
CbC	Carlsbad gravelly loamy sand – slope class (5 - 9 %)
CbD	Carlsbad gravelly loamy sand – slope class (9 - 15 %)
CbE	Carlsbad gravelly loamy sand – slope class (15 - 30 %)
CgC	Chesterton-Urban land complex – slope class (2 - 9 %)
Cr	Coastal beaches – slope class (0 %)
CsC	Corralitos loamy sand – slope class (5 - 9 %)
GaF	Gaviota fine sandy loam – slope class (30 - 50 %)
HrC	Huerhuero loam – slope class (2 - 9 %)
HrE2	Huerhuero loam – slope class (15 - 30 %) eroded
Lagoon	Lagoons – slope class (0 %)
LeE	Las Flores loamy fine sand – slope class (15 - 30 %)
LeE3	Las Flores loamy fine sand – slope class (9 - 30 %) severely eroded
LfC	Las Flores-Urban land complex – slope class (2 - 9 %)
LvF3	Loamy alluvial land-Huerhuero complex – slope class (9 - 50 %) severely eroded
Md	Madeland – slope class (0 %)
MIC	Marina loamy coarse sand – slope class (2 - 9 %)
MIE	Marina loamy coarse sand – slope class (9 - 30 %)
SbC	Salinas clay loam – slope class (2 - 9 %)
TeF	Terrace escarpments – slope class (0 %)
Tf	Tidal flats – slope class (0 %)

LEGEND

- ENCINA POWER STATION PROPERTY BOUNDARIES
- PROJECT SITE BOUNDARY
- 1 MILE BUFFER
- RECLAIMED WATER LINE
- LAYDOWN AREAS
- TRANSMISSION LINES

0 1,000 2,000
FEET
1 INCH = 2000 FEET
1:24,000

N

FIGURE 5.11-1
SOILS AT THE CECP SITE AND VICINITY
CARLSBAD ENERGY CENTER PROJECT
CARLSBAD, CALIFORNIA

CH2MHILL

\\LOKI\PROJECTS\RDDGIS\361219_CABRILLO\MAPFILES\CECP_SOILS.MXD CECP_SOILS.PDF 9/7/2007 09:29:47