GROUNDWATER INVESTIGATION REPORT AND FOCUSED FEASIBILITY STUDY

REVISION 1

CRAB ORCHARD NATIONAL WILDLIFE REFUGE
PCB OPERABLE UNIT
SITES 32/33
MARION, ILLINOIS

PREPARED BY
RMT, INC.
MADISON, WISCONSIN

January 2000

PART I – GROUNDWATER INVESTIGATION REPORT

VOLUME 2 OF 2

5982-2

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Appendix K
Groundwater Flow and
Transport Model Calibration Documentation

K.1 Conceptual Model of Groundwater Flow

The groundwater flow system has been described in detail in Section 4, and is summarized briefly here. As shown on Figure 4-2 (Cross Sections A and B), the uppermost geologic stratum is a silty clay layer that ranges in thickness from approximately 15 to 30 feet. Discontinuous lenses of sand were encountered occasionally when drilling through the Upper Clay unit. This Upper Clay unit is underlain by a permeable Upper Sand unit that ranges in thickness from less than 1 foot to over 15 feet. The Upper Sand layer in turn is underlain by a Lower Clay unit that is typically 15 to 20 feet thick, and a discontinuous Lower Sand unit that ranges in thickness from less than 1 foot to 15 feet or more. Sandstone bedrock lies beneath the Lower Sand unit, at depths ranging from approximately 30 to 80 feet below ground surface.

Tables 4-4 and 4-5 present the range of values measured for hydraulic conductivity for the geologic strata at the site. The hydraulic conductivity values calculated from the pumping tests are judged to be more reliable, because the low permeability values from the slug test results are likely affected by coating of the sidewalls of the borehole with clay from the underlying strata. The pumping test results are in relatively close agreement; hydraulic conductivity estimates for the Upper Sand unit commonly are near 7×10^{-3} cm/s in the vicinity of Buildings I-1-23 and I-1-2.

The hydraulic conductivities of the Lower Clay and the Lower Sand units have been estimated using slug tests, as shown in Table 4-4. On the basis of the substantial difference in hydraulic head between the Upper Sand and the Lower Sand units in many areas, it is clear that the Lower Clay unit acts as a confining unit. Based on slug test results, the geometric mean of hydraulic conductivity values for the Lower Clay unit is 2×10^{-6} cm/s. The geometric mean of the hydraulic conductivity values for the Lower Sand unit is 1.9×10^{-3} cm/s, based on slug test results. Given that borehole smearing is likely, and on the basis of the soil boring descriptions, the hydraulic conductivity of the Lower Sand is likely similar to that of the Upper Sand, i.e., approximately 7×10^{-3} cm/s.

The hydraulic head distributions shown on Figures 4-5, 4-6, 4-7, and 4-8 show that shallow groundwater flow is generally toward Crab Orchard Lake and the swales and surface water discharge zones that occur over the site. The head distribution in the shallow groundwater is a muted image of the surface topography to a large degree, which is typical in near-surface, low permeability strata similar to the Upper Clay unit. Horizontal hydraulic gradients in the Upper Sand are commonly 0.003 to 0.006 ft/ft. Groundwater flow is primarily downward from the

Upper Clay to the Upper Sand layer over much of the area, based on the measured heads in these units. However, groundwater gradients vary from upward to downward over the site, with downward gradients characterizing the upland areas (most of the site), and upward gradients typically occurring near the lake and surface water discharge zones (the swales and wetland areas). Vertical gradients vary widely, ranging up to 0.3 ft/ft.

Contaminant concentrations in the groundwater are shown on Figure 6-1. The contaminants in the groundwater are dominated by chlorinated solvents, especially TCE, DCE, and PCE. Of these contaminants, TCE is present at the highest concentrations over most of the site. Contaminants occur mainly within the Upper Clay and the Upper Sand units; monitoring wells within the underlying Lower Clay and Lower Sand units generally show non-detectable concentrations.

The conceptual model for transport of contaminants at the site, presented in Section 8, is that dissolved contaminants migrate vertically downward from the source areas, through the Upper Clay into the Upper Sand unit. The high permeability of the Upper Sand unit relative to the Lower Clay unit results in flow that is primarily horizontal. Although there is a significant downward gradient from the Upper Sand to the Lower Sand over much of the site, the low permeability of the Lower Clay confining unit restricts the downward flow of groundwater to the Lower Sand unit.

It appears that the permeable Upper Sand unit is the primary pathway for lateral contaminant migration in groundwater at the site. TCE and related compounds occur in groundwater plumes that extend up to 1,000 feet or more in the Upper Sand unit. The general absence of contaminants in the Lower Sand unit indicates that, despite the existence of relatively strong downward gradients over portions of the site, contaminants have not reached the Lower Sand. Although the process responsible for this attenuation has not been investigated in detail, the presence of daughter products of biodegradation of the chlorinated solvents within the upper strata indicates that biodegradation is likely occurring at the site, and may be limiting the migration of contaminants into the Lower Clay and the Lower Sand units. Additional evidence of this biodegradation is presented in the following section on calibration of the contaminant transport model.

K.2 Model Setup

The model domain is illustrated on Figure K-1. The domain of the model includes all of the site and an additional area extending approximately 6,000 feet east, 4,000 feet west, 2,400 feet north, and 7,000 feet south of the site. The total model domain measures 15,000 feet (north-south) by 13,000 feet (east-west). The model domain was selected to extend away from the site so that model boundaries could be set at existing groundwater divides. The groundwater divides were assumed to be at roughly the same location as surface water divides; given the relatively thin,

near-surface layers of geologic strata that are simulated, this assumption is justified. U.S. Geological Survey 7.5-minute topographic maps (Crab Orchard Lake and Marion Illinois quadrangles) were used to identify surface water divides.

MT3D (Zheng, 1990) was used to simulate contaminant transport. Visual Modflow ver. 3.7.2 (Guigier and Franz, 1995) provided a graphical user interface to integrate the flow and transport models. The three-dimensional finite difference numerical groundwater flow model Modflow (McDonald and Harbaugh, 1984) was used to simulate the groundwater system. A grid of 104 x 90 x 5 with variable grid spacing ranging from 8 ft to 300 ft was constructed using a topographic map overlay of the site, to simulate the hydraulic conditions at the site (Figure K-2). The five layers of the model represent the following hydrogeologic strata:

- Layer 1: Upper Clay
- Layer 2: Upper Sand
- Layer 3: Upper Portion of Lower Clay
- Layer 4: Lower Portion of Lower Clay
- Layer 5: Lower Sand

The Lower Clay unit was divided into two layers to more accurately simulate contaminant transport in this unit because of the high concentration gradient between the Upper Sand and the Lower Clay units. Because of the general absence of contaminants from the Lower Sand unit, there was no need to extend the model any deeper, and the base of the model was set at the Lower Sand.

K.3 Boundary Conditions

The boundary conditions of the flow model were set to represent actual hydraulic boundaries at the site, based on available site data. Boundary conditions for the model are shown on Figure K-1. As shown on Cross Section A on Figure 4-2, the Upper Sand unit thins and pinches out to the south at the site as the surface topography rises; conversely, it thickens in the topographically low areas such as the swales (see Cross Sections A, B, C, and D on Figures 4-2 and 4-3). Based on these observations, it was assumed that the Upper Sand unit does not exist in the topographic high areas above an elevation of 820 feet. This assumption appears reasonable if the Upper Sand unit represents an outwash deposit from glacial meltwater, which would tend to be focused in the topographically low areas. No-flow boundaries were set at approximately the 820-foot contour to represent the limits of the Upper Sand.

No-flow boundaries were set in the Lower Sand to coincide with those in the Upper Sand; there are few data on the extent of the Lower Sand, but this assumption is reasonable given the likely similar glacial outwash origin of the Lower Sand. Because groundwater flow in low

permeability clays tends to be largely vertical, the Upper and Lower Clay units were assigned no-flow boundaries at the same locations as those of the Upper Sand.

Constant-head nodes of 605 feet were assigned to the northern boundary of the model where Crab Orchard Lake exists (see Figure K-1).

Modflow RIVER nodes were assigned to two surface water bodies: Wolf Creek and an unnamed creek, both located west of the site (see Figure K-1). DRAIN nodes were assigned to more ephemeral surface water drainageways, such as the West Swale, the Middle Swale, the East Swale, and to the Heron Flats Wetland. Because these surface water features generally represent discharge zones for groundwater, they are appropriate to simulate as drains in Modflow. Surface water elevations for the RIVER and DRAIN nodes were estimated from topographic map elevations. Conductance terms were adjusted during calibration to obtain an appropriate degree of influence of the swales and creeks on the groundwater heads.

Constant-concentration nodes were set in the transport model to represent the source areas (see Figures K-2 and K-3). The source areas around building I-1-23 and I-1-2, and the Repository have yielded groundwater samples with concentrations well over 10,000 μg/L of TCE. TCE at a concentration of 67,000 μg/L has been observed in groundwater at the site, and it is possible that higher concentrations would be revealed if densely spaced (although impractical) monitoring well networks were installed at the source areas. The persistence of CVOC concentrations at this level measured at these locations, years after the release of contaminants ceased at the sites, indicates that a source of remnant TCE likely exists at these locations, or existed prior to the PCB remedial action. As discussed in Section 8, it is suspected that TCE residuals may be present in the aquifer, dispersed as small ganglia and blebs within the aquifer sediments, and represent a continuing source of contaminants to the groundwater. Initial attempts to calibrate the transport model without the presence of constant-concentration nodes (representing the source areas) failed to reproduce the persistent plumes of the lengths that have been observed at the site. For these reasons, constant-concentration nodes were set at 100,000 μg/L for the Building I-1-23 and I-1-2 areas, and 20,000 μg/L for the Repository.

These values were chosen based on adjustments made during calibration to reproduce the observed concentrations in the aquifer, and do not take into account removal of source materials during the PCB remedial action. However, given the slow velocity of groundwater, the impact of soil removal activities would not likely be apparent in downgradient monitoring wells in the calibration period. Therefore, it is appropriate to not consider source material reductions as a result of soil removal, in the calibrated model. During predictive modeling and sensitivity testing, discussed in the Feasibility Study report (Volume II of this document), the effect of soil removal on source concentrations is considered.

K.4 Model Parameters

Model parameter values were based on measured values from the site where available, or were estimated based on typical values reported in the literature for similar sites. Parameter values were adjusted during calibration to achieve the best match to measured head values. Some additional adjustment of the flow parameters was made during calibration of the transport model, to achieve a reasonable match to observed contaminant distributions as well. Table K-1 presents the model parameter values used for the five model layers in the calibrated model.

K.4.1 Hydraulic Conductivity

The hydraulic conductivity values of model layer 1 (the Upper Clay) were set at 1×10^{-4} cm/s over most of the model, but were adjusted downward to 1×10^{-5} and 4×10^{-5} cm/s in the areas east and north of the Repository, where field measurements indicate that zones of lower hydraulic conductivity occur (see Figure K-5). The hydraulic conductivity of model layer 2 (the Upper Sand) was initially set at the geometric mean of the measured values, 7×10^{-3} cm/s; however, it was adjusted upward to 1.4×10^{-2} cm/s during calibration of the flow and transport model, to more accurately reproduce the hydraulic head distribution, and the transport rate and size of the contaminant plume in the Upper Sand. This adjustment in hydraulic conductivity value for the Upper Sand is justified because hydraulic conductivity estimates from pumping test results are commonly only accurate to within a factor of two (+100 percent, -50 percent); further uncertainties arise from extrapolating estimates from a limited area to a broad area covered by the model. As discussed in the section on sensitivity testing, the assignment of a higher value of hydraulic conductivity resulted in a much better match of both hydraulic heads and contaminant plume concentrations. For simplicity, the Upper Sand unit was simulated with two zones of hydraulic conductivity, although it is recognized that there is likely more heterogeneity (e.g., with sand lenses) than is simulated.

The horizontal hydraulic conductivity of the Lower Clay unit (model Layers 4 and 5) was adjusted down to 1×10^{-6} cm/s based on slug test results, boring logs descriptions, and on model calibration trials. The vertical hydraulic conductivities of model layers 4 and 5 were adjusted down to 5×10^{-8} cm/s to create a strong vertical gradient in the model to match observed gradients, and to retard the movement of contaminants into the Lower Sand unit in the model.

K.4.2 Recharge

Groundwater recharge was set at 6 inches/year over the model domain, to create a representative head distribution. The value of 6 inches/year falls well within the range of values reported for sites with similar soil types and climate in the midwestern U.S.

(Walton, 1970), and is a common value for areas with sediments of moderate permeability.

K.4.3 Dispersion

A horizontal dispersivity value of 50 feet was used in the model, based on the scale of the model domain. The vertical dispersivity was assigned a value of 5 percent of the longitudinal dispersivity, or 2.5 feet. Dispersivity values were adjusted downward during sensitivity testing of the model, as discussed in Subsection K.6, which resulted in a poorer match to observed concentrations.

K.4.4 Sorption

Linear isotherm sorption is assumed in the transport model. The sorption of TCE and related compounds to aquifer solids is simulated by MT3D using a distribution coefficient (K_d) value, that is a product of the organic carbon distribution coefficient (K_{oc}) for TCE times the fraction of particulate organic carbon (f_{oc}) in the aquifer. A K_{oc} value of 126 ml/g for TCE was based on literature values reported in Mabey (1982). A f_{oc} value of 0.003 was used, based on reported values for the site (IT Corp., 1995b). The resulting K_d value of 0.062 mL/g was assumed to be uniform for all five model layers, although the existing f_{oc} data are primarily from the Upper Clay and Upper Sand units.

K.4.5 Biodegradation

Biodegradation half-life constants were estimated based on reported values in the literature, and were adjusted during calibration of the transport portion of the model to best represent measured contaminant concentration values. Literature values for biodegradation half-lives for TCE generally range from approximately 0.3 to 3 years; however, some sites report very long half-life values over 10 years, and there are likely many sites that have not reported long half-life values, where biodegradation is so slow that it appears to be unimportant (Wiedemeier et al., 1998).

The biodegradation half-life values used for TCE in the calibrated transport model are 24 years for model layers 1 and 2, 2.4 years for model layer 3, and 1.5 years for model layers 4 and 5. Initial attempts at calibrating the model to uniform half-life values ranging from 2 years to 12 years showed that the contaminant plume would be attenuated far too quickly in the Upper Sand unit, such that it was impossible to reproduce a plume that resembled the observed plume. Conversely, the observed absence of contaminants in the Lower Sand unit required that the half-life values for the Lower Clay and the Lower Sand units must be sufficiently short (e.g., 1.5 years) to attenuate the plume before measurable levels of contaminants could build up in the lower geologic strata. If no dispersion occurred in the aquifer, the calculation of vertical

groundwater velocities would indicate that the contaminants might not have had time to arrive at the Lower Clay and Lower Sand units; however, when dispersion is taken into account, the transport model indicates that relatively high concentrations would migrate into the deeper geologic strata at the site (which is not consistent with monitoring well results) unless biodegradation is occurring. The half-life value of 1.5 years for the Lower Clay and Lower Sand unit resulted in the best match of predicted concentrations to observed concentrations. Further discussion of the biodegradation half-life values is presented in Subsection K.6. Potential reasons that the apparent values for half-life for TCE for the upper strata are substantially lower than those in the upper strata are discussed in Section 8.

K.5 Calibration

The flow model was calibrated to August 1998 groundwater elevations. This data set was chosen because it represents the most complete set of groundwater elevations (along with the December 1998 data), and because this period was judged to be more representative of typical hydraulic conditions than the December 1998 period. Figures 4-5 and 4-7 show the measured hydraulic head values for the water table (generally within the Upper Clay unit) and the Lower Sand unit. Comparison of equivalent hydraulic head maps for August and December 1998 indicates that, although the hydraulic heads change significantly from season to season, the magnitude and direction of the hydraulic gradients are similar.

Figures 7-3 and K-6 show the calibrated model head distribution for the water table and the Lower Sand unit. A comparison of the model-derived head values to those measured during August 1998 shows a reasonably good fit of the model to the observed heads. Most of the model-generated contours agree to the measured points to within 1 foot, especially in the Upper Clay and Upper Sand units (model layers 1 and 2). The model-derived heads in the Lower Sand unit are generally within one to two feet of the measured values. Using reasonable values of hydraulic parameters, the model has produced a hydraulic head distribution that is a reasonable match to measured hydraulic head values, and to the direction and magnitude of the hydraulic gradient, especially in the upper geologic strata where the contaminant migration occurs. For this reason, the flow model is considered to be calibrated sufficiently to test the remedial alternatives that are being considered.

The transport portion of the model was also calibrated to the existing contaminant plume concentrations. TCE was chosen as the representative contaminant for model calibration because TCE concentrations are generally the highest relative to existing drinking water standards, and because the distribution of the TCE plume is generally coincident with, and more extensive than, other contaminant distributions in the groundwater.

The TCE plume generated by the model for the Upper Sand unit is shown on Figures 7-4, K-7, and K-8. A comparison of Figure 7-4 to Figure 6-1 shows that the extent and concentrations of the model-generated map are similar to those observed at the site, based on the data that are available, especially for the I-1-23 plume. The model also successfully simulates the absence of TCE in the Lower Sand unit. Although the observed plume has some measured concentrations that are higher or lower than the model-predicted values, the extent, shape, and concentrations provide a reasonable approximation of the observed plume that is useful for the purpose of comparing the effectiveness of remedial alternatives. The results of these predictive simulations are presented in the accompanying Feasibility Study, Section 6.

K.6 Sensitivity Tests

Sensitivity testing was conducted to evaluate the sensitivity of the model results to variations in the value of key flow or transport parameters. The preliminary stages of sensitivity testing actually begin during the calibration process, when various parameters are varied within reasonable limits, to arrive at a model that closely matches observed conditions of hydraulic head and contaminant concentration. Formal sensitivity testing occurs after the model has been calibrated, where key parameters identified during the calibration process are varied, to test the effect of the change on the model results.

Table K-2 summarizes the results of the sensitivity testing. The results of the calibration run (Crab151) are compared with those of five other simulations: Crab220, Crab221, Crab 222, Crab223, and Crab 225. In Crab220, the rate of biodegradation was increased substantially in the Upper Clay and the Upper Sand units, by reducing the half-life of TCE from 24 years to 1.5 years. The resulting predicted concentration in the Upper Sand unit at the Northern Access Road decreases from 2,870 μg/L in the calibration run to 150 μg/L in Crab220. These results indicate that, since measured concentrations downgradient of the Northern Access Road range from over 1,000 to over 3,000 μg/L, the rate of biodegradation must be very low, similar to that of the calibration run (i.e., with a half-life of 24 years).

The opposite scenario, a decreased biodegradation rate, was tested in Crab225. Here, the effect of decreasing the rate of biodegradation in the lower layers of the model (the Lower Clay and the Lower Sand units), from a half-life of 1.5 years to a half-life of 24 years, was simulated. With this slow rate of biodegradation in the lower geologic units, the maximum concentration in the Upper Sand at the Northern Access Road increases to over 7,000 μg/L, which is far higher than observed. More importantly, under this scenario, the concentration in the Lower Clay also increased to as high as several thousand μg/L. These results indicate that very slow rates of biodegradation in the Lower Clay and Lower Sand result in unreasonably high predicted concentrations at depth.

The effect of removing constant-concentration source nodes from the model was simulated in Crab221. The model results indicate that, if there are no constant-concentration source nodes in the model, the plume concentrations would be far lower than observed, with concentrations of less than 300 μg/L near the Northern Access Road instead of several thousand μg/L. These results illustrate that continuing sources of TCE are required in the model at the origins of the major plumes on-site, to reproduce the existing pattern of contaminants. As discussed in Section 8, it is likely that dispersed blebs and ganglia of concentrated TCE residuals are present in the subsurface, and represent a continuing source of TCE to the aquifer.

The effect of decreasing the hydraulic conductivity of the Upper Sand was tested in Crab222. The hydraulic conductivity value of the Upper Sand was decreased to half the value used in the calibrated model, to 7×10^{-2} cm/s. The results showed that the predicted maximum concentration of TCE would decrease somewhat, from 2,870 to 1,743 μg/L, at the Northern Access Road, resulting in a poorer match to existing conditions at the site. The change in hydraulic conductivity directly affected head values in the Upper Sand unit, raising heads substantially (approximately 2 feet higher than in the calibrated model), and resulting in a worse match to measured heads.

The effect of a change in dispersivity values was tested in run Crab223. The horizontal dispersivity values (both longitudinal and transverse) were decreased by a factor of 2.5; the transverse vertical dispersivity was decreased by a factor of 5. The resulting mass transport results indicate that the maximum concentration at the Northern Access Road would decrease by about 30 percent, while the total mass dissolved in the aquifer would decrease by about 50 percent. These results are expected, in that dispersion tends to spread-out the contaminants, and decreasing the dispersion will slow the arrival of higher concentrations at the leading edge of the plume; the decrease in total TCE mass in the aquifer results from the lower dispersion of concentrations away from the constant-concentration nodes, requiring less mass to be added by the model through these nodes to maintain constant concentrations.

Table K-1
Model Parameters - Calibrated Model

	UPPER CLAY	UPPER SAND	LOWER CLAY	LOWER SAND
Model layer	1	2	3 & 4	5
Hydraulic conductivity (horizontal) (cm/s)	2×10^{-4}	1.4×10^{-2}*	1×10^{-6}	7×10^{-3}
Hydraulic conductivity (vertical) (cm/s)	2×10^{-5}	7×10^{-4}	5×10^{-8}	7×10^{-4}
Recharge (in/yr)	6	--	--	--
Dispersivity - horizontal (ft)	50	50	50	50
Dispersivity - vertical (ft)	2.5	2.5	2.5	2.5
Distribution coefficient (mL/g)	0.062	0.062	0.062	0.062
Biodegradation half-life (years)	24	24	12/1.5	1.5

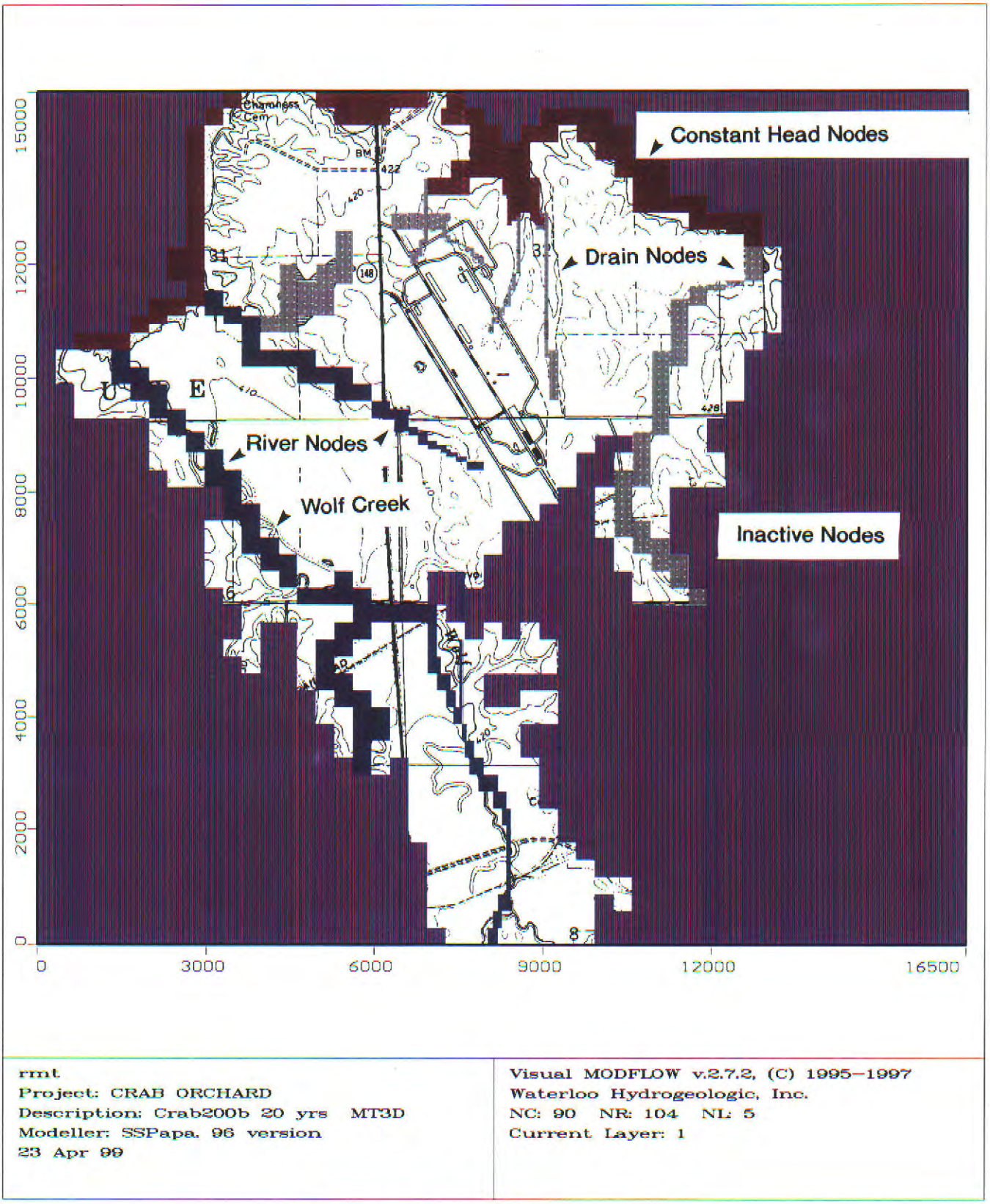
Note:

* Hydraulic conductivity values in two zones within the Upper Sand unit located beneath the Area 9 Repository are 1×10^{-3} cm/s and 4×10^{-3} cm/s, respectively.

Table K-2
Sensitivity Analysis

RUN #			RESULTS	
CURRENT CONDITIONS SIMULATIONS	PARAMETER/ BOUNDARY CONDITION	CHANGE	MAX. CONC. AT N. ACCESS RD., IN UPPER SAND (µg/L)	TOTAL MASS (kg) OF TCE IN AQUIFER
Crab 151 (calibration)	--	--	2,870	1,484
Crab 220	Biodegradation half-life	Reduce from 24 yr. to 1.5 yr. in Layers 1, 2	150	446
Crab 221	Constant-concentration source nodes	Remove	262	102
Crab 222	Hydraulic conductivity of Upper Sand unit	Decrease, from 1.4×10^{-2} to 7×10^{-3} cm/s	1,743	1,289
Crab 223	Dispersivity	α_L, from 50′ to 20′ α_{TH} from 5′ to 2′ α_{TV} from 2.5′ to 0.5′	2,024	709
Crab 225	Biodegradation half-life	Increase from 1.5 yr. to 24 yr. in Layers 3, 4, 5	7,180	3,078

Notes:
α_L = longitudinal dispersivity.
α_{TH} = transverse, horizontal dispersivity.
α_{TV} = transverse, vertical dispersivity.



rmt
Project: CRAB ORCHARD
Description: Crab200b 20 yrs MT3D
Modeller: SSPapa. 96 version
23 Apr 99

Visual MODFLOW v.2.7.2, (C) 1995-1997
Waterloo Hydrogeologic, Inc.
NC: 90 NR: 104 NL: 5
Current Layer: 1

Figure K-1

Model Domain and Boundary Conditions

Model Layer 1 (Upper Clay)

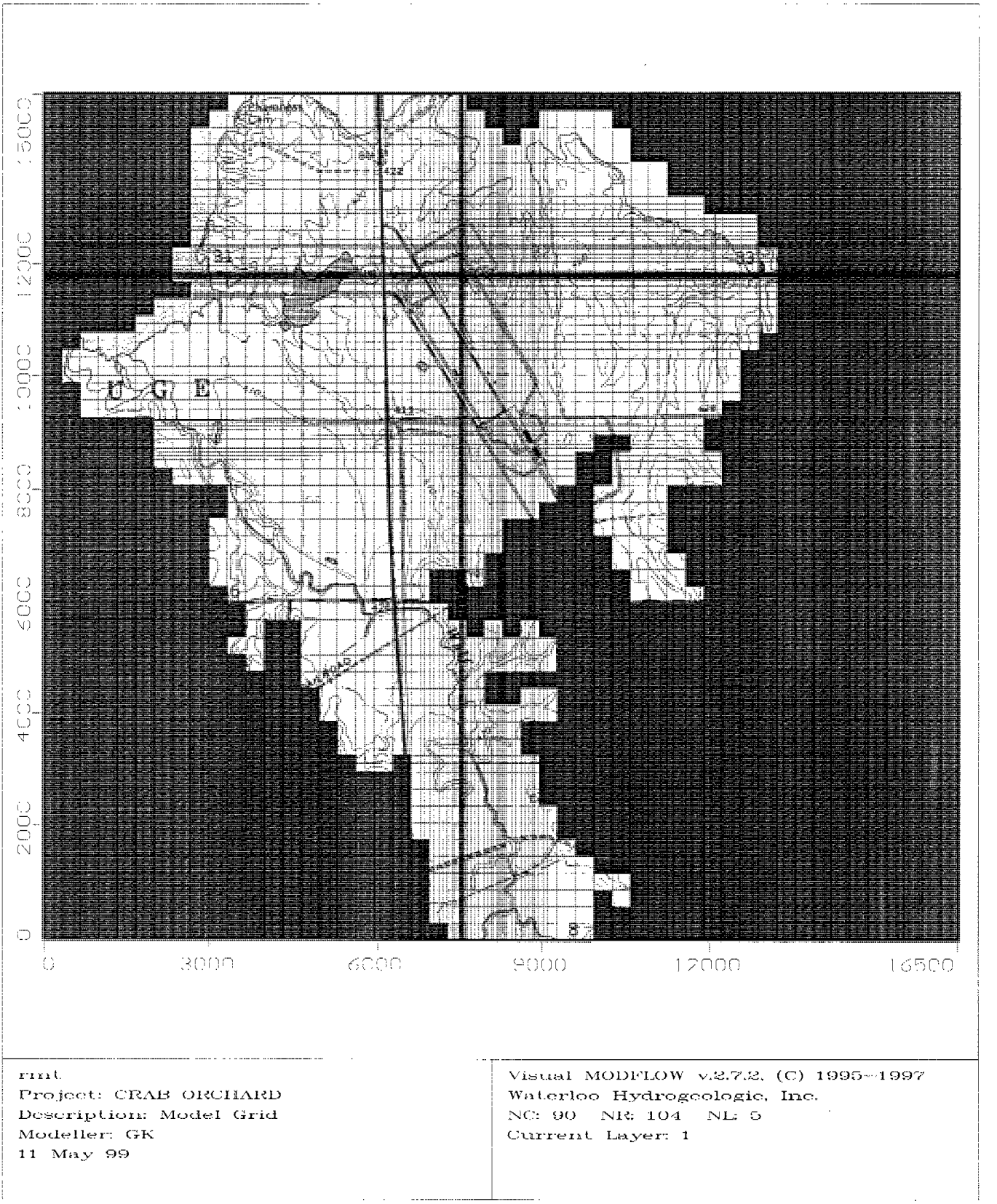
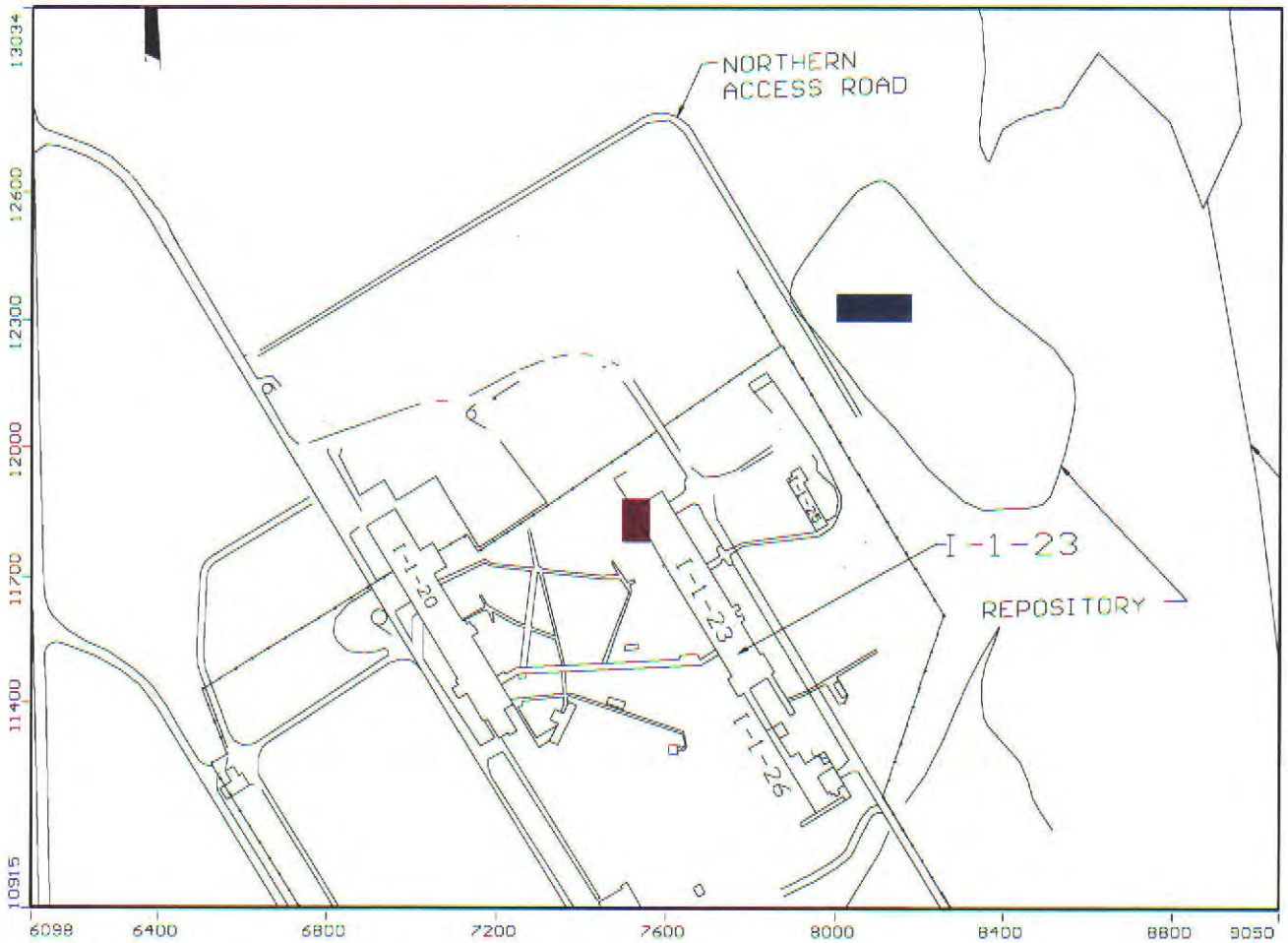


Figure K-2

Model Grid

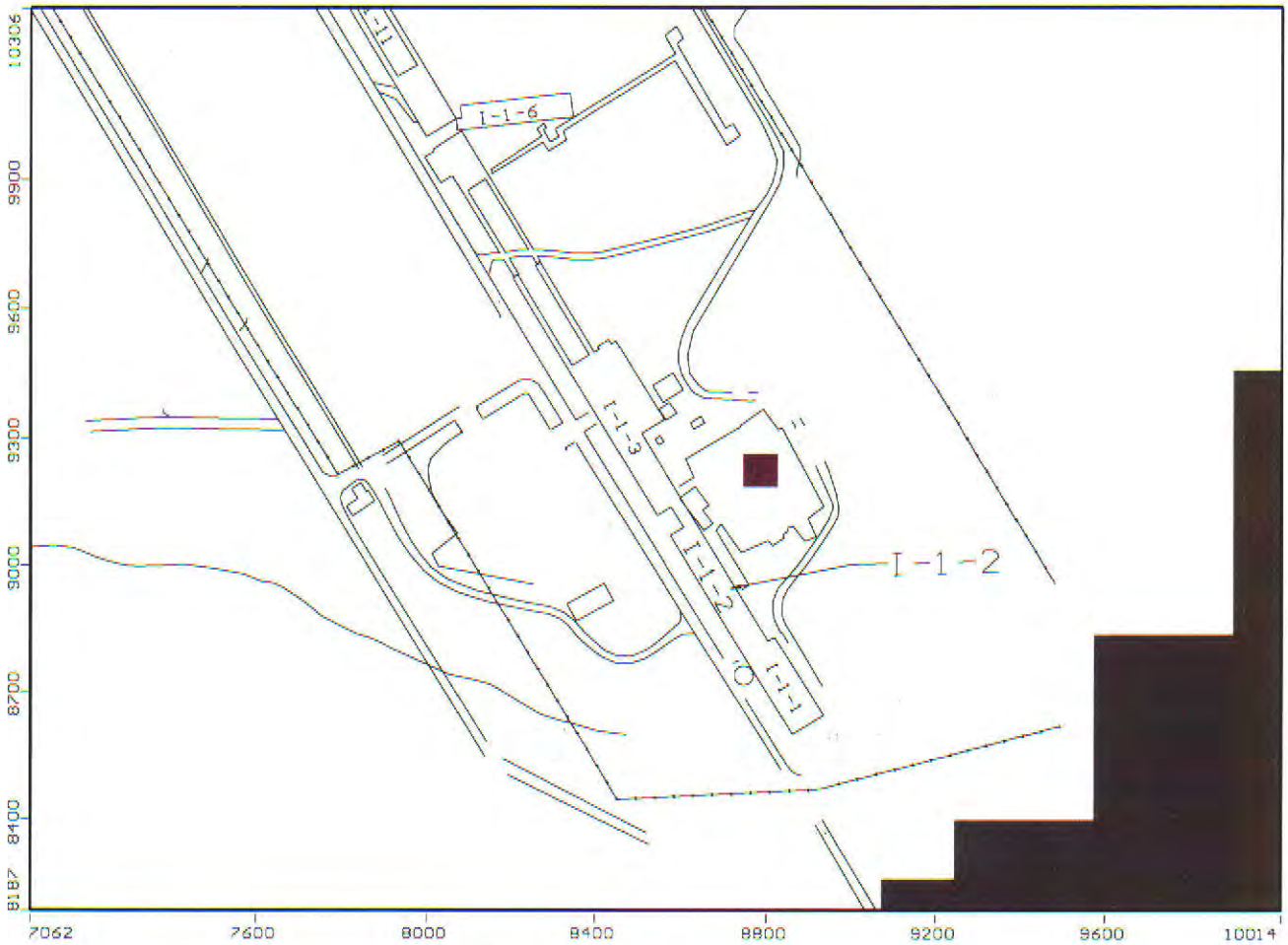


rmt
Project: CRAB ORCHARD
Description: Crab216 Source Areas
Modeller: GJK 20 yrs
17 Dec 99

Visual MODFLOW v.2.7.2, (C) 1995-1997
Waterloo Hydrogeologic, Inc.
NC: 90 NR: 104 NL: 5
Current Layer: 1

Figure K-3

Designated Source Zones
(Constant Concentration Nodes),
I-1-23 and Repository Areas



rmt
Project: CRAB ORCHARD
Description: Crab216 Source Areas
Modeller: GJK 20 yrs
17 Dec 99

Visual MODFLOW v.2.7.2, (C) 1995–1997
Waterloo Hydrogeologic, Inc.
NC: 90 NR: 104 NL: 5
Current Layer: 1

Figure K-4

Designated Source Zone
(Constant Concentration Nodes),
I-1-2 Area

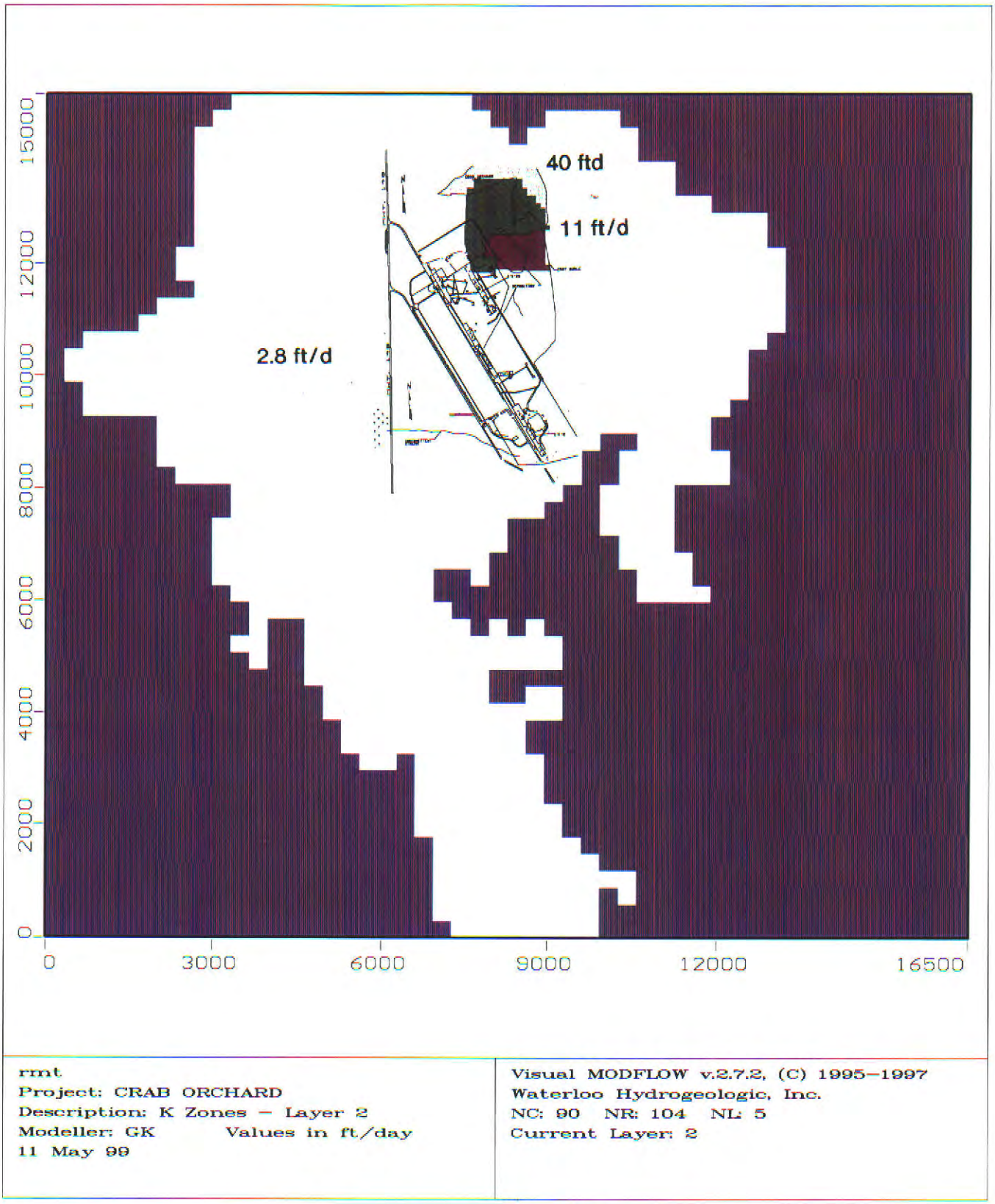
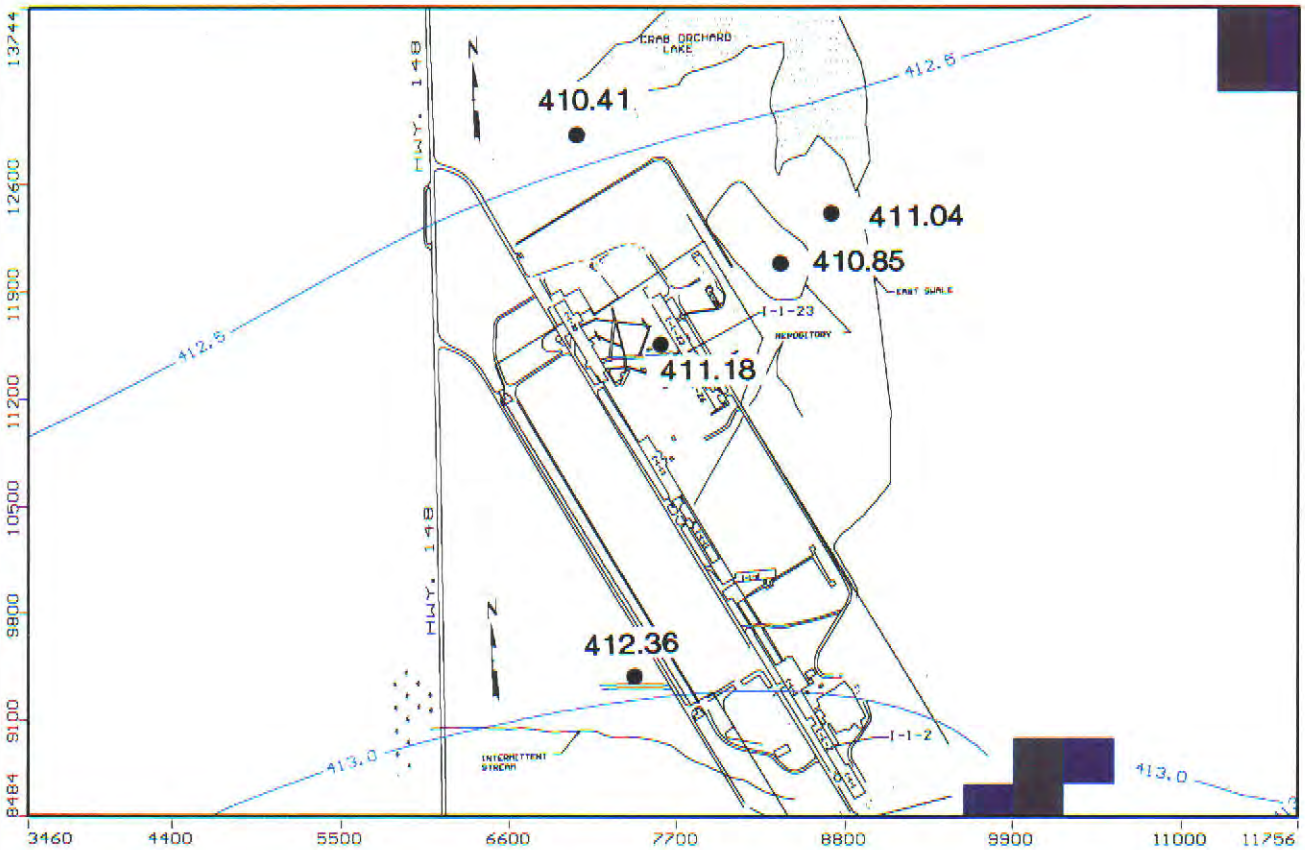


Figure K-5

Hydraulic Conductivity Zones - Model Layer 2, (Upper Sand)



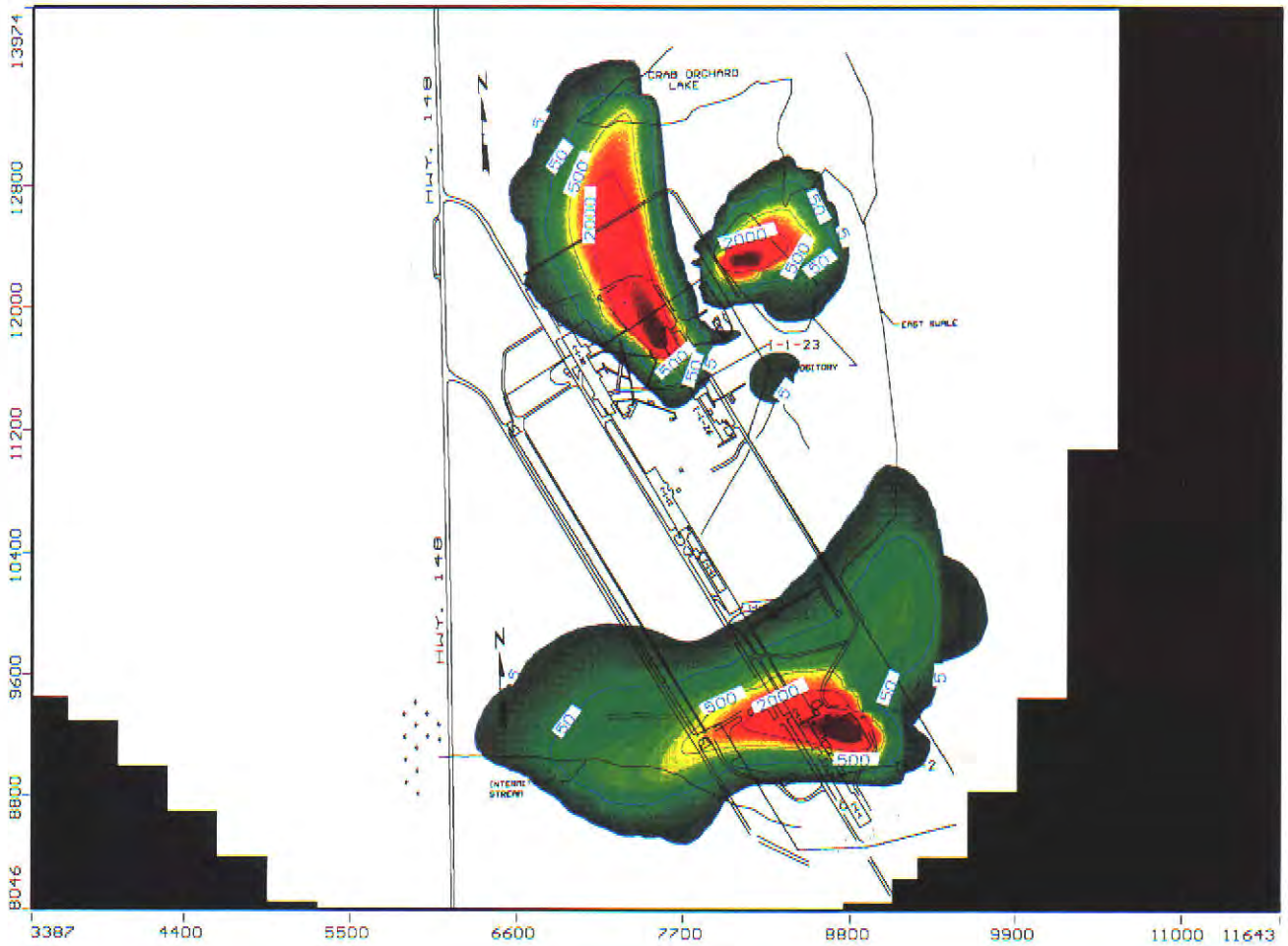
KEY

- **412 Measured Hydralic Head (ft) (August 1998)**

rmt Project: CRAB ORCHARD Crab151 Description: Flow Calibration Modeller: GK Contours in Feet 11 May 99	Visual MODFLOW v.2.7.2, (C) 1995-1997 Waterloo Hydrogeologic, Inc. NC: 90 NR: 104 NL: 5 Current Layer: 5

Figure K-6

Flow Calibration - Model Layer 5,
(Lower Sand)

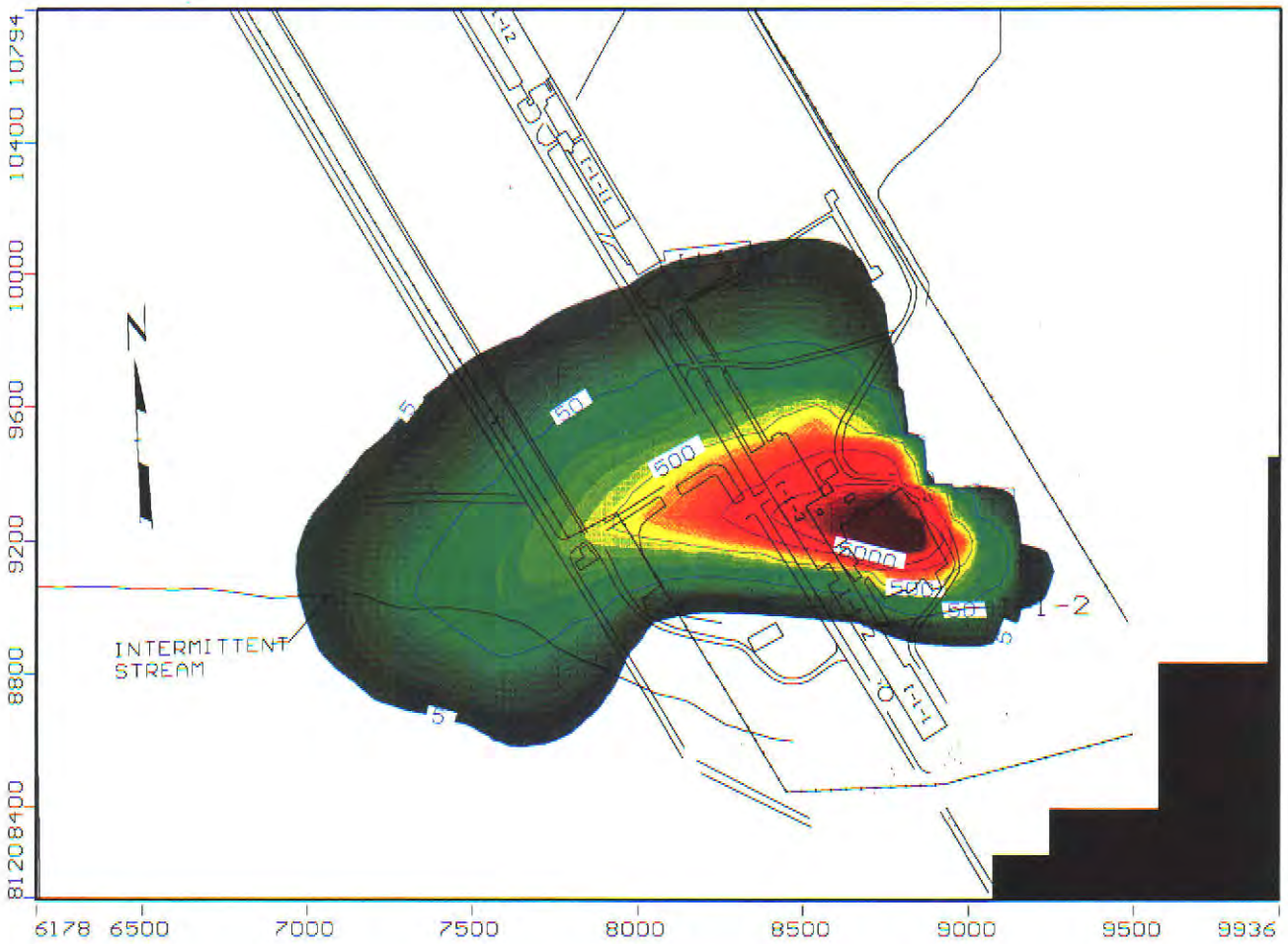


rmt
Project: CRAB ORCHARD Crab151
Description: Tranport Calibration
Modeller: GK TCE Contours in ppb
19 May 99

Visual MODFLOW v.2.7.2, (C) 1995-1997
Waterloo Hydrogeologic, Inc.
NC: 90 NR: 104 NL: 5
Current Layer: 1

Figure K-7

Transport Model Calibration,
Sites 32/33 TCE Plume



rmt
Project: CRAB ORCHARD Crab151
Description: Transport Calibration
Modeller: GK Contours TCE, ppb
7 May 99

Visual MODFLOW v.2.7.2, (C) 1995-1997
Waterloo Hydrogeologic, Inc.
NC: 90 NR: 104 NL: 5
Current Layer: 1

Figure K-8

Transport Model,
Calibration, I-1-2 Plume

Calibration Run Crab151 Model Output

```
LISTING FILE: crab151.LST
              UNIT  6

 OPENING crab151.BAS
 FILE TYPE:BAS   UNIT  1

 OPENING crab151.BCF
 FILE TYPE:BCF   UNIT  11

 OPENING crab151.DRN
 FILE TYPE:DRN   UNIT  13

 OPENING crab151.RIV
 FILE TYPE:RIV   UNIT  14

 OPENING crab151.RCH
 FILE TYPE:RCH   UNIT  18

 OPENING crab151.OC
 FILE TYPE:OC   UNIT  22

 OPENING crab151.MT3
 FILE TYPE:MT3   UNIT  25

 OPENING crab151.FLO
 FILE TYPE:DATA(BINARY)   UNIT  75

 OPENING crab151.WHS
 FILE TYPE:WHS   UNIT  31

 OPENING crab151.CLB
 FILE TYPE:CLB   UNIT  32
```


K21

```
OPENING crab151.HDS
FILE TYPE:DATA(BINARY)   UNIT  50

OPENING crab151.DDN
FILE TYPE:DATA(BINARY)   UNIT  51

OPENING crab151.BGT
FILE TYPE:DATA(BINARY)   UNIT  54

OPENING crab151.HVT
FILE TYPE:DATA(BINARY)   UNIT  52

OPENING crab151.DVT
FILE TYPE:DATA(BINARY)   UNIT  53
1                    MODFLOW
   U.S. GEOLOGICAL SURVEY MODULAR FINITE-DIFFERENCE GROUND-WATER FLOW MODEL

Basic Package translator - (c) 1994 Waterloo Hydrogeologic Software
CRAB151.BAS Tue Apr 20 08:23:30 1999
  5 LAYERS      104 ROWS      90 COLUMNS
  1 STRESS PERIOD(S) IN SIMULATION
MODEL TIME UNIT IS DAYS

BAS5 -- BASIC MODEL PACKAGE, VERSION 5, 1/1/95 INPUT READ FROM UNIT  1
ARRAYS RHS AND BUFF WILL SHARE MEMORY
INITIAL HEAD WILL BE KEPT THROUGHOUT THE SIMULATION
   458854 ELEMENTS IN X ARRAY ARE USED BY BAS
   458854 ELEMENTS OF X ARRAY USED OUT OF 1999999999

BCF5 -- BLOCK-CENTERED FLOW PACKAGE, VERSION 5, 9/1/93 INPUT READ FROM UNIT 11
STEADY-STATE SIMULATION
CELL-BY-CELL FLOWS WILL BE SAVED ON UNIT 54
HEAD AT CELLS THAT CONVERT TO DRY= -0.10000E+31
WETTING CAPABILITY IS ACTIVE
WETTING FACTOR=  1.00000    WETTING ITERATION INTERVAL=  1
```


K22

FLAG THAT SPECIFIES THE EQUATION TO USE FOR HEAD AT WETTED CELLS= 0

LAYER	LAYER-TYPE CODE	INTERBLOCK T
1	3	0 -- HARMONIC
2	3	0 -- HARMONIC
3	3	0 -- HARMONIC
4	3	0 -- HARMONIC
5	3	0 -- HARMONIC

271440 ELEMENTS IN X ARRAY ARE USED BY BCF

730294 ELEMENTS OF X ARRAY USED OUT OF 1999999999

DRN5 -- DRAIN PACKAGE, VERSION 5, 9/1/93 INPUT READ FROM UNIT 13

MAXIMUM OF 826 DRAINS

CELL-BY-CELL FLOWS WILL BE SAVED ON UNIT 54

4130 ELEMENTS IN X ARRAY ARE USED BY DRN

734424 ELEMENTS OF X ARRAY USED OUT OF 1999999999

RIV5 -- RIVER PACKAGE, VERSION 5, 9/1/93 INPUT READ FROM UNIT 14

MAXIMUM OF 699 RIVER REACHES

CELL-BY-CELL FLOWS WILL BE SAVED ON UNIT 54

4194 ELEMENTS IN X ARRAY ARE USED BY RIV

738618 ELEMENTS OF X ARRAY USED OUT OF 1999999999

RCH5 -- RECHARGE PACKAGE, VERSION 5, 6/1/95 INPUT READ FROM UNIT 18

OPTION 3 -- RECHARGE TO HIGHEST ACTIVE NODE IN EACH VERTICAL COLUMN

CELL-BY-CELL FLOWS WILL BE SAVED ON UNIT 54

18720 ELEMENTS IN X ARRAY ARE USED BY RCH

757338 ELEMENTS OF X ARRAY USED OUT OF 1999999999

0WHS1 - CGSTAB-P PROCEDURE SOLUTION PACKAGE, VERSION 1, 8/4/95 INPUT READ FROM UNIT 31

MAXIMUM OF 50OUTER ITERATIONS ALLOWED FOR CLOSURE

25 MAXIMUM OF

1965600 ELEMENTS IN X ARRAY ARE USED BY CGSTAB-P

2722938 ELEMENTS OF X ARRAY USED OUT OF 1999999999

0CAL1 -- W.H.S. CALIBRATION PACKAGE INPUT READ FROM UNIT 32

OF CAL POINTS : 11

K2

```
     33 ELEMENTS IN X ARRAY ARE USED FOR CALIBRATION POINTS
   2722971 ELEMENTS OF X ARRAY USED OUT OF 1999999999
1
Basic Package translator - (c) 1994 Waterloo Hydrogeologic Software
CRAB151.BAS Tue Apr 20 08:23:30 1999


            BOUNDARY ARRAY FOR LAYER  1
READING ON UNIT  1 WITH FORMAT: (40I2)
            BOUNDARY ARRAY FOR LAYER  2
READING ON UNIT  1 WITH FORMAT: (40I2)
            BOUNDARY ARRAY FOR LAYER  3
READING ON UNIT  1 WITH FORMAT: (40I2)
            BOUNDARY ARRAY FOR LAYER  4
READING ON UNIT  1 WITH FORMAT: (40I2)
            BOUNDARY ARRAY FOR LAYER  5
READING ON UNIT  1 WITH FORMAT: (40I2)

AQUIFER HEAD WILL BE SET TO 1.00000E+30 AT ALL NO-FLOW NODES (IBOUND=0).
             INITIAL HEAD FOR LAYER  1
READING ON UNIT  1 WITH FORMAT:  (10G12.5)
             INITIAL HEAD FOR LAYER  2
READING ON UNIT  1 WITH FORMAT:  (10G12.5)
       INITIAL HEAD =  435.0000    FOR LAYER  3
       INITIAL HEAD =  435.0000    FOR LAYER  4
       INITIAL HEAD =  435.0000    FOR LAYER  5
HYD. COND. ALONG ROWS =  0.5669000    FOR LAYER  1
                BOTTOM FOR LAYER  1
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
      VERT HYD COND /THICKNESS FOR LAYER  1
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
             TOP =  435.0000    FOR LAYER  1
        HYD. COND. ALONG ROWS FOR LAYER  2
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
                BOTTOM FOR LAYER  2
```


K24

```
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
      VERT HYD COND /THICKNESS FOR LAYER   2
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
                 TOP FOR LAYER   2
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
           WETDRY PARAMETER FOR LAYER   2
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
  HYD. COND. ALONG ROWS =  0.2835000E-02 FOR LAYER   3
               BOTTOM FOR LAYER   3
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
      VERT HYD COND /THICKNESS FOR LAYER   3
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
                 TOP FOR LAYER   3
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
           WETDRY PARAMETER FOR LAYER   3
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
  HYD. COND. ALONG ROWS =  0.2835000E-02 FOR LAYER   4
               BOTTOM FOR LAYER   4
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
      VERT HYD COND /THICKNESS FOR LAYER   4
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
                 TOP FOR LAYER   4
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
           WETDRY PARAMETER FOR LAYER   4
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
  HYD. COND. ALONG ROWS =   19.84000    FOR LAYER   5
          BOTTOM =  320.0000    FOR LAYER   5
                 TOP FOR LAYER   5
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
           WETDRY PARAMETER FOR LAYER   5
READING ON UNIT  11 WITH FORMAT:  (10G11.4)
                    SOLUTION BY CGSTAB-P
                    ----------------------------------------
0                   MAXIMUM ITERATIONS ALLOWED FOR CLOSURE=     50
0                   MAXIMUM INNER ITERATIONS ALLOWED =     25
                         DAMPING FACTOR =    1.0000
```


K26

HEAD CHANGE CRITERION FOR CLOSURE = 0.10000E-02

MAXIMUM RESIDUAL FOR LINEAR ITERATION 0.50000E-03

STRESS PERIOD NO. 1, LENGTH = 1.000000

NUMBER OF TIME STEPS = 1
MULTIPLIER FOR DELT = 1.000
INITIAL TIME STEP SIZE = 1.000000

826 DRAINS

LAYER	ROW	COL	ELEVATION	CONDUCTANCE	DRAIN NO.
2	52	44	420.0	1.580	1
2	51	44	420.0	1.434	2
2	52	45	420.0	1.996	3
2	51	45	420.0	1.811	4
2	52	46	420.0	3.506	5
2	51	46	420.0	3.181	6
2	52	47	420.0	3.149	7
2	51	47	420.0	2.858	8
.....					
.....					
.....					
1	23	79	405.2	152.3	824
1	22	79	405.1	151.2	825
1	21	79	405.0	150.0	826

699 RIVER REACHES

LAYER	ROW	COL	STAGE	CONDUCTANCE	BOT. ELEV.	REACH NO.
2	58	5	405.3	238.8	404.3	1
2	57	5	405.3	261.2	404.3	2
2	56	5	405.0	259.6	404.0	3
.....						
.....						
1	99	58	418.8	225.8	417.8	697
1	98	58	418.6	230.0	417.6	698
1	97	58	418.4	234.3	417.4	699

RECHARGE = 0.1370000E-02

0

SOLUTION BY CGSTAB-P

K26

0 MAXIMUM ITERATIONS ALLOWED FOR CLOSURE = 50

0 MAXIMUM INNER ITERATIONS ALLOWED = 25

DAMPING FACTOR = 1.0000

HEAD CHANGE CRITERION FOR CLOSURE = 0.10000E-02

MAXIMUM RESIDUAL FOR LINEAR ITERATION 0.50000E-03

MAXIMUM RELATIVE RESIDUAL FOR LINEAR ITERATION 0.00000E+00

Outer iteration 1 Inner iteration 1 Max. residual 8.227E+02

Outer iteration 1 Inner iteration 2 Max. residual -4.348E+02

Outer iteration 5 Inner iteration 25 Max. residual 5.605E-04

HEADS AND FLOW TERMS SAVED ON UNIT 75 FOR USE BY MT3D TRANSPORT MODEL

HEAD WILL BE SAVED ON UNIT 50 AT END OF TIME STEP 1, STRESS PERIOD 1

DRAWDOWN WILL BE SAVED ON UNIT 51 AT END OF TIME STEP 1, STRESS PERIOD 1

VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP 1 IN STRESS PERIOD 1

CUMULATIVE VOLUMES L**3		RATES FOR THIS TIME STEP L**3/T	
IN:		IN:	
CONSTANT HEAD =	0.0000	CONSTANT HEAD =	0.0000
DRAINS =	0.0000	DRAINS =	0.0000
RIVER LEAKAGE =	4.1554	RIVER LEAKAGE =	4.1554
RECHARGE =	128011.3906	RECHARGE =	128011.3906
TOTAL IN =	128015.5469	TOTAL IN =	128015.5469
OUT:		OUT:	
CONSTANT HEAD =	29361.1992	CONSTANT HEAD =	29361.1992
DRAINS =	32978.3008	DRAINS =	32978.3008
RIVER LEAKAGE =	65675.8438	RIVER LEAKAGE =	65675.8438
RECHARGE =	0.0000	RECHARGE =	0.0000
TOTAL OUT =	128015.3438	TOTAL OUT =	128015.3438

K2

```
IN - OUT =        0.2031        IN - OUT =        0.2031

PERCENT DISCREPANCY =        0.00    PERCENT DISCREPANCY =        0.00


    TIME SUMMARY AT END OF TIME STEP  1 IN STRESS PERIOD  1
          SECONDS    MINUTES     HOURS      DAYS      YEARS
          ----------------------------------------------------
 TIME STEP LENGTH  86400.     1440.0     24.000     1.0000    2.73785E-03
STRESS PERIOD TIME  86400.     1440.0     24.000     1.0000    2.73785E-03
    TOTAL TIME  86400.     1440.0     24.000     1.0000    2.73785E-03
1
```


K28

Crab151 Calibration Run
Transport Model Output

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++

                +                                    +
                +                  M T 3 D                 +
                +        A Modular Three-Dimensional Transport Model        +
                +  For Simulation of Advection, Dispersion and Chemical Reactions  +
                +          of Contaminants in Groundwater Systems          +
                +                                    +
                ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 -----
| M T | MT3D dataset
| 3 D | Translated by Visual MODFLOW
 -----
THE TRANSPORT MODEL CONSISTS OF    5 LAYER(S)  104 ROW(S)   90 COLUMN(S)
NUMBER OF STRESS PERIOD(S) IN SIMULATION =   6
UNIT FOR TIME IS day ;  UNIT FOR LENGTH IS ft K;  UNIT FOR MASS IS g
MAJOR TRANSPORT COMPONENTS TO BE SIMULATED:
 1  ADVECTION
 2  DISPERSION
 3  SINK AND SOURCE MIXING
 4  CHEMICAL REACTIONS (DECAY AND/OR SORPTION)

BTN1 -- BASIC TRANSPORT PACKAGE, VER DOD_1.5, JULY 1996, INPUT READ FROM UNIT  1
 608788 ELEMENTS OF THE  X ARRAY USED BY THE BTN PACKAGE
  46805 ELEMENTS OF THE IX ARRAY USED BY THE BTN PACKAGE

ADV1 -- ADVECTION PACKAGE, VER DOD_1.5, JULY 1996, INPUT READ FROM UNIT  2
ADVECTION IS SOLVED WITH THE HYBRID [MOC]/[MMOC] SCHEME
COURANT NUMBER ALLOWED IN SOLVING THE ADVECTION TERM = 0.750
MAXIMUM NUMBER OF MOVING PARTICLES ALLOWED =  500000
 2500000 ELEMENTS OF THE  X ARRAY USED BY THE ADV PACKAGE
```


K25

46800 ELEMENTS OF THE IX ARRAY USED BY THE ADV PACKAGE

DSP1 -- DISPERSION PACKAGE, VER DOD_1.5, JULY 1996, INPUT READ FROM UNIT 3

468015 ELEMENTS OF THE X ARRAY USED BY THE DSP PACKAGE

0 ELEMENTS OF THE IX ARRAY USED BY THE DSP PACKAGE

SSM1 -- SINK & SOURCE MIXING PACKAGE, VER DOD_1.5, JULY 1996, INPUT READ FROM UNIT 4

MAJOR STRESS COMPONENTS PRESENT IN THE FLOW MODEL:

1 DRAIN

2 RECHARGE

3 RIVER

MAXIMUM NUMBER OF POINT SINKS/SOURCES = 2338

32748 ELEMENTS OF THE X ARRAY USED BY THE SSM PACKAGE

9360 ELEMENTS OF THE IX ARRAY BY THE SSM PACKAGE

RCT1 -- CHEMICAL REACTIONS PACKAGE, VER DOD_1.5, JULY 1996, INPUT READ FROM UNIT 9

TYPE OF SORPTION SELECTED IS [LINEAR]

FIRST-ORDER RATE REACTION [DECAY OR BIODEGRADATION] IS SIMULATED

25 ELEMENTS OF THE X ARRAY USED BY THE RCT PACKAGE

0 ELEMENTS OF THE IX ARRAY USED BY THE RCT PACKAGE

.....

3609577 ELEMENTS OF THE X ARRAY USED OUT OF 5000000

102966 ELEMENTS OF THE IX ARRAY USED OUT OF 1000000

.....

LAYER NUMBER	AQUIFER TYPE
1	3
2	3
3	3
4	3
5	3

WIDTH ALONG ROWS (DELR) READ ON UNIT 1 USING FORMAT: "(10G11.4) "

K30

WIDTH ALONG COLS (DELC) READ ON UNIT 1 USING FORMAT: "(10G11.4) "

TOP ELEV. OF 1ST LAYER = 435.0000

CELL THICKNESS (DZ) FOR LAYER 1 READ ON UNIT 1 USING FORMAT: " (10G11.4) "

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77
78	79	80	81	82	83	84	85	86	87	88
89	90									

.....

1	42.3	42.3	42.3	42.3	42.3	42.3	42.3	42.2	42.2	42.2	42.1
	42.1	42.1	42.0	42.0	42.0	42.0	42.0	42.0	42.1	42.1	42.1
	42.2	42.2	42.2	42.5	42.5	42.5	42.5	42.8	42.8	42.8	42.8
	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	43.0

EFFECTIVE POROSITY = 0.2500000 FOR LAYER 1

EFFECTIVE POROSITY = 0.2500000 FOR LAYER 2

EFFECTIVE POROSITY = 0.2500000 FOR LAYER 3

EFFECTIVE POROSITY = 0.2500000 FOR LAYER 4

EFFECTIVE POROSITY = 0.2500000 FOR LAYER 5

CONCN. BOUNDARY ARRAY FOR LAYER 1 READ ON UNIT 1 USING FORMAT: "(40I2) "

INITIAL CONCENTRATION FOR LAYER 1 READ ON UNIT 1 USING FORMAT: " (10G11.4) "

1	2	3	4	5	6	7	8	9	10	11

K31

12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77
78	79	80	81	82	83	84	85	86	87	88
89	90									

.....

1 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.494E-20

2.517E-20 8.634E-20 1.263E-18 6.807E-17 1.761E-15 9.130E-22 0.000E+00 0.000E+00 1.645E-15 2.149E-12 5.801E-12

1.567E-11 3.117E-11 4.114E-11 1.982E-11 2.284E-11 2.350E-11 4.896E-11 2.371E-10 0.000E+00 0.000E+00 0.000E+00

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 6.868E-17 4.075E-11 2.845E-17 0.000E+00

VALUE INDICATING INACTIVE CONCENTRATION CELLS = -0.1000000E+31
NUMBER OF TIMES AT WHICH SIMULATION RESULTS ARE SAVED = 20

TOTAL ELAPSED TIMES AT WHICH SIMULATION RESULTS ARE SAVED:

0.00000E+00 1.0000 146.00 292.00 438.00 584.00 730.00 876.00

1022.0 1168.0 1314.0 1460.0 2190.0 2920.0 3650.0 4380.0

5110.0 5840.0 6570.0 7300.0

MAXIMUM LENGTH ALONG THE X (J) AXIS = 16500.00

MAXIMUM LENGTH ALONG THE Y (I) AXIS = 15000.00

MAXIMUM LENGTH ALONG THE Z (K) AXIS = 115.0000

METHOD FOR PARTICLE TRACKING IS [1ST ORDER]

CONCENTRATION WEIGHTING FACTOR = 0.500

THE CONCENTRATION GRADIENT CONSIDERED NEGLIGIBLE [DCEPS] = 0.1000000E-04

INITIAL PARTICLES ARE PLACED RANDOMLY WITHIN CELL BLOCK

PARTICLE NUMBER PER CELL IF DCCELL =< DCEPS = 0

PARTICLE NUMBER PER CELL IF DCCELL > DCEPS = 16

MINIMUM PARTICLE NUMBER ALLOWD PER CELL = 2

MAXIMUM PARTICLE NUMBER ALLOWD PER CELL = 30

MULTIPLIER OF PARTICLE NUMBER AT SOURCE = 1.00

SCHEME FOR CONCENTRATION INTERPOLATION IS [LINEAR]

PARTICLES FOR APPROXIMATING A SINK CELL IN THE [MMOC] SCHEME

K32

ARE PLACED RANDOMLY WITHIN CELL BLOCK

NUMBER OF PARTICLES USED TO APPROXIMATE A SINK CELL IN THE [MMOC] SCHEME = 16

CRITICAL CONCENTRATION GRADIENT USED IN THE "HMOC" SCHEME [DCHMOC] = 0.1000E-02

THE "MOC" SOLUTION IS USED WHEN DCCELL > DCHMOC

THE "MMOC" SOLUTION IS USED WHEN DCCELL =< DCHMOC

DISPERSION PARAMETERS

LONG. DISPERSIVITY (AL) = 50.00000 FOR LAYER 1

LONG. DISPERSIVITY (AL) = 50.00000 FOR LAYER 2

LONG. DISPERSIVITY (AL) = 50.00000 FOR LAYER 3

LONG. DISPERSIVITY (AL) = 50.00000 FOR LAYER 4

LONG. DISPERSIVITY (AL) = 50.00000 FOR LAYER 5

H. TRANS./LONG. DISP. READ ON UNIT 3 USING FORMAT: " (10G11.4) "

	1	2	3	4	5
1	0.1000	0.1000	0.1000	0.1000	0.1000

V. TRANS./LONG. DISP. READ ON UNIT 3 USING FORMAT: " (10G11.4) "

	1	2	3	4	5
1	5.0000E-02	5.0000E-02	5.0000E-02	5.0000E-02	5.0000E-02

DIFFUSION COEFFICIENT READ ON UNIT 3 USING FORMAT: " (10G11.4) "

	1	2	3	4	5

1 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00

SORPTION AND 1ST ORDER RATE REACTION PARAMETERS

BULK DENSITY (RHOB) READ ON UNIT 9 USING FORMAT: " (10G11.4) "

	1	2	3	4	5
1	48.14	48.14	48.14	48.14	48.14

SORPTION CONSTANT NO. 1 READ ON UNIT 9 USING FORMAT: " (10G11.4) "

	1	2	3	4	5
1	2.2000E-03	2.2000E-03	2.2000E-03	2.2000E-03	2.2000E-03

SORPTION CONSTANT NO. 2 READ ON UNIT 9 USING FORMAT: " (10G11.4) "

	1	2	3	4	5
1	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

DISSOLVED RATE CONSTANT READ ON UNIT 9 USING FORMAT: " (10G11.4) "

	1	2	3	4	5
1	8.0000E-05	8.0000E-05	8.0000E-04	1.3000E-03	1.3000E-03

SORBED RATE CONSTANT READ ON UNIT 9 USING FORMAT: " (10G11.4) "

	1	2	3	4	5
1	8.0000E-05	8.0000E-05	8.0000E-04	1.3000E-03	1.3000E-03

MAXIMUM STEPSIZE WHICH MEETS STABILITY CRITERION OF THE REACTION TERM

= 384.6 AT K= 5, I= 82, J= 47

++

STRESS PERIOD NO. 001

++

LENGTH OF CURRENT STRESS PERIOD = 1460.000

NUMBER OF TIME STEPS FOR CURRENT STRESS PERIOD = 1

TIME STEP MULTIPLIER = 1.000000

USER-SPECIFIED TRANSPORT STEPSIZE = 0.0000000E+00day

MAXIMUM NUMBER OF TRANSPORT STEPS ALLOWED IN ONE TIME STEP = 5000

CONCENTRATION OF RECHARGE FLUXES WILL BE READ IN STRESS PERIOD 1

CONC. OF RECH. FLUX = 0.0000000E+00

NO	LAYER	ROW	COLUMN	CONCENTRATION	TYPE
1	1	36	36	0.2832000E-02	CONSTANT CONC.
2	1	35	36	0.2832000E-02	CONSTANT CONC.
3	1	34	36	0.2832000E-02	CONSTANT CONC.
4	1	33	36	0.2832000E-02	CONSTANT CONC.
5	1	32	36	0.2832000E-02	CONSTANT CONC.
6	1	31	36	0.2832000E-02	CONSTANT CONC.
7	1	30	36	0.2832000E-02	CONSTANT CONC.
8	1	29	36	0.2832000E-02	CONSTANT CONC.
9	1	28	36	0.2832000E-02	CONSTANT CONC.

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10	1	27	36	0.2832000E-02	CONSTANT CONC.
11	1	36	37	0.2832000E-02	CONSTANT CONC.
12	1	35	37	0.2832000E-02	CONSTANT CONC.
13	1	34	37	0.2832000E-02	CONSTANT CONC.
14	1	33	37	0.2832000E-02	CONSTANT CONC.
15	1	32	37	0.2832000E-02	CONSTANT CONC.
16	1	31	37	0.2832000E-02	CONSTANT CONC.
17	1	30	37	0.2832000E-02	CONSTANT CONC.
18	1	29	37	0.2832000E-02	CONSTANT CONC.
19	1	28	37	0.2832000E-02	CONSTANT CONC.
20	1	27	37	0.2832000E-02	CONSTANT CONC.
21	1	36	38	0.2832000E-02	CONSTANT CONC.
22	1	35	38	0.2832000E-02	CONSTANT CONC.
23	1	34	38	0.2832000E-02	CONSTANT CONC.
24	1	33	38	0.2832000E-02	CONSTANT CONC.
25	1	32	38	0.2832000E-02	CONSTANT CONC.
26	1	31	38	0.2832000E-02	CONSTANT CONC.
27	1	30	38	0.2832000E-02	CONSTANT CONC.
28	1	29	38	0.2832000E-02	CONSTANT CONC.
29	1	28	38	0.2832000E-02	CONSTANT CONC.
30	1	27	38	0.2832000E-02	CONSTANT CONC.
31	1	36	39	0.2832000E-02	CONSTANT CONC.
32	1	35	39	0.2832000E-02	CONSTANT CONC.
33	1	34	39	0.2832000E-02	CONSTANT CONC.
34	1	33	39	0.2832000E-02	CONSTANT CONC.
35	1	32	39	0.2832000E-02	CONSTANT CONC.
36	1	31	39	0.2832000E-02	CONSTANT CONC.
37	1	30	39	0.2832000E-02	CONSTANT CONC.
38	1	29	39	0.2832000E-02	CONSTANT CONC.
39	1	28	39	0.2832000E-02	CONSTANT CONC.
40	1	27	39	0.2832000E-02	CONSTANT CONC.
41	1	36	40	0.2832000E-02	CONSTANT CONC.
42	1	35	40	0.2832000E-02	CONSTANT CONC.
43	1	34	40	0.2832000E-02	CONSTANT CONC.
44	1	33	40	0.2832000E-02	CONSTANT CONC.

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45	1	32	40	0.2832000E-02	CONSTANT CONC.
46	1	31	40	0.2832000E-02	CONSTANT CONC.
47	1	30	40	0.2832000E-02	CONSTANT CONC.
48	1	29	40	0.2832000E-02	CONSTANT CONC.
49	1	28	40	0.2832000E-02	CONSTANT CONC.
50	1	27	40	0.2832000E-02	CONSTANT CONC.
51	1	36	41	0.2832000E-02	CONSTANT CONC.
52	1	35	41	0.2832000E-02	CONSTANT CONC.
53	1	34	41	0.2832000E-02	CONSTANT CONC.
54	1	33	41	0.2832000E-02	CONSTANT CONC.
55	1	32	41	0.2832000E-02	CONSTANT CONC.
56	1	31	41	0.2832000E-02	CONSTANT CONC.
57	1	30	41	0.2832000E-02	CONSTANT CONC.
58	1	29	41	0.2832000E-02	CONSTANT CONC.
59	1	28	41	0.2832000E-02	CONSTANT CONC.
60	1	27	41	0.2832000E-02	CONSTANT CONC.
61	1	20	50	0.5664000E-03	CONSTANT CONC.
62	1	19	50	0.5664000E-03	CONSTANT CONC.
63	1	18	50	0.5664000E-03	CONSTANT CONC.
64	1	20	51	0.5664000E-03	CONSTANT CONC.
65	1	19	51	0.5664000E-03	CONSTANT CONC.
66	1	18	51	0.5664000E-03	CONSTANT CONC.
67	1	20	52	0.5664000E-03	CONSTANT CONC.
68	1	19	52	0.5664000E-03	CONSTANT CONC.
69	1	18	52	0.5664000E-03	CONSTANT CONC.
70	1	20	53	0.5664000E-03	CONSTANT CONC.
71	1	19	53	0.5664000E-03	CONSTANT CONC.
72	1	18	53	0.5664000E-03	CONSTANT CONC.
73	1	65	63	0.2832000E-02	CONSTANT CONC.
74	1	64	63	0.2832000E-02	CONSTANT CONC.
75	1	65	64	0.2832000E-02	CONSTANT CONC.
76	1	64	64	0.2832000E-02	CONSTANT CONC.

==========

K31

TIME STEP NO. 001

==========

FROM TIME = 0.00000E+00 TO 1460.0

TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION = 0.0000000E+00day

.....

TOTAL PARTICLES USED IN THE CURRENT STEP = 79520

PARTICLES ADDED AT BEGINNING OF THE STEP = 79520

PARTICLES REMOVED AT END OF LAST STEP = 0

CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP 1, TIME STEP 1, STRESS PERIOD 1

	IN	OUT
CONSTANT CONCENTRATION:	0.0000000E+00	0.0000000E+00
CONSTANT HEAD:	0.0000000E+00	0.0000000E+00
DRAINS:	0.0000000E+00	0.0000000E+00
RIVERS:	0.0000000E+00	0.0000000E+00
RECHARGE:	0.0000000E+00	0.0000000E+00
DECAY OR BIODEGRADATION:	0.0000000E+00	0.0000000E+00
MASS STORAGE (SOLUTE):	0.3406633E-01	-0.3632450E-01
MASS STORAGE (ADSORBED):	0.1443131E-01	-0.1538799E-01
[TOTAL]:	0.4849763E-01 g	-0.5171249E-01 g

NET (IN - OUT): -0.3214858E-02

DISCREPANCY (PERCENT): -6.416235

TRANSPORT STEP NO. 2

K38

TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION = 1.000000 day

.....

TOTAL PARTICLES USED IN THE CURRENT STEP = 79504

PARTICLES ADDED AT BEGINNING OF THE STEP = 0

PARTICLES REMOVED AT END OF LAST STEP = 16

CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP 2, TIME STEP 1, STRESS PERIOD 1

	IN	OUT
CONSTANT CONCENTRATION:	0.4970495	0.0000000E+00
CONSTANT HEAD:	0.0000000E+00	-0.1642252E-01
DRAINS:	0.0000000E+00	-0.4592641E-01
RIVERS:	0.0000000E+00	-0.1490206E-01
RECHARGE:	0.0000000E+00	0.0000000E+00
DECAY OR BIODEGRADATION:	0.0000000E+00	-0.6572033
MASS STORAGE (SOLUTE):	1.360024	-1.222757
MASS STORAGE (ADSORBED):	0.5761367	-0.5179893
[TOTAL]:	2.433210 g	-2.475200 g

NET (IN - OUT): -0.4199004E-01

DISCREPANCY (PERCENT): -1.710943

TRANSPORT STEP NO. 120

TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION = 146.0000 day

K39

.....

TOTAL PARTICLES USED IN THE CURRENT STEP = 77607

PARTICLES ADDED AT BEGINNING OF THE STEP = 96

PARTICLES REMOVED AT END OF LAST STEP = 84

CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP 120, TIME STEP 1, STRESS PERIOD 1

	IN	OUT
CONSTANT CONCENTRATION:	71.24133	0.0000000E+00
CONSTANT HEAD:	0.0000000E+00	-2.469289
DRAINS:	0.0000000E+00	-6.656339
RIVERS:	0.0000000E+00	-2.146295
RECHARGE:	0.0000000E+00	0.0000000E+00
DECAY OR BIODEGRADATION:	0.0000000E+00	-95.08944
MASS STORAGE (SOLUTE):	175.3922	-151.6834
MASS STORAGE (ADSORBED):	74.30018	-64.25664
[TOTAL]:	320.9337 g	-322.3015 g

NET (IN - OUT): -1.367767

DISCREPANCY (PERCENT): -0.4252776

==========

TIME STEP NO. 001

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FROM TIME = 6570.0 TO 7300.0

K40

TRANSPORT STEP NO. 590

TOTAL ELAPSED TIME SINCE BEGINNING OF SIMULATION = 7300.000 day

.....

TOTAL PARTICLES USED IN THE CURRENT STEP = 56874

PARTICLES ADDED AT BEGINNING OF THE STEP = 96

PARTICLES REMOVED AT END OF LAST STEP = 68

CUMMULATIVE MASS BUDGETS AT END OF TRANSPORT STEP 590, TIME STEP 1, STRESS PERIOD 6

	IN	OUT
CONSTANT CONCENTRATION:	3606.679	0.0000000E+00
CONSTANT HEAD:	0.0000000E+00	-105.0758
DRAINS:	0.0000000E+00	-249.9680
RIVERS:	0.0000000E+00	-46.08675
RECHARGE:	0.0000000E+00	0.0000000E+00
DECAY OR BIODEGRADATION:	0.0000000E+00	-3881.729
MASS STORAGE (SOLUTE):	8972.698	-8669.516
MASS STORAGE (ADSORBED):	3801.035	-3672.610
[TOTAL]:	16380.41 g	-16624.98 g

NET (IN - OUT): -244.5723

DISCREPANCY (PERCENT): -1.482014

| M T |

| 3 D | End of Model Output

Appendix L
Summary Tables of Validated Laboratory Results

Summary Tables of Validated Laboratory Results
Table of Contents

- Notes to Reviewers
- Summary of Laboratory and Data Validation Qualifiers
- Water Chemistry Data - February 1995
  - Summary of Constituents Detected in Groundwater, Background and Baseline Monitoring - February 1995
    - Volatile Organic Compounds
    - Semivolatile Organic Compounds
    - Pesticides and PCBs
    - Metals and Cyanide
    - Dioxins and Furans
  - Summary of Constituents Detected in Surface Water, Background and Baseline Monitoring - February 1995
    - Volatile Organic Compounds
    - Semivolatile Organic Compounds
    - Pesticides and PCBs
    - Metals and Cyanide
    - Dioxins and Furans
- Water Chemistry Data - April 1996
  - Summary of Constituents Detected in Groundwater - April 1996
    - Volatile Organic Compounds
    - Semivolatile Organic Compounds
    - Pesticides and PCBs
    - Metals and Cyanide
    - Dioxins and Furans

- Summary of Constituents Detected in Surface Water - April 1996
  - Volatile Organic Compounds
  - Semivolatile Organic Compounds
  - Pesticides and PCBs
  - Metals and Cyanide
  - Dioxins and Furans
- Water Chemistry Data - 1997

  Groundwater Monitoring Results
  - Volatile Organic Compounds

    Semivolatile Organic Compounds
  - Inorganic Parameters
- Water Chemistry Data - 1998
  - Groundwater Monitoring Results
    - Volatile Organic Compounds
    - Semivolatile Organic Compounds
    - Pesticides and PCBs
    - Metals
    - Field Data and Inorganic Indicator Parameters
  - Surface Water Monitoring Results
    - Volatile Organic Compounds
    - Semivolatile Organic Compounds
    - Pesticides and PCBs
    - Metals
    - Field Data and Inorganic Indicator Parameters
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    - Volatile Organic Compounds
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    - Pesticides and PCBs
    - Metals
    - Inorganic Parameters

- Soil Samples
  - TCLP Parameters
  - Pesticides and PCBs
  - Metals
  - Inorganic Parameters
- Groundwater Samples Collected During Aquifer Tests
  - Volatile Organic Compounds
  - Semivolatile Organic Compounds

Decontamination Verification Samples

- Volatile Organic Compounds
- Semivolatile Organic Compounds
- Pesticides and PCBs
- Metals
- Field and Inorganic Indicator Parameters

Appendix L
Summary Tables for Validated Laboratory Data

Notes to Reviewers

1. Data Tables for the February 1995 and April 1996 monitoring events contain only the parameters and concentrations detected in the water samples as reported by IT Corporation in the Final Supplemental Investigation Report, September 1995, and in the Groundwater and Surface Water Monitoring Report, February 1997. Laboratory detection limits and full analyte lists for the monitoring program are not currently available. Only those compounds which were detected in at least one water sample are included in the parameter list. Blank spaces in the 1995 and 1996 data tables indicate either that the analyte was not detected in the given water sample, or the sample was not analyzed for that parameter.

2. Data Tables for the 1997 monitoring event contain complete laboratory results, including detection limits for compounds reported at concentrations below the Limit of Detection (LOD), for monitoring wells 32-063, 33MWC-07, 33MWC-08, and 33MWC-10 through 33MWC-15. Blank entries in the summary tables for these wells indicate that the water sample was not analyzed for the given parameter. Results for monitoring wells 33-340, 33-341, 33-342, 33MWC-01 through 33MWC-06, and 33MWC-09 contain only the parameters and concentrations detected in the water samples as reported by FDGTI in the Pre 1998 TCE Investigation Report, March 1998. Blank entries in the summary tables for these wells indicate either that the water sample was not analyzed for the given parameter, or the analyte was not detected in the water sample. Only those compounds which were detected in at least one water sample are included on the parameter list.

3. Data Tables for the 1998 monitoring events contain complete laboratory results, including detection limits for compounds reported at concentrations below the LOD. Blank entries in these tables indicate that the water sample was not analyzed for the given parameter. Only those compounds which were detected in at least one water sample are included on the parameter list.

4. Cyanide is generally included in the inorganic indicator parameter list. Since Cyanide was the only inorganic indicator parameter analyzed during the 1995 and 1996 monitoring events, it is included with the metals results for these rounds.

5. Geoprobe boring identification numbers have been altered slightly in the validated data tables in order to properly sort the analytical data. The letter designating the area of investigation (A through E) at the end of the Geoprobe boring identification number (e.g. the letter "E" in boring number "GP-1E") has been moved in front of the Geoprobe number. For example, Geoprobe boring number "GP-1E" becomes "GPE-01" in these tables.

Appendix L

Crab Orchard National Wildlife Refuge
PCB Operable Unit
Laboratory Qualifiers

INORGANIC DATA	
B	Analyte value is below the Quantitation Limit.
D	Analyte value is from a diluted analysis.
H	Analysis was performed past holding time.
E	ICP serial dilution exceeded the control limits.
J	Reported value is less than the reporting limit but greater than zero.
U	Analyte was tested for but was not detected; value indicates the detection limit.
ORGANIC DATA	
B	Analyte was present in the method blank.
D	Analyte value is from a diluted analysis.
E	Reported concentration exceeded the calibration range of the instrument.
J	Reported value is less than the reporting limit but greater than zero.
P	The difference for detected pesticide/Aroclor result between the two GC columns is greater than 25 percent.
U	The compound was analyzed for but not detected, the value indicates the detection limit.

Data Validation Qualifiers

b	Analyte was present in the trip blank.
f	Analyte was present in the field blank.
h	Analyte was present in the laboratory holding/storage blank.
u	Analyte was present at less than 10 times the concentration in the associated method (B), trip (b), field (f), and/or laboratory storage blank for common laboratory contaminants, or at less than 5 times the blank concentration of other analytes, and is therefore qualified as nondetectable (u) according to USEPA data validation procedures (USEPA, 1994a and 1994b). The reports of 4,4'-DDT, 4,4'-DDE, and 4,4'DDD below the Quantitation Limits are believed to be false-positives representing baseline interference and/or Aroclor peaks. Therefore, u-qualifiers indicate that the results should be considered nondetected.
j	When specific QC criteria are outside the established control limits, the reported concentration or the Quantitation Limit is approximate.
R	*(Pre-1997 data)** Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result. *QC criteria for calibration were not met and/or reported concentration exceeded calibration range of instrument.*

* Qualifier description is taken from the Final Supplemental Investigation Report, Revision 2 (IT Corp., 9/95). Text in italics added by RMT, 2/99.

Appendix M
Rainfall Data for Crab Orchard National Wildlife Refuge

1998 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

Date	Rn24 inch
1998 Jan 01	0.03
1998 Jan 02	0
1998 Jan 03	0
1998 Jan 04	0
1998 Jan 05	1
1998 Jan 06	0.8
1998 Jan 07	0.38
1998 Jan 08	0.64
1998 Jan 09	0.02
1998 Jan 10	0
1998 Jan 11	0.01
1998 Jan 12	0.02
1998 Jan 13	0.02
1998 Jan 14	0
1998 Jan 15	0.19
1998 Jan 16	0
1998 Jan 17	0.01
1998 Jan 18	0
1998 Jan 19	0.03
1998 Jan 20	0
1998 Jan 21	0
1998 Jan 22	0.05
1998 Jan 23	0.32
1998 Jan 24	0.03
1998 Jan 25	0
1998 Jan 26	0
1998 Jan 27	0.13
1998 Jan 28	0
1998 Jan 29	0
1998 Jan 30	0
1998 Jan 31	0
1998 Feb 01	0
1998 Feb 02	0
1998 Feb 03	0
1998 Feb 04	0
1998 Feb 05	0.06
1998 Feb 06	0.04
1998 Feb 07	0.03
1998 Feb 08	0

1998 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

1998 Feb 09	0
1998 Feb 10	0
1998 Feb 11	0.35
1998 Feb 12	0.11
1998 Feb 13	0
1998 Feb 14	0
1998 Feb 15	0
1998 Feb 16	0.8
1998 Feb 17	0.66
1998 Feb 18	0.41
1998 Feb 19	0
1998 Feb 20	0.14
1998 Feb 21	0
1998 Feb 22	0
1998 Feb 23	0
1998 Feb 24	0
1998 Feb 25	0
1998 Feb 26	0
1998 Feb 27	1.05
1998 Feb 28	0.02
1998 Mar 01	0
1998 Mar 02	0
1998 Mar 03	0.02
1998 Mar 04	0
1998 Mar 05	0
1998 Mar 06	0
1998 Mar 07	0
1998 Mar 08	0.18
1998 Mar 09	0.16
1998 Mar 10	0
1998 Mar 11	0.01
1998 Mar 12	0
1998 Mar 13	0
1998 Mar 14	0
1998 Mar 15	0
1998 Mar 16	0.35
1998 Mar 17	0.4
1998 Mar 18	0.74
1998 Mar 19	0.03
1998 Mar 20	1.31
1998 Mar 21	0.06
1998 Mar 22	0
1998 Mar 23	0

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1998 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

1998 Mar 24	0
1998 Mar 25	0
1998 Mar 26	0
1998 Mar 27	0
1998 Mar 28	0.33
1998 Mar 29	0
1998 Mar 30	0
1998 Mar 31	0.31
1998 Apr 01	0.24
1998 Apr 02	0
1998 Apr 03	0.38
1998 Apr 04	0.02
1998 Apr 05	0
1998 Apr 06	0
1998 Apr 07	0.03
1998 Apr 08	0.11
1998 Apr 09	0.03
1998 Apr 10	0
1998 Apr 11	0
1998 Apr 12	0
1998 Apr 13	0
1998 Apr 14	0.26
1998 Apr 15	0.78
1998 Apr 16	1.95
1998 Apr 17	0
1998 Apr 18	0
1998 Apr 19	0
1998 Apr 20	0
1998 Apr 21	0.13
1998 Apr 22	0
1998 Apr 23	0.09
1998 Apr 24	0
1998 Apr 25	0.07
1998 Apr 26	0
1998 Apr 27	0.48
1998 Apr 28	0.2
1998 Apr 29	0.12
1998 Apr 30	1.02
1998 May 01	0.11
1998 May 02	0.03
1998 May 03	0.21
1998 May 04	0
1998 May 05	0

1998 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

1998 May 06	0.56
1998 May 07	0.66
1998 May 08	0
1998 May 09	0
1998 May 10	0.03
1998 May 11	0
1998 May 12	0
1998 May 13	0
1998 May 14	0
1998 May 15	0
1998 May 16	0
1998 May 17	0
1998 May 18	0
1998 May 19	0
1998 May 20	0
1998 May 21	0
1998 May 22	0.76
1998 May 23	0.06
1998 May 24	0.23
1998 May 25	1.05
1998 May 26	0.01
1998 May 27	0.1
1998 May 28	0
1998 May 29	0
1998 May 30	0
1998 May 31	0
1998 Jun 01	0
1998 Jun 02	0
1998 Jun 03	0
1998 Jun 04	0.06
1998 Jun 05	0.89
1998 Jun 06	0
1998 Jun 07	0
1998 Jun 08	0
1998 Jun 09	3.84
1998 Jun 10	0.09
1998 Jun 11	0.54
1998 Jun 12	0.04
1998 Jun 13	1.47
1998 Jun 14	1.45
1998 Jun 15	2.53
1998 Jun 16	0.18
1998 Jun 17	0

1998 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

1998 Jun 18	0
1998 Jun 19	1.81
1998 Jun 20	0.22
1998 Jun 21	0.64
1998 Jun 22	0.01
1998 Jun 23	0
1998 Jun 24	0
1998 Jun 25	0
1998 Jun 26	0
1998 Jun 27	0
1998 Jun 28	0
1998 Jun 29	0
1998 Jun 30	5.34
1998 Jul 01	0
1998 Jul 02	0
1998 Jul 03	0.02
1998 Jul 04	2.24
1998 Jul 05	0
1998 Jul 06	0
1998 Jul 07	0.01
1998 Jul 08	0.63
1998 Jul 09	0
1998 Jul 10	0
1998 Jul 11	0.02
1998 Jul 12	0
1998 Jul 13	0
1998 Jul 14	0.05
1998 Jul 15	0.05
1998 Jul 16	0
1998 Jul 17	0
1998 Jul 18	0
1998 Jul 19	0
1998 Jul 20	0
1998 Jul 21	0
1998 Jul 22	0
1998 Jul 23	0.08
1998 Jul 24	0
1998 Jul 25	0
1998 Jul 26	0.42
1998 Jul 27	0.03
1998 Jul 28	0
1998 Jul 29	0.48
1998 Jul 30	0.49

1998 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

1998 Jul 31	0.04
1998 Aug 01	0
1998 Aug 02	0
1998 Aug 03	0.03
1998 Aug 04	0.02
1998 Aug 05	0.17
1998 Aug 06	0.38
1998 Aug 07	1.43
1998 Aug 08	0.78
1998 Aug 09	0.01
1998 Aug 10	0
1998 Aug 11	0
1998 Aug 12	0.1
1998 Aug 13	0
1998 Aug 14	0
1998 Aug 15	0
1998 Aug 16	0
1998 Aug 17	0
1998 Aug 18	0
1998 Aug 19	0
1998 Aug 20	0
1998 Aug 21	0
1998 Aug 22	0
1998 Aug 23	0
1998 Aug 24	0
1998 Aug 25	0
1998 Aug 26	0.01
1998 Aug 27	0
1998 Aug 28	0
1998 Aug 29	0
1998 Aug 30	0
1998 Aug 31	0
1998 Sep 01	0
1998 Sep 02	0
1998 Sep 03	0
1998 Sep 04	0
1998 Sep 05	0
1998 Sep 06	0
1998 Sep 07	0.03
1998 Sep 08	0
1998 Sep 09	0
1998 Sep 10	0
1998 Sep 11	0

1998 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

1998 Sep 12	0
1998 Sep 13	0
1998 Sep 14	0
1998 Sep 15	0.09
1998 Sep 16	0
1998 Sep 17	0.02
1998 Sep 18	0.23
1998 Sep 19	0
1998 Sep 20	0
1998 Sep 21	0
1998 Sep 22	0.01
1998 Sep 23	0
1998 Sep 24	0
1998 Sep 25	0.09
1998 Sep 26	0
1998 Sep 27	0
1998 Sep 28	0
1998 Sep 29	0
1998 Sep 30	0
1998 Oct 01	0
1998 Oct 02	0
1998 Oct 03	0.04
1998 Oct 04	0
1998 Oct 05	0
1998 Oct 06	0.98
1998 Oct 07	2.03
1998 Oct 08	0
1998 Oct 09	0
1998 Oct 10	0
1998 Oct 11	0
1998 Oct 12	0
1998 Oct 13	0
1998 Oct 14	0
1998 Oct 15	0
1998 Oct 16	0.17
1998 Oct 17	0
1998 Oct 18	0.73
1998 Oct 19	0
1998 Oct 20	0
1998 Oct 21	0
1998 Oct 22	0
1998 Oct 23	0
1998 Oct 24	0

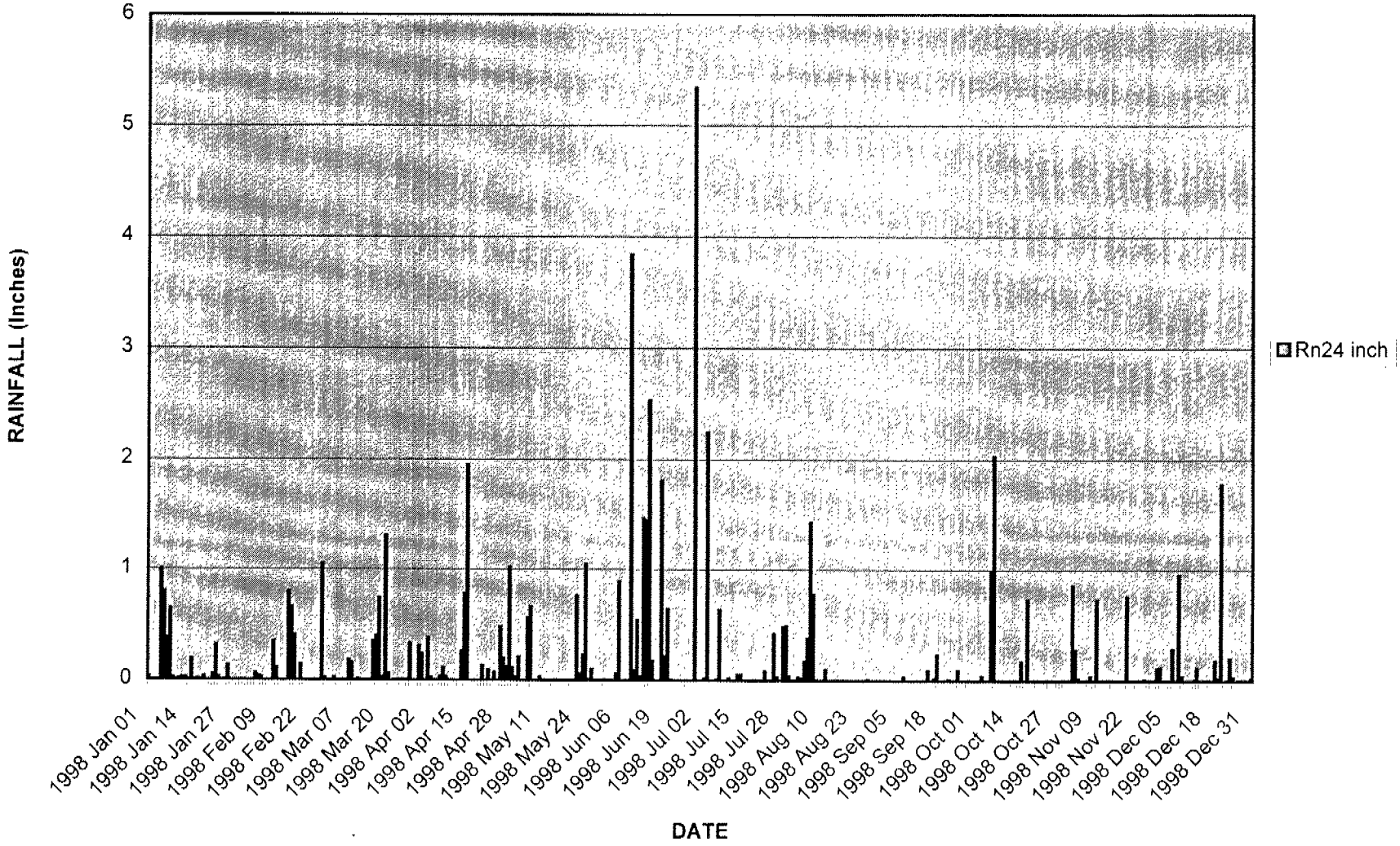
1998 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

1998 Oct 25	0
1998 Oct 26	0
1998 Oct 27	0
1998 Oct 28	0
1998 Oct 29	0
1998 Oct 30	0
1998 Oct 31	0
1998 Nov 01	0
1998 Nov 02	0.86
1998 Nov 03	0.28
1998 Nov 04	0.02
1998 Nov 05	0
1998 Nov 06	0
1998 Nov 07	0
1998 Nov 08	0.04
1998 Nov 09	0
1998 Nov 10	0.73
1998 Nov 11	0
1998 Nov 12	0
1998 Nov 13	0
1998 Nov 14	0
1998 Nov 15	0
1998 Nov 16	0
1998 Nov 17	0
1998 Nov 18	0
1998 Nov 19	0
1998 Nov 20	0.76
1998 Nov 21	0
1998 Nov 22	0
1998 Nov 23	0
1998 Nov 24	0
1998 Nov 25	0
1998 Nov 26	0.01
1998 Nov 27	0
1998 Nov 28	0
1998 Nov 29	0
1998 Nov 30	0.11
1998 Dec 01	0.12
1998 Dec 02	0
1998 Dec 03	0
1998 Dec 04	0
1998 Dec 05	0.29
1998 Dec 06	0

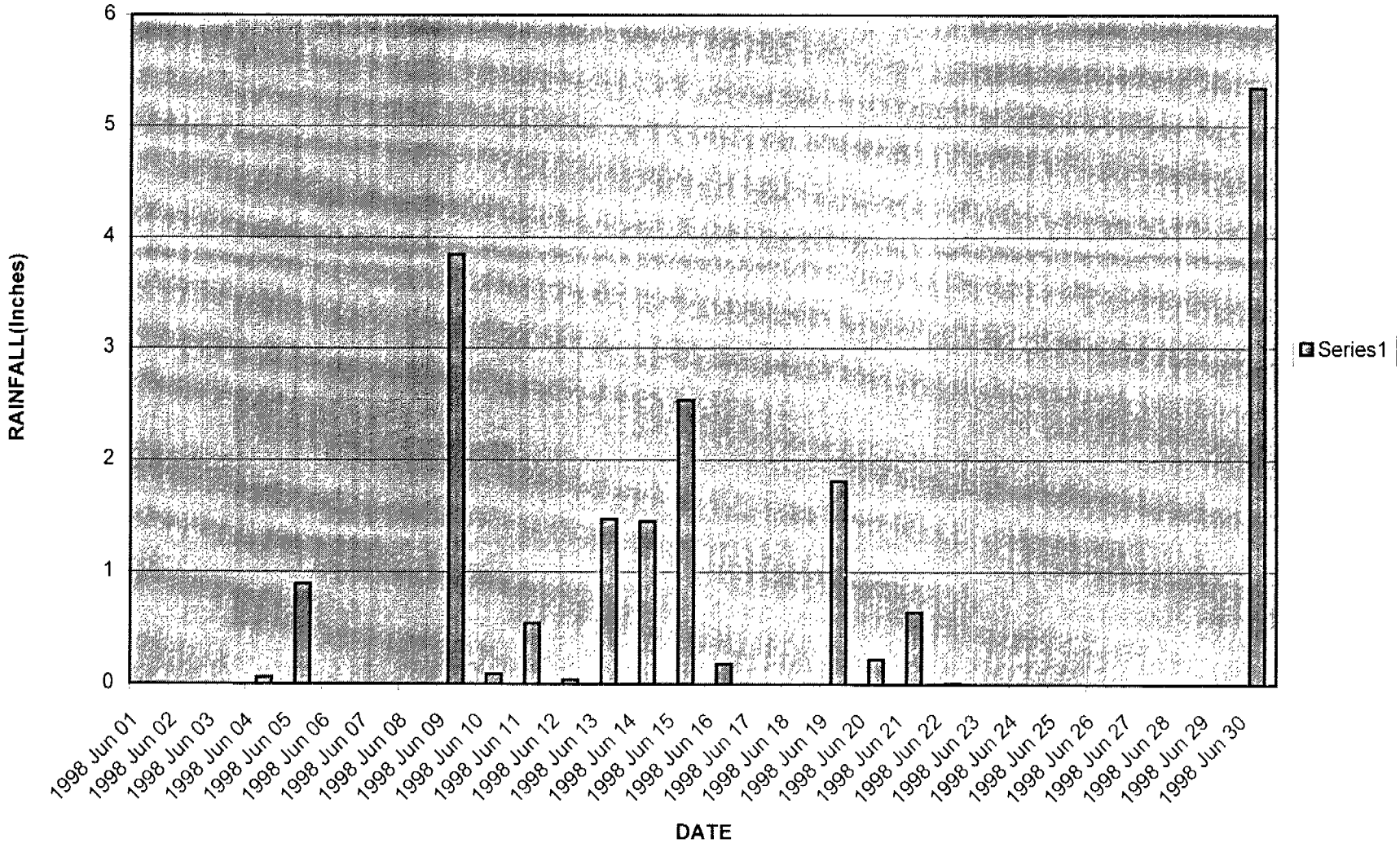
1998 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

1998 Dec 07	0.96
1998 Dec 08	0.04
1998 Dec 09	0
1998 Dec 10	0
1998 Dec 11	0
1998 Dec 12	0.01
1998 Dec 13	0.12
1998 Dec 14	0
1998 Dec 15	0
1998 Dec 16	0
1998 Dec 17	0
1998 Dec 18	0
1998 Dec 19	0.18
1998 Dec 20	0.02
1998 Dec 21	1.78
1998 Dec 22	0
1998 Dec 23	0
1998 Dec 24	0.2
1998 Dec 25	0.03
1998 Dec 26	0
1998 Dec 27	0
1998 Dec 28	0
1998 Dec 29	0
1998 Dec 30	0
1998 Dec 31	0.02

1998 RAINFALL



JUNE 1998 RAINFALL



M.14

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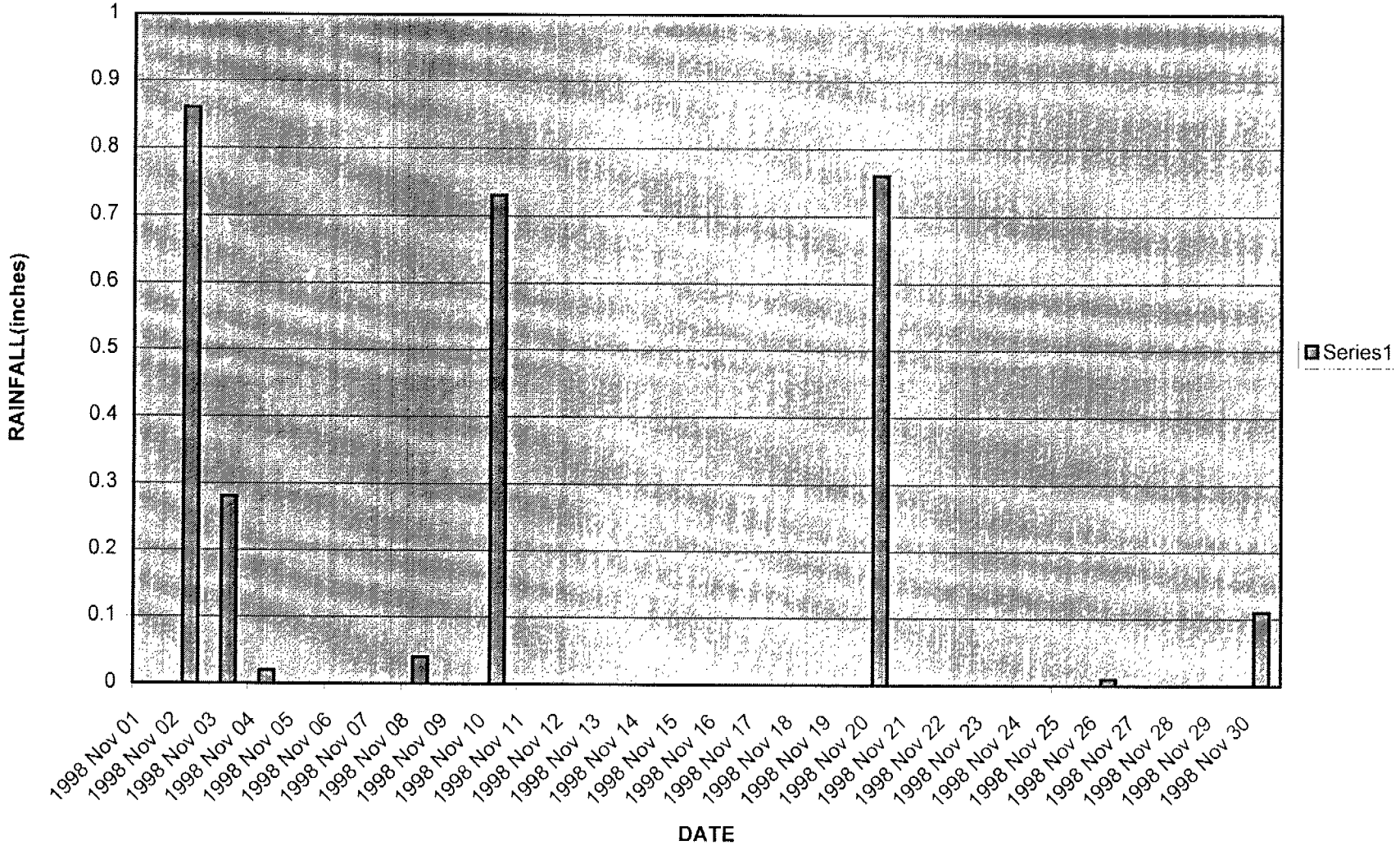
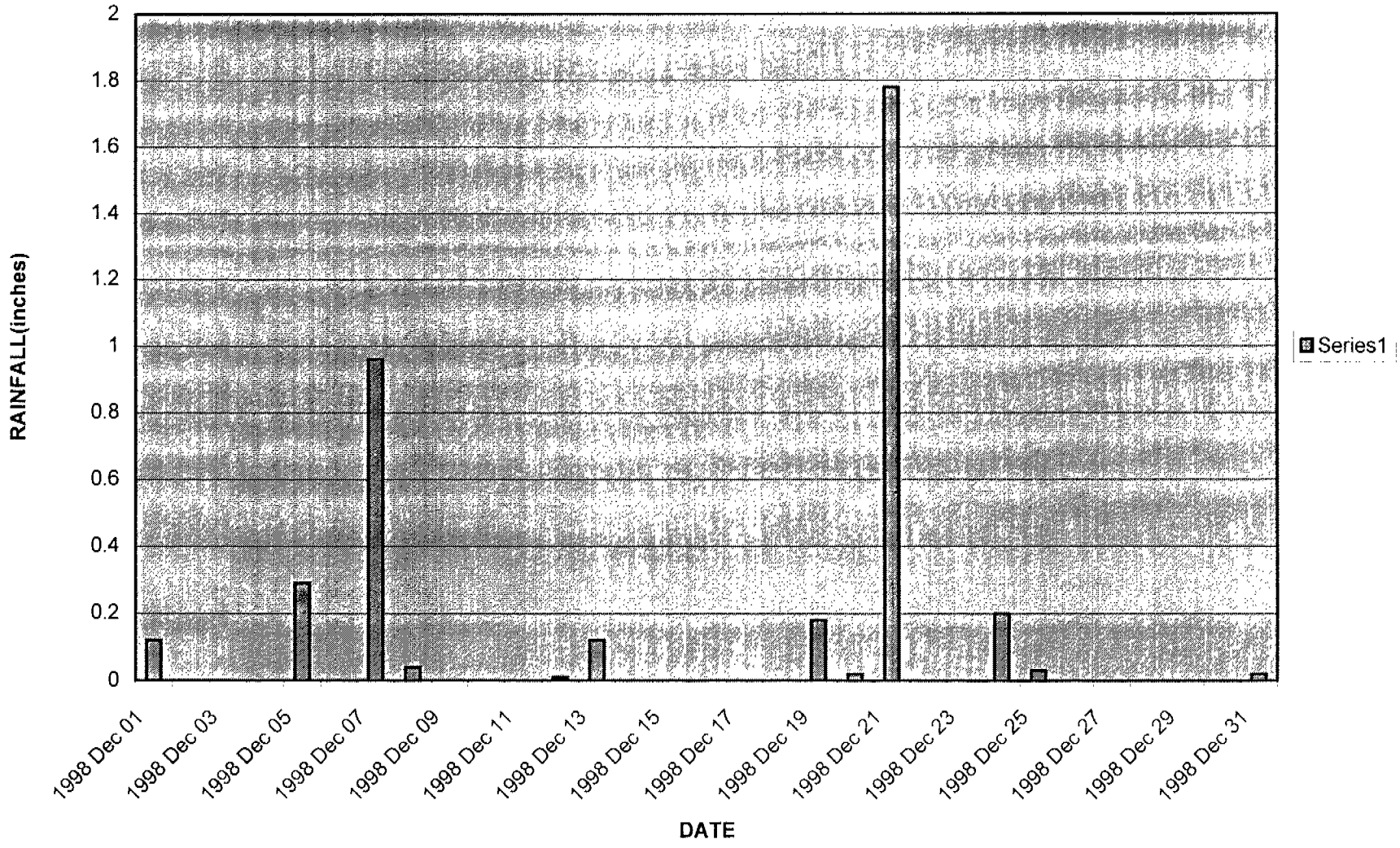


DECEMBER 1998 RAINFALL



1999 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

Date	Rn24 inch
1999 Jan 01	0
1999 Jan 02	0.85
1999 Jan 03	0
1999 Jan 04	0.04
1999 Jan 05	0.01
1999 Jan 06	0.11
1999 Jan 07	0
1999 Jan 08	0
1999 Jan 09	0.06
1999 Jan 10	0.13
1999 Jan 11	0.02
1999 Jan 12	0
1999 Jan 13	0.14
1999 Jan 14	0.05
1999 Jan 15	0
1999 Jan 16	0
1999 Jan 17	0.09
1999 Jan 18	1.01
1999 Jan 19	0
1999 Jan 20	0
1999 Jan 21	0
1999 Jan 22	5.09
1999 Jan 23	0.24
1999 Jan 24	0
1999 Jan 25	0
1999 Jan 26	0
1999 Jan 27	0
1999 Jan 28	0
1999 Jan 29	0
1999 Jan 30	0
1999 Jan 31	1.27
1999 Feb 01	0.44
1999 Feb 02	0.01
1999 Feb 03	0
1999 Feb 04	0
1999 Feb 05	0
1999 Feb 06	0
1999 Feb 07	0.73
1999 Feb 08	0
1999 Feb 09	0
1999 Feb 10	0

1999 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

1999 Feb 11	0
1999 Feb 12	0.45
1999 Feb 13	0
1999 Feb 14	0
1999 Feb 15	0
1999 Feb 16	0.03
1999 Feb 17	0.08
1999 Feb 18	0
1999 Feb 19	0.06
1999 Feb 20	0
1999 Feb 21	0
1999 Feb 22	0
1999 Feb 23	0.16
1999 Feb 24	0.1
1999 Feb 25	0
1999 Feb 26	0
1999 Feb 27	0
1999 Feb 28	0.41
1999 Mar 01	0
1999 Mar 02	0
1999 Mar 03	0
1999 Mar 04	0
1999 Mar 05	0.01
1999 Mar 06	1.34
1999 Mar 07	0
1999 Mar 08	0
1999 Mar 09	0.7
1999 Mar 10	0
1999 Mar 11	0
1999 Mar 12	0
1999 Mar 13	0
1999 Mar 14	0.01
1999 Mar 15	0.06
1999 Mar 16	0.5
1999 Mar 17	0
1999 Mar 18	0
1999 Mar 19	0
1999 Mar 20	0
1999 Mar 21	0
1999 Mar 22	0
1999 Mar 23	0.41
1999 Mar 24	0
1999 Mar 25	0
1999 Mar 26	0

1999 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

1999 Mar 27	0
1999 Mar 28	0
1999 Mar 29	0
1999 Mar 30	0
1999 Mar 31	0.1
1999 Apr 01	0.04
1999 Apr 02	0
1999 Apr 03	2.15
1999 Apr 04	1.17
1999 Apr 05	0
1999 Apr 06	1.36
1999 Apr 07	0
1999 Apr 08	0
1999 Apr 09	0.48
1999 Apr 10	0
1999 Apr 11	0
1999 Apr 12	0
1999 Apr 13	0
1999 Apr 14	0.26
1999 Apr 15	0.89
1999 Apr 16	0
1999 Apr 17	0
1999 Apr 18	0
1999 Apr 19	0
1999 Apr 20	0
1999 Apr 21	0.09
1999 Apr 22	0
1999 Apr 23	0
1999 Apr 24	0
1999 Apr 25	0
1999 Apr 26	0.42
1999 Apr 27	0.15
1999 Apr 28	0.11
1999 Apr 29	0.66
1999 Apr 30	0
1999 May 01	0
1999 May 02	0
1999 May 03	0
1999 May 04	0
1999 May 05	0.89
1999 May 06	0.59
1999 May 07	0
1999 May 08	0
1999 May 09	0

1999 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

1999 May 10	0
1999 May 11	0
1999 May 12	0
1999 May 13	0.53
1999 May 14	0.01
1999 May 15	0
1999 May 16	0
1999 May 17	0
1999 May 18	0.52
1999 May 19	0
1999 May 20	0
1999 May 21	0
1999 May 22	0
1999 May 23	0
1999 May 24	0
1999 May 25	0
1999 May 26	0
1999 May 27	0
1999 May 28	0
1999 May 29	0
1999 May 30	0
1999 May 31	0.1
1999 Jun 01	0.01
1999 Jun 02	4.46
1999 Jun 03	0
1999 Jun 04	0
1999 Jun 05	0.04
1999 Jun 06	0
1999 Jun 07	0.1
1999 Jun 08	0
1999 Jun 09	0
1999 Jun 10	0
1999 Jun 11	0
1999 Jun 12	0.04
1999 Jun 13	0
1999 Jun 14	1.01
1999 Jun 15	0
1999 Jun 16	0
1999 Jun 17	0
1999 Jun 18	0
1999 Jun 19	0
1999 Jun 20	0.01
1999 Jun 21	0
1999 Jun 22	0

1999 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

1999 Jun 23	0.11
1999 Jun 24	0.38
1999 Jun 25	0.05
1999 Jun 26	0
1999 Jun 27	0.01
1999 Jun 28	0.01
1999 Jun 29	0.01
1999 Jun 30	0
1999 Jul 01	0.11
1999 Jul 02	0.26
1999 Jul 03	0
1999 Jul 04	0
1999 Jul 05	0
1999 Jul 06	0
1999 Jul 07	0
1999 Jul 08	0
1999 Jul 09	0
1999 Jul 10	0.89
1999 Jul 11	0
1999 Jul 12	0
1999 Jul 13	0
1999 Jul 14	0
1999 Jul 15	0
1999 Jul 16	0
1999 Jul 17	0
1999 Jul 18	0.16
1999 Jul 19	0
1999 Jul 20	0
1999 Jul 21	0.13
1999 Jul 22	0
1999 Jul 23	0.09
1999 Jul 24	0
1999 Jul 25	0
1999 Jul 26	0
1999 Jul 27	0
1999 Jul 28	0
1999 Jul 29	0
1999 Jul 30	0
1999 Jul 31	0
1999 Aug 01	0.13
1999 Aug 02	0
1999 Aug 03	0
1999 Aug 04	0
1999 Aug 05	0

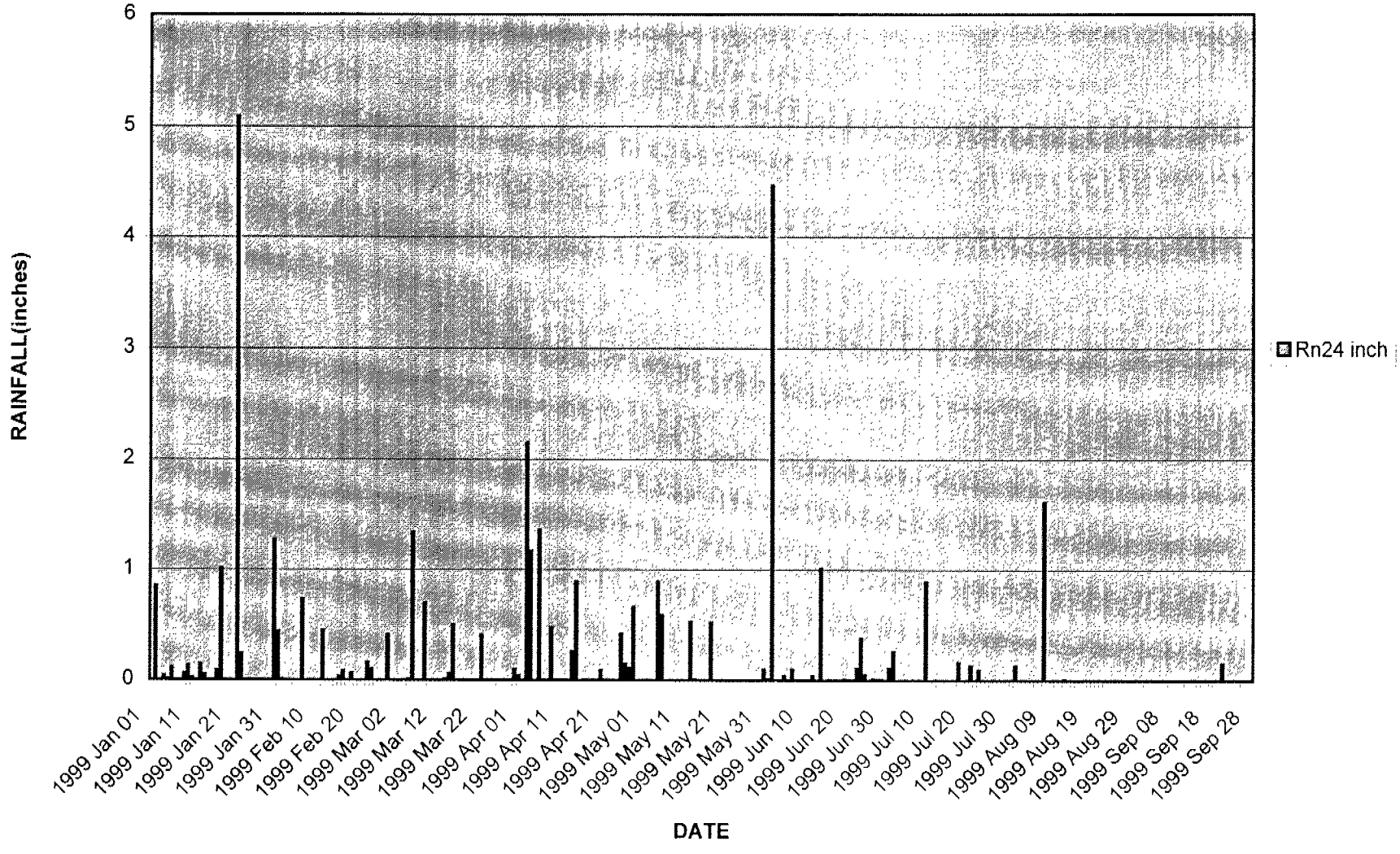
1999 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

1999 Aug 06	0
1999 Aug 07	0
1999 Aug 08	1.61
1999 Aug 09	0
1999 Aug 10	0
1999 Aug 11	0
1999 Aug 12	0
1999 Aug 13	0.01
1999 Aug 14	0
1999 Aug 15	0
1999 Aug 16	0
1999 Aug 17	0
1999 Aug 18	0
1999 Aug 19	0
1999 Aug 20	0
1999 Aug 21	0
1999 Aug 22	0
1999 Aug 23	0
1999 Aug 24	0
1999 Aug 25	0
1999 Aug 26	0
1999 Aug 27	0
1999 Aug 28	0
1999 Aug 29	0
1999 Aug 30	0
1999 Aug 31	0
1999 Sep 01	0
1999 Sep 02	0
1999 Sep 03	0
1999 Sep 04	0
1999 Sep 05	0
1999 Sep 06	0
1999 Sep 07	0
1999 Sep 08	0
1999 Sep 09	0
1999 Sep 10	0
1999 Sep 11	0
1999 Sep 12	0
1999 Sep 13	0
1999 Sep 14	0
1999 Sep 15	0
1999 Sep 16	0
1999 Sep 17	0
1999 Sep 18	0

1999 RAINFALL DATA
CRAB ORCHARD NATIONAL WILDLIFE REFUGE
SOURCE: U.S. FISH & WILDLIFE SERVICE DATABASE

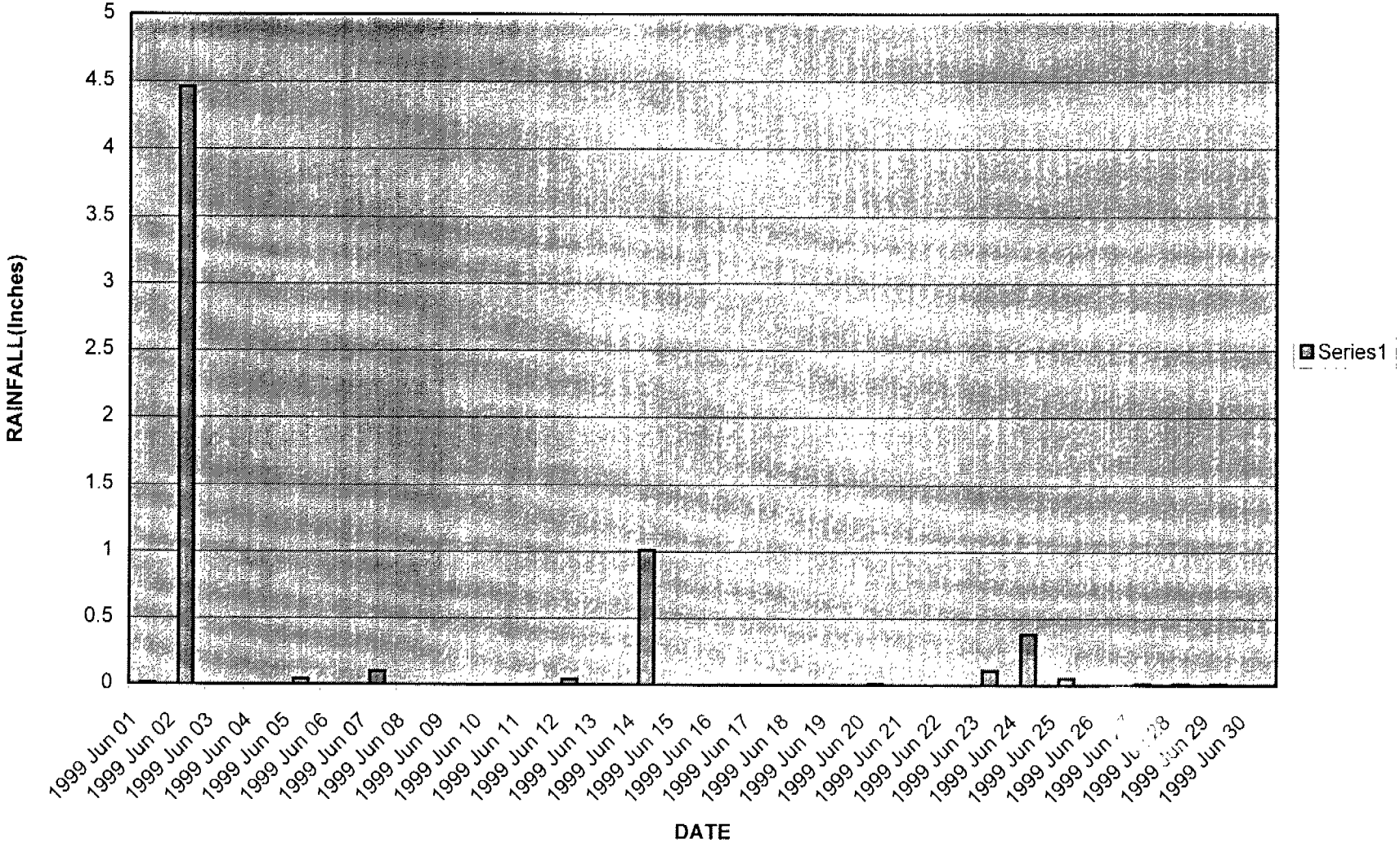
1999 Sep 19	0
1999 Sep 20	0
1999 Sep 21	0.15
1999 Sep 22	0
1999 Sep 23	0
1999 Sep 24	0
1999 Sep 25	0
1999 Sep 26	0
1999 Sep 27	0
1999 Sep 28	0

1999 RAINFALL



M-2b

JUNE 1999 RAINFALL

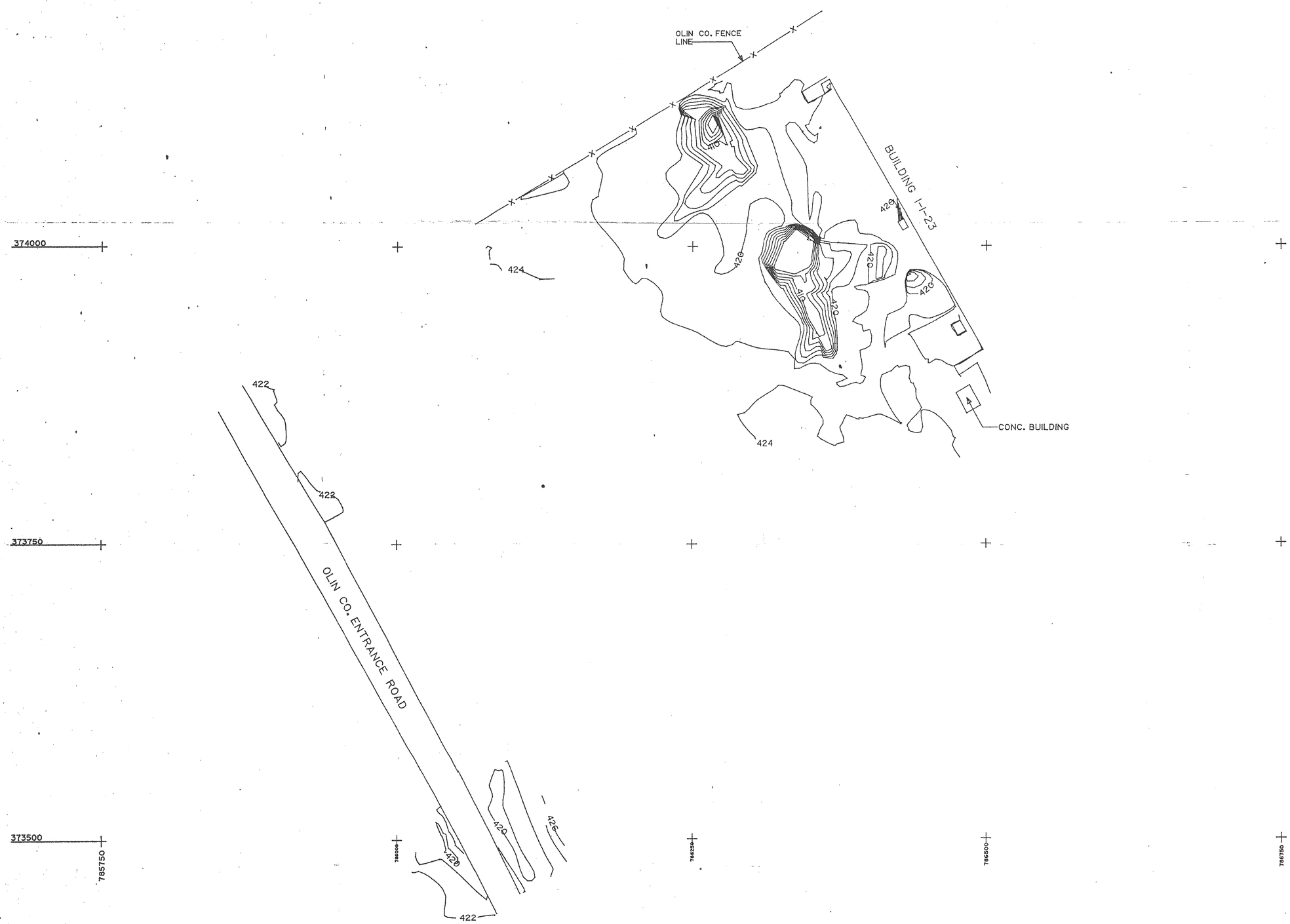


M-27

Appendix N
Drawings from Final Closeout Report for the PCB Operable Unit at the Crab Orchard National Wildlife Refuge Superfund Site, Marion, Illinois, Revision 0, March 1998, Prepared by Fluor Daniel GTI

Robert G. Sewell 9-20-97

ROBERT G. SEWELL
NO. 2347
PROFESSIONAL LAND SURVEYOR
MARION, ILL.
STATE OF ILLINOIS



GRAPHIC SCALE - FEET (40 0 40 80 120)

NOTE: CONTOURS ARE ON A ONE FOOT CONTOUR INTERVAL

DATE	DRAWN BY	CKD BY
8/15/97	RJB	RGS

CLIENT:
FLUOR DANIEL, INC.

CLEINT JOB NO. 687400-9-05K

ROBERT G. SEWELL
PROFESSIONAL LAND SURVEYOR
P.O. BOX 1052--MARION, IL. 62959
PHONE (618) 997-9777

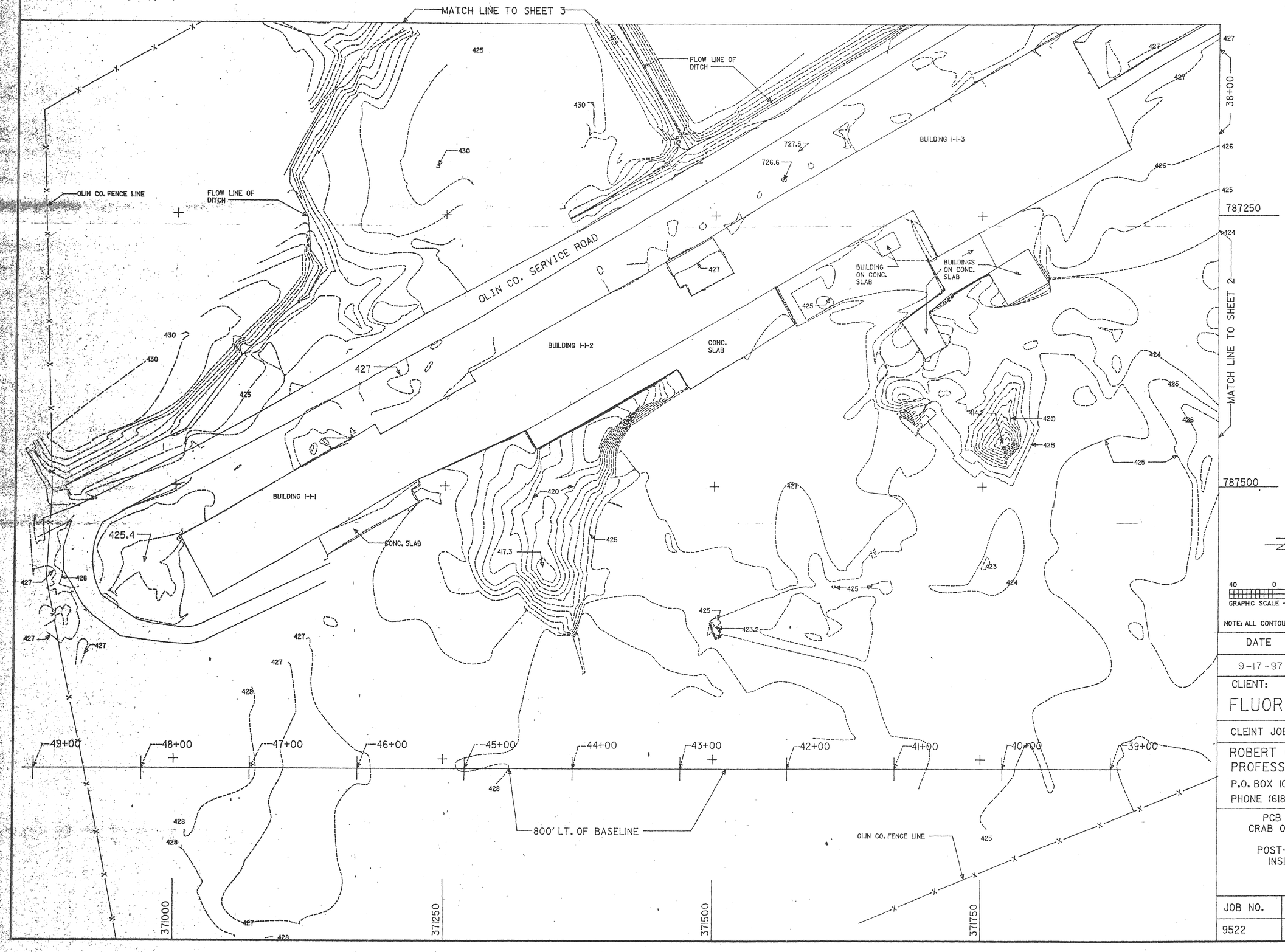
PCB AREAS OPERABLE UNIT
CRAB ORCHARD WILDLIFE REFUGE
MARION, ILLINOIS
SITE 32/33
WEST OF BUILDING 1-1-23
CONTOUR MAP

JOB NO.	DRAWING NO.	SHEET
9522	NOWBII23	1 OF 1

JAN 13 2000

Robert G. Sewell 9-20-97

ROBERT G. SEWELL
NO. 2347
PROFESSIONAL LAND SURVEYOR
MARION, ILL.
STATE OF ILLINOIS



40 0 40 80 120
GRAPHIC SCALE - FEET

NOTE: ALL CONTOURS ARE ON A ONE FOOT INTERVAL.

DATE	DRAWN BY	CKD BY
9-17-97	RJB	RGS

CLIENT:
FLUOR DANIEL, INC.

CLEINT JOB NO. 687400-9-05K

ROBERT G. SEWELL
PROFESSIONAL LAND SURVEYOR
P.O. BOX 1052--MARION, IL. 62959
PHONE (618) 997-9777

PCB AREAS OPERABLE UNIT
CRAB ORCHARD WILDLIFE REFUGE
MARION, ILLINOIS
POST-CONTAMINANT REMOVAL
INSIDE OLIN-SOUTH SIDE
CONTOUR MAP

JOB NO.	DRAWING NO.	SHEET
9522	9522101	1 OF 3

JAN 13 2000 VOL. 1, TAB 9, #4

Robert G. Sewell 9-20-97

ROBERT G. SEWELL NO. 2347 PROFESSIONAL LAND SURVEYOR MARION, ILL. STATE OF ILLINOIS

DATE	DRAWN BY	CKD BY
9/3/97	RJB	RGS

CLIENT:
MAXYMILLIAN TECHNOLOGIES, INC.

CLIENT JOB NO. M-4049

ROBERT G. SEWELL
PROFESSIONAL LAND SURVEYOR
P.O.BOX 1052
MARION, ILLINOIS 62959
PHONE (618) 997-9777

PCB OPERABLE UNIT
CRAB ORCHARD WILDLIFE REFUGE
MARION, ILLINOIS
POST-CONTAMINANT REMOVAL MAP
CONTOUR SHEET
AREA 9 LANDFILL

JOB NO.	DRAWING NO.	SHEET
9604	AREA9PO	1 OF 1

JAN 13 2000

Appendix O
Summary Tables for Validated Laboratory Data from Samples Collected in June 1999

RMT
Integrated Environmental Solutions

744 Heartland Trail 53717-1934
P.O. Box 8923 53708-8923
Madison, WI
Telephone: 608-831-4444
Fax: 608-831-3334

October 7, 1999

VIA OVERNIGHT DELIVERY

Mr. Nan Gowda
Remedial Project Manager
U.S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd. (SRF-5J)
Chicago, IL 60604-3590

Re: Crab Orchard National Wildlife Refuge Site
PCB Operable Unit
Marion, Illinois
Validated Data for June 1999 Sampling Program

Dear Mr. Gowda:

Enclosed, for the USEPA's review and use, is one copy of each of the following items:

- Report titled "Evaluation of Data Quality from Laboratory Analyses of Samples Collected June 1999 at the Crab Orchard National Wildlife Refuge Site, PCB Operable Unit, Marion, Illinois," October 1999

- Summary tables for the validated laboratory data, from the June 1999 sampling program

The enclosures were prepared by RMT, Inc., and are being submitted on behalf of Schlumberger Limited. The samples collected in June 1999 included groundwater from Sites 17, 28, 33, and the PCB Operable Unit Landfill, surface water at Site 32, and leachate from the PCB Operable Unit Landfill. These samples were collected and analyzed in compliance with the short-term groundwater and surface water monitoring requirements, and the long-term landfill leachate monitoring requirements, defined as Performance Standards in the Consent Decree - Scope of Work.

Please contact me if you have questions regarding the information or data provided in this transmittal.

Sincerely,

Eric Gredell

Eric Gredell, P.E.
Project Manager

gmk/enclosure

cc: Mr. Cliff Kirchof - RMT (w/enclosures)
Ms. Patricia A. VanAllan - Schlumberger (w/enclosures)

SUMMARY TABLES FOR VALIDATED LABORATORY DATA FROM SAMPLES COLLECTED IN JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE
PCB OPERABLE UNIT
MARION, ILLINOIS

Prepared by
RMT, Inc.
Madison, Wisconsin

October 1999

Index

MW - V	Monitoring wells – volatile organic compounds
SW - V	Surface water – volatile organic compounds
MW – S	Monitoring wells – semivolatile organic compounds
SW – S	Surface water – semivolatile organic compounds
MW – P	Monitoring wells – PCBs/pesticides
SW – P	Surface water – PCBs/pesticides
MW – M	Monitoring wells – metals
SW – M	Surface water – metals
MW – I	Monitoring wells – field data and inorganic parameters
SW – I	Surface water – field data and inorganic parameters
LF – L	PCB Operable Unit Landfill – leachate; all parameters
WW – P	Wastewater – purge tank; all parameters
QC	Quality control samples; all parameters

Note to data reviewers: **No entry in the attached table indicates that the analysis was not performed.**

Index of Laboratory and Data Validation Qualifiers

Laboratory Qualifiers

INORGANIC DATA	
B	Analyte value is below the Quantitation Limit.
D	Analyte value is from a diluted analysis.
E	ICP serial dilution exceeded the control limits.
H	Analysis was performed past holding time.
J	Reported value is less than the reporting limit, but greater than zero.
N	Spiked sample recovery is not within control limits.
U	Analyte was tested for but was not detected; value indicates the detection limit.
ORGANIC DATA	
B	Analyte was present in the method blank.
D	Analyte value is from a diluted analysis.
E	Reported concentration exceeded the calibration range of the instrument.
J	Reported value is less than the reporting limit, but greater than zero.
P	The difference for detected pesticide/Aroclor result between the two GC columns is greater than 25 percent.
U	The compound was analyzed for but not detected; the value indicates the detection limit.

Data Validation Qualifiers

b	Analyte was present in the trip blank.
f	Analyte was present in the field blank.
h	Analyte was present in the laboratory holding/storage blank.
u	Analyte was present at less than 10 times the concentration in the associated method (B), trip (b), field (f), and/or laboratory storage blank for common laboratory contaminants, or at less than 5 times the blank concentration of other analytes, and is therefore qualified as nondetectable (u) according to USEPA data validation procedures (USEPA, 1994a and 1994b). The reports of 4,4'-DDT and 4,4'-DDE below the Quantitation Limits are believed to be false positives representing interference.. Therefore, u-qualifiers were added to indicate that the results should be considered nondetected.
j	When specific QC criteria are outside the established control limits, the reported concentration or the Quantitation Limit is approximate.

MONITORING WELL SAMPLES

VOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	17MWC-01 16-JUN-99 9906143-07		17MWC-02 17-JUN-99 9906163-09		17MWC-03 17-JUN-99 9906163-11		28-16 15-JUN-99 9906131-11		28MWC-01 15-JUN-99 9906131-13		2A-01 15-JUN-99 9906131-05	
1,1,1-TRICHLOROETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	Uj
1,1,2,2-TETRACHLOROETHANE	UG/L	1.0	Uj	1.0	Uj	1.0	Uj	1.0	U	1.0	U	1.0	U
1,1,2-TRICHLOROETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1-DICHLOROETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1-DICHLOROETHENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2,4-TRICHLOROBENZENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DIBROMOETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DICHLOROETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DICHLOROPROPANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,3-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,4-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
2-BUTANONE	UG/L	5.0	Uj	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
2-HEXANONE	UG/L	5.0	Uj	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
4-METHYL-2-PENTANONE	UG/L	5.0	Uj	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
ACETONE	UG/L	5.0	Uj	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
BENZENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
BROMOCHLOROMETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
BROMODICHLOROMETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
BROMOFORM	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
BROMOMETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	Uj
CARBON DISULFIDE	UG/L	1.0	Uj	1.0	U	0.3	Jbfu	4.5	bhu	1.0	U	0.3	Jbhu
CARBON TETRACHLORIDE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CHLOROBENZENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CHLORODIBROMOMETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CHLOROETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CHLOROFORM	UG/L	1.0	Uj	1.0	U	1.0	U	0.7	JBbhu	0.3	JBbhu	1.0	U
CHLOROMETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CIS-1,2-DICHLOROETHENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CIS-1,3-DICHLOROPROPENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U

MONITORING WELL SAMPLES

VOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	17MWC-01 16-JUN-99 9906143-07		17MWC-02 17-JUN-99 9906163-09		17MWC-03 17-JUN-99 9906163-11		28-16 15-JUN-99 9906131-11		28MWC-01 15-JUN-99 9906131-13		2A-01 15-JUN-99 9906131-05	
ETHYLBENZENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
METHYLENE CHLORIDE	UG/L	2.0	Uj	1.9	JBbhu	2.0	Bbfhu	0.6	JBbhu	0.6	JBbhu	0.7	JBbhu
STYRENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
TETRACHLOROETHENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
TOLUENE	UG/L	1.0	Uj	1.0	U	0.2	J	1.0	U	1.0	U	1.0	U
TRANS-1,2-DICHLOROETHENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
TRANS-1,3-DICHLOROPROPENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
TRICHLOROETHENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
VINYL CHLORIDE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	Uj	1.0	U
XYLENE, TOTAL	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U

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MONITORING WELL SAMPLES
VOLATILE ORGANIC COMPOUNDS
JUNE 1999
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	2A-02 15-JUN-99 9906131-07		33MWC-01 16-JUN-99 9906143-01		33MWC-02 17-JUN-99 9906163-01		33MWC-03 16-JUN-99 9906143-03		33MWC-03 DUP 16-JUN-99 9906143-13		33MWC-05 16-JUN-99 9906143-05	
1,1,1-TRICHLOROETHANE	UG/L	1.0	Uj	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
1,1,2,2-TETRACHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
1,1,2-TRICHLOROETHANE	UG/L	1.0	U	1.0	U	1.2	j	1.0	U	1.0	U	1.0	Uj
1,1-DICHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
1,1-DICHLOROETHENE	UG/L	1.0	U	1.0	U	0.4	J	1.0	U	1.0	U	1.0	Uj
1,2,4-TRICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	U
1,2-DIBROMOETHANE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
1,2-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	U
1,2-DICHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
1,2-DICHLOROPROPANE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
1,3-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	U
1,4-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	U
2-BUTANONE	UG/L	5.0	U	5.0	U	5.0	Uj	5.0	U	5.0	U	5.0	Uj
2-HEXANONE	UG/L	5.0	U	5.0	U	5.0	Uj	5.0	U	5.0	U	5.0	Uj
4-METHYL-2-PENTANONE	UG/L	5.0	U	5.0	U	5.0	Uj	5.0	U	5.0	U	5.0	Uj
ACETONE	UG/L	5.0	U	5.0	U	5.0	Uj	5.0	U	5.0	U	5.0	Uj
BENZENE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
BROMOCHLOROMETHANE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
BROMODICHLOROMETHANE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
BROMOFORM	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	U
BROMOMETHANE	UG/L	1.0	Uj	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
CARBON DISULFIDE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
CARBON TETRACHLORIDE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
CHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
CHLORODIBROMOMETHANE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
CHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
CHLOROFORM	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
CHLOROMETHANE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
CIS-1,2-DICHLOROETHENE	UG/L	1.0	U	1.0	U	87.0	Dj	8.7		11.1		1.0	Uj
CIS-1,3-DICHLOROPROPENE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj

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MONITORING WELL SAMPLES

VOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	2A-02 15-JUN-99 9906131-07		33MWC-01 16-JUN-99 9906143-01		33MWC-02 17-JUN-99 9906163-01		33MWC-03 16-JUN-99 9906143-03		33MWC-03 DUP 16-JUN-99 9906143-13		33MWC-05 16-JUN-99 9906143-05	
ETHYLBENZENE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
METHYLENE CHLORIDE	UG/L	0.8	JBbhu	2.0	U	1.4	JBbhu	2.0	U	2.0	U	2.0	Uj
STYRENE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
TETRACHLOROETHENE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
TOLUENE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
TRANS-1,2-DICHLOROETHENE	UG/L	1.0	U	1.0	U	6.0	j	1.0	U	1.0	U	1.0	Uj
TRANS-1,3-DICHLOROPROPENE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
TRICHLOROETHENE	UG/L	1.0	U	1.0	U	1087.5	Dj	180.2		175.5	Dj	1.0	Uj
VINYL CHLORIDE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj
XYLENE, TOTAL	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	Uj

MONITORING WELL SAMPLES
VOLATILE ORGANIC COMPOUNDS
JUNE 1999
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-05 DUP 16-JUN-99 9906143-11		33MWC-06 17-JUN-99 9906163-03		IT-01A 15-JUN-99 9906131-01		IT-02A 15-JUN-99 9906131-03		IT-02A DUP 15-JUN-99 9906131-15	
1,1,1-TRICHLOROETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	Uj	1.0	U
1,1,2,2-TETRACHLOROETHANE	UG/L	1.0	Uj	1.0	Uj	1.0	U	1.0	U	1.0	U
1,1,2-TRICHLOROETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
1,1-DICHLOROETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
1,1-DICHLOROETHENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
1,2,4-TRICHLOROBENZENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DIBROMOETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DICHLOROBENZENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DICHLOROETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DICHLOROPROPANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
1,3-DICHLOROBENZENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
1,4-DICHLOROBENZENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
2-BUTANONE	UG/L	5.0	Uj	5.0	U	5.0	U	5.0	U	5.0	U
2-HEXANONE	UG/L	5.0	Uj	5.0	U	5.0	U	5.0	U	5.0	U
4-METHYL-2-PENTANONE	UG/L	5.0	Uj	5.0	U	5.0	U	5.0	U	5.0	U
ACETONE	UG/L	5.0	Uj	5.0	U	5.0	U	5.0	U	5.0	U
BENZENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
BROMOCHLOROMETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
BROMODICHLOROMETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
BROMOFORM	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
BROMOMETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
CARBON DISULFIDE	UG/L	1.0	Uj	1.0	Jbfu	0.2	Jbhu	0.3	Jbhu	0.3	Jbhu
CARBON TETRACHLORIDE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
CHLOROBENZENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
CHLORODIBROMOMETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
CHLOROETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
CHLOROFORM	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
CHLOROMETHANE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
CIS-1,2-DICHLOROETHENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
CIS-1,3-DICHLOROPROPENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U

MONITORING WELL SAMPLES

VOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-05 DUP 16-JUN-99 9906143-11		33MWC-06 17-JUN-99 9906163-03		IT-01A 15-JUN-99 9906131-01		IT-02A 15-JUN-99 9906131-03		IT-02A DUP 15-JUN-99 9906131-15	
ETHYLBENZENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
METHYLENE CHLORIDE	UG/L	2.0	Uj	1.3	JBbhu	0.8	JBbhu	0.8	JBbhu	0.7	JBbhu
STYRENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
TETRACHLOROETHENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
TOLUENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
TRANS-1,2-DICHLOROETHENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
TRANS-1,3-DICHLOROPROPENE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
TRICHLOROETHENE	UG/L	1.0	Uj	0.6	J	1.0	U	1.0	U	1.0	U
VINYL CHLORIDE	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	Uj
XYLENE, TOTAL	UG/L	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U

SURFACE WATER

VOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	SW32R-233 17-JUN-99 9906163-13		SW32R-236 17-JUN-99 9906163-14		SW32R-237 17-JUN-99 9906163-15		SW32R-240/241 17-JUN-99 9906163-16		SW32R-242 17-JUN-99 9906163-17		SW32R-242 DUP 17-JUN-99 9906163-19	
1,1,1-TRICHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1,2,2-TETRACHLOROETHANE	UG/L	1.0	U	1.0	Uj	1.0	Uj	1.0	Uj	1.0	Uj	1.0	Uj
1,1,2-TRICHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1-DICHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1-DICHLOROETHENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2,4-TRICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DIBROMOETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DICHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DICHLOROPROPANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,3-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,4-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
2-BUTANONE	UG/L	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
2-HEXANONE	UG/L	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
4-METHYL-2-PENTANONE	UG/L	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
ACETONE	UG/L	5.0	U	5.0	U	5.0	U	11.1	fu	8.1	fu	10.7	fu
BENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
BROMOCHLOROMETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
BROMODICHLOROMETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
BROMOFORM	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
BROMOMETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CARBON DISULFIDE	UG/L	0.7	Jbfu	0.3	Jbfu	0.2	Jbfu	1.0	U	0.5	Jbfu	0.3	Jbfu
CARBON TETRACHLORIDE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CHLORODIBROMOMETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CHLOROFORM	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CHLOROMETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CIS-1,2-DICHLOROETHENE	UG/L	1.0	U	1.0	U	1.0	U	2.6		9.5		9.1	
CIS-1,3-DICHLOROPROPENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U

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SURFACE WATER

VOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	SW32R-233 17-JUN-99 9906163-13		SW32R-236 17-JUN-99 9906163-14		SW32R-237 17-JUN-99 9906163-15		SW32R-240/241 17-JUN-99 9906163-16		SW32R-242 17-JUN-99 9906163-17		SW32R-242 DUP 17-JUN-99 9906163-19	
ETHYLBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
METHYLENE CHLORIDE	UG/L	1.6	JBbfu	1.9	JBbfu	1.7	JBbfu	1.5	JBbfu	1.8	JBbfu	1.7	JBbfu
STYRENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
TETRACHLOROETHENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
TOLUENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
TRANS-1,2-DICHLOROETHENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
TRANS-1,3-DICHLOROPROPENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
TRICHLOROETHENE	UG/L	1.0	U	0.6	J	1.0	U	0.4	J	20.6		20.0	
VINYL CHLORIDE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
XYLENE, TOTAL	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U

SURFACE WATER

VOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	SW32R-250 17-JUN-99 9906163-18	
1,1,1-TRICHLOROETHANE	UG/L	1.0	U
1,1,2,2-TETRACHLOROETHANE	UG/L	1.0	Uj
1,1,2-TRICHLOROETHANE	UG/L	1.0	U
1,1-DICHLOROETHANE	UG/L	1.0	U
1,1-DICHLOROETHENE	UG/L	0.4	J
1,2,4-TRICHLOROBENZENE	UG/L	1.0	U
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	1.0	U
1,2-DIBROMOETHANE	UG/L	1.0	U
1,2-DICHLOROBENZENE	UG/L	1.0	U
1,2-DICHLOROETHANE	UG/L	1.0	U
1,2-DICHLOROPROPANE	UG/L	1.0	U
1,3-DICHLOROBENZENE	UG/L	1.0	U
1,4-DICHLOROBENZENE	UG/L	1.0	U
2-BUTANONE	UG/L	5.0	U
2-HEXANONE	UG/L	5.0	U
4-METHYL-2-PENTANONE	UG/L	5.0	U
ACETONE	UG/L	5.0	U
BENZENE	UG/L	1.0	U
BROMOCHLOROMETHANE	UG/L	1.0	U
BROMODICHLOROMETHANE	UG/L	1.0	U
BROMOFORM	UG/L	1.0	U
BROMOMETHANE	UG/L	1.0	U
CARBON DISULFIDE	UG/L	0.3	Jbfu
CARBON TETRACHLORIDE	UG/L	1.0	U
CHLOROBENZENE	UG/L	1.0	U
CHLORODIBROMOMETHANE	UG/L	1.0	U
CHLOROETHANE	UG/L	1.0	U
CHLOROFORM	UG/L	1.0	U
CHLOROMETHANE	UG/L	1.0	U
CIS-1,2-DICHLOROETHENE	UG/L	170.8	Dj
CIS-1,3-DICHLOROPROPENE	UG/L	1.0	U

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SURFACE WATER

VOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	SW32R-250 17-JUN-99 9906163-18	
ETHYLBENZENE	UG/L	1.0	U
METHYLENE CHLORIDE	UG/L	1.6	JBbfu
STYRENE	UG/L	1.0	U
TETRACHLOROETHENE	UG/L	0.3	J
TOLUENE	UG/L	1.0	U
TRANS-1,2-DICHLOROETHENE	UG/L	3.8	
TRANS-1,3-DICHLOROPROPENE	UG/L	1.0	U
TRICHLOROETHENE	UG/L	87.2	Dj
VINYL CHLORIDE	UG/L	1.1	
XYLENE, TOTAL	UG/L	1.0	U

MONITORING WELL SAMPLES

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	17MWC-01 16-JUN-99 9906143-07		17MWC-02 17-JUN-99 9906163-09		17MWC-03 17-JUN-99 9906163-11		28-16 15-JUN 99 9906131-11		28MWC-01 15-JUN-99 9906131-13		2A-01 15-JUN-99 9906131-05	
2,2'-OXYBIS(1-CHLOROPROPANE)	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
2,4,5-TRICHLOROPHENOL	UG/L	26	U	27	U	28	U	26	U	26	U	25	U
2,4,6-TRICHLOROPHENOL	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
2,4-DICHLOROPHENOL	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
2,4-DIMETHYLPHENOL	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
2,4-DINITROPHENOL	UG/L	26	U	27	U	28	U	26	U	26	U	25	U
2,4-DINITROTOLUENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
2,6-DINITROTOLUENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
2-CHLORONAPHTHALENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
2-CHLOROPHENOL	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
2-METHYLNAPHTHALENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
2-METHYLPHENOL	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
2-NITROANILINE	UG/L	26	U	27	U	28	U	26	U	26	U	25	U
2-NITROPHENOL	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
3,3'-DICHLOROBENZIDINE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
3-NITROANILINE	UG/L	26	U	27	U	28	U	26	U	26	U	25	U
4,6-DINITRO-2-METHYLPHENOL	UG/L	26	U	27	U	28	U	26	U	26	U	25	U
4-BROMOPHENYL-PHENYLETHER	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
4-CHLORO-3-METHYLPHENOL	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
4-CHLOROANILINE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
4-CHLOROPHENYL-PHENYLETHER	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
4-METHYLPHENOL	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
4-NITROANILINE	UG/L	26	U	27	U	28	U	26	U	26	U	25	U
4-NITROPHENOL	UG/L	26	U	27	U	28	U	26	U	26	U	25	U
ACENAPHTHENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
ACENAPHTHYLENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
ANTHRACENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
BENZO(A)ANTHRACENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
BENZO(A)PYRENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
BENZO(B)FLUORANTHENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
BENZO(G,H,I)PERYLENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U

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MONITORING WELL SAMPLES

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	17MWC-01 16-JUN-99 9906143-07		17MWC-02 17-JUN-99 9906163-09		17MWC-03 17-JUN-99 9906163-11		28-16 15-JUN-99 9906131-11		28MWC-01 15-JUN-99 9906131-13		2A-01 15-JUN-99 9906131-05	
BENZO(K)FLUORANTHENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
BIS(2-CHLOROETHOXY)METHANE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
BIS(2-CHLOROETHYL)ETHER	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	10	U	2	JBfu	2	JBfu	2	Jfu	10	U	10	U
BUTYLBENZYLPHTHALATE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
CARBAZOLE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
CHRYSENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
DI-N-BUTYLPHTHALATE	UG/L	2	JBfu	11	U	11	U	2	JBfu	2	JBfu	2	JBfu
DI-N-OCTYLPHTHALATE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
DIBENZ(A,H)ANTHRACENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
DIBENZOFURAN	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
DIETHYLPHTHALATE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
DIMETHYLPHTHALATE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
FLUORANTHENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
FLUORENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
HEXACHLOROBENZENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
HEXACHLOROBUTADIENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
HEXACHLOROCYCLOPENTADIENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
HEXACHLOROETHANE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
INDENO(1,2,3-CD)PYRENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
ISOPHORONE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
N-NITROSODI-N-PROPYLAMINE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
N-NITROSODIPHENYLAMINE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
NAPHTHALENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
NITROBENZENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
PENTACHLOROPHENOL	UG/L	26	U	27	U	28	U	26	U	26	U	25	U
PHENANTHRENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
PHENOL	UG/L	10	U	11	U	11	U	10	U	10	U	10	U
PYRENE	UG/L	10	U	11	U	11	U	10	U	10	U	10	U

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MONITORING WELL SAMPLES

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	2A-02 15-JUN-99 9906131-07		33MWC-01 16-JUN-99 9906143-01		33MWC-02 17-JUN-99 9906163-01		33MWC-03 16-JUN-99 9906143-03		33MWC-03 DUP 16-JUN-99 9906143-13		33MWC-05 16-JUN-99 9906143-05	
2,2'-OXYBIS(1-CHLOROPROPANE)	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
2,4,5-TRICHLOROPHENOL	UG/L	25	U	25	U	25	U	25	U	26	U	25	U
2,4,6-TRICHLOROPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
2,4-DICHLOROPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
2,4-DIMETHYLPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
2,4-DINITROPHENOL	UG/L	25	U	25	U	25	U	25	U	26	U	25	U
2,4-DINITROTOLUENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
2,6-DINITROTOLUENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
2-CHLORONAPHTHALENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
2-CHLOROPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
2-METHYLNAPHTHALENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
2-METHYLPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
2-NITROANILINE	UG/L	25	U	25	U	25	U	25	U	26	U	25	U
2-NITROPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
3,3'-DICHLOROBENZIDINE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
3-NITROANILINE	UG/L	25	U	25	U	25	U	25	U	26	U	25	U
4,6-DINITRO-2-METHYLPHENOL	UG/L	25	U	25	U	25	U	25	U	26	U	25	U
4-BROMOPHENYL-PHENYLETHER	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
4-CHLORO-3-METHYLPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
4-CHLOROANILINE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
4-CHLOROPHENYL-PHENYLETHER	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
4-METHYLPHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
4-NITROANILINE	UG/L	25	U	25	U	25	U	25	U	26	U	25	U
4-NITROPHENOL	UG/L	25	U	25	U	25	U	25	U	26	U	25	U
ACENAPHTHENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
ACENAPHTHYLENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
ANTHRACENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
BENZO(A)ANTHRACENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
BENZO(A)PYRENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
BENZO(B)FLUORANTHENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
BENZO(G,H,I)PERYLENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U

MONITORING WELL SAMPLES

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	2A-02 15-JUN-99 9906131-07		33MWC-01 16-JUN-99 9906143-01		33MWC-02 17-JUN-99 9906163-01		33MWC-03 16-JUN-99 9906143-03		33MWC-03 DUP 16-JUN-99 9906143-13		33MWC-05 16-JUN-99 9906143-05	
BENZO(K)FLUORANTHENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
BIS(2-CHLOROETHOXY)METHANE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
BIS(2-CHLOROETHYL)ETHER	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	10	U	10	U	2	JBfu	10	U	1	Jfu	1	Jfu
BUTYLBENZYLPHTHALATE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
CARBAZOLE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
CHRYSENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
DI-N-BUTYLPHTHALATE	UG/L	2	JBfu	2	JBfu	1	JBu	2	JBfu	2	JBfu	2	JBfu
DI-N-OCTYLPHTHALATE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
DIBENZ(A,H)ANTHRACENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
DIBENZOFURAN	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
DIETHYLPHTHALATE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
DIMETHYLPHTHALATE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
FLUORANTHENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
FLUORENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
HEXACHLOROBENZENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
HEXACHLOROBUTADIENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
HEXACHLOROCYCLOPENTADIENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
HEXACHLOROETHANE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
INDENO(1,2,3-CD)PYRENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
ISOPHORONE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
N-NITROSODI-N-PROPYLAMINE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
N-NITROSODIPHENYLAMINE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
NAPHTHALENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
NITROBENZENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
PENTACHLOROPHENOL	UG/L	25	U	25	U	25	U	25	U	26	U	25	U
PHENANTHRENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
PHENOL	UG/L	10	U	10	U	10	U	10	U	10	U	10	U
PYRENE	UG/L	10	U	10	U	10	U	10	U	10	U	10	U

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MONITORING WELL SAMPLES
SEMIVOLATILE ORGANIC COMPOUNDS
JUNE 1999
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-05 DUP 16-JUN-99 9906143-11		33MWC-06 17-JUN-99 9906163-03		IT-01A 15-JUN-99 9906131-01		IT-02A 15-JUN-99 9906131-03		IT-02A DUP 15-JUN-99 9906131-15	
2,2'-OXYBIS(1-CHLOROPROPANE)	UG/L	10	U	10	U	10	U	10	U	11	U
2,4,5-TRICHLOROPHENOL	UG/L	26	U	26	U	26	U	26	U	27	U
2,4,6-TRICHLOROPHENOL	UG/L	10	U	10	U	10	U	10	U	11	U
2,4-DICHLOROPHENOL	UG/L	10	U	10	U	10	U	10	U	11	U
2,4-DIMETHYLPHENOL	UG/L	10	U	10	U	10	U	10	U	11	U
2,4-DINITROPHENOL	UG/L	26	U	26	U	26	U	26	U	27	U
2,4-DINITROTOLUENE	UG/L	10	U	10	U	10	U	10	U	11	U
2,6-DINITROTOLUENE	UG/L	10	U	10	U	10	U	10	U	11	U
2-CHLORONAPHTHALENE	UG/L	10	U	10	U	10	U	10	U	11	U
2-CHLOROPHENOL	UG/L	10	U	10	U	10	U	10	U	11	U
2-METHYLNAPHTHALENE	UG/L	10	U	10	U	10	U	10	U	11	U
2-METHYLPHENOL	UG/L	10	U	10	U	10	U	10	U	11	U
2-NITROANILINE	UG/L	26	U	26	U	26	U	26	U	27	U
2-NITROPHENOL	UG/L	10	U	10	U	10	U	10	U	11	U
3,3'-DICHLOROBENZIDINE	UG/L	10	U	10	U	10	U	10	U	11	U
3-NITROANILINE	UG/L	26	U	26	U	26	U	26	U	27	U
4,6-DINITRO-2-METHYLPHENOL	UG/L	26	U	26	U	26	U	26	U	27	U
4-BROMOPHENYL-PHENYLETHER	UG/L	10	U	10	U	10	U	10	U	11	U
4-CHLORO-3-METHYLPHENOL	UG/L	10	U	10	U	10	U	10	U	11	U
4-CHLOROANILINE	UG/L	10	U	10	U	10	U	10	U	11	U
4-CHLOROPHENYL-PHENYLETHER	UG/L	10	U	10	U	10	U	10	U	11	U
4-METHYLPHENOL	UG/L	10	U	10	U	10	U	10	U	11	U
4-NITROANILINE	UG/L	26	U	26	U	26	U	26	U	27	U
4-NITROPHENOL	UG/L	26	U	26	U	26	U	26	U	27	U
ACENAPHTHENE	UG/L	10	U	10	U	10	U	10	U	11	U
ACENAPHTHYLENE	UG/L	10	U	10	U	10	U	10	U	11	U
ANTHRACENE	UG/L	10	U	10	U	10	U	10	U	11	U
BENZO(A)ANTHRACENE	UG/L	10	U	10	U	10	U	10	U	11	U
BENZO(A)PYRENE	UG/L	10	U	10	U	10	U	10	U	11	U
BENZO(B)FLUORANTHENE	UG/L	10	U	10	U	10	U	10	U	11	U
BENZO(G,H,I)PERYLENE	UG/L	10	U	10	U	10	U	10	U	11	U

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MONITORING WELL SAMPLES

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-05 DUP 16-JUN-99 9906143-11		33MWC-06 17-JUN-99 9906163-03		IT-01A 15-JUN-99 9906131-01		IT-02A 15-JUN-99 9906131-03		IT-02A DUP 15-JUN-99 9906131-15	
BENZO(K)FLUORANTHENE	UG/L	10	U	10	U	10	U	10	U	11	U
BIS(2-CHLOROETHOXY)METHANE	UG/L	10	U	10	U	10	U	10	U	11	U
BIS(2-CHLOROETHYL)ETHER	UG/L	10	U	10	U	10	U	10	U	11	U
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	1	Jfu	2	JBfu	1	Jfu	1	Jfu	11	U
BUTYLBENZYLPHTHALATE	UG/L	10	U	10	U	10	U	10	U	11	U
CARBAZOLE	UG/L	10	U	10	U	10	U	10	U	11	U
CHRYSENE	UG/L	10	U	10	U	10	U	10	U	11	U
DI-N-BUTYLPHTHALATE	UG/L	2	JBfu	1	JBu	3	JBfu	2	JBfu	2	JBfu
DI-N-OCTYLPHTHALATE	UG/L	10	U	10	U	10	U	10	U	11	U
DIBENZ(A,H)ANTHRACENE	UG/L	10	U	10	U	10	U	10	U	11	U
DIBENZOFURAN	UG/L	10	U	10	U	10	U	10	U	11	U
DIETHYLPHTHALATE	UG/L	10	U	10	U	10	U	10	U	11	U
DIMETHYLPHTHALATE	UG/L	10	U	10	U	10	U	10	U	11	U
FLUORANTHENE	UG/L	10	U	10	U	10	U	10	U	11	Uj
FLUORENE	UG/L	10	U	10	U	10	U	10	U	11	U
HEXACHLOROBENZENE	UG/L	10	U	10	U	10	U	10	U	11	U
HEXACHLOROBUTADIENE	UG/L	10	U	10	U	10	U	10	U	11	U
HEXACHLOROCYCLOPENTADIENE	UG/L	10	U	10	U	10	U	10	U	11	U
HEXACHLOROETHANE	UG/L	10	U	10	U	10	U	10	U	11	U
INDENO(1,2,3-CD)PYRENE	UG/L	10	U	10	U	10	U	10	U	11	U
ISOPHORONE	UG/L	10	U	10	U	10	U	10	U	11	U
N-NITROSODI-N-PROPYLAMINE	UG/L	10	U	10	U	10	U	10	U	11	U
N-NITROSODIPHENYLAMINE	UG/L	10	U	10	U	10	U	10	U	11	U
NAPHTHALENE	UG/L	10	U	10	U	10	U	10	U	11	U
NITROBENZENE	UG/L	10	U	10	U	10	U	10	U	11	U
PENTACHLOROPHENOL	UG/L	26	U	26	U	26	U	26	U	27	U
PHENANTHRENE	UG/L	10	U	10	U	10	U	10	U	11	U
PHENOL	UG/L	10	U	10	U	10	U	10	U	11	U
PYRENE	UG/L	10	U	10	U	10	U	10	U	11	Uj

SURFACE WATER

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	SW32R-233 17-JUN-99 9906163-13		SW32R-236 17-JUN-99 9906163-14		SW32R-237 17-JUN-99 9906163-15		SW32R-240/241 17-JUN-99 9906163-16		SW32R-242 17-JUN-99 9906163-17		SW32R-242 DUP 17-JUN-99 9906163-19	
2,2'-OXYBIS(1-CHLOROPROPANE)	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
2,4,5-TRICHLOROPHENOL	UG/L	29	U	25	U	27	U	25	U	27	U	25	U
2,4,6-TRICHLOROPHENOL	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
2,4-DICHLOROPHENOL	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
2,4-DIMETHYLPHENOL	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
2,4-DINITROPHENOL	UG/L	29	U	25	U	27	U	25	U	27	U	25	U
2,4-DINITROTOLUENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
2,6-DINITROTOLUENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
2-CHLORONAPHTHALENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
2-CHLOROPHENOL	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
2-METHYLNAPHTHALENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
2-METHYLPHENOL	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
2-NITROANILINE	UG/L	29	U	25	U	27	U	25	U	27	U	25	U
2-NITROPHENOL	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
3,3'-DICHLOROBENZIDINE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
3-NITROANILINE	UG/L	29	U	25	U	27	U	25	U	27	U	25	U
4,6-DINITRO-2-METHYLPHENOL	UG/L	29	U	25	U	27	U	25	U	27	U	25	U
4-BROMOPHENYL-PHENYLETHER	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
4-CHLORO-3-METHYLPHENOL	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
4-CHLOROANILINE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
4-CHLOROPHENYL-PHENYLETHER	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
4-METHYLPHENOL	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
4-NITROANILINE	UG/L	29	U	25	U	27	U	25	U	27	U	25	U
4-NITROPHENOL	UG/L	29	U	25	U	27	U	25	U	27	U	25	U
ACENAPHTHENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
ACENAPHTHYLENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
ANTHRACENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
BENZO(A)ANTHRACENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
BENZO(A)PYRENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
BENZO(B)FLUORANTHENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
BENZO(G,H,I)PERYLENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U

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SURFACE WATER

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	SW32R-233 17-JUN-99 9906163-13		SW32R-236 17-JUN-99 9906163-14		SW32R-237 17-JUN-99 9906163-15		SW32R-240/241 17-JUN-99 9906163-16		SW32R-242 17-JUN-99 9906163-17		SW32R-242 DUP 17-JUN-99 9906163-19	
BENZO(K)FLUORANTHENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
BIS(2-CHLOROETHOXY)METHANE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
BIS(2-CHLOROETHYL)ETHER	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	2	JBfu	2	JBfu	2	JBfu	2	JBfu	2	JBfu	2	JBfu
BUTYLBENZYLPHTHALATE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
CARBAZOLE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
CHRYSENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
DI-N-BUTYLPHTHALATE	UG/L	12	U	1	JBu	1	JBu	1	JBu	1	JBu	10	U
DI-N-OCTYLPHTHALATE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
DIBENZ(A,H)ANTHRACENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
DIBENZOFURAN	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
DIETHYLPHTHALATE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
DIMETHYLPHTHALATE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
FLUORANTHENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
FLUORENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
HEXACHLOROBENZENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
HEXACHLOROBUTADIENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
HEXACHLOROCYCLOPENTADIENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
HEXACHLOROETHANE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
INDENO(1,2,3-CD)PYRENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
ISOPHORONE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
N-NITROSODI-N-PROPYLAMINE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
N-NITROSODIPHENYLAMINE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
NAPHTHALENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
NITROBENZENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
PENTACHLOROPHENOL	UG/L	29	U	25	U	27	U	25	U	27	U	25	U
PHENANTHRENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
PHENOL	UG/L	12	U	10	U	11	U	10	U	11	U	10	U
PYRENE	UG/L	12	U	10	U	11	U	10	U	11	U	10	U

SURFACE WATER

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	SW32R-250 17-JUN-99 9906163-18	
2,2'-OXYBIS(1-CHLOROPROPANE)	UG/L	11	U
2,4,5-TRICHLOROPHENOL	UG/L	28	U
2,4,6-TRICHLOROPHENOL	UG/L	11	U
2,4-DICHLOROPHENOL	UG/L	11	U
2,4-DIMETHYLPHENOL	UG/L	11	U
2,4-DINITROPHENOL	UG/L	28	U
2,4-DINITROTOLUENE	UG/L	11	U
2,6-DINITROTOLUENE	UG/L	11	U
2-CHLORONAPHTHALENE	UG/L	11	U
2-CHLOROPHENOL	UG/L	11	U
2-METHYLNAPHTHALENE	UG/L	11	U
2-METHYLPHENOL	UG/L	11	U
2-NITROANILINE	UG/L	28	U
2-NITROPHENOL	UG/L	11	U
3,3'-DICHLOROBENZIDINE	UG/L	11	U
3-NITROANILINE	UG/L	28	U
4,6-DINITRO-2-METHYLPHENOL	UG/L	28	U
4-BROMOPHENYL-PHENYLETHER	UG/L	11	U
4-CHLORO-3-METHYLPHENOL	UG/L	11	U
4-CHLOROANILINE	UG/L	11	U
4-CHLOROPHENYL-PHENYLETHER	UG/L	11	U
4-METHYLPHENOL	UG/L	11	U
4-NITROANILINE	UG/L	28	U
4-NITROPHENOL	UG/L	28	U
ACENAPHTHENE	UG/L	11	U
ACENAPHTHYLENE	UG/L	11	U
ANTHRACENE	UG/L	11	U
BENZO(A)ANTHRACENE	UG/L	11	U
BENZO(A)PYRENE	UG/L	11	U
BENZO(B)FLUORANTHENE	UG/L	11	U
BENZO(G,H,I)PERYLENE	UG/L	11	U

SURFACE WATER

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	SW32R-250 17-JUN-99 9906163-18	
BENZO(K)FLUORANTHENE	UG/L	11	U
BIS(2-CHLOROETHOXY)METHANE	UG/L	11	U
BIS(2-CHLOROETHYL)ETHER	UG/L	11	U
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	2	JBfu
BUTYLBENZYLPHTHALATE	UG/L	11	U
CARBAZOLE	UG/L	11	U
CHRYSENE	UG/L	11	U
DI-N-BUTYLPHTHALATE	UG/L	11	U
DI-N-OCTYLPHTHALATE	UG/L	11	U
DIBENZ(A,H)ANTHRACENE	UG/L	11	U
DIBENZOFURAN	UG/L	11	U
DIETHYLPHTHALATE	UG/L	11	U
DIMETHYLPHTHALATE	UG/L	11	U
FLUORANTHENE	UG/L	11	U
FLUORENE	UG/L	11	U
HEXACHLOROBENZENE	UG/L	11	U
HEXACHLOROBUTADIENE	UG/L	11	U
HEXACHLOROCYCLOPENTADIENE	UG/L	11	U
HEXACHLOROETHANE	UG/L	11	U
INDENO(1,2,3-CD)PYRENE	UG/L	11	U
ISOPHORONE	UG/L	11	U
N-NITROSODI-N-PROPYLAMINE	UG/L	11	U
N-NITROSODIPHENYLAMINE	UG/L	11	U
NAPHTHALENE	UG/L	11	U
NITROBENZENE	UG/L	11	U
PENTACHLOROPHENOL	UG/L	28	U
PHENANTHRENE	UG/L	11	U
PHENOL	UG/L	11	U
PYRENE	UG/L	11	U

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MONITORING WELL SAMPLES

PESTICIDES AND PCBS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	17MWC-01 16-JUN-99 9906143-07		17MWC-02 17-JUN-99 9906163-09		17MWC-03 17-JUN-99 9906163-11		28-16 15-JUN-99 9906131-11		28MWC-01 15-JUN-99 9906131-13		2A-01 15-JUN-99 9906131-05	
4,4'-DDD	UG/L	0.10	U	0.11	U	0.11	U	0.10	U	0.10	U	0.10	U
4,4'-DDE	UG/L	0.10	U	0.11	U	0.11	U	0.10	U	0.10	U	0.10	U
4,4'-DDT	UG/L	0.10	U	0.11	U	0.11	U	0.10	U	0.10	U	0.10	U
ALDRIN	UG/L	0.051	U	0.054	U	0.053	U	0.052	U	0.052	U	0.052	U
ALPHA-BHC	UG/L	0.051	U	0.054	U	0.053	U	0.052	U	0.052	U	0.052	U
ALPHA-CHLORDANE	UG/L	0.051	U	0.054	U	0.053	U	0.052	U	0.052	U	0.052	U
AROCLOR-1016	UG/L	1.0	U	1.1	U	1.1	U	1.0	U	1.0	U	1.0	U
AROCLOR-1221	UG/L	2.0	U	2.2	U	2.1	U	2.1	U	2.1	U	2.1	U
AROCLOR-1232	UG/L	1.0	U	1.1	U	1.1	U	1.0	U	1.0	U	1.0	U
AROCLOR-1242	UG/L	1.0	U	1.1	U	1.1	U	1.0	U	1.0	U	1.0	U
AROCLOR-1248	UG/L	1.0	U	1.1	U	1.1	U	1.0	U	1.0	U	1.0	U
AROCLOR-1254	UG/L	1.0	U	1.1	U	1.1	U	1.0	U	1.0	U	1.0	U
AROCLOR-1260	UG/L	1.0	U	1.1	U	1.1	U	1.0	U	1.0	U	1.0	U
BETA-BHC	UG/L	0.051	U	0.054	U	0.053	U	0.052	U	0.052	U	0.052	U
DELTA-BHC	UG/L	0.051	U	0.054	U	0.053	U	0.052	U	0.052	U	0.052	U
DIELDRIN	UG/L	0.10	U	0.11	U	0.11	U	0.10	U	0.10	U	0.10	U
ENDOSULFAN I	UG/L	0.051	U	0.054	U	0.053	U	0.052	U	0.052	U	0.052	U
ENDOSULFAN II	UG/L	0.10	U	0.11	U	0.11	U	0.10	U	0.10	U	0.10	U
ENDOSULFAN SULFATE	UG/L	0.10	U	0.11	U	0.11	U	0.10	U	0.10	U	0.10	U
ENDRIN	UG/L	0.10	U	0.11	U	0.11	U	0.10	U	0.10	U	0.10	U
ENDRIN ALDEHYDE	UG/L	0.10	U	0.11	U	0.11	U	0.10	U	0.10	U	0.10	U
ENDRIN KETONE	UG/L	0.10	U	0.11	U	0.11	U	0.10	U	0.10	U	0.10	U
GAMMA-BHC (LINDANE)	UG/L	0.051	U	0.054	U	0.053	U	0.052	U	0.052	U	0.052	U
GAMMA-CHLORDANE	UG/L	0.051	U	0.054	U	0.053	U	0.052	U	0.052	U	0.052	U
HEPTACHLOR	UG/L	0.051	U	0.054	U	0.053	U	0.052	U	0.052	U	0.052	U
HEPTACHLOR EPOXIDE	UG/L	0.051	U	0.054	U	0.053	U	0.052	U	0.052	U	0.052	U
METHOXYCHLOR	UG/L	0.51	U	0.54	U	0.53	U	0.52	U	0.52	U	0.52	U
TOXAPHENE	UG/L	5.1	U	5.4	U	5.3	U	5.2	U	5.2	U	5.2	U

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MONITORING WELL SAMPLES

PESTICIDES AND PCBS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	2A-02 15-JUN-99 9906131-07		33MWC-01 16-JUN-99 9906143-01		33MWC-02 17-JUN-99 9906163-01		33MWC-03 16-JUN-99 9906143-03		33MWC-03 DUP 16-JUN-99 9906143-13		33MWC-05 16-JUN-99 9906143-05	
4,4'-DDD	UG/L	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.11	U
4,4'-DDE	UG/L	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.11	U
4,4'-DDT	UG/L	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.11	U
ALDRIN	UG/L	0.051	U	0.051	U	0.051	U	0.052	U	0.051	U	0.053	U
ALPHA-BHC	UG/L	0.051	U	0.051	U	0.051	U	0.052	U	0.051	U	0.053	U
ALPHA-CHLORDANE	UG/L	0.051	U	0.051	U	0.051	U	0.052	U	0.051	U	0.053	U
AROCLOR-1016	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.1	U
AROCLOR-1221	UG/L	2.0	U	2.0	U	2.0	U	2.1	U	2.0	U	2.1	U
AROCLOR-1232	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.1	U
AROCLOR-1242	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.1	U
AROCLOR-1248	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.1	U
AROCLOR-1254	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.1	U
AROCLOR-1260	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.1	U
BETA-BHC	UG/L	0.051	U	0.051	U	0.051	U	0.052	U	0.051	U	0.053	U
DELTA-BHC	UG/L	0.051	U	0.051	U	0.051	U	0.052	U	0.051	U	0.053	U
DIELDRIN	UG/L	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.11	U
ENDOSULFAN I	UG/L	0.051	U	0.051	U	0.051	U	0.052	U	0.051	U	0.053	U
ENDOSULFAN II	UG/L	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.11	U
ENDOSULFAN SULFATE	UG/L	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.11	U
ENDRIN	UG/L	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.11	U
ENDRIN ALDEHYDE	UG/L	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.11	U
ENDRIN KETONE	UG/L	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.11	U
GAMMA-BHC (LINDANE)	UG/L	0.051	U	0.051	U	0.051	U	0.052	U	0.051	U	0.053	U
GAMMA-CHLORDANE	UG/L	0.051	U	0.051	U	0.051	U	0.052	U	0.051	U	0.053	U
HEPTACHLOR	UG/L	0.051	U	0.051	U	0.051	U	0.052	U	0.051	U	0.053	U
HEPTACHLOR EPOXIDE	UG/L	0.051	U	0.051	U	0.051	U	0.018	J	0.051	U	0.053	U
METHOXYCHLOR	UG/L	0.51	U	0.51	U	0.51	U	0.52	U	0.51	U	0.53	U
TOXAPHENE	UG/L	5.1	U	5.1	U	5.1	U	5.2	U	5.1	U	5.3	U

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MONITORING WELL SAMPLES

PESTICIDES AND PCBS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-05 DUP 16-JUN-99 9906143-11		33MWC-06 17-JUN-99 9906163-03		IT-01A 15-JUN-99 9906131-01		IT-02A 15-JUN-99 9906131-03		IT-02A DUP 15-JUN-99 9906131-15	
4,4'-DDD	UG/L	0.10	U	0.10	U	0.10	U	0.11	U	0.10	U
4,4'-DDE	UG/L	0.10	U	0.10	U	0.10	U	0.11	U	0.10	U
4,4'-DDT	UG/L	0.10	U	0.10	U	0.10	U	0.11	U	0.10	U
ALDRIN	UG/L	0.052	U	0.051	U	0.051	U	0.053	U	0.052	U
ALPHA-BHC	UG/L	0.052	U	0.051	U	0.051	U	0.053	U	0.052	U
ALPHA-CHLORDANE	UG/L	0.052	U	0.051	U	0.051	U	0.053	U	0.052	U
AROCLOR-1016	UG/L	1.0	U	1.0	U	1.0	U	1.1	U	1.0	U
AROCLOR-1221	UG/L	2.1	U	2.0	U	2.0	U	2.1	U	2.1	U
AROCLOR-1232	UG/L	1.0	U	1.0	U	1.0	U	1.1	U	1.0	U
AROCLOR-1242	UG/L	1.0	U	1.0	U	1.0	U	1.1	U	1.0	U
AROCLOR-1248	UG/L	1.0	U	1.0	U	1.0	U	1.1	U	1.0	U
AROCLOR-1254	UG/L	1.0	U	1.0	U	1.0	U	1.1	U	1.0	U
AROCLOR-1260	UG/L	1.0	U	1.0	U	1.0	U	1.1	U	1.0	U
BETA-BHC	UG/L	0.052	U	0.051	U	0.051	U	0.053	U	0.052	U
DELTA-BHC	UG/L	0.052	U	0.051	U	0.051	U	0.053	U	0.052	U
DIELDRIN	UG/L	0.10	U	0.10	U	0.10	U	0.11	U	0.10	U
ENDOSULFAN I	UG/L	0.052	U	0.051	U	0.051	U	0.053	U	0.052	U
ENDOSULFAN II	UG/L	0.10	U	0.10	U	0.10	U	0.11	U	0.10	U
ENDOSULFAN SULFATE	UG/L	0.10	U	0.10	U	0.10	U	0.11	U	0.10	U
ENDRIN	UG/L	0.10	U	0.10	U	0.10	U	0.11	U	0.10	U
ENDRIN ALDEHYDE	UG/L	0.10	U	0.10	U	0.10	U	0.11	U	0.10	U
ENDRIN KETONE	UG/L	0.10	U	0.10	U	0.10	U	0.11	U	0.10	U
GAMMA-BHC (LINDANE)	UG/L	0.052	U	0.051	U	0.051	U	0.053	U	0.052	U
GAMMA-CHLORDANE	UG/L	0.052	U	0.051	U	0.051	U	0.053	U	0.052	U
HEPTACHLOR	UG/L	0.052	U	0.051	U	0.051	U	0.053	U	0.052	U
HEPTACHLOR EPOXIDE	UG/L	0.052	U	0.051	U	0.051	U	0.053	U	0.052	U
METHOXYCHLOR	UG/L	0.52	U	0.51	U	0.51	U	0.53	U	0.52	U
TOXAPHENE	UG/L	5.2	U	5.1	U	5.1	U	5.3	U	5.2	U

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SURFACE WATER

PESTICIDES AND PCBS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	SW32R-233 17-JUN-99 9906163-13		SW32R-236 17-JUN-99 9906163-14		SW32R-237 17-JUN-99 9906163-15		SW32R-240/241 17-JUN-99 9906163-16		SW32R-242 17-JUN-99 9906163-17		SW32R-242 DUP 17-JUN-99 9906163-19	
4,4'-DDD	UG/L	0.11	U	0.10	U	0.11	U	0.10	U	0.11	U	0.11	U
4,4'-DDE	UG/L	0.11	U	0.10	U	0.11	U	0.10	U	0.11	U	0.11	U
4,4'-DDT	UG/L	0.11	U	0.10	U	0.11	U	0.011	JPu	0.11	U	0.11	U
ALDRIN	UG/L	0.054	U	0.051	U	0.053	U	0.052	U	0.053	U	0.053	U
ALPHA-BHC	UG/L	0.054	U	0.051	U	0.053	U	0.052	U	0.053	U	0.053	U
ALPHA-CHLORDANE	UG/L	0.054	U	0.051	U	0.053	U	0.052	U	0.053	U	0.053	U
AROCLOR-1016	UG/L	1.1	U	1.0	U	1.1	U	1.0	U	1.1	U	1.1	U
AROCLOR-1221	UG/L	2.2	U	2.0	U	2.1	U	2.1	U	2.1	U	2.1	U
AROCLOR-1232	UG/L	1.1	U	1.0	U	1.1	U	1.0	U	1.1	U	1.1	U
AROCLOR-1242	UG/L	1.1	U	1.0	U	1.1	U	1.0	U	1.1	U	1.1	U
AROCLOR-1248	UG/L	1.1	U	1.0	U	1.1	U	1.0	U	1.1	U	1.1	U
AROCLOR-1254	UG/L	1.1	U	1.0	U	1.1	U	1.0	U	1.1	U	1.1	U
AROCLOR-1260	UG/L	1.1	U	1.0	U	1.1	U	1.0	U	1.1	U	1.1	U
BETA-BHC	UG/L	0.054	U	0.051	U	0.053	U	0.052	U	0.053	U	0.053	U
DELTA-BHC	UG/L	0.054	U	0.051	U	0.053	U	0.052	U	0.053	U	0.053	U
DIELDRIN	UG/L	0.11	U	0.10	U	0.11	U	0.10	U	0.11	U	0.11	U
ENDOSULFAN I	UG/L	0.054	U	0.051	U	0.053	U	0.052	U	0.053	U	0.053	U
ENDOSULFAN II	UG/L	0.11	U	0.10	U	0.11	U	0.10	U	0.11	U	0.11	U
ENDOSULFAN SULFATE	UG/L	0.11	U	0.10	U	0.11	U	0.10	U	0.11	U	0.11	U
ENDRIN	UG/L	0.11	U	0.10	U	0.11	U	0.10	U	0.11	U	0.11	U
ENDRIN ALDEHYDE	UG/L	0.11	U	0.10	U	0.11	U	0.10	U	0.11	U	0.11	U
ENDRIN KETONE	UG/L	0.11	U	0.10	U	0.11	U	0.10	U	0.11	U	0.11	U
GAMMA-BHC (LINDANE)	UG/L	0.054	U	0.051	U	0.053	U	0.052	U	0.053	U	0.053	U
GAMMA-CHLORDANE	UG/L	0.054	U	0.051	U	0.053	U	0.052	U	0.053	U	0.053	U
HEPTACHLOR	UG/L	0.054	U	0.051	U	0.053	U	0.052	U	0.053	U	0.053	U
HEPTACHLOR EPOXIDE	UG/L	0.054	U	0.051	U	0.053	U	0.052	U	0.053	U	0.053	U
METHOXYCHLOR	UG/L	0.54	U	0.51	U	0.53	U	0.52	U	0.53	U	0.53	U
TOXAPHENE	UG/L	5.4	U	5.1	U	5.3	U	5.2	U	5.3	U	5.3	U

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SURFACE WATER

PESTICIDES AND PCBS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	SW32R-250 17-JUN-99 9906163-18	
4,4'-DDD	UG/L	0.11	U
4,4'-DDE	UG/L	0.11	U
4,4'-DDT	UG/L	0.11	U
ALDRIN	UG/L	0.055	U
ALPHA-BHC	UG/L	0.055	U
ALPHA-CHLORDANE	UG/L	0.055	U
AROCLOR-1016	UG/L	1.1	U
AROCLOR-1221	UG/L	2.2	U
AROCLOR-1232	UG/L	1.1	U
AROCLOR-1242	UG/L	1.1	U
AROCLOR-1248	UG/L	1.1	U
AROCLOR-1254	UG/L	1.1	U
AROCLOR-1260	UG/L	1.1	U
BETA-BHC	UG/L	0.055	U
DELTA-BHC	UG/L	0.055	U
DIELDRIN	UG/L	0.11	U
ENDOSULFAN I	UG/L	0.055	U
ENDOSULFAN II	UG/L	0.11	U
ENDOSULFAN SULFATE	UG/L	0.11	U
ENDRIN	UG/L	0.11	U
ENDRIN ALDEHYDE	UG/L	0.11	U
ENDRIN KETONE	UG/L	0.11	U
GAMMA-BHC (LINDANE)	UG/L	0.055	U
GAMMA-CHLORDANE	UG/L	0.055	U
HEPTACHLOR	UG/L	0.055	U
HEPTACHLOR EPOXIDE	UG/L	0.055	U
METHOXYCHLOR	UG/L	0.55	U
TOXAPHENE	UG/L	5.5	U

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MONITORING WELL SAMPLES

METALS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	17MWC-01 16-JUN-99 9906143-07		17MWC-01 (F) 16-JUN-99 9906143-08		17MWC-02 17-JUN-99 9906163-09		17MWC-02 (F) 17-JUN-99 9906163-10		17MWC-03 17-JUN-99 9906163-11		17MWC-03 (F) 17-JUN-99 9906163-12	
ALUMINUM, DISSOLVED	UG/L			38.2	U			76.5	B			81.8	B
ANTIMONY, DISSOLVED	UG/L			2.7	U			2.7	U			2.7	U
ARSENIC, DISSOLVED	UG/L			2.6	Bfu			2.8	Bfu			2.0	U
BARIUM, DISSOLVED	UG/L			134	Bf			81.7	Bf			93.6	Bf
BERYLLIUM, DISSOLVED	UG/L			0.10	U			0.10	U			0.10	U
CADMIUM, DISSOLVED	UG/L			0.30	U			0.30	U			0.30	U
CADMIUM, TOTAL	UG/L	0.74	B			0.65	B			1.2	B		
CALCIUM, DISSOLVED	UG/L			41100				74700				25700	
CHROMIUM, DISSOLVED	UG/L			1.1	U			2.6	B			1.1	U
COBALT, DISSOLVED	UG/L			0.50	U			0.50	U			2.0	B
COPPER, DISSOLVED	UG/L			2.8	Bfu			3.5	Bfu			6.1	Bfu
IRON, DISSOLVED	UG/L			30.8	U			30.8	U			1560	
LEAD, DISSOLVED	UG/L			1.0	U			1.0	U			1.0	U
LEAD, TOTAL	UG/L	1.0	U			2.2	B			51.4			
MAGNESIUM, DISSOLVED	UG/L			16700	f			29900	f			9890	
MANGANESE, DISSOLVED	UG/L			6.3	B			4.0	B			458	
MERCURY, DISSOLVED	UG/L			0.10	U			0.10	U			0.10	U
NICKEL, DISSOLVED	UG/L			5.3	B			3.3	B			8.3	B
POTASSIUM, DISSOLVED	UG/L			804	B			1640	B			1510	B
SELENIUM, DISSOLVED	UG/L			2.7	BNj			2.7	B			2.6	U
SILVER, DISSOLVED	UG/L			0.90	U			0.90	U			0.90	U
SODIUM, DISSOLVED	UG/L			88700				135000				95900	
THALLIUM, DISSOLVED	UG/L			3.2	U			3.2	U			3.2	U
VANADIUM, DISSOLVED	UG/L			1.2	Bfu			0.60	U			0.60	U
ZINC, DISSOLVED	UG/L			4.0	B			30.9				17.1	B

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MONITORING WELL SAMPLES

METALS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	28-16 15-JUN-99 9906131-11		28-16 (F) 15-JUN-99 9906131-12		28MWC-01 15-JUN-99 9906131-13		28MWC-01 (F) 15-JUN-99 9906131-14		2A-01 15-JUN-99 9906131-05		2A-01 (F) 15-JUN-99 9906131-06	
ALUMINUM, DISSOLVED	UG/L			38.2	U			780				38.2	U
ANTIMONY, DISSOLVED	UG/L			2.7	U			2.7	U			2.7	U
ARSENIC, DISSOLVED	UG/L			2.2	Bfu			3.5	Bfu			3.8	Bfu
BARIUM, DISSOLVED	UG/L			50.4	Bf			31.6	Bf			45.2	Bf
BERYLLIUM, DISSOLVED	UG/L			0.10	U			0.10	U			0.10	U
CADMIUM, DISSOLVED	UG/L			0.30	U			0.30	U			0.30	U
CADMIUM, TOTAL	UG/L	2.3	B			0.42	B			0.56	B		
CALCIUM, DISSOLVED	UG/L			24000				70000				65700	
CHROMIUM, DISSOLVED	UG/L			4.2	B			1.6	B			1.1	U
COBALT, DISSOLVED	UG/L			0.50	U			1.1	Bfu			0.60	Bfu
COPPER, DISSOLVED	UG/L			2.8	Bfu			2.4	Bfu			2.3	Bfu
IRON, DISSOLVED	UG/L			30.8	U			786				30.8	U
LEAD, DISSOLVED	UG/L			1.0	U			1.5	B			1.0	U
LEAD, TOTAL	UG/L	11.9				10.9				5.5			
MAGNESIUM, DISSOLVED	UG/L			8020	f			31800	f			24300	f
MANGANESE, DISSOLVED	UG/L			2.4	B			40.9				2.4	B
MERCURY, DISSOLVED	UG/L			0.10	U			0.10	U			0.10	U
NICKEL, DISSOLVED	UG/L			2.4	B			1.0	B			0.90	U
POTASSIUM, DISSOLVED	UG/L			590	B			264	B			456	B
SELENIUM, DISSOLVED	UG/L			2.6	U			2.6	U			3.7	B
SILVER, DISSOLVED	UG/L			0.90	U			0.90	U			0.90	U
SODIUM, DISSOLVED	UG/L			24800				39300				38600	
THALLIUM, DISSOLVED	UG/L			3.2	U			3.2	U			3.2	U
VANADIUM, DISSOLVED	UG/L			0.60	U			2.5	Bfu			1.4	Bfu
ZINC, DISSOLVED	UG/L			8.8	B			10.0	B			7.4	B

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MONITORING WELL SAMPLES

METALS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	2A-02 15-JUN-99 9906131-07		2A-02 (F) 15-JUN-99 9906131-08		33MWC-01 16-JUN-99 9906143-01		33MWC-01 (F) 16-JUN-99 9906143-02		33MWC-02 17-JUN-99 9906163-01		33MWC-02 (F) 17-JUN-99 9906163-02	
ALUMINUM, DISSOLVED	UG/L			38.2	U			60.7	B			207	
ANTIMONY, DISSOLVED	UG/L			2.7	U			2.7	U			2.7	U
ARSENIC, DISSOLVED	UG/L			2.0	U			5.0	Bfu			2.0	U
BARIUM, DISSOLVED	UG/L			63.3	Bf			53.6	Bf			69.5	Bf
BERYLLIUM, DISSOLVED	UG/L			0.10	U			0.10	U			0.10	U
CADMIUM, DISSOLVED	UG/L			0.30	U			0.30	U			0.30	U
CADMIUM, TOTAL	UG/L	1.1	B			0.30	B			0.30	B		
CALCIUM, DISSOLVED	UG/L			59100				48200				435000	
CHROMIUM, DISSOLVED	UG/L			2.0	B			1.3	B			2.2	B
COBALT, DISSOLVED	UG/L			0.51	Bfu			0.50	U			2.5	B
COPPER, DISSOLVED	UG/L			2.1	Bfu			2.9	Bfu			5.4	Bfu
IRON, DISSOLVED	UG/L			30.8	U			30.8	U			35.1	B
LEAD, DISSOLVED	UG/L			1.3	B			1.0	U			4.4	
LEAD, TOTAL	UG/L	7.8				1.0	U			1.0	U		
MAGNESIUM, DISSOLVED	UG/L			21200	f			18500	f			180000	f
MANGANESE, DISSOLVED	UG/L			3.4	B			7.1	B			129	f
MERCURY, DISSOLVED	UG/L			0.10	U			0.10	U			0.10	U
NICKEL, DISSOLVED	UG/L			0.90	U			2.9	B			794	
POTASSIUM, DISSOLVED	UG/L			734	B			540	B			774	B
SELENIUM, DISSOLVED	UG/L			2.6	U			2.6	UN			2.6	U
SILVER, DISSOLVED	UG/L			0.90	U			0.90	U			0.90	U
SODIUM, DISSOLVED	UG/L			36200				59900				336000	
THALLIUM, DISSOLVED	UG/L			3.2	U			3.2	U			3.2	U
VANADIUM, DISSOLVED	UG/L			2.1	B			1.1	B			0.60	U
ZINC, DISSOLVED	UG/L			11.6	B			17.1	B			40.3	

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MONITORING WELL SAMPLES

METALS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-03 16-JUN-99 9906143-03		33MWC-03 (F) 16-JUN-99 9906143-04		33MWC-03 DUP 16-JUN-99 9906143-13		33MWC-03 DUP(F) 16-JUN-99 9906143-14		33MWC-05 16-JUN-99 9906143-05		33MWC-05 (F) 16-JUN-99 9906143-06	
ALUMINUM, DISSOLVED	UG/L			38.2	U			38.2	U			38.2	U
ANTIMONY, DISSOLVED	UG/L			2.7	U			2.7	U			2.7	U
ARSENIC, DISSOLVED	UG/L			2.0	U			2.0	U			2.6	Bfu
BARIUM, DISSOLVED	UG/L			138	Bf			144	Bf			39.8	Bf
BERYLLIUM, DISSOLVED	UG/L			0.10	U			0.10	U			0.10	U
CADMIUM, DISSOLVED	UG/L			0.30	U			0.30	U			0.30	U
CADMIUM, TOTAL	UG/L	0.30	U			0.30	U			0.30	U		
CALCIUM, DISSOLVED	UG/L			60500				63800				65900	
CHROMIUM, DISSOLVED	UG/L			1.1	U			1.1	U			1.1	U
COBALT, DISSOLVED	UG/L			0.62	Bfu			0.70	Bfu			0.50	U
COPPER, DISSOLVED	UG/L			3.2	Bfu			3.5	Bfu			3.3	Bfu
IRON, DISSOLVED	UG/L			30.8	U			30.8	U			30.8	U
LEAD, DISSOLVED	UG/L			1.0	U			1.0	U			1.0	U
LEAD, TOTAL	UG/L	1.0	U			1.0	U			1.0	U		
MAGNESIUM, DISSOLVED	UG/L			36900	f			38800	f			29700	f
MANGANESE, DISSOLVED	UG/L			5.0	B			5.6	B			1.4	B
MERCURY, DISSOLVED	UG/L			0.20	U			0.10	U			0.10	U
NICKEL, DISSOLVED	UG/L			6.6	B			7.1	B			0.90	U
POTASSIUM, DISSOLVED	UG/L			907	B			944	B			458	B
SELENIUM, DISSOLVED	UG/L			2.6	UN			2.6	UN			3.0	BNj
SILVER, DISSOLVED	UG/L			0.90	U			0.90	U			0.90	U
SODIUM, DISSOLVED	UG/L			93100				97900				155000	
THALLIUM, DISSOLVED	UG/L			3.3	B			3.2	U			3.2	U
VANADIUM, DISSOLVED	UG/L			1.1	Bfu			1.2	Bfu			1.6	Bfu
ZINC, DISSOLVED	UG/L			4.4	B			5.5	B			2.2	B

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MONITORING WELL SAMPLES

METALS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-05 DUP 16-JUN-99 9906143-11		33MWC-05 DUP(F) 16-JUN-99 9906143-12		33MWC-06 17-JUN-99 9906163-03		33MWC-06 (F) 17-JUN-99 9906163-04		IT-01A 15-JUN-99 9906131-01		IT-01A (F) 15-JUN-99 9906131-02	
ALUMINUM, DISSOLVED	UG/L			38.2	U			101	B			38.2	U
ANTIMONY, DISSOLVED	UG/L			2.7	U			2.7	U			2.7	U
ARSENIC, DISSOLVED	UG/L			3.4	Bfu			2.0	U			2.0	Bfu
BARIUM, DISSOLVED	UG/L			39.3	Bf			79.0	Bf			36.8	Bf
BERYLLIUM, DISSOLVED	UG/L			0.10	U			0.10	U			0.10	U
CADMIUM, DISSOLVED	UG/L			0.30	U			0.30	U			0.30	U
CADMIUM, TOTAL	UG/L	0.30	U			0.30	U			0.33	B		
CALCIUM, DISSOLVED	UG/L			64100				28400				74200	
CHROMIUM, DISSOLVED	UG/L			1.1	U			1.1	U			1.1	U
COBALT, DISSOLVED	UG/L			0.54	Bfu			0.50	U			0.70	Bfu
COPPER, DISSOLVED	UG/L			3.0	Bfu			2.5	Bfu			2.3	Bfu
IRON, DISSOLVED	UG/L			30.8	U			45.1	Bfu			30.8	U
LEAD, DISSOLVED	UG/L			1.0	U			1.0	U			1.0	U
LEAD, TOTAL	UG/L	1.0	U			1.1	B			1.0	U		
MAGNESIUM, DISSOLVED	UG/L			29000	f			9970	f			28900	f
MANGANESE, DISSOLVED	UG/L			1.4	B			4.9	Bf			0.53	B
MERCURY, DISSOLVED	UG/L			0.10	U			0.10	U			0.10	U
NICKEL, DISSOLVED	UG/L			0.90	U			3.6	B			0.90	U
POTASSIUM, DISSOLVED	UG/L			442	B			169	B			240	B
SELENIUM, DISSOLVED	UG/L			2.8	BNj			2.6	U			2.6	U
SILVER, DISSOLVED	UG/L			0.90	U			0.90	U			0.90	U
SODIUM, DISSOLVED	UG/L			152000				24800				46600	
THALLIUM, DISSOLVED	UG/L			3.2	U			3.2	U			3.2	U
VANADIUM, DISSOLVED	UG/L			1.5	Bfu			0.60	U			1.3	Bfu
ZINC, DISSOLVED	UG/L			3.2	B			38.5				5.8	B

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MONITORING WELL SAMPLES

METALS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	IT-02A 15-JUN-99 9906131-03		IT-02A (F) 15-JUN-99 9906131-04		IT-02A DUP 15-JUN-99 9906131-15		IT-02A DUP (F) 15-JUN-99 9906131-16	
ALUMINUM, DISSOLVED	UG/L			96.8	B			38.2	U
ANTIMONY, DISSOLVED	UG/L			2.7	U			2.7	U
ARSENIC, DISSOLVED	UG/L			2.5	Bfu			3.4	Bfu
BARIUM, DISSOLVED	UG/L			46.5	Bf			48.9	Bf
BERYLLIUM, DISSOLVED	UG/L			0.10	U			0.10	U
CADMIUM, DISSOLVED	UG/L			0.30	U			0.30	U
CADMIUM, TOTAL	UG/L	0.30	U			0.30	U		
CALCIUM, DISSOLVED	UG/L			104000				116000	
CHROMIUM, DISSOLVED	UG/L			1.1	U			1.1	U
COBALT, DISSOLVED	UG/L			0.50	U			0.50	U
COPPER, DISSOLVED	UG/L			2.0	Bfu			2.2	Bfu
IRON, DISSOLVED	UG/L			30.8	U			30.8	U
LEAD, DISSOLVED	UG/L			1.0	U			1.3	B
LEAD, TOTAL	UG/L	1.0	U			1.0	U		
MAGNESIUM, DISSOLVED	UG/L			64900	f			72400	f
MANGANESE, DISSOLVED	UG/L			0.59	B			1.1	B
MERCURY, DISSOLVED	UG/L			0.10	U			0.10	U
NICKEL, DISSOLVED	UG/L			0.90	U			0.90	U
POTASSIUM, DISSOLVED	UG/L			1200	B			1300	B
SELENIUM, DISSOLVED	UG/L			4.1	B			3.4	B
SILVER, DISSOLVED	UG/L			0.90	U			0.90	U
SODIUM, DISSOLVED	UG/L			38300				42700	
THALLIUM, DISSOLVED	UG/L			3.2	U			3.2	U
VANADIUM, DISSOLVED	UG/L			0.60	U			0.60	U
ZINC, DISSOLVED	UG/L			5.1	B			12.3	B

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SURFACE WATER

METALS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	SW32R-233 17-JUN-99 9906163-13		SW32R-236 17-JUN-99 9906163-14		SW32R-237 17-JUN-99 9906163-15		SW32R-240/241 17-JUN-99 9906163-16		SW32R-242 17-JUN-99 9906163-17		SW32R-242 DUP 17-JUN-99 9906163-19	
ALUMINUM, TOTAL	UG/L	264		707		1340		1210		548		622	
ANTIMONY, TOTAL	UG/L	2.7	U	2.7	U	2.7	U	2.7	U	2.7	U	2.7	U
ARSENIC, TOTAL	UG/L	5.3	Bfu	4.1	Bfu	5.5	Bfu	6.6	Bfu	3.8	Bfu	3.2	Bfu
BARIUM, TOTAL	UG/L	27.3	Bf	118	Bf	94.6	Bf	87.8	Bf	32.9	Bf	31.4	Bf
BERYLLIUM, TOTAL	UG/L	0.10	U	0.10	U	0.12	B	0.10	U	0.10	U	0.10	U
CADMIUM, TOTAL	UG/L	0.30	U	0.30	U	0.30	U	0.30	U	0.30	U	0.30	U
CALCIUM, TOTAL	UG/L	42400		108000		41400		45000		102000		106000	
CHROMIUM, TOTAL	UG/L	1.1	U	1.1	U	1.1	U	1.1	B	1.1	U	1.1	U
COBALT, TOTAL	UG/L	0.50	U	1.7	B	2.4	B	2.3	B	0.85	B	1.2	B
COPPER, TOTAL	UG/L	5.1	Bfu	7.3	Bfu	6.4	Bfu	7.6	Bfu	13.2	Bfu	4.9	Bfu
IRON, TOTAL	UG/L	173		1870		2080		2310		292		341	
LEAD, TOTAL	UG/L	1.0	U	2.8	B	5.1		5.8		1.0	U	1.0	U
MAGNESIUM, TOTAL	UG/L	14100	f	23700	f	13000	f	14300	f	34300	f	36200	f
MANGANESE, TOTAL	UG/L	94.6	f	2100	f	1430	f	1370	f	190	f	195	f
MERCURY, TOTAL	UG/L	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U
NICKEL, TOTAL	UG/L	1.6	B	2.6	B	3.5	B	4.0	B	1.8	B	3.2	B
POTASSIUM, TOTAL	UG/L	2760	B	5480		6060		6150		3630	B	3750	B
SELENIUM, TOTAL	UG/L	2.6	U	2.6	U	2.6	U	2.6	U	2.6	U	2.6	U
SILVER, TOTAL	UG/L	0.90	U	0.90	U	0.90	U	0.90	U	0.90	U	0.90	U
SODIUM, TOTAL	UG/L	42500		60400		30600		38700		160000		169000	
THALLIUM, TOTAL	UG/L	3.2	U	3.2	U	3.2	U	3.2	U	3.2	U	3.2	U
VANADIUM, TOTAL	UG/L	2.8	Bfu	3.4	B	9.2	B	9.0	B	1.9	B	2.3	B
ZINC, TOTAL	UG/L	9.1	Bfu	10.0	Bfu	12.7	Bfu	17.4	Bfu	5.5	B	5.3	B

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SURFACE WATER

METALS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	SW32R-250 17-JUN-99 9906163-18	
ALUMINUM, TOTAL	UG/L	321	
ANTIMONY, TOTAL	UG/L	2.7	U
ARSENIC, TOTAL	UG/L	3.4	Bfu
BARIUM, TOTAL	UG/L	120	Bf
BERYLLIUM, TOTAL	UG/L	0.10	U
CADMIUM, TOTAL	UG/L	0.30	U
CALCIUM, TOTAL	UG/L	213000	
CHROMIUM, TOTAL	UG/L	1.2	B
COBALT, TOTAL	UG/L	1.0	B
COPPER, TOTAL	UG/L	5.3	B
IRON, TOTAL	UG/L	259	
LEAD, TOTAL	UG/L	1.3	B
MAGNESIUM, TOTAL	UG/L	128000	
MANGANESE, TOTAL	UG/L	688	
MERCURY, TOTAL	UG/L	0.10	U
NICKEL, TOTAL	UG/L	2.2	B
POTASSIUM, TOTAL	UG/L	3910	B
SELENIUM, TOTAL	UG/L	2.6	U
SILVER, TOTAL	UG/L	0.90	U
SODIUM, TOTAL	UG/L	301000	
THALLIUM, TOTAL	UG/L	3.2	U
VANADIUM, TOTAL	UG/L	3.0	B
ZINC, TOTAL	UG/L	6.9	B

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MONITORING WELL SAMPLES

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	17MWC-01 16-JUN-99 9906143-07	17MWC-01 (F) 16-JUN-99 9906143-08	17MWC-02 17-JUN-99 9906163-09	17MWC-02 (F) 17-JUN-99 9906163-10	17MWC-03 17-JUN-99 9906163-11	17MWC-03 (F) 17-JUN-99 9906163-12
COLOR, FIELD		LT BRN		LT BRN		BROWN	
CONDUCTANCE, SPECIFIC	UMHOS/CM	460		1100		590	
DEPTH TO WATER	FEET	8.86		6.98		6.82	
ODOR, FIELD		NONE		NONE		NONE	
PH, FIELD	SU	6.8		7.2		6.52	
TEMPERATURE	DEG C	15.1		15.7		16.3	
TURBIDITY, FIELD		SLIGHT		SLIGHT		MOD	
WATER ELEVATION	FEET	419.34		411.86		421.73	
WELL DRY							
ALKALINITY AS CACO3	MG/L		207		334		186
CHLORIDE	MG/L		20.5		21.5		11.5
CYANIDE, AMENABLE	MG/L						
CYANIDE, TOTAL	MG/L	< 0.005		< 0.005		< 0.005	
NITROGEN, NITRATE + NITRITE	MG/L		1.63		0.078		0.242
SULFATE	MG/L		82.0		169		272

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MONITORING WELL SAMPLES

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	28-16 15-JUN-99 9906131-11	28-16 (F) 15-JUN-99 9906131-12	28MWC-01 15-JUN-99 9906131-13	28MWC-01 (F) 15-JUN-99 9906131-14	2A-01 15-JUN-99 9906131-05	2A-01 (F) 15-JUN-99 9906131-06
COLOR, FIELD		BROWN		BROWN		BROWN	
CONDUCTANCE, SPECIFIC	UMHOS/CM	300		730		520	
DEPTH TO WATER	FEET	17.89		10.22		11.07	
ODOR, FIELD		NONE		NONE		NONE	
PH, FIELD	SU	6.10		7.0		7.35	
TEMPERATURE	DEG C	15.9		14.5		15.2	
TURBIDITY, FIELD		MOD		MOD		SLIGHT	
WATER ELEVATION	FEET	437.91		435.48			
WELL DRY							
ALKALINITY AS CACO3	MG/L		53.8		224		134
CHLORIDE	MG/L		4.79		6.22		4.79
CYANIDE, AMENABLE	MG/L						
CYANIDE, TOTAL	MG/L	< 0.005		< 0.005		< 0.005	
NITROGEN, NITRATE + NITRITE	MG/L		0.610		0.950		3.71
SULFATE	MG/L		42.2		82.0		138

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MONITORING WELL SAMPLES

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	2A-02 15-JUN-99 9906131-07	2A-02 (F) 15-JUN-99 9906131-08	32-063 16-JUN-99 9906163-X01	33-340 16-JUN-99 9906163-X02	33-341 16-JUN-99 9906163-X03	33-342 16-JUN-99 9906163-X04
COLOR, FIELD		TAN					
CONDUCTANCE, SPECIFIC	UMHOS/CM	560					
DEPTH TO WATER	FEET	13.31		6.42	11.19	7.14	10.42
ODOR, FIELD		NONE					
PH, FIELD	SU	7.25					
TEMPERATURE	DEG C	15.1					
TURBIDITY, FIELD		MOD					
WATER ELEVATION	FEET			412.51	415.67	422.17	422.39
WELL DRY							
ALKALINITY AS CACO3	MG/L		163				
CHLORIDE	MG/L		5.26				
CYANIDE, AMENABLE	MG/L						
CYANIDE, TOTAL	MG/L	< 0.005					
NITROGEN, NITRATE + NITRITE	MG/L		5.52				
SULFATE	MG/L		80.5				

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MONITORING WELL SAMPLES

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-01 16-JUN-99 9906143-01	33MWC-01 (F) 16-JUN-99 9906143-02	33MWC-02 17-JUN-99 9906163-01	33MWC-02 (F) 17-JUN-99 9906163-02	33MWC-03 16-JUN-99 9906143-03	33MWC-03 (F) 16-JUN-99 9906143-04
COLOR, FIELD		LT BRN		RED-BRN		LT YEL	
CONDUCTANCE, SPECIFIC	UMHOS/CM	86		290		150	
DEPTH TO WATER	FEET	8.32		5.82		10.85	
ODOR, FIELD		NONE		NONE		NONE	
PH, FIELD	SU	6.63		6.70		7.12	
TEMPERATURE	DEG C	16.7		16.7		14.5	
TURBIDITY, FIELD		SLIGHT		SLIGHT		SLIGHT	
WATER ELEVATION	FEET	423.7		419.04		418.65	
WELL DRY							
ALKALINITY AS CACO3	MG/L		202		390		245
CHLORIDE	MG/L		7.50		715		19.5
CYANIDE, AMENABLE	MG/L						
CYANIDE, TOTAL	MG/L	< 0.005		< 0.005		< 0.005	
NITROGEN, NITRATE + NITRITE	MG/L		0.060		< 0.050		0.520
SULFATE	MG/L		92.5		557		158

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MONITORING WELL SAMPLES

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-03 DUP 16-JUN-99 9906143-13	33MWC-03 DUP(F) 16-JUN-99 9906143-14	33MWC-05 16-JUN-99 9906143-05	33MWC-05 (F) 16-JUN-99 9906143-06	33MWC-05 DUP 16-JUN-99 9906143-11	33MWC-05 DUP(F) 16-JUN-99 9906143-12
COLOR, FIELD				CLEAR			
CONDUCTANCE, SPECIFIC	UMHOS/CM			140			
DEPTH TO WATER	FEET			8.15			
ODOR, FIELD				NONE			
PH, FIELD	SU			7.18			
TEMPERATURE	DEG C			15.6			
TURBIDITY, FIELD				NONE			
WATER ELEVATION	FEET			416.24			
WELL DRY							
ALKALINITY AS CACO3	MG/L		260		334		343
CHLORIDE	MG/L		20.5		17.5		17.5
CYANIDE, AMENABLE	MG/L			< 0.005			
CYANIDE, TOTAL	MG/L	< 0.005		9.00		< 0.005	
NITROGEN, NITRATE + NITRITE	MG/L		0.534		0.520		0.525
SULFATE	MG/L		151		150		177

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MONITORING WELL SAMPLES

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-06 17-JUN-99 9906163-03	33MWC-06 (F) 17-JUN-99 9906163-04	33MWC-07 16-JUN-99 9906163-X05	33MWC-08 16-JUN-99 9906163-X06	33MWC-09 16-JUN-99 9906163-X07	33MWC-10 16-JUN-99 9906163-X08
COLOR, FIELD		CLEAR					
CONDUCTANCE, SPECIFIC	UMHOS/CM	290					
DEPTH TO WATER	FEET	10.98		9.52	6.14	22.13	9.16
ODOR, FIELD		NONE					
PH, FIELD	SU	6.50					
TEMPERATURE	DEG C	13.6					
TURBIDITY, FIELD		NONE					
WATER ELEVATION	FEET	410.72		415.17	411.13	413	417.1
WELL DRY							
ALKALINITY AS CACO3	MG/L		100				
CHLORIDE	MG/L		4.50				
CYANIDE, AMENABLE	MG/L						
CYANIDE, TOTAL	MG/L	< 0.005					
NITROGEN, NITRATE + NITRITE	MG/L		6.12				
SULFATE	MG/L		16.6				

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MONITORING WELL SAMPLES

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-11 16-JUN-99 9906163-X09	33MWC-12 16-JUN-99 9906163-X10	33MWC-13 16-JUN-99 9906163-X11	33MWC-14 16-JUN-99 9906163-X12	33MWC-15 16-JUN-99 9906163-X13	33MWC-16 16-JUN-99 9906163-X14
COLOR, FIELD							
CONDUCTANCE, SPECIFIC	UMHOS/CM						
DEPTH TO WATER	FEET	8.82	13.40	6.56	6.81	3.88	9.79
ODOR, FIELD							
PH, FIELD	SU						
TEMPERATURE	DEG C						
TURBIDITY, FIELD							
WATER ELEVATION	FEET	417.13	416.51	423.12	422.86	413.71	414.33
WELL DRY							
ALKALINITY AS CACO3	MG/L						
CHLORIDE	MG/L						
CYANIDE, AMENABLE	MG/L						
CYANIDE, TOTAL	MG/L						
NITROGEN, NITRATE + NITRITE	MG/L						
SULFATE	MG/L						

MONITORING WELL SAMPLES

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-17 16-JUN-99 9906163-X15	33MWC-18 16-JUN-99 9906163-X16	33MWC-19 16-JUN-99 9906163-X17	33MWC-20 16-JUN-99 9906163-X18	33MWC-21 16-JUN-99 9906163-X19	33MWC-22 16-JUN-99 9906163-X20
COLOR, FIELD							
CONDUCTANCE, SPECIFIC	UMHOS/CM						
DEPTH TO WATER	FEET	9.75	3.35	3.34	9.44	9.74	9.97
ODOR, FIELD							
PH, FIELD	SU						
TEMPERATURE	DEG C						
TURBIDITY, FIELD							
WATER ELEVATION	FEET	408.68	405.61	406.09	409.11	415.37	415.29
WELL DRY							
ALKALINITY AS CACO3	MG/L						
CHLORIDE	MG/L						
CYANIDE, AMENABLE	MG/L						
CYANIDE, TOTAL	MG/L						
NITROGEN, NITRATE + NITRITE	MG/L						
SULFATE	MG/L						

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MONITORING WELL SAMPLES

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-23 16-JUN-99 9906163-X21	33MWC-24 16-JUN-99 9906163-X22	33MWC-27 16-JUN-99 9906163-X23	33MWC-28 16-JUN-99 9906163-X24	33MWC-29 16-JUN-99 9906163-X25	33MWC-30 16-JUN-99 9906163-X26
COLOR, FIELD							
CONDUCTANCE, SPECIFIC	UMHOS/CM						
DEPTH TO WATER	FEET	15.36	6.24	21.35	21.84	25.13	2.82
ODOR, FIELD							
PH, FIELD	SU						
TEMPERATURE	DEG C						
TURBIDITY, FIELD							
WATER ELEVATION	FEET	409.32	423.41	413.1	412.75	409.02	406.87
WELL DRY							
ALKALINITY AS CACO3	MG/L						
CHLORIDE	MG/L						
CYANIDE, AMENABLE	MG/L						
CYANIDE, TOTAL	MG/L						
NITROGEN, NITRATE + NITRITE	MG/L						
SULFATE	MG/L						

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MONITORING WELL SAMPLES

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-31 16-JUN-99 9906163-X27	33MWC-32 16-JUN-99 9906163-X28	33MWC-33 16-JUN-99 9906163-X29	33MWC-35 16-JUN-99 9906163-X30	33MWC-36 16-JUN-99 9906163-X31	33MWC-39 16-JUN-99 9906163-X32
COLOR, FIELD							
CONDUCTANCE, SPECIFIC	UMHOS/CM						
DEPTH TO WATER	FEET	2.93	0.79	13.10	18.37	5.30	10.24
ODOR, FIELD							
PH, FIELD	SU						
TEMPERATURE	DEG C						
TURBIDITY, FIELD							
WATER ELEVATION	FEET	406.93	409.12	416.45	411.41	418.83	406.88
WELL DRY							
ALKALINITY AS CACO3	MG/L						
CHLORIDE	MG/L						
CYANIDE, AMENABLE	MG/L						
CYANIDE, TOTAL	MG/L						
NITROGEN, NITRATE + NITRITE	MG/L						
SULFATE	MG/L						

MONITORING WELL SAMPLES

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	33MWC-41 16-JUN-99 9906163-X33	33SG-01 16-JUN-99 9906163-X34	33SG-02 16-JUN-99 9906163-X35	33SG-03 16-JUN-99 9906163-X36	33SG-04 16-JUN-99 9906163-X37	IT-01A 15-JUN-99 9906131-01
COLOR, FIELD							CLEAR
CONDUCTANCE, SPECIFIC	UMHOS/CM						690
DEPTH TO WATER	FEET	8.33	-0.79	-0.32			6.01
ODOR, FIELD							NONE
PH, FIELD	SU						7.05
TEMPERATURE	DEG C						14.6
TURBIDITY, FIELD							SLIGHT
WATER ELEVATION	FEET	408.91	414.76	411.33			
WELL DRY					DRY	DRY	
ALKALINITY AS CACO3	MG/L						
CHLORIDE	MG/L						
CYANIDE, AMENABLE	MG/L						
CYANIDE, TOTAL	MG/L						< 0.005
NITROGEN, NITRATE + NITRITE	MG/L						
SULFATE	MG/L						

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MONITORING WELL SAMPLES

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	IT-01A (F) 15-JUN-99 9906131-02	IT-02A 15-JUN-99 9906131-03	IT-02A (F) 15-JUN-99 9906131-04	IT-02A DUP 15-JUN-99 9906131-15	IT-02A DUP (F) 15-JUN-99 9906131-16
COLOR, FIELD			CLEAR			
CONDUCTANCE, SPECIFIC	UMHOS/CM		950			
DEPTH TO WATER	FEET		11.28			
ODOR, FIELD			NONE			
PH, FIELD	SU		8.03			
TEMPERATURE	DEG C		16.2			
TURBIDITY, FIELD			NONE			
WATER ELEVATION	FEET					
WELL DRY						
ALKALINITY AS CACO3	MG/L	187		135		141
CHLORIDE	MG/L	30.6		5.26		7.18
CYANIDE, AMENABLE	MG/L					
CYANIDE, TOTAL	MG/L		< 0.005		< 0.005	
NITROGEN, NITRATE + NITRITE	MG/L	1.04		8.24		7.88
SULFATE	MG/L	97.5		389		368

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SURFACE WATER

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	SW32R-233 17-JUN-99 9906163-13	SW32R-236 17-JUN-99 9906163-14	SW32R-237 17-JUN-99 9906163-15	SW32R-240/241 17-JUN-99 9906163-16	SW32R-242 17-JUN-99 9906163-17	SW32R-242 DUP 17-JUN-99 9906163-19
COLOR, FIELD		LT BRN	BROWN	BROWN	BROWN	LT BROWN	
CONDUCTANCE, SPECIFIC	UMHOS/CM	460	740	400	460	1250	
ODOR, FIELD		NONE	NONE	NONE	NONE	NONE	
PH, FIELD	SU	8.55	7.48	8.59	8.33	7.94	
TEMPERATURE	DEG C	28	26	27.8	30.1	29.1	
TURBIDITY, FIELD		SLIGHT		SLIGHT	SLIGHT	SLIGHT	
ALKALINITY AS CACO3	MG/L	68.6	224	74.2	74.2	102	108
CHLORIDE	MG/L	31.5	24.7	24.6	28.7	91.0	94.0
CYANIDE, TOTAL	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
NITROGEN, NITRATE + NITRITE	MG/L	< 0.050	0.118	< 0.050	< 0.050	< 0.050	< 0.050
SULFATE	MG/L	102	104	102	107	224	369

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SURFACE WATER

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS		SW32R-250 17-JUN-99 9906163-18
COLOR, FIELD			BROWN
CONDUCTANCE, SPECIFIC	UMHOS/CM		2300
ODOR, FIELD			NONE
PH, FIELD	SU		6.92
TEMPERATURE	DEG C		19.4
TURBIDITY, FIELD			SLIGHT
ALKALINITY AS CACO3	MG/L		300
CHLORIDE	MG/L		80.5
CYANIDE, TOTAL	MG/L	<	0.005
NITROGEN, NITRATE + NITRITE	MG/L	<	0.050
SULFATE	MG/L		708

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LEACHATE SAMPLES

VOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	LEACHATE 15-JUN-99 9906131-09	
1,1,1-TRICHLOROETHANE	UG/L	1.0	Uj
1,1,2,2-TETRACHLOROETHANE	UG/L	1.0	U
1,1,2-TRICHLOROETHANE	UG/L	1.0	U
1,1-DICHLOROETHANE	UG/L	1.0	U
1,1-DICHLOROETHENE	UG/L	1.0	U
1,2,4-TRICHLOROBENZENE	UG/L	1.0	U
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	1.0	U
1,2-DIBROMOETHANE	UG/L	1.0	U
1,2-DICHLOROBENZENE	UG/L	1.0	U
1,2-DICHLOROETHANE	UG/L	1.0	U
1,2-DICHLOROPROPANE	UG/L	1.0	U
1,3-DICHLOROBENZENE	UG/L	1.0	U
1,4-DICHLOROBENZENE	UG/L	1.0	U
2-BUTANONE	UG/L	5.0	U
2-HEXANONE	UG/L	5.0	U
4-METHYL-2-PENTANONE	UG/L	5.0	U
ACETONE	UG/L	5.0	U
BENZENE	UG/L	1.0	U
BROMOCHLOROMETHANE	UG/L	1.0	U
BROMODICHLOROMETHANE	UG/L	1.0	U
BROMOFORM	UG/L	1.0	U
BROMOMETHANE	UG/L	1.0	Uj
CARBON DISULFIDE	UG/L	0.2	Jbhu
CARBON TETRACHLORIDE	UG/L	1.0	U
CHLOROBENZENE	UG/L	1.0	U
CHLORODIBROMOMETHANE	UG/L	1.0	U
CHLOROETHANE	UG/L	1.0	U
CHLOROFORM	UG/L	1.0	U
CHLOROMETHANE	UG/L	1.0	U
CIS-1,2-DICHLOROETHENE	UG/L	1.0	U
CIS-1,3-DICHLOROPROPENE	UG/L	1.0	U

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LEACHATE SAMPLES

VOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	LEACHATE 15-JUN-99 9906131-09	
ETHYLBENZENE	UG/L	1.0	U
METHYLENE CHLORIDE	UG/L	0.7	JBbhu
STYRENE	UG/L	1.0	U
TETRACHLOROETHENE	UG/L	1.0	U
TOLUENE	UG/L	1.0	U
TRANS-1,2-DICHLOROETHENE	UG/L	1.0	U
TRANS-1,3-DICHLOROPROPENE	UG/L	1.0	U
TRICHLOROETHENE	UG/L	1.0	U
VINYL CHLORIDE	UG/L	1.0	U
XYLENE, TOTAL	UG/L	1.0	U

LEACHATE SAMPLES

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	LEACHATE 15-JUN-99 9906131-09	
2,2'-OXYBIS(1-CHLOROPROPANE)	UG/L	10	U
2,4,5-TRICHLOROPHENOL	UG/L	26	U
2,4,6-TRICHLOROPHENOL	UG/L	10	U
2,4-DICHLOROPHENOL	UG/L	10	U
2,4-DIMETHYLPHENOL	UG/L	10	U
2,4-DINITROPHENOL	UG/L	26	U
2,4-DINITROTOLUENE	UG/L	10	U
2,6-DINITROTOLUENE	UG/L	10	U
2-CHLORONAPHTHALENE	UG/L	10	U
2-CHLOROPHENOL	UG/L	10	U
2-METHYLNAPHTHALENE	UG/L	10	U
2-METHYLPHENOL	UG/L	10	U
2-NITROANILINE	UG/L	26	U
2-NITROPHENOL	UG/L	10	U
3,3'-DICHLOROBENZIDINE	UG/L	10	U
3-NITROANILINE	UG/L	26	U
4,6-DINITRO-2-METHYLPHENOL	UG/L	26	U
4-BROMOPHENYL-PHENYLETHER	UG/L	10	U
4-CHLORO-3-METHYLPHENOL	UG/L	10	U
4-CHLOROANILINE	UG/L	10	U
4-CHLOROPHENYL-PHENYLETHER	UG/L	10	U
4-METHYLPHENOL	UG/L	10	U
4-NITROANILINE	UG/L	26	U
4-NITROPHENOL	UG/L	26	U
ACENAPHTHENE	UG/L	10	U
ACENAPHTHYLENE	UG/L	10	U
ANTHRACENE	UG/L	10	U
BENZO(A)ANTHRACENE	UG/L	10	U
BENZO(A)PYRENE	UG/L	10	U
BENZO(B)FLUORANTHENE	UG/L	10	U
BENZO(G,H,I)PERYLENE	UG/L	10	U

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LEACHATE SAMPLES

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	LEACHATE 15-JUN-99 9906131-09	
BENZO(K)FLUORANTHENE	UG/L	10	U
BIS(2-CHLOROETHOXY)METHANE	UG/L	10	U
BIS(2-CHLOROETHYL)ETHER	UG/L	10	U
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	10	U
BUTYLBENZYLPHTHALATE	UG/L	10	U
CARBAZOLE	UG/L	10	U
CHRYSENE	UG/L	10	U
DI-N-BUTYLPHTHALATE	UG/L	2	JBfu
DI-N-OCTYLPHTHALATE	UG/L	10	U
DIBENZ(A,H)ANTHRACENE	UG/L	10	U
DIBENZOFURAN	UG/L	10	U
DIETHYLPHTHALATE	UG/L	10	U
DIMETHYLPHTHALATE	UG/L	10	U
FLUORANTHENE	UG/L	10	U
FLUORENE	UG/L	10	U
HEXACHLOROBENZENE	UG/L	10	U
HEXACHLOROBUTADIENE	UG/L	10	U
HEXACHLOROCYCLOPENTADIENE	UG/L	10	U
HEXACHLOROETHANE	UG/L	10	U
INDENO(1,2,3-CD)PYRENE	UG/L	10	U
ISOPHORONE	UG/L	10	U
N-NITROSODI-N-PROPYLAMINE	UG/L	10	U
N-NITROSODIPHENYLAMINE	UG/L	10	U
NAPHTHALENE	UG/L	10	U
NITROBENZENE	UG/L	10	U
PENTACHLOROPHENOL	UG/L	26	U
PHENANTHRENE	UG/L	10	U
PHENOL	UG/L	10	U
PYRENE	UG/L	10	U

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LEACHATE SAMPLES

PESTICIDES AND PCBS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	LEACHATE 15-JUN-99 9906131-09	
4,4'-DDD	UG/L	0.10	U
4,4'-DDE	UG/L	0.013	JPu
4,4'-DDT	UG/L	0.10	U
ALDRIN	UG/L	0.051	U
ALPHA-BHC	UG/L	0.051	U
ALPHA-CHLORDANE	UG/L	0.051	U
AROCLOR-1016	UG/L	1.0	U
AROCLOR-1221	UG/L	2.0	U
AROCLOR-1232	UG/L	1.0	U
AROCLOR-1242	UG/L	1.0	U
AROCLOR-1248	UG/L	1.0	U
AROCLOR-1254	UG/L	1.0	U
AROCLOR-1260	UG/L	1.0	U
BETA-BHC	UG/L	0.051	U
DELTA-BHC	UG/L	0.051	U
DIELDRIN	UG/L	0.10	U
ENDOSULFAN I	UG/L	0.051	U
ENDOSULFAN II	UG/L	0.10	U
ENDOSULFAN SULFATE	UG/L	0.10	U
ENDRIN	UG/L	0.10	U
ENDRIN ALDEHYDE	UG/L	0.10	U
ENDRIN KETONE	UG/L	0.10	U
GAMMA-BHC (LINDANE)	UG/L	0.051	U
GAMMA-CHLORDANE	UG/L	0.051	U
HEPTACHLOR	UG/L	0.051	U
HEPTACHLOR EPOXIDE	UG/L	0.051	U
METHOXYCHLOR	UG/L	0.51	U
TOXAPHENE	UG/L	5.1	U

LEACHATE SAMPLES

METALS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	LEACHATE 15-JUN-99 9906131-09	
ALUMINUM, TOTAL	UG/L	53.2	Bu
ANTIMONY, TOTAL	UG/L	2.7	U
ARSENIC, TOTAL	UG/L	2.8	Bfu
BARIUM, TOTAL	UG/L	85.4	Bf
BERYLLIUM, TOTAL	UG/L	0.10	U
CADMIUM, TOTAL	UG/L	0.57	Bu
CALCIUM, TOTAL	UG/L	542000	
CHROMIUM, TOTAL	UG/L	1.1	U
COBALT, TOTAL	UG/L	5.5	Bfu
COPPER, TOTAL	UG/L	18.4	B
IRON, TOTAL	UG/L	44.8	B
LEAD, TOTAL	UG/L	1.0	U
MAGNESIUM, TOTAL	UG/L	125000	f
MANGANESE, TOTAL	UG/L	3560	
MERCURY, TOTAL	UG/L	0.10	U
NICKEL, TOTAL	UG/L	46.4	
POTASSIUM, TOTAL	UG/L	13400	
SELENIUM, TOTAL	UG/L	2.6	U
SILVER, TOTAL	UG/L	1.2	B
SODIUM, TOTAL	UG/L	488000	
THALLIUM, TOTAL	UG/L	3.2	U
VANADIUM, TOTAL	UG/L	0.86	Bfu
ZINC, TOTAL	UG/L	14.7	Bu

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LEACHATE SAMPLES

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	LEACHATE 15-JUN-99 9906131-09	LEACHATE(F) 15-JUN-99 9906131-10	
COLOR, FIELD		CLEAR		
CONDUCTANCE, SPECIFIC	UMHOS/CM	5160		
DEPTH TO LEACHATE	FEET	49.25		
ODOR, FIELD		NONE		
PH, FIELD	SU	6.66		
TEMPERATURE	DEG C	19.0		
TURBIDITY, FIELD		SLIGHT		
ALKALINITY AS CACO3	MG/L	306		
BOD	MG/L		< 2.00	
CHLORIDE	MG/L	1360		
CYANIDE, TOTAL	MG/L	< 0.005		
NITROGEN, NITRATE + NITRITE	MG/L	< 0.050		
SOLIDS, TOTAL DISSOLVED	MG/L		3790	j
SOLIDS, TOTAL SUSPENDED	MG/L		5.00	U
SULFATE	MG/L	372		

WASTEWATER

VOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	PURGE TANK 17-JUN-99 9906163-24	
1,1,1-TRICHLOROETHANE	UG/L	1.0	U
1,1,2,2-TETRACHLOROETHANE	UG/L	1.0	Uj
1,1,2-TRICHLOROETHANE	UG/L	1.0	U
1,1-DICHLOROETHANE	UG/L	1.0	U
1,1-DICHLOROETHENE	UG/L	1.0	U
1,2,4-TRICHLOROBENZENE	UG/L	1.0	U
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	1.0	U
1,2-DIBROMOETHANE	UG/L	1.0	U
1,2-DICHLOROBENZENE	UG/L	1.0	U
1,2-DICHLOROETHANE	UG/L	1.0	U
1,2-DICHLOROPROPANE	UG/L	1.0	U
1,3-DICHLOROBENZENE	UG/L	1.0	U
1,4-DICHLOROBENZENE	UG/L	1.0	U
2-BUTANONE	UG/L	5.0	U
2-HEXANONE	UG/L	5.0	U
4-METHYL-2-PENTANONE	UG/L	5.0	U
ACETONE	UG/L	5.0	U
BENZENE	UG/L	1.0	U
BROMOCHLOROMETHANE	UG/L	1.0	U
BROMODICHLOROMETHANE	UG/L	1.0	U
BROMOFORM	UG/L	1.0	U
BROMOMETHANE	UG/L	1.0	U
CARBON DISULFIDE	UG/L	0.7	Jbfu
CARBON TETRACHLORIDE	UG/L	1.0	U
CHLOROBENZENE	UG/L	1.0	U
CHLORODIBROMOMETHANE	UG/L	1.0	U
CHLOROETHANE	UG/L	1.0	U
CHLOROFORM	UG/L	1.0	U
CHLOROMETHANE	UG/L	1.0	U
CIS-1,2-DICHLOROETHENE	UG/L	1.0	U
CIS-1,3-DICHLOROPROPENE	UG/L	1.0	U

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WASTEWATER

VOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	PURGE TANK 17-JUN-99 9906163-24	
ETHYLBENZENE	UG/L	1.0	U
METHYLENE CHLORIDE	UG/L	2.0	Bbhfu
STYRENE	UG/L	1.0	U
TETRACHLOROETHENE	UG/L	1.0	U
TOLUENE	UG/L	1.0	U
TRANS-1,2-DICHLOROETHENE	UG/L	1.0	U
TRANS-1,3-DICHLOROPROPENE	UG/L	1.0	U
TRICHLOROETHENE	UG/L	1.8	
VINYL CHLORIDE	UG/L	1.0	U
XYLENE, TOTAL	UG/L	1.0	U

WASTEWATER

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	PURGE TANK 17-JUN-99 9906163-24	
2,2'-OXYBIS(1-CHLOROPROPANE)	UG/L	11	U
2,4,5-TRICHLOROPHENOL	UG/L	26	U
2,4,6-TRICHLOROPHENOL	UG/L	11	U
2,4-DICHLOROPHENOL	UG/L	11	U
2,4-DIMETHYLPHENOL	UG/L	11	U
2,4-DINITROPHENOL	UG/L	26	U
2,4-DINITROTOLUENE	UG/L	11	U
2,6-DINITROTOLUENE	UG/L	11	U
2-CHLORONAPHTHALENE	UG/L	11	U
2-CHLOROPHENOL	UG/L	11	U
2-METHYLNAPHTHALENE	UG/L	11	U
2-METHYLPHENOL	UG/L	11	U
2-NITROANILINE	UG/L	26	U
2-NITROPHENOL	UG/L	11	U
3,3'-DICHLOROBENZIDINE	UG/L	11	U
3-NITROANILINE	UG/L	26	U
4,6-DINITRO-2-METHYLPHENOL	UG/L	26	U
4-BROMOPHENYL-PHENYLETHER	UG/L	11	U
4-CHLORO-3-METHYLPHENOL	UG/L	11	U
4-CHLOROANILINE	UG/L	11	U
4-CHLOROPHENYL-PHENYLETHER	UG/L	11	U
4-METHYLPHENOL	UG/L	11	U
4-NITROANILINE	UG/L	26	U
4-NITROPHENOL	UG/L	26	U
ACENAPHTHENE	UG/L	11	U
ACENAPHTHYLENE	UG/L	11	U
ANTHRACENE	UG/L	11	U
BENZO(A)ANTHRACENE	UG/L	11	U
BENZO(A)PYRENE	UG/L	11	U
BENZO(B)FLUORANTHENE	UG/L	11	U
BENZO(G,H,I)PERYLENE	UG/L	11	U

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WASTEWATER

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	PURGE TANK 17-JUN-99 9906163-24	
BENZO(K)FLUORANTHENE	UG/L	11	U
BIS(2-CHLOROETHOXY)METHANE	UG/L	11	U
BIS(2-CHLOROETHYL)ETHER	UG/L	11	U
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	2	JBfu
BUTYLBENZYLPHTHALATE	UG/L	11	U
CARBAZOLE	UG/L	11	U
CHRYSENE	UG/L	11	U
DI-N-BUTYLPHTHALATE	UG/L	1	JBu
DI-N-OCTYLPHTHALATE	UG/L	11	U
DIBENZ(A,H)ANTHRACENE	UG/L	11	U
DIBENZOFURAN	UG/L	11	U
DIETHYLPHTHALATE	UG/L	11	U
DIMETHYLPHTHALATE	UG/L	11	U
FLUORANTHENE	UG/L	11	U
FLUORENE	UG/L	11	U
HEXACHLOROBENZENE	UG/L	11	U
HEXACHLOROBUTADIENE	UG/L	11	U
HEXACHLOROCYCLOPENTADIENE	UG/L	11	U
HEXACHLOROETHANE	UG/L	11	U
INDENO(1,2,3-CD)PYRENE	UG/L	11	U
ISOPHORONE	UG/L	11	U
N-NITROSODI-N-PROPYLAMINE	UG/L	11	U
N-NITROSODIPHENYLAMINE	UG/L	11	U
NAPHTHALENE	UG/L	11	U
NITROBENZENE	UG/L	11	U
PENTACHLOROPHENOL	UG/L	26	U
PHENANTHRENE	UG/L	11	U
PHENOL	UG/L	11	U
PYRENE	UG/L	11	U

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WASTEWATER

PESTICIDES AND PCBS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	PURGE TANK 17-JUN-99 9906163-24	
4,4'-DDD	UG/L	0.10	U
4,4'-DDE	UG/L	0.10	U
4,4'-DDT	UG/L	0.10	U
ALDRIN	UG/L	0.052	U
ALPHA-BHC	UG/L	0.052	U
ALPHA-CHLORDANE	UG/L	0.052	U
AROCLOR-1016	UG/L	1.0	U
AROCLOR-1221	UG/L	2.1	U
AROCLOR-1232	UG/L	1.0	U
AROCLOR-1242	UG/L	1.0	U
AROCLOR-1248	UG/L	1.0	U
AROCLOR-1254	UG/L	1.0	U
AROCLOR-1260	UG/L	1.0	U
BETA-BHC	UG/L	0.052	U
DELTA-BHC	UG/L	0.052	U
DIELDRIN	UG/L	0.10	U
ENDOSULFAN I	UG/L	0.052	U
ENDOSULFAN II	UG/L	0.10	U
ENDOSULFAN SULFATE	UG/L	0.10	U
ENDRIN	UG/L	0.10	U
ENDRIN ALDEHYDE	UG/L	0.10	U
ENDRIN KETONE	UG/L	0.10	U
GAMMA-BHC (LINDANE)	UG/L	0.052	U
GAMMA-CHLORDANE	UG/L	0.052	U
HEPTACHLOR	UG/L	0.052	U
HEPTACHLOR EPOXIDE	UG/L	0.052	U
METHOXYCHLOR	UG/L	0.52	U
TOXAPHENE	UG/L	5.2	U

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WASTEWATER

METALS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	PURGE TANK 17-JUN-99 9906163-24	
ALUMINUM, TOTAL	UG/L	393	
ANTIMONY, TOTAL	UG/L	2.7	U
ARSENIC, TOTAL	UG/L	3.7	Bfu
BARIUM, TOTAL	UG/L	74.9	Bf
BERYLLIUM, TOTAL	UG/L	0.10	U
CADMIUM, TOTAL	UG/L	0.50	B
CALCIUM, TOTAL	UG/L	60300	
CHROMIUM, TOTAL	UG/L	2.1	B
COBALT, TOTAL	UG/L	0.88	B
COPPER, TOTAL	UG/L	9.3	Bfu
IRON, TOTAL	UG/L	383	
LEAD, TOTAL	UG/L	1.7	B
MAGNESIUM, TOTAL	UG/L	32100	f
MANGANESE, TOTAL	UG/L	51.6	
MERCURY, TOTAL	UG/L	0.10	U
NICKEL, TOTAL	UG/L	7.2	B
POTASSIUM, TOTAL	UG/L	27400	
SELENIUM, TOTAL	UG/L	2.6	U
SILVER, TOTAL	UG/L	0.90	U
SODIUM, TOTAL	UG/L	183000	
THALLIUM, TOTAL	UG/L	3.2	U
VANADIUM, TOTAL	UG/L	2.6	B
ZINC, TOTAL	UG/L	19.9	Bfu

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WASTEWATER

FIELD AND INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS		PURGE TANK 17-JUN-99 9906163-24
COLOR, FIELD			LT BRN
CONDUCTANCE, SPECIFIC	UMHOS/CM		330
ODOR, FIELD			NONE
PH, FIELD	SU		8.17
TEMPERATURE	DEG C		22.3
TURBIDITY, FIELD			MOD
ALKALINITY AS CACO3	MG/L		215
CHLORIDE	MG/L		94.6
CYANIDE, TOTAL	MG/L	<	0.005
NITROGEN, NITRATE + NITRITE	MG/L		2.44
SULFATE	MG/L		202

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QUALITY CONTROL SAMPLES

INORGANIC PARAMETERS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	FIELD BLANK01 17-JUN-99 9906163-20	FIELD BLANK01(F 17-JUN-99 9906163-21	FIELD BLANK02 17-JUN-99 9906163-22	FIELD BLANK02(F 17-JUN-99 9906163-23	FIELD BLANK03 16-JUN-99 9906143-09	FIELD BLANK03(F 16-JUN-99 9906143-10
ALKALINITY AS CACO3	MG/L		2.80		< 1.00		< 1.00
CHLORIDE	MG/L		7.76		6.00		5.40
CYANIDE, TOTAL	MG/L	< 0.005		< 0.005		< 0.005	
NITROGEN, NITRATE + NITRITE	MG/L		< 0.050		< 0.050		< 0.050
SULFATE	MG/L		< 1.00		< 1.00		< 1.00

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QUALITY CONTROL SAMPLES

METALS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	FIELD BLANK01 17-JUN-99 9906163-20		FIELD BLANK01(F 17-JUN-99 9906163-21		FIELD BLANK02 17-JUN-99 9906163-22		FIELD BLANK02(F 17-JUN-99 9906163-23		FIELD BLANK03 16-JUN-99 9906143-09		FIELD BLANK03(F 16-JUN-99 9906143-10	
ALUMINUM, DISSOLVED	UG/L			38.2	U			38.2	U			38.2	U
ANTIMONY, DISSOLVED	UG/L			2.7	U			2.7	U			2.7	U
ARSENIC, DISSOLVED	UG/L			4.1	Bu			2.0	U			2.1	Bu
BARIUM, DISSOLVED	UG/L			5.6	B			0.85	B			0.66	Bu
BERYLLIUM, DISSOLVED	UG/L			0.10	U			0.10	U			0.10	U
CADMIUM, DISSOLVED	UG/L			0.30	U			0.30	U			0.30	U
CADMIUM, TOTAL	UG/L	0.30	U			0.30	U			0.30	U		
CALCIUM, DISSOLVED	UG/L			612	B			98.1	B			57.9	U
CHROMIUM, DISSOLVED	UG/L			1.1	U			1.1	U			1.1	U
COBALT, DISSOLVED	UG/L			0.50	U			0.50	U			0.54	Bu
COPPER, DISSOLVED	UG/L			3.5	B			2.7	B			1.9	B
IRON, DISSOLVED	UG/L			31.6	Bu			30.8	U			30.8	U
LEAD, DISSOLVED	UG/L			1.1	B			1.0	U			1.0	U
LEAD, TOTAL	UG/L	1.0	U			1.0	U			1.0	U		
MAGNESIUM, DISSOLVED	UG/L			70.9	Bu			25.0	Bu			25.1	Bu
MANGANESE, DISSOLVED	UG/L			1.3	B			0.47	B			0.30	U
MERCURY, DISSOLVED	UG/L			0.10	U			0.10	U			0.10	U
NICKEL, DISSOLVED	UG/L			0.90	U			0.90	U			0.90	U
POTASSIUM, DISSOLVED	UG/L			13.5	U			13.5	U			13.5	U
SELENIUM, DISSOLVED	UG/L			2.6	U			2.6	U			2.6	UN
SILVER, DISSOLVED	UG/L			0.90	U			0.90	U			0.90	U
SODIUM, DISSOLVED	UG/L			148	U			148	U			148	U
THALLIUM, DISSOLVED	UG/L			3.2	U			3.2	U			3.3	B
VANADIUM, DISSOLVED	UG/L			0.60	U			0.60	U			0.68	Bu
ZINC, DISSOLVED	UG/L			7.0	B			8.0	B			1.9	U

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QUALITY CONTROL SAMPLES
PESTICIDES AND PCBS
JUNE 1999
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	FIELD BLANK01 17-JUN-99 9906163-20		FIELD BLANK02 17-JUN-99 9906163-22		FIELD BLANK03 16-JUN-99 9906143-09	
4,4'-DDD	UG/L	0.10	U	0.11	U	0.10	U
4,4'-DDE	UG/L	0.10	U	0.11	U	0.10	U
4,4'-DDT	UG/L	0.10	U	0.11	U	0.10	U
ALDRIN	UG/L	0.052	U	0.054	U	0.052	U
ALPHA-BHC	UG/L	0.052	U	0.054	U	0.052	U
ALPHA-CHLORDANE	UG/L	0.052	U	0.054	U	0.052	U
AROCLOR-1016	UG/L	1.0	U	1.1	U	1.0	U
AROCLOR-1221	UG/L	2.1	U	2.2	U	2.1	U
AROCLOR-1232	UG/L	1.0	U	1.1	U	1.0	U
AROCLOR-1242	UG/L	1.0	U	1.1	U	1.0	U
AROCLOR-1248	UG/L	1.0	U	1.1	U	1.0	U
AROCLOR-1254	UG/L	1.0	U	1.1	U	1.0	U
AROCLOR-1260	UG/L	1.0	U	1.1	U	1.0	U
BETA-BHC	UG/L	0.052	U	0.054	U	0.052	U
DELTA-BHC	UG/L	0.052	U	0.054	U	0.052	U
DIELDRIN	UG/L	0.10	U	0.11	U	0.10	U
ENDOSULFAN I	UG/L	0.052	U	0.054	U	0.052	U
ENDOSULFAN II	UG/L	0.10	U	0.11	U	0.10	U
ENDOSULFAN SULFATE	UG/L	0.10	U	0.11	U	0.10	U
ENDRIN	UG/L	0.10	U	0.11	U	0.10	U
ENDRIN ALDEHYDE	UG/L	0.10	U	0.11	U	0.10	U
ENDRIN KETONE	UG/L	0.10	U	0.11	U	0.10	U
GAMMA-BHC (LINDANE)	UG/L	0.052	U	0.054	U	0.052	U
GAMMA-CHLORDANE	UG/L	0.052	U	0.054	U	0.052	U
HEPTACHLOR	UG/L	0.052	U	0.054	U	0.052	U
HEPTACHLOR EPOXIDE	UG/L	0.052	U	0.054	U	0.052	U
METHOXYCHLOR	UG/L	0.52	U	0.54	U	0.52	U
TOXAPHENE	UG/L	5.2	U	5.4	U	5.2	U

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QUALITY CONTROL SAMPLES

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	FIELD BLANK01 17-JUN-99 9906163-20		FIELD BLANK02 17-JUN-99 9906163-22		FIELD BLANK03 16-JUN-99 9906143-09	
2,2'-OXYBIS(1-CHLOROPROPANE)	UG/L	11	U	11	U	10	U
2,4,5-TRICHLOROPHENOL	UG/L	27	U	27	U	25	U
2,4,6-TRICHLOROPHENOL	UG/L	11	U	11	U	10	U
2,4-DICHLOROPHENOL	UG/L	11	U	11	U	10	U
2,4-DIMETHYLPHENOL	UG/L	11	U	11	U	10	U
2,4-DINITROPHENOL	UG/L	27	U	27	U	25	U
2,4-DINITROTOLUENE	UG/L	11	U	11	U	10	U
2,6-DINITROTOLUENE	UG/L	11	U	11	U	10	U
2-CHLORONAPHTHALENE	UG/L	11	U	11	U	10	U
2-CHLOROPHENOL	UG/L	11	U	11	U	10	U
2-METHYLNAPHTHALENE	UG/L	11	U	11	U	10	U
2-METHYLPHENOL	UG/L	11	U	11	U	10	U
2-NITROANILINE	UG/L	27	U	27	U	25	U
2-NITROPHENOL	UG/L	11	U	11	U	10	U
3,3'-DICHLOROBENZIDINE	UG/L	11	U	11	U	10	U
3-NITROANILINE	UG/L	27	U	27	U	25	U
4,6-DINITRO-2-METHYLPHENOL	UG/L	27	U	27	U	25	U
4-BROMOPHENYL-PHENYLETHER	UG/L	11	U	11	U	10	U
4-CHLORO-3-METHYLPHENOL	UG/L	11	U	11	U	10	U
4-CHLOROANILINE	UG/L	11	U	11	U	10	U
4-CHLOROPHENYL-PHENYLETHER	UG/L	11	U	11	U	10	U
4-METHYLPHENOL	UG/L	11	U	11	U	10	U
4-NITROANILINE	UG/L	27	U	27	U	25	U
4-NITROPHENOL	UG/L	27	U	27	U	25	U
ACENAPHTHENE	UG/L	11	U	11	U	10	U
ACENAPHTHYLENE	UG/L	11	U	11	U	10	U
ANTHRACENE	UG/L	11	U	11	U	10	U
BENZO(A)ANTHRACENE	UG/L	11	U	11	U	10	U
BENZO(A)PYRENE	UG/L	11	U	11	U	10	U
BENZO(B)FLUORANTHENE	UG/L	11	U	11	U	10	U
BENZO(G,H,I)PERYLENE	UG/L	11	U	11	U	10	U

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QUALITY CONTROL SAMPLES

SEMIVOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	FIELD BLANK01 17-JUN-99 9906163-20		FIELD BLANK02 17-JUN-99 9906163-22		FIELD BLANK03 16-JUN-99 9906143-09	
BENZO(K)FLUORANTHENE	UG/L	11	U	11	U	10	U
BIS(2-CHLOROETHOXY)METHANE	UG/L	11	U	11	U	10	U
BIS(2-CHLOROETHYL)ETHER	UG/L	11	U	11	U	10	U
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	2	JBu	2	JBu	1	J
BUTYLBENZYLPHTHALATE	UG/L	11	U	11	U	10	U
CARBAZOLE	UG/L	11	U	11	U	10	U
CHRYSENE	UG/L	11	U	11	U	10	U
DI-N-BUTYLPHTHALATE	UG/L	11	U	11	U	2	JBu
DI-N-OCTYLPHTHALATE	UG/L	11	U	11	U	10	U
DIBENZ(A,H)ANTHRACENE	UG/L	11	U	11	U	10	U
DIBENZOFURAN	UG/L	11	U	11	U	10	U
DIETHYLPHTHALATE	UG/L	11	U	11	U	10	U
DIMETHYLPHTHALATE	UG/L	11	U	11	U	10	U
FLUORANTHENE	UG/L	11	U	11	U	10	U
FLUORENE	UG/L	11	U	11	U	10	U
HEXACHLOROBENZENE	UG/L	11	U	11	U	10	U
HEXACHLOROBUTADIENE	UG/L	11	U	11	U	10	U
HEXACHLOROCYCLOPENTADIENE	UG/L	11	U	11	U	10	U
HEXACHLOROETHANE	UG/L	11	U	11	U	10	U
INDENO(1,2,3-CD)PYRENE	UG/L	11	U	11	U	10	U
ISOPHORONE	UG/L	11	U	11	U	10	U
N-NITROSODI-N-PROPYLAMINE	UG/L	11	U	11	U	10	U
N-NITROSODIPHENYLAMINE	UG/L	11	U	11	U	10	U
NAPHTHALENE	UG/L	11	U	11	U	10	U
NITROBENZENE	UG/L	11	U	11	U	10	U
PENTACHLOROPHENOL	UG/L	27	U	27	U	25	U
PHENANTHRENE	UG/L	11	U	11	U	10	U
PHENOL	UG/L	11	U	11	U	10	U
PYRENE	UG/L	11	U	11	U	10	U

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QUALITY CONTROL SAMPLES

VOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	FIELD BLANK01 17-JUN-99 9906163-20		FIELD BLANK02 17-JUN-99 9906163-22		FIELD BLANK03 16-JUN-99 9906143-09		HOLD BLANK1 15-JUN-99 9906131-18		HOLD BLANK2 16-JUN-99 9906143-16		HOLD BLANK3 17-JUN-99 9906163-26	
1,1,1-TRICHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1,2,2-TETRACHLOROETHANE	UG/L	1.0	Uj	1.0	Uj	1.0	U	1.0	U	1.0	U	1.0	U
1,1,2-TRICHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1-DICHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,1-DICHLOROETHENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2,4-TRICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DIBROMOETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DICHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,2-DICHLOROPROPANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,3-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
1,4-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
2-BUTANONE	UG/L	13.9		5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
2-HEXANONE	UG/L	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
4-METHYL-2-PENTANONE	UG/L	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
ACETONE	UG/L	46.3		35.9		5.0	U	5.0	U	5.0	U	5.0	U
BENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
BROMOCHLOROMETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
BROMODICHLOROMETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
BROMOFORM	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
BROMOMETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CARBON DISULFIDE	UG/L	1.0	Jbu	0.7	Jbu	1.0	U	1.3		1.0	JBu	1.0	U
CARBON TETRACHLORIDE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CHLORODIBROMOMETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CHLOROFORM	UG/L	1.0	U	1.0	U	1.0	U	0.8	JBu	0.8	JBu	1.0	Bu
CHLOROMETHANE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CIS-1,2-DICHLOROETHENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
CIS-1,3-DICHLOROPROPENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U

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QUALITY CONTROL SAMPLES

VOLATILE ORGANIC COMPOUNDS

JUNE 1999

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	FIELD BLANK01 17-JUN-99 9906163-20		FIELD BLANK02 17-JUN-99 9906163-22		FIELD BLANK03 16-JUN-99 9906143-09		HOLD BLANK1 15-JUN-99 9906131-18		HOLD BLANK2 16-JUN-99 9906143-16		HOLD BLANK3 17-JUN-99 9906163-26	
ETHYLBENZENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
METHYLENE CHLORIDE	UG/L	1.8	JBbhu	2.1	JBbhu	2.0	U	0.9	uJB	1.0	JBu	1.5	JBu
STYRENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
TETRACHLOROETHENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
TOLUENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
TRANS-1,2-DICHLOROETHENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
TRANS-1,3-DICHLOROPROPENE	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
TRICHLOROETHENE	UG/L	1.0	U	1.0	U	1.0	U	0.4	J	1.0	U	1.0	U
VINYL CHLORIDE	UG/L	1.0	U	1.0	U	1.0	Uj	1.0	U	1.0	U	1.0	U
XYLENE, TOTAL	UG/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U

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QUALITY CONTROL SAMPLES
VOLATILE ORGANIC COMPOUNDS
JUNE 1999
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	TRIP BLANK01 15-JUN-99 9906131-17		TRIP BLANK02 16-JUN-99 9906143-15		TRIP BLANK03 17-JUN-99 9906163-25	
1,1,1-TRICHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U
1,1,2,2-TETRACHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	Uj
1,1,2-TRICHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U
1,1-DICHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U
1,1-DICHLOROETHENE	UG/L	1.0	U	1.0	U	1.0	U
1,2,4-TRICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	1.0	U	1.0	U	1.0	U
1,2-DIBROMOETHANE	UG/L	1.0	U	1.0	U	1.0	U
1,2-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U
1,2-DICHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U
1,2-DICHLOROPROPANE	UG/L	1.0	U	1.0	U	1.0	U
1,3-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U
1,4-DICHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U
2-BUTANONE	UG/L	5.0	U	5.0	U	5.0	U
2-HEXANONE	UG/L	5.0	U	5.0	U	5.0	U
4-METHYL-2-PENTANONE	UG/L	5.0	U	5.0	U	5.0	U
ACETONE	UG/L	5.0	U	5.0	U	5.0	U
BENZENE	UG/L	1.0	U	1.0	U	1.0	U
BROMOCHLOROMETHANE	UG/L	1.0	U	1.0	U	1.0	U
BROMODICHLOROMETHANE	UG/L	1.0	U	1.0	U	1.0	U
BROMOFORM	UG/L	1.0	U	1.0	U	1.0	U
BROMOMETHANE	UG/L	1.0	U	1.0	U	1.0	U
CARBON DISULFIDE	UG/L	2.9	f	1.0	U	13.9	f
CARBON TETRACHLORIDE	UG/L	1.0	U	1.0	U	1.0	U
CHLOROBENZENE	UG/L	1.0	U	1.0	U	1.0	U
CHLORODIBROMOMETHANE	UG/L	1.0	U	1.0	U	1.0	U
CHLOROETHANE	UG/L	1.0	U	1.0	U	1.0	U
CHLOROFORM	UG/L	0.6	JBhu	0.6	JBhu	0.6	JBhu
CHLOROMETHANE	UG/L	1.0	U	1.0	U	1.0	U
CIS-1,2-DICHLOROETHENE	UG/L	1.0	U	1.0	U	1.0	U
CIS-1,3-DICHLOROPROPENE	UG/L	1.0	U	1.0	U	1.0	U

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QUALITY CONTROL SAMPLES
VOLATILE ORGANIC COMPOUNDS
JUNE 1999
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

PARAMETER	UNITS	TRIP BLANK01 15-JUN-99 9906131-17		TRIP BLANK02 16-JUN-99 9906143-15		TRIP BLANK03 17-JUN-99 9906163-25	
ETHYLBENZENE	UG/L	1.0	U	1.0	U	1.0	U
METHYLENE CHLORIDE	UG/L	0.8	JBhu	2.0	U	2.1	Bhu
STYRENE	UG/L	1.0	U	1.0	U	1.0	U
TETRACHLOROETHENE	UG/L	1.0	U	1.0	U	1.0	U
TOLUENE	UG/L	1.0	U	1.0	U	1.0	U
TRANS-1,2-DICHLOROETHENE	UG/L	1.0	U	1.0	U	1.0	U
TRANS-1,3-DICHLOROPROPENE	UG/L	1.0	U	1.0	U	1.0	U
TRICHLOROETHENE	UG/L	1.0	U	1.0	U	0.5	J
VINYL CHLORIDE	UG/L	1.0	Uj	1.0	Uj	1.0	U
XYLENE, TOTAL	UG/L	1.0	U	1.0	U	1.0	U

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