Albuquerque Bernalillo County
Water Utility Authority

Agenda Item No. 10a

Meeting Date: February 26, 2014
Staff Contact: Rick Shean, Water Quality Hydrologist

TITLE: OB-14-4 - Groundwater Modeling Results from the Contingency Plan for Groundwater Production Wells near the Bulk Fuels Facility

BACKGROUND: On November 28, 2012 the Water Authority Governing Board authorized the Water Authority to enter into a Memorandum of Agreement (MOA) with Kirtland Air Force Base for development of a Contingency Plan for Water Authority wells threatened by the KAFB Bulk Fuels Facility spill. The plan was to be prepared by an independent contractor and funded by the Air Force Civil Engineering Center (AFCEC). On December 19th, 2012 the MOA was authorized and AFCEC procured CH2M Hill, an environmental and engineering firm, to prepare the contingency plan with input from AFCEC, KAFB, the U.S. Geological Survey and the Water Authority. As part of the contingency plan, a groundwater flow model was prepared to help determine optimal locations for the installation of sentinel wells for detecting the approach of the jet fuel plume towards the Water Authority's production wells. CH2M Hill has completed the groundwater model portion of the contingency plan. The full draft plan will be released for public comment in March of 2014.

SUMMARY: CH2M Hill's groundwater flow simulation (i.e., modeling) results show varying possibilities for movement of groundwater contaminated by the fuel spill, both in terms of time and of direction. Different assumptions for future pumping rates in the basin result in different flow paths of groundwater from the area of the spill to the production wells downgradient of the ethylene dibromide (EDB) plume. The model predicts that the plume may impact either the Ridgecrest Wells No. 3 and 5 in 26 to 40 years, and KAFB production well No. 3 in 10 to 22 years. The model is especially useful inasmuch as direction of travel of the EDB plume is as important as time of travel. The U.S. Environmental Protection Agency (EPA) recently released its own model for the KAFB BFF Spill, and in addition to the CH2M Hill model, two more groundwater models related to the spill are expected to be released by spring of 2015. All of the results for the models being prepared will be compared to CH2M Hill's model to inform the Water Authority's decision for the optimal location of sentinel wells for the Ridgecrest production wells.

FISCAL IMPACT: None

Groundwater Modeling Results from the Contingency Plan for Groundwater Production Wells Near the Bulk Fuels Facility



Sharon Minchak, P.G., CH2M HILL

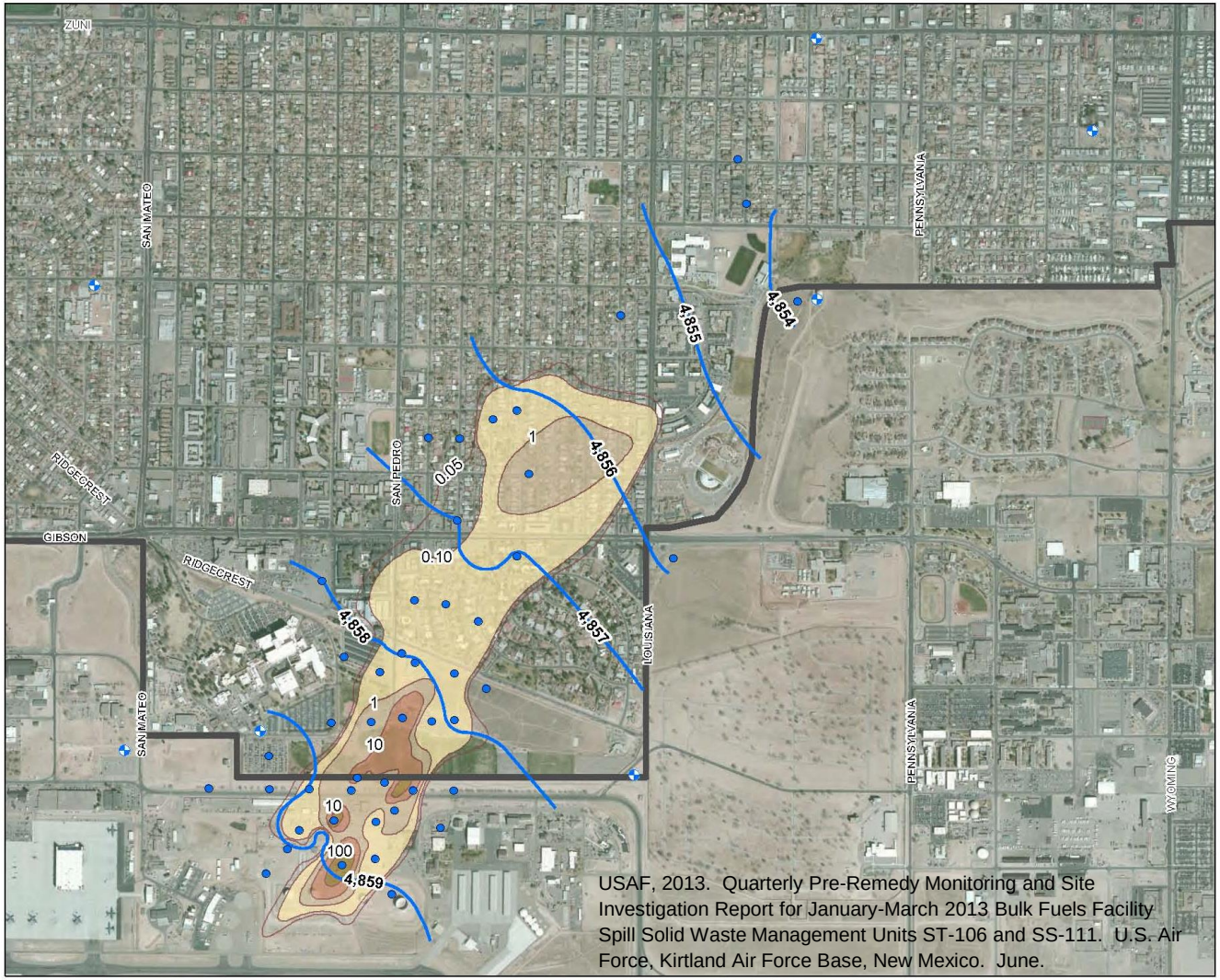
Albuquerque Bernalillo County Water Utility Authority Board Meeting

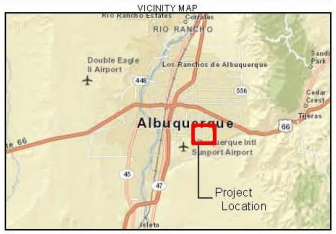
February 26, 2014

Introduction

- Contingency Plan – a course of action to be followed if a preferred plan fails or an existing situation changes
  - Preferred Plan – remedial actions prevent contaminated groundwater from reaching any water supply wells
  - Existing Situation – water supply wells meet drinking water standards
- Contingency Plan Elements
  - Analysis of current conditions (conceptual site model)
  - **Groundwater modeling**
  - Evaluation of possible contingencies
  - Determination of trigger points to implement a contingency

Water Supply Wells Near the Bulk Fuels Facility





LEGEND

- Water Supply Well
- Groundwater Monitoring Well
- Groundwater Elevation Contour (ft msl)
- Kirtland AFB Boundary

EDB Concentration (µg/L) (USAF, 2013)

- 0.014 - 0.1
- 0.11 - 1
- 1.1 - 10
- 11 - 100
- 110 - 280

0 500 1,000 2,000 Feet

USAF, 2013. Quarterly Pre-Remedy Monitoring and Site Investigation Report for January-March 2013 Bulk Fuels Facility Spill Solid Waste Management Units ST-106 and SS-111. U.S. Air Force, Kirtland Air Force Base, New Mexico. June.

Ethylene Dibromide (EDB) Shallow Groundwater Plume and Water Supply Wells near the Kirtland Air Force Base Bulk Fuels Facility

CH2MHILL.

CH2MHILL.

Groundwater Modeling Objectives

- Estimate future contaminant migration paths of ethylene dibromide (EDB)
- Estimate travel times of EDB from the Kirtland Air Force Base Bulk Fuels Facility to downgradient water supply wells
- Provide data for the selection of locations for groundwater monitoring wells to provide guidance for when a contingency should be implemented

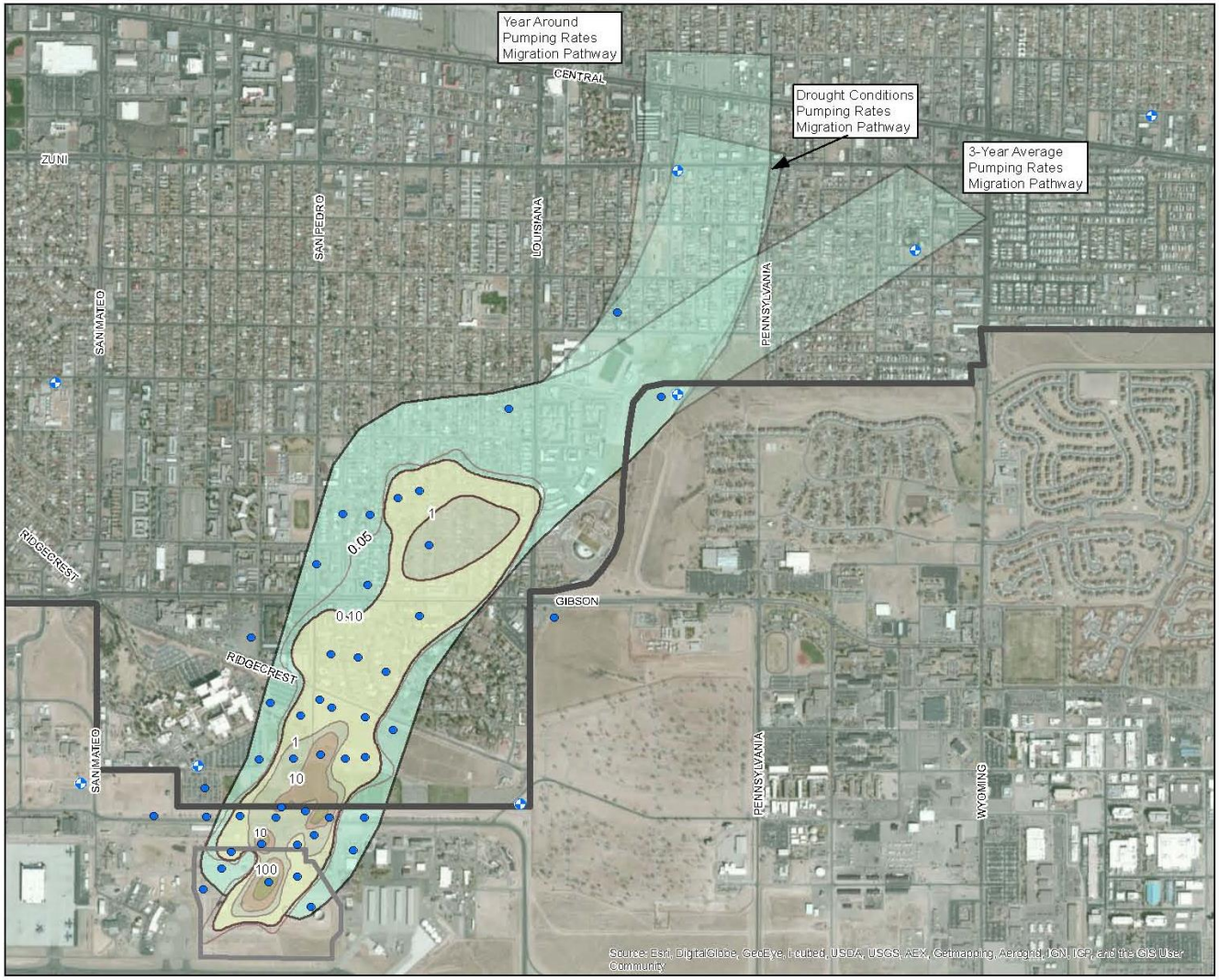
Groundwater Modeling Methodology

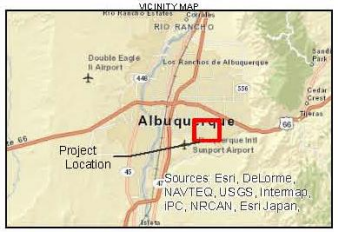
- Updated existing U.S. Geological Survey (USGS) Middle Rio Grande Basin (MRGB) groundwater flow model with current groundwater pumping rates
- Calibrated MRGB groundwater flow model based on 2012 contaminant distribution and groundwater elevation data
- Assumed no remediation of groundwater contamination
- Evaluated three different pumping scenarios based on Water Authority and Kirtland AFB pumping rates
- Modeled future particle tracks to predict EDB migration pathways and travel times to downgradient water supply wells

Future Groundwater Pumping Scenarios

Groundwater Pumping Scenario	Season	
	Irrigation Season March 16 – October 31	Non-Irrigation Season November 1 – March 15
3-Year Average	Average Water Authority and Kirtland AFB pumping rates, measured for each well, during the irrigation seasons of 2010, 2011, and 2012	Average Water Authority and Kirtland AFB pumping rates, measured for each well, during the non-irrigation seasons of 2010, 2011, and 2012
Drought Conditions	Actual Water Authority and Kirtland AFB pumping rates, measured for each well, during the irrigation seasons for 2012 and 2013	Actual Water Authority and Kirtland AFB pumping rates, measured for each well, during the non-irrigation seasons for 2012 and 2013
Year Around Pumping	Actual Water Authority and Kirtland AFB pumping rates, measured for each well, during the irrigation seasons of 2012 and 2013	

Estimated Migration Pathways





LEGEND

- Water Supply Well
- Groundwater Monitoring Well
- Predicted Plume Migration Path

EDB Concentration in Shallow Groundwater-January 2013 (µg/L) (USAF, 2013)

- 0.014 - 0.1
- 0.11 - 1
- 1.1 - 10
- 11 - 100
- 110 - 280
- Kirtland AFB Boundary
- Kirtland AFB Bulk Fuels Facility

0 750 1,500 3,000
Feet

Predicted Plume Migration Paths Based on Three Groundwater Pumping Scenarios

UNK: K:\AV_PROJ\KIRTLAND\GIS\MAPFILES\MODELMIGRTATIONPATHS.MXD TARROWOO 2/20/2014 3:18:11 PM

CH2MHILL.

Estimated Travel Times

Groundwater Pumping Scenario	Estimated Year Ethylene Dibromide will Reach Water Supply Wells		
	KAFB-3	**Ridgecrest W-3**	**Ridgecrest W-5**
3-Year Average	2028 to 2036	2054	Not Applicable*
Drought Conditions	2028 to 2036	Not Applicable*	2054
Year Around Pumping	2024 to 2032	Not Applicable*	2040 to 2042

*Based on the groundwater pumping scenario, EDB does not reach this water supply well.

Groundwater Flow Modeling Conclusions

- Utilized the published USGS MRGB flow model with particle tracking to simulate future EDB migration
- Assumed no groundwater remediation at the Kirtland AFB Bulk Fuels Facility Site
- Evaluated three possible future groundwater pumping scenarios
  - EDB may reach water supply well Ridgecrest W-5 as soon as 2040 to 2042 based on year around pumping or 2054 based on drought condition pumping
  - EDB may reach water supply well Ridgecrest W-3 as soon as 2054 based on 3-year average pumping
- Future pumping will influence when contamination may reach the water supply wells if no remediation occurs
- Groundwater modeling should be updated as additional information and data become available

Thank you for your attention