

Appendix I
Potential Sand Sources

DRAFT

Potential Sand Sources

March 4, 2024

Introduction

Potential sand sources for a regional beach nourishment program would include upland sources or coastal and offshore sources. This appendix only provides a listing of potential sand sources and does not contain specific details on quantity, grain size, availability, or costs.

Upland Sand Sources

Upland sources represent the numerous sand sources from the watershed, such as rivers, lakes, reservoirs, retention basins, and debris basins. An extensive list of upland sources was previously identified in the *Orange County Coastal Regional Sediment Management Plan* (OC CRSMP; USACE 2013). Construction sources were excluded because these would only be opportunistically available sources and may not be available in the quantities needed for a regional scale beach nourishment program. Sand-mining sources are not included, but a listing is available in the OC CRSMP, and this option could be further explored in the next phase of this regional coastal resiliency collaborative effort.

Historically, upland sand from Camp Pendleton was used for a large beach nourishment at Doheny State Beach in 1967. Sand-mining sources from upland quarries should be considered for use in a South Orange County regional beach nourishment program due to direct access to local beaches from roadways, as well as via rail. These sources of sand could be cost competitive with other sand sources because they do not need to be dredged from the offshore, but rather could be placed directly on the beach via trucks and/or rail delivery.

Potential fluvial sources were identified as the major fluvial sources that supply sediment to their respective littoral systems. Major fluvial sources in Orange and San Diego counties include the following:

- San Gabriel River
- Santa Ana River
- San Diego Creek
- Laguna Canyon
- San Juan Creek
- San Mateo Creek
- Santa Margarita River
- San Luis Rey River

These major rivers have been modified (e.g., channelized with armoring of riverbanks) for flood-control purposes and in some cases, sand deposits at the river mouth are dredged to maintain

flood capacity. For example, the County of Orange (County) currently conducts maintenance dredging of the Lower Santa Ana River and has dredged the mouth of San Juan Creek. These river-mouth sediments are beach-quality sands and are normally placed within the same littoral cell. However, sand from the Santa Ana River has previously been used for beach nourishment at North Beach and at Capistrano Beach and Doheny Beach. In addition, sand accumulated within the riverbeds are a potential sand source. For example, sand deposits are found along channelized portions of San Diego Creek, upstream of Upper Newport Bay.

The major rivers are extensively regulated with dams, reservoirs, and other flood-control infrastructure and have trapped a significant portion of sediment supply in the upper watersheds (USACE 2013). For example, Prado Dam traps a significant portion of the Santa Ana River sediment supply, and the accumulated sediment has reduced the flood storage capacity of the reservoir. The Prado Basin Sediment Management Demonstration Project was recently completed to demonstrate the effects of sediment removal from Prado Basin and re-entrainment of sediment into the Lower Santa Ana River. If successful, changes in Prado Basin sediment management could result in a potential sand source. It should be noted that Prado Dam was not included in the following list because it is located in Riverside County; a full listing of potential upland sources in Los Angeles, Orange, and Riverside Counties is available in the OC CRSMP (USACE 2013). Lakes, reservoirs, retention basins, and debris basins in Orange County include the following:

- Agua Chinon Retarding Basin
- Bee Canyon Retarding Basin
- Big Canyon Reservoir
- Brea Flood Control Basin Reservoir
- Carbon Canyon Reservoir
- E. Hicks Canyon Retarding Basin
- Edinger, Sunset, and Wintersburg flood control channels
- El Toro Reservoir
- Irvine (Santiago River) Lake
- Laguna Reservoir
- Lagunas Lake
- Miller Retarding Basin
- Mission Viejo Lake
- Orchard Estates Retarding Basin
- Palisades Reservoir
- Peters Canyon Reservoir
- Rattlesnake Canyon Reservoir
- Rossmoor Number 1 799 Reservoir
- Round Canyon Retarding Basin

- San Joaquin Reservoir
- Sand Canyon Dam
- Trabuco Retarding Basin
- Upper Oso Dam Reservoir
- Veeh Reservoir
- Walnut Canyon Reservoir
- Yorba Linda Reservoir

Offshore Sand Sources

Coastal and offshore sources are the potential sand sources from harbor, lagoons, and offshore region. Sand sources from harbors and bays come from maintenance or access dredging conducted to remove accumulated sediment within navigation channels. Lagoon sand sources are from sediment dredged to maintain tidal inlets or removal of fluvial sediment deposition. Harbors, bays, and lagoons along the Orange County coastline include the following:

- Anaheim Bay
- Huntington Harbor
- Bolsa Chica Ecological Reserve
- Huntington Beach Wetlands and Talbert Marsh
- Newport Bay
- Upper Newport Bay
- Newport Banning Ranch Wetlands and Semeniuk Slough
- Dana Point Harbor

Offshore sources refer to sand sources just offshore of the active littoral zone and may include known borrow sites. An example of using an offshore source for beach nourishment is the large-scale San Diego Association of Governments Regional Beach Sand Project (RBSP), a beach nourishment project conducted in 2001 and again in 2011 to 2012. The RBSP used approximately 3.5 million cubic yards of sand from offshore borrow sites located off the San Diego County coastline to nourish receiver beaches along the coastline between the cities of Oceanside (north) and Imperial Beach (south).

In Orange County, the U.S. Army Corps of Engineers (USACE) has previously designated four offshore borrow sites: ORA-1 offshore of Seal Beach, ORA-2 offshore of Huntington Harbor, ORA-3 offshore of the Santa Ana River, and a site offshore of Dana Point Harbor. A map of these four offshore borrow sites is available in the OC CRSMP (USACE 2013). Additionally, a beach nourishment study by OC Parks (2021) determined two possible offshore borrow sites located east of Dana Point Harbor, offshore of Doheny State Beach and Capistrano Beach Park. The City of San Clemente, in the planned USACE project scheduled for later in 2023 will utilize an offshore borrow site located west of Oceanside and known as Borrow Site 2A.

A key recommended next step in the *South Orange County Regional Coastal Resilience Strategic Plan* (Strategic Plan) is to conduct additional investigations of the offshore area to include further analysis of known borrow sites and to identify new borrow sites to assess sediment quantity and quality that could be available to support a regional beach nourishment program as contemplated within this Strategic Plan. There are a variety of ongoing independent agency projects with opportunities to coordinate sand nourishment on a regional level going forward.

References

OC Parks (County of Orange Parks Department), 2021. *Capistrano Beach County Park Beach Nourishment Study*. Prepared by Moffatt and Nichol. July 2021.

USACE (U.S. Army Corps of Engineers), 2013. *Orange County Coastal Regional Sediment Management Plan*. Prepared for U.S. Army Corps of Engineers, County of Orange, and California Coastal Sediment Management Workgroup. Prepared by Everest International Consultants, Inc., in association with Science Applications International Corporation and Dr. Philip King. June 2013.