C2-087-00015 (8.1)

APPROVED

Golder Associates

September 15, 2010

Our Ref.: 103-81541

Kansas Department of Health and Environment
Curtis State Office Building
1000 SW Jackson St., Ste. 410
Topeka, Kansas 66612-1367

BER SCANNED
MAY 07 2012

RECEIVED
OCT 1 2010
BUREAU OF
ENVIRONMENTAL REMEDIATION

Attn: Ms. E. Jean Underwood

RE: OPTIMIZATION WORK PROPOSAL SUMMARY FOR THE MONITORING WELL AND RECOVERY WELL NETWORKS FORMER BOEING FACILITY, WICHITA, KANSAS

Dear Ms. Underwood:

As requested by the Boeing Company (Boeing), Golder Associates Inc. (Golder) prepared this summary of the Optimization Work Proposal (OWP) for the Monitoring Well and Recovery Well Networks at the Former Boeing Facility at 4615 South Oliver Street in Wichita, Kansas (Figure 1). Golder submitted a Draft OWP on September 30, 2009 in response to the Kansas Department of Health and Environment (KDHE) July 27, 2009 letter to Boeing requesting a "Optimization Work Plan" for "optimizing the current groundwater monitoring and recovery systems." KDHE provided comments on the OWP on December 10, 2009. The purpose of this letter is to confirm KDHE approval of the OWP and incorporate the KDHE comments into the OWP. The following presents a summary of the OWP, and modifications to the OWP since submittal of the draft report. By using the term "optimization", Golder does not imply that the opinions in this report represent a unique or absolute solution to the problem of improving the efficiency of the monitoring or recovery well networks at the Site.

MONITORING WELL NETWORK

The proposed monitoring well network (MWN) for monitoring during optimization of the recovery well network is presented in Table 1 and Figure 2. Table 1 and Figure 2 represent the MWN presented in the draft OWP, with the following modifications:

- The proposed monitoring frequency for RW-181 has changed from semi-annual to annual because there is no submersible pump in this well.
- The proposed monitoring frequency for RW-182 has changed from annual to semi-annual because there is a submersible pump in this well.
- The Fuel Farm and D-9 air stripper sampling frequency has changed from quarterly to not-sampled as these systems are no longer treating extracted groundwater.

RECOVERY WELL NETWORK

The proposed primary and secondary recovery well network (RWN) is presented in Table 2 and Figure 3. Table 2 and Figure 3 represent the RWN presented in the draft OWP, with the following modifications:

- KDHE requested that Plant 2 recovery wells RW-134 and RW-135 be added to the primary recovery well network. However, Boeing informed KDHE that these wells are currently approved and in use as injection wells for the in situ treatment program. KDHE verbally approved continued use of these wells as injection wells.

- A6 recovery wells RW-005A and RW-029 have been added to the primary recovery well network as requested by KDHE.
- Recovery well RW-181 has been removed from the list of active recovery wells.

Should you have any questions regarding this report, please do not hesitate to call.

Sincerely,

GOLDER ASSOCIATES INC.

Eric Kern, Ph.D.
Senior Microbiologist

Ross Bennett, P.E.
Project Engineer

Todd H. Rees, Ph.D., P.E.
Program Leader and Principal

TABLES

Table 1 OWP Monitoring Well Network
Table 2 Primary and Secondary Recovery Well Network Rates

FIGURES

Figure 1 Site Location Map
Figure 2 Revised Monitoring Well Network
Figure 3 Primary and Secondary Optimization Recovery Well Locations

KANSAS

DEPARTMENT OF HEALTH
AND ENVIRONMENT

Mark Parkinson, Governor
Roderick L. Bremby, Secretary

www.kdheks.gov

December 10, 2009

Mike Spain
The Boeing Company
2727 East MacArthur
Wichita, Kansas 67216

RE: Boeing Commercial Aircraft Group Site
Wichita, Kansas
Review of the *Draft Optimization Work Proposal for the Monitoring Well and Recovery Well Networks*

Dear Mr. Spain,

The Kansas Department of Health and Environment - Bureau of Environmental Remediation (KDHE - BER) has completed its review of the *Draft Optimization Work Proposal for the Monitoring Well and Recovery Well Networks* (Optimization Proposal), received by KDHE-BER on October 2, 2009. The Optimization Proposal was prepared by Golder Associates Inc. (Golder) on behalf of The Boeing Company (Boeing). Preparation and submittal of the Optimization Proposal was in response to requirements contained in the July 27, 2009 KDHE-BER letter to Boeing requesting an optimization work plan.

KDHE-BER hereby provides approval of the Optimization Proposal and acceptance into the administrative record. However, KDHE-BER has the following comments and suggestions on the Optimization Proposal.

1. The Monitoring and Remediation Optimization System (MAROS) developed by GSI Environmental Inc. and the University of Houston, in combination with the Air Force Center for Environmental Excellence (AFCEE), is an additional resource for evaluating the recovery and monitoring well network. Information regarding MAROS is available at http://www.gsi-net.com/software/free-software/maros.html#MAROS_Features.

2. KDHE-BER suggests that Boeing consider retaining the following recovery wells active due to historically elevated trichloroethylene (TCE) concentrations.

   - Plant 2: RW-134 (2008: TCE 47,500 µg/L); RW-135 (2008: TCE 55,400 µg/L); and,
   - A6: RW-005A (2008: TCE 1,150 µg/L); RW-029 (2008: TCE 519 µg/L).

3. Please ensure that future evaluations of the recovery well and monitoring well optimizations are submitted to KDHE-BER for review and approval prior to making any further changes to the recovery well and monitoring well networks.

4. Please be aware that any proposed plugging and abandonment of monitoring and/or recovery wells must be approved in advance by KDHE-BER.

5. Please be aware that a reduction in the number of recovery wells may increase the time required to reach cleanup goals.

6. Due to the extensive proposed revisions to the monitoring well and recovery well networks and sampling frequency, KDHE-BER requests that an updated Sampling and Analysis Plan (SAP; consisting of a Field Sampling Plan [FSP] and Quality Assurance Project Plan [QAPP]) be submitted for KDHE-BER review and approval by January 30, 2010 (prior to the first groundwater sampling event for Calendar Year 2010).

As a reminder, please provide one hard copy of all documents submitted for KDHE-BER review in addition to the electronic version. Should you have any questions or concerns regarding this letter, you may reach me by telephone at 785-291-3066 or by e-mail at sbryant@kdheks.gov.

Sincerely,

Steve Bryant
Professional Geologist
Remedial Section/Site Remediation Unit
Bureau of Environmental Remediation

c: E. Jean Underwood→file Boeing Commercial Aircraft Group Site (C2-087-00015-01)
Eric Kern, Golder Associates Inc.

TABLES

TABLE 1
OWP MONITORING WELL NETWORK

FORMER BOEING FACILITY
WICHITA, KANSAS

MONITORING WELLS

Sample ID	Monthly	Quarterly	Annual
MW-03-01		X	X
MW-003MK			X
MW-004A			X
MW-005A			X
MW-006A			X
MW-007A			X
MW-008A		X	X
MW-015A		X	X
MW-018A			X
MW-019			X
MW-020C		X	X
MW-021C			X
MW-023			X
MW-024A		X	X
MW-032A			X
MW-033			
MW-034			
MW-035			X
MW-037			X
MW-039			X
MW-040			X
MW-041A			X
MW-043			
MW-044A			X
MW-046			X
MW-047			X
MW-053		X	X
MW-055			X
MW-056		X	X
MW-058			X
MW-058A			X
MW-059			X
MW-060			X
MW-061			X
MW-061A			X
MW-062			X
MW-064			
MW-065			X
MW-067			X
MW-069			X
MW-074			X
MW-075			X
MW-076			X
MW-078			X
MW-080			X
MW-081			X
MW-084			X
MW-085			X
MW-086A		X	X
MW-087A			
MW-088			
MW-089		X	X
MW-092			X
MW-093			
MW-094R			X
MW-095R			X
MW-096			X
MW-097D			X
MW-097S		X	X
MW-102			
MW-103			X
MW-104		X	X
MW-105			X

Sample ID	Monthly	Quarterly	Annual
MW-109			X
MW-110		X	X
MW-113		X	X
MW-117			X
MW-118			X
MW-122		X	X
MW-123			X
MW-124			
MW-125			
MW-137			X
MW-138			X
MW-141			X
MW-143			X
MW-144		X	X
MW-145		X	X
MW-146			X
MW-149			X
MW-150			X
MW-151			X
MW-160			X
MW-161			X
MW-162			
MW-165			
MW-166			X
MW-167			X
MW-168			X
MW-169			X
MW-176		X	X
MW-177		X	X
MW-178			X
MW-179		X	X
MW-180		X	X
MW-181			X
MW-182			X
MW-185		X	X
MW-186			X
MW-187			X
MW-192			X
MW-193		X	X
MW-194			
MW-195			
MW-196			X
MW-197			X
MW-198		X	X
MW-199		X	X
MW-200			X
MW-201			X
MW-202			X
MW-203		X	X
MW-204			X
MW-205			X
MW-206			X
MW-207			X
MW-208			X
MW-209			X
MW-210			X
MW-211			X
MW-212			X
MW-213			X
MW-214			X
MW-215			X
MW-216			X
MW-217			X

Sample ID	Monthly	Quarterly	Annual
MW-218			X
MW-219			X
MW-220			X
MW-221			X
MW-222			X
MW-223			X
MW-224			X
MW-225			X
MW-226			X
BH-02-01S			X
BH-02-01			X
BH-02-02S			X
BH-02-02			X
BH-02-03S			X
BH-02-03			X
BH-02-04S			X
BH-02-04			X
BH02-05S			X
BH-02-05			X
BH-02-06S			X
BH-02-06			X
BH-02-09S			X
BH-02-09			X
BH-03-02			X
BH-03-03			X
BH-03-04			X
BH-03-05			X
BH-03-06			X
Inj-03-01			X
Inj-03-02			X
Inj-03-03			X
Inj-03-04			X
Inj-03-05			X
Inj-03-06			X
Inj-03-07			X
Inj-03-08			X
Inj 05-01			X
Inj 05-02			X
Inj 05-03			X
Inj 05-04			X
SUBTOTAL Per Event =	0	25	152
Samples Per Year =	11	3	1
Subtotal samples per year =	0	75	152
			227

House Wells	
	Frequency
Sample ID	Annual
4300 S.Clifton	X

TABLE 1
OWP MONITORING WELL NETWORK

FORMER BOEING FACILITY
WICHITA, KANSAS
RECOVERY WELLS

Sample ID	Quarterly	Semi-Annual	Annual
RW-002B			X
RW-002FF			X
RW-004AA		X	X
RW-004FF			X
RW-005A			X
RW-006A			X
RW-007A			X
RW-008A			X
RW-009A			X
RW-010AA			X
RW-011A		X	X
RW-012A		X	X
RW-013A			X
RW-014			X
RW-015A			X
RW-016			X
RW-017			X
RW-018A			X
RW-019A		X	X
RW-020			X
RW-026		X	X
RW-027A			X
RW-028A		X	X
RW-029			X
RW-030			X
RW-031			X
RW-033A		X	X
RW-034			X
RW-035A			X
RW-040			X
RW-041			X
RW-042			X
RW-043			X
RW-044			X
RW-045		X	X
RW-046A		X	X
RW-047A		X	X
RW-049A		X	X
RW-052			X
RW-053		X	X
RW-054		X	X
RW-055		X	X
RW-056			X
RW-057		X	X
RW-058		X	X
RW-059			X
RW-060		X	X
RW-061		X	X
RW-062		X	X
RW-063	X		X
RW-064			X
RW-065			X
RW-066		X	X
RW-067			X
RW-068	X		X
RW-069			X
RW-070		X	X
RW-071			X
RW-072			X
RW-073	X		X
RW-074			X
RW-075			X
RW-076			X
RW-077			X
RW-078			X

Sample ID	Quarterly	Semi-Annual	Annual
RW-079		X	X
RW-080		X	X
RW-081		X	X
RW-082		X	X
RW-083			X
RW-084			X
RW-085		X	X
RW-086			X
RW-087		X	X
RW-088			X
RW-089			X
RW-090			X
RW-091			X
RW-092			X
RW-093		X	X
RW-094		X	X
RW-095		X	X
RW-096		X	X
RW-097		X	X
RW-098		X	X
RW-099A			X
RW-100			X
RW-101		X	X
RW-102			X
RW-103			X
RW-104			X
RW-105			X
RW-106			X
RW-107			X
RW-108			X
RW-113			X
RW-114			X
RW-115			X
RW-116		X	X
RW-117			X
RW-118			X
RW-120			X
RW-122			X
RW-125			X
RW-127		X	X
RW-128			X
RW-129			X
RW-130			X
RW-131			X
RW-132			X
RW-133			X
RW-134			X
RW-135			X
RW-136			X
RW-137			X
RW-138			X
RW-139			X
RW-140			X
RW-141			X
RW-142		X	X
RW-143		X	X
RW-144			X
RW-145		X	X
RW-146		X	X
RW-147		X	X
RW-148			X
RW-149		X	X
RW-150			X
RW-151			X
RW-152		X	X

Sample ID	Quarterly	Semi-Annual	Annual
RW-153		X	X
RW-154			X
RW-155			X
RW-156			X
RW-157			X
RW-158			X
RW-159			X
RW-160			X
RW-161R			X
RW-162R			X
RW-163R			X
RW-164R			X
RW-165R			X
RW-170			X
RW-171			X
RW-181			X
RW-182		X	X
RW-183			X
RW-184			X
RW-185			X
RW-186			X
RW-187			X
RW-188			X
RW-189			X
RW-190		X	X
RW-191		X	X
RW-192		X	X
RW-193		X	X
RW-194		X	X
RW-195		X	X
RW-196		X	X
RW-197		X	X
RW-198		X	X
RW-199		X	X
RW-200		X	X
SUBTOTAL Per Event =	3	56	165
Samples Per Year =	3	1	1
Subtotal Samples Per Year =	9	56	165
			230

Air Strippers	
Sample ID	**Quarterly**
Main	X
S. Campus	X
Plant 1	X
Plant 2	X
Activity Center	X
Fuel Farm	
D-9	
K-15	X
IPB2	X
Englewood	X

Reference:
Existing monitoring well network based on excel spreadsheet "monitoring schedule 2009.xls" provided by Boeing.

Checked by: RWB
Reviewed by: EK

TABLE 2
PRIMARY AND SECONDARY RECOVERY WELL NETWORK RATES

BOEING FACILITY
WICHITA, KANSAS

Extraction Well ID	Flow Rate[1] ft³/day	gpm	Note
RW-004AA	-389	-2.02	
RW-005A	-114	-0.59	RW added per KDHE
RW-011A	-1003	-5.21	
RW-012A	-87	-0.45	
RW-019A	-631	-3.28	
RW-026	-1196	-6.21	
RW-028A	-264	-1.37	
RW-029	-30	-0.16	RW added per KDHE
RW-033	-566	-2.94	
RW-045	-1985	-10.31	
RW-046A	-55	-0.29	
RW-047A	-174	-0.90	
RW-049A	-272	-1.41	
RW-053	-617	-3.21	
RW-054	-375	-1.95	
RW-055	-179	-0.93	
RW-057	-1154	-5.99	
RW-058	**-252**	**-1.31**	
RW-060	***-40***	***-0.21***	
RW-061	-107	-0.56	
RW-062	-173	-0.90	
RW-066	-245	-1.27	
RW-070	-689	-3.58	
RW-079	**-11**	**-0.06**	
RW-080	-255	-1.32	
RW-081	**-25**	**-0.13**	
RW-082	-437	-2.27	
RW-085	-381	-1.98	
RW-087	-392	-2.04	
RW-093	-526	-2.73	
RW-094	-2713	-14.09	
RW-095	-1551	-8.06	
RW-096	-387	-2.01	
RW-097	-794	-4.12	
RW-098	**-67**	**-0.35**	
RW-101	**-344**	**-1.79**	
RW-116	**-308**	**-1.60**	
RW-127	**-475**	**-2.47**	
RW-134	**-136**	**-0.71**	RW added per KDHE
RW-135	**-59**	**-0.31**	RW added per KDHE
RW-142	**-22**	**-0.11**	
RW-143	**-29**	**-0.15**	
RW-145	-28	-0.15	
RW-146	-35	-0.18	
RW-147	-14	-0.07	
RW-149	**-86**	**-0.45**	
RW-152	***-85***	***-0.44***	
RW-153	***-25***	***-0.13***	
RW-192	-433	-2.25	
RW-193	-32	-0.17	
RW-194	-132	-0.69	
RW-195	-15	-0.08	
RW-196	-133	-0.69	
RW-197	-18	-0.09	
RW-198	-178	-0.92	
RW-199	-26	-0.14	
RW-200	-9.4	-0.05	
Sum of Modeled Extraction Well Rates =	**-20,758**	**-108**	

Notes:

1) Well rates based on 2006-2007 average well rates from "Pumping_rates_Model08.xls" provided by Franz Environmental Inc

gpm = gallons per minute

Negative rates indicate water being removed from model

BOLD indicates secondary recovery well

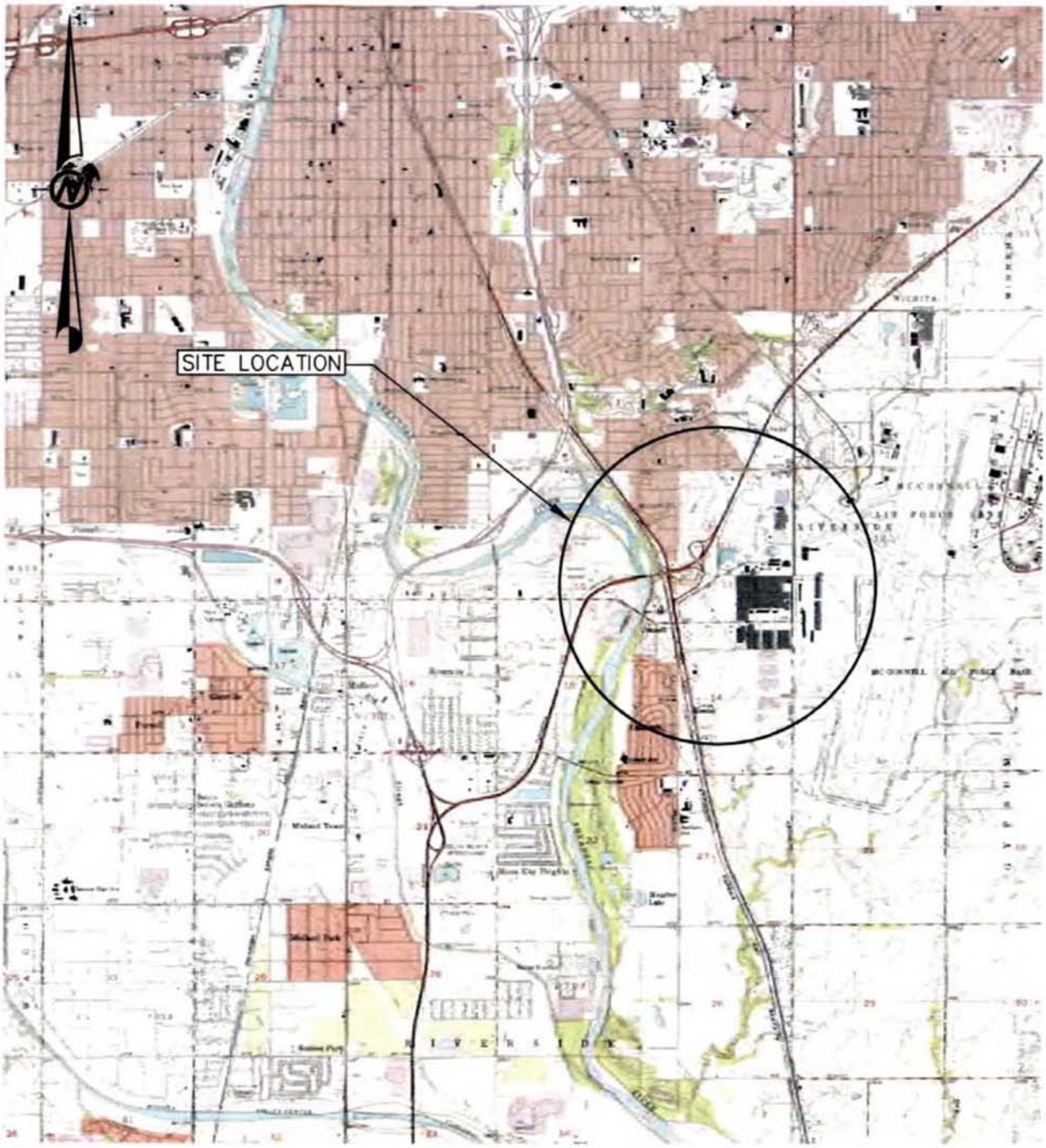
BOLD ITALICS indicates primary recovery well with increased flow rate

Reference:

Pumping and extraction rates from monthly extraction well meter reading excel spreadsheet files provided by Boeing and summary files provided by Franz Environmental Inc.

Checked by: RWB
Reviewed by: EK

FIGURES



REFERENCES

BASE MAPS TAKEN FROM 7.5 MINUTE USGS QUADRANGLE MAPS TITLED, "DERBY, KS.", DATED 1961. AND "WICHITA EAST, KS" DATED 1960.

5000 0 5000
SCALE APPROXIMATE FEET

Golder Associates
Manchester, New Hampshire

FILE No.	09381501A008	SCALE	AS SHOWN
PROJECT No.	093-81501 REV. 0	DATE	08/21/09
		DESIGN	RWB
		CADD	MPB
		CHECK	RWB
		REVIEW	THR

TITLE

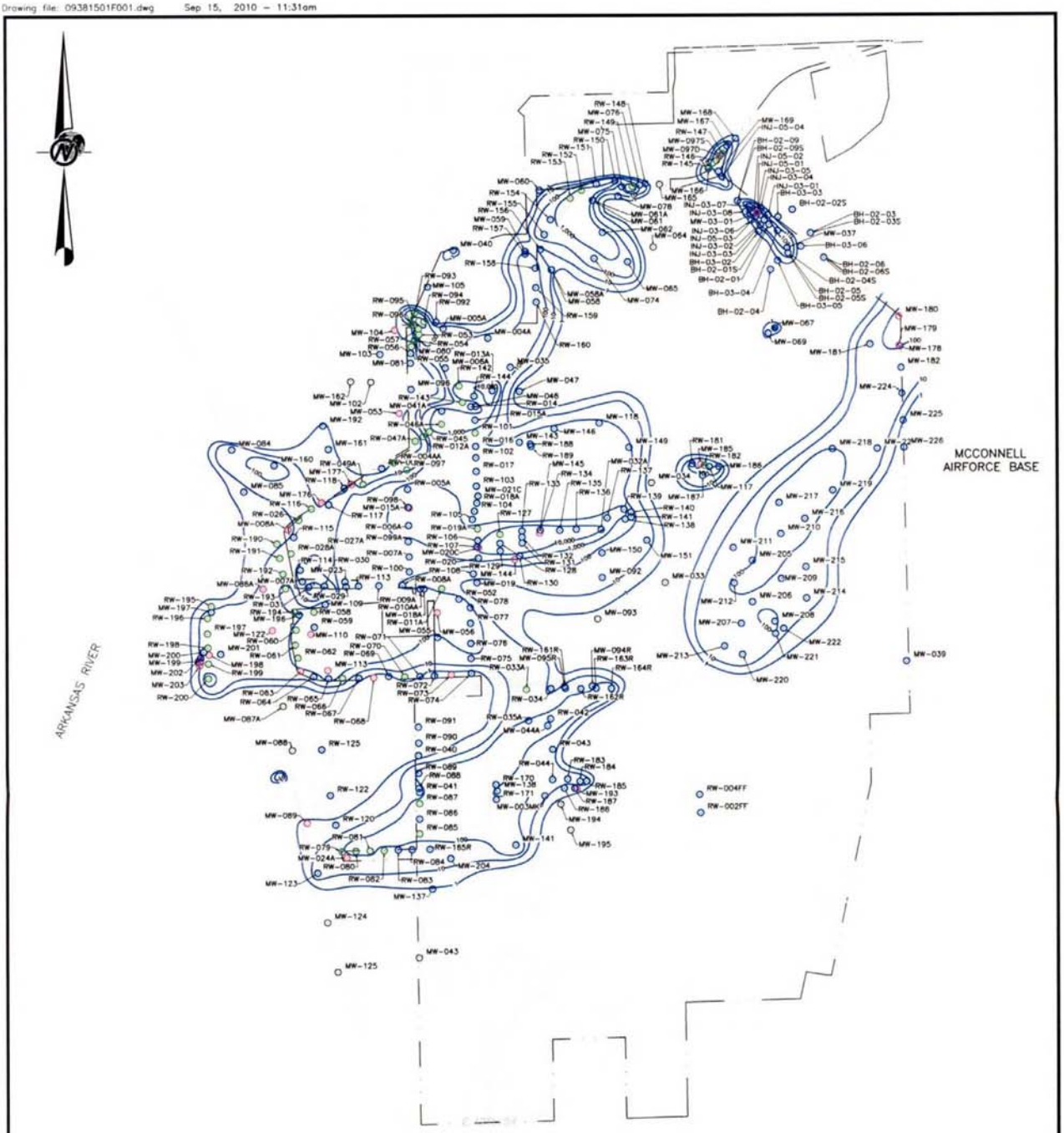
SITE LOCATION MAP

THE BOEING COMPANY
BOEING AND MCCONNELL AIR FORCE BASE
WICHITA, KANSAS

FIGURE 1

Drawing file: 09381501A008.dwg Aug 21, 2009 - 4:24pm

Drawing file: 09381501F001.dwg Sep 15, 2010 - 11:31am



LEGEND

APPROXIMATE BOEING PROPERTY BOUNDARY

TVOC CONTOURS

NOTE

2008 TOTAL VOLATILE ORGANIC COMPOUND (TVOC) CONTOURS BASED ON CAD FILE "208TVOC.DXF BY BOEING.

NOTE

1.) BASE MAP FROM CADD FILE TITLED "NEWBASEMAP2.DWG", PROVIDED BY THE BOEING COMPANY.

2. EXTENT OF STREAMS AND RIVERS BASED ON CADD FILE TITLED "STREAMS.DXF" PROVIDED BY FRANZ ENVIRONMENTAL INC.

FREQUENCIES

- MONTHLY FREQUENCY
- QUARTERLY FREQUENCY
- SEMI-ANNUAL FREQUENCY
- ANNUAL FREQUENCY
- NOT SAMPLED

1000 0 1000
SCALE FEET

FIGURE 2

PROJECT No.	093-81501	
FILE No.	09381501F001	
REV. 0	SCALE AS SHOWN	
DESIGN	RWB	08/07/10
CADD	BCL	09/14/10
CHECK	RWB	09/15/10
REVIEW	EK	09/15/10

TITLE

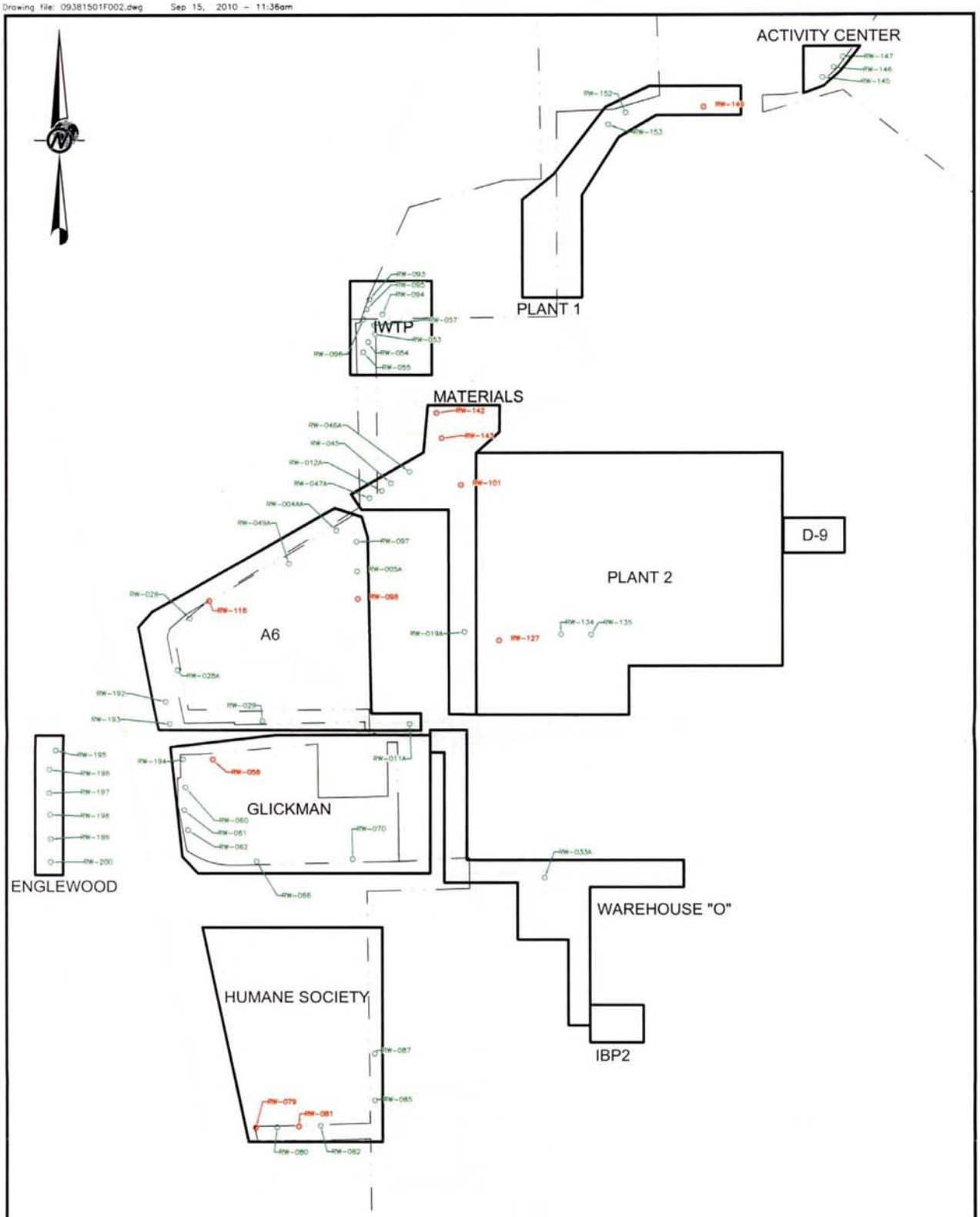
PROPOSED MONITORING WELL NETWORK

PROJECT

THE BOEING COMPANY
MODFLOW REPORT
WICHITA, KANSAS

Golder Associates
Manchester, New Hampshire

Drawing file: 09381501F002.dwg Sep 15, 2010 - 11:36am



LEGEND

- APPROXIMATE BOEING PROPERTY BOUNDARY
- RECOVERY WELL NETWORK SUB-AREAS
- RW-087 PRIMARY RECOVERY WELL NETWORK WELLS
- RW-079 SECONDARY RECOVERY WELL NETWORK WELLS

REFERENCES

1.) BASE MAP FROM CADD FILE TITLED "NEWBASEMAP2.DWG", PROVIDED BY THE BOEING COMPANY.

600 0 600
SCALE FEET

FIGURE 3

PROJECT No.	093-81501
FILE No.	09381501F002
REV. 0	SCALE AS SHOWN
DESIGN	RWB 06/07/10
CADD	BCL 09/14/10
CHECK	RWB 09/15/10
REVIEW	EK 09/15/10

TITLE

PRIMARY AND SECONDARY OPTIMIZATION RECOVERY WELL LOCATIONS

PROJECT

THE BOEING COMPANY
MODFLOW REPORT
WICHITA, KANSAS

Golder Associates
Manchester, New Hampshire