

Opening Day 2000!

Pacific Bell Park, the long-awaited new home of the San Francisco Giants, will host its first regular season game on April 11, 2000. The beautiful stadium on the shore of San Francisco Bay is expected to be one of the major stars of the National League baseball season.

Treadwell & Rollo has been involved with Pacific Bell Park since the days when the Port of San Francisco first reached agreement with the Giants to develop the site near China Basin Channel. We performed a detailed geotechnical investigation and a probabilistic seismic hazard analysis, which addressed foundation support, earthquake design criteria for the building and site behavior during ground shaking. We also assisted with the structural evaluation of the 900-foot-long bulkhead retaining structure along the channel.

Until the early 1900s, the area known as China Basin was part of the Bay. The project site and vicinity were filled at various times until the early 1920s when the bulkhead and the Pier 46B building were constructed along the channel and the remainder of the site was filled.



Pacific Bell Park

Subsurface conditions vary significantly across the site and presented a challenge to the design team. The site is generally blanketed by loose to medium dense fill underlain by soft to medium stiff, highly compressible marine clay known locally as Bay Mud. The Bay Mud beneath Pier 46B had been removed by dredging during the construction of the bulkhead and building. Over the remainder of the site, dense to very dense sand, stiff clay, and bedrock underlie the Bay Mud. However, bedrock was encountered directly beneath the fill at the northwest corner of the site.

The potential seismic hazards were liquefaction of the loose fill, movement of the bulkhead, and lateral spreading of the sand fill seawall. In the site's origi-

nal condition, we estimated that substantial liquefaction-induced settlement could occur. We concluded the liquefaction potential of the various fills and its associated impacts could be mitigated through ground improvement consisting of stone columns and compaction grouting.

Considering the subsurface conditions, a driven pile foundation was determined the most suitable system. The precast, prestressed piles were designed to gain their primary support in end bearing in the dense sand or bedrock below the Bay Mud. Over a span of 16 months, more than 2,200 piles were driven, all under the observation of Treadwell & Rollo. The majority of the piles were 16-inch-square piles driven from land. A small

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Ball Park Facts:

- The stadium seats 40,800; about 500 bleacher tickets will be available on game days
- 2,000+ workers of all trades took part in the construction
- 4,000+ tons of structural steel and 66,500+ cubic yards of structural concrete were used
- Home runs over the 25-foot-high right field fence may land in the Bay

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Cary Ronan performing a Dynamic Penetrometer Test

Portable Dynamic Penetrometer

Many of our projects involve the renovation and seismic strengthening of an existing building in a heavily urbanized location, such as Union Square in San Francisco. One of the challenges on such projects is to be able to gather the needed subsurface information quickly and economically. Historically, this information has been gathered by drilling borings outside the building with truck-mounted drilling equipment, or inside with portable drilling equipment. Drilling outside a building is often impractical or impossible because of traffic issues, utilities, or lack of access due to adjacent buildings. Although drilling borings inside a building with portable equipment is

possible, problems often arise due to caving or heaving sands. For these reasons, we often augment standard techniques by using the Portable Dynamic Penetrometer (PDP).

Manufactured by Triggs Technologies, the PDP consists of a 35-pound hammer that drives a series of 1.1-inch-diameter steel rods with 1.4-inch-diameter disposable cone tips. A PDP test is performed by manually driving the cone-tipped rods into the ground with the hammer dropping from a distance of 15 inches. The blows are recorded in 4-inch increments. The rods are driven to "refusal" (defined as 50 blows for 4 inches) or to a

maximum depth of 25 feet.

The blow counts obtained by the PDP are converted to values for use in engineering analyses, such as the evaluation of liquefaction potential. Because no soil is removed from the ground for the PDP test, a test boring must be drilled or hand-augered near a PDP test to determine the soil type. Our experience with the PDP has been very positive in that difficult access and working conditions can be overcome at a reasonable cost while still obtaining quality data.

This technical note was prepared by Craig S. Shields. Craig is a principal engineer at Treadwell & Rollo and operates from our Oakland office.

Cost Savings

Treadwell & Rollo recently completed an environmental and geotechnical investigation for a proposed industrial facility at a shoreline parcel in San Francisco. Technical challenges on the project included developing a cost-effective disposal plan for about 15,000 cubic yards of potentially hazardous soil stockpiled on the site and importing fill to improve the site grade of the proposed industrial facility.

As a solution, we designed a mitigation plan for the affected soil and successfully obtained a permit with the San Francisco Department of Public Health for using the potentially hazardous soil as fill material to improve the site grade. This approach saved our client more than one million dollars in landfill disposal fees and soil import costs.

This note was prepared by Jeffery F. Ludlow. Jeff is a senior geologist in our San Francisco office.

Influence of Embedment on Surface Spectra

High land prices associated with the continuing construction boom in urban centers have resulted in many major new structures having underground portions deeper than 20 feet below ground surface. The earthquake engineers of Treadwell & Rollo have been involved in a number of such projects in the San Francisco Bay Area, such as the Four Seasons Hotel and Tower and Moscone Center III

Current codes result in ground surface response spectra that do not consider basement-level

depths. This often causes surface spectrum data at the basement level of a structure to be overly conservative. Thus, it becomes necessary to take into account the effects of embedment when estimating ground motions.

Recorded data and ground response analyses indicate that acceleration response spectra diminish with depth. We have made comparisons of recorded downhole data with depth and basement and ground surface data and have developed scaling factors that can be used to modify the

surface spectrum. Based on these comparisons, we have developed an approach to account for such effects. The results of our studies will be published in the proceedings of the upcoming 6th International Conference on Seismic Zonation.

This technical note was prepared by Ramin Golesorkhi. Dr. Golesorkhi is the senior member of the earthquake engineering group at Treadwell & Rollo and received his doctorate from the University of California at Berkeley.

Groundwater Containment Zones

At many sites, removal of contaminated groundwater is not feasible at a reasonable cost using existing technology. Containment zones can be the optimum remedial alternative to manage the contamination. Because a containment zone is a commitment to long-term responsibilities, well-planned strategies are critical to the success and for acceptance by the regulatory agencies and the community.

A number of technical criteria must be evaluated to determine if a site has the basic features of a containment zone. On the hydrogeologic side, the extent and movement of groundwater contamination must be relatively certain. The extent includes both the vertical and horizontal limits. Sites where natural features reduce the risk of future movement, soils are fine-grained, and migration pathways are few and short are optimal. At these sites, the bacteria and groundwater chemistry favor a breakdown of the contaminant compounds.

On the engineering side, removal of the contaminant source and mass reduces the risk of future movement and potentially reduces the time required for contamination management and is usually the preferred method of remediation. A containment zone is an alternative where the current technology cannot remove the contamination at a reasonable cost. This is commonly the case where the soils are fine-grained with some coarser-grained soils. The question of cost also involves other stakeholders.

It is important that the contamination does not significantly impact on human health, the surrounding environment, and most particularly use of the groundwater. The most favorable sites are where the contaminated groundwater is not pumped out of the ground or does not reach nearby lakes or streams. A recent regulatory change is to designate some local groundwater areas as non-potable; as a result, these areas are less sensitive to the potential

impacts of contamination.

Currently, containment zones do not include a foreseeable end to the care and management of the groundwater contamination. This means that the groundwater must be monitored using wells and that if the contamination in a well exceeds a particular concentration more wells and possible cleanup will be required. Thus, the location of wells is critical.

Regarding land use, the contamination may require institutional controls or deed restrictions prohibiting groundwater use. This also means that the potential for property transfers and need for loans be considered as part of the containment zone evaluation. Because of the restrictions on land and groundwater use and review by potentially impacted shareholders, the optimal site for a containment zone is commonly where the contamination is limited to the site where the contamination was released.

This article was prepared by Patrick B. Hubbard. Patrick has more than 20 years of experience in the characterization and cleanup of contaminated sites.

Note from Don and Frank

We are very pleased to note the first issue of the Treadwell & Rollo newsletter. Since its founding in February 1988, the firm has been involved on many notable projects and has attracted many outstanding staff members. We have grown and prospered by providing our clients with quality work and responsive service.

Our services are client-focused and all of us at Treadwell & Rollo very much appreciate the continued trust and loyalty that our clients have given us for the past 12 years. We hope that you enjoy the newsletter and we look forward to serving you for many years to come.

Donald D. Treadwell

Frank L. Rollo

Pacific Bell Park (con't)

percentage were 24-inch-octagonal piles driven from a barge in the China Basin Channel to support the infill pier at the southeastern portion of the site.

A soil densification program was performed to reduce liquefaction and

improve the stability of the Pier 46B bulkhead along the China Basin Channel, and to reduce the effects of potential lateral spreading along the seawall at the eastern limit of the stadium. The soil improvement work included the in-

stallation of stone columns and compaction grouting.

This article was prepared by Aimee L. Landes. Other members of the Treadwell & Rollo project team included Frank L. Rollo, Christian Divis, and Chris Ridley. We are very proud to be a part of the San Francisco Giants team. Now, play ball!



Bay West Cove

From the early 1900s, the shoreline property now known as Bay West Cove was a major steel fabrication facility serving the West Coast. During World War II, the facility was used to construct Liberty ships for the war effort. Later, it was a large fabrication and assembly plant for offshore structures installed on the North Slope of Alaska. Purchased in 1948 by United States Steel, the facility was closed in the 1980s and all the equipment and buildings were removed.

Treadwell & Rollo was retained in the early 1990s to characterize the site for redevelopment and, as prime consultant, to conduct all onshore and offshore planning and design activities. The primary issues were residual contamination from the historical industrial operation and the variability of soil conditions beneath the site, including some compressible clayey deposits. The property consists of 47 acres onshore and 120 acres of submerged land on the

north side of Oyster Point Boulevard in South San Francisco.

The developers (Bay West Cove LLC) and former owners of the property (including United States Steel) cooperatively funded the onshore and offshore activities in compliance with the site cleanup requirements issued by the Regional Water Quality Control Board. The Corps of Engineers and the San Francisco Bay Conservation and Development Commission also had permitting authority over the work. In addition, site development was subject to the guidelines of the East of 101 Master Plan adopted by the City.

Along with completing a number of geotechnical investigations, Treadwell & Rollo created site mitigation plans that integrated all soil cleanup activities with the proposed development. Virtually all the hydrocarbon- and lead-contaminated soil found onshore was treated at the site and used as fill in specific areas. Minimal off-site

disposal was a key factor in the economical redevelopment of the site.

With the construction of two new hotels, the Marriott Corporation is now developing a portion of Bay West Cove. Other portions of the site will most likely be used for selected retail and technology office structures. At the current time, Treadwell & Rollo is continuing work at the site, including environmental and geotechnical consultation and construction observation, including pile foundations. The Regional Water Quality Control Board has used Bay West Cove as a model of how owners, regulators, and consultants can work effectively together to restore impacted sites to productive use.

Treadwell & Rollo professional staff involved with the Bay West Cove development include Craig S. Shields, Philip G. Smith, David G. Dixon, Elizabeth K. Gouchon and Donald D. Treadwell.



Bay West Cove (1948)
The site and vicinity in its post-war industrial configuration with United States Steel in the foreground. Edwards Wire Rope and Bethlehem Steel are in the background.



Bay West Cove (1998)
The site after onshore remediation and ready for development. Highway 101 is in the foreground and the Oyster Point industrial/office park (including Genentech) is in the background.

Note from the Managing Editor

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This newsletter is published by Treadwell & Rollo for our clients, colleagues, and friends. If you wish to be added or deleted from our mailing list, please email Emily Husband at

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