January 8, 2016

Stephen TerMaath
Chief BRAC Program Management
AFCEC/CIB
2261 Hughes Avenue, Suite 155, JBSA
Lackland, TX 78236-9853
stephen.termaath@lackland.af.mil

I would ask for your assistance to ensure that the U.S. Air Force (Air Force) take further steps to address concerns raised by the California Regional Water Quality Control Board, Lahontan Region (Water Board) regarding cleanup at the former George Air Force Base (GAFB) located in Victorville, San Bernardino County. Unfortunately, the Water Board cannot accept the Air Force's proposed application of monitored natural attenuation (MNA) as a sole remedial method for all contaminated groundwater sites at GAFB because it will not comply with state and federal law and policies, including the Water Board's mission to protect and restore the state's water resources. I am requesting that the Air Force incorporate additional source control measures and active remediation at GAFB to restore water quality in a more reasonable timeframe than has been shown to be possible from reliance on MNA as a sole remedial method.

The Water Board understands the technical challenges presented by the extensive groundwater contamination at GAFB. This is one reason that MNA as a sole remedy is not adequately protective and cleanup goals cannot be achieved in a reasonable time without the incorporation of active groundwater remediation and aggressive source control measures. The integration of these additional measures will help ensure protectiveness, decrease the extent of impacts, and achieve cleanup goals in a shorter timeframe.

I request that the Air Force schedule a meeting to specifically discuss these issues and to develop a path forward that includes implementation of additional source control actions and incorporation of active cleanup actions in its remedies for the groundwater sites at GAFB. If unresolved, these issues will lead to delays in the restoration program at GAFB and protracted disputes. Such delays also allow continued groundwater degradation and contaminant migration and will ultimately increase the time and cost to achieve cleanup goals.

Some of Water Board's concerns relate to the effects of the Air Force's performance based contracts (PBC) on its environmental restoration efforts. At the September 2015 Quarterly Air Force Regulators Partnering Meeting in Sacramento, state regulatory agencies (i.e., Water Board, State Water Resources Control Board, and Department of

Toxic Substances Control) and the U.S. Environmental Protection Agency (USEPA) discussed their concerns regarding the effects of the Air Force's PBCs. The regulatory agencies' concerns include unrealistic goals and schedules, poor document quality, problems with the document review and revision process, prolonged disputes, and impediments to team building. The Water Board finds these problems are impeding the cleanup process and reaching remedial decisions at GAFB.

The use of PBCs at complex groundwater sites, such as the groundwater contamination sites at GAFB, is especially problematic because of the uncertainties involved with these sites and the Air Force's unrealistic schedule for remedial milestones (e.g., remedy-in-place). Additionally, the Water Board has found that the documents produced to support GAFB remedial decisions under PBCs are commonly incomplete or technically unacceptable and that Water Board comments on the documents are not adequately addressed. The Water Board has discussed these concerns with the Air Force in project meetings and in comment letters since startup of the PBC contract in April 2012. However, it appears that the Air Force's PBC does not account for changes to address Water Board concerns or consideration of other reasonable and feasible alternatives and the Air Force continues to propose MNA despite Water Board concerns.

Background – Groundwater Contamination at GAFB

There are five areas of extensive groundwater contamination at GAFB. Collectively, the portions of the contamination that exceed water quality objectives encompass an aerial extent of approximately 1,800 acres, almost a third of the 5,000-acre facility. The Air Force is proposing MNA for four of these sites. The fifth site has an existing MNA remedy that is not performing as predicted. The groundwater contamination consists of the following five areas.

- **CG070.** Solvent plumes (primarily tricholorethene [TCE]) in the upper and lower aquifers extend over **700 acres**. Half of this groundwater contamination extends beyond the boundaries of the former facility. A groundwater extraction and treatment system (GETS) was operated from 1991 to 2003, when it was shut down for optimization and never restarted. The estimated timeframe to achieve maximum contaminant levels (MCLs) using MNA is **500 years** and 600 years to reach background (*Final Focused Feasibility Study OU1 TCE Ground Water Plume, Revision 4,* 2012). The CG070 plumes impair the beneficial uses of these aquifers and threaten water supply wells along the Mojave River, including the water supply wells for Victor Valley Wastewater Reclamation Authority. The contamination also represents a threatened discharge to the Mojave River.
- **OT071**. Pesticide (primarily dieldrin) plumes in the upper and lower aquifers extend over **700 acres**, although the lateral extent is not well defined in all directions. The time to achieve the public health goal using MNA is uncertain with estimates ranging from **30 to more than 500 years** (*Draft Non-CERCLA Site OT071 Corrective Action Plan for Pesticides in Ground Water*, 2011). No source control measures have been implemented. The OT071 plumes impair the beneficial uses

of the aquifers and threaten municipal water supply wells for the City of Adelanto and supply wells for the Federal Bureau of Prisons facility.

- **SS030.** Petroleum plumes in the vicinity of the flightline have several areas of free product that act as continuing contaminant sources for the dissolved groundwater plumes. The portions of the plumes above MCLs extend over **120 acres** in the upper aquifer. The estimated timeframe to achieve cleanup goals using MNA is **360 years and 6,700 years** for benzene and naphthalene, respectively (*Draft Petroleum Sites Corrective Action Plan Sites SS030, ST054, ST057, and SS084*, 2013). The SS030 plume impacts the beneficial uses of the upper aquifer and the impacts to the lower aquifer have not been investigated.
- **ST067b.** The petroleum contamination from the bulk fuel tank farm extends over **200 acres** and impacts both the upper and lower aquifers. 4.5 million gallons of free product cover 63 acres of the upper aquifer. The free product acts as a continuing contaminant source for the dissolved groundwater plume. The extent of impact to the lower aquifer is not well defined. Estimated timeframe to achieve cleanup goals using MNA is **1,000 years and 40,000 years** for benzene and naphthalene, respectively (*Draft Petroleum Site Corrective Action Plan, Site ST067b,* 2013). The ST067b plume impacts the beneficial uses of the aquifers and threatens the water supply wells for the Federal Bureau of Prisons facility.
- **OT069**. The flightline solvent (primarily TCE) plumes consist of one larger plume and two smaller plumes that collectively extend over **83 acres** (area above the MCL). MNA was selected as the remedy for this site in a 1998 record of decision. TCE concentrations in groundwater have generally increased since 1998 because of inadequate source control. The Air Force has implemented additional source control measures and the current estimated timeframe to achieve cleanup goals is an additional **50 years**. (*Site OT069 Ground Water Modeling Results and Revised Long-term Monitoring Program,* 2009). Therefore, the total timeframe to cleanup this groundwater contamination will be approximately 70 years. OT069 impacts the beneficial uses of the upper aquifer and the impacts to the lower aquifer have not been investigated.

Limitations of MNA as a Sole Remedy at GAFB

At public meetings held in September 2014 and November 2015, Water Board members provided direction to their staff regarding the evaluation and application of MNA for cleanup of groundwater sites in the Lahontan Region. Water Board members emphasized the expectation that all dischargers must follow regulatory requirements and guidance, including thorough site characterization, evaluation/demonstration of the feasibility and benefits of active remediation and source control measures, and provide site-specific demonstrations that MNA is effective and protective of beneficial uses. Moreover, cleanup time must be reasonable and not unreasonably deny beneficial uses of the groundwater, given all of the competing demands on the uses of the groundwater. These concerns are consistent with the USEPA's Office of Solid Waste and Emergency Response (OSWER) Directive "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites" 1999 (USEPA MNA

Directive) and with federal and state requirements for the cleanup of groundwater contamination.

For sites subject to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) at federal facilities that are on the National Priority List (NPL), such as George Air Force Base, one of the cornerstones of the regulatory cleanup process is the identification by the state and federal regulatory agencies of the applicable or relevant and appropriate requirements (ARARs) under federal and state environmental law. These ARARs become the remedial standard or level of control for each hazardous substance, pollutant, or contaminant. Although there is occasionally some disagreement over whether certain state laws are ARARs, or whether cleanup levels have to be to background levels, if feasible, or some other risk-based level, the Air Force and the Water Board have generally been able to reach agreement on cleanup levels at specific sites.

Some sites on federal facilities are not subject to CERCLA because they are exempt from CERCLA's definition of "hazardous substance." In those circumstances, the remediation is governed by other federal laws, such as the Resource Conservation and Recovery Act (RCRA), subdivision D, for sites contaminated by petroleum, and state law and regulations, including the Porter-Cologne Water Quality Control Act, particularly Water Code section 13304, and State Water Resources Control Board Resolution 92-49, "Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304," and California Code of Regulations chapter 16 for petroleum releases. Resolution 92-49 requires that discharges are cleaned up "in a manner that promotes attainment of either background water quality, or the best water quality which is reasonable if water quality cannot be restored..." Where the discharger has demonstrated that it is technologically or economically infeasible to remediate contamination to the level that achieves water quality objectives or meet objectives within a reasonable period, Resolution 92-49 allows for the designation of containment zones. However, a designation of a containment zone requires that the contamination be fully characterized, the source be removed and/or controlled and monitored, and that impacts attributable to the discharge be mitigated. For a full description of requirements for Regional Water Board approval of containment zone, see State Water Board's Resolution 92-49, subdivision III.H.

Ultimately, the goal of both the federal and state requirements for the remediation of contaminated groundwater is to reduce the contamination to either background levels, or to those levels that are protective of human health and the environment, within a reasonable timeframe. Where the proposed remedy cannot meet ARARs for CERCLA sites or applicable federal and state requirements for non-CERCLA sites, or cannot meet them within a reasonable timeframe, the proposed remedy is not in compliance with the applicable federal or state requirements. (40 CFR 300.430(f)(1)(ii)(B). What is a reasonable timeframe depends, in part, upon the potential remediation times of alternative remedial technologies, anticipated need of the contaminated groundwater, and the plumes containment or proximity to population centers or other resources.

The Water Board cannot accept the Air Force's proposed selection of MNA as the sole remedy at the four contaminated groundwater sites because the Air Force has not made site-specific demonstrations that reliance on MNA will meet technical and regulatory requirements, including effectiveness within a reasonable timeframe and protection of human health and the environment. Concerns about the Air Force selecting MNA as the sole remedy for the groundwater sites at GAFB include the following:

- The Air Force has not demonstrated that natural attenuation processes can effectively remediate the plumes and that MNA is adequately protective of human health and the environment, which is the cornerstone of cleanup requirements under CERCLA, state law requirements, including Resolution 92-49, and federal guidance on the appropriate use of MNA. (See USEPA MNA Directive).
- MNA will not restore the beneficial uses of groundwater in a reasonable timeframe and will not comply with either the Water Quality Control Plan, Lahontan Region (Basin Plan), Resolution 92-49, CERCLA, or federal guidance on the appropriate use of MNA. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP), which sets forth the federal regulations for Superfund sites, notes that "EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a time frame that is reasonable given the particular circumstances of the site." (40 CFR 300.430(a)(1)(iii)(F). To allow beneficial uses to be impacted in some cases for potentially hundreds of years is fundamentally inconsistent with this requirement and with state law requirements to require cleanup of contamination to background levels, or the best quality which is reasonable if background levels cannot be restored.
- Groundwater contamination impacts or threatens a primary water supply aquifer that serves adjacent communities, and the demand for that groundwater in the Mojave Desert is high and will probably become even greater considering drought conditions and climate change. Therefore, the denial of the beneficial use of this resource for hundreds to thousands of years constitutes an unacceptable burden on the community, and is inconsistent with state and federal requirements, as noted above.
- There is an unacceptable level of uncertainty associated with the conditions (e.g., changes in groundwater flow direction due to the operation of adjacent wastewater treatment ponds and pumping from adjacent water supply wells) that will affect the plumes' behavior over the cleanup timeframe. These uncertainties preclude the selection of MNA as a sole remedial method at these sites and underscore the need for additional active remediation. The NCP notes that the use of treatment is expected to address the principal threats posed by a site, wherever practicable. (40 CFR 300.430(a)(iii)(A).
- Source control measures have not been adequately implemented at all of the sites, e.g., there have been no source control actions at OT071 and there is inadequate secondary source control (free product) at SS030 and ST067b. Federal guidance suggests that MNA for groundwater response actions is likely only appropriate where source control has already removed the bulk of the

contaminant mass (see USEPA OSWER, "Rules of Thumb for Superfund Remedy Selection," [USEPA Superfund Remedy Selection] 1997, p. 20 and USEPA MNA Directive). Inadequate source control will result in continued groundwater impacts and will impede groundwater restoration, contrary to the expectation of both federal and state environmental rules and regulations. 40 CFR 300.430(a)(iii)(F) sets the expectation that groundwaters be returned to beneficial uses wherever practicable, within timeframe that is reasonable, given the particular circumstances of the site, and State Water Board Resolution 92-49, which requires cleanup and abatement of effects of discharges in manner that promotes attainment of either background water quality or the best water quality which is reasonable, considering site-specific factors.

- Active remediation technologies (e.g., enhanced reductive dechlorination) have not been adequately evaluated and pilot studies have not been conducted. The NCP states that the USEPA expects the use of treatment to address the principal threats posed by a site, wherever practicable (40 CFR 300.430(a)(1)(iii)(A).
- The Air Force's proposed institutional controls cannot be relied on to be effective throughout the long cleanup timeframes estimated to achieve groundwater restoration via MNA. Therefore, the MNA remedy may not be protective of human health and the environment.

In response to Water Board comments on the documents proposing MNA, the Air Force's consultant has agreed to conduct additional investigations to address data gaps at OT071 and SS030. The Water Board appreciates the Air Force's willingness to address these data gaps to better support remedial selection decisions. The Air Force has also conducted additional analysis to estimate degradation rates at CG070. Unfortunately, Water Board determined that the Air Force's calculation of degradation rates was flawed and, consequently, could not accept the analysis. The Water Board is currently preparing comments on the fourth site, ST067b and will address the protectiveness of the existing MNA remedy at OT069 through the CERCLA Five-Year Review process.

Requested Action

To be consistent with state law and federal requirements, including the Porter-Cologne Water Quality Act, State Water Board Resolution 92-49, CERCLA, the NCP, and federal guidance on remedy selection and the use of MNA, the Air Force must identify additional remedial actions that can be taken to reduce groundwater contamination at GAFB. I request the Air Force meet with my staff in the next 60 days to evaluate the use of active remediation and additional source control measures that can be strategically implemented at GAFB to attain our shared goals of cost-effective remedies that are protective of human health and the environment and restoration of water quality in a reasonable timeframe. Specifically, I request that the Air Force identify and discuss potential remedial strategies (e.g., hot spot treatment through enhanced reductive dechlorination) and more aggressive source control measures.

Thank you for your attention to these important matters. The Water Board looks forward to working with the Air Force to reach resolution of the issues described in this letter. You may contact me at (530) 542-5412 (Patty.Kouyoumdjian@waterboards.ca.gov), Lauri Kemper at (530) 542-5436 Lauri.Kemper@waterboards.ca.gov or Mike Plaziak at (760) 241-7325 (Mike.Plaziak@waterboards.ca.gov) regarding the requested actions.

Patty Z. Kouyoumdjian

PATTY Z. KOUYOUMDJIAN
EXECUTIVE OFFICER

cc (via email):

Steve Ashton, City of Victorville, Public Works
Mary Aycock, USEPA, Region IX
David Bell, AFCEC
Karen Bessette, State Water Board, DOD
Kirby Brill, Mojave Water Agency
Indira Balkissoon, Tech Law
Calvin Cox, CNGS
Phillip Crader, State Water Board
David Daftary, CBI
Eric Esler, USEPA, Region IX
Anna Garcia, Mojave Water Agency
Kevin Graves, State Water Board
Donald Gronstal, AFCEC
Loren Henning, USEPA, Region IX
Angeles Herrera, USEPA, Region IX
Brett Jurgensen, Victorville Correction Complex
Tarek Ladaa, CBI
Steve McMasters, State Water Board, DOD
Keith Metzler, City of Victorville, SCLA
Philip Mook, AFCEC, BRAC
Logan Olds, VVWRA
Eric Ray, City of Victorville, SCLA
Tom Thornton, City of Adelanto, Operations
Dan Ward, DTSC, DOD
Valerie Wiegenstein, Mojave Water Agency