Chapter 10
Soils

10.1 Summary Comparison of Proposed Project

A summary comparison of quantifiable impacts on soils is provided in Figure 10-0. This figure provides information on the impact of loss of topsoil (expressed as acres) that is expected to result from the proposed project compared with the approved project. The incremental values indicate the change in acreage attributable to the proposed project. These incremental values, together with consideration of the severity of the underlying impacts as set forth in the Final EIR/EIS, are the bases for making both NEPA and CEQA impact significance findings. The incremental analysis addresses whether the proposed project, compared with the approved project, would lead to any new significant environmental effects or to any substantial increase in the severity of previously identified significant effects. The incremental difference between the original impacts and the newly anticipated impacts is then considered against the backdrop of the original significance determinations for the original underlying impacts as described in the Final EIR/EIS.

Figure 10-0. Comparison of Impacts on Soils

Chapter 10 – Soils	Approved Project	Proposed Project (Total)	Proposed Project (Increment)
Impact SOILS-2: Loss of Topsoil from Excavation, Overcovering and Inundation as a Result of Constructing the Proposed Water Conveyance Facilities	7,590 acres	4,459 acres	-3,131 acres
	Significant and unavoidable/adverse	Remains significant and unavoidable/ adverse. No change from the approved project	

As depicted in Figure 10-0, the proposed project would not result in new or a substantial increase in the severity of previously identified soils impacts. This chapter contains the information necessary to make the Final EIR/EIS adequate for the approved project as revised.

10.2 Environmental Setting/Affected Environment

10.2.1 Affected Environment

The Existing Conditions of soils that would be affected by construction and operation of the proposed project are similar to those as described in Final EIR/EIS Chapter 10, *Soils*, Section 10.1, *Environmental Setting/Affected Environment*. The Final EIR/EIS provides a discussion of soil physical and chemical properties, shrink-swell potential, corrosivity, wind and water erodibility, ratings and limitations for various uses, and subsidence issues found within the soils study area. Because the modifications to the approved project would be located entirely within the previously analyzed project area, the Existing Conditions have not changed.

10.3 Environmental Consequences

This section describes the potential effects of the modifications to the approved project on soils within the study area. The focus of this assessment is on determining the incremental effect on soil resources that is attributable to these modifications. With the exception of focusing on the incremental effects, the methods of analysis and determination of effects is the same as indicated in the Final EIR/EIS.

Effects are evaluated for severity and, where appropriate, mitigation measures are identified. Where mitigation measures identified in the Final EIR/EIS remain sufficient, such sufficiency is noted. This section describes potential direct and reasonably foreseeable indirect effects on soils that would result with implementation of the proposed project. Some impact topics addressed in the Final EIR/EIS are not addressed herein because the change in the footprint of the water conveyance facilities would not result in a changed impact. Topics not addressed in this chapter include impacts resulting from operations because both the approved project and proposed project would be operated in the same way. Additionally, impacts from implementation of Environmental Commitments 3, 4, 6–12, 15, and 16 are not discussed because they are fully disclosed in the Final EIR/EIS and would not change if the footprint changes described for the proposed project are constructed.

Direct or indirect effects on soils in areas upstream of the Delta are not anticipated; thus, soils in these areas are not discussed further in this section.

10.3.1 Effects and Mitigation Approaches

10.3.1.1 No Action Alternative

Under the No Action Alternative, the new Byron Tract Forebay, reusable tunnel material (RTM) storage, and other footprint changes described for the proposed project would not occur. For the purposes of this Supplemental EIR/EIS, the No Action Alternative, against which this proposed project is compared, is consistent with the No Action Alternative Early Long-Term in the Final EIR/EIS. No differing effects on soil resources would occur along the proposed project alignment from what was previously described for the No Action Alternative Early Long-Term in the Final EIR/EIS if the No Action Alternative were to occur.

10.3.1.2 Proposed Project

The proposed project would result in permanent effects on soils in the study area associated with construction of a forebay, canals, staging areas, concrete batch plants, fuel stations, and storage areas. Implementing the proposed project would also result in the permanent loss of topsoil associated with the water conveyance structures. Other feature modifications that would result in loss of topsoil and degradation of soil health include soil borrow, spoil, and RTM storage areas, and access roads. Transmission lines, access roads, and other incidental facilities would also be needed for operation of the project, and construction of these structures would have a permanent effect on soils.

Impact SOILS-1: Accelerated Erosion Caused by Vegetation Removal and Other Soil Disturbances as a Result of Constructing the Proposed Water Conveyance Facilities

RTM Storage

The soils in the vicinity the RTM storage area on Zacharias Island and on Bouldin Island have an erosion hazard that is similar to the soils in the vicinity of the RTM storage areas for the approved project. Additionally, the RTM itself that would be placed under the proposed project would be identical to the RTM that would be placed under the approved project. Therefore, changes related to moving RTM storage from Zacharias Island and reconfiguring the storage sites on Bouldin Island would result in a level of impact and potential accelerated erosion rates similar to those described for the approved project in Final EIR/EIS Section 10.3.4.2, *Alternative 4A*. The RTM would have similar erodibility and be placed in a manner similar to that for the approved project. Therefore, its potential for accelerated erosion would be similar to that of the approved project.

Byron Tract Forebay and Conveyance

Changes related to constructing the new Byron Tract Forebay instead of the Clifton Court Forebay modifications would result in a slightly lower risk of accelerated water erosion because part of the footprint of the Byron Tract Forebay is underlain by organic soils, which have a lower water erosion potential than mineral soils that underlie the Clifton Court Forebay modification footprint. However, the overall risk of accelerated wind erosion in the Byron Tract Forebay footprint would be higher than in the Clifton Court Forebay modification footprint because of the presence of highly wind-erodible soils in part of the Byron Tract Forebay footprint.

NEPA Effects: Construction of the proposed water conveyance facility under the proposed project could cause substantial accelerated erosion. However, as described in Final EIR/EIS Section 10.3.1, *Methods for Analysis*, and Appendix 3B, *Environmental Commitments, AMMs, and CMs*, DWR would be required to obtain coverage under the General Permit for Construction and Land Disturbance Activities, necessitating the preparation of a stormwater pollution prevention plan (SWPPP) and an erosion control plan. Proper implementation of the requisite SWPPP and compliance with the General Permit (as discussed in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) would ensure that there would not be substantial soil erosion resulting in daily site runoff turbidity in excess of 250 nephelometric turbidity units (NTUs) as a result of construction of the proposed water conveyance facility, and therefore, there would not be an adverse effect.

Additionally, implementation of the environmental commitment for Disposal and Reuse of Spoils, RTM, and Dredged Material, would help reduce wind blowing of excavated soils, particularly peat soils, during transport and placement at spoils storage, disposal, and reuse areas.

***CEQA Conclusion*:** Vegetation removal and other soil disturbances associated with construction of water conveyance facilities could cause accelerated water and wind erosion of soil, similar to what would result under the approved project. However, DWR would seek coverage under the state General Permit for Construction and Land Disturbance Activities (as discussed in Appendix 3B, *Environmental Commitments, AMMs, and CMs*), necessitating the preparation of a SWPPP and an erosion control plan. As a result of implementation of the requisite SWPPP and compliance with the General Permit, there would not be substantial soil erosion resulting in daily site runoff turbidity in excess of 250 NTUs.

Incremental Impact: The impact on soils associated with accelerated erosion caused by the location and types of water conveyance facilities under the proposed project would be the same as under the approved project. The impact under the proposed projects would remain less than significant. No mitigation is required.

Impact SOILS-2: Loss of Topsoil from Excavation, Overcovering and Inundation as a Result of Constructing the Proposed Water Conveyance Facilities

RTM Storage

Changes related to moving RTM storage from Zacharias Island and reconfiguring the storage sites on Bouldin Island under the proposed project would result in 185 fewer acres of topsoil loss than was reported for the approved project in Final EIR/EIS Section 10.3.4.2, *Alternative 4A*. Approximately 2,386 acres of topsoil loss would occur at the RTM storage areas under the proposed project.

Byron Tract Forebay and Conveyance

Constructing the new Byron Tract Forebay instead of the Clifton Court Forebay modifications would result in 1,692 fewer acres of topsoil loss than reported for the approved project. Approximately 1,361 acres of topsoil loss would occur at the Byron Tract Forebay under the proposed project.

Constructing the canal segments between the California Aqueduct and Delta-Mendota Canal would result in 7 more acres of topsoil loss than reported for the approved project. Approximately 126 acres of topsoil loss would result from canal construction in association with the Byron Tract Forebay under the proposed project.

The combined net effect of moving the RTM storage area from Zacharias Island and on Bouldin Island, constructing the Byron Tract Forebay and conveyance, and disposing of the soils from the Byron Tract Forebay and conveyance excavation would be a decrease in 1,884 acres of topsoil loss than reported for the approved project.

NEPA Effects: The combined conveyance facility changes under the proposed project would cause the loss of 2,005 fewer acres of topsoil over what was described for the approved project in the Final EIR/EIS. Topsoil effectively would be lost as a resource as a result of its excavation (e.g., forebays, borrow areas, tunnel shafts, levee foundations, intake facilities, pumping plants); and overcovering (e.g., levees and embankments, spoil storage, pumping plants).

Soil health (formerly referred to as soil quality) degradation could also occur at sites in which the topsoil would not be excavated, overcovered, or inundated, such as at construction staging and laydown areas where the soil could be compacted or otherwise affected. DWR has made an environmental commitment for Material Storage Site Preparation, which would require that a portion of the temporary sites selected for storage of spoils, RTM, and dredged material will be set aside for topsoil storage; and the topsoil would be saved for reapplication to disturbed areas, thereby lessening the effect. However, this effect would be adverse because it would result in a substantial loss of topsoil. Mitigation Measures SOILS-2a and SOILS-2b would reduce the severity of this effect. These measures, as written in the Final EIR/EIS, remain adequate without change for dealing with the impacts of the proposed project.

The environmental commitment for Disposal and Reuse of Spoils, RTM, and Dredged Material in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, describes measures for how excavated subsurface soil materials would be handled, stored, and disposed of. The commitment also specifies

that temporary storage sites for spoils, RTM, and dredged material storage provide for the storage of salvaged topsoil. In addition, Mitigation Measure SOILS-2b supplements the environmental commitment, specifically by defining topsoil for the purposes of the mitigation measure and by providing details on topsoil salvaging, handling, and storage procedures.

Table 10-1 presents an itemization of the effects on soils on the proposed project caused by excavation, overcovering, and inundation, based on GIS analysis by facility type. Because of the nature of the earthwork to construct many of the facilities, more than one mechanism of topsoil loss may be involved at a given facility. For example, levee construction would require both excavation to prepare the subgrade and overcovering to construct the levee. The table shows that the greatest extent of topsoil loss would be associated with overcovering such as spoil/RTM storage areas, unless measures (such as Mitigation Measure SOILS-2b) are undertaken to salvage the topsoil and reapply it on top of excavated borrow areas or on top of the spoils once they have been placed.

Table 10-1. Topsoil Lost as a Result of Excavation and Overcovering Associated with the Proposed Water Conveyance Facility (acres)

Topsoil Loss Mechanism	Proposed Project	Approved Project	Incremental Change
Excavation (forebays, intakes, shafts, levee foundations, borrow areas)	1,899	4,394	-2,495
Overcovering (spoil storage, reusable tunnel material storage, pads)	2,560	3,096	-536
Inundation (sedimentation basins solids lagoons)	–	100	-100
Total	4,459	7,590	-3,131

Note: Some mechanisms for topsoil loss entail more than one process of soil loss. For example, construction of setback levees would first require overexcavation for the levee foundation (i.e., excavation), then placement of fill material (i.e., overcovering).

***CEQA Conclusion*:** Construction of the water conveyance facilities would involve excavation, overcovering, and inundation of topsoil over extensive areas, thereby resulting in a substantial loss of topsoil despite a commitment for Material Storage Site Preparation. The approved project would result in the loss of 7,590 acres of topsoil, which, despite mitigation, would be a significant and unavoidable impact. The combined facility changes under the proposed project would cause 3,131 fewer acres of topsoil to be lost compared with the approved project (for a total of 4,459 acres of topsoil lost).

Incremental Impact: Changing the footprint of water conveyance facilities would result in the loss of 3,131 fewer acres of soils, and some impacts would be redirected to sites not impacted by the approved project. Although the incremental impact on soils would be a decrease under the proposed project when compared with the approved project, the overall impact would still remain significant and unavoidable, as was the case with the approved project. Mitigation Measures SOILS-2a and SOILS-2b would minimize and compensate for this impact, but would not reduce the impact to a less-than-significant level because topsoil would be permanently lost over extensive areas. The impact would remain significant and unavoidable.

Mitigation Measure SOILS-2a: Minimize Extent of Excavation and Soil Disturbance

Please refer to Mitigation Measure SOILS-2a under Impact SOILS-2 in Chapter 10, *Soils*, of the Final EIR/EIS.

Mitigation Measure SOILS-2b: Salvage, Stockpile, and Replace Topsoil and Prepare a Topsoil Storage and Handling Plan

Please refer to Mitigation Measure SOILS-2b under Impact SOILS-2, in Chapter 10, *Soils*, of the Final EIR/EIS.

Impact SOILS-3: Property Loss, Personal Injury, or Death from Instability, Failure, and Damage from Construction on or in Soils Subject to Subsidence as a Result of Constructing the Proposed Water Conveyance Facilities

The risk and potential effects of instability, failure, and damage from construction on or in soils subject to subsidence under the proposed project would be similar to those of the approved project. Therefore the effects from potential soil subsidence under the proposed project would be the same as those of the approved project. See the discussion of Impact SOILS-3 under Alternative 4 in Final EIR/EIS Section 10.3.3.9.

NEPA Effects: This potential effect could be substantial because the facilities could be located on unstable soils that are subject to subsidence. However, as described in Final EIR/EIS Section 10.3.1, *Methods for Analysis*, and Appendix 3B, *Environmental Commitments, AMMs, and CMs*, geotechnical studies (as described in the Geotechnical Exploration Plan—Phase 2 [California Department of Water Resources 2014]) would be conducted at all facilities to identify the types of soil avoidance or soil stabilization measures that should be implemented to ensure that the facilities are constructed to withstand subsidence and settlement and to conform to applicable state and federal standards. These investigations would build upon the geotechnical data reports (California Department of Water Resources 2010a, 2010b, 2011) and the Conceptual Engineering Reports (California Department of Water Resources 2018a, 2018b, 2018c), as well as the results of the investigations that will be conducted under the Geotechnical Exploration Plan—Phase 2 (California Department of Water Resources 2014). As discussed under Alternative 4 in Final EIR/EIS Section 10.3.3.9, conforming to state and federal design standards, including conduct of site-specific geotechnical evaluations, would ensure that appropriate design measures are incorporated into the project and that any subsidence that takes place under the project facilities would not jeopardize their integrity. Therefore, there would not be an adverse effect.

***CEQA Conclusion*:** Significant impacts could occur if there is property loss, personal injury, or death from instability, failure, or damage from construction on or in soils subject to subsidence as a result of constructing the proposed water conveyance facilities, similar to what would occur under the approved project. Some of the conveyance facilities would be constructed on soils that are subject to subsidence. Subsidence occurring after the facility is constructed could result in damage to or failure of the facility. However, DWR would be required to design and construct the facilities according to state and federal design standards and guidelines (e.g., California Building Code, American Society of Civil Engineers Minimum Design Loads for Buildings and Other Structures, ASCE/SEI 7-10, 2010) (see Appendix 3B, *Environmental Commitments, AMMs, and CMs*). Conforming to these codes would reduce the potential hazard of subsidence or settlement to acceptable levels by avoiding construction directly on, or otherwise stabilizing, soil material that is prone to subsidence.

Incremental Impact: Although the modifications to the configuration and location of water conveyance under the proposed project would result in a slightly smaller permanent footprint, the potential for property loss, personal injury, or death would essentially be the same as for the approved project. Consequently, there would be no incremental change in the potential for those impacts to result. Because the measures set forth above would reduce the potential hazard of subsidence or settlement so as to meet design standards, the impact would remain less than significant. No additional mitigation is required.

Impact SOILS-4: Risk to Life and Property as a Result of Constructing the Proposed Water Conveyance Facilities in Areas of Expansive, Corrosive, and Compressible Soils

The risk of and potential effects on life and property as a result of constructing the proposed water conveyance facilities in areas of expansive, corrosive, and compressible soils under the proposed project would be similar to those described for the approved project; and therefore the effects from such hazards under the proposed project would be the same as those of the approved project, as described in the Final EIR/EIS. See the discussion of Impact SOILS-4 under Alternative 4 in Final EIR/EIS Section 10.3.3.9.

NEPA Effects: The integrity of the water conveyance facilities, including tunnels, pipelines, intake facilities, pumping plants, access roads and utilities, and other features could be adversely affected because they would be located on expansive, corrosive, and compressible soils. However, all facility design and construction would be executed in conformance with the California Building Code, which specifies measures to mitigate effects of expansive soils, corrosive soils, and soils subject to compression and subsidence. By conforming to the California Building Code and other applicable design standards, potential effects associated with expansive and corrosive soils and soils subject to compression and subsidence would be offset (see Appendix 3B, *Environmental Commitments, AMMs, and CMs*). There would be no adverse effect.

***CEQA Conclusion*:** Some of the project facilities would be constructed on soils that are subject to expansion, corrosion to concrete and uncoated steel, and compression under load. Expansive soils could cause foundations, underground utilities, and pavements to crack and fail. Corrosive soils could damage in-ground facilities or shorten their service life. Compression/settlement of soils after a facility is constructed could result in damage to or failure of the facility. These impacts would be similar to those under the approved project. However, DWR would be required to design and construct the facilities in conformance with state and federal design standards, guidelines, and building codes (e.g., California Building Code and U.S. Army Corps of Engineers design standards). Conforming to these codes and standards is an environmental commitment by DWR to ensure that potential adverse effects associated with expansive and corrosive soils and soils subject to compression and subsidence would be offset (see Appendix 3B, *Environmental Commitments, AMMs, and CMs*).

Incremental Impact: Although the modifications to the configuration and location of water conveyance under the proposed project would result in a slightly smaller permanent footprint, the potential risk to life and property as a result of constructing the project in areas of expansive, corrosive, and compressible soils would essentially be the same as for the approved project. Consequently, there would be no incremental change in the potential for those impacts to result or in the severity of the impact. Because the measures indicated above would reduce the potential hazard of subsidence or settlement by requiring DWR to meet facility design standards, the impact would remain less than significant. No additional mitigation is required.

10.3.2 Cumulative Analysis

The Final EIR/EIS found that there was a potential for the approved project to have a cumulative effect on soils due to the loss of topsoil. The analysis for cumulative effects for soils remains the same as described in the Final EIR/EIS with consideration of the proposed project modifications. Although mitigation has been adopted to minimize these cumulative effects, construction associated with proposed project modifications would still result in the loss of topsoil.

10.4 References Cited

California Department of Water Resources. 2010a. *Conceptual Engineering Report—Isolated Conveyance Facility—All Tunnel Option*. March 10. Revision 0. Design Document 500-05-05-100-03. Delta Habitat Conservation and Conveyance Program. Sacramento, CA.

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