

1 4.2 MINERAL RESOURCES

2 This section evaluates the potential loss of availability of known mineral resources,
3 including sand and construction aggregate associated with the proposed San Francisco
4 Bay and Delta Sand Mining Project (Project) over the next 10 years. Since sand mining
5 in San Francisco Bay would not impact land-based mineral resources, the analysis is
6 limited to impacts on mineral resources contained within the sediments and underlying
7 strata (bay floor) of San Francisco Bay and the western Sacramento-San Joaquin Delta
8 (Delta).

9 4.2.1 Environmental Setting

10 Information presented in this section is primarily based on the following documents:

- 11 • *Aggregate Availability in California*, prepared by the California Geological Survey
12 (CGS), 2006 (Kohler 2006a);
- 13 • *Assessment & Evaluation of the Effects of Sand Mining on Aquatic Habitat and*
14 *Fishery Populations of Central San Francisco Bay and the Sacramento-San*
15 *Joaquin Estuary*, prepared by C.H. Hanson, J. Coil, B. Keller, J. Johnson, J.
16 Taplin, J. Monroe, Hanson Environmental, Inc., 2004 (Hanson Environmental
17 2004a);
- 18 • *California Non-fuel Minerals 2007 and California Non-fuel Minerals 2008*,
19 prepared by Susan Kohler, Senior Geologist, CGS (Kohler 2007, 2008);
- 20 • *Limestone, Dolomite, and Shell Resources of the Coast Ranges Province,*
21 *California, Bulletin 197*, prepared by Earl W. Hart, California Division of Mines
22 and Geology, 1978 (Hart 1978);
- 23 • *Oyster Shell Mining within South San Francisco Bay, State Lands Commission*
24 *Lease PRC 5534.1* – prepared by Hanson Environmental, Inc., 2004 (Hanson
25 Environmental 2004b);
- 26 • *San Francisco Bay Plan*, San Francisco Bay Conservation and Development
27 Commission (BCDC), 2011 (BCDC 2011);
- 28 • *Sand Mining Resource Evaluation and Impact Analysis*, prepared by Coast &
29 Harbor Engineering (CHE), 2009 (CHE 2009), which is included in this report as
30 Appendix G; and
- 31 • *Shifting Shoals and Shattered Rocks – How Man Has Transformed the Floor of*
32 *West-Central San Francisco Bay*, prepared by the U.S. Geological Survey, 2004
33 (Chin et al. 2004).

1 Information presented in these documents is summarized below. Additional references
2 from the California Geological Survey (CGS; formerly the Division of Mines and
3 Geology) were also consulted, as indicated.

4 The effects of past sand mining on the availability of mineral resources are considered
5 part of the baseline condition.

6 **Regional Context**

7 Known mineral resources in the floor of the San Francisco Bay and the western Delta
8 are primarily sand and gravel deposits that are valuable as construction aggregate or as
9 construction fill material. The CGS defines construction aggregate as alluvial sand and
10 gravel or crushed stone that meets standard specifications for use in Portland cement
11 concrete or asphalt concrete. Oyster shell mining is also considered a commercially
12 beneficial activity, and oyster shells have been commercially mined from the Bay for
13 their mineral content since 1924. As a mineral resource, principal shell accumulations
14 consist of native oysters deposited in upper mud units in the shallow parts of South San
15 Francisco Bay (Hart 1978). Currently, oyster shell mining is limited to the shallow
16 southern regions of the Bay (near the San Mateo Bridge) under California State Lands
17 Commission (CSLC) Lease PRC 5534. This operation is relatively small and distant
18 from the proposed Project lease areas.

19 Marine aggregate, which includes sand resources that would be mined under the
20 Project, is largely composed of alluvial sand and gravel that result from erosion and
21 sediment transport associated with the San Francisco Bay-Delta and River systems. As
22 a construction aggregate resource, alluvial sand and gravel have some advantages
23 over crushed stone in terms of concrete workability and impacts on equipment. For
24 example, a wet mix of construction-grade concrete made from crushed stone aggregate
25 is generally more difficult to work with than the same mix made from alluvial aggregate,
26 as the sharp edges of angular fragments of crushed stone increase wear and damage
27 to pumping equipment.

28 California is the nation's largest producer of sand and gravel, yet due to a growing
29 population and associated infrastructure needs, demand outstrips supply. California
30 produced approximately 167 million tons of sand and gravel in 2006, and 148 million
31 tons in 2007 (Kohler 2007, 2008).¹ Imports of sand and gravel, primarily via ship and
32 barge from Mexico and Canada into California, have generally increased in recent years

¹ The slowdown in residential construction contributed to the decrease in production in 2007 (Kohler 2007).

1 and the trend is expected to continue. The CGS reports (Kohler 2001, 2002, 2004,
2 2005, 2006b, 2007) the following volumes of imported aggregate:

- 3 • 2001: 0.9 million tons
- 4 • 2002: 2.4 million tons
- 5 • 2004: 3.3 million tons
- 6 • 2005: 2.4 million tons
- 7 • 2006: 3.2 million tons
- 8 • 2007: 2.0 million tons

9 The 2006 CGS study on aggregate availability estimates that demand for construction
10 aggregate in California in the next 50 years will total approximately 13.5 billion tons
11 (Kohler 2006a), not including increased demand following major bond initiatives, e.g.,
12 for major public infrastructure projects or from reconstruction following a major
13 earthquake. The study identifies approximately 74 billion tons of non-permitted
14 construction aggregate resources in California, but points out that these resources are
15 not likely to be fully exploited due to social, environmental, and economic concerns.

16 Transportation cost is the primary constraint that defines the market area for an
17 aggregate mining operation. Aggregate is a high weight-to-unit value commodity such
18 that demand for aggregate tends to be met with local supply where possible. Local
19 mining minimizes fuel consumption associated with transport, as well as associated air
20 pollution (including greenhouse gas emissions), traffic congestion, and road
21 maintenance. However, regulations and environmental concerns associated with the
22 mining operations make it increasingly difficult to permit aggregate sources near
23 population centers. This is especially true of sand and gravel resources from instream
24 and floodplain areas.

25 Under the Surface Mining and Reclamation Act of 1975 (SMARA; Pub. Resources
26 Code, § 2710 et seq.) the CGS develops mineral land classification maps and reports
27 on the known or inferred mineral resource potential of regional Mineral Resource Zones
28 (MRZs). Local agencies are required to use the classification information when
29 developing land-use plans and when making land-use decisions. The 2006 CGS report
30 assesses the current availability of California's permitted aggregate resources, based
31 on a series of mineral land classification reports completed between 1981 and 2005 that
32 identify and assess economically significant aggregate deposits in 31 study areas
33 across the State, including two in the greater San Francisco Bay Area (Kohler 2006a).
34 Aggregate study areas are described using either a Production-Consumption (P-C)

1 region boundary or a county boundary.² For each study area, the report projects the 50-
2 year demand for aggregates, calculates permitted and non-permitted aggregate
3 resources, and estimates when the permitted resources will be depleted. Only land-
4 based resources are considered; i.e., aggregate resources in the Bay sediments and
5 underlying strata or rock are not evaluated. The CGS report concludes that four of the
6 31 aggregate study areas were projected to have less than 10 years of permitted
7 resources remaining. This includes the North San Francisco Bay P-C Region. Permitted
8 construction aggregate resources in the North San Francisco Bay P-C Region constitute
9 8 percent of the expected 50-year demand of 647,000,000 tons; for the South San
10 Francisco Bay P-C Region the figure is 37 percent of the expected 50-year demand of
11 1,244,000,000 tons.

12 Historically, millions of cubic yards of sand and gravel have been mined from Bay floor
13 shoals since 1915. This includes approximately 20 million cubic yards of sediment
14 extracted during 1936 through 1938 from the Point Knox Shoal area near Angel Island,
15 used as fill material to create Treasure Island for the 1939 Golden Gate International
16 Exposition. Sand mining in recent decades has been conducted under mining leases
17 granted by the CSLC. Under the latest mining leases, for the years 1998 through 2007,
18 an average of approximately 1,200,000 cubic yards of sand per year was mined from
19 the Central Bay lease areas and 135,700 cubic yards per year were mined from the
20 Delta and Carquinez Strait lease areas (as shown in Table 2-3 in Section 2.0, Project
21 Description). The Carquinez Strait lease area is not part of the Project.

22 **Central Bay**

23 CHE found, through morphological analysis, that the vast majority of sediment mined
24 from the Central Bay lease areas during the past decade has not been replenished
25 through natural processes (CHE 2009). The study concluded that recovery of sand
26 resources in the Central Bay area is a long-term process, and for the additional 10
27 years of mining as proposed by the Project, the available resource is largely limited to
28 material already in place.

29 **Suisun Bay and Western Delta**

30 CHE concluded that there has been no clear trend with regard to sediment depletion in
31 the sand mining lease areas in Suisun Bay and the Western Delta (CHE 2009). The

² Prior to 1989, the aggregate study areas were defined as Production-Consumption (P-C) regions that included one or more producing aggregate mines and the market they serve. In 1989 the State Mining and Geology Board (SMGB) changed the scope of the aggregate study areas to county-wide studies to make them more user-friendly to local government planners (the primary users of the reports).

1 notable exception is the deeper areas of the Middle Ground lease area, where there is
2 measurable depletion and available sand resources appear to be limited to what is
3 already in place (CHE 2009).

4 **4.2.2 Regulatory Setting**

5 This subsection briefly describes Federal, State, and local regulations, permits, and
6 policies pertaining to mineral resources as they apply to the Proposed Project.

7 **Federal**

8 *U.S. Army Corps of Engineers*

9 The U.S. Army Corps of Engineers (ACOE) has jurisdiction over sand mining in San
10 Francisco Bay and the Bay-Delta system under Section 10 of the Rivers and Harbors
11 Act (33 U.S. Code [U.S.C.], § 401 et seq.). Section 10 of the Rivers and Harbors Act
12 requires authorization from the ACOE for the construction of any structure in or over any
13 navigable water of the United States, excavation/dredging or deposition of material in
14 these waters, or any obstruction or alteration in a navigable water.³ Section 10 and
15 Federal Clean Water Act (CWA) Section 404 overlap in some activities involving
16 wetlands. The ACOE coordinates with many Federal agencies, including the following.

- 17 • The ACOE and the U.S. Environmental Protection Agency (U.S. EPA) regulate
18 the discharge of dredged or fill material into waters of the United States, under
19 CWA Section 404. Projects that would result in the placement of dredged or fill
20 material into waters of the United States require a Section 404 permit from the
21 ACOE.
- 22 • Federal and State law requires that the ACOE consult and coordinate with the
23 U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service
24 (NMFS)⁴ as part of the permitting and associated environmental review process
25 to ensure that sand mining activities do not jeopardize federally listed
26 endangered or threatened species under their respective jurisdictions or
27 adversely affect designated critical habitat for such species within the estuary.
28 For more information, see Section 4.1, Biological Resources.

³ Navigable waters of the U.S. are those subject to the ebb and flow of the tide shoreward to the mean high water mark and/or presently used, or have been used in the past, or are susceptible for use to transport interstate or foreign commerce. The term includes coastal and inland waters, lakes, rivers and streams that are navigable, and the territorial sea.

⁴ Subsequently renamed NOAA Fisheries, the agency continues to be referred to as NMFS or NOAA Fisheries; it is referred to herein as NMFS.

1 **State**

2 *California Department of Conservation*

3 The California Department of Conservation is the primary State agency with regard to
4 mineral resource protection. The Department of Conservation is charged with
5 conserving earth resources (Pub. Resources Code, §§ 600-690) and has three program
6 divisions that address mineral resource issues: CGS; Division of Oil, Gas, and
7 Geothermal Resources; and Office of Mine Reclamation. The SMGB develops policy
8 direction regarding the development and conservation of mineral resources and
9 reclamation of mined lands.

10 *California Surface Mining and Reclamation Act of 1975*

11 SMARA (Pub. Resources Code, § 2710 et seq.), adopted in 1975, requires the State
12 Geologist to classify land into MRZs, according to the known or inferred mineral
13 potential of that area. The process is based solely on the underlying geology without
14 regard to existing land use or land ownership. The primary goal of classifying the State's
15 mineral lands is to aid agencies, planners, and the public in the prudent use,
16 management, and conservation of the State's mineral resources and to ensure that
17 local government decision-makers recognize and consider the mineral potential of the
18 land before making land use decisions that could preclude access to or development of
19 the mineral resource.

20 Under SMARA, all operators of surface mines in California must prepare and submit for
21 approval by the lead agency, a reclamation plan, along with financial assurances that
22 sufficient funds would be available to accomplish reclamation (Pub. Resources Code, §
23 2770). The lead agency under SMARA is the jurisdiction that has the principal
24 responsibility for approving a reclamation plan applicable to the surface mining
25 operation – in this case the SMGB. Substantial deviations from an approved
26 reclamation plan may not be undertaken without the submission to and approval by the
27 lead agency, of amendments to the reclamation plan (Pub. Resources Code, § 2777).

28 SMARA defines “Reclamation” as the combined process of land treatment that
29 minimizes water degradation, air pollution, damage to aquatic or wildlife habitat,
30 flooding, erosion, and other adverse effects from surface mining operations, so that
31 mined lands are reclaimed to a usable condition which is readily adaptable for alternate
32 land uses and creates no danger to public health or safety (Pub. Resources Code, §
33 2733). Typically, the process may extend to affected lands surrounding mined lands,

1 and may require backfilling, grading, resoiling, revegetation, soil compaction,
2 stabilization, or other measures.

3 SMGB regulations govern the reclamation of mined lands and conduct of surface mining
4 in accord with SMARA (Cal. Code Regs., tit. 14, § 3500 et seq.). In February 2005, the
5 SMGB adopted Resolution 2005-02, approving the reclamation plans for 10 marine
6 sand mining leases in the Central Bay, Suisun Bay and Western Delta. The reclamation
7 plan approval is limited to the term of the leases that expired in 2008. Five of the 10
8 lease areas are within the scope of the Project. All 10 approved plans state that
9 “cessation of mining operations followed by natural replenishment is the most logical
10 plan for reclamation.” Due to the underwater nature of the mining sites, no rehabilitation
11 of streambed channels or streambanks was deemed necessary. The approved
12 reclamation plans also state that “neither the mining itself nor the method of reclamation
13 will preclude future mining activities in this area, because the area’s end use is as the
14 San Francisco Bay and Delta Estuary floor, and natural replenishment of sand sources
15 follows mining events. Hence mining could be continued or reinstated here following
16 any cessation of mining, provided it is carried out with appropriate agency approvals
17 and monitoring data.”

18 *California State Lands Commission*

19 The CSLC administers lands owned by the State, which include the beds of all naturally
20 navigable waterways, such as major rivers, streams and lakes, and tidal and
21 submerged lands below the high tide line. The CSLC issues Land Use Leases, and
22 occasionally Permits, for use of State lands that are determined to be consistent with
23 the public trust values for fisheries, navigation, public access, recreation, wildlife habitat
24 and open space.

25 *San Francisco Bay Conservation and Development Commission*

26 BCDC administers the San Francisco Bay Plan (Bay Plan) and has permit approval
27 authority over dredging operations in the waters of San Francisco Bay (including
28 Suisun, San Pablo, Honker, Richardson, San Rafael, San Leandro and Grizzly Bays
29 and the Carquinez Strait). Under Public Resources Code, section 66664.4, dredging is
30 defined as “the extraction of sand, mud, or other materials from San Francisco Bay, its
31 tributaries, the delta, or coastal state waters.” Other than policies pertaining to dredging,
32 the Bay Plan does not explicitly address mining or mineral resources.

1 *San Francisco Bay Regional Water Quality Control Board*

2 As discussed in Section 4.3, Hydrology and Water Quality, the primary responsibility for
3 the protection and enhancement of water quality in the Project area has been assigned
4 by the California legislature to the State Water Resources Control Board (SWRCB) and
5 the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB). The
6 SWRCB administers water rights, water pollution control, and water quality functions
7 throughout the State, while the RWQCBs conduct planning, permitting, and
8 enforcement activities.

9 **Other Plans and Policies**

10 Other plans and policies governing activities and resources within the Bay and Delta
11 include the Suisun Marsh Protection Plan developed by BCDC and California
12 Department of Fish and Game (CDFG), the Solano County Local Protection Plan, and
13 the Solano County General Plan. The County's general plan identifies mineral
14 resources within the County, but does not identify any within any water areas in its
15 jurisdiction.

16 **4.2.3 Significance Criteria**

17 Based on Appendix G of the State CEQA Guidelines, the Project would have a
18 significant adverse impact on mineral resources if it would result in:

- 19 • The loss of availability of a known mineral resource that would be of value to the
20 region and the residents of the State; or
- 21 • The loss of availability of a locally-important mineral resource recovery site
22 delineated on a local general plan, specific plan or other use plan.

23 These criteria reflect State and local policy that recognizes the importance of mineral
24 resources in meeting society's needs and are intended to ensure the disclosure of a
25 proposed project's potential to preclude mineral extraction, for example by developing a
26 land use over or adjacent to a deposit of mineral resources that was incompatible with or
27 that would preclude future mining activities. As such, these criteria are understood and
28 interpreted as primarily concerning the potential loss of access to known mineral resources.

29 **4.2.4 Impact Analysis and Mitigation**

30 This section examines the potential for the Project to cause a significant impact to
31 mineral resources. Table 4.2-1, located at the end of Section 4.2.4, summarizes impacts
32 for the mineral resources issue area.

1 **Impact MIN-1: Loss of availability of a known mineral resource**
2 **Renewal of sand mining leases for an additional 10 year period would not result**
3 **in the loss of availability of a known mineral resource of regional or statewide**
4 **value (Less than Significant, Class III).**

5 The lease parcels on which the Applicants propose to mine sand are not designated on
6 State or local maps as areas having minerals of State, regional, or local importance;
7 however, the parcels contain construction-grade sand, an important component of
8 construction aggregate needed to meet local development needs. The Project consists
9 of the continued mining of sand, the only known mineral resource within the lease
10 parcels, and therefore would not prevent or cause the loss of access to the sand
11 resource. Oyster shells, which are mined for their mineral content, are the only known
12 mineral resource in the San Francisco Bay and Delta other than sand and gravel.
13 Oyster shell deposits are located in the shallow southern reaches of the Bay, from the
14 area of the Oakland Airport south (Hart 1978). Given that the proposed sand mining
15 operations are located in the Central Bay and even more distant areas to the north and
16 east, these operations would not interfere with mining of these known oyster shell beds
17 nor would they preclude the future development of mineral resources other than sand,
18 should such resources be identified within any of the lease areas in the future.

19 The additional 10 years of mining sand from the lease areas in the Central Bay and
20 Delta are expected to reduce the amount of sand that would be available for future
21 mining in most of the lease areas. Since the total extent of sand deposits in the Project
22 area is not known, over the long term mining could deplete the sand deposits. While
23 there has been speculation that sand mined from the Bay and Delta was “renewable”
24 because it was thought to be replenished by additional sand carried by river and tidal
25 currents to the mining lease areas, the CHE report conducted for this EIR indicates that
26 replenishment essentially did not occur over the past 10 years of mining in the Central
27 Bay lease areas, and that for practical purposes, the resource in the proposed lease
28 areas is limited to the material in place (CHE 2009). In the Suisun Bay and western
29 Delta lease areas, the sand resource was not noticeably depleted over the past 10-year
30 mining period, indicating that sand in these areas is replenished over the short term
31 (CHE 2009). The exception to this observation is the deeper portions of the Middle
32 Ground lease area, where the resource also appears to be limited to the material
33 currently in place.

34 Mining of a non-renewable mineral resource can generally be expected to eventually
35 deplete the resource. As discussed in Section 4.2.3 above, the significance criteria used

1 for this section are based on the State’s interest in ensuring that important mineral
 2 resource deposit areas be conserved for extraction of mineral resources and not be lost
 3 to the development of incompatible land uses. The Project is consistent with this goal,
 4 and therefore the Project’s impact on known mineral resources is not significant.

5 **Impact MIN-2: Loss of availability of a locally-important mineral resource recovery**
 6 **site**

7 **Renewal of sand mining leases for an additional 10-year period would not result**
 8 **in the loss of availability of a locally-important mineral resource recovery site**
 9 **delineated on a local general plan, specific plan, or other use plan (Less than**
 10 **Significant, Class III).**

11 As noted in Section 4.7.2, Land Use and Recreation, subsection 4.7.2, Regulatory
 12 Setting, the applicable land use plans in the Project area consist of the Bay Plan,
 13 developed by the BCDC, the Suisun Marsh Protection Plan developed by BCDC and
 14 CDFG, the Solano County Local Protection Plan, and the Solano County General Plan.
 15 Other than natural gas located several thousand feet below the tidal marshes, managed
 16 wetlands, sloughs and bays of the Suisun Marsh, only the Solano County General Plan
 17 directly addresses mineral resources; none of the plans identify mineral resources
 18 within the water areas where sand mining would be conducted. Sand mining proposed
 19 by the Project in the Central Bay or Delta, conducted at or near the surface of the Bay
 20 floor, would not affect the availability of natural gas. Therefore, impacts associated with
 21 the loss of availability of a locally-important mineral recovery site as delineated in local
 22 plans are less than significant.

23 **Table 4.2-1. Summary of Mineral Resources Impacts and Mitigation Measures**

Impact	Mitigation Measures
MIN-1: Loss of availability of a known mineral resource.	Less than Significant impact; no mitigation necessary.
MIN-2: Loss of availability of a locally-important mineral resource recovery site.	Less than Significant impact; no mitigation necessary.

24

25 **4.2.5 Impacts of Alternatives**

26 **No Project Alternative**

27 Under the No Project Alternative, the proposed leases for sand mining in the
 28 San Francisco Bay and Delta would not be granted and sand mining at the existing CSLC
 29 and Middle Ground Shoal sites would cease. It is assumed that under this alternative the

1 demand for construction sand would be met by other local sources or that sand would be
2 imported from more distant sources. The No Project Alternative would not, however,
3 preclude future mining of the lease areas, and therefore this alternative would not have a
4 significant adverse effect on the availability of known mineral resources.

5 **Long-term Management Strategy Conformance Alternative**

6 Under the Long-term Management Strategy (LTMS) Conformance Alternative, time and
7 location restrictions would be placed on the sand mining operations to conform with the
8 LTMS work windows (periods during which dredging activities can proceed without
9 agency consultation under the LTMS). This would limit all mining in the Central Bay to
10 the period June through November and would further limit mining of the Central Bay
11 parcels within Marin County (i.e., part or all of PRC 7779, part of PRC 709, and most of
12 PRC 2036) to the period June through October. Mining within the Suisun Bay and Delta
13 would be limited to the three-month period of September through November. As with the
14 proposed Project, this alternative would not limit or preclude access to a known mineral
15 resource.

16 **Clamshell Dredge Mining Alternative**

17 Under the Clamshell Dredge Mining Alternative, a barge-mounted crane and clamshell
18 bucket would be used rather than a suction dredge. Mining would be conducted at the
19 same CSLC and privately-owned lease parcel sites as proposed for the Project, and,
20 the Applicants would be permitted to mine the same volume of sand as proposed under
21 the Project; therefore, the impacts of this alternative on mineral resources would be the
22 same as for the proposed Project.

23 **Reduced Project Alternative**

24 The Reduced Project Alternative would reduce the allowable mining volumes in all lease
25 areas to a level equivalent to current baseline volumes (i.e., the average mined per year
26 at each Project parcel from 2002 to 2007). All other aspects of the Project would remain
27 the same, including mining methods, equipment, and locations. Although this alternative
28 would reduce the volume of sand that could be mined, it would not preclude or hinder
29 future access to the sand deposits in the Bay and Delta. Therefore, like the Project as
30 proposed, this alternative would have a less-than-significant impact on the availability of
31 known mineral resources.

1 **4.2.6 Cumulative Projects Impact Analysis**

2 As discussed above, the proposed Project is not expected to have any significant
3 impacts on the availability of a known mineral resource. None of the other projects listed
4 in Table 3-3 in Section 3.0, Alternatives and Cumulative Projects, would hinder or
5 restrict access to the known mineral deposits in the Bay and Delta. Therefore, these
6 other projects would not combine with the San Francisco Bay and Delta Sand Mining
7 Project to cause a significant cumulative impact related to loss of availability of mineral
8 resources.