Dear Mr. Peterson,

Kirtland Air Force Base (KAFB) is submitting herein one “Application for Permit to Drill Well with No Consumptive Use of Water” for one well, and supporting documents. KAFB is proposing to advance one air sparge/soil vapor extraction (SVE) well (KAFB-106211) into the water table to aid in the evaluation and remediation of contaminated groundwater associated with the KAFB bulk fuels facility fuel release. This proposed well is located on Veteran’s Administration property. KAFB respectfully requests your review/response no later than 12 May 2014 in order to meet the New Mexico Environment Department’s (NMED) 30 June 2014 Liquid Non Aqueous Phase Liquid Interim Measure implementation directive dated 24 April 2014.

The air sparge/SVE well, KAFB-106211, will consist of a single borehole, advanced to approximately 510 ft bgs (depth to the water table is approximately 470 ft bgs). Borehole advancement (drilling) will be performed using the air-rotary casing hammer (ARCH) method. The borehole will contain two installed well casings, one air sparge casing and one SVE casing. The air sparge casing will be 1 1/4-inch-diameter with a screened interval at approximately 490 to 495 ft bgs and the SVE casing will be a 3-inch diameter casing screened at approximately 370 to 450 ft bgs. The casings will be flush threaded with Schedule 80 polyvinyl chloride (PVC) casing. The sparge casing will utilize factory-slotted PVC 0.010-inch slot screen and the SVE casing will utilize factory-slotted PVC 0.050-inch slot screen. The air sparge casing will be pressurized to oscillate the groundwater, which will move volatile contaminants from the groundwater to the vadose zone, and the SVE system will remove those contaminants from the vadose zone.

KAFB-106211 will be installed upgradient, approximately 50 ft south and 10 ft west, of the existing well KAFB-10617 (just south of Ridgecrest and east of the VA parking lot). KAFB-10617 contains low levels of ethylene di-bromide (EDB) and benzene and will be used to monitor these contaminants during the air sparge/SVE pilot test. Well KAFB-10617 will
initially be sampled every two weeks for the first month, and subsequently sampled once per month. The anticipated radius of influence of the sparge/SVE well is 50 feet and therefore KAFB-10617 should show results within the first few months of testing.

The specific requirements for pollution control and recovery (Page 3 of the enclosed application) will apply to all wells as follows:

- The need for the pollution control or recovery operation:
The sparge/SVE well will be installed as part of SWMU SS-111, which is groundwater impacted by jet fuel. The New Mexico Environment Department has directed Kirtland AFB to implement Interim Measures to address the groundwater contamination by June 30, 2014.

- The estimated maximum period of time for completion of the operation:
10 years

- The annual diversion amount:
Not applicable.

- The annual consumptive use:
Not applicable, as the sparge well will not be used for pumping or groundwater sampling.

- The maximum amount of water to be diverted and injected for the duration of the operation:
Not applicable.

- The method and place of discharge
Not applicable.

- The method of measurement of water produced and discharged:
Not applicable.

- The source of water to be injected:
Not applicable.

- The method of measurement of water injected:
Not applicable.

- The characteristics of the aquifer:
The aquifer is primarily comprised of unconsolidated sand and gravel, with an average hydraulic conductivity of 63 feet/day.

- The method of determining the resulting annual consumptive use of water and depletion from any related stream system:
Not applicable.

- Proof of any permit required from the New Mexico Environment Department:
Not applicable.

- An access agreement if the applicant is not the owner of the land on which the pollution plume control or recovery well is to be located:
Kirtland AFB has access to all wells included in the application.

In addition to the application, this packet contains a summary of the well construction, a figure of the well construction and a figure showing the well location.
Please contact Mr. L. Wayne Bitner at 505.853.3484 or ludie.bitner@us.af.mil or Ms. Victoria R. Branson at 505.846.6362 or victoria.branson@us.af.mil, if you have any questions.

Sincerely

[Signature]

(FOR) TOM D. MILLER, Colonel, USAF
Commander

Attachments:
NMED OSE Application for Sparge/SVE Well KAFB-106211

cc:
NMED-HWB (Kieling, Cobrain, Moats, McDonald, Brandwein) w/attach
NMED-GWQB (Schoeppner) w/attach
NMED-PSTB (Reuter) w/attach
NMED-OGC (Kendall) w/o attach
EPA Region 6 (King) w/o attach
AFCEC-CZRX (Oyelowo) w/o attach
Public Info Repository, AR/IR, and File w/attach
**NEW MEXICO OFFICE OF THE STATE ENGINEER**

**APPLICATION FOR PERMIT TO DRILL A WELL WITH NO CONSUMPTIVE USE OF WATER**

(check applicable box):

For fees, see State Engineer website: [http://www.ose.state.nm.us/](http://www.ose.state.nm.us/)

<table>
<thead>
<tr>
<th>Purpose:</th>
<th>☒ Pollution Control And / Or Recovery</th>
<th>☐ Geo-Thermal</th>
</tr>
</thead>
<tbody>
<tr>
<td>☒ Exploratory</td>
<td>☐ Construction Site De-Watering</td>
<td>☒ Other (Describe): Air Sparging / Soil Vapor Extraction</td>
</tr>
<tr>
<td>☐ Monitoring</td>
<td>☐ Mineral De-Watering</td>
<td></td>
</tr>
</tbody>
</table>

A separate permit will be required to apply water to beneficial use.

<table>
<thead>
<tr>
<th>☐ Temporary Request - Requested Start Date:</th>
<th>Requested End Date:</th>
</tr>
</thead>
</table>

Plugging Plan of Operations Submitted? | ☐ Yes | ☒ No |

---

### 1. APPLICANT(S)

<table>
<thead>
<tr>
<th>Name: Kirtland Air Force Base</th>
<th>Name: N/A</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Contact or Agent:</th>
<th>Wayne Bitner</th>
<th>Contact or Agent:</th>
<th>Check here if Agent</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mailing Address:</td>
<td>Chief Environmental Restoration</td>
<td>Mailing Address:</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>377 MSG/CEANR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2050 Wyoming Blvd. SE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>City: Albuquerque</th>
<th>City: N/A</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>State: NM</th>
<th>Zip Code: 87117-5270</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Phone: N/A</th>
<th>☐ Home</th>
<th>☐ Cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone (Work): 505-853-3484</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E-mail (optional):</th>
<th><a href="mailto:Ludie.Bitner@us.af.mil">Ludie.Bitner@us.af.mil</a></th>
</tr>
</thead>
</table>

---

FOR OSE INTERNAL USE

Application for Permit, Form wr-07, Rev 4/12/12

<table>
<thead>
<tr>
<th>File Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trans Description (optional):</td>
</tr>
<tr>
<td>Sub-Basin:</td>
</tr>
</tbody>
</table>

PCW/LOG Due Date:
2. WELL(S) Describe the well(s) applicable to this application.

**Location Required:** Coordinate location must be reported in NM State Plane (NAD 83), UTM (NAD 83), or Latitude/Longitude (Lat/Long - WGS84). District II (Roswell) and District VII (Cimarron) customers, provide a PLSS location in addition to above.

- **NM State Plane (NAD83)** (Feet)
- **UTM (NAD83)** (Meters)
- **Lat/Long (WGS84)** (to the nearest 1/10th of second)

### Well Number (If known):

<table>
<thead>
<tr>
<th>Well Number (If known)</th>
<th>X or Easting or Longitude</th>
<th>Y or Northing or Latitude</th>
<th>Provide if known:</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAFB-105211</td>
<td>1542915.4291</td>
<td>1475187.9540</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** If more well locations need to be described, complete form WR-08 (Attachment 1 – POD Descriptions)

Additional well descriptions are attached: Yes No

If yes, how many

Other description relating well to common landmarks, streets, or other: Please see attached Figure 1. The well will be installed approximately 200 feet south of Ridgecrest Ave SE, and approximately 700 ft east of San Pedro Blvd SE.

Well is on land owned by: The Veteran's Administration

Well Information: NOTE: If more than one (1) well needs to be described, provide attachment. Attached? Yes No

If yes, how many

Approximate depth of well (feet): 510.00

Outside diameter of well casing (inches): 5

Driller Name: National EWP, Inc.

Driller License Number: WD-1210

3. ADDITIONAL STATEMENTS OR EXPLANATIONS

Please see attachments for well location and installation details. Well KAFB-105211 will be installed to sparge the groundwater which will move volatile contaminants from the groundwater to the vadose zone, and SVE will remove those contaminants from the vadose zone. The air sparge/SVE well will allow CB&I evaluate further EDB and benzene remedial, and also evaluate how creating more aerobic conditions in this limited area might affect ongoing anaerobic degradation and potential plume expansion/migration.
4. SPECIFIC REQUIREMENTS: The applicant must include the following, as applicable to each well type. Please check the appropriate boxes, to indicate the information has been included and/or attached to this application:

<table>
<thead>
<tr>
<th>Exploratory:</th>
<th>Pollution Control and/or Recovery:</th>
<th>Construction De-Watering:</th>
<th>Mine De-Watering:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☒ Include a description of any proposed pump test, if applicable.</td>
<td>☒ Include a plan for pollution control/recovery, that includes the following:</td>
<td>☐ Include a description of the proposed dewatering operation,</td>
<td>☐ Include a plan for pollution control/recovery, that includes the following:</td>
</tr>
<tr>
<td></td>
<td>☐ A description of the need for the pollution control or recovery operation.</td>
<td>☐ The estimated duration of the operation.</td>
<td>☐ A description of the need for mine dewatering.</td>
</tr>
<tr>
<td></td>
<td>☐ The estimated maximum period of time for completion of the operation.</td>
<td>☐ The maximum amount of water to be diverted,</td>
<td>☐ The estimated maximum period of time for completion of the operation.</td>
</tr>
<tr>
<td></td>
<td>☐ The annual diversion amount.</td>
<td>☐ A description of the need for the dewatering operation, and,</td>
<td>☐ The source(s) of the water to be diverted.</td>
</tr>
<tr>
<td></td>
<td>☐ The annual consumptive use amount.</td>
<td>☐ A description of how the diverted water will be disposed of,</td>
<td>☐ The geohydrologic characteristics of the aquifer(s).</td>
</tr>
<tr>
<td></td>
<td>☐ The maximum amount of water to be diverted and injected for the duration of the operation.</td>
<td>☐ The method and place of discharge.</td>
<td>☐ The maximum amount of water to be diverted per annum.</td>
</tr>
<tr>
<td></td>
<td>☐ The method of measurement of water produced and discharged.</td>
<td>☐ The method of measurement of water injected.</td>
<td>☐ The quality of the water.</td>
</tr>
<tr>
<td></td>
<td>☐ The source of water to be injected.</td>
<td>☐ The characteristics of the aquifer.</td>
<td>☐ The method of measurement of water diverted.</td>
</tr>
<tr>
<td></td>
<td>☐ The method of measurement of water injected.</td>
<td>☐ The method of determining the resulting annual consumptive use of water and depletion from any related stream system.</td>
<td>☐ The recharge of water to the aquifer.</td>
</tr>
<tr>
<td></td>
<td>☐ The characteristics of the aquifer.</td>
<td>☐ Proof of any permit required from the New Mexico Environment Department.</td>
<td>☐ Description of the estimated area of hydrologic effect of the project.</td>
</tr>
<tr>
<td></td>
<td>☐ The method of determining the resulting annual consumptive use of water and depletion from any related stream system.</td>
<td>☐ An access agreement if the applicant is not the owner of the land on which the pollution plume control or recovery well is to be located.</td>
<td>☐ The method and place of discharge.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ Proof of any permit required from the New Mexico Environment Department.</td>
<td>☐ An estimation of the effects on surface water rights and underground water rights from the mine dewatering project.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ An access agreement if the applicant is not the owner of the land on which the pollution plume control or recovery well is to be located.</td>
<td>☐ A description of the methods employed to estimate effects on surface water rights and underground water rights.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>☐ Information on existing wells, rivers, springs, and wetlands within the area of hydrologic effect.</td>
</tr>
</tbody>
</table>

ACKNOWLEDGEMENT

I, We (name of applicant(s)), (FOR) TOM D. MILLER, Colonel, USAF, Commander

affirm that the foregoing statements are true to the best of (my, our) knowledge and belief.

Applicant Signature

ACTION OF THE STATE ENGINEER

This application is:

☐ approved ☐ partially approved ☐ denied

provided it is not exercised to the detriment of any others having existing rights, and is not contrary to the conservation of water in New Mexico nor detrimental to the public welfare and further subject to the attached conditions of approval.

Witness my hand and seal this ______ day of __________________________ 20_____, for the State Engineer,

__________________________________________, State Engineer

By:

Signature

Print

Title:

FOR OSE INTERNAL USE

Application for Permit, Form wr-07

File Number:

Trm Number:

Page 3 of 4
KIRTLAND AIR FORCE BASE
BULK FUELS FACILITY SPILL
WELL SUMMARY

Air Sparging/SVE Well

One air sparging/SVE well, KAFB-106211 will consist of a single borehole drilled to 40 feet below the water table (approximately 510-ft bgs), with the borehole containing two installed well casings, one air sparge casing and one SVE casing. The air sparge casing will be 1 ¼-inch-diameter, schedule 80, polyvinylchloride (PVC) riser pipe and equipped with a 0.010-inch slot, PVC screen with a 5-ft sump, and PVC bottom cap. The air sparge casing will be fitted with 5-ft screen length that will be completely submerged in the water positioned approximately 20-ft below the water table. The SVE casing will be 3-inch-diameter, schedule 80, PVC riser pipe and equipped with a 0.050 inch slot, PVC screen with a 5-ft sump, and PVC bottom cap. The SVE casing will be fitted with an 80-ft screen length that will be positioned approximately 20-ft above the water table. After the air sparge well screen and riser pipe are in place, filter pack (sand) will be placed adjacent to the well screen followed by a bentonite seal. Following placement of the SVE well screen and riser pipe, filter pack (tacna pea gravel) will be placed adjacent to the SVE well screen above the bentonite seal used for the air sparge casing. The SVE filter pack will be followed by a bentonite chip seal. For both casings, a cement/bentonite grout will extend from the upper bentonite chip seal to near ground surface. The bentonite chip seal will be hydrated in lifts using a “clean” water source.

- The borehole will be drilled to the total depth for the well to be installed using an air rotary casing hammer (ARCH) rig. Temporary surface casing to the water table may be used to stabilize the upper portion of the drill hole, but casing will be removed as filter pack and bentonite-cement grout are installed.

- The appropriate depth of the boring will be determined in the field and is dependent on the occurrence of significant water. If significant groundwater is encountered during drilling, drilling will cease, and the hole will be allowed to equilibrate for approximately 1 hour to determine the water table elevation.

- If the boring is over drilled beyond the bottom of the proposed sump elevation by more than 10 ft, the borehole will be backfilled with filter pack material to an elevation approximately 5 ft below the proposed bottom of sump elevation.

- The air sparge casing will be constructed within the borehole using a 5-ft PVC sump; Schedule 80, PVC, 0.010-inch, slotted screen; and Schedule 80, PVC blank casing to the top of the well stick-up. The sump will extend 5 ft below the bottom of the screened interval.

- While slowly removing the drill casing from the borehole, the borehole annular space will be backfilled from a maximum of 2 ft and minimum of 0.5 ft below the bottom of the air sparge casing sump to a minimum of 2 ft above the well screen with a filter pack (10/20 silica sand). A 2-ft layer of chemically inert fine sand (20/40 silica sand) will be placed directly above the filter pack. The filter pack will be placed using a tremie pipe to avoid bridging and ensure a continuous filter pack throughout the screened interval of the well. The well may be gently surged to breakup bridging and ensure complete placement of the filter pack around the well screen.
• A 26-foot hydrated bentonite seal will be emplaced above the sand filter pack, incrementally hydrated with potable water in 1-foot lifts for the first 10 feet.

• After the 26-foot hydrated bentonite seal is in place, the SVE casing will be constructed within the borehole using a 5-ft PVC sump; Schedule 80, PVC, 0.050-inch, slotted screen; and Schedule 80, PVC blank casing to the top of the well stick-up. The sump will extend 5 ft below the bottom of the screened interval.

• A 92-ft layer of filter pack (tacna pea gravel) will be placed for the filter pack of the SVE casing. A 2-ft layer of fine sand (10/20 silica sand) will be placed directly above the filter pack. The filter pack will be placed using a tremie pipe to avoid bridging and ensure a continuous filter pack throughout the screened interval of the well. The well may be gently surged to breakup bridging and ensure complete placement of the filter pack around the well screen.

• A 25-foot hydrated bentonite seal will be emplaced above the sand filter pack, incrementally hydrated with potable water in 1-foot lifts for the first 10 feet.

• A high solids (20 wt%) bentonite grout will be emplaced by tremie pipe to within 50 feet of the surface, and a cement/bentonite grout will be emplaced to the ground surface.

• A four-foot square by four-inch thick concrete surface pad shall be installed around the well immediately after the protective casing is installed. The surface pad shall be sloped so that drainage will be off the pad and away from the protective casing. In addition, a minimum of one inch of the finished pad shall be below grade or ground elevation to prevent washing and undermining by soil erosion.

• Protective casing with a locking cover shall be installed around the well casing (stickup or riser) to prevent damage or unauthorized entry. The protective casing shall be anchored in the concrete surface pad below the frost line and extend at least several inches above the casing stickup. A weep hole shall be drilled into the protective casing just above the top of the concrete surface pad to prevent water from accumulating and freezing inside the protective casing. A cap shall be placed on the well riser to prevent the entry of foreign materials into the well.

• A minimum of three bumper guards consisting of steel pipes three to four inches in diameter and a minimum of five-feet in length shall be installed next to the concrete surface pad. The bumper guards shall be installed to a minimum depth of two feet below the ground surface in a concrete footing and extend a minimum of three feet above ground surface. The pipes that form the bumper guards shall be filled with concrete to provide additional strength, and shall be painted a bright color to make them readily visible.
Air Sparge/SVE Well Construction

Ground Surface

- **Cement Seal**
  - (1.5 - 50 ft bgs)

- **High Solids Bentonite Grout**
  - 9.4 lb gal
  - (60 - 341 ft bgs)

- **1-1/4" Schedule 80 PVC Riser**

- **3/8" Bentonite Chips**
  - (341 - 366 ft bgs)

- **10/20 Colorado Silica Sand**
  - (366 - 368 ft bgs)

- **Filter Pack: TACNA 0.25/8**
  - (368 - 460 ft bgs)

- **3/8" Bentonite Chips**
  - (460 - 486 ft bgs)

- **20/40 Colorado Silica Sand**
  - (486 - 488 ft bgs)

- **10/20 Colorado Silica Sand**
  - (488 - 510 ft bgs)

- **Schedule 80 PVC 5-foot Sump**
  - (490 - 495 ft bgs)

- **Schedule 80 PVC 5 feet (0.010" Slot Screen)**
  - (370 - 450 ft bgs)

- **Schedule 80 PVC 5 feet**
  - (490 - 495 ft bgs)

- **Approx. 470 ft bgs**

- **3/8" Bentonite Chips**
  - (480 - 488 ft bgs)

- **20/40 Colorado Silica Sand**
  - (486 - 488 ft bgs)

- **10/20 Colorado Silica Sand**
  - (488 - 510 ft bgs)

- **Schedule 80 PVC 5-foot Sump**
  - (490 - 495 ft bgs)

Not to Scale

*BGS = Below Ground Surface
Depths Subject to Change Based on Field Observations*
Existing Monitoring Well KAFB-10617

Proposed Sparging/SVE Well KAFB-106211

Inset: City Areas

Source: Microsoft Virtual Earth