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Remediation of Landfill 8, Landfill 10, and Graded Area 9

The U.S. Army lowered its flag at the Presidio of San Francisco for the last time in October 1994, transferring it to the National Park Service as part of the Golden Gate National Recreation Area. Because of its city-like infrastructure, its nearly 800 buildings, and its expansive cultivated forest and natural areas, the funding of the Presidio's operation and long-term care is much more costly than traditional parks. In 1996, Congress devised a unique management and funding model for the Presidio. The Presidio Trust was created to preserve the natural, scenic, cultural, and recreational resources and to ultimately help the Presidio become financially self-sufficient. The Presidio Trust manages the interior 80 percent of the lands which include most of the buildings and infrastructure, while the National Park Service manages the coastal areas. A goal of the Presidio Trust is to remediate the environmentally impacted areas of the Presidio.

When the Presidio was a military post the Army disposed of waste at 15 landfill sites. Ranging in size from one to five acres, these landfills contain primarily building debris, municipal solid waste, and fill soils. In addition, they contain some metals (such as lead), pesticides and other chemicals. The Presidio Trust is removing and or closing some of the landfills and restoring the sites as native plant areas or forest groves.

Landfills 8, 10, and Graded Area 9 surround Building 1801, the largest historic building formally known as the Public Health Service Hospital. In a remarkable adaptive reuse project, Forest City Development has converted the building into a 154-unit apartment building, renamed the Presidio Landmark. Strategic Engineering & Science, Inc. (SES) designed Landfill 8, behind the building, and Graded Area 9, to its northwest, with a soil cover that was graded to form actual dunes. Landfill 10, the largest of the three landfills, was restored to provide habitat for native coastal scrub vegetation, parking spaces for the Presidio Landmark, and a nature trail and overlook over Lobos Creek.

SUCCESSES

Final Remedy met all regulatory requirements:

- Provided Presidio Landmark Development with required parking spaces
- Substantial cost savings by minimizing excavation, using construction debris, not moving power line, and re-orienting the trail and overlook
- Successful interaction with multiple stakeholders
- Provided habitat for protected and endangered species, most notably the San Francisco *Lessingia*
- Included BMP contributing to LEED classification of Presidio landmark

SERVICES PROVIDED

Strategic Engineering & Science, Inc. (SES) was retained by the Presidio Trust to perform the following services to close Landfill 8, Landfill 10, and Graded Area 9 and restore them to beneficial use:

Hydrogeologic Modeling

SES developed a hydrogeologic conceptual site model using results from previous geologic, hydrogeologic, and geotechnical investigations. The model evaluated the occurrence and impact of hexavalent chromium found in groundwater wells installed in Serpentinite bedrock underlying the sites.

The purpose of the study was to evaluate whether:

- The debris in the landfills could exacerbate the release of hexavalent chromium from the Serpentinite into groundwater, or
- There could be a pathway from groundwater from the Serpentinite into Lobos Creek, the Presidio's drinking water source.

SES concluded that the amount of water derived from the Serpentinite was negligible, thus eliminating the possibility of hexavalent chromium impacts to Lobos Creek. We also concluded that the distribution of chromium concentrations around the landfills indicated that they were not a source, nor did they induce conditions that exacerbated dissolution of chromium. However, in the event large areas of Serpentinite were exposed during construction, SES recommended safeguard measures that would minimize water running onto the landfill and control runoff.

Field Investigations

Soil samples were collected for testing to determine the concentration of any contaminants of concern and to verify the limits of the three landfills. At Graded Area 9, SES monitored the excavation of trenches and test pits along existing buildings to determine the extent of waste. These investigations led to the redesign of the grading plans. In addition, we prepared the required Health and Safety plan and procured the required monitoring devices when drilling into potential waste.

Engineering Design Services

For Landfill 10, SES designed a grading plan based on selected cutting and backfilling. The slopes were graded at an inclination of 1.75:1 (horizontal to vertical) to fit within the geometrical constraints at toe and top. The grading plan met static and seismic stability criteria and also included placement of two feet of cover soil with the top six inches amended to offer a suitable growth medium for endangered coastal scrub, the construction of nature trails, and one overlook. The design of the top deck of the landfill was developed into a parking lot for the Presidio Landmark apartment building.

MISCELLANEOUS SERVICES

Emergency Repair at Landfill 8

SES designed and monitored the construction of the geogrid reinforced slope that failed at Landfill 8 following a large winter storm. The design was performed and approved by DTSC in record time and construction was undertaken over a couple of weeks during the rainy season.

Temporary Parking Lot

SES designed a temporary parking lot for the construction workers working on the three landfills and the Presidio Landmark.

Tree Removal

SES identified the location and quantity of trees slated for removal to allow construction of the final remedy at the three landfills. SES identified and secured a specialty subcontractor, oversaw the removal, coordinated the removal operation, interacted with the public, and designed and oversaw installation of post-tree removal erosion control measures.



At Graded Area 9 and Landfill 8, SES designed a final cover that included sand dunes in order to restore the overall topography of the site to what it might have been prior to construction of the first hospital in the 1800's. To protect a patch of endangered San Francisco Lessingia at Landfill 8, the grading plan included an area where the waste was excavated and replaced with dune sand to control water flow. The soil in the area was tested for contaminants and left in place.

SES prepared the Design Report including all the back-up calculations, the Technical Specifications, the Construction Drawings, and the Construction Quality Assurance Plan for all three landfills.

Hydrologic and Hydraulic Engineering Erosion Control

SES performed the hydrologic and hydraulic calculation to size and designed a 100-year, 24-hour storm stormwater conveyance system over and around the three landfills.

To support the Presidio Trust's effort to obtain a LEED rating for the Presidio Landmark, we designed Best Management Practices for the deck of Landfill 10 which serves as a parking a lot. The latter consists of vegetated bio-swales, underlain by drainage.

The design of the erosion control plan for all three landfills was based on soil loss calculations and slope flow velocities. Due to NPS restrictions, only biodegradable weed-free products such as coir wattles were used.

Construction Quality Assurance and Engineering Support Services

SES provided CQA services during the construction of the final remedy at Landfill 8, Landfill 10 and Graded Area 9 which lasted for 18 months. These CQA services included monitoring earthworks, installation of the geosynthetic components, placement of concrete and asphalt, review and approval of contractor submittals, review of laboratory testing, and review of Contractor Request for Information.

SES provided engineering support during construction by providing clarifications and/or adapting the design to changed conditions, or to satisfy new requirement from Presidio Trust stakeholders. The Engineering Solution developed for the three landfills met all regulatory requirements, was economical, and preserved the essence of the National Park.

REGULATORY INTERFACE

Throughout the design process and construction period, SES interacted with the multiple stakeholders:

- Presidio Trust
- National Park Service
- Department of Toxic Substance Control (DTSC)
- California Department of Fish and Game
- Remediation Advisory Board

SES successfully managed the expectations and requirements of each of the stakeholders. The Engineering Solution developed for the three landfills met all regulatory requirements and all construction documents were reviewed and met DTSC approval.

