

27.1 Summary Comparison of Proposed Project

A summary comparison of a number of important impacts on paleontological resources is provided in Figure 27-0. This figure provides information on the impact of excavation on paleontological resources that is expected to result from the proposed project as compared with the approved project. An important impact to consider is the potential destruction of significant paleontological resources due to excavation for borrow and construction of tunnels and canals. The incremental values in Figure 27-0 indicate the change in thousands of cubic yards of material excavated for borrow, tunnels, and canals.

These incremental differences in impact between the approved project and the proposed project, together with consideration of the severity of the underlying impacts as set forth in the Final EIR/EIS, are the basis for making both NEPA and CEQA impact significance findings. The incremental analysis addresses whether the proposed project, compared with the approved project, will 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 27-0. Comparison of Impacts on Paleontological Resources

Chapter 27 – Paleontological Resources	Approved Project	Proposed Project (Total)	Proposed Project (Increment)
Amount of excavation that could potentially result in the destruction of unique or significant paleontological resources as a result of construction of water conveyance facilities (thousand cubic yards of material excavated for borrow, tunnels, and canals)	Up to 56,000	Up to 36,364	-19,636
	Significant and unavoidable/ adverse	Remains significant and unavoidable/ adverse. No change from the approved project.	

As depicted in Figure 27-0, the proposed project would not result in new significant impacts or a substantial increase in the severity of previously identified significant paleontological impacts. This chapter contains the information necessary to make the Final EIR/EIS¹ adequate for the approved project as revised.

¹ The July 2017 document titled *Developments after Publication of the Proposed Final Environmental Impact Report* included modifications and additions to the proposed Final EIR/EIS. In this chapter, references to “the Final EIR/EIS” should be understood to include changes made to the December 2016 document as set forth in the July 2017 document.

1 **27.2 Environmental Setting/Affected Environment**

2 **27.2.1 Affected Environment**

3 The Existing Conditions of paleontological resources that would be affected by construction and
4 operation of the proposed project are the same as those described in Final EIR/EIS Chapter 27,
5 *Paleontological Resources*, Section 27.1, *Environmental Setting/Affected Environment*. The Final
6 EIR/EIS provides a discussion of potential paleontological resources present within the study area
7 based on the physiographic, geologic, and stratigraphic settings. The modifications to the approved
8 project would be located entirely within the previously analyzed project area; therefore, the Existing
9 Conditions have not changed.

10 **27.3 Environmental Consequences**

11 This section describes the potential effects of the proposed project on paleontological resources
12 within the study area. The focus of this assessment is on determining the incremental effect on
13 paleontological resources that is attributable to these modifications. With the exception of focusing
14 on the incremental effects, the methods of analysis and determination of effects are the same as
15 indicated in Section 27.3 in the Final EIR/EIS.

16 Effects are evaluated for severity and, where appropriate, mitigation measures are identified. Where
17 mitigation measures identified in the Final EIR/EIS remain sufficient, such sufficiency is noted. This
18 section describes potential direct and reasonably foreseeable indirect effects on paleontological
19 resources that would result with implementation of the proposed project. Some impact topics
20 addressed in the Final EIR/EIS are not addressed herein because the change in the footprint of the
21 water conveyance facilities would not result in a changed impact. This chapter does not address
22 impacts from implementation of Environmental Commitments 3, 4, 6–12, 15, and 16 because those
23 impacts are fully disclosed in the Final EIR/EIS and would not change if the footprint changes
24 described for the proposed project are constructed.

25 The methods applied to the analysis of impacts on paleontological resources are the same as
26 indicated in Chapter 27, *Paleontological Resources*, of the Final EIR/EIS. This analysis considers the
27 likelihood that the geologic units containing significant paleontological resources could be directly
28 or indirectly affected, damaged, or destroyed as a result of the project. This section also describes
29 implementing measures to mitigate potential adverse impacts.

30 **27.3.1 Effects and Mitigation Approaches**

31 **27.3.1.1 No Action Alternative**

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

1 **27.3.1.2 Proposed Project**

2 The proposed project would result in effects on paleontological resources in the study area
 3 associated with the construction of the new Byron Tract Forebay, the tunnels leading from the
 4 Byron Tract Forebay to the State Water Project (SWP), and the canal leading to the Central Valley
 5 Project (CVP).

6 **Impact PALEO-1: Destruction of Unique or Significant Paleontological Resources as a Result**
 7 **of Construction of Water Conveyance Facilities**

8 As indicated in Table 27-1, the proposed project would have a slightly different impact than the
 9 approved project due to a slightly different footprint from the approved project.

10 **Table 27-1. Summary of Conveyance Construction Activities and Geologic Units Sensitive for**
 11 **Paleontological Resources That Could Be Disturbed under the Proposed Project**

Proposed Project	Location	Construction/Excavation	Sensitive Units Disturbed ^a
Same as the Approved Project			
Three new north Delta intakes	East bank Sacramento River between Clarksburg and Walnut Grove	30 feet below existing grade; 88–106 acres per intake, including sedimentation basins	Riverbank and Modesto Formations
Intermediate forebay	Glannvale Tract	243 acres to a depth of 12–16 feet below existing grade	Riverbank Formation
Tunnel 1a	Single-bore 28- to 40-foot-diameter tunnel, 8.73 miles from Intakes 2 and 3 to the intermediate forebay	Shaft to 75 feet below existing grade; tunnel invert at 125 feet; boring using pressurized face mechanized tunneling machines, including earth pressure balance machines and slurry tunneling machines	Riverbank and Modesto Formations
Tunnel 1b	Single-bore 28-foot-diameter tunnel, 4.77 miles from Intake 5 to the intermediate forebay	Same as Tunnel 1a	Riverbank Formation
Tunnel 2	Dual-bore 40-foot-diameter tunnel, 30.1 miles from the intermediate forebay to Byron Tract Forebay	Same as Tunnels 1a and 1b but tunnel invert depth down to 163 feet	Riverbank and Modesto Formations

Proposed Project	Location	Construction/Excavation	Sensitive Units Disturbed ^a
Unique to the Proposed Project			
New pumping plants	Northeast corner of new Byron Tract Forebay	Pumping plant 50 feet below existing grade; staging/storage area and construction zone prep (0.74 acre for each pumping plant)	Younger alluvium of Marsh Creek
Byron Tract Forebay	Northwest of the existing Clifton Court Forebay	Light grading, 1,081 acres	Alluvial flood plain deposits; Younger alluvium of Marsh Creek; Alluvium from Corral Hollow Drainage to Brushy Creek
South tunnels	Dual-bore 40-foot diameter tunnel, 1.58 miles from the Byron Tract Forebay to south tunnels outlet structure at connection canal	Same as Tunnel 2	Alluvium from Corral Hollow Drainage to Brushy Creek
Canal from south tunnels outlet structure to Banks Pumping Plant intake canal	2,800 feet	46–50 feet below existing grade; 226 feet at the base	Alluvium from Corral Hollow Drainage to Brushy Creek
Canal from south tunnels outlet structure to Jones Pumping Plant intake canal	4,800 feet	46–50 feet below existing grade; 126 feet at the base	Alluvium from Corral Hollow Drainage to Brushy Creek

^a Please see generally Section 27.1.1.3 and Tables 27-1 and 27-2 in the Final EIR/EIS for a detailed description of sensitivity of these units for paleontological resources.

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2 ***RTM Storage and other Footprint Changes***

3 Changes under the proposed project include relocating reusable tunnel material (RTM) storage
 4 areas on Bouldin Island and from Zacharias Island to areas near the intermediate forebay. These
 5 footprint changes would not have any permanent impacts on, or cause the destruction of, unique
 6 paleontological resources.

7 Construction of the proposed project would require new temporary and permanent access roads in
 8 some slightly changed locations. This would involve shallow excavation and grading, primarily along
 9 existing farm roads or across lands disturbed by agricultural activity. It is unlikely that this shallow
 10 ground disturbance would affect significant paleontological resources.

1 **Byron Tract Forebay and Conveyance**

2 Changes related to the construction of a new Byron Tract Forebay, south tunnels, and canal under
3 the proposed project would involve ground-disturbing activities directly northwest of Clifton Court
4 Forebay. Ground-disturbing activities would include clearing and grubbing, rough grading,
5 constructing foundations, and final grading for the Byron Tract Forebay. Units sensitive for
6 paleontological resources that underlie the area may be exposed at the surface. These units include
7 the Holocene or Upper Pleistocene alluvium of creeks from the Corral Hollow Drainage to Bushy
8 Creek (Qch) as well as the younger alluvium of Marsh Creek (Qymc). The proposed project proposes
9 building levees at the existing grade to construct the Byron Tract Forebay, as opposed to excavation
10 for an expanded Clifton Court Forebay under the approved project. RTM and spoils from the canals
11 would be used to build the aforementioned levees. Therefore, the impacts on paleontological
12 resources under the proposed project would likely be less than under the approved project.

13 However, under the proposed project, two new tunnel segments (south tunnels) and two canals
14 would be constructed. The south tunnels would connect the new Byron Tract Forebay to the south
15 tunnels outlet structure. There would be two connection channels (canals): one from the south
16 tunnels outlet structure leading to the Banks Pumping Plant intake canal (part of the Delta Mendota
17 Canal), and one from the south tunnels outlet structure leading to the Jones Pumping Plant intake
18 canal (part of the California Aqueduct). Canal segments would be excavated to a depth of between
19 10–50 feet below existing grade.

20 Construction of the south tunnels would entail deep excavation using a tunnel-boring machine
21 (TBM) (Table 27-1). The south tunnels would connect the Byron Tract Forebay outlet structure to
22 the south tunnels outlet structure at the connection canal. The tunnels would be excavated at a
23 depth of approximately 100–150 feet at the tunnel invert, mainly to avoid the peaty Holocene soils.
24 The TBMs would be mechanized soft-ground tunneling machines designed for use in soft soils with
25 high groundwater pressure. The tunnels would be lined with precast concrete bolted-and-gasketed
26 segments. The tunnel concrete liner would serve as permanent ground support and would be
27 installed immediately behind the TBM, forming a continuous watertight vessel.

28 The south tunnels would be excavated through Holocene and Pleistocene deposits (Figures 27-1 and
29 27-2). Shafts would be excavated through surficial Holocene deposits and then through Pleistocene
30 deposits of the Riverbank or Modesto Formations. Tunnels would be bored wholly through
31 Pleistocene deposits.

32 Excavation for the canal segments would be conducted in geologic units both sensitive and
33 nonsensitive for paleontological resources (Figure 27-1). These units include the Holocene or Upper
34 Pleistocene alluvium of creeks from the Corral Hollow Drainage to Brushy Creek (Qch), which is
35 sensitive for paleontological resources. These Pleistocene units likely occur at a depth of less than 5
36 feet and would therefore be disturbed during excavation of the canal (Figure 27-2). Excavation of
37 the canal segments would therefore likely disturb Pleistocene units sensitive for paleontological
38 resources.

39 Borrow material would be needed primarily for the new Byron Tract Forebay embankments, as well
40 as for access roads. Borrow material would be excavated from targeted units described in the
41 engineering report (California Department of Water Resources 2010). Some of these units, including
42 the Modesto and Montezuma Formations, are sensitive for paleontological resources. Excavation of
43 borrow material from these units could disturb paleontological resources. In addition, borrow/spoil
44 areas are designated in the area of the intakes, along the intermediate forebay, and along the Byron

1 Tract Forebay (Figure 27-1). Units sensitive for paleontological resources in these areas include the
2 Riverbank and Modesto Formations (potentially in the shallow subsurface) in the area of the intakes
3 and intermediate forebay, and the alluvium of creeks from the Corral Hollow Drainage to Bushy
4 Creek along the Byron Tract Forebay. Excavation of borrow material from these units could disturb
5 paleontological resources.

6 **NEPA Effects:** The construction of water conveyance facilities and the extent of destruction of
7 unique or significant paleontological resources under the proposed project would be similar to
8 those described for the approved project in Final EIR/EIS Section 27.3.4.2. The ground-disturbing
9 activities in geologic units sensitive for paleontological resources have the potential to damage or
10 destroy these resources. Direct or indirect destruction of significant paleontological resources as
11 defined by the Society of Vertebrate Paleontology (SVP) (2010) would represent an adverse effect.
12 The facility changes under the proposed project would lessen certain adverse effects, but would
13 increase other adverse effects due to aspects of the footprint changes. With construction of the new
14 Byron Tract Forebay, excavation would no longer be needed south of the Clifton Court Forebay, as is
15 described under the approved project. However, the proposed project involves excavation for the
16 canals from the south tunnels outlet structure leading to the Banks Pumping Plant intake canal (part
17 of the Delta Mendota Canal), and one from the south tunnels outlet structure leading to the Jones
18 Pumping Plant intake canal (part of the California Aqueduct), which would most likely destroy
19 unique or significant paleontological resources as defined by SVP (2010). Additionally, as with the
20 tunnels from the intakes to the intermediate forebay and then down to the Byron Tract Forebay,
21 construction of the south tunnels would be problematic for paleontological resources simply due to
22 the nature of tunneling. Therefore, this effect would remain the same as under the approved project
23 and would be adverse.

24 Mitigation Measures PALEO-1a through PALEO-1d have been adopted to mitigate the effects of the
25 surface-related ground disturbance activities associated with the proposed project. These measures,
26 as written in the Final EIR/EIS, remain adequate without change for dealing with the impacts of the
27 proposed project.

28 **CEQA Conclusion:** Construction of water conveyance facilities under the proposed project could
29 cause the destruction of unique paleontological resources. Similar to the approved project, the
30 ground-disturbing activities associated with the proposed project would be implemented in geologic
31 units sensitive for paleontological resources and could, therefore, have the potential to damage or
32 destroy those resources. Direct or indirect destruction of significant paleontological resources as
33 defined by the SVP (2010) would constitute a significant impact under CEQA.

34 **Incremental Impact:** Construction of the proposed project would have no incremental impact
35 over that of the approved project. Although the footprint of the proposed project would slightly
36 differ from the approved project, ground-disturbing activities associated with both would be
37 implemented in geologic units sensitive for paleontological resources and could, therefore, have
38 the potential to damage or destroy those resources. There would be some reduction in impact
39 due to the construction of Byron Tract Forebay instead of the expansion of Clifton Court
40 Forebay. However, the additional south tunnels from Byron Tract Forebay to the south tunnels
41 outlet structure would require deep excavation using a TBM, and additional excavation would
42 be needed to construct the canal segments from the south tunnels outlet structure to the CVP
43 and SWP, which would most likely destroy unique or significant paleontological resources in the
44 Plan Area and would potentially cause a significant and unavoidable impact. Implementation of
45 Mitigation Measures PALEO-1a through PALEO-1d would reduce the effects of any surface-

1 related ground disturbance under the proposed project, but not to a less-than-significant level.
2 The impact remains adverse (NEPA) and significant and unavoidable (CEQA).

3 There would be no new or changed impact resulting from the proposed project.

4 **Mitigation Measure PALEO-1a: Prepare a Monitoring and Mitigation Plan for**
5 **Paleontological Resources**

6 Please refer to Mitigation Measure PALEO-1a under Impact PALEO-1, in Chapter 27,
7 *Paleontological Resources*, of the Final EIR/EIS.

8 **Mitigation Measure PALEO-1b: Review 90% Design Submittal and Develop Specific**
9 **Language Identifying How the Mitigation Measures Will Be Implemented along the**
10 **Alignment**

11 Please refer to Mitigation Measure PALEO-1b under Impact PALEO-1, in Chapter 27,
12 *Paleontological Resources*, of the Final EIR/EIS.

13 **Mitigation Measure PALEO-1c: Educate Construction Personnel in Recognizing Fossil**
14 **Material**

15 Please refer to Mitigation Measure PALEO-1c under Impact PALEO-1, in Chapter 27,
16 *Paleontological Resources*, of the Final EIR/EIS.

17 **Mitigation Measure PALEO-1d: Collect and Preserve Substantial Potentially Unique or**
18 **Significant Fossil Remains When Encountered**

19 Please refer to Mitigation Measure PALEO-1d under Impact PALEO-1, in Chapter 27,
20 *Paleontological Resources*, of the Final EIR/EIS.

21 **27.3.2 Cumulative Analysis**

22 The Final EIR/EIS found that there was a potential for the approved project to have a cumulative
23 effect on sensitive paleontological resources. The analysis for cumulative effects on paleontological
24 resources remains the same as described in the Final EIR/EIS even with consideration of the
25 proposed project modifications of the new Byron Tract Forebay and associated conveyance, in lieu
26 of disruption and expansion of the existing Clifton Court Forebay. Although mitigation has been
27 adopted to minimize these cumulative effects, construction associated with proposed project
28 modifications would still result in a significant and unavoidable impact on sensitive paleontological
29 resources. As with the approved project, the proposed project's incremental impacts would be
30 cumulatively considerable. There would be no new or changed impact resulting from the proposed
31 project.

32 **Mitigation Measure PALEO-1a: Prepare a Monitoring and Mitigation Plan for**
33 **Paleontological Resources**

34 Please see Mitigation Measure PALEO-1a under Impact PALEO-1 in Chapter 27 of the Final
35 EIR/EIS.

1 **Mitigation Measure PALEO-1b: Review 90% Design Submittal and Develop Specific**
2 **Language Identifying How the Mitigation Measures Will Be Implemented along the**
3 **Alignment**

4 Please see Mitigation Measure PALEO-1b under Impact PALEO-1 in Chapter 27 of the Final
5 EIR/EIS.

6 **Mitigation Measure PALEO-1c: Educate Construction Personnel in Recognizing Fossil**
7 **Material**

8 Please see Mitigation Measure PALEO-1c under Impact PALEO-1 in Chapter 27 of the Final
9 EIR/EIS.

10 **Mitigation Measure PALEO-1d: Collect and Preserve Substantial Potentially Unique or**
11 **Significant Fossil Remains When Encountered**

12 Please see Mitigation Measure PALEO-1d under Impact PALEO-1 under Chapter 27 of the Final
13 EIR/EIS.

14 **27.4 References Cited**

15 California Department of Water Resources. 2010. *Conceptual Engineering Report—Isolated*
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18 Society of Vertebrate Paleontology. 2010. Standard Procedures for the Assessment and Mitigation of
19 Adverse Impacts to Paleontological Resources. Last revised 2010. Impact Mitigation Guidelines
20 Revision Committee. Available: <[http://vertpaleo.org/PDFS/8f/8fe02e8f-11a9-43b7-9953-](http://vertpaleo.org/PDFS/8f/8fe02e8f-11a9-43b7-9953-cdcfaf4d69e3.pdf)
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