5.8 Paleontological Resources

5.8.1 Introduction

On August 16, 2001, GWF Energy LLC filed an Application for Certification (AFC) with the California Energy Commission (CEC) for the Tracy Peaker Project (TPP). The CEC found the AFC data adequate on October 17, 2001. The CEC released a staff assessment on December 28, 2001, and a supplemental staff assessment on February 1, 2002. The CEC published its Presiding Member's Proposed Decision on May 31, 2002, with the project receiving its Final Decision on July 17, 2002. These documents are incorporated by reference into this AFC and are presented in electronic form in Appendix 1A.

This section evaluates the potential effect to paleontological resources (fossils) from the construction and operation of the GWF Energy LLC Tracy Combined Cycle Power Plant (GWF Tracy). The project will be sited within the boundaries of the area disturbed during the construction of the TPP (see Figure 1.1-3), with the exception of replacing conductors on two segments of pre-existing transmission line: one from the southern plant boundary to a substation approximately 0.7 mile to the east-northeast, and the second segment from 8.1 to 10.7 northeast of the plant site in a crossing of the San Joaquin River floodplain.

Section 5.8.2 discusses application laws, ordinances, regulations, and standards (LORS), while Section 5.8.3 considers the potential for sediments containing significant fossil remains to be within the area of potential effect from earth moving associated with construction of GWF Tracy. Operation of GWF Tracy will not involve further ground disturbing activities; therefore, no impacts to paleontological resources would occur during the operational phase of this project.

In 2001, an Application for Certification (AFC) was prepared for the TPP for submission to the CEC. The 2001 AFC included an assessment of the Paleontological Resources for the project site and vicinity, presented in Section 8.16 of the AFC (see Appendix 1A for a copy of the TPP AFC Paleontological Resource Assessment). The majority of the data and analyses presented in that AFC are still valid and comprise the primary data source for this supplemental AFC, and is cited as "GWF, 2001." The geological resources assessment for the current project (see Section 5.4) is also a primary reference for this current assessment.

This section of the AFC meets all Site Regulations of the CEC (2000, 2007) and conforms with the recommendations of the Society of Vertebrate Paleontology (SVP, 1991; 1995; 1996) that address mitigating impacts to paleontological resources resulting from earth moving activities. This paleontological resources inventory and impact assessment was conducted by W. Geoffrey Spaulding, Ph.D., a senior paleontologist with CH2M HILL. Dr. Spaulding has advanced degrees in geology with emphases in paleobiology, and is a recognized expert on the glacial-age environments of the American West. He previously has completed paleontological resource surveys and prepared paleontological resource impact assessments in support of energy generation and other large construction projects in central California, including projects in the San Joaquin Valley, where the GFW Tracy project is located.

5.8.2 Laws, Ordinances, Regulations, and Standards

Paleontological resources (fossils) are the remains or traces of prehistoric plants and animals. They may range from the actual bones and shells of ancient organisms, to mineral replacements of a once-living organism, to simple impressions of plants or animals in soft sediments later transformed to rock. They range in size and abundance from many thousands per cubic centimeter for microfossils, such as pollen, diatoms, and radiolaria, to very rare large-mammal bones exceeding 1 meter in length. Fossils are important scientific and educational resources because of their use in (1) documenting the presence and evolutionary history of particular groups of now-extinct organisms; (2) reconstructing the environments in which these organisms lived; and (3) in determining the relative ages of the strata in which they occur and the geologic events that resulted in the deposition of the sediments that formed these strata. In the project area, the fossils of marine organisms, as well as those of terrestrial animals and plants, are important in the paleontological record. They have helped define the age and sequences of deposition and uplift along the margins of the San Joaquin Valley, where fossiliferous marine and terrestrial sedimentary rock provide important data on the development and tectonics of California's complex geology.

Paleontological resources are non-renewable scientific resources and are protected by several federal and state statutes (California Office of Historic Preservation 1983; see also Marshall 1976, Fisk and Spencer 1994), most notably by the 1906 Federal Antiquities Act and other subsequent federal legislation and policies, and by the State of California's environmental regulations (CEQA, Section 15064.5). Professional standards for assessment and mitigation of adverse impacts to paleontological resources have been established by the Society of Vertebrate Paleontology (1991, 1995, 1996). Design, construction, and operation of GWF Tracy will be conducted in accordance with all LORS applicable to paleontological resources. Federal, state, and local LORS applicable to paleontological resources are summarized in Table 5.8-1 and discussed briefly below, along with professional standards for paleontological resources assessment and impact mitigation.

TABLE 5.8-1
Laws, Ordinances, Regulations, and Standards for Paleontological Resources

LORS	Requirements/Applicability	Administering Agency	AFC Section Explaining Conformance
Federal			
Antiquities Act of 1906	Protects paleontological resources on federal lands; requires inventory, assessment of effects, and mitigation if appropriate. Not applicable – No federal land involved, or federal entitlement required	Federal lead agency	—
National Environmental Policy Act of 1969	Not applicable – No federal land involved, or federal entitlement required	Federal lead agency	—

State			
CEQA, Appendix G	Requires that impacts to paleontological resources be assessed and mitigated on all discretionary projects, public and private. Applicable – Fossil remains may be encountered by earth-moving activities	California Energy Commission	Sections 5.8.3, 5.8.4, and 5.8.6
Public Resources Code, Sections 5097.5/5097.9	Designates unauthorized removal or disturbance of fossil remains or fossil site on publicly owned lands in the State of California as a misdemeanor. Not applicable – Applies to state-owned land	California Energy Commission	—

5.8.2.1 Federal LORS

Federal protection for significant paleontological resources would apply to GWF Tracy only if any construction or other related project impacts occur on federally owned or managed lands, or if a federal entitlement or other permit were required. Federal legislative protection for paleontological resources stems from the Antiquities Act of 1906 (PL 59-209; 16 United States Code 431 et seq.; 34 Stat. 225), which calls for protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federal lands. In addition, the National Environmental Policy Act of 1969 (United States Code, section 4321 et seq.; 40 Code of Federal Regulations, section 1502.25), as amended, requires analysis of potential environmental impacts to important historic, cultural, and natural aspects of our national heritage. Because no federally owned or managed lands will be affected by this project, and no federal entitlement or other permit is required, these statutes do not extend to paleontological resources (see Table 5.8-1).

5.8.2.2 State LORS

The CEC environmental review process under the Warren-Alquist Act is considered functionally equivalent to that of the California Environmental Quality Act (CEQA; Public Resources Code Sections 21000 et seq.). CEQA requires that public agencies and private interests identify the environmental consequences of their proposed projects on any object or site of significance to the scientific annals of California (Division I, California Public Resources Code: 5020.1 [b]). *Guidelines for the Implementation of CEQA* (Public Resources Code Sections 15000 et seq.) defines procedures, types of activities, persons, and public agencies required to comply with CEQA. Appendix G in Section 15023 provides an Environmental Checklist of questions that a lead agency should normally address if relevant to a project's environmental impacts. One of the questions to be answered in the Environmental Checklist (Section 15023, Appendix G, Section V, part c) is the following: "Would the project directly or indirectly destroy a unique paleontological resource or site…?"

Although CEQA does not define what is "a unique paleontological resource or site," Section 21083.2 defines "unique archaeological resources" as "…any archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

- Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information
- Has a special and particular quality such as being the oldest of its type or the best available example of its type.
- Is directly associated with a scientifically recognized import prehistoric or historic event."

With only slight modification, this definition is equally applicable to recognizing "a unique paleontological resource or site." Additional guidance is provided in CEQA Section 15064.5 (a)(3)(D), which indicates that "generally, a resource shall be considered historically significant if it has yielded, or may be likely to yield, information important in prehistory or history."

Section XVII, part a, of the CEQA Environmental Checklist asks a second question equally applicable to paleontological resources: "Does the project have the potential to . . . eliminate important examples of the major periods of California history or pre-history?"

To be in compliance with CEQA, impact assessments must answer both these questions in the Environmental Checklist. If the answer to either question is "yes" or "possibly," a mitigation and monitoring plan must be designed and implemented to protect significant paleontological resources. The answer to these questions is "possibly" if not "yes," and therefore, CEQA does apply to this project (Table 5.8-1).

The CEQA lead agency having jurisdiction over a project is responsible for ensuring that paleontological resources are protected in compliance with CEQA and other applicable statutes. The lead agency with the responsibility to ensure that fossils are protected during construction of the proposed GWF Tracy is the CEC. California Public Resources Code Section 21081.6, entitled Mitigation Monitoring Compliance and Reporting, requires that the CEQA lead agency demonstrate project compliance with mitigation measures developed during the environmental impact review process.

Other state requirements for paleontological resource management are in California Public Resources Code Chapter 1.7, Section 5097.5/5097.9 (Stats. 1965, c. 1136, p. 2792), entitled Archaeological, Paleontological, and Historical Sites. This statute defines any unauthorized disturbance or removal of a fossil site or remains on public land as a misdemeanor, and specifies that state agencies may undertake surveys, excavations, or other operations as necessary on state lands to preserve or record paleontological resources. Public Resources Code Sections 5097.5/5097.9 do not apply to GWF Tracy because construction or other related project impacts will not occur on state owned or managed lands, and no state agency is intended to obtain ownership of project lands during the term of the project license (Table 5.8-1).

5.8.2.3 Local LORS

Title 9 of the Development Title of San Joaquin County (n.d.) places emphasis on the preservation of historic and cultural resources, including heritage resources, but does not address paleontological resources per se.

5.8.2.4 Professional Standards

The SVP, an international organization of professional paleontologists, has established standard guidelines (SVP, 1991; 1995; 1996) that outline acceptable professional practices in the conduct of paleontological resource assessments and surveys; monitoring and mitigation; data and fossil recovery; sampling procedures; and specimen preparation, identification, analysis, and curation. Most practicing paleontologists in the nation adhere to the SVP's guidelines, and extend those to address other types of fossils of scientific significance, such as invertebrate fossils and paleobotanical specimens. Many federal and state regulatory agencies, including the CEC, have informally adopted the SVP standard guidelines.

5.8.3 Affected Environment

5.8.3.1 Physiographic Setting

The proposed site of GWF Tracy is within the northern and lowest portion of California's San Joaquin Valley and lies along the boundary between the Coast Ranges to the west and south, and the Great Valley (Central Valley) physiographic province to the east and north. This region is known as the Coast Ranges–Sierran Block boundary zone (CRSBBZ) and is delineated by a series of low hills and complex thrust/reverse faults. The Great Valley and the adjacent Sierra Nevada form a relatively stable crustal block (Sierran block) composed of Mesozoic crystalline basement that dips gently to the west. The western edge of the Sierra Nevada block is buried beneath the sediments of the Great Valley, and its terminus at great depth is generally thought to be coincident with the western margin of the Great Valley (GWF, 2001).

The Great Valley physiographic province separates the Coast Ranges to the west from the Sierra Nevada to the east (Fenneman, 1931). This province is comprised of two elongated northwest- to southeast-trending basins: the Sacramento basin to the northwest and the San Joaquin basin to the southeast. This province is approximately 435 miles (700 kilometers [km]) long and 44 to 56 miles (70 to 90 km) wide, and characterized by a thick, relatively undeformed sequence of alluvium and volcanic deposits. The present-day basin evolved from a late Jurassic to middle Tertiary (40–150 million years ago [Ma]) marine fore-arc basin. In the late Tertiary (25–30 Ma), a change in the relative motion between the Pacific and North American plates resulted in the gradual uplift of the Coast Ranges and the eventual isolation of the basin of the Central Valley from the ocean. More recent Miocene through Pleistocene sediments were derived from the bounding Coast Ranges and the Sierra Nevada. By the late Pliocene (2–3 Ma), subaerial depositional conditions prevailed and Sierra Nevada–derived sediments dominated basin deposition (GWF, 2001).

The Coast Ranges are a north-northwest- to northwest-trending series of mountains and intervening valleys extending for 597 miles (960 km) from the Oregon border, south to the Santa Ynez River near Santa Barbara. Physiographically, the Coast Ranges can be divided into two subprovinces, the northern and southern subprovinces, separated by the San Francisco Bay and the Sacramento River Delta. The Coast Ranges to the west of the project are composed at their surface by Tertiary marine sediment, and are underlain by uplifted and intensely deformed Upper Jurassic (150 Ma) and younger rocks of the Franciscan ophiolite complex and the Salinian metamorphic and granitic complex (GWF, 2001). The GWF Tracy project lies on

that narrow strip of land to the west of the San Joaquin River where sediments include alluvium from the Coast Ranges rather than the Sierra Nevada.

5.8.3.2 Resource Inventory Methods

To develop a baseline paleontological resource inventory of the project area and surrounding lands, and to assess the potential paleontological productivity of the stratigraphic units that may be present, geological and paleontological literature—published and available unpublished—was reviewed. Other than the prior paleontological resources assessment for the site (GWF, 2001) and the *Final Paleontological Resources Report* (Lawler Associates, 2003), sources included geological maps, satellite and aerial photography, and technical and scientific reports. For GWF Tracy, an updated paleontological resources records review was conducted for the project using the online database maintained by the University of California Museum of Paleontology at Berkeley (UCMP).

Field reconnaissance by the project paleontologist of the areas where transmission line reconductoring will take place was conducted because these lay outside the plant site, itself an area composed entirely of artificial fill (primarily gravel padding). Field reconnaissance rather than formal survey was made because the areas are characterized by highly disturbed topsoil, chiefly by agricultural activities, and no fossiliferous sediments could be observed. This is consistent with the results of the prior paleontological resources survey of the project area (GWF, 2001).

5.8.3.3 Resource Inventory Results

5.8.3.3.1 Geological Units in the Vicinity

In the vicinity of the project site, the surface slopes gently down at about a 1-percent grade to the northeast. Local drainage is directed toward the northeast. The elevation of the site varies from about 155 to 180 feet (GWF, 2001). The San Joaquin River floodplain lies 6 to 8 miles to the northwest, and represents local base level.

The local area is underlain by a complex series of sedimentary and volcanic rocks ranging in age from Jurassic to Tertiary. Since their deposition, these rocks have been extensively deformed by repeated episodes of folding and faulting. Valleys within the region are generally filled with unconsolidated sedimentary deposits of Quaternary age. A thick sequence of alluvial fan deposits forms the west side of the Great Valley province in the Tracy area. These sedimentary deposits consist of interbedded sand, gravel, silt, and clay. A brief description of the structure and stratigraphy beneath the project facilities is presented below (GWF, 2001).

The site is immediately underlain by Quaternary alluvium mapped as Unit Qf (Figure 5.4-1). This alluvium comprises the outwash fan extending from the foot of the Coast Range, about a half-mile to the southwest, to the lower San Joaquin River, which describes a highly meandering course 5 to 7 miles to the north and east. Past geotechnical investigations have shown that the subsurface at the site consists of a layer of moderately to highly expansive clay underlain by an alluvial sequence of silt, clay, sand, and gravel. The surface expansive clay layer varies from about 2 to 7 feet thick. The material is loose to a depth of 1 to 1.5 feet and stiff to hard below this depth. The material directly below the clay consists of 4 to 7 feet of silty sand at four locations, and sandy silt or sandy clay at the other locations. This layer is underlain mainly by sandy silt to silty clay to the depths explored. The clay and

silt are typically very stiff to hard and contain varying amounts of sand and gravel. Occasional layers of sand and gravel are present to the depths explored. Two layers of dense sand and gravel were encountered at depths of about 30 and 50 feet below ground surface.

Quaternary alluvium extends to the San Joaquin River to the north and east, while to the south and west toward the foothills of the Coast Range, older alluvium is encountered intercalated with yet older Miocene fanglomerates (coarse, lithified alluvium). At almost 2 miles southwest of the project site are outcrops of the San Pablo Formation. Quaternary fluvial facies of the San Joaquin River occur in and near the present river floodplain, which is crossed by the second reconductoring segment, about 8 to 10.7 miles to the northeast.

Of the four geological units present in the project vicinity that have the potential to yield fossils, older and younger Quaternary alluvium (including fluvial facies of the San Joaquin River), Miocene fanglomerate, and the Miocene San Pablo Formation, only the youngest, Quaternary (Late Pleistocene) alluvium occurs beneath the project site. Other geological formations occur no closer than one-half mile to the site, and the Miocene San Pablo Formation is no closer than 1.9 miles to the southwest (Figure 5.4-1).

5.8.3.3.2 Results of the Resource Inventory

A search of the UCMP database on February 4, 2008, and again on May 27, 2008, yielded records of 81 fossil localities within San Joaquin County; 25 of these are invertebrate collections or microfossil samples. The rest of the localities have yielded vertebrate fossils and, of these, 31 are from the San Pablo Formation, while an additional eight are from geological formations even more distant from the project site. Of the 17 remaining localities, six are from the excavation of the Delta-Mendota Canal, which lies immediately southwest of the plant site. These site records were reviewed during the prior paleontological resources assessment, and the localities are more than 1 mile distant from the project site (GWF, 2001). These are records primarily of fragmentary large vertebrate remains, and are similar in condition (well preserved, but fragmented and occurring as inclusions in alluvium) to those of extinct camel (*Camelops*) and horse (*Equus*) recovered during monitoring of the TPP at the current project site (Lawler Associates, 2003). A UCMP site record of giant ground sloth (*Megalonyx jeffersoni*) from the "Tracy Gravel Pit" likely relates to the gravel pit that lies on the San Joaquin River floodplain immediately south of Tower T 5/37, just east and south of the I-5/I-205 merge.

5.8.3.3.3 Paleontological Sensitivity of the Project Site

Paleontological sensitivity is the qualitative assessment made by a professional paleontologist taking into account the paleontological potential of the stratigraphic units present, the local geology and geomorphology, and any other local factors that may be germane. According to SVP (1995), standard guidelines sensitivity comprises (1) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, or paleobotanical remains; and (2) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecological, or stratigraphic data (Table 5.8-2).

TABLE 5.8-2
Paleontological Sensitivity Ratings Employed

	Definition
High	Assigned to geological formations known to contain paleontological resources that include rare, well-preserved, and/or fossil materials important to ongoing paleoclimatic, paleobiological and/or evolutionary studies. They have the potential to produce, or have produced, vertebrate remains that are the particular research focus of many paleontologists, and can represent important educational resources as well.
Moderate	Stratigraphic units that have yielded fossils that are but moderately well-preserved, are common elsewhere, and/or that are stratigraphically long-ranging would be assigned a moderate rating. This evaluation can also be applied to strata that have an unproven but strong potential to yield fossil remains based on its stratigraphy and/or geomorphologic setting.
Low	Sediment that is relatively recent, or that represents a high-energy subaerial depositional environment where fossils are unlikely to be preserved. A low abundance of invertebrate fossil remains, or reworked marine shell from other units, can occur, but the paleontological sensitivity would remain low due to their lack of potential to serve as significant scientific or educational purposes.
Marginal and Zero	Stratigraphic units with marginal potential include pyroclastic flows and soils that might preserve traces or casts of plants or animals. Most igneous rocks, however, have zero paleontological potential. Other stratigraphic units deposited subaerially in a high energy environment (such as alluvium) may also be assigned a marginal or zero sensitivity rating. Manmade fill is also considered to possess zero (no) paleontological potential.

As noted above, within 1 mile of the project area is a limited suite of geological units, and the paleontological localities that have been recorded have yielded primarily fragmentary remains of Late Pleistocene vertebrates. Petrified wood weathered from the sediments of the Coast Ranges, and therefore out of stratigraphic context, have also been encountered. The paleontological sensitivity of these geological units is summarized below.

The records search reported here, as well as in the prior paleontological resources investigations (GWF, 2001; Lawler Associates, 2003), show that scientifically significant fossil records occur in the Quaternary sediments lying immediately beneath the surface of the project area. Discoveries to date, however, are of fragmentary remains, bones, and pieces of petrified wood that appear to be included as clasts in alluvium; therefore, a "moderate" sensitivity rating is warranted. This is a "downgrading" of the rating of "high" paleontological sensitivity assigned in the 2001 TPP AFC, essentially because while the paleontological potential of Quaternary sediment in the project vicinity is unproven, little of scientific value has been encountered to date. Nevertheless, it still acknowledges the reasonable probability that scientifically significant fossil remains may occur in the fine-grained facies that are found within Quaternary sediment.

5.8.4 Environmental Analysis

The surface of GWF Tracy is entirely occupied by previously disturbed sediment and artificial fill (sediment transported from elsewhere or fill that is a mix of materials). The depth to undisturbed sediment is variable from place to place, but, generally in this area, extends at least to the bottom of the "plow zone," 3 to 4 feet below the surface. This material

has no potential to yield scientifically important materials, and therefore possesses no paleontological sensitivity.

The environmental impacts on paleontological resources from both construction and operation of GWF Tracy are presented in the following sections.

5.8.4.1 Paleontological Resource Significance Criteria

In its standard guidelines for assessment and mitigation of adverse impacts to paleontological resources, the SVP (1995) notes that an individual fossil specimen is considered scientifically important and significant if it is: (1) identifiable; (2) complete; (3) well preserved; (4) age-diagnostic; (5) useful in paleoenvironmental reconstruction; (6) a type or topotypic specimen; (7) a member of a rare species; (8) a species that is part of a diverse assemblage; or (9) a skeletal element different from, or a specimen more complete than, those now available for that species. For example, identifiable land mammal fossils are considered scientifically important because of their potential use in determining the age and providing input to paleoenvironmental reconstructions for the sediments in which they occur. Moreover, vertebrate remains are comparatively rare in the fossil record. Fossil plants are also important in this regard and, as sedentary organisms, are actually more sensitive indicators of their paleoenvironment and, thus, more important than mobile mammals for paleoenvironmental reconstructions. For marine sediments, invertebrate fossils, including marine microfossils, are scientifically important for the same reasons that land mammal and/or land plant fossils are valuable in terrestrial deposits. The value or importance of different fossil groups varies depending on the age and depositional environment of the stratigraphic unit that contains the fossils, their abundance in the record, and their degree of preservation.

Using the criteria of the SVP (1995) and the sensitivity ratings provided above, the significance of potentially adverse impacts of earth moving on the paleontological resources was assessed. Any unmitigated impact on a fossil site or a fossil-bearing rock unit of high or moderate sensitivity would be considered significant.

5.8.4.2 Paleontological Resource Impact Assessment

The significance of potential adverse impacts of project-related activities on the paleontological resources of each stratigraphic unit anticipated to be present at the project site is presented in this section. This assessment includes the entirety of the project area, including the two stretches of transmission line identified for reconductoring.

- **Artificial Fill and Previously Disturbed Sediment –** Construction-related excavations within artificial fill will not result in any adverse impacts to paleontological resources. Reworked and disturbed fossil material may be present in the artificial fill and previously disturbed sediment, but lack of stratigraphic context and likely mechanical damage would compromise all scientific values. This would apply to all excavations within 4 feet of current ground surface and all excavations within the current boundary of the plant compound.
- **Quaternary Alluvium –** Excavations including drilling and trenching extending to depths below 4 feet outside of the current plant compound are likely to affect Quaternary-age alluvium. This unit has moderate paleontological sensitivity; fine-

grained facies could yield significant fossil resources. Uncontrolled excavation affecting identifiable and *in situ* fossils potentially present at depth in this unit would be an adverse impact.

Impacts to paleontological resources could occur from subsurface excavations associated with construction of GWF Tracy, and no impacts to paleontological resources are expected to occur from the operation of the project. At this time, because all excavations are to be restricted to previously disturbed sediment (no excavations are anticipated during the reconductoring of the transmission line segments beyond the plant boundaries), no impacts to paleontological resources are expected from project construction either.

5.8.5 Cumulative Effects

Widespread development in the San Francisco Bay area and in the Central Valley has resulted in proportionately extensive impacts to paleontological resources, and this is anticipated to continue. The extensive nature of these cumulative impacts is due to this extensive development combined with the widespread presence of numerous fossiliferous sedimentary units in the area (GWF, 2001). However, measures typically implemented pursuant to State statutes (See Section 5.8.2) serve to mitigate these impacts through the recovery of the scientific and educational potential of the affected paleontological resources. Although not all projects are subject to CEQA review, and only a proportion of those incorporate paleontological protection measures, application of paleontological monitoring and mitigation measures is common, and therefore mitigates the cumulative and direct impacts of continued development.

The potential contribution to cumulative impacts to paleontological resources from this project would be limited at most, given the limited area extent of the current project, lack of excavations planned for native sediment, and the moderate paleontological potential of the Quaternary alluvium determined to date. Thus, the proposed project is not expected to contribute measurably to cumulative negative impacts to paleontological resources in the absence of mitigation. With the mitigation described below, however, the contribution of GWF Tracy to cumulative negative impacts to paleontological resources would indeed be negligible. Moreover, the application of controlled scientific recovery methods to discovered paleontological resources is typically thought of as constituting a beneficial impact to the extent that new scientific specimens and knowledge are generated.

5.8.6 Mitigation Measures

Guidelines for the implementation of CEQA (Public Resources Code Sections 15000 *et seq.*) include, among the questions to be answered in the Environmental Checklist (Section 15023, Appendix G), the following: "*Would the project directly or indirectly destroy a unique paleontological resource or site*?" and "*Does the project have the potential to . . . eliminate important examples of the major periods of California . . . pre-history*?" These questions are answered in the affirmative based on the data and considerations provided above. Because construction of GWF Tracy may have potential adverse impacts on significant paleontological resources, mitigation measures are described below.

This section describes applicant-proposed mitigation measures that would be implemented to reduce potential adverse impacts to significant paleontological resources resulting from

project construction. These proposed paleontological resource impact mitigation measures would reduce, to an insignificant level, the direct, indirect, and cumulative adverse environmental impacts on paleontological resources that might result from project construction. The mitigation measures proposed below are consistent with those identified previously (GWF, 2001) and the results of prior monitoring (Lawler Associates, 2003). They also are in compliance with CEC environmental guidelines (CEC, 2000; 2007) and with SVP standard guidelines for mitigating adverse construction-related impacts on paleontological resources (SVP, 1991; 1995; 1996).

5.8.6.1 Paleontological Resources Monitoring and Mitigation Program

A Paleontological Resources Monitoring and Mitigation Program (PRMMP) will be developed for review and approval by the CEC prior to implementation. The PRMMP will include: construction monitoring and coordination; emergency discovery procedures; sampling and data recovery, if needed; museum storage coordination for any specimens and data recovered; preconstruction coordination; and reporting. Reporting requirements will include monthly monitoring reports and a final report.

Implementation of these mitigation measures would reduce the potential impact from project-related ground disturbance on paleontological resources to an insignificant level by allowing for the recovery of fossil remains and associated specimen data, and corresponding geologic and paleoenvironmental data, that otherwise might be lost to earth moving or to unauthorized fossil collecting. These scientific and associated educational values constitute the chief significance of the resource; therefore, their recovery mitigates the impacts to that resource.

With a well-designed and implemented PRMMP, project construction could potentially result in beneficial impacts to paleontological resources through the recovery of fossil remains that would otherwise not have been exposed and, therefore, would not have been available for study. This consideration is particularly applicable to this area with its complex geological history, as well as a paucity of fossil sites on this particular terrace surface compared to those farther inland. The recovery of fossil remains as part of project construction could help answer important questions regarding the geographic distribution, stratigraphic position, and age of fossiliferous sediments in the area.

5.8.6.1.1 Paleontological Monitoring

Prior to construction, a qualified paleontologist will be retained as project Paleontological Resource Specialist (PRS) to design and implement a monitoring program during project-related earth-moving activities. Prior to construction, the PRS will review excavation plans to determine whether sensitive stratigraphic units will be disturbed by project-related earth movement.

Currently, no plans exist to excavate in areas that have not been disturbed and refilled as a consequence of earlier excavations. Should that change, earth-moving construction activities will be monitored where they will potentially disturb previously undisturbed sediment. Monitoring will not be conducted in areas where the ground will not be disturbed. Monitoring procedures will include measures to suspend monitoring should construction activities be restricted to previously disturbed fill, and to adjust monitoring protocols based on updated evaluations of sensitivity subsequent to initial excavations.

5.8.6.1.2 Construction Personnel Education

Prior to working on the site for the first time, all personnel involved in earth-moving activities will be provided with Paleontological Resources Awareness Training. This training would ideally be provided as a module in their worker environmental awareness training. They will be informed that fossils may be encountered, and provided with information on the appearance of fossils, the role of paleontological monitors, and on proper notification procedures. This worker training will be prepared and initially presented by PRS. Subsequent training may be conducted using recorded and hard copy training materials.

5.8.6.1.3 Discoveries and Reporting

The PRMMP will also provide plans for the recovery and disposition of fossils should they be encountered during construction related excavations. These will include preparation for analysis; initial analysis; identification and inventory; preparation for curation; and the delivery for curation of all significant paleontological resource materials encountered and collected during the data recovery, mapping, and mitigation activities related to the project. To complete the mitigation of impacts to paleontological resources, a report describing the finds and their geological and paleontological context will be prepared and submitted to the repository accepting the paleontological material for curation.

5.8.6.2 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts on paleontological resources are anticipated as a result of the construction and/or operation of GWF Tracy.

5.8.7 Agencies and Agency Contacts

There are no agencies having blanket jurisdiction over paleontological resources. The CEC has jurisdiction over paleontological resources for this project. Title 9 of the Development Title of San Joaquin County (n.d.) places emphasis on the preservation of historic and cultural resources, including heritage resources, but does not address paleontological resources *per se*. If encountered, scientifically significant fossil specimens and associated site records will be submitted to the UCMP (Table 5.8-3).

TABLE 5.8-3
Agency Contacts for Paleontological Resources

Issue	Agency	Contact
Paleontological Resources Documentation	University of California Museum of Paleontology Berkeley, CA	Dr. Patricia Holroyd Curator of Vertebrate Paleontology 1101 Valley Life Sciences Building Berkeley, CA 94720-4780 (510) 642-3733 pholroyd@berkeley.edu

5.8.8 Permits and Permit Schedule

No state, county, or city agency requires a paleontological collecting permit to allow for the recovery of fossil remains discovered as a result of construction-related earth moving on this project site.

5.8.9 References

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