

**STATE OF CALIFORNIA  
REGIONAL WATER QUALITY CONTROL BOARD  
CENTRAL COAST REGION**

**STAFF REPORT FOR REGULAR MEETING OF MARCH 18, 2010**

Prepared on February 23, 2010

**ITEM NUMBER:** 7

**SUBJECT:** **Perchlorate Cases Update**

**THIS ACTION:** Status Update – Information item only

**SUMMARY:**

This update provides background information on perchlorate, fate and transport, health effects, regulatory standards, and treatment options, as well as the status of characterization and cleanup efforts at five perchlorate sites located in the northern part of the region. The key water quality outcomes and milestones achieved since the last update (July 2009) include:

- Completion of an onsite groundwater containment system at the Whittaker Ordnance facility. This milestone is significant because this system will eliminate future offsite migration of perchlorate and volatile organic compounds (VOCs) in groundwater;
- Continued decreasing perchlorate concentration trends associated with the Olin cleanup project in groundwater of the Llagas Subbasin. This water quality improvement is the result of successful onsite soil cleanup, operation of the onsite groundwater containment and treatment system, and attenuation through natural physical processes.
- Issuance of a cleanup and abatement order to Whittaker that establishes a schedule for completion of investigation activities and implementation of onsite source area cleanup and offsite groundwater cleanup.
- Completion of soil and groundwater perchlorate investigation at MK Ballistics. The results of the investigation determine that this site does not pose a significant threat to water quality.
- Completion of soil and groundwater characterization activities at BAE Systems. BAE Systems will now focus on developing a cleanup plan to improve and restore water quality beneath the site.

**Background**

Perchlorate ( $\text{ClO}_4^-$ ) occurs both naturally and as a man-made chemical. One-third of all perchlorate used in the United States is used in California and 90% of California's perchlorate use is related to the aerospace industry. There are three major man-made sources of perchlorate in the United States:

1. Ammonium perchlorate, used as an oxidizer in solid rocket propellants,
2. Sodium perchlorate, used in slurry explosives, and
3. Potassium perchlorate, used in road flares and air bag inflation systems.

**Fate and Transport**

Perchlorate is a highly soluble, mobile compound that dissolves and moves with water. For comparison, perchlorate has similar chemical properties as nitrate. Perchlorate can persist in the

environment for many decades under typical groundwater and surface water conditions because of its resistance to reacting with other available constituents (e.g., soil particles).

### **Health Effects**

Perchlorate interferes with the natural function of the thyroid gland by inhibiting the uptake of iodide. Iodide is an essential component of thyroid hormones, which are needed for prenatal and postnatal growth and development, as well as for normal body metabolism. Doctors used potassium perchlorate until recently to treat hyperthyroidism related to Graves disease, and is still used diagnostically to test thyroid hormone production in some clinical settings.

### **Regulatory Standards**

Perchlorate is a regulated drinking water pollutant in California, with a maximum contaminant level (MCL) of six micrograms per liter ( $\mu\text{g/L}$ ), effective October 18, 2007. Currently there is no federal drinking water MCL for perchlorate.

### **Treatment Methods**

Perchlorate treatment in water is complicated because the perchlorate anion does not respond to typical treatment techniques due to its fundamental physical and chemical nature. Currently, ion exchange is the most common treatment technology for removing perchlorate from groundwater. Biological degradation, thermal treatment, and, more recently, phytoremediation show promise for perchlorate treatment.

### **Perchlorate Cleanup Cases Status Updates**

The Central Coast Water Board (Water Board) regulates five perchlorate sites. Two of the five perchlorate sites (Whittaker and Olin Corporation) have significant offsite groundwater plume migration. In the following sections, Water Board staff provides a status update for each perchlorate site.

### **WHITTAKER ORDNANCE FACILITY**

Project Manager: Kristina Seley: 805/549-3121

Technical Support: Diane Kukol

### **KEY INFORMATION**

<b>Location:</b>	2751 San Juan Rd, Hollister, San Benito County
<b>Responsible Party:</b>	Whittaker Ordnance
<b>Current Owner:</b>	Pacific Scientific, Inc.
<b>Type of Operations:</b>	Former Ordnance Manufacturer
<b>Type of Discharge:</b>	Perchlorate, Volatile Organic Compounds (VOCs), Hexavalent Chromium
<b>Priority:</b>	High
<b>Existing Orders:</b>	Cleanup and Abatement Order No. R3-2009-0015 Monitoring and Reporting Program No. R3-2009-0022 General NPDES Permit for Discharges of Highly Treated Groundwater, General Waiver for Specific Types of Discharges

### **SUMMARY:**

This staff report provides an update on the status of the Whittaker groundwater cleanup site and addresses the following items:

- Cleanup and Abatement Order (CAO) No. R3-2009-0015.
- Startup of onsite groundwater containment and treatment system.
- Onsite and offsite investigation activities.
- Sitewide Summary Report
- Human health risk evaluations, and Risk Based Cleanup Level Report

Over the past three years, in response to our CAO No. R3-2009-0015 and previous requirements and orders issued by the Executive Officer, Whittaker has completed an offsite groundwater investigation; an onsite soil, soil gas, and groundwater investigation for volatile organic compounds (VOCs) at Building 5 and Building 23 areas (VOC source area); and completed construction of an onsite groundwater containment and treatment system to prevent further offsite migration of pollutants. Whittaker's next steps are to finalize characterization activities, establish cleanup goals, and prepare feasibility and corrective action plans to cleanup soil and groundwater. Whittaker has provided replacement water to all domestic and agricultural well users impacted by Whittaker's pollution and there are currently no associated exposure risks to existing onsite workers or offsite residents, based on characterization work to date.

## **DISCUSSION:**

### **Site Background**

The former Whittaker facility is a 94-acre property located in western Hollister. Whittaker owned and operated an ordnance manufacturing facility from 1980 to July 1993. Pacific Scientific Energetic Materials currently uses a few buildings at the facility for metal-parts manufacturing. Since 1991, under various orders and requirements from the Water Board, Whittaker has conducted on- and offsite characterization activities for VOCs and hexavalent chromium and, since 1997, for perchlorate. Investigation and cleanup activities are complex at this facility because of the complicated hydrogeology, the presence of several faults, numerous waste source areas, and co-mingled groundwater plumes within multiple water-bearing zones.

### **Cleanup and Abatement Order**

On July 31, 2009, Water Board staff issued CAO No. R3-2009-0015 (CAO). The CAO addresses our water quality and health risk priorities for this cleanup project; by requiring Whittaker to complete characterization and accomplish the following:

- Monitor, evaluate, and address potential health risk to onsite workers and offsite residents.
- Initiate, maintain, evaluate and modify groundwater extraction to provide onsite groundwater containment and treatment.
- Develop cleanup plans for
  - Onsite waste constituent source areas in soil, and related impacts in soil, soil gas, and groundwater.
  - Offsite groundwater affected by migration of waste constituents.

### **Health Risk Assessment Work**

Over the past two years, Whittaker has evaluated health risk associated with onsite discharges, and submitted numerous risk assessment documents that:

1. Confirm that there are no potential human health risks to current workers and offsite residents; and
2. Develop risk-based, soil cleanup levels protective of current and potential future site use, and groundwater quality.

### *Current Human Health Risks*

Based on soil gas sampling results, Whittaker has assessed vapor intrusion risks to both onsite workers and offsite residents. Whittaker submitted an *Updated Current Worker Exposure Evaluation*, which concluded that there is no risk to workers; however, soil gas concentrations near one onsite building (Building 24) slightly exceed the Water Board's environmental screening level. Based on Water Board requirements, Whittaker must sample indoor air at Building 24 and assess the vapor intrusion risk, or mitigate the potential risk, by March 1, 2010.

In October 2009, Whittaker sampled soil gas near two residential properties near the site. All concentrations of VOCs were less than screening levels or less than detection limits; therefore, there is no potential for human health risks due to vapor intrusion from groundwater into indoor air. Whittaker must conduct a second round of sampling six months after the first event, and submit confirmation results for Water Board staff review.

### *Revised Risk Assessment Summary Report*

On January 28, 2010, Whittaker submitted the *Revised Risk Assessment Summary Report*. The report provides Whittaker's summary, evaluation, and validation of all historic risk assessment documents. Whittaker presented updated risk-based, soil cleanup levels for human health risk, soil vapor screening levels, and draft groundwater cleanup goals. Water Board staff is currently reviewing the document.

## **Groundwater Containment and Treatment System**

In August 2009, Whittaker began operation of the onsite groundwater containment and treatment system, which is designed to prevent offsite migration of wastes in groundwater. Whittaker extracts groundwater from six onsite wells, and treats the groundwater with granular activated carbon to remove VOCs, and uses bioreactors for perchlorate, hexavalent chromium, and selenium remediation. Whittaker discharges treated water to the San Benito River pursuant to our General NPDES Permit for Discharges of Highly Treated Water. Although the system successfully treats perchlorate, VOCs, and hexavalent chromium, initially it did not remediate selenium (a naturally occurring metal – not a site waste constituent) to the surface water effluent limit (5 micrograms per liter [ $\mu\text{g/L}$ ]). To allow Whittaker to continue operating the groundwater containment and treatment system, we enrolled Whittaker in the General Waiver for Specific Types of Waste Discharges to allow short-term discharge of the treated water to land nearby the site.

Whittaker has continued to make changes to the treatment system and extraction well pumping rates to meet the surface water selenium effluent limit. Based on improvements, on October 11, 2009, Whittaker began continuous discharge to the San Benito River at a rate of 30 to 40 gallons per minute. However, on January 21, 2010, Whittaker notified Water Board staff that the selenium effluent again exceeded the surface water effluent limit. Whittaker immediately ceased discharge, and contained the water. Water Board staff will issue the appropriate violation (e.g. mandatory minimum penalty), as required pursuant to the General NPDES Permit.

Currently, Whittaker extracts groundwater from select extraction wells with low to non-detect concentrations of selenium to meet effluent limits, and discharges to San Benito River at an approximate rate of 30 gallons per minute. Because Whittaker is not extracting water from all six extraction wells, as of the date of this report, Whittaker has not successfully contained affected groundwater onsite. Whittaker continues to work with the treatment system contractor to improve selenium removal. In addition, Whittaker is working with Water Board staff to evaluate alternative disposal options if selenium reduction by the bioreactor continues to be inadequate for surface water disposal.

**Waste Constituent Investigation**

Whittaker has installed over 140 monitoring wells and collected numerous groundwater samples in the shallow and deep aquifer units to characterize the perchlorate and VOC plumes.

**Attachment 1** illustrates the groundwater plumes originating from the facility. The site is separated into three investigation and cleanup groupings: offsite groundwater; onsite Building 5 and Building 23 area soil, soil gas, and groundwater; and all “other” sitewide source areas on the property.

*Offsite Groundwater and Onsite Building 5 and 23 Areas Investigation*

In November 2009, Water Board staff completed review of Whittaker’s Offsite Investigation Report and Building 5 and 23 Investigation Report. Although we generally concurred that Whittaker has characterized the areas, we identified data gaps. In response, Whittaker is currently delineating waste constituents in groundwater north of the facility and in soil near the onsite Building 1 dry well. Pursuant to the CAO, after completion of the delineation activities, Whittaker will prepare a final investigation report, and submit: (1) a Building 5 and Building 23 Areas Feasibility Study Report by March 31, 2010, and (2) an Offsite Groundwater Feasibility Study Report by April 30, 2010. These reports will assess various cleanup options and their respective feasibility and present Whittaker’s preferred risk management and cleanup options with substantiating rationale.

*Other Sitewide Source Areas*

Whittaker submitted a Sitewide Summary Report on October 30, 2009, which is currently under review by Water Board staff. The Sitewide Summary Report summarizes all characterization/investigation data to identify all potential sources, any remaining data gaps, refine the conceptual site model, and provide data necessary for a sitewide feasibility study. The report includes all onsite areas, excluding Buildings 5 and 23 (addressed separately in the CAO), and confirms that there are data gaps at potential source areas onsite. Whittaker will address these sitewide data gaps by submitting an investigation workplan and a subsequent summary report following field investigation activities, pursuant to the CAO. In order to address cleanup at site source areas (excluding Buildings 5 and 23), the CAO requires Whittaker to develop:

- A Sitewide Source Area Feasibility Study that assesses various source area cleanup options and their respective feasibility, along with Whittaker’s preferred risk management and cleanup options with substantiating rationale, and
- A Sitewide Source Area Corrective Action Plan that provides detailed design and implementation plans, with schedule, for the approved cleanup remedy.

Water Board staff will evaluate and comment, as appropriate, on each of the phases identified above.

**Agricultural Well Abandonment**

Whittaker destroyed the Riverside agricultural supply well in December 2009 in accordance with the Riverside Well Abandonment Work Plan and the requirements of the San Benito County Water District. The Riverside well was impacted with VOCs and perchlorate (most recently at concentrations of 770 µg/L and 130 µg/L, respectively) migrating from the site and was suspected to be a vertical conduit for pollutants. The Riverside well was located approximately 300 feet northwest of the site. Currently, Whittaker allows the Riverside well users to have access to treated groundwater from the extraction and treatment system for replacement agricultural supply. During abandonment activities, Whittaker discovered an old supply well nearby (the Gomes well). Because this well may have also been a vertical conduit for pollutants, Whittaker destroyed the Gomes well after obtaining Riverside well user’s approval in December 2009. Whittaker informed staff that the Gomes well was not in use, and likely preceded the Riverside well; therefore, there was no need for replacement water.

**OLIN CORPORATION FACILITY**

Project Manager: Dean Thomas: 805/549-3690

**KEY INFORMATION:**

<b>Location:</b>	425 Tennant Avenue, Morgan Hill, Santa Clara County, approximately 30-miles southeast of San Jose and 0.5-miles west of Highway 101.
<b>Responsible Party:</b>	Olin Corporation, Inc.
<b>Current Owner:</b>	Olin Corporation, Inc.
<b>Type of Operation:</b>	Manufacturing of Signal Flares
<b>Type of Discharge:</b>	Potassium Perchlorate
<b>Priority:</b>	High
<b>Existing Orders:</b>	<u>Cleanup Order</u> <ul style="list-style-type: none"><li>• Cleanup and Abatement Order (CAO) No. R3-2007-0077</li></ul> <u>Replacement Water Orders</u> <ul style="list-style-type: none"><li>• Cleanup and Abatement Order No. R3-2004-0101</li><li>• State Board Order No. WQ 2005-0007</li></ul> <u>General Waiver of Waste Discharge Requirements:</u> <ul style="list-style-type: none"><li>• Resolution No. R3-2008-0010 (General Waiver)</li></ul> <u>Monitoring and Reporting Program</u> <ul style="list-style-type: none"><li>• Monitoring and Reporting Program No. R3-2008-0028 (Revised May 22, 2009)</li></ul>

**SUMMARY:**

This section of the staff report provides an update on the status of the Olin groundwater cleanup site including the following items:

- Decreasing perchlorate trends in the Llagas Subbasin of the Gilroy-Hollister Groundwater Basin;
- Replacement water and domestic supply well treatment with ion exchange status;
- Cleanup status and Olin's compliance with Cleanup and Abatement Order No. R3-2007-0077 (Cleanup Order No. R3-2007-0077);
- Perchlorate Community Advisory Group efforts; and
- Background information on Olin site history and hydrogeology.

Perchlorate concentrations associated with the Olin cleanup case continue to decrease throughout the Llagas Subbasin due to successful onsite soil remediation, operation of the onsite hydraulic containment and treatment system, and attenuation through natural physical processes of dilution and dispersion. Currently, 12 domestic supply wells exceed the drinking water standard for perchlorate in the Llagas Subbasin as compared to 188 wells during the first quarter of 2004.

In May 2009, Water Board staff agreed with Olin that for the purposes of implementing groundwater cleanup southeast of the site, delineation of the shallow, intermediate, and deep aquifers is complete.

Olin continues to operate the onsite groundwater containment and treatment system. As of December 31, 2009, Olin has treated over 255 million gallons of groundwater and successfully removed 87 pounds of perchlorate from onsite groundwater. Based on analytical data from the groundwater treatment system influent, this represents an average perchlorate concentration of

approximately 49 µg/L. Olin also continues to modify the design of the offsite cleanup system. Olin has installed three offsite extraction wells, completed hydraulic testing on two of the wells, and will complete hydraulic testing of the third well in February/March 2010. Olin designed each extraction well to hydraulically contain and treat the offsite intermediate and upper/middle deep aquifer plumes southeast of the site.

The offsite cleanup system startup has been delayed beyond dates stipulated in CAO No. R3-2007-0077 for the following two reasons:

- 1) Olin and the City of Morgan Hill (City) were evaluating a water reuse alternative where the City would use the treated groundwater for municipal supply, thus creating energy savings in the process. Although Water Board staff supported this energy-saving alternative, the City and Olin could not come to agreement at this time.
- 2) Olin and Water Board staff are working together to modify the approved cleanup approach (hydraulic containment, treatment, and reinjection) in order to address elevated nitrate concentrations in groundwater. Olin found elevated nitrate concentrations during testing of the intermediate aquifer extraction well IEW-01; these elevated concentrations prevent Olin from recharging treated groundwater into the onsite aquifer without addressing the nitrate. Elevated nitrate concentrations in groundwater exist throughout most of the Llagas Subbasin (as discussed at the June and July 2009 Water Board meetings) but are not the result of Olin's industrial activities. Olin has evaluated groundwater treatment strategies to address the nitrate; Water Board staff is reviewing Olin's strategies with respect to State Water Resources Control Board Resolution 68-16 (Anti-Degradation Policy).

## **DISCUSSION:**

### **Site Background**

The former Olin Corporation Facility (Olin) is a 13-acre parcel located in southern Morgan Hill in Santa Clara County. Olin and Standard Fusee used potassium perchlorate to manufacture flares from 1956 to 1995. Perchlorate was first detected at the site in August 2000 during a due diligence investigation by a potential buyer. Since February 2001, Olin continues to investigate and clean up perchlorate impacts from this site. Perchlorate pollution at the site may have occurred primarily from an unlined evaporation pond that received wastes from the manufacturing process.

Perchlorate migrated into groundwater below the site, resulting in a perchlorate plume that extends approximately 10 miles southeast of the site and to a depth of over 500 feet. Perchlorate has degraded groundwater in the shallow, intermediate, and deep aquifer zones of the Llagas Subbasin. Groundwater in the Llagas Subbasin typically occurs at depths ranging from seven to about 570 feet below ground surface. In general, regional groundwater flow is toward the south, except near large-capacity pumping wells where strong, localized hydraulic gradient reversals exist in the lower intermediate and deep aquifers. The most up-to-date hydrogeologic site conceptual model is included in Olin's January 31, 2009, Llagas Sub-basin Characterization – 2008, Santa Clara County Olin/Standard Fusee, Morgan Hill, California (2008 Characterization Report)<sup>1</sup>.

### **Decreasing Trends in Perchlorate Concentrations in the Llagas Subbasin**

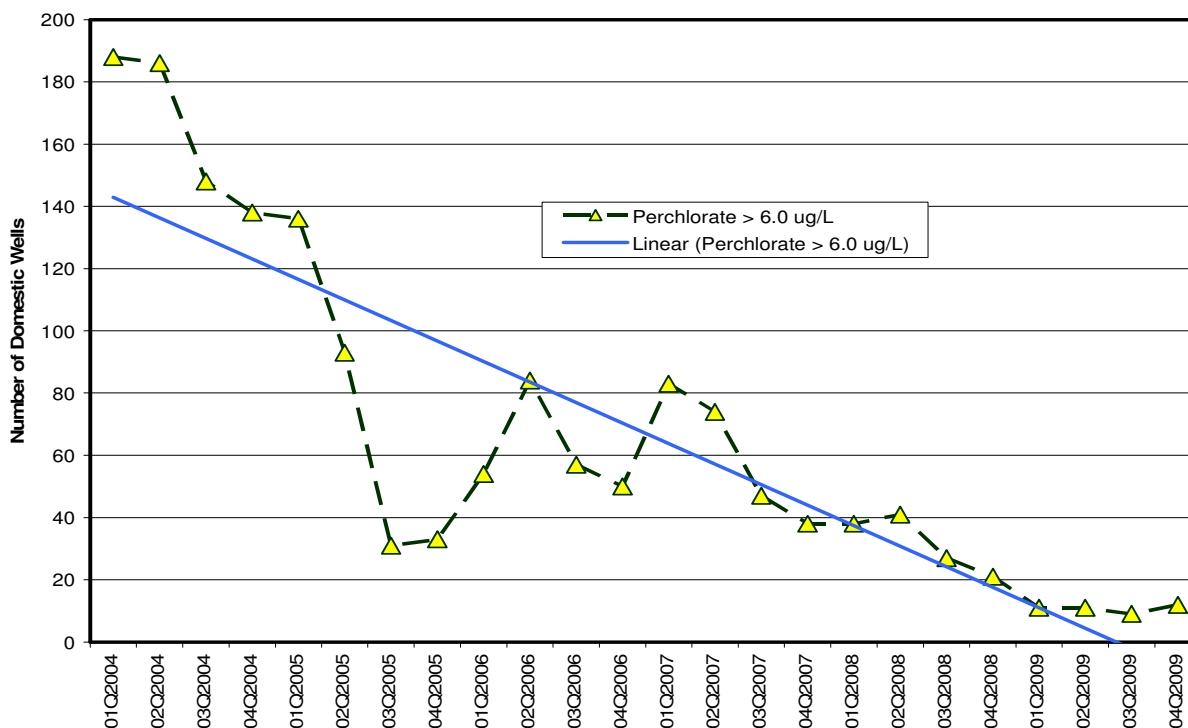
Residents, agricultural operations, businesses, and communities near the former Olin site rely solely on groundwater for domestic, municipal, agricultural, and industrial supply purposes. Olin began monitoring perchlorate in offsite domestic supply wells in 2004. Since offsite monitoring of domestic

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<sup>1</sup> The 2008 Characterization Report is located at:

<ftp://swrcb2a.swrcb.ca.gov/pub/rwqcb3/Olin%20Perchlorate/Olin%20Llagas%20Subbasin/Charac%20Rpt%20Update%202008/>

wells began, perchlorate concentrations have decreased throughout the Subbasin, particularly south of Middle Avenue (approximately 1.5 miles south of the site). Historically, over 800 domestic supply wells, predominantly screened in the intermediate aquifer, exhibited perchlorate impacts. In the first quarter of 2004, 188 domestic supply wells had perchlorate concentrations greater than the MCL. During the fourth quarter of 2009, there were 12 domestic supply wells above the MCL. Of these 12 domestic supply wells, eight wells are within 1.5 miles of the former Olin site near the plume core. Below is a graph that shows the decreasing trends in perchlorate concentrations in the number of domestic supply wells above the MCL over the past six years. The decreasing trends demonstrate that attenuation by natural physical processes such as dilution, successful onsite soil remediation, and onsite groundwater containment have resulted in decreasing perchlorate concentrations throughout the Llagas Subbasin over the last six years.



**Attachments 2 and 3** of the staff report show perchlorate groundwater plumes in the intermediate aquifer (70 – 200 feet below the surface) for the first quarter 2006 and the fourth quarter of 2009. These figures reveal a significant reduction in the size of the perchlorate plume outside the area of the plume core (south of the area with perchlorate concentrations above 24.5  $\mu\text{g/L}$  within 1.5 miles south of the site). We expect these decreases in perchlorate concentrations will continue, particularly when offsite hydraulic control and treatment of Priority Zones A and B (perchlorate concentrations greater than 11  $\mu\text{g/L}$ ) is initiated with intermediate aquifer extraction well IEW-1. However, as concentrations approach lower levels (around 4  $\mu\text{g/L}$ ), concentration declines may slow down due to the influence of other potential background perchlorate sources and typical asymptotic behavior of groundwater cleanup systems. Going forward, there may be short-term increases in perchlorate concentration during high precipitation years due to increased mobilization of perchlorate in the unsaturated zone and flushing through the A-B aquitard.



### **Replacement Water Service Terminations**

Olin is required to provide replacement water (e.g., bottled water or wellhead treatment) to well owners and tenants whose drinking water wells have perchlorate concentrations greater than 6.0 µg/L. Currently, Olin provides bottled drinking water to users of 18 domestic supply wells, which serve 25 households. Olin provides bottled water in accordance with the Water Board Cleanup and Abatement Order No. R3-2004-0101 (CAO No. R3-2004-0101), as revised by the State Water Resources Control Board in its Order WQ 2005-0007 (State Water Board Order) and Water Board staff's letters dated October 6, 2006 and December 8, 2006. In accordance with these Orders, Olin may terminate replacement water service, with Executive Officer concurrence, for users of wells that have four consecutive quarters of perchlorate results less than or equal to 6.0 µg/L.

After bottled water service is terminated, Olin is required to monitor perchlorate in those wells in accordance with the requirements of the State Water Board Order. Since July 2006, the Water Board Executive Officer has concurred with Olin's requests to terminate bottled water service for 645 wells in accordance with State Water Board Order requirements, because each of these wells had exhibited at least four consecutive quarters with perchlorate concentrations below the MCL. Water Board staff will continue to review and evaluate all data submitted by Olin that is associated with bottled water terminations and post-bottled water termination monitoring. Additionally, Water Board staff evaluates monitoring data submitted in accordance with the monitoring and reporting program (separate from post-bottled water termination monitoring) to determine if concentrations continue to decline even in areas that are no longer monitored through the post-bottled water termination program.

### **Domestic Supply Well Ion Exchange Systems**

In addition to providing bottled replacement water to specific owners and tenants, Olin continues to operate and maintain ion exchange systems on seven private domestic supply wells; the systems continue to remove perchlorate as designed. All domestic supply wells that are actively used as a potable water source and have perchlorate concentrations above 7.9 µg/L are equipped with ion exchange systems, with the exception of two wells. Of these exceptions, Olin has provided funding for one well owner to connect to the San Martin municipal system. The other well has bacteria counts that exceed Santa Clara County recommendations. The well owner needs to address the bacteria issue prior to Olin installing an ion exchange system. Olin has not installed any new ion exchange systems since December 2006.

### **Status of Activities and Compliance with Cleanup Order No. R3-2007-0077**

Cleanup Order No. R3-2007-0077 outlines Olin's groundwater investigation and groundwater cleanup requirements, including the groundwater cleanup approach and schedule<sup>2</sup>. Olin's approved cleanup strategy consists of a phased cleanup that includes hydraulic containment and treatment of groundwater in the area of highest concentrations (plume core) in combination with monitored attenuation for those areas with lower perchlorate concentrations.

Groundwater Investigations – For the purposes of implementing groundwater cleanup southeast of the site, Water Board staff concluded in 2009 that after numerous groundwater investigation phases during the last seven years, delineation of the perchlorate plume in the shallow, intermediate, and deep (upper, middle, and lower zones) aquifers is complete. However, Olin has since installed additional performance monitoring wells for monitoring the effectiveness of the groundwater

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<sup>2</sup> Cleanup and Abatement Order No. R3-2007-0077 is located at:  
<http://swrcb2a.waterboards.ca.gov/Olin%20Perchlorate/December%207%202007%20Board%20Meeting/>

extraction and treatment system. It should be noted that relative to similar projects of this scale and complexity statewide and nationally, this project has moved very rapidly to this stage.

Olin had not fully delineated perchlorate in groundwater in the area east and northeast of the site in the middle and lower deep aquifer zones. In an effort to mitigate further migration of perchlorate east of the site, Water Board staff required Olin to submit a deep aquifer cleanup work plan to address the elevated perchlorate concentrations in the middle and lower deep aquifer zones instead of requiring additional groundwater investigations in this area. Olin submitted, and Water Board staff concurred with, the deep aquifer cleanup work plan. Subsequently, in accordance with the work plan, Olin installed DEW-2 with the intention to extract and treat groundwater from the middle and lower deep aquifer zones below the area east/northeast of the site. Olin plans to conclude aquifer testing of DEW-2 in February or March 2010. Olin will submit these results along with plans for integrating DEW-2 into the overall remedial system in the Feasibility Study III Addendum, due in May 2010.

Onsite Groundwater Treatment System – In 2004, the Executive Officer required Olin to initiate operation of the onsite groundwater treatment system (GWTS), and Olin began operation on April 7, 2004. Olin designed the system to extract perchlorate-impacted groundwater from the shallow aquifer and the upper-intermediate aquifer at the southern (downgradient) boundary of the site. Olin treats the extracted water with a perchlorate-specific ion exchange process. Olin then reinjects the treated groundwater into the shallow aquifer along the northern portion of the site.

Since 2004, operation of the onsite GWTS coupled with successful onsite soil remediation, have effectively decreased the mass and concentration of perchlorate in the shallow aquifer beneath and adjacent to the site. In July 2008, drought conditions caused declining water levels in the shallow aquifer wells that resulted in GWTS operational difficulties. Water Board staff approved Olin's request to discontinue groundwater extraction in the shallow aquifer as part of a pilot study in the shallow aquifer because perchlorate concentrations have generally declined to below the MCL. Olin continues to operate the GWTS in the upper intermediate aquifer and Water Board staff continues to evaluate monitoring data to watch for increasing trends in perchlorate concentrations due to the shutdown of the shallow aquifer extraction wells. As of fourth quarter 2009, perchlorate concentrations have not shown consistent increases downgradient of the site in the shallow aquifer. The Executive Officer will require Olin to restart shallow aquifer extraction if such concentration increases are observed.

Offsite Aquifer Cleanup Status - Water Board staff had originally approved a phased cleanup approach for Olin to first address the intermediate aquifer's cleanup, and subsequently address the deep aquifer after Olin completed characterization activities in the deep aquifer. Cleanup of the intermediate aquifer includes extracting groundwater from intermediate extraction well IEW-1 and conveying the water via buried pipeline to the site where it will be treated using ion exchange and then recharged into the shallow aquifer for beneficial reuse.

Progress with the original phased cleanup approach was slowed while Olin and the City explored a beneficial reuse alternative, and Olin also needed to address elevated nitrate concentrations. The reuse alternative consisted of the City using the treated groundwater as municipal supply. Water Board staff prefer this energy-saving alternative, but the City and Olin could not come to an agreement that was amenable to both parties. In response to a Water Board requirement, Olin indicated that they had selected the post-treatment reinjection alternative, and were not currently pursuing the reuse alternative, in October 2009. With respect to elevated nitrate concentrations, intermediate aquifer groundwater near IEW-1 contains nitrate at concentrations greater than the onsite receiving water into which Olin plans to inject treated groundwater. Due to the difference in nitrate concentrations, Olin and Water Board staff are currently modifying the approved cleanup approach to address the State Water Resources Control Board's Anti-Degradation Policy (State

Board Resolution 68-16). Olin's approach is to combine the two cleanup phases (extraction from both the intermediate and deep aquifers), which would allow for blending of lower nitrate concentration extracted groundwater from DEW-2 with higher nitrate concentration water from IEW-1, to reduce nitrate concentrations prior to injection.

Olin has completed installation and hydraulic testing of intermediate zone groundwater extraction well IEW-1 and deep aquifer extraction well DEW-1. Olin has also completed installation of the second deep aquifer extraction well DEW-2. Numerical modeling results indicate that IEW-1 will hydraulic contain Priority Zones A and B (perchlorate concentrations greater than 11 µg/L) of the perchlorate plume in the intermediate aquifer, and DEW-1/DEW-2 will contain Priority Zone A (perchlorate concentrations greater than 24.5 µg/L) in the deep aquifer, as required under Cleanup Order No. R3-2007-0077. Olin provided a nitrate management plan in a Feasibility Study Assessment II Report (FSA II Report). However, Olin will need to refine the numerical model using results of hydraulic testing at DEW-2 that Olin has not completed at the time of this report. Water Board staff is working with Olin to address State Board Resolution 68-16 in the findings for an upcoming Waste Discharge Requirements (WDRs) for onsite reinjection. Following the FSA III Report, Olin is scheduled to resubmit a Revised 90% Design Report (for cleanup) in July 2010 that addresses elevated nitrate concentrations, and provides new compliance dates and schedule for cleanup. The current schedule for startup of the full-scale offsite treatment system is early 2011.

### Upcoming Reports/Board Items

- First Quarter 2010 Groundwater Monitoring Report.
- Monthly Progress Reports. Refer to **Attachment 4** for the most recent progress report.
- Area I Plume Migration Control FS Addendum III. Olin will provide their preferred cleanup plan and rationale for offsite groundwater cleanup and nitrate management. This report will incorporate the hydraulic testing results from recently installed DEW-2.
- Area I Revised 90% Engineering Design Package. This report will provide detailed engineering design and implementation plans, with schedule, for the approved full-scale offsite groundwater cleanup remedy.
- WDR for re-injection of treated groundwater at the Olin site (tentatively scheduled for the September 2010 Board Meeting)

### Perchlorate Community Advisory Group

The Perchlorate Community Advisory Group (PCAG) meets quarterly in San Martin. The advisory group provides a forum for public discussion of the perchlorate impacts to groundwater and potential solutions. Water Board staff solicits advisory group input at key decision points in the investigation and cleanup process and continues to participate in each PCAG meeting.

PCAG plans to hold its next meeting at the San Martin Lions Club on April 29, 2010 at 7 pm. Water Board staff will attend and be available to address questions from the public concerning the ongoing Olin cleanup case.

### Olin Reports and Correspondence can be accessed on our website at:

<http://www.swrcb.ca.gov/rwqcb3/Facilities/Olin%20Perchlorate/Olinsite.htm>

or on our GeoTracker website at:

[https://geotracker.waterboards.ca.gov/profile\\_report.asp?global\\_id=SL0608756247](https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL0608756247)

**BAE SYSTEMS (FORMERLY UNITED DEFENSE)**

Project Manager: Kristina Seley 805/549-3121

**KEY INFORMATION:**

<b>Location:</b>	900 John Smith Road, Hollister, San Benito County
<b>Responsible Party:</b>	BAE Systems Land and Armaments L.P. (BAE Systems)
<b>Current Owner:</b>	BAE Systems leases land from FRIIS Thomas Ranch L.P.
<b>Type of Operations:</b>	Munitions testing
<b>Type of Discharge:</b>	Perchlorate and explosives
<b>Priority:</b>	Medium
<b>Existing Requirements:</b>	13267 investigation requirements

**SUMMARY:**

This staff report provides an update on the status of the BAE systems groundwater cleanup site. BAE Systems is completing investigation activities to delineate an onsite perchlorate plume. After delineation is complete, BAE will conduct a risk assessment and feasibility study to establish site cleanup goals and a final corrective action plan for cleanup.

**DISCUSSION:****Site Background**

Since 1968, BAE Systems (BAE) has conducted munitions testing on a 1,200 acre leased property, known as the Hollister Test Facility, in eastern Hollister. The site contains several buildings, former munitions magazines, and two munitions test arenas. Waste constituents identified in soil and/or groundwater include perchlorate and explosives. BAE has cooperatively investigated the site since 2003, and complied with all Water Board requirements.

**Soil and Groundwater Investigation**

BAE's consultants have identified three areas with perchlorate or explosive impacts to soil (Arena 1, Building No. 3 area, and Building No. 6 area); and two onsite perchlorate groundwater plumes. BAE has installed a total of 55 monitoring wells onsite to assess these areas. BAE has not identified any offsite groundwater impacts, or any offsite risks. In late September 2005, BAE voluntarily excavated shallow, perchlorate-impacted soils at Arena 1 to minimize potential perchlorate mobilization associated with rainfall and runoff infiltration through the soil source area.

On October 30, 2010, BAE submitted a final soil and groundwater investigation report for the Building No. 3 groundwater and Arena 1 soil. Based on our review, at this time, no additional investigation is necessary. After BAE collects additional monitoring data, it will prepare a final Risk Assessment and Feasibility Study, and then prepare a corrective action plan for cleanup.

**TDY INDUSTRIES (FORMERLY MCCORMICK-SELPH, INC.)**

Project Manager: Diane Kukol 805/542-4637

**KEY INFORMATION**

<b>Location:</b>	3601 Union Road, Hollister, San Benito County.
<b>Responsible Party:</b>	Allegheny Technologies Incorporated
<b>Current Owner:</b>	TDY Industries

**Type of Operation:** Former manufacturing of pyrotechnics  
**Type of Discharge:** Perchlorate and VOCs  
**Priority:** Medium  
**Existing Requirements:** 13267 investigation requirements

### Site Background

The TDY Industries (TDY) site (formerly known as the McCormick Selph, Inc. facility) occupies approximately 270 acres in rural Hollister, San Benito County. Controlled pyrotechnics (electric igniters, electric primers, explosive bolts, gas generators, etc.) for the aerospace and automotive industries have been and continue to be manufactured on the property. The facility has undergone several name changes since McCormick Selph, Inc. completed construction in 1971. TDY is the current responsible party for environmental issues at the Hollister facility.

In 1999, TDY informed Water Board staff that it detected perchlorate and volatile organic compounds (VOCs) in soil and groundwater at the facility. TDY completed delineation of the perchlorate and trichloroethylene (TCE) plumes in 2002. TDY's delineation activities indicate perchlorate and VOC pollution is confined to the site property. With Water Board staff concurrence, TDY implemented pilot testing of enhanced in-situ bioremediation and monitored natural attenuation as the cleanup remedy for the perchlorate plume near the thermal destruction segment of the facility (the area with highest detected perchlorate concentrations<sup>3</sup>). In addition, TDY initiated natural attenuation monitoring for other areas of the site that have shown relatively low concentrations of perchlorate and/or VOCs in groundwater<sup>4</sup>. TDY provided Water Board staff with groundwater monitoring results for these pilot cleanup methods from 2002 to 2005. TDY also submitted a workplan in 2005 for full-scale enhanced in situ bioremediation in the area previously pilot tested. Due to Water Board staffing shortages and subsequent project prioritization, Water Board staff did not comment on the 2005 workplan until July 2009. In response to a request in our July 2009 letter, TDY submitted a report to Water Board staff on November 13, 2009 containing revisions to the 2005 workplan.

### Current Status

Water Board staff is in the process of reviewing *Third Quarter 2009 Groundwater Monitoring Report and Modifications to the Full-Scale Enhanced Bioremediation Work Plan* (November 13, 2009), and is working with TDY and its consultants to implement this and additional cleanup actions.

### MK BALLISTIC SYSTEMS

Project Manager: Kristina Seley 805/549-3121

### KEY INFORMATION:

**Location:** 2707 Santa Ana Valley Road, Hollister, San Benito County  
**Responsible Party:** MK Ballistics and land owner  
**Current Owner:** Family Trustees: Gloria Zuniga, Sheron Johnson  
**Type of Operations:** Ordnance manufacturer  
**Type of Discharge:** Phase I investigation underway for perchlorate

<sup>3</sup> TDY reported perchlorate concentrations before and after initiation of the enhanced in-situ bioremediation pilot study to be approximately 5,000 µg/L and 600 µg/L, respectively,

<sup>4</sup> In areas where TDY implemented natural attenuation monitoring, perchlorate concentrations have remained stable and have been detected from approximately 4.9 to 790 µg/L. Where detected, TCE concentrations have ranged from 1.0 to 140 µg/L.

**Priority:** Low  
**Existing Requirements:** 13267 investigation requirements

### **Site Background**

The MK Ballistic Systems site is located northwest of the BAE Systems site. Currently, MK Ballistic Systems leases buildings and storage magazines on the five-acre property and manufactures less lethal munitions such as bean bag munitions. Numerous other tenants have conducted similar operations at the facility and have used perchlorate and other explosive compounds in their manufacturing processes.

An environmental investigation report prepared for BAE Systems indicated that historical use of perchlorate at MK Ballistic Systems may be the cause of perchlorate pollution in a supply well located upgradient of the BAE System's facility but downgradient of the MK Ballistics Systems site. Therefore, Water Board staff directed the current operator and the landowner to conduct a preliminary soil and groundwater investigation for perchlorate.

### **Preliminary Soil and Groundwater Investigation**

During the first quarter of 2009, the landowner's consultant installed five shallow groundwater monitoring wells (MW-1 to MW-5). The consultant has collected three quarters of data, and based on these data, this site is not a source of significant groundwater impacts. Three wells have consistently not detected perchlorate, and two wells have had low detections above the reporting level (4 µg/L), but less than or equal to the maximum contaminant level (6 µg/L). The landowner will conduct another round of perchlorate groundwater sampling in March 2010, after which, they will submit a final report with a summary and interpretation of all groundwater and soil results, as well as recommendations. The landowner has complied with all Water Board requirements.

### **CONCLUSION:**

Water Board staff will 1) continue to address water quality impacts related to priority perchlorate projects, and 2) prioritize those sites that have impacted drinking water wells.

The next planned update on these perchlorate sites will be in 2011, however, some sites (e.g., Olin) may warrant updating sooner.

### **ATTACHMENTS**

**Attachment 1:** Whittaker - Figure 2. Groundwater Plume Map

**Attachment 2:** Olin – Perchlorate Distribution Map for Intermediate Aquifer – First Quarter 2006

**Attachment 3:** Olin - Perchlorate Distribution Map for Intermediate Aquifer – Fourth Quarter 2009

**Attachment 4:** Olin's Monthly Progress Report for January 2010