

1 **4.14 GROUNDWATER**

2 Groundwater is defined as subsurface water that occurs below the water table in soils and other
3 geologic formations.

4 Redevelopment could result in potentially significant and less than significant impacts to
5 groundwater. With implementation of measures recommended in this section, all potentially
6 significant impacts can be mitigated to a level that is less than significant.

7 **4.14.1 Study Area**

8 The areal extent of the study area for groundwater consists of the approximately 1,800-acre
9 redevelopment project area. The vertical extent of the study area for groundwater is to the
10 deepest depths explored on the OARB, approximately 45 feet below ground surface (bgs).¹ In
11 addition, the study area for groundwater includes resources partially located within the district,
12 and which may extend outside the district boundary.

13 **4.14.2 Regulatory Setting**

14 **Federal**

15 Laws and regulations that pertain to groundwater include the following:

- 16 • Clean Water Act of 1977 (CWA, 33 United States Code [USC] § 1251 *et seq.*)
- 17 • Safe Drinking Water Act of 1974 (SDWA, 42 USC § 300f *et seq.*, , which includes
18 requirements for drinking water supplied at the tap);
- 19 • Resource Conservation and Recovery Act of 1976 (RCRA, Pub. L. 94-580; USC § 6901 *et*
20 *seq.*) laws and regulations pertaining to the management of wastes (to prevent releases to
21 groundwater resulting from improper hazardous and non-hazardous waste disposal); and
- 22 • Comprehensive Environmental Response, Compensation and Liability Act of 1980
23 (CERCLA, also known as “Superfund,”; 42 USC § 9601 *et seq.*).

24 The U.S. Environmental Protection Agency has the responsibility for implementing requirements
25 of these laws and regulations. Of significance for the study area is EPA’s standard for potential
26 sources of drinking water: water containing less than 10,000 parts per million (ppm) total
27 dissolved solids (TDS) is considered a potential source of drinking water.

28 **State**

29 At the state level, groundwater is under the jurisdiction of the Department of Water Resources
30 (DWR) and the State Water Resources Control Board (SWRCB). The SWRCB delegates most

¹ One well was installed to a depth of 157 feet. However, the remaining deep wells were installed to depths ranging from 39 to 47 feet bgs.

1 of its authority and activities to its nine Regional Water Quality Control Boards (RWQCB). The
2 most important policies promulgated by the RWQCB Region 2 relevant to the study area include
3 Resolutions No. 68-13 and No. 88-63: Maintaining High Quality Water Sources (also known as
4 the Non-Degradation Policy), and Sources of Drinking Water, respectively.

5 Resolution No. 68-13 prohibits any activity that would adversely affect the potential uses of
6 groundwater, including degrading the quality of groundwater so that higher uses are no longer
7 feasible. Resolution No. 88-63 specifies the various potential uses of groundwater. Specifically,
8 it states that in order for an aquifer to be considered a potential source of drinking water, it must
9 contain less 3,000 ppm TDS, and a well installed into the aquifer must yield at least 250 gallons
10 per day.

11 **Local**

12 The study area is located within the San Francisco Bay Groundwater Basin, and is regulated by
13 the RWQCB (Region 2). The RWQCB Region 2 prepares the *Groundwater Basin Plan* for the
14 San Francisco Bay Area (the Basin Plan). The Basin Plan describes actual and potential uses of
15 groundwater throughout the region, and provides requirements for groundwater protection.
16 Proposed amendments to the Basin Plan were adopted by the RWQCB in April 2000; the
17 amendments are currently awaiting approval from the SWRCB and the California Office of
18 Administrative Law. One of these amendments would de-designate groundwater of the
19 redevelopment project area as a source of municipal drinking water supply.

20 In addition to regulating uses of groundwater, the RWQCB provides screening standards for
21 assessing soil and groundwater contamination (RWQCB 2000). These screening criteria
22 provide allowable levels of contaminants in groundwater based on existing and potential uses of
23 the groundwater, and on its proximity to the Bay.

24 In addition to the policies and regulations promulgated by the RWQCB Region 2, the County of
25 Alameda and the City of Oakland also impose standards pertaining to groundwater use. The
26 County of Alameda regulates water well installation in accordance with DWR requirements. The
27 City of Oakland has developed Urban Land Redevelopment soil and groundwater screening
28 criteria that specify allowable levels of contaminants in groundwater in the Oakland area. For a
29 discussion of the Urban Land Redevelopment Program, see Section 4.7: Hazardous Materials.

30 **4.14.3 Regional Setting**

31 The region under consideration is identified in the Basin Plan for the San Francisco Bay Region
32 as being within the East Bay Plain “significant groundwater basin” (RWQCB 1995), within the
33 newly defined Oakland Sub-Area (RWQCB 2000). The East Bay Plain Basin and Sub-Areas are
34 depicted by Figure 4.14-1. According to the Basin Plan amendments, existing beneficial uses for
35 the basin include municipal, industrial process and service, agricultural, and potentially, drinking
36 water uses. Primary aquifers in the East Bay Plain include the San Antonio Formation (including
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1 Insert

2 Figure 4.14-1 East Bay Plain Sub-Areas

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1 the Merritt and Posey sands), a semi-confined aquifer between Old and Young Bay Mud units,
2 and the Alameda Formation between the Old Bay Mud and Franciscan basement. A shallow,
3 unconfined water-bearing zone is frequently encountered in the fill layers overlaying the Young
4 Bay Mud.

5 The deeper part of the Merritt Sand aquifer has been used in the past for water supply wells, as
6 has the Alameda Formation. The Merritt Sand unit of the San Antonio Formation contains some
7 groundwater but is not considered a primary water supply aquifer because of limited distribution
8 and thickness. Groundwater in the Merritt Sand may be considered for temporary use in the
9 event of emergency disruption of East Bay Municipal Utility District water supplies (Corps and
10 Port of Oakland 1998).

11 The majority of groundwater in the East Bay Plain area is a bicarbonate type containing calcium
12 and sodium as the predominant cations. TDS concentrations are generally between about 300
13 to 1,000 milligrams per liter (mg/L). Groundwater quality is generally suitable for most uses,
14 although high TDS concentrations can limit industrial and domestic uses (Alameda County
15 Flood Control and Water Conservation District [ACFCD] 1988).

16 **4.14.4 Local Setting**

17 Groundwater within the study area is found in a shallow (fill) zone, within the Merritt Sands, and
18 in the deeper portions of the Alameda Formation below the Bay Mud unit (see Section 4.13:
19 Geology, Seismicity, and Soils). The Regional Water Quality Control Board (RWQCB), San
20 Francisco Bay Region (Region 2) has proposed de-designation of shallow groundwater at the
21 Oakland Army Base (OARB) and at the former Fleet and Industrial Supply Center, Oakland
22 (FISCO) as a potential source of drinking water. In the near-shore areas of the study area, the
23 Merritt Sand aquifer has experienced significant saltwater intrusion, and is not considered a
24 potential source of drinking water. The status of the Merritt Sand aquifer in the inland portions of
25 the study area is not known.

26 The study area is underlain by the same three primary hydrostratigraphic units described above
27 for the region. From older to younger, they are: the Alameda Formation, San Antonio Formation
28 (the Posey and Merritt sands in particular), and surficial fill unit (Corps and Port of Oakland
29 1998). The surficial fill unit is also known as the artificial fill unit. The unconfined shallow water-
30 bearing zone in the fill unit and the semi-confined aquifer within the Merritt Sand beneath the
31 Young Bay Mud are the most relevant to the study area.

32 Shallow groundwater beneath the majority of the study area has been proposed for de-
33 designation as a potential source of municipal supply (including drinking water) by the RWQCB
34 Region 2. The de-designation is based on the fact that shallow groundwater within this area is
35 tidally connected to the Bay (*i.e.*, much of it is brackish, and would become increasingly more
36 saline with ongoing extraction), that the area has had long-term industrial use, and that the area

1 was filled over an existing marsh. The shallow groundwater in the areas east of I-880 and in the
2 Union Pacific Railyard maintains its potential municipal use designation (RWQCB 2000).

3 Groundwater data, including hydraulic gradient and flow direction, as well as chemical
4 concentrations, are variable from location to location within the study area. However, several
5 generalizations concerning area hydrogeology can be made based on available data. Since the
6 majority of the study area is covered by asphalt and concrete, recharge of the aquifers
7 originates from precipitation and infiltration from off-site areas. The regional groundwater flow
8 direction is westerly from the Berkeley Hills to San Francisco Bay. Shallow groundwater within
9 the study area as a whole is typically encountered at depths between 4 and 13 feet below
10 ground surface (the shallow water-bearing zone). These depths typically fluctuate seasonally,
11 and may also be tidally influenced in near-shore areas. The hydraulic gradient typically ranges
12 from 0.001 to 0.006 foot per foot. Groundwater parameters may be variable in near-shore areas,
13 due to tidal influence. Man-made preferential pathways (e.g., highly permeable backfill along
14 utility lines) may influence both groundwater gradient and flow directions on the local scale
15 (Geomatrix 2000).

16 Shallow groundwater has been investigated extensively within much of the study area.
17 Investigation programs have been conducted at the OARB, former FISCO, former UP
18 roundhouse property, Schnitzer Steel, Berth 24 (the former Mobil and Ashland Oil sites), the
19 Ringsby site, a tank site on the UP railyard, various tank sites within the Port of Oakland's Outer
20 Harbor area, and at the former Phoenix Ironworks site (Geomatrix 2000; Port of Oakland 1999;
21 Kleinfelder 1999 and 2000; Port of Oakland 2001a; Riedel 1995; IT Corporation 2000).
22 Information regarding groundwater beneath the 16th/Wood sub-district is limited.

23 A small number of deep groundwater monitoring wells installed at the OARB, former FISCO,
24 and Berth 24 have penetrated the Merritt Sand aquifer. In addition, one well was reportedly
25 installed into the Alameda Formation. The data from these wells indicate the Merritt Sand
26 aquifer in the western portion of the study is generally saline in nature (having TDS
27 concentrations in excess of 30,000 ppm), and that only very low concentrations of chemicals of
28 concern were detected. Where present, anthropogenic chemicals, primarily aromatic and
29 chlorinated solvents, have generally been detected only in concentrations of low parts per billion
30 (EarthTech and Geomatrix 2000; TetraTech 1999; ICF Kaiser 1997).

31 Removal of the Young Bay Mud and portions of the Merritt Sand by dredging operations in the
32 Inner, Middle and Outer harbors at the Port of Oakland has exposed the Merritt Sand aquifer,
33 potentially allowing salt water intrusion eastward into the aquifer if the sea water is under a
34 greater head (pressure) than the water in the Merritt Sand (DWR 1981). Studies for the Corps
35 and Port of Oakland -50-Foot Dredging Project (Corps and Port of Oakland 1998) note that
36 deepening the existing channels to -50 feet mean lower low water could cause a very small
37 increase in salt intrusion into the Merritt Sand aquifer (the increase is estimated to be 4 percent
38 over the next 100 years).

1 Shallow groundwater at the OARB is typically encountered at 5 to 9 feet bgs (Geomatrix 2000).
2 At least 100 monitoring wells have been installed at OARB, including five wells installed into the
3 Merritt Sand aquifer, and one well (SC1MW1C in Parcel 2) that was reportedly installed into the
4 Alameda Formation. In addition, the Army has proposed to install additional monitoring wells.
5 Based on available information, groundwater flow is generally to the west and northwest. The
6 presence of storm drains and other utility lines may create local changes in the groundwater
7 flow direction and groundwater gradient. TDS concentrations in wells at the OARB ranged from
8 170 to 33,400 ppm. The OARB is within the Oakland Shoreline zone which is proposed for de-
9 designation by the RWQCB as a potential source of drinking water.

10 **4.14.5 Impact Analysis Methodology**

11 Potential impacts to groundwater resources were assessed by identifying and evaluating
12 potential redevelopment activities. These activities include groundwater extraction as part of
13 remedial efforts, and groundwater removal during construction (e.g., dewatering of excavations).

14 **Significance Criteria**

15 Redevelopment would have a significant impact on the environment if it would:

- 16 • Substantially deplete groundwater supplies;
- 17 • Interfere substantially with groundwater recharge such that there would be a net deficit in
18 aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of
19 pre-existing nearby wells would drop to a level that would not support existing land uses or
20 planned uses for which permits have been granted); or
- 21 • Otherwise substantially degrade water quality.

22 Depletion of groundwater includes both a physical reduction in the quantity of available
23 groundwater, and a loss in existing or potential uses due to changes in the quality of the
24 groundwater. Because the area has been proposed for de-designation as a potential source for
25 drinking water, domestic water wells are prohibited from being installed in the area. If the area is
26 built-out as proposed (mixed use, light industrial, warehouse distribution, and maritime), drinking
27 water would be supplied to the area by EBMUD.

28 **4.14.6 Impacts**

29 **Impact 4.14-1:** Operation of wells could cause saltwater to intrude into shallow
30 groundwater.

31 **Significance:** Potentially significant

Mitigation 4.14-1: Installation of groundwater extraction wells into the shallow water-bearing zone or Merritt Sand aquifer for any purpose other than construction de-watering and remediation shall be prohibited.

Residual Significance: Less than significant

If groundwater is extracted from the shallow water-bearing zone or from the Merritt Sand unit, a cone of depression would be created that could draw saltwater into the aquifer. This could result in areas that previously contained fresh water becoming brackish or saline, or it could increase the salinity of currently brackish groundwater. Because the occurrence of groundwater extraction-related saltwater intrusion is a possibility, and it is not certain how much, if any, intrusion could occur for a site-specific groundwater extraction activity, the impact is considered potentially significant. With implementation of Mitigation Measure 4.14-1, the impact would be avoided or minimized, and the residual impact is considered less than significant.



Impact 4.14-2: Operation of wells could cause contaminants to migrate to uncontaminated groundwater.

Significance: Potentially significant

Mitigation 4.14-2: Extraction of groundwater for construction de-watering or remediation shall be minimized where practicable.

Residual Significance: Less than significant

Extraction of groundwater in the study area may cause contaminants to migrate to areas where contamination has not previously been detected. This could include drawing contaminants into underlying deeper aquifers. Because the occurrence of groundwater-extraction-related contaminant migration is a possibility, the impact is considered potentially significant. With implementation of Mitigation Measure 4.14-2, the impact would be avoided or minimized, and the residual impact is considered less than significant.



Impact 4.14-3: Reduction in available groundwater.

Significance: Less than significant

Mitigation: Mitigation is not warranted.

Although shallow groundwater resources in most of the study area are not suitable for human consumption, groundwater from the Merritt Sand unit and the underlying Alameda Formation has several beneficial uses. In addition, groundwater from the shallow zone provides recharge

1 to the Bay. Moderate amounts of groundwater may be extracted during construction; none is
2 expected to be extracted during operation of redevelopment elements. During construction
3 excavation (for foundations, underground utilities, etc.), the contractor could encounter shallow
4 groundwater, which is generally removed from the excavation by pumping, a practice termed
5 “dewatering.” It is not expected that dewatering would result in extraction of groundwater in such
6 quantities that it could substantially affect the amount of available ground water for beneficial
7 uses, or that it would measurably affect recharge. EBMUD would supply potable, process, and
8 reclaimed water to the study area for operations (see Section 4.9: Public Services and Utilities),
9 and long-term extraction of groundwater by local wells for operational purposes is not
10 anticipated as part of redevelopment. Moreover, such extraction not related to remediation
11 activities is prohibited by Mitigation Measure 4.14-1.

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13 **4.14.7 Mitigation**

14 Implementation of the following mitigation measures will avoid, minimize, reduce, rectify, or
15 compensate for significant impacts of redevelopment.

16 **Mitigation 4.14-1:** Installation of groundwater extraction wells into the shallow water-bearing
17 zone or Merritt Sand aquifer for any purpose other than construction de-watering or remediation
18 shall be prohibited.

19 This measure applies to Impact 4.14-1 and Cumulative Impact 5.14-1.

20 Implementation of this measure would prevent saltwater from being drawn into the aquifer and
21 potentially causing fresh water to become brackish or saline. Limiting extraction of shallow
22 groundwater and groundwater from the Merritt Sand unit will prevent potential impacts to
23 existing study area groundwater resources.

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25 **Mitigation 4.14-2:** Extraction of groundwater for construction de-watering or remediation shall
26 be minimized where practicable.

27 This measure applies to Impact 4.14-2 and Cumulative Impact 5.14-1.

28 Implementation of this measure would prevent unnecessary extraction of groundwater; therefore
29 it will help avoid or reduce the potential migration of contaminants. The City and Port shall
30 ensure that groundwater extraction, other than for remediation or construction dewatering, is
31 minimized where practicable in the redevelopment project area.

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