From Superfund Site to World-Class Park
Linda Moore – Fuscoe Engineering

Scheduled to open in 2010 at the former location of El Toro Marine Corps Air Station, the new Orange County Great Park in Irvine, California, aspires to become one of America’s most prestigious urban parks, on par with New York’s Central Park and San Diego’s Balboa Park. In addition to expansive lawns, groves, and meadows, the Great Park is slated to offer amenities including a 3.5-mile wildlife corridor; two-mile long canyon with hiking, riding, and biking trails; a 21-acre lake; amphitheater; botanical garden; and extensive sports fields.

The air station was commissioned in 1943 and served as the major West Coast jet fighter facility until its decommissioning in 1999. It was declared a Superfund site in 1990 after 25 potentially contaminated areas were identified. Two large aircraft hangers were the primary source of groundwater contamination.

Transforming this Superfund site into an environmentally sustainable community park is proving challenging for contractor Hooshang Nezafati and the engineering team from Fuscoe Engineering Inc. The Great Park comprises 4,740 acres with approximately 500 existing structures and a massive network of runways ranging up to 10,000 feet in length. Project construction must take into consideration the contamination associated with past military base operations and disposal practices; ongoing remedial actions must not be significantly impacted.

Recharge Impact
Challenge: The Park’s master plan requires conversion from highly impervious to more pervious land uses, including the incorporation of a large recreational park and open spaces. This change means groundwater recharge would be augmented, which could potentially impact existing contaminant plumes and ongoing remediation programs at two Navy Installation Restoration Program (IRP) sites. Increased recharge could affect groundwater flow direction and velocities and adversely impact the design capture zone for the existing groundwater extraction system.

Solution: The initial design of the Great Park was revised and the adjusted recharge quantities were calculated and incorporated into a groundwater flow model. Forty-year flow, particle tracking, and contaminant transport simulations indicated that the increased recharge quantities did shift the groundwater contours, raising groundwater elevations by approximately 10 feet near the onsite TCE plume. However, hydraulic gradients and associated velocities were not significantly affected. Thus, the simulations demonstrated that, due to design revisions, there are no significant impacts to flow conditions or to the Navy’s contamination plumes and groundwater extraction system.

Groundwater Extraction System Conflict
Challenge: One of the IRP sites

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encompasses the volatile organic compound (VOC) source area in the project’s southwest quadrant. There, VOC contamination migrated from the soil to the shallow groundwater and subsequently to the regional principal aquifer. The Navy implemented a groundwater extraction system, comprising 39 shallow extraction wells with dedicated pumps collectively producing up to 500 gallons per minute. A 1,600-foot-long pipeline conveys the groundwater to a nearby treatment plant. The Great Park design called for grading that would raise existing surface elevations by as much as 25 feet, however the Navy did not want the extraction system impacted or its operation disrupted. The challenge was therefore to resolve conflicts between the Park design and the groundwater extraction system while honoring specific limitations imposed by the Navy.

**Solution:** The Park’s lake and cultural terraces at the IRP location are being redesigned to minimize conflicts with the Navy’s groundwater extraction system. The extraction and monitoring wells will be retrofitted to new grade levels in a phased approach, isolating a few at a time without shutting down the system. The conveying pipeline will be relocated in phases to ensure the extraction system remains functional but with a reduced capacity, at a level acceptable to the Navy.

**Monitoring Wells**

**Challenge:** Some of the more than 200 monitoring wells on the site conflict with the park design. Most are used to comply with the Record of Decision requirements for groundwater elevation measurement and water quality sampling.

**Solution:** The Fuscoe team is preparing work plans to abandon several monitoring wells. In a concerted effort with the Navy and other regulatory agencies, groundwater monitoring reports are being reviewed to determine more suitable locations for the replacement wells.

The nonprofit Orange County Great Park Corporation is responsible for designing, building, and maintaining the Great Park, while land use authority and zoning rests with the City of Irvine.

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Pressure Buildup in Colorado Mine Tunnel

Alison Williams

A mine drainage tunnel built in the 1940s and 1950s near Leadville, Colorado, has been backing up water and brewing trouble for residents in the area as well as for state and federal agencies. While Lake County and the U.S. Environmental Protection Agency warned of risks from the tunnel beginning in 2007, the U.S. Bureau of Reclamation has been less concerned, stating that extensive instrumentation in the tunnel and an emergency warning system would identify and communicate any danger.

Reclamation purchased the 2.1-mile-long Leadville Mine Drainage Tunnel (LMDT) in 1959 from the Bureau of Mines, in the unrealized hope of using the water for an irrigation project. It was understood that Reclamation did not need to maintain the tunnel because of the decline of mining. However, in response to outside pressures and litigation, Reclamation began to stabilize it in the 1970s. In 1992 the agency started to operate a water treatment plant to remove contaminants such as lead, cadmium, and zinc from the water before releasing it to the Arkansas River.

Collapses in the LMDT since 1959 and especially since 1995 have reduced the drainage rate from 2,000 gallons per minute (gpm) to around 1,000 gpm. It is now estimated that between 0.5 billion and 1.0 billion gallons of water are trapped behind the blockages in the “mine pool.” The high water level has increased seepage from wells, springs, and shafts, sending contaminated water into California Gulch.

A November 2007 letter from EPA to Reclamation warned that increasing water pressure behind the collapses was creating the potential for a “blow-out” and “environmental disaster” that could send contaminated water downhill through parts of a subdivision of around 400 people and into the Arkansas River.

In February 2008, Lake County commissioners declared a state of emergency based on predicted high rates of snowmelt runoff that could raise the already-high water level in the tunnel. The county cited three threats: a blow-out; additional metals contamination to the Arkansas River resulting from dissolution of mine wastes in California Gulch; and contamination of nearby Elkhorn Shaft, a local water supply source. The City of Leadville subsequently lost its liability insurance.

EPA Acts

EPA, which is responsible for mine drainage in the California Gulch Superfund site, began pumping the Gaw Shaft near the LMDT in February in the hope of reducing the mine pool. Because the shaft and the LMDT are not connected through mine tunnels, it was unclear how effective this action would be. Water from the Gaw was tested and found to be safe enough to discharge to California Gulch without treatment.

EPA also drilled a well into the LMDT behind the blockages and constructed a pipeline to send the water to the Reclamation water treatment plant. Pumping of approximately 1,000 gallons per minute began June 24. Although Reclamation originally maintained it was not responsible for treating the water because it was not a “historic flow,” the agency subsequently agreed to do so.

County commissioners suggested that the Canterbury Tunnel above the LMDT may be contributing to the increased mine pool, reported the Leadville Chronicle. That tunnel historically captured recharge to relieve the mine pool and was used as a drinking water source. However, deterioration and blockages in the Canterbury have prevented use of its water in recent years. SourceWater LLC, a consulting company, wrote in a memo to EPA that groundwater levels in the area point to a relationship between the decreased drainage of Canterbury and the increase in the mine pool behind the LMDT. However, in an April
letter to Lake County Commissioners, Colorado Gov. Bill Ritter wrote that the EPA did not believe pumping from Canterbury was necessary.

In June 2008, Reclamation released a draft risk assessment that concluded “it is unlikely there would be a sudden release of water from the Leadville Mine Drainage Tunnel and that there is no imminent public safety hazard.”

The assessment said that “if the [LMDT] blockage…were to fail, it would likely occur over a time frame of weeks or months, not hours or days.” Reclamation planned to implement recommendations from the risk assessment team to add water pressure monitoring instruments and connect them to the existing early warning system, and to update and exercise the emergency action plan.

Also in June, Lake County released a statement that the risk of a tunnel blowout had been reduced due to the drainage activities that had occurred.

**Meanwhile, Legislators Act**

In May, Gov. Ritter signed a bill appropriating $325,000 to study the relationship of the Canterbury Tunnel and the LMDT, and if a connection is found, to implement a long-term solution, such as dewatering the Canterbury.

In June, the U.S. House passed a bill clarifying Reclamation’s long-term responsibility for the situation, including treating water in the mine pool, investigating the effects of the blockage on water quality in the area, and maintaining the tunnel to prevent degradation of water quality and uncontrolled releases of water. As of early August, the Senate had yet to vote on its version of the bill.