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Lockheed Martin Corporation

Interim Data Report for Supplemental Field Activities

Former American Beryllium Company Site

February 22, 2008

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List of Acronyms

- 2/22/08 Interim Data Report
- 3/19/08 Groundwater Model Calibration Report
- 4/25/08 Pilot Study Evaluation
- 4/30/08 Groundwater Model Hydraulic Containment Evaluation
- 7/8/08 Groundwater Model Solute Transport Evaluation

This IDR summarizes supplemental field activities performed by ARCADIS on behalf of Lockheed Martin that were detailed in the following two work plans provided to FDEP:

- Proposed Field Activities Scope of Work (SOW) dated October 5, 2007:
  - Geotechnical borings to recover soil samples for laboratory analysis;
  - Installation of additional monitoring wells to measure water levels during the proposed pumping tests;
  - Pond and ditch characterization to further evaluate the potential interaction of surface water on the shallow groundwater; and
  - Long-Term Monitoring Water levels to provide additional water level data to be used in the groundwater model and aid in model calibration.
- Proposed Pumping Test SOW dated November 16, 2007:
  - Characterization of hydraulic properties of the groundwater flow for use in the three dimensional (3-D) groundwater model in preparation of the final remedy.

In addition, this IDR also provides results of field work conducted to date as detailed in

All planned field activities related to the additional data collection as detailed in the above SOWs have been completed and are presented in the following sections. In cases where an activity is still in progress, such as the MIP investigations, a notation to this effect has been made, with the understanding that the associated data and interpretations will be provided in future interim deliverables and in the revised RAP.

2. Activities Pursuant to the October 5, 2007 SOW

The October 5, 2007 SOW included drilling ten geotechnical borings, installing three monitoring wells, collecting samples from twenty-two pond or drainage ditch locations, and monitoring water levels at selected locations to obtain additional information on the physical properties of the aquifers that will be used to develop a three dimensional groundwater model to support the evaluation and selection of a remedial alternative.

2.1 Geotechnical Borings

Six deep (~175 to 180 feet below land surface [ft bls]) and four shallow (~40 to 50 ft bls) geotechnical borings were drilled at the locations shown on **Figure 1** to recover soil samples for laboratory analysis. The deep borings include GT-D-1, GT-D-2, GT-D-3, GT-D-4, GT-D-5, and GT-D-6. The shallow borings include GT-S-7,/(t9 GT-p3 GT-)-7P/TT-6.1(90.0113(geo)allS-892 -1)52

subsurface units could be reliably tested and quantified. Depending on lithology type, degree of consolidation, and sub-surface drilling conditions, the following methods were employed for collection of subsurface samples:

- Un-lined 2-inch diameter split-spoon sampling;
- Lexan-lined 2-inch and 3-inch diameter split-spoon sampling;
- Brass sleeve-lined 3-inch diameter split-spoon sampling;
- Dual-tube split-barrel HQ-wireline coring (Layne-Christensen model); and
- Triple-tube split-barrel HQ-wireline coring (Boart Longyear model).

Hollow-stem augers were used to advance boreholes within the surficial aquifer units and into the upper portion of the Venice Clay unit. The HQ-wireline and spin casing were used to advance the boreholes through the Venice Clay and underlying units. Upon termination of the borings at their total depths, each borehole was tremie-grouted to land surface. Materials that were retrieved via coring have been archived in labeled wooden core boxes stored on-site.

The draft geologic logs of the soil borings are provided in **Appendix A**. **Table 2** provides the survey data for the geotechnical borings. **Tables 3A, 3B, and 3C** provide a summary of laboratory analytical data for the geotechnical borings. The actual laboratory data reports are provided in **Appendix B**. The data is still undergoing validation (reviewed for completeness and appropriately qualified) and is therefore noted as draft at this time. The trichloroethene (TCE) soil adsorption (Kd) batch testing is still being evaluated and results will be presented in the groundwater model interim deliverable. Validated results, summary tables, and interpretations will be presented in the revised RAP.

2.2 Monitoring Wells

Three monitoring wells were originally proposed to be installed, one in each of the lower surficial aquifer system (LSAS), Arcadian Formation Gravels (AF Gravel) and Salt and Pepper Sands (S&P Sand) zones. These monitoring wells were to be clustered near existing upper surficial aquifer system (USAS) monitoring wells MW-4 and MW-70, located at the northwest corner of building 3 (see **Figure 1**). Ultimately, two wells were installed: MW-252 (S&P Sand); and MW-253 (AF Gravel).

The third monitoring well, intended for the LSAS, was not installed because, as discussed and agreed upon during the November 29, 2007 meeting with FDEP,

groundwater extraction well EW-102 installed in the LSAS as part of interim remedial action plan (IRAP) was located in the vicinity and with the IRAP system being shut down during the pumping test, EW-102 served as the LSAS monitoring well. Wells MW-252 and MW-253 were installed using a rotosonic rig consistent with procedures and materials used for monitoring wells installed during the SARA 3 field activities. **Table 2** provides the survey data for these well locations, and the draft boring logs are provided in **Appendix A**.

The monitoring wells (MW-252 and MW-253) have been added to the comprehensive monitoring event list. The new LSAS groundwater extraction well EW-102 and the new USAS groundwater extraction well EW-107 installed previously as part of the IRAP modifications were plumbed into the IRAP groundwater extraction system. Since these extraction wells were developed prior to the aquifer testing activities, they were monitored as part of the aquifer testing and comprehensive water level events.

2.3 Pond and Ditch Characterization

Two sediment/soil cores were retrieved from each of the 22 pond or ditch locations shown on **Figure 2** and identified in **Table 1**. **Table 2** provides survey data for the sampled locations.

One sediment/soil core at each location was recovered from the sediment/water interface to a depth of approximately 3 ft below the pond bottom or refusal, whichever was encountered first. Observation of the material in the core was noted, and the draft sediment logs are provided in **Appendix A**. Two samples, one from the top half and one from the bottom half of the core, were collected for grain size analysis using *ASTM D 422/4464*. If the material in the core was stratified, then the grain size samples were collected from the top two to three strata observed in the core. A second core from each location was retrieved from the sediment/water interface to a depth of approximately 1 to 2 ft below the pond bottom and sent to the laboratory for K_v by *ASTM D 5084*. The depth of water at each boring location was recorded.

During pond coring activities, three stilling well/staff gauge pairs were installed: one located in the pond on the Boothe property, one in the pond located at 1975/2003 Tallevast Road and one located within the ditch along Tallevast Road, north of the airport. A stilling well was also installed in the pond located on the former ABC facility, next to the existing staff gauge. **Figure 3** indicates the locations of all existing and new staff gauges and stilling wells. The locations will be surveyed at a future date, and the survey data may be provided in a future interim deliverable and will be provided in the

revised RAP. **Table 3A** provides a summary of analytical data for the sediment samples collected. The laboratory data reports are contained in **Appendix B**. The presented results are not currently fully validated, and so should be considered draft. This data will be incorporated into the 3-D groundwater model to evaluate remedial alternatives and the validated results and interpretation will be presented in the revised RAP.

2.4 Long-Term Monitoring Water Levels

Transducers were installed in the three stilling wells and all the monitoring wells shown on **Figure 3**. The transducers located in the stilling wells were programmed to record water level data at 15-minute intervals. The transducers in the monitoring wells were programmed to record water level data at 2-minute intervals. Periodically, manual water level measurements were collected from the three new and six previously-existing staff gauges and at the monitoring wells shown **Figure 3**. These water level measurements are described in Section 4, since they were collected concurrently with the aquifer testing activities. Long-term monitoring of water levels is currently ongoing.

3. Activities Pursuant to the October 12, 2007 SOW

Lockheed Martin is evaluating additional Interim Remedial Actions (IRA) that may reduce the mass of contaminants as part of the overall remedy for the former ABC site. Prior to preparation of an IRAP, the actual area and volume that is most amenable to mass reduction activities need to be more accurately defined. As discussed during the September 27, 2007 meeting and illustrated in **Figure 4A**, the target area initially identified for further IRA evaluation included the vicinity of the former process sumps (Area A).

In addition to the area defined in **Figure 4A**, Lockheed Martin is evaluating the potential for IRA at the offsite location shown in **Figure 4B** (Area B). Area B is located at 1864 Tallevast Road, in the vicinity of monitoring well MW-21, which is located approximately 700 feet east-southeast of the former ABC facility. This location was not proposed in the initial SOW of October 12, 2007, however, upon further consideration and discussions with the community technical representative it was agreed that Area B might be amenable to some form of focused mass reduction and therefore warranted further evaluation. An access agreement was subsequently obtained to conduct a limited investigation in this area.

A MIP was used to more precisely determine the depth of contaminants in the target area. This tool consists of a heated probe containing both a soil conductivity sensor and a gas-permeable port. As the probe was advanced using direct-push technology (DPT), the soil conductivity sensor provided a direct read-out that could be correlated to lithology. Simultaneously, organic vapors were drawn through the membrane and transferred through a heated trunk line to an gas chromatograph equipped with an electron capture detector (ECD), flame ionization detector (FID), and photoionization detector (PID), providing a real-time vertical profile of the distribution of volatile organic compounds at approximately six-inch intervals. Prior to the advancement of the probe, a response test was conducted to determine that the probe was functioning within acceptable limits. The probe was then advanced tertely2iufativeTT2ufur.2.tog.4( )]TJ at appr9(t)kewetect2r pr0.2276.4(f)nn.22 per minute until refusal. In specific locations, soil samples and groundwr0.r samples

locations of interest (such as form

4. Activities Pursuant to the November 16, 2007 SOW

The November 16, 2007 SOW outlined proposed aquifer testing field work, which was presented and discussed during a meeting with FDEP on September 27, 2007. The goals and objectives of this field work, as discussed during the meeting, were as follows:

- Provide data for improving the characterization of hydraulic properties of the groundwater flow system in the immediate vicinity of the site, for incorporation in the 3D modeling;
- Specifically, perform testing focused on identifying influences between the LSAS and AF Gravel units, under controlled test conditions that include measured flow rates;
- Characterize non-pumping groundwater flow patterns through shut-down of the IRAP pumping system, and also ident

4.1 LSAS Piezometer Installation

Seven piezometers were installed to the top of the Venice Clay to monitor water levels within the LSAS during aquifer testing. **Figure 1** indicates the locations of the piezometers, and the survey data are provided in **Table 2**. **Appendix A** contains the draft boring logs and well completion diagrams.

The piezometers were screened in the LSAS using 2-inch pre-threaded polyvinyl chloride (PVC) screen. The screened interval was the five-foot interval directly overlying the Venice Clay. Screen intervals were selected during drilling based on the observed location of the LSAS at the piezometers. The top of the sand pack extended one foot above the top of the screen. The remainder of the annulus was backfilled with bentonite up to the surface completion, which consisted of a steel curb box set in concrete.

4.2 Water Level Collection

Both the October 5, 2007 and the November 16, 2007 work plans described collection of water levels at a number of locations. In addition, both work plans discussed installation of pressure transducers for continuous water level monitoring. Hence, the water data collection efforts were combined. **Table 5** provides a master list of water level monitoring locations, and indicates which locations were included as part of each data collection effort.

4.2.1 Transducer Installation

Transducers were ultimately installed in a total of 52 locations. **Figure 5** indicates the locations of transducers, and shows which of the transducers were installed as part of the long-term water level data collection.

Table 6 provides a list of the transducer installation locations and the serial numbers of the actual instruments installed. Transducer installation began on November 8, 2007. Most transducers were installed by November 13, 2007. New wells were instrumented after installation was complete. In addition, wells EW-101/EXU-1 and EW-108/EXL-1 were instrumented after they were connected to the IRAP system.

Transducer data downloaded from November 8, 2007 to January 30, 2008 are provided electronically as **Appendix D** for convenience. Draft files divided by well and aquifer testing event are provided are in Microsoft Excel format. Raw data files are

provided in comma-delimited text file and binary format. The transducers currently in use have a large amount of memory, allowing for flexibility in download times. Transducer data collection is ongoing through February 2008.

4.2.2 Manual Water Level Collection

Manual water level collection was also planned as part of the aquifer testing work plan. The measurement events were conducted as follows:

- Aquifer test data collection. All on-site and selected nearby off-site wells were monitored as part of the aquifer test data collection. The group of wells measured is shown on **Figure 6** and listed in **Table 5** under "Manual Water Levels". Because the long-term monitoring locations listed in Section 2.4 were instrumented with transducers, water levels were also collected from these locations when the transducers were downloaded; and

- Comprehensive water level events. Two comprehensive water level events were completed. **Table 5** lists the intended wells for monitoring during the comprehensive events, and **Figure 7** provides a plot of the well locations.

All manual water level data collected from November 8, 2007 to January 2, 2008 is provided as **Tables 7A** to **7M**. Data collected subsequent to that date is still in the process of being checked for accuracy and will be provided in the revised RAP.

4.3 Data Collection Events

The following sub-sections describe the data collection events in chronological order. **Table 8** provides a timeline of events relating to aquifer testing and water level collection activities. Barometric pressure and precipitation data for the time period covered by the aquifer testing data collection efforts are provided in **Appendix F**.

4.3.1 Pre-Shutdown Data Collection

Transducer data collection began on November 10, 2007. Manual water levels during IRAP system operation were collected on November 9, 2007, and are reported in **Table 7A.**

4.3.2 IRAP System Shutdown

The IRAP system shut down on November 12, 2007. The groundwater system was allowed to recover for 3 weeks. Water levels in the wells listed in **Table 5** were measured regularly to evaluate water level recovery. **Tables 7B** through **7G** report the manual measurements collected during system recovery.

The pressure transducer data was also downloaded periodically and plotted to evaluate the progress of water level recovery. **Figures 8A** through **8J** show the response to IRAP system shutdown in monitored groundwater zones.

4.3.3 First Round of Comprehensive Static Water Level Measurements

Water levels in the groundwater zones had stabilized within the three weeks following IRAP system shutdown. Hence, a comprehensive round of water level measurements was completed at the accessible monitoring wells, extraction wells, and piezometers listed in **Table 5** and shown on **Figure 7**. In addition, field personnel measured water levels at available staff gauges. **Table 7H** provides the water level measurements for the wells which were accessible for measurement during the comprehensive water

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- Specific capacity tests were performed at wells EW-UAFG-1, IWI-1, MW-127, and MW-134 to select the pumping rates for the longer term pumping tests. Each tested well was pumped separately for approximately one hour and then allowed to recover to its static water level before testing was conducted on the next well;

- One-day pumping tests were performed at three on-site AF Gravel wells to evaluate spatial distribution of interaction between the AF Gravel and LSAS. These tests were 24 hours in duration and were conducted at wells IWI-1, MW-127, and MW-134. The aquifer system was allowed to recover for at least 24 hours between tests. The extraction wells were observed to recover to within 90% of their static water levels during this time; and

- A 7-day pumping test was conducted at well EW-UAFG-1, with the intent of evaluating longer-term responses to pumping in the AF Gravel. Extraction began on January 7, 2008 and ended on January 14, 2008. The groundwater system was allowed to recover until January 21, 2008 after the cessation of extraction. **Figures 9A** through **9J** show the water level responses in the monitored zones during the pumping and recovery phases of this test. In addition, **Appendix E** provides data collected regarding the operation of the well located at the nearby golf course.

Manual water levels measured as part of the aquifer testing activities are provided in **Tables 7J** through **7M**.

4.3.5 Second Round of Comprehensive Static Water Level Measurements

After water levels in the groundwater zones had been allowed to recover following the final AF Gravel pumping test, a comprehensive round of water level measurements was completed at the available monitoring wells, extraction wells, and piezometers listed in **Table 5** and shown on **Figure 7**. In addition, field personnel monitored water level elevation at the available staff gauges. These water levels are in the process of being checked for accuracy and will be provided as part of a future report. Potentiometric surface maps illustrating the static groundwater elevations are being prepared and will be presented in the revised RAP.

4.3.6 IRAP System Startup

The IRAP groundwater recovery and treatment system was re-started on February 4, 2008. The extraction wells in the IRAP system were re-started at as close to the same time as possible. The pressure transducers at the wells listed in **Table 5** continued

operating for approximately two weeks following the IRAP system startup. Additionally, water levels were measured manually approximately twice a week at the monitoring wells, extraction wells, and piezometers listed in **Table 5** during the system startup. The hydraulic response data collected will be used in the verification phase of the groundwater flow model development program.

Appendix A

Geologic Logs and Well Completion Diagrams (In Compact Disc Holder)

Appendix

Appendix C

MIP Data Output (In Compact Disc Holder)

Appendix D

Pressure Transducer Data (Data in Compact Disc Holder)

Appendix F

Weather Data (Data in Compact Disc Holder)

Compact Disc

Tables

Figures