Appendix B
Notice of Availability

APPENDIX B

Notice of Availability

THE U.S. AIR FORCE INVITES PUBLIC COMMENT ON THE PROPOSED GROUNDWATER CLEANUP PLAN FOR TRAVIS AIR FORCE BASE, CALIFORNIA.

The U.S. Air Force will hold a public meeting to discuss the Proposed Plan for the cleanup of residual groundwater contamination beneath Travis Air Force Base (AFB), California. The meeting will be held at the office of the Northern Solano County Association of Realtors, 3690 Hilborn Street, Fairfield, California, on October 18, 2012, at 7:00 p.m.

Chlorinated solvents and pesticides from discontinued base activities are present in groundwater at 19 locations. Cleanup began in the late 1990's using standard groundwater extraction and treatment (GET) methods, which have extracted over 1.3 billion gallons of water and removed almost 12,000 pounds of contaminants to date. No risks are associated with the groundwater contaminants because people and animals do not consume it or bathe in the water. Nonetheless, the remaining contaminants represent a potential health threat and must be cleaned up.

The Proposed Plan explains the Air Force's preference to transition from GET to methods that use less electricity, cost less, and will complete the groundwater cleanup. To identify the most effective cleanup technology for each location, environmental specialists compared the merits and limitations of monitored natural attenuation and enhanced attenuation (natural biological, chemical and physical processes), mulch-based biological treatment (bioreactor), engineered tree plantings (phytoremediation), and vegetable oil injections that break down contaminants into harmless compounds. They also looked at GET and passive skimming that physically remove contaminants from groundwater. The proposed cleanup alternatives are: (1) No Further Action, (2) Monitored Natural Attenuation, (3) GET, (4) Bioreactor and GET, (5) Emulsified Vegetable Oil (EVO) and Enhanced Attenuation (EA), (6) Bioreactor, Phytoremediation, EVO Permeable Reactive Barrier, and EA, and (7) Passive Skimming and EA.

Community members are encouraged to read the Proposed Plan at the Vacaville Cultural Center and Fairfield Civic Center libraries, or obtain an electronic copy from the Travis AFB Environmental Public Website at (http://www.travis.af.mil/enviro/library), and provide comments during the public comment period from October 10 to November 9, 2012. All comments must be postmarked or received by November 9, 2012. Send written comments to either:

Environmental Restoration Program, 60 AMW/PA Ms. Merrie Schilter-Lowe 400 Brennan Circle Travis AFB, CA 94535	or	California Department of Toxic Substances Control Mr. Jose Salcedo 8800 Cal Center Drive Sacramento, CA 95826

Oral and written comments will also be accepted at the public meeting.

After reviewing and considering all public comments on the Air Force proposed remedies, the selection of the final groundwater cleanup actions for each restoration site will be documented in a formal legal report know as a Record of Decision. The Air Force will carry out the groundwater cleanup actions under the oversight of the U.S. Environmental Protection Agency, the California Department of Toxic Substances Control and the San Francisco Bay Regional Water Board.

A meeting of the Travis AFB Restoration Advisory Board will immediately follow the public meeting. For more information, contact Ms. Merrie Schilter-Lowe at (707) 424-0132 or Mr. Jose Salcedo at (916) 255-3741.

Appendix C
Summary of ARARs and TBCs

TABLE C-1
Chemical-specific ARARs
Groundwater Record of Decision, Travis Air Force Base, California

Remedy Components/ Alternatives	Sites	Requirement	Citation	Federal, or State Requirement	Description	ARAR Determination	Comments
Groundwater treatment systems 2 – MNA 3 – GET 4 – Bioreactor and GET 5 – EVO and EA 6 – Bioreactor, Phytoremediation, EVO PRB, and EA 7 – Passive Skimming and EA	Site FT004, Site FT005, Site LF006, Subarea LF007B, Subarea LF007C, Subarea LF007D, Site LF008, Site SS015, Site SS016, Site ST027B, Site SS029, Site SS030, Site SD031, Site SD033, Site SD034, Site SS035, Site SD036, Site SD037, Site DP039, Site SD043	Primary drinking water standards (Non-zero MCLGs and MCLs)	Safe Drinking Water Act, 40 CFR Part 141, Sections 141.11, 141.50-.51, and 141.61-.62 40 CFR 300.430(e)(2)(i)(C)	Federal	MCLGs are goals under the SDWA which are set at levels at which no adverse health effects will occur and allow an adequate margin of safety. MCLs are promulgated and enforceable maximum concentrations of drinking water priority pollutants that are set as closely as feasible to MCLGs, considering best technology, treatment techniques, and other factors. The NCP states that primary drinking water standards are legally applicable only to drinking water at the tap, but are relevant and appropriate as cleanup standards for groundwater and surface water that have been determined to be current or future drinking water sources. Under CERCLA 121(d)(2)(A), remedial actions shall attain MCLGs where relevant and appropriate. The NCP provides that where an MCLG has been set at a level of zero, the MCL for that contaminant shall be attained.	Relevant and appropriate	This regulation addresses drinking water-based cleanup goals for groundwater plumes.
			22 CCR, Div. 4, Ch. 15, Articles 4, 4.5, and 5.5, Sections 64431 et seq., 64444	State	Establishes standards for public water supply systems, including primary MCLs. State MCLs must be at least as stringent as Federal MCLs. State MCLs are incorporated into State and Regional Water Quality Board Water Quality Control Plans as water quality objectives for protection of current and potential drinking water supply sources. MCLs are some of the applicable upper-end objectives for ambient ground and surface water where the water is a source of drinking water, as defined in the Water Quality Control Plans.		
Groundwater treatment systems and treatment system effluent discharged to surface water 2 – MNA 3 – GET 4 – Bioreactor and GET 5 – EVO and EA 6 – Bioreactor, Phytoremediation, EVO PRB, and EA 7 – Passive Skimming and EA	Site FT004, Site FT005, Site LF006, Subarea LF007B, Subarea LF007C, Subarea LF007D, Site LF008, Site SS015, Site SS016, Site ST027B, Site SS029, Site SS030, Site SD031, Site SD033, Site SD034, Site SS035, Site SD036, Site SD037, Site DP039, Site SD043	Policies and Procedures for Investigation and Cleanup and Abatement	SWRCB Resolution No. 92-49. (23 CCR 2900) Water Code Sections 13140, 13240, 13304, and 13307	State	State Board Resolution No. 92-49 establishes policies and procedures for the oversight of investigation and cleanup and abatement activities resulting from discharges of waste which affect or threaten water quality. It requires cleanup of all waste discharged and restoration of affected water to background conditions (i.e., the water quality that existed before the discharge). Requires actions for cleanup and abatement to conform to Resolution No. 68-16, (Anti-degradation Policy) water quality control plans and policies, and applicable provisions of California Code of Regulations, Title 23, Division 3, Chapter 15 (Discharges of Hazardous Waste to Land) as feasible.	TBC	See Joint AF/State, AF, State, EPA position comments 1 below.
Treatment system effluent discharged to surface water 3 – GET 4 – Bioreactor and GET	Site FT005, Subarea LF007C, Site SS029, Site SS030 Site SS016	California Toxics Rule	40 CFR 131.38	Federal	Establishes criteria for priority toxic pollutants in the State of California for inland surface waters and enclosed bays and estuaries that apply to all waters assigned any aquatic life or human health use classifications in a Basin Plan. The criteria apply concurrently with any criteria adopted by the State, except when State regulations contain criteria which are more stringent for a particular parameter and use, or except as provided in specific exceptions	Applicable	These criteria are subject to the State's general rules of applicability in the same way and to the same extent as are other Federally-adopted and State-adopted numeric toxics criteria. They will be reflected in effluent limitations established for discharges of extracted groundwater or from groundwater treatment plants.

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Remedy Components/ Alternatives	Sites	Requirement	Citation	Federal, or State Requirement	Description	ARAR Determination	Comments
Groundwater treatment systems and treatment system effluent discharged to surface water 2 – MNA 3 – GET 4 – Bioreactor and GET 5 – EVO and EA 6 – Bioreactor, Phytoremediation, EVO PRB, and EA 7 – Passive Skimming and EA	Site FT004, Site FT005, Site LF006, Subarea LF007B, Subarea LF007C, Subarea LF007D, Site LF008, Site SS015, Site SS016, Site ST027B, Site SS029, Site SS030, Site SD031, Site SD033, Site SD034, Site SS035, Site SD036, Site SD037, Site DP039, Site SD043	Water Quality Control Plan, San Francisco Bay Basin (Basin Plan) Ch. 2, Beneficial Uses Ch. 3, Water Quality Objectives	23 CCR 3912 Water Code Sections 13140 and 13240	State	The Porter-Cologne Water Quality Control Act establishes authority of the SWRCB and RWQCB to regulate discharges into Waters of the State. The Basin Plan establishes beneficial uses and the water quality criteria based upon such uses (water quality objectives). The Basin Plan serves to protect the beneficial uses and water quality of the surface and groundwater in the San Francisco Bay Basin. Beneficial uses of Union Creek and downstream receiving waters include navigation, contact and non-contact recreation, fish spawning, warm freshwater habitat, and wildlife habitat Beneficial uses of groundwater in the Suisun-Fairfield Valley Basin are municipal and domestic water supply, industrial process water supply, industrial service water supply and agricultural water supply. Selected water quality objectives from the following lists potentially apply: Table 3-1, Water Quality Objectives for Coliform Bacteria Table 3-2, U.S. EPA Bacteriological Criteria for Water Contact Recreation Table 3-4, Freshwater Water Quality Objectives for Toxic Pollutants for Surface Waters Table 3-5, Water Quality Objectives for Municipal Supply Table 3-6, Water Quality Objectives for Agricultural Supply	TBC	See Joint AF/State, AF, State, EPA position comments 2 below.
Groundwater treatment systems and treatment system effluent discharged to surface water 2 – MNA 3 – GET 4 – Bioreactor and GET 5 – EVO and EA 6 – Bioreactor, Phytoremediation, EVO PRB, and EA 7 – Passive Skimming and EA	Site FT004, Site FT005, Site LF006, Subarea LF007B, Subarea LF007C, Subarea LF007D, Site LF008, Site SS015, Site SS016, Site ST027B, Site SS029, Site SS030, Site SD031, Site SD033, Site SD034, Site SS035, Site SD036, Site SD037, Site DP039, Site SD043	Sources of Drinking Water Policy	SWRCB Resolution 88-63	State	Designates all ground and surface water of the state of California as potential drinking water with certain exceptions	TBC	See Joint AF/State, AF, State, EPA position comments 3 below.
Groundwater treatment systems and treatment system effluent discharged to surface water 2 – MNA 3 – GET 4 – Bioreactor and GET 5 – EVO and EA 6 – Bioreactor, Phytoremediation, EVO PRB, and EA 7 – Passive Skimming and EA	Site FT004, Site FT005, Site LF006, Subarea LF007B, Subarea LF007C, Subarea LF007D, Site LF008, Site SS015, Site SS016, Site ST027B, Site SS029, Site SS030, Site SD031, Site SD033, Site SD034, Site SS035, Site SD036, Site SD037, Site DP039, Site SD043	Anti-degradation Policy	SWRCB Resolution No. 68-16 23 CCR 2900	State	Requires that high quality surface and ground waters be maintained to the maximum extent possible. Degradation of waters will be allowed (or allow to remain) only if it is consistent with the maximum benefit to the people of the state, does not unreasonably affect present and anticipated beneficial uses, and does not result in water quality less than that prescribed in the RWQCB and SWRCB policies. If degradation is allowed, the discharge must meet best practicable treatment or control, which must prevent pollution or nuisance and result in the highest water quality consistent with maximum benefit to the people of the state.	TBC	See Joint AF/EPA/State, AF, State position comments 4 below.

TABLE C-1
Chemical-specific ARARs
Groundwater Record of Decision, Travis Air Force Base, California

Joint AF/State, AF, State, EPA Position Comments

Citation	Position Comments
1. SWRCB Resolution No. 92-49	1. Joint AF/State Comments: AF and State disagree on whether Res 92-49 is a potential ARAR. As a practical matter, AF and State have been able to reach agreement on cleanup levels at specific sites. Although AF believes it is not required to do so, AF has conducted TEFAs to demonstrate that achievement of background levels is infeasible. TEFAs may be conducted as a part of the Feasibility Study if appropriate. Another option is to designate an interim cleanup level (such as an MCL) in the Record of Decision and conduct a TEFA after that interim cleanup level is achieved. 2. AF Comments: In so far as Resolution 92-49 establishes a process for the RWQCB to follow, it is not applicable to the AF. However, the AF will accept the Resolution as a TBC. CERCLA and the NCP require that clean-up levels are to be protective, based on the identified risk to human health and the environment. Background levels are not risk based or necessary to protect human health and the environment. Investigation requirements are pre-remedy and therefore are not ARARs, because ARARs specify clean up levels and standards of control a remedy must attain not the investigation of a site. AF conducts site investigations in accordance with the CERCLA process. The AF conducted a TEFA in conjunction with the Travis AFB Groundwater Focused Feasibility Study which demonstrated that achievement of background levels is infeasible. 3. State Comments: It is the Regional Water Board's position that Res. 92-49 is an applicable ARAR, because according to CERCLA, state ARARs can be those that are more stringent than federal law. In addition, Res. 92-49 has language nearly identical to federal regulations that are also ARARs for groundwater cleanups. 4. EPA Comments: Resolution 92-49 outlines the policies and procedures that the Regional Water Boards are required to apply for the investigation and cleanup and abatement of discharges subject to Section 13304 of the California Water Code. It is EPA's position that only Section IIIG of Resolution 94-49 is "relevant and appropriate" for the Travis groundwater remedies. Because this is a narrative standard, the AF, as the lead Agency, needs to exercise its discretion to choose the cleanup level, giving deference to the State's interpretation of its own requirements. Section III.G therefore sets a level or standard of control, albeit a narrative one, and therefore is "substantive" and meets the first criterion for being an ARAR. The second criterion, promulgation, includes the requirement that a State standard be of general applicability and that it be legally enforceable. By its terms, Resolution 92-49 appears to be applicable to all circumstances covered by the requirement, not just to Superfund sites. Resolution 92-49 was issued in accordance with state procedural laws and is enforceable by means of orders issued by the Regional Water Boards under the authority of California Water Code Section 13304. The substantive portions of Resolution 92-49 therefore appear to have been "promulgated." Finally, Section III.G may be more stringent than the federal MCLs, depending on the factual circumstances, and therefore meets the final ARAR criterion.
2. 23 CCR 3912, Water Code Sections 13140, 13240	1. Joint AF/State Comments: The beneficial use designations in the basin plan apply to restoration actions for purposes of determining cleanup level. Potential ARARs are water quality objectives (WQOs) for bacteria (2.2 organisms per 100 ml), chemical constituents based on State MCLS (if more stringent than Federal MCLs). Baseline risk assessment will evaluate cumulative human health and ecological risk and assist in identifying needs for risk reduction. AF and State disagree on whether Narrative Toxicity Objective could be an ARAR. 2. AF Comments: Beneficial use designation is not an ARAR, because it does not set a numeric standard. AF accepts the beneficial use designations in the basin plan for purposes of determining cleanup level. AF reserves the right to challenge beneficial use designations as provided for by state law. The following are probably not ARARs: WQOs for chemical constituents based on secondary MCLs if not risk-base; WQOs for taste, odor (not risk-based) narrative WQO for toxicity (vague and does not set a numerical standard). In evaluating other provisions, such as those regarding beneficial uses other than drinking water (MUN), AF would consider whether the provision is related to the beneficial use; is risk-based; is numeric; and is chemical-specific or location-specific. Water quality objectives in Tables 3-1, 3-2, and 3-4 potentially apply to discharges to Union Creek. Water quality objectives based on State MCLs (if more stringent than Federal MCLs) and other risk-based water quality objectives in Tables 3-5 and 3-6 potentially apply to groundwater. 3. State Comments: It is the Regional Water Board's position that the Basin Plan is not a TBC requirement, but an ARAR. The Basin Plan is the master policy document adopted by the Regional Water Board and approved by the Office of Administrative Law and the US EPA. The Basin Plan is an applicable requirement for discharge of treated groundwater. The ROD should include a narrative description identifying the beneficial uses. The beneficial uses are the key to identifying numeric standards necessary to protect the uses. ARARs are defined in CERCLA as "standard, requirement, criteria or limitation." It says nothing about "numeric standards." The State reserves the right to assure that all beneficial uses are protected as required by state and federal law. Narrative objectives are ARARs. How they are interpreted is addressed in the NCP and its preamble and also discussed in the EPA resolution of the Mather/George AFB dispute. With respect to taste and odor- although "secondary MCLs" they are still ARARs because taste and odor can interfere with the use of water. For example, MTBE has a strong odor at very low concentrations; some pesticides impart strong taste, etc. There is nothing in CERCLA that says that state requirements are not ARARs if they are not risk-based. State disagrees that Narrative Toxicity Objective is not an ARAR. The NCP clearly states that narrative standards are ARARs. Also see 40 CFR 122.44(d) which discusses implementation of narrative standards for discharges to surface water. The States are required to have a narrative toxicity objective for surface water in their basin plans. If EPA can require for surface water, states can certainly adopt for groundwater under state sovereign authority. State ARARSs are those standards that are more stringent than federal law, so if state adopts a narrative standard that is more stringent than federal law, it can be an ARAR. 4. EPA Comments: With regard to the Porter-Cologne Water Quality Control Act, it is EPA's position that the Act itself is not an ARAR; rather, it is an enabling statute that authorizes the SWRCB to regulate activities which may affect the quality of the waters of the State. With regard to the Basin Plan, it is the EPA's position that only those parts of the Basin Plan which set out the designated uses (Chapter 2, beneficial uses) and the water quality criteria based upon such uses (Chapter 3, water quality objectives) meet the NCP definition of substantive standards. Therefore, EPA believes that the designated beneficial uses and water quality criteria are "applicable" to the selected remedies at Travis.
3. SWRCB Resolution No. 88-63	1. Joint AF/State Comments: The beneficial use designations in the basin plan apply to restoration actions for purposes of determining cleanup levels. 2. AF Comments: Resolution 88-63 is not an applicable requirement, because it applies only to RWQCBs. Nor is it relevant or appropriate in that it is procedural and does not establish substantive requirements for remediation. AF accepts the beneficial use designations in the basin plan for purposes of determining cleanup levels. AF reserves the right to challenge beneficial use designations as provided for by state law. 3. State Comments: It is the Regional Water Board's position that Resolution 88-63 is an applicable ARAR, because the beneficial use designations in the Basin Plan apply to restoration actions at Travis AFB. 4. EPA Comments: It is EPA's position that SWRCB Resolution 88-63 is "applicable" at Travis, because it provides specific numbers for what is or is not a drinking water source, and therefore is not just procedural. While Resolution 88-63 initially requires the Regional Water Boards to designate the uses of surface and ground waters in its Basin Plan, the Regional Water Boards have done this through issuance of their respective Basin Plans, so EPA does not consider the resolution a directive just to the Regional Water Boards. The specific surface and ground water designations are now "applicable" to all persons.
4. SWRCB Resolution No. 68-16	1. Joint AF/EPA/State Comments: Res. 68-16 is a potential ARAR for the discharge and/or reinjection of treated effluent into existing high quality surface water or groundwater. This is based on the EPA decision resolving a dispute between EPA, AF and State at Mather/George AFBs. Res. 68-16 is not an ARAR for determining cleanup levels. EPA, AF and State disagree on whether Res. 68-16 is a potential ARAR for the treatment of ground water via injection of treatment media. 2. AF Comments: General AF position is Res. 68-16 is not an ARAR because it does not meet NCP criteria of enforceability and general applicability because it is directed to state agencies. It is also not relevant or appropriate because background level may be zero or a level not related to risk. AF also believes Res. 68-16 is not an ARAR for injection of media to groundwater, because treatment media is not a waste under Water Code Section 13050(d). 3. State Comments: Res 68-16 is a promulgated standard that applies to discharges of waste to ground or surface water. It requires use of best practical treatment or control to achieve a level between background and the water quality standard. Res. 68-16 does apply to treatment via injection of treatment media. The injection can result in unintended consequences that can increase concentrations of constituents or form new compounds. The Regional Water Boards have adopted permits and other approvals of reinjection and found those to be generally consistent with Res. 68-16.

TABLE C-1
Chemical-specific ARARs
Groundwater Record of Decision, Travis Air Force Base, California

Notes:

AF = Air Force
AFB = Air Force Base
ARAR = Applicable or Relevant and Appropriate Requirement
BAAQMD = Bay Area Air Quality Management District
Basin Plan = Water Quality Control Plan for San Francisco Bay Region
CCR = California Code of Regulations
CDFG = California Department of Fish and Game
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
Ch. = Chapter
CWC = California Water Code
Div. = Division
EPA = Environmental Protection Agency
gpd = gallon(s) per day
H&S = health and safety
IC = institutional control
ID = identification
LDR = land disposal restriction
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
NCP = National Contingency Plan
NWP = Nationwide permit
ppm = part(s) per million
RCRA = Resource Conservation and Recovery Act
ROD = Record of Decision
RWQCB = Regional Water Quality Control Board
SDWA = Safe Drinking Water Act
STLC = soluble threshold limit concentration
SWRCB = State Water Resources Control Board
TBC = To Be Considered
TCLP = toxic characteristic leaching procedure
TDS = total dissolved solids
TEFA = Technical and Economic Feasibility Analysis
TTLC = total threshold limit concentration
UIC = Underground Injection Control
U.S.C. = United States Code
UTS = universal treatment standard

TABLE C-2
Location-specific ARARs
Groundwater Record of Decision, Travis Air Force Base, California

Location/Alternatives	Sites	Requirement	Citation	Federal, or State Requirement	Description	ARAR Determination	Comments
Critical habitat upon which endangered species or threatened species depend 2 – MNA 3 – GET 4 – Bioreactor and GET 5 – EVO and EA 6 – Bioreactor, Phytoremediation, EVO PRB, and EA 7 – Passive Skimming and EA	Site FT004, Site FT005, Site LF006, Subarea LF007B, Subarea LF007C, Subarea LF007D, Site LF008, Site SS015, Site SS016, Site ST027B, Site SS029, Site SS030, Site SD031, Site SD033, Site SD034, Site SS035, Site SD036, Site SD037, Site DP039, Site SD043	Endangered Species Act	16 USC Section 1531(c)	Federal	Requires action to conserve endangered species and critical habitats upon which endangered species depend. Includes consultation with the Dept of Interior.	Applicable	Activities at remedial sites must be performed in such a manner as to identify the presence of and protect endangered or threatened plants and animals at the site. Species at Travis AFB include the California tiger salamander, vernal pool fairy shrimp, Contra Costa goldfields, and vernal pool tadpole shrimp.
Wildlife habitat 2 – MNA 3 – GET 4 – Bioreactor and GET 5 – EVO and EA 6 – Bioreactor, Phytoremediation, EVO PRB, and EA 7 – Passive Skimming and EA	Site FT004, Site FT005, Site LF006, Subarea LF007B, Subarea LF007C, Subarea LF007D, Site LF008, Site SS015, Site SS016, Site ST027B, Site SS029, Site SS030, Site SD031,Site SD033, Site SD034, Site SS035, Site SD036,Site SD037, Site DP039, Site SD043	Migratory Bird Treaty Act	16 USC Section 703	Federal	Prohibits unlawful taking, possession, and sale of almost all species of native birds in the U.S.	Applicable	Species at Travis AFB include many species of birds, including ducks, geese, and tri-colored blackbirds.

Notes:

AFB = Air Force Base
ARAR = Applicable or Relevant and Appropriate Requirement
USC = United States Code

TABLE C-3
Action-specific ARARs
Groundwater Record of Decision, Travis Air Force Base, California

Remedy Component/ Alternatives	Sites	Requirement	Citation	Federal or State Requirement	Description	ARAR Determination	Comments
Discharges to surface water 3 – GET 4 – Bioreactor and GET	Site FT005, Subarea LF007C, Site SS029, Site SS030 Site SS016	Effluent requirements for discharges to surface water	40 CFR Part 122.41(d) and (e), 122.41(j)(1), (3) and (4), 122.41(l)(6), 122.44((a), (b)(1), (d), (e), and (i), 122.45(a), (d) and (f), 122.48(a) and 122.48(b)	Federal	Establishes requirements to ensure that discharges to surface water do not contribute to a violation of surface water quality standards, including effluent limitations, monitoring and reporting requirements, and the requirement to comply with effluent requirements for discharges to surface water.	Applicable	Applicable at all sites where there will be discharge of extracted or treated groundwater to surface water via the storm water system or to Union Creek. The SWRCB is authorized to implement the NPDES program in the State of California. California Regional Water Quality Control Board, San Francisco Bay Region Order No. R2-2009-0059, NPDES NO. CAG912003, General Waste Discharge Requirements for Discharge or Reuse of Extracted and Treated Groundwater Resulting From the Cleanup of Groundwater Polluted by Volatile Organic Compounds, establishes substantive discharge standards. Only the substantive portions from Subpart C, 40 CFR Part 122.41-48, including the listed citations in this table are ARARs; reporting requirements and other procedural or administrative requirements are not ARARs.
Contaminated groundwater containing hazardous waste; remediation waste 3 – GET 4 – Bioreactor and GET	Site FT005, Subarea LF007C, Site SS029, Site SS030 Site SS016	Definition of and criteria for identifying hazardous wastes	22 CCR, Div. 4.5, Ch. 11	State	Defines wastes that are subject to regulation as a RCRA or non-RCRA hazardous waste. Remediation waste (contaminated soil, extracted groundwater, spent carbon and other residuals from onsite groundwater treatment systems, recovered free product, etc.) must be classified using AF knowledge of the timing and nature of the release as well as waste toxicity characteristic testing. If, after good faith effort, the AF determines that the contaminated soil or groundwater contains a listed RCRA or non-RCRA hazardous waste or exhibits hazardous waste characteristics, then the excavated soil or extracted groundwater is considered hazardous based on EPA's "contained-in" policy and must be managed as hazardous remediation waste. Contaminated soils or groundwater treated in situ are not subject to the identification or classification requirements.	Applicable	The definitions of hazardous waste in Article 1 and toxicity characteristic criteria in Section 66261.24 are applicable for the characterization of remediation waste. Treated groundwater from onsite groundwater treatment systems will no longer be hazardous waste and will be subject to the facility's discharge permit limits. Spent carbon will be tested, as necessary, prior to offsite disposal or regeneration.
Remediation waste 3 – GET 4 – Bioreactor and GET	Site FT005, Subarea LF007C, Site SS029, Site SS030 Site SS016	Standards applicable to generators of hazardous waste	22 CCR, Div. 4.5, Ch. 12	State	These regulations apply to generators of hazardous waste. Travis AFB is a large quantity generator of hazardous waste and already subject to these requirements. Establishes standards for generators of RCRA and non-RCRA hazardous wastes, including those for hazardous waste determination, accumulation, identification numbers, manifesting, pre-transport, and record keeping and reporting requirements.	Applicable	Substantive requirements are applicable to waste generated (contaminated soil, extracted groundwater, spent carbon and other residuals from onsite groundwater treatment systems, recovered free product, etc.) as part of groundwater remedies if these wastes are hazardous.
Remediation waste 3 – GET 4 – Bioreactor and GET	Site FT005, Subarea LF007C, Site SS029, Site SS030 Site SS016	Hazardous waste land disposal restrictions	22 CCR, Div. 4.5, Ch. 18	State	Identifies hazardous wastes that are restricted from land disposal without prior treatment. Characteristic hazardous remediation wastes that are managed offsite are subject to the LDR UTS specified in Section 66268.48 for wastewater (liquid) and non-wastewater (solid). Hazardous soils must be treated to 90 percent reduction in concentration capped at 10 times the UTS for principal hazardous constituents prior to land disposal.	Applicable	LDR requirements are applicable to offsite disposal of remediation wastes if they contain RCRA-listed hazardous wastes, exhibit RCRA hazardous waste characteristics, or are specified non-RCRA hazardous wastes.

TABLE C-3
Action-specific ARARs
Groundwater Record of Decision, Travis Air Force Base, California

Remedy Component/ Alternatives	Sites	Requirement	Citation	Federal or State Requirement	Description	ARAR Determination	Comments
Institutional controls 2 – MNA 3 – GET 4 – Bioreactor and GET 5 – EVO and EA 6 – Bioreactor, Phytoremediation, EVO PRB, and EA 7 – Passive Skimming and EA	Site FT004, Site FT005, Site LF006, Subarea LF007B, Subarea LF007C, Subarea LF007D, Site LF008, Site SS015, Site SS016, Site ST027B, Site SS029, Site SS030, Site SD031, Site SD033, Site SD034, Site SS035, Site SD036, Site SD037, Site DP039, Site SD043	Institutional controls	22 CCR 67391.1(a), (b), and (e)(2) Calif. Civil Code Section 1471, a and b	State	Requires that if a remedy will result in hazardous substances remaining on a property at levels not suitable for designated beneficial uses of groundwater (domestic, municipal, agricultural, and industrial supply) as well as unlimited use and unrestricted exposure, the limitations or controls are clearly set forth and defined in the response action decision document, and that the decision document include an implementation and enforcement plan. In the event of a property transfer, requires the State to enter into restrictive land use covenants with land-owners and their successors under such circumstances, with exceptions for federal-to-federal property transfers.	Relevant and appropriate	If a remedy at property owned by the federal government will result in levels of hazardous substances remaining on the property at levels not suitable for designated beneficial uses of groundwater (domestic, municipal, agricultural, and industrial supply) as well as unlimited use and unrestricted exposure, and it is not feasible, as is the case with these groundwater sites that may be subject to LUCs, to record a land use covenant, then the ROD will clearly define and include limitations on land use and other institutional control mechanisms to ensure that future land use will be compatible with the levels of hazardous substances remaining on the property. This ROD sets forth such LUCs in Section 2.12.2.8. It is EPA's position that only 22 CCR 67391 (a) (d) and (e) are substantive provisions that are potentially relevant and appropriate.
Remediation waste 3 – GET 4 – Bioreactor and GET	Site FT005, Subarea LF007C, Site SS029, Site SS030 Site SS016	Hazardous waste container management requirements	22 CCR Division 4.5, Ch. 15, Article 9	State	Establishes requirements for managing hazardous waste containers, including maintaining containers in good condition, keeping containers closed, and minimum setback distances for containers of ignitable or reactive waste	Applicable	Applicable to hazardous waste generated during remediation activities, including waste generated by groundwater treatment systems.
Groundwater treatment systems and hazardous remediation waste 3 – GET 4 – Bioreactor and GET	Site FT005, Subarea LF007C, Site SS029, Site SS030 Site SS016	Corrective action temporary units	22 CCR 66264.553	State	Establishes requirements for Corrective Action Temporary Units for temporary storage or treatment of hazardous remediation waste in tanks and containers. Temporary units are subject to alternative design, operating, and closure standards set by DTSC. Temporary units may operate for up to one year with the opportunity for a one year extension.	Applicable	Applicable to groundwater treatment in tanks and storage of remediation waste in tanks and containers if temporary units are authorized as part of the remediation.
Groundwater treatment systems 3 – GET 4 – Bioreactor and GET	Site FT005, Subarea LF007C, Site SS029, Site SS030 Site SS016	Air emissions standards for hazardous waste process vents	22 CCR Div. 4.5, Ch. 14, Article 27, Sections 22264.1032-.1035	State	Establishes requirements for process vents associated with equipment storing or treating hazardous waste, including emission limits when process vents are used; standards for closed vent systems and control devices; test methods and procedures for closed vent systems; record keeping requirements and performance and design analysis/ parameters for closed vent systems.	Relevant and appropriate	Relevant and appropriate to alternatives where closed vent systems are used. This includes sites with remediation systems that have system vents, to include air strippers, UV oxidation, carbon treatment vessels and catalytic oxidation equipment.
Groundwater treatment systems 3 – GET 4 – Bioreactor and GET	Site FT005, Subarea LF007C, Site SS029, Site SS030 Site SS016	New source review for sources requiring air permits	BAAQMD Rule 2-2 Section 112	State	Establishes exemptions for secondary pollutant emissions from abatement control equipment that complies with BACT or BARCT requirements.	Applicable	Applicable to actions where BARCT or BACT abatement devices are used (i.e., carbon adsorption is used together with catalytic oxidation or UV oxidation or ion exchange) but where secondary emissions from the abatement equipment still exist.
Groundwater treatment systems 3 – GET 4 – Bioreactor and GET	Site FT005, Subarea LF007C, Site SS029, Site SS030 Site SS016	New source review for sources requiring air permits	BAAQMD Rule 2-2 Section 301	State	Establishes BACT requirement for new sources emitted in excess of 10 lbs/day of non-precursor organic compounds, precursor organic compounds, NO_x, SO_x, PM_{10}, and CO_2.	Applicable	Applicable to actions with potential to discharge to air. Not applicable for permitting requirements or authority to construct. Applicable for determining the applicability of BACT to a new source. Remedial alternatives using air strippers must ensure BACT is used (i.e., catalytic oxidation with carbon adsorption) to control emissions in excess of levels specified in the rule.

TABLE C-3
Action-specific ARARs
Groundwater Record of Decision, Travis Air Force Base, California

Remedy Component/ Alternatives	Sites	Requirement	Citation	Federal or State Requirement	Description	ARAR Determination	Comments
Construction activities 3 – GET 4 – Bioreactor and GET 5 – EVO and EA 6 – Bioreactor, Phytoremediation, EVO PRB, and EA	Site FT005, Subarea LF007C, Site SS029, Site SS030 Site SS016 Sites SS015, SD036, SD037 Site DP039	Visible emissions	BAAQMD Rule 6-1, Sections 301, 302, 303, and 501	State	Establishes visible emissions limits of 20 percent opacity or Ringlemann 1 for all sources except specified engines, laboratory equipment, and brazing, soldering and welding equipment, which are limited to 40 percent opacity or Ringlemann 2. Sets requirements for sampling facilities and instruments.	Applicable	Applicable to sites where excavation or construction activities have the potential to release particulate matter into the air (i.e., dirt and dust), or at sites where portable soldering, brazing, welding equipment is used. Also applicable at sites where portable combustion engines of < 25 liters of displacement are used.
7- Passive skimming and EA	Site SD034	Standards for Owners and Operators of Hazardous Waste Transfer, Treatment, Storage, and Disposal Facilities – Use and Management of Containers	Title 22 CCR, Sections 66264.171 through 66264.177	State	Section 66264.171: Sets standards for containers holding hazardous waste for chemicals recovered from sediments, surface soils, or groundwater. Section 66264.172: Requires use of containers that are compatible with the recovered material for the storage of that material. Section 66264.173: Requires containers used to transport material to be closed during transport and that waste be handled to minimize damage to containers. Section 66264.174: Establishes requirements for inspecting containers weekly. Section 66264.175: Establishes requirement for adequate secondary containment for stored waste. Section 66264.176: Requires isolating waste from sources of ignition if waste is ignitable. Section 66264.177: Requires segregation of waste from incompatible waste. Section 66264.178: Establishes the requirement to remove all hazardous waste and waste residue at closure.	Relevant and appropriate	Sections 66264.171 through 66264.177 in this article are relevant and appropriate to sites or actions where waste containers are used. Containers will be used to transfer and store wastes generated from construction activities or the operation of remedial actions, i.e. free product removed from the plume at SD034. Section 66264.178 is relevant and appropriate when sites are closed and wastes or residue, as described above, are on-site at closure.

Notes:

AF = Air Force
AFB = Air Force Base
ARAR = Applicable or Relevant and Appropriate Requirement
BAAQMD = Bay Area Air Quality Management District
BACT = best available control technology
BARCT = best available retrofit control technology
CCR = California Code of Regulations
CFR = Code of Federal Regulations
Ch. = Chapter
CO_2 = carbon dioxide
Div. = Division
DTSC = Department of Toxic Substances Control
EA = enhanced attenuation
EPA = Environmental Protection Agency
EVO = emulsified vegetable oil
GET = groundwater extraction and treatment
lbs/day = pound(s) per day
LDR = land disposal restriction
LUC = land use control
MNA = monitored natural attenuation
NCP = National Contingency Plan
NO_x = nitrogen oxides
NPDES = National Pollutant Discharge Elimination System
PM_{10} = particulate matter
PRB = permeable reactive barrier
RCRA = Resource Conservation and Recovery Act
ROD = Record of Decision
SO_x = sulfur oxides
SWRCB = State Water Resources Control Board
UTS = universal treatment standard
UV = ultraviolet

Appendix D
Remedy Cost Estimates

TABLE D-1
Site FT004 Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Interim Action – GET/MNA

Extraction Well	Average Flow (gpm)	Average Energy (kWh)/mo	Cost ($)/kWh	Estimated Cost ($)/mo	Estimated Cost ($)/yr
EW576x04	2.2	206	0.07	14.42	173.04
EW577x04	1.8	206	0.07	14.42	173.04
EW578x04	0.7	206	0.07	14.42	173.04
EW579x04	1.0	206	0.07	14.42	173.04
EW580x04	1.3	206	0.07	14.42	173.04
EW621x04	3.2	206	0.07	14.42	173.04
EW622x04	1.8	206	0.07	14.42	173.04
EW623x04	1.1	206	0.07	14.42	173.04
Total	**13.1**	**1,648**		**115.36**	**$1,384**

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	Total Cost ($)/Yr
10	3	$188	$63	$2,703

Total Cost/yr of Interim **$4,088**

Pump Replacement

Interval	Equipment Cost	Labor Cost	Total
5 years	$1,700	$454	$2,154

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-35	$143,080	$4,088	22.0646	$90,200
Periodic	5	$17,232	$17,232	0.8753	$15,083
Periodic	10	$17,232	$17,232	0.7661	$13,201
Periodic	15	$17,232	$17,232	0.6706	$11,556
Periodic	20	$17,232	$17,232	0.5869	$10,113
Periodic	25	$17,232	$17,232	0.5137	$8,852
Periodic	30	$17,232	$17,232	0.4497	$7,749
Periodic	35	$17,232	$17,232	0.3936	$6,783
		$263,704			**$163,538**

TABLE D-1

Site FT004 Cost Estimate

Groundwater Record of Decision, Travis Air Force Base, California

Selected Alternative	**2**			
# of Wells in Network	**# of QA/QC Samples**	**$ to Sample/Well**	**VOC Analysis**	**Total Cost ($)/Yr**
10	3	$188	$63	$2,703

Total Cost/yr Alternative	**$2,703**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-35	$94,605	$2,703	22.0646	$59,641
		$94,605			**$59,641**

TABLE D-2
Site FT005 Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Interim Action – GET

Extraction Well	Average Flow (gpm)	Average Energy (kWh)/mo	Cost ($)/kWh	Estimated Cost ($)/mo	Estimated Cost ($)/yr
EW01x05	1.4	206	0.07	14.42	173.04
EW02x05	2.1	206	0.07	14.42	173.04
EW03x05	3.2	206	0.07	14.42	173.04
EW731x05	0.8	206	0.07	14.42	173.04
EW732x05	2.2	206	0.07	14.42	173.04
EW733x05	0.7	206	0.07	14.42	173.04
EW734x05	11.0	206	0.07	14.42	173.04
EW735x05	4.5	206	0.07	14.42	173.04
EW736x05	3.3	206	0.07	14.42	173.04
EW737x05	3.5	206	0.07	14.42	173.04
EW742x05	5.3	206	0.07	14.42	173.04
EW743x05	0.5	206	0.07	14.42	173.04
EW744x05	1.0	206	0.07	14.42	173.04
EW745x05	7.5	206	0.07	14.42	173.04
EW746x05	4.4	206	0.07	14.42	173.04
Total	**51.4**	**3,090**		**216.3**	**$2,596**

Pump Replacement	Interval	Equipment Cost	Labor Cost	Total
	5 years	$1,700	$454	$2,154

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-21	$54,516	$2,596	15.8856	$41,239
Periodic	5	$32,310	$32,310	0.8753	$28,281
Periodic	10	$32,310	$32,310	0.7661	$24,753
		$119,136			**$94,273**

TABLE D-2

Site FT005 Cost Estimate

Groundwater Record of Decision, Travis Air Force Base, California

Selected Alternative **2**

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	Total Cost ($)/Yr
15	4	$188	$63	$4,024

Total Cost/yr Alternative **$4,024**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-43	$94,605	$4,024	25.2568	$101,633
		$94,605			**$101,633**

TABLE D-3
Site LF006 Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Interim Action – MNA
Selected Alternative – 2

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	TPH-G Analysis	TPH-D Analysis	Total Cost/Yr
6	2	$188	$63	$63	$73	$2,451

Total Cost/yr Interim	$2,451
Total Cost/yr Alternative	$2,451

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (1.6%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-5	$12,255	$2,451	4.8589	$11,909
		$12,255			**$11,909**

TABLE D-4
Site LF007B Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Interim Action – MNA
Selected Alternative – 2

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	Total Cost/Yr
3	1	$188	$63	$817

Total Cost/yr Interim	**$817**
Total Cost/yr Alternative	**$817**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (0%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	0	$0	$817		$0
		$0			**$0**

TABLE D-5
Site LF007C Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Interim Action - GET
Selected Alternative - 3

CAPITAL COSTS

	Unit	Unit Cost	Quantity	Line Item Cost	Total Cost	Comments
Remedial Design	EA	$15,785.54	1	$15,785.54		Includes planning, engineering, permitting, costing, and other design costs
					$15,785.54	
Extraction Well Installation						
IDW costs	EA	$1,500.00	1	$1,500.00		Bin rental and IDW disposal
Additional Cost	DAY	$200.00	4	$800.00		Consumables, H&S, equipment rental
Labor	DAY	$529.10	4	$2,116.40		One (1) person on site for 13 hr/day at a $40.7 bill rate
Well Installation	FT	$114.00	50	$5,700.00		50' of wells
Auto Mileage	DAY	$45.00	4	$180.00		Mileage to and from Travis - approx 90 miles
Development	HR	$150.00	16	$2,400.00		Development costs per hr
					$12,696.40	
Performance Monitoring Well Installation						
IDW costs	EA	$1,500.00	1	$1,500.00		Bin rental and IDW disposal
Additional Cost	DAY	$200.00	1	$200.00		Consumables, H&S, equipment rental
Labor	DAY	$529.10	1	$529.10		One (1) person on site for 13 hr/day at a $40.7 bill rate
Well Installation	FT	$48.00	50	$2,400.00		50' of wells
Auto Mileage	DAY	$45.00	1	$45.00		Mileage to and from Travis - approx 90 miles
Development	HR	$150.00	16	$2,400.00		Development costs per hr
					$7,074.10	
Mobilization/Demobilization	EA	$1,000.00	2			Two (2) mob/demob (installation and abandonment)
					$2,000.00	
Solar Equipment						
Mount	EA	$325.00	1	$325.00		Sierra Solar Systems
85 Watt Modules	EA	$305.00	4	$1,220.00		Sierra Solar Systems
Solar Pump	EA	$2,122.00	2	$4,244.00		Sierra Solar Systems
Control Box	EA	$81.00	1	$81.00		Sierra Solar Systems
Vault	EA	$2,640.00	2	$5,280.00		
					$11,150.00	
					$32,920.50	
Demolition and Removal of Treatment Plant						
Dismantle Equipment	EA	$30,000.00	1	$30,000.00		
Truck Materials to Landfill	EA	$30,000.00	1	$30,000.00		Includes trucking and landfill costs
Well Abandonment	FT	$41.00	200	$8,200.00		Overdrilling and grout included
Additional Cost	DAY	$500.00	4	$2,000.00		Consumables, H&S, equipment rental
Labor	DAY	$529.10	4	$2,116.40		One (1) person on site for 13 hr/day at a $40.7 bill rate
					$72,316.40	
					$105,236.90	

TABLE D-5
Site LF007C Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

O&M COSTS

Extraction Wells	Average Flow	Average Energy/Mo (kWh)	Cost/kWh	Estimated Cost/Mo	Estimated Cost/Yr
EW614x07	0.8	472	$0.07	$33.04	$396
EW615x07	0.8	472	$0.07	$33.04	$396
To be installed					$396
To be installed					$396
	1.6				**$1,585**

Carbon Usage Rates

4.0431	#GAC/Day
0.1404	#GAC/1,000 gal

Total Carbon in NGWTP vessels	400#
Lifecylce of carbon	100 Days
Cost to Replace	$495/vessel
# of Vessels	2
Total Cost/100 Days	$990
Total Cost/yr	$3,614

Carbon Changeout	Interval	Cost per changeout	Cost/yr
	50 Days	$1,500	**$10,950**

Labor

Field Tech Hr/Mo	Cost/Field Tech Hr	Labor Cost/Mo	Labor Cost/Yr
4	$56.72	$226.88	**$2,723**

Total O&M Cost/Yr	**$15,257.52**

Periodic Costs

Item	Interval	Equipment Cost	Labor Cost	Total
Pump Replacement	5 years	$1,700	$454	**$2,154**
Motor Control Center Repairs	5 years	$2,000	$0	**$2,000**

Present Value Analysis - Time to Cleanup: 26yrs

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$32,921	$32,921	1	$32,921
Annual O&M	1-26	$396,696	$15,258	20.3983	$311,227
Periodic	5	$10,616	$10,616	0.8753	$9,292
Periodic	10	$10,616	$10,616	0.7661	$8,133
Periodic	15	$10,616	$10,616	0.6706	$7,119
Periodic	20	$10,616	$10,616	0.5869	$6,231
Periodic	25	$10,616	$10,616	0.5137	$5,453
Capital	26	$72,316	$72,316	0.5002	$36,173
		$555,012			**$416,549**

TABLE D-6
Site LF007D Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Interim Action – MNA
Selected Alternative – 2

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	Total Cost/Yr
4	1	$188	$63	$1,069

Total Cost/yr Interim	**$1,069**
Total Cost/yr Alternative	**$1,069**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-23	$24,587	$1,069	16.9685	$18,139
		$24,587			**$18,139**

TABLE D-7
Site LF008 Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Interim Action – GET

Extraction Well	Average Flow (gpm)	Average Energy (kWh)/mo	Cost ($)/kWh	Estimated Cost ($)/mo	Estimated Cost ($)/yr
EW719x08	1.0	206	0.07	14.42	173.04
EW720x08	1.0	206	0.07	14.42	173.04
EW721x08	1.0	206	0.07	14.42	173.04
Total	**3.0**	**618**		**43.26**	**$519**

Pump Replacement	Interval	Equipment Cost	Labor Cost	Total
	5 years	$1,700	$454	$2,154

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$15,570	$519	20.3983	$10,587
Periodic	5	$6,462	$6,462	0.8753	$5,656
Periodic	10	$6,462	$6,462	0.7661	$4,951
Periodic	15	$6,462	$6,462	0.6706	$4,333
Periodic	20	$6,462	$6,462	0.5869	$3,793
Periodic	25	$6,462	$6,462	0.5137	$3,320
Periodic	30	$6,462	$6,462	0.4497	$2,906
		$54,342			**$35,545**

Selected Alternative **2**

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	Pesticide Analysis	Total Cost/Yr
8	1	$188	$84	$2,264

Total Cost/yr Alternative **$2,264**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$67,920	$2,264	20.3983	$46,182
		$67,920			**$46,182**

TABLE D-8
Site SS015 Cost Estimate for MNA
Groundwater Record of Decision, Travis Air Force Base, California

MNA

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	Total Cost ($)/Yr
10	3	$188	$63	**$2,703**

Total Cost/yr Interim **$2,703**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$2,703	$2,703	20.3983	$55,137
		$2,703			**$55,137**

TABLE D-9
Site SS015 Cost Estimate for EVO Injection and EA
Groundwater Record of Decision, Travis Air Force Base, California

CAPITAL COSTS - Technology Demonstration

	Unit	Unit Cost	Quantity	Line Item Cost	Total Cost	Comments
Injection Well Installation						
IDW costs	EA	$1,500.00	1	$1,500.00		Bin rental and IDW disposal
Additional Cost	DAY	$200.00	5	$1,000.00		Consumables, H&S, equipment rental
Labor	DAY	$533.00	5	$2,665.00		One (1) person on site for 13 hours per day at a $41 bill rate
Well Installation	FT	$114.00	250	$28,500.00		Five (5) wells 25 feet deep per well – includes installation and completion
Auto Mileage	DAY	$45.00	5	$225.00		Mileage to and from Travis AFB approximately 90 miles
Development	HR	$150.00	40	$6,000.00		Development costs per well for mob/demob and 8 hours of development
					$39,890.00	
Performance Monitoring Well Installation						
IDW costs	EA	$1,500.00	1	$1,500.00		Bin rental and IDW disposal
Additional Cost	DAY	$200.00	1	$200.00		Consumables, H&S, equipment rental
Labor	DAY	$533.00	1	$533.00		One (1) person on site for 13 hours per day at a $41 bill rate
Well Installation	FT	$48.00	60	$2,880.00		Two (2) wells 30 feet deep per well – includes installation and completion
Auto Mileage	DAY	$45.00	1	$45.00		Mileage to and from Travis AFB approximately 90 miles
Development	HR	$150.00	10	$1,500.00		Development costs per well for mob/demob and 8 hours of development
					$6,658.00	
Mobilization/Demobilization	EA	$1,000.00	1		**$1,000.00**	There will likely be one (1) mob/demob for all field work
Injection Costs						
Labor	HR	$55.00	24	$1,320.00		One (1) person at $55 per hour for 24 hours a day
Vehicle Rental	DAY	$75.00	1	$75.00		One (1) truck rental per day
Additional Cost	DAY	$200.00	1	$200.00		includes consumables, H&S, and equipment rental
					$1,595.00	
Emulsified Vegetable Oil	LB	$1.51	1,066		**$1,609.66**	Depends on stock price of vegetable oil – cost based on price in Oct 2009, weight based on design tool
Fixed Costs	EVENT	$16,160.00	1		**$16,160.00**	Includes planning, engineering, permitting, and building manifold
Utility Clearance	HRS	$157.50	2		**$315.00**	Cost is 105% of hourly cost for utility clearance during characterizatoin
Surveying Wells	WELL	$118.18	7		**$827.26**	Price from Phillippe Engineering
Total Event Costs					**$68,054.92**	

TABLE D-9
Site SS015 Cost Estimate for EVO Injection and EA
Groundwater Record of Decision, Travis Air Force Base, California

CAPITAL COSTS - Post-Demonstration Optimization

	Unit	Unit Cost	Quantity	Line Item Cost	Total Cost	Comments
Injection Well Installation						
IDW costs	EA	$1,560.00	1	$1,560.00		Bin rental and IDW disposal
Additional Cost	DAY	$208.00	5	$1,040.00		Consumables, H&S, equipment rental
Labor	DAY	$554.32	5	$2,771.60		One (1) person on site for 13 hours per day at a $41 bill rate
Well Installation	FT	$118.56	250	$29,640.00		Five (5) wells 25 feet deep per well – includes installation and completion
Auto Mileage	DAY	$46.80	5	$234.00		Mileage to and from Travis AFB approximately 90 miles
Development	HR	$156.00	40	$6,240.00		Development costs per well for mob/demob and 8 hours of development
					$41,485.60	
Performance Monitoring Well Installation						
IDW costs	EA	$1,560.00	1	$1,560.00		Bin rental and IDW disposal
Additional Cost	DAY	$208.00	1	$208.00		Consumables, H&S, equipment rental
Labor	DAY	$554.32	1	$554.32		One (1) person on site for 13 hours per day at a $41 bill rate
Well Installation	FT	$49.92	60	$2,995.20		Two (2) wells 30 feet deep per well – includes installation and completion
Auto Mileage	DAY	$46.80	1	$46.80		Mileage to and from Travis AFB approximately 90 miles
Development	HR	$156.00	10	$1,560.00		Development costs per well for mob/demob and 8 hours of development
					$6,924.32	
Mobilization/Demobilization	EA	$1,040.00	1		**$1,040.00**	There will likely be one (1) mob/demob for all field work
Injection Costs						
Labor	HR	$57.20	24	$1,372.80		One (1) person at $55 per hour for 24 hours a day
Vehicle Rental	DAY	$78.00	1	$78.00		One (1) truck rental per day
Additional Cost	DAY	$208.00	1	$208.00		includes consumables, H&S, and equipment rental
					$1,658.80	
Emulsified Vegetable Oil	LB	$1.57	1,066		**$1,674.05**	Depends on stock price of vegetable oil – cost based on price in Oct 2009, weight based on design tool
Remedial Design	EVENT	$16,806.40	1		**$16,806.40**	Includes planning, engineering, permitting, costing and other costs associated with design of injection
Utility Clearance	HRS	$163.80	2		**$327.60**	Cost is 105% of hourly cost for utility clearance during characterizatoin
Surveying Wells	WELL	$122.91	7		**$860.35**	Price from Phillippe Engineering
Total Event Costs					**$70,777.12**	

OPERATION AND MAINTENANCE

Total Sampling and Analysis Costs						
Labor and Equipment	WELL	$197.40	20	$3,948.00		Five (5) wells 2 x the first year for initial and baseline, and Five (5) wells 2 x following expansion
Analysis	WELL	$228.00	20	$4,560.00		Unit Cost based on analytes listed in work plan
					$8,508.00	

EA

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	Total Cost/Yr
6	2	$188	63	**$1,635**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$68,055	$68,055	1	$68,055
Capital	1	$70,777	$70,777	0.9737	$68,916
Annual O&M	1-30	$49,039	$1,635	20.3982	$33,344
Periodic	1	$8,508	$8,508	0.9737	$8,284
Periodic	6	$56,652	$56,652	0.8523	$48,284
Periodic	12	$56,652	$56,652	0.7264	$41,152
Periodic	18	$56,652	$56,652	0.6191	$35,073
Periodic	24	$56,652	$56,652	0.5276	$29,890
Periodic	30	$56,652	$56,652	0.4497	$25,476
		$479,639			**$358,474**

TABLE D-10

Site SS016 Cost Estimate for Interim GET System O&M

Groundwater Record of Decision, Travis Air Force Base, California

Extraction Wells	Average Flow	Average Energy/mo (kWh)	Cost/kWh	Estimated Cost/mo	Estimated Cost/yr
EW605x16	13.4	16	$0.07	$1.12	$13.44
EW610x16	2.7	16	$0.07	$1.12	$13.44
EW01x16	23.3	16	$0.07	$1.12	$13.44
EW02x16	6.8	16	$0.07	$1.12	$13.44
EW03x16	1	16	$0.07	$1.12	$13.44
TPE-W	0.05	16	$0.07	$1.12	$13.44
	47.25				**$81**

Carbon Changeout

Total Flow from EWs at SS016	Adjusted Frequency of changeout	Cost per changeout	Carbon Cost/yr	EW Cost/yr	Total GET System Cost/yr
47.25	469	$47,828	$34,436	$80.64	**$34,517**

EW Cost/Yr	**$81**

Periodic Costs

Item	Interval	Equipment Cost	Labor Cost	Total
Pump Replacement	5 years	$1,700	$454	**$2,154**
Motor Control Center Repairs	5 years	$2,000	$0	**$2,000**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$759,366	$34,517	20.3982	$704,077
Periodic	5	$14,924	$14,924	0.8753	$13,063
Periodic	10	$14,924	$14,924	0.7661	$11,433
Periodic	15	$14,924	$14,924	0.6706	$10,008
Periodic	20	$14,924	$14,924	0.5869	$8,759
Periodic	25	$14,924	$14,924	0.5137	$7,666
Periodic	30	$14,924	$14,924	0.4497	$6,711
		$819,062			**$761,718**

TABLE D-11
Site SS016 Cost Estimate for OSA Bioreactor
Groundwater Record of Decision, Travis Air Force Base, California

CAPITAL COSTS

	Unit	Unit Cost	Quantity	Line Item Cost	Total Cost	Comments
Remedial Design	EA	$39,928	1	$39,928	**$39,928**	Includes planning, engineering, permitting, costing and other costs associated with the design
Excavation						
Pre-Mobilization	Lump sum	$5,722.00	1	$5,722		Bid from ERRG
Mobilization	Lump sum	$3,900.00	1	$3,900		Bid from ERRG
Site Preparation	Lump sum	$3,350.00	1	$3,350		Bid from ERRG
Infrastructure Removal	Lump sum	$19,975.00	1	$19,975		Bid from ERRG
Excavation of Bioreactor and Backfill with Biomulch	Lump sum	$41,560.00	1	$41,560		Bid from ERRG
Relocate surface water drain	Lump sum	$6,240.00	1	$6,240		Bid from ERRG
Install bollards and chain fence	Lump sum	$11,390.00	1	$11,390		Bid from ERRG
Install monitoring well	Lump sum	$1,450.00	1	$1,450		Bid from ERRG
Demobilization/Site Clean up	Lump sum	$3,460.00	1	$3,460		Bid from ERRG
					$97,047.00	
Materials						
Biomulch	Cu Yd	$61.20	340	$20,808.00		Bid from ERRG
Clay Soil	Cu Yd	$73.50	60	$4,410.00		Bid from ERRG
					$25,218.00	
Labor						
ERRG - Level B	Hours	$198.00	8	$1,584.00		Bid from ERRG
ERRG - Level C	Hours	$104.00	4	$416.00		Bid from ERRG
CH2M HILL - Construction	Hours	$55.00	195	$10,725.00		Assumes 15 days to complete bioreactor w/ one person on site
CH2M HILL - Preparation	Hours	$55.00	40	$2,200.00		Actual Prep Time
Auto Mileage - Construction	Days	$45.00	15	$675.00		Assumes 15 days to complete bioreactor w/ one person on site
Auto Mileage - Preparation	Days	$45.00	4	$180.00		Actual Prep Time
					$15,780.00	

TABLE D-11
Site SS016 Cost Estimate for OSA Bioreactor
Groundwater Record of Decision, Travis Air Force Base, California

CAPITAL COSTS

	Unit	Unit Cost	Quantity	Line Item Cost	Total Cost	Comments
Waste Disposal						Assumes 750 total tons of excavated soil
Disposal at Off Base Class I Landfill (RCRA Haz)	Tons	$209.07	250	$52,267.50		
Disposal at Off Base Class I Landfill (State Haz)	Tons	$139.80	250	$34,950.00		
Disposal at Off Base Class II Landfill	Tons	$31.00	250	$7,750.00		
					$94,967.50	
Manifold						
Materials	Lump sum	$300.00	1	$300.00		Estimate of PVC, Fittings, Bag Filters, Valves
					$300.00	
EW03x16 Solar Modification						
Mount	EA	$325.00	1	$325.00		Actual cost from Sierra Solar Systems
85 Watt Modules	EA	$305.00	3	$915.00		Actual cost from Sierra Solar Systems
Solar Pump	EA	$2,122.00	1	$2,122.00		Actual cost from Sierra Solar Systems
Control Box	EA	$81.00	1	$81.00		Actual cost from Sierra Solar Systems
					$3,443.00	
Other:						
Utility Locating-Trench	Hours	$157.50	3			Estimate based on verbal quote
					$472.50	
Subtotal					**$306,116.00**	

O&M COSTS

1 Field Tech Hr/Mo		Estimate for time required for basic regular maintenance
$56.72		
Cost/yr		
$680.64		

TABLE D-12

Site SS016 Cost Estimate for GET System O&M

Groundwater Record of Decision, Travis Air Force Base, California

Extraction Wells	Average Flow	Average Energy/Mo	Cost/kWh	Estimated Cost/Mo	Estimated Cost/Yr
EW605x16	10.7	16	$0.07	$1.12	$13.44
EW610x16	3.6	16	$0.07	$1.12	$13.44
EW01x16	22.6	16	$0.07	$1.12	$13.44
EW02x16	5.8	16	$0.07	$1.12	$13.44
	42.7				**$54**

Carbon Changeout

Total Flow from EWs w/Alternative	Adjusted Frequency of changeout	Cost per changeout	Carbon Cost/Yr
43	516 days	$47,828	**$33,832**

Labor

Field Tech Hr/Mo	Cost per Field Tech Hr	Labor Cost/Mo	Labor Cost/Yr
2	$57	$113	**$1,361**

Total GET System Cost/Yr	**$35,247**

Periodic Costs

Item	Interval	Equipment Cost	Labor Cost	Total
Pump Replacement	5 years	$1,700	$454	**$2,154**
Motor Control Center Repairs	5 years	$2,000	$0	**$2,000**

TABLE D-13
Site SS016 Present Value Analysis for OSA Bioreactor and GE T System
Groundwater Record of Decision, Travis Air Force Base, California

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$306,116	$306,116	1	$306,116
Annual O&M	1-30	$1,077,831	$35,928	20.3982	$732,860
Periodic	4	$17,000	$17,000	0.8989	$15,281
Periodic	5	$16,616	$16,616	0.8753	$14,544
Periodic	8	$17,000	$17,000	0.808	$13,736
Periodic	10	$16,616	$16,616	0.7661	$12,730
Periodic	15	$16,616	$16,616	0.6706	$11,143
Periodic	20	$16,616	$16,616	0.5869	$9,752
Periodic	25	$16,616	$16,616	0.5137	$8,536
Periodic	30	$16,616	$16,616	0.4497	$7,472
		$1,484,411			**$1,116,162**

TABLE D-14
Site ST027B Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Interim Action – MNA
Selected Alternative – 2

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	TPH-G Analysis	TPH-D Analysis	Total Cost/Yr
6	2	$188	$63	$63	$73	$2,451

Total Cost/yr Interim	**$2,451**
Total Cost/yr Alternative	**$2,451**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$73,530	$2,451	20.3983	$49,996
		$73,530			**$49,996**

TABLE D-15
Site SS029 Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Interim Action –
Selected Alternative – 3

Extraction Well	Average Flow	Average Energy/Mo (kWh)	Cost/kWh	Estimated Cost/Mo	Estimated Cost/yr
EW01x29	1.12	1,723	$0.07	$120.61	$1,447.32
EW02x29	6.34	1,723	$0.07	$120.61	$1,447.32
EW03x29	offline				
EW04x29	9.22	1,723	$0.07	$120.61	$1,447.32
EW05x29	0.96	1,723	$0.07	$120.61	$1,447.32
EW06x29	14.3	1,723	$0.07	$120.61	$1,447.32
EW07x29	16.4	1,723	$0.07	$120.61	$1,447.32
	48.34				**$8,683.92**

Carbon Changeout

Total Flow from EWs w/ Alternative	Frequency	SBBGWTP Cost/Change out	SBBGWTP Carbon Cost/Yr	Carbon Cost/Yr SS029
49	400 days	$22,922	$20,916.33	**$10,458**

EW Energy Cost/Yr	**$8,684**

Labor

Field Tech Hr/Mo	Cost/Field Tech Hr	Labor Cost/Mo	Labor Cost/Yr
2	$56.72	$113.44	**$1,361**

Total O&M Cost/Yr	**$20,503**

Periodic Costs

Item	Interval	Equipment Cost	Labor Cost	Total
Pump Replacement	5 years	$1,700	$454	**$2,154**
Motor Control Center Repairs	5 years	$2,000	$0	**$2,000**

TABLE D-15

Site SS029 Cost Estimate

Groundwater Record of Decision, Travis Air Force Base, California

Present Value Analysis – Time to Cleanup: 62 yrs

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$415,050	$13,835	20.3983	$282,210
Periodic	5	$14,924	$14,924	0.8753	$13,063
Periodic	10	$14,924	$14,924	0.7661	$11,433
Periodic	15	$14,924	$14,924	0.6706	$10,008
Periodic	20	$14,924	$14,924	0.5869	$8,759
Periodic	25	$14,924	$14,924	0.5137	$7,666
Periodic	30	$14,924	$14,924	0.4497	$6,711
		$504,594			**$339,851**

TABLE D-16
Site SS030 Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Interim Action – GET
Selected Alternative – 3

CAPITAL COSTS

	Unit	Unit Cost	Quantity	Line Item Cost	Total Cost	Comments
Extraction Well Installation						
IDW costs	EA	$1,500.00	1	$1,500.00		Bin rental and IDW disposal
Additional Cost	DAY	$200.00	2	$400.00		Consumables, H&S, equipment rental
Labor	DAY	$529.10	2	$1,058.20		One (1) person on site for 13 hr/day at a $40.7 bill rate
Well Installation	FT	$114.00	40	$4,560.00		Seven (7) wells total 265'-includes installation and completion
Auto Mileage	DAY	$45.00	2	$90.00		Mileage to and from Travis - approx 90 miles
Development	HR	$150.00	8	$1,200.00		Development costs per hr
					$5,100.00	
Mobilization/Demobilization	EA	$1,000.00	1	1,000.00	$1,000.00	One (1) mob/demob
Valut Installation and Plumbing	EA	$8,510.00	1	8,510.00	$8,510.00	Cost from Cornerstone including vault, plumbing, pump
Remedial Design	EA	$2,922.00	1	2,922.00	$2,922.00	
					$17,532.00	

Extraction Well	Average Flow	Average Energy/Mo (kWh)	Cost/kWh	Estimated Cost/Mo	Estimated Cost/Yr
EW01x30	7.73	1,723	$0.07	$120.61	$1,447.32
EW02x30	3.79	1,723	$0.07	$120.61	$1,447.32
EW03x30	1.2	1,723	$0.07	$120.61	$1,447.32
EW04x30	21.5	1,723	$0.07	$120.61	$1,447.32
EW05x30	11.6	1,723	$0.07	$120.61	$1,447.32
EW06x30	dry				
EW711x30	11.1	1,723	$0.07	$120.61	$1,447.32
Total	**56.92**				**$8,683.92**

Carbon Changeout

Total Flow from EWs	Frequency	SBBGWTP Cost/Change out	SBBGWTP Carbon Cost/yr	Carbon Cost/Yr SS030
57	400 days	$22,922	$20,916	**$10,458**

EW Energy Cost/Yr	**$8,684**

Labor

Field Tech Hr/Mo	Cost per Field Tech Hr	Labor Cost/Mo	Labor Cost/Yr
2	$57	$113	**$1,361**

Total O&M Cost/Yr	**$20,503**

Periodic Costs

Item	Interval	Cost	Labor Cost	Total
Pump Replacement	5 years	$1,700	$454	**$2,154**
Motor Control Center Repairs	5 years	$2,000	$0	**$2,000**

TABLE D-16

Site SS030 Cost Estimate

Groundwater Record of Decision, Travis Air Force Base, California

Present Value Analysis - Time to Cleanup: 22 yrs

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$17,532	$17,532	1	$17,532
Annual O&M	1-22	$304,370	$13,835	16.433	$227,351
Periodic	5	$17,078	$17,078	0.8753	$14,948
Periodic	10	$17,078	$17,078	0.7661	$13,083
Periodic	15	$17,078	$17,078	0.6706	$11,453
Periodic	20	$17,078	$17,078	0.5869	$10,023
		$390,214			**$294,390**

TABLE D-17
Site SD031 Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Interim Action – GET/MNA

Extraction Well	Average Flow (gpm)	Average Energy (kWh)/mo	Cost ($)/kWh	Estimated Cost ($)/mo	Estimated Cost ($)/yr
EW565x31	2.0	206	0.07	14.42	173.04
EW566x31	1.5	206	0.07	14.42	173.04
EW567x31	1.1	206	0.07	14.42	173.04
Total	**4.6**	**618**		**43.26**	**$519**

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	TPH-G Analysis	TPH-D Analysis	Total Cost/Yr
6	2	$188	$63	$63	$73	$2,451

Total Cost/yr Interim **$2,970**

Pump Replacement

Interval	Equipment Cost	Labor Cost	Total
5 years	$1,700	$454	$2,154

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.2%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-10	$29,700	$2,970	8.9048	$26,447
Periodic	5	$6,462	$6,462	0.8969	$5,796
Periodic	10	$6,462	$6,462	0.8044	$5,198
Periodic	15	$6,462	$6,462	0.7215	$4,662
		$42,624			**$42,103**

TABLE D-17

Site SD031 Cost Estimate

Groundwater Record of Decision, Travis Air Force Base, California

Selected Alternative – 2

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	TPH-G Analysis	TPH-D Analysis	Total Cost/Yr
6	2	$188	$63	$63	$73	$2,451

Total Cost/yr Alternative **$2,451**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.45%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-15	$24,510	$2,451	12.4357	$30,480
		$24,510			**$30,480**

TABLE D-18
Site SD033 Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Interim Action – GET/MNA

Extraction Well	Average Flow (gpm)	Average Energy (kWh)/mo	Cost ($)/kWh	Estimated Cost ($)/mo	Estimated Cost ($)/yr
EW501x33	1.0	206	0.07	14.42	173.04
EW503x33	1.5	206	0.07	14.42	173.04
Total	**2.5**	**412**		**28.84**	**$346**

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	TPH-G Analysis	TPH-D Analysis
5	2	$188	$63	$63	$73

		Total Cost/Yr
Total Cost/yr Interim	**$2,409**	**$2,063**

Pump Replacement	Interval	Equipment Cost	Labor Cost	Total
	5 years	$1,700	$454	$2,154

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$72,270	$2,409	20.3983	$49,140
Periodic	5	$4,308	$4,308	0.8753	$3,771
Periodic	10	$4,308	$4,308	0.7661	$3,300
Periodic	15	$4,308	$4,308	0.6706	$2,889
Periodic	20	$4,308	$4,308	0.5869	$2,528
Periodic	25	$4,308	$4,308	0.5137	$2,213
Periodic	30	$4,308	$4,308	0.4497	$1,937
		$98,118			**$65,778**

TABLE D-18

Site SD033 Cost Estimate

Groundwater Record of Decision, Travis Air Force Base, California

Selected Alternative – 2

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	TPH-G Analysis	TPH-D Analysis
5	2	$188	$63	$63	$73

Total Cost/yr Alternative	**$2,063**	**Total Cost/Yr** **$2,063**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$61,890	$2,063	20.3983	$42,082
		$61,890			**$42,082**

TABLE D-19
Site SD034 Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Interim Action – Passive Skimming/GET

Passive Skimming	# of Wells w/ Skimmers	Field Tech Hrs/mo	Technician Cost	Data Management Hrs/mo	Data Management Cost	Cost/yr
	5	2	$113	1	$57	**$2,042**

GET

Extraction Well	Average Flow	Average Energy/mo (kWh)	Cost/kWh	Estimated Cost/mo	Estimated Cost/yr
EW01x34	0.36	206	$0.07	$14.42	$173.04
EW03x34	0.7	206	$0.07	$14.42	$173.04
	1.06				**$346.08**

Carbon Changeout

Total Flow from EWs at DP039	% of Total Flow	Adjusted Frequency of changeout	Cost per changeout	Carbon Cost/yr	Carbon Cost/yr due to SD034	EW Cost/yr	Total GET System Cost/yr
1.1	1%	300	$30,000	$36,500	$365	$346.08	**$711.08**

Labor

Field Tech Hr/Mo	Cost per Field Tech Hr	Labor Cost/Mo	Labor Cost/Yr
2	$57	$113	**$1,361**

Total O&M Cost/Yr	**$4,114**

Periodic Costs

Item	Interval	Cost	Labor Cost	Total
Pump Replacement	5 years	$1,700	$454	**$2,154**
Motor Control Center Repairs	5 years	$2,000	$0	**$2,000**

Present Value Analysis – Time to Cleanup: 62 yrs

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$123,428	$4,114	20.3983	$83,924
Periodic	5	$6,308	$6,308	0.8753	$5,521
Periodic	10	$6,308	$6,308	0.7661	$4,833
Periodic	15	$6,308	$6,308	0.6706	$4,230
Periodic	20	$6,308	$6,308	0.5869	$3,702
Periodic	25	$6,308	$6,308	0.5137	$3,240
Periodic	30	$6,308	$6,308	0.4497	$2,837
		$161,276			**$108,288**

TABLE D-19
Site SD034 Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Selected Alternative – 7

EA

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	TPH-G Analysis	TPH-D Analysis	Cost/Yr
4	1	$188	$63	$63	$73	**$1,613**

Passive Skimming

# of Wells w/ Skimmers	Field Tech Hrs/mo	Technician Cost	Data Management Hrs/mo	Data Management Cost	Cost/yr
5	2	$113	1	$57	**$2,042**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$94,605	$3,655	22.0646	$80,639
		$94,605			**$80,639**

TABLE D-20

Site SS035 Cost Estimate for MNA

Groundwater Record of Decision, Travis Air Force Base, California

MNA

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	Total Cost ($)/Yr
5	1	$188	$63	**$1,320**

Total Cost/yr Interim **$1,320**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-2	$1,320	$1,320	1.9220	$2,537
		$1,320			**$2,537**

TABLE D-21

Site SD036 Cost Estimate for GET and MNA

Groundwater Record of Decision, Travis Air Force Base, California

GET

Extraction Well	Average Flow	Average Energy/mo	Cost/kWh	Estimated Cost/mo	Estimated Cost/yr
EW593x36	2.5	206	$0.07	$14.42	$173.04
EW594x36	0.98	206	$0.07	$14.42	$173.04
EW595x36	3.71	206	$0.07	$14.42	$173.04
					$519.12

Carbon Changeout

Total Flow from EWs at SD037	7.19
% of Total Flow	5%
Adjusted Frequency of changeout	300
Cost per changeout	$30,000
Carbon Cost/yr	$36,500
Carbon Cost/yr due to SD037	$1,825
EW Cost/yr	$519.12

Total GET System Cost/yr **$2,344.12**

Periodic Costs

Pump Replacement	Interval	Equipment Cost	Labor Cost	Total
	5 years	$1,700	$454	$2,154

MNA

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	Total Cost/Yr
6	2	$188	63	**$1,635**

Total Cost/yr Interim **$3,978.76**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$119,370	$3,979	20.3983	$81,165
Periodic	5	$4,904	$4,904	0.8753	$4,292
Periodic	10	$4,904	$4,904	0.7661	$3,757
Periodic	15	$4,904	$4,904	0.6706	$3,289
Periodic	20	$4,904	$4,904	0.5869	$2,878
Periodic	25	$4,904	$4,904	0.5137	$2,519
Periodic	30	$4,904	$4,904	0.4497	$2,205
		$148,794			**$100,106**

TABLE D-22
Site SD036 Cost Estimate for EVO Injection and EA
Groundwater Record of Decision, Travis Air Force Base, California

CAPITAL COSTS – Technology Demonstration

	Unit	Unit Cost	Quantity	Line Item Cost	Total Cost	Comments
Injection Well Installation-18,500 µg/L						
IDW costs	EA	$1,500.00	2	$3,000.00		Bin rental and IDW disposal
Additional Cost	DAY	$200.00	4	$800.00		Consumables, H&S, equipment rental
Labor	DAY	$533.00	4	$2,132.00		One (1) person on site for 13 hours per day at a $41 bill rate
Well Installation	FT	$114.00	200	$22,800.00		Four (4) wells 50 feet deep per well – includes installation and completion
Auto Mileage	DAY	$45.00	1	$45.00		Auto mileage to and from Travis AFB – approximately 90 miles
Development	HR	$150.00	20	$3,000.00		development costs per well for mob/demob and 8 hours of development
					$31,777.00	
Injection Well Installation-3,760 µg/L						
IDW costs	EA	$1,500.00	2	$3,000.00		Bin rental and IDW disposal
Additional Cost	DAY	$200.00	4	$800.00		Consumables, H&S, equipment rental
Labor	DAY	$533.00	4	$2,132.00		One (1) person on site for 13 hours per day at a $41 bill rate
Well Installation	FT	$114.00	140	$15,960.00		Six (6) wells 35 feet deep per well-includes installation and completion
Auto Mileage	DAY	$45.00	4	$180.00		Auto mileage to and from Travis AFB – approximately 90 miles
Development	HR	$150.00	20	$3,000.00		Development costs per well for mob/demob and 8 hours of development
					$25,072.00	
Mobilization/Demobilization	EA	$1,000.00	1			There will likely be one (1) mob/demob for all field work
					$1,000.00	
Injection Costs						
Labor	HR	$41.00	240	$9,840.00		One (1) person at $41 per hour for 24 hours a day
Auto Mileage	DAY	$45.00	10	$450.00		Auto mileage to and from Travis AFB – approximately 90 miles
Additional Cost	DAY	$200.00	10	$2,000.00		Includes consumables, H&S, and equipment rental
					$12,290.00	
Emulsified Vegetable Oil						Depends on stock price of vegetable oil – cost based on price in Oct 2009
18,500 µg/L	LB	$1.51	6,009	$9,073.59		
3,760 µg/L	LB	$1.51	12,085	$18,248.35		
					$27,321.94	
Fixed Costs						Includes planning, engineering, permitting, and building manifold
18,500 µg/L	EVENT	$13,320.00	1			
3,760 µg/L	EVENT	$13,320.00	1			
					$26,640.00	
Utility Clearance	HRS	$157.50	8		**$1,260.00**	Cost is 105% of hourly cost for utility clearance during characterizatoin
Surveying Wells	WELL	$118.18	8		**$945.44**	Price from Phillippe Engineering
Total Event Costs					**$125,306.38**	

TABLE D-22
Site SD036 Cost Estimate for EVO Injection and EA
Groundwater Record of Decision, Travis Air Force Base, California

CAPITAL COSTS – Post-Demonstration Optimization

	Unit	Unit Cost	Quantity	Line Item Cost	Total Cost	Comments
Injection Well Installation-18,500 µg/L						
IDW costs	EA	$1,560.00	2	$3,120.00		Bin rental and IDW disposal
Additional Cost	DAY	$208.00	4	$832.00		Consumables, H&S, equipment rental
Labor	DAY	$554.32	4	$2,217.28		One (1) person on site for 13 hours per day at a $41 bill rate
Well Installation	FT	$118.56	200	$23,712.00		Four (4) wells 50 feet deep per well – includes installation and completion
Auto Mileage	DAY	$46.80	1	$46.80		Auto mileage to and from Travis AFB – approximately 90 miles
Development	HR	$156.00	20	$3,120.00		development costs per well for mob/demob and 8 hours of development
					$33,048.08	
Injection Well Installation-3,760 µg/L						
IDW costs	EA	$1,560.00	2	$3,120.00		Bin rental and IDW disposal
Additional Cost	DAY	$208.00	4	$832.00		Consumables, H&S, equipment rental
Labor	DAY	$554.32	4	$2,217.28		One (1) person on site for 13 hours per day at a $41 bill rate
Well Installation	FT	$118.56	140	$16,598.40		Six (6) wells 35 feet deep per well-includes installation and completion
Auto Mileage	DAY	$46.80	4	$187.20		Auto mileage to and from Travis AFB – approximately 90 miles
Development	HR	$156.00	20	$3,120.00		Development costs per well for mob/demob and 8 hours of development
					$26,074.88	
Mobilization/Demobilization	EA	$1,040.00	1			There will likely be one (1) mob/demob for all field work
					$1,040.00	
Injection Costs						
Labor	HR	$42.64	240	$10,233.60		One (1) person at $41 per hour for 24 hours a day
Auto Mileage	DAY	$46.80	10	$468.00		Auto mileage to and from Travis AFB – approximately 90 miles
Additional Cost	DAY	$208.00	10	$2,080.00		Includes consumables, H&S, and equipment rental
					$12,781.60	
Emulsified Vegetable Oil						Depends on stock price of vegetable oil – cost based on price in Oct 2009
18,500 µg/L	LB	$1.57	6,009	$9,436.53		
3,760 µg/L	LB	$1.57	12,085	$18,978.28		
					$28,414.82	
Remedial Design						Includes planning, engineering, permitting, costing and other costs associated with design of injection
18,500 µg/L	EVENT	$13,852.80	1			
3,760 µg/L	EVENT	$13,852.80	1			
					$27,705.60	
Utility Clearance	HRS	$163.80	8		**$1,310.40**	Cost is 105% of hourly cost for utility clearance during characterizatoin
Surveying Wells	WELL	$122.91	8		**$983.26**	Price from Phillippe Engineering
Total Event Costs					**$130,318.64**	

OPERATION AND MAINTENANCE

Total Costs Sampling and Analysis						
Labor and Equipment	WELL	$197.40	60	$11,844.00		Fifteen (15) wells 2 x in year 1 for initial and baseline and Fifteen (15) wells 2 x following expansion
Analysis	WELL	$274.00	60	$16,440.00		Unit Cost based on analytes listed in work plan
					$28,284.00	

SD036 – EA
O&M

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	Total Cost/Yr
6	2	$188	63	**$1,635**

TABLE D-23

Site SD037 Cost Estimate for GET and MNA

Groundwater Record of Decision, Travis Air Force Base, California

GET

Extraction Well	Average Flow	Average Energy/mo	Cost/kWh	Estimated Cost/mo	Estimated Cost/yr
EW510x37	4.16	206	$0.07	$14.42	$173.04
EW511x37	1.72	206	$0.07	$14.42	$173.04
EW599x37	5.1	206	$0.07	$14.42	$173.04
EW700x37	4.54	206	$0.07	$14.42	$173.04
EW701x37	1.3	206	$0.07	$14.42	$173.04
EW702x37	2.44	206	$0.07	$14.42	$173.04
EW703x37	1.49	206	$0.07	$14.42	$173.04
EW704x37	0.74	206	$0.07	$14.42	$173.04
EW705x37	2	206	$0.07	$14.42	$173.04
EW706x37	0.52	206	$0.07	$14.42	$173.04
EW707x37	0.69	206	$0.07	$14.42	$173.04
	24.69				**$1,557.36**

Carbon Changeout

Total Flow from EWs at SD037	25
% of Total Flow	16%
Adjusted Frequency of changeout	300
Cost per changeout	$30,000
Carbon Cost/yr	$36,500
Carbon Cost/yr due to SD037	$5,840
EW Cost/yr	$1,557.36

Total GET System Cost/yr **$7,397.36**

MNA

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	Total Cost/Yr
6	2	$188	63	**$1,635**

Total Cost/yr Interim **$9,032.00**

TABLE D-23
Site SD037 Cost Estimate for GET and MNA
Groundwater Record of Decision, Travis Air Force Base, California

Periodic Costs

Pump Replacement	**Interval**	**Equipment Cost**	**Labor Cost**	**Total**
	5 years	$1,700	$454	$2,154

Present Value Analysis

Cost Type	**Year**	**Total Cost**	**Total Cost/Yr**	**Discount Factor (2.7%)**	**Present Value**
Capital	0	$0	$0		$0
Annual O&M	1-30	$270,960	$9,032	20.3983	$184,237
Periodic	5	$23,694	$23,694	0.8753	$20,739
Periodic	10	$23,694	$23,694	0.7661	$18,152
Periodic	15	$23,694	$23,694	0.6706	$15,889
Periodic	20	$23,694	$23,694	0.5869	$13,906
Periodic	25	$23,694	$23,694	0.5137	$12,172
Periodic	30	$23,694	$23,694	0.4497	$10,655
		$413,124			**$275,751**

TABLE D-24
Site SD037 Cost Estimate for EVO Injection and EA
Groundwater Record of Decision, Travis Air Force Base, California

CAPITAL COSTS - Technology Demonstration

	Unit	Unit Cost	Quantity	Line Item Cost	Total Cost	Comments
Injection Well Installation						
IDW costs	EA	$1,500.00	6	$9,000.00		Bin rental and IDW disposal
Additional Cost	DAY	$200.00	4	$800.00		Consumables, H&S, equipment rental (4 days spent installing IWs)
Labor	DAY	$529.10	4	$2,116.40		One (1) person on site for 13 hours per day at a $40.7 bill rate
Well Installation	FT	$114.00	265	$30,210.00		Seven (7) wells total 265 feet – includes installation and completion
Auto Mileage	DAY	$45.00	4	$180.00		Mileage to and from Travis AFB – approximately 90 miles
Development	HR	$150.00	33	$4,950.00		Development costs per hour
					$47,256.40	
Performance Monitoring Well Installation						
IDW costs	EA	$1,500.00	3	$4,500.00		Bin rental and IDW disposal
Additional Cost	DAY	$200.00	5	$1,000.00		Consumables, H&S, equipment rental (5 days spend installing MWs)
Labor	DAY	$529.10	5	$2,645.50		One (1) person on site for 13 hours per day at a $40.7 average bill rate
Well Installation	FT	$48.00	333.5	$16,008.00		Seven (7) wells total 333.5 feet – includes installation and completion
Auto Mileage	DAY	$45.00	5	$225.00		Mileage to and from Travis AFB – approximately 90 miles
Development	HR	$150.00	33	$4,950.00		Development costs per hour
					$29,328.50	
Mobilization/Demobilization	EA	$1,000.00	0.5		**$500.00**	One (1) mob/demob split between SD037 and DP039
Injection Costs						
Labor	HR	$40.70	480	$19,536.00		One (1) person at $40.7 average per hour for 24 hours a day
Vehicle Rental	DAY	$45.00	20	$900.00		Mileage to and from Travis AFB – approximately 90 miles
Additional Cost	DAY	$200.00	14	$2,800.00		Includes consumables, H&S, and equipment rental
					$23,236.00	
Emulsified Vegetable Oil	LB	$1.31	61,695		$80,820.45	Depends on stock price of vegetable oil – cost based on price in Oct 2009
Fixed Costs	EVENT	$16,160.00	1		$16,160.00	Includes planning, engineering, permitting, and building manifold
Utility Clearance	HRS	$157.50	3		$472.50	Cost is 105% of hourly cost for utility clearance during characterizatoin
Surveying Wells	WELL	$118.18	14		$1,654.52	Price from Phillippe Engineering
Total Event Costs					**$198,928.37**	

TABLE D-24
Site SD037 Cost Estimate for EVO Injection and EA
Groundwater Record of Decision, Travis Air Force Base, California

CAPITAL COSTS - Post-Demonstration Optimization

	Unit	Unit Cost	Quantity	Line Item Cost	Total Cost	Comments
Injection Well Installation						
IDW costs	EA	$1,560.00	6	$9,360.00		Bin rental and IDW disposal
Additional Cost	DAY	$208.00	4	$832.00		Consumables, H&S, equipment rental (4 days spent installing IWs)
Labor	DAY	$550.26	4	$2,201.06		One (1) person on site for 13 hours per day at a $40.7 bill rate
Well Installation	FT	$118.56	265	$31,418.40		Seven (7) wells total 265 feet – includes installation and completion
Auto Mileage	DAY	$46.80	4	$187.20		Mileage to and from Travis AFB – approximately 90 miles
Development	HR	$156.00	33	$5,148.00		Development costs per hour
					$49,146.66	
Performance Monitoring Well Installation						
IDW costs	EA	$1,560.00	3	$4,680.00		Bin rental and IDW disposal
Additional Cost	DAY	$208.00	5	$1,040.00		Consumables, H&S, equipment rental (5 days spend installing MWs)
Labor	DAY	$550.26	5	$2,751.32		One (1) person on site for 13 hours per day at a $40.7 average bill rate
Well Installation	FT	$49.92	333.5	$16,648.32		Seven (7) wells total 333.5 feet – includes installation and completion
Auto Mileage	DAY	$46.80	5	$234.00		Mileage to and from Travis AFB – approximately 90 miles
Development	HR	$156.00	33	$5,148.00		Development costs per hour
					$30,501.64	
Mobilization/Demobilization	EA	$1,040.00	0.5		**$520.00**	One (1) mob/demob split between SD037 and DP039
Injection Costs						
Labor	HR	$42.33	480	$20,317.44		One (1) person at $40.7 average per hour for 24 hours a day
Vehicle Rental	DAY	$46.80	20	$936.00		Mileage to and from Travis AFB – approximately 90 miles
Additional Cost	DAY	$208.00	14	$2,912.00		Includes consumables, H&S, and equipment rental
					$24,165.44	
Emulsified Vegetable Oil	LB	$1.36	61,695		$84,053.27	Depends on stock price of vegetable oil – cost based on price in Oct 2009
Remedial Design	EVENT	$16,806.40	1		$16,160.00	Includes planning, engineering, permitting, costing and other costs associated with design of injection
Utility Clearance	HRS	$163.80	3		$491.40	Cost is 105% of hourly cost for utility clearance during characterizatoin
Surveying Wells	WELL	$122.91	14		$1,720.70	Price from Phillippe Engineering
Total Event Costs					**$206,759.10**	

OPERATION AND MAINTENANCE

Total Sampling and Analysis Costs						
Labor and Equipment	WELL	$197.40	24	$4,737.60		Six (6) wells sampled 2 x in year 1 for initial sample and baseline and six (6) wells 2 x following expansion
Analysis	WELL	$228.00	24	$5,472.00		Unit Cost based on analytes listed in work plan
					$10,209.60	

SD037 - EA
O&M

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	Total Cost/Yr
6	2	$188	63	**$1,635**

TABLE D-25
WIOU Sites SD037, SD036, SD033, and SD043 Present Value Analysis for EVO and EA
Groundwater Record of Decision, Travis Air Force Base, California

SD037 Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$198,928	$198,928	1	$198,928
Capital	1	$206,759	$206,759	0.9737	$201,321
Annual O&M	1-30	$49,039	$1,635	20.3982	$33,344
Periodic	1	$10,210	$10,210	0.9737	$9,941
Periodic	6	$269,140	$269,140	0.8523	$229,388
Periodic	12	$269,140	$269,140	0.7264	$195,503
Periodic	18	$269,140	$269,140	0.6191	$166,625
Periodic	24	$269,140	$269,140	0.5276	$141,998
Periodic	30	$269,140	$269,140	0.4497	$121,032
		$1,810,636			**$1,298,081**

SD036 Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$125,306	$125,306	1	$125,306
Capital	1	$130,319	$130,319	0.9737	$126,891
Annual O&M	1-30	$49,039	$1,635	20.3982	$33,344
Periodic	1	$28,284	$28,284	0.9737	$27,540
Periodic	6	$140,084	$140,084	0.8523	$119,394
Periodic	12	$140,084	$140,084	0.7264	$101,757
Periodic	18	$140,084	$140,084	0.6191	$86,726
Periodic	24	$140,084	$140,084	0.5276	$73,908
Periodic	30	$140,084	$140,084	0.4497	$62,996
		$1,033,368			**$757,862**

SD033 Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$61,890	$2,063	20.3983	$42,082
		$61,890			**$42,082**

SD043 Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$38,640	$1,288	20.3983	$26,273
		$38,640			**$26,273**

Total WIOU Present Value
$2,124,298

TABLE D-26
Site DP039 Cost Estimate for GET and MNA
Groundwater Record of Decision, Travis Air Force Base, California

GET

Extraction Well	Average Flow	Average Energy/mo	Cost/kWh	Estimated Cost/mo	Estimated Cost/yr
EW563x39	1.07	206	$0.07	$14.42	$173.04
EW782x39	1.53	206	$0.07	$14.42	$173.04
	2.6				**$346.08**

Average SBBGWTP Energy Consumption/mo	15,072 kWh
Estimated Energy from EWs	2,261 kWh
# of Active EWs	11
Average Energy Consumption/EW/mo	206 kWh

Carbon Changeout

Total Flow from EWs at DP039	% of Total Flow	Adjusted Frequency of Changeout	Cost per Changeout	Carbon Cost/yr	Carbon Cost/yr due to DP039	EW Cost/yr	Total GET System Cost/yr
2.6	3%	300	$30,000	$36,500	$986	$346.08	**$1,331.58**

MNA

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	Total Cost/Yr
3	2	$188	63	**$880**

Total Cost/yr Interim	**$2,211.90**

Periodic Costs

Item	Interval	Cost	Labor Cost	Total
Pump Replacement	5 years	$1,700	$454	**$2,154**
Motor Control Center Repairs	5 years	$2,000	$0	**$2,000**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$61,170	$2,039	20.3983	$41,592
Periodic	5	$8,308	$8,308	0.8753	$7,272
Periodic	10	$8,308	$8,308	0.7661	$6,365
Periodic	15	$8,308	$8,308	0.6706	$5,571
Periodic	20	$8,308	$8,308	0.5869	$4,876
Periodic	25	$8,308	$8,308	0.5137	$4,268
Periodic	30	$8,308	$8,308	0.4497	$3,736
		$111,018			**$73,680**

TABLE D-27
Site DP039 Cost Estimate for Bioreactor
Groundwater Record of Decision, Travis Air Force Base, California

CAPITAL COSTS

	Unit	Unit Cost	Quantity	Total Cost	Comments
Dillard-Bin Delivery	bin	$1,040.00	1	$1,040	Bin with liner delivered to Travis AFB
Dillard-Waste Disposal	bin	$3,315.00	1	$3,315	Disposal of IDW to Cleanharbors landfill
Geotech-Solar Pump	pump system	$5,314.30	1	$5,314	Includes all materials (panels, pump, mount, misc materials)
Dolver Costs					
Mobilization/Demobilization/Clean-up	per mob	$2,930.00	1	$2,930	Movement to and from Travis AFB and decon
Excavation	crew	$1,904.00	1	$1,904	Performed with crew in Level C
Excavation of 20'x20'x20'	8,000 cu ft	$14,294.00	1	$14,294	Only includes actual excavation
Construction and Backfill Bioreactor	bioreactor	$23,224.00	1	$23,224	Purchased gravel, mulch was on site
Install blank casing in Extraction Well	well	$561.00	1	$561	EW563x39
Abandon Extraction Well	well	$2,038.00	1	$2,038	EW563x39 – includes $1,080 for delivery of iron pyrite
Install Solar Panel	system	$1,275.00	1	$1,275	Includes trenching and installation
Saratoni-2000 lbs Soybean Oil	tote	$1,460.30	2	$2,921	Includes delivery, taxes, fuel surcharge
Curtis and Tompkins	sampling	$1,482.75	1	$1,483	Includes all sampling during and right after install
WDC	event	$15,096.00	1	$15,096	Includes mob, coring, well installation, development and decon
CAL INC	event	$1,940.00	1	$1,940	Lead monitoring
Precision Locating	location	$139.00	3	$417	Utility locator
CH2M HILL staff on site	hr	$55.00	165	$9,075	Includes CH2M HILL employee onsite 11 hours per day for 3 weeks
Total Capital to Install Bioreactor				**$86,827**	

O&M COSTS

1 Field Tech Hr/Mo
$56.72
Cost/yr
$680.64

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$86,827	$86,827	1	$86,827
Annual O&M	1-30	$20,400	$680	20.3982	$13,871
Periodic	4	$17,000	$17,000	0.8989	$15,281
Periodic	8	$17,000	$17,000	0.808	$13,736
Periodic	12	$17,000	$17,000	0.7264	$12,349
Periodic	16	$17,000	$17,000	0.6529	$11,099
Periodic	20	$17,000	$17,000	0.5869	$9,977
Periodic	28	$17,000	$17,000	0.4743	$8,063
		$209,227			**$171,204**

TABLE D-28
Site DP039 Cost Estimate for EVO PRB and EA
Groundwater Record of Decision, Travis Air Force Base, California

CAPITAL COSTS

	Unit	Unit Cost	Quantity	Line Item Cost	Total Cost	Comments
Injection Well Installation						
IDW costs	EA	$1,500.00	6	$9,000.00		Bin rental and IDW disposal
Additional Cost	DAY	$200.00	14	$2,800.00		Consumables, H&S, equipment rental
Labor	DAY	$500.40	14	$7,005.60		One (1) person on site for 12 hours per day at a $44.7 average bill rate
Well Installation	FT	$114.00	787	$89,718.00		Thirteen (13) wells total depth – includes installation and completion
Auto Mileage	DAY	$45.00	14	$630.00		Drive to and from Travis AFB – approximately 90 miles
Development	HR	$150.00	21	$3,150.00		Development costs per well for mob/demob and 8 hours of development
					$112,303.60	
Performance Monitoring Well Installation						
IDW costs	EA	$1,500.00	1	$1,500.00		Bin rental and IDW disposal
Additional Cost	DAY	$200.00	3	$600.00		Consumables, H&S, equipment rental
Labor	DAY	$500.40	3	$1,501.20		One (1) person on site for 12 hours per day at a $41.7 average bill rate (according to total imp. Cost/hrs on the impl PN)
Well Installation	FT	$48.00	159	$7,632.00		three wells 73', 50', and 36' deep, includes completion
Auto Mileage	DAY	$45.00	3	$135.00		Drive to and from Travis AFB – approximately 90 miles
Development	HR	$150.00	20.5	$3,075.00		Development costs per well for mob/demob and 8 hours of development
					$14,443.20	
Mobilization/Demobilization	EA	$1,000.00	0.5		**$500.00**	One (1) mob/demob for field work
Injection Costs						
Labor	HR	$41.70	325	$13,552.50		25 days at 13 hours per
Auto Mileage	DAY	$45.00	25	$1,125.00		Drive to and from Travis AFB – approximately 90 miles
Additional Cost	DAY	$200.00	13	$2,600.00		Includes consumables, H&S, and equipment rental
					$17,277.50	
Emulsified Vegetable Oil	LB	$1.31	31,911		**$41,803.41**	Depends on stock price of vegetable oil – cost based on price in Oct 2009
Remedial Design	EVENT	$16,160.00	1		**$16,160.00**	Includes planning, engineering, permitting, costing and other costs associated with injection design
Utility Clearance	HRS	$157.50	3		**$472.50**	Cost is 105% of hourly cost for utility clearance during characterizatoin
Surveying Wells	WELL	$118.18	16		**$1,890.88**	Price from Phillippe Engineering 13 IWs and 3 MWs
Total Event Costs					**$204,351.09**	

OPERATION AND MAINTENANCE

Total Costs Sampling and Analysis						
Labor and Equipment	WELL	$197.40	10	$1,974.00		Five (5) wells 2 x the first year
Analysis	WELL	$274.00	10	$2,740.00		Unit Cost based on analytes listed in work plan
					$4,714.00	

DP039 - EA
O&M

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	Total Cost/Yr
7	3	$188	63	**$1,949**

TABLE D-28
Site DP039 Cost Estimate for EVO PRB and EA
Groundwater Record of Decision, Travis Air Force Base, California

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$204,351	$204,351	1	$204,351
Annual O&M	1-30	$58,470	$1,949	20.3982	$39,756
Periodic	1	$4,714	$4,714	0.9737	$4,590
Periodic	6	$238,486	$238,486	0.8523	$203,262
Periodic	12	$238,486	$238,486	0.7264	$173,236
Periodic	18	$238,486	$238,486	0.6191	$147,647
Periodic	24	$238,486	$238,486	0.5276	$125,825
Periodic	30	$238,486	$238,486	0.4497	$107,247
		$1,459,965			**$1,005,914**

TABLE D-29
Site SD043 Cost Estimate
Groundwater Record of Decision, Travis Air Force Base, California

Interim Action – GET/MNA

Extraction Well	Average Flow (gpm)	Average Energy (kWh)/mo	Cost ($)/kWh	Estimated Cost ($)/mo	Estimated Cost ($)/yr
EW555x43	0.7	206	0.07	14.42	173.04
Total	**0.7**	**206**		**14.42**	**$173**

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	TPH-G Analysis	TPH-D Analysis	Total Cost/Yr
3	2	$188	$63	$63	$73	$1,288

Total Cost/yr Interim **$1,461**

Pump Replacement

Interval	Equipment Cost	Labor Cost	Total
5 years	$1,700	$454	$2,154

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$43,830	$1,461	20.3983	$29,802
Periodic	5	$2,154	$2,154	0.8753	$1,885
Periodic	10	$2,154	$2,154	0.7661	$1,650
Periodic	15	$2,154	$2,154	0.6706	$1,444
Periodic	20	$2,154	$2,154	0.5869	$1,264
Periodic	25	$2,154	$2,154	0.5137	$1,107
Periodic	30	$2,154	$2,154	0.4497	$969
		$56,754			**$38,121**

TABLE D-29

Site SD043 Cost Estimate

Groundwater Record of Decision, Travis Air Force Base, California

Selected Alternative – 2

# of Wells in Network	# of QA/QC Samples	$ to Sample/Well	VOC Analysis	TPH-G Analysis	TPH-D Analysis	Total Cost/Yr
3	2	$188	$63	$63	$73	$1,288

Total Cost/yr Alternative **$1,288**

Present Value Analysis

Cost Type	Year	Total Cost	Total Cost/Yr	Discount Factor (2.7%)	Present Value
Capital	0	$0	$0		$0
Annual O&M	1-30	$38,640	$1,288	20.3983	$26,273
		$38,640			**$26,273**