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REMEDIAL INVESTIGATION FOR OPERABLE UNIT 4 (OU 4) STUDY AREAS 12, 13 AND 14
VOLUME 2 OF 2 NTC ORLANDO FL
1/1/2001
HARDING LAWSON ASSOCIATES

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REMEDIAL INVESTIGATION
OPERABLE UNIT 4
STUDY AREAS 12, 13, AND 14 (AREA C)

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

VOLUME II: APPENDICES F THROUGH R

UNIT IDENTIFICATION CODE: N65928
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JANUARY 2001

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA 29418

Harding Lawson Associates
Engineering and Environmental Services
2533 Greer Road, Suite 6
Tallahassee, Florida 32308 - (850) 656-1293

Harding Lawson Associates
2533 Greer Road
Suite 6
Tallahassee, FL 32308
Telephone: 850/656-1293
Fax: 850/656-3386

Engineering, Environmental
and Construction Services

January 17, 2001

Document No.: 2545.037

Commanding Officer
SOUTHNAVFACENGCOM
ATTN: Ms. Barbara Nwokike, Code 187300
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, SC 29406

SUBJECT: Final Remedial Investigation Report
Operable Unit (OU) 4
Naval Training Center (NTC), Orlando, Florida
Contract No.: N62467-89-D-0317/CTO 135

Dear Barbara:

Enclosed please find two copies of the Final NTC Orlando OU 4 Remedial Investigation Report. This report includes revisions in response to comments received on the Final Draft OU 4 RI Report, as well as the redline/strikeout interim version that was issued for comment in the spring of 2000 (Appendix R). Responses to comments for the redline/strikeout RI are also attached to this letter.

The majority of comments to the redline/strikeout document were provided by USEPA, focusing primarily on the sources of inorganics, PAHs, pesticides, and PCBs in Lake Druid. After a comparison of Lake Druid data with stormwater sediments collected throughout the state of Florida, the OPT had previously agreed that the most likely sources of these compounds were urban stormwater discharges to the lake, and likely unrelated to any Navy activities at Area C.

However, in comments to the redline/strikeout document, USEPA suggested that PCBs (being flame retardant) could have been used to treat clothing laundered in Building 1100, that sources of PCBs were unlikely present in the residential neighborhoods surrounding Lake Druid, and therefore the source of PCBs in the lake was likely the Navy. We have carefully researched these possibilities, and the attached responses include considerable detail and references that we feel demonstrate PCBs were not used to treat clothing, and the likely sources of PCBs in Lake Druid include the surrounding urban environment, as well as potential atmospheric deposition. We do not believe Navy activities at Area C contributed to the PCBs in the lake.

If you have questions or comments regarding this document, please contact me at (781) 213-5652 or John Kaiser at (407) 522-7570.

Very truly yours,

HARDING LAWSON ASSOCIATES

Mark J. Salvetti, P.E.
Task Order Manager

Enclosures

cc:

W. Hansel (SDIV)
D. Grabka (FDEP)
N. Rodriguez (USEPA)
S. Tsangaris (CH2M HILL)
S. McCoy (Tetra Tech NUS)
J. Kaiser (HLA)
R. Allen (HLA)
File

APPENDIX F

APPENDIX F

ECOLOGICAL RISK ASSESSMENT

Table F.1-1
Vegetation Observed at OU4 During the October 1997 Habitat Survey

Scientific Name	Common Name	OU 4 [a] Wooded Area	Vegetative Type
Albizia julibrissin	Mimosa; silk tree	o	substratum
Ambrosia artemissifolia	Ragweed	c	ground
Andropogon virginicus	Broom sedge	o	emergent wetland
Andropogon glomeratus	Broom sedge	o	upland
Axonopus spp.	Carpet grass	o	ground
Bidens frondosa	Beggar's tick	o	substratum
Blechnum serrulatum	Swamp fern	d	wetland substratum
Boehmeria cylindrica	False nettle	c	substratum
Buyla nodiflora??	Grapeweed	c	ground
Callicarpa americana	Beautyberry	c	substratum
Carex spp.	Sedges	c	emergent wetland
Cenchrus sp.	Sandspur	o	ground
Chamaesyce hypercifolia	Spurge	o	substratum
Citrus sp.	Citrus tree	r	canopy
Cladium jamaicense	Saw grass	d	emergent wetland
Colocasia escoleuta	Wild toro	d	wetland substratum
Cyperus haspan	Sedge	d	emergent wetland
Cyperus pseudovegetus	Sedge	o	emergent wetland
Desmodium spp.	Beggar's lice	o	substratum
Digitaria spp.	Crabgrass	c	ground
Dioscorea bulbifera	Air yam	o	substratum
Eleocharis sp.	Spike rush	o	emergent wetland
Elodea canadensis	Elodea	o	emergent wetland
Eupatorium capillifolium	Dog fennel	c	substratum
Gordonia lasianathus	Loblolly bay	c	wetland canopy
Habenaria repens	Water-spider orchid	o	emergent wetland
Hygrophila lacustris	Lake hygrophila	o	emergent wetland
Hydrocotyle sp.	Water pennywort	c	ground (upland and wetland)
Hypericum sp.	Hypericum	o	emergent wetland
Ilex myrtifolia	Myrtle-leaf holly	c	substratum
Ipomoea sp.	Morning Glory	c	canopy-vine
Juncus spp.	Rushes	d	emergent wetland
Lantana camara	Lantana	c	substratum
Lonicera spp.	Trumpet honeysuckle	c	substratum
Ludwigia leptocarpa	Ludwigia	d	substratum
Ludwigia peruviana	Primrose willow	d	substratum
Lyonia lucida	Fetterbush	o	substratum
Magnolia grandiflora	Magnolia	o	canopy
Magnolia virginiana	Sweet bay	o	canopy
Melia azedarach	Chinaberry	r	substratum
Mikania scandens	Climbing hempweed	o	wetland substratum-vine
Morus alba	White mulberry	o	substratum
Myrica cerifera	Bayberry; wax myrtle	d	substratum
Nuphar luteum orbiculatum	Yellow cow lily	d	floating wetland
Nymphaea ordorata	Fragrant white water lily	d	floating wetland

Table F.1-1
Vegetation Observed at OU4 During the October 1997 Habitat Survey

Scientific Name	Common Name	OU 4 [a] Wooded Area	Vegetative Type
Nyssa sylvatica	Black gum; sourgum	o	canopy
Oenothera laciniata	Evening primrose	d	substratum
Osmunda cinnomomea	Cinnamon fern	d	wetland substratum
Osmunda regalis	Royal fern	d	wetland substratum
Panicum spp.	Panic grass	c	ground
Paspalum spp.	Paspalum grass	o	ground
Passiflora incarnata	Passion flower	o	substratum
Parthenocissus quinquefolia	Virginia creeper	d	canopy - vine
Persea borbonia	Red bay	o	wetland canopy
Persea palustris	Swamp red bay	o	wetland canopy
Phragmites australis	Common reed	d	emergent wetland
Pinus elliottii	Slash pine	o	canopy
Pinus palustris	Longleaf pine	o	canopy
Pinus serotina	Pond pine	o	wetland canopy
Poinsettia heterophylla	Painted leaf	c	substratum
Pontederia cordata	Pickerel weed	d	emergent wetland
Polygonum punctatum	Knotweed	o	emergent wetland
Pteridium aquilinum	Bracken fern	o	wetland substratum
Quercus hemisphaerica	Laurel oak	c	canopy
Quercus myrtifolia	Myrtle oak	c	canopy
Quercus phellos	Willow oak	c	canopy
Rhexia mariana	Pale meadow beauty	o	substratum
Rhus copallina	Winged sumac	c	substratum
Sabal minor	Dwarf palmetto	c	substratum
Sabal palmetto	Cabbage Palm	c	substratum
Salix nigra	Black willow	o	wetland canopy
Salvinia rotundifolia	water fern; water spang	c	floating wetland
Sambucus simpsonii	Florida elder	d	substatum
Schinus terebinthifolius	Brazilian Pepper	d	canopy
Scirpus sp.	Sedge	o	emergent wetland
Senecio aureus	Hawkweed	o	ground
Serenoa repens	Saw palmetto	o	substratum
Smilax bona-nox	Bullbriar; greenbriar	o	substratum
Thelypteris palustris	Marsh fern	d	wetland substratum
Tillandsia usneoides	Spanish moss	c	epiphyte
Tradescantia ohiensis	Spiderwort	o	ground
Typha domingensis	Cattail	d	emergent wetland
Verbena brasiliensis	Verbena	o	ground
Vitis rotundifolia	Muscadine Grape	d	canopy - vine
Woodwardia aerolata	Netted chain fern	c	wetland substratum
Xyris fimbriata	Yellow-eyed grass	o	ground

NOTES:
[a] d = dominant; c = common; o = occasional; r = rare

Table F.1-2

Summary of Bioaccumulation and Bioconcentration Data

Remedial Investigation Report
Naval Training Center, Orlando OU 4
Orlando, Florida

Analyte	log K_{ow} [b]		Soil/Sediment Bioaccumulation Factor [a]						Surface Water Bioconcentration Factor [a]
			Terrestrial Invertebrate [c]	Terrestrial Plant [d]	Mammal [e]	Bird [f]	Aquatic [g]	Aquatic Plant	Fish
VOLATILES									
1,1-Dichloroethene	2.1		[h]	[h]	[h]	[h]	NA	NA	[h]
1,2-Dichloroethene (total)	2.1		[h]	[h]	[h]	[h]	NA	NA	NA
Acetone	-0.24		NA	NA	NA	NA	NA	NA	[h]
Carbon disulfide	2.2		[h]	[h]	[h]	[h]	[h]	[h]	NA
Methylene chloride	1.3		NA	NA	NA	NA	NA	NA	[h]
Tetrachloroethene	3.4		NA	NA	NA	NA	NA	NA	[h]
Toluene	2.8		[h]	[h]	[h]	[h]	NA	NA	[h]
Trichloroethene	2.4		[h]	[h]	[h]	[h]	NA	NA	NA
Vinyl chloride	1.4		[h]	[h]	[h]	[h]	NA	NA	NA
SEMIVOLATILES									
4-Methylphenol	2.0	2.0	[h]	[h]	[h]	[h]	[h]	[h]	NA
Benzo(a)anthracene	5.7	5.5	5.0E-02	5.1E-03	4.8E-01	NA	[h]	[h]	[h]
Benzo(a)pyrene	6.0	5.5	5.0E-02	5.1E-03	4.8E-01	NA	[h]	[h]	[h]
Benzo(b)fluoranthene	6.1	5.5	5.0E-02	5.1E-03	4.8E-01	NA	[h]	[h]	[h]
Benzo(g,h,i)perylene	6.6	5.5	5.0E-02	5.1E-03	4.8E-01	NA	[h]	[h]	[h]
Benzo(k)fluoranthene	6.1	5.5	5.0E-02	5.1E-03	4.8E-01	NA	[h]	[h]	[h]
Carbazole	3.8 [i]	3.8	5.0E-02	4.9E-02	1.5E-01	NA	[h]	[h]	[h]
Chrysene	5.7	5.5	5.0E-02	5.1E-03	4.8E-01	NA	[h]	[h]	[h]
Dibenz(a,h)anthracene	6.5	5.5	5.0E-02	5.1E-03	4.8E-01	NA	[h]	[h]	[h]
bis(2-Ethylhexyl)phthalate	5.1	5.1	5.0E-02	8.7E-03	1.9E-01	NA	5.0E-02	8.7E-03	[h]
Fluoranthene	5.0 [j]	5.5	5.0E-02	5.1E-03	4.8E-01	NA	5.0E-02	5.1E-03	[h]
Fluorene	4.2	5.5	5.0E-02	5.1E-03	4.8E-01	NA	[h]	[h]	[h]
Indeno(1,2,3-cd)pyrene	6.6	5.5	5.0E-02	5.1E-03	4.8E-01	NA	[h]	[h]	[h]
Phenanthrene	4.5	5.5	5.0E-02	5.1E-03	4.8E-01	NA	[h]	[h]	[h]
Pyrene	5.3	5.5	5.0E-02	5.1E-03	4.8E-01	NA	5.0E-02	5.1E-03	[h]
ESTICIDES/PCBs									
4,4'-DDD	6.0		3.3E+00 [ao]	1.3E-03 [l]	1.2E+00 [ap]	2.9E+00 [aq]	[h]	[h]	[h]
4,4'-DDE	5.7		1.7E+00 [ao]	2.0E-03 [l]	1.2E+00 [ap]	2.9E+00 [aq]	2.1E+01 [k]	1.0E-02 [l]	[h]
4,4'-DDT	6.4		5.7E-01 [ao]	7.7E-04 [l]	1.2E+00 [ap]	2.9E+00 [aq]	[h]	[h]	3.4E+04 [m]
Aroclor-1254	7.1 [n]		5.8E+00 [o]	1.2E-01 [p]	3.8E+00 [q]	3.2E-01 [r]	1.2E+01 [s]	1.2E-01 [p]	[h]
Endosulfan I	3.6		[h]	[h]	[h]	[h]	5.5E+00 [t]	6.4E-02	[h]
Endrin ketone	3.1 [u]		1.9E+00 [t]	1.2E-01	6.2E-02 [ar]	5.9E-01 [ar]	[h]	[h]	5.5E+03 [m]
Heptachlor	4.3		[h]	[h]	[h]	[h]	1.0E+00 [t]	2.5E-02	[h]
Methoxychlor	4.8		5.7E-01 [v]	1.3E-02	1.0E-06 [w]	2.9E+00 [x]	[h]	[h]	[h]
alpha-Chlordane	5.5		[h]	[h]	[h]	[h]	1.6E+00 [t]	5.1E-03	[h]
delta-BHC	4.1		[h]	[h]	[h]	[h]	2.6E+00 [t]	3.3E-02	[h]
gamma-BHC	4.1		2.6E+00 [as]	3.3E-02	1.4E-01 [ar]	1.5E-01 [ar]	[h]	[h]	[h]
INORGANICS									
Aluminum	NA		7.5E-02 [y]	8.0E-04 [z]	7.5E-02 [aa]	NA	7.5E-02 [y]	6.0E-03 [ab]	[h]
Barium	NA		7.5E-03 [y]	3.0E-02 [z]	7.5E-03 [aa]	7.5E-03 [aa]	[h]	[h]	[h]
Beryllium	NA		5.0E-02 [y]	2.0E-03 [z]	5.0E-02 [ac]	NA	[h]	[h]	[h]
Cadmium	NA		1.4E+00 [ad]	3.3E+01 [ae]	2.1E+00 [aa]	3.8E-01 [af]	[h]	[h]	[h]
Chromium	NA		1.6E-01 [o]	1.5E-03 [z]	2.8E-01 [aa]	2.8E-01 [aa]	[h]	[h]	[h]
Lead	NA		7.8E-02 [ag]	0.0E+00 [ae]	1.5E-02 [aa]	NA	7.8E-02 [ag]	5.6E-02 [ah]	[h]
Manganese	NA		2.0E-02 [y]	5.0E-02 [z]	2.0E-02 [aa]	NA	[h]	[h]	[h]
Mercury	NA		6.8E-02 [ai]	1.8E-01 [z]	1.0E-02 [aj]	2.3E+00 [aj]	1.7E+01 [ak]	4.9E-02 [ab]	[h]
Selenium	NA		7.6E-01 [al]	9.0E-03 [am]	7.5E-01 [aa]	5.1E-01 [an]	[h]	[h]	[h]
Silver	NA		1.5E-01 [y]	8.0E-02 [z]	1.5E-01 [aa]	NA	[h]	[h]	[h]
Vanadium	NA		1.2E-01 [y]	1.1E-03 [z]	1.3E-01 [aa]	NA	[h]	[h]	[h]
Zinc	NA		1.8E+00 [o]	6.1E-01 [af]	2.1E+00 [aa]	NA	[h]	[h]	[h]

NOTES:

[a] Units for bioaccumulation factors (BAFs) are mg/kg fresh wt tissue over mg/kg dry wt soil for terrestrial invertebrates and plants, mg/kg fresh wt. tissue over mg/kg fresh wt. food for small mammals and small birds, and mg/kg fresh wt. tissue over mg/kg fresh wt. sediment for aquatic plants and organisms. No BAFs were calculated for VOAs since available evidence suggests that these analytes do not bioaccumulate. Units for bioconcentration factors (BCFs) are µg/kg fresh wt. tissue over µg/L water. BCFs are presented for only those analytes that are selected as surface water CPCs.

[b] From Superfund Chemical Data Matrix (USEPA, 1993b) unless otherwise noted. Log Kows for classes of semivolatile compounds were averaged to provide an average BAF value. Compounds were grouped accordingly: PAHs (5.5) and bis(2-Ethylhexyl)phthalate (5.1), carbazole (3.8), and 4-methylphenol (2.0).

[c] Average of earthworm BAFs for SVOCs (Beyer, 1990) converted from dry weight to wet weight assuming earthworm is 80% water, unless otherwise noted. When no earthworm data were available, the BAF for small mammals was used as a surrogate.

Table F.1-2
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Remedial Investigation Report
Naval Training Center, Orlando OU 4
Orlando, Florida

Analyte	log K_{ow} [b]	Soil/Sediment Bioaccumulation Factor [a]						Surface Water Bioconcentration Factor [a]
		Terrestrial Invertebrate [c]	Terrestrial Plant [d]	Mammal [e]	Bird [f]	Aquatic [g]	Aquatic Plant	Fish

[d] Plant BAF calclulated using the following equation presented by Travis and Arms (1988) unless otherwise noted:
log (Plant Uptake Factor)=1.588-0.578 (log Kow). Converted from dry weight to wet weight plant concentration assuming 80% water content.
[e] Calculated using the following equation in Travis and Arms (1988) for semivolatile organic analytes with log Kows >5:
log BTF (biotransfer factor) = log Kow - 7.6; result multiplied by average ingestion rates for non-lactating and lactating test animals to convert from BTFs to BAFs, and divided by a factor of 0.2 to convert from dry feed to fresh feed. There is an uncertainty involved in using this equation for PAHs because this study did not use any PAHs in the regression analysis. BAFs for analytes with log Kows <5 are assumed to be 0.15 because they are unlikely to bioaccumulate in animal tissue (Maughan, 1993).
[f] Bioaccumulation data are generally lacking for birds. When no bird data were available, the BAF for small mammals was used as a surrogate.
[g] Used to represent bioaccumulation from sediment and aquatic invertebrates. Sediment BAFs are presented for only those analytes that were selected as sediment CPCs. When no aquatic BAF data were available, the BAF for terrestrial inverebrates was used as a surrogate.
[h] This analyte was not detected in the medium this receptor group would liekly be found. Receptor exposures to analytes detected in surface soil include terrestrial invertebrates, terrestrial plants, mammals, and birds. Receptor exposures to analytes detected in surface water and sediment include aquatic invertebrates, aquatic plants, and amphibians.
[i] Provided in Bamthouse *et al.* (1988).
[j] USEPA (1992), Dermal Exposure Guidance.
[k] Sediment to amphipod mean biomagnification factor for total DDT in Lake Michigan and Lake Ontario (Evans et al., 1991).
[l] Geometric mean of 4,4'-DDT, 4,4'-DDD, and 4,4'-DDE BAFs (fresh wt/dry wt) reported for roots (carrot, potato, sugar beet), grains (corn, oats), and legumes (alfalfa) derived from USEPA (1985b) converted from dry weight to wet-weight per values provided by Suter (1993).
[m] Geometric mean of BCFs obtained from AQUIRE (1994) and AWQC documents (calculated in Appendix F, Table F-2).
[n] USEPA (1990a) - basics of Pump-and-Treat Ground-Water Remediation Technology
[o] BCF for earthworms from Diercxsens et al. (1985).
[p] Arthmetic mean BAF for corn, leaves, carrots, beets, sugarbeets, radishes, and soybeans (tops, roots, and whole plants) from USEPA (1985a) and Webber etal. (1983).
[q] BAF calculated from discussion in Eisler (1986) stating that Aroclor 1254 residues in subcutaneous fat of adult minks were up to 38 times dietary levels. Converted to whole body concentrations assuming 10% lipid content.
[r] BAF calculated from data presented in Eisler, 1986. Kestrels fed 33 mg PCB/kg diet for 62-69 days accumulated 107 mg PCB/kg lipid weight in muscle Assuming muscle is 10%lipid content, the muscle concentration is about 10.7 mg/kg.
[s] Amphipod to sediment mean biomagnification factor for total PCBs in Lake Michigan and Lake Ontario (Evans et al., 1991).
[t] Geometric mean of reported BAFs for earthworms (Gish, 1970) converted from dry weight to wet weight assuming 80% water composition of earthworms. Value for gamma-chlordane used as a surrogate for alpha-chlordane. Value for gamma-BHC used as a surrogate for delta-BHC. Value for dieldrin used as a surrogate for Endosulfan I.
[u] Arthur D. Little, Inc. (1981).
[v] Value for 4,4'-DDT used as a surrogate. Geometric means of 4,4'-DDT [Davis (1968), Davis & Harrison (1966), Wheatley & Hardman (1968), Bailey et al. (1970), Cramp & Olney (1967), and Beyer & Gish (1980)].
Dry soil concentrations calculated assuming 10% moisture content in sandy-loam soils (Donahue et al., 1977).
[w] BAFs from Garten & Trabalka (1983) were converted from (mg/kg of fat)/(mg/kg of diet) to (mg/kg fresh wt.)/(mg/kg diet) by multiplying the value by an assumed fat content of 10%.
[x] Value for 4,4'-DDT used as a surrogate. BAF for shrews and voles calculated using measured concentrations of DDTR (4,4'-DDT and it's daughter products) in stomach content and in whole body (Forsyth & Petrle, 1984).
[y] Prey-specific value not available; value shown is small mammal BAF for this chemical.
[z] Value from Baes et al. (1984) for leafy portions of plants multiplied by 0.2 to represent 80% water composition of plants.
[aa] Value derived from biotransfer factors (BTFs), presented in Baes et al. (1984) for uptake into cattle. BTF converted to BAF by multiplying by food ingestion rate of 50 kg/day wet weight.
[ab] Aquatic plant BAFs derived from an uptake study (Cherry & Guthrie, 1979) with two sedge species, *Andropogon virginicus* and *Cyperus retrofractus*, that were exposed to contaminated sediment. Values were converted from dry weight plant tissue to wet weight by applying a factor of 0.2 (assuming plants are 80% water).
[ac] Mean of values reported for *Sorex araneus* in MacFadyen (1980).
[ad] Mean of values reported for soil invertebrates in MacFadyen (1980) converted from dry weight to wet weight.
[ae] Mammal value for copper and plant value for cadmium from Levine et al., 1989. Lead does not accumulate in plant tissue, therefore, a BAF of zero was assigned.
[af] Based on accumulation of cadmium in kidneys of European quail in Pimentel et al. (1984).
[ag] Geometric mean of BAF values (fresh wt./dry wts) for worms and woodlice (USEPA, 1985c). Fresh weight tissue concentrations calculated assuming 80% body water content.
[ah] Value for lead from Mudroch & Capobianco (1979) represent an average of BAFs from sediment in several lakes, rivers, and bays into water lilies. Value converted from dry weight plant tissue to wet weight by applying a factor of 0.2 (assuming plants are 80% water).
[ai] Uptake value (fresh wt./dry wt.) for earthworms from USEPA (1985d) sludge document. Fresh weight tissue concentrations calculated assuming 80% body water content.
[aj] USEPA, 1985d.
[ak] Based on the ranges of mercury concentrations in sediment and macroinvertebrates in an eight lake ecosystem in Sweden. Sediment concentrations ranged from 0.05 to 0.3 µg/g dry weight (mid point = 0.18 µg/g) and macroinvertebrate concentrations ranged from 0.02 to 6 µg/g dry weight (mid point = 3.01 µg/g). Based on these midpoints, a bioaccumulation factor of 16.7 was obtained.
[al] Average of values for industrial soils from Beyer and Cromatie (1987) multiplied by 0.2 to represent 80% water composition in earthworms.
[am] Based on reported ratio of selenium in plant tissue and iron fly ash amended soil (Stoewsand et. al., 1978).
[an] Based on average of reported ratio of selenium in diet to liver, kidney, and breast tissue of chickens (Eisler, 1985a).
[ao] Geometric means of 4,4'-DDT [Davis (1968), Davis & Harrison (1966), Wheatley & Hardman (1968), Bailey et al. (1970), Cramp & Olney (1967), and Beyer & Gish (1980)], 4,4'-DDE [Davis (1968), Davis & Harrison (1966), Cramp & Olney (1967), Collett & Harrison (1968), Hunt & Sacho (1969), and Gish (1970)], and 4,4-DDD [Barker (1958), Davis (1968), Davis & Harrison (1966), Cramp & Olney (1967), Collett & Harrison (1968), Wheatley & Hardman (1968), Hunt & Sacho (1969), Bailey et al. (1970), Dimond

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Summary of Bioaccumulation and Bioconcentration Data

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Naval Training Center, Orlando OU 4
Orlando, Florida

Analyte	log K_{ow} [b]	Soil/Sediment Bioaccumulation Factor [a]						Surface Water Bioconcentration Factor [a]
		Terrestrial Invertebrate [c]	Terrestrial Plant [d]	Mammal [e]	Bird [f]	Aquatic [g]	Aquatic Plant	Fish

et al. (1970), Gish (1970), and Beyer & Gish (1980)] reported for earthworms. Dry soil concentrations calculated assuming 10% moisture content in sandy-loam soils (Donahue et al., 1977).

[ap] BAF for shrews and voles calculated using measured concentrations of DDT_R in stomach content and in whole body (Forsyth & Petrle, 1984).

[aq] Whole-body pheasant BAF for 4,4'-DDT presented in USEPA (1985b); derived from Kenaga (1973). Used as surrogate for other pesticides for both birds and mammals.

[ar] BAF from Garten and Trabalka (1985), multiplied by 0.1 to convert from (mg/kg of fat)/(mg/kg of diet) to (mg/kg fresh weight)/(mg/kg of diet). When possible, the value for rodents was used for small mammals; if unavailable, data for swine, sheep, cows, or dogs were used instead. When possible, the values for small birds were used; if unavailable, data for poultry were used instead.

NA = Not available

ıble F.1-3
Bioconcentration Data

Remedial Investigation, OU 4
Naval Training Center, Orlando
Orlando, Florida

Chemical Name	Species	Age	Exposure	Concentration (µg/L)	BCF	ln (BCF)	Reference		Year of Publ.
Pesticides									
4,4'-DDT	Lepomis macrochirus; Bluegill	.1 CM, JUVENILE	5 days	0.249	23,000	10.04325	AQUIRE, 1994	216498	94
	Lepomis macrochirus; Bluegill	.1 CM, JUVENILE	5 days	0.028	25,000	10.12663	AQUIRE, 1994	216498	94
	Lepomis macrochirus; Bluegill	.1 CM, JUVENILE	28 days	0.249	24,000	10.08581	AQUIRE, 1994	216498	94
	Lepomis macrochirus; Bluegill	.1 CM, JUVENILE	28 days	0.028	25,000	10.12663	AQUIRE, 1994	216498	94
				Average ln(BCF) for Bluegill =		**10.10**			
	Salvelinus namaycush; Lake trout, siscowet	EARLING, 29.5 G	90 days	0.006 to 0.009	52,750	10.87332	AQUIRE, 1994	212049	94
	Salvelinus namaycush; Lake trout, siscowet	EARLING, 29.5 G	120 days	0.006 to 0.009	44,286	10.69842	AQUIRE, 1994	212049	94
	Salvelinus namaycush; Lake trout, siscowet	EARLING, 29.5 G	152 days	0.006 to 0.009	45,250	10.71996	AQUIRE, 1994	212049	94
				Average ln(BCF) for Lake trout =		**10.76**			
				Geometric Mean BCF for 4,4'-DDT = 33,852					
Endrin ketone	Ictalurus punctatus, Channel catfish				2,000	7.600902	USEPA, 1980a		80
	Jordanella floridae, Flagfish				15,000	9.615805	USEPA, 1980a		80
				Average ln(BCF) for Fish =		**8.61**			
				Geometric Mean BCF for Endrin ketone = 5,477					

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Table F.1-4
Ingestion Toxicity Information for Wildlife

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Naval Training Center, Orlando OU4
Orlando, Florida

Chemical	Test Species	Test Type	Duration	Effect	Lethal RTV mg/kgBW-day			Sublethal RTV mg/kgBW-day			Reference
					Oral LD50	LOAEL	RTV [a]	LOAEL	NOAEL	RTV [a]	
VOLATILE ORGANIC COMPOUNDS											
1,1-Dichloroethene (surrogat	Rat	Single oral dose		Mortality	200		40				IRIS, 1988
for 1,2-DCE)	Rat	Oral (chronic)	2 years	Liver lesions				9		0.9	IRIS, 1988
1,2-Dichloroethene											
Acetone	Rat	Oral	NR	Reproductive effects				273,000		27,300	RTECS, 1993
	Rat	Oral LD50	NR	Mortality	5,800						RTECS, 1993
	Rat	Oral LD50		Mortality	9,750						Sax, 1984
	Mouse	Oral LD50	NR	Mortality	3,000		600				RTECS, 1993
	Rabbit	Oral LD50	NR	Mortality	5,340						RTECS, 1993
Carbon disulfide	Rabbit	Converted inhalation	34 weeks	Fetotoxicity/malformations					11	11	IRIS, 1991
Methylene chloride	Rat	Oral LD50	NR	Mortality	1,600		320				RTECS, 1994
	Dog	Oral LD50	NR	Mortality	3,000						RTECS, 1994
	Rabbit	Oral LD50	NR	Mortality	1,900						RTECS, 1994
	Rat	Oral (chronic)	2 years	Liver toxicity				52.6	5.9	5.9	IRIS, 1993
	Rat	Oral (subchronic)	3 months	Mortality and histopathology					12.5		USEPA, 1984a
Tetrachloroethene	Rat	Single oral dose		Mortality	8850						NIOSH, 1985
	Mouse	Single oral dose		Mortality	8100		1,620				TDB, 1984
	Mouse	Oral (subchronic)	6 weeks	Hepatotoxicity				100		10	Buben and O'Flaherty, 1985
Toluene	Rat	Oral (subchronic)	13 weeks	Incr. liver and kidney weight				446			IRIS, 1991
	Rat	Oral LD50		Mortality	5,000		1,000				NIOSH, 1985
	Mouse	Oral (subchronic)	76 days	Decreased open field activity				76		8	ATSDR, 1992a
Trichloroethene	Mouse	Single oral dose		Mortality	2,402		480				NIOSH, 1985
	Rat	Single oral dose		Mortality	7,193		1,439				NIOSH, 1985
	Mouse	Oral (multi-generation	12 weeks	Decr. dam and fetal wght.				750		75	ATSDR, 1991a
Vinyl chloride	Rat	Oral (subchronic)	13 weeks	Hematological effects				130		13	USEPA, 1980b
	Rat	Single oral dose		Mortality	500		100				NIOSH, 1985
SEMIVOLATILE ORGANIC COMPOUNDS											
4-Methylphenol	Rat	Single oral dose		Mortality	1800		360				Verschueren, 1983
	Rat	Oral		Decreased RBC counts				175			ATSDR, 1990
	Rabbit	Single oral dose		Mortality	1100		220				Verschueren, 1983
	Rat	Oral (subchronic)	13 weeks	CNS stimulation				50			ATSDR, 1990
	Rat	Single oral dose	90 days	Loss in body weight/neurotoxicity					50	50	USEPA, 1991
Acenapythylene	Mouse	Oral (chronic)	90 days	Liver weight increase					175	175	IRIS, 1990
	Rat	Oral (chronic)	32 days	Physiological changes				2,000			USEPA, 1984b
Anthracene	Mouse	Oral LD50	NR	Mortality	17,000		3,400				RTECS, 1993
	Rodents	Oral (chronic)	NS	Carcinogenicity				3,300			Eisler, 1987a
	Mouse	Oral (chronic)	90 days	Clinical and pathological effects					1,000	1,000	IRIS, 1990
Benzo(a)anthracene	Rodents	Oral (chronic)	NS	Carcinogenicity				2			Eisler, 1987a
Benzo(a)pyrene (surrogate fo	Rat	Oral (chronic)	Pregnancy	Sterility in offspring				40			USEPA, 1984c
Dibenz(a,h)anthracene)	Rat	Oral (chronic)	3.5 months	Reproductive				50			USEPA, 1984c
	Mouse	Oral	Multi-gener	Decr. fert. of F1; decr. F2 litter				10		1	MacKenzie and Angevine, 1981

Table F.1-4
Ingestion Toxicity Information for Wildlife

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Orlando, Florida

Chemical	Test Species	Test Type	Duration	Effect	Lethal RTV mg/kgBW-day			Sublethal RTV mg/kgBW-day			Reference
					Oral LD50	LOAEL	RTV [a]	LOAEL	NOAEL	RTV [a]	
	Mouse	Oral (subchronic)	6 months	Mortality		120	12				ATSDR, 1993a
Benzo(b)fluoranthene and Benzo(k)fluoranthene	Rodents	Oral (chronic)	NS	Carcinogenicity				40			Eisler, 1987a
Benzo(g,h,i)perylene	Rodents	Oral (chronic)	NS	Carcinogenicity				99			Eisler, 1987a
bis(2-Ethylhexyl)phthalate	Rat	Oral LD50	NR	Mortality	30,600						RTECS, 1993
	Rat	Oral	NR	Reproductive effects				7,140			RTECS, 1993
	Rat	Oral	NR	Reproductive effects				35		3.5	RTECS, 1993
	Rat	Oral	NR	Reproductive effects				6,000			RTECS, 1993
	Rat	Oral	NR	Reproductive effects				17,200			RTECS, 1993
	Rat	Oral	NR	Reproductive effects				10,000			RTECS, 1993
	Rat	Oral	NR	Reproductive effects				9,766			RTECS, 1993
	Mouse	Oral LD50	NR	Mortality	30,000						RTECS, 1993
	Mouse	Oral	NR	Reproductive effects				78,880			RTECS, 1993
	Mouse	Oral	NR	Reproductive effects				4,200			RTECS, 1993
	Mouse	Oral	NR	Reproductive effects				50			RTECS, 1993
	Mouse	Oral	NR	Reproductive effects				1,000			RTECS, 1993
	Mouse	Oral	NR	Reproductive effects				2,040			RTECS, 1993
	Rabbit	Oral LD50	NR	Mortality	34,000						RTECS, 1993
	Guinea pig	Oral LD50	NR	Mortality	26,000						RTECS, 1993
	Guinea pig	Oral	NR	Reproductive effects				20,000			RTECS, 1993
	Mammal	Oral	NR	Reproductive effects				20,000			RTECS, 1993
	Mammal	Oral	NR	Reproductive effects				509,000			RTECS, 1993
	Mouse	Oral LD50		Mortality	800		160				RTECS, 1993
	Mouse	Oral (subchronic)	13 weeks	Renal effects				125			RTECS, 1993
Carbazole	Rat	Oral LD50		Mortality	500		100				USEPA, 1986a
Chrysene	Rodents	Oral (chronic)	NS	Carcinogenicity				99			Eisler, 1987a
Fluoranthene	Rat	Oral LD50	NR	Mortality	2000		400				RTECS, 1994
	Mouse	Oral (subchronic)	90 days	Nephropathy				250	125		IRIS, 1990
Fluorene	Mouse	Oral (chronic)	13 weeks	Hematological changes				250	125		IRIS, 1990
Indeno(1,2,3-cd)pyrene	Rodents	Oral (chronic)	NS	Carcinogenicity				72			Eisler, 1987a
Phenanthrene	Mouse	Oral LD50	NR	Mortality	700		140				RTECS, 1994
	Mouse	Oral (subchronic)	6 months	Increased liver weight				120			ATSDR, 1989
Pyrene	Rat	Oral LD50	NR	Mortality	2,700						RTECS, 1993 and NIOSH, 1985
	Mouse	Oral LD50	NR	Mortality	800		160				RTECS, 1993 and NIOSH, 1985
	Mouse	Oral (chronic)	13 weeks	Renal effects				125	75		IRIS, 1990
PESTICIDES AND PCBs											
4,4'-DDE	Rat	Oral LD50	NR	Mortality	800						RTECS, 1993
	Mouse	Oral LD50	NR	Mortality	700		140				RTECS, 1993
	Hamster	Oral LD50	NR	Mortality	>5,000						RTECS, 1993
	Mallard	Oral	NR	Eggshell thinning				2.91		0.291	USEPA, 1993c

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Chemical	Test Species	Test Type	Duration	Effect	Lethal RTV mg/kgBW-day			Sublethal RTV mg/kgBW-day			Reference
					Oral LD50	LOAEL	RTV [a]	LOAEL	NOAEL	RTV [a]	
	Mallard	Oral	2 years	Embryo mortality, cracked eg				0.58			USEPA, 1993c
	Kestrel	Oral	NR	Eggshell thinning				0.39		0.039	USEPA, 1993c
4,4'-DDT (surrogate for 4,4'-DDD)	Rat	Oral LD50	NR	Mortality	87		17.4				RTECS, 1993
	Rat	Oral LD50		Mortality	100						USEPA, 1985b
	Rat	Oral	NR	Reproductive				112			RTECS, 1993
	Rat	Oral	NR	Reproductive				100			RTECS, 1993
	Rat	Oral	NR	Reproductive				430			RTECS, 1993
	Rat	Oral	NR	Reproductive				1,890			RTECS, 1993
	Rat	Oral	NR	Reproductive				250			RTECS, 1993
	Rat	Oral	NR	Reproductive				50			RTECS, 1993
	Rat	Oral (chronic)	3 generatio	Reproductive				0.2		0.2	IRIS, 1991
	Rat	Oral	2 years	Reproductive				2.5			USEPA, 1993c
	Mouse	Oral LD50	NR	Mortality	135						RTECS, 1993
	Mouse	Oral LD50		Mortality	200						USEPA, 1985b
	Mouse	Oral	NR	Reproductive				504			RTECS, 1993
	Mouse	Oral	NR	Reproductive				81			RTECS, 1993
	Mouse	Oral	NR	Reproductive				124			RTECS, 1993
	Mouse	Oral	NR	Reproductive				148			RTECS, 1993
	Rabbit	Oral LD50	NR	Mortality	250						RTECS, 1993
	Rabbit	Oral	NR	Reproductive				150			RTECS, 1993
	Guinea pig	Oral LD50	NR	Mortality	150						RTECS, 1993
	Hamster	Oral LD50	NR	Mortality	>5,000						RTECS, 1993
	Dog	Oral LD50	NR	Mortality	150						RTECS, 1993
	Dog	Oral LD50		Mortality	60		12				USEPA, 1985b
	Dog	Oral	NR	Reproductive				3540		354	RTECS, 1993
	Monkey	Oral LD50	NR	Mortality	200						RTECS, 1993
	Chicken	Oral (subchronic)	10 weeks	Decr. repro. success				91.4 [b]			USEPA, 1985b
	Rock dove	Oral LD50		Mortality	4,000						USFWS, 1984
	Black duck	Oral (chronic)	2 years	Reduced eggshell thickness				0.14 [b]		0.014	Longcore and Stendell, 1977
	Mallard	Oral LD50		Mortality	2,240						USFWS, 1984
	Mallard	Oral (subchronic)	96 days	Reduced eggshell thickness				2.8			Longcore and Stendell, 1977
	Mallard	Oral	NR	Eggshell thinning				1.16			USEPA, 1993c
	Mallard	Oral	NR	Eggshell thinning				2.91			USEPA, 1993c
	Mallard	Oral	2 years	Reproductive				1.45			USEPA, 1993c
	California quail	Oral LD50		Mortality	595		119				USFWS, 1984
	Japanese quail	Oral LD50		Mortality	841						USFWS, 1984
	Pheasant	Oral LD50		Mortality	1,334						USFWS, 1984
	Sandhill crane	Oral LD50		Mortality	1,200						USFWS, 1984
	Kestrel	Oral (chronic)	7 wk - 1 yr	Reduced eggshell thickness				0.56			USEPA, 1985b
	Kestrel	Oral (chronic)	1 year	Reduced eggshell thickness				0.16			Wiemeyer, et al., 1986
	Barn owl	Oral (chronic)	2 years	Reduced eggshell thickness				0.14 [b]		0.014	Longcore and Stendell, 1977
Aroclor 1254	Mouse	Oral	NR	Reproductive				1.53		0.153	USEPA, 1993c
	Chicken	Oral (chronic)	NR	Embryonic mortality				0.9			USEPA, 1976

Table F.1-4
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Chemical	Test Species	Test Type	Duration	Effect	Lethal RTV mg/kgBW-day			Sublethal RTV mg/kgBW-day			Reference
					Oral LD50	LOAEL	RTV [a]	LOAEL	NOAEL	RTV [a]	
	Rock dove	Oral (chronic)	NR	Parental incubation behavior				0.9			Peakall and Peakall, 1973
	American kestrel	Oral (chronic)	69 days	Reduced sperm concentration				9		0.9	Eisler, 1986
	Mink	Oral dose	160 days	Reproductive				0.096			USEPA, 1993c
	Mink	Oral	NR	Kit growth				0.15			USEPA, 1993c
	Mink	Oral	12.5 days	Reproductive				0.375			USEPA, 1993c
	Chicken	Oral	39 weeks	Egg production and fertility				2.44			USEPA, 1993c
	Chicken	Oral	NR	Egg production and hatchability				9.8			USEPA, 1993c
	Chicken	Maternal diet	NR	Chick growth				0.98			USEPA, 1993c
	Pheasant	Oral	16 weeks	Egg hatchability				1.8			USEPA, 1993c
Aroclor 1260 (surrogate for	Rat	Oral LD50	NR	Mortality	500		100				Eisler, 1986
Aroclor 1254)	Bobwhite quail	Oral LD50	8 days	Mortality	80		16				Eisler, 1986
Endosulfan (surrogate for	Mouse	Oral (chronic)	78 weeks	Mortality				0.9			ATSDR, 1991
Endosulfan II and Endosu	Mouse	Oral (chronic)	78 weeks	Ovarian cyst development				0.26		0.026	ATSDR, 1991
sulfate)	Rat	Single oral dose	NR	Mortality	24		4.8				ATSDR, 1991
	Rat	Oral (chronic)	2 years	Reduced testes weight				10			USEPA, 1980c
	Mallard	Single oral dose	NR	Mortality	33						USFWS, 1984
	Mallard	Single oral dose	NR	Mortality	31.2		6.24				USFWS, 1984
	Pheasant	Single oral dose	NR	Mortality	80						USFWS, 1984
Endrin (surrogate for Endrin	Mouse	Oral (chronic)	80 weeks	Mortality				0.53		0.053	ATSDR, 1990
Ketone)	Dog	Oral (chronic)	19 months	Decreased weight gain				0.1		0.01	USEPA, 1985e
	Rat	Single oral dose	NR	Mortality	3		0.6				Sax, 1984
	Bird	Single oral dose	NR	Mortality	1.8		0.36				Sax, 1984
Heptachlor	Dog	Oral (chronic)	60 weeks	Incr. liver to body weight ratio				0.013			IRIS, 1993
	Rat	Oral (chronic)	2 years	Incr. liver to body weight ratio				0.25			IRIS, 1991
	Rat	Oral (chronic)	1 generatio	Increased pup death				0.35		0.035	IRIS, 1991
	Cat	Oral (chronic)	2 years	Increased liver weight				0.15			USEPA, 1987
	Rat	Single oral dose	NR	Mortality	40		8				Sax, 1984
	Chicken	Single oral dose	NR	Mortality	62		12.4				Sax, 1984
gamma-Chlordane (surrogat	Rat	Oral LD50	NR	Mortality	283						RTECS, 1993
for alpha-chlordane)	Rat	Oral LD50		Mortality	430						Allen et al., 1979
	Rat	Oral LD50		Mortality	335						Allen et al., 1979
	Rabbit	Oral LD50		Mortality	300						Allen et al., 1979
	Rabbit	Oral LD50		Mortality	100		20				Allen et al., 1979
	Dog	Oral LD50		Mortality	200						Allen et al., 1979
	Goat	Oral LD50		Mortality	180						Allen et al., 1979
	Rat	Oral(subchronic)	Multi-gener	Decreased fertility				16		1.6	ATSDR, 1992b
	Japanese quail	Oral LD50	5 days	Mortality	35						Hill et al., 1975
	Bobwhite	Oral LD50	5 days	Mortality	29						Hill et al., 1975
	Mallard	Oral LD50	5 days	Mortality	62						Hill et al., 1975
	Pheasant	Oral LD50		Mortality	24		4.8				USFWS, 1984
	Mouse	Oral (chronic)	2 years	Hepatocelluar hypertrophy a				0.47			ATSDR, 1992b
	Mouse	Oral (chronic)	30 months	Regional liver hypertrophy				0.273	0.055		ATSDR, 1992b
	Dog	Oral (chronic)	2 years	Histologic changes				0.375			USEPA, 1988

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Chemical	Test Species	Test Type	Duration	Effect	Lethal RTV mg/kgBW-day			Sublethal RTV mg/kgBW-day			Reference
					Oral LD50	LOAEL	RTV [a]	LOAEL	NOAEL	RTV [a]	
	Young chicken	Chronic	4 week	Egg hatchability and growth					0.031 [b]	0.031	Eisler, 1990
alpha-BHC	Rat	Single oral dose	NR	Mortality	177		35.4				Sax, 1984
gamma-BHC (Lindane)	Rat	Oral (chronic)	56 weeks	NOAEL for reproductive effects					5 [b]	5.0	ATSDR, 1988a
(surrogates for delta-BHC)	Bobwhite	Oral (acute)	5 days	Mortality	78		15.6				Hill et al., 1975
	Mallard	Oral (acute)	5 days	Mortality	360						Hill et al., 1975
Methoxychlor	Mouse	Single oral dose	NR	Mortality	2900						ATSDR, 1993b
	Rat	Oral (acute)	6-20 days	Incr. mort. and early puberty		200	20				Khera et al., 1978 & Gray, 1989
	Rat	Oal (chronic)	2 years	Growth retardation				10		1.0	USEPA, 1985f
	Rat	Oral (chronic)	6 weeks	Early puberty and decr. litter				60			Harris et al., 1975
INORGANIC ANALYTES											
Aluminum	Mouse	Oral (chronic)	2-3 genrtns	Reduced body weight gain of				425			NIOSH, 1985
	Rat	Oral (subchronic)	15 days	Reduced growth				100		10	Bernuzzi, et al., 1989
	Rat	Oral LD50	NR	Mortality	3700		740				Sax, 1984
Barium	Rat	Oral (chronic)	68 weeks	Renal ultrastructure changes				142			IRIS, 1993
	Rat	Oral (subchronic)	13 weeks	Renal effects				91			Dietz et al., 1992
	Rat	Oral (acute)	10 days	Decreased ovarian weight				198		19.8	ATSDR, 1991b
	Rat	Oral (subchronic)	13 weeks	20% population mortality		430	43				Dietz et al., 1992
Beryllium	Rat	Oral LD50	NR	Mortality	10		2				USEPA, 1985g
	Rat	Oral (chronic)	NR	Increase in lung sacromas			0.22				USEPA, 1985g
	Rat	Oral (chronic)	3.2 years	Respiratory, cardiopulmonar				0.85		0.085	ATSDR, 1992c
Cadmium	Rat	Oral	NR	Reproductive effects				155			RTECS, 1993
	Rat	Oral	NR	Reproductive effects				220			RTECS, 1993
	Rat	Oral	NR	Reproductive effects				21.5		2.1	RTECS, 1993
	Rat	Oral	NR	Reproductive effects				23			RTECS, 1993
	Rat	Oral LD50		Mortality	250						Eisler, 1985b
	Rat	Oral LD50	NR	Mortality	225						RTECS, 1993
	Mouse	Oral LD50	NR	Mortality	890						RTECS, 1993
	Mouse	Oral	NR	Reproductive effects				448			RTECS, 1993
	Mouse	Oral	NR	Reproductive effects				1,700			RTECS, 1993
	Guinea pig	Oral LD50	NR	Mortality	150		30				Eisler, 1985b
	Mallard	Oral (subchronic)	90 days	Egg production suppressed				10		1	Eisler, 1985b
	Beef cattle	Oral	NR	Maximum tolerable level for				0.5			NRC, 1989
Chromium	Japanese quail	Oral LD50	5 days	Mortality	126		12.6				Hill and Camardese, 1986
	Rat	Oral (subchronic)	90 days	Histopathologic and reproductive effects					1400	1400	Ivankovic and Preussman, 1975
	Mouse	Oral (chronic)	7 weeks	Decreased spermatogenesis				3.5			ATSDR, 1993c
	Black Duck	Oral (subchronic)	5 months	Reproductive effects					200	200	Outridge and Scheuhammer, 1'99
	Rat	Oral LD50		Mortality	200		20				ATSDR, 1993c
Lead	Rat	Oral	NR	Reproductive effects				790			RTECS, 1993
	Rat	Oral	NR	Reproductive effects				1,140			RTECS, 1993
	Rat	Oral	NR	Reproductive effects				520			RTECS, 1993
	Rat	Oral	NR	Reproductive effects				1,100			RTECS, 1993
	Calf	Oral LD50	NR	Mortality	220						Eisler, 1988

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					Oral LD50	LOAEL	RTV [a]	LOAEL	NOAEL	RTV [a]	
	Rat	Oral (subchronic)	12-14 days	Decreased fetal body weight				2.5			McClain and Becker, 1972
	Mouse	Oral	NR	Reproductive effects				1,120			RTECS, 1993
	Mouse	Oral	NR	Reproductive effects				6,300			RTECS, 1993
	Mouse	Oral	NR	Reproductive effects				300			RTECS, 1993
	Mouse	Oral	NR	Reproductive effects				4,800			RTECS, 1993
	Domestic animal	Oral	NR	Reproductive effects				662			RTECS, 1993
	Mammal	Oral	NR	Reproductive effects				2,118			RTECS, 1993
	Kestrel	Diet	NR	Decreased egg laying fertility; shell thickness					4.61 [b]	4.61	Eisler, 1988
	Kestrel nestlings	Oral	10 days	Reduced growth and brain w development				125			Eisler, 1988
	Japanese quail	Oral LD50	5 days	Mortality	24,752						Hill and Camardese, 1986
	Rat	Oral (chronic)	2 generatio	Developmental effects					7	7	Kimmel et al., 1980 and Grant et al., 1980
	Guinea pig	Oral LD50		Mortality	300		60				Sax, 1984
	Rock dove	Oral (chronic)	NS	Kidney pathology; learning d				6.25			Anders et al., 1982 and Dietz et al., 1979
	Rock dove	Oral LD50		Mortality	375		75				Kendall and Scanlon, 1985
Manganese	Mouse	Oral (subchronic)	90 days	Delayed growth of testes				140			ATSDR, 1990a
	Mouse	Oral (chronic)	103 weeks	Mortality				4,050			ATSDR, 1990a
	Rat	Oral LD50	NR	Mortality	410						ATSDR, 1990a
	Rat	Oral LD50	20 days	Mortality	225		45				ATSDR, 1990a
	Rat	Oral (subchronic)	20 days	Decreased litter weight durin					620		ATSDR, 1990a
	Rat	Oral (chronic)	103 weeks	Mortality				930			ATSDR, 1990a
	Guinea pig	Oral LD50	NR	Mortality	400						USEPA, 1984b
	Monkey	Oral (chronic)	18 months	Weakness, rigidity				25			ATSDR, 1990a
	Rodents/livestock	Oral (subchronic)	10 days - 2	Decreased growth rate				100		10	Cunningham et al., 1966
	Mouse	Oral (subchronic)	180 days	NOAEL for mortality		2,300					Gianutsos and Murray, 1982
Mercury	Mouse	Single oral dose		Mortality	22						NIOSH, 1985
	Mouse	Oral (subchronic)	18 days	Mortality; neurological sympt				6.3			Suzuki, 1979
	Mouse	Oral (subchronic)	38 days	Mortality; neurological sympt				5			Suzuki, 1979
	Mouse	Oral (subchronic)	50 days	Embryotoxicity and teratoge				0.9			Suzuki, 1979
	Mouse	Oral (subchronic)	45 days	Hypophagia, weight loss, we				1			Suzuki, 1979
	Mouse	Oral (subchronic)	ay 6-17 (ges	Stillbirths and neonatal death				4		0.4	Suzuki, 1979
	Mouse	Oral (subchronic)	ay 0-18 (ges	Embryolethality and teratoge				0.7			Suzuki, 1979
	Rat	Oral (subchronic)	ay 6-14 (ges	Retarded fetus growth and te				4			Suzuki, 1979
	Rat	Oral (subchronic)	est.+ 16 da	Behavioral changes in offspri				0.12 [e]			Suzuki, 1979
	Rat	Oral (chronic)	NS	Reduced fertility				0.5			Eisler, 1987b
	Rat	Oral (chronic)	38 days	Adverse behavioral change				0.16 [b]			Eisler, 1987b
	Rat	Single oral dose		Mortality	18		3.6				NIOSH, 1985
	Pig	Oral (chronic)	Pregnancy	High incidence of stillbirths				0.5			Eisler, 1987b
	House sparrow	Single oral dose		Mortality	12.6						Eisler, 1987b
	Rock dove	Single oral dose		Mortality	22.8						Eisler, 1987b

Table F.1-4
Ingestion Toxicity Information for Wildlife

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Orlando, Florida

Chemical	Test Species	Test Type	Duration	Effect	Lethal RTV mg/kgBW-day			Sublethal RTV mg/kgBW-day			Reference
					Oral LD50	LOAEL	RTV [a]	LOAEL	NOAEL	RTV [a]	
	Pigeon	Oral (subchronic)	17 days	Behavioral alterations				3			Eisler, 1987b
	Pigeon	Oral (subchronic)	5 weeks	Behavioral alterations				1			Eisler, 1987b
	Starling	Oral (chronic)	8 weeks	Kidney lesions				0.25 [b]			Eisler, 1987b
	Chicken	Single oral dose		Mortality	20						Fimreite, 1979
	Bantam chicken	Single oral dose		Mortality	190						Fimreite, 1979
	Prairie chicken	Single oral dose		Mortality	11.5						Eisler, 1987b
	Chukar	Single oral dose		Mortality	26.9						Eisler, 1987b
	Coturnix	Single oral dose		Mortality	11		2.2				Eisler, 1987b
	Black duck	Oral (chronic)	28 weeks	Reproduction inhibited, brain lesions				0.22 [b]			Eisler, 1987b
	Fulvous whistling duc	Single oral dose		Mortality	37.8						Eisler, 1987b
	Northern bobwhite	Single oral dose		Mortality	23.8						Eisler, 1987b
	Bobwhite quail	Oral (acute	5 days	Mortality	523						Hill et al., 1975
	Japanese quail	Single oral dose		Mortality	14.4						Eisler, 1987b
	Japanese quail	Oral (subchronic)	3 weeks	Depressed gonad weights				0.81			Eisler, 1987b
	Japanese quail	Oral (subchronic)	9 weeks	Alterations in brain and plas				0.10			Eisler, 1987b
	Japanese quail	Oral (chronic)	NS	Reproductive effects				5.0			Fimreite, 1979
	Gray partridge	Single oral dose		Mortality	17.6						Eisler, 1987b
	Gray pheasant	Oral (chronic)	30 days	Reduced reproductive ability				0.64		0.064	Eisler, 1987b
	Ring-necked pheasant	Single oral dose		Mortality	11.5						Eisler, 1987b
	Mule deer	Single oral dose		Mortality	17.9						Eisler, 1987b
	Rhesus monkey	Oral (chronic)	Pregnancy	Maternally toxic and abortient				0.5			Eisler, 1987b
	River otter	Single oral dose		Mortality	2						Eisler, 1987b
	Mink	Single oral dose		Mortality	1		0.2				Eisler, 1987b
	Mink	Oral (subchronic)	2 months	Mortality		0.029					Eisler, 1987b
	Cat	Oral (chronic)	ay 10-58 (ge	Increased incidence of anom				0.25			Eisler, 1987b
	Dog	Oral (chronic)	Pregnancy	High incidence of stillbirths				0.1		0.01	Eisler, 1987b
Selenium	Rat	Oral LD50	NR	Mortality	6,700						RTECS, 1993
	Rat	Oral LD50	NR	Mortality	138		27.6				Sax, 1984
	Mouse	Oral	NR	Reproductive effects				134			RTECS, 1993
	Mallard	Oral (subchronic)	3 months	Reduced hatchability				1.75			Eisler, 1985 a
	Rat	Oral (chronic)	2 years	Decrease in breeding				0.2		0.02	ATSDR, 1988b
	Rat	Oral (chronic)	NS	Histological changes in heart				0.045			Eisler, 1985 a
	Japanese quail	Oral (chronic)	NS	Reduced egg hatching				0.6			Eisler, 1985 a
	Mallard	Oral (subchronic)	3 months	NOAEL for tratogenic effects				0.72	0.36	0.36	Eisler, 1985 a
	Horse	Oral LD50		MLD	3.3						Eisler, 1985 a
	Mallard	Oral	6 weeks	Increased mortality		2.7 [b]	0.27				Heinz et al., 1988
	Night heron	Oral	NR	NOAEL for egg hatchability					0.61	0.61	Smith et al., 1988
Silver	Mouse	Intraperitoneal (acute)		Mortality	34		6.8				NIOSH, 1985
	Rat	Oral (chronic)	37 week	Weight gain				222.2			ATSDR, 1990b
	Mouse	Oral (chronic)	125 days	Hypoactivity				18.1		1.81	ATSDR, 1990b
Vanadium	Japanese quail	Oral LD50	5 days	Mortality	96		19.2				Hill, E.F., et al., 1975
	Mouse	Gavage LD50	One-time	Mortality	31		6.2				ATSDR, 1991c
	Rat	Oral (subchronic)	2 months	Hypertension				15			Susic, D., et al., 1986

Table F.1-4
Ingestion Toxicity Information for Wildlife

Remedial Investigation Report
Naval Training Center, Orlando OU4
Orlando, Florida

Chemical	Test Species	Test Type	Duration	Effect	Lethal RTV mg/kgBW-day			Sublethal RTV mg/kgBW-day			Reference
					Oral LD50	LOAEL	RTV [a]	LOAEL	NOAEL	RTV [a]	
	Rat	Oral (subchronic)	35 days	Developmental effects					8.4	8.4	Domingo, J.L., et al., 1986
	Chicken	Oral (subchronic)	Decrease in egg-laying					11		1.1	Berg, L.R., et al., 1963
Zinc	Rat	Oral LD50		Mortality	2510		502				RTECS, 1993
	Rat	Oral	Gestation	Fetal resorptions in 4 to 20%				200		20	Shlicker and Cox, 1968
	Ferret	Oral	3-13 days	Mort. & gastrointestinal effect		390					Straube et al., 1980
	Rat	Oral (subchronic)	NR	Kidney toxicity				160			Llobet, et al., 1988

Notes:
LD50 = Dose resulting in 50% mortality in test population
BW = Body weight
LOAEL = Lowest Observed Adverse Effect Level
NOAEL = No Observed Adverse Effect Level
NR = Not reported
[a] Selected RTVs are boxed. Lethal and sublethal RTVs are chosen based on the data hierarchy discussed in Section 7.1.5.1.
[b] Converted to dose per kilogram body weight by multiplying by ingestion and dividing by body weight. Body weights for birds obtained from Dunning, 1984.
Ingestion rates were calculated using the following regression equation (for all birds) from USEPA, 1993b: Food Ingestion (kg/day) = 0.00582 * Body Weight □u0.651□ (kg). Ingestion rates for the chicken from NRC, 1984 (pg. 1

Table F.1-5
RTVs Selected for Ecological Risk Assessment [a]
Units (mg/kgBW/day)

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Compound	Small Mammal [b]		Small Bird [c]		Predatory Mammal [d]		Predatory Bird [e]	
	Lethal	Sublethal	Lethal	Sublethal	Lethal	Sublethal	Lethal	Sublethal
Volatile Organic Compounds								
1,1-Dichloroethene	40	0.09			40	0.09		
1,2-Dichloroethene	40	0.09			40	0.09		
Acetone	600	27,300			600	27,300		
Carbon disulfide		11				11		
Methylene chloride	320	5.9			320	5.9		
Tetrachloroethene	1620	10			1620	10		
Toluene	1000	8			1000	8		
Trichloroethene	480	75			1440	75		
Vinyl chloride	100	13			100	13		
Semivolatile Organic Compounds								
4-Methylphenol	360	50			360	50		
Acenaphthylene	12 [f]	1 [f]			12 [f]	1 [f]		
Anthracene	3400	1000			3400	1000		
Benzo(a)anthracene	12 [f]	1 [f]			12 [f]	1 [f]		
Benzo(a)pyrene	12	1			12	1		
Benzo(b)fluoranthene	12 [f]	1 [f]			12 [f]	1 [f]		
Beno(g,h,i)perylene	12 [f]	1 [f]			12 [f]	1 [f]		
Benzo(k)fluoranthene	12 [f]	1 [f]			12 [f]	1 [f]		
bis(2-Ethylhexyl)phthalat	160	3.5			160	3.5		
Carbazole	100	1 [f]			100	1 [f]		
Chrysene	12 [f]	1 [f]			12 [f]	1 [f]		
Diben(a,h)anthracene	12 [f]	1 [f]			12 [f]	1 [f]		
Fluoranthene	400	1 [f]			400	1 [f]		
Fluorene	12 [f]	1 [f]			12 [f]	1 [f]		
Indeno(1,2,3-cd)pyrene	12 [f]	1 [f]			12 [f]	1 [f]		
Phenanthre	140	1 [f]			140	1 [f]		
Pyrene	160	1 [f]			160	1 [f]		
Pesticides and PCBs								
4,4'-DDD	17.4 [g]	0.2 [g]	119 [g]	0.014 [g]	12 [g]	354 [g]	119 [g]	0.014 [g]
4,4'-DDE	140	0.2 [g]	119 [g]	0.291	140	354 [g]	119 [g]	0.039
4,4'-DDT	17.4	0.2	119	0.014	12	354	119	0.014
Aroclor-1254	100	0.153	16	0.9	100	0.153	16	0.9
Endosulfan I	4.8	0.026	6.24		4.8	0.026	6.24	
Endrin ketone	0.6	0.053	0.36		0.6	0.01	0.36	
Heptachlor	8	0.035	12.4		8	0.035	12.4	
alpha-Chlordane	20	1.6	4.8	0.031	20	1.6	4.8	0.031
delta-BHC	35.4	5	15.6		35.4	5	15.6	
gamma-BHC	35.4 [h]	5 [h]			35.4 [h]	5 [h]		
Methoxychlor	20	1			20	1		
Inorganic Compounds								
Aluminum	740	10			740	10		
Barium	43	19.8			43	19.8		
Beryllium	2	0.085			2	0.085		
Cadmium	30	2.1		1	30	2.1		1
Chromium	20	200	12.6	1400	20	200	12.6	1400
Lead	60	7	75	4.61	60	7	75	4.61
Mercury	3.6	0.4	2.2	0.064	0.2	0.01	2.2	0.064
Selenium	27.6	0.02	0.27	0.36	27.6	0.02	0.27	0.61
Silver	6.8	1.81			6.8	1.81		
Vanadium	6.2	8.4	19.2	1.1	6.2	8.4	19.2	1.1
Zinc	502	20			502	20		

Notes:
[a] Lethal and sublethal RTVs correspond to the boxed values presented in Table F-3.
[b] These RTVs represent chemical concentrations that are not anticipated to result in adverse effects for the cotton mouse or the short tailed shre
[c] These RTVs represent chemical concentrations that are not anticipated to result in adverse effects for the American woodcock and mourning d
[d] These RTVs represent chemical concentrations that are not anticipated to result in adverse effects for the red fox.
When no data were available, the small mammal values were used as a surrogate.
[e] These RTVs represent chemical concentrations that are not anticipated to result in adverse effects for the great blue heron. When no data were available, the small bird values were used as a surrogate.
[f] The value for benzo(a)pyrene used as a surrogate.
[g] The value for 4,4'-DDT used as a surrogate.
[h] The value for delta-BHC used as a surrogate.

TABLE F.1-6

SUMMARY OF TOXICITY DATA FOR PLANT RECEPTORS

Remedial Investigation Report

Naval Training Center, Orlando OU4

Orlando, Florida

Chemical	Reference	RTV in soil [a] (mg/kg)	RTV in solution [a] (mg/L)
VOLATILE ORGANICS			
Acetone	NA	NA	NA
Methylene chloride		>1,000 [d]	12 [d]
Tetrachloroethylene	Hulzebos et al., 1993 [b]	>1,000	12
SEMI-VOLATILE ORGANICS			
Acenaphthylene	Hulzebos et al., 1993 [b]	25 [b]	0.1 [b]
Anthracene		25 [b]	0.1 [b]
Benzo(a)anthracene		25 [b]	0.1 [b]
Benzo(a)pyrene		25 [b]	0.1 [b]
Benzo(b)fluoranthene		25 [b]	0.1 [b]
Benzo(g,h,i)perylene		25 [b]	0.1 [b]
Benzo(k)fluoranthene		25 [b]	0.1 [b]
Bis(2-ethylhexyl)phthalate	Hulzebos et al., 1993 [b]	>1,000	>S_w
Carbazole		NA	NA
Chrysene		25 [b]	0.1 [b]
Dibenz(a,h)anthracene		25 [b]	0.1 [b]
Fluoranthene		25 [b]	0.1 [b]
Fluorene		25 [b]	0.1 [b]
Indeno(1,2,3-cd)pyrene		25 [b]	0.1 [b]
Phenanthrene		25 [b]	0.1 [b]
Pyrene		25 [b]	0.1 [b]
PESTICIDES/PCBs			
4,4'-DDT, DDD, and DDE	Eno & Everett, 1958	12.5	NA
Aroclors	Will and Suter, 1994	40	NA
Endrin		12.5 [c]	NA
gamma-BHC (Lindane)	Hulzebos *et al.*, 1993	>1,000 [e]	3.2
Methoxychlor	Eno and Everett, 1958	12.5 [c]	NA
INORGANICS			
Aluminum	Will and Suter, 1994	50	0.2
Barium	Will and Suter, 1997	500	NA
Beryllium	Will and Suter, 1994	10	0.5
Cadmium	Will and Suter, 1994	3	0.05
Chromium	Will and Suter, 1997	1	0.05
Lead	Will and Suter, 1994	50	0.02
Mercury	Will and Suter, 1994	0.3	0.004
Selenium	Will and Suter, 1994	1	0.7
Silver	Will and Suter, 1994	2	0.1
Vanadium	Will and Suter, 1994	2	0.5
Zinc	Will and Suter, 1994	50	0.4

Notes:

[a] RTVs in soil are equal to chemical concentrations in soil that are not expected to result in adverse effects to plants.

TABLE F.1-6

SUMMARY OF TOXICITY DATA FOR PLANT RECEPTORS

Remedial Investigation Report

Naval Training Center, Orlando OU4

Orlando, Florida

Chemical	Reference	RTV in soil [a] (mg/kg)	RTV in solution [a] (mg/L)

RTVs in solution are equal to chemical concentrations in groundwater that are not expected to result in adverse effects to plants.

[b] Value for acenaphthene used as a surrogate.

[c] Value for 4,4'-DDT used as a surrogate.

[d] Value for tetrachloroethylene used as a surrogate.

[e] Value for delta-BHC used as a surrogae

NA = Not Available

S_w = Water solubility

TABLE F.1-7

SUMMARY OF TOXICITY DATA FOR TERRESTRIAL AND PALUSTRINE INVERTEBRATE RECEPTORS

Remedial Investigation Report
Naval Training Center, Orlando OU4
Orlando, Florida

Chemical	Test Type	Test Duration	Test Species	Chemical Concentration (mg/kg)	Effect	RTV (mg/kg)	Reference
VOLATILE ORGANIC COMPOUNDS							
Acetone	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	Soil Test	14 day	*E. foetida*	740	LC_{50}	150 [a]	Neuhauser *et al*., 1985.
Tetrachloroethylene	Soil Test	14 day	*E. foetida*	740	LC_{50}	150 [a]	Neuhauser *et al*., 1985.
SEMI-VOLATILE ORGANIC COMPOUNDS							
Acenaphthylene	Soil Test	14 day	*E. foetida*	173	LC_{50}	34 [a]	Neuhauser *et al*., 1985.
Anthracene	Soil Test	14 day	*E. foetida*	173	LC_{50}	34 [a]	Neuhauser *et al*., 1985.
Benzo(a)anthracene	Soil Test	14 day	*E. foetida*	173	LC_{50}	34 [a]	Neuhauser *et al*., 1985.
Benzo(a)pyrene	Soil Test	14 day	*E. foetida*	173	LC_{50}	34 [a]	Neuhauser *et al*., 1985.
Benzo(b and k)fluoranthene	Soil Test	14 day	*E. foetida*	173	LC_{50}	34 [a]	Neuhauser *et al*., 1985.
Benzo(g,h,i)perylene	Soil Test	14 day	*E. foetida*	173	LC_{50}	34 [a]	Neuhauser *et al*., 1985.
Benzo(b and k)fluoranthene	Soil Test	14 day	*E. foetida*	173	LC_{50}	34 [a]	Neuhauser *et al*., 1985.
bis(2-Ethylhexyl)phthalate	Soil Test	14 day	4 test species	2,390	LC_{50}	478 [e]	Neuhauser *et al*., 1986.
Carbazole	NA	NA	NA	NA	NA	NA	NA
Chrysene	Soil Test	14 day	*E. foetida*	173	LC_{50}	34 [a]	Neuhauser *et al*., 1985.
Dibenz(a,h)anthracene	Soil Test	14 day	*E. foetida*	173	LC_{50}	34 [a]	Neuhauser *et al*., 1985.
Fluoranthene	Soil Test	14 day	*E. foetida*	173	LC_{50}	34 [a]	Neuhauser *et al*., 1985.
Fluorene	Soil Test	14 day	*E. foetida*	173	LC_{50}	34 [a]	Neuhauser *et al*., 1985.
Fluorene	Soil Test	14 day	4 test species	187	LC_{50}		Neuhauser *et al*., 1986.
Indeno(1,2,3-cd)pyrene	Soil Test	14 day	*E. foetida*	173	LC_{50}	34 [a]	Neuhauser *et al*., 1985.
Phenanthrene	Soil Test	14 day	*E. foetida*	173	LC_{50}	34 [a]	Neuhauser *et al*., 1985.
Pyrene	Soil Test	14 day	*E. foetida*	173	LC_{50}	34 [a]	Neuhauser *et al*., 1985.
PESTICIDES/PCBs							
4,4'-DDD	Soil Test	NS	NS	60	58% mortality	12 [b]	U.S. EPA, 1985b
4,4'-DDE	Soil Test	NS	NS	60	58% mortality	12 [b]	U.S. EPA, 1985b
4,4'-DDT	Soil Test	NS	NS	60	58% mortality	12 [b]	U.S. EPA, 1985b
gamma-BHC (lindane)	Soil Test	14 day	*P. posthuma*	40	LC_{50}	8 [b]	Hans *et al*., 1990
Aroclor-1254	NA	NA	NA	NA	NA	NA	NA
Edrin ketone	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA
INORGANICS							
Aluminum	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA

TABLE F.1-7
SUMMARY OF TOXICITY DATA FOR TERRESTRIAL AND PALUSTRINE INVERTEBRATE RECEPTORS

Remedial Investigation Report
Naval Training Center, Orlando OU4
Orlando, Florida

Chemical	Test Type	Test Duration	Test Species	Chemical oncentration (mg/kg)	Effect	RTV (mg/kg)	Reference
Cadmium	Soil Test	14 day	*E. foetida*	900	0 % mortality		Bouche *et al*., 1987
Cadmium	Soil Test	14 day	*E. foetida*	2,700	100 % mortality		Bouche *et al*., 1987
Cadmium	Soil Test	14 day	*E. foetida*	1,000 [c]	LC_{50}		van Gestel and van Dis, 1988
Cadmium	Soil Test	20 week	*E. foetida*	50	Decrease in cocoon production	5 [b]	Malecki *et al*., 1982
Cadmium	Soil Test	2 week	*E. foetida*	1,843	LC_{50}		Neuhauser *et al*., 1985.
Chromium (III)	Soil Test	8 week	*E. foetida*	250	Reproduction 50% inhibited	50	Molnar *et al*., 1989
Lead	Soil Test	20 week	*E. foetida*	5,000 [d]	Decrease in cocoon production	500 [b]	Malecki *et al*., 1982
Lead	Soil Test	2 week	*E. foetida*	5,941	LC_{50}		Neuhauser *et al*., 1985.
Mercury	Soil Test	14 day	*E. foetida*	36	0 % mortality	36	Bouche *et al*., 1987
Mercury	Soil Test	14 day	*E. foetida*	216	60 % mortality		Bouche *et al*., 1987
Selenium	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA
Zinc	Soil Test	20 week	*E. foetida*	5,000 [d]	Decrease in cocoon production		Malecki *et al*., 1982
Zinc	Soil Test	2 week	*E. foetida*	662	LC_{50}	130 [b]	Neuhauser *et al*., 1985.

NOTES:
[a] Equal to the lowest LC_{50} in each chemical class, multiplied by a safety factor of 0.2, resultant value should be protective of 99.9% of the exposed population from acute effects (USEPA, 1984).
[b] Conservative factor of 0.1 applied to endpoint, to convert a LOAEL to a NOAEL.
[c] LC_{50} value for soil at pH = 7.0; LC_{50} = 320 ug/g - 560 ug/g for soil pH = 4.1
[d] Acetate salt
[e] Mean of LC_{50}s for four test species (*A. tuberculata*, *E. foetida*, *E. eugeniae*, and *P. excavatus*) from artificial soil tests; values used for a whole chemical class are multiplied by a factor of 0.2 (Neuhauser *et al*., 1986). Value for dimethylphthalate used for phthalates.
NA = Not available.
NS = Not stated.
LOAEL = Lowest observed adverse effect level
NOAEL = No observed adverse effect level

Ta[illegible]1-8

AQUIRE Freshwater Toxicity Information (µg/L)

Remedial Investigation Report
Naval Training Center, OU 4
Orlando, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Volatile Organics								
Acetone	Aedes aegypti;Mosquito	3rd INST-AR	48 H	LC_{50}	15,000,000		310574	83
	Ambystoma mexicanum;Salamander	3-4 WK	48 H	LC_{50}	20,000,000		219740	80
	Asellus aquaticus;Aquatic sowbug	NR	48 H	LC_{50}	7,550,000		315788	83
	Chironomus thummi;Midge	NR	48 H	LC_{50}	13,000,000		315788	83
	Chlorella pyrenoidosa;Green algae	LOG PHASE	48 H	GRO		3,400,000	310574	83
	Cipangopaludina malleata;Mud snail	NR	48 H	LC_{50}	48,000,000		219158	72
	Cloeon dipterum;Mayfly	NR	48 H	LC_{50}	7,600,000		315788	83
	Corixa punctata;Water boatman	NR	48 H	LC_{50}	5,000,000		315788	83
	Culex pipiens;Mosquito	3rd INST-AR	48 H	LC_{50}	17,000,000		310574	83
	Culex restuans;White dotted mosquito	3rd INST-AR	18 H	LC_{50}	6,190,000		212192	81
	Daphnia magna;Water flea	¾24 H	28 D	MOR	1,100,000		310694	83
	Daphnia magna;Water flea	¾24 H	28 D	MOR	4,300,000		310694	83
	Daphnia magna;Water flea	¾24 H	7 D	MOR	2,200,000		310694	83
	Daphnia magna;Water flea	¾24 H	14 D	MOR	4,300,000		310694	83
	Daphnia magna;Water flea	¾24 H	28 D	MOR	550,000		310694	83
	Daphnia magna;Water flea	¾24 H	7 D	MOR	550,000		310694	83
	Daphnia magna;Water flea	¾24 H	14 D	MOR	550,000		310694	83
	Daphnia magna;Water flea	¾24 H	21 D	MOR	550,000		310694	83
	Daphnia magna;Water flea	8 H	0.25 H	LOC		9,280,000	212171	44
	Daphnia magna;Water flea	¾24 H	7 D	LET	8,700,000		310694	83
	Daphnia magna;Water flea	¾24 H	21 D	MOR	1,100,000		310694	83
	Daphnia magna;Water flea	¾24 H	14 D	MOR	1,100,000		310694	83
	Daphnia magna;Water flea	¾24 H	28 D	MOR	2,200,000		310694	83
	Daphnia magna;Water flea	¾24 H	7 D	MOR	1,100,000		310694	83
	Daphnia magna;Water flea	¾24 H	14 D	MOR	2,200,000		310694	83
	Daphnia magna;Water flea	¾24 H	28 D	REP		4,300,000	310694	83
	Daphnia magna;Water flea	¾24 H	21 D	MOR	4,300,000		310694	83
	Daphnia magna;Water flea	¾ 24 H	48 H	LC_{50}	31,000,000		310694	83
	Daphnia magna;Water flea	¾ 24 H	24 H	LC_{50}	35,000,000		310694	83
	Daphnia magna;Water flea	¾24 H	21 D	MOR	2,200,000		310694	83
	Daphnia magna;Water flea	<24 H	48 H	EC_{50}IM		13,500,000	212193	80
	Daphnia magna;Water flea	¾24 H	28 D	REP		1,100,000	310694	83
	Daphnia magna;Water flea	¾24 H	7 D	MOR	4,300,000		310694	83
	Daphnia pulex;Water flea	<24 H	18 H	LC_{50}	1,220,000		212192	81
	Dugesia lugubris;Turbellarian	NR	48 H	LC_{50}	7,500,000		315788	83
	Erpobdella octoculata;Leech	NR	48 H	LC_{50}	7,000,000		315788	83
	Gambusia affinis;Mosquitofish	ADULT FEMALE	96 H	LC_{50}	13,000,000		210508	57
	Gambusia affinis;Mosquitofish	ADULT FEMALE	24 H	LC_{50}	13,500,000		210508	57
	Gambusia affinis;Mosquitofish	ADULT FEMALE	48 H	LC_{50}	13,000,000		210508	57
	Gammarus pulex;Scud	NR	48 H	LC_{50}	6,000,000		315788	83
	Hydra oligactis;Hydra	NR	48 H	LC_{50}	13,500,000		315788	83
	Hydra oligactis;Hydra	BUD-LESS	48 H	LC_{50}	13,500,000		310574	83
	Indoplanorbis exustus;Snail	NR	48 H	LC_{50}	35,000,000		219158	72
	Ischnura elegans;Dragonfly	NR	48 H	LC_{50}	6,400,000		315788	83
	Lepomis macrochirus;Bluegill	5.3-7.2cm 3.5-3.9 g	96 H	LC_{50}	8,300,000		212406	68
	Lepomis macrochirus;Bluegill	NR	96 H	LC_{50}	8,300,000		210949	68
	Lymnaea stagnalis;Great pond snail	3-4 WK	48 H	LC_{50}	7,000,000		310574	83

Table F.1-8
AQUIRE Freshwater Toxicity Information (µg/L)

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Naval Training Center, OU 4
Orlando, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Lymnaea stagnalis;Great pond snail	NR	48 H	LC_{50}	7,000,000		315788	83
	Nemoura cinerea;Stonefly	NR	48 H	LC_{50}	10,300,000		315788	83
Acetone (cont.)	Oncorhynchus mykiss;Rainbow trout	5-8 WK	48 H	LC_{50}	7,400,000		310574	83
	Oncorhynchus mykiss;Rainbow trout	10.0cm 10.2 g	6 H	LET	12,500,000		210991	78
	Oncorhynchus mykiss;Rainbow trout	1.0 g	96 H	LC_{50}	5,540,000		210666	80
	Oncorhynchus mykiss;Rainbow trout	9.4 cm 10.8 g	24 H	LC_{50}	6,100,000		210991	78
	Oryzias latipes;Medaka, high-eyes	4-5 WK	48 H	LC_{50}	14,300,000		310574	83
	Palaemonetes kadiakensis;Grass shrimp, freshwater prawn	JUV-ENILE	18 H	LC_{50}	2,610,000		212192	81
	Physa acuta;Bladder snail	NR	48 H	LC_{50}	35,000,000		219158	72
	Pimephales promelas;Fathead minnow	28 D	96 H	LC_{50}	7,280,000		312448	84
	Pimephales promelas;Fathead minnow	0.12 g	96 H	LC_{50}	7,310,000		310183	83
	Pimephales promelas;Fathead minnow	33 D	96 H	LC_{50}	8,120,000		312448	84
	Pimephales promelas;Fathead minnow	32 D	96 H	LC_{50}	6,210,000		312448	84
	Pimephales promelas;Fathead minnow	3-4 WK	48 H	LC_{50}	15,000,000		310574	83
	Pimephales promelas;Fathead minnow	0.12 g	96 H	LC_{50}	8,140,000		310183	83
	Rasbora heteromorpha;Harlequinfish, red rasbora	1.3-3 cm	48 H	LC_{50}	4,000,000		210542	69
	Rasbora heteromorpha;Harlequinfish, red rasbora	1.3-3 cm	24 H	LC_{50}	5,700,000		210542	69
	Scenedesmus pannonicus;Green algae	LOG PHASE	48 H	GRO		4,740,000	310574	83
	Selenastrum capricornutum;Green algae	LOG PHASE	96 H	GRO		7,000,000	310574	83
	Semisulcospira libertina;Marsh snail	NR	48 H	LC_{50}	35,000,000		219158	72
	Tubificidae;Oligochaete family	NR	48 H	LC_{50}	15,000,000		315788	83
	Xenopus laevis;Clawed toad	3-4 WK	48 H	LC_{50}	24,000,000		219740	80
1,1-Dichloroethylene	Daphnia magna; Water flea	FIRST INSTAR	24 H	LC_{50}	11,600			80
	Daphnia magna; Water flea	<24 H	24 H	LC_{50}	98,000			80
	Daphnia magna; Water flea	<24 H	48 H	LETHAL	<2,400			80
	Daphnia magna; Water flea	<24 H	48 H	LC_{50}	79,000			80
	Daphnia magna; Water flea	FIRST INSTAR	48 H	LC_{50}	11,600			80
	Lepomis macrochirus; Bluegill	33-75 MM	96 H	LC_{50}	220,000			77
	Lepomis macrochirus; Bluegill	JUVENILE, 0.32-1.2 G	96 H	LC_{50}	140,000			81
	Lepomis macrochirus; Bluegill	JUVENILE, 0.32-1.2 G	96 H	LC_{50}	74,000			81
	Lepomis macrochirus; Bluegill	JUVENILE, 0.32-1.2 G	24 H	LC_{50}	74,000			81
	Lepomis macrochirus; Bluegill	JUVENILE, 0.32-1.2 G	24 H	LC_{50}	165,000			81
	Pimephales promelas; Fathead minnow	0.8 G, 35 MM, ADULT	9 D	LC_{50}	29,000			80
	Pimephales promelas; Fathead minnow	ADULT, 0.8 G, 35 MM	48 H	LC_{50}	169,000			80
	Pimephales promelas; Fathead minnow	ADULT, 0.8 G, 35 MM	5 D	LC_{50}	97,000			80
	Pimephales promelas; Fathead minnow	0.8 G, 35 MM, ADULT	8 D	LC_{50}	29,000			80
	Pimephales promelas; Fathead minnow	ADULT, 0.8 G, 35 MM	6 D	LC_{50}	74,000			80
	Pimephales promelas; Fathead minnow	0.8 G, 35 MM, ADULT	96 H	LC_{50}	108,000			80
	Pimephales promelas; Fathead minnow	ADULT, 0.8 G, 35 MM	7 D *	LC_{50}	29,000			80
	Pimephales promelas; Fathead minnow	ADULT, 0.8 G, 35 MM	24 H	LC_{50}	175,000			80
	Pimephales promelas; Fathead minnow	ADULT, 0.8 G, 35 MM	96 H	LC_{50}	169,000			80
	Pimephales promelas; Fathead minnow	0.8 G, 35 MM, ADULT	13 D	LC_{50}	29,000			80
	Pimephales promelas; Fathead minnow	ADULT, 0.8 G, 35 MM	24 H	LC_{50}	116,000			80
	Pimephales promelas; Fathead minnow	0.8 G, 35 MM, ADULT	10 D	LC_{50}	29,000			80
	Pimephales promelas; Fathead minnow	0.8 G, 35 MM, ADULT	12 D	LC_{50}	29,000			80
	Pimephales promelas; Fathead minnow	ADULT, 0.8 G, 35 MM	48 H	LC_{50}	108,000			80
	Pimephales promelas; Fathead minnow	0.8 G, 35 MM, ADULT	11 D	LC_{50}	29,000			80

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AQUIRE Freshwater Toxicity Information (µg/L)

Remedial Investigation Report
Naval Training Center, OU 4
Orlando, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Scenedesmus abundans; Green algae	10E4 CELLS/ML	96 H	EC_{50}; GRO		410,000		85
Tetrachloroethylene	Daphnia magna; Water flea	FIRST INSTAR, <= 24 H	48 H	EC_{50}; IMM		7,490		83
	Daphnia magna; Water flea	<24 H	24 H	LC_{50}	18,000			80
Tetrachloroethylene	Daphnia magna; Water flea	<24 H	48 H	LETHAL	10,000			80
(cont.)	Daphnia magna; Water flea	FIRST INSTAR, <= 24 H	48 H	LC_{50}	9,090			83
	Daphnia magna; Water flea	FIRST INSTAR, < 24 H	48 H	EC_{50}; IMM		8,500		83
	Daphnia magna; Water flea	FIRST INSTAR, <= 24 H	48 H	LC_{50}	18,100			83
	Daphnia magna; Water flea	FIRST INSTAR, < 24 H	48 H	LC_{50}	18,000			83
	Daphnia magna; Water flea	FIRST INSTAR, <= 24 H	48 H	EC_{50}; IMM		8,500		83
	Daphnia magna; Water flea	FIRST INSTAR, < 24 H	48 H	LC_{50}	9,100			83
	Daphnia magna; Water flea	<24 H	48 H	LC_{50}	18,000			80
	Daphnia magna; Water flea	NR	24 H	EC_{50}		147,000		82
	Daphnia magna; Water flea	FIRST INSTAR, < 24 H	48 H	EC_{50}; IMM		7,500		83
	Daphnia magna; Water flea	< 24 H	28 D	GRO		1,110		83
	Daphnia magna; Water flea	FIRST INSTAR, < 24 H	28 D	GRO		1,100		83
	Daphnia magna; Water flea	FIRST INSTAR, < 24 H	28 D	GRO		510		83
	Daphnia magna; Water flea	FIRST INSTAR, < 24 H	28 D	REP		510		83
	Daphnia magna; Water flea	FIRST INSTAR, < 24 H	28 D	REP		1,100		83
	Daphnia magna; Water flea	< 24 H	28 D	REP		1,110		83
	Daphnia magna; Water flea	NR	24 H	EC_{100}		250,000		82
	Daphnia magna; Water flea	NR	24 H	EC_{0}		65,000		82
	Lepomis macrochirus; Bluegill	JUVENILE, 0.32-1.2 G	24 H	LC_{50}	46,000			81
	Lepomis macrochirus; Bluegill	JUVENILE, 0.32-1.2 G	96 H	LC_{50}	13,000			81
	Lepomis macrochirus; Bluegill	0.37-0.95 G, 25-35 MM	to 21 D	RSD		3.43		80
	Moina macrocopa; Water flea	5 D	3 H	LC_{50}	1,800			86
	Oncorhynchus mykiss; Rainbow trout	6.1 CM, 3.2 G, FINGERLING	48 H	LC_{50}	4,990			83
	Oncorhynchus mykiss; Rainbow trout	3.20 G	96 H	LC_{50}	4,990			82
	Oncorhynchus mykiss; Rainbow trout	7.3 CM, 5.86 G, FINGERLING	24 H	LC_{50}	6,310			83
	Oncorhynchus mykiss; Rainbow trout	7.3 CM, 5.86 G, FINGERLING	96 H	LC_{50}	5,840			83
	Oncorhynchus mykiss; Rainbow trout	6.1 CM, 3.2 G, FINGERLING	72 H	LC_{50}	4,990			83
	Oncorhynchus mykiss; Rainbow trout	6.1 CM, 3.2 G, FINGERLING	96 H	LC_{50}	4,990			83
	Oncorhynchus mykiss; Rainbow trout	7.3 CM, 5.86 G, FINGERLING	72 H	LC_{50}	5,810			83
	Oncorhynchus mykiss; Rainbow trout	7.3 CM, 5.86 G, FINGERLING	48 H	LC_{50}	5,950			83
	Oncorhynchus mykiss; Rainbow trout	6.1 CM, 3.2 G, FINGERLING	24 H	LC_{50}	4,990			83
	Oryzias latipes; Medaka	3 CM, 0.3 G	48 H	LC_{50}	1,600			86
	Pimephales promelas; Fathead minnow	1.04 G, 49.0 MM	96 H	LC_{50}	21,400			78
	Pimephales promelas; Fathead minnow	30-35 D	72 H	LC_{50}	14,900			83
	Pimephales promelas; Fathead minnow	1.04 G, 49.0 MM	72 H	LC_{50}	18,900			78
	Pimephales promelas; Fathead minnow	1.04 G, 49.0 MM	96 H	LC_{50}	18,400			78
	Pimephales promelas; Fathead minnow	1.04 G, 49.0 MM	96 H	EC_{50}; IMM		14,400		78
	Pimephales promelas; Fathead minnow	31 D, 20.3 MM, 0.120 G	96 H	LC_{50}	20,300			85
	Pimephales promelas; Fathead minnow	30 D	96 H	LC_{50}	13,400			85
	Pimephales promelas; Fathead minnow	1.04 G, 49.0 MM	48 H	LC_{50}	19,600			78
	Pimephales promelas; Fathead minnow	0.12 G	96 H	LC_{50}	13,500			83
	Pimephales promelas; Fathead minnow	30-35 D	48 H	LC_{50}	15,900			83
	Pimephales promelas; Fathead minnow	30-35 D	96 H	LC_{50}	13,400			83
	Pimephales promelas; Fathead minnow	1.04 G, 49.0 MM	72 H	EC_{50}; IMM		14,400		78

Table F.1-8
AQUIRE Freshwater Toxicity Information (µg/L)

Remedial Investigation Report
Naval Training Center, OU 4
Orlando, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Pimephales promelas; Fathead minnow	1.04 G, 49.0 MM	24 H	EC_{50}; IMM		14,400		78
	Pimephales promelas; Fathead minnow	1.04 G, 49.0 MM	48 H	EC_{50}; IMM		14,400		78
	Pimephales promelas; Fathead minnow	30-35 D	24 H	LC_{50}	17,900			83
	Pimephales promelas; Fathead minnow	1.04 G, 49.0 MM	24 H	LC_{50}	23,500			78
	Tanytarsus dissimilis; Midge	3RD OR 4TH INSTAR, 2.0-3.5 MM	24 H	LC_{50}	54,600			83
	Tanytarsus dissimilis; Midge	3RD OR 4TH INSTAR, 2.0-3.5 MM	48 H	LC_{50}	30,800			83
1,1,2-Trichloroethylene	Aedes aegypti, mosquito	3RD INSTAR	48 H	LC_{50}	48,000			83
	Ambystoma mexicanum, salamander	3-4 WK	48 H	LC_{50}	48,000			80
	Asellus aquaticus, sowbug	NR	48 H	LC_{50}	30,000			83
	Brachydanio rerio, zebrafish	NR	48 H	LC_{50}	60,000			79
	Chironomus thummi, midge	NR	48 H	LC_{50}	64,000			83
	Cloeon dipterum, mayfly	NR	48 H	LC_{50}	42,000			83
	Corixa punctata, water boatman	NR	48 H	LC_{50}	110,000			83
	Culex pipiens, mosquito	3RD INSTAR	48 H	LC_{50}	55,000			83
	Daphnia magna, water flea	<=24 H	48 H	LC_{50}	18,000			80
	Daphnia magna, water flea	NR	3 D	ABD	25,000			84
	Daphnia magna, water flea	24 H	24 H	LC_{50}	1,000,000			77
	Daphnia magna, water flea	NR	24 H	leth	110,000			84
	Daphnia magna, water flea	NR	24 H	EC_{50}	1,313,000			82
	Daphnia magna, water flea	<=24 H	24 H	LC_{50}	22,000			80
	Daphnia magna, water flea	<=24 H	48 H		2,200			80
	Dugesia lugubris, flatworm	NR	48 H	LC_{50}	42,000			83
	Erpobdella octoculata, leech	NR	48 H	LC_{50}	75,000			83
	Gammarus pulex, scud	NR	48 H	LC_{50}	24,000			83
	Hydra oligactis, hydra	BUDLESS	48 H	LC_{50}	75,000			83
	Hydra oligactis, hydra	NR	48 H	LC_{50}	75,000			83
	Ischnura elegans, dragonfly	NR	48 H	LC_{50}	49,000			83
	Lepomis macrochirus, bluegill	JUVENILE 75 D, 2.2 CM	1 H	RES	100			90
	Lepomis macrochirus, bluegill	JUVENILE, 0.32-1.2 G	96 H	LC_{50}	45,000			81
	Lepomis macrochirus, bluegill	JUVENILE, 0.32-1.2 G	24 H	LC_{50}	68,000 to 100,000			81
	Lymnaea stagnalis, great pond snail	3-4 WK	48 H	LC_{50}	56,000			83
	Lymnaea stagnalis, great pond snail	NR	48 H	LC_{50}	56,000			83
	Moina macrocopa, water flea	5 D	3 H	LC_{50}	2,300			86
	Nemoura cinerea, stonefly	NR	48 H	LC_{50}	70,000			83
	Oncorhynchus mykiss, rainbow trout	NR	24 H	RES	5,000			79
	Oncorhynchus mykiss, rainbow trout	5-8 WK	48 H	LC_{50}	42,000			83
	Oryzias latipes, medaka	3 CM, 0.3 G	48 H	LC_{50}	1,900			86
	Oryzias latipes, medaka	4-5 WK	48 H	LC_{50}	270,000			83
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	48 H	IMM	22,700			78
	Pimephales promelas, fathead minnow	31 D	96 H	LC_{50}	44,100			85
	Pimephales promelas, fathead minnow	30-35 D	24 H	LC_{50}	58,800			83
	Pimephales promelas, fathead minnow	3-4 WK	48 H	LC_{50}	47,000			83
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	96 H	IMM	21,900			78
	Pimephales promelas, fathead minnow	30-35 D	48 H	LC_{50}	57,900			83
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	72 H	IMM	22,200			78
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	24 H	LC_{50}	52,400			78
	Pimephales promelas, fathead minnow	30-35 D	96 H	LC_{50}	45,000			83

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	24 H	IMM	23,000			78
	Pimephales promelas, fathead minnow	0.12 G	96 H	LC_{50}	44,100			83
	Pimephales promelas, fathead minnow	30-35 D	72 H	LC_{50}	55,400			83
	Pimephales promelas, fathead minnow	1.04 G; 49.0 MM	96 H	LC_{50}	66,800			78
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	96 H	LC_{50}	40,700			78
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	72 H	LC_{50}	39,000			78
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	48 H	LC_{50}	53,300			78
	Scenedesmus abundans, green algae	10E4 CELLS/ML	96 H	GRO	450,000			85
1,1,2-Trichloroethylene	Selenastrum capricornutum, green algae	LOG PHASE	96 H	PGR	175,000			83
(cont.)	Tubificidae, tubificidae	NR	48 H	LC_{50}	132,000			83
	Xenopus laevis, clawed toad	3-4 WK	48 H	LC_{50}	45,000			80
Pesticides								
4,4'-DDT	Acartia sp; Calanoid copepod	MATURE	24 H	LC_{50}	28		212658	88
	Acroneuria pacifica; Stonefly	NAIADS	25 D	LC_{50}	76		212238	64
	Acroneuria pacifica; Stonefly	NAIAD; 2-2.5 CM	96 H	LC_{50}	320		210528	65
	Acroneuria pacifica; Stonefly	NAIADS	30 D	LC_{50}	72		212238	64
	Acroneuria pacifica; Stonefly	NAIADS	20 D	LC_{50}	84		212238	64
	Acroneuria pacifica; Stonefly	NAIAD, 2-2.5 CM	96 H	LC_{50}	320		212667	64
	Acroneuria pacifica; Stonefly	NAIADS	5 D	LC_{50}	2,150		212238	64
	Acroneuria pacifica; Stonefly	NAIADS	10 D	LC_{50}	440		212238	64
	Acroneuria pacifica; Stonefly	NAIAD, 2-2.5 CM	48 H	LC_{50}	2,200		212667	64
	Acroneuria pacifica; Stonefly	NAIADS	15 D	LC_{50}	240		212238	64
	Acroneuria pacifica; Stonefly	NAIAD, 2-2.5 CM	72 H	LC_{50}	320		212667	64
	Aedes aegypti; Mosquito	LARVAE, 2ND INSTAR	0.193 H	ET_{50} IMM		1,000	212929	54
	Aedes aegypti; Mosquito	4TH INSTAR LARVAE *	24 H	EC_{50} IMM		83	216867	93
	Aedes aegypti; Mosquito	LARVAE, 2ND INSTAR	1.93 H	ET_{50} IMM		10	212929	54
	Aedes aegypti; Mosquito	LARVAE	96 H	LC_{50}	1		216270	74
	Aedes aegypti; Mosquito	4TH INSTAR LARVAE *	24 H	EC_{50} IMM		22	216867	93
	Aedes aegypti; Mosquito	LARVAE, 2ND INSTAR	0.307 H	ET_{50} IMM		100	212929	54
	Aedes aegypti; Mosquito	LARVAE, 2ND INSTAR	0.14 H	ET_{50} IMM		10,000	212929	54
	Aedes cantans; Mosquito	LARVAE	24 H	LC_{50}	5		215162	79
	Aedes cantans; Mosquito	LARVAE	48 H	LC_{50}	4.2		215162	79
	Aedes cantans; Mosquito	YOUNG, 4TH INSTAR	72 H	LC_{100}	20		215162	79
	Aedes sp; Mosquito	NR	24 H	LETH	1 to 7		219269	72
	Alburnus albidus; Bleak	6 CM	48 H	LC_{50}	21,500		310309	72
	Alburnus alburnus; Bleak	8 CM	96 H	LC_{50}	80		215185	79
	Algae; Algae, phytoplankton, algal mat	NR	28 H	PSE		5	212223	72
	Algae; Algae, phytoplankton, algal mat	NR	to 10 H	EC_{50} PSE		100	218926	73
	Algae; Algae, phytoplankton, algal mat	NR	4 H	PSE		1,000	212188	63
	Algae; Algae, phytoplankton, algal mat	NR	10 H	EC_{50} PSE		100	218926	73
	Algae; Algae, phytoplankton, algal mat	NR	28 H	EC_{50} PSE		55	218926	73
	Amphidinium carterae; Dinoflagellate	10000 CELLS/ML	1 to 17 D	PGR		80	219047	72
	Anguilla rostrata; American eel	NR	1 H	ENZ		50,000	219110	72
	Anguilla rostrata; American eel	NR	1 H	PHY		50,000	219110	72
	Anguilla rostrata; American eel	56 MM, 0.18 G	24 H	LC_{50}	7		210628	70
	Anguilla rostrata; American eel	56 MM, 0.18 G	96 H	LC_{50}	4		210628	70
	Anguilla rostrata; American eel	56 MM, 0.18 G	48 H	LC_{50}	6		210628	70

Table F.1-8
AQUIRE Freshwater Toxicity Information (µg/L)

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Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Anguilla rostrata; American eel	5 G	6 H	HEM, PHY		1,000	219110	72
	Anguilla vulgaris; Eel	MATURE	96 H	HEM, PHY		1	315978	83
	Anguilla vulgaris; Eel	MATURE	96 H	GRO		1	315978	83
	Anguilla vulgaris; Eel	MATURE	96 H	HEM, PHY		0.05	315978	83
	Anguilla vulgaris; Eel	MATURE	96 H	PHY		0.1	315978	83
	Anopheles sp; Mosquito	LARVAE, MIXED MICROFAUNA SPECI	2 D	POP		70	312237	83
	Anopheles stephensi; Mosquito	4TH INSTAR LARVAE	24 H	LC_{50}	282		312464	84
	Anopheles stephensi; Mosquito	4TH INSTAR LARVAE	24 H	LC_{50}	175		312464	84
	Aplocheilus lineatus; Killifish	25-40 MM STD LENGTH	24 H	LC_{50}	148.9		311081	82
	Aplocheilus lineatus; Killifish	25-40 MM STD LENGTH	48 H	LC_{50}	122.8		311081	82
4,4'-DDT (cont.)	Aplodinotus grunniens; Freshwater drum	3.3 G	96 H	LC_{50}	10		212009	66
	Aquatic community; Aquatic community	MICROCOSM	25 D	POP		10 to 500	213972	92
	Arctopsyche grandis; Caddisfly	LARVAE	96 H	LC_{50}	175		210528	65
	Artemia salina; Brine shrimp	5TH INSTAR	5 H	EC_{50} BEH		24	218105	58
	Artemia salina; Brine shrimp	ADULT	5 H	EC_{50} BEH		142	218105	58
	Artemia salina; Brine shrimp	3RD INSTAR	5 H	EC_{50} BEH		105	218105	58
	Artemia salina; Brine shrimp	9TH INSTAR	5 H	EC_{50} BEH		12	218105	58
	Artemia salina; Brine shrimp	7TH INSTAR	5 H	EC_{50} BEH		12	218105	58
	Artemia salina; Brine shrimp	DRIED EGG	48 H	HAT		10,000	216548	80
	Artemia salina; Brine shrimp	11TH INSTAR	5 H	EC_{50} BEH		28	218105	58
	Arthropoda; Arthropod phylum	NR	48 H	LETH	200		219237	72
	Asellus brevicaudus; Aquatic sowbug	MATURE	96 H	LC_{50}	4		210666	80
	Asellus brevicaudus; Aquatic sowbug	NR	96 H	LC_{50}	4		210887	72
	Asellus brevicaudus; Aquatic sowbug	NR	24 H	LC_{50}	8.7		210887	72
	Asplanchna brightwelli; Rotifer	<= 1 D	12 H	LC_{50}	2,218		312237	83
	Astacus astacus; European crayfish	MATURE, 80-90 MM, 22 G	96 H	LC_{50}	1 to 10		218297	77
	Astacus leptodactylus; Crayfish	6.8 G	NR	RSD		50	218908	73
	Balanus amphitrite; Barnacle	ADULT	1 H *	BEH		1	218645	74
	Balanus amphitrite; Barnacle	ADULT	1 H *	BEH		0.1	218645	74
	Balanus improvisus; Barnacle	CYPRIDS	24 H *	BEH		0.03	217940	74
	Balanus improvisus; Barnacle	CYPRIDS	24 H *	CLN		60,000 to 500,000	217940	74
	Balanus improvisus; Barnacle	CYPRIDS	24 H *	BEH		1,000,000	217940	74
	Barbus dorsalis; Two spot african barb	6-8.5 CM, 0.52-0.59 G	96 H	LC_{50}	48		216722	67
	Barbus dorsalis; Two spot african barb	6-8.5 CM, 0.52-0.59 G	24 H	LC_{50}	86		216722	67
	Barbus dorsalis; Two spot african barb	6-8.5 CM, 0.52-0.59 G	48 H	LC_{50}	86		216722	67
	Barbus sophore; Two spot barb, dotted barb	7.1-9.1 CM, 4.0-9.5 G	15 D	CEL, PHY		50	312352	85
	Barytelphusa cunicularis; Crab	NR	72 H	LC_{50}	980		312790	87
	Barytelphusa cunicularis; Crab	NR	24 H	LC_{50}	2,020		312790	87
	Barytelphusa cunicularis; Crab	NR	48 H	LC_{50}	1,540		312790	87
	Barytelphusa cunicularis; Crab	NR	96 H	LC_{50}	560		312790	87
	Biomphalaria glabrata; Snail	14-16 MM SHELL DIAMETER	24 H	PHY		41,100	218797	73
	Biomphalaria glabrata; Snail	14-16 MM SHELL DIAMETER	24 H	PHY		1,100	218797	73
	Bosmina longirostris; Water flea	NEONATE, < 24 H	48 H	EC_{50} IMM		1.72	310658	84
	Bosmina longirostris; Water flea	NEONATE, < 24 H	48 H	EC_{50} IMM		0.63	310658	84
	Branchiura sowerbyi; Oligochaete	NR	72 H	LETH	4,000		212798	73
	Branchiura sowerbyi; Oligochaete	NR	72 H	LETH	4,000		212798	73
	Branchiura sowerbyi; Oligochaete	NR	90 D	MOR	4,000		212798	73
	Branchiura sowerbyi; Oligochaete	NR	72 H	MOR	4,000		212798	73

Table F.1-8

AQUIRE Freshwater Toxicity Information (µg/L)

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Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Bufo woodhousei fowleri; Fowler's toad	TADPOLE, 28-35 D	96 H	LC_{50}	1,000		212891	70
	Bufo woodhousei fowleri; Fowler's toad	TADPOLE, 28-35 D	48 H	LC_{50}	1,500		212891	70
	Bufo woodhousei fowleri; Fowler's toad	TADPOLE, 28-35 D	24 H	LC_{50}	2,400		212891	70
	Callinectes sapidus; Blue crab	JUVENILE	24 H	EC_{50} EQU		10	212188	63
	Callinectes sapidus; Blue crab	JUVENILE	48 H	EC_{50} EQU		10	212188	63
	Cancer magister; Dungeness or edible crab	ZOEA	96 H	EC_{50} IMM		1.1	212264	89
	Capitella capitata; Polychaete	NR	96 H	LC_{50}	>1,000		213785	91
	Carassius auratus; Goldfish	NR	48 H	LC_{50}	68		315192	67
	Carassius auratus; Goldfish	2.72 G	96 H	LC_{50}	9.8		210851	75
	Carassius auratus; Goldfish	25 G	5.9 D	HEM		17.5	218756	74
	Carassius auratus; Goldfish	2.5-6.0 CM	24 H	LC_{50}	160		313000	65
	Carassius auratus; Goldfish	6 CM	48 H	LC_{50}	27,500		310309	72
4,4'-DDT (cont.)	Carassius auratus; Goldfish	0.8 G	96 H	LC_{50}	40		212009	66
	Carassius auratus; Goldfish	4.01 CM, 1.04 G	48 H	LC_{50}	68		212682	69
	Carassius auratus; Goldfish	1.9 G	96 H	LC_{50}	180		212009	66
	Carassius auratus; Goldfish	19-31 CM	96 H	BEH		10	218528	73
	Carassius auratus; Goldfish	1.0 G	96 H	LC_{50}	21		212009	66
	Carassius auratus; Goldfish	19-31 CM	96 H	LOC		10	219065	72
	Carassius auratus; Goldfish	2.5-6.0 CM	96 H	LC_{50}	13		313000	65
	Carassius auratus; Goldfish	2.5-6.0 CM	72 H	LC_{50}	18		313000	65
	Carassius auratus; Goldfish	2.5-6.0 CM	48 H	LC_{50}	32		313000	65
	Carassius auratus; Goldfish	NR	48 H	LETH	2,000		212807	50
	Carassius auratus; Goldfish	19-30 CM	96 H	LOC		10	218814	73
	Carassius auratus; Goldfish	2.4 G	96 H	LC_{50}	32		212009	66
	Carassius auratus; Goldfish	NR	96 H	LC_{50}	21		210610	70
	Carassius auratus; Goldfish	2.4 G	96 H	LC_{50}	27		212009	66
	Carassius auratus; Goldfish	0.7 G	96 H	LC_{50}	35		212009	66
	Carassius auratus; Goldfish	25 G	5.9 D	HEM		17.5	218756	74
	Carassius auratus; Goldfish	2.5 G	96 H	LC_{50}	76		212009	66
	Carassius carassius; Crucian carp	25-50 G	96 H	LC_{50}	80		312999	75
	Carassius sp; Carp	FRY	96 H	LC_{50}	710		216270	74
	Catla catla; Catla	30 MM, FINGERLING	96 H	LC_{50}	6,800		212520	86
	Ceriodaphnia cornuta; Water flea	MIXED MICROFAUNA SPECIES	2 D	POP		70	312237	83
	Ceriodaphnia cornuta; Water flea	<= 1 D	24 H	LC_{50}	23		312237	83
	Ceriodaphnia reticulata; Water flea	<= 1 D	24 H	LC_{50}	44		312237	83
	Channa punctatus; Snake-head catfish	10-15 CM	48 H	LC_{50}	46		218371	72
	Channa punctatus; Snake-head catfish	10-15 CM	72 H	LC_{50}	29		218371	72
	Channa punctatus; Snake-head catfish	10-15 CM	96 H	LC_{50}	21.4		218371	72
	Channa punctatus; Snake-head catfish	10-15 CM	24 H	LC_{50}	83		218371	72
	Channa punctatus; Snake-head catfish	NR	24 H	CEL, PHY		100	219363	71
	Chaoborus sp; Phantom midge	JUVENILE	96 H	LC_{50}	7.4		210666	80
	Chasmichthys dolichognathus; Agohaze, goby	0.01-0.02 G	24 H	LC_{50}	8		216128	76
	Chasmichthys dolichognathus; Agohaze, goby	0.01-0.02 G	24 H	LC_{50}	10		216128	76
	Chasmichthys dolichognathus; Agohaze, goby	0.01-0.02 G	48 H	LC_{50}	4.8		216128	76
	Chironomidae; Midge family	LARVAE, 9-11 MM	24 H	LC_{50}	74.65		217954	75
	Chironomus riparius; Midge	4TH INSTAR	24 H	EC_{50} IMM		4.7	216830	79
	Chironomus tentans; Midge	2ND INSTAR, 10-14 D	48 H	LC_{50}	1		217884	86
	Chironomus tentans; Midge	3RD-4TH INSTAR	24 H	EC_{50} IMM		19.5	216267	74

Table F.1-8
AQUIRE Freshwater Toxicity Information (µg/L)

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Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Chironomus yoshimatsui; Midge	LARVAE	24 H *	EC_{50} BEH		23	212687	79
	Chlorella sp; Green algae	150000 CELLS/ML INITIAL CONC	10 D	PGR		1,000	218039	62
	Chlorella sp; Green algae	150000 CELLS/ML INITIAL CONC	10 D	PGR		600	218039	62
	Chlorella vulgaris; Green algae	NR	NR	BIO, PHY		100 to 10,000	213306	87
	Chrysophyta; Diatoms, chrysophyte division	NR	48 H	ABD		200	219237	72
	Cipangopaludina malleata; Mud snail	NR	48 H	LC_{50}	13,000		219158	72
	Cirrhinus mrigala; Carp, hawk fish	FINGERLING, 7.1 CM, 3.1 G	48 H	OXC		20	218402	78
	Cirrhinus mrigala; Carp, hawk fish	30 MM, FINGERLING	96 H	LC_{50}	6,400		212520	86
	Claassenia sabulosa; Stonefly	20-25 MM	24 H	LC_{50}	16		210889	68
	Claassenia sabulosa; Stonefly	20-25 MM	48 H	LC_{50}	6.4		210889	68
	Claassenia sabulosa; Stonefly	20-25 MM	96 H	LC_{50}	3.5		210889	68
	Clarias batrachus; Walking catfish	NR	72 H	LC_{50}	4.2		311522	84
	Clarias batrachus; Walking catfish	NR	24 H	LC_{50}	18		311522	84
	Clarias batrachus; Walking catfish	NR	48 H	LC_{50}	8.5		311522	84
4,4'-DDT (cont.)	Clarias batrachus; Walking catfish	NR	96 H	LC_{50}	1.75		311522	84
	Colisa fasciata; Giant gourami	48-69 MM	48 H	EC_{50} IMM		132	218745	74
	Colisa fasciata; Giant gourami	FINGERLING, 4.4 CM, 1.9 G	48 H	OXC		20	218402	78
	Colisa fasciata; Giant gourami	48-69 MM	96 H	EC_{50} IMM		126	218745	74
	Colisa fasciata; Giant gourami	48-69 MM	6 H	EC_{50} IMM		162	218745	74
	Colisa fasciata; Giant gourami	48-69 MM	24 H	EC_{50} IMM		150	218745	74
	Crangon septemspinosa; Sand shrimp	2.0 G	21 H	LC_{50}	0.9		215409	80
	Crangon septemspinosa; Sand shrimp	26 MM, 0.25 G	24 H	LC_{50}	3		210627	69
	Crangon septemspinosa; Sand shrimp	2.0 G	15 H	LC_{50}	1.1		215409	80
	Crangon septemspinosa; Sand shrimp	2.0 G	96 H	LC_{50}	0.4		215409	80
	Crangon septemspinosa; Sand shrimp	2.0 G	20 H	LC_{50}	1.8		215409	80
	Crangon septemspinosa; Sand shrimp	2.0 G	15 H	LC_{50}	1.9		215409	80
	Crangon septemspinosa; Sand shrimp	26 MM, 0.25 G	48 H	LC_{50}	1		210627	69
	Crangon septemspinosa; Sand shrimp	2.0 G	16 H	LC_{50}	0.9		215409	80
	Crassostrea madrasensis; Oyster	15-20 MM	72 H	LC_{50}	15.75		210276	89
	Crassostrea madrasensis; Oyster	15-20 MM	96 H	LC_{50}	9.36		210276	89
	Crassostrea madrasensis; Oyster	15-20 MM	120 H	LC_{50}	9.28		210276	89
	Crassostrea madrasensis; Oyster	15-20 MM	24 H	LC_{50}	24.82		210276	89
	Crassostrea madrasensis; Oyster	15-20 MM	48 H	LC_{50}	16.19		210276	89
	Crassostrea virginica; American or viginia oyster	2.5-5.1 CM	96 H	GRO		7	212188	63
	Crassostrea virginica; American or viginia oyster	2 MO	1 to 48 WK	HIS, PHY		0.6	210981	71
	Crassostrea virginica; American or viginia oyster	2 D LARVAE	12 D	LC_{50}	34		212400	79
	Crassostrea virginica; American or viginia oyster	2 MO	48 WK	GRO		0.6	210981	71
	Crassostrea virginica; American or viginia oyster	2.5-5.1 CM	96 H	GRO		9	212188	63
	Crithidia fasciculata; Flagellate	NR	NR	PGR		3,500	218552	74
	Culaea inconstans; Brook stickleback	1.6 G	96 H	LC_{50}	67		212009	66
	Culex fatigans; Mosquito	LARVAE, 4TH INSTAR STAGE	24 H	LC_{50}	180		312237	83
	Culex pipiens molestus; Mosquito	4TH INSTAR	72 H	LC_{100}	50		215162	79
	Culex pipiens molestus; Mosquito	NR	3 D *	MOR	250		215162	79
	Culex pipiens molestus; Mosquito	NR	3 D *	MOR	250		215162	79
	Culex pipiens molestus; Mosquito	LARVAE	48 H	LC_{50}	7.2		215162	79
	Culex pipiens molestus; Mosquito	LARVAE	24 H	LC_{50}	8.6		215162	79
	Culex pipiens molestus; Mosquito	4TH INSTAR	72 H	LC_{100}	50		215162	79
	Culex pipiens molestus; Mosquito	NR	3 D *	MOR	250		215162	79

AQUIRE Freshwater Toxicity Information (µg/L)

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Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Culex pipiens quinquefasciata; Mosquito	3RD-4TH INSTAR LARVAE	24 H	LC_{50}	100		219297	71
	Culex pipiens quinquefasciata; Mosquito	3RD-4TH INSTAR LARVAE	24 H	LC_{50}	80		219297	71
	Culex quinquefasciatus; Mosquito	4TH INSTAR LARVAE	24 H	LC_{50}	2.1		210810	88
	Culex quinquefasciatus; Mosquito	3RD OR 4TH INSTAR LARVAE	24 H	LC_{50}	22		311201	85
	Cyclops sp; Cyclopoid copepod	4TH INSTAR STAGE	24 H	LC_{50}	515		312237	83
	Cyclops sp; Cyclopoid copepod	MIXED MICROFAUNA SPECIES	2 D	POP		70	312237	83
	Cyclotella cryptica; Diatom	INIT CONC 50000 CELLS/ML	6 D	BMS		10	310161	84
	Cyclotella cryptica; Diatom	INIT CONC 50000 CELLS/ML	6 D	BMS		20	310161	84
	Cymatogaster aggregata; Shiner perch	48-104 MM, 1.2-11.0 G	96 H	LC_{50}	0.45		210611	72
	Cymatogaster aggregata; Shiner perch	48-104 MM, 1.2-11.0 G	96 H	LC_{50}	3.7		210611	72
	Cypridopsis vidua; Ostracod	NR	24 H	MOR	250		218599	74
	Cypridopsis vidua; Ostracod	MATURE	48 H	EC_{50} IMM		15	210666	80
	Cypridopsis vidua; Ostracod	NR	48 H	MOR	125		218599	74
	Cypridopsis vidua; Ostracod	NR	48 H	MOR	63		218599	74
	Cypridopsis vidua; Ostracod	NR	24 H	MOR	1,000		218599	74
	Cypridopsis vidua; Ostracod	NR	24 H	MOR	63		218599	74
4,4'-DDT (cont.)	Cypridopsis vidua; Ostracod	NR	48 H	MOR	250		218599	74
	Cyprinodon variegatus; Sheepshead minnow	NR	24 H	EC_{50} EQU		1,000	210807	65
	Cyprinodon variegatus; Sheepshead minnow	20-40 MM	0.5 H *	AVO		5	215145	69
	Cyprinodon variegatus; Sheepshead minnow	NR	48 H	LC_{50}	5		210807	65
	Cyprinodon variegatus; Sheepshead minnow	JUVENILE	48 H	LC_{50}	5		210646	64
	Cyprinodon variegatus; Sheepshead minnow	JUVENILE	24 H	IRR		100	210646	64
	Cyprinodontidae; Killifish, topminnow family	ADULT, 13-15 CM	72 H	LETH	500		212807	50
	Cyprinus carpio; Common, mirror, colored, carp	15 G	96 H	ENZ		21	219265	72
	Cyprinus carpio; Common, mirror, colored, carp	0.6 G	96 H	LC_{50}	6		212009	66
	Cyprinus carpio; Common, mirror, colored, carp	2.2 G	96 H	LC_{50}	9.2		212009	66
	Cyprinus carpio; Common, mirror, colored, carp	NR	48 H	LC_{50}	110		315192	67
	Cyprinus carpio; Common, mirror, colored, carp	NR	6 H	BIO, PHY		50	311249	84
	Cyprinus carpio; Common, mirror, colored, carp	0.8 G	96 H	LC_{50}	6.9		212009	66
	Cyprinus carpio; Common, mirror, colored, carp	15 G	96 H	ENZ		34	219265	72
	Cyprinus carpio; Common, mirror, colored, carp	2.1 G	96 H	LC_{50}	11.3		212009	66
	Cyprinus carpio; Common, mirror, colored, carp	15 G	96 H	ENZ		34	219265	72
	Cyprinus carpio; Common, mirror, colored, carp	EGGS	96 H	HAT		1,000	219629	70
	Cyprinus carpio; Common, mirror, colored, carp	4.5 CM, 1.1 G	48 H	LC_{50}	110		212682	69
	Cyprinus carpio; Common, mirror, colored, carp	NR	96 H	LC_{50}	10		210610	70
	Cyprinus carpio; Common, mirror, colored, carp	NR	6 H	BIO, PHY		50	311249	84
	Cyprinus carpio; Common, mirror, colored, carp	12-17 CM, 40-80 G	6 H	PHY		50	310912	85
	Cyprinus carpio; Common, mirror, colored, carp	EGGS	96 H	HAT		5,000	219629	70
	Cyprinus carpio; Common, mirror, colored, carp	FRY	96 H	LC_{50}	540		216270	74
	Cyprinus carpio; Common, mirror, colored, carp	EGG	96 H	LC_{50}	350		311812	86
	Cyprinus carpio; Common, mirror, colored, carp	2.0 G	96 H	LC_{50}	4		212009	66
	Cyprinus carpio; Common, mirror, colored, carp	2.5 G	96 H	LC_{50}	12		212009	66
	Cyprinus carpio; Common, mirror, colored, carp	NR	6 H	BIO, PHY		50	311249	84
	Daphnia carinata; Water flea	2-2.5 MM ADULT	48 H	EC_{50} IMM		12	215194	76
	Daphnia carinata; Water flea	2-2.5 MM ADULT	24 H	EC_{50} IMM		23	215194	76
	Daphnia magna; Water flea	NR	26 H	EC_{50} IMM		5.5	217984	66
	Daphnia magna; Water flea	JUVENILE, 6-24 H	24 H	EC_{50} IMM		510	310871	84
	Daphnia magna; Water flea	JUVENILE, 6-24 H	48 H	EC_{50} IMM		1.1	310871	84

Table F.1-8
AQUIRE Freshwater Toxicity Information (µg/L)

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Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Daphnia magna; Water flea	< 24 H	14 D	REP		0.5	215525	75
	Daphnia magna; Water flea	JUVENILE, 6-24 H	24 H	EC_{50} IMM		71	310871	84
	Daphnia magna; Water flea	<24 H	14 D	REP		0.75	215525	75
	Daphnia magna; Water flea	1ST INSTAR, < 24 H	26 H	LC_{50}	4.4		212820	67
	Daphnia magna; Water flea	< 24 H	48 H	MOR	0.04		218455	74
	Daphnia magna; Water flea	1ST INSTAR, 9 UG	24 H *	MOR	8		219303	71
	Daphnia magna; Water flea	1ST INSTAR	48 H	EC_{50} IMM		4.7	210666	80
	Daphnia magna; Water flea	2-26 H ADULT	24 H	EC_{50} IMM		6.5	215539	75
	Daphnia magna; Water flea	1ST INSTAR, 9 UG	24 H *	MOR	200		219303	71
	Daphnia magna; Water flea	JUVENILE, 6-24 H	24 H	EC_{50} IMM		0.5	310871	84
	Daphnia magna; Water flea	1ST INSTAR, 9 UG	24 H *	MOR	50		219303	71
	Daphnia magna; Water flea	NR	48 H	LC_{50}	2.66		313007	76
	Daphnia magna; Water flea	< 24 H	24 H	LC_{50}	9		315291	75
	Daphnia magna; Water flea	JUVENILE, 6-24 H	24 H	EC_{50} IMM		42	310871	84
	Daphnia magna; Water flea	1ST INSTAR, 9 UG	24 H *	MOR	16		219303	71
	Daphnia magna; Water flea	JUVENILE, 6-24 H	48 H	EC_{50} IMM		0.68	310871	84
	Daphnia magna; Water flea	< 24 H	48 H	EC_{50} IMM		1.7	212076	79
	Daphnia magna; Water flea	JUVENILE, 6-24 H	24 H	EC_{50} IMM		0.99	310871	84
4,4'-DDT (cont.)	Daphnia magna; Water flea	JUVENILE, 1-2 MM, <24 H	48 H	EC_{50} IMM		1.08	212554	90
	Daphnia magna; Water flea	JUVENILE, 6-24 H	24 H	EC_{50} IMM		98	310871	84
	Daphnia magna; Water flea	NR	96 H	LC_{50}	3		216270	74
	Daphnia magna; Water flea	JUVENILE, 6-24 H	24 H	EC_{50} IMM		1.3	310871	84
	Daphnia magna; Water flea	1ST INSTAR, 9 UG	24 H *	MOR	1,100		219303	71
	Daphnia magna; Water flea	JUVENILE, 1-2 MM, <24 H	48 H	EC_{50} IMM		1.23	212554	90
	Daphnia magna; Water flea	< 24 H	48 H	MOR	0.9		218455	74
	Daphnia magna; Water flea	<24 H	14 D	EC_{50} IMM		0.67	215525	75
	Daphnia magna; Water flea	12 +/- 12 H	14 D	EC_{50} IMM		0.67	215525	75
	Daphnia magna; Water flea	<24 H	48 H	LC_{50}	3		217884	86
	Daphnia magna; Water flea	<24 H	14 D	REP		0.61	215525	75
	Daphnia magna; Water flea	JUVENILE, 1-2 MM, <24 H	48 H	EC_{50} IMM		1.51	212554	90
	Daphnia magna; Water flea	1ST INSTAR, 9 UG	24 H *	MOR	100		219303	71
	Daphnia magna; Water flea	JUVENILE, 1-2 MM, <24 H	48 H	EC_{50} IMM		1.13	212554	90
	Daphnia magna; Water flea	< 24 H	48 H	EC_{50} IMM		1.1	212076	79
	Daphnia magna; Water flea	12 +/- 12 H	14 D	REP		0.5	215525	75
	Daphnia magna; Water flea	NR	26 H	EC_{50} IMM		195	217984	66
	Daphnia magna; Water flea	JUVENILE, 1-2 MM, <24 H	48 H	EC_{50} IMM		1.2	212554	90
	Daphnia pulex; Water flea	NEONATE, <24 H	48 H	EC_{50} IMM		1.1	213283	88
	Daphnia pulex; Water flea	1ST INSTAR	48 H	EC_{50} IMM		0.36	210888	66
	Daphnia pulex; Water flea	FEMALE ADULT	3 H	LC_{50}	3,500		212682	69
	Daphnia pulex; Water flea	NR	48 H	EC_{50} IMM		2.67	310658	84
	Daphnia pulex; Water flea	NEONATE, < 24 H	48 H	EC_{50} IMM		1.1	312730	87
	Daphnia pulex; Water flea	NR	3 H	LC_{50}	3,500		315192	67
	Daphnia sp; Water flea	NR	48 H	REP		100	210666	80
	Dendraster excentricus; Sand dollar	EMBRYO	72 H	EC_{50} DVP		>17.2	212264	89
	Diphanosoma excisum; Water flea	MIXED MICROFAUNA SPECIES	2 D	POP		70	312237	83
	Diphanosoma excisum; Water flea	<= 1 D	24 H	LC_{50}	28		312237	83
	Diptera; Fly, mosquito, midge order	NR	3 H *	DRF		10 to 11	217387	61
	Donax cuneatus; Marine bivalve	ADULT, 20-25 MM	72 H	FLT		1,000	218286	79

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Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Donax cuneatus; Marine bivalve	ADULT, 20-25 MM	72 H	PHY		1,000	218286	79
	Donax cuneatus; Marine bivalve	ADULT, 20-25 MM	9 D	LETH	1,000		218286	79
	Donax cuneatus; Marine bivalve	ADULT, 20-25 MM	8 D	OXC		1,000	218286	79
	Dunaliella euchlora; Green algae	150000 CELLS/ML INITIAL CONC	10 D	PGR		1,000	218039	62
	Dunaliella euchlora; Green algae	150000 CELLS/ML INITIAL CONC	10 D	PGR		600	218039	62
	Dunaliella euchlora; Green algae	NR	24 H	PSE		10	219310	71
	Dunaliella tertiolecta; Green algae	10000 CELLS/ML	1 to 17 D	PGR		80	219047	72
	Emiliania huxleyi; Coccolithophorid	10000 CELLS/ML	1 to 17 D	PGR		80	219047	72
	Ephemerella grandis; Mayfly	NYMPH	96 H	LC_{50}	25		210528	65
	Ephemeroptera; Mayfly order	NR	2.5 H *	DRF		10 to 11	217387	61
	Eretes sticticus; Beetle	NR	24 H	LC_{50}	35		215182	78
	Eretes sticticus; Beetle	NR	48 H	LC_{50}	21.5		215182	78
	Esox lucius; Northern pike	0.7 G	96 H	LC_{50}	2.7		210666	80
	Esox lucius; Northern pike	0.5 G	96 H	LC_{50}	1.7		212009	66
	EuCalanus sp; Calanoid copepod	MATURE	24 H	LC_{50}	12		212658	88
	Euplotes vannus; Ciliate	NR	48 H	REP		10,000	215922	75
	Fundulus heteroclitus; Mummichog	55 MM, 20 G	96 H	LC_{50}	5		210628	70
	Fundulus heteroclitus; Mummichog	5 G	6 H	HEM		250	219110	72
	Fundulus heteroclitus; Mummichog	5 G	24 H	LETH	750		219110	72
	Fundulus heteroclitus; Mummichog	55 MM, 20 G	24 H	LC_{50}	11		210628	70
4,4'-DDT (cont.)	Fundulus heteroclitus; Mummichog	5 G	96 H	MOR	250		219110	72
	Fundulus heteroclitus; Mummichog	4-5 CM	7 D	RGN		10	218232	75
	Fundulus heteroclitus; Mummichog	5 G	72 H	MOR	250		219110	72
	Fundulus heteroclitus; Mummichog	ADULT	24 H	LC_{100}	1,000		218806	72
	Fundulus heteroclitus; Mummichog	5 G	48 H	MOR	250		219110	72
	Fundulus heteroclitus; Mummichog	42 (36-45) MM	10 D	LC_{50}	2.7		212814	70
	Fundulus heteroclitus; Mummichog	5-10 CM	0.25 H	BIO, PHY		18,000	219485	81
	Fundulus heteroclitus; Mummichog	5 G	24 H	HEM		75	219110	72
	Fundulus heteroclitus; Mummichog	5 G	96 H	MOR	25		219110	72
	Fundulus heteroclitus; Mummichog	5 G	24 H	MOR	250		219110	72
	Fundulus heteroclitus; Mummichog	5 G	24 H	MOR	75		219110	72
	Fundulus heteroclitus; Mummichog	4-5 CM	14 D	RGN		10	218232	75
	Fundulus heteroclitus; Mummichog	5 G	48 H	MOR	75		219110	72
	Fundulus heteroclitus; Mummichog	42 (36-45) MM	96 H	LC_{50}	3		212814	70
	Fundulus heteroclitus; Mummichog	5 G	72 H	MOR	75		219110	72
	Fundulus heteroclitus; Mummichog	55 MM, 20 G	48 H	LC_{50}	5		210628	70
	Fundulus heteroclitus; Mummichog	5 G	6 H	HEM		250	219110	72
	Fundulus heteroclitus; Mummichog	ADULT	24 H	LC_{0}	70		218806	72
	Fundulus heteroclitus; Mummichog	5 G	96 H	MOR	75		219110	72
	Fundulus majalis; Striped killifish	40 MM, 0.92 G	48 H	LC_{50}	2		210628	70
	Fundulus majalis; Striped killifish	40 MM, 0.92 G	24 H	LC_{50}	3		210628	70
	Fundulus majalis; Striped killifish	40 MM, 0.92 G	96 H	LC_{50}	1		210628	70
	Fundulus similis; Longnose killifish	JUVENILE	48 H	LC_{50}	5.5		212188	63
	Fundulus similis; Longnose killifish	NR	24 H	LC_{50}	28		210807	65
	Fundulus similis; Longnose killifish	NR	48 H	LC_{50}	18		210807	65
	Fundulus similis; Longnose killifish	JUVENILE	24 H	LC_{50}	5.5		212188	63
	Gambusia affinis; Mosquitofish	NR	48 H	LC_{50}	313		215494	73
	Gambusia affinis; Mosquitofish	NR	14.5 D	LT_{50}	4		216978	77

Table F.1-8
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					Lethal	Sublethal		
	Gambusia affinis; Mosquitofish	FEMALE, 3.8-5.1 CM, 0.68-0.81 G	48 H	LC_{50}	60		210568	80
	Gambusia affinis; Mosquitofish	NR	13.4 H	LT_{50}	1,500		216978	77
	Gambusia affinis; Mosquitofish	NR	24 H *	MOR	2		212128	61
	Gambusia affinis; Mosquitofish	1.8-4.8 CM	24 H	MOR	1		219096	72
	Gambusia affinis; Mosquitofish	NR	48 H *	MOR	2		212128	61
	Gambusia affinis; Mosquitofish	NR	13.4 H	LT_{50}	2,500		216978	77
	Gambusia affinis; Mosquitofish	NR	48 H	LC_{50}	528		215494	73
	Gambusia affinis; Mosquitofish	1.9 G, 4.3 CM	24 H	LC_{50}	560		216038	70
	Gambusia affinis; Mosquitofish	1.9 G, 4.3 CM	96 H	LC_{50}	20		216038	70
	Gambusia affinis; Mosquitofish	FEMALE, 3.8-5.1 CM, 0.68-0.81 G	96 H	LC_{50}	40		210568	80
	Gambusia affinis; Mosquitofish	NR	24 H *	MOR	2		212128	61
	Gambusia affinis; Mosquitofish	NR	12.5 H	LT_{50}	1,000		216978	77
	Gambusia affinis; Mosquitofish	NR	48 H *	MOR	2		212128	61
	Gambusia affinis; Mosquitofish	NR	13 H	LT_{50}	500		216978	77
	Gambusia affinis; Mosquitofish	NR	24 H *	MOR	2		212128	61
	Gambusia affinis; Mosquitofish	FRY, 2.06 CM, 222 MG, BEHERA STRAI	96 H	LC_{50}	9.87		313099	86
	Gambusia affinis; Mosquitofish	NR	96 H *	MOR	0.5		212128	61
	Gambusia affinis; Mosquitofish	NR	48 H	LC_{50}	43		215494	73
	Gambusia affinis; Mosquitofish	1.9 G, 4.3 CM	48 H	LC_{50}	46		216038	70
	Gambusia affinis; Mosquitofish	NR	0.17 H	ENZ		40,000	217212	78
	Gambusia affinis; Mosquitofish	NR	23 H	LT_{50}	100		216978	77
	Gambusia affinis; Mosquitofish	95 % MATURE FEMALES	0.67 H	ENZ		3	219148	72
4,4'-DDT (cont.)	Gambusia affinis; Mosquitofish	NR	13.4 H	LT_{50}	2,000		216978	77
	Gambusia affinis; Mosquitofish	NR	24 H	MOR	2		212128	61
	Gambusia affinis; Mosquitofish	FEMALE, 3.8-5.1 CM, 0.68-0.81 G	72 H	LC_{50}	55		210568	80
	Gambusia affinis; Mosquitofish	NR	48 H	MOR	2		212128	61
	Gambusia affinis; Mosquitofish	2.0-5.8 CM	96 H	LC_{50}	0.45		216033	77
	Gambusia affinis; Mosquitofish	NR	24 H *	MOR	2		212128	61
	Gambusia affinis; Mosquitofish	FRY, 2.06 CM, 222 MG	24 H	LC_{50}	58.58		313099	86
	Gambusia affinis; Mosquitofish	NR	48 H *	MOR	2		212128	61
	Gambusia affinis; Mosquitofish	FRY, 2.06 CM, 222 MG	24 H	LC_{50}	22.74		313099	86
	Gambusia affinis; Mosquitofish	NR	24 H	MOR	0.5		212128	61
	Gambusia affinis; Mosquitofish	NR	14.2 D	LT_{50}	20		216978	77
	Gambusia affinis; Mosquitofish	NR	48 H	MOR	0.5		212128	61
	Gambusia affinis; Mosquitofish	FEMALE, 3.8-5.1 CM, 0.68-0.81 G	24 H	LC_{50}	70		210568	80
	Gambusia affinis; Mosquitofish	NR	24 H *	MOR	0.5		212128	61
	Gambusia affinis; Mosquitofish	0.5 G	96 H	LC_{50}	27		210942	72
	Gambusia affinis; Mosquitofish	NR	48 H *	MOR	0.5		212128	61
	Gambusia affinis; Mosquitofish	FRY, 2.06 CM, 222 MG, BEHERA STRAI	96 H	LC_{50}	27.69		313099	86
	Gambusia affinis; Mosquitofish	95 % MATURE FEMALES	0.67 H	ENZ		3	219148	72
	Gambusia affinis; Mosquitofish	1.8-4.8 CM	24 H	MOR	5		219096	72
	Gambusia affinis; Mosquitofish	NR	72 H *	MOR	0.5		212128	61
	Gammarus duebeni; Scud	ADULT, 50-80 MG	72 H	PHY		3.5	218132	75
	Gammarus fasciatus; Scud	NR	48 H	LC_{50}	1		210887	72
	Gammarus fasciatus; Scud	NR	24 H	LC_{50}	15		210887	72
	Gammarus fasciatus; Scud	NR	96 H	LC_{50}	3.2		210948	72
	Gammarus fasciatus; Scud	NR	96 H	LC_{50}	3.2		210887	72
	Gammarus fasciatus; Scud	NR	24 H	LC_{50}	1.1		210887	72

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					Lethal	Sublethal		
	Gammarus fasciatus; Scud	NR	24 H	LC_{50}	4.2		210887	72
	Gammarus fasciatus; Scud	NR	5 D	LC_{50}	0.6		210887	72
	Gammarus fasciatus; Scud	NR	48 H	LC_{50}	3.1		210887	72
	Gammarus fasciatus; Scud	NR	5 D	LC_{50}	0.32		210887	72
	Gammarus fasciatus; Scud	NR	5 D	LC_{50}	0.6		210948	72
	Gammarus fasciatus; Scud	NR	96 H	LC_{50}	0.8		210887	72
	Gammarus fasciatus; Scud	NR	96 H	LC_{50}	1.8		210887	72
	Gammarus lacustris; Scud	2 MONTH OLD	48 H	LC_{50}	2.1		210885	69
	Gammarus lacustris; Scud	2 MO	24 H	LC_{50}	12		210885	69
	Gammarus lacustris; Scud	2 MONTH OLD	24 H	LC_{50}	4.7		210885	69
	Gammarus lacustris; Scud	2 MONTH OLD	96 H	LC_{50}	1		210885	69
	Gammarus lacustris; Scud	MATURE	96 H	LC_{50}	1		210666	80
	Gammarus lacustris; Scud	1 MONTH OLD	24 H	LC_{50}	1.4		210885	69
	Gammarus lacustris; Scud	NR	96 H	LC_{50}	9		212094	64
	Gammarus lacustris; Scud	2 MONTH OLD	24 H	LC_{50}	5.6		210885	69
	Gammarus lacustris; Scud	NR	96 H	LC_{50}	9		210528	65
	Gammarus lacustris; Scud	3 MONTH OLD	24 H	LC_{50}	8		210885	69
	Gammarus lacustris; Scud	2 MONTH OLD	24 H	LC_{50}	7.6		210885	69
	Gasterosteus aculeatus; Three spine stickleback	22-44 MM, 0.38-0.77 G	24 H	LC_{50}	18		210522	61
	Gasterosteus aculeatus; Three spine stickleback	22-44 MM, 0.38-0.77 G	96 H	LC_{50}	11.5		210522	61
	Gasterosteus aculeatus; Three spine stickleback	22-44 MM, 0.38-0.77 G	96 H	LC_{50}	18		210522	61
	Gasterosteus aculeatus; Three spine stickleback	22-44 MM, 0.38-0.77 G	72 H	LC_{50}	14.5		210522	61
	Gasterosteus aculeatus; Three spine stickleback	22-44 MM, 0.38-0.77 G	72 H	LC_{50}	18.5		210522	61
	Gasterosteus aculeatus; Three spine stickleback	22-44 MM, 0.38-0.77 G	24 H	LC_{50}	22		210522	61
4,4'-DDT (cont.)	Gasterosteus aculeatus; Three spine stickleback	22-44 MM, 0.38-0.77 G	48 H	LC_{50}	21		210522	61
	Gasterosteus aculeatus; Three spine stickleback	22-44 MM, 0.38-0.77 G	48 H	LC_{50}	15		210522	61
	Girella punctata; Green fish	0.15-0.24 G	24 H	LC_{50}	6.5		216128	76
	Girella punctata; Green fish	0.15-0.24 G	48 H	LC_{50}	7		216128	76
	Girella punctata; Green fish	0.15-0.24 G	24 H	LC_{50}	7.2		216128	76
	Girella punctata; Green fish	0.15-0.24 G	48 H	LC_{50}	6		216128	76
	Halodule uninervis; Macrophyte	2-3 G FRESH WT	6 H	PSE		50	310569	84
	Halophila ovalis; Macrophyte	2-3 G FRESH WT	6 H	PSE		50	310569	84
	Hemitripterus americanus; Sea raven	NR	0.5 H	ENZ		1,000	219361	71
	Hesperophylax sp; Caddisfly	LARVAE	0.25 H	LETH	15,000		315079	49
	Hesperophylax sp; Caddisfly	LARVAE	0.25 H	MOR	15,000		315079	49
	Heterocypris incongruens; Ostracod	ADULT	48 H	LETH	5,000		218599	74
	Heterocypris incongruens; Ostracod	ADULT	48 H	MOR	100		218599	74
	Heterocypris incongruens; Ostracod	ADULT	24 H	MOR	5,000		218599	74
	Heterocypris incongruens; Ostracod	ADULT	24 H	MOR	100		218599	74
	Heteropneustes fossilis; Indian catfish	19.8-22.0 CM, 40-57 G	96 H	LC_{50}	2,950		312480	84
	Heteropneustes fossilis; Indian catfish	19.8-22.0 CM, 40-57 G	11 D	HEM, PHY		500	312480	84
	Heteropneustes fossilis; Indian catfish	19.8-22.0 CM, 40-57 G	72 H	LC_{50}	3,020		312480	84
	Heteropneustes fossilis; Indian catfish	19.8-22.0 CM, 40-57 G	48 H	LC_{50}	3,550		312480	84
	Homarus americanus; American lobster	NR	0.17 H	BIO, PHY		1,100	212818	74
	Homarus americanus; American lobster	NR	0.17 H	BIO, PHY		3,500	212818	74
	Hydropsyche californica; Caddisfly	LARVAE	96 H	LC_{50}	48		210528	65
	Hydropsyche morosa; Caddisfly	LARVAE, 42 MG	6 H	EC_{50} IMM		50	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 25 MG	6 H	EC_{50} IMM		50	212822	72

Table F.1-8
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					Lethal	Sublethal		
	Hydropsyche morosa; Caddisfly	LARVAE, 32.5 MG	40 H	ET_{50} IMM		20	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 19.0 MG	6 H	ET_{50} IMM		20	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 42 MG	3 H	EC_{50} IMM		70	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 25 MG	6 H *	EC_{50} IMM		250	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 42 MG	6 H *	EC_{50} IMM		50	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 25 MG	6 H *	EC_{50} IMM		100	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 40 MG	6 H	EC_{50} IMM		40	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 25 MG	3 H	EC_{50} IMM		40	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 40 MG	6 H	EC_{50} IMM		20	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 25 MG	3 H	EC_{50} IMM		90	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 32.5 MG	9 H	ET_{50} IMM		100	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 40 MG	6 H	EC_{50} IMM		30	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 40 MG	6 H	EC_{50} IMM		60	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 25 MG	3 H	EC_{50} IMM		500	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 25 MG	6 H	EC_{50} IMM		150	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 40 MG	6 H	EC_{50} IMM		20	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 25 MG	6 H *	EC_{50} IMM		50	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 25 MG	6 H *	EC_{50} IMM		50	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 40 MG	6 H	EC_{50} IMM		20	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 25 MG	6 H	EC_{50} IMM		250	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 19.0 MG	2 H	ET_{50} IMM		100	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 25 MG	6 H	EC_{50} IMM		50	212822	72
	Hydropsyche morosa; Caddisfly	LARVAE, 25 MG	3 H	EC_{50} IMM		90	212822	72
	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	6 H	EC_{50} IMM		60	212822	72
	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	24 H *	EC_{50} IMM		40	212822	72
	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	6 H *	EC_{50} IMM		40	212822	72
4,4'-DDT (cont.)	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	6 H	EC_{50} IMM		30	212822	72
	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	3 H	EC_{50} IMM		1,000	212822	72
	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	3 H	EC_{50} IMM		10	212822	72
	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	3 H	EC_{50} IMM		1,000	212822	72
	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	3 H	EC_{50} IMM		100	212822	72
	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	6 H *	EC_{50} IMM		20	212822	72
	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	6 H	EC_{50} IMM		60	212822	72
	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	24 H *	EC_{50} IMM		300	212822	72
	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	24 H *	EC_{50} IMM		400	212822	72
	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	6 H	EC_{50} IMM		500	212822	72
	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	3 H	EC_{50} IMM		90	212822	72
	Hydropsyche recurvata; Caddisfly	LARVAE, 25 MG	6 H	EC_{50} IMM		150	212822	72
	Hydropsyche sp; Caddisfly	LARVAE	0.25 H	LETH	15,000		315079	49
	Hydropsyche sp; Caddisfly	LARVAE	0.25 H	MOR	15,000		315079	49
	Ictalurus melas; Black bullhead	1.2 G	96 H	LC_{50}	4.8		210666	80
	Ictalurus melas; Black bullhead	2.1 G	96 H	LC_{50}	42		212009	66
	Ictalurus melas; Black bullhead	2.4 G	96 H	LC_{50}	23.5		212009	66
	Ictalurus melas; Black bullhead	NR	96 H	LC_{50}	5		210610	70
	Ictalurus melas; Black bullhead	2.2 G	96 H	LC_{50}	20		212009	66
	Ictalurus melas; Black bullhead	2.3 G	96 H	LC_{50}	17		212009	66
	Ictalurus punctatus; Channel catfish	NR	96 H	LC_{50}	16		210610	70
	Ictalurus punctatus; Channel catfish	10.0 G	24 H	LC_{50}	34		210942	72

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AQUIRE Freshwater Toxicity Information (µg/L)

Remedial Investigation Report
Naval Training Center, OU 4
Orlando, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Ictalurus punctatus; Channel catfish	2.0 G	96 H	LC_{50}	17.5		212009	66
	Ictalurus punctatus; Channel catfish	2.98 G	96 H	LC_{50}	13.5		210851	75
	Ictalurus punctatus; Channel catfish	1.5 G	96 H	LC_{50}	21.5		210666	80
	Ictalurus punctatus; Channel catfish	43 (39-46) MM, 0.5 (0.4-0.6) G	96 H	LC_{50}	3.3		218048	65
	Ictalurus punctatus; Channel catfish	86.5 G, 194.6 MM	96 H	BEH		10	218528	73
	Ictalurus punctatus; Channel catfish	43, (39-46) MM, 0.5 (0.4-0.6) G	48 H	LC_{50}	4.1		218048	65
	Ictalurus punctatus; Channel catfish	43 (39-46) MM, 0.5 (0.4-0.6) G	24 H	LC_{50}	4.9		218048	65
	Ictalurus punctatus; Channel catfish	1.9 G	96 H	LC_{50}	17.5		212009	66
	Ictiobus cyprinellus; Bigmouth buffalo	ADULT	45 D	MOR	1,000		212807	50
	Indonaia caerulea; Unionid clam	ADULT, 55-65 MM	72 H	LT_{50}	1,000		218286	79
	Indoplanorbis exustus; Snail	NR	48 H	LC_{50}	5,500		219158	72
	Ischnura verticalis; Damselfly	NR	96 H	LC_{50}	56		210948	72
	Isoperla sp; Stonefly	JUVENILE	96 H	LC_{50}	1.2		210666	80
	Katelysia opima; Marine bivalve	10-15 MM	24 H	LC_{50}	16.48		210276	89
	Katelysia opima; Marine bivalve	ADULT, 25-30 MM	72 H	FLT		1,000	218286	79
	Katelysia opima; Marine bivalve	10-15 MM	96 H	LC_{50}	13.19		210276	89
	Katelysia opima; Marine bivalve	ADULT, 25-30 MM	80 H	MOR	1,000		218286	79
	Katelysia opima; Marine bivalve	10-15 MM	72 H	LC_{50}	14.62		210276	89
	Katelysia opima; Marine bivalve	10-15 MM	120 H	LC_{50}	11.05		210276	89
	Katelysia opima; Marine bivalve	ADULT, 25-30 MM	72 H	OXC		1,000	218286	79
	Katelysia opima; Marine bivalve	ADULT, 25-30 MM	72 H	PHY		1,000	218286	79
	Katelysia opima; Marine bivalve	10-15 MM	48 H	LC_{50}	15.78		210276	89
	Kuhlia sandvicensis; Aholehole	1.49 G, 4.3 CM	48 H	LC_{50}	6.3		216038	70
	Kuhlia sandvicensis; Aholehole	1.49 G, 4.3 CM	96 H	LC_{50}	3.9		216038	70
	Kuhlia sandvicensis; Aholehole	1.49 G, 4.3 CM	24 H	LC_{50}	12		216038	70
	Labeo rohita; Rohu	30 MM, FINGERLING	96 H	LC_{50}	6,400		212520	86
	Labeo rohita; Rohu	FINGERLING, 5.9 CM, 1.9 G	48 H	OXC		20	218402	78
	Leiostomus xanthurus; Spot	JUVENILE	24 H	LC_{50}	5		210646	64
4,4'-DDT (cont.)	Leiostomus xanthurus; Spot	JUVENILE	48 H	LC_{50}	2		210646	64
	Lepomis cyanellus; Green sunfish	1.1 G	96 H	LC_{50}	6.7		212009	66
	Lepomis cyanellus; Green sunfish	1.4 G	96 H	LC_{50}	3.9		212009	66
	Lepomis cyanellus; Green sunfish	0.7 G	96 H	LC_{50}	4.4		212009	66
	Lepomis cyanellus; Green sunfish	0.8 G	96 H	LC_{50}	5		212009	66
	Lepomis cyanellus; Green sunfish	1.0 G	96 H	LC_{50}	3		212009	66
	Lepomis cyanellus; Green sunfish	0.7 G	96 H	LC_{50}	2.8		212009	66
	Lepomis cyanellus; Green sunfish	0.8 G	96 H	LC_{50}	6.4		212009	66
	Lepomis cyanellus; Green sunfish	0.8 G	96 H	LC_{50}	3.6		212009	66
	Lepomis gibbosus; Pumpkinseed	1.4 G	96 H	LC_{50}	6.7		212009	66
	Lepomis gibbosus; Pumpkinseed	1.3 G	96 H	LC_{50}	3.6		212009	66
	Lepomis gibbosus; Pumpkinseed	1.3 G	96 H	LC_{50}	2.8		212009	66
	Lepomis gibbosus; Pumpkinseed	1.4 G	96 H	LC_{50}	7.5		212009	66
	Lepomis gibbosus; Pumpkinseed	1.3 G	96 H	LC_{50}	1.8		212009	66
	Lepomis macrochirus; Bluegill	1.3 G	96 H	LC_{50}	7		212009	66
	Lepomis macrochirus; Bluegill	42 MM, 0.8 G	24 H	LC_{50}	16.5		313045	71
	Lepomis macrochirus; Bluegill	2.5 CM	96 H	LC_{50}	0.2 to 1.0		218343	77
	Lepomis macrochirus; Bluegill	38 (35-42) MM, 0.6 (0.5-0.8) G	24 H	LC_{50}	8.4		218048	65
	Lepomis macrochirus; Bluegill	1.1 G	96 H	LC_{50}	3		212009	66
	Lepomis macrochirus; Bluegill	0.6 G	96 H	LC_{50}	1.7		212009	66

Table F.1-8
AQUIRE Freshwater Toxicity Information (µg/L)

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Naval Training Center, OU 4
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Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Lepomis macrochirus; Bluegill	2.5 CM	8 D	LOC		0.008	218343	77
	Lepomis macrochirus; Bluegill	0.6 G	96 H	LC_{50}	4.3		212009	66
	Lepomis macrochirus; Bluegill	2.5-5.0 CM	48 H	LC_{50}	3.3		313000	65
	Lepomis macrochirus; Bluegill	42 MM, 0.8 G	48 H	LC_{50}	13.5		313045	71
	Lepomis macrochirus; Bluegill	3.8-6.4 CM, 1.0-2.0 G	96 H	LC_{50}	8.8		210936	59
	Lepomis macrochirus; Bluegill	0.26 G ; < 1 YEAR	96 H	LC_{50}	9		212076	79
	Lepomis macrochirus; Bluegill	NR	96 H	LC_{50}	8		210610	70
	Lepomis macrochirus; Bluegill	0.5 G	96 H	LC_{50}	7		210942	72
	Lepomis macrochirus; Bluegill	ADULT, 13-15 CM	7 WK	LETH	500		212807	50
	Lepomis macrochirus; Bluegill	2.5-5.0 CM	72 H	LC_{50}	3		313000	65
	Lepomis macrochirus; Bluegill	1.0 G	96 H	LC_{50}	2.8		212009	66
	Lepomis macrochirus; Bluegill	1.2 G	96 H	LC_{50}	9.4		212009	66
	Lepomis macrochirus; Bluegill	ADULTS, 13-15 CM	7 WK	MOR	200		212807	50
	Lepomis macrochirus; Bluegill	0.8 G	96 H	LC_{50}	1.2		212009	66
	Lepomis macrochirus; Bluegill	FINGERLING, 5-7.6 CM	7 WK	LETH	100		212807	50
	Lepomis macrochirus; Bluegill	0.6 G	96 H	LC_{50}	7		212009	66
	Lepomis macrochirus; Bluegill	ADULT	45 D	MOR	1,000		212807	50
	Lepomis macrochirus; Bluegill	2.5-5.0 CM	96 H	LC_{50}	2.7		313000	65
	Lepomis macrochirus; Bluegill	1.5 G	96 H	LC_{50}	8.6		210666	80
	Lepomis macrochirus; Bluegill	0.26 G ; < 1 YEAR	96 H	LC_{50}	3.4		212076	79
	Lepomis macrochirus; Bluegill	38 (35-42) MM, 0.6 (0.5-0.8) G	48 H	LC_{50}	6		218048	65
	Lepomis macrochirus; Bluegill	0.5 G	96 H	LC_{50}	2.2		210851	75
	Lepomis macrochirus; Bluegill	38 (35-42) MM, 0.6 (0.5-0.8) G	96 H	LC_{50}	4.7		218048	65
	Lepomis macrochirus; Bluegill	1.1 G	96 H	LC_{50}	3.6		212009	66
	Lepomis macrochirus; Bluegill	NR	96 H	LC_{50}	21		218046	66
	Lepomis macrochirus; Bluegill	2.5-5.0 CM	24 H	LC_{50}	10		313000	65
	Lepomis macrochirus; Bluegill	0.5 G, 35-45 MM	96 H	LC_{50}	2.9		313034	72
	Lepomis macrochirus; Bluegill	0.9 G	96 H	LC_{50}	4.6		212009	66
	Lepomis macrochirus; Bluegill	3.8-6.4 CM, 1.0-2.0 G	96 H	LC_{50}	6.4		210936	59
	Lepomis macrochirus; Bluegill	42 MM, 0.8 G	96 H	LC_{50}	12.5		313045	71
4,4'-DDT (cont.)	Lepomis macrochirus; Bluegill	3.8-6.4 CM, 1.0-2.0 G	96 H	LC_{50}	16		210936	59
	Lepomis megalotis; Longear sunfish	1.0 G	96 H	LC_{50}	4.9		212009	66
	Lepomis megalotis; Longear sunfish	1.0 G	96 H	LC_{50}	12.5		212009	66
	Lepomis microlophus; Redear sunfish	NR	96 H	LC_{50}	5		210610	70
	Leuresthes tenuis; California grunion	FRY	51 D *	LETH	100		219010	73
	Limanda ferruginea; Yellowtail flounder	NR	0.5 H	ENZ		50,000	219361	71
	Lucifer sp; Decapod	MATURE	24 H	LC_{50}	26		212658	88
	Lumbriculus variegatus; Oligochaete	NR	7 D *	LC_{50}	>130		216502	80
	Lumbriculus variegatus; Oligochaete	NR	6 D *	LC_{50}	>130		216502	80
	Lymnaea stagnalis; Great pond snail	28.16 (25-35) MM	45 D	EGP		0.9	215094	92
	Macrobrachium kistnensis; Shrimp	ADULT MALE, 50-66 MM, 1.2-1.5 G	24 H	LC_{50}	48		216296	83
	Macrobrachium kistnensis; Shrimp	ADULT MALE, 50-66 MM, 1.2-1.5 G	24 H	BIO, PHY		9.6	216296	83
	Macrobrachium kistnensis; Shrimp	ADULT MALE, 50-66 MM, 1.2-1.5 G	24 H	ENZ		9.6	216296	83
	Macrobrachium lamarrei; Prawn	INTERMOLT, 12-17 MM, *	72 H	LC_{50}	4.7		311973	86
	Macrobrachium lamarrei; Prawn	INTERMOLT, 12-17 MM, *	48 H	LC_{50}	6.1		311973	86
	Macrobrachium lamarrei; Prawn	INTERMOLT, 12-17 MM, *	24 H	LC_{50}	8.6		311973	86
	Macropodus cupanus; Paradise fish	20-28 MM STD LENGTH	24 H	LC_{50}	2,813		311081	82
	Macropodus cupanus; Paradise fish	20-28 MM STD LENGTH	48 H	LC_{50}	2,277		311081	82

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Menidia menidia; Atlantic silverside	59 MM, 1.2 G	96 H	LC_{50}	0.4		210628	70
	Menidia menidia; Atlantic silverside	59 MM, 1.2 G	24 H	LC_{50}	4		210628	70
	Menidia menidia; Atlantic silverside	59 MM, 1.2 G	48 H	LC_{50}	0.4		210628	70
	Mercenaria mercenaria; Northern quahog or hard clam	ADULT, 82 MM, 21 G SHELL WT	96 H	MOR	10,000		212896	70
	Meretrix casta; Bivalve	12-17 MM	24 H	LC_{50}	24.04		210276	89
	Meretrix casta; Bivalve	12-17 MM	48 H	LC_{50}	20		210276	89
	Meretrix casta; Bivalve	12-17 MM	72 H	LC_{50}	14.42		210276	89
	Meretrix casta; Bivalve	12-17 MM	96 H	LC_{50}	14.16		210276	89
	Meretrix casta; Bivalve	12-17 MM	120 H	LC_{50}	11.28		210276	89
	Metapenaeus monoceros; Sand shrimp	70.0 MM	48 H	LC_{50}	81		212505	88
	Metapenaeus monoceros; Sand shrimp	2.5 G, 77 MM	96 H	BIO, PHY		6	213081	90
	Micrometrus minimus; Dwarf perch	48-104 MM, 1.2-11.0 G	96 H	LC_{50}	5		210611	72
	Micrometrus minimus; Dwarf perch	48-104 MM, 1.2-11.0 G	96 H	LC_{50}	0.26		210611	72
	Micropterus salmoides; Largemouth bass	YEARLING, 15-20 CM	7 WK	MOR	50		212807	50
	Micropterus salmoides; Largemouth bass	0.8 G	96 H	LC_{50}	1.5		210666	80
	Micropterus salmoides; Largemouth bass	NR	96 H	LC_{50}	2		210610	70
	Micropterus salmoides; Largemouth bass	0.5 G	96 H	LC_{50}	0.8		212009	66
	Micropterus salmoides; Largemouth bass	ADULT	45 D	MOR	1,000		212807	50
	Micropterus salmoides; Largemouth bass	YEARLING, 15-20 CM	7 WK	LETH	100		212807	50
	Moina brachiata; Water flea	<= 1 D	24 H	LC_{50}	49		312237	83
	Moina brachiata; Water flea	MIXED MICROFAUNA SPECIES	2 D	POP		70	312237	83
	Moina macrocopa; Water flea	NR	3 H	LC_{50}	4,800		315192	67
	Moina macrocopa; Water flea	FEMALE ADULT	3 H	LC_{50}	4,800		212682	69
	Moronoe saxatilis; Striped bass	JUVENILE 2.7 G	96 H	LC_{50}	0.53		210602	74
	Mugil cephalus; Striped mullet	46 MM, 1.0 G	24 H	LC_{50}	4		210628	70
	Mugil cephalus; Striped mullet	88 MM, 6.8 G	96 H	LC_{50}	3		210628	70
	Mugil cephalus; Striped mullet	15.3 G	12.2 H	LC_{50}	56		310891	82
	Mugil cephalus; Striped mullet	MATURE	96 H	PHY		0.1	315978	83
	Mugil cephalus; Striped mullet	15.3 G	26.6 H	LT_{50}	56		310891	82
	Mugil cephalus; Striped mullet	100-110 MM	72 H	LC_{50}	0.4		210276	89
	Mugil cephalus; Striped mullet	MATURE	96 H	GRO		1	315978	83
	Mugil cephalus; Striped mullet	100-110 MM	48 H	LC_{50}	0.72		210276	89
4,4'-DDT (cont.)	Mugil cephalus; Striped mullet	15.3 G	11.6 H	LT_{50}	56		310891	82
	Mugil cephalus; Striped mullet	100-110 MM	24 H	LC_{50}	1.19		210276	89
	Mugil cephalus; Striped mullet	100-110 MM	96 H	LC_{50}	0.26		210276	89
	Mugil cephalus; Striped mullet	MATURE	96 H	HEM		1	315978	83
	Mugil cephalus; Striped mullet	100-110 MM	120 H	LC_{50}	0.2		210276	89
	Mugil cephalus; Striped mullet	46 MM, 1.0 G	96 H	LC_{50}	0.9		210628	70
	Mugil cephalus; Striped mullet	MATURE	96 H	HEM		0.05	315978	83
	Mugil cephalus; Striped mullet	88 MM, 6.8 G	24 H	LC_{50}	7		210628	70
	Mugil cephalus; Striped mullet	46 MM, 1.0 G	48 H	LC_{50}	0.9		210628	70
	Mugil cephalus; Striped mullet	15.3 G	48 H	LC_{50}	42 to 56		310891	82
	Mugil cephalus; Striped mullet	15.3 G	7.4 H	LT_{50}	56		310891	82
	Mugil cephalus; Striped mullet	88 MM, 6.8 G	48 H	LC_{50}	6		210628	70
	Mugil curema; White mullet	JUVENILE	24 H	LC_{50}	0.8		212188	63
	Mugil curema; White mullet	0.60-1.51 G, 40.0-53.2 MM, *	24 H *	BEH		9	218124	73
	Mugil curema; White mullet	JUVENILE	48 H	LC_{50}	0.4		212188	63
	Myoxocephalus octodecemspinosu; Longhorn sculpin	NR	0.5 H	ENZ		50,000	219361	71

Table F.1-8
AQUIRE Freshwater Toxicity Information (µg/L)

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Naval Training Center, OU 4
Orlando, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Nassarius obsoletus; Eastern mud snail	15 MM, 0.16 G - SHELL	96 H	MOR	10,000		212896	70
	Nassarius obsoletus; Eastern mud snail	15 MM, 0.16 G SHELL	96 H	REP		10	212896	70
	Neanthes grubei; Polychaete	NR	96 H	LC_{50}	>1,000		213785	91
	Nereis arenaceodentata; Polychaete	NR	96 H	LC_{50}	>1,000		213785	91
	Nereis virens; Polychaete	NR	12 D	MOR	10		315468	82
	Nereis virens; Polychaete	NR	12 D	MOR	30		315468	82
	Nitocra spinipes; Harpacticoid copepod	0.6-0.8 MM, ADULTS	96 H	LC_{50}	30		215185	79
	Nitzschia delicatissima; Diatom	LOG PHASE, 75000 CELLS/ML	24 H	CLR, PHY		23.5	219126	72
	Nitzschia delicatissima; Diatom	LOG PHASE, 75000 CELLS/ML	24 H	PSE		100	219126	72
	Nitzschia delicatissima; Diatom	LOG PHASE, 75000 CELLS/ML	24 H	LETH	1,000		219126	72
	Nitzschia delicatissima; Diatom	LOG PHASE, 75000 CELLS/ML	24 H	PSE		100	219126	72
	Nitzschia delicatissima; Diatom	LOG PHASE, 75000 CELLS/ML	24 H	CLR, PHY		220	219126	72
	Nitzschia delicatissima; Diatom	LOG PHASE, 75000 CELLS/ML	24 H	PSE		100	219126	72
	Nitzschia delicatissima; Diatom	LOG PHASE, 75000 CELLS/ML	24 H	PSE		100	219126	72
	Nitzschia delicatissima; Diatom	LOG PHASE, 75000 CELLS/ML	24 H	CLR, PHY		220	219126	72
	Nitzschia delicatissima; Diatom	LOG PHASE, 75000 CELLS/ML	24 H	CEL, PHY		9.4	219126	72
	Notemigonus crysoleucas; Golden shiner	1.02-1.31 G, 54.0-60.0 MM, ADULT	24 H *	BEH		15	218124	73
	Notopterus notopterus; Featherback	92-212 MM	6 H	EC_{50} IMM		92	218745	74
	Notopterus notopterus; Featherback	92-212 MM	96 H	EC_{50} IMM		43	218745	74
	Notopterus notopterus; Featherback	92-212 MM	48 H	EC_{50} IMM		62	218745	74
	Notopterus notopterus; Featherback	92-212 MM	24 H	EC_{50} IMM		84	218745	74
	Oligochaeta; Annelid worm class	NR	48 H	LETH	200		219237	72
	Oncorhynchus clarki; Cutthroat trout	1.25 G	96 H	LC_{50}	1.37		210964	71
	Oncorhynchus clarki; Cutthroat trout	.33 G	96 H	LC_{50}	0.85		210964	71
	Oncorhynchus clarki; Cutthroat trout	.33 G	48 H	LC_{50}	1.63		210964	71
	Oncorhynchus kisutch; Coho salmon, silver salmon	1.65 G	96 H	LC_{50}	18.5		210964	71
	Oncorhynchus kisutch; Coho salmon, silver salmon	< 1 YR, FINGERLING, 0.63 G	22.5 D	LT_{50}	100,000		212448	69
	Oncorhynchus kisutch; Coho salmon, silver salmon	< 1 YR, FINGERLING, 0.63 G	>95 D	LT_{50}	25,000		212448	69
	Oncorhynchus kisutch; Coho salmon, silver salmon	57-76 MM, 2.7-4.1 G	48 H	LC_{50}	46		210522	61
	Oncorhynchus kisutch; Coho salmon, silver salmon	< 1 YR, FINGERLING, 0.63 G	>95 D	LT_{50}	6,250		212448	69
	Oncorhynchus kisutch; Coho salmon, silver salmon	1.0 G	96 H	LC_{50}	4		210666	80
	Oncorhynchus kisutch; Coho salmon, silver salmon	< 1 YR, FINGERLING, 3.7 G	6.5 D	LT_{50}	400,000		212448	69
	Oncorhynchus kisutch; Coho salmon, silver salmon	NR	96 H	LC_{50}	4		210610	70
	Oncorhynchus kisutch; Coho salmon, silver salmon	< 1 YR, FINGERLING, 3.7 G	60 D	LT_{50}	100,000		212448	69
4,4'-DDT (cont.)	Oncorhynchus kisutch; Coho salmon, silver salmon	FRY	25 H	LT_{50}	3.2		212298	74
	Oncorhynchus kisutch; Coho salmon, silver salmon	JUVENILE	48 H	LC_{50}	24		212003	67
	Oncorhynchus kisutch; Coho salmon, silver salmon	FRY	7.3 D	LT_{50}	0.8		212298	74
	Oncorhynchus kisutch; Coho salmon, silver salmon	JUVENILE	96 H	LC_{50}	13		212003	67
	Oncorhynchus kisutch; Coho salmon, silver salmon	< 1 YR, FINGERLING, 3.7 G	>60 D	LT_{50}	100,000		212448	69
	Oncorhynchus kisutch; Coho salmon, silver salmon	JUVENILE	96 H	PHY		50	212003	67
	Oncorhynchus kisutch; Coho salmon, silver salmon	FRY	7 D	LC_{50}	> 0.7		212298	74
	Oncorhynchus kisutch; Coho salmon, silver salmon	JUVENILE, SMALLER FISH	30 H	LETH	50		212003	67
	Oncorhynchus kisutch; Coho salmon, silver salmon	1.65 G	72 H	LC_{50}	24		210964	71
	Oncorhynchus kisutch; Coho salmon, silver salmon	JUVENILE, LARGER FISH	96 H	LETH	50		212003	67
	Oncorhynchus kisutch; Coho salmon, silver salmon	< 1 YR, FINGERLING, 0.63 G	7.5 D	LT_{50}	400,000		212448	69
	Oncorhynchus kisutch; Coho salmon, silver salmon	JUVENILE, LARGER FISH	12 H	LETH	200		212003	67
	Oncorhynchus kisutch; Coho salmon, silver salmon	57-76 MM, 2.7-4.1 G	24 H	LC_{50}	66		210522	61
	Oncorhynchus kisutch; Coho salmon, silver salmon	JUVENILE, LARGER FISH	7 H	LETH	350		212003	67

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Oncorhynchus kisutch; Coho salmon, silver salmon	57-76 MM, 2.7-4.1 G	96 H	LC_{50}	44		210522	61
	Oncorhynchus kisutch; Coho salmon, silver salmon	< 1 YR, FINGERLING, 3.7 G	60 D	LT_{50}	25,000		212448	69
	Oncorhynchus kisutch; Coho salmon, silver salmon	FRY	14 D	LT_{50}	> 0.5		212298	74
	Oncorhynchus kisutch; Coho salmon, silver salmon	< 1 YR, FINGERLING, 3.7 G	>60 D	LT_{50}	6,250		212448	69
	Oncorhynchus kisutch; Coho salmon, silver salmon	.5 G	24 H	LC_{50}	25		210964	71
	Oncorhynchus kisutch; Coho salmon, silver salmon	< 1 YR, FINGERLING, 0.63 G	23.8 D	LT_{50}	100,000		212448	69
	Oncorhynchus kisutch; Coho salmon, silver salmon	57-76 MM, 2.7-4.1 G	72 H	LC_{50}	44		210522	61
	Oncorhynchus kisutch; Coho salmon, silver salmon	.5 G	96 H	LC_{50}	11.3		210964	71
	Oncorhynchus kisutch; Coho salmon, silver salmon	FRY	55 H	LT_{50}	1.4		212298	74
	Oncorhynchus kisutch; Coho salmon, silver salmon	.5 G	72 H	LC_{50}	11.7		210964	71
	Oncorhynchus kisutch; Coho salmon, silver salmon	1.65 G	48 H	LC_{50}	30		210964	71
	Oncorhynchus kisutch; Coho salmon, silver salmon	FRY	25 H	LT_{50}	3.3		212298	74
	Oncorhynchus kisutch; Coho salmon, silver salmon	FRY	55 H	LT_{50}	1.9		212298	74
	Oncorhynchus kisutch; Coho salmon, silver salmon	.5 G	48 H	LC_{50}	12.5		210964	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	33 (30-38) MM, 0.3 (0.2-0.4) G	24 H	LC_{50}	3		218048	65
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	YOUNG, 9-11 CM	1 H	MOR	40,000		219634	70
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	3-7 CM	48 H	LC_{50}	5.6		313000	65
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	YOUNG, 9-11 CM	1 H	MOR	40,000		219634	70
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	JUVENILE, 1-1.5 YR, 120 G, 22.8 CM	5 H	RES		52.5	217846	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	JUVENILE, 1-1.5 YR, 120 G, 22.8 CM	5 H	RES		140	217846	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	51-79 MM, 3.2 G	72 H	LC_{50}	42		210522	61
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	.41 G	96 H	LC_{50}	1.72		210964	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	51-79 MM, 3.2 G	48 H	LC_{50}	42		210522	61
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	.41 G	72 H	LC_{50}	2.25		210964	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	51-79 MM, 3.2 G	24 H	LC_{50}	42		210522	61
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	0.16 G, 28-35 MM	96 H	LC_{50}	1.9		313034	72
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	NR	10 D	LC_{50}	0.87		210948	72
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	15 G	140 D	HEM, PHY		1	315101	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	0.9 G	96 H	LC_{50}	4.6		212009	66
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	0.8 G	96 H	LC_{50}	18		313046	72
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1.0 G	96 H	LC_{50}	8.7		210666	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	0.8 G	48 H	LC_{50}	16.7		313046	72
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1.6 G	96 H	LC_{50}	15		212009	66
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	0.8 G	24 H	LC_{50}	17.8		313046	72
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1.9 G	96 H	LC_{50}	17		212009	66
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	25-50 G	96 H	LC_{50}	60		312999	75
4,4'-DDT (cont.)	Oncorhynchus mykiss; Rainbow trout, donaldson trout	3.1 G	96 H	LC_{50}	12		212009	66
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	33 (30-38) MM, 0.3 (0.2-0.4) G	96 H	LC_{50}	1.5		218048	65
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	6 CM	48 H	LD_{50}	17,000		310309	72
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	YEARLING	0.25 H	ENZ, PHY		40,000	219308	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	JUVENILE, 1-1.5 YR, 120 G, 22.8 CM	5 H	PHY		140	217846	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	.41 G	48 H	LC_{50}	3.05		210964	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	NR	15 D	LC_{50}	0.26		210948	72
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	33 (30-38) MM, 0.3 (0.2-0.4) G	48 H	LC_{50}	2		218048	65
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	NR	5 D	LC_{50}	2.26		210948	72
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	5-13 CM	0.25 H	MOR	12,000		315079	49
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	3.4 G	96 H	LC_{50}	3.8		210851	75
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	51-79 MM, 3.2 G	96 H	LC_{50}	42		210522	61

Table F.1-8
AQUIRE Freshwater Toxicity Information (µg/L)

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Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	2.5 G	96 H	LC_{50}	13		212009	66
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	.41 G	24 H	LC_{50}	6.9		210964	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	JUVENILE, 1-1.5 YR, 120 G, 22.8 CM	5 H	PHY		140	217846	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	5-13 CM	0.25 H	MOR	35,000		315079	49
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	0.9 G	96 H	LC_{50}	14		212009	66
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	3-7 CM	24 H	LC_{50}	5.6		313000	65
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	NR	96 H	LC_{50}	7		210610	70
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	3-7 CM	96 H	LC_{50}	3.4		313000	65
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	JUVENILE, 1-1.5 YR, 120 G, 22.8 CM	5 H	PHY		350	217846	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	0.5 G	96 H	LC_{50}	2.4		212009	66
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1.2 G	96 H	LC_{50}	7.2		212009	66
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	3-7 CM	72 H	LC_{50}	5.6		313000	65
	Oncorhynchus tshawytscha; Chinook salmon	< 1 YR, FINGERLING, 1.1 G	12.3 D	LT_{50}	100,000		212448	69
	Oncorhynchus tshawytscha; Chinook salmon	< 1 YR, FINGERLING, 0.61 G	26.6 D	LT_{50}	37,500		212448	69
	Oncorhynchus tshawytscha; Chinook salmon	51-114 MM, 1.45-5 G	96 H	LC_{50}	11.5		210522	61
	Oncorhynchus tshawytscha; Chinook salmon	< 1 YR, FINGERLING, 1.1 G	>60 D	LT_{50}	6,250		212448	69
	Oncorhynchus tshawytscha; Chinook salmon	51-114 MM, 1.45-5 G	72 H	LC_{50}	14		210522	61
	Oncorhynchus tshawytscha; Chinook salmon	51-114 MM, 1.45-5 G	48 H	LC_{50}	17		210522	61
	Oncorhynchus tshawytscha; Chinook salmon	< 1 YR, FINGERLING, 4.4 G	35.5 D	LT_{50}	100,000		212448	69
	Oncorhynchus tshawytscha; Chinook salmon	< 1 YR, FINGERLING, 0.61 G	4.8 D	LT_{50}	150,000		212448	69
	Oncorhynchus tshawytscha; Chinook salmon	< 1 YR, FINGERLING, 0.61 G	>40 D	LT_{50}	9,400		212448	69
	Oncorhynchus tshawytscha; Chinook salmon	< 1 YR, FINGERLING, 0.61 G	1.6 D	LT_{50}	600,000		212448	69
	Oncorhynchus tshawytscha; Chinook salmon	51-114 MM, 1.45-5 G	24 H	LC_{50}	38		210522	61
	Oncorhynchus tshawytscha; Chinook salmon	< 1 YR, FINGERLING, 1.1 G	>60 D	LT_{50}	25,000		212448	69
	Oncorhynchus tshawytscha; Chinook salmon	< 1 YR, FINGERLING, 1.1 G	13.7 D	LT_{50}	100,000		212448	69
	Oncorhynchus tshawytscha; Chinook salmon	< 1 YR, FINGERLING, 1.1 G	4.8 D	LT_{50}	400,000		212448	69
	Ophryotrocha labronica; Polychaete	NR	96 H	LC_{50}	>1,000		213785	91
	Orconectes nais; Crayfish	35 D, 50 MG	96 H	LC_{50}	0.9		210887	72
	Orconectes nais; Crayfish	80 D, 1200 MG	96 H	LC_{50}	30		210887	72
	Orconectes nais; Crayfish	1 D, 15 MG	24 H	LC_{50}	1.4		210887	72
	Orconectes nais; Crayfish	14 D, 23 MG	96 H	LC_{50}	0.2		210887	72
	Orconectes nais; Crayfish	21-35 D	24 H	LC_{50}	1		210887	72
	Orconectes nais; Crayfish	56 D, 500 MG	24 H	LC_{50}	45		210887	72
	Orconectes nais; Crayfish	MATURE	24 H	LC_{50}	1,100		210887	72
	Orconectes nais; Crayfish	21 D, 30 MG	24 H	LC_{50}	1		210887	72
	Orconectes nais; Crayfish	80 D, 1200 MG	24 H	LC_{50}	50		210887	72
	Orconectes nais; Crayfish	21 D, 30 MG	96 H	LC_{50}	0.24		210887	72
	Orconectes nais; Crayfish	14 D, 23 MG	24 H	LC_{50}	1.2		210887	72
4,4'-DDT (cont.)	Orconectes nais; Crayfish	7 D, 20 MG	24 H	LC_{50}	1		210887	72
	Orconectes nais; Crayfish	1 D, 15 MG	96 H	LC_{50}	0.3		210887	72
	Orconectes nais; Crayfish	7 D, 20 MG	96 H	LC_{50}	0.18		210887	72
	Orconectes nais; Crayfish	JUVENILE	96 H	LC_{50}	0.18		210666	80
	Orconectes nais; Crayfish	21-35 D	96 H	LC_{50}	0.24		210887	72
	Orconectes nais; Crayfish	56 D, 500 MG	96 H	LC_{50}	28		210887	72
	Orconectes nais; Crayfish	NR	96 H	LC_{50}	100		210948	72
	Orconectes nais; Crayfish	MATURE	96 H	LC_{50}	100		210887	72
	Orconectes nais; Crayfish	35 D, 50 MG	24 H	LC_{50}	3.2		210887	72
	Oryzias latipes; Medaka, high-eyes	YOLK SAC FRY STAGE	96 H	LC_{50}	14		311174	84

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AQUIRE Freshwater Toxicity Information (µg/L)

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Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Oryzias latipes; Medaka, high-eyes	NR	24 H	LC_{50}	380		312497	86
	Oryzias latipes; Medaka, high-eyes	NR	48 H	LC_{50}	450		312497	86
	Oryzias latipes; Medaka, high-eyes	2.54 CM, 0.16 G	48 H	LC_{50}	12		212682	69
	Oryzias latipes; Medaka, high-eyes	ADULT FEMALE, SEXUALLY INACTIVA	96 H	LC_{50}	48.7		311174	84
	Oryzias latipes; Medaka, high-eyes	ADULT MALE, SEXUALLY INACTIVATE	96 H	LC_{50}	35.6		311174	84
	Oryzias latipes; Medaka, high-eyes	NR	48 H	LC_{50}	540		312497	86
	Oryzias latipes; Medaka, high-eyes	POST-LARVAE, STAGE II	96 H	LC_{50}	4.9		311174	84
	Oryzias latipes; Medaka, high-eyes	NR	48 H	LC_{50}	12		315192	67
	Oryzias latipes; Medaka, high-eyes	ADULT MALE, SEXUALLY ACTIVATED	96 H	LC_{50}	31.6		311174	84
	Oryzias latipes; Medaka, high-eyes	NR	48 H	LC_{50}	290		312497	86
	Oryzias latipes; Medaka, high-eyes	NR	24 H	LC_{50}	10,000		312497	86
	Oryzias latipes; Medaka, high-eyes	ADULT FEMALE, SEXUALLY ACTIVAT	96 H	LC_{50}	43.7		311174	84
	Oryzias latipes; Medaka, high-eyes	JUVENILE, 70 D POST-HAT	96 H	LC_{50}	76 to 157		311174	84
	Oryzias latipes; Medaka, high-eyes	NR	24 H	LC_{50}	490		312497	86
	Ostracoda; Ostracod, seed shrimp subclass	MIXED MICROFAUNA SPECIES	2 D	POP		70	312237	83
	Pagurus longicarpus; Longwrist hermit crab	3.5 MM, 0.28 G	48 H	LC_{50}	6		210627	69
	Pagurus longicarpus; Longwrist hermit crab	3.5 MM, 0.28 G	24 H	LC_{50}	7		210627	69
	Palaemon squilla; Black sea shrimp	NR	3 H	LC_{100}	100		217260	72
	Palaemon squilla; Black sea shrimp	NR	24 H	LC_{100}	1		217260	72
	Palaemon squilla; Black sea shrimp	200-300 MG	15 D	OXC		0.001	217260	72
	Palaemon squilla; Black sea shrimp	NR	24 H	LC_{100}	10		217260	72
	Palaemon squilla; Black sea shrimp	NR	3 H	LC_{100}	100		217260	72
	Palaemon squilla; Black sea shrimp	NR	6.5 D	LC_{100}	0.1		217260	72
	Palaemon squilla; Black sea shrimp	ADULTS, 750-850 MG	10 D	OXC		0.00001	217260	72
	Palaemon squilla; Black sea shrimp	ADULTS, 750-850 MG	96 H	OXC		0.01	217260	72
	Palaemonetes kadiakensis; Grass shrimp	NR	24 H *	LC_{50}	3.7		212665	70
	Palaemonetes kadiakensis; Grass shrimp	NR	5 D	LC_{50}	1		210948	72
	Palaemonetes kadiakensis; Grass shrimp	LATE INSTAR	5 D	LC_{50}	1		210887	72
	Palaemonetes kadiakensis; Grass shrimp	NR	5 D	LC_{50}	1.3		210948	72
	Palaemonetes kadiakensis; Grass shrimp	LATE INSTAR	96 H	LC_{50}	2.3		210887	72
	Palaemonetes kadiakensis; Grass shrimp	LATE INSTAR	24 H	LC_{50}	6.8		210887	72
	Palaemonetes kadiakensis; Grass shrimp	NR	24 H *	LC_{50}	5.7		212665	70
	Palaemonetes kadiakensis; Grass shrimp	LATE INSTAR	5 D	LC_{50}	1.3		210887	72
	Palaemonetes kadiakensis; Grass shrimp	NR	24 H *	LC_{50}	2.6		212665	70
	Palaemonetes kadiakensis; Grass shrimp	LATE INSTAR	96 H	LC_{50}	3.5		210887	72
	Palaemonetes kadiakensis; Grass shrimp	MATURE	96 H	LC_{50}	2.3		210666	80
	Palaemonetes kadiakensis; Grass shrimp	LATE INSTAR	24 H	LC_{50}	9.4		210887	72
	Palaemonetes kadiakensis; Grass shrimp	NR	24 H *	LC_{50}	6.8		212665	70
	Palaemonetes kadiakensis; Grass shrimp	LATE INSTAR	48 H	LC_{50}	4.7		210887	72
	Palaemonetes kadiakensis; Grass shrimp	LATE INSTAR	48 H	LC_{50}	7.7		210887	72
4,4'-DDT (cont.)	Palaemonetes pugio; Daggerblade grass shrimp	10-40 MM	0.5 H *	AVO		0.1	215146	73
	Palaemonetes vulgaris; Marsh grass shrimp	31 MM, 0.47 G	24 H	LC_{50}	12		210627	69
	Palaemonetes vulgaris; Marsh grass shrimp	31 MM, 0.47 G	48 H	LC_{50}	5.1		210627	69
	Paratanytarsus parthenogenetic; Midge	LARVAE	24 H *	EC_{50} BEH		1.4	212687	79
	Paratelphusa jacuemontii; Crab	INTERMOLT, MALE AND FEMALE	96 H	LC_{50}	62.129		213938	91
	Paratelphusa jacuemontii; Crab	INTERMOLT, MALE AND FEMALE	24 H	LC_{50}	116.43		213938	91
	Paratelphusa jacuemontii; Crab	INTERMOLT, MALE AND FEMALE	48 H	LC_{50}	91.24		213938	91
	Paratelphusa jacuemontii; Crab	INTERMOLT, MALE AND FEMALE	72 H	LC_{50}	74.35		213938	91

Table F.1-8
AQUIRE Freshwater Toxicity Information (µg/L)

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Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Pavlova lutheri; Haptophyte	150000 CELLS/ML INIT CONC	10 D	PGR		1,000	218039	62
	Pavlova lutheri; Haptophyte	150000 CELLS/ML INIT CONC	10 D	PGR		600	218039	62
	Pelecypoda; Bivalve, clam, mussel class	OYSTER, 3.8-6.4 CM	96 H	EC_{50} SHD		40	313008	65
	Peltodytes sp; Beetle	ADULT, 5 MG	48 H	LC_{50}	4		217775	76
	Peltodytes sp; Beetle	ADULT, 5 MG	96 H	LC_{50}	1		217775	76
	Peltodytes sp; Beetle	ADULT, 5 MG	72 H	LC_{50}	2		217775	76
	Peltodytes sp; Beetle	ADULT, 5 MG	24 H	LC_{50}	7		217775	76
	Penaeus aztecus; Brown shrimp	ADULT	48 H	EC_{50} EQU		1	212188	63
	Penaeus aztecus; Brown shrimp	ADULT	24 H	EC_{50} EQU		5.5	212188	63
	Penaeus indicus; Indian prawn	70.0 MM	48 H	LC_{50}	63		212505	88
	Penaeus indicus; Indian prawn	2.5 G, 70.0 MM	48 H	LC_{50}	63		210015	87
	Penaeus indicus; Indian prawn	2.5 G, 70.0 MM	96 H	LC_{50}	37		210015	87
	Penaeus indicus; Indian prawn	75 MM, 2.5 G	48 H	LC_{50}	120		213434	90
	Penaeus sp; Penaeidean shrimp	NR	30 D	GRO		0.1	219156	72
	Penaeus sp; Penaeidean shrimp	NR	30 D	PHY		0.05	219156	72
	Penaeus sp; Penaeidean shrimp	NR	30 D	PHY		0.1	219156	72
	Pentaneura sp; Midge	JUVENILE	96 H	LC_{50}	1.5		210666	80
	Perca flavescens; Yellow perch	1.1 G	96 H	LC_{50}	0.8		212009	66
	Perca flavescens; Yellow perch	0.8 G	96 H	LC_{50}	0.6		212009	66
	Perca flavescens; Yellow perch	1.2 G	96 H	LC_{50}	1.5		212009	66
	Perca flavescens; Yellow perch	1.4 G	96 H	LC_{50}	9		210666	80
	Perca flavescens; Yellow perch	NR	96 H	LC_{50}	9		210610	70
	Phaeodactylum tricornutum; Diatom	NR	24 H	PSE		1,000	219310	71
	Phaeodactylum tricornutum; Diatom	INIT CONC 50000 CELLS/ML	6 D	BMS		20	310161	84
	Phaeodactylum tricornutum; Diatom	250000 CELLS/ML INITIAL CONC	10 D	PGR		20	218039	62
	Phaeodactylum tricornutum; Diatom	INIT CONC 50000 CELLS/ML	6 D	BMS		10	310161	84
	Phaeodactylum tricornutum; Diatom	250000 CELLS/ML INITIAL CONC	10 D	PGR		40	218039	62
	Phaeodactylum tricornutum; Diatom	250000 CELLS/ML INITIAL CONC	10 D	PGR		1,000	218039	62
	Phaeodactylum tricornutum; Diatom	NR	24 H	PSE		100	219310	71
	Phagocata gracilis; Turbellarian, flatworm	NR	10 D	LC_{50}	3,980		312705	87
	Phoxinus eos; Northern redbelly dace	1.1 G	96 H	LC_{50}	68		212009	66
	Physa acuta; Bladder snail	NR	48 H	LC_{50}	3,500		219158	72
	Phytoconis sp; Green algae	150000 CELLS/ML INITIAL CONC	10 D	PGR		600	218039	62
	Phytoconis sp; Green algae	150000 CELLS/ML INITIAL CONC	10 D	PGR		1,000	218039	62
	Phytoconis sp; Green algae	150000 CELLS/ML INITIAL CONC	10 D	PGR		40	218039	62
	Pimephales promelas; Fathead minnow	3.8-6.4 CM, 1-2 G	24 H	LC_{50}	78		210878	59
	Pimephales promelas; Fathead minnow	3.8-6.4 CM, 1-2 G	48 H	LC_{50}	68		210878	59
	Pimephales promelas; Fathead minnow	3.8-6.4 CM, 1-2 G	96 H	LC_{50}	45 ; 34		210878	59
	Pimephales promelas; Fathead minnow	RECENTLY HATCHED	1 WK	LETH	400		212807	50
	Pimephales promelas; Fathead minnow	3.8-6.4 CM, 1-2 G	24 H	LC_{50}	29		210878	59
	Pimephales promelas; Fathead minnow	3 CM	48 H	LC_{50}	> 40		219615	70
	Pimephales promelas; Fathead minnow	NR	96 H	LC_{50}	34		218046	66
4,4'-DDT (cont.)	Pimephales promelas; Fathead minnow	LARVAE	5 D	LETH	1.53		210534	77
	Pimephales promelas; Fathead minnow	41 D	266 D	PHY		1.53	210534	77
	Pimephales promelas; Fathead minnow	3.8-6.4 CM, 1-2 G	48 H	LC_{50}	27		210878	59
	Pimephales promelas; Fathead minnow	LARGE	48 H	LETH	2,000		212807	50
	Pimephales promelas; Fathead minnow	PROGENY	60 D	GRO		1.53	210534	77
	Pimephales promelas; Fathead minnow	3 CM	48 H	LC_{50}	7.4		219615	70

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					Lethal	Sublethal		
	Pimephales promelas; Fathead minnow	NR	96 H	LC_{50}	19		210610	70
	Pimephales promelas; Fathead minnow	1.2 G	96 H	LC_{50}	12.2		210666	80
	Pimephales promelas; Fathead minnow	3.8-6.4 CM, 1-2 G	96 H	LC_{50}	26		210878	59
	Plecoglossus altivelis; Ayu	YOUNG, 8-9 CM	1 H	MOR	60,000		219634	70
	Plecoglossus altivelis; Ayu	YOUNG, 5-7 CM	1 H	MOR	60,000		219634	70
	Plecoptera; Stonefly	NR	1 H *	DRF		10 to 11	217387	61
	Poecilia reticulata; Guppy	7 WK	0.5 H	MOR	7,000		219297	71
	Poecilia reticulata; Guppy	0.17 G, 1.8 CM	48 H	LC_{50}	8		216038	70
	Poecilia reticulata; Guppy	7 WK	24 H	LC_{50}	200		219297	71
	Poecilia reticulata; Guppy	MALE, 70 MG	12 D	HIS, PHY		2.5 to 5.8	312501	86
	Poecilia reticulata; Guppy	NR	12 D	HIS, PHY		1.2 to 3.0	219916	80
	Poecilia reticulata; Guppy	MALE, 70 MG	12 D	HIS, PHY		1.3 to 3.0	312501	86
	Poecilia reticulata; Guppy	7 WK	24 H	LC_{50}	50		219297	71
	Poecilia reticulata; Guppy	MALE, 70 MG	12 D	HIS, PHY		1.3 to 3.5	312501	86
	Poecilia reticulata; Guppy	0.17 G, 1.8 CM	96 H	LC_{50}	3		216038	70
	Poecilia reticulata; Guppy	0.17 G, 1.8 CM	24 H	LC_{50}	20		216038	70
	Polycelis felina; Turbellarian	0.80 CM	96 H	LC_{50}	1,230		212015	74
	Polypedilum nubifer; Midge	LARVAE	24 H *	EC_{50} BEH		15	212687	79
	Porphyridium sp; Red algae	10000 CELLS/ML	1 to 17 D	PGR		80	219047	72
	Procambarus acutus acutus; White river crayfish	0.7 G	96 H	LC_{50}	28		210942	72
	Procambarus acutus acutus; White river crayfish	0.25-0.40 G; 11.8-14.6 MM	48 H	EC_{50} IMM		3	212029	72
	Procladius sp; Midge	LARVAE	24 H	LC_{50}	3.6		212687	79
	Procladius sp; Midge	LARVAE	24 H *	EC_{50} BEH		3.8	212687	79
	Procladius sp; Midge	LARVAE	48 H	LC_{50}	1		212687	79
	Psectrocladius sp; Midge	LARVAE	24 H *	EC_{50} BEH		57	212687	79
	Pseudacris triseriata triseria; Western chorus frog	TADPOLE, 7 D	48 H	LC_{50}	900		212891	70
	Pseudacris triseriata triseria; Western chorus frog	TADPOLE, 7 D	96 H	LC_{50}	800		212891	70
	Pseudacris triseriata triseria; Western chorus frog	TADPOLE, 7 D	24 H	LC_{50}	1,400		212891	70
	Pseudopleuronectes americanus; Winter flounder	NR	0.5 H	ENZ		1,000	219361	71
	Pseudopleuronectes americanus; Winter flounder	NR	0.5 H	ENZ		50,000	219361	71
	Pteronarcella badia; Stonefly	15-20 MM	48 H	LC_{50}	9		210889	68
	Pteronarcella badia; Stonefly	15-20 MM	24 H	LC_{50}	12		210889	68
	Pteronarcella badia; Stonefly	15-20 MM	96 H	LC_{50}	1.9		210889	68
	Pteronarcys californica; Stonefly	30-35 MM	48 H	LC_{50}	19		210889	68
	Pteronarcys californica; Stonefly	NAIAD, 4-6 CM	72 H	LC_{50}	2,450		212667	64
	Pteronarcys californica; Stonefly	NAIADS	25 D	LC_{50}	290		212238	64
	Pteronarcys californica; Stonefly	2ND YR CLASS	96 H	LC_{50}	7		210666	80
	Pteronarcys californica; Stonefly	NAIADS	4 D	LC_{50}	3,800		212238	64
	Pteronarcys californica; Stonefly	NAIAD, 4-6 CM	48 H	LC_{50}	2,450		212667	64
	Pteronarcys californica; Stonefly	NAIAD, 4-6 CM	96 H	LC_{50}	1,800		212667	64
	Pteronarcys californica; Stonefly	30-35 MM	96 H	LC_{50}	7		210889	68
	Pteronarcys californica; Stonefly	NAIADS	15 D	LC_{50}	510		212238	64
	Pteronarcys californica; Stonefly	NAIADS	10 D	LC_{50}	1,100		212238	64
	Pteronarcys californica; Stonefly	30-35 MM, NYMPHS	96 H	LC_{50}	7		218048	65
4,4'-DDT (cont.)	Pteronarcys californica; Stonefly	NAIADS	30 D	LC_{50}	265		212238	64
	Pteronarcys californica; Stonefly	30-35 MM, NYMPHS	24 H	LC_{50}	41		218048	65
	Pteronarcys californica; Stonefly	NAIAD; 4-6 CM	96 H	LC_{50}	1,800		210528	65
	Pteronarcys californica; Stonefly	NAIADS	20 D	LC_{50}	365		212238	64

Table F.1-8
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					Lethal	Sublethal		
	Pteronarcys californica; Stonefly	NAIADS	5 D	LC_{50}	3,000		212238	64
	Pteronarcys californica; Stonefly	30-35 MM, NYMPHS	48 H	LC_{50}	19		218048	65
	Pteronarcys californica; Stonefly	30-35 MM	24 H	LC_{50}	41		210889	68
	Rana temporaria; Frog	TADPOLE, STAGE 28, 689 MG	48 H	MOR	100		315713	79
	Rana temporaria; Frog	TADPOLE, STAGE 28, 363 MG	48 H	BEH		100	315713	79
	Rana temporaria; Frog	TADPOLE, STAGE 28, 363 MG	48 H	DVP		100	315713	79
	Rana temporaria; Frog	TADPOLE, STAGE 28, 363 MG	48 H	BEH		100	315713	79
	Rasbora daniconia; Slender rasbora	ADULT, 12 CM, 40 G	8 D	LC_{50}	6,000		313217	88
	Rasbora daniconia; Slender rasbora	ADULT, 12 CM, 40 G	8 D	PHY		< 6,000	313217	88
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	24 H	LC_{50}	20		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	24 H	LC_{50}	10		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	48 H	LC_{50}	17		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	24 H	LC_{50}	140		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	24 H	LC_{50}	14,200		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	24 H	LC_{50}	13		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	48 H	LC_{50}	110		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	48 H	LC_{50}	3.1		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	24 H	LC_{50}	10,700		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	48 H	LC_{50}	0.54		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	48 H	LC_{50}	1		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	48 H	LC_{50}	8,000		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	24 H	LC_{50}	3.8		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	48 H	LC_{50}	170		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	48 H	LC_{50}	1.4		210542	69
	Rasbora heteromorpha; Harlequinfish, red rasbora	1.3-3 CM	24 H	LC_{50}	200		210542	69
	Rotifera; Rotifer phylum	NR	48 H	LETH	200		219237	72
	Sagitta sp; Chaetognaths; Arrowworms	MATURE	24 H	LC_{50}	37		212658	88
	Salmo salar; Atlantic salmon	YEARLING, 10-12 CM	24 H	PRB		70	218872	72
	Salmo salar; Atlantic salmon	20.1 G	24 H	MOR	20		219591	70
	Salmo salar; Atlantic salmon	20.1 G	24 H	MOR	200		219591	70
	Salmo salar; Atlantic salmon	EGG AT GASTRULATION	1 MO	BEH		50	218533	74
	Salmo salar; Atlantic salmon	2.5-4 CM	24 H	BEH		30	218952	73
	Salmo salar; Atlantic salmon	EGG AT GASTRULATION	1 MO	BEH		10	218533	74
	Salmo salar; Atlantic salmon	20.1 G	24 H	BEH		200	219591	70
	Salmo trutta; Brown trout	ALEVIN	24 H	LC_{50}	4.2		210542	69
	Salmo trutta; Brown trout	ALEVIN	24 H	LC_{50}	16		210542	69
	Salmo trutta; Brown trout	ALEVIN	48 H	LC_{50}	2.5		210542	69
	Salmo trutta; Brown trout	NR	96 H	LC_{50}	2		210610	70
	Salmo trutta; Brown trout	4.0 G	96 H	LC_{50}	10.9		212009	66
	Salmo trutta; Brown trout	ALEVIN	48 H	LC_{50}	11		210542	69
	Salvelinus fontinalis; Brook trout	3.3 G	96 H	LC_{50}	20		212009	66
	Salvelinus fontinalis; Brook trout	FINGERLING, 1-3 G	24 H	LC_{50}	30		212825	73
	Salvelinus fontinalis; Brook trout	UNDERYEARLING, 2-3 MO	24 H	THL		10	215531	75
	Salvelinus fontinalis; Brook trout	UNDERYEARLING, 2-3 MO	24 H	LC_{50}	54		215531	75
	Salvelinus fontinalis; Brook trout	FINGERLING, 1-3 G	24 H	THL		20	212825	73
	Salvelinus fontinalis; Brook trout	105.0 G	24 H	MOR	1,000		219591	70
4,4'-DDT (cont.)	Salvelinus fontinalis; Brook trout	3.3 G	96 H	LC_{50}	17		212009	66
	Salvelinus fontinalis; Brook trout	213 G	48 H	LC_{50}	12.75		210964	71

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					Lethal	Sublethal		
	Salvelinus fontinalis; Brook trout	1.4 G	96 H	LC_{50}	7.2		212009	66
	Salvelinus fontinalis; Brook trout	0.4 G	96 H	LC_{50}	1.8		212009	66
	Salvelinus fontinalis; Brook trout	213 G	96 H	LC_{50}	11.9		210964	71
	Salvelinus fontinalis; Brook trout	105.0 G	24 H	BEH		1,000	219591	70
	Salvelinus fontinalis; Brook trout	1.15 G	96 H	LC_{50}	7.4		210964	71
	Salvelinus fontinalis; Brook trout	213 G	72 H	LC_{50}	11.9		210964	71
	Salvelinus fontinalis; Brook trout	213 G	24 H	LC_{50}	23.1		210964	71
	Salvelinus fontinalis; Brook trout	1.15 G	48 H	LC_{50}	7.35		210964	71
	Salvelinus fontinalis; Brook trout	1.15 G	72 H	LC_{50}	7.4		210964	71
	Salvelinus namaycush; Lake trout, siscowet	2.8 G	96 H	LC_{50}	9.5		212009	66
	Salvelinus namaycush; Lake trout, siscowet	2.5 G	96 H	LC_{50}	9.1		212009	66
	Salvelinus sp; Trout, charr	FRY	96 H	LC_{50}	46		216270	74
	Scenedesmus quadricauda; Green algae	NR	6 D	PSE		1,000	212251	71
	Scenedesmus quadricauda; Green algae	NR	48 H	PSE		100	212251	71
	Scenedesmus quadricauda; Green algae	NR	96 H	PSE		100	212251	71
	Scenedesmus quadricauda; Green algae	NR	8 D	PSE		1,000	212251	71
	Scomber scombrus; Atlantic mackerel	NR	0.5 H	ENZ		50,000	219361	71
	Selenastrum capricornutum; Green algae	NR	to 3 D	PSE		36	212249	76
	Semisulcospira libertina; Marsh snail	NR	48 H	LC_{50}	3,800		219158	72
	Seriola quinqueradiata; Yellowtail	6.1-7.6 G	24 H	LC_{50}	6.5		216128	76
	Simocephalus serrulatus; Water flea	1ST INSTAR	48 H	EC_{50} IMM		2.5	210888	66
	Simocephalus serrulatus; Water flea	1ST INSTAR	48 H	EC_{50} IMM		2.8	210888	66
	Simocephalus sp; Water flea	NR	48 H	EC_{50} IMM		5.8	219859	80
	Simuliidae; Blackfly family	LARVAE	72 H	MOR	200		219237	72
	Simuliidae; Blackfly family	LARVAE, 3RD-6TH INSTAR	0.083 H	DRF		400	212837	66
	Simuliidae; Blackfly family	LARVAE, 3RD-6TH INSTAR	0.083 H	DRF		40	212837	66
	Simulium ornatum; Blackfly	EGG	24 H	HAT		1,000	212805	69
	Simulium sp; Blackfly	LARVAE	0.17 H	MOR	1,000		219634	70
	Simulium sp; Blackfly	LARVAE	0.017 H	MOR	10,000		219634	70
	Simulium sp; Blackfly	LARVAE	0.17 H	MOR	100		219634	70
	Simulium sp; Blackfly	LARVAE	0.017 H	MOR	1,000		219634	70
	Skeletonema costatum; Diatom	NR	24 H	PSE		10	219310	71
	Skeletonema costatum; Diatom	10000 CELLS/ML	1 to 17 D	PGR		80	219047	72
	Sphoeroides maculatus; Northern puffer	146 MM, 63 G	48 H	LC_{50}	89		210628	70
	Sphoeroides maculatus; Northern puffer	146 MM, 63 G	96 H	LC_{50}	89		210628	70
	Sphoeroides maculatus; Northern puffer	146 MM, 63 G	24 H	LC_{50}	115		210628	70
	Spicodiaptomus chilospinus; Calanoid copepod	ADULT, 2.2-2.8 MM	48 H	LC_{50}	24		215264	76
	Spicodiaptomus chilospinus; Calanoid copepod	ADULT, 2.2-2.8 MM	24 H	LC_{50}	32		215264	76
	Stizostedion vitreum vitreum; Walleye	1.4 G	96 H	LC_{50}	2.9		210666	80
	Stolephorus purpureus; Nehu	0.39 G, 3.6 CM	12 H	LC_{50}	1		216038	70
	Stronglyocentrotus droebachien; Green sea urchin	SPERM	1.3 H	REP		3	212264	89
	Stronglyocentrotus droebachien; Green sea urchin	EMBRYO	120 H	EC_{50} DVP		>82	212264	89
	Stronglyocentrotus purpuratus; Purple sea urchin	EMBRYO	120 H	EC_{50} DVP		>8.2	212264	89
	Stronglyocentrotus purpuratus; Purple sea urchin	SPERM	1.3 H	REP		>0.5 to <1.0	212264	89
	Stylonychia notophora; Ciliate	NR	36 H	PGR		1,000	219892	80
	Stylonychia notophora; Ciliate	NR	36 H	PGR		40,000	219892	80
	Stylonychia notophora; Ciliate	NR	9 H	PGR		100,000	219892	80
	Tetrahymena pyriformis; Ciliate	LOG PHASE	96 H	PGR		100	315127	70

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					Lethal	Sublethal		
4,4'-DDT (cont.)	Thalassiosira guillardii; Diatom	NR	24 H	PSE		100	219310	71
	Thalassiosira guillardii; Diatom	10000 CELLS/ML	1 to 17 D	PGR		80	219047	72
	Thalassiosira guillardii; Diatom	NR	96 H	PGR		100	212225	72
	Thalassiosira guillardii; Diatom	NR	24 H	PSE		10	219310	71
	Thalassiosira weissflogii; Diatom	10000 CELLS/ML	1 to 17 D	PGR		80	219047	72
	Thalassoma bifasciatum; Bluehead wrasse	80 MM, 5.4 G	96 H	LC_{50}	7		210628	70
	Thalassoma bifasciatum; Bluehead wrasse	80 MM, 5.4 G	24 H	LC_{50}	17		210628	70
	Thalassoma bifasciatum; Bluehead wrasse	80 MM, 5.4 G	48 H	LC_{50}	4		210628	70
	Therapon jarbua; Tigerfish, crescent perch	6.9-9.2 CM, 6.5-13.1 G, 6-9 MO	96 H	LC_{50}	3.6		216020	78
	Tilapia mossambica; Mozambique tilapia	1.3 G, 3.4 CM	96 H	LC_{50}	7		216038	70
	Tilapia mossambica; Mozambique tilapia	15-20 G	to 15 D	ENZ		10	312483	85
	Tilapia mossambica; Mozambique tilapia	1.3 G, 3.4 CM	48 H	LC_{50}	12		216038	70
	Tilapia mossambica; Mozambique tilapia	ADULT, 22 G, 9.2 CM	20 D	CEL, PHY		1	312488	84
	Tilapia mossambica; Mozambique tilapia	1.3 G, 3.4 CM	24 H	LC_{50}	20		216038	70
	Tilapia mossambica; Mozambique tilapia	ADULT, 9.2 CM, 22.5 G	20 D	HIS, PHY		1	311764	86
	Tilapia mossambica; Mozambique tilapia	FEMALE, 22.0 G, 9.3 CM	20 D	HIS, PHY		1	311558	85
	Tilapia mossambica; Mozambique tilapia	15-20 G	to 15 D	BIO, PHY		10	210552	88
	Tilapia mossambica; Mozambique tilapia	MATURE, 22.00 G, 9.2 CM	10 D	HIS, PHY		1	311851	86
	Tilapia nilotica; Nile tilapia	NR	NR	RSD		0.04	312855	86
	Tilapia zillii; Tilapia	FRY, 3.36 CM, 825 MG *	96 H	LC_{50}	9.5		313099	86
	Tilapia zillii; Tilapia	FRY, 3.36 CM, 825 MG *	24 H	LC_{50}	63		313099	86
	Tilapia zillii; Tilapia	FRY, 3.36 CM, 825 MG, BEHERA STRAI	96 H	LC_{50}	15.5		313099	86
	Tilapia zillii; Tilapia	FRY, 3.36 CM, 825 MG, BEHERA STRAI	24 H	LC_{50}	12.78		313099	86
	Tilapia zillii; Tilapia	FRY, 3.36 CM, 825 MG, BEHERA STRAI	24 H	LC_{50}	21.81		313099	86
	Tilapia zillii; Tilapia	FRY, 3.36 CM, 825 MG *	24 H	LC_{50}	27.5		313099	86
	Tilapia zillii; Tilapia	FRY, 3.36 CM, 825 MG *	96 H	LC_{50}	42		313099	86
	Tilapia zillii; Tilapia	FRY, 3.36 CM, 825 MG, BEHERA STRAI	96 H	LC_{50}	9.52		313099	86
	Tinca tinca; Tench	FRY	96 H	LC_{50}	370		216270	74
	Trichoptera; Caddisfly order	NR	3 H *	DRF		10 to 11	217387	61
	Uca pugilator; Fiddler crab	FEMALE	72 H	LOC		80	218349	79
	Uca pugilator; Fiddler crab	MALE	72 H	LOC		80	218349	79
Metals								
Manganese	Algae; Algae, phytoplankton, algal mat;	NATURAL COLONY	38 D	POP *		280	212862	69
	Anabolia nervosa; Quiver fly;	LARVAE	7 D	LET	2,000,000		210725	57
	Chironomus thummi; Midge;	LARVAE	7 D	LET	1,000,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	2.25 H	LET *	1,000,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	24 H	LET *	2,000,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	25 H	LET *	1,800,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	4.17 D	LET *	800,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	5.13 D	LET *	700,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	6.63 D	LET *	650,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	7 D	MOR *	600,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	78 H	LET *	900,000		210725	57
	Cyprinidae; Minnow, carp family;	2 SUMMERS	48 H	LET *	2,000,000		210725	57
	Gammarus roeseli; Scud;	NR	7 D	LET	70,000		210725	57
	Lemna minor; Duckweed;	20 COLONIES OR 40 FRONDS	4 D	EC_{50}GR		31,000	311789	86
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	10 H	LET *	700,000		210725	57

AQUIRE Freshwater Toxicity Information (µg/L)

Remedial Investigation Report
Naval Training Center, OU 4
Orlando, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	13 H	LET *	600,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	34 H	LET *	300,000		210725	57
Manganese (cont.)	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	5 D	LET *	100,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	7 D	MOR *	75,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	77 H	LET *	150,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	2 SUMMERS	34 H	LET *	600,000		210725	57
	Salvelinus fontinalis; Brook trout;	1 SUMMER	15 H	LET *	700,000		210725	57
	Salvelinus fontinalis; Brook trout;	1 SUMMER	23 H	LET *	600,000		210725	57
	Salvelinus fontinalis; Brook trout;	1 SUMMER	4.79 D	LET *	150,000		210725	57
	Salvelinus fontinalis; Brook trout;	1 SUMMER	66 H	LET *	300,000		210725	57
	Salvelinus fontinalis; Brook trout;	1 SUMMER	7 D	MOR *	100,000		210725	57
	Salvelinus fontinalis; Brook trout;	2 SUMMERS	41 H	LET *	600,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	48 H	LET *	2,000,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	6.75 D	LET *	1,500,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	7 D	MOR *	1,200,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	7 D	MOR *	1,300,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	96 H	LET *	1,800,000		210725	57
	Tinca tinca; Tench;	2 SUMMERS	7 D	LET *	2,000,000		210725	57
	Tubifex tubifex; Tubificid worm;	NR	7 D	LET	700,000		210725	57

NOTES:

ABD = Abundance
ABN = Abnormalities
BCF = Bioconcentration factor
BEH = Behavioral change
BIO = Biochemical effect
BM = Biomass
BMS = Biomass
C = Celcius
CLR = Chlorophyll content
CM = Centimeter
D = Days
EC_{50} = Effect of concentration to 50% of the population
EMS = Emergance?
ENZ = Enzyme effect
F = Farenheit
G = Grams
GR = Growth
GRO = Growth
H = Hours
HAT = Hatchability
HEM = Hematological effect
HIS = Histological effect
IM = Immobilization
LC d50 = Lethal concentration to 50% of test organisms
LET = Lethality
LOC = Locomotor Behaviour
LT d50 = Lethal threshold to 50% of test organisms
MM = Millimeter
MOR = Mortality
NR = Not reported
OC = Oxygen consumption
PGR = Population growth
PHY = Physiological effects
POP = Population, species diversity
PSE = Photosynthesis effect
RE = Reproduction
REP = Adverse effect to reproduction
RES = Respiratory effects
RN = Renewel
RSD = Residue
ST = Static
STR = Stress
THL = Thermal effect
VTE = Vertebral effect
µg/L = Microgram per liter

TABLE F.1-9
SUMMARY OF TOXICITY DATA FOR AMPHIBIAN RECEPTORS

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER, OU 4
ORLANDO, FLORIDA

Chemical Name	Species Identification (Organism)	Age/Life Stage	Exposure Regimen	Effects Concentration (µg/L)	Effect	Source
VOLATILE ORGANIC COMPOUNDS (µg/L)						
Acetone	Ambystoma mexicanum; Axolotl	3-4 weeks	48 h	20,000,000	LC_{50}	Devillers & Exbrayat, 1992
	Ambystoma mexicanum; Axolotl	3-4 weeks	48 h	12,000,000	NOLC	Devillers & Exbrayat, 1992
	Xenopus laevis; Clawed toad	3-4 weeks	48 h	24,000,000	LC_{50}	Devillers & Exbrayat, 1992
	Xenopus laevis; Clawed toad	3-4 weeks	48 h	20,000,000	NOLC	Devillers & Exbrayat, 1992
Trichloroethylene	Ambystoma mexicanum; Axolotl	3-4 weeks	48 h	48,000	LC_{50}	Devillers & Exbrayat, 1992
	Ambystoma mexicanum; Axolotl	3-4 weeks	48 h	29,000	NOLC	Devillers & Exbrayat, 1992
	Xenopus laevis; Clawed toad	3-4 weeks	48 h	45,000	LC_{50}	Devillers & Exbrayat, 1992
	Xenopus laevis; Clawed toad	3-4 weeks	48 h	41,000	NOLC	Devillers & Exbrayat, 1992
PESTICIDES/PCBs (µg/L)						
4,4'-DDT	Bufo woodhousei fowleri; Fowler's toad	Tadpole 6 we	96 h	100	LC_{50}	Devillers & Exbrayat, 1992
	Bufo woodhousei fowleri; Fowler's toad	Tadpole 7 we	96 h	30	LC_{50}	Devillers & Exbrayat, 1992
	Rana temporaria; Common/Grass frog	Adults of both	20 d	7.6 mg/kg (dose)	LC_{50}	Devillers & Exbrayat, 1992
Endrin	Acris crepitans; Cricket frog	Larva	96 h [d]	10	LC_{50}	Devillers & Exbrayat, 1992
	Acris crepitans; Cricket frog	Larva	24 h	23	EC_{50}	ECOTOX
	Ambystoma maculatum; Spotted salamander	Larva	96 h [d]	56	LC_{50}	Devillers & Exbrayat, 1992
	Ambystoma maculatum; Spotted salamander	Larva	24 h	48	EC_{50}	ECOTOX
	Ambystoma opacum; Marbled salamander	Larva	96 h [d]	18	LC_{50}	Devillers & Exbrayat, 1992
	Ambystoma opacum; Marbled salamander	Larva	24 h	18	EC_{50}	ECOTOX
	Bufo americanus; American toad	Larva	96 h [d]	10	LC_{50}	Devillers & Exbrayat, 1992
	Bufo americanus; American toad	Larva	24 h	8	EC_{50}	ECOTOX
	Bufo woodhousei fowleri; Fowler's toad	Tadpole	96 h	120	LC_{50}	Devillers & Exbrayat, 1992
	Pseudacris triseriata; Chorus frog	Tadpole	96 h [d]	180	LC_{50}	Devillers & Exbrayat, 1992
	Pseudacris triseriata; Chorus frog	Tadpole	24 h	290	LC_{50}	ECOTOX
	Rana catesbeiana; Bullfrog	Larva	96 h [d]	2	LC_{50}	Devillers & Exbrayat, 1992
	Rana catesbeiana; Bullfrog	Larva	24 h	>40	EC_{50}	ECOTOX
	Rana catesbeiana; Bullfrog	Tadpole	96 h	2.5	LC_{50}	Devillers & Exbrayat, 1992
	Rana pipiens; Northern leopard frog	3.5 inches an	30 d	30	30% Mortality	Devillers & Exbrayat, 1992
	Rana sphenocephala; Southern leopard frog	Egg	24 h	25	LC_{50}	Devillers & Exbrayat, 1992
	Rana sphenocephala; Southern leopard frog	Young larva	96 h	6	LC_{50}	Devillers & Exbrayat, 1992
	Rana sphenocephala; Southern leopard frog	Older larva	96 h	6	LC_{50}	Devillers & Exbrayat, 1992
	Rana sphenocephala; Southern leopard frog	Sub-adult	96 h	5	LC_{50}	Devillers & Exbrayat, 1992
	Rana sphenocephala; Southern leopard frog	Larva	96 h [d]	9	LC_{50}	Devillers & Exbrayat, 1992
	Rana sphenocephala; Southern leopard frog	Larva	24 h	13	EC_{50}	ECOTOX
Endrin (cont.)	Rana sylvatica; Wood frog	Larva	96 h [d]	34	LC_{50}	Devillers & Exbrayat, 1992
	Rana sylvatica; Wood frog	Larva	24 h	<16	EC_{50}	ECOTOX
	Rana pipiens; Northern leopard frog	65 g	30 d	<20	Mortality	ECOTOX

NOTES:
LC_{50} = The concentration at which 50% of the population died (exhibited a lethal endpoint).
LD_{50} = The administered dose which causes 50% of the population to die.

TABLE F.1-9
SUMMARY OF TOXICITY DATA FOR AMPHIBIAN RECEPTORS

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER, OU 4
ORLANDO, FLORIDA

Chemical Name	Species Identification (Organism)	Age/Life Stage	Exposure Regimen	Effects Concentration (µg/L)	Effect	Source

EC_{50} = The concentration at which 50% of the population exhibited an effect.
TL_{50} = Mortality endpoint; concentration represents the median tolerance limit.
NOLC = No Observed Lethal Concentration

[a] Initiated at fertilization and maintained through 4 day posthatching.
[b] Devillers & Exbrayat (1992) provides synergism data for magnesium and mercury, lead, cadmium, and manganese as % mortality.
[c] pH 7 tap water conditions.
[d] Animals were exposed to the pesticide for 96 hours, but tabulations of mortality were made at 192 hours to account for delayed effects.
[e] 30 minutes exposure to the sun
[f] 5 hours exposure to the sun
[g] When no LC_{50} or LD_{50} data were available, other mortality data where a known percentage of the population died was used.
[h] LD_{50} data available but not used for calculation of chronic screening value.

Table F.1-10
Environmental Residue-Effects Database

Remedial Investigation Report
Naval Training Center, Orlando OU4
Orlando, Florida

Analyte [1]	Species		Effect	Effect Concentration (mg/kg)
	Scientific Name	Common Name		
1,1-Dichloroethene [2]				
1,2-Dichloroethene (total) [2]				
Acetone [2]				
Carbon disulfide [2]				
Methylene chloride [2]				
Tetrachloroethene	Lepomis macrochirus	bluegill	mortality, NOEC	0.17
Toluene [2]				
Trichloroethene [2]				
Vinyl chloride [2]				
4-Methylphenol [2]				
Fluoranthene	Cyprinus carpio	carp	physiological, NOEC	182
Pyrene	Diporeia sp.	amphipod	mortality, EC50	1270
bis(2-Ethylhexyl)phthalate [2]				
4,4'-DDE	Chironomus riparius	midge	behavioral, NOEC (swimming)	1.6
	Chironomus riparius	midge	behavioral, NOEC (swimming)	0.27
	Chironomus riparius	midge	behavioral, NOEC (swimming)	0.1
	Chironomus riparius	midge	developmental, LOEC	7.35
	Chironomus riparius	midge	developmental, NOEC	3.75
,4'-DDT	Pimephales promelas	fathead minnow	mortality, NOEC	19.7
	Pimephales promelas	fathead minnow	reproduction, LOEC	3.8
	Orconectes nais	crayfish	mortality, NOEC	0.047
	Diporeia spp.	amphipod	mortality, NOEC	19.7
	Gammarus fasciatus	amphipod	mortality, NOEC	0.336
	Daphnia magna	water flea	mortality, NOEC	1.8
	Chironomus	midge	mortality, NOEC	0.44
	Chironomus riparius	midge	behavioral, LOEC	0.83
	Chironomus riparius	midge	behavioral, NOEC	0.18
	Chironomus riparius	midge	behavioral, NOEC	0.08
	Hexagenia bilineata	mayfly	mortality, NOEC	0.336
	Siphlonurus sp.	mayfly	mortality, NOEC	0.216
	Ischnura verticilatus	damselfly	mortality, NOEC	0.075
	Libellula sp.	dragonfly	mortality, NOEC	0.014
Aroclor-1254 [2]				
Endosulfan I [2]				
Endrin ketone [3]	Pimephales promelas	fathead minnow	mortality	1.1
	Pimephales promelas	fathead minnow	mortality	1.6
	Pimephales promelas	fathead minnow	reproductive	0.05
	Pimephales promelas	fathead minnow	reproductive	0.34
	Pimephales promelas	fathead minnow	reproductive	0.5
	Ictalurus punctatus	channel catfish	behavioral, LOEC	1
	Ictalurus punctatus	channel catfish	growth, NOEC	0.31
	Ictalurus punctatus	channel catfish	mortality, EC100	1
	Ictalurus punctatus	channel catfish	mortality, NOEC	0.41
	Ictalurus punctatus	channel catfish	mortality, NOEC	0.31
Heptachlor [2]				

Table F.1-10
Environmental Residue-Effects Database

Remedial Investigation Report
Naval Training Center, Orlando OU4
Orlando, Florida

Analyte [1]	Species		Effect	Effect Concentration (mg/kg)
	Scientific Name	Common Name		
alpha-Chlordane [2]				
delta-BHC [2]				
Aluminum [2]				
Lead	Chironomus gr. thummi	midge	morphology, NOEC	2.5
Mercury [2]				

Notes:
[1] Surface water and sediment ECPCs, presented in Tables 9-4 and 9-5.
[2] The Environmental Residue-Effects Database did not have any data on this analyte or the data that was available was for species not likely to be present at OU4.
[3] Endrin used as a surrogate.

Notes:
ECPC = Ecological contaminants of potential concern.
LOEC = Lowest observed effect concentration.
NOEC = No observed effect concentration.
EC50 = Concentration that had an effect on 50% of the test population.
EC100 = Concentration that had an effect on 100% of the test population.

TABLE F.2-1
ESTIMATION OF CHRONIC EXPOSURES TO TERRESTRIAL RECEPTORS FROM EXPOSURE TO RME CONCENTRATIONS IN FOOD AND SURFACE SOIL

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

EXPOSURE CONCENTRATION DATA		TISSUE LEVELS IN PRIMARY PREY ITEMS (Site Specific)							
CHEMICAL	REASONABLE MAXIMUM SOIL CONCENTRATION (mg/kg)	Invertebrate BAF [a]	Invertebrate Tissue Level (mg/kg) [b]	Plant BAF [a]	Plant Tissue Level (mg/kg) [b]	Mammal BAF [a]	Mammal Tissue Level (mg/kg) [c]	Bird BAF [a]	Small Bird Tissue Level (mg/kg) [c]
Acetone	1.0E-02	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00
Methylene chloride	0.0E+00	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00
Tetrachloroethene	2.7E-02	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00
Benzo(a)anthracene	2.6E-01	5.0E-02	1.3E-02	5.1E-03	1.3E-03	4.8E-01	1.1E-02	NA	0.0E+00
Benzo(a)pyrene	3.3E-01	5.0E-02	1.7E-02	5.1E-03	1.7E-03	4.8E-01	1.3E-02	NA	0.0E+00
Benzo(b)fluoranthene	6.3E-01	5.0E-02	3.2E-02	5.1E-03	3.2E-03	4.8E-01	2.6E-02	NA	0.0E+00
Benzo(g,h,i)perylene	2.2E-01	5.0E-02	1.1E-02	5.1E-03	1.1E-03	4.8E-01	8.9E-03	NA	0.0E+00
Benzo(k)fluoranthene	2.3E-01	5.0E-02	1.2E-02	5.1E-03	1.2E-03	4.8E-01	9.3E-03	NA	0.0E+00
bis(2-Ethylhexyl)phthalate	2.4E-01	5.0E-02	1.2E-02	8.7E-03	2.1E-03	1.9E-01	3.9E-03	NA	0.0E+00
Carbazole	2.0E-01	5.0E-02	1.0E-02	4.9E-02	9.9E-03	1.5E-01	3.2E-03	NA	0.0E+00
Chrysene	4.6E-01	5.0E-02	2.3E-02	5.1E-03	2.4E-03	4.8E-01	1.9E-02	NA	0.0E+00
Fluoranthene	5.5E-01	5.0E-02	2.8E-02	5.1E-03	2.8E-03	4.8E-01	2.2E-02	NA	0.0E+00
Fluorene	0.0E+00	5.0E-02	0.0E+00	5.1E-03	0.0E+00	4.8E-01	0.0E+00	NA	0.0E+00
Indeno(1,2,3-cd)pyrene	2.0E-01	5.0E-02	1.0E-02	5.1E-03	1.0E-03	4.8E-01	8.1E-03	NA	0.0E+00
Phenanthrene	2.4E-01	5.0E-02	1.2E-02	5.1E-03	1.2E-03	4.8E-01	9.7E-03	NA	0.0E+00
Pyrene	5.8E-01	5.0E-02	2.9E-02	5.1E-03	3.0E-03	4.8E-01	2.4E-02	NA	0.0E+00
4,4'-DDD	4.4E-03	3.3E+00	1.5E-02	1.3E-03	5.7E-06	1.2E+00	8.0E-03	2.9E+00	2.6E-03
4,4'-DDE	1.1E-02	1.7E+00	1.9E-02	2.0E-03	2.2E-05	1.2E+00	1.1E-02	2.9E+00	3.9E-03
4,4'-DDT	1.0E-02	5.7E-01	5.7E-03	7.7E-04	7.7E-06	1.2E+00	3.7E-03	2.9E+00	1.8E-03
Aroclor-1254	6.9E-02	5.8E+00	4.0E-01	1.2E-01	8.3E-03	3.8E+00	7.0E-01	3.2E-01	8.7E-03
Endrin keytone	5.6E-03	1.9E+00	1.1E-02	1.2E-01	6.7E-04	6.2E-02	3.3E-04	5.9E-01	6.2E-04
gamma-BHC (Lindane)	9.0E-04	2.6E+00	2.3E-03	3.3E-02	3.0E-05	1.4E-01	1.5E-04	1.5E-01	2.5E-05
Methoxychlor	8.7E-02	5.7E-01	5.0E-02	1.3E-02	1.1E-03	1.0E-06	2.8E-08	2.9E+00	1.7E-02
Aluminum	9.7E+03	7.5E-02	7.3E+02	8.0E-04	7.8E+00	7.5E-02	6.8E+01	NA	0.0E+00
Barium	6.0E+01	7.5E-03	4.5E-01	3.0E-02	1.8E+00	7.5E-03	3.5E-02	7.5E-03	2.0E-02
Beryllium	0.0E+00	5.0E-02	0.0E+00	2.0E-03	0.0E+00	5.0E-02	0.0E+00	NA	0.0E+00
Cadmium	1.3E+00	1.4E+00	1.8E+00	3.3E+01	4.3E+01	2.1E+00	4.7E+01	3.8E-01	7.8E+00
Chromium	1.5E+01	1.6E-01	2.3E+00	1.5E-03	2.2E-02	2.8E-01	5.4E-01	2.8E-01	1.6E-01
Lead	7.8E+01	7.8E-02	6.1E+00	0.0E+00	0.0E+00	1.5E-02	1.1E-01	NA	0.0E+00
Mercury	1.7E-01	6.8E-02	1.2E-02	1.8E-01	3.1E-02	1.0E-02	3.1E-04	2.3E+00	4.7E-02
Selenium	5.2E-01	7.6E-01	4.0E-01	9.0E-03	4.7E-03	7.5E-01	1.6E-01	5.1E-01	2.0E-02
Silver	2.2E+00	1.5E-01	3.3E-01	8.0E-02	1.8E-01	1.5E-01	5.5E-02	NA	0.0E+00
Vanadium	4.8E+00	1.2E-01	5.8E-01	1.1E-03	5.3E-03	1.3E-01	6.8E-02	NA	0.0E+00
Zinc	2.3E+02	1.8E+00	4.1E+02	6.1E-01	1.4E+02	2.1E+00	5.5E+02	NA	0.0E+00

[a] Bioaccumulation factors are presented in Appendix F, Table F-1

[b] Plant and invertebrate tissue concentrations are calculated by multiplying the soil concentration by the plant or invertebrate BAF.

[c] Mammal and bird tissue concentrations are calculated by multiplying the small mammal or bird body weight- and ingestion rate-normalized TBD by the mammal or bird BAF.

NA = Not analyzed

ND = Not detected

TBD = Total body dose

TABLE F.2-1

ESTIMATION OF CHRONIC EXPOSURES TO TERRESTRIAL RECEPTORS FROM EXPOSURE TO RME CONCENTRATIONS IN FOOD AND SURFACE SOIL

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

EXPOSURE PARAMETERS [c]

Indicator Species		Percent Prey in Diet: Inverts	Plants	Small Mammals	Amphibians	Birds	Soil	Home Range (acres)	Site Foraging Frequency [d]	Dietary Ingestion Rate (kg/day)	Water Ingestion Rate (l/day)	Body Weight (kg)	Exposure Duration
Cotton mouse	Small herb. mammal	10%	88%	0%	0%	0%	2%	0.147	1.0E+00	0.0049	0.0055	0.04	1
Mourning dove	Small omn. bird	1%	94%	0%	0%	0%	5%	5	1.0E+00	0.015	0.015	0.13	1
Short-tailed shrew	Small omn. mammal	78%	12%	0%	0%	0%	10%	0.96	1.0E+00	0.002	0.0025	0.017	1
Woodcock	Small verm. bird	80%	10%	0%	0%	0%	10%	80	1.6E-01	0.020	0.02	0.197	0.75
Red fox	Predatory mammal	20%	10%	57%	0%	12%	3%	457	2.8E-02	0.240	0.38	4.5	1

SITE AREA: 12.7 acres

NOTES:
[c] Documentation of exposure parameters presented in Table 9-8.
[d] Site Foraging Frequency (SFF). Calculated by dividing site area by receptor home range (cannot exceed 1.0)

TABLE F.2-1
ESTIMATION OF CHRONIC EXPOSURES TO TERRESTRIAL RECEPTORS FROM EXPOSURE TO RME CONCENTRATIONS IN FOOD AND SURFACE SOIL

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

TOTAL BODY DOSE (mg/kgBW-day) [a]

Chemical	Cotton mouse	Mourning dove	Short-tailed shrew	Woodcock	Red fox
Acetone	2.5E-05	5.8E-05	1.4E-04	1.2E-05	4.4E-07
Methylene chloride	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Tetrachloroethene	6.6E-05	1.6E-04	3.8E-04	3.3E-05	1.2E-06
Benzo(a)anthracene	9.4E-04	1.7E-03	5.1E-03	4.4E-04	2.5E-05
Benzo(a)pyrene	1.2E-03	2.1E-03	6.5E-03	5.6E-04	3.1E-05
Benzo(b)fluoranthene	2.3E-03	4.0E-03	1.2E-02	1.1E-03	5.9E-05
Benzo(g,h,i)perylene	8.0E-04	1.4E-03	4.3E-03	3.7E-04	2.1E-05
Benzo(k)fluoranthene	8.3E-04	1.5E-03	4.5E-03	3.9E-04	2.2E-05
bis(2-Ethylhexyl)phthalate	9.6E-04	1.6E-03	4.7E-03	4.1E-04	1.8E-05
Carbazole	1.7E-03	2.2E-03	4.1E-03	3.5E-04	1.6E-05
Chrysene	1.7E-03	2.9E-03	9.1E-03	7.8E-04	4.3E-05
Fluoranthene	2.0E-03	3.5E-03	1.1E-02	9.3E-04	5.2E-05
Fluorene	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Indeno(1,2,3-cd)pyrene	7.2E-04	1.3E-03	3.9E-03	3.4E-04	1.9E-05
Phenanthrene	8.7E-04	1.5E-03	4.7E-03	4.1E-04	2.3E-05
Pyrene	2.1E-03	3.7E-03	1.1E-02	9.9E-04	5.5E-05
4,4'-DDD	1.9E-04	4.3E-05	1.7E-03	1.5E-04	1.2E-05
4,4'-DDE	2.6E-04	8.7E-05	2.2E-03	1.9E-04	1.6E-05
4,4'-DDT	9.5E-05	6.5E-05	7.7E-04	6.7E-05	5.6E-06
Aroclor-1254	6.0E-03	1.8E-03	4.5E-02	4.0E-03	7.2E-04
Endrin keytone	2.2E-04	1.2E-04	1.3E-03	1.1E-04	3.9E-06
gamma-BHC (Lindane)	3.4E-05	1.1E-05	2.7E-04	2.4E-05	8.7E-07
Methoxychlor	9.4E-04	6.8E-04	6.7E-03	5.9E-04	2.2E-05
Aluminum	3.4E+01	5.8E+01	2.2E+02	1.9E+01	7.1E-01
Barium	3.4E-01	5.4E-01	9.2E-01	7.9E-02	3.1E-03
Beryllium	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cadmium	4.7E+00	4.7E+00	9.5E-01	7.1E-02	4.8E-02
Chromium	6.7E-02	8.9E-02	4.6E-01	4.0E-02	1.8E-03
Lead	2.7E-01	4.6E-01	1.8E+00	1.5E-01	5.4E-03
Mercury	3.9E-03	4.3E-03	4.2E-03	3.5E-04	2.4E-05
Selenium	6.6E-03	4.0E-03	5.1E-02	4.5E-03	2.8E-04
Silver	2.8E-02	3.2E-02	7.0E-02	6.1E-03	2.7E-04
Vanadium	1.9E-02	2.9E-02	1.3E-01	1.1E-02	4.4E-04
Zinc	2.0E+01	1.7E+01	5.0E+01	4.4E+00	6.1E-01

[a] Calculated by summing the products of individual prey type concentrations and percent in diet, multiplying by the SFF, exposure duration, and ingestion rate, and then dividing by body weight.

TABLE F.2-2
RISK FROM POTENTIAL LETHAL EFFECTS FOR TERRESTRIAL RECEPTORS FROM RME CONCENTRATIONS OF CPCs IN FOOD AND SURFACE SOIL

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

CHEMICAL	Cotton mouse Lethal			Mourning dove Lethal			Short-tailed shrew Lethal		
	TBD	RTV	HQ	TBD	RTV	HQ	TBD	RTV	HQ
Acetone	2.5E-05	6.0E+02	4.1E-08	5.8E-05			1.4E-04	6.0E+02	2.4E-07
Methylene chloride	0.0E+00	3.2E+02	0.0E+00	0.0E+00			0.0E+00	3.2E+02	
Tetrachloroethene	6.6E-05	1.6E+03	4.1E-08	1.6E-04			3.8E-04	1.6E+03	2.4E-07
Benzo(a)anthracene	9.4E-04	1.2E+01	7.8E-05	1.7E-03			5.1E-03	1.2E+01	4.3E-04
Benzo(a)pyrene	1.2E-03	1.2E+01	9.9E-05	2.1E-03			6.5E-03	1.2E+01	5.4E-04
Benzo(b)fluoranthene	2.3E-03	1.2E+01	1.9E-04	4.0E-03			1.2E-02	1.2E+01	1.0E-03
Benzo(g,h,i)perylene	8.0E-04	1.2E+01	6.6E-05	1.4E-03			4.3E-03	1.2E+01	3.6E-04
Benzo(k)fluoranthene	8.3E-04	1.2E+01	6.9E-05	1.5E-03			4.5E-03	1.2E+01	3.8E-04
bis(2-Ethylhexyl)phthalate	9.6E-04	1.6E+02	6.0E-06	1.6E-03			4.7E-03	1.6E+02	3.0E-05
Carbazole	1.7E-03	1.0E+02	1.7E-05	2.2E-03			4.1E-03	1.0E+02	4.1E-05
Chrysene	1.7E-03	1.2E+01	1.4E-04	2.9E-03			9.1E-03	1.2E+01	7.6E-04
Fluoranthene	2.0E-03	4.0E+02	5.0E-06	3.5E-03			1.1E-02	4.0E+02	2.7E-05
Fluorene	0.0E+00	1.2E+01	0.0E+00	0.0E+00			0.0E+00	1.2E+01	0.0E+00
Indeno(1,2,3-cd)pyrene	7.2E-04	1.2E+01	6.0E-05	1.3E-03			3.9E-03	1.2E+01	3.3E-04
Phenanthrene	8.7E-04	1.4E+02	6.2E-06	1.5E-03			4.7E-03	1.4E+02	3.4E-05
Pyrene	2.1E-03	1.6E+02	1.3E-05	3.7E-03			1.1E-02	1.6E+02	7.1E-05
4,4'-DDD	1.9E-04	1.7E+01	1.1E-05	4.3E-05	1.2E+02	3.6E-07	1.7E-03	1.7E+01	9.5E-05
4,4'-DDE	2.6E-04	1.4E+02	1.8E-06	8.7E-05	1.2E+02	7.3E-07	2.2E-03	1.4E+02	1.6E-05
4,4'-DDT	9.5E-05	1.7E+01	5.5E-06	6.5E-05	1.2E+02	5.5E-07	7.7E-04	1.7E+01	4.4E-05
Aroclor-1254	6.0E-03	1.0E+02	6.0E-05	1.8E-03	1.6E+01	1.1E-04	4.5E-02	1.0E+02	4.5E-04
Endrin keytone	2.2E-04	6.0E-01	3.6E-04	1.2E-04	3.6E-01	3.3E-04	1.3E-03	6.0E-01	2.1E-03
gamma-BHC (Lindane)	3.4E-05	3.5E+01	9.6E-07	1.1E-05			2.7E-04	3.5E+01	7.7E-06
Methoxychlor	9.4E-04	2.0E+01	4.7E-05	6.8E-04			6.7E-03	2.0E+01	3.4E-04
Aluminum	3.4E+01	7.4E+02	4.5E-02	5.8E+01			2.2E+02	7.4E+02	2.9E-01
Barium	3.4E-01	4.3E+01	8.0E-03	5.4E-01			9.2E-01	4.3E+01	2.1E-02
Beryllium	0.0E+00	2.0E+00	0.0E+00	0.0E+00			0.0E+00	2.0E+00	0.0E+00
Cadmium	4.7E+00	3.0E+01	1.6E-01	4.7E+00			9.5E-01	3.0E+01	3.2E-02
Chromium	6.7E-02	2.0E+01	3.3E-03	8.9E-02	1.3E+01	7.1E-03	4.6E-01	2.0E+01	2.3E-02
Lead	2.7E-01	6.0E+01	4.4E-03	4.6E-01	7.5E+01	6.1E-03	1.8E+00	6.0E+01	3.0E-02
Mercury	3.9E-03	3.6E+00	1.1E-03	4.3E-03	2.2E+00	2.0E-03	4.2E-03	3.6E+00	1.2E-03
Selenium	6.6E-03	2.8E+01	2.4E-04	4.0E-03	2.7E-01	1.5E-02	5.1E-02	2.8E+01	1.8E-03
Silver	2.8E-02	6.8E+00	4.2E-03	3.2E-02			7.0E-02	6.8E+00	1.0E-02
Vanadium	1.9E-02	6.2E+00	3.1E-03	2.9E-02	1.9E+01	1.5E-03	1.3E-01	6.2E+00	2.1E-02
Zinc	2.0E+01	5.0E+02	4.0E-02	1.7E+01			5.0E+01	5.0E+02	1.0E-01
SUMMARY HAZARD INDEX			**2.7E-01**			**3.2E-02**			**5.4E-01**

TBD = Total Body Dose (mg/kgBW-day).
RTV = Reference Toxicity Value (mg/kgBW-day); wildlife RTVs are presented in Appendix F, Table F-9.
HQ = Hazard Quotient (calculated by dividing TBD by RTV)
NA = Not Available

TABLE F.2-2
RISK FROM POTENTIAL LETHAL EFFECTS FOR TERRESTRIAL RECEPTORS FROM RME CONCENTRATIONS
OF CPCs IN FOOD AND SURFACE SOIL

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

CHEMICAL	Woodcock Lethal			Red fox Lethal		
	TBD	RTV	HQ	TBD	RTV	HQ
Acetone	1.2E-05			4.4E-07	6.0E+02	7.4E-10
Methylene chloride	0.0E+00			0.0E+00	3.2E+02	0.0E+00
Tetrachloroethene	3.3E-05			1.2E-06	1.6E+03	7.4E-10
Benzo(a)anthracene	4.4E-04			2.5E-05	1.2E+01	2.0E-06
Benzo(a)pyrene	5.6E-04			3.1E-05	1.2E+01	2.6E-06
Benzo(b)fluoranthene	1.1E-03			5.9E-05	1.2E+01	5.0E-06
Benzo(g,h,i)perylene	3.7E-04			2.1E-05	1.2E+01	1.7E-06
Benzo(k)fluoranthene	3.9E-04			2.2E-05	1.2E+01	1.8E-06
bis(2-Ethylhexyl)phthalate	4.1E-04			1.8E-05	1.6E+02	1.1E-07
Carbazole	3.5E-04			1.6E-05	1.0E+02	1.6E-07
Chrysene	7.8E-04			4.3E-05	1.2E+01	3.6E-06
Fluoranthene	9.3E-04			5.2E-05	4.0E+02	1.3E-07
Fluorene	0.0E+00			0.0E+00	1.2E+01	0.0E+00
Indeno(1,2,3-cd)pyrene	3.4E-04			1.9E-05	1.2E+01	1.6E-06
Phenanthrene	4.1E-04			2.3E-05	1.4E+02	1.6E-07
Pyrene	9.9E-04			5.5E-05	1.6E+02	3.4E-07
4,4'-DDD	1.5E-04	1.2E+02	1.2E-06	1.2E-05	1.2E+01	9.8E-07
4,4'-DDE	1.9E-04	1.2E+02	1.6E-06	1.6E-05	1.4E+02	1.1E-07
4,4'-DDT	6.7E-05	1.2E+02	5.6E-07	5.6E-06	1.2E+01	4.7E-07
Aroclor-1254	4.0E-03	1.6E+01	2.5E-04	7.2E-04	1.0E+02	7.2E-06
Endrin keytone	1.1E-04	3.6E-01	3.1E-04	3.9E-06	6.0E-01	6.5E-06
gamma-BHC (Lindane)	2.4E-05			8.7E-07	3.5E+01	2.5E-08
Methoxychlor	5.9E-04			2.2E-05	2.0E+01	1.1E-06
Aluminum	1.9E+01			7.1E-01	7.4E+02	9.6E-04
Barium	7.9E-02			3.1E-03	4.3E+01	7.2E-05
Beryllium	0.0E+00			0.0E+00	2.0E+00	0.0E+00
Cadmium	7.1E-02			4.8E-02	3.0E+01	1.6E-03
Chromium	4.0E-02	1.3E+01	3.2E-03	1.8E-03	2.0E+01	9.1E-05
Lead	1.5E-01	7.5E+01	2.0E-03	5.4E-03	6.0E+01	8.9E-05
Mercury	3.5E-04	2.2E+00	1.6E-04	2.4E-05	2.0E-01	1.2E-04
Selenium	4.5E-03	2.7E-01	1.7E-02	2.8E-04	2.8E+01	1.0E-05
Silver	6.1E-03			2.7E-04	6.8E+00	3.9E-05
Vanadium	1.1E-02	1.9E+01	5.9E-04	4.4E-04	6.2E+00	7.1E-05
Zinc	4.4E+00			6.1E-01	5.0E+02	1.2E-03
SUMMARY HAZARD INDEX			**2.3E-02**			**4.3E-03**

TBD = Total Body Dose (mg/kgBW-day).
RTV = Reference Toxicity Value (mg/kgBW-day); wildlife RTVs are presented in Appendix F, Table F-9.
HQ = Hazard Quotient (calculated by dividing TBD by RTV)
NA = Not Available

TABLE F.2-3
RISK FROM POTENTIAL SUBLETHAL EFFECTS FOR TERRESTRIAL RECEPTORS FROM RME CONCENTRATIONS OF CPC'S IN FOOD AND SURFACE SOIL

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

CHEMICAL	Cotton mouse Sublethal			Mourning dove Sublethal			Short-tailed shrew Sublethal		
	TBD	RTV	HQ	TBD	RTV	HQ	TBD	RTV	HQ
Acetone	2.5E-05	2.7E+04	9.0E-10	5.8E-05			1.4E-04	2.7E+04	5.2E-09
Methylene chloride	0.0E+00	5.9E+00	0.0E+00	0.0E+00			0.0E+00	5.9E+00	0.0E+00
Tetrachloroethene	6.6E-05	1.0E+01	6.6E-06	1.6E-04			3.8E-04	1.0E+01	3.8E-05
Benzo(a)anthracene	9.4E-04	1.0E+00	9.4E-04	1.7E-03			5.1E-03	1.0E+00	5.1E-03
Benzo(a)pyrene	1.2E-03	1.0E+00	1.2E-03	2.1E-03			6.5E-03	1.0E+00	6.5E-03
Benzo(b)fluoranthene	2.3E-03	1.0E+00	2.3E-03	4.0E-03			1.2E-02	1.0E+00	1.2E-02
Benzo(g,h,i)perylene	8.0E-04	1.0E+00	8.0E-04	1.4E-03			4.3E-03	1.0E+00	4.3E-03
Benzo(k)fluoranthene	8.3E-04	1.0E+00	8.3E-04	1.5E-03			4.5E-03	1.0E+00	4.5E-03
bis(2-Ethylhexyl)phthalate	9.6E-04	3.5E+00	2.7E-04	1.6E-03			4.7E-03	3.5E+00	1.4E-03
Carbazole	1.7E-03	1.0E+00	1.7E-03	2.2E-03			4.1E-03	1.0E+00	4.1E-03
Chrysene	1.7E-03	1.0E+00	1.7E-03	2.9E-03			9.1E-03	1.0E+00	9.1E-03
Fluoranthene	2.0E-03	1.0E+00	2.0E-03	3.5E-03			1.1E-02	1.0E+00	1.1E-02
Fluorene	0.0E+00	1.0E+00	0.0E+00	0.0E+00			0.0E+00	1.0E+00	0.0E+00
Indeno(1,2,3-cd)pyrene	7.2E-04	1.0E+00	7.2E-04	1.3E-03			3.9E-03	1.0E+00	3.9E-03
Phenanthrene	8.7E-04	1.0E+00	8.7E-04	1.5E-03			4.7E-03	1.0E+00	4.7E-03
Pyrene	2.1E-03	1.0E+00	2.1E-03	3.7E-03			1.1E-02	1.0E+00	1.1E-02
4,4'-DDD	1.9E-04	2.0E-01	9.5E-04	4.3E-05	1.4E-02	3.1E-03	1.7E-03	2.0E-01	8.3E-03
4,4'-DDE	2.6E-04	2.0E-01	1.3E-03	8.7E-05	2.9E-01	3.0E-04	2.2E-03	2.0E-01	1.1E-02
4,4'-DDT	9.5E-05	2.0E-01	4.8E-04	6.5E-05	1.4E-02	4.7E-03	7.7E-04	2.0E-01	3.8E-03
Aroclor-1254	6.0E-03	1.5E-01	3.9E-02	1.8E-03	9.0E-01	2.0E-03	4.5E-02	1.5E-01	3.0E-01
Endrin keytone	2.2E-04	5.3E-02	4.1E-03	1.2E-04			1.3E-03	5.3E-02	2.4E-02
gamma-BHC (Lindane)	3.4E-05	5.0E+00	6.8E-06	1.1E-05			2.7E-04	5.0E+00	5.4E-05
Methoxychlor	9.4E-04	1.0E+00	9.4E-04	6.8E-04			6.7E-03	1.0E+00	6.7E-03
Aluminum	3.4E+01	1.0E+01	3.4E+00	5.8E+01			2.2E+02	1.0E+01	2.2E+01
Barium	3.4E-01	2.0E+01	1.7E-02	5.4E-01			9.2E-01	2.0E+01	4.7E-02
Beryllium	0.0E+00	8.5E-02	0.0E+00	0.0E+00			0.0E+00	8.5E-02	0.0E+00
Cadmium	4.7E+00	2.1E+00	2.2E+00	4.7E+00	1.0E+00	4.7E+00	9.5E-01	2.1E+00	4.5E-01
Chromium	6.7E-02	2.0E+02	3.3E-04	8.9E-02	1.4E+03	6.4E-05	4.6E-01	2.0E+02	2.3E-03
Lead	2.7E-01	7.0E+00	3.8E-02	4.6E-01	4.6E+00	9.9E-02	1.8E+00	7.0E+00	2.5E-01
Mercury	4.3E-03	4.0E-01	1.1E-02	4.8E-03	6.4E-02	7.5E-02	4.7E-03	4.0E-01	1.2E-02
Selenium	6.6E-03	2.0E-02	3.3E-01	4.0E-03	3.6E-01	1.1E-02	5.1E-02	2.0E-02	2.5E+00
Silver	2.8E-02	1.8E+00	1.6E-02	3.2E-02			7.0E-02	1.8E+00	3.9E-02
Vanadium	1.9E-02	8.4E+00	2.3E-03	2.9E-02	1.1E+00	2.6E-02	1.3E-01	8.4E+00	1.6E-02
Zinc	2.0E+01	2.0E+01	1.0E+00	1.7E+01			5.0E+01	2.0E+01	2.5E+00
SUMMARY HAZARD INDEX			**7.1E+00**			**4.9E+00**			**2.8E+01**

TBD = Total Body Dose (mg/kgBW-day).
RTV = Reference Toxicity Value (mg/kgBW-day); wildlife RTVs are presented in Appendix F, Table F-9.
HQ = Hazard Quotient (calculated by dividing TBD by RTV)
NA = Not Available

TABLE F.2-3
RISK FROM POTENTIAL SUBLETHAL EFFECTS FOR TERRESTRIAL RECEPTORS FROM MAXIMUM EXPOSURE CONCENTRATIONS IN FOOD AND SURFACE SOIL

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

CHEMICAL	Woodcock Sublethal			Red fox Sublethal		
	TBD	RTV	HQ	TBD	RTV	HQ
Acetone	1.2E-05			4.4E-07	2.7E+04	1.6E-11
Methylene chloride	0.0E+00			0.0E+00	5.9E+00	0.0E+00
Tetrachloroethene	3.3E-05			1.2E-06	1.0E+01	1.2E-07
Benzo(a)anthracene	4.4E-04			2.5E-05	1.0E+00	2.5E-05
Benzo(a)pyrene	5.6E-04			3.1E-05	1.0E+00	3.1E-05
Benzo(b)fluoranthene	1.1E-03			5.9E-05	1.0E+00	5.9E-05
Benzo(g,h,i)perylene	3.7E-04			2.1E-05	1.0E+00	2.1E-05
Benzo(k)fluoranthene	3.9E-04			2.2E-05	1.0E+00	2.2E-05
bis(2-Ethylhexyl)phthalate	4.1E-04			1.8E-05	3.5E+00	5.1E-06
Carbazole	3.5E-04			1.6E-05	1.0E+00	1.6E-05
Chrysene	7.8E-04			4.3E-05	1.0E+00	4.3E-05
Fluoranthene	9.3E-04			5.2E-05	1.0E+00	5.2E-05
Fluorene	0.0E+00			0.0E+00	1.0E+00	0.0E+00
Indeno(1,2,3-cd)pyrene	3.4E-04			1.9E-05	1.0E+00	1.9E-05
Phenanthrene	4.1E-04			2.3E-05	1.0E+00	2.3E-05
Pyrene	9.9E-04			5.5E-05	1.0E+00	5.5E-05
4,4'-DDD	1.5E-04	1.4E-02	1.0E-02	1.2E-05	3.5E+02	3.3E-08
4,4'-DDE	1.9E-04	2.9E-01	6.7E-04	1.6E-05	3.5E+02	4.4E-08
4,4'-DDT	6.7E-05	1.4E-02	4.8E-03	5.6E-06	3.5E+02	1.6E-08
Aroclor-1254	4.0E-03	9.0E-01	4.4E-03	7.2E-04	1.5E-01	4.7E-03
Endrin keytone	1.1E-04			3.9E-06	1.0E-02	3.9E-04
gamma-BHC (Lindane)	2.4E-05			8.7E-07	5.0E+00	1.7E-07
Methoxychlor	5.9E-04			2.2E-05	1.0E+00	2.2E-05
Aluminum	1.9E+01			7.1E-01	1.0E+01	7.1E-02
Barium	7.9E-02			3.1E-03	2.0E+01	1.6E-04
Beryllium	0.0E+00			0.0E+00	8.5E-02	0.0E+00
Cadmium	7.1E-02	1.0E+00	7.1E-02	4.8E-02	2.1E+00	2.3E-02
Chromium	4.0E-02	1.4E+03	2.9E-05	1.8E-03	2.0E+02	9.1E-06
Lead	1.5E-01	4.6E+00	3.3E-02	5.4E-03	7.0E+00	7.7E-04
Mercury	4.0E-04	6.4E-02	6.2E-03	2.7E-05	1.0E-02	2.7E-03
Selenium	4.5E-03	3.6E-01	1.2E-02	2.8E-04	2.0E-02	1.4E-02
Silver	6.1E-03			2.7E-04	1.8E+00	1.5E-04
Vanadium	1.1E-02	1.1E+00	1.0E-02	4.4E-04	8.4E+00	5.3E-05
Zinc	4.4E+00			6.1E-01	2.0E+01	3.1E-02
SUMMARY HAZARD INDEX			**1.5E-01**			**1.5E-01**

TBD = Total Body Dose (mg/kgBW-day).
RTV = Reference Toxicity Value (mg/kgBW-day); wildlife RTVs are presented in Appendix F, Table F-9.
HQ = Hazard Quotient (calculated by dividing TBD by RTV)
NA = Not Available

TABLE F.2-4

ESTIMATION OF SUBCHRONIC EXPOSURES TO TERRESTRIAL RECEPTORS FROM EXPOSURE TO CT CONCENTRATIONS IN FOOD AND SURFACE SOIL

REMEDIAL INVESTIGATION REPORT

NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

EXPOSURE CONCENTRATION DATA		TISSUE LEVELS IN PRIMARY PREY ITEMS (Site Specific)							
CHEMICAL	CENTRAL TENDENCY EXPOSURE CONCENTRATION (mg/kg)	Invertebrate BAF [a]	Invertebrate Tissue Level (mg/kg) [b]	Plant BAF [a]	Plant Tissue Level (mg/kg) [b]	Mammal BAF [a]	Mammal Tissue Level (mg/kg) [c]	Bird BAF [a]	Small Bird Tissue Level (mg/kg) [c]
Acetone	8.2E-03	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00
Methylene chloride	0.0E+00	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00
Tetrachloroethene	1.6E-02	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00
Benzo(a)anthracene	1.6E-01	5.0E-02	8.0E-03	5.1E-03	8.2E-04	4.8E-01	6.5E-03	NA	0.0E+00
Benzo(a)pyrene	1.6E-01	5.0E-02	8.0E-03	5.1E-03	8.2E-04	4.8E-01	6.5E-03	NA	0.0E+00
Benzo(b)fluoranthene	1.8E-01	5.0E-02	9.0E-03	5.1E-03	9.2E-04	4.8E-01	7.3E-03	NA	0.0E+00
Benzo(g,h,i)perylene	1.6E-01	5.0E-02	8.0E-03	5.1E-03	8.2E-04	4.8E-01	6.5E-03	NA	0.0E+00
Benzo(k)fluoranthene	1.6E-01	5.0E-02	8.0E-03	5.1E-03	8.2E-04	4.8E-01	6.5E-03	NA	0.0E+00
bis(2-Ethylhexyl)phthalate	1.9E-01	5.0E-02	9.5E-03	8.7E-03	1.7E-03	1.9E-01	3.1E-03	NA	0.0E+00
Carbazole	1.8E-01	5.0E-02	9.0E-03	4.9E-02	8.9E-03	1.5E-01	2.9E-03	NA	0.0E+00
Chrysene	1.7E-01	5.0E-02	8.5E-03	5.1E-03	8.7E-04	4.8E-01	6.9E-03	NA	0.0E+00
Fluoranthene	1.8E-01	5.0E-02	9.0E-03	5.1E-03	9.2E-04	4.8E-01	7.3E-03	NA	0.0E+00
Fluorene	0.0E+00	5.0E-02	0.0E+00	5.1E-03	0.0E+00	4.8E-01	0.0E+00	NA	0.0E+00
Indeno(1,2,3-cd)pyrene	1.6E-01	5.0E-02	8.0E-03	5.1E-03	8.2E-04	4.8E-01	6.5E-03	NA	0.0E+00
Phenanthrene	1.7E-01	5.0E-02	8.5E-03	5.1E-03	8.7E-04	4.8E-01	6.9E-03	NA	0.0E+00
Pyrene	1.9E-01	5.0E-02	9.5E-03	5.1E-03	9.7E-04	4.8E-01	7.7E-03	NA	0.0E+00
4,4'-DDD	3.2E-03	3.3E+00	1.1E-02	1.3E-03	4.2E-06	1.2E+00	5.8E-03	2.9E+00	1.9E-03
4,4'-DDE	7.3E-03	1.7E+00	1.2E-02	2.0E-03	1.5E-05	1.2E+00	7.1E-03	2.9E+00	2.6E-03
4,4'-DDT	4.6E-03	5.7E-01	2.6E-03	7.7E-04	3.5E-06	1.2E+00	1.7E-03	2.9E+00	8.2E-04
Aroclor-1254	3.6E-02	5.8E+00	2.1E-01	1.2E-01	4.3E-03	3.8E+00	3.7E-01	3.2E-01	4.5E-03
Endrin keytone	4.8E-03	1.9E+00	9.1E-03	1.2E-01	5.8E-04	6.2E-02	2.8E-04	5.9E-01	5.3E-04
gamma-BHC (Lindane)	9.0E-04	2.6E+00	2.3E-03	3.3E-02	3.0E-05	1.4E-01	1.5E-04	1.5E-01	2.5E-05
Methoxychlor	8.7E-02	5.7E-01	5.0E-02	1.3E-02	1.1E-03	1.0E-06	2.8E-08	2.9E+00	1.7E-02
Aluminum	1.7E+03	7.5E-02	1.3E+02	8.0E-04	1.3E+00	7.5E-02	1.2E+01	NA	0.0E+00
Barium	1.6E+01	7.5E-03	1.2E-01	3.0E-02	4.7E-01	7.5E-03	9.2E-03	7.5E-03	5.3E-03
Beryllium	0.0E+00	5.0E-02	0.0E+00	2.0E-03	0.0E+00	5.0E-02	0.0E+00	NA	0.0E+00
Cadmium	3.7E-01	1.4E+00	5.2E-01	3.3E+01	1.2E+01	2.1E+00	1.3E+01	3.8E-01	2.2E+00
Chromium	5.7E+00	1.6E-01	9.1E-01	1.5E-03	8.6E-03	2.8E-01	2.1E-01	2.8E-01	6.4E-02
Lead	1.2E+01	7.8E-02	9.1E-01	0.0E+00	0.0E+00	1.5E-02	1.7E-02	NA	0.0E+00
Mercury	1.5E-01	6.8E-02	1.0E-02	1.8E-01	2.7E-02	1.0E-02	2.7E-04	2.3E+00	4.1E-02
Selenium	4.2E-01	7.6E-01	3.2E-01	9.0E-03	3.8E-03	7.5E-01	1.3E-01	5.1E-01	1.6E-02
Silver	1.9E+00	1.5E-01	2.9E-01	8.0E-02	1.5E-01	1.5E-01	4.7E-02	NA	0.0E+00
Vanadium	2.3E+00	1.2E-01	2.8E-01	1.1E-03	2.5E-03	1.3E-01	3.3E-02	NA	0.0E+00
Zinc	2.0E+01	1.8E+00	3.7E+01	6.1E-01	1.2E+01	2.1E+00	5.0E+01	NA	0.0E+00

[a] Bioaccumulation factors are presented in Appendix F, Table F-1

[b] Plant and invertebrate tissue concentrations are calculated by multiplying the soil concentration by the plant or invertebrate BAF.

[c] Mammal and bird tissue concentrations are calculated by multiplying the small mammal or bird body weight- and ingestion rate-normalized TBD by the mammal or bird BAF.

NA = Not analyzed

ND = Not detected

TBD = Total body dose

TABLE F.2-4
ESTIMATION OF SUBCHRONIC EXPOSURES TO TERRESTRIAL RECEPTORS FROM EXPOSURE TO CT CONCENTRATIONS IN FOOD AND SURFACE SOIL

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

TOTAL BODY DOSE (mg/kgBW-day) [a]

Chemical	*Cotton mouse*	Mourning dove	Short-tailed shrew	Woodcock	Red fox
Acetone	2.0E-05	4.7E-05	1.2E-04	9.9E-06	3.6E-07
Methylene chloride	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Tetrachloroethene	3.9E-05	9.2E-05	2.3E-04	1.9E-05	7.1E-07
Benzo(a)anthracene	5.8E-04	1.0E-03	3.2E-03	2.7E-04	1.5E-05
Benzo(a)pyrene	5.8E-04	1.0E-03	3.2E-03	2.7E-04	1.5E-05
Benzo(b)fluoranthene	6.5E-04	1.1E-03	3.5E-03	3.1E-04	1.7E-05
Benzo(g,h,i)perylene	5.8E-04	1.0E-03	3.2E-03	2.7E-04	1.5E-05
Benzo(k)fluoranthene	5.8E-04	1.0E-03	3.2E-03	2.7E-04	1.5E-05
bis(2-Ethylhexyl)phthalate	7.6E-04	1.3E-03	3.8E-03	3.2E-04	1.4E-05
Carbazole	1.5E-03	2.0E-03	3.7E-03	3.2E-04	1.4E-05
Chrysene	6.1E-04	1.1E-03	3.4E-03	2.9E-04	1.6E-05
Fluoranthene	6.5E-04	1.1E-03	3.5E-03	3.1E-04	1.7E-05
Fluorene	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Indeno(1,2,3-cd)pyrene	5.8E-04	1.0E-03	3.2E-03	2.7E-04	1.5E-05
Phenanthrene	6.1E-04	1.1E-03	3.4E-03	2.9E-04	1.6E-05
Pyrene	6.9E-04	1.2E-03	3.7E-03	3.2E-04	1.8E-05
4,4'-DDD	1.4E-04	3.1E-05	1.2E-03	1.1E-04	8.5E-06
4,4'-DDE	1.7E-04	5.8E-05	1.5E-03	1.3E-04	1.0E-05
4,4'-DDT	4.4E-05	3.0E-05	3.5E-04	3.1E-05	2.6E-06
Aroclor-1254	3.1E-03	9.2E-04	2.4E-02	2.1E-03	3.7E-04
Endrin keytone	1.9E-04	1.0E-04	1.1E-03	9.5E-05	3.3E-06
gamma-BHC (Lindane)	3.4E-05	1.1E-05	2.7E-04	2.4E-05	8.7E-07
Methoxychlor	9.4E-04	6.8E-04	6.7E-03	5.9E-04	2.2E-05
Aluminum	5.8E+00	1.0E+01	3.8E+01	3.3E+00	1.2E-01
Barium	9.0E-02	1.4E-01	2.4E-01	2.1E-02	8.1E-04
Beryllium	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cadmium	1.3E+00	1.3E+00	2.7E-01	2.0E-02	1.4E-02
Chromium	2.6E-02	3.5E-02	1.8E-01	1.6E-02	7.1E-04
Lead	4.0E-02	6.9E-02	2.7E-01	2.3E-02	8.0E-04
Mercury	3.4E-03	3.8E-03	3.7E-03	3.1E-04	2.1E-05
Selenium	5.3E-03	3.2E-03	4.1E-02	3.6E-03	2.2E-04
Silver	2.5E-02	2.8E-02	6.1E-02	5.2E-03	2.3E-04
Vanadium	9.3E-03	1.4E-02	6.3E-02	5.5E-03	2.1E-04
Zinc	1.8E+00	1.5E+00	4.5E+00	3.9E-01	5.6E-02

[a] Calculated by summing the products of individual prey type concentrations and percent in diet, multiplying by the SFF, exposure duration, and ingestion rate, and then dividing by body weight.

TABLE F.2-4

ESTIMATION OF SUBCHRONIC EXPOSURES TO TERRESTRIAL RECEPTORS FROM EXPOSURE TO CT CONCENTRATIONS IN FOOD AND SURFACE SOIL

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

EXPOSURE PARAMETERS [c]

Indicator Species		Percent Prey in Diet						Home Range (acres)	Site Foraging Frequency [d]	Dietary Ingestion Rate (kg/day)	Water Ingestion Rate (l/day)	Body Weight (kg)	Exposure Duration
		Inverts	Plants	Small Mammals	Amphibians	Birds	Soil						
Cotton mouse	Small herb. mammal	10%	88%	0%	0%	0%	2%	0.147	1.0E+00	0.0049	0.0055	0.04	1
Mourning dove	Small omn. bird	1%	94%	0%	0%	0%	5%	5	1.0E+00	0.015	0.015	0.13	1
Short-tailed shrew	Small omn. mammal	78%	12%	0%	0%	0%	10%	0.96	1.0E+00	0.002	0.0025	0.017	1
Woodcock	Small verm. bird	80%	10%	0%	0%	0%	10%	80	1.6E-01	0.020	0.02	0.197	0.75
Red fox	Predatory mammal	20%	10%	57%	0%	12%	3%	457	2.8E-02	0.240	0.38	4.5	1

SITE AREA:	12.7	acres

NOTES:
[c] Documentation of exposure parameters presented in Table 9-8.
[d] Site Foraging Frequency (SFF). Calculated by dividing site area by receptor home range (cannot exceed 1.0)

TABLE F.2-5
RISK FROM POTENTIAL SUBLETHAL EFFECTS FOR TERRESTRIAL RECEPTORS FROM CENTRAL TENDENCY EXPOSURE CONCENTRATIONS OF CPCs IN FOOD AND SURFACE SOIL

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

CHEMICAL	Cotton mouse Sublethal			Mourning dove Sublethal			Short-tailed shrew Sublethal		
	TBD	RTV	HQ	TBD	RTV	HQ	TBD	RTV	HQ
Acetone	2.0E-05	2.7E+04	7.4E-10	4.7E-05			1.2E-04	2.7E+04	4.2E-09
Methylene chloride	0.0E+00	5.9E+00	0.0E+00	0.0E+00			0.0E+00	5.9E+00	0.0E+00
Tetrachloroethene	3.9E-05	1.0E+01	3.9E-06	9.2E-05			2.3E-04	1.0E+01	2.3E-05
Benzo(a)anthracene	5.8E-04	1.0E+00	5.8E-04	1.0E-03			3.2E-03	1.0E+00	3.2E-03
Benzo(a)pyrene	5.8E-04	1.0E+00	5.8E-04	1.0E-03			3.2E-03	1.0E+00	3.2E-03
Benzo(b)fluoranthene	6.5E-04	1.0E+00	6.5E-04	1.1E-03			3.5E-03	1.0E+00	3.5E-03
Benzo(g,h,i)perylene	5.8E-04	1.0E+00	5.8E-04	1.0E-03			3.2E-03	1.0E+00	3.2E-03
Benzo(k)fluoranthene	5.8E-04	1.0E+00	5.8E-04	1.0E-03			3.2E-03	1.0E+00	3.2E-03
bis(2-Ethylhexyl)phthalate	7.6E-04	3.5E+00	2.2E-04	1.3E-03			3.8E-03	3.5E+00	1.1E-03
Carbazole	1.5E-03	1.0E+00	1.5E-03	2.0E-03			3.7E-03	1.0E+00	3.7E-03
Chrysene	6.1E-04	1.0E+00	6.1E-04	1.1E-03			3.4E-03	1.0E+00	3.4E-03
Fluoranthene	6.5E-04	1.0E+00	6.5E-04	1.1E-03			3.5E-03	1.0E+00	3.5E-03
Fluorene	0.0E+00	1.0E+00	0.0E+00	0.0E+00			0.0E+00	1.0E+00	0.0E+00
Indeno(1,2,3-cd)pyrene	5.8E-04	1.0E+00	5.8E-04	1.0E-03			3.2E-03	1.0E+00	3.2E-03
Phenanthrene	6.1E-04	1.0E+00	6.1E-04	1.1E-03			3.4E-03	1.0E+00	3.4E-03
Pyrene	6.9E-04	1.0E+00	6.9E-04	1.2E-03			3.7E-03	1.0E+00	3.7E-03
4,4'-DDD	1.4E-04	2.0E-01	6.9E-04	3.1E-05	1.4E-02	2.2E-03	1.2E-03	2.0E-01	6.0E-03
4,4'-DDE	1.7E-04	2.0E-01	8.6E-04	5.8E-05	2.9E-01	2.0E-04	1.5E-03	2.0E-01	7.3E-03
4,4'-DDT	4.4E-05	2.0E-01	2.2E-04	3.0E-05	1.4E-02	2.1E-03	3.5E-04	2.0E-01	1.8E-03
Aroclor-1254	3.1E-03	1.5E-01	2.0E-02	9.2E-04	9.0E-01	1.0E-03	2.4E-02	1.5E-01	1.5E-01
Endrin keytone	1.9E-04	5.3E-02	3.5E-03	1.0E-04			1.1E-03	5.3E-02	2.0E-02
gamma-BHC (Lindane)	3.4E-05	5.0E+00	6.8E-06	1.1E-05			2.7E-04	5.0E+00	5.4E-05
Methoxychlor	9.4E-04	1.0E+00	9.4E-04	6.8E-04			6.7E-03	1.0E+00	6.7E-03
Aluminum	5.8E+00	1.0E+01	5.8E-01	1.0E+01			3.8E+01	1.0E+01	3.8E+00
Barium	9.0E-02	2.0E+01	4.6E-03	1.4E-01			2.4E-01	2.0E+01	1.2E-02
Beryllium	0.0E+00	8.5E-02	0.0E+00	0.0E+00			0.0E+00	8.5E-02	0.0E+00
Cadmium	1.3E+00	2.1E+00	6.3E-01	1.3E+00	1.0E+00	1.3E+00	2.7E-01	2.1E+00	1.3E-01
Chromium	2.6E-02	2.0E+02	1.3E-04	3.5E-02	1.4E+03	2.5E-05	1.8E-01	2.0E+02	9.1E-04
Lead	4.0E-02	7.0E+00	5.7E-03	6.9E-02	4.6E+00	1.5E-02	2.7E-01	7.0E+00	3.8E-02
Mercury	3.4E-03	4.0E-01	8.5E-03	3.8E-03	6.4E-02	5.9E-02	3.7E-03	4.0E-01	9.2E-03
Selenium	5.3E-03	2.0E-02	2.7E-01	3.2E-03	3.6E-01	8.9E-03	4.1E-02	2.0E-02	2.1E+00
Silver	2.5E-02	1.8E+00	1.4E-02	2.8E-02			6.1E-02	1.8E+00	3.4E-02
Vanadium	9.3E-03	8.4E+00	1.1E-03	1.4E-02	1.1E+00	1.3E-02	6.3E-02	8.4E+00	7.5E-03
Zinc	1.8E+00	2.0E+01	9.2E-02	1.5E+00			4.5E+00	2.0E+01	2.3E-01
SUMMARY HAZARD INDEX			**1.6E+00**			**1.4E+00**			**6.5E+00**

TBD = Total Body Dose (mg/kgBW-day).
RTV = Reference Toxicity Value (mg/kgBW-day); wildlife RTVs are presented in Appendix S, Table S-9.
HQ = Hazard Quotient (calculated by dividing TBD by RTV)
NA = Not Available

TABLE F.2-5
RISK FROM POTENTIAL SUBLETHAL EFFECTS FOR TERRESTRIAL RECEPTORS FROM CENTRAL TENDENCY EXPOSURE CONCENTRATIONS OF CPCs IN FOOD AND SURFACE SOIL

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

CHEMICAL	Woodcock Sublethal			Red fox Sublethal		
	TBD	RTV	HQ	TBD	RTV	HQ
Acetone	9.9E-06			3.6E-07	2.7E+04	1.3E-11
Methylene chloride	0.0E+00			0.0E+00	5.9E+00	0.0E+00
Tetrachloroethene	1.9E-05			7.1E-07	1.0E+01	7.1E-08
Benzo(a)anthracene	2.7E-04			1.5E-05	1.0E+00	1.5E-05
Benzo(a)pyrene	2.7E-04			1.5E-05	1.0E+00	1.5E-05
Benzo(b)fluoranthene	3.1E-04			1.7E-05	1.0E+00	1.7E-05
Benzo(g,h,i)perylene	2.7E-04			1.5E-05	1.0E+00	1.5E-05
Benzo(k)fluoranthene	2.7E-04			1.5E-05	1.0E+00	1.5E-05
bis(2-Ethylhexyl)phthalate	3.2E-04			1.4E-05	3.5E+00	4.0E-06
Carbazole	3.2E-04			1.4E-05	1.0E+00	1.4E-05
Chrysene	2.9E-04			1.6E-05	1.0E+00	1.6E-05
Fluoranthene	3.1E-04			1.7E-05	1.0E+00	1.7E-05
Fluorene	0.0E+00			0.0E+00	1.0E+00	0.0E+00
Indeno(1,2,3-cd)pyrene	2.7E-04			1.5E-05	1.0E+00	1.5E-05
Phenanthrene	2.9E-04			1.6E-05	1.0E+00	1.6E-05
Pyrene	3.2E-04			1.8E-05	1.0E+00	1.8E-05
4,4'-DDD	1.1E-04	1.4E-02	7.6E-03	8.5E-06	3.5E+02	2.4E-08
4,4'-DDE	1.3E-04	2.9E-01	4.4E-04	1.0E-05	3.5E+02	3.0E-08
4,4'-DDT	3.1E-05	1.4E-02	2.2E-03	2.6E-06	3.5E+02	7.3E-09
Aroclor-1254	2.1E-03	9.0E-01	2.3E-03	3.7E-04	1.5E-01	2.4E-03
Endrin keytone	9.5E-05			3.3E-06	1.0E-02	3.3E-04
gamma-BHC (Lindane)	2.4E-05			8.7E-07	5.0E+00	1.7E-07
Methoxychlor	5.9E-04			2.2E-05	1.0E+00	2.2E-05
Aluminum	3.3E+00			1.2E-01	1.0E+01	1.2E-02
Barium	2.1E-02			8.1E-04	2.0E+01	4.1E-05
Beryllium	0.0E+00			0.0E+00	8.5E-02	0.0E+00
Cadmium	2.0E-02	1.0E+00	2.0E-02	1.4E-02	2.1E+00	6.5E-03
Chromium	1.6E-02	1.4E+03	1.1E-05	7.1E-04	2.0E+02	3.6E-06
Lead	2.3E-02	4.6E+00	5.0E-03	8.0E-04	7.0E+00	1.1E-04
Mercury	3.1E-04	6.4E-02	4.9E-03	2.1E-05	1.0E-02	2.1E-03
Selenium	3.6E-03	3.6E-01	1.0E-02	2.2E-04	2.0E-02	1.1E-02
Silver	5.2E-03			2.3E-04	1.8E+00	1.3E-04
Vanadium	5.5E-03	1.1E+00	5.0E-03	2.1E-04	8.4E+00	2.5E-05
Zinc	3.9E-01			5.6E-02	2.0E+01	2.8E-03
SUMMARY HAZARD INDEX			**5.8E-02**			**3.8E-02**

TBD = Total Body Dose (mg/kgBW-day).
RTV = Reference Toxicity Value (mg/kgBW-day); wildlife RTVs are presented in Appendix S, Table S-9.
HQ = Hazard Quotient (calculated by dividing TBD by RTV)
NA = Not Available

TABLE F.2-6
ESTIMATION OF CHRONIC EXPOSURES TO SEMI-AQUATIC RECEPTORS FROM
EXPOSURE TO RME CONCENTRATIONS IN FOOD, WATER, AND SEDIMENT

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

EXPOSURE CONCENTRATION DATA			TISSUE LEVELS IN PRIMARY PREY ITEMS (Calculated)						
CHEMICAL	REASONABLE MAXIMUM SEDIMENT CONCENTRATION (mg/kg)	REASONABLE MAXIMUM SURFACE WATER CONCENTRATION (mg/L)	Aquatic Plant BAF	Aquatic Plant Tissue Level [a] (mg/kg)	Aquatic Invert. BAF	Aquatic Invert. Tissue Level [a] (mg/kg)	Aquatic Organism BCF	Aquatic Org. Tissue Level [a] (mg/kg)	Aquatic Tissue Level [b]
1,1-Dichloroethene	1.3E-02	ND	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00
1,2-Dichloroethene (total)	1.3E+00	7.6E-01	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00
Acetone	4.6E-02	Not a CPC	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00
Carbon disulfide	ND	1.0E-03	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00
Trichloroethene	Not a CPC	5.7E-02	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00
Vinyl chloride	5.6E-01	3.5E-02	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00
4-Methylphenol	ND	Not a CPC	NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00
Fluoranthene	3.5E+00	ND	5.1E-03	1.8E-02	5.0E-02	1.8E-01	NA	0.0E+00	1.8E-01
Pyrene	3.4E+00	ND	5.1E-03	1.7E-02	5.0E-02	1.7E-01	NA	0.0E+00	1.7E-01
bis(2-Ethylhexyl)phthalate	5.6E+00	ND	8.7E-03	4.9E-02	5.0E-02	2.8E-01	NA	0.0E+00	2.8E-01
4,4'-DDE	7.6E-03	ND	1.0E-02	7.6E-05	2.1E+01	1.6E-01	NA	0.0E+00	1.6E-01
4,4'-DDT	ND	2.9E-05	NA	0.0E+00	NA	0.0E+00	3.4E+04	9.8E-01	9.8E-01
Aroclor-1254	6.8E-02	ND	1.2E-01	8.2E-03	1.2E+01	8.3E-01	NA	0.0E+00	8.3E-01
Endosulfan I	4.6E-03	ND	6.4E-02	3.0E-04	5.5E+00	2.5E-02	NA	0.0E+00	2.5E-02
Endrin ketone	ND	1.0E-05	NA	0.0E+00	NA	0.0E+00	5.5E+03	5.5E-02	5.5E-02
Heptachlor	2.6E-03	ND	2.5E-02	6.6E-05	1.0E+00	2.7E-03	NA	0.0E+00	2.7E-03
alpha-Chlordane	2.0E-03	ND	5.1E-03	1.0E-05	1.6E+00	3.2E-03	NA	0.0E+00	3.2E-03
delta-BHC	6.1E-03	ND	3.3E-02	2.0E-04	2.6E+00	1.6E-02	NA	0.0E+00	1.6E-02
Aluminum	7.8E+03	Not a CPC	6.0E-03	4.7E+01	7.5E-02	5.8E+02	NA	0.0E+00	5.8E+02
Lead	3.8E+01	Not a CPC	5.6E-02	2.1E+00	7.8E-02	3.0E+00	NA	0.0E+00	3.0E+00
Mercury	3.1E-01	ND	4.9E-02	1.5E-02	1.7E+01	5.3E+00	NA	0.0E+00	5.3E+00

[a] Tissue concentrations are calculated by multiplying site specific sediment and surface water concentrations times a bioaccumulation factor (BAF) or bioconcentration factor (BCF). BAFs and BCFs are presented in Table F-1.

[b] The greater of the BAF and BCF derived tissue level was selected for modeling food chain exposures.

ND = Not Detected

NC = Not Calculated

TABLE F.2-6
RISK ESTIMATION OF LETHAL EFFECTS TO SEMI-AQUATIC
RECEPTORS VIA FOOD, WATER, AND SEDIMENT INGESTION

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

TOTAL BODY DOSE (mg/kgBW-day) [b]

CHEMICAL	*Grt.blue heron*	*Raccoon*	*Osprey*
1,1-Dichloroethene	2.2E-06	3.4E-07	0.0E+00
1,2-Dichloroethene (total)	6.8E-03	3.9E-04	3.6E-05
Acetone	7.7E-06	1.2E-06	0.0E+00
Carbon disulfide	8.6E-06	4.7E-07	4.8E-08
Trichloroethene	4.9E-04	2.7E-05	2.7E-06
Vinyl chloride	4.0E-04	3.1E-05	1.7E-06
4-Methylphenol	0.0E+00	0.0E+00	0.0E+00
Fluoranthene	2.0E-03	1.4E-04	8.2E-06
Pyrene	2.0E-03	1.3E-04	7.9E-06
bis(2-Ethylhexyl)phthalate	3.2E-03	2.2E-04	1.3E-05
4,4'-DDE	1.3E-03	4.3E-05	7.4E-06
4,4'-DDT	8.0E-03	2.6E-04	4.5E-05
Aroclor-1254	6.8E-03	2.2E-04	3.9E-05
Endosulfan I	2.1E-04	6.9E-06	1.2E-06
Endrin ketone	4.5E-04	1.5E-05	2.6E-06
Heptachlor	2.2E-05	7.8E-07	1.2E-07
alpha-Chlordane	2.7E-05	9.1E-07	1.5E-07
delta-BHC	1.3E-04	4.4E-06	7.4E-07
Aluminum	6.1E+00	3.6E-01	2.7E-02
Lead	3.1E-02	1.8E-03	1.4E-04
Mercury	4.3E-02	1.4E-03	2.5E-04

[b] Calculated by summing the products of individual prey type concentrations and percent in diet, surface water and sediment exposures, multiplying by the exposure duration, SFF and ingestion rate, and dividing by body weight.

TABLE F.2-6

ESTIMATION OF CHRONIC EXPOSURES TO SEMI-AQUATIC RECEPTORS FROM EXPOSURE TO RME CONCENTRATIONS IN FOOD, WATER, AND SEDIMENT INGES

REMEDIAL INVESTIGATION REPORT

NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

EXPOSURE PARAMETERS [d]

Indicator Species		Percent Prey in Diet: Aquatic Organisms	Percent Prey in Diet: Sediment	Home Range (acres)	ED [e]	Site Foraging Frequency [f]	Dietary Ingestion Rate (kg/day)	Water Ingestion Rate (L/day)	Body Weight (kg)
Grt.blue heron	(Omni. bird)	98%	2%	11	1.0	1.9E-01	0.098	0.101	2.23
Raccoon	(Omni. mammal)	91%	9%	385	1.0	5.5E-03	0.21	0.344	3.99
Osprey	(Pisci. bird)	100%	0%	2242	1.0	9.4E-04	0.078	0.080	1.57

SITE AREA: 2.10 acres

NOTES:

[d] Documentation of exposure parameters presented in Table 9-8.

[e] ED = Exposure Duration (percentage of year receptor is expected to be found at study area)

[f] SFF = Site Foraging Frequency (calculated by dividing site area by receptor home range (cannot exceed 1.0))

TABLE F.2-7
RISK ESTIMATION OF LETHAL EFFECTS TO SEMI-AQUATIC
RECEPTORS VIA FOOD, WATER, AND SEDIMENT INGESTION

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

CHEMICAL	*Grt.blue heron* Lethal			*Raccoon* Lethal			*Osprey* Lethal		
	TBD	RTV	HQ	TBD	RTV	HQ	TBD	RTV	HQ
1,1-Dichloroethene	2.2E-06			3.4E-07	4.0E+01	8.6E-09	0.0E+00		
1,2-Dichloroethene (total)	6.8E-03			3.9E-04	4.0E+01	9.8E-06	3.6E-05		
Acetone	7.7E-06			1.2E-06	6.0E+02	2.0E-09	0.0E+00		
Carbon disulfide	8.6E-06			4.7E-07			4.8E-08		
Trichloroethene	4.9E-04			2.7E-05	1.4E+03	1.9E-08	2.7E-06		
Vinyl chloride	4.0E-04			3.1E-05	1.0E+02	3.1E-07	1.7E-06		
4-Methylphenol	0.0E+00			0.0E+00	3.6E+02	0.0E+00	0.0E+00		
Fluoranthene	2.0E-03			1.4E-04	4.0E+02	3.5E-07	8.2E-06		
Pyrene	2.0E-03			1.3E-04	1.6E+02	8.4E-07	7.9E-06		
bis(2-Ethylhexyl)phthalate	3.2E-03			2.2E-04	1.6E+02	1.4E-06	1.3E-05		
4,4'-DDE	1.3E-03	1.2E+02	1.1E-05	4.3E-05	1.4E+02	3.0E-07	7.4E-06	1.2E+02	6.2E-08
4,4'-DDT	8.0E-03	1.2E+02	6.7E-05	2.6E-04	1.2E+01	2.2E-05	4.5E-05	1.2E+02	3.8E-07
Aroclor-1254	6.8E-03	1.6E+01	4.3E-04	2.2E-04	1.0E+02	2.2E-06	3.9E-05	1.6E+01	2.4E-06
Endosulfan I	2.1E-04	6.2E+00	3.3E-05	6.9E-06	4.8E+00	1.4E-06	1.2E-06	6.2E+00	1.9E-07
Endrin ketone	4.5E-04	3.6E-01	1.3E-03	1.5E-05	6.0E-01	2.4E-05	2.6E-06	3.6E-01	7.1E-06
Heptachlor	2.2E-05	1.2E+01	1.8E-06	7.8E-07	8.0E+00	9.8E-08	1.2E-07	1.2E+01	1.0E-08
alpha-Chlordane	2.7E-05	4.8E+00	5.6E-06	9.1E-07	2.0E+01	4.5E-08	1.5E-07	4.8E+00	3.1E-08
delta-BHC	1.3E-04	1.6E+01	8.4E-06	4.4E-06	3.5E+01	1.2E-07	7.4E-07	1.6E+01	4.7E-08
Aluminum	6.1E+00			3.6E-01	7.4E+02	4.8E-04	2.7E-02		
Lead	3.1E-02	7.5E+01	4.1E-04	1.8E-03	6.0E+01	3.0E-05	1.4E-04	7.5E+01	1.8E-06
Mercury	4.3E-02	2.2E+00	2.0E-02	1.4E-03	2.0E-01	7.1E-03	2.5E-04	2.2E+00	1.1E-04
SUMMARY HAZARD INDEX			**2.2E-02**			**7.6E-03**			**1.2E-04**

TBD = Total Body Dose (mg/kgBW-day).
RTV = Reference Toxicity Value (mg/kgBW-day); wildlife RTVs are presented in Appendix F, Table F-9.
HQ = Hazard Quotient (calculated by dividing TBD by RTV)
NA = Not Available

TABLE F.2-8
RISK ESTIMATION OF SUBLETHAL EFFECTS TO SEMI-AQUATIC RECEPTORS VIA FOOD, WATER, AND SEDIMENT INGESTION

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

CHEMICAL	*Grt.blue heron* Sublethal			*Raccoon* Sublethal			*Osprey* Sublethal		
	TBD	RTV	HQ	TBD	RTV	HQ	TBD	RTV	HQ
1,1-Dichloroethene	2.2E-06			3.4E-07	9.0E-01	3.8E-07	0.0E+00		
1,2-Dichloroethene (total)	6.8E-03			3.9E-04	9.0E-01	4.4E-04	3.6E-05		
Acetone	7.7E-06			1.2E-06	2.7E+04	4.4E-11	0.0E+00		
Carbon disulfide	8.6E-06			4.7E-07	1.1E+01	4.3E-08	4.8E-08		
Trichloroethene	4.9E-04			2.7E-05	7.5E+01	3.6E-07	2.7E-06		
Vinyl chloride	4.0E-04			3.1E-05	1.3E+01	2.4E-06	1.7E-06		
4-Methylphenol	0.0E+00			0.0E+00	5.0E+01	0.0E+00	0.0E+00		
Fluoranthene	2.0E-03			1.4E-04	1.0E+00	1.4E-04	8.2E-06		
Pyrene	2.0E-03			1.3E-04	1.0E+00	1.3E-04	7.9E-06		
bis(2-Ethylhexyl)phthalate	3.2E-03			2.2E-04	3.5E+00	6.3E-05	1.3E-05		
4,4'-DDE	1.3E-03	2.9E-01	4.5E-03	4.3E-05	2.0E-01	2.1E-04	7.4E-06	2.9E-01	2.6E-05
4,4'-DDT	8.0E-03	1.4E-02	5.7E-01	2.6E-04	3.5E+02	7.3E-07	4.5E-05	1.4E-02	3.2E-03
Aroclor-1254	6.8E-03	9.0E-01	7.6E-03	2.2E-04	1.5E-01	1.5E-03	3.9E-05	9.0E-01	4.3E-05
Endosulfan I	2.1E-04			6.9E-06	2.6E-02	2.6E-04	1.2E-06		
Endrin ketone	4.5E-04			1.5E-05	1.0E-02	1.5E-03	2.6E-06		
Heptachlor	2.2E-05			7.8E-07	3.5E-02	2.2E-05	1.2E-07		
alpha-Chlordane	2.7E-05	3.1E-02	8.6E-04	9.1E-07	1.6E+00	5.7E-07	1.5E-07	3.1E-02	4.8E-06
delta-BHC	1.3E-04			4.4E-06	5.0E+00	8.7E-07	7.4E-07		
Aluminum	6.1E+00			3.6E-01	1.0E+01	3.6E-02	2.7E-02		
Lead	3.1E-02	4.6E+00	6.7E-03	1.8E-03	7.0E+00	2.6E-04	1.4E-04	4.6E+00	3.0E-05
Mercury	4.3E-02	6.4E-02	6.8E-01	1.4E-03	1.0E-02	1.4E-01	2.5E-04	6.4E-02	3.8E-03
SUMMARY HAZARD INDEX			**1.3E+00**			**1.8E-01**			**7.2E-03**

TBD = Total Body Dose (mg/kgBW-day).
RTV = Reference Toxicity Value (mg/kgBW-day); wildlife RTVs are presented in Appendix F, Table F-9.
HQ = Hazard Quotient (calculated by dividing TBD by RTV)
NA = Not Available

TABLE F.2-9
ESTIMATION OF CHRONIC EXPOSURES TO SEMI-AQUATIC RECEPTORS FROM
EXPOSURE OF CT CONCENTRATIONS IN FOOD, WATER, AND SEDIMENT

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

EXPOSURE CONCENTRATION DATA

CHEMICAL	CENTRAL TENDENCY SEDIMENT CONCENTRATION (mg/kg)	CENTRAL TENDENCY SURFACE WATER CONCENTRATION (mg/L)
1,1-Dichloroethene	1.3E-02	ND
1,2-Dichloroethene (total)	4.2E-01	2.6E-01
Acetone	3.2E-02	Not a CPC
Carbon disulfide	ND	1.0E-03
Trichloroethene	Not a CPC	2.2E-02
Vinyl chloride	1.3E-01	1.1E-02
4-Methylphenol	ND	Not a CPC
Fluoranthene	3.5E+00	ND
Pyrene	3.4E+00	ND
bis(2-Ethylhexyl)phthalate	5.6E+00	ND
4,4'-DDE	7.6E-03	ND
4,4'-DDT	ND	2.9E-05
Aroclor-1254	6.8E-02	ND
Endosulfan I	4.6E-03	ND
Endrin ketone	ND	1.0E-05
Heptachlor	2.6E-03	ND
alpha-Chlordane	2.0E-03	ND
delta-BHC	6.1E-03	ND
Aluminum	7.8E+03	Not a CPC
Lead	3.8E+01	Not a CPC
Mercury	3.1E-01	ND

TISSUE LEVELS IN PRIMARY PREY ITEMS (Calculated)

Aquatic Plant BAF	Aquatic Plant Tissue Level [a] (mg/kg)	Aquatic Invert. BAF	Aquatic Invert. Tissue Level [a] (mg/kg)	Aquatic Organism BCF	Aquatic Org. Tissue Level [a] (mg/kg)	Aquatic Tissue Level [b]
NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00
NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00
NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00
NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00
NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00
NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00
NA	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00
5.1E-03	1.8E-02	5.0E-02	1.8E-01	NA	0.0E+00	1.8E-01
5.1E-03	1.7E-02	5.0E-02	1.7E-01	NA	0.0E+00	1.7E-01
8.7E-03	4.9E-02	5.0E-02	2.8E-01	NA	0.0E+00	2.8E-01
1.0E-02	7.6E-05	2.1E+01	1.6E-01	NA	0.0E+00	1.6E-01
NA	0.0E+00	NA	0.0E+00	3.4E+04	9.8E-01	9.8E-01
1.2E-01	8.2E-03	1.2E+01	8.3E-01	NA	0.0E+00	8.3E-01
6.4E-02	3.0E-04	5.5E+00	2.5E-02	NA	0.0E+00	2.5E-02
NA	0.0E+00	NA	0.0E+00	5.5E+03	5.5E-02	5.5E-02
2.5E-02	6.6E-05	1.0E+00	2.7E-03	NA	0.0E+00	2.7E-03
5.1E-03	1.0E-05	1.6E+00	3.2E-03	NA	0.0E+00	3.2E-03
3.3E-02	2.0E-04	2.6E+00	1.6E-02	NA	0.0E+00	1.6E-02
6.0E-03	4.7E+01	7.5E-02	5.8E+02	NA	0.0E+00	5.8E+02
5.6E-02	2.1E+00	7.8E-02	3.0E+00	NA	0.0E+00	3.0E+00
4.9E-02	1.5E-02	1.7E+01	5.3E+00	NA	0.0E+00	5.3E+00

[a] Tissue concentrations are calculated by multiplying site specific sediment and surface water concentrations times a bioaccumulation factor (BAF) or bioconcentration factor (BCF). BAFs and BCFs are presented in Table F-1.

[b] The greater of the BAF and BCF derived tissue level was selected for modeling food chain exposures.

ND = Not Detected

NC = Not Calculated

TABLE F.2-9
RISK ESTIMATION OF LETHAL EFFECTS TO SEMI-AQUATIC
RECEPTORS VIA FOOD, WATER, AND SEDIMENT INGESTION

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

TOTAL BODY DOSE (mg/kgBW-day) [b]

CHEMICAL	*Grt.blue heron*	*Raccoon*	*Osprey*
1,1-Dichloroethene	2.2E-06	3.4E-07	0.0E+00
1,2-Dichloroethene (total)	2.3E-03	1.3E-04	1.2E-05
Acetone	5.4E-06	8.4E-07	0.0E+00
Carbon disulfide	8.6E-06	4.7E-07	4.8E-08
Trichloroethene	1.9E-04	1.0E-05	1.1E-06
Vinyl chloride	1.2E-04	8.5E-06	5.1E-07
4-Methylphenol	0.0E+00	0.0E+00	0.0E+00
Fluoranthene	2.0E-03	1.4E-04	8.2E-06
Pyrene	2.0E-03	1.3E-04	7.9E-06
bis(2-Ethylhexyl)phthalate	3.2E-03	2.2E-04	1.3E-05
4,4'-DDE	1.3E-03	4.3E-05	7.4E-06
4,4'-DDT	8.0E-03	2.6E-04	4.5E-05
Aroclor-1254	6.8E-03	2.2E-04	3.9E-05
Endosulfan I	2.1E-04	6.9E-06	1.2E-06
Endrin ketone	4.5E-04	1.5E-05	2.6E-06
Heptachlor	2.2E-05	7.8E-07	1.2E-07
alpha-Chlordane	2.7E-05	9.1E-07	1.5E-07
delta-BHC	1.3E-04	4.4E-06	7.4E-07
Aluminum	6.1E+00	3.6E-01	2.7E-02
Lead	3.1E-02	1.8E-03	1.4E-04
Mercury	4.3E-02	1.4E-03	2.5E-04

[b] Calculated by summing the products of individual prey type concentrations and percent in diet, surface water and sediment exposures, multiplying by the exposure duration, SFF and ingestion rate, and dividing by body weight.

TABLE F.2-9

ESTIMATION OF CHRONIC EXPOSURES TO SEMI-AQUATIC RECEPTORS VIA FOOD, WATER, AND SEDIMENT INGESTION

REMEDIAL INVESTIGATION REPORT

NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

EXPOSURE PARAMETERS [d]

Indicator Species		Percent Prey in Diet: Aquatic Organisms	Percent Prey in Diet: Sediment	Home Range (acres)	ED [e]	Site Foraging Frequency [f]	Dietary Ingestion Rate (kg/day)	Water Ingestion Rate (L/day)	Body Weight (kg)
Grt.blue heron	(Omni. bird)	98%	2%	11	1.0	1.9E-01	0.098	0.101	2.23
Raccoon	(Omni. mammal)	91%	9%	385	1.0	5.5E-03	0.21	0.344	3.99
Osprey	(Pisci. bird)	100%	0%	2242	1.0	9.4E-04	0.08	0.080	1.57

SITE AREA: 2.10 acres

NOTES:

[d] Documentation of exposure parameters presented in Table 9-8.

[e] ED = Exposure Duration (percentage of year receptor is expected to be found at study area)

[f] SFF = Site Foraging Frequency (calculated by dividing site area by receptor home range (cannot exceed 1.0))

TABLE F.2-10
RISK ESTIMATION OF LETHAL EFFECTS TO SEMI-AQUATIC
RECEPTORS VIA FOOD, WATER, AND SEDIMENT INGESTION

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

CHEMICAL	*Grt.blue heron* Lethal			*Raccoon* Lethal			*Osprey* Lethal		
	TBD	RTV	HQ	TBD	RTV	HQ	TBD	RTV	HQ
1,1-Dichloroethene	2.2E-06			3.4E-07	4.0E+01	8.6E-09	0.0E+00		
1,2-Dichloroethene (total)	2.3E-03			1.3E-04	4.0E+01	3.3E-06	1.2E-05		
Acetone	5.4E-06			8.4E-07	6.0E+02	1.4E-09	0.0E+00		
Carbon disulfide	8.6E-06			4.7E-07			4.8E-08		
Trichloroethene	1.9E-04			1.0E-05	1.4E+03	7.3E-09	1.1E-06		
Vinyl chloride	1.2E-04			8.5E-06	1.0E+02	8.5E-08	5.1E-07		
4-Methylphenol	0.0E+00			0.0E+00	3.6E+02	0.0E+00	0.0E+00		
Fluoranthene	2.0E-03			1.4E-04	4.0E+02	3.5E-07	8.2E-06		
Pyrene	2.0E-03			1.3E-04	1.6E+02	8.4E-07	7.9E-06		
bis(2-Ethylhexyl)phthalate	3.2E-03			2.2E-04	1.6E+02	1.4E-06	1.3E-05		
4,4'-DDE	1.3E-03	1.2E+02	1.1E-05	4.3E-05	1.4E+02	3.0E-07	7.4E-06	1.2E+02	6.2E-08
4,4'-DDT	8.0E-03	1.2E+02	6.7E-05	2.6E-04	1.2E+01	2.2E-05	4.5E-05	1.2E+02	3.8E-07
Aroclor-1254	6.8E-03	1.6E+01	4.3E-04	2.2E-04	1.0E+02	2.2E-06	3.9E-05	1.6E+01	2.4E-06
Endosulfan I	2.1E-04	6.2E+00	3.3E-05	6.9E-06	4.8E+00	1.4E-06	1.2E-06	6.2E+00	1.9E-07
Endrin ketone	4.5E-04	3.6E-01	1.3E-03	1.5E-05	6.0E-01	2.4E-05	2.6E-06	3.6E-01	7.1E-06
Heptachlor	2.2E-05	1.2E+01	1.8E-06	7.8E-07	8.0E+00	9.8E-08	1.2E-07	1.2E+01	1.0E-08
alpha-Chlordane	2.7E-05	4.8E+00	5.6E-06	9.1E-07	2.0E+01	4.5E-08	1.5E-07	4.8E+00	3.1E-08
delta-BHC	1.3E-04	1.6E+01	8.4E-06	4.4E-06	3.5E+01	1.2E-07	7.4E-07	1.6E+01	4.7E-08
Aluminum	6.1E+00			3.6E-01	7.4E+02	4.8E-04	2.7E-02		
Lead	3.1E-02	7.5E+01	4.1E-04	1.8E-03	6.0E+01	3.0E-05	1.4E-04	7.5E+01	1.8E-06
Mercury	4.3E-02	2.2E+00	2.0E-02	1.4E-03	2.0E-01	7.1E-03	2.5E-04	2.2E+00	1.1E-04
SUMMARY HAZARD INDEX			**2.2E-02**			**7.6E-03**			**1.2E-04**

TBD = Total Body Dose (mg/kgBW-day).
RTV = Reference Toxicity Value (mg/kgBW-day); wildlife RTVs are presented in Appendix F, Table F-9.
HQ = Hazard Quotient (calculated by dividing TBD by RTV)
NA = Not Available

TABLE F.2-10
RISK ESTIMATION OF SUBLETHAL EFFECTS TO SEMI-AQUATIC
RECEPTORS VIA FOOD, WATER, AND SEDIMENT INGESTION

REMEDIAL INVESTIGATION REPORT
NAVAL TRAINING CENTER - OU4 ORLANDO, FLORIDA

CHEMICAL	*Grt.blue heron* Sublethal			*Raccoon* Sublethal			*Raccoon* Sublethal		
	TBD	RTV	HQ	TBD	RTV	HQ	TBD	RTV	HQ
1,1-Dichloroethene	2.2E-06			3.4E-07	9.0E-01	3.8E-07	0.0E+00		
1,2-Dichloroethene (total)	2.3E-03			1.3E-04	9.0E-01	1.5E-04	1.2E-05		
Acetone	5.4E-06			8.4E-07	2.7E+04	3.1E-11	0.0E+00		
Carbon disulfide	8.6E-06			4.7E-07	1.1E+01	4.3E-08	4.8E-08		
Trichloroethene	1.9E-04			1.0E-05	7.5E+01	1.4E-07	1.1E-06		
Vinyl chloride	1.2E-04			8.5E-06	1.3E+01	6.5E-07	5.1E-07		
4-Methylphenol	0.0E+00			0.0E+00	5.0E+01	0.0E+00	0.0E+00		
Fluoranthene	2.0E-03			1.4E-04	1.0E+00	1.4E-04	8.2E-06		
Pyrene	2.0E-03			1.3E-04	1.0E+00	1.3E-04	7.9E-06		
bis(2-Ethylhexyl)phthalate	3.2E-03			2.2E-04	3.5E+00	6.3E-05	1.3E-05		
4,4'-DDE	1.3E-03	2.9E-01	4.5E-03	4.3E-05	2.0E-01	2.1E-04	7.4E-06	2.9E-01	2.6E-05
4,4'-DDT	8.0E-03	1.4E-02	5.7E-01	2.6E-04	3.5E+02	7.3E-07	4.5E-05	1.4E-02	3.2E-03
Aroclor-1254	6.8E-03	9.0E-01	7.6E-03	2.2E-04	1.5E-01	1.5E-03	3.9E-05	9.0E-01	4.3E-05
Endosulfan I	2.1E-04			6.9E-06	2.6E-02	2.6E-04	1.2E-06		
Endrin ketone	4.5E-04			1.5E-05	1.0E-02	1.5E-03	2.6E-06		
Heptachlor	2.2E-05			7.8E-07	3.5E-02	2.2E-05	1.2E-07		
alpha-Chlordane	2.7E-05	3.1E-02	8.6E-04	9.1E-07	1.6E+00	5.7E-07	1.5E-07	3.1E-02	4.8E-06
delta-BHC	1.3E-04			4.4E-06	5.0E+00	8.7E-07	7.4E-07		
Aluminum	6.1E+00			3.6E-01	1.0E+01	3.6E-02	2.7E-02		
Lead	3.1E-02	4.6E+00	6.7E-03	1.8E-03	7.0E+00	2.6E-04	1.4E-04	4.6E+00	3.0E-05
Mercury	4.3E-02	6.4E-02	6.8E-01	1.4E-03	1.0E-02	1.4E-01	2.5E-04	6.4E-02	3.8E-03
SUMMARY HAZARD INDEX			**1.3E+00**			**1.8E-01**			**7.2E-03**

TBD = Total Body Dose (mg/kgBW-day).
RTV = Reference Toxicity Value (mg/kgBW-day); wildlife RTVs are presented in Appendix F, Table F-9.
HQ = Hazard Quotient (calculated by dividing TBD by RTV)

APPENDIX G

APPENDIX G

SOIL BORING LOGS

SOIL BORING LOG

Client: NAVY	Project No. 2545.05	Point of Interest: OU4	
Contractor: AEI	Date Started: 12/17/97	Soring No.: OLD-13-33	
Method: Rotosonic	Casing Size: 6 in Ø	Protection: D	
Ground Elev.:	Soil Drilled:	Completed: 12/17/97	
Logged by: J. Nash	Checked by:	PI Meter: Porta FID	
Screen: (ft.)	Riser: (ft.)	Diam: 2 in (ID)	Material: PVC
		Total Depth: 13 ft BLS	
		▽ Below Ground:	
		Page 1 of: 1	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	CLP/SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN.	WELL DATA	LITHOLOGY	ELEVATION (FT.)
					Ø	SAND, fine, organic rich, black	PT				
						SAND, fine grained, dk gray	SP				
5											
						SAND, fine grained, reddish brown, w/ thin layers of cemented fine sand	SP				
10											
						SAND, f-m, brown, w/ phosphate f-grav.	SP				
15											

PROPORTIONS

	(-) AMOUNT (+)
Trace (tr)	0-10%
Little (li)	10-20%
Some (so)	20-35%
and	35-50%

ABBREVIATIONS

f = fine	gr = gray	MS = Split Spoon
m = medium	bn = brown	BW = Screened Auger
c = coarse	blk = black	HP = Hydropunch

SOIL BORING LOG

Client: NAVY	Project No. 2545.05	Point of Interest: OU4	
Contractor: AEI	Date Started: 12/17/97	Soring No.: OLD-13-34	
Method: Rotosonic	Casing Size: 6 in. Ø	Protection: D	
Ground Elev.:	Soil Drilled:	Completed: 12/17/97	
Logged by: J. Nash	Checked by:	PI Meter: Porta FID	
Screen: (ft.)	Riser: (ft.)	Diam: 2 in. (ID)	Material: PVC
		Total Depth: 25 ft BLS	
		▽ Below Ground:	
		Page 1 of: 1	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	CLP/SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN.	WELL DATA	LITHOLOGY	ELEVATION (FT.)
					Ø	SAND, fine, organic rich, black	PT				
						SAND, fine grained, dk gray	SP				
5											
						SAND, fine grained, reddish brown, w/ thin layers of cemented fine sand	SP				
10											
						SAND, fine - medium grained, brown, w/ phosphate grains from fine sand to fine gravel	SP				
15											
20											
						SAND, fine grained, brown, w/ fine grained phosphate	SP				
25											

PROPORTIONS

Trace (tr)
Little (li)
Some (so)
and

(-) AMOUNT (-)

0-10%
10-20%
20-35%
35-50%

ABBREVIATIONS

f = fine
m = medium
c = coarse
gr = gray
bn = brown
blk = black
MS = Split Spoon
BW = Screened Auger
HP = Hydropunch

SOIL BORING LOG

Client: NAVY	Project No. 2545.05	Point of Interest: OU4	
Contractor: AEI	Date Started: 12/17/97	Boring No.: OLD-13-35	
Method: Rotosonic	Casing Size: 6 in ⊖	Protection: D	
Ground Elev.:	Soil Drilled:	Completed: 12/17/97	
Logged by: J. Nash	Checked by:	PI Meter: Porta FID	
Screen: (ft.)	Riser: (ft.)	Diam: 2 in (ID)	Material: PVC
		Total Depth: 56 ft BLS	
		▽ Below Ground:	
		Page 1 of: 2	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	CLP/SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN.	WELL DATA	LITHOLOGY	ELEVATION (FT.)
					Ø	SAND, fine, organic rich, black	PT				
						SAND, fine grained, dk. gray	SP				
5											
	U4B03001 U4B03001D	8-10				SAND, fine grained, reddish brown, w/ thin layers of cemented fine sand	SP				
10											
						SAND, fine-medium, brown, w/ phosphate grains from fine to fine gravel	SP				
15											
20	U4B03002 U4B03002MS U4B03002MSD	20-22									
						SAND, fine grained, brown, w/ fine grained phosphate	SP				
25											
30											
35											
40	U4B03003 U4B03003D	38-40									
45					✓	SAND, fine grained, greenish gray	SP				
50											

PROPORTIONS

	(-) AMOUNT (+)
Trace (tr)	0-10%
Little (li)	10-20%
Some (so)	20-35%
and	35-50%

ABBREVIATIONS

f = fine	gr = gray	MS = Split Spoon
m = medium	bn = brown	BW = Screened Auger
c = coarse	blk = black	HP = Hydropunch

SOIL BORING LOG

Client: NAVY	Project No. 2545.05		Point of Interest: OU4
Contractor: AEI	Date Started: 12/17/97		Soring No.: OLD-13-35
Method: Rotosonic	Casing Size: 6 in ⌀		Protection: D
Ground Elev.:	Soil Drilled:		Completed: 12/17/97
Logged by: J. Nash	Checked by:		PI Meter: Porta FID
Screen: (ft.)	Riser: (ft.)	Diam: 2 in (ID) / Material: PVC	Total Depth: 56 ft BLS
			▽ Below Ground:
			Page 2 of: 2

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	CLP/SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN.	WELL DATA	LITHOLOGY	ELEVATION (FT.)
	U4B03004	52-54			Ø						
55						SAND, fine grained, w/ some clay, green	SC				
60											

PROPORTIONS

Trace (tr)
Little (li)
Some (so)
and

(-) AMOUNT (+)

0-10%
10-20%
20-35%
35-50%

ABBREVIATIONS

f = fine
m = medium
c = coarse

gr = gray
bn = brown
blk = black

MS = Split Spoon
BW = Screened Auger
HP = Hydropunch

SOIL BORING LOG

Client: NAVY	Project No. 2545.05	Point of Interest: OU4	
Contractor: AEI	Date Started: 12/13/97	Soring No.: OLD-13-36	
Method: Rotosonic	Casing Size: 6 in ⌀	Protection: D	
Ground Elev.:	Soil Drilled:	Completed: 12/13/97	
Logged by: J. Nash	Checked by:	PI Meter: Porta FID	
Screen: (ft.)	Riser: (ft.)	Diam: 2 in (ID)	Material: PVC
		Total Depth: 15 ft BLS	
		▽ Below Ground: 5.24 ft	
		Page 1 of: 1	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	CLP/SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN.	WELL DATA	LITHOLOGY	ELEVATION (FT.)
					⌀	SAND, fine grained, brown	SP				
5											
10						SILTY SAND, fine grained, brown	SM				
						SAND, fine grained, brown	SP				
15											
20											

PROPORTIONS

Trace (tr)
Little (li)
Some (so)
and

(-) AMOUNT (+)

0-10%
10-20%
20-35%
35-50%

ABBREVIATIONS

f = fine
m = medium
c = coarse

gr = gray
bn = brown
blk = black

MS = Split Spoon
BW = Screened Auger
HP = Hydropunch

SOIL BORING LOG

Client: NAVY	Project No. 2545.05	Point of Interest: OU4	
Contractor: AEI	Date Started: 12/13/97	Boring No.: OLD-13-37	
Method: Rotosonic	Casing Size: 6 in ⊖	Protection: D	
Ground Elev.:	Soil Drilled:	Completed: 12/13/97	
Logged by: J. Nash	Checked by:	PI Meter: Porta FID	
Screen: (ft.)	Riser: (ft.)	Diam: 2 in (ID)	Material: PVC
		Total Depth: 26 ft BLS	
		▽ Below Ground: 4.71 ft	
		Page 1 of: 1	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	CLP/SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN.	WELL DATA	LITHOLOGY	ELEVATION (FT.)
					Ø	SAND, fine grained, brown	SP				
5											
10						SILTY SAND, fine grained, brown	SM				
						SAND, fine, brown	SP				
15						SAND, fine-medium grained, brown — at 20-23' greater percent of medium grains					
20											
25											
30											

PROPORTIONS

Trace (tr)
Little (li)
Some (so)
and

(-) AMOUNT (+)

0-10%
10-20%
20-35%
35-50%

ABBREVIATIONS

f = fine
m = medium
c = coarse

gr = gray
bn = brown
blk = black

MS = Split Spoon
BW = Screened Auger
HP = Hydropunch

SOIL BORING LOG

Client: NAVY	Project No. 2545.05	Point of Interest: OU4	
Contractor: AEI	Date Started: 12/13/97	Soring No.: OLD-13-38	
Method: Rotosonic	Casing Size: 6 in. Ø	Protection: D	
Ground Elev.:	Soil Drilled:	Completed: 12/13/97	
Logged by: J. Nash	Checked by:	PI Meter: Porta FID	
Screen: (ft.)	Riser: (ft.)	Diam: 2 in (ID)	Material: PVC
		Total Depth: 65 ft BLS	
		▽ Below Ground: 4.09 ft	
		Page 1 of: 2	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	CLP/SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN.	WELL DATA	LITHOLOGY	ELEVATION (FT.)
					Ø	SAND, fine grained, brown	SP				
5											
10	U4B03301	8-10									
						SILTY SAND, fine grained, brown	SM				
						SAND, fine, brown	SP				
15						SAND, fine - medium grained, brown	SP				
20	U4B03302	20-22				- at 20-23' greater percent of medium grains					
25						- light brown					
30						- less than 5% fine grained phosphate					
35						from 31-34' phosphate ranges from 1 cm Ø nodules to med grained					
40	U4B03303	38-40									
45						SAND, fine, greenish-tan, w/ trace fine phosphate	SP				
50											

PROPORTIONS

Trace (tr)
Little (li)
Some (so)
and

(-) AMOUNT (+)

0-10%
10-20%
20-35%
35-50%

ABBREVIATIONS

f = fine
m = medium
c = coarse

gr = gray
bn = brown
blk = black

MS = Split Spoon
BW = Screened Auger
HP = Hydropunch

SOIL BORING LOG

Client: NAVY	Project No. 2545.05	Point of Interest: OU4	
Contractor: AEI	Date Started: 12/13/97	Boring No.: OLD-13-38	
Method: Rotosonic	Casing Size: 6 in Ø	Protection: D	
Ground Elev.:	Soil Drilled:	Completed: 12/13/97	
Logged by: J. Nash	Checked by:	PI Meter: Porta FID	
Screen: (ft.)	Riser: (ft.)	Diam: 2 in (ID)	Material: PVC
		Total Depth: 65 ft BLS	
		▽ Below Ground: 4.09 ft	
		Page 2 of: 2	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	CLP/SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN.	WELL DATA	LITHOLOGY	ELEVATION (FT.)
					Ø						
55	V4B03304	56-58				SANDY CLAY, olive green	CL				
						CLAY, w/a little sand, olive green	CL				
60						CLAY, stiff, high plasticity, olive green	CH				
65											

PROPORTIONS

	(-) AMOUNT (+)
Trace (tr)	0-10%
Little (li)	10-20%
Some (so)	20-35%
and	35-50%

ABBREVIATIONS

f = fine	gr = gray	MS = Split Spoon
m = medium	bn = brown	BW = Screened Auger
c = coarse	blk = black	HP = Hydropunch

SOIL BORING LOG

Client: NAVY	Project No. 2545.05	Point of Interest: OU4	
Contractor: AEI	Date Started: 12/15/97	Boring No.: OLD-13-39	
Method: Rotosonic	Casing Size:	Protection: D	
Ground Elev.:	Soil Drilled:	Completed: 12/15/97	
Logged by: J. Nash	Checked by:	PI Meter: Porta FID	
Screen: (ft.)	Riser: (ft.)	Diam: 2 in (ID)	Material: PVC
		Total Depth: 25 ft BLS	
		▽ Below Ground: 6.05 ft	
		Page	of:

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	CLP/SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN.	WELL DATA	LITHOLOGY	ELEVATION (FT.)
					Ø	SAND, fine grained, gray	SP				
5						— brown					
10											
15						SILTY SAND, fine grained, dk. brown	SM				
20						SAND w/some silt, fine grained, brown, dense	SM				
25						SAND, fine grained, brown	SP				

PROPORTIONS	(-) AMOUNT (+)
Trace (tr)	0-10%
Little (li)	10-20%
Some (so)	20-35%
and	35-50%

ABBREVIATIONS

f = fine	gr = gray	MS = Split Spoon
m = medium	bn = brown	BW = Screened Auger
c = coarse	blk = black	HP = Hydropunch

SOIL BORING LOG

Client: NAVY	Project No. 2545.05	Point of Interest: OU4	
Contractor: AEI	Date Started: 12/15/97	Boring No.: OLD-13-40	
Method: Rotosonic	Casing Size: 6 in. Ø	Protection: D	
Ground Elev.:	Soil Drilled:	Completed: 12/15/97	
Logged by: J. Nash	Checked by:	PI Meter: Porta FID	
Screen: (ft.)	Riser: (ft.)	Diam: 2 in (ID)	Material: PVC
		Total Depth: 25 ft BLS	
		▽ Below Ground: 4.42 ft	
		Page 1 of: 1	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	CLP/SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN.	WELL DATA	LITHOLOGY	ELEVATION (FT.)
					Ø	SAND, fine grained, brown	SP				
5											
10											
15	U4B03S01	15-17									
						SILTY SAND, fine grained, dk. brown	SM				
20						SILTY SAND, fine, brown, dense	SM				
	U4B03S02	23-25			✓	SAND, fine, brown	SP				
25											

PROPORTIONS

Trace (tr)
Little (li)
Some (so)
and

(-) AMOUNT (+)

0-10%
10-20%
20-35%
35-50%

ABBREVIATIONS

f = fine
m = medium
c = coarse

gr = gray
bn = brown
blk = black

MS = Split Spoon
BW = Screened Auger
HP = Hydropunch

SOIL BORING LOG

Client: NAVY	Project No. 2545.05	Point of Interest: OU4	
Contractor: AEI	Date Started: 12/14/97	Boring No.: OLD-13-41	
Method: Rotosonic	Casing Size: 6 in Ø	Protection: D	
Ground Elev.:	Soil Drilled:	Completed: 12/14/97	
Logged by: J. Nash	Checked by:	PI Meter: Porta FID	
Screen: (ft.)	Riser: (ft.)	Diam: 2 in (ID)	Material: PVC
Total Depth: 28 ft BLS		Below Ground:	
Page 1 of: 1			

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	CLP/SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN.	WELL DATA	LITHOLOGY	ELEVATION (FT.)
					Ø	SAND, fine grained, brown	SP				
5											
10	04B03601	12-14									
15						– reddish-brown, med. dense from 18-21 ft					
20											
25	04B03602	25-27			✓	SAND, fine-medium grained, brown w/ trace phosphate grains	SP				
30											

PROPORTIONS

Trace (tr)
Little (li)
Some (so)
and

(-) AMOUNT (+)

0-10%
10-20%
20-35%
35-50%

ABBREVIATIONS

f = fine
m = medium
c = coarse
gr = gray
bn = brown
blk = black
MS = Split Spoon
BW = Screened Auger
HP = Hydropunch

SOIL BORING LOG

Client: NAVY	Project No. 2545.05	Point of Interest: OU4	
		Soring No.: OLD-13-42	
		Protection: D	
Contractor: AEI	Date Started: 12/14/97	Completed: 12/14/97	
Method: Rotosonic	Casing Size: 6 in Ø	PI Meter: Porta FID	
		Total Depth: 28 ft BLS	
Ground Elev.:	Soil Drilled:	▽ Below Ground: 3.43 ft	
Logged by: J. Nash	Checked by:	Page of:	
Screen: (ft.)	Riser: (ft.)	Diam: 2in(ID)	Material: PVC

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	CLP/SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN.	WELL DATA	LITHOLOGY	ELEVATION (FT.)
					Ø	SAND, fine grained, brown	SP				
5											
10											
15											
20						– reddish-brown, dense from 18-21 ft					
25						SAND, fine-medium grained, brown w/ trace phosphate grains	SP				
30											

PROPORTIONS

Trace (tr)
Little (li)
Some (so)
and

(-) AMOUNT (+)

0-10%
10-20%
20-35%
35-50%

ABBREVIATIONS

f = fine
m = medium
c = coarse

gr = gray
bn = brown
blk = black

MS = Split Spoon
BW = Screened Auger
HP = Hydropunch

SOIL BORING LOG

Client: NAVY	Project No. 2545.05	Point of Interest: OU4	
Contractor: AEI	Date Started: 12/14/97	Soring No.: OLD-13-43	
Method: Rotosonic	Casing Size: 6 in. Ø	Protection: D	
Ground Elev.:	Soil Drilled:	Completed: 12/14/97	
Logged by: J. Nash	Checked by:	PI Meter: Porta FID	
Screen: (ft.)	Riser: (ft.)	Diam: 2in (ID)	Material: PVC
		Total Depth: 50 ft BLS	
		▽ Below Ground: 3.82 ft	
		Page 1 of: 1	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	CLP/SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN.	WELL DATA	LITHOLOGY	ELEVATION (FT.)
					Ø	SAND, fine grained, brown	SP				
5											
10											
15											
						– reddish-brown, med. dense from 18-21 ft					
20											
25						SAND, fine-medium grained, brown w/ trace phosphate grains	SP				
						SAND, fine grained, brown	SP				
30											
35						SAND, fine-medium grained, brown, w/ trace phosphate grains	SP				
40											
45						SAND, fine grained, olive green, w/ trace phosphate	SP				
50											

PROPORTIONS

Trace (tr)
Little (li)
Some (so)
and

(-) AMOUNT (+)

0-10%
10-20%
20-35%
35-50%

ABBREVIATIONS

f = fine
m = medium
c = coarse

gr = gray
bn = brown
blk = black

MS = Split Spoon
BW = Screened Auger
HP = Hydropunch

APPENDIX H

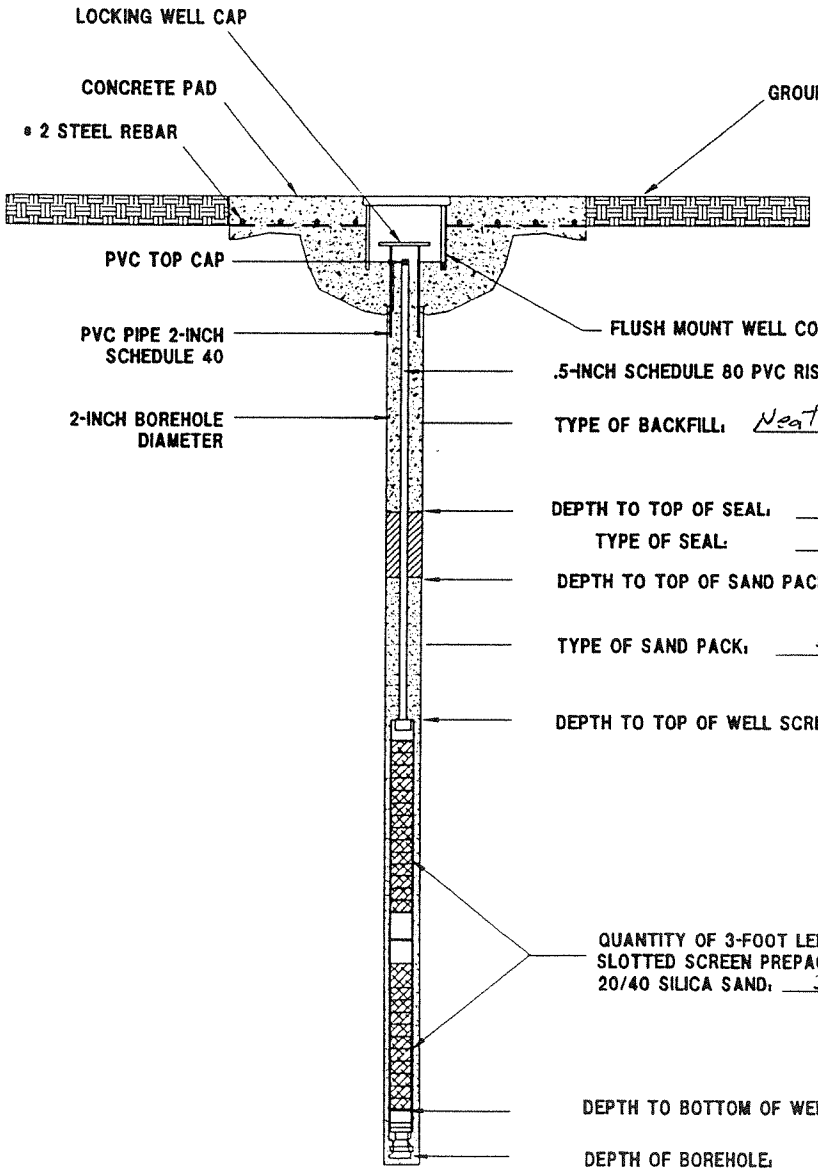
APPENDIX H

MONITORING WELL CONSTRUCTION LOGS

MICROWELL CONSTRUCTION DIAGRAM

PROJECT: NTC Orlando RI
PROJECT NO: 2545.05
WELL ID: OLD-14-05A
FIELD PERSONNEL: J. Nash

SITE NAME: SA 14
DATE INSTALLED: 11/14/97
INSTALLATION METHOD: Terraprobe



TYPE OF BACKFILL: Neat Cement Grout

DEPTH TO TOP OF SEAL: 1 ft
TYPE OF SEAL: 30/65

DEPTH TO TOP OF SAND PACK: 2 ft

TYPE OF SAND PACK: 20/30

DEPTH TO TOP OF WELL SCREEN: 6 ft

QUANTITY OF 3-FOOT LENGTH .010-INCH SLOTTED SCREEN PREPACKED WITH 20/40 SILICA SAND: 3

DEPTH TO BOTTOM OF WELL SCREEN: 15 ft

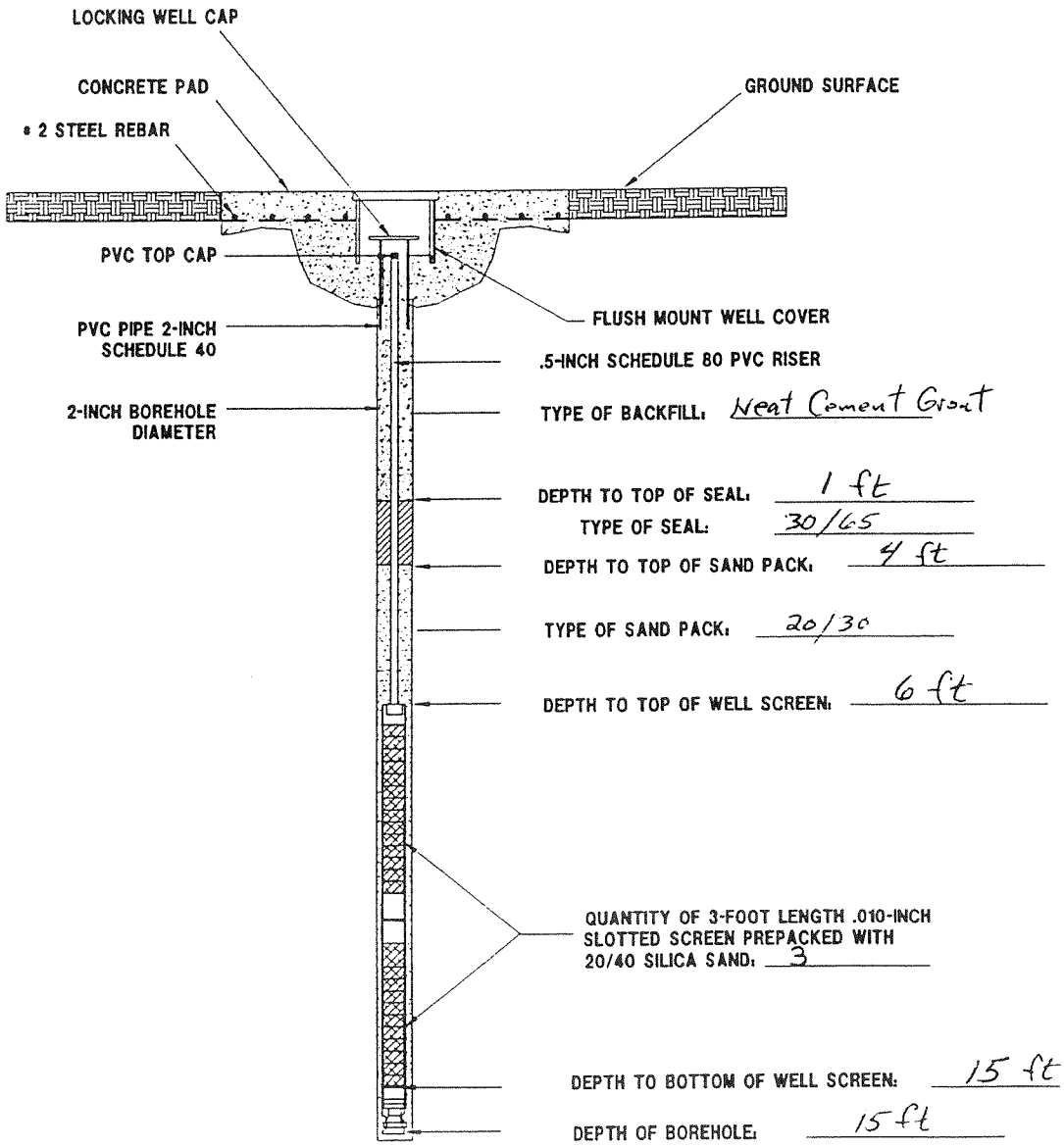
DEPTH OF BOREHOLE: 15 ft

NOT TO SCALE

MICROWELL CONSTRUCTION DIAGRAM

PROJECT: NTC Orlando RI
PROJECT NO: 2545.05
WELL ID: OLD-14-06A
FIELD PERSONNEL: J. Nash

SITE NAME: SA 14
DATE INSTALLED: 11/4/97
INSTALLATION METHOD: Terraprobe

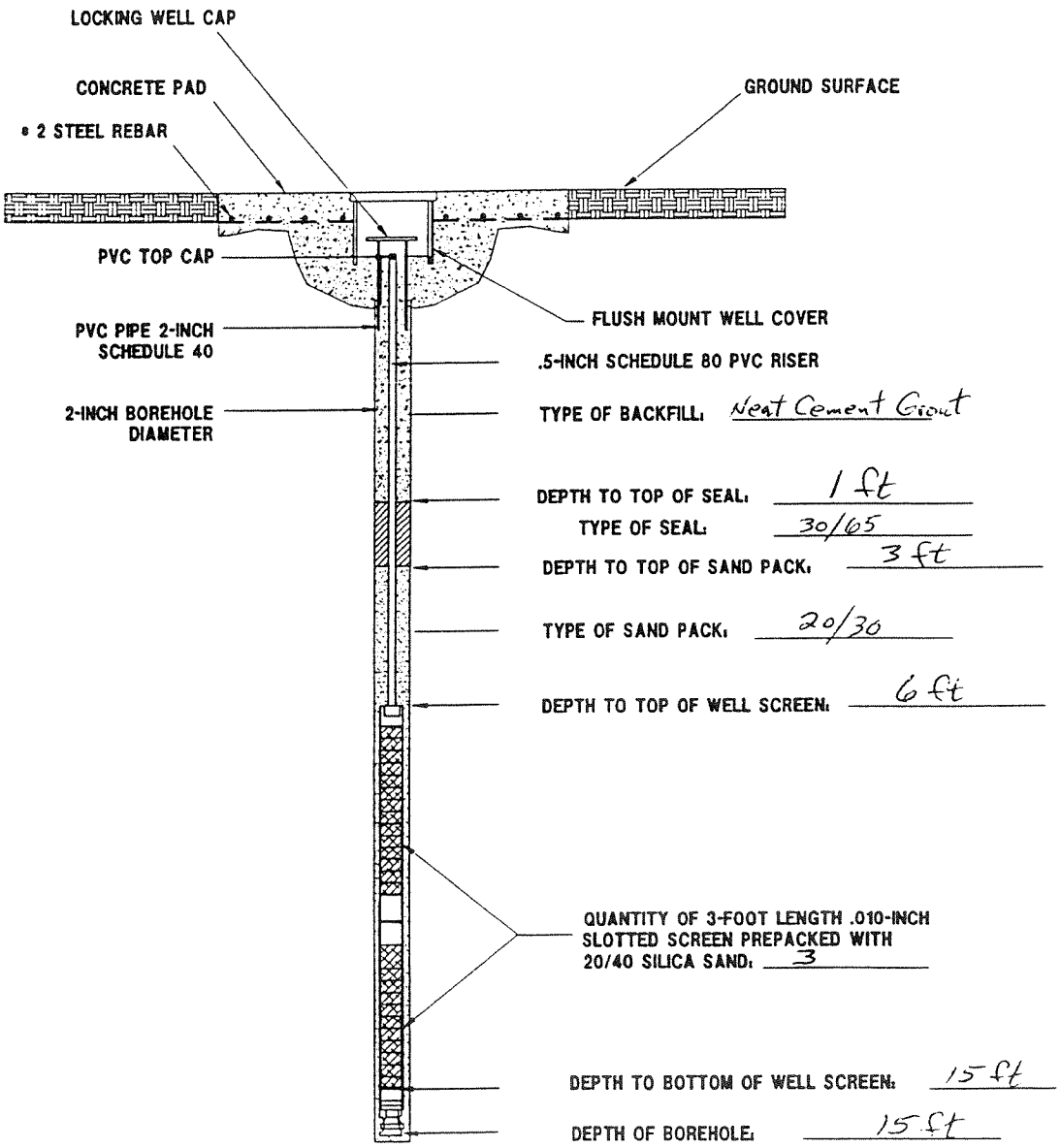


NOT TO SCALE

MICROWELL CONSTRUCTION DIAGRAM

PROJECT: NTC Orlando RI
PROJECT NO: 2545.05
WELL ID: OLD-14-07A
FIELD PERSONNEL: J. Nash

SITE NAME: SA 14
DATE INSTALLED: 11/4/97
INSTALLATION METHOD: Terraprobe

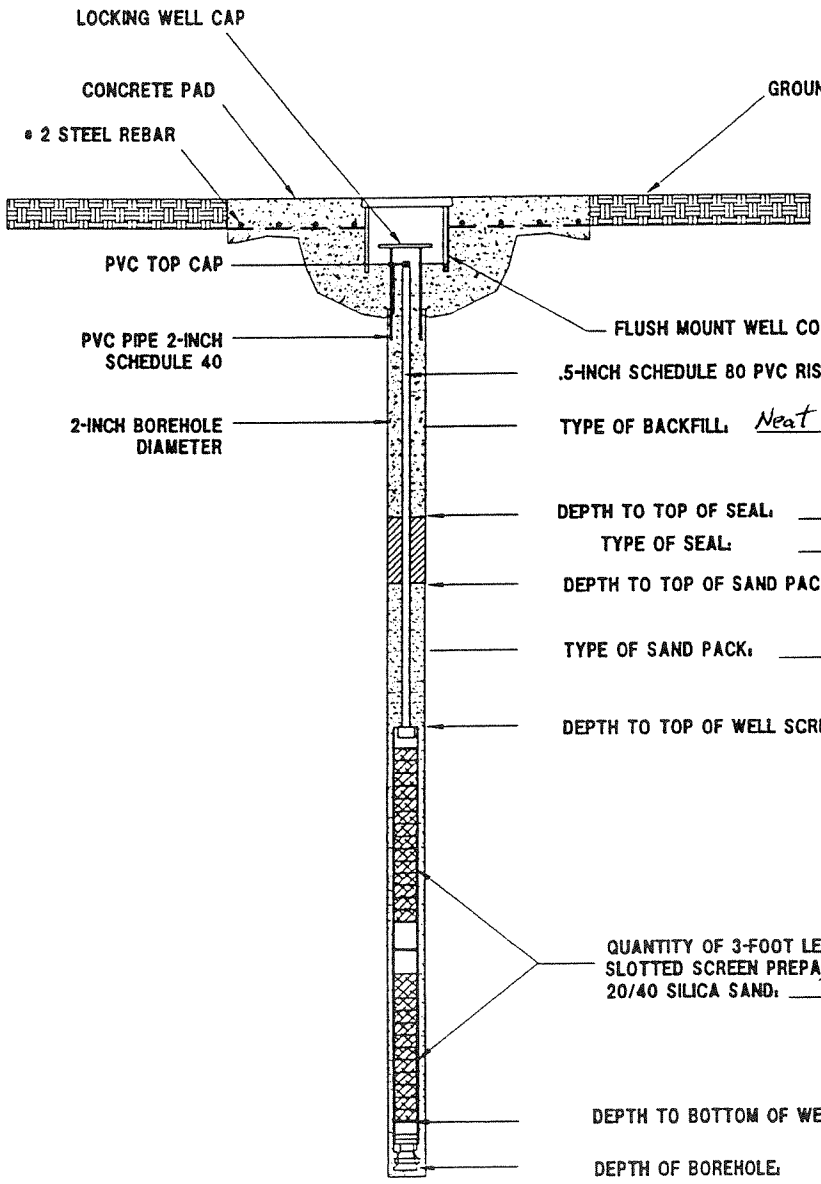


NOT TO SCALE

MICROWELL CONSTRUCTION DIAGRAM

PROJECT: NTC Orlando RI
PROJECT NO: 2545.05
WELL ID: OLD-14-08A
FIELD PERSONNEL: J. Nash

SITE NAME: SA 14
DATE INSTALLED: 11/4/97
INSTALLATION METHOD: Terrapiche



TYPE OF BACKFILL: Neat Cement Grout

DEPTH TO TOP OF SEAL: 1 ft

TYPE OF SEAL: 30/65

DEPTH TO TOP OF SAND PACK: 3 ft

TYPE OF SAND PACK: 20/30

DEPTH TO TOP OF WELL SCREEN: 6 ft

QUANTITY OF 3-FOOT LENGTH .010-INCH SLOTTED SCREEN PREPACKED WITH 20/40 SILICA SAND: 3

DEPTH TO BOTTOM OF WELL SCREEN: 15 ft

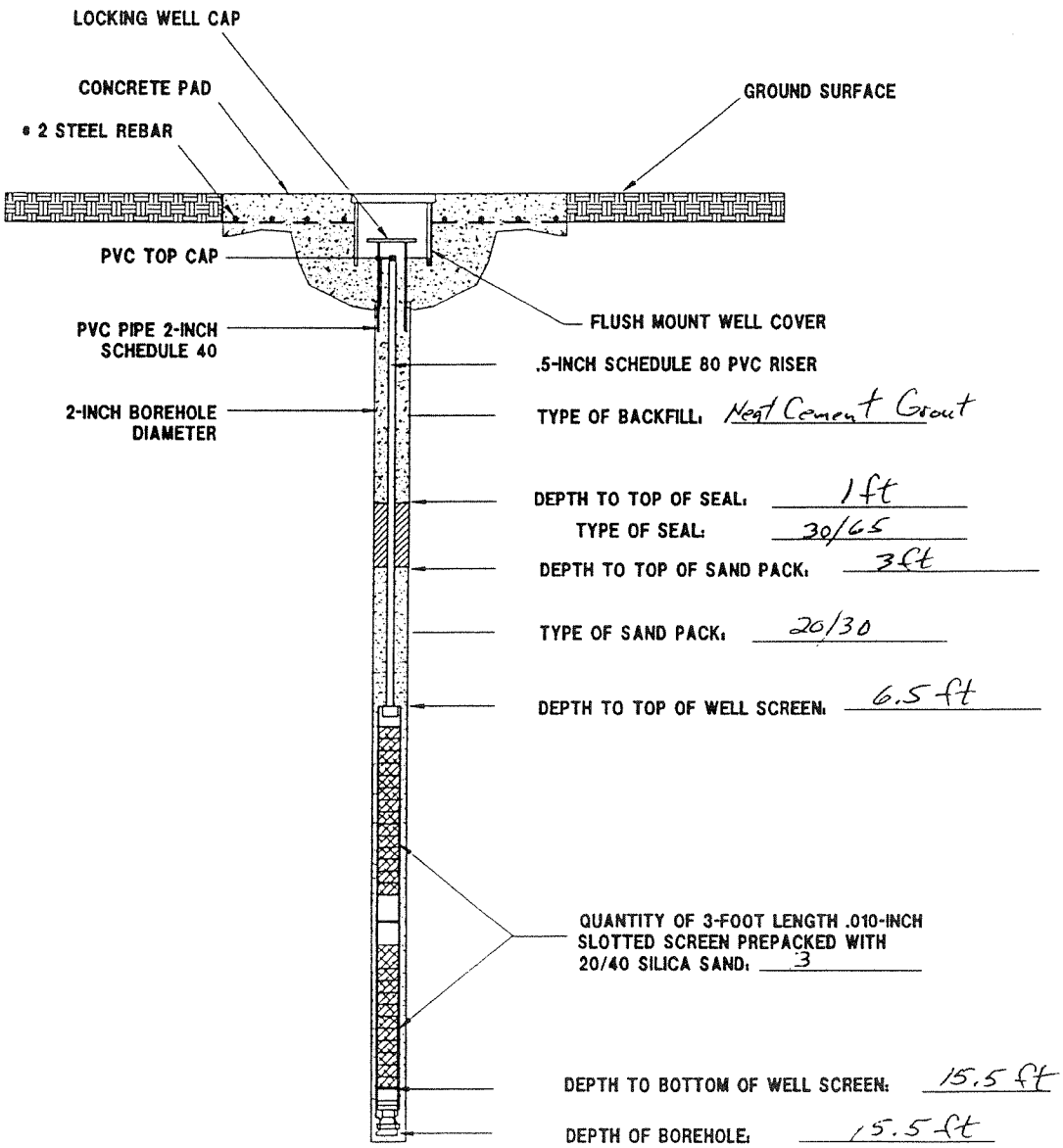
DEPTH OF BOREHOLE: 15 ft

NOT TO SCALE

MICROWELL CONSTRUCTION DIAGRAM

PROJECT: NTC Orlando RI
PROJECT NO: 2545.05
WELL ID: OLD-13-27A
FIELD PERSONNEL: S. Nash

SITE NAME: SA 13
DATE INSTALLED: 11/4/97
INSTALLATION METHOD: Terraprobe



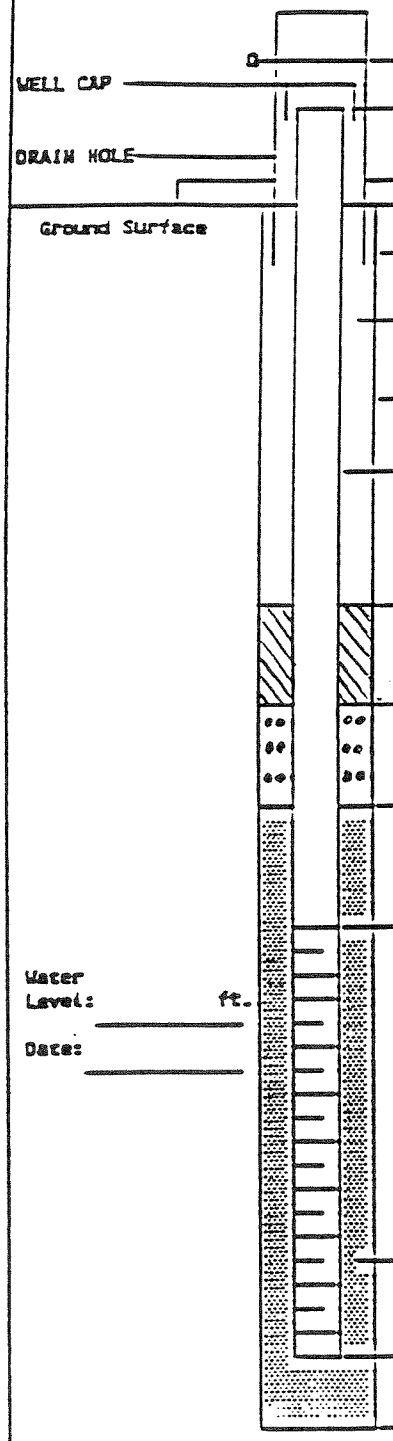
NOT TO SCALE

WELL INSTALLATION DIAGRAM

PROJECT: ITC Orlando
PROJECT No.: 2545.05
ELEVATION:
FIELD GEOLOGIST: J. Nash

SITE NAME: Area C.
DATE INSTALLED: 12/17/97
DRILLING METHOD: Rotosonic
AUGER SIZE: 6 in.

Site: OU4
Well ID: OLD-13-33



ELEVATION OF TOP OF PROTECTIVE CASING: _____

ELEVATION OF TOP OF WELL RISER: _____

GRAVEL PAD

OUTSIDE DIAMETER OF SURFACE CASING: —

TYPE OF BACKFILL: Neat Cement Grout

BOREHOLE DIAMETER: 6 in.

WELL RISER ID: 2 in

TYPE OF RISER: Sch 40 PVC

DEPTH TO TOP OF FINE SAND: —

TYPE OF FINE SAND: —

DEPTH TO TOP OF BENTONITE SEAL: 1 ft BLS

TYPE OF SEAL: Med. Bentonite Chips

DEPTH TO TOP OF SAND PACK: 1.5 ft

DEPTH TO TOP OF WELL SCREEN: 2.5 ft

TYPE OF WELL SCREEN: Sch 40 PVC

WELL SCREEN ID: 2 in.

WELL SCREEN SLOT SIZE: .020 in

LENGTH OF WELL SCREEN: 10 ft

TYPE OF SAND PACK: 20/30

DEPTH TO BOTTOM OF WELL SCREEN: 12.5 ft

DEPTH OF BOREHOLE: 13 ft

WELL INSTALLATION DIAGRAM

PROJECT: NTC Orlando

PROJECT No.: 2545.05

ELEVATION:

FIELD GEOLOGIST: J. Nash

SITE NAME: Area C

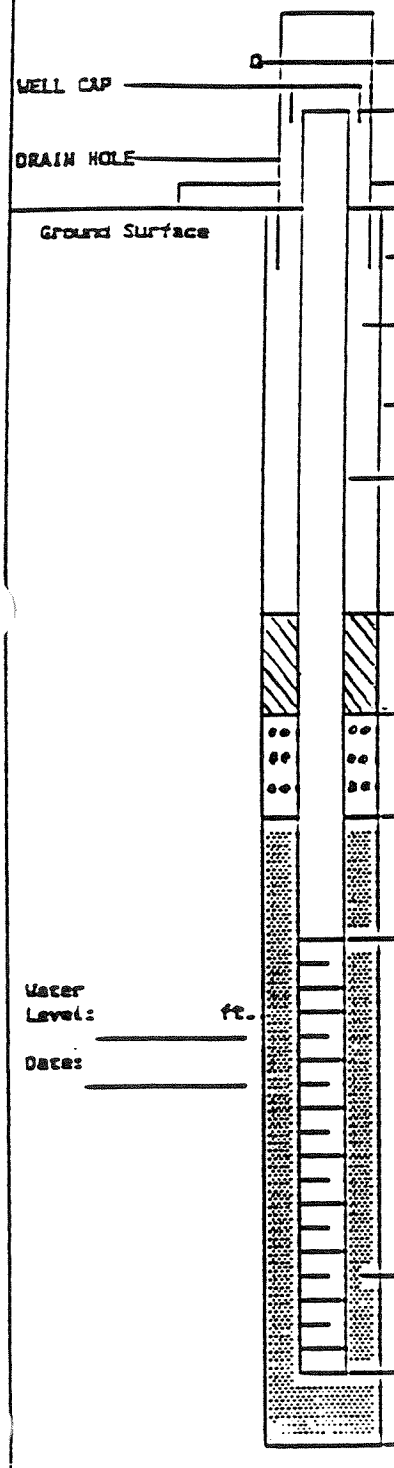
DATE INSTALLED: 12/17/97

DRILLING METHOD: Roto sonic

AUGER SIZE: 6 in

Site: OU4

Well ID: OLD-13-34



ELEVATION OF TOP OF PROTECTIVE CASING: _____

ELEVATION OF TOP OF WELL RISER: _____

GRAVEL PAD

OUTSIDE DIAMETER OF SURFACE CASING: —

TYPE OF BACKFILL: Neat Cement Grout

BOREHOLE DIAMETER: 6 in

WELL RISER ID: 2 in

TYPE OF RISER: Sch 40 PVC

DEPTH TO TOP OF FINE SAND: 11 ft BLS

TYPE OF FINE SAND: 20/30

DEPTH TO TOP OF BENTONITE SEAL: 13 ft

TYPE OF SEAL: Med Bentonite Chips

DEPTH TO TOP OF SAND PACK: 17.5 ft

DEPTH TO TOP OF WELL SCREEN: 20 ft

TYPE OF WELL SCREEN: Sch 40 PVC

WELL SCREEN ID: 2 in

WELL SCREEN SLOT SIZE: .020 in

LENGTH OF WELL SCREEN: 5 ft

TYPE OF SAND PACK: 20/30

DEPTH TO BOTTOM OF WELL SCREEN: 25 ft

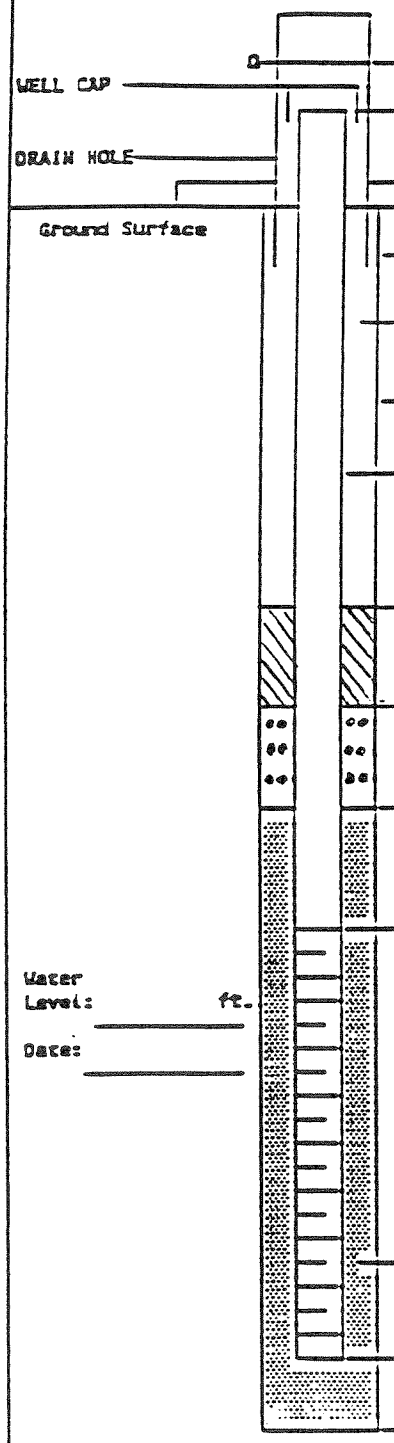
DEPTH OF BOREHOLE: 25 ft

WELL INSTALLATION DIAGRAM

PROJECT: NTC Orlando
PROJECT No.: 2545.05
ELEVATION:
FIELD GEOLOGIST: J. Nash

SITE NAME: Area C.
DATE INSTALLED: 12/17/93
DRILLING METHOD: Rotosonic
AUGER SIZE: 6 in.

Site: OU4
Well ID: OLD-13-35



ELEVATION OF TOP OF PROTECTIVE CASING: _____

ELEVATION OF TOP OF WELL RISER: _____

GRAVEL PAD

OUTSIDE DIAMETER OF SURFACE CASING: —

TYPE OF BACKFILL: Neat Cement Grout

BOREHOLE DIAMETER: 6 in

WELL RISER ID: 2 in

TYPE OF RISER: Sch 40 PVC

DEPTH TO TOP OF FINE SAND: 41 ft BLS

TYPE OF FINE SAND: 20/30

DEPTH TO TOP OF BENTONITE SEAL: 43 ft

TYPE OF SEAL: Med. Bentonite Chips

DEPTH TO TOP OF SAND PACK: 49 ft

DEPTH TO TOP OF WELL SCREEN: 51 ft

TYPE OF WELL SCREEN: Sch 40 PVC

WELL SCREEN ID: 2 in

WELL SCREEN SLOT SIZE: .020 in.

LENGTH OF WELL SCREEN: 5 ft

TYPE OF SAND PACK: 20/30

DEPTH TO BOTTOM OF WELL SCREEN: 56 ft

DEPTH OF BOREHOLE: 56 ft

WELL INSTALLATION DIAGRAM

PROJECT: NTC Orlando

PROJECT No.: 2545.05

ELEVATION:

FIELD GEOLOGIST: J. Nash

SITE NAME: Area C.

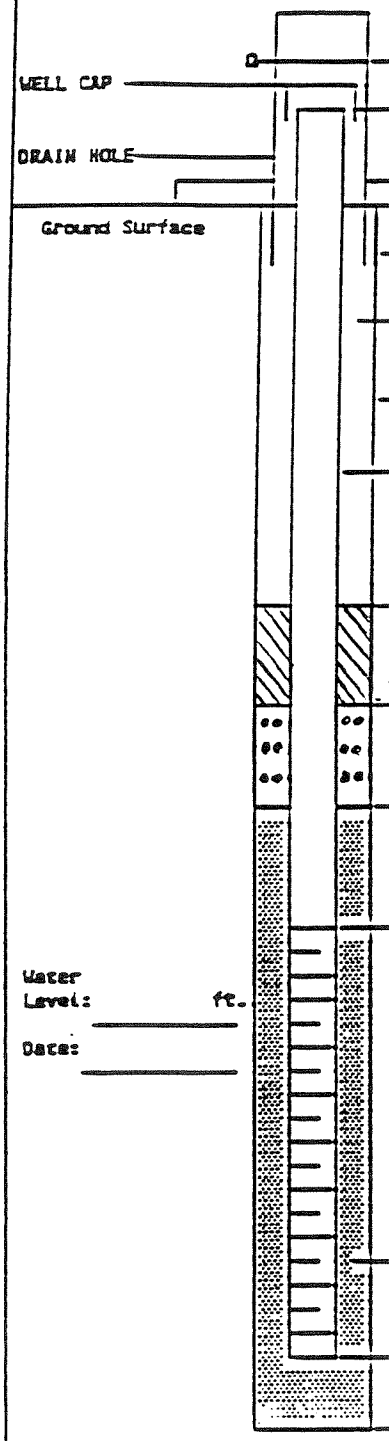
DATE INSTALLED: 12/13/97

DRILLING METHOD: Rotosonic

AUGER SIZE: 6 in.

Site: OU4

Well ID: OU-13-36



ELEVATION OF TOP OF PROTECTIVE CASING: _____

ELEVATION OF TOP OF WELL RISER: _____

GRAVEL PAD

OUTSIDE DIAMETER OF SURFACE CASING: —

TYPE OF BACKFILL: Neat Cement Grout

BOREHOLE DIAMETER: 6 in

WELL RISER ID: 2 in

TYPE OF RISER: Sch 40 PVC

DEPTH TO TOP OF FINE SAND: 1 ft BLS

TYPE OF FINE SAND: 20/30

DEPTH TO TOP OF BENTONITE SEAL: 2 ft

TYPE OF SEAL: Med. Bentonite chips

DEPTH TO TOP OF SAND PACK: 3 ft

DEPTH TO TOP OF WELL SCREEN: 4 ft

TYPE OF WELL SCREEN: sch 40 PVC

WELL SCREEN ID: 2 in

WELL SCREEN SLOT SIZE: .020 in.

LENGTH OF WELL SCREEN: 10 ft

TYPE OF SAND PACK: 20/30

DEPTH TO BOTTOM OF WELL SCREEN: 14 ft

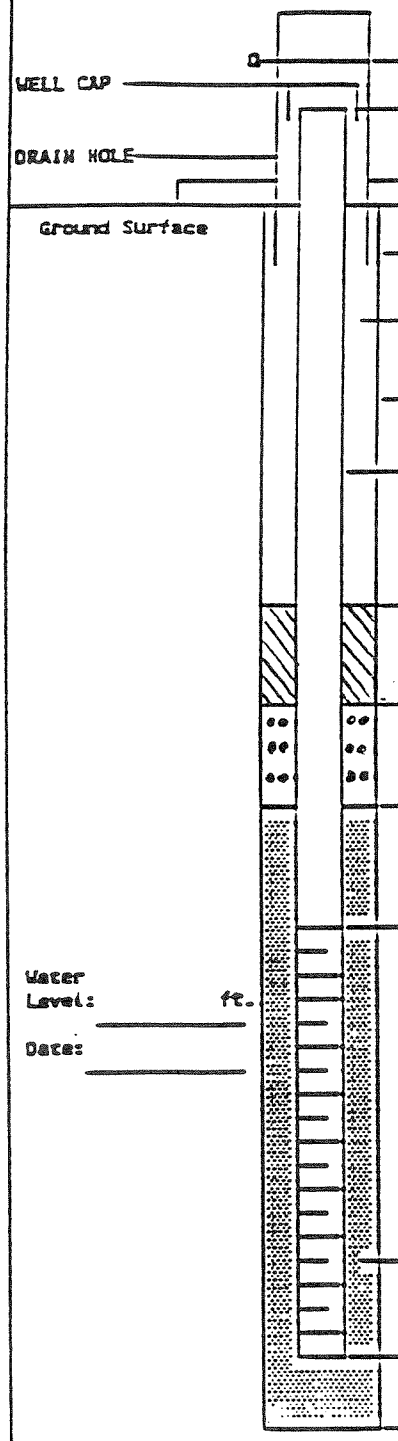
DEPTH OF BOREHOLE: 15 ft

WELL INSTALLATION DIAGRAM

PROJECT: NTC Orlando
PROJECT No.: 2545.05
ELEVATION:
FIELD GEOLOGIST: J. Nash

SITE NAME: Area C.
DATE INSTALLED: 12/13/97
DRILLING METHOD: Rotosonic
AUGER SIZE: 6 in.

Site: OU4
Well ID: OLD-13-37



ELEVATION OF TOP OF PROTECTIVE CASING:
ELEVATION OF TOP OF WELL RISER:
GRAVEL PAD
OUTSIDE DIAMETER OF SURFACE CASING: —
TYPE OF BACKFILL: Neat Grout
BOREHOLE DIAMETER: 6 in.
WELL RISER ID: 2 in.
TYPE OF RISER: Sch. 40 PVC
DEPTH TO TOP OF FINE SAND: 10 ft BLS
TYPE OF FINE SAND: 20/30
DEPTH TO TOP OF BENTONITE SEAL: 12 ft
TYPE OF SEAL: Med. Bentonite chips
DEPTH TO TOP OF SAND PACK: 12.5 ft
DEPTH TO TOP OF WELL SCREEN: 20 ft
TYPE OF WELL SCREEN: sch. 40 PVC
WELL SCREEN ID: 2 in
WELL SCREEN SLOT SIZE: .020 in.
LENGTH OF WELL SCREEN: 5 ft
TYPE OF SAND PACK: 20/30
DEPTH TO BOTTOM OF WELL SCREEN: 25 ft
DEPTH OF BOREHOLE: 26 ft

WELL INSTALLATION DIAGRAM

PROJECT: NTC Orlando

PROJECT No.: 2545.05

ELEVATION:

FIELD GEOLOGIST: J. Nash

SITE NAME: Area C

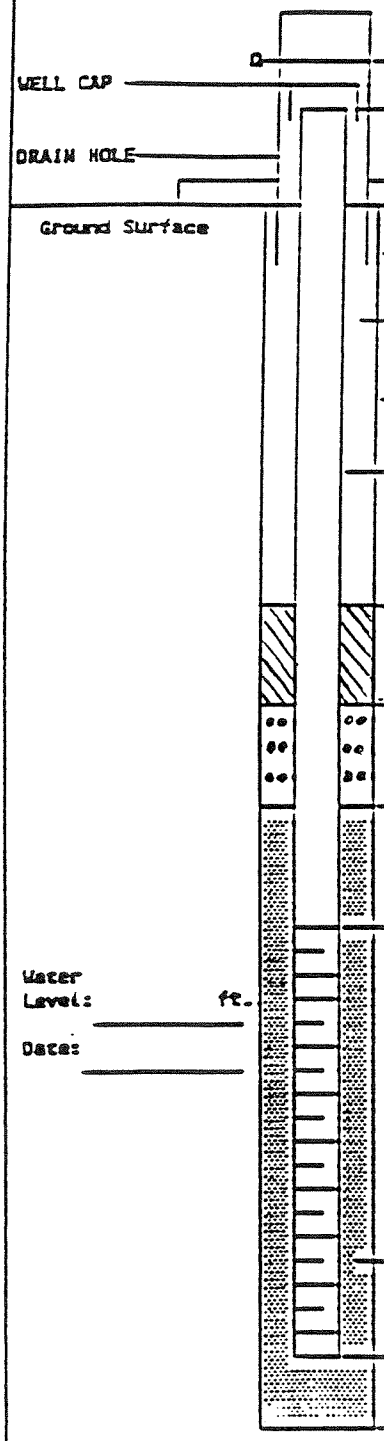
DATE INSTALLED: 12/13/97

DRILLING METHOD: Rotosonic

AUGER SIZE: 6 in

Site: OU4

Well ID: OLD-13-38



ELEVATION OF TOP OF PROTECTIVE CASING: _____

ELEVATION OF TOP OF WELL RISER: _____

GRAVEL PAD

OUTSIDE DIAMETER OF SURFACE CASING: —

TYPE OF BACKFILL: Neat Grout

BOREHOLE DIAMETER: 6 in.

WELL RISER ID: 2 in.

TYPE OF RISER: Sch. 40 PVC

DEPTH TO TOP OF FINE SAND: 43 ft BLS

TYPE OF FINE SAND: 20/30

DEPTH TO TOP OF BENTONITE SEAL: 45 ft

TYPE OF SEAL: Med. Bentonite Chips

DEPTH TO TOP OF SAND PACK: 47.5 ft

DEPTH TO TOP OF WELL SCREEN: 50 ft

TYPE OF WELL SCREEN: .020" slot sch. 40 PVC

WELL SCREEN ID: 2 in

WELL SCREEN SLOT SIZE: .020 in

LENGTH OF WELL SCREEN: 5 ft

TYPE OF SAND PACK: 20/30

DEPTH TO BOTTOM OF WELL SCREEN: 55 ft

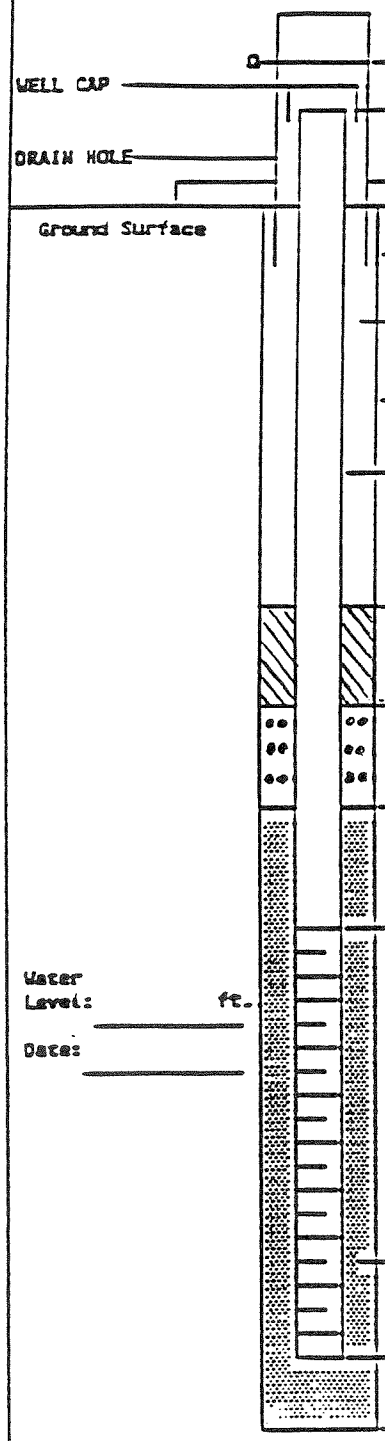
DEPTH OF BOREHOLE: 65 ft

WELL INSTALLATION DIAGRAM

PROJECT: NTC Orlando
PROJECT No.: 2545.05
ELEVATION:
FIELD GEOLOGIST: J. Nash

SITE NAME: Area C.
DATE INSTALLED: 12/15/92
DRILLING METHOD: Rotosonic
AUGER SIZE: 6 in.

Site: OU4
Well ID: OLD-13-34



ELEVATION OF TOP OF PROTECTIVE CASING: _____

ELEVATION OF TOP OF WELL RISER: _____

GRAVEL PAD

OUTSIDE DIAMETER OF SURFACE CASING: —

TYPE OF BACKFILL: Neat Cement Grout

BOREHOLE DIAMETER: 6 in

WELL RISER ID: 2 in

TYPE OF RISER: Sch 40 PVC

DEPTH TO TOP OF FINE SAND: 9 ft BLS

TYPE OF FINE SAND: 20/30

DEPTH TO TOP OF BENTONITE SEAL: 13 ft

TYPE OF SEAL: Med. Bentonite Chips

DEPTH TO TOP OF SAND PACK: 18 ft

DEPTH TO TOP OF WELL SCREEN: 20 ft

TYPE OF WELL SCREEN: Sch 40 PVC

WELL SCREEN ID: 2 in

WELL SCREEN SLOT SIZE: .020 in

LENGTH OF WELL SCREEN: 5 ft

TYPE OF SAND PACK: 20/30

DEPTH TO BOTTOM OF WELL SCREEN: 25 ft

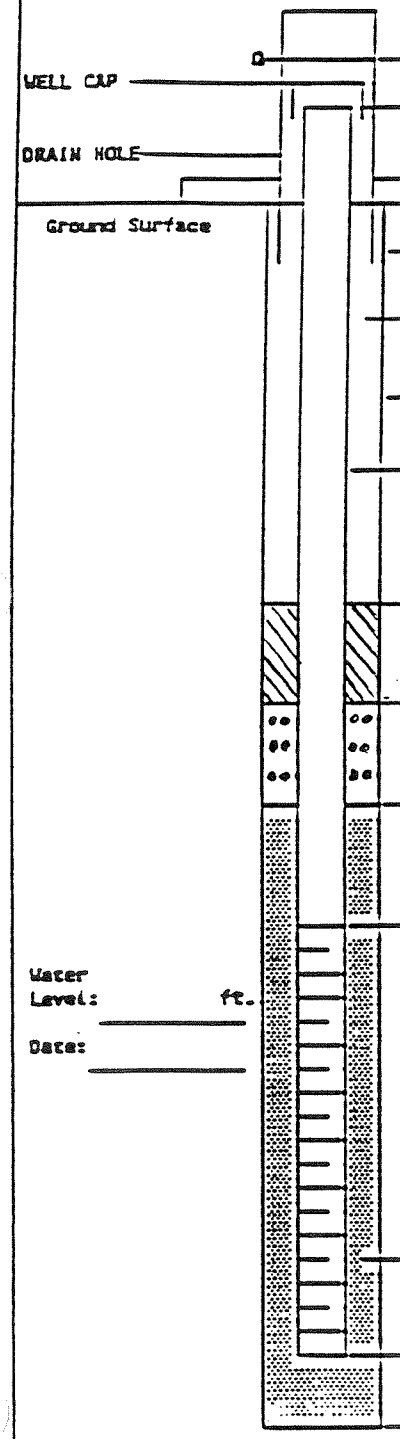
DEPTH OF BOREHOLE: 25 ft

WELL INSTALLATION DIAGRAM

PROJECT: NTC Orlando
PROJECT No.: 2545.05
ELEVATION:
FIELD GEOLOGIST: J. Nash

SITE NAME: Area C
DATE INSTALLED: 12/15/97
DRILLING METHOD: Rotosonic
AUGER SIZE: 6 in.

Site: OU4
Well ID: OLD-13-40



ELEVATION OF TOP OF PROTECTIVE CASING: _____

ELEVATION OF TOP OF WELL RISER: _____

GRAVEL PAD

OUTSIDE DIAMETER OF SURFACE CASING: —

TYPE OF BACKFILL: Neat Cement Grout

BOREHOLE DIAMETER: 6 in.

WELL RISER ID: 2 in

TYPE OF RISER: Sch 40 PVC

DEPTH TO TOP OF FINE SAND: 9 ft BLS

TYPE OF FINE SAND: 20/30

DEPTH TO TOP OF BENTONITE SEAL: 13 ft

TYPE OF SEAL: Med. Bentonite Chips

DEPTH TO TOP OF SAND PACK: 18 ft

DEPTH TO TOP OF WELL SCREEN: 20 ft

TYPE OF WELL SCREEN: Sch 40 PVC

WELL SCREEN ID: 2 in.

WELL SCREEN SLOT SIZE: .020 in

LENGTH OF WELL SCREEN: 5 ft

TYPE OF SAND PACK: 20/30

DEPTH TO BOTTOM OF WELL SCREEN: 25 ft

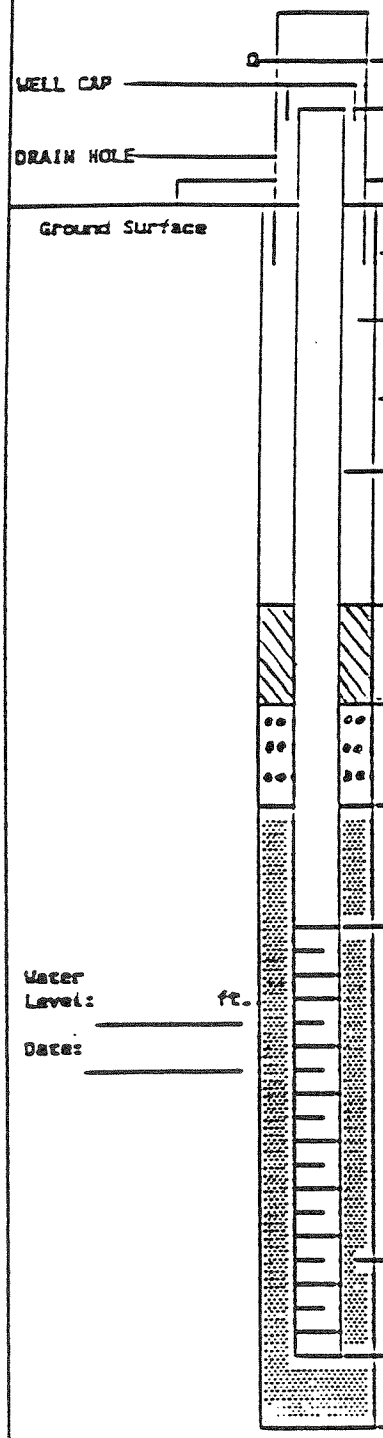
DEPTH OF BOREHOLE: 25 ft

WELL INSTALLATION DIAGRAM

PROJECT: NTC Orlando
PROJECT No.: 2545.05
ELEVATION:
FIELD GEOLOGIST: J. Nash

SITE NAME: Area C.
DATE INSTALLED: 12/14/97
DRILLING METHOD: Rotosonic
AUGER SIZE: 6 in

Site: OU 4
Well ID: OLD-13-41



ELEVATION OF TOP OF PROTECTIVE CASING: _____

ELEVATION OF TOP OF WELL RISER: _____

GRAVEL PAD

OUTSIDE DIAMETER OF SURFACE CASING: —

TYPE OF BACKFILL: Neat Cement Grout

BOREHOLE DIAMETER: 6 in

WELL RISER ID: 2 in

TYPE OF RISER: sch 40 PVC

DEPTH TO TOP OF FINE SAND: 15 ft BLS

TYPE OF FINE SAND: 20/30

DEPTH TO TOP OF BENTONITE SEAL: 17 ft

TYPE OF SEAL: Med. Bentonite Chips

DEPTH TO TOP OF SAND PACK: 21 ft

DEPTH TO TOP OF WELL SCREEN: 23 ft

TYPE OF WELL SCREEN: Sch 40 PVC

WELL SCREEN ID: 2 in

WELL SCREEN SLOT SIZE: .020 in

LENGTH OF WELL SCREEN: 5 ft

TYPE OF SAND PACK: 20/30

DEPTH TO BOTTOM OF WELL SCREEN: 28 ft

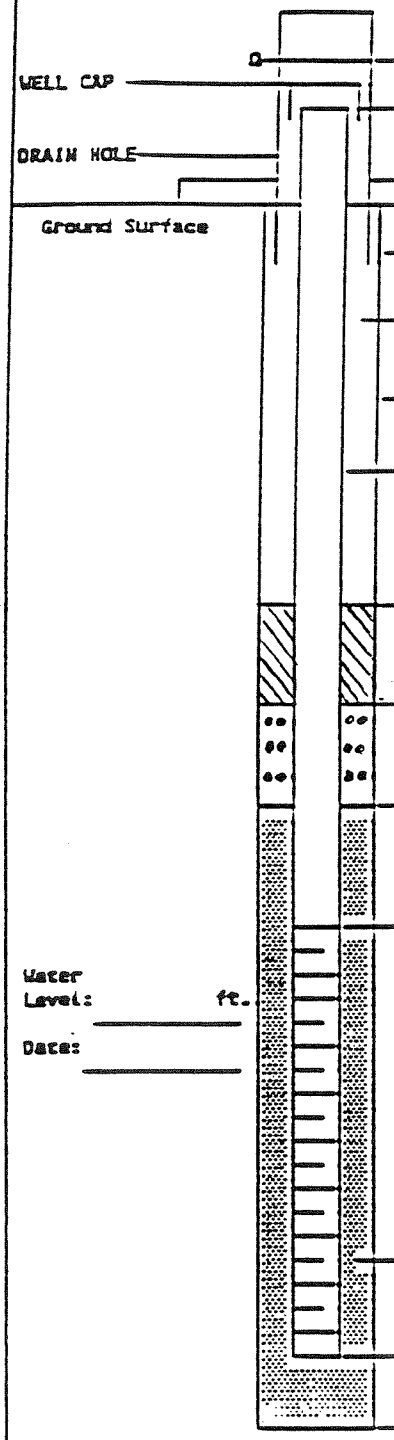
DEPTH OF BOREHOLE: 28 ft

WELL INSTALLATION DIAGRAM

PROJECT: NTC Orlando
PROJECT No.: 2545.05
ELEVATION:
FIELD GEOLOGIST: J. Nash

SITE NAME: Area C.
DATE INSTALLED: 12/14/97
DRILLING METHOD: Rotosonic
AUGER SIZE: 6 in.

Site: OU4
Well ID: OLD-13-42



ELEVATION OF TOP OF PROTECTIVE CASING: _____

ELEVATION OF TOP OF WELL RISER: _____

GRAVEL PAD

OUTSIDE DIAMETER OF SURFACE CASING: —

TYPE OF BACKFILL: Neat Cement Grout

BOREHOLE DIAMETER: 6 in.

WELL RISER ID: 2 in.

TYPE OF RISER: Sch. 40 PVC

DEPTH TO TOP OF FINE SAND: 15.5 ft BLS

TYPE OF FINE SAND: 20/30

DEPTH TO TOP OF BENTONITE SEAL: 17 ft

TYPE OF SEAL: Med. Bentonite chips

DEPTH TO TOP OF SAND PACK: 21 ft

DEPTH TO TOP OF WELL SCREEN: 23 ft

TYPE OF WELL SCREEN: sch 40 PVC

WELL SCREEN ID: 2 in

WELL SCREEN SLOT SIZE: .020 in

LENGTH OF WELL SCREEN: 5 ft

TYPE OF SAND PACK: 20/30

DEPTH TO BOTTOM OF WELL SCREEN: 28 ft

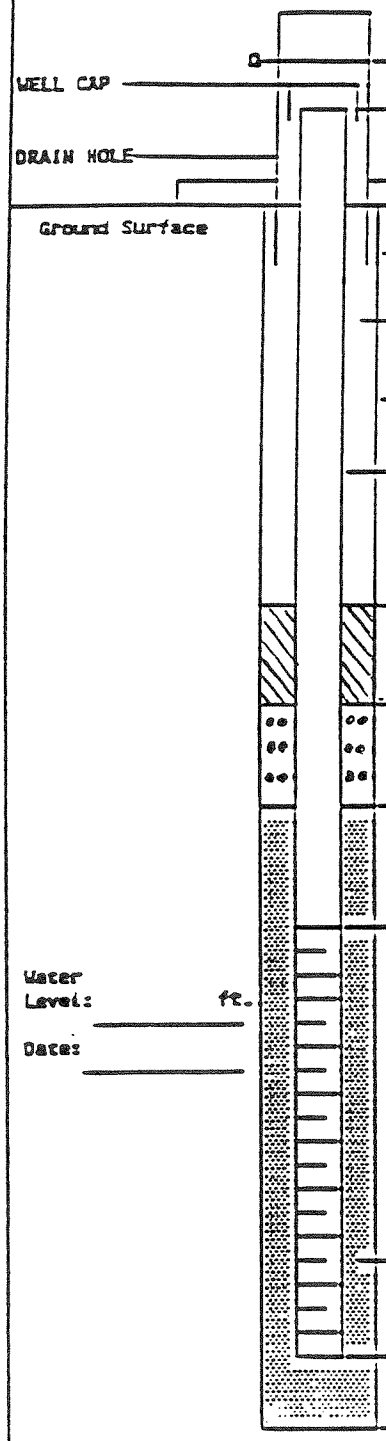
DEPTH OF BOREHOLE: 28 ft

WELL INSTALLATION DIAGRAM

PROJECT: NTC Orlando
PROJECT No.: 2545.05
ELEVATION:
FIELD GEOLOGIST: J. Nash

SITE NAME: Area C.
DATE INSTALLED: 12/14/97
DRILLING METHOD: Rotosonic
AUGER SIZE: 6 in

Site: OU 4
Well ID: OLD-13-43



ELEVATION OF TOP OF PROTECTIVE CASING: _____

ELEVATION OF TOP OF WELL RISER: _____

GRAVEL PAD

OUTSIDE DIAMETER OF SURFACE CASING: —

TYPE OF BACKFILL: Neat Cement Grout

BOREHOLE DIAMETER: 6 in

WELL RISER ID: 2 in

TYPE OF RISER: Sch 40 PVC

DEPTH TO TOP OF FINE SAND: 32 ft BLS

TYPE OF FINE SAND: 20/30

DEPTH TO TOP OF BENTONITE SEAL: 36 ft

TYPE OF SEAL: Med. Bentonite Chips

DEPTH TO TOP OF SAND PACK: 43 ft

DEPTH TO TOP OF WELL SCREEN: 45 ft

TYPE OF WELL SCREEN: Sch 40 PVC

WELL SCREEN ID: 2 in

WELL SCREEN SLOT SIZE: .020 in

LENGTH OF WELL SCREEN: 5 ft

TYPE OF SAND PACK: 20/30

DEPTH TO BOTTOM OF WELL SCREEN: 50 ft

DEPTH OF BOREHOLE: 50 ft

APPENDIX I

APPENDIX I

MONITORING WELL DEVELOPMENT LOGS

WELL DEVELOPMENT RECORD

Project: OU4	Well Installation Date and Time: 12/17/97		Project No. 02545.05
Client: NTC Orlando	Well Development Date and Time:	Logged by: JN	Checked by: MH
Well/Site I.D.: OLD-13-33	Weather:	Start Date: 12/31/97	Finish Date: 12/31/97
Volume of Drilling Fluid Lost (gal.)	Volume of Water in Well and Filter Pack (gal.). 5.62 Gallons	Start Time: 10:59	Finish Time: 11:49

Installed Depth From Top of Well Casing to Bottom of Well:

Initial Depth to Water (ft): 4.85'	Initial Depth to Well Bottom:

Water Level during Initial Pumping/Purging (ft):

Depth to Water at Termination of Pumping/Purging (ft): ~~4.85'~~	Depth to Well Bottom at Termination of Pumping/Purging (ft):

	TIME	TEMP.	pH	Conductivity	Turbidity ~~Approximate Pumping Rate (gal/min)~~	Vo
BEGINNING OF WELL DEVELOPMENT	1113	20.9	5.82	119	74.2	50
	1130	20.9	5.91	126	48.9	80
	1139	21.6	5.92	129	17.06	110
END OF WELL DEVELOPMENT						

NOTES: (Include physical character of removed water, type & size of pump, volume of water removed.)

Well Developer's Signature

WELL DEVELOPMENT RECORD

Project: OU4	Well Installation Date and Time: 12/17/97		Project No. 02545.05
Client: NTC Orlando	Well Development Date and Time:	Logged by: JN	Checked by: MH
Well/Site I.D.: OLD-13-34	Weather:	Start Date: 12/31/97	Finish Date: 12/31/97
Volume of Drilling Fluid Lost (gal.) 0	Volume of Water in Well and Filter Pack (gal.) 6.5 Gallons	Start Time: 10:18	Finish Time: 10:55

Installed Depth From Top of Well Casing to Bottom of Well:

Initial Depth to Water (ft): 4.88'	Initial Depth to Well Bottom:

Water Level during Initial Pumping/Purging (ft):

Depth to Water at Termination of Pumping/Purging (ft):	Depth to Well Bottom at Termination of Pumping/Purging (ft): 28.72

	TIME	TEMP.	pH	Conductivity	~~Approximate Pumping Rate (gal/min)~~ Turbidity	Vol
BEGINNING OF WELL DEVELOPMENT	1034	23.1	5.10	69	22.2	50
	1043	23.2	5.18	69	18.85	
	1053	22.9	5.13	70	10.61	100
END OF WELL DEVELOPMENT						

NOTES: (Include physical character of removed water, type & size of pump, volume of water removed.)

Well Developer's Signature

WELL DEVELOPMENT RECORD

Project: OU4	Well Installation Date and Time: 12/17/97		Project No. 02545.05
Client: NTC Orlando	Well Development Date and Time:	Logged by: JN	Checked by: MH
Well/Site I.D.: OLD-13-35	Weather:	Start Date: 12/31/97	Finish Date: 12/31/97
Volume of Drilling Fluid Lost (gal.) 0	Volume of Water in Well and Filter Pack (gal.)	Start Time: ~~0820~~ 0821	Finish Time: 0941

Installed Depth From Top of Well Casing to Bottom of Well:

Initial Depth to Water (ft): 4.91'	Initial Depth to Well Bottom:

Water Level during Initial Pumping/Purging (ft):

Depth to Water at Termination of Pumping/Purging (ft):	Depth to Well Bottom at Termination of Pumping/Purging (ft): 59.52'

	TIME	TEMP.	pH	Conductivity	Turbidity ~~Approximate Pumping Rate (gal/min)~~	Vo
BEGINNING OF WELL DEVELOPMENT	0840	23.2	5.69	210	>200	50
	0850	24.0	5.46	160	>200	100
	0900	24.3	5.23	150	118.6	15
	0913	23.9	5.24	150	109.8	165
	0925	23.9	5.22	150	96.5	180
END OF WELL DEVELOPMENT	0939	24.1	5.21	149	82.0	200

NOTES: (Include physical character of removed water, type & size of pump, volume of water removed.)

Well Developer's Signature

WELL DEVELOPMENT RECORD

Project: OU4	Well Installation Date and Time: 12/13/97		Project No. 02545.05
Client: NTC Orlando	Well Development Date and Time: 12/16/97	Logged by: JN	Checked by: MH
Well/Site I.D.: OLD-13-36	Weather:	Start Date: 12/16/97	Finish Date: 12/30/97
Volume of Drilling Fluid Lost (gal.) 0	Volume of Water in Well and Filter Pack (gal.) 5 Gal.	Start Time: 16:27	Finish Time: 1442

Installed Depth From Top of Well Casing to Bottom of Well:

Initial Depth to Water (ft):	Initial Depth to Well Bottom:

Water Level during Initial Pumping/Purging (ft):

Depth to Water at Termination of Pumping/Purging (ft): 5.19'	Depth to Well Bottom at Termination of Pumping/Purging (ft): 14.20'

	TIME	TEMP.	pH	Conductivity	Turbidity ~~Approximate Pumping Rate (gal/min)~~	Vol
BEGINNING OF WELL DEVELOPMENT	16:28	23.5	6.10	258	>200	5
	17:13	23.5	6.13	188	>200	
	17:26	23.0	6.11	170	>200	120
12/30/97 →	13:20	23.1	Broken	134	196.7	125
	13:28	23.3	↓	129	>200	150
END OF WELL DEVELOPMENT	14:42	24.0	↓	133	138.5	165

NOTES: (Include physical character of removed water, type & size of pump, volume of water removed.)

Well Developer's Signature

WELL DEVELOPMENT RECORD

Project: OU4	Well Installation Date and Time: 12/13/97		Project No. 02545.05
Client: NTC Orlando	Well Development Date and Time: 12/16/97	Logged by: JN	Checked by: MH
Well/Site I.D.: OLD-13-37	Weather:	Start Date: 12/16/97	Finish Date: 12/30/97
Volume of Drilling Fluid Lost (gal.) 0	Volume of Water in Well and Filter Pack (gal.) 5.9 Gallons	Start Time: 1330	Finish Time: 1310

Installed Depth From Top of Well Casing to Bottom of Well:

Initial Depth to Water (ft):	Initial Depth to Well Bottom:

Water Level during Initial Pumping/Purging (ft):

Depth to Water at Termination of Pumping/Purging (ft): 5.32'	Depth to Well Bottom at Termination of Pumping/Purging (ft): 24.84'

	TIME	TEMP.	pH	Conductivity	Turbidity ~~Approximate Pumping Rate (gal/min)~~	Vol
BEGINNING OF WELL DEVELOPMENT	1338	28.4	6.04	485	>200	20
	1504	30.0	6.08	515	>200	75
	1601	25.8	5.54	505	>200	125
12/30/97	12:07	25.0	Broken	491	>200	155
	12:31	24.0		499	>200	200
	12:51	24.0		499	>200	230
END OF WELL DEVELOPMENT	13:04	24.0		501	>200	240

NOTES: (Include physical character of removed water, type & size of pump, volume of water removed.)

Well Developer's Signature

WELL DEVELOPMENT RECORD

Project: OU4	Well Installation Date and Time: 12/13/97		Project No. 02545.05
Client: NTC Orlando	Well Development Date and Time: 12/16/97	Logged by: JN	Checked by: MH
Well/Site I.D.: OLD-13-38	Weather:	Start Date: 12/16/97	Finish Date: 12/30/97
Volume of Drilling Fluid Lost (gal.) 0	Volume of Water in Well and Filter Pack (gal.) 11 gallons	Start Time: 11:14	Finish Time: 11:42

Installed Depth From Top of Well Casing to Bottom of Well:

Initial Depth to Water (ft): 4.09'	Initial Depth to Well Bottom: ~~55.70~~ MH

Water Level during Initial Pumping/Purging (ft):

Depth to Water at Termination of Pumping/Purging (ft): 5.39'	Depth to Well Bottom at Termination of Pumping/Purging (ft): 55.70

	TIME	TEMP.	pH	Conductivity	Turbidity ~~Approximate Pumping Rate (gal/min)~~	Vol
BEGINNING OF WELL DEVELOPMENT	11:14	24.9	5.92	270	>200	50g
	11:24	25.5	5.63	198	184.4	10[illegible]
	11:43	25.3	5.54	199	199.8	120
	11:46	25.3	5.51	182	>200	135
	11:49	25.1	5.47	180	147.3	155
END OF WELL DEVELOPMENT	11:53	25.4	5.51	180	>200	18[illegible]

NOTES: (Include physical character of removed water, type & size of pump, volume of water removed.)

Well Developer's Signature Mar Harm

WELL DEVELOPMENT RECORD

Project:	Well Installation Date and Time:		Project No.
Client:	Well Development Date and Time:	Logged by:	Checked by:
Well/Site I.D.: OLD-13-38	Weather:	Start Date:	Finish Date:
Volume of Drilling Fluid Lost (gal.)	Volume of Water in Well and Filter Pack (gal.)	Start Time:	Finish Time:

Installed Depth From Top of Well Casing to Bottom of Well:

Initial Depth to Water (ft):	Initial Depth to Well Bottom:

Water Level during Initial Pumping/Purging (ft):

Depth to Water at Termination of Pumping/Purging (ft):	Depth to Well Bottom at Termination of Pumping/Purging (ft):

	TIME	TEMP.	pH	Conductivity	Turbidity ~~Approximate Pumping Rate (gal/min)~~	Vol
BEGINNING OF WELL DEVELOPMENT	11:16	23.0	Broken	220	131.6	190
	11:27	24.0		193	28.8	210
	11:35	24.2		189	40.9	23
	11:41	24.0		184	29.7	30
END OF WELL DEVELOPMENT						

NOTES: (Include physical character of removed water, type & size of pump, volume of water removed.)

Well Developer's Signature

WELL DEVELOPMENT RECORD

Project: OU4	Well Installation Date and Time: 12/15/97		Project No. 02545.05
Client: NTC Orlando	Well Development Date and Time: 12/17/97	Logged by: JN	Checked by: MH
Well/Site I.D.: OLD-13-39	Weather:	Start Date: 12/17/97	Finish Date: 12/17/97
Volume of Drilling Fluid Lost (gal.) 0	Volume of Water in Well and Filter Pack (gal.) 5.7 Gal.	Start Time: 0746	Finish Time: 1152

Installed Depth From Top of Well Casing to Bottom of Well:

Initial Depth to Water (ft):	Initial Depth to Well Bottom:

Water Level during Initial Pumping/Purging (ft):

Depth to Water at Termination of Pumping/Purging (ft): 6.72'	Depth to Well Bottom at Termination of Pumping/Purging (ft): 25.43'

	TIME	TEMP.	pH	Conductivity	Turbidity ~~Approximate Pumping Rate (gal/min)~~	Vol
BEGINNING OF WELL DEVELOPMENT	0751	22.1	6.39	510	>200	5
	0812	25.5	5.90	218	>200	
	8:48	24.0	5.25	190	>200	50
stop →	11:16	25.6	5.42	210	>200	55
	11:38	25.9	5.07	175	97	90
	1144	26.1	5.01	171	36.3	95
END OF WELL DEVELOPMENT	1150	26.3	4.99	169	18.22	105

NOTES: (Include physical character of removed water, type & size of pump, volume of water removed.)

Well Developer's Signature

WELL DEVELOPMENT RECORD

Project: OU4	Well Installation Date and Time: 12/15/97		Project No. 02545.05
Client: NTC Orlando	Well Development Date and Time:	Logged by: JN	Checked by: MN
Well/Site I.D.: OLD-13-40	Weather:	Start Date: 12/17/97	Finish Date: 12/31/97
Volume of Drilling Fluid Lost (gal.) 0	Volume of Water in Well and Filter Pack (gal.) 5.8 Gallons	Start Time: 1310	Finish Time: 1352

Installed Depth From Top of Well Casing to Bottom of Well:

Initial Depth to Water (ft):	Initial Depth to Well Bottom:

Water Level during Initial Pumping/Purging (ft):

Depth to Water at Termination of Pumping/Purging (ft): 4.60'	Depth to Well Bottom at Termination of Pumping/Purging (ft): 23.65'

	TIME	TEMP.	pH	Conductivity	Turbidity ~~Approximate Pumping Rate (gal/min)~~	Vo
BEGINNING OF WELL DEVELOPMENT	1336	25.1	5.59	339	>200	22
	1350	25.0	5.40	209	>200	50
12/31/97	13:13 ~~1405~~	25.2	5.60	172	>200	125
	1327	25.5	5.37	157	136.8	150
	1335	25.9	5.36	152	101.7	16[illegible]
END OF WELL DEVELOPMENT	1349	25.8	5.37	149	72.3	17[illegible]

NOTES: (Include physical character of removed water, type & size of pump, volume of water removed.)

Well Developer's Signature

WELL DEVELOPMENT RECORD

Project: OU4	Well Installation Date and Time: 12/14/97		Project No. 02545.10
Client: NTC Orlando	Well Development Date and Time:	Logged by: MH	Checked by: MH
Well/Site I.D.: OLD-13-41	Weather:	Start Date: 12/18/97	Finish Date: 12/18/97
Volume of Drilling Fluid Lost (gal.) 0	Volume of Water in Well and Filter Pack (gal.) 6.5 Gallons	Start Time: 1010	Finish Time: 1110

Installed Depth From Top of Well Casing to Bottom of Well:

Initial Depth to Water (ft):

Initial Depth to Well Bottom:

Water Level during Initial Pumping/Purging (ft):

Depth to Water at Termination of Pumping/Purging (ft):

Depth to Well Bottom at Termination of Pumping/Purging (ft): 27.43

	TIME	TEMP.	pH	Conductivity	Turbidity ~~Approximate Pumping Rate (gal/min)~~	Vol
BEGINNING OF WELL DEVELOPMENT	1042	24.7	5.29	148	190.6	50
	1049	25.3	5.29	151	192.0	2
	1100	25.2	5.29	148	110.0	70
	1110	25.3	5.30	141	85.3	80
END OF WELL DEVELOPMENT						

NOTES: (Include physical character of removed water, type & size of pump, volume of water removed.)

Well Developer's Signature

WELL DEVELOPMENT RECORD

Project: OU4	Well Installation Date and Time: 12/14/97		Project No. 02545.05
Client: NTC Orlando	Well Development Date and Time: 12/18/97	Logged by: MH	Checked by: MH
Well/Site I.D.: OLD-13-42	Weather:	Start Date: 12/18/97	Finish Date: 12/18/97
Volume of Drilling Fluid Lost (gal.) 0	Volume of Water in Well and Filter Pack (gal.) 6.5 Gallons	Start Time: 0912	Finish Time: 0945

Installed Depth From Top of Well Casing to Bottom of Well:

Initial Depth to Water (ft):	Initial Depth to Well Bottom:

Water Level during Initial Pumping/Purging (ft):

Depth to Water at Termination of Pumping/Purging (ft):	Depth to Well Bottom at Termination of Pumping/Purging (ft): 27.55'

	TIME	TEMP.	pH	Conductivity	Turbidity ~~Approximate Pumping Rate (gal/min)~~	Vol
BEGINNING OF WELL DEVELOPMENT	0912	22.1	5.60	142	186.0	45
	0922	24.3	5.49	301	168.7	55
	0929	24.8	5.26	145	62.8	65
	0939	24.5	5.24	155	127.1	80
	0945	24.4	5.40	238	138.2	90
END OF WELL DEVELOPMENT						

NOTES: (Include physical character of removed water, type & size of pump, volume of water removed.)

Well Developer's Signature

WELL DEVELOPMENT RECORD

Project: OU4	Well Installation Date and Time: 12/14/97		Project No. 02545.05
Client: NTC Orlando	Well Development Date and Time:	Logged by: MH	Checked by: MH
Well/Site I.D.: OLD-13-43	Weather:	Start Date: 12/18/97	Finish Date: 12/18/97
Volume of Drilling Fluid Lost (gal.) 0	Volume of Water in Well and Filter Pack (gal.) 11 Gallons	Start Time: ~~1408~~ 1310	Finish Time: 1500

Installed Depth From Top of Well Casing to Bottom of Well:

Initial Depth to Water (ft):	Initial Depth to Well Bottom:

Water Level during Initial Pumping/Purging (ft):

Depth to Water at Termination of Pumping/Purging (ft):	Depth to Well Bottom at Termination of Pumping/Purging (ft): 55.03

	TIME	TEMP.	pH	Conductivity	Turbidity ~~Approximate Pumping Rate (gal/min)~~	Vol
BEGINNING OF WELL DEVELOPMENT	14:08	26.0	5.78	200	198.0	80
	14:48	25.4	5.73	191	>200	--
	15:00	25.4	5.75	195	197.1	150
END OF WELL DEVELOPMENT						

NOTES: (Include physical character of removed water, type & size of pump, volume of water removed.)

Well Developer's Signature

APPENDIX J

APPENDIX J

MONITORING WELL GROUNDWATER SAMPLING LOGS

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-12-01A
Time: Start: 1244 End: 1325

Point of Interest: 004
Date: 2/10/99
Signature of Sampler: Mel Tolar for John Nash

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up _____ Ft. (from ground)

Protective _____ Ft. Casing/Well Difference

Protective _____ Ft. Casing

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 4.0 Gal.
Temperature, Deg. C	24.2	24.0	24.0	24.0	24.0
pH, units	7.07	7.08	6.89	6.82	6.81
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	370	360	360	360	362
Oxidation - Reduction, +/- mv	246.3	244.8	255.2	272.7	278.4
~~Dissolved Oxygen, ppm~~ Turbidity	29.0	32.0	36.2	41.8	55.9

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	12 / G / 001 / 02
SVOA		4°C			12 / G / 001 / 02 MS
Pest/PCB		4°C			12 / G / 001 / 02 MSD
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/10/98
Sample Location ID: OLA-12-02A
Time: Start: 1250 End: 1355
Signature of Sampler: Mark Tolar for John Nash

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = [_____ Gal/Vol _____ Total Gal Purged]

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 2.5 Gal.	@ 5.0 Gal.	@ 5.5 Gal.	@ 6.0 Gal.
Temperature, Deg. C	24	24	24.8	24	24
pH, units	6.34	6.24	6.06	6.01	6.02
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	131	131	129	130	129
Oxidation - Reduction, +/- mv	276.8	276.4	301.5	302	302.8
~~Dissolved Oxygen, ppm~~ Turbidity	19.9	26.6	18.68	42.3	45.0

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCl		✓	12 / G / 002 / 02
SVOA		4°C			12 / G / 002 / 02 MS
Pest/PCB		4°C			12 / G / 002 / 02 MSD
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 253017
Date: 2/10/98
Sample Location ID: OU-12-03A
Time: Start: 1415 End: 1450
Signature of Sampler: Mark Tolar for John Nash

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well
___ Top of Protective Casing
___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material:
___ PVC
___ SS
_____

Well Locked?:
___ Yes
___ No

Well Dia.
___ 2 inch
___ 4 inch
___ 6 inch
___ _____

Water Level Equip. Used:
___ Elect. Cond. Probe
___ Float Activated
___ Press. Transducer
___ _____

Height of Water Column _____ Ft. X
___ .16 Gal/Ft. (2 in.)
___ .65 Gal/Ft. (4 in.)
___ 1.5 Gal/Ft. (6 in.)
___ ___ Gal/Ft. (___ in.)
=
_____ Gal/Vol
_____ Total Gal Purged

Well Integrity:

	Yes	No
Prot. Casing Secure	___	___
Concrete Collar Intact	___	___
Other _____	___	___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
___	✓	Peristaltic Pump	_____
___	___	Submersible Pump	_____
___	___	Bailer	_____
___	___	PVC/Silicon Tubing	_____
___	✓	Teflon/Silicon Tubing	_____
___	___	Airlift	_____
___	___	Hand Pump	_____
___	___	In-line Filter	_____
___	___	Press/Vac Filter	_____
___	___		_____

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm

Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 2.0 Gal.	@ 4.0 Gal.	@ 5.0 Gal.	@ ____ Gal.
Temperature, Deg. C	25°	26	25.5	25.0	
pH, units	5.69	5.53	5.46	5.46	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	201	201	208	209	
Oxidation - Reduction, +/- mv	319.5	333.2	337.4	340.0	
~~Dissolved Oxygen, ppm~~ Turbidity	15.03	4.68	3.68	3.79	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA	___	HCL	_____	___	___/___/___/___
SVOA	___	4OC	_____	___	___/___/___/___
Pest/PCB	___	4OC	_____	___	___/___/___/___
Inorganics	___	HNO_3	_____	___	___/___/___/___
Explosives	___	4°C	_____	___	___/___/___/___
TPH	___	H_2SO_4	_____	___	___/___/___/___
TOC	___	H_2SO_4	_____	___	___/___/___/___
Nitrate	___	H_2SO_4	_____	___	___/___/___/___

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.12
Date: 2/10/98
Sample Location ID: OU-12-04A
Time: Start: 1422 End: 1504
Signature of Sampler: Mark T for John Doe

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical ___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up _____ Ft. (from ground)

Protective _____ Ft. Casing/Well Difference

Protective _____ Ft. Casing

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 1 Gal.	@ 2 Gal.	@ 3 Gal.	@ 4 Gal.
Temperature, Deg. C	25	25	25	25	25
pH, units	6.04	6.00	6.00	6.01	6.01
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	121	140	140	138	138
Oxidation - Reduction, +/- mv	321.4	340.2	348.2	353.1	347.0
~~Dissolved Oxygen, ppm~~ Turbidity	14.00	18.70	18.55	15.24	10.29

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	12, 6, 004, 02
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/12/98
Sample Location ID: OLD-13-01A
Time: Start: 0918 End: 1010
Signature of Sampler: Mark Tobias for John Wa

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1.5 Gal.	@ 3.0 Gal.	@ 6.5 Gal.	@ ____ Gal.
Temperature, Deg. C	22	23	23	22	
pH, units	6.25	6.54	6.61	6.67	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	159	160	160	161	
Oxidation - Reduction, +/- mv	-42.1	-64.6	-53.1	-16.8	
~~Dissolved Oxygen, ppm~~ Turbidity	50.05	44.40	37.4	45.8	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	13 / G / 001 / 03
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/12/98
Sample Location ID: OU-13-02
Time: Start: 0813 End: 0910
Signature of Sampler: Mark T for John Nash

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity:	Yes	No
Prot. Casing Secure	___	___
Concrete Collar Intact	___	___
Other _____	___	___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
___	___	Peristaltic Pump	_____
___	___	Submersible Pump	_____
___	___	Bailer	_____
___	___	PVC/Silicon Tubing	_____
___	✓	Teflon/Silicon Tubing	_____
___	___	Airlift	_____
___	___	Hand Pump	_____
___	___	In-line Filter	_____
___	___	Press/Vac Filter	_____
___	___		_____

Decontamination Fluids Used:

(✓ All That Apply at Location)

___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.5 Gal.	@ 4.5 Gal.	@ 6.0 Gal.
Temperature, Deg. C	21.5	23	23	23	23
pH, units	4.23	4.40	4.58	4.60	4.59
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	153	138	140	135	131
Oxidation - Reduction, +/- mv	-59.5	-66.4	-82.8	-84.3	-81.4
~~Dissolved Oxygen, ppm~~ Turbidity	32.6	31.5	31.3	25.5	14.1

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA	___	HCl	_____	✓	13 / 6 / 002 / 03
SVOA	___	4°C	_____	___	___ / ___ / ___ / ___
Pest/PCB	___	4°C	_____	___	___ / ___ / ___ / ___
Inorganics	___	HNO_3	_____	___	___ / ___ / ___ / ___
Explosives	___	4°C	_____	___	___ / ___ / ___ / ___
TPH	___	H_2SO_4	_____	___	___ / ___ / ___ / ___
TOC	___	H_2SO_4	_____	___	___ / ___ / ___ / ___
Nitrate	___	H_2SO_4	_____	___	___ / ___ / ___ / ___

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/11/98
Sample Location ID: OLD-13-03A
Time: Start: 1512 End: 1545
Signature of Sampler: Mark Tidow for John Nash

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up _____ Ft. (from ground)

Protective _____ Ft. Casing/Well Difference

Protective _____ Ft. Casing

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1 Gal.	@ 2.5 Gal.	@ 3.5 Gal.	@ ____ Gal.
Temperature, Deg. C	25	24	24	24	
pH, units	6.39	6.30	6.31	6.29	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	290	291	290	290	
Oxidation - Reduction, +/- mv	-45.4	-55.4	-70.1	-71.7	
~~Dissolved Oxygen, ppm~~ Turbidity	3.09	2.07	0.50	0.10	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	13 / 6 / 003 / 03
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 02530.17
Date: 2/11/98
Sample Location ID: OU4-13-04C
Time: Start: 1507 End: 1535
Signature of Sampler: Mel Tolar for John Nash

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical ___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1.5 Gal.	@ 2.5 Gal.	@ 3.5 Gal.	@ ____ Gal.
Temperature, Deg. C	25	24	24	24	
pH, units	5.48	5.58	5.57	5.58	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	168	150	148	148	
Oxidation - Reduction, +/- mv	-71.7	-86.1	-95.5	-92.1	
~~Dissolved Oxygen, ppm~~ Turbidity	18.0	5.31	3.54	2.70	

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCl		✓	13 / 6 / 004 / 03
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-14-01A
Time: Start: 1016 End: 1104

Point of Interest: OU4
Date: 2/10/98
Signature of Sampler: Mark Tolson

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well
___ Top of Protective Casing
___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material:
___ PVC
___ SS
_____

Well Locked?:
___ Yes
___ No

Well Dia.
___ 2 inch
___ 4 inch
___ 6 inch
___ _____

Water Level Equip. Used:
___ Elect. Cond. Probe
___ Float Activated
___ Press. Transducer
___ _____

Height of Water Column _____ Ft. X
___ .16 Gal/Ft. (2 in.)
___ .65 Gal/Ft. (4 in.)
___ 1.5 Gal/Ft. (6 in.)
___ ___ Gal/Ft. (__in.)
= _____ Gal/Vol
_____ Total Gal Purged

Well Integrity:

	Yes	No
Prot. Casing Secure	___	___
Concrete Collar Intact	___	___
Other _____	___	___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
___	___	Peristaltic Pump	_____
___	___	Submersible Pump	_____
___	___	Bailer	_____
___	___	PVC/Silicon Tubing	_____
___	✓	Teflon/Silicon Tubing	_____
___	___	Airlift	_____
___	___	Hand Pump	_____
___	___	In-line Filter	_____
___	___	Press/Vac Filter	_____
___	___		_____

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm

Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1 Gal.	@ 2 Gal.	@ 3.5 Gal.	@ 5.0 Gal.
Temperature, Deg. C	21	21	21	21	21
pH, units	6.75	6.68	6.71	6.70	6.71
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	228	170	170	170	170
Oxidation - Reduction, +/- mv	221.4	151.8	153.1	139.4	141.4
~~Dissolved Oxygen, ppm~~ Turbidity	125.7	18.4	18.25	16.20	9.52

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA	___	HCl	_____	✓	14 / G / 001 / 02
SVOA	___	4°C	_____	___	___ / ___ / ___ / ___
Pest/PCB	___	4°C	_____	___	___ / ___ / ___ / ___
Inorganics	___	HNO_3	_____	___	___ / ___ / ___ / ___
Explosives	___	4°C	_____	___	___ / ___ / ___ / ___
TPH	___	H_2SO_4	_____	___	___ / ___ / ___ / ___
TOC	___	H_2SO_4	_____	___	___ / ___ / ___ / ___
Nitrate	___	H_2SO_4	_____	___	___ / ___ / ___ / ___

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/10/98
Sample Location ID: OLD-14-02A
Time: Start: 0748 End: 0909
Signature of Sampler: [signature]

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None
- ___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1 Gal.	@ 2 Gal.	@ 3.5 Gal.	@ 4.2 Gal.
Temperature, Deg. C	20	20	20	20	20
pH, units	6.45	6.47	6.46	6.41	6.89
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	250	250	250	235	242
Oxidation - Reduction, +/- mv	260.1	264.8	262.7	268.1	281.1
~~Dissolved Oxygen, ppm~~ Turbidity	15.25	6.35	5.03	4.70	3.20

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	14 / G / 002 / 03
SVOA		4°C			14 / G / 002 / 03D
Pest/PCB		4°C			14 / G / 002 / 03
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLO-14-03A
Time: Start: 1434 End: 1532

Point of Interest: OU4
Date: 2/9/98
Signature of Sampler: Mark Todaro

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up _____ Ft. (from ground)

Protective _____ Ft. Casing/Well Difference

Protective _____ Ft. Casing

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1 Gal.	@ 2 Gal.	@ 3 Gal.	@ ___ Gal.
Temperature, Deg. C	25	25	25	25	
pH, units	6.55	6.46	6.47	6.51	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	290	280	280	275	
Oxidation - Reduction, +/- mv	267.0	260.0	244.0	243.0	
~~Dissolved Oxygen, ppm~~ Turbidity	6.93	6.45	8.90	7.60	

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	14 / G / 003 / 04
SVOA		4°C			14 / H / 003 / 04
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2520.17
Sample Location ID: OLD-14-04A
Time: Start: 0858 End: 0958

Point of Interest: OU4
Date: 2/10/98
Signature of Sampler: Mark C Tullos for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical ___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm

Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1 Gal.	@ 2.5 Gal.	@ 4.0 Gal.	@ 5.0 Gal.
Temperature, Deg. C	23	24	24	24	24
pH, units	6.54	6.39	6.38	6.35	6.35
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	170	150	160	160	157
Oxidation - Reduction, +/- mv	236.8	246.7	220.5	211.6	227.1
~~Dissolved Oxygen, ppm~~ Turbidity	12.16	15.10	9.90	11.04	11.44

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	14 / 6 / 004 / 03
SVOA		4°C			14 / H / 004 / 03
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-14-05A
Time: Start: 0938 End: 1024

Point of Interest: OU4
Date: 2/10/98
Signature of Sampler: [signature] for JC MC

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
___ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1.0 Gal.	@ 2.5 Gal.	@ 4.0 Gal.	@ ____ Gal.
Temperature, Deg. C	23	24	24	23	
pH, units	6.60	6.59	6.60	6.63	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	219	218	212	212	
Oxidation - Reduction, +/- mv	243.3	247.6	248.1	215.2	
~~Dissolved Oxygen, ppm~~ Turbidity	18.28	10.80	6.62	4.74	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	14 / G / 005 / 01
SVOA		4°C			14 / H / 005 / 01
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-14-06A
Time: Start: 0747 End: 0845

Point of Interest: OU4
Date: 2/10/98
Signature of Sampler: [signature] for JC MC

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up _____ Ft. (from ground)

Protective _____ Ft. Casing/Well Difference

Protective _____ Ft. Casing

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1 Gal.	@ 2.5 Gal.	@ 4.0 Gal.	@ _____ Gal.
Temperature, Deg. C	18	18	20	20	
pH, units	6.88	6.86	6.91	6.87	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	370	350	350	260	
Oxidation - Reduction, +/- mv	216.7	216.8	218.6	228.9	
~~Dissolved Oxygen, ppm~~ Turbidity					

Sample Collection Requirements
(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	14 / 6 / 006 / 01
SVOA		4°C			14 / 4 / 006 / 01
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-14-07A
Time: Start: 1421 End: 1510

Point of Interest: OU4
Date: 2/9/98
Signature of Sampler: [signature] for Joh[illegible]

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS ___ _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None
- ___ _____
- ___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1.0 Gal.	@ 2.0 Gal.	@ 4.0 Gal.	@ _____ Gal.
Temperature, Deg. C	25	23	25	25	
pH, units	6.34	6.70	6.88	6.89	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	300	202	200	200	
Oxidation - Reduction, +/- mv	283	242.6	258.2	259.0	
~~Dissolved Oxygen, ppm~~ Turbidity	14.38	8.38	5.20	5.20	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	14 / G / 007 / 01
SVOA		4°C			14 / A / 007 / 01
Pest/PCB		4°C			14 / G / 007 / 01 MS
Inorganics		HNO_3			14 / G / 007 / 01 MSD
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-14-08A
Time: Start: 1048 End: 1132

Point of Interest: OU4
Date: 2/10/98
Signature of Sampler: [signature] for J.C. [illegible]

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm

Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1.5 Gal.	@ 2.5 Gal.	@ 4.0 Gal.	@ ____ Gal.
Temperature, Deg. C	22	23	23	23	
pH, units	6.67	6.67	6.68	6.71	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	218	210	210	210	
Oxidation - Reduction, +/- mv	173.1	182.8	217.5	221.3	
~~Dissolved Oxygen, ppm~~ Turbidity	28.1	22.4	18.10	18.11	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	14 / G / 008 / 01
SVOA		4°C			14 / A / 008 / 01
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2520.17
Sample Location ID: OLD-13-07A
Time: Start: 1109 End: 1145

Point of Interest: OU4
Date: 1/27/98
Signature of Sampler: [illegible] for [illegible]

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well
___ Top of Protective Casing
___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity:

	Yes	No
Prot. Casing Secure	___	___
Concrete Collar Intact	___	___
Other _____	___	___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
___	___	Peristaltic Pump	_____
___	___	Submersible Pump	_____
___	___	Bailer	_____
___	___	PVC/Silicon Tubing	_____
___	✓	Teflon/Silicon Tubing	_____
___	___	Airlift	_____
___	___	Hand Pump	_____
___	___	In-line Filter	_____
___	___	Press/Vac Filter	_____
___	___		_____

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm

Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1.0 Gal.	@ 3.0 Gal.	@ 4.5 Gal.	@ _____ Gal.
Temperature, Deg. C	23.5	23.5	23.5	23.5	
pH, units	6.29	6.35	6.35	6.38	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	145	135	128	140	
Oxidation - Reduction, +/- mv	122.7	124.8	142.2	154.5	
~~Dissolved Oxygen, ppm~~ Turbidity	3.80	2.90	2.55	2.86	

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA	___	HCL	_____	✓	13 / 6 / 007 / 06
SVOA	___	4°C	_____	___	___ / ___ / ___ / ___
Pest/PCB	___	4°C	_____	___	___ / ___ / ___ / ___
Inorganics	___	HNO_3	_____	___	___ / ___ / ___ / ___
Explosives	___	4°C	_____	___	___ / ___ / ___ / ___
TPH	___	H_2SO_4	_____	___	___ / ___ / ___ / ___
TOC	___	H_2SO_4	_____	___	___ / ___ / ___ / ___
Nitrate	___	H_2SO_4	_____	___	___ / ___ / ___ / ___

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/12/99
Sample Location ID: OLD-13-07A
Time: Start: 1445 End: 1536
Signature of Sampler: [signature] for JC MC

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm

Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 2.5 Gal.	@ 3.5 Gal.	@ ___ Gal.	@ ___ Gal.
Temperature, Deg. C	24.0	24	24		
pH, units	3.87	3.69	3.77		
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	166	168	168		
Oxidation - Reduction, +/- mv	-37.7	80.6	91.6		
~~Dissolved Oxygen, ppm~~ Turbidity	3.22	2.21	2.34		

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	13 / 6 / 0021 / 08
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2520.17
Sample Location ID: OLD-13-07A
Time: Start: 0940 End: 1000

Point of Interest: OU4
Date: 2/19/98
Signature of Sampler: [signature] for [illegible]

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well
___ Top of Protective Casing
___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective _____ Ft. Casing/Well Difference

Protective _____ Ft. Casing

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.0 Gal.	@ .5 Gal.	@ 1 Gal.	@ 1.5 Gal.	@ 2.0 Gal.
Temperature, Deg. C	22	22	23	23	23
pH, units	6.54	6.62	6.68	6.60	6.58
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	210	180	180	185	175
Oxidation - Reduction, +/- mv	150.3	150.0	151.7	148.0	120.3
~~Dissolved Oxygen, ppm~~ Turbidity					

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	13 / 6 / 007 / 09
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-13-07A
Time: Start: 1449 End: 1535

Point of Interest: OUY
Date: 3/12/98
Signature of Sampler: [signature] for JC MC

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up _____ Ft. (from ground)

Protective _____ Ft. Casing/Well Difference

Protective _____ Ft. Casing

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 1.5 Gal.	@ 3.0 Gal.	@ ___ Gal.	@ ___ Gal.
Temperature, Deg. C	21	22	21.5		
pH, units	6.45	6.29	6.42		
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	159	159	156		
Oxidation - Reduction, +/- mv	123.4	99.8	83.7		
~~Dissolved Oxygen, ppm~~ Turbidity	2.73	1.01	.67		

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	13 / 6 / 002 / 10
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2520.17
Sample Location ID: OLO-1307A
Time: Start: 1530 End: 1600

Point of Interest: OU4
Date: 2/5/98
Signature of Sampler: Mark C Tullos for JC MC

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ ___; Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1 Gal.	@ 2.5 Gal.	@ 3.5 Gal.	@ 4.5 Gal.	@ ____ Gal.
Temperature, Deg. C	23.4	23.0	23.0	22.9	
pH, units	6.63	6.40	6.34	6.37	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	178	172	171	172	
Oxidation - Reduction, ~~ph~~ mv	141.2	142.4	141.1	126.3	
~~Dissolved Oxygen, ppm~~ Turbidity	2.57	2.34	2.67	2.54	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	13 / G / 007 / 07
SVOA		4°C			13 / H / 007 / 07
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2520.17
Sample Location ID: OLD-13-09A
Time: Start: 1012 End: 1115

Point of Interest: OU4
Date: 1/28/98
Signature of Sampler: [signature] for J. [illegible]

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS ___ _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = [_____ Gal/Vol _____ Total Gal Purged]

Well Integrity: Yes / No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1 Gal.	@ 2.5 Gal.	@ 4.0 Gal.	@ 5.0 Gal.	@ _____ Gal.
Temperature, Deg. C	20.5	20.5	21	21	
pH, units	5.26	4.42	4.41	4.32	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	98	95	104	112	
Oxidation - Reduction, +/- mv	27.5	26.1	23.0	22.1	
~~Dissolved Oxygen, ppm~~ Turbidity	7.21	5.03	5.50	5.06	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4 / 6 / 009 / 03
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2520.17
Sample Location ID: OLA-17-04A
Time: Start: 1055 End: 1127

Point of Interest: OU4
Date: 2/4/98
Signature of Sampler: [signature] for JC

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes / No
Prot. Casing Secure
Concrete Collar Intact
Other _____

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0 Gal.	@ 1 Gal.	@ 2 Gal.	@ 3 Gal.	@ 4.5 Gal.
Temperature, Deg. C	21.0	21.1	21.1	20.9	21.1
pH, units	5.18	5.07	5.17	5.18	5.22
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	94	92	94	93	104
Oxidation - Reduction, +/- mv	35.8	53.8	46.6	42.6	25.0
~~Dissolved Oxygen, ppm~~ Turbidity	12.46	9.94	6.12	5.09	3.97

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4 / G / 005 / 04
SVOA		4°C			U4 / H / 005 / 04
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLA-13-09A
Time: Start: 1008 End: 1045

Point of Interest: OU4
Date: 7/19/98
Signature of Sampler: [signature] for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up _____ Ft. (from ground)

Protective _____ Ft. Casing/Well Difference

Protective _____ Ft. Casing

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1 Gal.	@ 2.5 Gal.	@ 3.0 Gal.	@ _____ Gal.	@ _____ Gal.
Temperature, Deg. C	21.5	22	22		
pH, units	5.13	5.10	4.81		
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	91	92	96		
Oxidation - Reduction, +- mv	-37.6	-56.7	-21.4		
~~Dissolved Oxygen, ppm~~ Turbidity					

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4 / G / 009 / 05
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLA-13-09A
Time: Start: 1012 End: 1115

Point of Interest: OU4
Date: 3/12/98
Signature of Sampler: [signature] for J.C. [illegible]

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well
___ Top of Protective Casing
___ _____

Well Riser Stick-up _____ Ft. (from ground)

Protective _____ Ft. Casing/Well Difference

Protective _____ Ft. Casing

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS ___ _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol; _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used: (✓ All That Apply at Location)

___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.7 Gal.	@ 2.3 Gal.	@ 4.5 Gal.	@ 5.0 Gal.	@ _____ Gal.
Temperature, Deg. C	20	20	20	21	
pH, units	5.21	5.16	5.41	5.26	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	70	89	88	88	
Oxidation - Reduction, +/- mv	8.1	-2.5	85	-6.7	
~~Dissolved Oxygen, ppm~~ TURBIDITY	3.91	2.66	2.00	1.21	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	04 / 6 / 009 / 06
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-13-09A
Time: Start: 1050 End: 1310

Point of Interest: OU4
Date: 3/17/98
Signature of Sampler: [signature] for [illegible]

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used: (✓ All That Apply at Location)

___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm

Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 2 Gal.	@ 2.5 Gal.	@ 3 Gal.	@ 3.5 Gal.	@ 4 Gal.
Temperature, Deg. C	23	24	24	24	24
pH, units	5.16	5.20	5.39	5.45	5.38
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	93	94	101	101	105
Oxidation - Reduction, +/- mv	-20.2	-25.7	-10.8	-20.3	-33.2
~~Dissolved Oxygen, ppm~~ Turbidity	2.59	2.31	2.24	2.48	2.01

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	114, 5, 009, 07
SVOA		4OC			/ / /
Pest/PCB		4OC			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2520.17
Date: 2/12/98
Sample Location ID: OU4-13-116
Time: Start: 1607 End: 1640
Signature of Sampler: [signature] for [illegible]

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used: (✓ All That Apply at Location)

- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 4.0 Gal.
Temperature, Deg. C	23	24	24	24	24
pH, units	9.56	9.72	9.56	9.51	9.49
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	340	340	340	350	346
Oxidation - Reduction, +/- mv	-32.1	-103.2	-100.0	-106.7	-108.1
~~Dissolved Oxygen, ppm~~ Turbidity	3.44	2.57	1.82	2.01	1.80

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	14, 6, 011, 03
SVOA		4°C			
Pest/PCB		4°C			
Inorganics		HNO_3			
Explosives		4°C			
TPH		H_2SO_4			
TOC		H_2SO_4			
Nitrate		H_2SO_4			

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2520.17
Sample Location ID: OCD-13-12A
Time: Start: 0847 End: 0945

Point of Interest: OU4
Date: 11/28/98
Signature of Sampler: [signature] for J.C. 440

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1 Gal.	@ 2 Gal.	@ 3 Gal.	@ 4 Gal.	@ ___ Gal.
Temperature, Deg. C	19.5	20	20.5	21	
pH, units	5.93	5.80	5.78	5.80	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	40	40	88	88	
Oxidation - Reduction, +/- mv	53.0	71.2	54.0	54.1	
~~Dissolved Oxygen, ppm~~ Turbidity	13.03	8.74	7.06	6.58	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4, G, 012, 03
SVOA		4°C			
Pest/PCB		4°C			
Inorganics		HNO_3			
Explosives		4°C			
TPH		H_2SO_4			
TOC		H_2SO_4			
Nitrate		H_2SO_4			

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-13-12A
Time: Start: 0843 End: 0928

Point of Interest: OU4
Date: 2/4/93
Signature of Sampler: Mark C Tolles for J.C. Mo.

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well
___ Top of Protective Casing
___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS ___ _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
—	✓	Peristaltic Pump	
—	—	Submersible Pump	
—	—	Bailer	
—	—	PVC/Silicon Tubing	
—	✓	Teflon/Silicon Tubing	
—	—	Airlift	
—	—	Hand Pump	
—	—	In-line Filter	
—	—	Press/Vac Filter	
—	—		

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm

Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1 Gal.	@ 2.3 Gal.	@ 3.4 Gal.	@ 5.0 Gal.
Temperature, Deg. C	18.5	18.6	18.4	18.9	19.5
pH, units	5.55	5.56	5.65	5.63	5.62
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	81	81	87	87	88
Oxidation - Reduction, +/- mv	63.7	100.1	63.4	47.3	60.2
~~Dissolved Oxygen, ppm~~ Turbidity	17.7	16.67	11.63	8.86	8.03

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA	___	HCL	___	✓	U4, G, 012, 04
SVOA	___	4°C	___	___	___ / ___ / ___ / ___
Pest/PCB	___	4°C	___	___	___ / ___ / ___ / ___
Inorganics	___	HNO_3	___	___	___ / ___ / ___ / ___
Explosives	___	4°C	___	___	___ / ___ / ___ / ___
TPH	___	H_2SO_4	___	___	___ / ___ / ___ / ___
TOC	___	H_2SO_4	___	___	___ / ___ / ___ / ___
Nitrate	___	H_2SO_4	___	___	___ / ___ / ___ / ___

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLO-13-12A
Time: Start: 0815 End: 0930

Point of Interest: OU4
Date: 2/19/98
Signature of Sampler: Mark Tolles for Johnson of March

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical ___ Top of Well ___ Top of Protective Casing

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ___ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 2.0 Gal.	@ 3.0 Gal.	@ 5.0 Gal.	@ 5.5 Gal.	@ 6.0 Gal.
Temperature, Deg. C	19.5	19	19.5	20	20
pH, units	5.17	5.48	5.64	5.69	5.68
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	90	89	90	90	90
Oxidation - Reduction, +/- mv	141.9	5.96	66.7	59.2	59.7
~~Dissolved Oxygen, ppm~~ Turbidity					

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	04 / G / 012 / 05
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-13-12A
Time: Start: 0906 End: 0945

Point of Interest: OU4
Date: 3/12/98
Signature of Sampler: [signature] for JO. HO.

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ __ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes / No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used: (✓ All That Apply at Location)

- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ___ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 1.5 Gal.	@ 2.5 Gal.	@ ____ Gal.	@ ____ Gal.
Temperature, Deg. C	17	19.5	19		
pH, units	5.77	5.84	5.84		
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	68	85	78		
Oxidation - Reduction, +/- mv	46.2	-20.0	-33.4		
~~Dissolved Oxygen, ppm~~ Turbidity	12.23	13.08	9.22		

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4 / G / 012 / 06
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OU0-13-15A
Time: Start: 0912 End: 1000

Point of Interest: OU4
Date: 1/27/98
Signature of Sampler: Mark C Tolbert for J.O. Hoi

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ Gal/Ft. (__in.) = [_____ Gal/Vol _____ Total Gal Purged]

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Colored ___ Clear ___ Odor ___ Cloudy

Purge Data	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 4.0 Gal.	@ ____ Gal.
Temperature, Deg. C	21.5	21	21.5	21.5	
pH, units	6.10	6.17	6.24	6.24	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	217	205	199	192	
Oxidation - Reduction, ~~mv~~	64.5	50	43.5	24.7	
~~Dissolved Oxygen, ppm~~ Turbidity	1.12	1.38	1.42	1.65	

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	14 / G / 015 / 07
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-13-15A
Time: Start: 1402 End: 1450

Point of Interest: OU4
Date: 2/5/98
Signature of Sampler: [signature] for JO, MO

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 2.5 Gal.	@ 4.0 Gal.	@ 5.0 Gal.	@ ____ Gal.
Temperature, Deg. C	21.8	21.7	21.3	21.5	
pH, units	6.72	6.75	6.68	6.71	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	231	222	222	222	
Oxidation - Reduction, +/- mv	66.6	26.7	41.4	21.5	
~~Dissolved Oxygen, ppm~~ Turbidity	2.79	1.66	1.01	0.93	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4 / G / 015 / 03
SVOA		4OC		✓	U4 / H / 015 / 03
Pest/PCB		4OC			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLA-13-15A
Time: Start: 0833 End: 0900

Point of Interest: OU4
Date: 2/18/98
Signature of Sampler: Mark Tolbert for JC MO

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.5 Gal.	@ 4.0 Gal.	@ 5.0 Gal.	@ ___ Gal.	@ ___ Gal.
Temperature, Deg. C	21	20	20		
pH, units	6.99	6.53	6.52		
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	280	270	270		
Oxidation - Reduction, +/- mv	-26.5	-28.0	-36.4		
~~Dissolved Oxygen, ppm~~ Turbidity					

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCl		✓	V4, G, 015, 04
SVOA		4°C			
Pest/PCB		4°C			
Inorganics		HNO_3, 4°C			
Explosives					
TPH		H_2SO_4			
TOC		H_2SO_4			
Nitrate		H_2SO_4			

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 3/12/99
Sample Location ID: OLD-13-15
Time: Start: 1448 End: 1555
Signature of Sampler: Mark C Tillus for Jo, Mo.

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ ___; Concrete Collar Intact ___ ___; Other _____ ___ ___ (Yes / No)

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used: (✓ All That Apply at Location)

___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 3.8 Gal.	@ _____ Gal.
Temperature, Deg. C	21	20	21	21	
pH, units	6.33	6.40	6.47	6.55	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	271	269	249	241	
Oxidation - Reduction, +/- mv	79.9	37.1	63.3	62.3	
~~Dissolved Oxygen, ppm~~ Turbidity	3.40	3.40	1.93	1.02	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	VY / G / OLS / OS
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/12/98
Sample Location ID: OU4-13-19B
Time: Start: 1030 End: 1155
Signature of Sampler: Mark Tillas for JC MO.

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used: (✓ All That Apply at Location)

- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 5.0 Gal.	@ 6.0 Gal.	@ 7.0 Gal.	@ 8.0 Gal.	@ 10.0 Gal.
Temperature, Deg. C	23	23	23	23	23
pH, units	5.90	5.85	5.87	5.85	5.77
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	195	193	191	192	191
Oxidation - Reduction, +/- mv	106.4	22.9	5.5	5.4	15.7
~~Dissolved Oxygen, ppm~~ Turbidity	146.3	>200	>200	>200	>200

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCl		✓	V4 / 6 / 019 / 07
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-13-20B
Time: Start: 1033 End: 1130

Point of Interest: OU4
Date: 2/12/99
Signature of Sampler: [signature] for JC

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well
___ Top of Protective Casing
___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective _____ Ft. Casing/Well Difference

Protective _____ Ft. Casing

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity:	Yes	No
Prot. Casing Secure	___	___
Concrete Collar Intact	___	___
Other _____	___	___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
___	___	Peristaltic Pump	_____
___	___	Submersible Pump	_____
___	___	Bailer	_____
___	___	PVC/Silicon Tubing	_____
___	✓	Teflon/Silicon Tubing	_____
___	___	Airlift	_____
___	___	Hand Pump	_____
___	___	In-line Filter	_____
___	___	Press/Vac Filter	_____
___	___		_____

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 5.0 Gal.	@ 6.0 Gal.
Temperature, Deg. C	21.5	22.5	22.5	23	23
pH, units	5.66	5.67	5.74	5.71	5.72
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	191	192	198	196	196
Oxidation - Reduction, +/- mv	-9.2	-12.8	25.2	-5.6	-5.7
~~Dissolved Oxygen, ppm~~ Turbidity	16.19	12.46	11.46	6.02	6.02

Sample Collection Requirements
(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA	___	HCL	_____	✓	UY / G / 020 / 03
SVOA	___	4°C	_____	___	___ / ___ / ___ / ___
Pest/PCB	___	4°C	_____	___	___ / ___ / ___ / ___
Inorganics	___	HNO_3	_____	___	___ / ___ / ___ / ___
Explosives	___	4°C	_____	___	___ / ___ / ___ / ___
TPH	___	H_2SO_4	_____	___	___ / ___ / ___ / ___
TOC	___	H_2SO_4	_____	___	___ / ___ / ___ / ___
Nitrate	___	H_2SO_4	_____	___	___ / ___ / ___ / ___

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 11/27/98
Sample Location ID: OU4-13-21B
Time: Start: 0910 End: 1030
Signature of Sampler: Mark C Tolbert for JC MO

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective _____ Ft. Casing/Well Difference

Protective _____ Ft. Casing

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes / No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 4.0 Gal.	@ 5.0 Gal.
Temperature, Deg. C	22.5	22	22.5	22.5	22.5
pH, units	4.90	4.90	5.00	4.97	5.00
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	175	141	135	123	140
Oxidation - Reduction, +/- mv	-29.7	-36.7	-40.4	-31.3	-23.7
~~Dissolved Oxygen ppm~~ Turbidity	2.35	1.01	0.71	0.70	0.17

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	V4 / G / 021 / 02
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLA-13-213
Time: Start: 1400 End: 1440

Point of Interest: OU4
Date: 2/5/99
Signature of Sampler: Mark C Tullos for Jo Mo

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None
- ___ _____
- ___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 2.5 Gal.	@ 4 Gal.	@ 5 Gal.	@ _____ Gal.
Temperature, Deg. C	23.6	23.9	23.5	23.4	
pH, units	9.93	9.91	9.83	9.81	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	157	157	151	149	
Oxidation - Reduction, +/- mv	23.1	-11.1	-17.1	-22.6	
~~Dissolved Oxygen, ppm~~ Turbidity	1.11	.63	.10	.01	

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA	___	HCL		✓	U4 / G / 021 / 03
SVOA	___	4°C		✓	U4 / H / 021 / 03
Pest/PCB	___	4°C		___	___ / ___ / ___ / ___
Inorganics	___	HNO_3		___	___ / ___ / ___ / ___
Explosives	___	4°C		___	___ / ___ / ___ / ___
TPH	___	H_2SO_4		___	___ / ___ / ___ / ___
TOC	___	H_2SO_4		___	___ / ___ / ___ / ___
Nitrate	___	H_2SO_4		___	___ / ___ / ___ / ___

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/19/98
Sample Location ID: OLD-13-21B
Time: Start: 0932 End: 0953
Signature of Sampler: Mark C Tolan for Joe Mo

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical ___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .5 Gal.	@ 1.0 Gal.	@ 2.5 Gal.	@ 3.0 Gal.	@ _____ Gal.
Temperature, Deg. C	22	23	23	22	
pH, units	4.20	4.81	4.75	4.77	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	155	150	150	150	
Oxidation - Reduction, +/- mv	57.8	31.3	71.3	-59.6	
~~Dissolved Oxygen, ppm~~ Turbidity					

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	04, G, 021, 04
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-13-21
Time: Start: 1447 End: 1545

Point of Interest: OU4
Date: 3/12/98
Signature of Sampler: Mark Tolbert for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity:	Yes	No
Prot. Casing Secure		
Concrete Collar Intact		
Other _____		

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 2.0 Gal.	@ 2.8 Gal.	@ 3.3 Gal.	@ 4.5 Gal.
Temperature, Deg. C	22	22	22	22.5	23
pH, units	4.20	4.41	4.69	4.69	4.77
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	153	150	144	144	146
Oxidation - Reduction, +/- mv	-36.1	-58.3	-45.7	-11.9	-26.9
~~Dissolved Oxygen, ppm~~ Turbidity	3.16	2.81	1.09	.39	.83

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4 / G / 021 / 05
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 12/9/97
Sample Location ID: OU4-17-22B
Time: Start: 0921 End: 0935
Signature of Sampler: Mark C Tolbert for JC MC

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ .1 Gal.	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 4.0 Gal.
Temperature, Deg. C	22.0	22.6	23.0	23.8	24.0
pH, units	4.51	4.55	4.67	4.61	4.68
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	141	123	123	125	126
Oxidation - Reduction, +/- mv	-26.0	-14.8	-26.6	-51.2	-59.9
~~Dissolved Oxygen, ppm~~ Turbidity	40.2	12.35	13.68	12.55	11.45

Sample Collection Requirements
(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4 / G / 022 / 01
SVOA		4C			/ / /
Pest/PCB		4C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes:

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 1/29/98
Sample Location ID: OU4-13-22B
Time: Start: 0844 End: 0915
Signature of Sampler: Mark Tolan for JC MC

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity:	Yes	No
Prot. Casing Secure	___	___
Concrete Collar Intact	___	___
Other _____	___	___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
___	___	Peristaltic Pump	
___	___	Submersible Pump	
___	___	Bailer	
___	___	PVC/Silicon Tubing	
___	✓	Teflon/Silicon Tubing	
___	___	Airlift	
___	___	Hand Pump	
___	___	In-line Filter	
___	___	Press/Vac Filter	
___	___		

Decontamination Fluids Used:

(✓ All That Apply at Location)

___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 2.5 Gal.	@ 4.0 Gal.	@ 5.0 Gal.	@ ____ Gal.
Temperature, Deg. C	20	20	20.5	20	
pH, units	5.44	5.40	5.44	5.45	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	78	.65	62	60	
Oxidation - Reduction, +/- mv	185.0	119.0	107.3	117.8	
~~Dissolved Oxygen, ppm~~ Turbidity	9.32	2.60	1.76	1.33	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA	___	HCL	___	✓	U4, B, 022, 02
SVOA	___	4°C	___	___	___/___/___/___
Pest/PCB	___	4°C	___	___	___/___/___/___
Inorganics	___	HNO_3	___	___	___/___/___/___
Explosives	___	4°C	___	___	___/___/___/___
TPH	___	H_2SO_4	___	___	___/___/___/___
TOC	___	H_2SO_4	___	___	___/___/___/___
Nitrate	___	H_2SO_4	___	___	___/___/___/___

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OU4-13-22B
Time: Start: 0940 End: 0920

Point of Interest: OU4
Date: 2/4/98
Signature of Sampler: [signature] for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well
___ Top of Protective Casing
___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective _____ Ft. Casing/Well Difference

Protective _____ Ft. Casing

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes / No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 1.0 Gal.	@ 2.3 Gal.	@ 4.0 Gal.	@ 5.0 Gal.
Temperature, Deg. C	19	20.3	20.1	20.3	20.3
pH, units	5.07	5.24	5.30	5.24	5.32
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	93	68	67	67	68
Oxidation - Reduction, +/- mv	72.9	152.0	182.3	183.2	191.8
~~Dissolved Oxygen, ppm~~ Turbidity	8.90	5.11	4.50	4.44	3.96

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs			
VOA		HCL		✓	UY	G	022	03
SVOA		4°C		✓	UY	G	022	03
Pest/PCB		4°C						
Inorganics		HNO_3						
Explosives		4°C						
TPH		H_2SO_4						
TOC		H_2SO_4						
Nitrate		H_2SO_4						

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLO-13-226
Time: Start: 1515 End: _____

Point of Interest: OU4
Date: 2/12/98
Signature of Sampler: Mark C Tolman for JO MO

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity:	Yes	No
Prot. Casing Secure		
Concrete Collar Intact		
Other _____		

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ___ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.5 Gal.	@ _____ Gal.
Temperature, Deg. C	22	22	22	22	
pH, units	5.64	7.18	7.27	7.38	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	73	80	80	80	
Oxidation - Reduction, +/- mv	-219.0	130.3	68.4	67.1	
~~Dissolved Oxygen, ppm~~ Turbidity	8.58	6.60	6.92	6.14	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4 / G / 022 / 04
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLA-13-22B
Time: Start: 0914 End: 0919

Point of Interest: OU4
Date: 2/19/98
Signature of Sampler: [signature] for JC

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical ___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS ___ _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity:	Yes	No
Prot. Casing Secure	___	___
Concrete Collar Intact	___	___
Other _____	___	___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
___	___	Peristaltic Pump	_____
___	___	Submersible Pump	_____
___	___	Bailer	_____
___	✓	PVC/Silicon Tubing	_____
___	___	Teflon/Silicon Tubing	_____
___	___	Airlift	_____
___	___	Hand Pump	_____
___	___	In-line Filter	_____
___	___	Press/Vac Filter	_____
___	___		_____

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 4.0 Gal.	@ 5.0 Gal.	@ 5.5 Gal.	@ _____ Gal.
Temperature, Deg. C	20	20	20.5	20	
pH, units	4.40	5.34	5.43	5.46	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	78	71	70	70	
Oxidation - Reduction, +/- mv	175.5	187.3	156.8	141.7	
~~Dissolved Oxygen, ppm~~ Turbidity					

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA	___	HCl	___	✓	U4, G, D22, 05
SVOA	___	4°C	___	___	___ / ___ / ___ / ___
Pest/PCB	___	4°C	___	___	___ / ___ / ___ / ___
Inorganics	___	HNO_3	___	___	___ / ___ / ___ / ___
Explosives	___	4°C	___	___	___ / ___ / ___ / ___
TPH	___	H_2SO_4	___	___	___ / ___ / ___ / ___
TOC	___	H_2SO_4	___	___	___ / ___ / ___ / ___
Nitrate	___	H_2SO_4	___	___	___ / ___ / ___ / ___

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 3/12/98
Sample Location ID: OU-13-22B
Time: Start: 0807 End: 0905
Signature of Sampler: Mark C Tullos for JC MO

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well
___ Top of Protective Casing
___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.3 Gal.	@ 2.5 Gal.	@ 3.0 Gal.	@ 5.0 Gal.	@ 5.5 Gal.
Temperature, Deg. C	19	19	20	20	20
pH, units	5.03	5.11	5.18	5.06	5.18
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	125	124	127	119	121
Oxidation - Reduction, +/- mv	162.6	113.2	70.3	63.0	66.0
~~Dissolved Oxygen, ppm~~ Turbidity	1.3	.81	1.13	.84	.77

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4, G, 022, 06
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-13-23B
Time: Start: 0906 End: 0945

Point of Interest: OU4
Date: 11/29/98
Signature of Sampler: [signature] for JC MO

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical ___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS ___ _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 4.5 Gal.
Temperature, Deg. C	21.5	22.5	22.5	22.5	22.5
pH, units	4.90	4.78	4.85	4.86	4.97
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	135	119	122	119	120
Oxidation - Reduction, ~~ch~~ mv	-45.8	-62.6	-65.7	-71.6	-66.2
~~Dissolved Oxygen~~ ppm Turbidity	1.45	0.92	0.35	0.27	0.24

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4 / G / 023 / 02
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-13-23B
Time: Start: 1326 End: 1405

Point of Interest: OU4
Date: 2/4/98
Signature of Sampler: Mark Tolan for John Mor

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS ___ _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity:	Yes	No
Prot. Casing Secure	___	___
Concrete Collar Intact	___	___
Other _____	___	___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
___	___	Peristaltic Pump	
___	___	Submersible Pump	
___	___	Bailer	
___	___	PVC/Silicon Tubing	
___	✓	Teflon/Silicon Tubing	
___	___	Airlift	
___	___	Hand Pump	
___	___	In-line Filter	
___	___	Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)

___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 4.5 Gal.	@ ____ Gal.
Temperature, Deg. C	20.4	21.5	21.4	20.6	
pH, units	4.80	4.76	4.76	4.72	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	104	115	118	118	
Oxidation - Reduction, +/- mv	-9.9	-14.3	-17.3	-22.0	
~~Dissolved Oxygen, ppm~~ Turbidity	1203	186	41	40	

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA	___	HCL		✓	U4 / G / 023 / 03
SVOA	___	4°C		✓	U4 / G / 023 / 03
Pest/PCB	___	4°C		___	___ / ___ / ___ / ___
Inorganics	___	HNO_3		___	___ / ___ / ___ / ___
Explosives	___	4°C		___	___ / ___ / ___ / ___
TPH	___	H_2SO_4		___	___ / ___ / ___ / ___
TOC	___	H_2SO_4		___	___ / ___ / ___ / ___
Nitrate	___	H_2SO_4		___	___ / ___ / ___ / ___

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/19/98
Sample Location ID: OU4-13-23B
Time: Start: 1125 End: 1200
Signature of Sampler: Mark Tolbert for JO, MO

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up _____ Ft. (from ground)

Protective _____ Ft. Casing/Well Difference

Protective _____ Ft. Casing

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ _____ Gal.
Temperature, Deg. C	24	23.5	23	24	
pH, units	4.68	4.74	4.75	4.77	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	129	129	129	129	
Oxidation - Reduction, +/- mv	-38.9	-43.5	-21.8	-36.1	
~~Dissolved Oxygen, ppm~~ Turbidity					

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4 / G / 023 / 04
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-13-23B
Time: Start: 0959 End: 1050

Point of Interest: OVY
Date: 3/12/99
Signature of Sampler: Mark C Tillman for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well
___ Top of Protective Casing
___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ ___ Gal.	@ ___ Gal.
Temperature, Deg. C	21	21	21		
pH, units	4.34	4.30	4.34		
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	182	180	176		
Oxidation - Reduction, +/- mv	1.7	-10.1	-21.4		
~~Dissolved Oxygen, ppm~~ Turbidity	.63	.51	.31		

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	04 / G / 023 / 05
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2570.17
Sample Location ID: OCD-13-24A
Time: Start: 0949 End: 1110

Point of Interest: OU4
Date: 12/9/97
Signature of Sampler: [signature]

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Horizontal

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
—	✓	Peristaltic Pump	
—	—	Submersible Pump	
—	—	Bailer	
—	—	PVC/Silicon Tubing	
—	✓	Teflon/Silicon Tubing	
—	—	Airlift	
—	—	Hand Pump	
—	—	In-line Filter	
—	—	Press/Vac Filter	
—	—		

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.2 Gal.	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 5.5 Gal.
Temperature, Deg. C	23.3	23.3	23.6	23.4	23.5
pH, units	4.84	5.04	5.24	5.24	5.30
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	116	139	145	141	148
Oxidation - Reduction, +/- mv	25.0	-43.3	-50.6	-24.1	-32.6
~~Dissolved Oxygen, ppm~~ Turbidity	6.91	6.46	5.13	2.87	5.28

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCl		✓	U4 / G / 024 / 01
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2520.17
Sample Location ID: OLD-13-24A
Time: Start: 1304 End: 1330

Point of Interest: OU4
Date: 11/23/98
Signature of Sampler: Mark Tolbert for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 4.5 Gal.	@ ____ Gal.
Temperature, Deg. C	22	22	22	22	
pH, units	5.61	5.67	5.68	5.66	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	112	116	112	115	
Oxidation - Reduction, +/- mv	261	94	-5.2	40	
~~Dissolved Oxygen, ppm~~ Turbidity	6.06	7.20	6.02	5.69	

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	04, 0, 024, 03
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/4/98
Sample Location ID: OU4-13-24A
Time: Start: 1511 End: 1525
Signature of Sampler: [signature] for

Water Level/Well Data

Well Depth ____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ ____

Well Riser Stick-up (from ground) ____ Ft.

Protective Casing/Well Difference ____ Ft.

Protective Casing ____ Ft.

Depth to Water ____ Ft.

Well Material: ___ PVC ___ SS ____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ ____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ ____

Height of Water Column ____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = ____ Gal/Vol ____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other ____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None

Field Analysis Data

Ambient Air VOC ____ ppm Well Mouth ____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 2.3 Gal.	@ 3.2 Gal.	@ 4.5 Gal.	@ ____ Gal.
Temperature, Deg. C	20.3	19.8	20.0	20.6	
pH, units	5.63	5.65	5.65	5.61	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	105	109	115	112	
Oxidation - Reduction, +/- mv	-11.9	-32.3	-39.4	-38.5	
~~Dissolved Oxygen, ppm~~ Turbidity	2.97	3.11	3.23	3.71	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4, G, 02Y, 03
SVOA		4°C		✓	U4, H, 02Y, 03
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: ____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2520.17
Sample Location ID: OLO-13-24A
Time: Start: 1409 End: 1440

Point of Interest: OU4
Date: 2/19/98
Signature of Sampler: Mark Tolles

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well
___ Top of Protective Casing
___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity:

	Yes	No
Prot. Casing Secure	___	___
Concrete Collar Intact	___	___
Other _____	___	___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
___	✓	Peristaltic Pump	_____
___	___	Submersible Pump	_____
___	___	Bailer	_____
___	___	PVC/Silicon Tubing	_____
___	✓	Teflon/Silicon Tubing	_____
___	___	Airlift	_____
___	___	Hand Pump	_____
___	___	In-line Filter	_____
___	___	Press/Vac Filter	_____
___	___		_____

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 1.5 Gal.	@ 2.5 Gal.	@ _____ Gal.	@ _____ Gal.
Temperature, Deg. C	24	23	23		
pH, units	5.81	5.79	5.79		
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	112	107	105		
Oxidation - Reduction, +/- mv	-44.1	-62.3	-57.9		
~~Dissolved Oxygen, ppm~~ Turbidity					

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA	___	HCL	_____	✓	04 / 6 / 024 / 04
SVOA	___	4°C	_____	___	___ / ___ / ___ / ___
Pest/PCB	___	4°C	_____	___	___ / ___ / ___ / ___
Inorganics	___	HNO_3	_____	___	___ / ___ / ___ / ___
Explosives	___	4°C	_____	___	___ / ___ / ___ / ___
TPH	___	H_2SO_4	_____	___	___ / ___ / ___ / ___
TOC	___	H_2SO_4	_____	___	___ / ___ / ___ / ___
Nitrate	___	H_2SO_4	_____	___	___ / ___ / ___ / ___

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-13-24
Time: Start: 1100 End: 1150

Point of Interest: OU4
Date: 3/12/98
Signature of Sampler: [illegible]

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical ___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS ___ _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ _____ Gal.	@ _____ Gal.
Temperature, Deg. C	20	20.5	20		
pH, units	5.77	5.50	5.69		
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	100	99	101		
Oxidation - Reduction, ~~mv~~	-61.4	-62.7	-57.1		
~~Dissolved Oxygen, ppm~~ Turbidity	2.04	.99	.86		

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCl		✓	04 / G / 02 / 05
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 1/28/99
Sample Location ID: OU4-13-25B
Time: Start: 1305 End: 1339
Signature of Sampler: Mark C Tullos for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes / No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 4.0 Gal.	@ ___ Gal.
Temperature, Deg. C	21.5	22	22	22	
pH, units	5.01	4.94	4.94	4.98	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	670	600	560	560	
Oxidation - Reduction, +/- mv	18.5	16.5	20.9	26.7	
~~Dissolved Oxygen, ppm~~ Turbidity	3.34	3.23	2.26	2.48	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4, G, 025, D2
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/4/98
Sample Location ID: OLD-13-25B
Time: Start: 1506 End: 1533
Signature of Sampler: Mark Tolbert for

Water Level/Well Data

Well Depth ____ Ft. ___ Measured ___ Historical ___ Top of Well ___ Top of Protective Casing ___ ____

Well Riser Stick-up (from ground) ____ Ft.

Protective Casing/Well Difference ____ Ft.

Protective Casing ____ Ft.

Depth to Water ____ Ft.

Well Material: ___ PVC ___ SS ____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ ____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ ____

Height of Water Column ____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = ____ Gal/Vol ____ Total Gal Purged

Well Integrity: Yes / No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other ____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC ____ ppm Well Mouth ____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 4.5 Gal.	@ ____ Gal.
Temperature, Deg. C	20.6	21.4	20.9	21.9	
pH, units	5.00	5.00	4.90	4.90	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	640	610	560	530	
Oxidation - Reduction, ~~ph~~ mv	160	160	-96	-252	
~~Dissolved Oxygen, ppm~~ Turbidity	5.55	2.11	1.34	1.42	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4 / G / 025 / 03
SVOA		4°C		✓	U4 / H / 025 / 03
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: ____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2520.17
Date: 2/19/98
Sample Location ID: OU-13-25B
Time: Start: 1410 End: 1450
Signature of Sampler: Mark Tolbert for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up _____ Ft. (from ground)

Protective _____ Ft. Casing/Well Difference

Protective _____ Ft. Casing

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity:	Yes	No
Prot. Casing Secure	___	___
Concrete Collar Intact	___	___
Other _____	___	___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
___	✓	Peristaltic Pump	_____
___	___	Submersible Pump	_____
___	___	Bailer	_____
___	___	PVC/Silicon Tubing	_____
___	✓	Teflon/Silicon Tubing	_____
___	___	Airlift	_____
___	___	Hand Pump	_____
___	___	In-line Filter	_____
___	___	Press/Vac Filter	_____
___	___		_____

Decontamination Fluids Used:

(✓ All That Apply at Location)

___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 1.0 Gal.	@ 3.5 Gal.	@ 4.5 Gal.	@ _____ Gal.	@ _____ Gal.
Temperature, Deg. C	24	23.5	23.5		
pH, units	4.93	4.98	4.90		
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	600	560	550		
Oxidation - Reduction, +/- mv	-19.3	-25.9	-20.8		
~~Dissolved Oxygen, ppm~~ Turbidity					

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA	___	HCL	_____	✓	U4, G, 025, 04
SVOA	___	4°C	_____	___	___ / ___ / ___ / ___
Pest/PCB	___	4°C	_____	___	___ / ___ / ___ / ___
Inorganics	___	HNO_3	_____	___	___ / ___ / ___ / ___
Explosives	___	4°C	_____	___	___ / ___ / ___ / ___
TPH	___	H_2SO_4	_____	___	___ / ___ / ___ / ___
TOC	___	H_2SO_4	_____	___	___ / ___ / ___ / ___
Nitrate	___	H_2SO_4	_____	___	___ / ___ / ___ / ___

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLA13-25
Time: Start: 1050 End: 1155

Point of Interest: OU4
Date: 3/12/98
Signature of Sampler: [illegible] for

Water Level/Well Data

Well Depth ____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ ____

Well Riser Stick-up (from ground) ____ Ft.

Protective Casing/Well Difference ____ Ft.

Protective Casing ____ Ft.

Depth to Water ____ Ft.

Well Material: ___ PVC ___ SS ____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ ____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ ____

Height of Water Column ____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = ____ Gal/Vol ____ Total Gal Purged

Well Integrity: Yes / No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other ____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ ____
___ ____

Field Analysis Data

Ambient Air VOC ____ ppm Well Mouth ____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Colored ___ Clear ___ Odor ___ Cloudy

Purge Data	@ 1.0 Gal.	@ 2.0 Gal.	@ 2.5 Gal.	@ 3.5 Gal.	@ 5.0 Gal.
Temperature, Deg. C	21	22	21.5	22	22
pH, units	4.90	4.76	4.66	4.56	4.78
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	700	600	750	600	560
Oxidation - Reduction, +/- mv	41.4	-40.4	-52.6	-38.4	-61.9
~~Dissolved Oxygen, ppm~~ Turbidity	1.32	256	1.13	1.01	.60

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs			
VOA		HCL		✓	U4	G	025	05
SVOA		4°C			/	/	/	/
Pest/PCB		4°C			/	/	/	/
Inorganics		HNO_3			/	/	/	/
Explosives		4°C			/	/	/	/
TPH		H_2SO_4			/	/	/	/
TOC		H_2SO_4			/	/	/	/
Nitrate		H_2SO_4			/	/	/	/

Notes: ____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OU-13-27A
Time: Start: 1520 End: 1555

Point of Interest: OU4
Date: 2/10/93
Signature of Sampler: [signature] for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ _____ Gal.
Temperature, Deg. C	24	24	24	24	
pH, units	6.47	6.41	6.48	6.45	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	265	265	261	261	
Oxidation - Reduction, +/- mv	294.5	269.1	257.8	287.6	
~~Dissolved Oxygen, ppm~~ Turbidity	34.1	84.0	53.1	16.5	

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4 / G / 027 / 01
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OU-13-33A
Time: Start: 0941 End: 1017

Point of Interest: OU4
Date: 2/11/98
Signature of Sampler: [signature] for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well
___ Top of Protective Casing
___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol; _____ Total Gal Purged

Well Integrity: Yes / No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 4.0 Gal.	@ ____ Gal.
Temperature, Deg. C	21	20	20	20	
pH, units	5.93	5.99	5.96	5.97	
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	141	128	128	130	
Oxidation - Reduction, ~~mv~~	-122.2	-134.0	-137.4	-144.4	
~~Dissolved Oxygen, ppm~~ Turbidity	128	14.57	13.00	14.60	

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	U4 / G / 033 / 01
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-13-34B
Time: Start: 0812 End: 0857

Point of Interest: OU4
Date: 9/11/98
Signature of Sampler: [signature] for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 1.5 Gal.	@ 2.5 Gal.	@ 3.5 Gal.	@ 4.5 Gal.
Temperature, Deg. C	21	22	22	22	22
pH, units	5.11	5.94	5.96	5.91	5.81
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	60	60	62	61	61
Oxidation - Reduction, +/- mv	-60.4	-83.9	-111.9	-121.1	-123.6
~~Dissolved Oxygen ppm~~ Turbidity	24.3	14.7	16.3	14.6	15.6

Sample Collection Requirements (✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	04 / 6 / 03Y / 01
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/11/98
Sample Location ID: OU-13-35C
Time: Start: 0816 End: 1115
Signature of Sampler: Mark C Tolan for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical ___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS ___ _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Prot. Casing Secure ___ Yes ___ No; Concrete Collar Intact ___ Yes ___ No; Other _____ ___ Yes ___ No

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None
- ___ _____
- ___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 5.0 Gal.	@ 10.0 Gal.	@ 15.0 Gal.	@ 16.0 Gal.
Temperature, Deg. C	21	22	22.4	23	22.5
pH, units	6.47	5.38	5.37	5.53	5.49
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	175	142	142	142	142
Oxidation - Reduction, +- mv	262	-122.6	-126.6	-136.8	-139.4
Dissolved Oxygen, ppm / Turbidity	121	142	142	28.0	26.5

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	OU / G / 035 / a
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-13-36A
Time: Start: 1240 End: 1320

Point of Interest: OVY
Date: 2/11/98
Signature of Sampler: Mark Tolbert for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = [_____ Gal/Vol _____ Total Gal Purged]

Well Integrity: Yes / No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 1.5 Gal.	@ 2.5 Gal.	@ 3.5 Gal.	@ 5.0 Gal.
Temperature, Deg. C	23	23	23	23	23
pH, units	6.39	6.41	6.42	6.44	6.42
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	131	121	122	121	123
Oxidation - Reduction, +/- mv	-115.9	-122.7	-134.1	-132.6	-130.7
~~Dissolved Oxygen, ppm~~ Turbidity	58.6	49.9	49.9	49.9	48.6

Sample Collection Requirements
(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	OV / G / 036 / 01
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-13-37B
Time: Start: 1124 End: 1250

Point of Interest: OU4
Date: 2/6/98
Signature of Sampler: [signature] for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well
___ Top of Protective Casing
___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol; _____ Total Gal Purged

Well Integrity:

	Yes	No
Prot. Casing Secure	___	___
Concrete Collar Intact	___	___
Other _____	___	___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
___	✓	Peristaltic Pump	_____
___	___	Submersible Pump	_____
___	___	Bailer	_____
___	___	PVC/Silicon Tubing	_____
___	✓	Teflon/Silicon Tubing	_____
___	___	Airlift	_____
___	___	Hand Pump	_____
___	___	In-line Filter	_____
___	___	Press/Vac Filter	_____
___	___		_____

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 1.5 Gal.	@ 3.0 Gal.	@ 5.0 Gal.	@ 10.0 Gal.
Temperature, Deg. C	22	22	23	24	24
pH, units	6.62	6.62	6.60	7.03	5.70
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	410	440	500	500	600
Oxidation - Reduction, +/- mv	144.1	-163.7	-163.8	-156.1	-140.3
~~Dissolved Oxygen, ppm~~ Turbidity	178.5	178.1	179.3	178.6	178.6

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA	___	HCL	_____	✓	114 / G / 037 / 01
SVOA	___	4°C	_____	✓	114 / G / 037 / 01B
Pest/PCB	___	4°C	_____	___	___ / ___ / ___ / ___
Inorganics	___	HNO_3	_____	___	___ / ___ / ___ / ___
Explosives	___	4°C	_____	___	___ / ___ / ___ / ___
TPH	___	H_2SO_4	_____	___	___ / ___ / ___ / ___
TOC	___	H_2SO_4	_____	___	___ / ___ / ___ / ___
Nitrate	___	H_2SO_4	_____	___	___ / ___ / ___ / ___

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2570.17
Date: 2/11/98
Sample Location ID: OU4-13-38C
Time: Start: 1117 End: 1230
Signature of Sampler: Mark C Tullos for

Water Level/Well Data

Well Depth _____ ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ ft.

Protective Casing/Well Difference _____ ft.

Protective Casing _____ ft.

Depth to Water _____ ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ ft. X ___ .16 Gal/ft. (2 in.) ___ .65 Gal/ft. (4 in.) ___ 1.5 Gal/ft. (6 in.) ___ ___ Gal/ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 1.5 Gal.	@ 4.0 Gal.	@ 8.0 Gal.	@ 10.0 Gal.
Temperature, Deg. C	22	22	24	24	24
pH, units	6.03	5.88	7.03	5.40	5.44
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	129	149	156	153	151
Oxidation - Reduction, +/- mv	-106.7	-127.4	-131.8	-108.4	-107.8
~~Dissolved Oxygen, ppm~~ Turbidity	16.40	10.90	10.60	9.15	7.04

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	V4 / G / 039 / 01
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/10/98
Sample Location ID: OU4-13-39B
Time: Start: 1524 End: 1600
Signature of Sampler: [signature]

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical ___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (__ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
- ___ Methanol (100%)
- ___ 25% Methanol/75% ASTM Type II water
- ✓ Deionized Water
- ✓ Liquinox Solution
- ___ Hexane
- ___ HNO_3/D.I. Water Solution
- ___ Potable Water
- ___ None
- ___ _____
- ___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 1.0 Gal.	@ 2.0 Gal.	@ 3.0 Gal.	@ 4.5 Gal.
Temperature, Deg. C	25	25	25	25	25
pH, units	6.16	6.12	6.05	6.00	6.01
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	340	240	235	225	220
Oxidation - Reduction, +/- mv	265.4	163.8	96.1	52.3	52.6
~~Dissolved Oxygen, ppm~~ Turbidity	132.4	136.0	115.4	111.2	110.8

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	UY / G / 039 / 01
SVOA		4°C			/ / /
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/12/98
Sample Location ID: OLD-13-40B
Time: Start: 0814 End: 1015
Signature of Sampler: Mark C Tolbert for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical

___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other _____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
		Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
✓ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 1.5 Gal.	@ 90 Gal.	@ 105 Gal.	@ 120 Gal.
Temperature, Deg. C	22	23	23.5	23.5	24
pH, units	5.97	5.95	6.24	6.21	6.29
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	430	441	336	320	315
Oxidation - Reduction, ~~ORP~~ mv	-64.2	-107.3	-129.8	-121.3	-120.3
~~Dissolved Oxygen, ppm~~ Turbidity	160.5	157.6	161.4	159.7	160.9

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs			
VOA		HCl		✓	U4	F	010	01
SVOA		4°C						
Pest/PCB		4°C						
Inorganics		HNO_3						
Explosives		4°C						
TPH		H_2SO_4						
TOC		H_2SO_4						
Nitrate		H_2SO_4						

Notes: _____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Project Number: 2530.17
Sample Location ID: OLD-17-41B
Time: Start: 1322 End: 1505

Point of Interest: OU4
Date: 2/12/98
Signature of Sampler: [signature] for

Water Level/Well Data

Well Depth ____ Ft. ___ Measured ___ Historical

___ Top of Well
___ Top of Protective Casing
___ ____

Well Riser Stick-up (from ground) ____ Ft.

Protective Casing/Well Difference ____ Ft.

Protective Casing ____ Ft.

Depth to Water ____ Ft.

Well Material:
___ PVC
___ SS
____

Well Locked?:
___ Yes
___ No

Well Dia.
___ 2 inch
___ 4 inch
___ 6 inch
___ ____

Water Level Equip. Used:
___ Elect. Cond. Probe
___ Float Activated
___ Press. Transducer
___ ____

Height of Water Column ____ Ft. X
___ .16 Gal/Ft. (2 in.)
___ .65 Gal/Ft. (4 in.)
___ 1.5 Gal/Ft. (6 in.)
___ ___ Gal/Ft. (__ in.)
=
____ Gal/Vol
____ Total Gal Purged

Well Integrity: Yes No
Prot. Casing Secure ___ ___
Concrete Collar Intact ___ ___
Other ____ ___ ___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
	✓	Peristaltic Pump	
		Submersible Pump	
		Bailer	
		PVC/Silicon Tubing	
	✓	Teflon/Silicon Tubing	
		Airlift	
		Hand Pump	
		In-line Filter	
		Press/Vac Filter	

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
✓ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ ____
___ ____

Field Analysis Data

Ambient Air VOC ____ ppm Well Mouth ____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 3.0 Gal.	@ 6.5 Gal.	@ 10.0 Gal.	@ 12.0 Gal.
Temperature, Deg. C	25	25	25	25	25
pH, units	4.51	4.39	4.34	4.31	4.32
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	178	150	142	133	139
Oxidation - Reduction, eh mv	-22.4	-64.9	-32.9	-27.7	-28.4
Dissolved Oxygen, ppm	166.9	125.2	121.5	40.6	36.03
Turbidity					

Sample Collection Requirements
(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs
VOA		HCL		✓	OU4 / G / OU4 / D1
SVOA		4°C		✓	OU4 / G / OU4 / G1 D
Pest/PCB		4°C			/ / /
Inorganics		HNO_3			/ / /
Explosives		4°C			/ / /
TPH		H_2SO_4			/ / /
TOC		H_2SO_4			/ / /
Nitrate		H_2SO_4			/ / /

Notes: ____

GROUNDWATER SAMPLE FIELD DATA

Project: NTC ORLANDO
Point of Interest: OU4
Project Number: 2530.17
Date: 2/12/98
Sample Location ID: OU4-13-43C
Time: Start: 1321 End: 1428
Signature of Sampler: [signature] for

Water Level/Well Data

Well Depth _____ Ft. ___ Measured ___ Historical ___ Top of Well ___ Top of Protective Casing ___ _____

Well Riser Stick-up (from ground) _____ Ft.

Protective Casing/Well Difference _____ Ft.

Protective Casing _____ Ft.

Depth to Water _____ Ft.

Well Material: ___ PVC ___ SS _____

Well Locked?: ___ Yes ___ No

Well Dia. ___ 2 inch ___ 4 inch ___ 6 inch ___ _____

Water Level Equip. Used: ___ Elect. Cond. Probe ___ Float Activated ___ Press. Transducer ___ _____

Height of Water Column _____ Ft. X ___ .16 Gal/Ft. (2 in.) ___ .65 Gal/Ft. (4 in.) ___ 1.5 Gal/Ft. (6 in.) ___ ___ Gal/Ft. (___ in.) = _____ Gal/Vol _____ Total Gal Purged

Well Integrity:	Yes	No
Prot. Casing Secure	___	___
Concrete Collar Intact	___	___
Other _____	___	___

Equipment Documentation

Purging/Sampling Equipment Used:

(✓ If Used For) Purging	Sampling		Equipment ID
___	___	Peristaltic Pump	_____
___	___	Submersible Pump	_____
___	___	Bailer	_____
___	___	PVC/Silicon Tubing	_____
___	✓	Teflon/Silicon Tubing	_____
___	___	Airlift	_____
___	___	Hand Pump	_____
___	___	In-line Filter	_____
___	___	Press/Vac Filter	_____
___	___		_____

Decontamination Fluids Used:

(✓ All That Apply at Location)
___ Methanol (100%)
___ 25% Methanol/75% ASTM Type II water
✓ Deionized Water
___ Liquinox Solution
___ Hexane
___ HNO_3/D.I. Water Solution
___ Potable Water
___ None
___ _____
___ _____

Field Analysis Data

Ambient Air VOC _____ ppm Well Mouth _____ ppm Field Data Collected ___ In-line ___ In Container

Sample Observations: ___ Turbid ___ Clear ___ Cloudy ___ Colored ___ Odor

Purge Data	@ 0.5 Gal.	@ 1.0 Gal.	@ 4.0 Gal.	@ 5.0 Gal.	@ 6.0 Gal.
Temperature, Deg. C	25	25	25	25	25
pH, units	4.46	4.39	4.39	4.35	4.31
Specific Conductivity (umhos/cm. @ 25 Deg. C.)	182	165	160	161	162
Oxidation - Reduction, ∆ mv					
Dissolved Oxygen ppm	-38.2	-19.3	-56.4	-67.9	-67.2
Turbidity	105.4	46.1	6.98	4.43	3.71

Sample Collection Requirements

(✓ If Required at this Location)

Analytical Parameter	✓ If Field Filtered	Preservation Method	Volume Required	✓ If Sample Collected	Sample Bottle IDs			
VOA	___	HCL	___	✓	U4	G	043	01
SVOA	___	4°C	___	✓	U4	G	042	01 D
Pest/PCB	___	4°C	___	___	___	___	___	___
Inorganics	___	HNO_3	___	___	___	___	___	___
Explosives	___	4°C	___	___	___	___	___	___
TPH	___	H_2SO_4	___	___	___	___	___	___
TOC	___	H_2SO_4	___	___	___	___	___	___
Nitrate	___	H_2SO_4	___	___	___	___	___	___

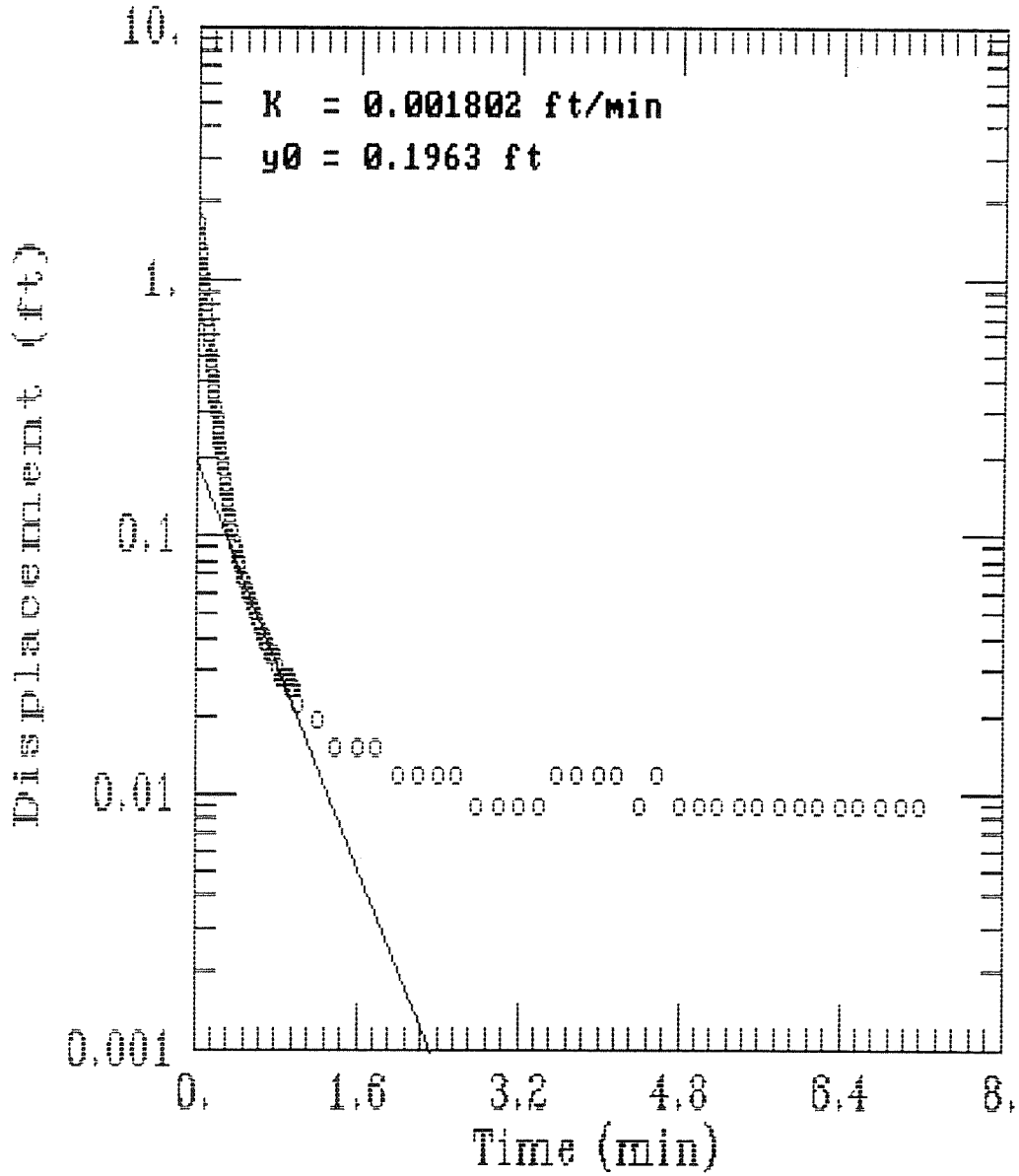
Notes: _____

APPENDIX K

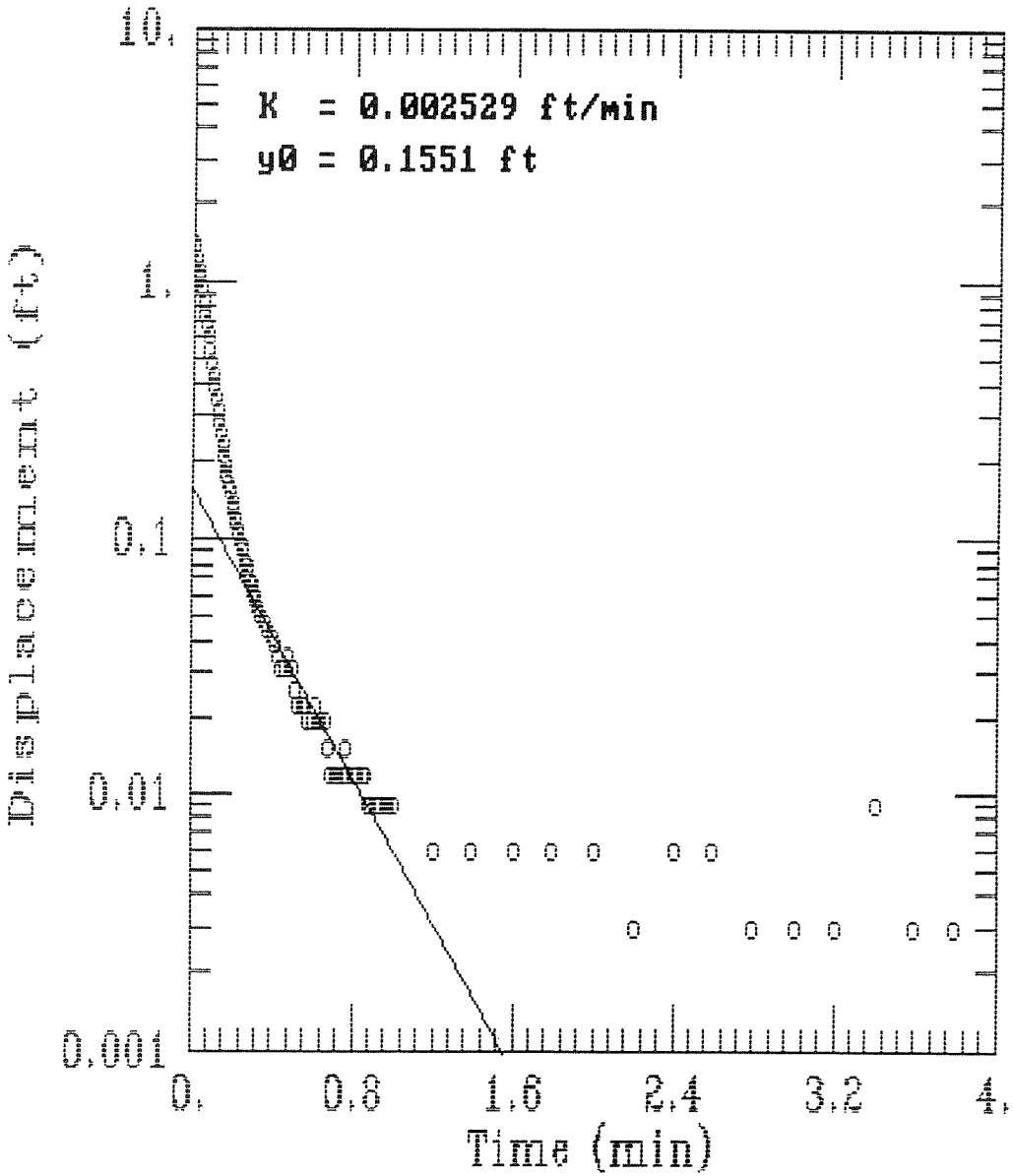
APPENDIX K

SLUG TEST GRAPHS

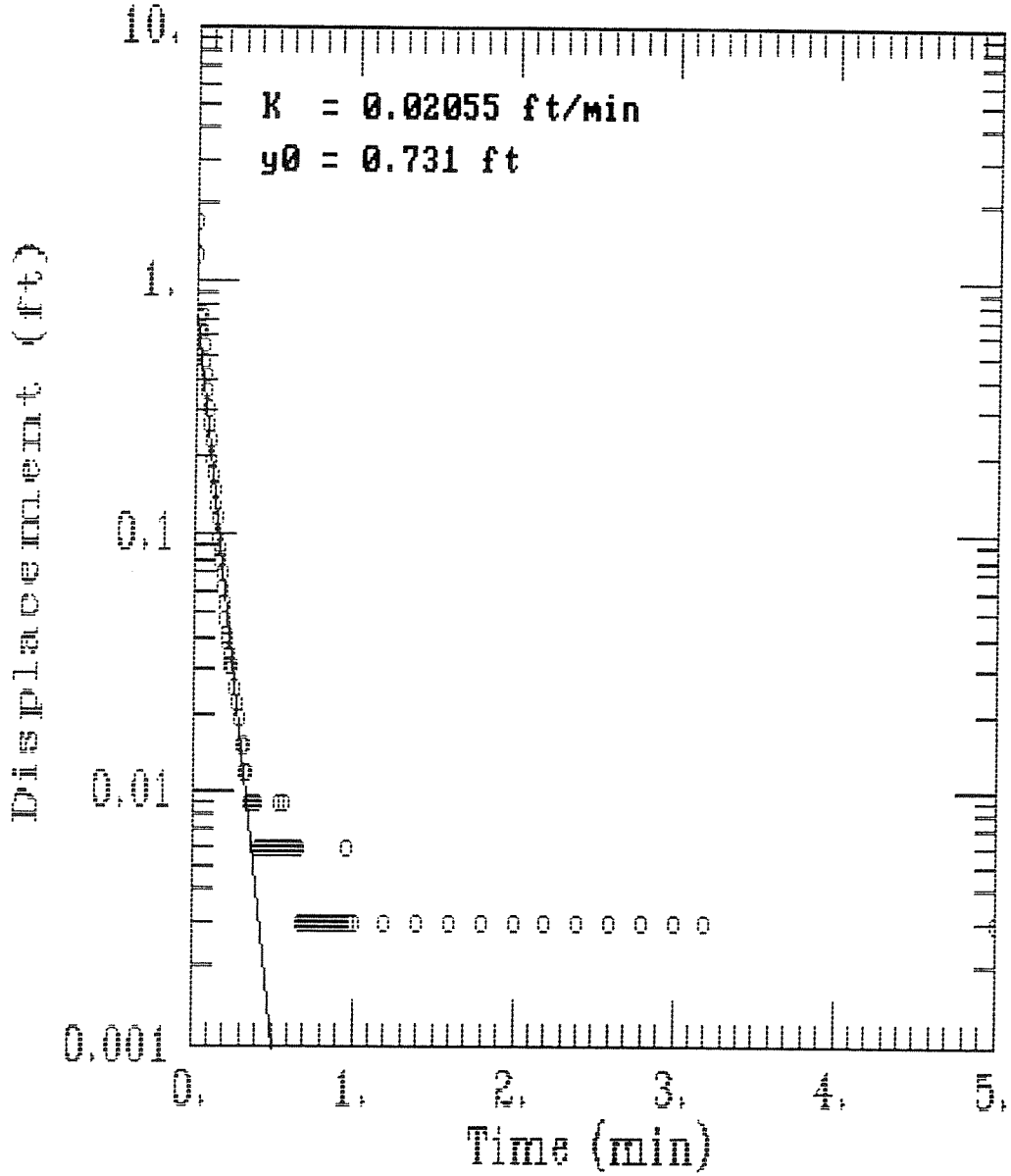
OLD-13-33 OUT#1



OLD-13-36 OUT#1



OLD-13-34 IN#1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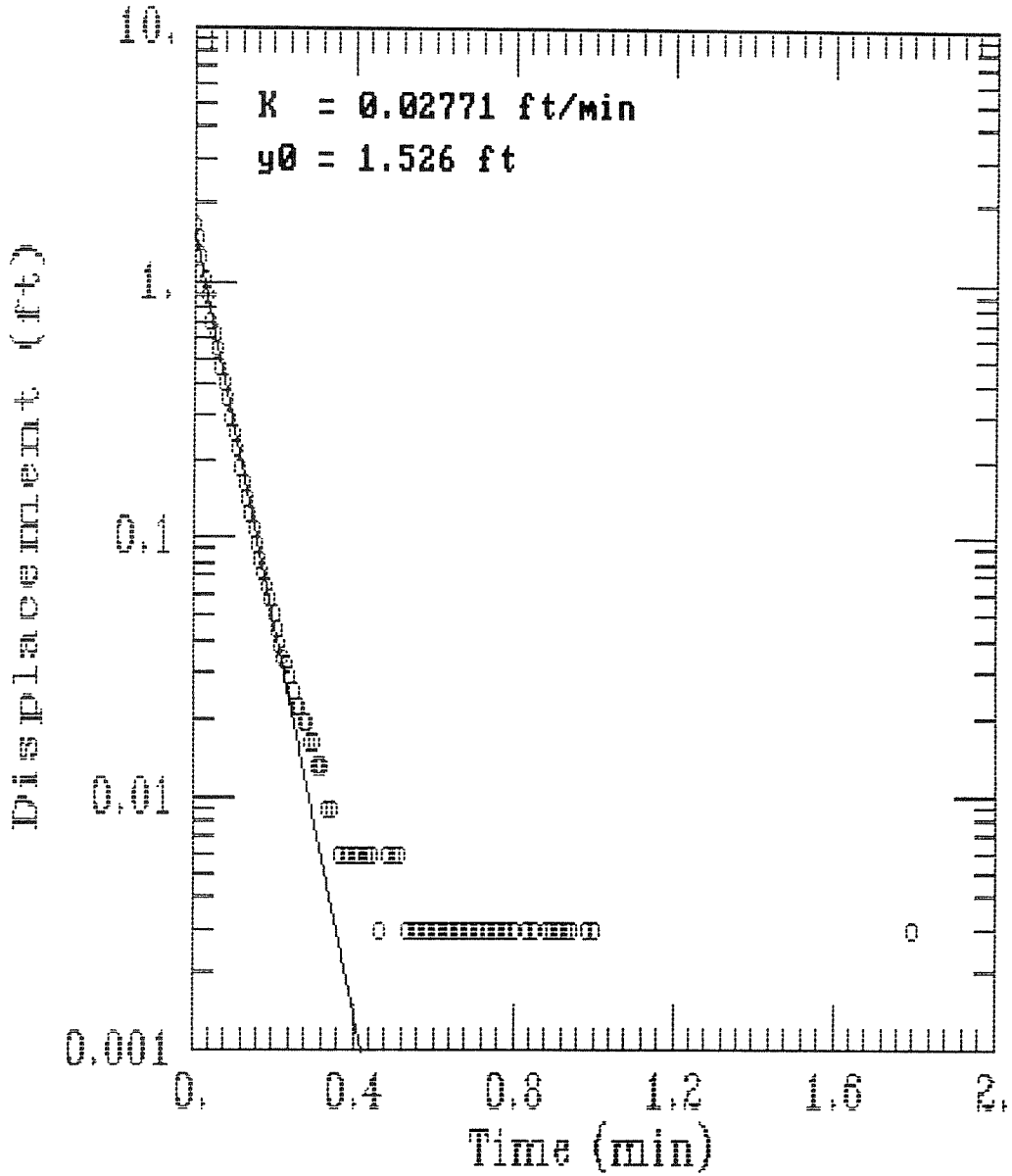
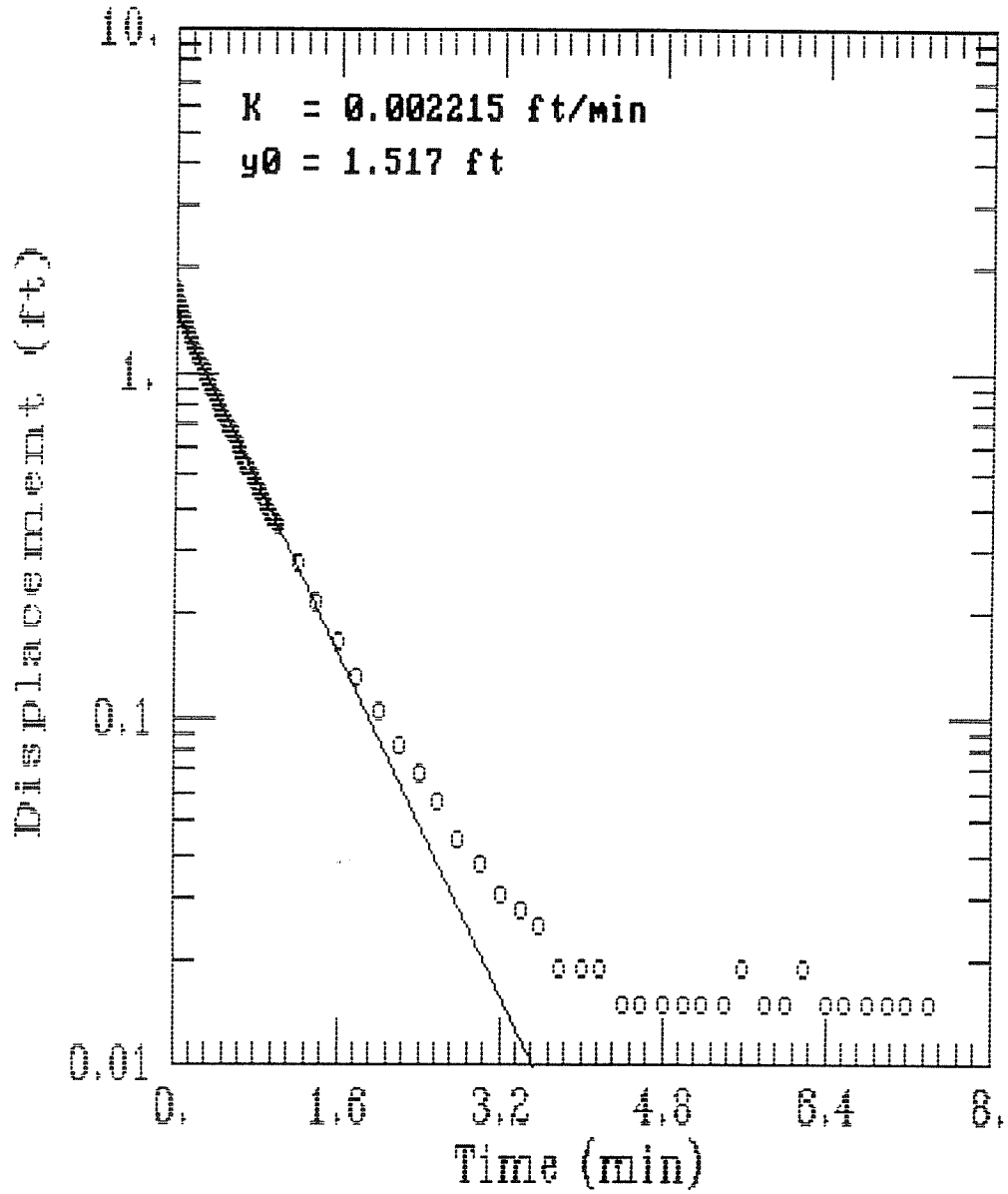
y0 = 0.731 ft
10.
1.
0.1
0.01
0.001
Displacement (ft)
0.
1.
2.
3.
4.
5.
Time (min)

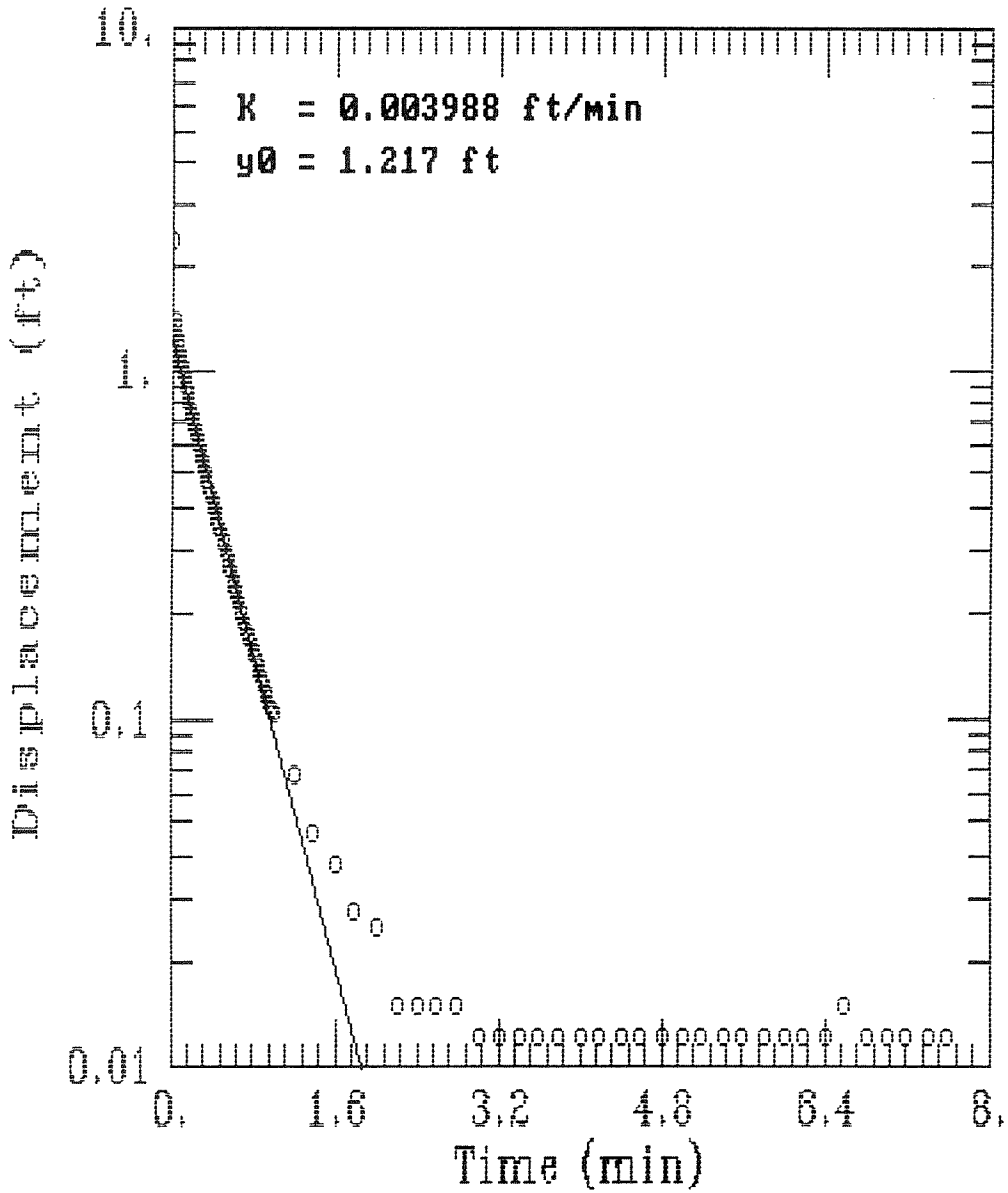
OLD-13-34 OUT#1



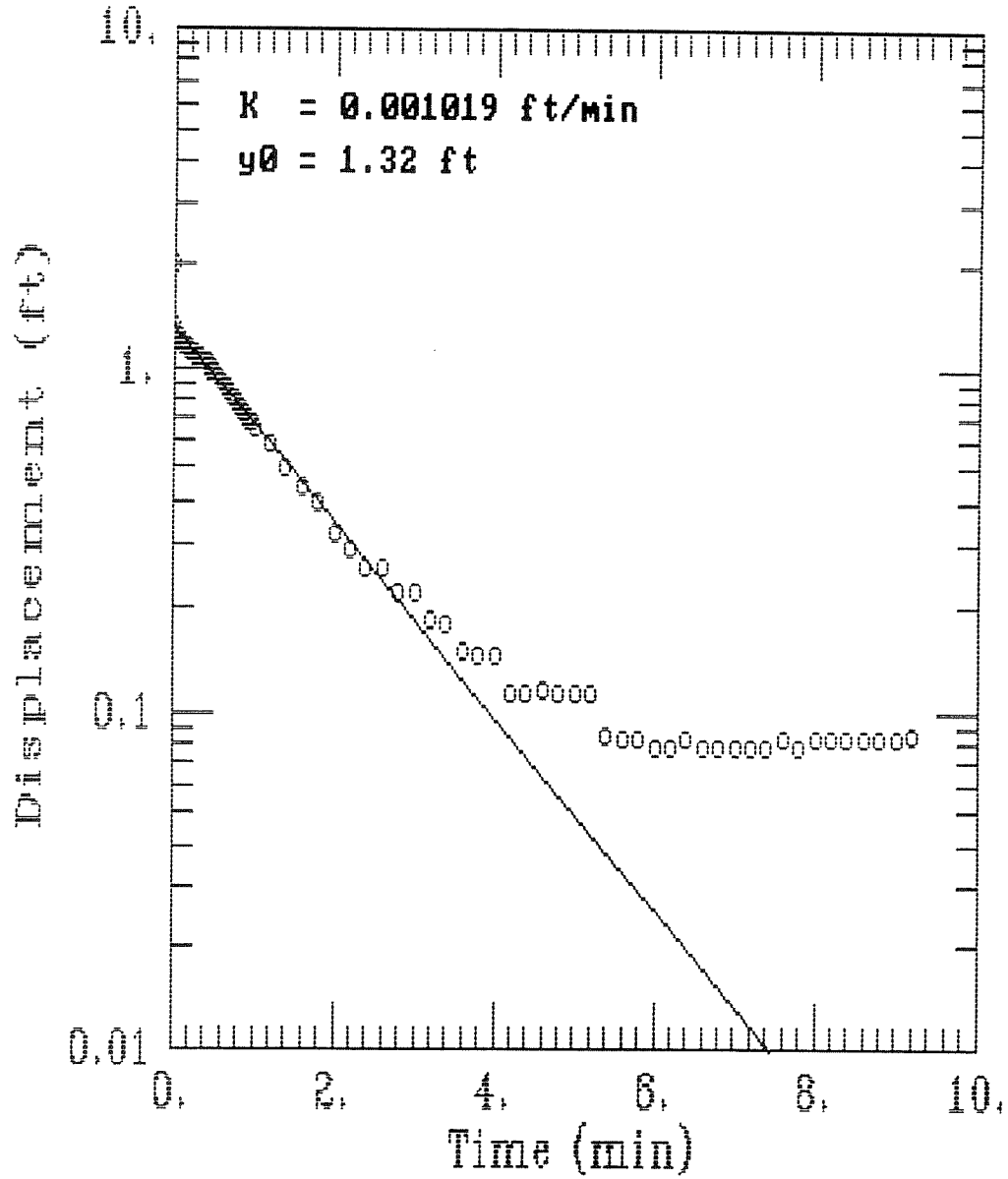
OLD-13-37 OUT#1



OLD-13-37 IN#1


K = 0.003988 ft/min
y0 = 1.217 ft
10.
1.
0.1
0.01
Displacement (ft)
0.
1.6
3.2
4.8
6.4
8.
Time (min)

OLD-13-39 IN#1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y0 = 1.32 ft
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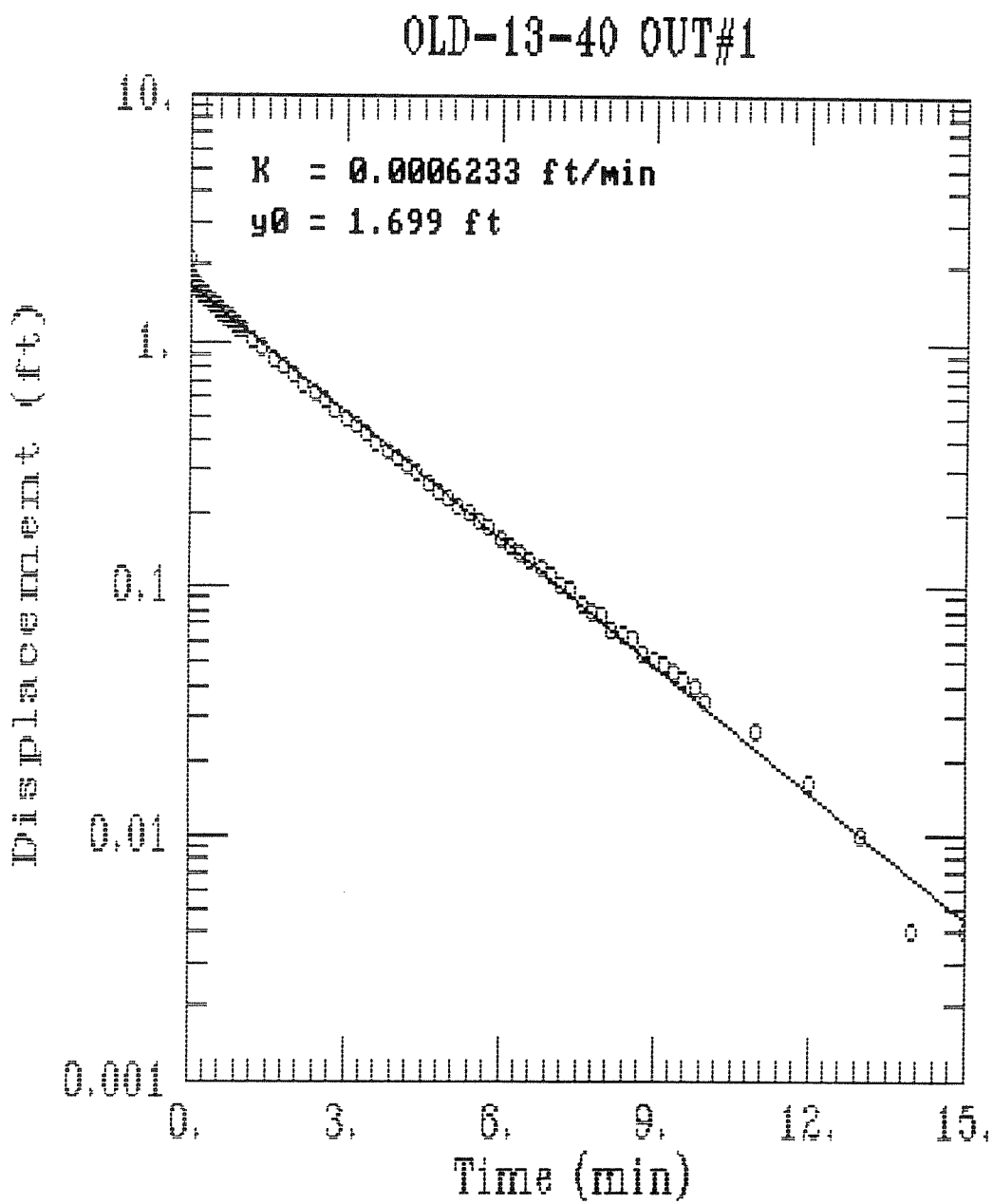
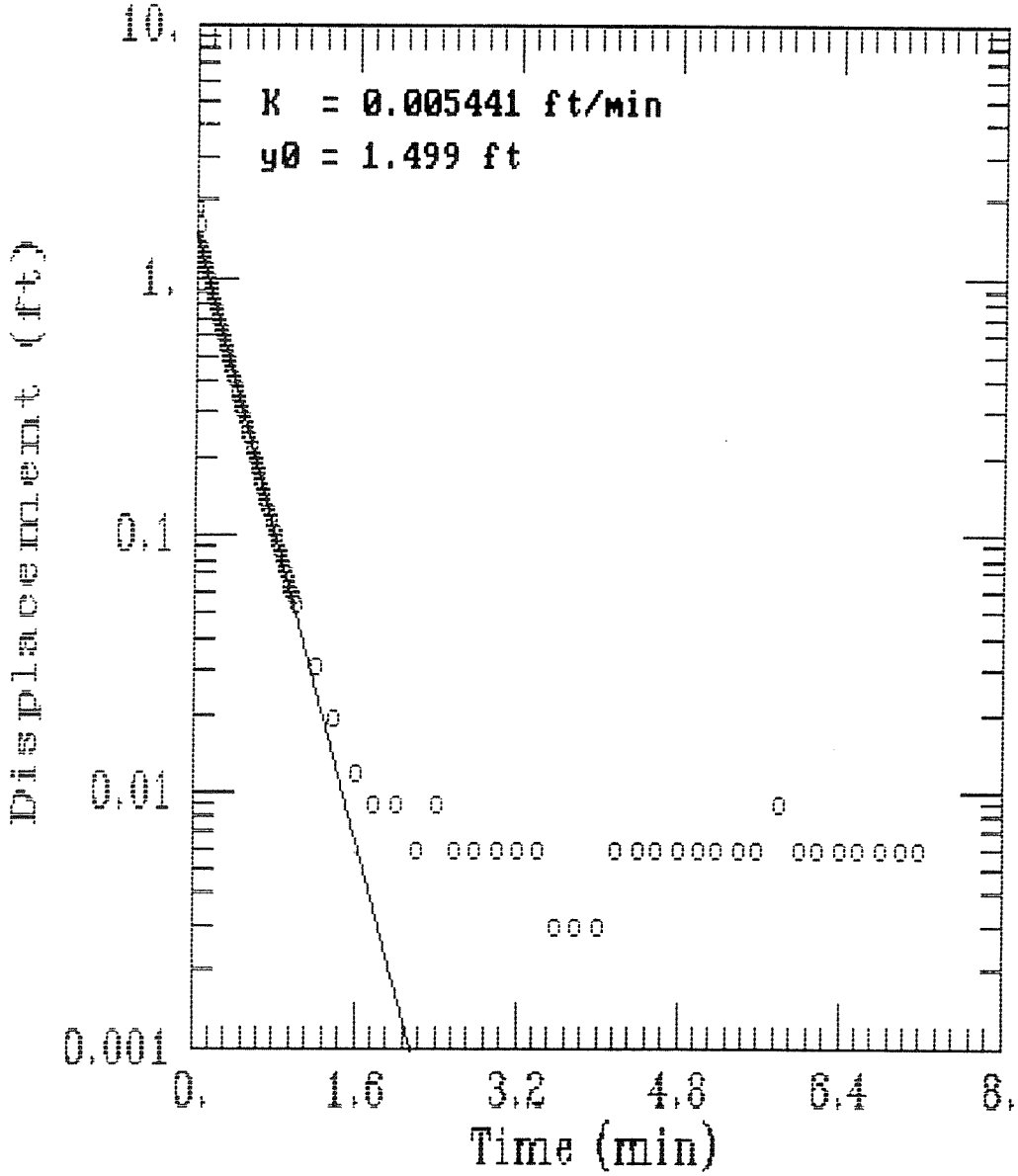
0.1
0.01
Displacement (ft)
0.
2.
4.
6.
8.
10.
Time (min)


OLD-13-40 OUT#1
K = 0.0006233 ft/min
y0 = 1.699 ft
10.
1.
0.1
0.01
0.001
Displacement (ft)
0.
3.
6.
9.
12.
15.
Time (min)

OLD-13-41 IN#1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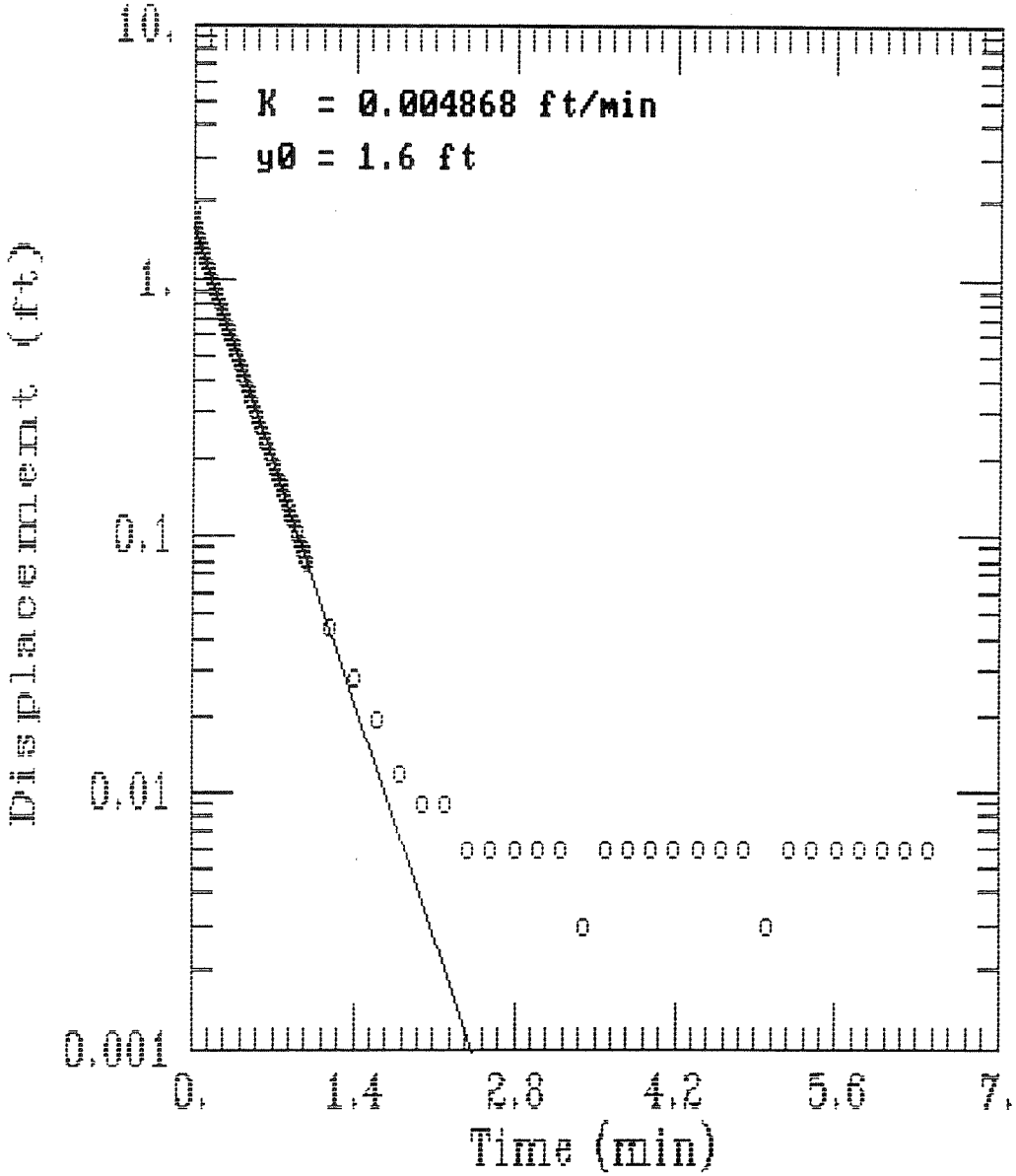
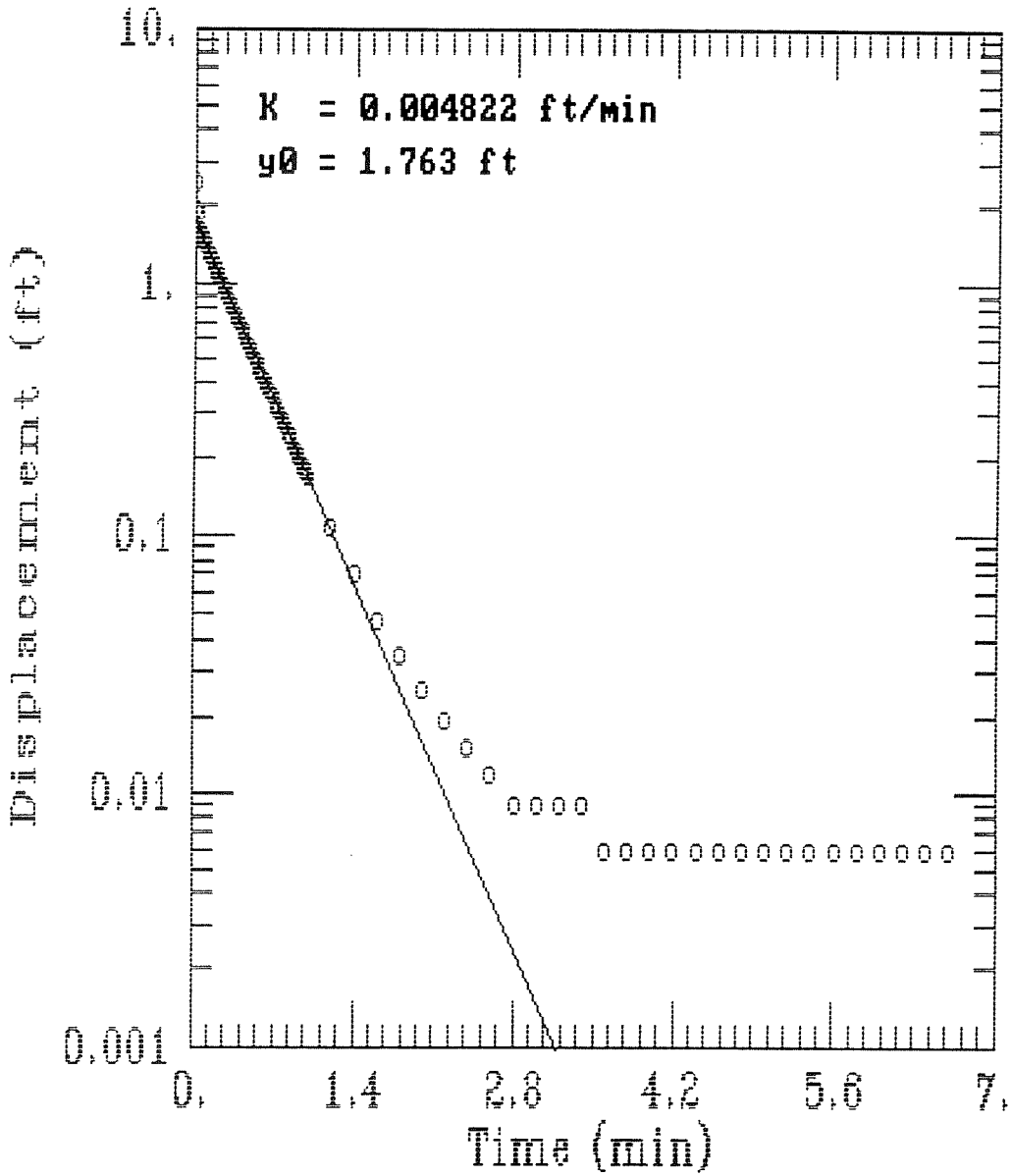
y0 = 1.499 ft
10.
1.
0.1
0.01
0.001
Displacement (ft)
0.
1.6
3.2
4.8
6.4
8.
Time (min)

OLD-13-41 OUT#1



OLD-13-35 IN#1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y0 = 1.763 ft
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1.
0.1
0.01
0.001
Displacement (ft)
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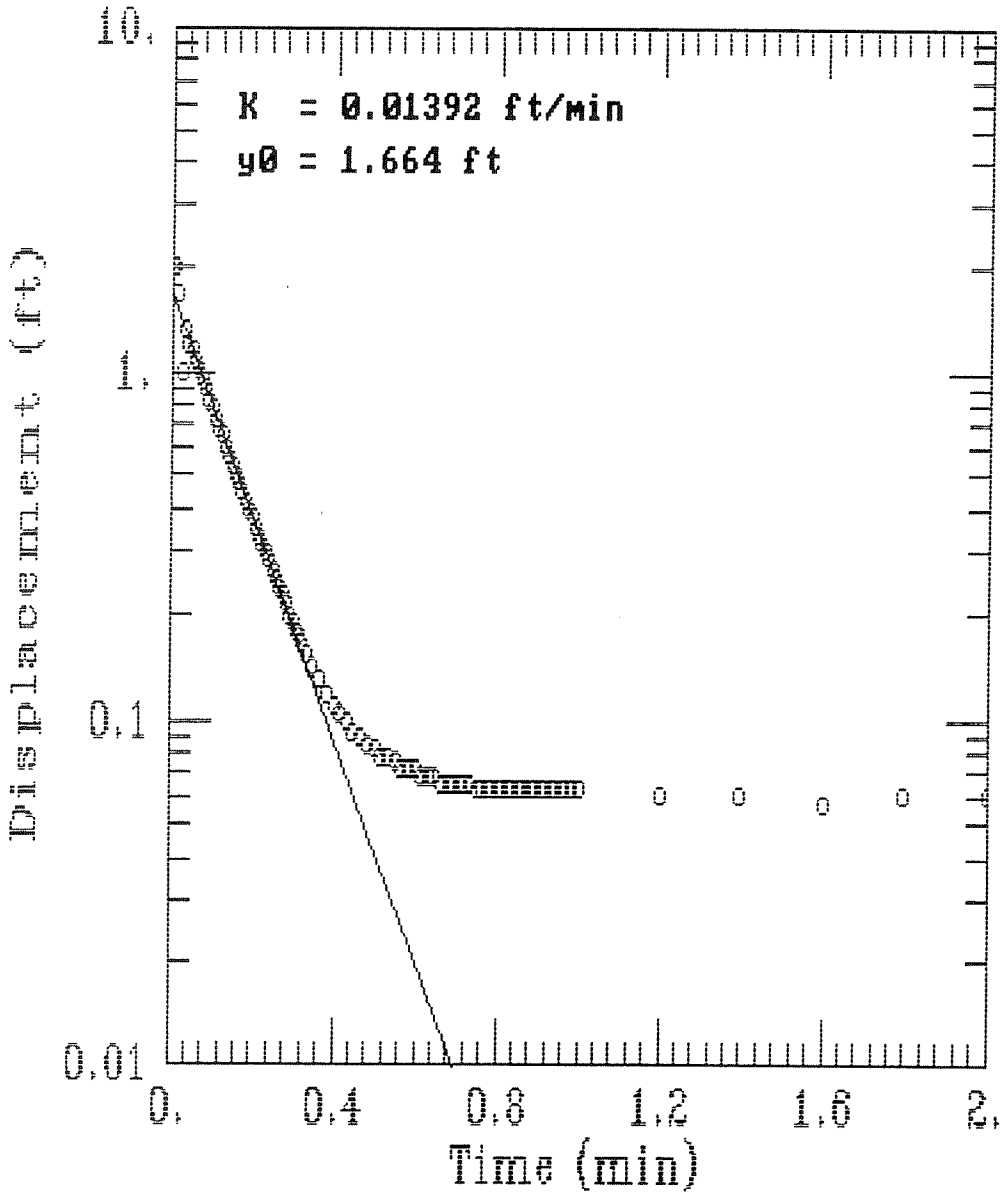
1.4
2.8
4.2
5.6
7.
Time (min)

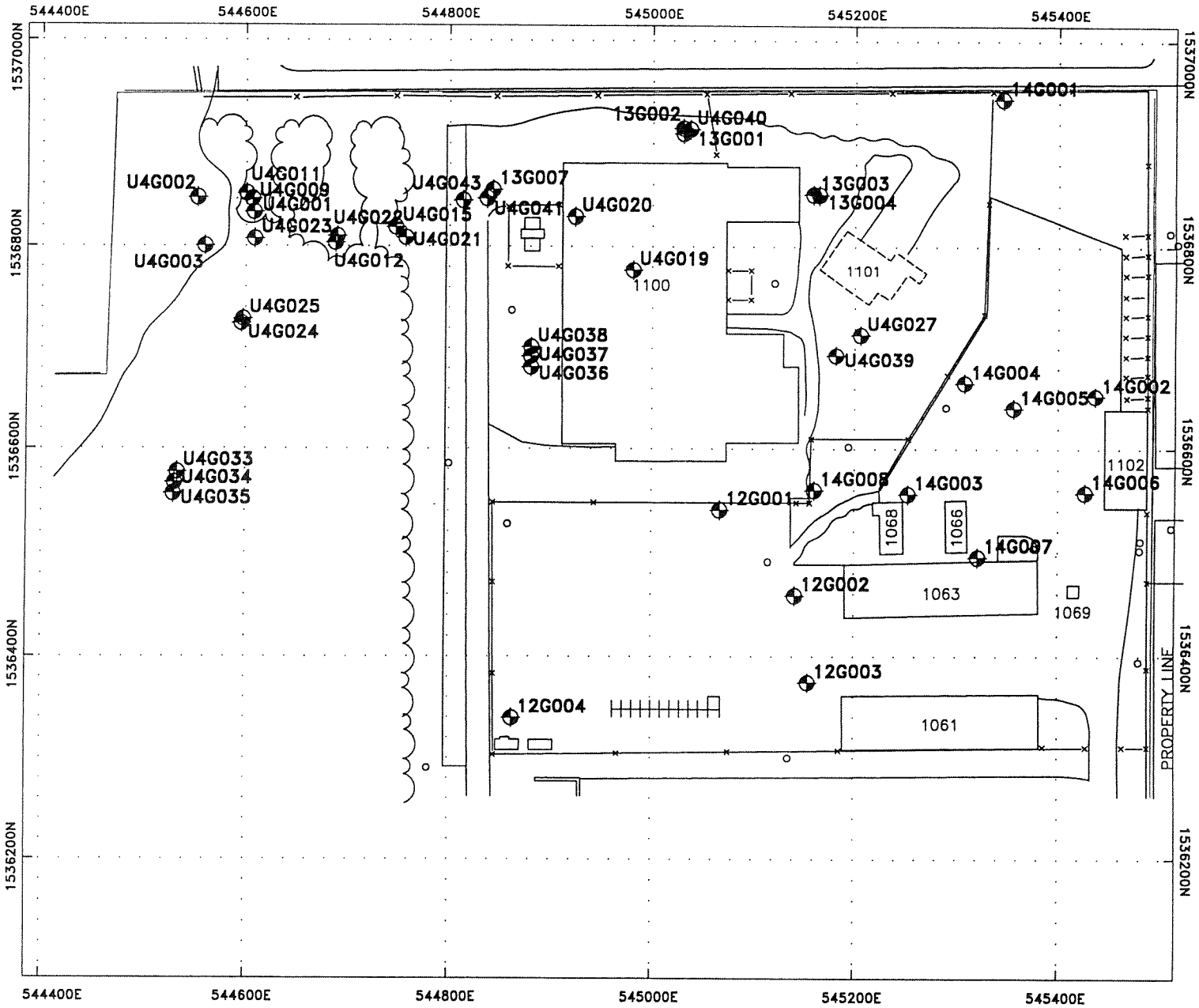
OLD-13-38 IN#1


K = 0.01392 ft/min
y0 = 1.664 ft
10.
1.
0.1
0.01
Displacement (ft)
0.
0.4
0.8
1.2
1.6
2.
Time (min)

APPENDIX L

APPENDIX L

GROUNDWATER PLUME CONTOURING



L-1

Scale 1:1800

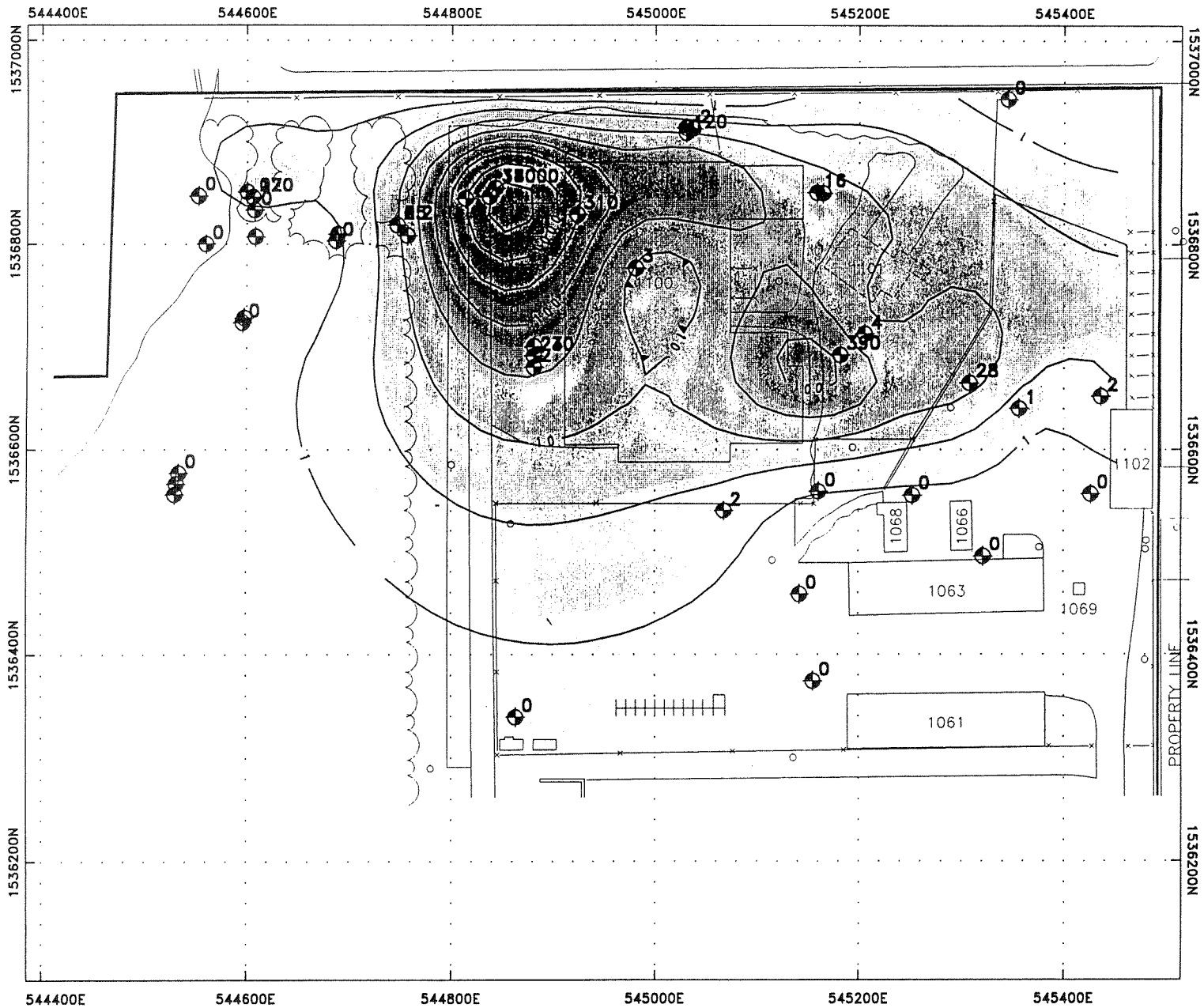
100 0 100

(feet)

SOUTHERN DIVISION

GROUNDWATER SAMPLE LOCATIONS
OPERABLE UNIT 4

HARDING LAWSON & ASSOCIATES



L-2

Scale 1:1800

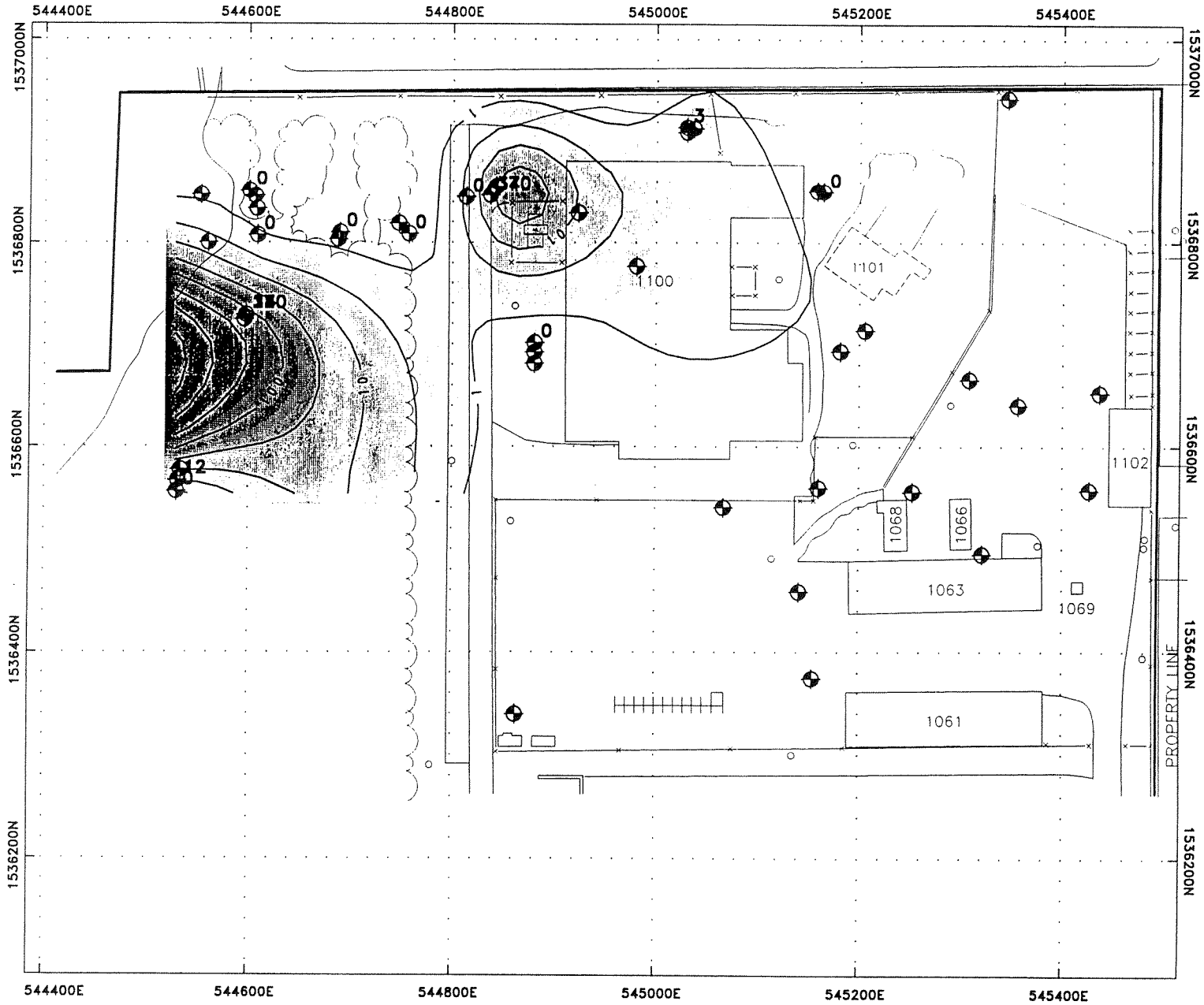
100 0 100

(feet)

SOUTHERN DIVISION

PCE CONCENTRATIONS IN GROUNDWATER
GROUND SURFACE TO ELEVATION 85 FT
OPERABLE UNIT 4

HARDING LAWSON & ASSOC



L-3

Scale 1:1800

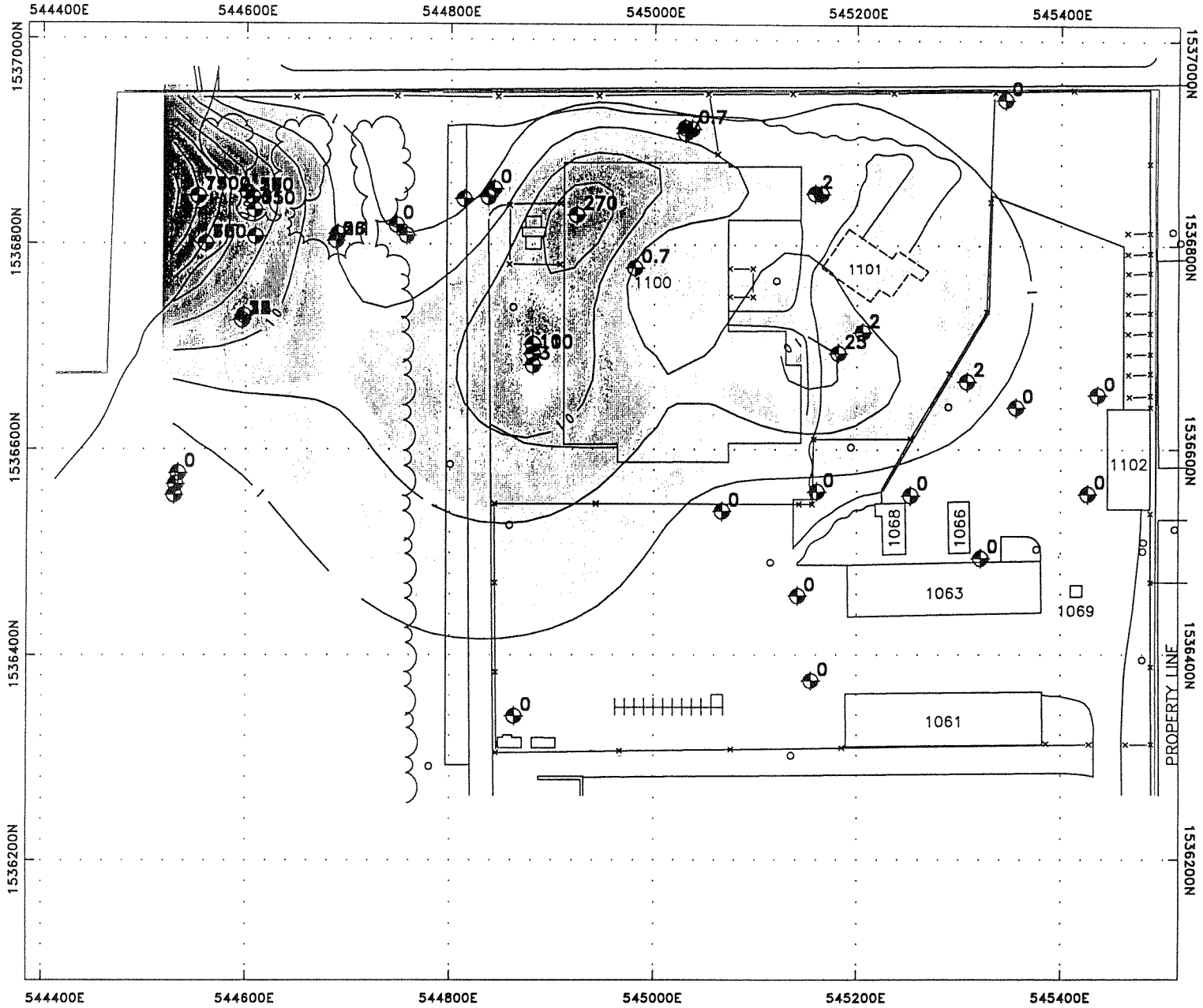
100 0 100

(feet)

SOUTHERN DIVISION

PCE CONCENTRATIONS IN GROUNDWATER
BELOW ELEVATION 85 FT
OPERABLE UNIT 4

HARDING LAWSON & ASSOCIATES



L-4

Scale 1:1800

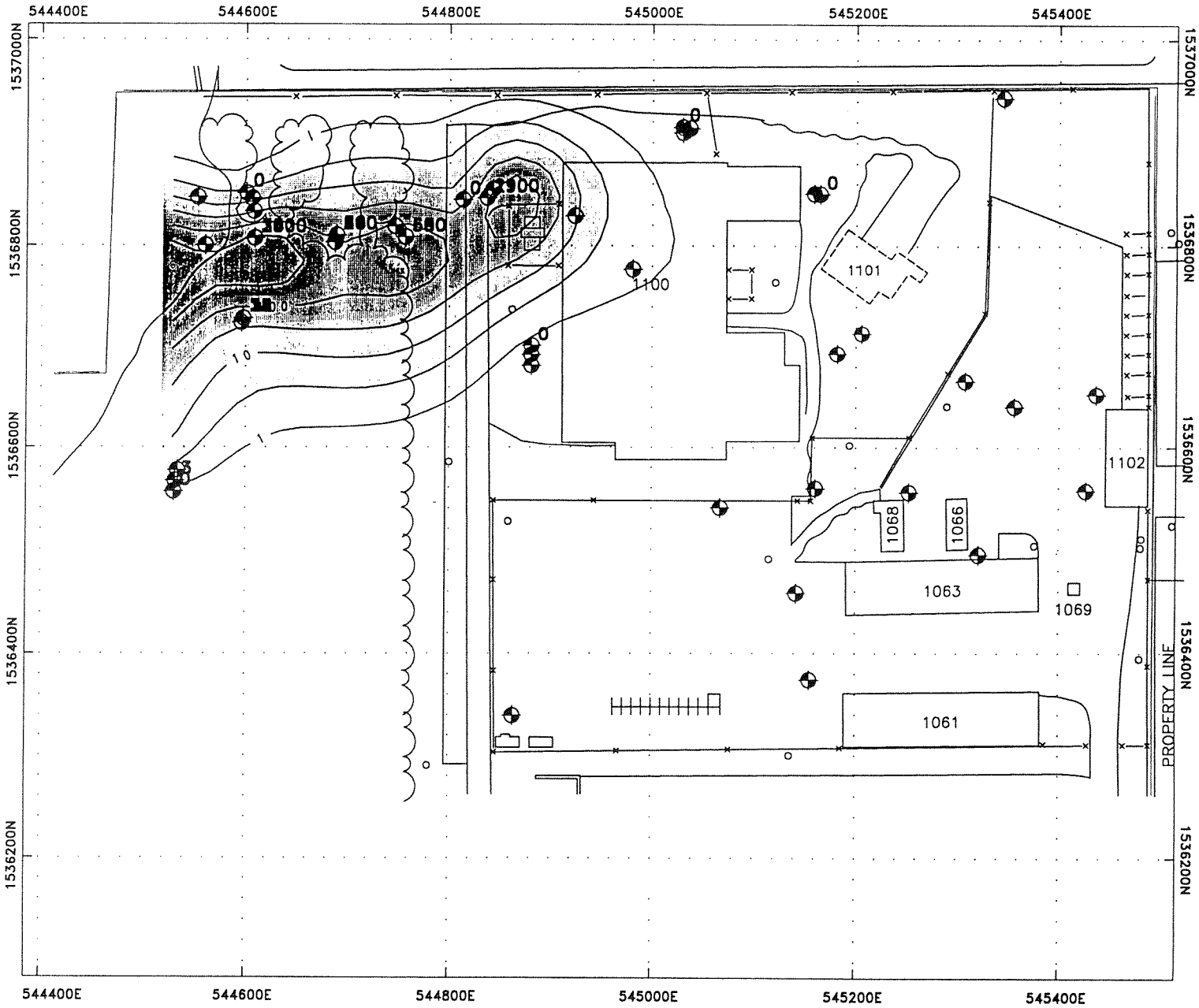
100 0 100

(feet)

SOUTHERN DIVISION

TCE CONCENTRATIONS IN GROUNDWATER
GROUND SURFACE TO ELEVATION 85 FT
OPERABLE UNIT 4

HARDING LAWSON & ASSOCI



L-5

Scale 1:1800

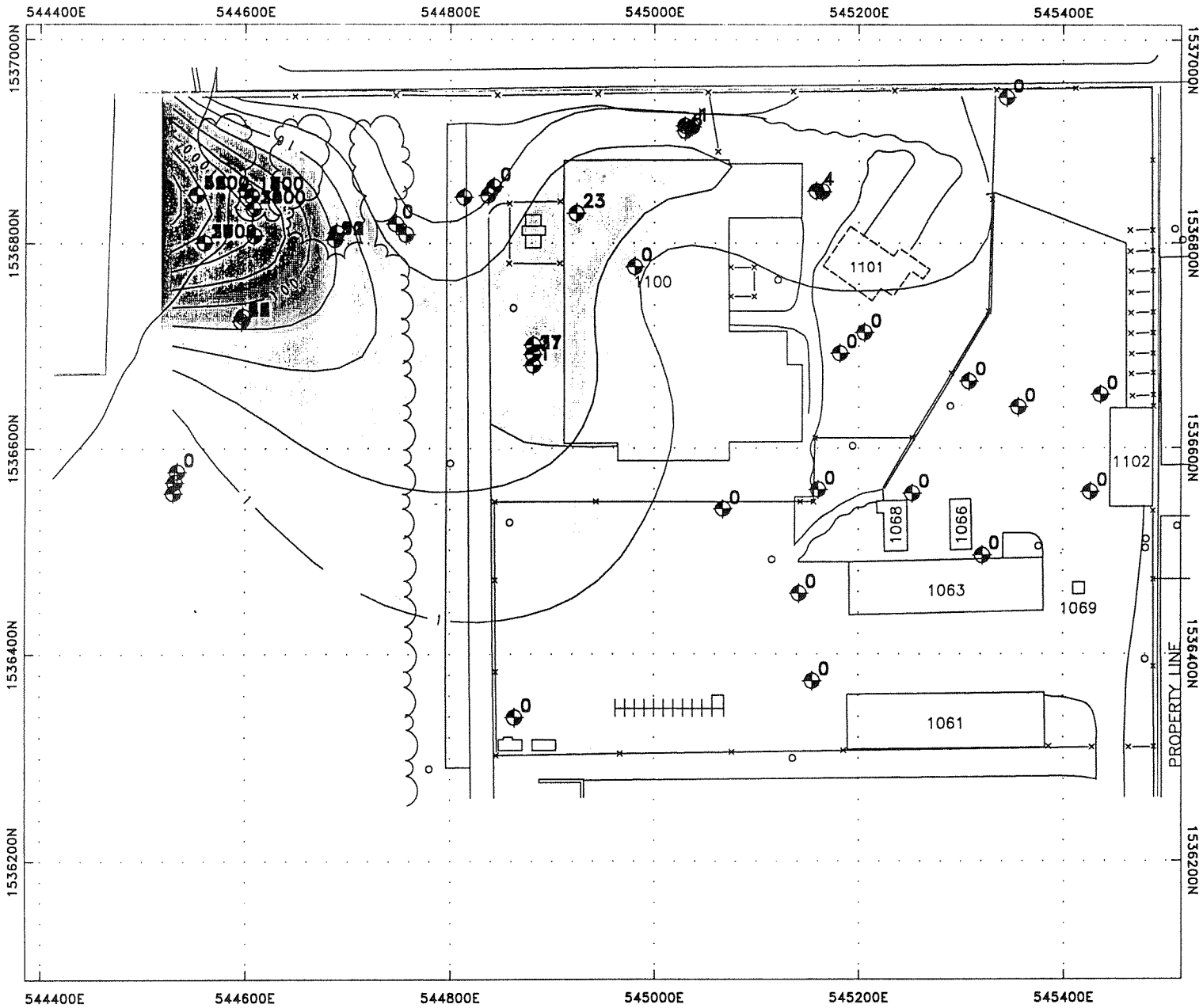
100 0 100

(feet)

SOUTHERN DIVISION

TCE CONCENTRATIONS IN GROUNDWATER
BELOW ELEVATION 85 FT
OPERABLE UNIT 4

HARDING LAWSON & ASSOCIATES



L-6

Scale 1:1800

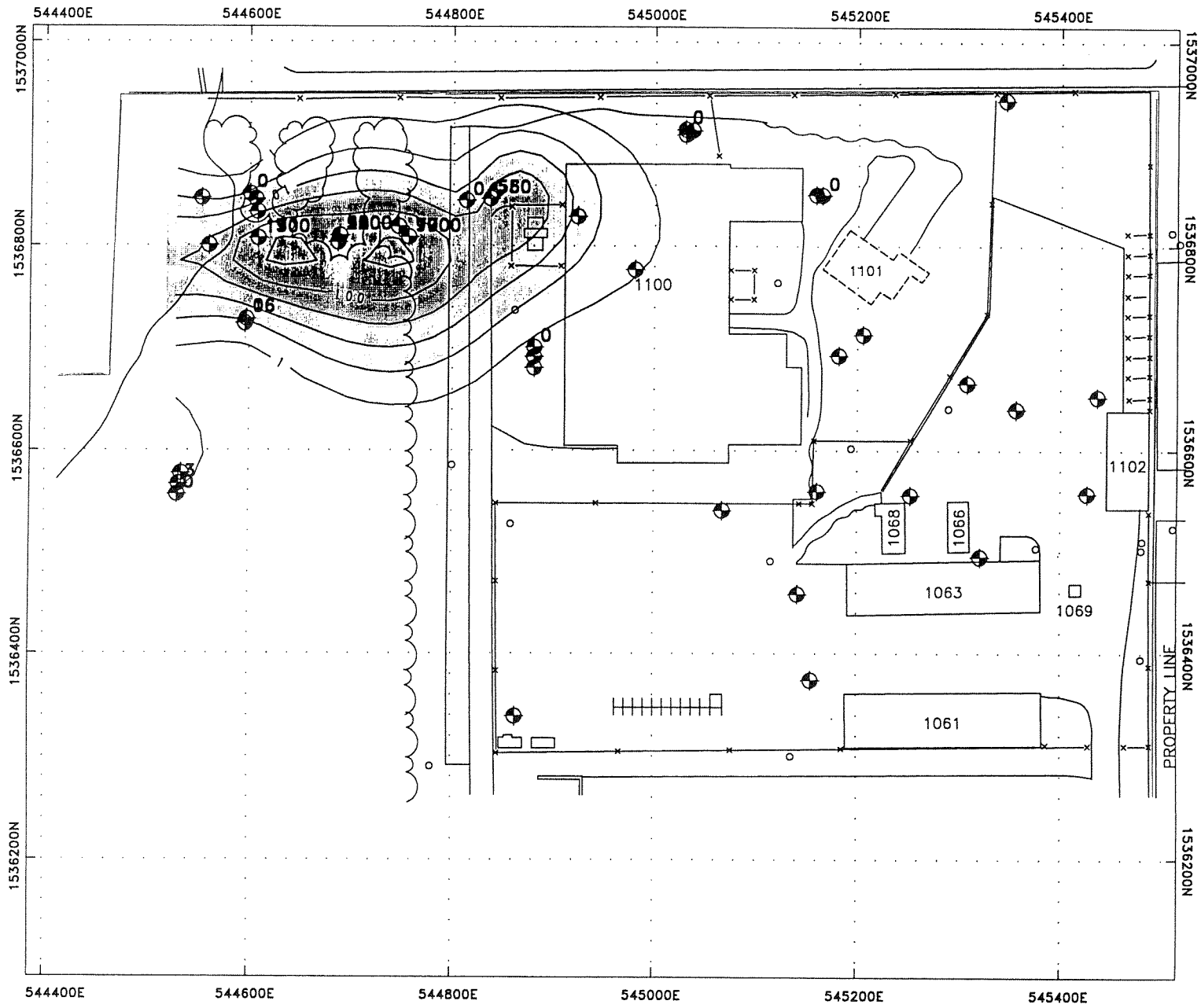
100 0 100

(feet)

SOUTHERN DIVISION

DCE CONCENTRATIONS IN GROUNDWATER
GROUND SURFACE TO ELEVATION 85 FT
OPERABLE UNIT 4

HARDING LAWSON & ASSOC



L-7

Scale 1:1800

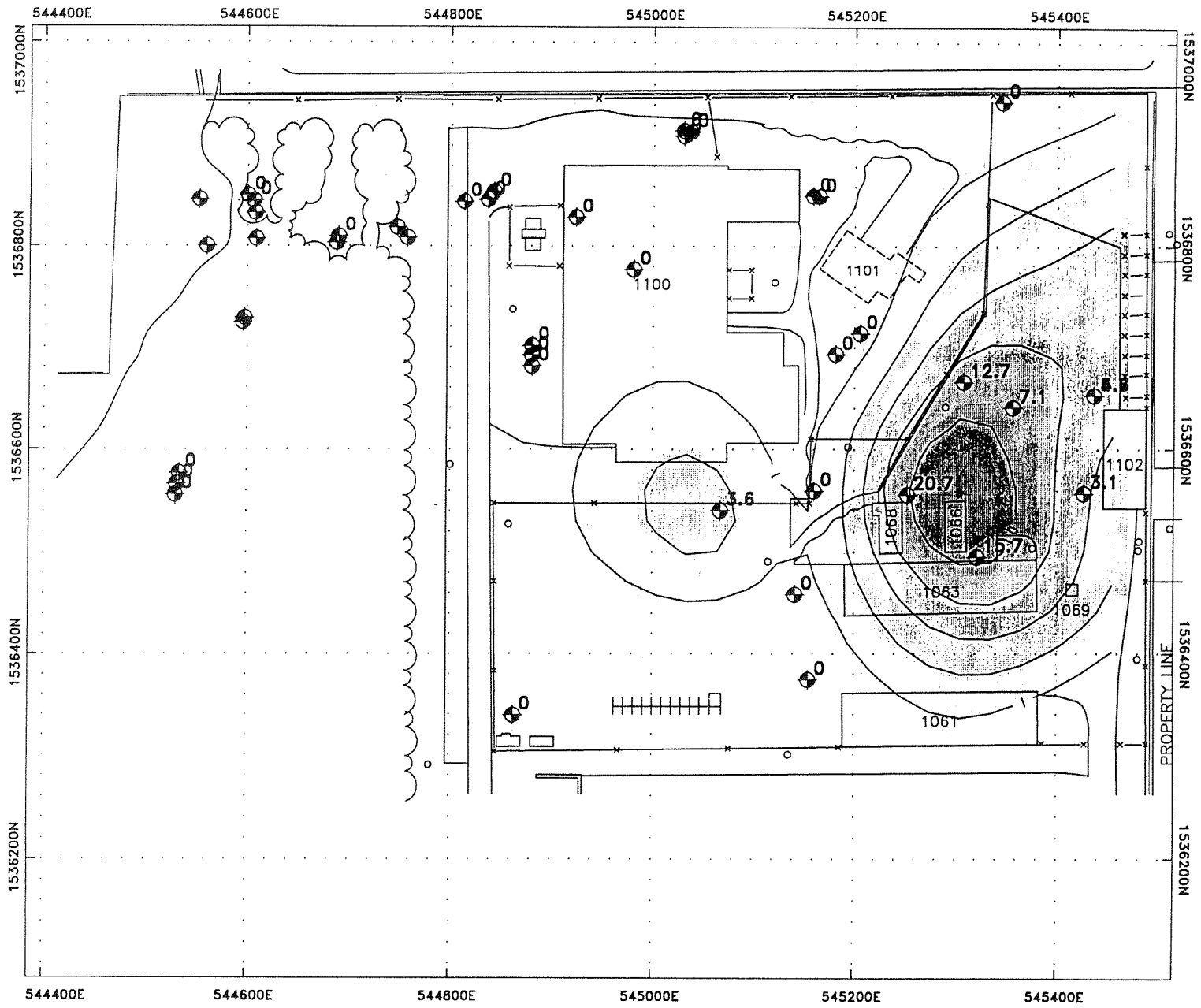
100 0 100

(feet)

SOUTHERN DIVISION

DCE CONCENTRATIONS IN GROUNDWATER
BELOW ELEVATION 85 FT
OPERABLE UNIT 4

HARDING LAWSON & ASSOCIATES



L-8

Scale 1:1800

100 0 100

(feet)

SOUTHERN DIVISION

ANTIMONY CONCENTRATIONS IN GROUNDWATER
OPERABLE UNIT 4

HARDING LAWSON & ASSOCIATES

APPENDIX M

APPENDIX M

INTERIM REMEDIAL ACTION (IRA) COMPLETION REPORT
SURFACE SOIL IRA

OU 4

Ser: 653
AUG 18 1999

MEMORANDUM

From: Director, Supervisor of Shipbuilding, Conversion and Repair, USN Portsmouth Va., Environmental Detachment, Charleston, SC (SPORTENVDETCHASN)
To: Southern Division Naval Facilities Engineering Command

Subj: INTERIM REMEDIAL ACTION COMPLETION REPORT FOR STUDY AREAS 17, 18, 23, 35, 37, 40, 42, and OU3 & 4

Ref: (a) Statement of Work for Project O98021
Naval Training Center and McCoy Annex, Orlando, Florida

Encl: (1) Interim Remedial Action Completion Report

1. SPORTENVDETCHASN was requested per reference (a) to proceed with the execution of Interim Remedial Action Work Plan for Study Areas 17, 18, 23, 35, 37, 40, 42, and OU3 & 4 at the Naval Training Center and McCoy Annex, Orlando, Florida. The scope of this work plan included the excavation and disposal of contaminated soil.

2. Southern Division is requested to distribute copies of this report to the Florida Department of Environmental Protection, the United States Environmental Protection Agency, Harding Lawson Associates, Inc. and TetraTech NUS, Inc. Questions concerning these plans should be addressed to A.J. Moyer at (843) 743-6777 ext. 137 or Kevin Tunstall at ext. 227.

Respectfully,

for E. R. Dearhart

copy to:
File

COMPLETION REPORT

INTERIM REMEDIAL ACTION
SA 17, 18, 23, 35, 37, 40, 42, and OU3 & 4
NAVAL TRAINING CENTER and McCOY ANNEX
ORLANDO, FLORIDA

VOL. 1 of 3

Prepared for:

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON SC

Prepared by:

Supervisor of Shipbuilding, Conversion and Repair,
USN, (SUPSHIP) Portsmouth Va.,
Environmental Detachment Charleston, S.C.
1899 North Hobson Ave.
North Charleston, SC 29405-2106

August 18, 1999

COMPLETION REPORT

Interim Remedial Action
SA 17, 18, 23, 35, 37, 40, 42 and OU3 & 4
Naval Training Center & McCoy Annex
Orlando, Florida

Engineering Branch Head: _____ **Date:** 8/18/99

Prepared By: _____ **Date:** 8/18/99

REPORT GENERATED BY:

ENVIRONMENTAL DETACHMENT CHARLESTON
1899 NORTH HOBSON AVENUE
NORTH CHARLESTON, SC 29405

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ACRONYMS, ABBREVIATIONS and SYMBOL

BLS	Below Land Surface
BRAC	Base Realignment and Closure
CFR	Code of Federal Regulations
DET	Environmental Detachment Charleston
DRMO	Defense Reutilization and Marketing Office
EPA	Environmental Protection Agency
FDEP	Florida Department of Environmental Protection
HLA	Harding Lawson Associates
IA	Immunoassay
IRA	Interim Remedial Action
NTC	Naval Training Center
OPT	Orlando Partnering Team
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbon
PPB	Parts Per Billion
RBC	Risk Based Concentration
RCRA	Resource Conservation and Recovery Act
RGO	Remedial Goal Options
RI/FS	Remedial Investigation/Feasibility Study
SA	Study Area
SCTL	Soil Cleanup Target Levels
SOUTHDIV	Southern Division Naval Facilities Engineering Command
SUPSHIP	Supervisor of Shipbuilding, Conversion and Repair, USN
TSDF	Treatment, Storage and Disposal Facility
USEPA	United States Environmental Protection Agency
USN	United States Navy

1. INTRODUCTION

1.1 OBJECTIVE Southern Division Naval Facilities Engineering Command (SOUTHDIV) tasked Supervisor of Shipbuilding, Conversion and Repair, Portsmouth, Va. Environmental Detachment Charleston (DET) to provide an Interim Remedial Action (IRA) Work Plan for Study Areas (SA) 17, 18, 23, 35, 37, 40, 42, and Operable Units (OU) 3 and 4 at the Naval Training Center (NTC) and the McCoy Annex, Orlando, Florida. The objective of this IRA was to excavate and dispose of contaminated soils at these areas.

The Remedial Goal Options (RGO) for these sites are as listed in the Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTL) dated 30 April 1998, or the Risk-Based Concentration Table, USEPA Region III, dated 01 Oct 1998 (RBC), whichever specifies the stricter criteria.

Individual site excavation boundaries and sampling requirements are consistent with the Base Realignment and Closure (BRAC) Work Plans for IRAs prepared by Harding Lawson Associates. (HLA).

All areas were backfilled with Florida-certified clean fill. See Appendix A2 for sampling documentation of the backfill.

Waste was characterized on each individual site based on process knowledge obtained from the Clean Contractors investigative sampling. Additional waste characterization analysis was performed by the DET as needed to verify the solid waste did not exceed the maximum concentration for the toxicity characteristic and to satisfy additional disposal/treatment requirements requested by the Treatment Storage Disposal Facility (TSDF) receiving the waste.

Separate Completion Reports are provided in Tabs A thru I of this document for each study area.

OPERABLE UNIT 4

1. INTRODUCTION

1.1 OPERABLE UNIT 4

OU4 is located near Building 1100 off of Port Hueneme Avenue on the Main Base, Naval Training Center, Orlando (Figure 1). OU4 consists of various sample points in this area. Arsenic and PAH's were detected at these sample points (Figure 1).

1.2 OU 4 INTERIM REMEDIAL ACTION

SOUTHDIV tasked the DET to perform an IRA for this site. The objective of the IRA was to excavate and dispose of soil contaminated with arsenic or PAH's. The excavation was to continue until the sampling program indicated with reasonable confidence that the concentrations of contaminants at the site were less than non-residential limits specified by FDEP SCG, dated 30 April 1998 or USEPA Region III, dated 01 October 1998, whichever specifies the stricter criteria.

1.2.1 OU 4 Interim Remedial Action Execution Summary

The execution of this IRA consisted of excavating an area approximately 10′ x 10′ to a depth of 2′ at sample locations U4S006 and U4S015 and an area approximately 10′ x 10′ to a depth of 2′ at sample location U4S011 (Figure 1). Soil removed from the site was characterized as non-hazardous and was sent to a Subtitle D landfill. Confirmation samples were collected from each sidewall testing for arsenic from sample point U4S011 (Figure 2) and for PAHs from sample points U4S0015 (Figure 3) and U4S006 (Figure 4). The results of these samples were all less than the RGOs.

2.0 INTERIM REMEDIAL ACTION EXCECUTION

2.1 ACTIONS PERFORMED BY THE INTERIM REMEDIAL ACTION WORK PLAN

Actions performed are listed below.

- Excavation and disposal of three areas approximately 10′ x 10′ x 2
- Collection of confirmatory samples from each sidewall for analysis of arsenic or PAHs
- Restoration of site by backfilling, grading to surrounding area, and seeding

2.2 OBSERVATIONS NOTES

2.2.1 Soil Conditions

From ground surface to the bottom of the excavation the soil was dark silty sand.

3.0 INTERIM REMEDIAL ACTION OUTCOME

3.1 SITE CONDITIONS FOLLOWING COMPLETION OF WORK

Following completion of work, the DET had removed 32 tons of arsenic or PAH contaminated soil. The site was backfilled, graded to surrounding area and seeded. Site photographs are included in Appendix I1.

4.0 SAMPLING

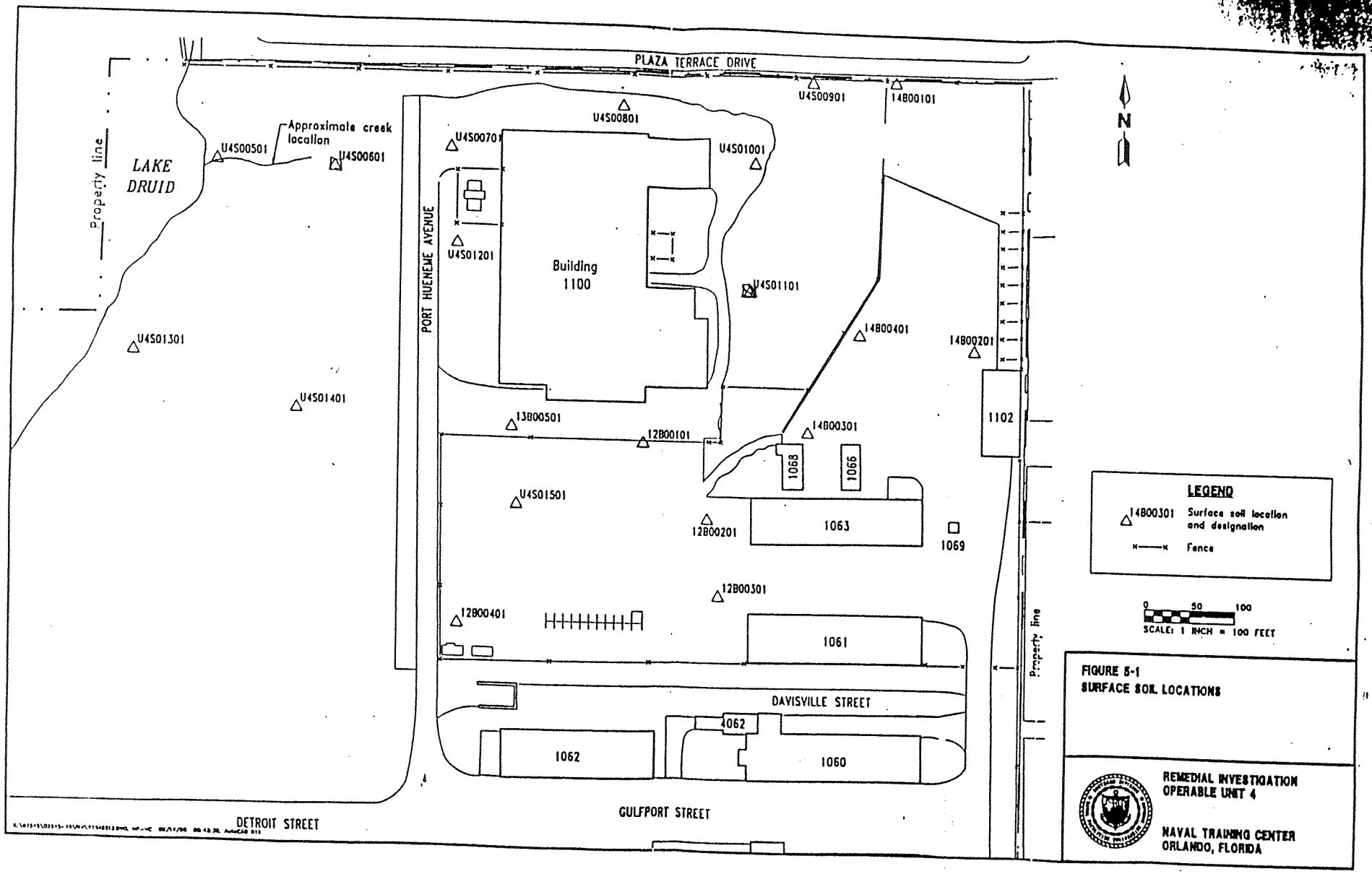
4.1 CONFIRMATION SAMPLING

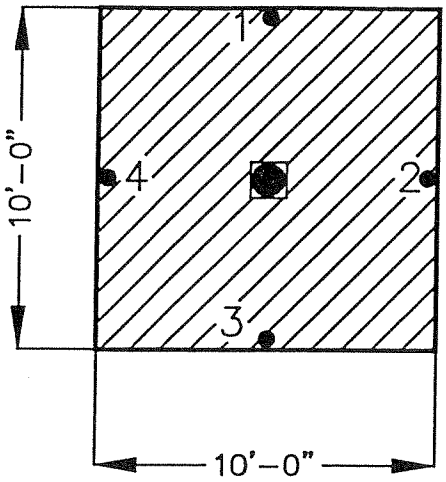
Upon completion of work a confirmation sample was collected from each sidewall testing for arsenic from sample point U4S011 (Figure 2) and testing for PAHs from sample points U4S015 (Figure 3) and U4S006 (Figure 4). See appendix I2 for sampling documentation

5.0 WASTE GENERATION

5.1 Non-Hazardous Waste

A total of 31 tons of non-hazardous PAH contaminated soil was disposed of to a permitted treatment, storage and disposal facility. Waste Manifests are in appendix I3.


PLAZA TERRACE DRIVE
U4S00901
14B00101
U4S00801
U4S00701
U4S01001
Approximate creek location
U4S00501
U4S00601
LAKE DRUID
Property line
U4S01201
Building 1100
U4S01101
PORT HUENEME AVENUE
14B00401
14B00201
U4S01301
U4S01401
13B00501
12B00101
14B00301
1102
1068
1066
U4S01501
12B00201
1063
1069
12B00301
12B00401
1061
DAVISVILLE STREET
4062
1062
1060
DETROIT STREET
GULFPORT STREET
Property line
N
LEGEND
14B00301 Surface soil location and designation
Fence
0 50 100
SCALE: 1 INCH = 100 FEET
FIGURE 5-1
SURFACE SOIL LOCATIONS
REMEDIAL INVESTIGATION
OPERABLE UNIT 4
NAVAL TRAINING CENTER
ORLANDO, FLORIDA



LEGEND

1 ● CONFIRMATORY SAMPLE ID 99SPORT0178-1

2 ● CONFIRMATORY SAMPLE ID 99SPORT0178-2

3 ● CONFIRMATORY SAMPLE ID 99SPORT0178-3

4 ● CONFIRMATORY SAMPLE ID 99SPORT0178-4

SAMPLE POINT U4S0011

EXCAVATED TO 2 FEET DEEP

N

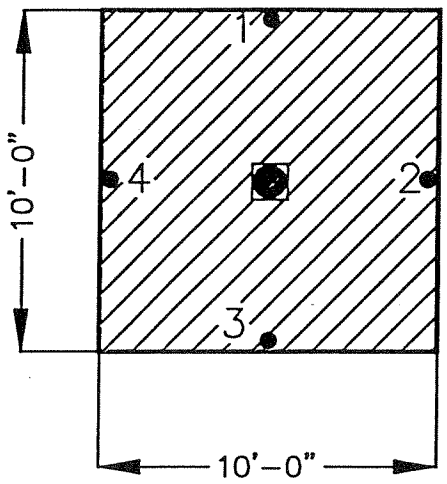
ENVIRONMENTAL DETACHMENT CHARLESTON
SOUTH CAROLINA

ENVIRONMENTAL DETACHMENT CHARLESTON
1899 NORTH HOBSON AVENUE - BUILDING 30
NORTH CHARLESTON, SOUTH CAROLINA 29405-2106

FIGURE 2
NAVAL TRAINING CENTER CENTER ORLANDO OU 4
EXCAVATION BOUNDARIES AND
CONFIRMATORY SAMPLE LOCATIONS

DATE:	PREPARED BY:	REV
18 AUGUST 1999	A. J. MOYER	—

SCALE: NONE | SHEET: —



LEGEND

1 ●	CONFIRMATORY SAMPLE ID 99SPORT0178-5
2 ●	CONFIRMATORY SAMPLE ID 99SPORT0178-6
3 ●	CONFIRMATORY SAMPLE ID 99SPORT0178-7
4 ●	CONFIRMATORY SAMPLE ID 99SPORT0178-8
◉	SAMPLE POINT U4S0015
▨	EXCAVATED TO 2 FEET DEEP

N

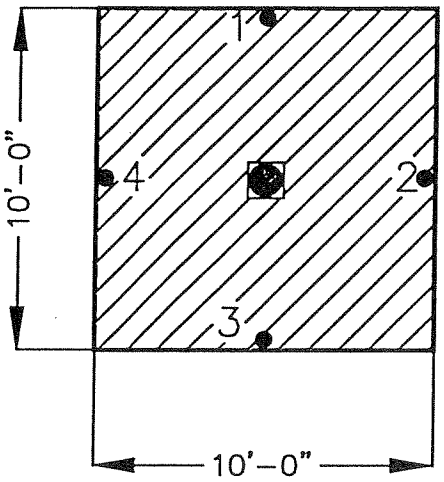
ENVIRONMENTAL DETACHMENT CHARLESTON
SOUTH CAROLINA

ENVIRONMENTAL DETACHMENT CHARLESTON
1899 NORTH HOBSON AVENUE - BUILDING 30
NORTH CHARLESTON, SOUTH CAROLINA 29405-2106

FIGURE 3
NAVAL TRAINING CENTER CENTER ORLANDO OU 4
EXCAVATION BOUNDARIES AND
CONFIRMATORY SAMPLE LOCATIONS

DATE:	PREPARED BY:	REV
18 AUGUST 1999	A. J. MOYER	—

SCALE: NONE | SHEET: —



LEGEND

1 ● CONFIRMATORY SAMPLE ID 99SPORT0178-9

2 ● CONFIRMATORY SAMPLE ID 99SPORT0178-10

3 ● CONFIRMATORY SAMPLE ID 99SPORT0178-11

4 ● CONFIRMATORY SAMPLE ID 99SPORT0178-12

SAMPLE POINT U4S006

EXCAVATED TO 2 FEET DEEP

N

ENVIRONMENTAL DETACHMENT CHARLESTON
SOUTH CAROLINA

ENVIRONMENTAL DETACHMENT CHARLESTON
1899 NORTH HOBSON AVENUE - BUILDING 30
NORTH CHARLESTON, SOUTH CAROLINA 29405-2106

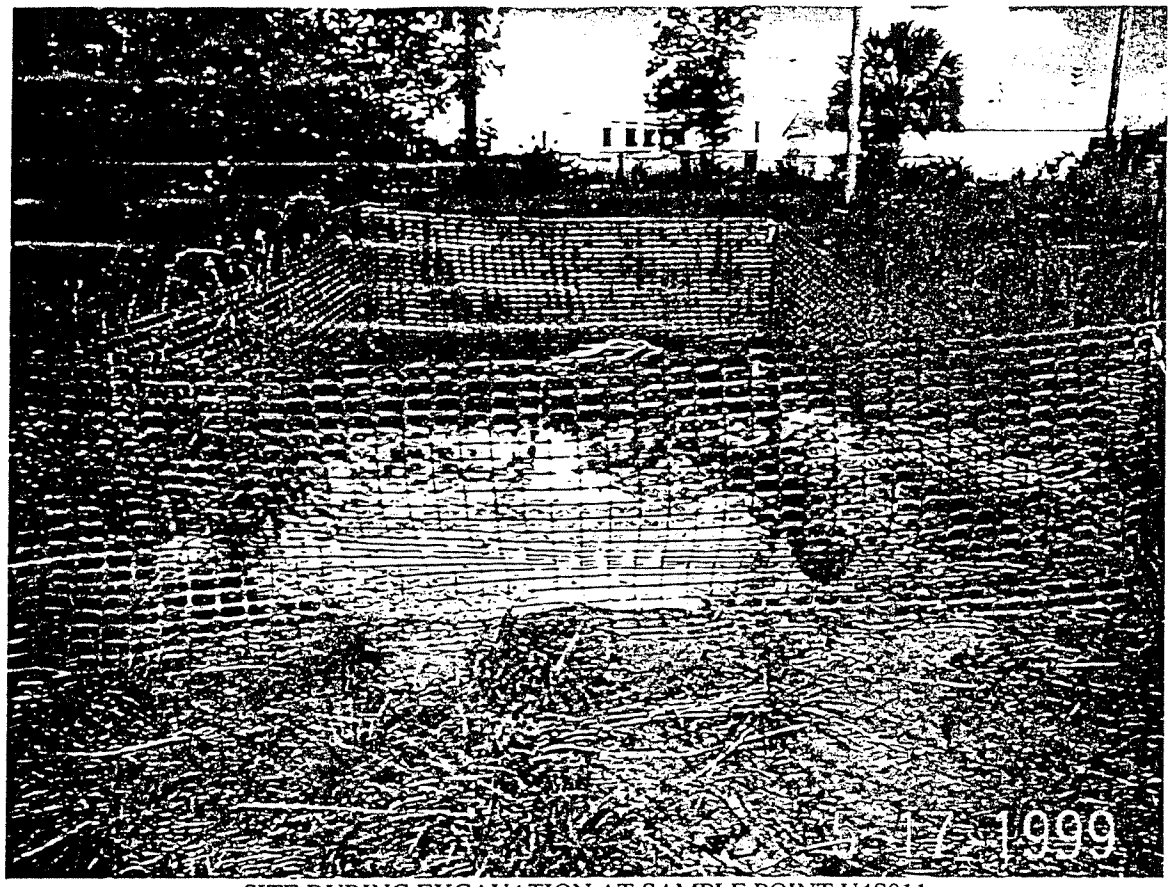
FIGURE 4
NAVAL TRAINING CENTER CENTER ORLANDO OU 4
EXCAVATION BOUNDARIES AND
CONFIRMATORY SAMPLE LOCATIONS

DATE:	PREPARED BY:	REV
18 AUGUST 1999	A. J. MOYER	—

SCALE: NONE | SHEET: —

SITE BEFORE EXCAVATION AT SAMPLE POINT U4S006

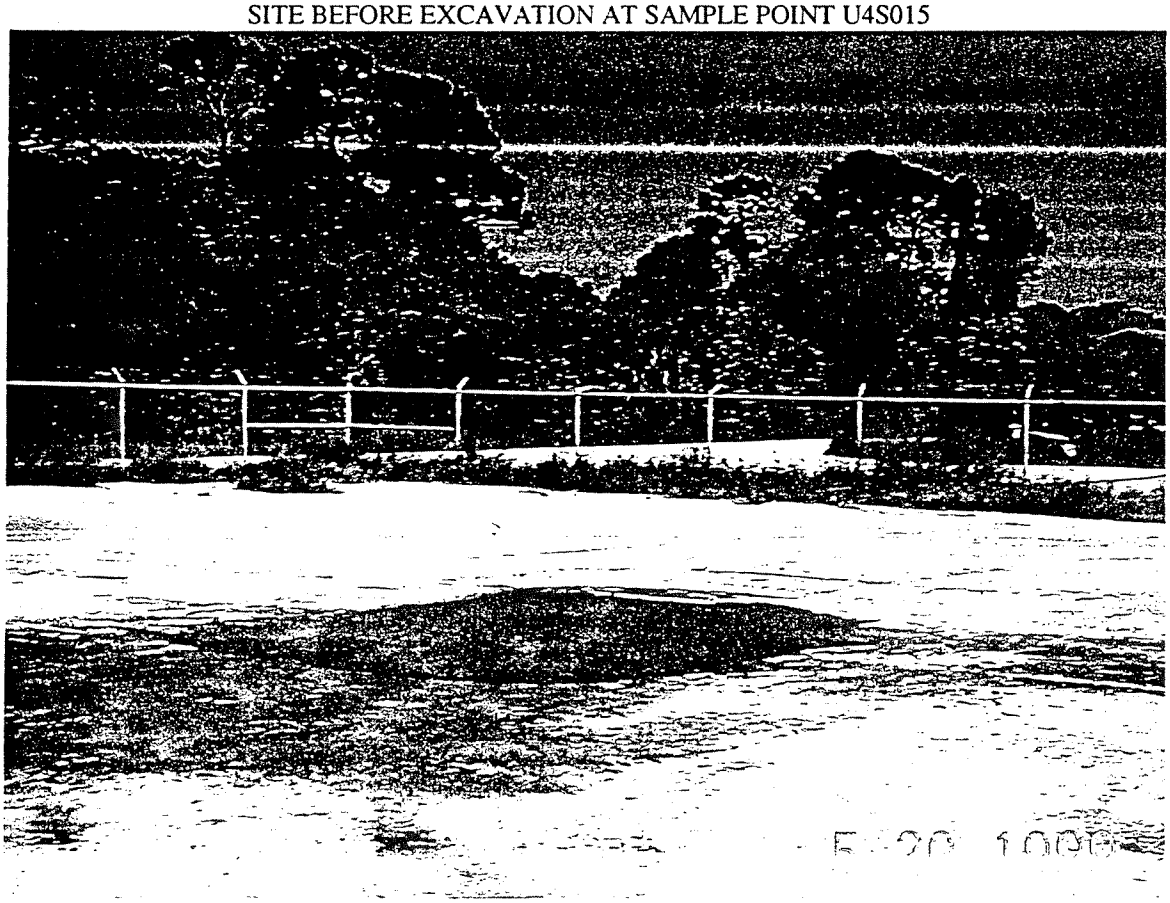
SITE AFTER EXCAVATION AT SAMPLE POINT U4S006



SITE DURING EXCAVATION AT SAMPLE POINT U4S011

SITE AFTER EXCAVATION AT SAMPLE POINT U4SO11

SITE BEFORE EXCAVATION AT SAMPLE POINT U4S015



SITE AFTER EXCAVATION AT SAMPLE POINT U4SO15

CONFIRMATION SAMPLES

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NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID	: 99SPORT0178-1
Lab ID	: 9905374-01
Matrix	: Soil
Date Collected	: 05/11/99
Date Received	: 05/12/99
Priority	: Rush
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Metals Analysis											
Arsenic	U	ND	414	455	ug/kg	2.0	MBL	05/13/99	2032	148913	

The following prep procedures were performed:

TRACE AJM 05/12/99 1730 148913 2

M = Method	Method-Description
M 1	EPA 6010B
M 2	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Elise Hanson at 843-556-8171.

E Hanson

Reviewed By

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SC	10120	10582
TN	02934	02934

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1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID	: 99SPORT0178-2
Lab ID	: 9905374-02
Matrix	: Soil
Date Collected	: 05/11/99
Date Received	: 05/12/99
Priority	: Rush
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Metals Analysis											
[illegible]senic		740	450	495	ug/kg	2.0	MBL	05/13/99	2038	148913	1
The following prep procedures were performed:											
TRACE							AJM	05/12/99	1730	148913	2

M = Method	Method-Description
M 1	EPA 6010B
M 2	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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NJ	79002	79002
SC	10120	10582
TN	02934	02934

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1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID	: 99SPORT0178-3
Lab ID	: 9905374-03
Matrix	: Soil
Date Collected	: 05/11/99
Date Received	: 05/12/99
Priority	: Rush
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Metals Analysis											
Arsenic		521	438	481	ug/kg	2.0	MBL	05/13/99	2044	148913	1

The following prep procedures were performed:

TRACE AJM 05/12/99 1730 148913 2

M = Method	Method-Description
M 1	EPA 6010B
M 2	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
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* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

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SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID	: 99SPORT0178-4
Lab ID	: 9905374-04
Matrix	: Soil
Date Collected	: 05/11/99
Date Received	: 05/12/99
Priority	: Rush
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Metals Analysis											
rsenic	U	ND	441	485	ug/kg	2.0	MBL	05/13/99	2050	148913	1

The following prep procedures were performed:

TRACE	AJM	05/12/99	1730	148913 2

M = Method	Method-Description
M 1	EPA 6010B
M 2	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID	: 99SPORT0178-5
Lab ID	: 9905374-05
Matrix	: Soil
Date Collected	: 05/11/99
Date Received	: 05/12/99
Priority	: Rush
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	ND	160	333	ug/kg	1.0	JPA	05/13/99	1536	149004	1
Acenaphthylene	U	ND	147	333	ug/kg	1.0					
Anthracene	U	ND	86.6	333	ug/kg	1.0					
Benzo(a)anthracene	U	ND	66.6	333	ug/kg	1.0					
Benzo(a)pyrene	U	ND	73.3	333	ug/kg	1.0					
Benzo(b)fluoranthene	U	ND	143	333	ug/kg	1.0					
Benzo(ghi)perylene	U	ND	79.9	333	ug/kg	1.0					
Benzo(k)fluoranthene	U	ND	133	333	ug/kg	1.0					
Chrysene	U	ND	53.3	333	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	ND	83.3	333	ug/kg	1.0					
Fluoranthene	U	ND	66.6	333	ug/kg	1.0					
Fluorene	U	ND	113	333	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	ND	79.9	333	ug/kg	1.0					
Naphthalene	U	ND	157	333	ug/kg	1.0					
Phenanthrene	U	ND	59.9	333	ug/kg	1.0					
Pyrene	U	ND	73.3	333	ug/kg	1.0					

The following prep procedures were performed:
GC/MS Base/Neutral Compounds

RDH 05/13/99 0800 149004 2

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610	65.2	(44.7 - 110.)
Nitrobenzene-d5	M610	60.9	(42.4 - 107.)
Terphenyl-d14	M610	68.6	(45.5 - 104.)

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NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID : 99SPORT0178-5

Surrogate Recovery	Test	Percent %	Acceptable Limits

M = Method	Method-Description
M 1	EPA 8270C
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Elise Hanson at 843-556-8171.

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NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID : 99SPORT0178-6
Lab ID : 9905374-06
Matrix : Soil
Date Collected : 05/11/99
Date Received : 05/12/99
Priority : Rush
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	ND	160	333	ug/kg	1.0	JPA	05/13/99	1606	149004	1
Acenaphthylene	U	ND	147	333	ug/kg	1.0					
Anthracene	U	ND	86.6	333	ug/kg	1.0					
Benzo(a)anthracene	U	ND	66.6	333	ug/kg	1.0					
Benzo(a)pyrene	U	ND	73.3	333	ug/kg	1.0					
Benzo(b)fluoranthene	U	ND	143	333	ug/kg	1.0					
Benzo(ghi)perylene	U	ND	79.9	333	ug/kg	1.0					
Benzo(k)fluoranthene	U	ND	133	333	ug/kg	1.0					
Chrysene	U	ND	53.3	333	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	ND	83.3	333	ug/kg	1.0					
Fluoranthene	U	ND	66.6	333	ug/kg	1.0					
Fluorene	U	ND	113	333	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	ND	79.9	333	ug/kg	1.0					
Naphthalene	U	ND	157	333	ug/kg	1.0					
Phenanthrene	U	ND	59.9	333	ug/kg	1.0					
Pyrene	U	ND	73.3	333	ug/kg	1.0					

The following prep procedures were performed:
GC/MS Base/Neutral Compounds

RDH 05/13/99 0800 149004 2

Surrogate Recovery	Test	Percent	Acceptable Limits
2-Fluorobiphenyl	M610	66.7	(44.7 - 110.)
Nitrobenzene-d5	M610	63.1	(42.4 - 107.)
Terphenyl-d14	M610	73.5	(45.5 - 104.)

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FL	E87156/87294	E87472/8
NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID : 99SPORT0178-6

Surrogate Recovery	Test	Percent %	Acceptable Limits

M = Method	Method-Description
M 1	EPA 8270C
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Elise Hanson at 843-556-8171.

E Hanson

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GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/8745
NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID	: 99SPORT0178-7
Lab ID	: 9905374-07
Matrix	: Soil
Date Collected	: 05/11/99
Date Received	: 05/12/99
Priority	: Rush
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	ND	160	333	ug/kg	1.0	JPA	05/13/99	1636	149004	1
Acenaphthylene	U	ND	147	333	ug/kg	1.0					
Anthracene	U	ND	86.6	333	ug/kg	1.0					
Benzo(a)anthracene	U	ND	66.6	333	ug/kg	1.0					
Benzo(a)pyrene	U	ND	73.3	333	ug/kg	1.0					
Benzo(b)fluoranthene	U	ND	143	333	ug/kg	1.0					
Benzo(ghi)perylene	U	ND	79.9	333	ug/kg	1.0					
Benzo(k)fluoranthene	U	ND	133	333	ug/kg	1.0					
Chrysene	U	ND	53.3	333	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	ND	83.3	333	ug/kg	1.0					
Fluoranthene	U	ND	66.6	333	ug/kg	1.0					
Fluorene	U	ND	113	333	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	ND	79.9	333	ug/kg	1.0					
Naphthalene	U	ND	157	333	ug/kg	1.0					
Phenanthrene	U	ND	59.9	333	ug/kg	1.0					
Pyrene	U	ND	73.3	333	ug/kg	1.0					

The following prep procedures were performed:
GC/MS Base/Neutral Compounds

RDH 05/13/99 0800 149004 2

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610	68.7	(44.7 - 110.)
Nitrobenzene-d5	M610	64.7	(42.4 - 107.)
Terphenyl-d14	M610	78.1	(45.5 - 104.)

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87.
NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID : 99SPORT0178-7

Surrogate Recovery	Test	Percent %	Acceptable Limits

M = Method	Method-Description
M 1	EPA 8270C
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Elise Hanson at 843-556-8171.

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874
NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID	: 99SPORT0178-8
Lab ID	: 9905374-08
Matrix	: Soil
Date Collected	: 05/11/99
Date Received	: 05/12/99
Priority	: Rush
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	ND	160	333	ug/kg	1.0	JPA	05/13/99	1705	149004	1
Acenaphthylene	U	ND	147	333	ug/kg	1.0					
Anthracene	U	ND	86.6	333	ug/kg	1.0					
Benzo(a)anthracene	U	ND	66.6	333	ug/kg	1.0					
Benzo(a)pyrene	U	ND	73.3	333	ug/kg	1.0					
Benzo(b)fluoranthene	U	ND	143	333	ug/kg	1.0					
Benzo(ghi)perylene	U	ND	79.9	333	ug/kg	1.0					
Benzo(k)fluoranthene	U	ND	133	333	ug/kg	1.0					
Chrysene	U	ND	53.3	333	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	ND	83.3	333	ug/kg	1.0					
Fluoranthene	U	ND	66.6	333	ug/kg	1.0					
Fluorene	U	ND	113	333	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	ND	79.9	333	ug/kg	1.0					
Naphthalene	U	ND	157	333	ug/kg	1.0					
Phenanthrene	U	ND	59.9	333	ug/kg	1.0					
Pyrene	U	ND	73.3	333	ug/kg	1.0					

The following prep procedures were performed:
GC/MS Base/Neutral Compounds

RDH 05/13/99 0800 149004 2

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610	68.9	(44.7 - 110.)
Nitrobenzene-d5	M610	67.0	(42.4 - 107.)
p-Terphenyl-d14	M610	80.9	(45.5 - 104.)

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STATE	GEL	EPI
FL	E87156/87294	E87472/87-
NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID : 99SPORT0178-8

Surrogate Recovery	Test	Percent %	Acceptable Limits

M = Method	Method-Description
M 1	EPA 8270C
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Elise Hanson at 843-556-8171.

E Hanson

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87
NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID	: 99SPORT0178-9
Lab ID	: 9905374-09
Matrix	: Soil
Date Collected	: 05/11/99
Date Received	: 05/12/99
Priority	: Rush
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	ND	160	333	ug/kg	1.0	JPA	05/13/99	1735	149004	1
Acenaphthylene	U	ND	147	333	ug/kg	1.0					
Anthracene	U	ND	86.6	333	ug/kg	1.0					
Benzo(a)anthracene	J	129	66.6	333	ug/kg	1.0					
Benzo(a)pyrene	J	203	73.3	333	ug/kg	1.0					
Benzo(b)fluoranthene	J	205	143	333	ug/kg	1.0					
Benzo(ghi)perylene	J	142	79.9	333	ug/kg	1.0					
Benzo(k)fluoranthene	J	233	133	333	ug/kg	1.0					
Chrysene	J	313	53.3	333	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	ND	83.3	333	ug/kg	1.0					
Fluoranthene		442	66.6	333	ug/kg	1.0					
Fluorene	U	ND	113	333	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	J	107	79.9	333	ug/kg	1.0					
Naphthalene	U	ND	157	333	ug/kg	1.0					
Phenanthrene	J	273	59.9	333	ug/kg	1.0					
Pyrene		521	73.3	333	ug/kg	1.0					

The following prep procedures were performed:
GC/MS Base/Neutral Compounds

RDH 05/13/99 0800 149004 2

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610	51.1	(44.7 - 110.)
Nitrobenzene-d5	M610	46.7	(42.4 - 107.)
p-Terphenyl-d14	M610	67.0	(45.5 - 104.)

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874.
NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID : 99SPORT0178-9

Surrogate Recovery	Test	Percent %	Acceptable Limits

M = Method	Method-Description
M 1	EPA 8270C
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Elise Hanson at 843-556-8171.

E Hanson

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874
NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID	: 99SPORT0178-10
Lab ID	: 9905374-10
Matrix	: Soil
Date Collected	: 05/11/99
Date Received	: 05/12/99
Priority	: Rush
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	ND	160	333	ug/kg	1.0	JPA	05/13/99	1805	149004	1
Acenaphthylene	U	ND	147	333	ug/kg	1.0					
Anthracene	U	ND	86.6	333	ug/kg	1.0					
Benzo(a)anthracene	J	74.6	66.6	333	ug/kg	1.0					
Benzo(a)pyrene	J	95.2	73.3	333	ug/kg	1.0					
Benzo(b)fluoranthene	U	ND	143	333	ug/kg	1.0					
Benzo(ghi)perylene	U	ND	79.9	333	ug/kg	1.0					
Benzo(k)fluoranthene	U	ND	133	333	ug/kg	1.0					
Chrysene	J	123	53.3	333	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	ND	83.3	333	ug/kg	1.0					
Fluoranthene	J	196	66.6	333	ug/kg	1.0					
Fluorene	U	ND	113	333	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	ND	79.9	333	ug/kg	1.0					
Naphthalene	U	ND	157	333	ug/kg	1.0					
Phenanthrene	J	98.4	59.9	333	ug/kg	1.0					
Pyrene	J	187	73.3	333	ug/kg	1.0					

The following prep procedures were performed:
GC/MS Base/Neutral Compounds

RDH 05/13/99 0800 149004 2

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610	43.3*	(44.7 - 110.)
Nitrobenzene-d5	M610	38.3*	(42.4 - 107.)
Terphenyl-d14	M610	58.7	(45.5 - 104.)

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874.
NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID : 99SPORT0178-10

Surrogate Recovery	Test	Percent %	Acceptable Limits

M = Method	Method-Description
M 1	EPA 8270C
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Elise Hanson at 843-556-8171.

E Hanson

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9905374-10

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87[illegible]
NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID	: 99SPORT0178-11
Lab ID	: 9905374-11
Matrix	: Soil
Date Collected	: 05/11/99
Date Received	: 05/12/99
Priority	: Rush
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	ND	160	333	ug/kg	1.0	JPA	05/13/99	1835	149004	1
Acenaphthylene	U	ND	147	333	ug/kg	1.0					
Anthracene	U	ND	86.6	333	ug/kg	1.0					
Benzo(a)anthracene	U	ND	66.6	333	ug/kg	1.0					
Benzo(a)pyrene	U	ND	73.3	333	ug/kg	1.0					
Benzo(b)fluoranthene	U	ND	143	333	ug/kg	1.0					
Benzo(ghi)perylene	U	ND	79.9	333	ug/kg	1.0					
Benzo(k)fluoranthene	U	ND	133	333	ug/kg	1.0					
Chrysene	U	ND	53.3	333	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	ND	83.3	333	ug/kg	1.0					
Fluoranthene	U	ND	66.6	333	ug/kg	1.0					
Fluorene	U	ND	113	333	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	ND	79.9	333	ug/kg	1.0					
Naphthalene	U	ND	157	333	ug/kg	1.0					
Phenanthrene	U	ND	59.9	333	ug/kg	1.0					
Pyrene	U	ND	73.3	333	ug/kg	1.0					

The following prep procedures were performed:
GC/MS Base/Neutral Compounds

RDH 05/13/99 0800 149004 2

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610	59.4	(44.7 - 110.)
Nitrobenzene-d5	M610	55.7	(42.4 - 107.)
p-Terphenyl-d14	M610	76.4	(45.5 - 104.)

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/8
NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID : 99SPORT0178-11

Surrogate Recovery	Test	Percent %	Acceptable Limits

M = Method	Method-Description
M 1	EPA 8270C
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Elise Hanson at 843-556-8171.

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87
NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID	: 99SPORT0178-12
Lab ID	: 9905374-12
Matrix	: Soil
Date Collected	: 05/11/99
Date Received	: 05/12/99
Priority	: Rush
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	ND	157	330	ug/kg	1.0	EH1	05/14/99	1816	149004	1
Acenaphthylene	U	ND	144	330	ug/kg	1.0					
Anthracene	U	ND	85.3	330	ug/kg	1.0					
Benzo(a)anthracene	U	ND	65.6	330	ug/kg	1.0					
Benzo(a)pyrene	U	ND	72.2	330	ug/kg	1.0					
Benzo(b)fluoranthene	U	ND	141	330	ug/kg	1.0					
Benzo(ghi)perylene	U	ND	78.7	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	ND	131	330	ug/kg	1.0					
Chrysene	U	ND	52.5	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	ND	82.0	330	ug/kg	1.0					
Fluoranthene	U	ND	65.6	330	ug/kg	1.0					
Fluorene	U	ND	112	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	ND	78.7	330	ug/kg	1.0					
Naphthalene	U	ND	154	330	ug/kg	1.0					
Phenanthrene	U	ND	59.0	330	ug/kg	1.0					
Pyrene	U	ND	72.2	330	ug/kg	1.0					

The following prep procedures were performed:
GC/MS Base/Neutral Compounds

RDH 05/14/99 0800 149004 2

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610	56.6	(44.7 - 110.)
Nitrobenzene-d5	M610	56.2	(42.4 - 107.)
p-Terphenyl-d14	M610	76.3	(45.5 - 104.)

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87.
NC	233	
NJ	79002	79002
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: May 15, 1999

Sample ID : 99SPORT0178-12

Surrogate Recovery	Test	Percent %	Acceptable Limits

M = Method	Method-Description
M 1	EPA 8270C
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Elise Hanson at 843-556-8171.

Reviewed By

P O Box 30712 • Charleston, SC 29417 • 2040 Savage Road • 29407
(843) 556-8171 • Fax (843) 766-1178

9905374-12

General Engineering Laboratories, Inc.
2040 Savage Road
Charleston, South Carolina 29407
P.O. Box 30712
Charleston, South Carolina 29417
(803) 556-8171

CHAIN OF CUSTODY RECORD

Client Name/Facility Name: NTC Orlando

Collected by/Company: ENS DET Chasn

SAMPLE ANALYSIS REQUIRED (x) - use remarks area to specify specific compounds or methods

Use F or P in the boxes to indicate whether sample was filtered or preserved

40196

3 DAY TURN AROUND

	SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB	# OF CONTAINERS	pH, conductivity	TOC/DOC	TOX	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method required	METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	PCB's	Cyanide	Coliform - specify type	Arsenic	PAH 8270	Remarks
-01	99Spot0178-1	5/11/99	1303		X		X	1																X		0045011-1
-02	99Spot0178-2	5/11/99	1309		X		X	1																X		0045011-2
-03	99Spot0178-3	5/11/99	1315		X		X	1																X		0045011-3
-04	99Spot0178-4	5/11/99	1319		X		X	1																X		0045011-4
-05	99Spot0178-5	5/11/99	1330		X		X	1																	X	0045015-1
-06	99Spot0178-6	5/11/99	1334		X		X	1																	X	0045015-2
-07	99Spot0178-7	5/11/99	1340		X		X	1																	X	0045015-3
-08	99Spot0178-8	5/11/99	1346		X		X	1																	X	0045015-4
-09	99Spot0178-9	5/11/99	1355		X		X	1																	X	0045006-1
-10	99Spot0178-10	5/11/99	1410		X		X	1																	X	0045006-2
-11	99Spot0178-11	5/11/99	1420		X		X	1																	X	0045006-3
-12	99Spot0178-12	5/11/99	1431		X		X	1																	X	0045006-4

Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received by:
K W Cope	5/11/99	1610					
Relinquished by:	Date:	Time:	Received by lab by:	Date:	Time:	Remarks:	
			P. Sauer	5/12/99	09:00		

White = sample collector Yellow = file Pink = with report

APPENDIX N

APPENDIX N

PARCC REPORT

PARCC CRITERIA EVALUATION REPORT

NTC Orlando, Orlando, Florida
Operable Unit 4

March 1998

Prepared for:

ABB Environmental Services, Inc.
1536 Kingsley Avenue, Suite 127
Orange Park, Florida 32073

Prepared by:

Environmental Data Services, Inc.
5 South State Street, Suite 2
Concord, New Hampshire 03301

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1.0 Introduction

Environmental Data Services, Inc. (EDS) performed data validation and evaluation of chemical analytical data from environmental samples which consisted of water and soil samples. These samples were collected at the Naval Training Center (NTC) - Operable Unit 4 in Orlando, Florida. The purpose of the data validation was to assess the reliability of the analytical data.

The data validation was performed in accordance with the Naval Facilities Engineering Service Center (NFESC) document Navy Installation Restoration Laboratory Quality Assurance Guide, February 1996. Other guidance documents used are the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, February 1994, and the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994. This report summarizes the results of the data quality assessment according to the precision, accuracy, representativeness, completeness and comparability (PARCC) parameters relative to the project specific Data Quality Objectives (DQOs).

The data consisted of NFESC Level C data packages for the organic and inorganic analyses. CompuChem Environmental, Inc. analyzed all of the samples in their North Carolina laboratory.

The data validation was performed to assess data quality. Data quality is dependent on field sampling procedures, analytical methods and instrumentation, and sample matrices. Field sampling procedures and laboratory analysis contain potential sources of uncertainty, error, or bias which can affect the overall quality of the data. Sampling errors can occur from inadequate equipment decontamination, improper sample collection techniques, improper filtering, improper preservation, and homogenization or non-homogenization of samples. Data quality can also be affected by analytical factors such appropriate analytical method, proper equipment maintenance, quality instrumentation and software.

Quality control samples are used to determine the effects of sampling procedures and evaluate laboratory contaminants, laboratory performance, and matrix effects. Quality control samples include trip blanks, equipment rinsate blanks, field source blanks, method blanks, laboratory control samples, surrogate spikes, matrix spike/matrix spike duplicate samples, laboratory duplicates and field duplicates.

Before conducting the PARCC evaluation, the data were validated according to the functional guidelines for organic and inorganic data (USEPA 1994). Samples not meeting functional guideline acceptance criteria were qualified with a data quality flag, as specified below. The qualifiers used for this project are as follows:

Organic Data Qualifiers

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

N - The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Inorganic Data Qualifiers

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J - The associated value is an estimated quantity.

R - The data are unusable. (Note: Analyte may or may not be present.)

UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

Following review and qualification of the data according to the functional guidelines, the data are then evaluated using PARCC criteria. PARCC criteria provide an evaluation of overall data useability. The following section defines the PARCC criteria in general terms, followed by a specific evaluation for each analysis; volatile organic compounds, semivolatile organic compounds, pesticides/PCBs, metals, and chlorinated herbicides.

Precision

Definition: Precision - Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation around the mean.

Precision is defined by the Contract Laboratory Program (CLP) as the relative percent difference of matrix spike recoveries for two matrix spikes of the same sample (matrix spike and matrix spike duplicates recoveries, MS/MSD). Precision was assessed by comparing the results for field sample duplicates and laboratory sample duplicates to provide information on homogeneity of field sampling techniques, improper handling of samples, and on laboratory sample preparation and analysis.

The relative percent difference (RPD) was calculated for the MS and MSD samples, ABB sample and associated field duplicate, and ABB sample and associated laboratory duplicate sample. Precision was quantitatively measured as the difference of the two sample results divided by the mean and multiplied by 100 in order to be reported as a percentage. The RPD was calculated by the reviewer for each of the duplicate samples and compared to the Data Quality Objectives (DQOs) for this project. Poor precision can be caused by sample heterogeneity, improper sample collection or handling, inconsistent sample preparation, and improper instrument use. An RPD above the numerical QC limit indicates imprecision which indicates that the actual concentrations may be higher or lower that the reported result.

Accuracy

Definition: Accuracy - Accuracy is the degree of conformity of a measurement (or an average of measurements of the same parameter), X, with an accepted reference or true value, T, usually expressed as the difference of the two values, X-T, or the difference as a percentage of the reference or true value 100(X-T)/T, and sometimes expressed as a ratio, X/T. Accuracy is a measurement of the bias in a system.

Accuracy is defined by the CLP as a percent recovery for a spiked sample for analyses. MS/MSD samples, surrogate recovery samples, and LCS samples are used to evaluate the data for accuracy. Recoveries outside of acceptable QC limits may be due to matrix interference, instrumentation, analyst error, or poor recovery of some of the target compounds.

Accuracy was quantitatively measured as the concentration of the spiked analyte minus the concentration of the spiked compound in the original sample, divided by the true concentration of the spiked analyte and multiplied by 100 in order to be reported as a percentage.

Accuracy was evaluated based on the results of the matrix spike/matrix spike duplicate, laboratory control sample, and surrogate spike. The reviewer calculated the percent recovery value (%R) for

each spiking compound and compared the results with the DQOs for this project. Spike recoveries outside the acceptable QC limits indicate a source of bias, where the reported results may be either higher or lower than reported.

Representativeness

Definition: Representativeness - Representativeness is the degree to which data accurately and precisely represent the true value of a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition intended to be characterized.

Representativeness is evaluated using the QC blank sample results. QC blank samples are equipment rinsate blanks, field source blanks, trip blanks, laboratory method blanks for organic analyses and laboratory preparation blanks for inorganic analyses. The presence of target compounds in these QC blanks provide an estimate of bias to the samples due to either cross contamination in the field or laboratory.

Field QC results were used to evaluate representativeness. Positive detection of compounds in the field QC samples identify compounds that could have been introduced to the associated field samples during sample collection, transportation to the laboratory, or during analysis. Contamination should not be found in field QC samples.

Qualifications were made to the data based on field blank contamination when the sample results were below ten (10) times the maximum amount detected in the blank for compounds that are common laboratory contaminants and five (5) times the maximum amount detected in the blank for compounds that are not common contaminants. Samples that were qualified as estimated due to blank contamination were flagged by the data reviewer with a "U." Compounds that were qualified due to blank contamination that were reported below the method detection limit were raised to the detection limit and the laboratory qualifier was replaced by the reviewer with a "U."

Qualifications were made to the data based on blank contamination in the following order:

- laboratory method blank contamination;

Followed by the highest concentration of contaminant found in any of the following:

- field blank contamination;
- trip blank contamination;
- equipment blank contamination;

Representativeness was also evaluated based on laboratory QC results. Laboratory method blanks were analyzed for the organic methods and preparation blanks were analyzed for inorganic compounds. Positive detection of compounds in the laboratory QC samples identify compounds that could have been introduced to the associated field samples during sample extraction or

preparation or during analysis. Contamination should not be found in laboratory QC samples. The detection of target compounds in the laboratory QC samples provides an estimate of bias to the associated samples due to cross contamination in the laboratory.

Qualifications were made to the data based on laboratory blank contamination when the sample results were below ten (10) times the maximum amount detected in the blank for compounds that are common laboratory contaminants and five (5) times the maximum amount detected in the blank for compounds that are not common contaminants. Samples that were qualified as estimated due to laboratory blank contamination were flagged by the data reviewer with a "U." Compounds that were qualified due to blank contamination that were reported below the method detection limit were raised to the detection limit and the laboratory qualifier was replaced by the reviewer with a "U."

Comparability

Definition: Comparability - Comparability is the confidence with which one data set can be compared to another. Comparability may be assessed by comparing sampling methodology, analytical methodology, and measurement units of reported data.

The comparability parameter assessment relies almost exclusively on the results of the data validation process. Each data reviewer assessed the comparability parameter by determining whether or not the data was acquired by using standard operating procedures for sampling, standard analytical methods for analysis and by reporting analytical results in standard units.

Comparability also may be assessed by review of the analytical method practical quantitation limits. The DQOs for this project specify that the any compound detected between the detection limit and practical quantitation limit will be reported and qualified as estimated (J).

Completeness

Definition: Completeness - Completeness is a measure of the amount of valid data expressed as a percentage obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions.

Completeness is evaluated to determine if an acceptable level of data was obtained so that a project can be completed with valid usable data. Valid usable values are data that are not rejected (R qualifier) by comparison of the analytical procedures with Level C Data Validation Guidelines as specified by NFESC. Completeness is quantitatively measured as the total number of analytes in each sample, equipment rinsate, field and trip blanks and duplicate samples, minus the total number of rejected analytes divided by the total number of analytes. The completeness criterion should be defined to be consistent with the project DQOs.

2.0 Volatile Organic Compounds

A total of seven (7) VOC SDGs were analyzed for this project. The SDGs were 0001S, 0001W, 0002S, 0002W, 0049W, 0059S, and 0059W.

This section discusses the QC supporting documentation as defined by the PARCC criteria and evaluated based on the project specific DQOs.

2.1 Precision

The relative percent difference (RPD) between MS/MSD samples and field duplicate samples is used to assess precision.

MS/MSD Samples

SDGs 0002W and 0059W did not have MS/MSD samples analyzed. For the remaining SDGs, at least one MS/MSD sample was analyzed. The functional guidelines establish RPD QC criteria limits for MS/MSD samples as follows:

MS/MSD Criteria

	Water RPD	Soil/Sediment RPD
1,1-Dichloroethene	14	22
Trichloroethene	14	24
Benzene	11	21
Toluene	13	21
Chlorobenzene	13	21

The RPD values for the MS/MSD analytical results for each SDG were acceptable with the following exception.

SDG 0002S

MS/MSD sample U4D05001 exhibited a high RPD value for 1,1-dichloroethene of 24, however, since the MS and MSD %R values and LCS %R values are acceptable, no qualifications were required.

Field Duplicate Samples

SDGs 0002S, 0049W, and 0059W did not have field duplicate samples analyzed. Field duplicate

sample results were non-detect for all remaining SDGs with the exception of the following. No qualifications were made based on these results.

SDG 0001S

Analyte	U4D01003 ug/kg	U4D01003D ug/kg	RPD
Acetone	91	59U	NC
1,2-Dichloroethene (total)	480	100	131
Toluene	6	59U	NC

Analyte	U4S00501 ug/kg	U4S00501D ug/kg	RPD
Methylene Chloride	17U	68	NC
Toluene	17U	2	NC

Analyte	U4S01201 ug/kg	U4S01201D ug/kg	RPD
Toluene	2	11U	NC

SDG 0001W

Analyte	U4Q03101 ug/L	U4Q03101D ug/L	RPD
Acetone	160	280	55
Trichloroethene	6	3	67
1,2-Dichloroethene (total)	5	3	50

Analyte	U4W01003 ug/L	U4W01003D ug/L	RPD
Vinyl Chloride	20	28	33
Trichloroethene	3	3	0
1,2-Dichloroethene (total)	110	130	17

2.2 Accuracy

The percent recovery results of MS/MSD samples and surrogate spikes are used to assess accuracy. Additionally, initial and continuing calibration results can be used to evaluate accuracy. Relative response factors (RRFs), percent relative standard deviation (%RSD) and percent difference (%D) are the three parameters used to evaluate instrument calibration.

MS/MSD Samples

The functional guidelines establish % Recovery QC criteria limits for MS/MSD samples as follows:

MS/MSD Criteria

	Water %R	Soil/Sediment %R
1,1-Dichloroethene	61-145	59-172
Trichloroethene	71-120	62-137
Benzene	76-127	66-142
Toluene	76-125	59-139
Chlorobenzene	75-130	60-133

SDGs 0002W and 0059W did not have MS/MSD samples analyzed. The percent recovery (%R) values for all analyzed MS/MSD samples were acceptable with the following exception.

SDG 0049W

MS/MSD sample U4G02201 exhibited low MS/MSD %R values for trichloroethene of 62% and 57%, respectively, however, all results have already been qualified due to holding times and no further qualifications were required.

Surrogate Spikes

Three surrogate compounds are used for spiking the volatile organic samples. Surrogate spike recoveries for volatile organic analyses were compared to the QC acceptance criteria as specified in the functional guidelines. These criteria are summarized as follows:

System Monitoring Compound Criteria

	Water %R	Soil/Sediment %R
Toluene-d_8 (TOL)	88-110	84-138
Bromofluorobenzene (BFB)	86-115	59-113
1,2-Dichloroethane-d_4 (DCE)	76-114	70-121

All surrogate recovery results for all SDGs were acceptable with the following exception.

SDG 0049W

Both samples exhibited low %R values for one or more surrogate compounds, however, all results have already been qualified due to holding times and calibration problems and no further qualifications were required.

Initial and Continuing Calibration

Initial and continuing calibration results can be used to evaluate accuracy within an SDG. Relative response factors (RRFs), percent relative standard deviation (%RSD) and percent difference (%D) are the three parameters used to evaluate instrument calibration. The RRF is a measure of relative response of an analyte compared to its internal standard. The %RSD is an expression of the linearity of instrument response and the %D is a comparison of the continuing calibration instrument response with its initial calibration response. The RRF is the most critical of the three parameters.

All SDGs were qualified due to initial and/or continuing calibration problems and are summarized below.

SDG 0001S

The initial calibration analyzed on 10/30/97 exhibited a high %RSD value for acetone of 51.0%. Positive acetone results have been qualified "J" in all samples.

The continuing calibration analyzed on 11/4/97 exhibited a high %D value for acetone of 28.2%. Acetone has been qualified "UJ" in associated sample U4S00901.

The continuing calibration analyzed on 11/5/97 (0743) exhibited acceptable %D and RRF values. No qualifications were required.

The continuing calibration analyzed on 11/5/97 (2010) exhibited acceptable %D and RRF values. No qualifications were required.

The continuing calibration analyzed on 11/6/97 exhibited a high %D value for acetone of 28.2%. Acetone has been qualified "UJ" in associated sample U4D01003D.

The continuing calibration analyzed on 11/7/97 exhibited a high %D value for chloromethane of 26.5%. Chloromethane has been qualified "UJ" in associated samples U4S00501 and U4S01401.

SDG 0001W

The initial calibration analyzed on 10/28/97 exhibited acceptable %RSD and mean RRF values. No qualifications were required.

The continuing calibration analyzed on 10/31/97 exhibited a high %D value for chloromethane of 28.1%. Chloromethane has been qualified "UJ" in associated samples U4T10001, U4T10101, and U4R10101.

The continuing calibration analyzed on 11/3/97 (0902) exhibited acceptable %D and RRF values. No qualifications were required.

The continuing calibration analyzed on 11/3/97 (1946) exhibited acceptable %D and RRF values. No qualifications were required.

The continuing calibration analyzed on 11/4/97 exhibited acceptable %D and RRF values. No qualifications were required.

The continuing calibration analyzed on 11/6/97 exhibited a high %D value for chloromethane of 41.7%. Chloromethane has been qualified "UJ" in associated sample U4Q04004.

The continuing calibration analyzed on 11/7/97 exhibited a high %D value for chloromethane of 26.1%. Chloromethane has been qualified "UJ" in associated sample U4T10301.

The continuing calibration analyzed on 11/10/97 exhibited acceptable %D and RRF values. No qualifications were required.

The continuing calibration analyzed on 11/11/97 exhibited a high %D value for chloromethane of 41.6%. Chloromethane has been qualified "UJ" in associated samples U4Q03101 and U3Q03008. Associated samples U4T10001RE and U4R10201RE have already been qualified due to holding times and no further qualifications were required.

The continuing calibration analyzed on 11/12/97 exhibited acceptable %D and RRF values. No qualifications were required.

The continuing calibration analyzed on 11/13/97 exhibited a high %D value for chloromethane of 25.6%. Chloromethane has been qualified "UJ" in associated samples U4Q04108 and U4Q03802. Associated samples U4T10101RE, U4F10001RE, and U4R10101RE have already been qualified due to holding times and no further qualifications were required.

SDG 0002S

The initial calibration analyzed on 10/30/97 exhibited a high %RSD value for acetone of 51.0%, however, sample U4D05001 was non-detect for acetone and no qualifications were required.

The continuing calibration analyzed on 11/4/97 exhibited a high %D value for acetone of 28.2%. Acetone has been qualified "UJ" in associated sample U4D05001.

SDG 0002W

The initial calibration analyzed on 10/28/97 exhibited acceptable %RSD and mean RRF values. No qualifications were required.

The initial calibration analyzed on 11/10/97 exhibited a high %RSD value for acetone of 54.9%. Acetone has been qualified "J" in associated samples U4Q03303, U4Q03305, and U4Q03309.

The continuing calibration analyzed on 11/10/97 exhibited a high %D value for acetone of 26.5%, however, all associated samples are already qualified for acetone due to initial calibration problems and no further qualifications were required.

The continuing calibration analyzed on 11/13/97 exhibited a high %D value for chloromethane of 25.6%. Chloromethane has been qualified "UJ" in associated sample U4Q03307.

The continuing calibration analyzed on 11/1797 (0103) exhibited acceptable %D and RRF values. No qualifications were required.

The continuing calibration analyzed on 11/17/97 (1247) exhibited high %D values for acetone and bromoform of 83.2% and 26.2%, respectively. Acetone and bromoform have been qualified "UJ" in associated samples U4Q04203 and U4Q04207.

SDG 0049W

The initial calibration analyzed on 12/8/97 exhibited a high %RSD value for methylene chloride of 49.6% and a low RRF value for 2-chloroethylvinylether of 0.033. Methylene chloride is non-detect in both samples and no qualifications were required. 2-Chloroethylvinylether has been rejected "R" in both samples since both results are non-detect. Several additional compounds exhibited %RSD and/or RRF values outside of QC limits, however, these compounds were not reported by the laboratory and no action has been taken.

The continuing calibration analyzed on 12/30/97 exhibited high %D values for twelve compounds, however, all associated results have already been qualified due to holding times and no further qualifications were required. The calibration also exhibited a low RRF value for 2-chloroethylvinylether of 0.021, however, this compound has already been rejected due to initial calibration problems, and no further qualifications were required. Several additional compounds exhibited %D and/or RRF values outside of QC limits, however, these compounds were not reported by the laboratory and no action has been taken.

SDG 0059S

The initial calibration analyzed on 12/10/97 exhibited high %RSD values for methylene chloride, acetone, and 2-butanone of 32.2%, 37.6%, and 31.3%, respectively, however, all associated results are non-detect and no qualifications were required.

The continuing calibration analyzed on 12/17/97 exhibited high %D values for acetone, carbon disulfide, and 2-butanone of 58.7%, 54.4%, and 35.8%, respectively. All of the above

compounds have been qualified "UJ" in associated samples U4B03301, U4B03302, U4B03303, U4B03304, U4B03501, U4B03502, and U4B03602 since all results are non-detect.

The continuing calibration analyzed on 12/18/97 exhibited high %D values for chloromethane, vinyl chloride, acetone, carbon disulfide, 2-butanone, and 2-hexanone of 37.0%, 32.5%, 41.7%, 56.3%, 28.1%, and 28.3%, respectively. All of the above compounds have been qualified "UJ" in associated sample U4B03601 since all results are non-detect.

The continuing calibration analyzed on 12/19/97 exhibited high %D values for chloromethane, vinyl chloride, methylene chloride, acetone, carbon disulfide, 2-butanone, and 2-hexanone of 30.8%, 33.1%, 26.6%, 47.6%, 34.7%, 51.9%, and 33.1%, respectively. All of the above compounds have been qualified "UJ" in associated samples U4B03001D, U4B03003D, U4B03004, U4B03001, U4B03003, and U4B03002 since all results are non-detect.

SDG 0059W

The initial calibration analyzed on 12/17/97 exhibited acceptable %RSD and mean RRF values. No qualifications were required.

The continuing calibration analyzed on 12/19/97 exhibited acceptable %D and RRF values. No qualifications were required.

The continuing calibration analyzed on 12/21/97 exhibited high %D values for chloromethane, bromomethane, vinyl chloride, chloroethane, and acetone of 38.7%, 27.2%, 35.2%, 25.9%, and 32.7%, respectively. All of the above compounds have been qualified "UJ" in associated sample U4T10601 since all results are non-detect.

2.3 Representativeness

Method blanks, equipment rinsate blanks, trip blanks, and field source blanks are used to evaluate representativeness. A summary of the contaminants found in these blanks can be found below. The laboratory method blank was applied first to the samples, followed by the highest concentration of the equipment rinsate blank, trip blank, and field source blank.

Qualifications were made to the data based on blank contamination when the sample results were below ten (10) times the maximum amount detected in the blank for compounds that are common laboratory contaminants and five (5) times the maximum amount detected in the blank for compounds that are not common contaminants. Samples that were qualified as undetected due to blank contamination were flagged by the data reviewer with a "U." Compounds that were qualified due to blank contamination that were reported below the method detection limit were raised to the detection limit and the laboratory qualifier was replaced by the reviewer with a "U." If a sample result exceeded 5X or 10X the amount in the blank, the result was not amended.

The following summarizes the method blanks, equipment rinsate blanks, trip blanks, and field source blanks.

Method Blanks

SDGs 0002W and 0059W did not exhibited method blank contamination. Method blank contamination for the remaining SDGs are summarized below.

SDG 0001S

Method blank VBLKG8 (11/4/97) exhibited methylene chloride contamination at 2 ug/kg. Methylene chloride has been qualified "U" in associated sample U4S00901.

Method blank VBLKG2 (11/5/97) exhibited methylene chloride contamination at 2 ug/kg. Methylene chloride has been qualified "U" in associated samples U4S00801, U4S01001, and U4S01201D.

Method blank VBLKL4 (11/6/97) exhibited methylene chloride contamination at 2 ug/kg. Methylene chloride has been qualified "U" in associated samples U4D01003D and U4S01501.

Method blank VBLKM4 (11/7/97) exhibited methylene chloride contamination at 1 ug/kg. Methylene chloride has been qualified "U" in associated samples U4S00501 and U4S01401.

SDG 0001W

Method blank VBLKTC (11/12/97) exhibited 2-hexanone contamination at 4 ug/L, however, all associated results were non-detect and no qualifications were required.

SDG 0002S

Method blank VBLKG8 (11/4/97) exhibited methylene chloride contamination at 2 ug/kg, however, methylene chloride in sample U4D05001 is greater than 10X the blank concentration and no qualifications were required.

SDG 0049W

Method blank VBLKUO (12/30/97) exhibited methylene chloride contamination at 1.0 ug/L. Methylene chloride has been qualified "U" in both samples.

SDG 0059S

Method blank VBLKV4 (12/17/97) exhibited methylene chloride contamination at 2 ug/kg.

Methylene chloride has been qualified "U" in associated samples U4B03301, U4B03302, U4B03303, U4B03304, U4B03501, U4B03502, and U4B03602.

Method blank VBLKY7 (12/19/97) exhibited methylene chloride and 1,1,2,2-tetrachloroethane contamination at 1 ug/kg and 2 ug/kg, respectively. Methylene chloride has been qualified "U" in associated samples U4B03001, U4B03001D, U4B03002, U4B03003, U4B03003D, and U4B03004. 1,1,2,2-Tetrchloroehtane is non-detect in all associated samples and no qualifications were required.

Equipment/Rinsate Blanks

Equipment rinsate blanks are used to evaluate contaminants that may have been introduced through the sampling equipment or laboratory handling of samples.

SDG 0001S

Rinsate blank U4R10101 (in SDG 0001W) was free of contamination. No qualifications were required.

Rinsate blank U4R10201 (in SDG 0001W) was free of contamination. No qualifications were required.

SDG 0001W

Rinsate blank U4R10101 was free of contamination. No qualifications were required.

Rinsate blank U4R10201 was free of contamination. No qualifications were required.

SDG 0002S

Rinsate blank U4R10101 (in SDG 0001W) was free of contamination. No qualifications were required.

Rinsate blank U4R10201 (in SDG 0001W) was free of contamination. No qualifications were required.

SDG 0002W

Rinsate blank U4R10101 (in SDG 0001W) was free of contamination. No qualifications were required.

Rinsate blank U4R10201 (in SDG 0001W) was free of contamination. No qualifications were required.

SDG 0049W

Rinsate blank U4R10101 (in SDG 0001W) was free of contamination. No qualifications were required.

Rinsate blank U4R10201 (in SDG 0001W) was free of contamination. No qualifications were required.

SDG 0059S

Rinsate blank U4R10401 (in SDG 0059W) exhibited methylene chloride and chloroform contamination at 1 ug/L and 1 ug/L, respectively, however, all associated methylene chloride results have already been qualified "U" due to blank contamination and all associated chloroform results are non-detect, therefore, no qualifications were required.

Rinsate blank U4R10101 (in SDG 0001W) was free of contamination. No qualifications were required.

Rinsate blank U4R10201 (in SDG 0001W) was free of contamination. No qualifications were required.

Trip Blanks

Trip blanks are used to evaluate contaminants that may have been introduced through storage, shipping, or site conditions. Trip blank contamination is summarized below.

SDG 0001S

Trip blank U4T10201 (in SDG 0001W) exhibited methylene chloride contamination at 3 ug/L. Methylene chloride has been qualified "U" in associated sample U4D01003.

U4T10101 (in SDG 0001W) exhibited methylene chloride contamination at 3 ug/L. Methylene chloride has been qualified "U" in associated sample U4S00601, U4S00701, U4S01101, and U4S01201.

SDG 0001W

Trip blank U4T10001 exhibited methylene chloride contamination at 3 ug/L, however, all associated results are non-detect and no qualifications were required.

Trip blank U4T10101 exhibited methylene chloride contamination at 3 ug/L, however, all associated results are non-detect and no qualifications were required.

Trip blank U4T10201 exhibited methylene chloride contamination at 3 ug/L, however, all associated results are non-detect and no qualifications were required.

Trip blank U4T10301 was free of contamination. No qualifications were required.

SDG 0002S

Trip blank U4T10201 (in SDG 0001W) exhibited methylene chloride contamination at 3 ug/L, however, methylene chloride is greater than 10X the blank concentration in sample U4D05001 and no qualifications were required.

SDG 0002W

Trip blank U4T10401 exhibited acetone contamination at 38 ug/L. Acetone has been qualified "U" in associated samples U4Q04203, U4Q04207, and U4Q04701.

Trip blank U4T10201 (in SDG 0001W) exhibited methylene chloride contamination at 3 ug/L, however, all associated results are non-detect and no qualifications were required.

Trip blank U4T10301 (in SDG 0001W) was free of contamination. No qualifications were required.

SDG 0059S

Trip blank U4BT10501 (in SDG 0059W) exhibited methylene chloride contamination at 2 ug/L. Methylene chloride has been qualified "U" in associated sample U4B03601.

Trip blank U4T10601 (in SDG 0059W) exhibited methylene chloride contamination at 1 ug/L, however, all associated results have already been qualified "U" due to blank contamination and no qualifications were required.

Field Source Blanks

Field source blanks are used to evaluate contaminants that may have been introduced through site conditions. Field source blanks are typically prepared in the field (on-site) as opposed to a trip blank which is typically prepared at the laboratory and shipped with the cooler.

SDG 0001S

Field blank U4F10001 (in SDG 0001W) exhibited methylene chloride contamination at 1 ug/L, however, qualifications were made based on the trip blanks since those results were higher.

SDG 0001W

Field blank U4F10001 exhibited methylene chloride contamination at 1 ug/L, however, all associated results are non-detect and no qualifications were required.

SDG 0002S

Field blank U4F10001 (in SDG 0001W) exhibited methylene chloride contamination at 1 ug/L, however, methylene chloride is greater than 10X the blank concentration in sample U4D05001 and no qualifications were required.

SDG 0002W

Field blank U4F10001 (in SDG 0001W) exhibited methylene chloride contamination at 1 ug/L, however, all associated results are non-detect and no qualifications were required.

SDG 0049W

Field blank U4F10001 (in SDG 0001W) exhibited methylene chloride contamination at 1 ug/L, however, all associated results have already been qualified due to method blank contamination and no further qualifications were required.

SDG 0059S

Field blank U4F10001 (in SDG 0001W) exhibited methylene chloride contamination at 1 ug/L, however, all methylene chloride results are non-detect or already qualified "U" due to blank contamination and no qualifications were required.

2.4 Comparability

The laboratory used standard analytical methods for all of the analyses. The method detection limits were below the contract required quantitation limits, therefore, the comparability was considered acceptable.

2.5 Completeness

There were 2 rejections of data in the volatile analyses. The percent of valid data is 99.9%.

3.0 Semivolatile Organic Compounds

A total of three (3) Semivolatile Organic Compound SDGs were analyzed for this project. The SDGs are 0001S, 0001W, and 0002S.

This section discusses the QC supporting documentation as defined by the PARCC criteria and evaluated based on the project specific DQOs.

3.1 Precision

MS/MSD Samples

The relative percent difference (RPD) between MS/MSD samples and field duplicate samples is used to assess precision.

One MS/MSD sample was analyzed for each SDG. The functional guidelines establish RPD QC criteria limits for MS/MSD samples as follows:

MS/MSD CRITERIA

	Water RPD	Soil/Sediment RPD
Phenol	42	35
2-Chlorophenol	40	50
1,4-Dichlorobenzene	28	27
N-Nitroso-di-n-propylamine	38	38
1,2,4-Trichlorobenzene	28	23
4-Chloro-3-methylphenol	42	33
Acenaphthene	31	19
4-Nitrophenol	50	50
2-4-Dinitrotoluene	38	47
Pentachlorophenol	50	47
Pyrene	31	36

MS/MSD RPD results for each SDG were acceptable with the exception of the following.

SDG 0001W

MS/MSD sample U4W05001 exhibited high RPD values for 1,4-dichlorobenzene and pyrene of 32 and 50, respectively, however, since these values only slightly exceeded QC criteria and the LCS %R values were acceptable, no qualifications were required.

Field Duplicate Samples

SDG 0002S did not have field duplicate samples analyzed. The following tables summarize field duplicate sample results for the remaining SDGs. No qualifications were made based on these results.

SDG 0001S

Analyte	U4D01003 ug/kg	U4D01003D ug/kg	RPD
Fluoranthene	1700U	6200	NC
Pyrene	200	6600	188
Bis(2-ethylhexyl)phthalate	160	11000	194

Analyte	U4S00501 ug/kg	U4S00501D ug/kg	RPD
Fluoranthene	100	92	8
Pyrene	99	94	5
Chrysene	63	76	19
Bis(2-ethylhexyl)phthalate	140	84	50
Benzo(b)fluoranthene	77	92	18
Benzo(a)pyrene	60	53	12

Analyte	U4S01201 ug/kg	U4S01201D ug/kg	RPD
Phenanthrene	68	95	33
Fluoranthene	140	250	56
Pyrene	170	270	45
Benzo(a)anthracene	55	130	81
Chrysene	120	190	45
Benzo(b)fluoranthene	160	180	12
Benzo(k)fluoranthene	160	66	83
Benzo(a)pyrene	78	120	42
Indeno(1,2,3-cd)pyrene	58	61	5
Benzo(g,h,i)perylene	64	77	18

SDG 0001W

Analyte	U4W01003 ug/L	U4W01003D ug/L	RPD
4-Methylphenol	10U	2	NC

3.2 Accuracy

The percent recovery results of MS/MSD samples and surrogate spikes are used to assess accuracy. Additionally, initial and continuing calibration results can be used to evaluate accuracy. Relative response factors (RRFs), percent relative standard deviation (%RSD) and percent difference (%D)

are the three parameters used to evaluate instrument calibration.

MS/MSD Samples

The functional guidelines establish % Recovery QC criteria limits for MS/MSD samples as follows:

MS/MSD CRITERIA

	Water %R	Soil/Sediment %R
Phenol	12-110	26-90
2-Chlorophenol	27-123	25-102
1,4-Dichlorobenzene	36-97	28-104
N-Nitroso-di-n-propylamine	41-116	41-126
1,2,4-Trichlorobenzene	39-98	38-107
4-Chloro-3-methylphenol	23-97	26-103
Acenaphthene	46-118	31-137
4-Nitrophenol	10-80	11-114
2-4-Dinitrotoluene	24-96	28-89
Pentachlorophenol	9-103	17-109
Pyrene	26-127	35-142

The percent recovery (%R) values for all of the MS/MSD samples were acceptable with the following exceptions.

SDG 0001S

MS/MSD sample U4S00601 exhibited low MS/MSD %R values for pentachlorophenol of 15%/10%, however, since the LCS %R value was acceptable for this compound, no qualifications were required.

SDG 0001W

MS/MSD sample U4W05001 exhibited a low MSD %R value for n-nitroso-di-n-propylamine of 37% and a high MSD %R value for 4-nitrophenol of 84%. Since these values only slightly exceeded QC criteria and the LCS %R values were acceptable, no qualifications were required.

SDG 0002S

MS/MSD sample U4D05001 exhibited a low MS %R value for n-nitroso-di-n-propylamine of 40% and low MS/MSD %R values for 1,2,4-trichlorobenzene of 36%/37%. Since the LCS %R value was also low for n-nitroso-di-n-propylamine, this compound has been qualified "UJ" in associated sample U4D05001. The LCS %R value was acceptable for 1,2,4-trichlorobenzene

and no qualifications were required.

Surrogate Spikes

Six surrogate compounds are used for spiking the semivolatile organic samples. Surrogate spike recoveries for semivolatile organic analyses were compared to the QC acceptance criteria as specified in the functional guidelines. These criteria are summarized as follows:

Surrogate Recovery Limits

	Water %R	Soil %R
NBZ (Nitrobenzene-d5)	35-114	23-120
FBP (2-Fluorobiphenyl)	43-116	30-115
TPH (Terphenyl-d14)	33-141	18-137
PHL (Phenol-d5)	10-110	24-113
2FP (2-Fluorophenol)	21-110	25-121
TBP (2,4,6-Tribromophenol)	10-123	19-122

Surrogate recovery values for all SDGs were acceptable.

Initial and Continuing Calibration

Initial and continuing calibration results can be used to evaluate accuracy within an SDG. Relative response factors (RRFs), percent relative standard deviation (%RSD) and percent difference (%D) are the three parameters used to evaluate instrument calibration. The RRF is a measure of relative response of an analyte compared to its internal standard. The %RSD is an expression of the linearity of instrument response and the %D is a comparison of the continuing calibration instrument response with its initial calibration response. The RRF is the most critical of the three parameters.

All SDGs were qualified due to initial and/or continuing calibration problems and are summarized below.

SDG 0001S

The initial calibration analyzed on 11/20/97 exhibited acceptable %RSD and mean RRF values. No qualifications were required.

The initial calibration analyzed on 11/21/97 exhibited high %RSD values for 4-chloroaniline, 3-nitroaniline, and carbazole of 53.7%, 63.3%, and 61.1%. Carbazole has been qualified "J" in associated sample U4S00901. All other associated results are non-detect and no further qualifications were required.

The initial calibration analyzed on 11/26/97 exhibited high %RSD values for 4-chloroaniline, 3-nitroaniline, and carbazole of 40.8%, 74.4%, and 35.1%. Carbazole has been qualified "J" in associated sample U4S00601. All other associated results are non-detect and no further qualifications were required.

The continuing calibration analyzed on 11/21/97 (1249) exhibited a high %D value for 4-chloroaniline of 27.1%. 4-Chloroaniline has been qualified "UJ" in associated samples U4D01003, U4D01003D, and U4S00901 since all results are non-detect.

The continuing calibration analyzed on 11/21/97 (2024) exhibited high %D values for 2,2'-oxybis(1-chloropropane), hexachlorobutadiene, hexachlorocyclopentadiene, 4-nitrophenol, n-nitroso-di-n-propylamine, pentachlorophenol, and fluoranthene of 31.5%, 42.5%, 29.0%, 72.8%, 29.4%, 37.1%, and 25.7%, respectively. Fluoranthene has been qualified "J" for positive results and "UJ" for non-detects in associated samples U4S00501D, U4S01001, U4S01201D, U4S01401, and U4S01501. All of the remaining compounds have been qualified "UJ" in associated samples U4S00501D, U4S01001, U4S01201D, U4S01401, and U4S01501 since all results are non-detect.

The continuing calibration analyzed on 11/22/97 exhibited high %D values for hexachloroethane, 4-chloroaniline, hexachlorobutadiene, 2,4-dinitrophenol, 4-nitrophenol, 4,6-dinitro-2-methylphenol, and 3,3'-dichlorobenzidine of 27.2%, 26.5%, 58.0%, 37.1%, 92.0%, 39.6%, and 51.3%, respectively. All of the above compounds have been qualified "UJ" in associated sample U4S00601DL since all results are non-detect.

The continuing calibration analyzed on 11/26/97 exhibited a high %D value for 4-chloroaniline and 3-nitroaniline of 26.4% and 25.5%, respectively. Both compounds have been qualified "UJ" in associated samples U4S00601, U4S00701, U4S00801, U4S01101, U4S01201, U4S01301, and U4S01501DL since all results are non-detect.

The continuing calibration analyzed on 11/28/97 exhibited a high %D value for 4-chloroaniline, 3-nitroaniline, pentachlorophenol, carbazole, and 3,3'-dichlorobenzidine of 44.0%, 122.6%, 25.1%, 30.4%, and 26.9%, respectively. All of the above compounds have been qualified "UJ" in associated sample U4S00501 since all results are non-detect.

SDG 0001W

The initial calibration analyzed on 11/21/97 exhibited high %RSD values for 4-chloroaniline, 3-nitroaniline, and carbazole of 53.7%, 63.3%, and 61.1%, respectively, however, these compounds are non-detect in the associated samples and no qualifications were required.

The initial calibration analyzed on 11/25/97 exhibited high %D values for 4-nitroaniline and carbazole of 32.2% and 37.3%, respectively, however, these compounds are non-detect in the

associated samples and no qualifications were required.

The continuing calibration analyzed on 11/21/97 (1249) exhibited a high %D value for 4-chloroaniline of 27.1%. 4-Chloroaniline has been qualified as estimated "UJ" in associated samples U4R10101, U4R10201, and U4F10001 since all results were non-detect.

The continuing calibration analyzed on 11/21/97 (2240) exhibited high %D values for 4-chloroaniline, 3-nitroaniline, carbazole, 3,3'-dichlorobenzidiene, and benzo(g,h,i)perylene of 42.2%, 56.6%, 73.7%, 28.7%, and 25.4%, respectively. All of the above compounds have been qualified "UJ" in associated samples U4W01003 and U4W01003D since all results were non-detect.

The continuing calibration analyzed on 11/25/97 exhibited a high %D value for 4-nitroaniline of 38.2%. 4-Nitroaniline has been qualified as estimated "UJ" in associated sample U4W05001 since the result was non-detect.

SDG 0002S

The initial calibration analyzed on 11/21/97 exhibited high %RSD values for 4-chloroaniline, 3-nitroaniline, and carbazole of 53.7%, 63.3%, and 61.1%, however, these compounds are non-detect in associated sample U4D05001 and no qualifications were required.

The continuing calibration analyzed on 11/21/97 exhibited a high %D value for 4-chloroaniline of 27.1%. This compound was qualified as estimated "UJ" in associated sample U4D05001 since the result was non-detect.

3.3 Representativeness

Method blanks, equipment rinsate blanks, and field source blanks are used to evaluate representativeness. A summary of the contaminants found in these blanks can be found below. Several compounds were detected in the various blanks. The laboratory method blank was applied first to the samples, followed by the highest concentration of the equipment rinsate blank and field source blank.

Qualifications were made to the data based on blank contamination when the sample results were below ten (10) times the maximum amount detected in the blank for compounds that are common laboratory contaminants and five (5) times the maximum amount detected in the blank for compounds that are not common contaminants. Samples that were qualified as undetected due to blank contamination were flagged by the data reviewer with a "U." Compounds that were qualified due to blank contamination that were reported below the method detection limit were raised to the detection limit and the laboratory qualifier was replaced by the reviewer with a "U." If a sample result exceeded 5X or 10X the amount in the blank, the result was not amended.

The following summarizes the method blanks, equipment rinsate blanks, and field source blanks.

Method Blanks

Method blanks were analyzed with each SDG for semivolatile organic compounds to identify contaminants that may have been introduced through analytical instrumentation or sample preparation. The following summarizes method blank contamination for each SDG.

SDG 0001S

Method blank SBLKKB (11/4/97) exhibited di-n-butylphthalate contamination at 81 ug/kg, however, this compound is non-detect in all associated samples and no qualifications were required.

SDG 0001W

Method blank SBLKKB (11/4/97) exhibited di-n-butylphthalate contamination at 81 ug/kg, however, this compound is non-detect in sample U4D05001 and no qualifications were required.

SDG 0002S

Method blank SBLKKB (11/4/97) exhibited di-n-butylphthalate contamination at 81 ug/kg, however, this compound is non-detect in sample U4D05001 and no qualifications were required.

Equipment/Rinsate Blanks

Equipment rinsate blanks are used to evaluate contaminants that may have been introduced through the sampling equipment or laboratory handling of samples. All equipment/rinsate blanks were free of contamination.

Field Source Blanks

Field source blanks are used to evaluate contaminants that may have been introduced through site conditions. Field source blanks are typically prepared in the field (on-site) as opposed to a trip blank which is typically prepared at the laboratory and shipped with the cooler. All field source blanks were free of contamination.

3.4 Comparability

The laboratory used standard analytical methods for all of the analyses. The method detection limits were below the contract required quantitation limits, therefore, the comparability was considered acceptable.

3.5 Completeness

There were 0 rejections of data in the semivolatile analyses. The percent of valid data is 100%.

4.0 Pesticide/PCB Compounds

A total of three (3) Pesticide/PCB SDGs were analyzed for this project. The SDGs are 0001S, 0001W, and 0002S.

This section discusses the QC supporting documentation as defined by the PARCC criteria and evaluated based on the project specific DQOs.

4.1 Precision

The relative percent difference (RPD) between MS/MSD samples and field duplicate samples is used to assess precision.

MS/MSD Samples

For each SDG, one MS/MSD sample was analyzed. The functional guidelines establish RPD QC criteria limits for MS/MSD samples as follows:

	MS/MSD Criteria	
	Water	Soil
	RPD	RPD
gamma-BHC (Lindane)	15	50
Heptachlor	20	31
Aldrin	22	43
Dieldrin	18	38
Endrin	21	45
4,4'-DDT	27	50

MS/MSD RPD results for each SDG were acceptable with the exception of the following.

SDG 0001S

MS/MSD sample U4S00601 exhibited high RPD values for heptachlor, aldrin, dieldrin, and 4,4'-DDT of 70, 61, 47, and 135, respectively. Endrin and dieldrin have been qualified "J" in sample U4S00601. 4,4'-DDT is non-detect and no qualifications were required. No qualifications were required for the heptachlor and aldrin RPD exceedences since the %R values were acceptable.

Field Duplicate Samples

SDG 0002S did not have field duplicate samples analyzed. Field duplicate sample results were as follows for the remaining SDGs.

SDG 0001S

Analyte	U4D01003 ug/kg	U4D01003D ug/kg	RPD
delta-BHC	5.4	6.7	21
gamma-BHC	0.54	10U	NC
Heptachlor	3.9	1.2	106
Endosulfan I	4.2	10U	NC
4,4'-DDE	17U	6.6	NC
alpha-Chlordane	2.1	1.9	10
Aroclor-1254	70	65	7

Analyte	U4S00501 ug/kg	U4S00501D ug/kg	RPD
4,4'-DDE	7.7	8.9	14
4,4'-DDD	4.4	4.6U	NC
Endosulfan Sulfate	5.6U	1.2	NC
4,4'-DDT	1.4	4.6U	NC
Aroclor-1254	56U	130	NC

Analyte	U4S01201 ug/kg	U4S01201D ug/kg	RPD
Heptachlor Epoxide	0.25	0.48	63
Endosulfan II	3.6U	1.0	NC
4,4'-DDD	0.78	0.24	106
Endosulfan Sulfate	0.16	3.5U	NC
gamma-Chlordane	1.8U	1.9	NC
Aroclor-1260	33	35U	NC

SDG 0001W

Analyte	U4W01003 ug/L	U4W01003D ug/L	RPD
gamma-BHC	0.0017	0.049U	NC
4,4'-DDT	0.0085	0.098U	NC
Endrin Ketone	0.0060	0.014	80

4.2 Accuracy

The percent recovery results of MS/MSD samples and surrogate spikes are used to assess accuracy. Additionally, initial and continuing calibration results can be used to evaluate accuracy. Relative response factors (RRFs), percent relative standard deviation (%RSD) and percent difference (%D) are the three parameters used to evaluate instrument calibration.

MS/MSD Samples

The functional guidelines establish % Recovery QC criteria limits for MS/MSD samples as follows:

MS/MSD Criteria

	Water %R	Soil/Sediment %R
gamma-BHC (Lindane)	56-123	46-127
Heptachlor	40-131	35-130
Aldrin	40-120	34-132
Dieldrin	52-126	31-134
Endrin	56-121	42-139
4,4'-DDT	38-127	23-134

MS/MSD %R results for each SDG were acceptable with the exception of the following.

SDG 0001S

MS/MSD sample U4S00601 exhibited a low MS %R value for endrin of 41%, and high MSD %R values for dieldrin and 4,4'-DDT of 148% and 210%, respectively. Endrin and dieldrin have been qualified "J" in sample U4S00601. 4,4'-DDT is non-detect and no qualifications were required.

Surrogate Spikes

Two surrogate compounds, TCX and DCB, are used for spiking the pesticide/PCB samples. Surrogate spike recoveries for pesticide/PCB analyses were compared to the QC acceptance criteria specified for each SDG. All surrogate recovery results were within QC advisory limits for TCX and DCB with the exception of the following.

SDG 0001S

Sample U4S00501 exhibited a high %R value for surrogate compound DCB2 and samples U4S00501D, U4S00601, and U4S01401 exhibited high %R values for surrogate compounds DCB1 and DCB2. All positive results for these samples have been qualified "J."

Samples U4S00601DL, U4S01501, and U4S01501DL were analyzed at a dilution and the surrogate %R values were reported with a "D" flag by the laboratory. No action was taken on this basis.

Initial and Continuing Calibration

Initial and continuing calibration results can be used to evaluate accuracy within an SDG. Relative response factors (RRFs), percent relative standard deviation (%RSD) and percent difference (%D) are the three parameters used to evaluate instrument calibration. The RRF is a measure of relative

response of an analyte compared to its internal standard. The %RSD is an expression of the linearity of instrument response and the %D is a comparison of the continuing calibration instrument response with its initial calibration response. The RRF is the most critical of the three parameters.

The initial and continuing calibrations analyzed were acceptable for all SDGs.

4.3 Representativeness

Method blanks, equipment rinsate blanks, and field source blanks were used to evaluate representativeness for the pesticide/PCB analyses. A summary of the contaminants found in these blanks can be found below. The blanks were used to assess the sample data.

The following summarizes the method blanks, equipment rinsate blanks, and field source blanks.

Method Blanks

Method blanks were analyzed with each SDG for pesticide/PCB compounds to identify contaminants that may have been introduced through analytical instrumentation or sample preparation. Method blank contamination is summarized below.

SDG 0001S

Method blank PBLKJP (10/30/97) exhibited beta-BHC, delta-BHC, heptachlor, 4,4'-DDE, methoxychlor, and endrin aldehyde contamination at 0.31 ug/kg, 0.36 ug/kg, 0.52 ug/kg, 0.098 ug/kg, 0.72 ug/kg, and 1.3 ug/kg, respectively. Beta-BHC has been qualified "U" in associated sample U4S01001.

Delta-BHC has been qualified "U" in associated samples U4S00501D, U4S00601DL, U4S00701, U4S00801, U4S01001, U4S01101, U4S01201, U4S01201D, U4S01301, and U4S01401.

Heptachlor has been qualified "U" in associated samples U4S00501, U4S00501D, U4S00701, U4S00801, U4S01001, U4S01101, U4S01201, U4S01201D, U4S01301, U4S01401, and U4S01501.

4,4'-DDE has been qualified "U" in associated samples U4S00801 and U4S01101.

Methoxychlor has been qualified "U" in associated samples U4S00501, U4S00701, U4S01001, U4S01201D, and U4S01301.

Endrin aldehyde has been qualified "U" in associated samples U4S00501D, U4S00801, U4S01001, U4S01101, and U4S01301.

Method blank PBLKKH (11/4/97) exhibited delta-BHC and methoxychlor contamination at 0.14 ug/kg and 3.8 ug/kg, respectively. Methoxychlor has been qualified "U" in associated sample U4D01003. All other associated results are non-detect or greater than 5X the blank concentration and no qualifications were required.

SDG 0001W

Method blank PBLKJL (10/30/97) exhibited beta-BHC, delta-BHC, heptachlor, and endrin aldehyde contamination at 0.0064 ug/L, 0.0056 ug/L, 0.0046 ug/L, and 0.021 ug/L, respectively. Beta-BHC is non-detect in all associated samples. Delta-BHC has been qualified "U" in associated samples U4W01003, U4W01003D, U4W05001, U4F10001, U4R10101, and U4R10201. Heptachlor has been qualified "U" in associated samples U4R10101, U4W01003, and U4W05001. Endrin aldehyde has been qualified "U" in associated sample U4R10101.

SDG 0002S

Method blank PBLKKH (11/4/97) exhibited delta-BHC and methoxychlor contamination at 0.14 ug/kg and 3.8 ug/kg, respectively. Delta-BHC was greater than 5X the blank concentration and methoxychlor was non-detect in sample U4D05001 and no qualifications were required.

Equipment/Rinsate Blanks

Equipment rinsate blanks are used to evaluate contaminants that may have been introduced through the sampling equipment or laboratory handling of samples. Equipment/rinsate blanks contamination is summarized below.

SDG 0001S

Rinsate blank U4R10101 (in SDG 0001W) exhibited aldrin and dieldrin contamination at 0.0033 ug/L and 0.0041 ug/L, respectively. Aldrin has been qualified "U" in associated samples U4S00501D, U4S00701, U4S00801, U4S01101, U4S01201, U4S01201D, and U4S01401.

Dieldrin has been qualified "U" in associated samples U4S00901 and U4S01101.

Rinsate blank U4R10201 (in SDG 0001W) exhibited aldrin contamination at 0.0068 ug/L. Aldrin has been qualified "U" in associated samples U4S00601DL and U4S00901.

SDG 0001W

Rinsate blank U4R10101 exhibited aldrin and dieldrin contamination at 0.0033 ug/L and 0.0041

ug/L, respectively. Associated aldrin results have been qualified based on rinsate blank U4R10201 and dieldrin is non-detect in all associated samples. No qualifications were required.

Rinsate blank U4R10201 exhibited aldrin contamination at 0.0068 ug/L. Aldrin has been qualified "U" in associated samples U4W01003 and U4W05001.

SDG 0002S

Rinsate blank U4R10101 (in SDG 0001W) exhibited aldrin and dieldrin contamination at 0.0033 ug/L and 0.0041 ug/L, respectively. All associated results are non-detect or greater than 5X the blank concentration and no qualifications were required.

Rinsate blank U4R10201 (in SDG 0001W) exhibited aldrin contamination at 0.0068 ug/L, however, all associated results are non-detect and no qualifications were required.

Field Source Blanks

Field source blanks are used to evaluate contaminants that may have been introduced through site conditions. Field source blanks are typically prepared in the field (on-site) as opposed to a trip blank which is typically prepared at the laboratory and shipped with the cooler. Field source blank contamination is summarized below.

SDG 0001S

Field blank U4F10001 (in SDG 0001W) exhibited endrin, methoxychlor, and alpha-chlordane contamination at 0.0088 ug/L, 0.040 ug/L, and 0.0051 ug/L, respectively. Endrin has been qualified "U" in associated samples U4S00501D, U4S00901, and U4S01201.

Methoxychlor has been qualified "U" in associated samples U4S00501D and U4S01101.

Alpha-Chlordane has been qualified "U" in associated samples U4S00501, U4S00501D, U4S00901, U4S01201, and U4S01201D.

SDG 0001W

Field blank U4F10001 exhibited endrin, methoxychlor, and alpha-chlordane contamination at 0.0088 ug/L, 0.040 ug/L, and 0.0051 ug/L, respectively. Methoxychlor has been qualified "U" in associated sample U4W01003D. All other associated results are non-detect and no further qualifications were required.

SDG 0002S

Field blank U4F10001 (in SDG 0001W) exhibited endrin, methoxychlor, and alpha-chlordane

contamination at 0.0088 ug/L, 0.040 ug/L, and 0.0051 ug/L, respectively. Endrin has been qualified "U" in associated sample U4D05001. All other associated results are non-detect or greater than 5X the blank concentration and no further qualifications were required.

4.4 Comparability

The laboratory used standard analytical methods for all of the analyses. The method detection limits were below the contract required quantitation limits, therefore, the comparability was considered acceptable.

4.5 Completeness

There were 0 rejections of data in the pesticides/PCB analyses. The percent of valid data is 100%.

5.0 Metals

A total of four (4) Metals SDGs were analyzed for this project. The SDGs are 0001S, 0001W, 0002S, and 0059S.

This section discusses the QC supporting documentation as defined by the PARCC criteria and evaluated based on the project specific DQOs.

5.1 Precision

Metals analysis is different from organic analyses in that no matrix spike duplicate sample is evaluated. A laboratory duplicate sample is analyzed instead. For duplicate analyte concentrations greater than 5X the CRDL, the relative percent difference (RPD) between the two reported results must be less than 20% for aqueous samples (35% for soil samples).

For duplicate analyte concentrations less than 5X the CRDL, the difference between the two reported results must be less than the CRDL value for aqueous samples, or less than 2X the CRDL value for soil samples. RPDs for samples with values less than the CRDL are not calculated.

The relative percent difference (RPD) between field duplicate samples is also used to assess precision.

Matrix Duplicates

The following summarizes matrix duplicate qualification.

SDG 0001S

Matrix duplicate sample U4S00601D exhibited high RPD values for cadmium, chromium, manganese, selenium, and zinc of 34.5, 42.7, 37.5, 32.3, and 36.7, respectively. All positive results for the above compounds have been qualified "J" in all samples.

SDG 0001W

Matrix duplicate sample U4W05001D exhibited a high RPD value for zinc of 26.6, however, all zinc results have already been qualified due to field blank or ICP serial dilution problems and no further qualifications were required.

SDG 0059S

Matrix duplicate sample U4B03002D exhibited high RPD values for chromium, iron, and lead of

8.2, 33.2, and 37.8, respectively. All positive results for these compounds have been qualified "J."

Field Duplicates

Field duplicate sample RPD results are summarized below. No qualifications were made based on field duplicate results.

SDG 0001S

Analyte	U4D01003 mg/kg	U4D01003D mg/kg	RPD
Aluminum	8330	7160	15
Barium	31.7	30.9	3
Beryllium	0.35	0.24	37
Cadmium	0.43	0.33U	NC
Calcium	6810	7350	8
Chromium	20.9	16.8	22
Copper	18.1	15.4	16
Iron	1140	1330	15
Lead	41.4	34.7	18
Manganese	7.6	6.1	22
Mercury	0.30	0.31	3
Nickel	4.7	3.7	24
Vanadium	6.4	6.9	8
Zinc	130	86.7	40

Analyte	U4S00501 mg/kg	U4S00501D mg/kg	RPD
Aluminum	5100	6260	20
Barium	13.8	22.3	47
Calcium	3970	6920	54
Chromium	9.8	13.3	30
Copper	5.1	7.7	41
Iron	273	452	49
Lead	11.3	20.3	57
Manganese	6.6	9.0	31
Mercury	0.22	0.27	20
Nickel	1.9	2.8	38
Vanadium	2.6	3.1	18
Zinc	15.0U	30.2	NC

Analyte	U4D01201 mg/kg	U4S01201D mg/kg	RPD
Aluminum	842	631	29
Barium	4.6	3.3	33
Calcium	1410	1230	14
Chromium	1.5	1.1	31
Copper	1.6	1.4	13

Analyte	U4D01201 mg/kg	U4S01201D mg/kg	RPD
Iron	258	182	35
Lead	6.5	5.2	22
Manganese	10	4.5	76
Nickel	0.52	0.32	48
Vanadium	0.92	0.70	27

SDG 0001W

Analyte	U4W01003 ug/L	U4W01003D ug/L	RPD
Aluminum	609	467	26
Calcium	6820	7610	11
Iron	187	164	13
Lead	2.7	2.8	4
Manganese	4.1	4.4	7
Vanadium	1.2	1.1	9

SDG 0059S

Analyte	U4B03001 mg/kg	U4B03001D mg/kg	RPD
Aluminum	18800	15800	17
Arsenic	0.97	0.57U	NC
Barium	135	85.9	44
Chromium	20.9	18.5	12
Cobalt	0.36	0.41	13
Copper	2.1	2.6	21
Iron	493	513	4
Lead	6.1	7.0	14
Manganese	1.3	2.0	42
Mercury	0.06U	0.24	NC
Nickel	0.72	0.74	3
Selenium	1.0U	1.2	NC
Vanadium	7.2	5.9	20

Analyte	U4B03003 mg/kg	U4B03003D mg/kg	RPD
Aluminum	2110	1790	16
Barium	28.3	25.0	12
Chromium	3.3	2.8	16
Copper	1.0	0.72U	NC
Iron	79.7	55.6	36
Manganese	0.47	0.53	12
Vanadium	2.7	2.2	20

5.2 Accuracy

Matrix Spike Analysis

The matrix spike recovery QC limits are 75-125%. It should be noted that spike recovery limits do not apply when the sample concentration exceeds the spike concentration by a factor of four or more. Matrix spike analytical results exhibited acceptable % recoveries with the exception of the following.

SDG 0001S

Matrix spike sample U4S00601S exhibited a low %R value for antimony of 74.3% and high %R values for mercury and zinc of 182.2% and 133.0%, respectively. Antimony has been qualified "UJ" in all samples since all results are non-detect. Mercury and zinc have been qualified "J" for positive results in all samples.

Initial and Continuing Calibration Results

All ICV and CCV %R values were within the QC limits for each SDG. The %R values do not suggest any systematic analytical problem with either accuracy or precision.

5.3 Representativeness

Preparation blanks, equipment rinsate blanks, and field source blanks were analyzed for metals to evaluate representativeness. Blank results are summarized below.

The preparation blanks are used first to evaluate data quality, followed by the highest value of the equipment rinsate blanks or the field source blanks.

Sample results were qualified due to blanks that had target analytes where the absolute value of the reported results was greater than or equal to the corresponding IDL value; sample results were less than 5X the absolute value of the blank result. Samples that were qualified as undetected due to blank contamination were flagged by the data reviewer with a "U."

Preparation and Calibration Blanks

Preparation blanks were analyzed for each SDG to identify target analytes that may have been introduced through the analytical instrumentation or sample preparation. Preparation and/or calibration blank contamination that resulted in qualification is summarized below.

SDG 0001S

Soil preparation blank PBS (11/5/97) exhibited contamination for several compounds, however, all sample results are non-detect or greater than 5X the blank concentration with the exception of sodium. Sodium has been qualified "U" in all samples except U4D01003 and U4D01003D.

Initial and continuing calibration blanks exhibited contamination for several compounds, however, all sample results were non-detect or greater than 5X the blank concentration with the exception of beryllium, cadmium, and copper. Beryllium has been qualified "U" in associated samples U4S00501, U4S00501D, U4S00901, and U4S01301. Cadmium has been qualified "U" in associated sample U4S00501D. Copper has been qualified "U" in associated sample U4S01001.

SDG 0001W

Water preparation blank PBW (11/12/97) exhibited contamination for several compounds, however, all sample results were non-detect, greater than 5X the blank concentration, or already qualified due to blank contamination. No qualifications were required.

Initial and continuing calibration blanks exhibited contamination for several compounds, however, all sample results were non-detect or greater than 5X the blank concentration with the exception of aluminum, barium, and beryllium. Aluminum has been qualified "U" in associated samples U4F10001, U4R10101, and U4R10201. Barium has been qualified "U" in associated sample U4F10001. Beryllium has been qualified "U" in associated samples U4F10001, U4R10101, U4R10201, U4W01003, U4W01003D, and U4W05001.

SDG 0002S

Soil preparation blank PBS (11/18/97) exhibited contamination for several compounds, however, all sample results were non-detect or greater than 5X the blank concentration. No qualifications were required.

Initial and continuing calibration blanks exhibited contamination for several compounds, however, all sample results were non-detect or greater than 5X the blank concentration. No qualifications were required.

SDG 0059S

Soil preparation blank PBS (11/18/97) exhibited contamination for several compounds, however, all sample results were non-detect or greater than 5X the blank concentration with the exception of lead and manganese.

Lead has been qualified "U" in associated samples U4B03002, U4B03003, U4B03003D,

U4B03302, U4B03303, U4B03601, and U4B03602. Manganese has been qualified "U" in associated sample U4B03601.

Initial and continuing calibration blanks exhibited contamination for several compounds, however, all sample results were non-detect or greater than 5X the blank concentration with the exception of beryllium and magnesium. Beryllium has been qualified "U" in all samples except U4B03004, U4B03304, and U4B03502. Magnesium has been qualified "U" in associated sample U4B03301.

Equipment/Rinsate Blanks

Target analytes found in the equipment rinsate blanks through inadequate decontamination procedures or sampling equipment are applied to associated samples. Equipment/rinsate blank contamination is summarized below.

SDG 0001S

Rinsate blank U4R10101 (in SDG 0001W) exhibited antimony, barium, calcium, copper, iron, magnesium, manganese, potassium, sodium, and zinc contamination at 3.4 ug/L, 2.2 ug/L, 1340 ug/L, 0.63 ug/L, 18.4 ug/L, 3750 ug/L, 0.10 ug/L, 1710 ug/L, 64900 ug/L, and 26.1 ug/L, respectively. Antimony has been qualified "U" in associated sample U4S00601. Barium has been qualified "U" in associated samples U4S00701 and U4S01001. Calcium has been qualified "U" in associated samples U4S01201D, U4S01301, and U4S01401. Zinc has been qualified "U" in associated samples U4S00501, U4S00701, U4S00801, U4S01001, U4S01201, U4S01201D, U4S01301, U4S01401, and U4S01501. All other associated results are non-detect or greater than 5X the blank concentration and no further qualifications were required.

Rinsate blank U4R10201 (in SDG 0001W) exhibited barium, calcium, copper, magnesium, potassium, sodium, and zinc contamination at 1.4 ug/L, 1260 ug/L, 0.80 ug/L, 3960 ug/L, 1760 ug/L, 65800 ug/L, and 23.9 ug/L, respectively. Magnesium has been qualified "U" in all samples. All other associated results are non-detect or greater than 5X the blank concentration and no further qualifications were required.

SDG 0001W

Rinsate blank U4R10101 exhibited antimony, barium, calcium, copper, iron, magnesium, manganese, potassium, sodium, and zinc contamination at 3.4 ug/L, 2.2 ug/L, 1340 ug/L, 0.63 ug/L, 18.4 ug/L, 3750 ug/L, 0.10 ug/L, 1710 ug/L, 64900 ug/L, and 26.1 ug/L, respectively. Antimony has been qualified "U" in associated samples U4W01003D and U4W05001. Barium has been qualified "U" in associated samples U4W01003 and U4W01003D. Zinc has been qualified "U" in associated samples U4W01003, U4W01003D, and U4W05001. All other associated results are non-detect, greater than 5X the blank concentration, or already qualified "U" due to blank contamination and no further qualifications were required.

Rinsate blank U4R10201 exhibited barium, calcium, copper, magnesium, potassium, sodium, and zinc contamination at 1.4 ug/L, 1260 ug/L, 0.80 ug/L, 3960 ug/L, 1760 ug/L, 65800 ug/L, and 23.9 ug/L, respectively. Magnesium has been qualified "U" in associated samples U4W01003, U4W01003D, U4W05001. All other associated results are non-detect, greater than 5X the blank concentration, or already qualified "U" due to blank contamination and no further qualifications were required.

SDG 0002S

Rinsate blank U4R10101 (in SDG 0001W) exhibited antimony, barium, calcium, copper, iron, magnesium, manganese, potassium, sodium, and zinc contamination at 3.4 ug/L, 2.2 ug/L, 1340 ug/L, 0.63 ug/L, 18.4 ug/L, 3750 ug/L, 0.10 ug/L, 1710 ug/L, 64900 ug/L, and 26.1 ug/L, respectively. Calcium has been qualified "U" in associated sample U4D05001. All other associated results are non-detect or greater than 5X the blank concentration and no further qualifications were required.

Rinsate blank U4R10201 (in SDG 0001W) exhibited barium, calcium, copper, magnesium, potassium, sodium, and zinc contamination at 1.4 ug/L, 1260 ug/L, 0.80 ug/L, 3960 ug/L, 1760 ug/L, 65800 ug/L, and 23.9 ug/L, respectively. Magnesium has been qualified "U" in associated sample U4D05001. All other associated results are non-detect or greater than 5X the blank concentration and no further qualifications were required.

SDG 0059S

Rinsate blank U4R10101 (in SDG 0001W) exhibited antimony, barium, calcium, copper, iron, magnesium, manganese, potassium, sodium, and zinc contamination at 3.4 ug/L, 2.2 ug/L, 1340 ug/L, 0.63 ug/L, 18.4 ug/L, 3750 ug/L, 0.10 ug/L, 1710 ug/L, 64900 ug/L, and 26.1 ug/L, respectively. Barium has been qualified "U" in associated samples U4B03501 and U4B03601. Calcium has been qualified "U" in all samples except U4B03004 and U4B03304. Iron has been qualified "U" in associated samples U4B03301 and U4B03601. Potassium has been qualified "U" in all samples. Zinc has been qualified "U" in all samples. All other associated results are non-detect or greater than 5X the blank concentration and no further qualifications were required.

Rinsate blank U4R10201 (in SDG 0001W) exhibited barium, calcium, copper, magnesium, potassium, sodium, and zinc contamination at 1.4 ug/L, 1260 ug/L, 0.80 ug/L, 3960 ug/L, 1760 ug/L, 65800 ug/L, and 23.9 ug/L, respectively. Magnesium has been qualified "U" in all samples. All other associated results are non-detect or greater than 5X the blank concentration and no further qualifications were required.

Field Source Blanks

Target analytes found in field source blanks through background or on-site contamination are applied to associated samples. Field source blank contamination is summarized below.

SDG 0001S

Field blank U4F10001 (in SDG 0001W) exhibited calcium, copper, magnesium, potassium, sodium, and zinc contamination at 961 ug/L, 0.82 ug/L, 3340 ug/L, 1830 ug/L, 66700 ug/L, and 19.3 ug/L, respectively. Potassium has been qualified "U" in all samples. Sodium has been qualified "U" in associated samples U4D01003 and U4D01003D. All other associated results are non-detect or greater than 5X the blank concentration and no further qualifications were required.

SDG 0001W

Field blank U4F10001 exhibited calcium, copper, magnesium, potassium, sodium, and zinc contamination at 961 ug/L, 0.82 ug/L, 3340 ug/L, 1830 ug/L, 66700 ug/L, and 19.3 ug/L, respectively. Copper has been qualified "U" in associated samples U4W01003 and U4W01003D. Potassium has been qualified "U" in associated samples U4W01003, U4W01003D, and U4W05001. Sodium has been qualified "U" in associated samples U4W01003, U4W01003D, and U4W05001. All other associated results are non-detect, greater than 5X the blank concentration, or already qualified "U" due to blank contamination and no further qualifications were required.

SDG 0002S

Field blank U4F10001 (in SDG 0001W) exhibited calcium, copper, magnesium, potassium, sodium, and zinc contamination at 961 ug/L, 0.82 ug/L, 3340 ug/L, 1830 ug/L, 66700 ug/L, and 19.3 ug/L, respectively. Potassium has been qualified "U" in associated sample U4D05001. Sodium has been qualified "U" in associated sample U4D05001. All other associated results are non-detect or greater than 5X the blank concentration and no further qualifications were required.

SDG 0059S

Field blank U4F10001 (in SDG 0001W) exhibited calcium, copper, magnesium, potassium, sodium, and zinc contamination at 961 ug/L, 0.82 ug/L, 3340 ug/L, 1830 ug/L, 66700 ug/L, and 19.3 ug/L, respectively. Copper has been qualified "U" in associated samples U4B03002, U4B03003D, U4B03303, U4B03501, and U4B03601. Sodium has been qualified "U" in all samples. All other associated results are non-detect or greater than 5X the blank concentration and no further qualifications were required.

5.4 Comparability

The laboratory used standard analytical methods for all of the analyses. The method detection limits were below the contract required quantitation limits, therefore, the comparability was considered acceptable.

5.5 Completeness

There were 0 rejections of data in the metals analyses. The percent of valid data is 100%.

6.0 Total Organic Carbon (TOC)

A total of four (4) TOC SDGs were analyzed for this project. The SDGs are 0001S, 0001W, 0002S, and 0059S.

This section discusses the QC supporting documentation as defined by the PARCC criteria and evaluated based on the project specific DQOs.

6.1 Precision

MS/MSD Samples

The relative percent difference (RPD) between MS/MSD samples and field duplicate samples is used to assess precision.

The functional guidelines establish RPD QC criteria limits for MS/MSD samples as follows:

MS/MSD CRITERIA

	Water RPD	Soil/Sediment RPD
TOC	20	20

MS/MSD RPD results for each SDG were acceptable with the exception of the following.

SDG 0001S

A MS/MSD sample was not analyzed.

SDG 0059S

The MS/MSD RPD result for sample U4B03002 was not reported due to severe matrix interference. The TOC result has been qualified "J" for sample U4B03002.

Field Duplicate Samples

Field duplicate samples were not analyzed for SDGs 0001W and 0002S. Field duplicate sample results for the other two SDGs are summarized in the following section. No qualifications were made based on these results.

SDG 0001S

Field duplicate results for samples U4D01003 and U4D01003D are >16,000 mg/kg for both samples.

SDG 0059S

Analyte	U4B03001 mg/kg	U4B03001D mg/kg	RPD
TOC	>16000	>16000	0

Analyte	U4B03003 mg/kg	U4B03003D mg/kg	RPD
TOC	1180	2530	73

6.2 Accuracy

The percent recovery results of MS/MSD samples and surrogate spikes are used to assess accuracy. Additionally, initial and continuing calibration results can be used to evaluate accuracy. Relative response factors (RRFs), percent relative standard deviation (%RSD) and percent difference (%D) are the three parameters used to evaluate instrument calibration.

MS/MSD Samples

The functional guidelines establish % Recovery QC criteria limits for MS/MSD samples as follows:

MS/MSD CRITERIA

	Water	Soil/Sediment
	%R	%R
TOC	60-140	60-140

The percent recovery (%R) values for all of the MS/MSD samples were acceptable with the following exceptions.

SDG 0001S

A MS/MSD sample was not analyzed.

SDG 0059S

The MS/MSD %R result for sample U4B03002 was not reported due to severe matrix interference. The TOC result has been qualified "J" for sample U4B03002.

Initial and Continuing Calibration Results

All ICV and CCV %R values were within the QC limits for each SDG. The %R values do not suggest any systematic analytical problem with either accuracy or precision.

6.3 Representativeness

Method blanks, equipment rinsate blanks, and field source blanks are used to evaluate representativeness. The laboratory method blank was applied first to the samples, followed by the highest concentration of the equipment rinsate blank and field source blank. If a sample result exceeded 5X the amount in the blank, the result was not qualified.

The following summarizes the method blanks, equipment rinsate blanks, and field source blanks.

Method Blanks

Method blanks were analyzed with each SDG to identify contaminants that may have been introduced through analytical instrumentation or sample preparation. All method blanks were free of contamination.

Equipment/Rinsate Blanks

Equipment rinsate blanks are used to evaluate contaminants that may have been introduced through the sampling equipment or laboratory handling of samples. The following summarizes equipment/rinsate blank results.

SDG 0001S

Rinsate blank U4R10201 (in SDG 0001W) exhibited TOC at 1.37 mg/L, however, the associated result for both samples in this data package is greater than 5X the blank concentration and no qualifications were required.

SDG 0001W

Rinsate blank U4R10201 exhibited TOC at 1.37 mg/L. This rinsate blank was applied to its associated samples in other data packages.

SDG 0002S

Rinsate blank U4R10201 (in SDG 0001W) exhibited TOC at 1.37 mg/L, however, the associated result for sample U4D05001 is greater than 5X the blank concentration and no

qualifications were required.

SDG 0059S

Rinsate blank U4R10201 (in SDG 0001W) exhibited TOC at 1.37 mg/L, however, all associated results are greater than 5X the blank concentration and no qualifications were required.

Field Source Blanks

Field source blanks are used to evaluate contaminants that may have been introduced through site conditions. Field source blanks are typically prepared in the field (on-site) as opposed to a trip blank which is typically prepared at the laboratory and shipped with the cooler. Field source blanks were not analyzed in any of the data packages.

6.4 Comparability

The laboratory used standard analytical methods for all of the analyses. The method detection limits were below the contract required quantitation limits, therefore, the comparability was considered acceptable.

6.5 Completeness

There were 0 rejections of data in the TOC analyses. The percent of valid data is 100%.

PARCC Criteria Summary Table

SDG Number	Precision	Accuracy	Representativeness	Completeness	Comparability
0001S	Acceptable w/qualification	Acceptable w/qualification	Acceptable w/qualification	Acceptable	Acceptable
0001W	Acceptable	Acceptable w/qualification	Acceptable w/qualification	Acceptable	Acceptable
0002S	Acceptable	Acceptable w/qualification	Acceptable w/qualification	Acceptable	Acceptable
0002W	Acceptable	Acceptable w/qualification	Acceptable w/qualification	Acceptable	Acceptable
0049W	Acceptable	Acceptable w/qualification	Acceptable w/qualification	Acceptable	Acceptable
0059S	Acceptable w/qualification	Acceptable w/qualification	Acceptable w/qualification	Acceptable	Acceptable
0059W	Acceptable	Acceptable w/qualification	Acceptable	Acceptable	Acceptable

Environmental Data Services, Inc.

Specializing in Laboratory Data Validation

PARCC CRITERIA EVALUATION REPORT - ADDENDUM

NTC Orlando, Orlando, Florida
Operable Unit 4

May 1998

Prepared for:

ABB Environmental Services, Inc.
1536 Kingsley Avenue, Suite 127
Orange Park, Florida 32073

Prepared by:

Environmental Data Services, Inc.
5 South State Street, Suite 2
Concord, New Hampshire 03301

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PARCC CRITERIA SUMMARY TABLE 32

1.0 Introduction

Environmental Data Services, Inc. (EDS) performed data validation and evaluation of chemical analytical data from environmental samples which consisted of water and soil samples. These samples were collected at the Naval Training Center (NTC) - Operable Unit 4 in Orlando, Florida. The purpose of the data validation was to assess the reliability of the analytical data.

The data validation was performed in accordance with the Naval Facilities Engineering Service Center (NFESC) document Navy Installation Restoration Laboratory Quality Assurance Guide, February 1996. Other guidance documents used are the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, February 1994, and the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994. This report summarizes the results of the data quality assessment according to the precision, accuracy, representativeness, completeness and comparability (PARCC) parameters relative to the project specific Data Quality Objectives (DQOs).

The data consisted of NFESC Level C data packages for the organic and inorganic analyses. CompuChem Environmental, Inc. analyzed all of the samples in their North Carolina laboratory.

The data validation was performed to assess data quality. Data quality is dependent on field sampling procedures, analytical methods and instrumentation, and sample matrices. Field sampling procedures and laboratory analysis contain potential sources of uncertainty, error, or bias which can affect the overall quality of the data. Sampling errors can occur from inadequate equipment decontamination, improper sample collection techniques, improper filtering, improper preservation, and homogenization or non-homogenization of samples. Data quality can also be affected by analytical factors such appropriate analytical method, proper equipment maintenance, quality instrumentation and software.

Quality control samples are used to determine the effects of sampling procedures and evaluate laboratory contaminants, laboratory performance, and matrix effects. Quality control samples include trip blanks, equipment rinsate blanks, field source blanks, method blanks, laboratory control samples, surrogate spikes, matrix spike/matrix spike duplicate samples, laboratory duplicates and field duplicates.

Before conducting the PARCC evaluation, the data were validated according to the functional guidelines for organic and inorganic data (USEPA 1994). Samples not meeting functional guideline acceptance criteria were qualified with a data quality flag, as specified below. The qualifiers used for this project are as follows:

Organic Data Qualifiers

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

N - The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Inorganic Data Qualifiers

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J - The associated value is an estimated quantity.

R - The data are unusable. (Note: Analyte may or may not be present.)

UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

Following review and qualification of the data according to the functional guidelines, the data are then evaluated using PARCC criteria. PARCC criteria provide an evaluation of overall data useability. The following section defines the PARCC criteria in general terms, followed by a specific evaluation for each analysis; volatile organic compounds, semivolatile organic compounds, pesticides/PCBs, metals, and chlorinated herbicides.

Precision

Definition: Precision - Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation around the mean.

Precision is defined by the Contract Laboratory Program (CLP) as the relative percent difference of matrix spike recoveries for two matrix spikes of the same sample (matrix spike and matrix spike duplicates recoveries, MS/MSD). Precision was assessed by comparing the results for field sample duplicates and laboratory sample duplicates to provide information on homogeneity of field sampling techniques, improper handling of samples, and on laboratory sample preparation and analysis.

The relative percent difference (RPD) was calculated for the MS and MSD samples, ABB sample and associated field duplicate, and ABB sample and associated laboratory duplicate sample. Precision was quantitatively measured as the difference of the two sample results divided by the mean and multiplied by 100 in order to be reported as a percentage. The RPD was calculated by the reviewer for each of the duplicate samples and compared to the Data Quality Objectives (DQOs) for this project. Poor precision can be caused by sample heterogeneity, improper sample collection or handling, inconsistent sample preparation, and improper instrument use. An RPD above the numerical QC limit indicates imprecision which indicates that the actual concentrations may be higher or lower that the reported result.

Accuracy

Definition: Accuracy - Accuracy is the degree of conformity of a measurement (or an average of measurements of the same parameter), X, with an accepted reference or true value, T, usually expressed as the difference of the two values, X-T, or the difference as a percentage of the reference or true value 100(X-T)/T, and sometimes expressed as a ratio, X/T. Accuracy is a measurement of the bias in a system.

Accuracy is defined by the CLP as a percent recovery for a spiked sample for analyses. MS/MSD samples, surrogate recovery samples, and LCS samples are used to evaluate the data for accuracy. Recoveries outside of acceptable QC limits may be due to matrix interference, instrumentation, analyst error, or poor recovery of some of the target compounds.

Accuracy was quantitatively measured as the concentration of the spiked analyte minus the concentration of the spiked compound in the original sample, divided by the true concentration of the spiked analyte and multiplied by 100 in order to be reported as a percentage.

Accuracy was evaluated based on the results of the matrix spike/matrix spike duplicate, laboratory control sample, and surrogate spike. The reviewer calculated the percent recovery value (%R) for

each spiking compound and compared the results with the DQOs for this project. Spike recoveries outside the acceptable QC limits indicate a source of bias, where the reported results may be either higher or lower than reported.

Representativeness

Definition: Representativeness - Representativeness is the degree to which data accurately and precisely represent the true value of a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition intended to be characterized.

Representativeness is evaluated using the QC blank sample results. QC blank samples are equipment rinsate blanks, field source blanks, trip blanks, laboratory method blanks for organic analyses and laboratory preparation blanks for inorganic analyses. The presence of target compounds in these QC blanks provide an estimate of bias to the samples due to either cross contamination in the field or laboratory.

Field QC results were used to evaluate representativeness. Positive detection of compounds in the field QC samples identify compounds that could have been introduced to the associated field samples during sample collection, transportation to the laboratory, or during analysis. Contamination should not be found in field QC samples.

Qualifications were made to the data based on field blank contamination when the sample results were below ten (10) times the maximum amount detected in the blank for compounds that are common laboratory contaminants and five (5) times the maximum amount detected in the blank for compounds that are not common contaminants. Samples that were qualified as estimated due to blank contamination were flagged by the data reviewer with a "U." Compounds that were qualified due to blank contamination that were reported below the method detection limit were raised to the detection limit and the laboratory qualifier was replaced by the reviewer with a "U."

Qualifications were made to the data based on blank contamination in the following order:

- laboratory method blank contamination;

Followed by the highest concentration of contaminant found in any of the following:

- field blank contamination;
- trip blank contamination;
- equipment blank contamination;

Representativeness was also evaluated based on laboratory QC results. Laboratory method blanks were analyzed for the organic methods and preparation blanks were analyzed for inorganic compounds. Positive detection of compounds in the laboratory QC samples identify compounds that could have been introduced to the associated field samples during sample extraction or

preparation or during analysis. Contamination should not be found in laboratory QC samples. The detection of target compounds in the laboratory QC samples provides an estimate of bias to the associated samples due to cross contamination in the laboratory.

Qualifications were made to the data based on laboratory blank contamination when the sample results were below ten (10) times the maximum amount detected in the blank for compounds that are common laboratory contaminants and five (5) times the maximum amount detected in the blank for compounds that are not common contaminants. Samples that were qualified as estimated due to laboratory blank contamination were flagged by the data reviewer with a "U." Compounds that were qualified due to blank contamination that were reported below the method detection limit were raised to the detection limit and the laboratory qualifier was replaced by the reviewer with a "U."

Comparability

Definition: Comparability - Comparability is the confidence with which one data set can be compared to another. Comparability may be assessed by comparing sampling methodology, analytical methodology, and measurement units of reported data.

The comparability parameter assessment relies almost exclusively on the results of the data validation process. Each data reviewer assessed the comparability parameter by determining whether or not the data was acquired by using standard operating procedures for sampling, standard analytical methods for analysis and by reporting analytical results in standard units.

Comparability also may be assessed by review of the analytical method practical quantitation limits. The DQOs for this project specify that the any compound detected between the detection limit and practical quantitation limit will be reported and qualified as estimated (J).

Completeness

Definition: Completeness - Completeness is a measure of the amount of valid data expressed as a percentage obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions.

Completeness is evaluated to determine if an acceptable level of data was obtained so that a project can be completed with valid usable data. Valid usable values are data that are not rejected (R qualifier) by comparison of the analytical procedures with Level C Data Validation Guidelines as specified by NFESC. Completeness is quantitatively measured as the total number of analytes in each sample, equipment rinsate, field and trip blanks and duplicate samples, minus the total number of rejected analytes divided by the total number of analytes. The completeness criterion should be defined to be consistent with the project DQOs.

2.0 Volatile Organic Compounds (VOCs)

A total of five (5) VOC SDGs were analyzed for this project. The SDGs were 0076W, 0090W, 0091W, 0092S, and 0092W.

This section discusses the QC supporting documentation as defined by the PARCC criteria and evaluated based on the project specific DQOs.

2.1 Precision

The relative percent difference (RPD) between MS/MSD samples and field duplicate samples is used to assess precision.

MS/MSD Samples

For all of the SDGs, at least one MS/MSD sample was analyzed. The functional guidelines establish RPD QC criteria limits for MS/MSD samples as follows:

MS/MSD Criteria

	Water RPD	Soil/Sediment RPD
1,1-Dichloroethene	14	22
Trichloroethene	14	24
Benzene	11	21
Toluene	13	21
Chlorobenzene	13	21

The RPD values for the MS/MSD analytical results for each SDG were acceptable.

Field Duplicate Samples

Field duplicate sample results were non-detect with the exception of the following. No qualifications were made based on these results.

SDG 0076W

Analyte	14G00203 ug/L	14G00203D ug/L	RPD
Tetrachloroethene	2	2	0

SDG 0090W

Analyte	U4G03701 ug/L	U4G03701D ug/L	RPD
Cis-1,2-Dichloroethene	31	27	14
Trichloroethene	110	100	10
Tetrachloroethene	240	230	4

SDG 0091W

Analyte	U4G04101 ug/L	U4G04101D ug/L	RPD
Cis-1,2-Dichloroethene	550	560	2
Trichloroethene	1800	2100	15
Tetrachloroethene	340	370	8

SDG 0092S

Analyte	U4D01104 ug/kg	U4G01104D ug/kg	RPD
1,2-Dichloroethene (total)	5	26	135

SDG 0092W

Analyte	U4W01103 ug/L	U4W01103D ug/L	RPD
Cis-1,2-Dichloroethene	42	40	5

2.2 Accuracy

The percent recovery results of MS/MSD samples and surrogate spikes are used to assess accuracy. Additionally, initial and continuing calibration results can be used to evaluate accuracy. Relative response factors (RRFs), percent relative standard deviation (%RSD) and percent difference (%D) are the three parameters used to evaluate instrument calibration.

MS/MSD Samples

The functional guidelines establish % Recovery QC criteria limits for MS/MSD samples as follows:

	MS/MSD Criteria	
	Water	Soil/Sediment
	%R	%R
1,1-Dichloroethene	61-145	59-172
Trichloroethene	71-120	62-137
Benzene	76-127	66-142
Toluene	76-125	59-139
Chlorobenzene	75-130	60-133

The percent recovery (%R) values for all analyzed MS/MSD samples were acceptable.

Surrogate Spikes

Three surrogate compounds are used for spiking the volatile organic samples. Surrogate spike recoveries for volatile organic analyses were compared to the QC acceptance criteria as specified in the functional guidelines. These criteria are summarized as follows:

System Monitoring Compound Criteria

	Water %R	Soil/Sediment %R
Toluene-d_8 (TOL)	88-110	84-138
Bromofluorobenzene (BFB)	86-115	59-113
1,2-Dichloroethane-d_4 (DCE)	76-114	70-121

All surrogate recovery results for all SDGs were acceptable.

Initial and Continuing Calibration

Initial and continuing calibration results can be used to evaluate accuracy within an SDG. Relative response factors (RRFs), percent relative standard deviation (%RSD) and percent difference (%D) are the three parameters used to evaluate instrument calibration. The RRF is a measure of relative response of an analyte compared to its internal standard. The %RSD is an expression of the linearity of instrument response and the %D is a comparison of the continuing calibration instrument response with its initial calibration response. The RRF is the most critical of the three parameters.

All SDGs were qualified due to initial and/or continuing calibration problems and are summarized below.

SDG 0076W

The initial calibration analyzed on 2/12/98 exhibited a high %RSD value for acetone of 36.4% and low RRF values for acetone, 2-butanone, and 2-hexanone of 0.014, 0.019, and 0.040, respectively. All associated positive results for the above compounds have been qualified as estimated "J" and all non-detects have been rejected "R."

The initial calibration analyzed on 2/13/98 exhibited a high %RSD value for chloroethane of 37.5% and low RRF values for acetone and 2-butanone of 0.017 and 0.022, respectively. All associated positive results for the above compounds have been qualified as estimated "J" and all acetone and 2-butanone non-detects have been rejected "R."

The continuing calibration analyzed on 2/13/98 (0744) exhibited low RRF values for acetone, 2-butanone, and 2-hexanone of 0.014, 0.016, and 0.032, respectively, however, all associated results have already been qualified due to initial calibration problems and no further qualifications were required.

The continuing calibration analyzed on 2/13/98 (1944) exhibited a high %D value for chloroethane of 29.1% and low RRF values for acetone and 2-butanone of 0.017 and 0.023, respectively. All associated non-detect chloroethane results have been qualified as estimated "UJ". All other associated results have already been qualified due to initial calibration problems and no further qualifications were required.

The continuing calibration analyzed on 2/16/98 exhibited low RRF values for acetone and 2-butanone of 0.021 and 0.024, respectively, however, all associated results have already been qualified due to initial calibration problems and no further qualifications were required.

SDG 0090W

The initial calibration analyzed on 2/13/98 exhibited a high %RSD value for chloroethane of 37.5% and low RRF values for acetone and 2-butanone of 0.017 and 0.022, respectively. All acetone and 2-butanone results have been rejected "R" since all results are non-detect. Chloroethane is non-detect in all samples and no qualifications were required.

The continuing calibration analyzed on 2/16/98 exhibited low RRF values for acetone and 2-butanone of 0.021 and 0.024, respectively, however, all associated results have already been qualified due to initial calibration problems and no further qualifications were required.

The continuing calibration analyzed on 2/17/98 exhibited low RRF values for acetone and 2-butanone of 0.016 and 0.023, respectively, however, all associated results have already been qualified due to initial calibration problems and no further qualifications were required.

The continuing calibration analyzed on 2/19/98 exhibited high %D values for chloroethane and carbon disulfide of 27.6% and 29.1%, respectively, and low RRF values for acetone and 2-butanone of 0.018 and 0.026, respectively. Chloroethane and carbon disulfide have been qualified as estimated "UJ" in associated samples U4G01902, U4G03901, U4G04001, U4T11301, 13G00103, and 13G00203 since all results are non-detect. All associated acetone and 2-butanone results have already been qualified due to initial calibration problems and no further qualifications were required.

SDG 0091W

The initial calibration analyzed on 2/13/98 exhibited a high %RSD value for chloroethane of 37.5% and low RRF values for acetone and 2-butanone of 0.017 and 0.022, respectively. All

acetone and 2-butanone results have been rejected "R" since all results are non-detect. Chloroethane is non-detect in all samples and no qualifications were required.

The continuing calibration analyzed on 2/13/98 exhibited a high %D value for chloroethane of 29.1%, and low RRF values for acetone and 2-butanone of 0.017 and 0.023, respectively. Chloroethane has been qualified as estimated "UJ" in associated sample 12G00202 since this result is non-detect. All associated acetone and 2-butanone results have already been qualified due to initial calibration problems and no further qualifications were required.

The continuing calibration analyzed on 2/19/98 exhibited high %D values for chloroethane and carbon disulfide of 27.6% and 29.1%, respectively, and low RRF values for acetone and 2-butanone of 0.018 and 0.026, respectively. Chloroethane and carbon disulfide have been qualified as estimated "UJ" in associated sample U4G04301 since both results are non-detect. All associated acetone and 2-butanone results have already been qualified due to initial calibration problems and no further qualifications were required.

The continuing calibration analyzed on 2/20/98 exhibited low RRF values for acetone and 2-butanone of 0.019 and 0.025, respectively, however, all associated results have already been qualified due to initial calibration problems and no further qualifications were required.

SDG 0092S

The initial calibration analyzed on 3/18/98 exhibited a high %RSD value for acetone of 59.4%, however, all acetone results are non-detect and no qualifications were required.

The continuing calibration analyzed on 3/19/98 exhibited a high %D value for acetone, 2-butanone, and 2-hexanone of 58.1%, 40.8%, and 26.7%, respectively. All of the above compounds have been qualified as estimated "UJ" in associated samples U4D01104, U4D01104D, and U4D05002 since all results are non-detect.

The continuing calibration analyzed on 3/20/98 exhibited high %D values for vinyl chloride and chloroethane of 26.2% and 25.5%, respectively. Vinyl chloride and chloroethane have been qualified "J" for positive results and "UJ" for non-detects in associated samples U4D01902, U4D00704, U4D01004, and U4D01305.

SDG 0092W

The initial calibration analyzed on 3/19/98 exhibited low RRF values for acetone, 2-butanone, and 2-hexanone of 0.009, 0.012, and 0.036, respectively. All 2-butanone and 2-hexanone results have been rejected "R" since all results are non-detect. All acetone results have been qualified "J" for positive results and "R" for non-detects.

The continuing calibration analyzed on 3/20/98 exhibited a high %D value for tetrachloroethene of 26.1%, and low RRF values for acetone, 2-butanone, and 2-hexanone of 0.009, 0.014, and 0.040, respectively. Tetrachloroethene has been qualified "J" for positive results and "UJ" for non-detects in all samples except U4W01004. All associated acetone, 2-butanone, and 2-hexanone results have already been qualified due to initial calibration problems and no further qualifications were required.

The continuing calibration analyzed on 3/21/98 exhibited low RRF values for acetone, 2-butanone, 2-hexanone, and 1,2-dibromo-3-chloropropane of 0.007, 0.009, 0.033, and 0.045, respectively. 1,2-Dibromo-3-chloropropane has been qualified "R" in associated sample U4W01004 since the result is non-detect. All associated acetone, 2-butanone, and 2-hexanone results have already been qualified due to initial calibration problems and no further qualifications were required.

2.3 Representativeness

Method blanks, equipment rinsate blanks, trip blanks, and field source blanks are used to evaluate representativeness. A summary of the contaminants found in these blanks can be found below. The laboratory method blank was applied first to the samples, followed by the highest concentration of the equipment rinsate blank, trip blank, and field source blank.

Qualifications were made to the data based on blank contamination when the sample results were below ten (10) times the maximum amount detected in the blank for compounds that are common laboratory contaminants and five (5) times the maximum amount detected in the blank for compounds that are not common contaminants. Samples that were qualified as undetected due to blank contamination were flagged by the data reviewer with a "U." Compounds that were qualified due to blank contamination that were reported below the method detection limit were raised to the detection limit and the laboratory qualifier was replaced by the reviewer with a "U." If a sample result exceeded 5X or 10X the amount in the blank, the result was not amended.

The following summarizes the method blanks, equipment rinsate blanks, trip blanks, and field source blanks.

Method Blanks

Method blanks were free of contamination with the exception of the following.

SDG 0092S

Method blank VBLKN1 (3/19/98) exhibited methylene chloride and acetone contamination at 1 ug/kg and 5 ug/kg, respectively. Methylene chloride has been qualified "U" in associated samples U4D01104, U4D01104D, and U4D05002. Acetone has been qualified "U" in

associated samples U4D01104D and U4D05002.

Method blank VBLKN2 (3/20/98) exhibited methylene chloride and acetone contamination at 2 ug/kg and 6 ug/kg, respectively. Methylene chloride has been qualified "U" in associated sample U4D01902. All other associated results are non-detect or greater than 10X the blank concentration and no further qualifications were required.

Equipment/Rinsate Blanks

Equipment rinsate blanks are used to evaluate contaminants that may have been introduced through the sampling equipment or laboratory handling of samples.

SDG 0076W

Rinsate blank U4R11001 exhibited methylene chloride and chloroform contamination at 0.7 ug/L and 2 ug/L, respectively. Chloroform has been qualified as undetected "U" in associated sample 14G00203. All other associated results are non-detect and no further qualifications were required.

SDG 0090W

Rinsate blank U4R11001 (in SDG 0076W) exhibited methylene chloride and chloroform contamination at 0.7 ug/L and 2 ug/L, respectively. All associated methylene chloride results have already been qualified due to trip blank contamination and chloroform is non-detect in all associated samples, therefore, no qualifications were required.

SDG 0091W

Rinsate blank U4R11001 (in SDG 0076W) exhibited methylene chloride and chloroform contamination at 0.7 ug/L and 2 ug/L, respectively. All associated methylene chloride results have already been qualified due to trip blank contamination and chloroform is non-detect in all associated samples, therefore, no qualifications were required.

Trip Blanks

Trip blanks are used to evaluate contaminants that may have been introduced through storage, shipping, or site conditions. Trip blank contamination is summarized below.

SDG 0076W

Trip blank U4T11001 exhibited methylene chloride and MTBE contamination at 2 ug/L and 1 ug/L, respectively, however, all associated results are non-detect or already qualified due to blank contamination and no qualifications were required.

Trip blank U4T11101 exhibited methylene chloride and bromoform contamination at 1 ug/L and 0.6 ug/L, respectively. Methylene chloride has been qualified as undetected "U" in associated samples 14G00203D, 14G00501, and 14G00601. All other associated results are non-detect and no further qualifications were required.

SDG 0090W

Trip blank U4T11201 exhibited methylene chloride contamination at 1 ug/L. Methylene chloride has been qualified "U" in associated samples U4G03401 and U4G03501. All other associated results are non-detect and no further qualifications were required.

Trip blank U4T11301 exhibited methylene chloride contamination at 1 ug/L. Methylene chloride has been qualified as undetected "U" in associated sample U4G04001. All other associated results are non-detect and no further qualifications were required.

SDG 0091W

Trip blank U4T11101 (in SDG 0076W) exhibited methylene chloride and bromoform contamination at 1 ug/L and 0.6 ug/L, respectively. Methylene chloride has been qualified "U" in associated sample 12G00202. All other associated results are non-detect and no further qualifications were required.

Trip blank U4T11301 (in SDG 0090W) exhibited methylene chloride contamination at 1 ug/L. Methylene chloride has been qualified as undetected "U" in associated samples U4G01103, U4G02204, U4G04301, and U4G04301D. All other associated results are non-detect and no further qualifications were required.

SDG 0092S

Trip blank U4T11401 (in SDG 0092W) was free of contamination. No qualifications were required.

SDG 0092W

Trip blank U4T11401 was free of contamination. No qualifications were required.

Field Source Blanks

Field source blanks are used to evaluate contaminants that may have been introduced through site conditions. Field source blanks are typically prepared in the field (on-site) as opposed to a trip blank which is typically prepared at the laboratory and shipped with the cooler. Field blanks were not analyzed with theses SDG packages.

2.4 Comparability

The laboratory used standard analytical methods for all of the analyses. The method detection limits were below the contract required quantitation limits, therefore, the comparability was considered acceptable.

2.5 Completeness

There were 114 rejections of data in the volatile analyses. The percent of valid data is 95%.

3.0 Semivolatile Organic Compounds

A total of four (4) Semivolatile Organic Compound SDGs were analyzed for this project. The SDGs are 0076W, 0090W, 0091W, and 0092W.

This section discusses the QC supporting documentation as defined by the PARCC criteria and evaluated based on the project specific DQOs.

3.1 Precision

MS/MSD Samples

The relative percent difference (RPD) between MS/MSD samples and field duplicate samples is used to assess precision.

One MS/MSD sample was analyzed for each SDG. The functional guidelines establish RPD QC criteria limits for MS/MSD samples as follows:

MS/MSD CRITERIA

	Water RPD	Soil/Sediment RPD
Phenol	42	35
2-Chlorophenol	40	50
1,4-Dichlorobenzene	28	27
N-Nitroso-di-n-propylamine	38	38
1,2,4-Trichlorobenzene	28	23
4-Chloro-3-methylphenol	42	33
Acenaphthene	31	19
4-Nitrophenol	50	50
2-4-Dinitrotoluene	38	47
Pentachlorophenol	50	47
Pyrene	31	36

A MS/MSD sample was not analyzed for SDGs 0090W and 0091W. MS/MSD RPD results for the other two SDGs were acceptable.

Field Duplicate Samples

Field duplicate samples were not analyzed for SDGs 0076W, 0091W and 0092W. Field duplicate sample results for SDG 0090W were non-detect.

3.2 Accuracy

The percent recovery results of MS/MSD samples and surrogate spikes are used to assess accuracy. Additionally, initial and continuing calibration results can be used to evaluate accuracy. Relative response factors (RRFs), percent relative standard deviation (%RSD) and percent difference (%D) are the three parameters used to evaluate instrument calibration.

MS/MSD Samples

The functional guidelines establish % Recovery QC criteria limits for MS/MSD samples as follows:

MS/MSD CRITERIA

	Water %R	Soil/Sediment %R
Phenol	12-110	26-90
2-Chlorophenol	27-123	25-102
1,4-Dichlorobenzene	36-97	28-104
N-Nitroso-di-n-propylamine	41-116	41-126
1,2,4-Trichlorobenzene	39-98	38-107
4-Chloro-3-methylphenol	23-97	26-103
Acenaphthene	46-118	31-137
4-Nitrophenol	10-80	11-114
2-4-Dinitrotoluene	24-96	28-89
Pentachlorophenol	9-103	17-109
Pyrene	26-127	35-142

A MS/MSD sample was not analyzed for SDGs 0090W and 0091W. The percent recovery (%R) values SDG 0076W were acceptable. A Blank Spike/Blank Spike Duplicate (BS/BSD) was analyzed for SDG 0092W and the percent recovery (%R) values were acceptable except that which is summarized below.

SDG 0092W

The BS/BSD sample exhibited a high BSD %R value for 4-nitrophenol of 82%, however, this compound is non-detect in sample U4G00907 and no qualifications were required.

Surrogate Spikes

Six surrogate compounds are used for spiking the semivolatile organic samples. Surrogate spike recoveries for semivolatile organic analyses were compared to the QC acceptance criteria as specified in the functional guidelines. These criteria are summarized as follows:

Surrogate Recovery Limits

	Water %R	Soil %R
NBZ (Nitrobenzene-d5)	35-114	23-120
FBP (2-Fluorobiphenyl)	43-116	30-115
TPH (Terphenyl-d14)	33-141	18-137
PHL (Phenol-d5)	10-110	24-113
2FP (2-Fluorophenol)	21-110	25-121
TBP (2,4,6-Tribromophenol)	10-123	19-122

Surrogate recovery values for all SDGs were acceptable.

Initial and Continuing Calibration

Initial and continuing calibration results can be used to evaluate accuracy within an SDG. Relative response factors (RRFs), percent relative standard deviation (%RSD) and percent difference (%D) are the three parameters used to evaluate instrument calibration. The RRF is a measure of relative response of an analyte compared to its internal standard. The %RSD is an expression of the linearity of instrument response and the %D is a comparison of the continuing calibration instrument response with its initial calibration response. The RRF is the most critical of the three parameters.

All SDGs were qualified due to initial and/or continuing calibration problems and are summarized below.

SDG 0076W

The initial calibration analyzed on 2/12/98 exhibited acceptable %RSD and mean RRF values. No qualifications were required.

The continuing calibration analyzed on 2/13/98 exhibited high %D values for 2,6-dinitrotoluene, 2,4-dinitrophenol, and 4,6-dinitro-2-methylphenol of 25.4%, 29.3%, and 30.7%, respectively. All of the above compounds have been qualified "UJ" in associated samples 14G00701 and U4R11001 since all results were non-detect.

SDG 0090W

The initial calibration analyzed on 2/12/98 exhibited acceptable %RSD and mean RRF values. No qualifications were required.

The continuing calibration analyzed on 2/13/98 exhibited high %D values for 2,6-dinitrotoluene, 2,4-dinitrophenol, and 4,6-dinitro-2-methylphenol of 25.4%, 29.3%, and 30.7%, respectively. All of the above compounds have been qualified "UJ" in associated sample U4G02701 since all results are non-detect.

The continuing calibration analyzed on 2/18/98 exhibited high %D values for 2,2'-oxybis(1-chloropropane), hexachlorobutadiene, hexachlorocyclopentadiene, 2,6-dinitrotoluene, 2,4-dinitrophenol, 4-nitrophenol, 2,4-dinitrotoluene, hexachlorobenzene, and pentachlorophenol of 44.5%, 47.3%, 42.2%, 31.5%, 36.8%, 32.1%, 26.7%, 31.8%, and 37.7%, respectively. All of the above compounds have been qualified "UJ" in associated samples U4G03301, U4G03401, and U4G03701 since all results are non-detect.

The continuing calibration analyzed on 2/19/98 exhibited high %D values for 2,2'-oxybis(1-chloropropane), hexachlorobutadiene, 4-nitrophenol, hexachlorobenzene, benzo(b)fluoranthene, and benzo(k)fluoranthene of 41.5%, 53.7%, 27.6%, 26.4%, 28.1%, and 29.0%, respectively. All of the above compounds have been qualified "UJ" in associated samples U4G03601 and U4G03701D since all results are non-detect.

SDG 0091W

The initial calibration analyzed on 2/12/98 exhibited acceptable %RSD and mean RRF values. No qualifications were required.

The continuing calibration analyzed on 2/17/98 exhibited high %D values for phenol, bis(2-chloroethoxy)methane, hexachlorobutadiene, 2,4-dinitrophenol, 4-nitrophenol, 4,6-dinitro-2-methylphenol, hexachlorobenzene, bis(2-ethylhexyl)phthalate and di-n-octylphthalate of 26.1%, 30.0%, 57.4%, 63.2%, 45.5%, 27.0%, 26.4%, 25.6%, and 28.2%, respectively. All of the above compounds have been qualified "UJ" in all three samples in this data package since all results are non-detect. All RRF values were acceptable.

SDG 0092W

The initial calibration analyzed on 3/19/98 exhibited high %RSD values for 4-chloroaniline and 2,4-dinitrophenol of 44.0% and 34.3%, respectively, however, both compounds are non-detect in sample U4G00907 and no qualifications were required.

The continuing calibration analyzed on 3/21/98 exhibited high %D values for 2,4-dinitrophenol and 3,3'-dichlorobenzidiene of 27.1% and 30.3%, respectively. Both compounds have been qualified "UJ" in sample U4G00907 since both results are non-detect.

3.3 Representativeness

Method blanks, equipment rinsate blanks, and field source blanks are used to evaluate representativeness. A summary of the contaminants found in these blanks can be found below. Several compounds were detected in the various blanks. The laboratory method blank was applied first to the samples, followed by the highest concentration of the equipment rinsate blank and field source blank.

Qualifications were made to the data based on blank contamination when the sample results were below ten (10) times the maximum amount detected in the blank for compounds that are common laboratory contaminants and five (5) times the maximum amount detected in the blank for compounds that are not common contaminants. Samples that were qualified as undetected due to blank contamination were flagged by the data reviewer with a "U." Compounds that were qualified due to blank contamination that were reported below the method detection limit were raised to the detection limit and the laboratory qualifier was replaced by the reviewer with a "U." If a sample result exceeded 5X or 10X the amount in the blank, the result was not amended.

The following summarizes the method blanks, equipment rinsate blanks, and field source blanks.

Method Blanks

Method blanks were analyzed with each SDG for semivolatile organic compounds to identify contaminants that may have been introduced through analytical instrumentation or sample preparation. The method blanks for SDG 0091W were free of contamination. The following summarizes method blank contamination for each remaining SDG.

SDG 0076W

Method blank SBLKEE (2/12/98) exhibited phenol and bis(2-ethylhexyl)phthalate contamination at 1 ug/L and 2 ug/L, respectively. Phenol has been qualified as undetected "U" in associated sample U4R11001. All other associated results are non-detect and no further qualifications were required.

SDG 0090W

Method blank SBLKEE (2/12/98) exhibited phenol and bis(2-ethylhexyl)phthalate contamination at 1 ug/L and 2 ug/L, respectively, however, all associated results are non-detect and no qualifications were required.

Method blank SBLKFO (2/17/98) was free of contamination. No qualifications were required.

SDG 0092W

Method blank SBLKLD (3/19/98) exhibited bis(2-ethylhexyl)phthalate contamination at 12 ug/L, however, this compound is non-detect in sample U4G00907 and no qualifications were required.

Equipment/Rinsate Blanks

Equipment rinsate blanks are used to evaluate contaminants that may have been introduced through the sampling equipment or laboratory handling of samples. All equipment/rinsate blanks were free of contamination.

Field Source Blanks

Field source blanks are used to evaluate contaminants that may have been introduced through site conditions. Field source blanks are typically prepared in the field (on-site) as opposed to a trip blank which is typically prepared at the laboratory and shipped with the cooler. Field blanks were not analyzed with these SDG packages.

3.4 Comparability

The laboratory used standard analytical methods for all of the analyses. The method detection limits were below the contract required quantitation limits, therefore, the comparability was considered acceptable.

3.5 Completeness

There were 0 rejections of data in the semivolatile analyses. The percent of valid data is 100%.

4.0 Pesticide/PCB Compounds

A total of four (4) Pesticide/PCB SDGs were analyzed for this project. The SDGs are 0076W, 0090W, 0091W, and 0092W.

This section discusses the QC supporting documentation as defined by the PARCC criteria and evaluated based on the project specific DQOs.

4.1 Precision

The relative percent difference (RPD) between MS/MSD samples and field duplicate samples is used to assess precision.

MS/MSD Samples

The functional guidelines establish RPD QC criteria limits for MS/MSD samples as follows:

	MS/MSD Criteria	
	Water	Soil
	RPD	RPD
gamma-BHC (Lindane)	15	50
Heptachlor	20	31
Aldrin	22	43
Dieldrin	18	38
Endrin	21	45
4,4'-DDT	27	50

A MS/MSD sample was not analyzed for SDGs 0090W and 0091W. The MS/MSD RPD results for SDG 0076W in summarized below. A BS/BSD sample was analyzed for SDG 0092W and is summarized below.

SDG 0076W

MS/MSD sample 14G00701 exhibited high RPD values for gamma-BHC, heptachlor, aldrin, dieldrin, endrin, and 4,4'-DDT of 32, 31, 32, 34, 33, and 35, respectively, however, all %R values were acceptable and no qualifications were required.

SDG 0092W

The BS/BSD sample exhibited a high RPD value for gamma-BHC of 16, however, the %R values were acceptable for this compound and no qualifications were required.

Field Duplicate Samples

Field duplicate samples were not analyzed for SDGs 0076W, 0091W, and 0092W. Field duplicate sample results for SDG 0090W were non-detect.

4.2 Accuracy

The percent recovery results of MS/MSD samples and surrogate spikes are used to assess accuracy. Additionally, initial and continuing calibration results can be used to evaluate accuracy. Relative response factors (RRFs), percent relative standard deviation (%RSD) and percent difference (%D) are the three parameters used to evaluate instrument calibration.

MS/MSD Samples

The functional guidelines establish % Recovery QC criteria limits for MS/MSD samples as follows:

MS/MSD Criteria

	Water	Soil/Sediment
	%R	%R
gamma-BHC (Lindane)	56-123	46-127
Heptachlor	40-131	35-130
Aldrin	40-120	34-132
Dieldrin	52-126	31-134
Endrin	56-121	42-139
4,4'-DDT	38-127	23-134

A MS/MSD sample was not analyzed for SDGs 0090W and 0091W. The MS/MSD %R results for SDG 0076W were acceptable. A BS/BSD sample was analyzed for SDG 0092W and the %R results were acceptable

Surrogate Spikes

Two surrogate compounds, TCX and DCB, are used for spiking the pesticide/PCB samples. Surrogate spike recoveries for pesticide/PCB analyses were compared to the QC acceptance criteria specified for each SDG. All surrogate recovery results were within QC advisory limits for TCX and DCB with the exception of the following.

SDG 0091W

All surrogate recoveries were within QC advisory limits of 30-150% for TCX and DCB except

for sample U4G02003 which exhibited a low % recovery for TCX1 of 29%. All associated results for this sample were qualified as estimated "J" for positive results and "UJ" for non-detects.

Initial and Continuing Calibration

Initial and continuing calibration results can be used to evaluate accuracy within an SDG. Relative response factors (RRFs), percent relative standard deviation (%RSD) and percent difference (%D) are the three parameters used to evaluate instrument calibration. The RRF is a measure of relative response of an analyte compared to its internal standard. The %RSD is an expression of the linearity of instrument response and the %D is a comparison of the continuing calibration instrument response with its initial calibration response. The RRF is the most critical of the three parameters.

The initial and continuing calibrations analyzed were acceptable for all SDGs.

4.3 Representativeness

Method blanks, equipment rinsate blanks, and field source blanks were used to evaluate representativeness for the pesticide/PCB analyses. A summary of the contaminants found in these blanks can be found below. The blanks were used to assess the sample data.

The following summarizes the method blanks, equipment rinsate blanks, and field source blanks.

Method Blanks

Method blanks were analyzed with each SDG for pesticide/PCB compounds to identify contaminants that may have been introduced through analytical instrumentation or sample preparation. The method blanks for SDGs 0091W and 0092W were free of contamination. Method blank contamination for SDGs 0076W and 0090W is summarized below.

SDG 0076W

Method blank PBLKEG (2/12/98) exhibited 4,4'-DDT and methoxychlor contamination at 0.011 ug/L and 0.025 ug/L, respectively. Methoxychlor is non-detect in all associated samples. 4,4'-DDT has been qualified "U" in associated samples 14G00701 and U4R11001.

SDG 0090W

Method blank PBLKEG (2/12/98) exhibited 4,4'-DDT and methoxychlor contamination at 0.011 ug/L and 0.025 ug/L, respectively, however, all associated sample results are non-detect and no qualifications were required.

Method blank PBLKEN (2/13/98) exhibited alpha-chlordane contamination at 0.0071 ug/L, however, all associated sample results are non-detect and no qualifications were required.

Equipment/Rinsate Blanks

Equipment rinsate blanks are used to evaluate contaminants that may have been introduced through the sampling equipment or laboratory handling of samples. All equipment/rinsate blanks were free of contamination.

Field Source Blanks

Field source blanks are used to evaluate contaminants that may have been introduced through site conditions. Field source blanks are typically prepared in the field (on-site) as opposed to a trip blank which is typically prepared at the laboratory and shipped with the cooler. Field source blanks were not analyzed with these SDG packages.

4.4 Comparability

The laboratory used standard analytical methods for all of the analyses. The method detection limits were below the contract required quantitation limits, therefore, the comparability was considered acceptable.

4.5 Completeness

There were 0 rejections of data in the pesticides/PCB analyses. The percent of valid data is 100%.

5.0 Metals

A total of four (4) Metals SDGs were analyzed for this project. The SDGs are 0076W, 0090W, 0091W, and 0092W.

This section discusses the QC supporting documentation as defined by the PARCC criteria and evaluated based on the project specific DQOs.

5.1 Precision

Metals analysis is different from organic analyses in that no matrix spike duplicate sample is evaluated. A laboratory duplicate sample is analyzed instead. For duplicate analyte concentrations greater than 5X the CRDL, the relative percent difference (RPD) between the two reported results must be less than 20% for aqueous samples (35% for soil samples).

For duplicate analyte concentrations less than 5X the CRDL, the difference between the two reported results must be less than the CRDL value for aqueous samples, or less than 2X the CRDL value for soil samples. RPDs for samples with values less than the CRDL are not calculated.

The relative percent difference (RPD) between field duplicate samples is also used to assess precision.

Matrix Duplicates

The following summarizes matrix duplicate qualification.

SDG 0090W

Matrix duplicate sample 12G00102D exhibited a high RPD value for lead of 3.0, however, all lead results are non-detect or have already been qualified due to blank contamination and no further qualifications were required.

Field Duplicates

Field duplicate sample RPD results are summarized below. No qualifications were made based on field duplicate results.

SDG 0076W

Analyte	14G00203 ug/L	14G00203D ug/L	RPD
Antimony	4.7	5.6	17

Analyte	14G00203 ug/L	14G00203D ug/L	RPD
Barium	1.7	2.3	30
Chromium	0.90U	1.0	NC
Vanadium	6.5	6.8	5

SDG 0090W

Analyte	U4G03701 ug/L	U4G03701D ug/L	RPD
Aluminum	14500	10900	28
Barium	75.0	55.7	30
Chromium	25.4	20.4	22
Iron	3560	3140	13
Mercury	0.23	0.30	26
Nickel	4.2	3.8	10
Selenium	4.1	3.6U	NC

SDG 0091W

Analyte	U4G04101 ug/L	U4G04101D ug/L	RPD
Aluminum	2380	2570	8
Barium	37.1	39.1	5
Chromium	3.2	3.8	17
Iron	1180	1430	19
Nickel	1.2U	1.9	NC
Vanadium	3.0	3.3	10

Analyte	U4G04301 ug/L	U4G04301D ug/L	RPD
Aluminum	315	310	2
Barium	15.6	15.7	1
Chromium	1.2	1.5	22
Iron	639	687	7
Vanadium	2.6	2.4	8

5.2 Accuracy

Matrix Spike Analysis

The matrix spike recovery QC limits are 75-125%. It should be noted that spike recovery limits do not apply when the sample concentration exceeds the spike concentration by a factor of four or more. Matrix spike analytical results exhibited acceptable % recoveries with the exception of the following.

SDG 0091W

Matrix spike sample 12G00202S exhibited a high %R value for selenium of 138.2%, however, all selenium results are non-detect and no qualifications were required.

SDG 0092W

Blank spike sample BS exhibited low BS/BSD %R values for selenium of 62.4% and 68.9%, respectively. Selenium has been qualified "UJ" in sample U4G00907.

Initial and Continuing Calibration Results

All ICV and CCV %R values were within the QC limits for each SDG. The %R values do not suggest any systematic analytical problem with either accuracy or precision.

5.3 Representativeness

Preparation blanks, equipment rinsate blanks, and field source blanks were analyzed for metals to evaluate representativeness. Blank results are summarized below.

The preparation blanks are used first to evaluate data quality, followed by the highest value of the equipment rinsate blanks or the field source blanks.

Sample results were qualified due to blanks that had target analytes where the absolute value of the reported results was greater than or equal to the corresponding IDL value; sample results were less than 5X the absolute value of the blank result. Samples that were qualified as undetected due to blank contamination were flagged by the data reviewer with a "U."

Preparation and Calibration Blanks

Preparation blanks were analyzed for each SDG to identify target analytes that may have been introduced through the analytical instrumentation or sample preparation. Preparation and/or calibration blank contamination that resulted in qualification is summarized below.

SDG 0076W

Water preparation blank PBW (2/18/98) exhibited contamination for several compounds, however, all sample results were non-detect or greater than 5X the blank concentration with the exception of manganese and sodium.

Manganese has been qualified "U" in associated samples 14G00501, 14G00801, 14H00304, 14H00501, and 14H00801. Sodium has been qualified "U" in associated samples 14G00701,

14G00801, 14H00701, and 14H00801.

Initial and continuing calibration blanks exhibited contamination for several compounds, however, all sample results were non-detect or greater than 5X the blank concentration with the exception of aluminum, barium, beryllium and manganese. Aluminum has been qualified "U" in associated samples 14H00403 and 14H00501. Barium has been qualified "U" in associated sample U4R11001. Beryllium has been qualified "U" in associated sample 14G00701. Manganese has been qualified "U" in associated samples 14G00203, 14G00203D, 14G00304, 14G00403, 14G00601, 14G00701, 14H00203, 14H00403, 14H00601, and 14H00701.

SDG 0090W

Water preparation blank PBW (2/17/98) exhibited contamination for several compounds, however, all sample results were non-detect or greater than 5X the blank concentration with the exception of lead, manganese and sodium.

Lead has been qualified "U" in associated samples U4G03301, U4G03501, U4G03601, U4G03801, U4G03901, 12G00102, 12G00402, 13G00103, and 13G00403.

Manganese has been qualified "U" in associated samples U4G03401, 12G00102, 12G00402, 13G00103, and 13G00303.

Sodium has been qualified "U" in associated sample 13G00103.

Initial and continuing calibration blanks exhibited contamination for several compounds, however, all sample results were non-detect or greater than 5X the blank concentration with the exception of aluminum, antimony, and beryllium. Aluminum has been qualified "U" in associated samples U4G02701, U4H02701, and 13G00303.

Antimony has been qualified "U" in associated samples U4G02701, U4H02701, 12G00402, 13G00103, and 13G00303.

Beryllium has been qualified "U" in all samples.

SDG 0091W

Water preparation blank PBW (2/17/98) exhibited contamination for several compounds, however, all sample results were non-detect or greater than 5X the blank concentration and no qualifications were required.

Initial and continuing calibration blanks exhibited contamination for several compounds, however, all sample results were non-detect or greater than 5X the blank concentration with

the exception of antimony, beryllium, and manganese. Antimony has been qualified "U" in associated samples U4G02204, 12G00202, and 13G00708. Beryllium has been qualified "U" in associated samples U4G01103, U4G02204, U4G04101, U4G04101D, U4G04301, and 12G00202. Manganese has been qualified "U" in associated samples U4G02204, 12G00202, and 13G00708.

SDG 0092W

Water preparation blank PBW (3/19/98) exhibited contamination for several compounds, however, all sample results were non-detect or greater than 5X the blank concentration and no qualifications were required.

Initial and continuing calibration blanks exhibited contamination for several compounds, however, all sample results were non-detect or greater than 5X the blank concentration with the exception of antimony and manganese. Antimony and manganese have been qualified "U" in associated sample U4G00907.

Equipment/Rinsate Blanks

Target analytes found in the equipment rinsate blanks through inadequate decontamination procedures or sampling equipment are applied to associated samples. Equipment/rinsate blank contamination is summarized below.

SDG 0076W

Rinsate blank U4R11001 exhibited aluminum, calcium, copper, lead, magnesium, manganese, potassium, sodium, and zinc contamination at 26.1 ug/L, 29700 ug/L, 0.94 ug/L, 2.0 ug/L, 13800 ug/L, 25.3 ug/L, 753 ug/L, 26900 ug/L, and 52.5 ug/L, respectively. Aluminum has been qualified "U" in associated samples 14G00203, 14G00203D, 14G00501, 14G00601, 14H00203, 14H00304, 14H00601, and 14H00701.

Calcium has been qualified "U" in all samples.

Copper has been qualified "U" in associated samples 14G00102, 14G00501, 14G00701, 14G00801, and 14H00403.

Lead has been qualified "U" in associated sample 14H00403.

Magnesium has been qualified "U" in all samples.

Manganese has been qualified "U" in all samples.

Potassium has been qualified "U" in all samples except 12G00302.

Sodium has been qualified "U" in all samples except 12G00302.

Zinc has been qualified "U" in associated samples 14G00102, 14G00403, 14G00501, 14G00701, 14G00801, 14H00403, 14H00501, 14H00701, and 14H00801.

All other associated results are non-detect or greater than 5X the blank concentration and no further qualifications were required.

SDG 0090W

Rinsate blank U4R11001 (in SDG 0076W) exhibited aluminum, calcium, copper, lead, magnesium, manganese, potassium, sodium, and zinc contamination at 26.1 ug/L, 29700 ug/L, 0.94 ug/L, 2.0 ug/L, 13800 ug/L, 25.3 ug/L, 753 ug/L, 26900 ug/L, and 52.5 ug/L, respectively. Calcium has been qualified "U" in all samples.

Copper has been qualified "U" in associated samples U4G03701, U4G03701D, U4G03901, U4G04001, and U4H02701.

Lead has been qualified "U" in associated samples U4G01901, U4G03701, U4G03701D, and U4G04001.

Magnesium has been qualified "U" in all samples.

Manganese has been qualified "U" in all samples.

Potassium has been qualified "U" in all samples.

Sodium has been qualified "U" in all samples.

Zinc has been qualified "U" in associated samples U4G01902, U4G03501, U4G04001, U4H02701, and 13G00403.

All other associated results are non-detect or greater than 5X the blank concentration and no further qualifications were required.

SDG 0091W

Rinsate blank U4R11001 (in SDG 0076W) exhibited aluminum, calcium, copper, lead, magnesium, manganese, potassium, sodium, and zinc contamination at 26.1 ug/L, 29700 ug/L, 0.94 ug/L, 2.0 ug/L, 13800 ug/L, 25.3 ug/L, 753 ug/L, 26900 ug/L, and 52.5 ug/L, respectively. Aluminum has been qualified "U" in associated sample U4G02003.

Calcium has been qualified "U" in all samples.

Copper has been qualified "U" in associated samples U4G04101D and 12G00202.

Lead has been qualified "U" in associated samples U4G04101, U4G04101D, U4G04301D, and 12G00202.

Magnesium has been qualified "U" in all samples.

Manganese has been qualified "U" in all samples.

Potassium has been qualified "U" in all samples.

Sodium has been qualified "U" in all samples.

Zinc has been qualified "U" in associated samples U4G01103, U4G04101, U4G04101D, and U4G04301D.

All other associated results are non-detect or greater than 5X the blank concentration and no further qualifications were required.

Field Source Blanks

Target analytes found in field source blanks through background or on-site contamination are applied to associated samples. Field source blanks were not analyzed with these SDG packages.

5.4 Comparability

The laboratory used standard analytical methods for all of the analyses. The method detection limits were below the contract required quantitation limits, therefore, the comparability was considered acceptable.

5.5 Completeness

There were 18 rejections of data in the metals analyses. The percent of valid data is 98%.

PARCC Criteria Summary Table

SDG Number	Precision	Accuracy	Representativeness	Comparability	Completeness
0076W	Acceptable	Acceptable w/qualification	Acceptable w/qualification	Acceptable	Acceptable
0090W	Acceptable	Acceptable w/qualification	Acceptable w/qualification	Acceptable	Acceptable
0091W	Acceptable	Acceptable w/qualification	Acceptable w/qualification	Acceptable	Acceptable
0092S	Acceptable	Acceptable w/qualification	Acceptable w/qualification	Acceptable	Acceptable
0092W	Acceptable	Acceptable w/qualification	Acceptable w/qualification	Acceptable	Acceptable

APPENDIX O

APPENDIX O

GEOSTATISTICS SUMMARY

Data for antimony, volatiles, and sample locations (northing, easting and depth) were received as Excel files and converted into text files for importing into GMS version 2.0 as .MDS files. Only four analytes contained sufficient detected analytes to continue geostatistical analysis of them. These were antimony (7 hits in 33 analyses), tetrachloroethene (20 hits in 39 analyses), trichloroethene (19 hits in 39 analyses), and *cis* 1,2 dichloroethene (15 hits in 38 analyses). The organic constituents' concentrations were dominated by a relative few very large values and a larger number of much lower values.

After successful importation as scattered 3D points, bounding grids 40 by 40 by 10 cells (x, y, and z direction, respectively) were constructed and the experimental semivariogram (3D version) was examined. A number of directional semivariograms with various azimuths of anisotropy were examined for each analyte, to determine direction of longest spatial correlation. The azimuth giving the experimental semivariogram with the longest range of influence was retained for the next step of semivariance modeling.

For each analyte, the retained experimental semivariogram was modeled. In all four cases, the classic spherical model adequately described the experimental semivariance. The organic constituents considered all had shorter ranges of influence than did the antimony (approximately 110 feet for the organics and 220 feet for antimony). The organics also showed better spatial correlation (longer range of influence) near azimuth 90 to 120 degrees (east to southeast), while antimony was much less directional. These two factors point to different sources for the two classes of analytes.

The model parameters for each analyte are listed in the table below.

ANALYTE	MODEL	NUGGET VALUE	SILL	RANGE	AZIMUTH
tetrachloroethene	Spherical	0.0	30000000	100 feet	120 degrees
trichloroethene	Spherical	0.0	490000	110 feet	120 degrees
cis 1,2dichloroethene	Spherical	0.0	330000	120 feet	90 degrees
antimony	Spherical	0.0	33	220 feet	NA

The relatively short range, strongly directionality, and high sill all indicate the organic analytes are probably violating geostatistic's underlying assumption of stationarity. This is not surprising, since the organics are concentrated in a plume with relatively quick concentration decreases, surrounded by analyses which were below detection limits.

The antimony, on the other hand, shows much less contrast with he surrounding below detection limit analyses and appears more as a smooth hill on a flat plain, rather than the precipitous peaks rising from a flat piedmont which is presented by the organic analytes considered. This may indicate a more diffuse, non-point release or a natural occurrence of the antimony.

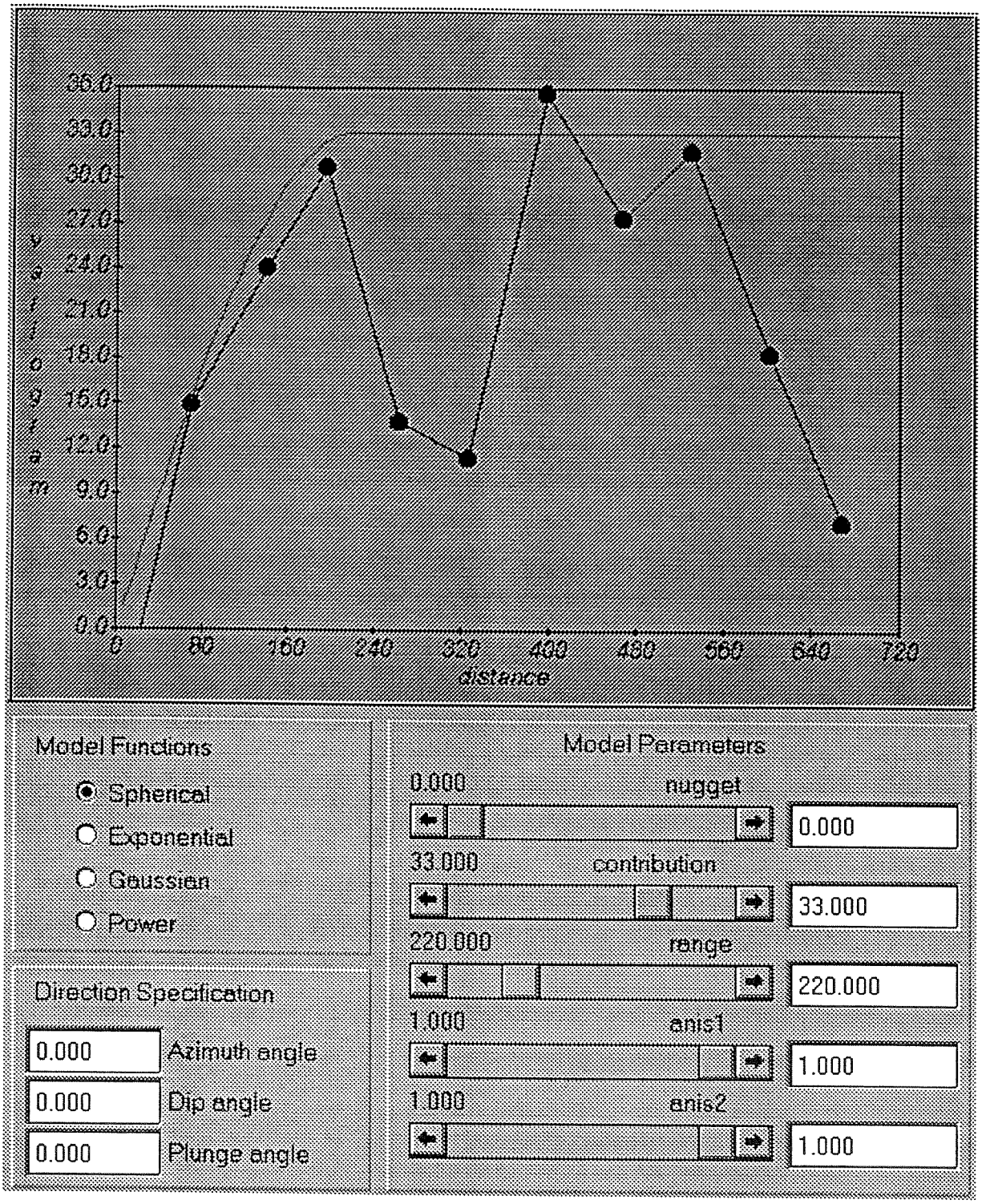

Figure 1. Antimony Semivariogram

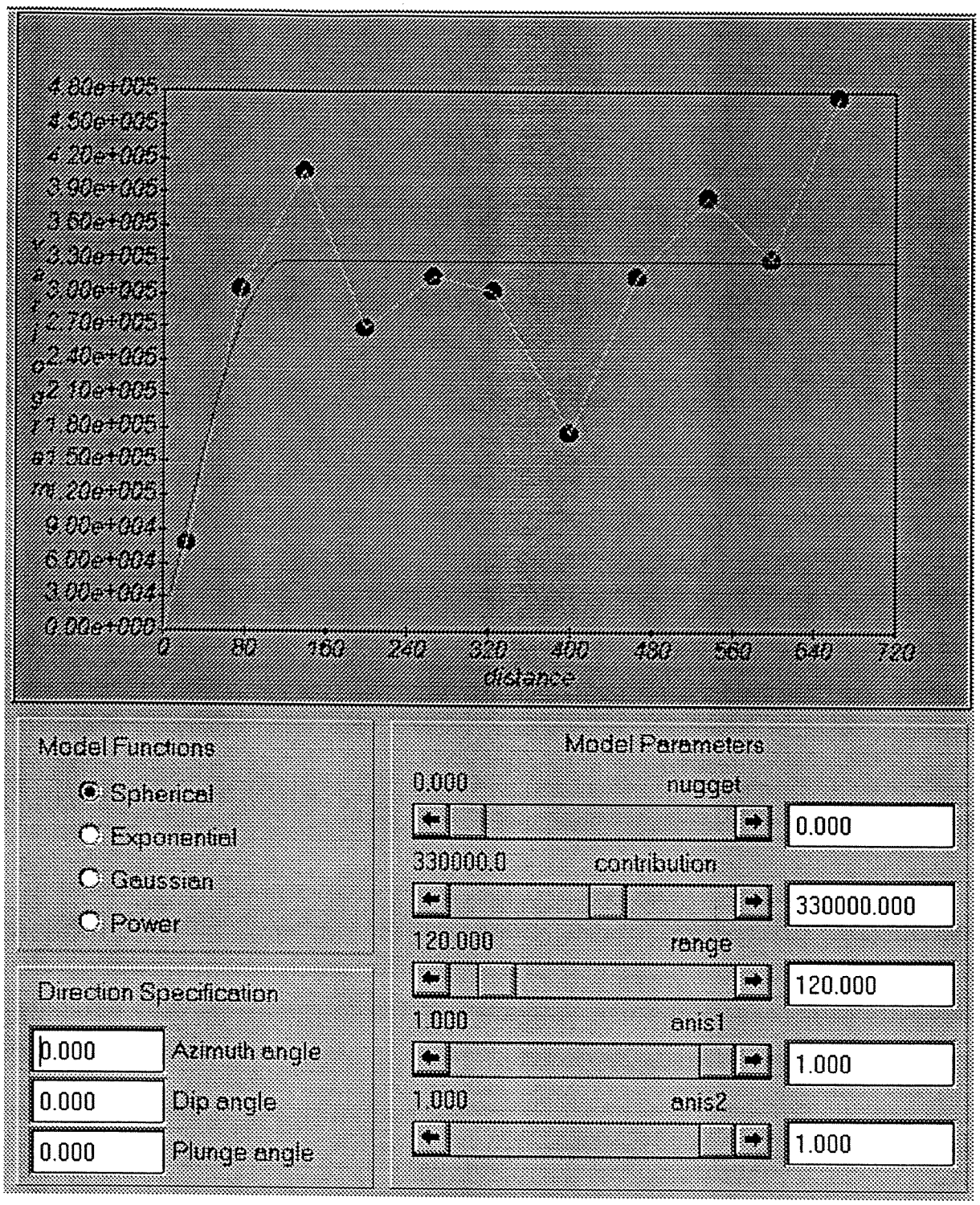

Figure 2. *cis* 1,2-Dichloroethene Semivariogram

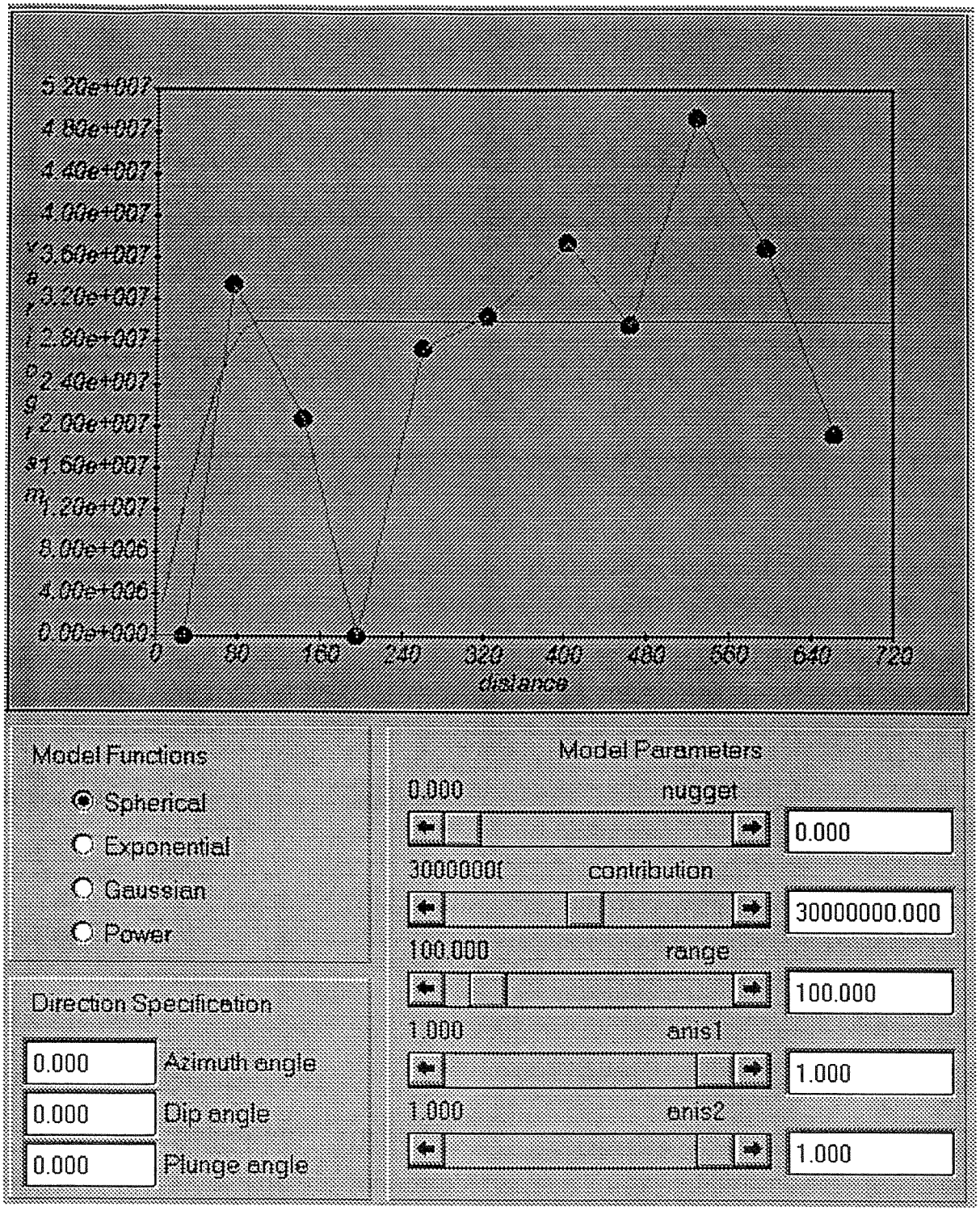

Figure 3. Tetrachloroethene Semivariogram

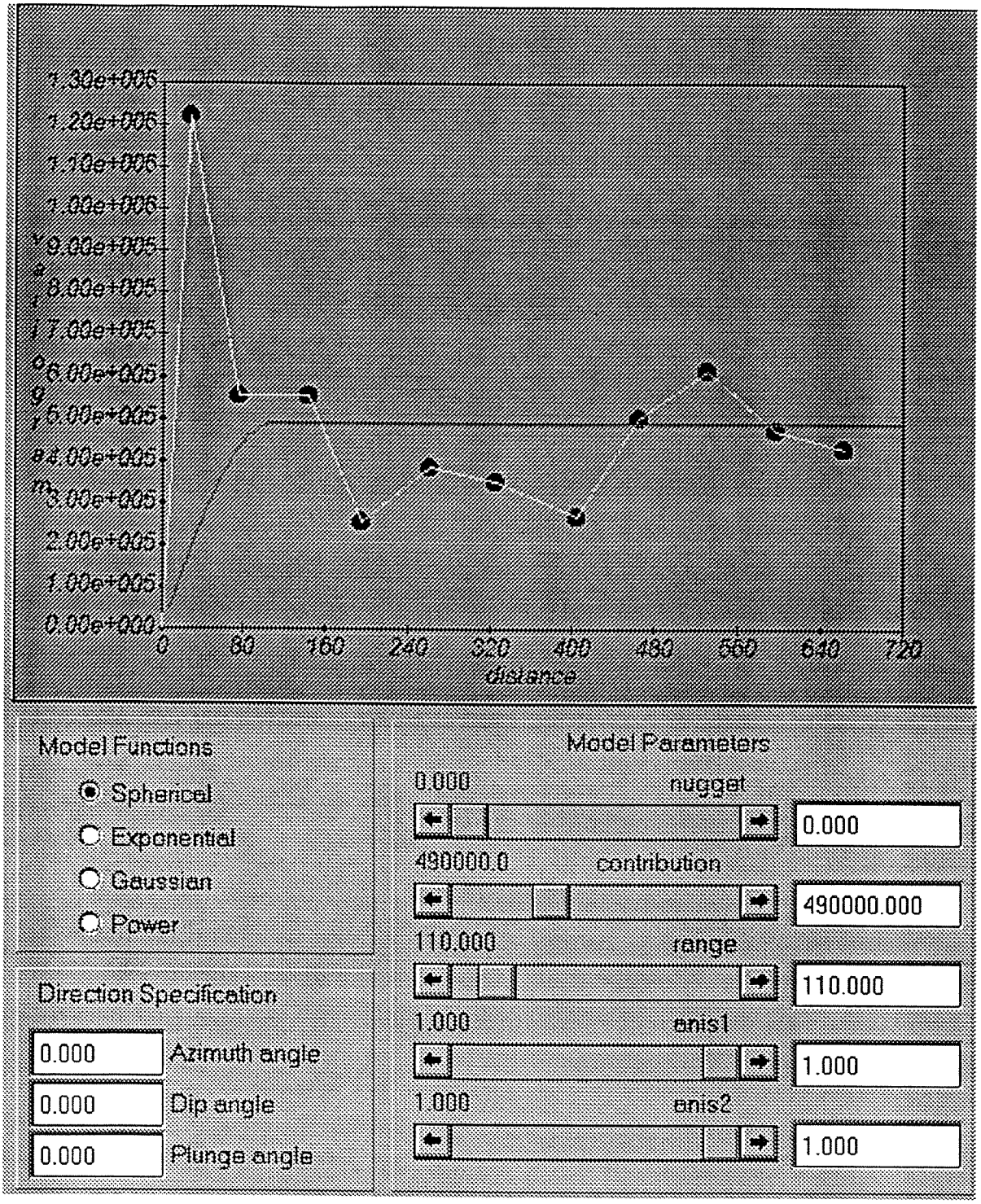

Figure 4. Trichloroethene Semivariogram

APPENDIX P

APPENDIX P

MEMORANDA RE: LAKE DRUID PAHS

Harding Lawson Associates

November 15, 1999

02545.031

Commanding Officer
Southern Division
Naval Facilities Engineering Command
ATTN: Barbara Nwokike, Code 1873
2155 Eagle Drive
Charleston, SC 29406

SUBJECT: Operable Unit (OU) 4 Remedial Investigation
Lake Druid PAHs
Naval Training Center (NTC), Orlando, Florida
CTO 135, Contract No. N62467-89-D-031/135

Dear Ms. Nwokike:

At the October 18, 1999 Orlando Partnering Team (OPT) meeting, HLA distributed a memorandum comparing PAH and pesticide concentrations in Lake Druid sediment to similar data collected statewide by the Florida Department of Environmental Protection (FDEP). The memorandum referenced three figures, two of which were not available at the meeting. These two figures are enclosed with this letter.

The October 18 memo concluded that the concentrations of PAHs and pesticides detected in Lake Druid were introduced by urban stormwater discharged to the lake, as opposed to Navy activities at Area C and OU 4. On October 27, 1999, FDEP issued a letter concurring with this conclusion, and agreeing that PAHs, PCBs, and pesticides may be screened off the COPC list for the OU 4 ecological risk assessment. HLA assumes that USEPA has also concurred, based on a verbal agreement reached in a conference call with the Navy and HLA on September 2, 1999. USEPA agreed to abide by FDEP's decision regarding these compounds in the lake.

If you should have any questions, or if you wish to discuss this topic further, please do not hesitate to call me at (781) 245-6606.

Very Truly Yours,

HARDING LAWSON ASSOCIATES

Mark J. Salvetti

Mark J. Salvetti, P.E.
Technical Lead

cc: File
Wayne Hansel, Southern Division
Nancy Rodriguez, USEPA Region IV
David Grabka, FDEP
Steve McCoy, Tetra Tech
Alan Aikens, CH2M HILL
John Kaiser (HLA)
Rick Allen (HLA)

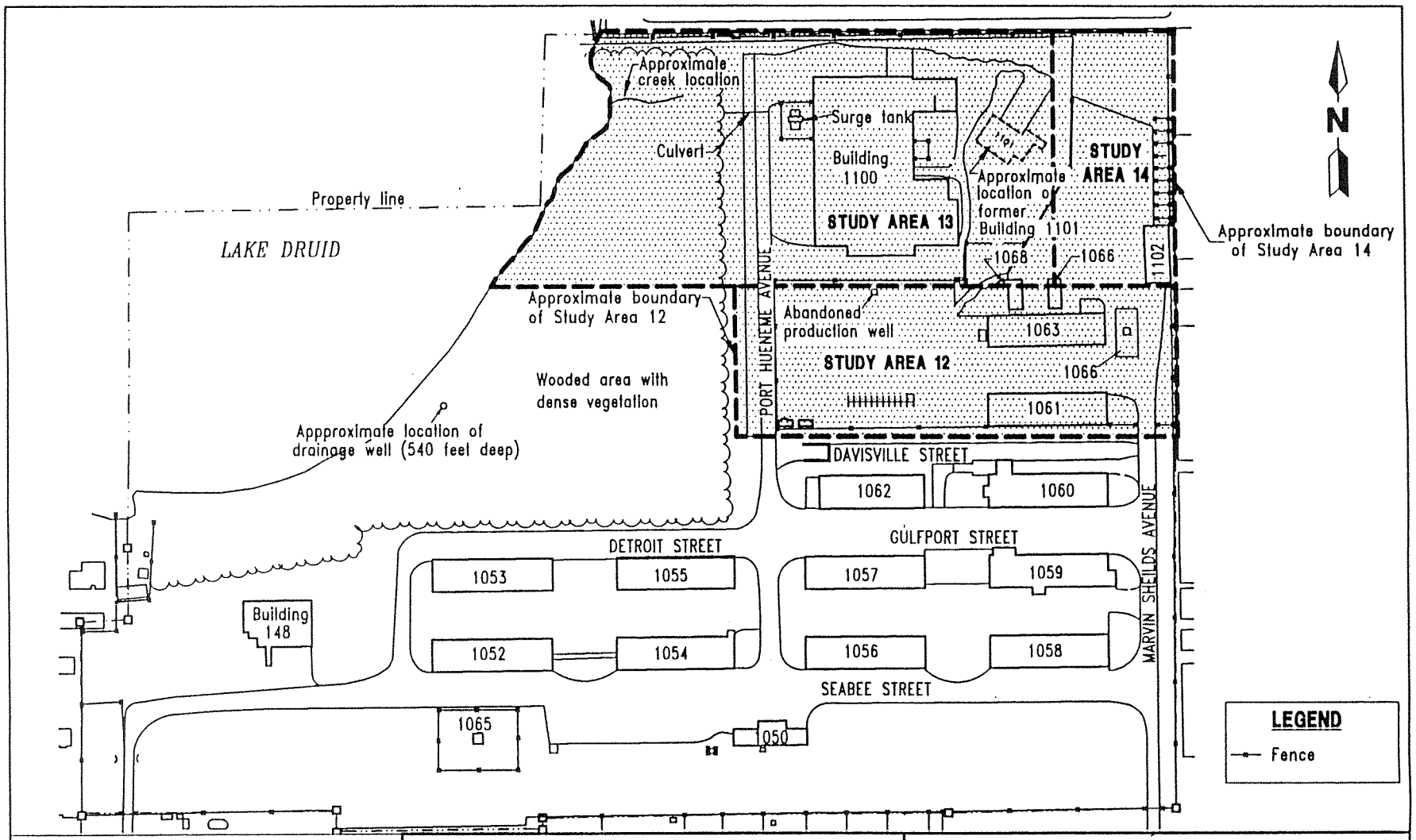

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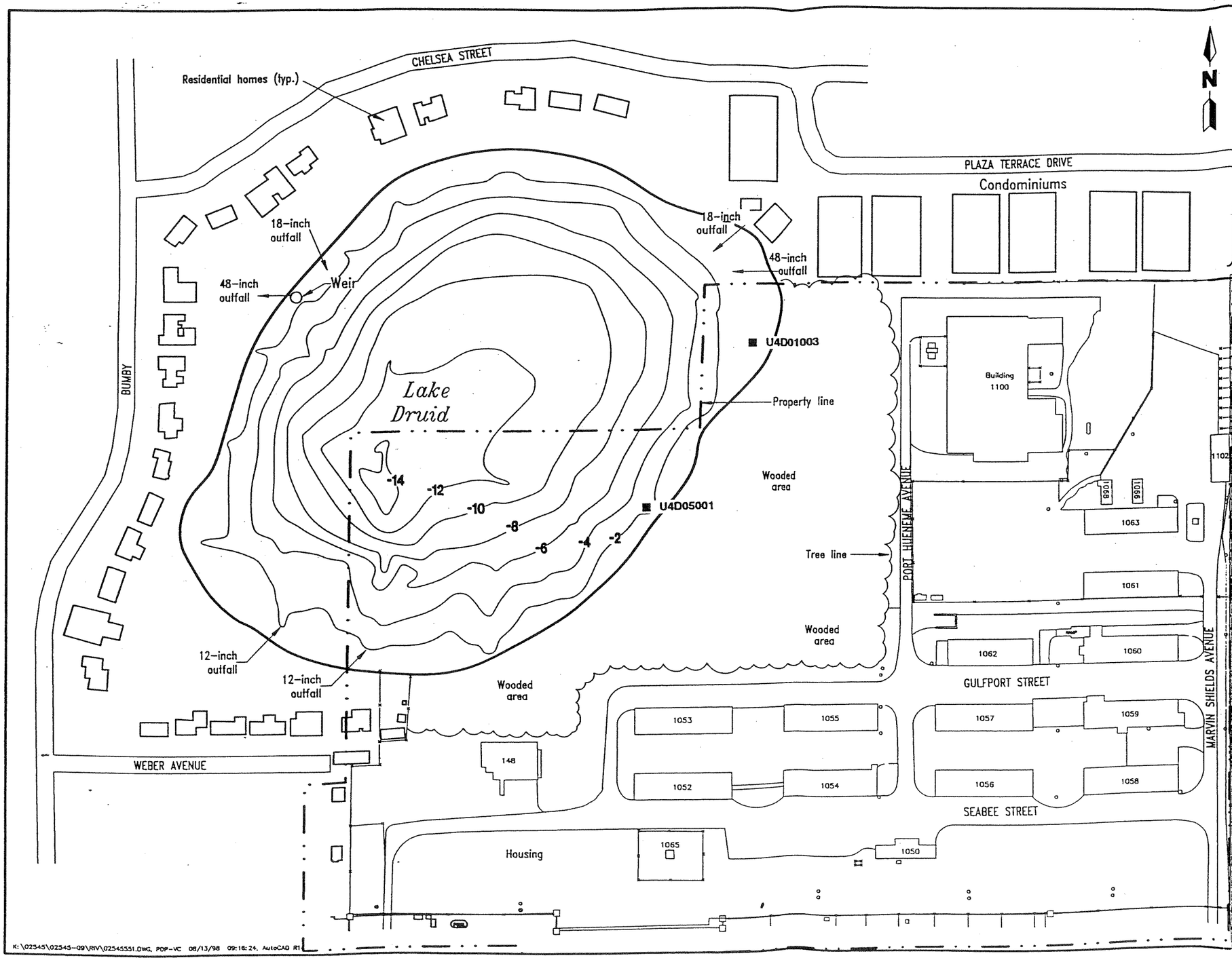
FIGURE 1

LAKE DRUID AND AREA C STUDY AREAS 12, 13, AND 14 (OPERABLE UNIT 4)

OPERABLE UNIT 4

NAVAL TRAINING CENTER ORLANDO, FLORIDA



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Lake Druid
Bathymetric Parameters

Maximum length	1,260 feet
Maximum width	860 feet
Mean width	660 feet
Water surface area	833,000 square feet
Lake bottom surface area	834,000 square feet
Volume	208,000 cubic yard
Maxium depth	14.6 feet
Mean depth	6.7 feet
Relative depth	1.4 percent
Shoreline	3,400 feet

LEGEND

-2 Lake depth in feet

0 100 200
SCALE: 1 INCH = 200 FEET

FIGURE 2
LAKE DRUID
BATHYMETRIC DETAIL WITH ASSOCIATED SURFACE WATER FEATURES

OPERABLE UNIT 4

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

Department of Environmental Protection

Jeb Bush
Governor

Twin Towers Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

October 27, 1999

Mr. Wayne Hansel
Code 18B7
Southern Division
Naval Facilities Engineering Command
P.O. Box 190010
North Charleston, South Carolina 29419-0068

RE: Operable Unit 4 Remedial Investigation, Lake Druid PAHs, Area C, Naval Training Center Orlando, Florida

Dear Mr. Hansel:

I have completed my review of the Harding Lawson Associates (HLA) letter report concerning Lake Druid PAHs at Operable Unit 4, NTC Orlando, dated October 18, 1999 (received on the same date). The letter report was written in response to comments relating to contaminants detected in sediments during the Remedial Investigation of Operable Unit 4. HLA and the Navy have maintained that PAHs, PCBs and pesticides (primarily DDT and chlordane) detected in sediments were due to stormwater discharges to Lake Druid from the surrounding urban environment. The letter report adequately supports the assumption made in the Draft Remedial Investigation Report that the contaminants detected were very likely from stormwater discharges from properties other than Operable Unit 4. I now concur that PAHs, PCBs and pesticides may be screened off the COPC list (using the argument supported by the letter report) in the Ecological Risk Assessment part of the Remedial Investigation for further study and risk evaluation.

If I can be of any further assistance with this matter, please contact me at (850)488-3693.

Sincerely,

David P. Grabka
Remedial Project Manager

cc: Barbara Nwokike, Navy SouthDiv
Nancy Rodriguez, USEPA Region 4
Richard Allen, HLA, Jacksonville
Steve McCoy, TetraTech NUS, Oak Ridge
Bill Bostwick, FDEP Central District
Al Aikens, CH2M Hill, Orlando

TJB TJB JJC JJC ESN ESN

Harding Lawson Associates
October 18, 1999

02545.030

Commanding Officer
Southern Division
Naval Facilities Engineering Command
ATTN: Barbara Nwokike, Code 1873
2155 Eagle Drive
Charleston, SC 29406

SUBJECT: Operable Unit (OU) 4 Remedial Investigation
Lake Druid PAHs
Naval Training Center (NTC), Orlando, Florida
CTO 107, Contract No. N62467-89-D-031/107

Dear Ms. Nwokike:

In September 1998, Harding Lawson Associates (HLA) issued the Final Draft Remedial Investigation (RI) Report for Operable Unit 4 (OU 4) at NTC, Orlando. USEPA Region IV provided review comments in December 1998, and the Florida Department of Environmental Protection (FDEP) provided review comments in February 1999. HLA prepared a detailed response to all regulator comments, which was issued in May 1999. In late June 1999, USEPA provided additional written comments, primarily related to the ecological risk assessment. FDEP also verbally concurred with USEPA's concerns.

The latest regulator comments were related to the formatting of the ecological risk assessment, the adequacy of the site characterization performed in the RI, and a concern that the ecological risk assessment did not adequately address potential risks associated with PAHs, Aroclor-1254, and pesticides detected in Lake Druid sediment.

These issues were discussed with the Navy, USEPA, and FDEP in a conference call on September 2, 1999, and at the Orlando Partnering Team (OPT) meeting in Orlando on September 29, 1999. HLA and the Navy maintain that the presence of PAHs, Aroclor-1254, and pesticides (primarily DDT and chlordane) in Lake Druid is due to the large volume of stormwater discharged to Lake Druid from the surrounding urban environment. No Area C stormwater discharges directly to the lake. It was agreed at the OPT meeting that literature reporting urban stormwater analyses would be researched and compared to data from Lake Druid.

LAKE DRUID CONDITIONS

Lake Druid is a Class III surface water body, as described in Chapter 62-302, Florida Administrative Code, Surface Water Quality Standards. Lake Druid straddles the western boundary of OU 4 and Area C (Figure 1). The lake captures storm runoff through the storm drainage system of the surrounding neighborhoods and from small, intermittent streams. The Lake Druid basin area is approximately 150 acres. Storm water outfalls include an 18 inch and a 48 inch outfall at the northeast corner of the lake, two 12 inch outfalls at the southwest end, and an 18 inch outfall on the northwest shoreline. The 48 inch outfall collects stormwater from up to 1000 feet away, including the Koger Center office park located east of Area C. Lake level is maintained by a weir at a 48 inch discharge on the northwest

Engineering and
Environmental Services

107 Audubon Road, Suite 301, Wakefield, Massachusetts 01880 781/245-6606 Fax: 781/246-5060

shoreline. Lake Druid overflow water is piped from this location to Lake Rowena, located approximately 0.75 mile to the northwest.

Bathymetry data on file with the city of Orlando's Stormwater Utility Bureau indicate that the lake covers over 800,000 square feet (approximately 18 acres). The lake reaches a maximum depth of approximately 15 feet in the south-central part, and has a mean depth of approximately seven feet. In 1996, the average elevation of the lake was 101.1 feet, National Geodetic Vertical Datum. Lake Druid details are shown on Figure 2.

No stormwater runoff from Area C is discharged directly to Lake Druid. No catch basins are present on the property. The primary means of stormwater control is by infiltration. Stormwater does collect in a drainage swale east of Port Hueneme Avenue, and from there is directed through a culvert into the wooded area to the west. Stormwater infiltrates through the wooded area, and during particularly heavy rains flows overland towards Lake Druid, located approximately 200 feet further west.

SAMPLING STRATEGY

During development of the RI Work Plan, the sampling strategy for Lake Druid was discussed with the OPT. Several pre-RI investigations (including groundwater, surface water, and surface soil sampling) had established that the primary Contaminants of Concern (COCs) were chlorinated VOCs. Recognizing the large volume of non-site related urban runoff discharging to the lake, it was originally proposed to the OPT that any further lake characterization conducted during the RI would focus only on VOCs. This was agreed to by the FDEP representative as a reasonable approach, given the likelihood that urban storm water had introduced organic compounds such as PAHs and pesticides that were clearly unrelated to OU 4 releases. However, USEPA required that at least one full suite sample be collected from Lake Druid sediment and surface water.

SAMPLING RESULTS

Sampling locations are shown on Figure 2. Two full suite sediment samples and a duplicate were collected from the lake. Samples U4D01003 and U4D01003D were collected from the portion of the lake where high concentrations of VOCs had been detected. This location was approximately 80 feet south of the 48 inch outfall. Sample U4D05001 was collected along the shoreline further south, away from VOCs but still on Navy property. This sample was intended to serve as a Control.

Sample results are shown on Table 1. Fluoranthene and pyrene were detected in sample U4D01003 at 6,200 ug/kg and 6,600 ug/kg, respectively. Only pyrene at 200 ug/kg was detected in the field sample itself. No PAHs were detected in the Control. Several pesticides and Aroclor-1254 were also detected at location U4D01003, although most were also present at higher concentrations in the Control.

Pyrene and fluoranthene are pyrogenic PAHs, produced primarily by the combustion of organic matter. These compounds would be expected to be present in urban runoff. Lake Druid receives substantial volumes of stormwater during rain events. Lake residents report that from the western shore, a wave of water can be observed moving across the lake from the 48 inch outfall near OU 4 during major rain events.

LITERATURE SEARCH

Several reports were researched for PAH and pesticide data collected at other sites in Florida. The U.S. Geological Survey has published reports evaluating the water quality of stormwater runoff, as has the St. John's Water Management District and Florida DEP. A reference list is provided at the end of this memo.

Unfortunately, several of the reports do not include comprehensive laboratory results, either because organic compounds were not the focus of the study, or because results were presented in a qualitative rather than quantitative manner. The St. John's report provides a large PAH database, but presented mostly as total PAHs, without a breakout of individual compounds.

The most useful report was prepared by Florida DEP, and is titled *"Final Report, Characterization of Stormwater Contaminated Sediment and Debris for Determining Proper Disposal Methods"*. This report evaluated sediment quality associated with stormwater management devices, in order to determine if hazardous constituents were present that might pose a concern when disposing of sediment removed during maintenance. Although many of the samples were collected from catch basins, manholes, and street sweepings, the study also evaluated sediment quality in detention and retention basins, canals, and lakes.

DATA COMPARISON

PAH data from the FDEP report was tabulated and plotted on a bar graph against data from Lake Druid sample U4D00103D (Figure 3). Samples that were obviously from catch basins and street sweepings were omitted, as these data are not readily comparable to Lake Druid. Sample descriptions in the report were not always clear, so some of the graphed data may still represent locations with different environments than Lake Druid. However, the majority of the data came from canals, basins, and lakes. Note also that the graph does not include every data point presented in the report. Occasionally low concentrations of PAHs were detected in some sediment samples, but the overwhelming majority of the data is represented by that shown on the graph.

The graph plots concentrations of total PAHs, pyrene, and fluoranthene from each sample location. From these results, it is clear that the PAH concentrations detected in Lake Druid are generally much lower than concentrations found in stormwater sediments in Florida. Also note the pyrene/fluoranthene ratio. In Lake Druid, pyrene and fluoranthene are present in (approximately) a 1:1 ratio. This is also true of the majority of the sediments evaluated in the FDEP report.

It is possible that the lower concentrations detected in Lake Druid may in part be due to dilution. Lake Druid, although small, is still larger than typical drainage basins and canals. Nevertheless, the data provide compelling evidence that PAHs detected in Lake Druid are clearly the result of runoff from the surrounding urban environment.

Although not illustrated graphically, comparison of pesticide results between Lake Druid and the FDEP report yielded similar results. DDT and its breakdown products were detected in sample U4D00103D

at a total concentration 6.6 ug/kg, and in the Control at 33.3 ug/kg. These compounds were also present in 17 out of the 20 data points shown in Figure 3, at concentrations up to 39.7 ug/kg. The highest concentration of chlordane (total) in Lake Druid was 7.3 ug/kg. Chlordane was also detected in 17 of the 20 data points shown on Figure 3, frequently at concentrations above 100 ug/kg.

CONCLUSION

Lake Druid is a small lake, located in a highly urbanized environment. Major stormwater outfalls are located around the perimeter of the lake, discharging stormwater collected from the surrounding residential neighborhood and the nearby Koger Center office park. No stormwater collected from Area C is discharged directly to the lake.

Comparison of data collected from Lake Druid to available data collected within Florida demonstrates that PAHs and pesticides are present in sediments associated with urban runoff throughout the state. The concentrations detected in Lake Druid are generally much lower than most of the data presented in a recent FDEP report on stormwater sediments.

The concentrations of PAHs and pesticides detected in Lake Druid are consistent with what has been shown to be present in urban stormwater sediments in Florida, and are therefore unrelated to activities conducted by the Navy at Area C and OU 4.

If you should have any questions, or if you wish to discuss this topic further, please do not hesitate to call me at (781) 245-6606.

Very Truly Yours,

HARDING LAWSON ASSOCIATES

Mark J. Salvetti

Mark J. Salvetti, P.E.
Technical Lead

cc: File
Wayne Hansel, Southern Division
Nancy Rodriguez, USEPA Region IV
David Grabka, FDEP
Steve McCoy, Tetra Tech
Alan Aikens, CH2M HILL
John Kaiser (HLA)
Rick Allen (HLA)

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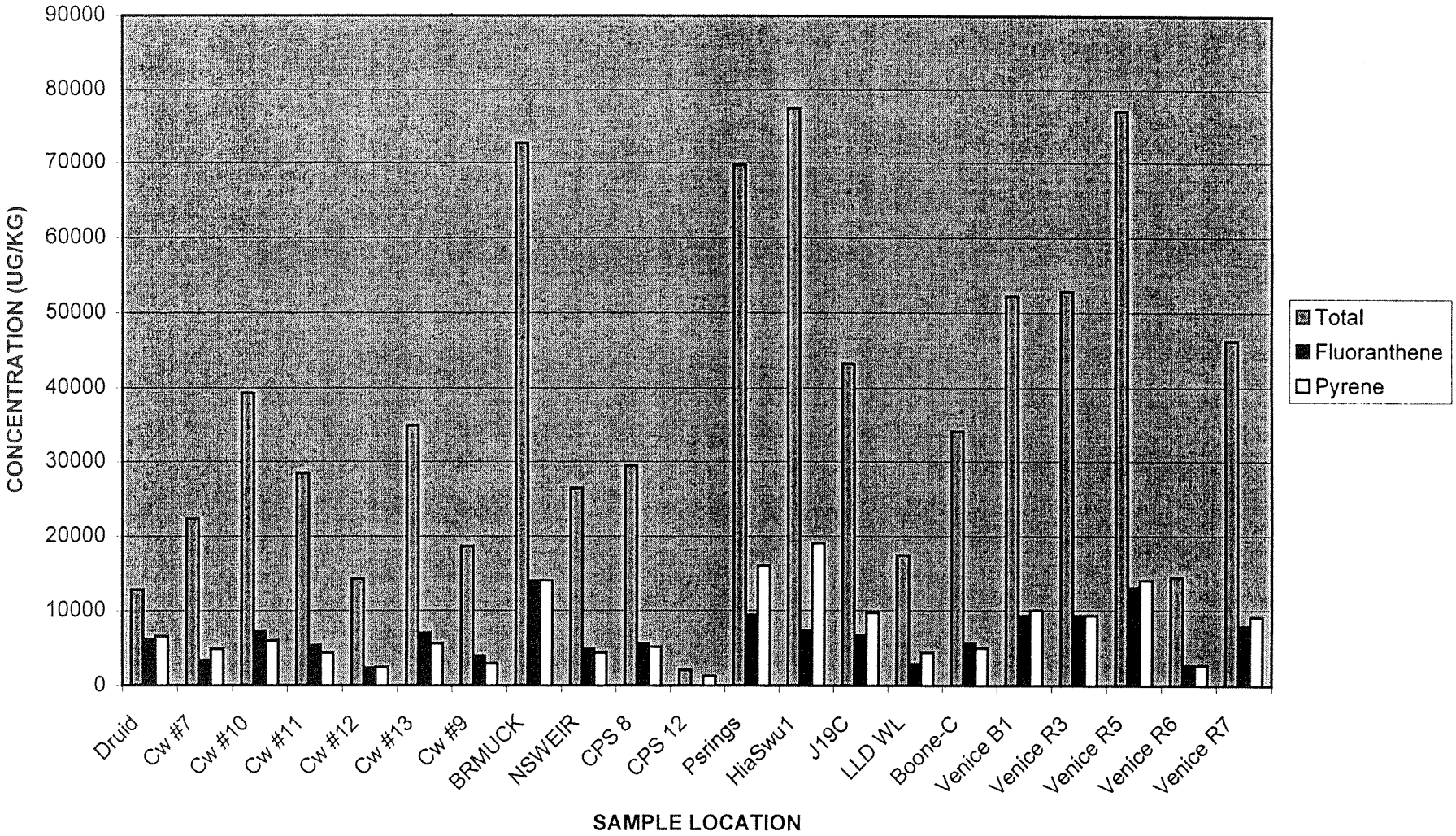
USGS, 1989. *Effects of Three Highway-Runoff Detention Methods on Water Quality of the Surficial Aquifer System in Central Florida*. Water-Resources Investigations Report 88-4170. Prepared in cooperation with the Florida Department of Transportation, 1989.

TABLE 1
Summary of Sediment Analytical Results
Lake Druid

Sample ID	U4D01003	U4D01003D	U4D05001
Lake	Druid	Druid	Druid Control
Sampling Date	10/29/97	10/29/97	10/29/97
Volatile Organics, ug/kg			
1,2-Dichloroethene (total)	480	100	140 U
Tetrachloroethene	53 U	59 U	140 U
Toluene	6 J	59 U	140 U
Vinyl chloride	27 J	59 U	140 U
Semivolatile Organics, ug/kg			
4-Methylphenol	1700 U	59000 U	4700 U
Benzo(a)anthracene	1700 U	59000 U	4700 U
Benzo(a)pyrene	1700 U	59000 U	4700 U
Benzo(b)fluoranthene	1700 U	59000 U	4700 U
Benzo(g,h,i)perylene	1700 U	59000 U	4700 U
Benzo(k)fluoranthene	1700 U	59000 U	4700 U
bis(2-Ethylhexyl)phthalate	170 J	11000 J	4700 U
Butylbenzylphthalate	1700 U	59000 U	4700 U
Chrysene	1700 U	59000 U	4700 U
Dibenz(a,h)anthracene	1700 U	59000 U	4700 U
Di-n-butylphthalate	1700 U	59000 U	4700 U
Di-n-octylphthalate	1700 U	59000 U	4700 U
Fluoranthene	1700 U	6200 J	4700 U
Indeno(1,2,3-cd)pyrene	1700 U	59000 U	4700 U
Phenanthrene	1700 U	59000 U	4700 U
Pyrene	200 J	6600 J	4700 U
TOTAL PAHs	**200**	**12800**	**ND**
Pesticides/PCBs, ug/kg			
4,4'-DDD	17 U	19 U	8.1 J
4,4'-DDE	17 U	6.6 J	18 J
4,4'-DDT	17 U	19 U	7.2 J
alpha-Chlordane	2.1 J	1.9 J	7.3 J
Aroclor-1254	70 J	65 J	470 U
Aroclor-1260	170 U	190 U	470 U
delta-BHC	5.4 J	6.7 J	12 J
Dieldrin	17 U	19 U	1.4 J
Endosulfan I	4.2 J	10 U	24 U
gamma-BHC (Lindane)	0.54 J	10 U	24 U
gamma-Chlordane	8.9 U	10 U	24 U
Heptachlor	3.9 J	1.2 J	8 J
General Chemistry, mg/kg			
Total Organic Carbon	16000 >	16000 >	16000 >
Total Petroleum Hydrocarbons	NA	NA	NA

Figure 3
COMPARISON OF PAH DATA



APPENDIX Q

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FATE AND TRANSPORT MODELING

APPENDIX Q

FATE AND TRANSPORT MODELING FOR OU 4 ORLANDO

Introduction

OU 4 at the Naval Training Center in Orlando, Florida, is the location of the former base laundry (Building 1100), and the site of a groundwater plume of chlorinated solvents consisting primarily of tetrachloroethene (PCE) and the daughter products of its biodegradation, trichloroethene (TCE), dichloroethene (DCE), and vinyl chloride (VC). The degradation sequence appears to be incomplete within the groundwater, and very little VC has been detected. VC has, however, been detected in the surface waters of Lake Druid, the major receptor for the plume, and a small ditch formed by the surface expression of groundwater which flows into the lake. This area has been the focus of a remedial investigation (RI), and the scene of recent data gathering to evaluate the possibility of incorporating natural attenuation as a component of measures planned to address the plume.

Purpose of the Modeling

Fate and transport modeling of the OU 4 plume has been performed as an element of the evaluation of natural attenuation for the OU 4 plume. The modeling attempts to match the normalized observed contaminant distribution in further evaluation of the present degree of degradation observed within the plume, and future prospects for degradation in attaining acceptable levels remaining in the plume that will not adversely impact the receptor surface waters. To the extent possible, the modeling employs site-specific data made available through the natural attenuation data gathering round (December, 1997).

Conceptual Model

Groundwater at OU 4 flows westerly beneath Building 1100, with a majority of this flow discharging into Lake Druid and the groundwater ditch that discharges to the lake (see Figure 1). Operations at the laundry, from 1943 to 1994, have resulted in the release of PCE to the subsurface, mainly at the northern and northwestern end of Building 1100. The solvent plume from this source area, expands from a width of about 80 feet at the building, to about 200 feet near the lake (based on interpreted 100 ppb contours). A secondary source of lesser strength appears to be present which contributes to a larger southerly half of the plume. The thickness of the plume is about 40 feet at downgradient locations, and rises in the aquifer near the discharge point at the groundwater ditch and lake. Concentrations of PCE detected in groundwater near the building have been in excess of 10 milligrams per liter (mg/L), which suggests that residual free product PCE (not necessarily mobile) exists in the subsurface to generate the plume. Explorations along cross-sections of the plume have indicated that the sources of PCE may extend as deeply as 35 feet at the building. The PCE continues to create a plume as it dissolves in groundwater flow and recharge of precipitation local to the source area. The PCE apparently undergoes degradation, as daughter products TCE and DCE are formed, and the concentrations of PCE and ratios of PCE to the daughter products decrease greatly along the migration pathway to the lake. Redox potentials were positive in the shallower aquifer target data set wells, but negative in the deep wells. The low redox

potentials suggest a greater potential for degradation of the PCE in the deeper, rather than shallow, aquifer. Very little VC has been detected in downgradient samples, which indicates that the degradation (to ethene) is not complete. Further conversion of the DCE to VC may occur in the groundwater ditch and lake bottom sediments to produce the concentrations of VC detected in surface water samples.

Site Hydrogeology

OU 4 lies within an area typified by a series of watersheds which discharge to local lakes. For OU 4, this discharge point is Lake Druid, which covers an area of approximately 17 acres. The aquifer beneath OU 4 consists of fine-to-medium sands, with the upper 20 to 30 feet of lower hydraulic conductivity than the lower 40 feet of cleaner, coarser sands. Modeling of the regional area by the USGS used hydraulic conductivities of 10 and 40 ft/day, respectively, for the upper and lower sands. As discussed above, the groundwater associated with OU 4 flows east to west beneath Building 1100, and likely discharges to the small groundwater ditch and Lake Druid. Patterns of contaminants in lake sediments have indicated discharge to distances of about 200 to 300 feet from the lake shoreline (the location of which varies seasonally with lake water level). Some of the distributed contaminated sediments may be due to sediment transport by the discharging groundwater ditch, as sediment and surface water concentrations were highest along a continuation of the groundwater ditch pathway. USGS modeling of the regional area indicated a groundwater divide about 2250 feet east of Building 1100, with recharge of precipitation being the main source of groundwater flow in the area. Vertical gradients in groundwater are downward in the recharge area, slightly downward to fairly neutral near Building 1100, and upward near the lake.

Model Code Selection

Modeling of groundwater flow was performed with the USGS three-dimensional, finite-difference code MODFLOW (Harbaugh and MacDonald, 1988), with particle tracking with MODPATH (Pollock; 1989, 1994), another USGS program. The MODFLOW code is a versatile flow model with a number of modules for simulation of various boundary and stress conditions that make it an accepted, flexible, and widely used model. The fate and transport of contaminants in groundwater was performed with the USEPA MT3D code (Zheng, 1990) and also RT3D (Clemens, 1998), developed by Battelle Pacific for the DoE for simulation of natural attenuation of multiple species in groundwater. Both fate and transport models were specifically designed to use MODFLOW as the flow portion of the model, although output from other models may be reformatted for use by the transport modules.

Preprocessing and calibration of the flow model was accomplished with Geraghty and Miller's ModelCad and version 5.0 of MODFLOW. The flow model was imported into the DoD Groundwater Modeling System (GMS), and simulations of contaminant transport with MT3D and RT3D were made and post-processed using GMS.

Flow Model Construction

The regional model developed by USGS, and finely discretized in the OU4 area, was taken as a basis for this present flow model. The changes made to the USGS model for this application included:

- reducing the area covered by the model;
- increasing the number of layers from three to six;
- making the upper layer watertable instead of confined;
- using general head boundaries (GHBs) for the east and west boundaries; and
- using no-flow conditions to represent streamline boundaries to the north and south as groundwater flow converges toward Lake Druid.

The features and input parameters of the USGS model retained for this model were:

- hydraulic conductivities of 10 and 40 ft/d for the upper and lower sand, respectively;
- the 19 inches per year (in/yr) recharge over open areas;
- river package conductance values (adjusted for block size for lake nodes);
- use of the well package in the bottom layer to simulate 3 in/yr leakage to the Upper Floridan; and
- a Lake Druid water level of 101.1 feet above mean sea level (msl).

Initially, a uniform 10-foot grid was specified for the 900-foot by 1000-foot area covered by the model. However, in the first MT3D model runs, the small spacing made for very short allowable time-steps and correspondingly long run times in the transport model. In order to make the transport model run times more practical, the flow model was rediscretized to 20-foot square grid blocks, thus decreasing the number of nodes in the model 4-fold, and allowing longer time steps in the transport model. The model area, grid spacing, and boundary conditions are shown on Figure 2 for Layer 1 of the model. The no-flow and GHB are carried down through each of the six layers. Layer thicknesses were: variable for Layer 1, watertable with bottom elevation taken as 98 feet msl; 10 feet for Layers 2 through 5; and 20 feet for Layer 6. While only a part of Lake Druid (about 2.25 acres along the east shore) is included in the model, most groundwater flux is believed to discharge to the near-shore portions of the lake. While some minor flow does reach the downgradient GHB in the model, this is presumed to represent discharge to the lake at some point beyond the model.

Calibration

The flow model was calibrated to approximate average groundwater elevations based on a review of up to 15 sets of water level data (varies depending on the installation date for some wells. The USGS model recharge rate, Lake Druid head, river package conductances, and hydraulic conductivity values were accepted as fixed, so the only variables to manipulate for the calibration of the model were the reference elevations in the GHB package. These were varied to get a close approximation of the overall gradient across the site. Individual point comparisons between observed and computed heads at monitoring well locations were good, which was not unexpected as the gradient is relatively uniform across the site. Results of the point-wise model head comparisons with estimated average heads in monitoring points across the site are shown on Table 1. This model was used as the basis of the fate and transport simulations which use the output MODFLOW heads to compute velocity vectors for the contaminant migration. Since the model was steady-state, no values for aquifer porosity were needed.

Output head contours for Layers 1 and 2 are shown on Figures 3 and 4, respectively. The apparent influence of discharge to the small groundwater ditch is seen less with depth into the aquifer, and lower layer head distributions look

similar to that of Layer 2. Upward gradients in the vicinity of the lake are apparent from the relative location of the 102 msl piezometric head contours in Layers 1 and 2.

Flow into the model through the upgradient GHB was reality checked by comparing it with an estimate of the net recharge between the model east boundary and the groundwater divide location. The estimated net recharge over the upgradient area was 38.4 gpm, while the model allowed 37.9 gpm through the upgradient GHB. This is a good match of flows, and suggests a reasonably good correlation of the recharge and hydraulic conductivity values.

Transport Model Input Data

The transport model requires additional parameters to describe the mechanisms of contaminant migration. The site-specific data provides the contaminant distribution and plume extent, discussed later in this section. For other parameters, reasonable values based on site setting, site geology, and chemical specific information have been used in the modeling. Assumed parameter values in the initial transport model included: a porosity of 0.30; a soil bulk density of 1.72 g/cc; a fraction organic carbon of 0.001; longitudinal, lateral, and vertical dispersivities of 30, 3, and 0.5 feet, respectively; and organic carbon partition coefficients of 364 ml/g for PCE, 126 ml/g for TCE, 49 ml/g for DCE, and 57 ml/g for VC were taken from literature. Reaction rates were varied from zero for a baseline no-reaction evaluation, to a half-life of about 1.5 years for the PCE. MT3D simulations focused on just the fate of the PCE, while only two RT3D runs were made to simulate simultaneous degradation of chlorinated ethenes. The reason for this decision is discussed in the following paragraphs.

Review of the natural attenuation data suggested vigorous degradation of the PCE along the migration pathway. However, resultant concentrations of TCE and DCE did not suggest a consistent pattern from well to well. That is, it seemed that due to the variability of releases and conditions in the aquifer, it was unlikely that any selection of reaction rates for the constituents could result in the somewhat random pattern of degradation products seen in the aquifer along the migration pathway. However, since no significant vinyl chloride was detected, it appears that the successive dechlorination reactions stop at DCE. The concentrations at each well location, then, represent the total contaminants derived from the parent PCE, and, by multiplying by the appropriate ratio of PCE molecular weight to that of the daughter product, an equivalent PCE concentration can be derived. This is useful in determining what dilution factors may be available due to non-destructive attenuative mechanisms such as dilution by recharge and dispersion. Table 2 indicates the concentrations determined in several of the monitoring wells, and their equivalent (based on molecular weight differences) total PCE concentrations.

Several MT3D runs were made with no degradation as a means of attempting to match the model to apparent observed dilution factors in order to evaluate the overall effects of natural attenuation. Since the ratios of PCE to TCE and DCE varied so much throughout the plume, no further attempts to model the simultaneous degradation products with RT3D were made beyond the initial setup of the RT3D input files and test runs, and one test run with greatly modified source terms based on further data evaluation and MT3D runs. Worst-case scenarios can still be run using the PCE MT3D runs, the equivalent PCE concentrations, and the aquifer criteria for PCE and/or any of the degradation products. This can be accomplished through dilution factors available in the aquifer (as indicated in

the real data and the modeling simulations) and dilution factors available from groundwater to surface water, if any, and criteria for each of the compounds of concern.

The other important input consisted of source area size, location, and strength. In initial MT3D runs, a simple source near the surge tank was introduced using recharge as the means for introducing the contaminant into model Layer 1. This simple source provided an easy way to debug the model and examine resultant distributions from a source of this size (three nodes, or 1200 square feet) and configuration. However, it was apparent that the source flux rate applied was insufficient to produce the sustained concentrations seen in monitoring well locations near the lake, i.e., dilution factors under these conditions were much larger than observed. In later simulations, a much larger source area (34 nodes, or 13,600 square feet) was introduced into Layers 1 through 4 of the model via simulated injection wells. The flow associated with each of these wells was made nominally small so that it would not affect the simulated flow field, but concentrations were made high enough to allow determination of dilution factors in the aquifer accurately. Actual numerical matches with observed concentrations were not attempted, as this would have involved additional runs, and the concentrations are directly scaleable. The source area input into the model is only a representative source used to recreate approximate downgradient contaminant distributions and may not be a true representation of the actual distribution which is not completely defined. The focus of the modeling is the resultant concentrations of contaminants in groundwater downgradient of the building.

Transport Model Adjustments, Simulations, and Sensitivity Results

Initial runs of MT3D indicated that most of the contaminant plume would discharge to the groundwater ditch, with little of the contaminant mass making it much further than the lake's edge. As this seemed inconsistent with the observed contaminated sediments extending out into the lake, the reference head for the river package was raised from 101.1 to 102.4 ft msl along the four nodes simulating the groundwater ditch to lessen the strength of the ditch as the ultimate receptor, and to allow contaminants to migrate further. Still, while more contaminants migrated to the downgradient GHB, most discharged near the lake shore. Undoubtedly, there are times when lake levels are seasonally low, there is no discharge to the groundwater ditch, and groundwater discharges further out into the lake.

The primary simulations included runs of MT3D with no degradation, various configurations of source area, and varying dispersivity terms. With a reasonable fit to plume thickness and width, dilution factors for concentrations at Building 1100 compared to those at the lake's edge could then be calculated and compared with observed concentrations. With longitudinal and transverse dispersivities of 30 feet and 3 feet, respectively, the approximate ratio of maximum concentration in the plume source area to the concentration at the lake's edge was about 15 to 20. The dilution factor based on concentration differences between the source area and the lake edge based on the observed equivalent PCE concentrations ranged from about 3 to 15 with target and averaged data, respectively. MT3D model runs suggested PCE half-lives of from about 0.5 to 1.5 years. Sample model output is shown for the final RT3D run with assumed half-lives of 0.5 years for PCE and 1.0 years for TCE, and no degradation of DCE. Figures 5 and 6 correspond to the PCE distribution in Layers 2 and 3 at steady-

state, while Figures 7 and 8 do the same for TCE. Similar distributions of DCE are shown on Figures 9 and 10.

The simulations run assumed a constant source of PCE to groundwater, and simulated the migration of contaminants to the lake beginning at time zero, i.e., the time of first release to groundwater. In observing the time series of model results, it appears that groundwater simulated by the lower model layer would have arrived at the lake sooner (due to the larger K of the lower aquifer)

The sensitivity of the dilution factor to changes in dispersivity values was examined by decreasing the longitudinal dispersivity first to 20 feet, and then to 10 feet. The ratios of longitudinal to lateral and vertical dispersivity were kept the same. When the longitudinal dispersivity was decreased to 20 ft, the dilution factor decreased to 16, and when the dispersivity was lowered to 10 feet, the dilution factor decreased to 12. The sensitivity of dilution factor to dispersivity changes over the range examined is not great, and for final simulations, the longitudinal and transverse dispersivities of 20 and 2 feet, respectively, appear to be appropriate.

Conclusions

- The modeling conducted was able to approximate the observed changes in PCE concentrations and in overall non-degradation dilution factors from the source area to the lake edge. The dilution factor for non-degrading compounds migrating from the source area to the lake is estimated to be between 3 and 10.

- Travel times for arrival at the lake vary due to the differences in hydraulic conductivities of the upper and lower portions of the aquifer, distance from the lake (the inferred source area extends east-west about 250 feet), and the location of the source. They also vary for some of the compounds, with PCE being retarded about 1.5 to 2 times that of the daughter products. The shortest PCE travel times were about 0.7 years in the lower more conductive zone.

- Approximate half-lives for the compounds were about 1 year for PCE and 2 years for TCE. Within the aquifer there appeared to be no significant further degradation to VC, so the half-life for DCE in this system is indeterminately long.

- With a constant source, the model suggested attainment of a near-equilibrium plume distribution in about 25 years (under non-degrading conditions).

- Modeling of the observed final transformation of DCE to VC in groundwater ditch and lake bottom sediments is not possible with the models used. However, if an acceptable action limit can be identified at the point of discharge for the critical contaminant, then an acceptable corresponding concentration of PCE at the source area can be calculated. This may be done by multiplying the action limit by the non-degradation dilution factor for migration from the building to the lake, and also by the ratio of the molecular weight of PCE divided by that of the compound.

- Modeling of contaminant transport is also limited by the data available to estimate the source area size or strength.

- Migration of the contaminant plume has likely reached the lake in a semi-stable condition, that is, dilution factors in the aquifer from point to point represent relatively constant ratios. Variations in concentrations at downgradient locations probably represent changes in source loading and possible dilution by varying precipitation and recharge events.

- The flow model may be improved with site-specific data collected to measure elevations along the groundwater ditch, and flow to the ditch under baseflow conditions (the only flow in the ditch is due to groundwater discharge).

APPENDIX R

APPENDIX R

RESPONSES TO PROJECT REVIEW COMMENTS

PROJECT REVIEW COMMENTS

REMEDIAL INVESTIGATION REPORT

REDLINE/STRIKEOUT VERSION

APRIL 2000

PROJECT REVIEW COMMENTS

Operable Unit 4, Study Areas 12, 13, and 14 – Area C
Remedial Investigation
Naval Training Center
Orlando, Florida

General Response Preface:

Several of the following comments are related to chemicals detected in Lake Druid sediments. There is uncertainty associated with the origin of PAHs, pesticides, and PCBs detected in Lake Druid sediment. The Navy has maintained that these analytes are present primarily due to stormwater discharges to the lake from the surrounding urban development. A comparison of data collected from sediments associated with urban runoff throughout the state of Florida and Lake Druid is now included as Appendix P of the Final OU 4 RI. This comparison shows that concentrations detected in Lake Druid are consistent with what has been shown to be present in urban stormwater sediments. Based on this comparison, the Florida Department of Environmental Protection (FDEP) and the Orlando Partnering Team (OPT) have concurred that the presence of these analytes in Lake Druid is likely not due to activities conducted by the Navy at Area C and OU 4.

U.S. Environmental Protection Agency, Region 4 – Nancy Rodriguez

GENERAL COMMENTS:

1. **All statements regarding the source of constituents detected in site media should be qualified appropriately. It cannot be stated conclusively that contaminants in sediments originated from stormwater discharges versus site-related activities or that pesticides were the result of "normal application." Changes are necessary to qualify statements on Page 9-11 (Specific Comment #2), Pages 9-73 through 9-74, Page 9-75, top bullet, Page 9-77 (bottom). The statement, "However, PAHs are not site related." should be deleted. It is not relevant to the discussion of the uncertainty due to excessively high detection limits.**

   Although the source of contaminants in sediments cannot conclusively be demonstrated to be from offsite sources, as noted above FDEP and the OPT have agreed that offsite sources are likely. We have added appropriate qualifiers to all statements regarding the source of constituents detected in site media, indicating that sources (other than VOCs) are likely from offsite.

   The statement "However, PAHs are not site related" on Page 9-75 will be deleted.

2. **EPA's screening comparison for surface water (Table 1) indicated slight exceedances of the screening values for cis-1,2-dichloroethylene, carbon disulfide, trichloroethylene, 4,4'-DDT and gamma-BHC. Screening of sediments (Table 2) revealed several constituents having maximum concentrations above screening values. These included two volatiles (1,2-dichloroethylene [total] and vinyl chloride, three semi-volatiles (fluoranthene, pyrene and bis(2-ethylhexyl)phthalate) and four pesticides/PCBs (4,4'-DDE, Aroclor-1254, endosulfan I, and alpha-chlordane).**

TABLE 1. Screening of Chemicals of Potential Concern in Surface Water (Organics)

Analyte	Maximum Detected Concentration, ug/L	Screening Value, ug/L	Screening Value Source
cis-1,2-DCE	760	590[1]	ORNL Tier II Secondary Chronic
Acetone	6	1500	ORNL Tier II Secondary Chronic
Carbon disulfide	1	0.92	ORNL Tier II Secondary Chronic
PCE	19	84	AWQ Value Chronic
Toluene	0.7	175	AWQ Value Chronic
TCE	57	47	ORNL Tier II Secondary Chronic
Vinyl chloride	35	N.A.	N.A.
4-Methylphenol	3.5	N.A.	N.A.
4,4'-DDT	0.029	0.001	AWQ Value Chronic
Endrin ketone	0.01	N.A.	N.A.
gamma-BHC (lindane)	0.013	0.08	AWQ Value Chronic

TABLE 2. Screening of Chemicals of Potential Concern in Sediment (Organics)

Analyte	Maximum Detected Conc., ug/kg	Screening Value, ug/kg	Screening Value Source
1,2-DCE (total)	1300	440	SSG Calculated by EQP[1]
Acetone	46	N.A.	N.A.
Methylene chloride	130	2000	Dutch intervention value divided by 10
PCE	19	530	EPA Ecotox threshold
Toluene	13	670	EPA Ecotox threshold
TCE	280	1600	EPA Ecotox threshold
Vinyl chloride	560	10	Dutch intervention value divided by 10
Fluoranthene	3500	330	EPA Region 4 Screening Value
Pyrene	3400	330	EPA Region 4 Screening Value
bis(2-Ethylhexyl)phthalate	5600	182	EPA Region 4 Screening Value
4,4'-DDE	7.6	3.3	EPA Region 4 Screening Value
Aroclor-1254	68	67	EPA Region 4 Screening Value
Endosulfan I	4.6	2.9	EPA Ecotox threshold

TABLE 2. Screening of Chemicals of Potential Concern in Sediment (Organics)

Analyte	Maximum Detected Conc., ug/kg	Screening Value, ug/kg	Screening Value Source
Hepachlor	2.6	N.A.	N.A.
alpha-Chlordane	2	1.7	EPA Region 4 Screening Value
delta-BHC	6.1	N.A.	N.A.
gamma-BHC (lindane)	2.8	3.3	EPA Region 4 Screening Value

[1]A screening value in sediment for 1,2-DCE was estimated from the final chronic value for cis-1,2-DCE using the equilibrium partitioning method. The mass water content (MC) of the sediment was assumed to be 40 percent and the distribution coefficient between sediment and pore water (K_D) was assumed to be 7.1E-02 L/kg, taken from EPA's 1996 Superfund Chemical Data Matrix.

The equation used was: **where ρ_W is density of water.**

When screening toxicity values are exceeded, the prudent course of action is to conduct site-specific toxicity testing. EPA recommends site-specific toxicity testing of Lake Druid surface water and sediment for OU4.

Regarding the exceedance of screening values for VOCs, the Navy will shortly begin treating contaminated site groundwater via a redesigned IRA. The new treatment system will use groundwater extraction and treatment to intercept the majority of the VOC-contaminated groundwater prior to reaching Lake Druid. VOC concentrations in Lake Druid are expected to decrease to below screening values shortly after startup. In the long-term, site closure will not be achieved until VOC concentrations in groundwater are below Florida Drinking Water Standards. The current VOC concentrations in the lake are expected to decrease, and are not representative of concentrations that will be present after remediation. Thus, toxicity testing for VOCs is unnecessary.

By agreement of FDEP and the OPT, the presence of PAHs, PCBs, and pesticides in Lake Druid above screening values is likely due to offsite sources. As the Navy is not responsible for their presence in the lake, the Navy is also not responsible for performing toxicity testing.

3. **Instead of performing toxicity testing the RI report compiled literature toxicity values in Table 9-13. These values were presented as a range. The upper end of the range typically represented a 48-hour LC_{50} for daphnids or fathead minnow. The toxicity benchmarks used by the NTC team were less than conservative because they represented mortality under acute and sub-chronic exposures. Toxicity reference values for sensitive reproductive endpoints and**

chronic exposures are preferred in ecological risk assessment. One cannot conclude that aquatic organisms are not at risk based on the comparisons made in Table 9-13. Also, the receptors in the field are exposed to a mixture of chemicals, many of which share a common mode of action.

There is validity to the above comments. The toxicity benchmarks used in this ecological risk assessment represent the data that are readily available in literature, and are consistent with the literature values presented in Suter and Tsao (1996). There are very few studies available that describe chronic effects from exposure to many of the chemicals of concern at this site. This may suggest that exposures to sublethal concentrations of these chemicals do not represent a significant risk to ecological receptors. The Tier II values presented in Suter and Tsao (1996) were used solely as a tool to select ecological contaminants of concern. They are calculated based on acute toxicity values and derived or default acute to chronic ratios, and are considered too conservative to base meaningful risk conclusions. However, as noted above, toxicity testing is not the Navy's responsibility, and we believe the conclusions made in the risk assessment are adequate to demonstrate that there are likely no ecological impacts to Lake Druid due to Navy activities at Area C and OU 4.

4. **Finally, the limited surface water monitoring may not represent the spatial variability of concentrations in Lake Druid. Justification is required for the choice of the control or reference station, which is in the same lake, less than 300 feet south of the closest site station. The site-related constituent 1,2-DCE was detected at 72 ug/L at the control station.**

The limited surface water sampling for VOCs performed during the RI was justifiable because the extent of VOC contamination in Lake Druid was previously established by close to 50 surface water and sediment samples (see RI Figures 2-4 and 2-5, and RI Appendix B, Figure B-5). The number and location of the reference samples was discussed with and approved by the OPT. A large number of full suite Lake Druid samples was not necessary, as it was believed (and subsequently demonstrated) that the only site-related contaminants of concern in the lake were VOCs.

Surface water and sediment from the control location were actually sampled twice, once in October 1997 and once in March 1998. No VOCs were detected in sediment in October (although the detection limit was a bit higher [140 ug/kg] than in March), and only 0.5 ug/l cis-1,2-DCE was detected in surface water. VOCs were detected primarily during the March sampling event, although at concentrations well below screening criteria. The variability in VOC detections suggests the control location is very close to the edge of the VOC contamination in the lake. The presence of very low concentrations of VOCs at the control location does not preclude the use of non-VOC compound results as controls, given that the presence of VOCs is unrelated to the presence of compounds such as inorganics, PAHs, and pesticides.

SPECIFIC COMMENTS:

1. **Section 5.1, Sources of Contamination, Page 5-2, top. Include the fact that in addition to antimony, PCBs were used in flame retardant clothing (ATSDR, 1998).**

   There is no evidence that PCBs were used as flame retardants in clothing. The cited reference (ATSDR, 1998) specifically states (in Section 4.3 Use), "Prior to 1974, PCBs were used...in open-end applications (e.g., plasticizers, surface coatings, inks, adhesives, flame retardants, pesticide extenders, paints, and microencapsulation of dyes for carbonless duplicating paper) (EPA 1976; IARC 1978; Safe 1984; Welsh 1995)." The reference to "flame retardants" refers to the flame retardant properties of PCBs as applied to paints, plasticizers, cable coatings, polyurethane foam, cooling oils, and hydraulic oils. A review of (EPA 1976) and (IARC 1978) supports this conclusion. No specific reference to the use of PCBs as flame retardants in clothing was found. Nor is there a mention of PCB use in clothing on the Binational Toxics Strategy website hosted by USEPA (http://www.epa.gov/glnpo/bnsdocs/pcbsrce/pcbsrce.html).

2. **Section 9.2, Problem Formulation and Conceptual Site Model, Page 9-11. Include that PCBs may have originated from laundering of flame retardant clothing. This is the most reasonable explanation for the source of PCBs at the site.**

   PCBs did not originate from the laundering of flame retardant clothing (see response to Specific Comment 1). There are numerous anthropogenic potential sources for PCBs in Lake Druid. See the detailed response to Specific Comment 14 for supporting information.

3. **Section 9.2.2, Identification of Exposure Pathways, Page 9-12, 2nd to last sentence of the first paragraph. Delete the phrase, "from normal application and paints at the DRMO." The source of the insecticides cannot be stated conclusively. The text should not falsely imply that the source can be independently verified, when there is no scientific test that can conclusively prove or disprove the source of specific detections.**

   Agree, the redline text on Page 9-12, will be replaced with the following text:

   A secondary exposure pathway at the site is exposure of terrestrial receptors to insecticides and metals in surface soil. The source of these contaminants is probably related to the use and storage of small quantities of insecticides and paint at the DRMO, as stated in Section 9.2 (Problem Formulation and Conceptual Site Model).

4. **Section 9.3.2.2, Exposure Assessment, Terrestrial and Semi-Aquatic Wildlife, Page 9-39. For the bullet for the great blue heron, replace the word "piscivorous" with the word "omnivorous." The term piscivorous falsely represents the diet assumed for the great blue heron as predominantly fish. Although 98 percent of the diet was assumed to be aquatic**

organisms, those aquatic organisms included ciliates, copepods, water fleas, mayflies, clams, shrimps, frogs, and sea squirts, in addition to fish (Table F.1-3). The bioaccumulation factor (BCF) assumed for accumulation of pesticides from water into aquatic organisms incorporated a geometric mean of values in AQUIRE for all organism types. The bioaccumulation factor would have been much higher (more conservative) if only the fish data in AQUIRE were used. Also, when a biota-to-sediment accumulation factor (BSAF) value was not identified in the literature, an accumulation factor describing how constituents in soils accumulate into terrestrial invertebrates was used as a surrogate. This was a frequent necessity in the risk assessment (80% of chemicals), which decreased the resemblance to piscivores even further.

The word "piscivorous" will be changed to "omnivorous" for the great-blue heron. The BCFs for representative semi-aquatic wildlife were recalculated, using bluegill and lake trout data for 4,4'-DDT, and catfish and flagfish data for endrin keytone. These values were applied to the food chain model and risks were recalculated. A truly piscivorous wildlife receptor (i.e., the osprey) was also added to the food chain evaluation of semi-aquatic wildlife, in order to evaluate risks to a receptor that consumes only fish.

Even with the above revisions, the ecological risk assessment for OU 4 concludes that there are no risks to the environment from contaminants present at OU 4.

5. **Table 9-13, Comparison of Surface Water ECPC Exposure Concentrations to Toxicity Benchmark Values. The footnote #8 applied to the FDEP Class II Freshwater Quality Standards indicates that the values are overly conservative for aquatic life and were not used to evaluate potential effects in the risk assessment. The FDEP values are intended for protection of piscivorous wildlife. The FDEP Freshwater Quality Standards should be used in this risk assessment to evaluate water column concentrations, given the lack of assessment of piscivorous mammals and birds in the risk assessment. The foot note should be modified to, "Based on uptake into wildlife, and is used to evaluate potential risks to piscivorous mammals and birds."**

Revisions to the footnote are not necessary, as this table was intended to present an evaluation of the effects of constituents in surface water on aquatic life including macroinvertebrates and fish, not wildlife. The Navy acknowledges that the FDEP screening values for 4,4'-DDT and endrin keytone were exceeded, suggesting that strictly piscivorous semi-aquatic wildlife would be at risk from exposures associated with contaminant uptake in the aquatic food web. An osprey was added to the food web model to evaluate risks to strictly piscivorous semi-aquatic wildlife that may use the site. The results of the food web model for the piscivore suggest the opposite, as the HIs calculated for the osprey were less than 1.

6. **Table 9-13, Comparison of Surface Water ECPC Exposure Concentrations to Toxicity Benchmark Values. Include Secondary Chronic Tier II values from Suter and Tsao (1996) to Table 9-13 to evaluate data gaps. Use the Tier II criteria instead of the Lowest Observed Effects Level for trichloroethene, i.e., 47 ug/L instead of 21,900 ug/L.**

   Tier II values are inappropriate for this evaluation. As discussed in General Comment #3, there is uncertainty associated with using the Tier II screening values to estimate risks. In addition, the value of 21,900 ug/L is consistent with the other data for fish, invertebrates, and amphibians presented in Table 9-13 and the lowest chronic values for fish and daphnids, presented in Table 1 from Suter and Tsao (1996). The value of 47 ug/L is an estimated value, based on applying an acute to chronic ratio to a single acute toxicity test (i.e., LC50), and would likely be overly conservative for this evaluation.

7. **Section 9.4.2.2, Risk Characterization, Aquatic Receptors, 7th paragraph, Page 9-66. The tissue concentration calculations for surface water and sediment were for concentrations in mixed aquatic organisms. References to fish in the section entitled "Surface Water and Sediment" should be changed to "aquatic organisms."**

   The section title will be changed to "Aquatic Organisms".

8. **Table 9-15, Comparison of Calculated Fish and Invertebrate Tissue Concentrations with Effects Concentrations. Change the title of Table 9-15 from Fish Tissue Concentrations to Aquatic Organism Concentrations.**

   The title of Table 9-15 will be changed from Fish and Invertebrate Tissue Concentrations to Aquatic Organisms Concentrations.

9. **Section 9.5, Uncertainty Analysis. Include an explicit statement in the uncertainties section that bioaccumulation factors were based on literature values averaged over wide classes of organisms and did not take into account biomagnification or food-chain multipliers for pesticides and mercury. Include that the biomagnification factor for DDT assumed in this study was 2.6E+03 L/kg versus a value of 7.6E+04 L/kg in the Superfund Chemical Data Matrix (USEPA, 1996), a value of 1.68E+05 L/kg for the Great lakes Initiative (USEPA, 1995), and a value of 2.55E+04 L/kg in the Draft Region 6 Combustion Risk Assessment Guidance (USEPA, 1999). Based on these references, it appears very likely that bioaccumulation for pesticides was underestimated in the risk assessment by at least a factor of 10. Describe in the uncertainties section how lack of site-specific bioaccumulation data may have underestimated risk to higher trophic level organisms, especially those whose diet consists primarily of fish.**

   An uncertainty will be added stating that bioaccumulation factors were based on literature values and not site specific data. Bioaccumulation factors for mercury and pesticides are presented in

Tables F.1-2 and F.1-3, respectively. The bioconcentration factors (BCFs) were recalculated using only fish data for 4,4'-DDT and endrin keytone, the resulting BCFs are 3.4E+04 and 5.5E+03, respectively. The revised BCFs were used in the food web model to recalculate risks for the great-blue heron and osprey. The osprey was added to the food chain model to evaluate a true piscivore. The results of this reevaluation suggested that semi-aquatic omnivorous and piscivorous avian receptors would not be at risk from exposure to RME or CT concentrations at the site.

10. **Table 9-17, Potential Sources of Uncertainty in Risk Assessment. Modify the direction of effect for bioaccumulation factor estimation from "unknown" to "possibly underestimate." Modify the direction of effects for food chain model exposure parameter assumptions from "unknown" to "underestimate." See Specific Comment #13.**

    Table 9-17 will be changed to be consistent with the comments; BAF estimation and food chain model exposure parameter assumption direction of effects will be changed to" possibly underestimate".

11. **Section 9.5, Uncertainty Analysis. Include an explicit statement in the uncertainties section that dietary exposures to piscivorous birds and mammals were not estimated for surface water or sediment. Omnivorous birds and mammals were exclusively employed in the risk assessment.**

    Dietary exposures to piscivorous birds have now been estimated. The osprey was added to the food chain model and risks were evaluated for this receptor. Based on the results of this evaluation, it is unlikely that omnivorous or piscivorous receptors at the site would be at risk from exposure to surface water or sediment at the site, as the HIs for these receptors were less than or only slightly exceed one.

12. **Section 9.5, Uncertainty Analysis. Include the list of the chemicals for which no toxicity reference values were available for either mammals or birds for food-chain analysis.**

    An uncertainty will be added listing the chemicals lacking reference toxicity values for the food chain analysis. In addition, a discussion of the potential effect on the risk conclusions will be included in this uncertainty, incorporating distribution of contamination, FOD, and known fate and transport properties of these chemicals.

13. **Section 9.5, Uncertainty Analysis. Describe uncertainty in exposure assumptions for terrestrial receptors. Specifically, describe how risks to terrestrial birds and mammals have more than likely been underestimated based on the following comparison of ingestion rates with those reported in EPA's Exposure Factors Handbook (USEPA, 1993b).**

Indicator Species	Dietary Ingestion Rate Used in Risk Assessment at OU4 (g/g-day) (Table F.2-1)	Range of Values Reported in USEPA 1993b Exposure Factors Handbook (g/g-day)
Cotton Mouse	0.12	0.19 - 0.45*
Mourning Dove	0.12	No data
Short-Tailed Shrew	0.12	0.49 - 0.62
Woodcock	0.10	0.77
Red Fox	0.05	0.069 - 0.16

* Data for deer mouse.

A discussion will be added to the Risk Assessment Uncertainty Section that describes the potential impacts to the risk conclusions of using the assumed dietary intake parameters. An uncertainty will be added that describes the Dietary Ingestion Rates used in this risk assessment and the potential for them underestimating risks to mammalian and avian receptors.

14. **Section 9.5, Uncertainty Analysis, Page 9-73. The last bullet on the page indicates that the origin of PAHs, pesticides, and PCBs detected in Lake Druid is stormwater discharges from the surrounding urban development. While this may be true of PAHs and pesticides, EPA does not agree that PCBs are derived from stormwater from the neighboring apartment complex, etc. It is unlikely that private residents would have access to PCBs. The more likely explanation for the PCBs is their use in flame retardant clothing used by army personnel and laundered on site. Moreover, the data in Appendix P do not support a diffuse background source of PCBs. PCBs were not detected in the background sample. The statement should be modified to remove the reference to PCBs.**

As previously noted, there is no evidence that PCBs were used as flame retardants in clothing. PCBs were present in numerous consumer goods potentially present in an urban environment, including carbonless duplicating paper, plasticizers, pesticides, electrical capacitors, and paints. PCBs were also commonly found in transformer and hydraulic oils, and could have been released in the urban area due to electrical transformer failures and hydraulic fluid releases from vehicles and construction equipment.

PCBs are still present in consumer goods due to "inadvertent generation" in the manufacturing process. These goods include paints, inks, plastics, and agricultural chemicals. Detergent bars are allowed to contain up to 5 ppm PCBs. Annual average concentrations of PCBs in other consumer goods can be up to 25 ppm, with a 50 ppm maximum (http://www.epa.gov/glnpo/bnsdocs/pcbsrce/pcbsrce.html).

Atmospheric deposition is also a likely potential source for PCBs in Lake Druid. In 1976 it was estimated that up to one million kilograms per year of PCBs fell on the US yearly in rain and particulate matter (IARC 1976, PCBs, Section 2.2(b)). Higher concentrations of PCBs have been detected in high-altitude Rocky Mountain lake sediment (ATSDR, 1998) than were found in Lake Druid.

The lack of a PCBs at the Lake Druid control location can be attributed to matrix effects, detection limits, or sample heterogeneity.

The presence of PCBs in Lake Druid is therefore most likely from stormwater or other anthropogenic sources other than Navy activities at OU 4. Modification of the last bullet of the uncertainty statement is not necessary.

15. **Section 9.6, Summary of Ecological Assessment for OU4, Page 9-75. Expand the summary of the ecological risk assessment. Insert text to describe each chemical and exposure pathway for which potential risk was identified. For example, a potential effect was estimated for aquatic organisms exposed to cis-1,2-dichloroethylene in ground water for both the RME and the CT exposure point concentrations in ground water (Table 9-16). Also, surface water concentrations of cis-1,2-dichloroethylene, and trichloroethene exceed Tier II Screening Values, which are the subject of Specific Comment #6. Discuss the implications of these findings.**

As noted in the response to Specific Comment #6, use of Tier II Screening Values is inappropriate. The summary of the ecological risk assessment will be expanded to include the following text, regarding potential risks under current conditions:

"The RME and CT concentrations of cis-1,2-DCE exceed the low end of the range of effect concentrations for invertebrates. However, based on the magnitude of this exceedance, population level risks to these receptors are unlikely. In addition, future impacts to invertebrate receptor populations are being addressed through the ongoing groundwater remediation at the site."

16. **Section 9.6, Summary of Ecological Assessment for OU4, Page 9-75, bullet 2. Change the description of the "predatory mammal" and the "piscivorous" bird to the "omnivorous mammal" and the "omnivorous bird."**

The summary will be changed to read "...adversely affect omnivorous mammal or omnivorous bird populations that occur at the site following..."

REFERENCES:

ATSDR 1998. *Toxicological Profile for Polychlorinated Biphenyls (Update),* Agency for Toxic Substances and Disease Registry, Atlanta, GA. December, 1998.

IARC 1978. IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, Polychlorinated Biphenyls and Polybrominated Biphenyls, International Agency for Research on Cancer, Volume 18. October 1978.

Suter, G.W. 1996. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Freshwater Biota. *Environmental Toxicology and Chemistry*, Vol. 15 (7): 1232-1241.

Suter, G.W., and C.L. Tsao. 1996. *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota,* 1996 Revision. Oak Ridge National Laboratory, ORNL Environmental Sciences Division, ES/ER/TM-96/R2. www.hsrd.ornl.gov/ecorisk/

USEPA, 1976. PCBs in the United States, Industrial Use and Environmental Distribution, U.S. Environmental Protection Agency, Office of Toxic Substances, Washington, D.C., EPA 560/76-005. February 1976.

USEPA, 1993a. Water Quality Guidance for the Great Lakes System and Correction; Proposed rules. *Federal Register* 58 (72): 20802-21047.

USEPA 1993b. *Wildlife Exposure Factors Handbook, Volume I,* U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C., EPA/600/R-93/187a. December 1993.

USEPA 1995. *Great Lakes Water Quality Initiative Criteria Documents for the Protection of Wildlife,* U.S. Environmental Protection Agency, Office of Water. EPA/820-B-95-008. March 1995.

USEPA 1996. *Superfund Chemical Data Matrix,* U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, EPA 540/R-96/028. June 1996. http://www.epa.gov/oerrpage/superfund/resources/scdm/index.htm

USEPA 1999. *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Peer Review Draft,* U.S. Environmental Protection Agency, Region 6, Dallas, TX http://www.epa.gov/earth1r6/6pd/rcra_c/protocol/slerap.htm

Florida Department of Environmental Protection – David Grabka

1. **Page 2-33, Second Paragraph. The discussion on water level elevations with respect to determining vertical gradients and flow direction is backwards. A higher water elevation in a well screened at a shallow depth than in a well screened at a deeper depth indicates a downward vertical gradient; i.e., groundwater velocity would have a component toward a deeper zone in the aquifer.**

   Appropriate changes will be made to correct this error.

2. **Section 5.2.4.2 Sediment Paragraph. I could not match the concentrations detected in sediment discussed in the text with the concentrations shown in the chem-boxes in Figure 5-11.**

   Concentrations have been corrected such that the values in the text and in the Chem-boxes in Figure 5-11 are consistent with the analytical results in Appendix C.

3. **Page 7-2, Table 7-1. The column listing biodegradation potentials for tetrachloroethene (PCE) and its degradation products appears to be incorrect. The column has degradation of PCE more likely occurring in an aerobic environment. In actuality, reductive dechlorination of PCE and TCE in anaerobic environments are important processes and are likely occurring at the site. Likewise, the biodegradation potentials column has vinyl chloride being more easily degraded in an anaerobic environment than in an aerobic environment. This is contrary to my experience. Please revise this column and also check the test to make sure that the discussion on natural attenuation is accurate.**

   The entries in Table 7-1 have been corrected as suggested, and the table is now consistent with the corresponding text.

4. **Sections 8.2.2.3, 8.2.2.4 and 8.2.2.5. Each section has a sentence starting that "For each sampling event not all parameters were analyzed; therefore, samples were averaged together." This statement does not make sense to me. How can analytical parameter results be averaged if they weren't analyzed for during each sampling event?**

   The sentence noted above is poorly worded and unnecessary. The sentence has been removed from each of the three sections.

5. **Figures 5-2 and 5-4 refer to FDEP Soil Cleanup Goals (SCGs). These should be changed to Soil Cleanup Target Levels (SCTLs).**

   The figures have been revised.

PROJECT REVIEW COMMENTS

DRAFT REMEDIAL INVESTIGATION REPORT

SEPTEMBER 1998

PROJECT REVIEW COMMENTS

Remedial Investigation
Operable Unit 4, Study Areas 12, 13, and 14 - Area C
and Treatability Study, Technical Memorandum No. 1
Naval Training Center
Orlando, Florida

U.S. Environmental Protection Agency, Region 4 – Nancy Rodriguez

1. **A plume of groundwater contaminated with PCE and daughter products has been identified at the site. The source of contamination has been identified as the vicinity of Building 1100, which was a military dry cleaning facility for decades beginning during 1943. Additional concerns include PAH contamination reported in surface soils at some locations, and a separate plume of groundwater contaminated with antimony. Lake Druid, located approximately 350 feet west of Building 1100, is the discharge area for groundwater in this area. Water level data and PCE concentrations indicate that contamination moves downward from the source area into deeper portions of the aquifer following groundwater flow paths. Density differences between water and PCE may help drive contamination downward. Dissolved contamination rises to discharge at the shore of Lake Druid and in a tributary creek which drains the western portion of the site. The potential for residual DNAPL solvents in the deeper portions of the flow system beneath the source is not eliminated by the upward movement of groundwater. Some type of source control probably will be necessary at this site.**

   Exceedances of State and Federal ARARs have been reported in soils, groundwater and surface water (RI, Tables 8-2 through 8-5). The extent of the plume contaminated with dissolved PCE and daughter products has been defined reasonably well, but Building 1100 is relatively large and a specific source has not been identified. RI Figures 2-5, 3-8 and L-3 suggest that the deep portion of the PCE plume may be south of the line of wells along the creek which flows into Lake Druid from the site. Note that the highest downgradient PCE concentrations in RI Figure L-3 are located south of the highest TCE concentrations in RI Figure L-5. This appears to have been resolved in the TS with the addition of wells south of the creek. Essentially, the extent of contamination is not well defined in the RI.

   Two issues of concern are the source and extent of PAH contamination in soils and the source and extent of the antimony plume in groundwater. Antimony trends over time have not been presented. The antimony plume is said to be stable (not expanding), but no supporting data is presented. Some comments which follow address these issues.

   Potential source areas were investigated during the *Focused Investigation/Source Confirmation, Building 1100 Surge Tank,* conducted by HLA (then ABB Environmental Services) in 1997. The sources of the chlorinated VOC plume were identified as periodic, accidental spills and releases associated with day-to-day laundry operations during the 35+ years of operation. Investigations have consisted of direct push soil and groundwater sampling, monitoring well installation and sampling, and passive soil gas surveys. Figure 2-4 in the Final Draft RI Report shows the suspected source area. Its location has been interpreted based on the very high concentrations (greater than 10,000 ug/l) of solvents

detected in groundwater at the northwestern end of Building 1100. Results of the soil gas survey, which are summarized in the OU 4 RI/FS Workplan, Section 2.3, also indicated high concentrations of VOCs in soil gas near this portion of the building. The northern end of the building was also where the dry cleaning machines were located, and where PCE was stored. No evidence of any other source areas have been found during the course of the exhaustive investigations conducted at OU 4.

Although the deepest portion of the groundwater VOC plume is located west of Port Hueneme Avenue, the highest concentrations of PCE are located in the suspected source area to the east of the road. The vertical groundwater gradient carries the dissolved PCE and daughter products downward from the source area before the gradient reverses to discharge groundwater to Lake Druid. Dissolved PCE does not provide a sufficient density difference to cause a dissolved PCE plume to descend in the aquifer without the presence of a downward gradient. It should also be noted that RI Figure L-3 shows PCE concentrations in groundwater below an *elevation* of 85 feet, not 85 feet below land surface (bls). These PCE detections are actually approximately 15-35 feet bls. Figure L-3 also includes very few locations where PCE was detected, and therefore the contaminant contours drawn by the software should be used with caution. The lone detection of PCE (250 ug/l) on Figure L-3 located south of the TCE concentrations shown on Figure L-5 could be present due to varying rates of biodegradation, and also likely represents PCE from the southern VOC plume.

PAHs detected in surface soil are likely present due to the urban nature of the site rather than a contaminant release. PAHs are primarily present in areas where stormwater flows or collects. More details are included in the Response to Comment 4.

Antimony trends are discussed in the Response to Comment 7.

2. **A range of hydraulic conductivity values are reported in the RI. The values from the 18 hour pumping test (RI, p.2-18) agree closely with the values determined by the USGS (p.2-26). However, the Kh values reported from the slug tests (RI, p.3-27) are an order of magnitude lower than the pumping test Kh. The lower hydraulic conductivity values from the slug tests were used in calculations presented in the RI.**

   The recovery from most of the slug tests was complete in less than 3 minutes (Appendix I), therefore, the results from the longer pumping test probably are more representative of the conditions in the aquifer away from the well screens and gravel packs. USEPA Guidelines for MNA (1998, p. 30) state "The investigator should use the highest valid hydraulic conductivity measured at the site during the preliminary screening because solute plumes tend to follow the path of least resistance (i.e., highest hydraulic conductivity). This will give the "worst-case" estimate of the solute migration distance over a given period of time.

Compare this "worst-case" estimate with the rate of plume migration determined from site characterization data." The same language was present in earlier versions of the guidance document. Groundwater travel times should be estimated with a hydraulic conductivity closer to that observed during the pumping test.

The problem appears to have been resolved in the TS, which uses USGS hydraulic conductivity values.

Groundwater flow velocities for shallow (0-20 feet bls) and deep (>20 feet bls) will be recalculated using the USGS hydraulic conductivity values of 10 feet/day (0-20 feet bls) and 40 feet/day (>20 feet bls). These USGS values were computed using data from the pumping test, and are considered more reliable than the slug test results. Paragraph 3.6.3.2 will be revised to reflect these changes.

3. **The RI (p.2-8) states a "production well" was located north of Area C in what is now a condo complex. Also an abandoned production well is shown on RI Figure 2-1 less than 100 feet from Building 1100 and a 500 ft deep drainage well is shown near the shore of Lake Druid approximately 600 ft SW of Building 1100. After stating that the wells exist in Section 2, the wells are not addressed further in the report. No operational history, construction details or estimates of capture zone size are provided. The current status of the well screens is not described.**

If these wells remain open or are in use, they may be pathways to deeper aquifers. Groundwater flow paths and contaminant distributors under the influence of pumping or drainage wells may be different observed under current conditions.

Were the production wells screened above or below the uppermost Hawthorn Group clay? The 500 foot deep drainage well must have been open deep into the Avon Park Limestone of the Floridan Aquifer (RI Figure 3-3). Using the groundwater velocity estimates from page 3-29, which range up to 115 ft/year and are not "worst-case" estimates, if groundwater from the vicinity of Building 1100 was within the capture zone of one of these wells, contamination may have entered the wells. Did contamination flow toward the production wells or the drainage well? Did the drainage well contaminate the Floridan Aquifer? Construction details and the operation history of these wells should be provided and used to evaluate the potential for contamination in deeper aquifers.

USGS records indicate the production well located north of Area C was installed in February 1943 to supply water for the laundry facility. The well was completed to a depth of 828 feet, and was cased down to 360 feet. Aerial photographs from 1962 show no evidence of the well or the associated pump house. No abandonment records have been found.

The production well located 75 feet south of the laundry was also installed in February 1943 to supply the laundry. This well was 655 feet deep, and was cased down to 383 feet. In December 1995, representatives from the City of Orlando purged and sampled groundwater from this well. No VOCs were detected. The well was then properly abandoned by the St. John's Water Management District. Further details will be included in the Final RI Report.

The drainage well shown on Figure 2-1 was also installed in the 1940s, presumably to regulate the Lake Druid water level. Lake overflow is now directed to Lake Rowena via a weir constructed on the western bank of the lake, and the old drainage well is not in use. A trench that once connected the well structure to the lake is now bermed. Presently, the former drainage well is covered by a square, brick enclosure. In 1997 HLA personnel probed the well using a PVC pipe, and encountered what appeared to be a concrete plug approximately 6 feet bls. This was interpreted as evidence that the drainage well had been abandoned, although no records of the abandonment have been located.

All three wells are screened below the Hawthorn Group clay, which extends to a depth of approximately 150 feet bls. Calculation of capture zone size is not necessary, as the wells are not in use. However, because the Area C production well was abandoned by the St. Johns Water Management District, and because the former drainage well also appears to be abandoned, there is little risk of site-related VOCs contaminating deep aquifers through these conduits.

It is likely that the production well formerly located north of Area C in the area now occupied by the condominium complex was also abandoned. However, if the well does exist, it would not be in use and it is located cross-gradient from the plume of chlorinated VOCs.

4. **The RI (p.5-7) states that PAHs were detected in surface soil at concentrations greater than the relevant SCGs, but goes on to say that these are not considered to be site related. One detect at an upgradient location (U4S00901) is dismissed in the text as being due to contaminated runoff in a drainage area. However two other notable occurrences U4S00601 and U4S01501 (RI Figure 5-2), with exceedances greater than at U4S00901, are not addressed in Section 5. How did contamination which is not site related get so far into the property?**

The RI (p.5-7) notes that "...many surface soil samples collected throughout SA 14 (much of which is paved) did not contain PAHs above SCGs." If many of the samples did not contain PAHs, the relatively high concentrations detected at U4S00601 and U4S01501 would seem to deserve additional evaluation and possibly additional sampling in these areas. Note that subsurface soil samples were not collected in the vicinity of U4S00601 and U4S01501 (RI Figure 5-4), and the nearest surface soil sample is at least 90 feet away from either location

(RI Figure 5-2). Therefore, the source and extent of PAH contamination in soils have not been defined. Please include text evaluating these locations for previous activity which would explain the presence of PAHs and please evaluate the need for additional sampling to define the extent of PAH contamination

Surface soil sample U4S00601 was collected at the outlet of a culvert that discharges runoff from the OU 4 land surface. PAHs detected in this sample likely originated from anthropogenic sources. Sample U4S01501 was collected within an area that has been paved for approximately 50 years. It is possible that a small piece of asphalt was inadvertently included in the sample. Other surface soil samples collected beneath the asphalt in this area did not exhibit elevated PAH concentrations.

In any case, both locations (U4S006 and U4S015) will be excavated during Spring 1999. Each excavation will measure 10 ft x 10 ft x 2 ft, and confirmatory samples will be collected to ensure all contaminated soil is removed. No further delineation is necessary.

5. **Numerous inorganic analytes, particularly metals, were detected at concentrations above applicable standards in 37/75 unfiltered groundwater samples (RI, p.5-20). Region 4 Standard Operating Procedure (USEPA, 1996, Section 7.2.1) states a turbidity of less than 10 NTU is the "...goal for most groundwater sampling objectives...". The monitoring well development records (RI Appendix G) show that the turbidity at the end of development was often much greater than the goal of 10 NTU. The Groundwater Sampling Logs (RI Appendix H) show that turbidity at the end of the purging period often was greater than 10 NTU. The records in RI Appendix H show that purge time typically was 45 minutes to 1 hour.**

As noted in the RI (p. 5-21), samples with high turbidity sometimes result in apparently high metals concentrations. It appears that some wells have not been fully developed and are likely to continue to produce samples with high turbidity if the same sampling procedures are implemented during the next sampling event. EPA Region 4 policy is to use unfiltered sample results only for risk assessment and determining the extent of contamination. The available data suggest that there are numerous exceedances of inorganic constituents in groundwater at this site, but the turbidity of the samples makes the results suspect. Therefore, the extent of metals contamination in groundwater has not been defined.

HLA should consider revising their sampling protocol to collect samples for metals analysis only after the turbidity meets the specifications of the Region 4 Standard Operating Procedure. A goal for the next groundwater sampling event should be to collect samples with turbidity levels suitable for definition of the extent of metals contamination in

groundwater. It may be necessary to re-develop the wells or increase purging time until samples of suitably low turbidity can be collected.

Aluminum and iron have historically been detected at relatively high concentrations in NTC, Orlando monitoring wells. Basewide background samples were collected in 1995 to provide a method of establishing the range of concentrations over which inorganic compounds naturally fluctuate. The background screening concentrations calculated for aluminum (4,067 ug/L) and iron (1,227 ug/L) in groundwater are both above their respective FDEP Groundwater Guidance Concentrations of 200 ug/L and 300 ug/L (*Background Sampling Report,* HLA, August 1995).

The RI Report will be revised to reflect the fact that of the 37 samples where iron and aluminum exceeded their respective standards, only six samples exceeded the associated background screening concentrations.

A comparison of the OU 4 RI groundwater data with turbidity measurements does indicate a possible correlation between the concentrations of aluminum and iron in groundwater and the turbidity of the sample. To some degree, aluminum and iron concentrations may reflect the entrainment of particulates in the sample. This has also been observed in groundwater collected from monitoring wells installed at other sites at NTC, Orlando. However, these results have always been naturally occurring and not indicative of groundwater contamination. This is also believed to be the case at OU 4, and resampling is not necessary.

6. **Two different buildings are identified as Building 1066 on RI Figure 2-1.**

Figure 2-1 will be revised to show the location of Building 1069, which was erroneously labeled as Building 1066 on the draft figure.

7. **Antimony was detected in groundwater at concentrations greater than applicable standards in unfiltered samples from 4 locations (RI, p.5-21) and in 4/7 filtered samples (RI, p.5-22). In the Executive Summary (page v), antimony is said not to have migrated in the last 3 years, but no supporting data or graphs showing antimony concentrations versus time are presented in Section 5 (Nature and Extent of Contamination). The stability of the plume has not been demonstrated.**

Antimony concentrations in groundwater from several OU 4 monitoring wells have been measured twice: groundwater samples were collected in April 1995 and in February 1998. Antimony concentrations detected during each sampling event are shown on Table 1-1 in the *Draft OU 4 Feasibility Study*, issued January 1999. This table, which will be included in the Final RI Report, is reproduced below:

Well ID	Antimony Concentration (µg/l)	
	April 1995	February 1998
OLD-14-01A	2.5 U	2.5 U
OLD-14-02A	10.1 B	4.7 J
OLD-14-03A	17.6	20.7 J
OLD-14-14A	10.6 B	12.7 J
OLD-12-01A[1]	2.5 U	3.6 J

[1] OLD-12-01A is located approximately 200 feet downgradient of OLD-14-03A.

Notes: µg/l = micrograms per liter.
U = Analyte not detected at the reporting limit.
B = Reported concentration is between the instrument detection limit and the contract required detection limit.
J = Reported concentration is an estimated quantity.

These data demonstrate that the detected concentrations of antimony have not varied significantly between 1995 and 1998. Results of the 1998 sampling event provided no indication that the antimony plume has migrated westward since 1995.

8. **An "isolated occurrence" of antimony in groundwater is described in the RI (p. 7-1), but a source is not identified. The interpretation of the antimony data presented in the report is that the distribution of antimony "...appears to be more dispersed and probably not plume shaped, but possibly the result of a non-point release or a natural occurrence" (RI, p. 5-24). However, the antimony is not widely or randomly distributed through the area as would be expected from a natural occurrence or non-point release. Instead, RI Figure 5-13 shows that the distribution of antimony in groundwater can be contoured and is centered near Building 1066 and 1068. No explanation for the source of antimony is presented (RI, p. 5-34). The history of Building 1066 and 1068 are not included in the descriptions of Area Background and Conditions (RI, p. 2-4 through 2-9).**

The history of Building 1066, Building 1068 and the vicinity should be examined and included in the report. Antimony concentrations in groundwater should be plotted versus time since the first observation in March, 1993 to demonstrate that the antimony plume is not expanding and support the statements that it is not migrating toward Lake Druid.

Vertical hydraulic gradients in the vicinity of the antimony plume are not apparent on RI Figure 3-9 or RI Table 3-2. From the concept model (RI Figure 2-5) and RI Figure 3-10, the dominant hydraulic gradient in Area 14 is inferred to be downward. Please evaluate whether the downgradient wells in Area 13, cited as evidence that the antimony plume is not

migrating toward Lake Druid (RI p. 7-12), are screened at a level which will intercept flow from Area 14. It may be necessary to draw a flow net for this demonstration.

The sentence in Subsection 7.1 that refers to the detections of antimony in groundwater as "isolated occurrences" will be revised to indicate that the antimony is present as a plume in groundwater. Similarly, the description of the distribution of antimony in Paragraph 5.2.3.5 as "dispersed and probably not plume shaped" will be removed, as Figures 5-13 and L-8 suggest a definite plume shape.

Potential sources for antimony include lead-acid batteries, munitions, and flame retardants for clothing. There is no evidence that munitions were ever present at OU 4. Batteries are an unlikely source, as no lead was detected in groundwater. It is likely, however, that the Navy laundry treated recruit clothing to make it flame retardant. A review of the chemical inventory of the laundry and nearby buildings did not identify any such chemical, but this hypothesis remains the most likely. As the extent of antimony contamination is limited, identification of the source is not critical.

The wells in which antimony was detected were installed as shallow (A-interval) wells, with screens typically set at 6 to 15 ft bls. The SA 13 wells downgradient of these SA 14 wells were also installed as A-interval wells. Therefore, any migration of the antimony plume would be evident from the detection of antimony in the downgradient (SA 13) wells. At each of the following shallow, downgradient wells, antimony was not detected above the method detection limit: OLD-12-02A, OLD-12-03A, OLD-12-04A, OLD-13-27A, OLD-13-33A, and OLD-13-36A. Antimony was also not detected in a groundwater sample collected from OLD-13-06C, a deep-interval well that is downgradient of SA 14 (*BRAC Environmental Site Screening Report*, HLA, July 1996).

Antimony concentrations detected in SA 14 groundwater in 1995 and 1998 are listed above, in Response to Comment 7. There is no indication that the plume has migrated toward Lake Druid. In the *Draft OU 4 Feasibility Study*, Appendix I, the antimony plume migration rate in the vicinity of SA 14 was calculated using the USGS hydraulic conductivity value of 10 feet/day. The resulting retarded antimony flow velocity was 0.5 feet per year (assuming an antimony K_d of 13.6 ml/g). At this rate, the antimony plume would have moved only 1.5 feet toward Lake Druid between 1995 and 1998. Further, all OU 4 monitoring wells sampled for VOCs during the RI were also sampled for inorganic constituents. Antimony was only detected in the monitoring wells from SA 14, along with a trace amount in OLD-12-01A.

9. **The text in RI Section 7 does not clearly distinguish between movement of contaminant dissolved in groundwater and the movement of contaminant as a DNAPL. The TerraProbe**

investigation (RI, p. 2-20) found some VOC concentrations in groundwater were approximately 20 percent of the solubility limit for PCE, which is strongly suggestive of NAPL presence. The text also states that a residual source for PCE probably has migrated downward in the aquifer beneath the source area and has become immobile (RI, p. 7-4). However, the next paragraph on RI page 7-4 states that while some downward movement may occur near recharge areas, the short distance to the lake, and the strong upward gradient to the surface water discharge area most likely limits the further vertical downward spread causing contaminants to converge along streamlines of flow into the lake. It is not clear if the paragraph is referring to dissolved contamination or DNAPL.

Dissolved contamination probably does move toward the natural discharge area, but there is no conclusive evidence eliminating the possibility of downward migration of a DNAPL source. There is no evidence that DNAPL source, if it exists, will move upward to this discharge area. The high concentrations relative to the solubility of PCE indicate that a DNAPL source probably exists beneath Building 1100 and DNAPL contamination is likely to downward until it reaches a layer of low permeability, possibly the top of the Hawthorn Formation. Additional characterization of the source area probably will be necessary when a source control measure is evaluated.

The "immobile" PCE to which the first paragraph in Subsection 7.2.4 refers is DNAPL that is trapped within soil pore spaces. The second paragraph refers to dissolved-phase contaminants in groundwater. These points will be clarified in the Final RI Report.

Groundwater screening data collected using the DPT rig and an on-site GC indicate that groundwater contamination does not extend below 45 feet bls. These data are summarized in Appendix C, Table C-3 of the Final Draft RI Report. Typically, no VOCs (or trace amounts) have been detected in groundwater collected from monitoring wells screened at the top of the Hawthorn Formation (approximately 60 feet bls). There is no evidence of deep, mobile DNAPL that has migrated (or will migrate) to the top of the Hawthorn Group clay layer.

10. **Retardation factors and contaminant specific travel times between the source area and the discharge area are not presented in the RI Section 7, Fate and Transport of Contaminants. Contaminant travel times are required to evaluate the validity of statements such as "The downgradient extent of the PCE plume is generally limited by this degradation" of PCE to TCE (RI, p. 5-34). Contaminant specific degradation rates have not been presented in Section 7. These hydraulic characteristics are included in the TS. Normally they are presented in the RI as part of the site characterization.**

The RI will be revised to include retardation factors, travel times, and degradation rates.

11. **RI Figures L-2 and L-5 show PCE and TCE concentrations above and below a horizon selected at an elevation of 85 ft above msl. The RI text states that as groundwater moves downgradient, "The downgradient extent of the PCE plume is generally limited by this degradation" of PCE to TCE (RI, p. 5-34). However RI Figures L3 and L5 indicate that the downgradient extent of the groundwater plume is limited by discharge to Lake Druid rather than by degradation processes. Contaminant mass may be flushing from the groundwater flow system into the lake rather than being destroyed by degradation processes. Retardation factors, contaminant specific travel times and degradation rates are required to evaluate the fate of contamination at this site.**

Some of this is addressed in the TS, however, some anomalies remain in the evaluation of MNA. Vinyl chloride detects are relatively rare in the downgradient portions of the plume. The dissolved oxygen levels in this area are low, so vinyl chloride should be persistent, yet "Ethene is present in almost all groundwater samples collected" (TS p. 3-2). Ethene is a product of reductive dechlorination of vinyl chloride, so it appears that a step in the process is being missed. Our understanding of MNA processes at this site remains incomplete. This is addressed further in the next comment.

The downgradient extent of the entire VOC plume is limited by discharge to Lake Druid, but the downgradient extent of PCE is generally limited by biodegradation. Release records for the former laundry are non-existent for most of the operational history of the facility. However, it is likely that releases of PCE have occurred since the beginning of dry cleaning operations in the late 1950's. PCE would certainly have reached Lake Druid at substantial concentrations if no degradation were occurring and limiting the downgradient extent. Figures L-3 and L-5 demonstrate that as PCE concentrations in the plume decrease, TCE concentrations increase. Although some PCE is detected near Lake Druid, the primary VOCs in groundwater are the breakdown products TCE and cis-DCE. PCE is likely not uniformly degrading due to varying biological conditions within the plume.

Vinyl chloride and ethene are biodegradation products formed when PCE, TCE and DCE undergo reductive dechlorination. In Comment 11, there is concern raised that VC was not detected although ethene was present in almost all wells sampled. This is a valid concern; however ethene was detected at very low levels, which means this concentration of ethene does not correspond to a very high concentration of original parent product (e.g., PCE, TCE).

The concentration of ethene was detected in the range of 0.009 –1.9ug/L and these data are equivalent to PCE (0.05 to 11 ug/L); TCE (0.04-8.8 ug/L); DCE (0.03-6.5 ug/L) and VC (0.02-4 ug/L). Ethene was detected at the highest concentration at well OLD-13-9A (1.9 ug/L), which also corresponded to the highest VC concentration (69 ug/L) detected in groundwater. VC was only detected in three monitoring wells during the natural attenuation

assessment. It is likely that VC is not detected at the other locations because biodegradation is limited and any VC that was formed was not detectable.

The absence of VC could also be explained if DCE biodegradation proceeded via an oxidation pathway rather than reductive dechlorination. There is evidence that VC can be oxidized under iron reducing conditions (Bradley, P.M. and Chapelle, F.H. 1996, Environ. Sci Technol., 40:2084-2084) and this pathway has also been suggested for DCE (Bradley, P.M. and Chapelle, F.H. 1997, Environ. Sci Technol., 31:2692-2696). This means if DCE was oxidized, then VC or ethene would not be formed. However, since there was little evidence of iron reduction, based upon the absence of ferrous iron, this may not have been a significant pathway. Therefore, at locations where low levels of ethene were detected, it is likely that the VC was present at concentrations too low to be detected by analytical methods.

12. **The seasonal variability of contaminant concentrations and concentration trends with time have not been presented in either the RI or TS. The AFCEE guidelines for MNA, the now superceded Region 4 Guidelines on MNA, and the newest USEPA (1998) MNA guidelines all stress that an evaluation of MNA should rely on multiple lines of evidence. Model results and calculations must be supported by field observations. The TS (p. 3-2) notes that several of the wells have been resampled since the December, 1997 event which was the basis for the conclusions in the TS, but these data are not presented. These data should be evaluated to resolve anomalies in the MNA process at this site, to define seasonal variations in site conditions and define degradation rates based on field observations. This is particularly important because the potential for successful MNA after the implementation of source control measures may be limited because carbon sources (TOC) in the aquifer may be depleted (TS, p. 3-9).**

In December 1997, two in-situ recirculation wells began operating between the suspected PCE source area and Lake Druid. The TS data was collected prior to startup of this remedial system in order to assess NA conditions present before remediation. If MNA becomes a component of the final remedy for OU 4, it would likely be after source removal and shutdown of the recirculation wells. Further assessment of the NA process would be required at that time to confirm that MNA is a feasible alternative.

13. **If monitored natural attenuation is to be considered as a potential remedial measure, a plan to monitor the process of natural attenuation should be implemented as soon as possible. The guidelines for a monitoring plan to demonstrate the effectiveness of monitored natural attenuation, including lists of parameters to be measured in the field and laboratory, and the recommended frequency of sample events, are included in the EPA Monitored Natural Attenuation Protocol (USEPA, 1998, p. 44& p. 52). Typically, sample events should be conducted quarterly for the first year of MNA evaluation to determine seasonal changes in**

groundwater flow direction, hydraulic gradient, water table elevation, MNA indicators and contaminant migration. Quarterly sampling should be maintained for at least one year, after which an evaluation of the observed variations in water level and water quality should be performed, and the appropriate interval for subsequent sample events should be determined. Methods for interpreting these data are provided in the references cited. If all wells are not to be sampled during these quarterly events, EPA would like to review the list of wells selected and see reasons for their selection.

MNA is not a feasible remedial measure until some form of source control is implemented. The technical memorandum was intended to evaluate the potential for natural attenuation. A monitoring plan will be a component of the design document that will be prepared describing the remedial plan for OU 4. The monitoring plan will be prepared in a manner that is consistent with guidelines described in the "Technical Evaluation Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water " (EPA/600/R-98/128).

14. **HLA should follow the EPA Protocol for the evaluation of MNA (USEPA, 1998) to the extent possible. All depth to water measurements, well drilling procedures, sample collection procedures, sample analysis methods, etc., shall be performed in a manner consistent with the specifications in the EPA Region 4 Standard Operating Procedure (SOP, USEPA, 1996). Data collected during the investigation should be stored and reported to EPA in a digital format, in addition to any data presented in tables and figures included in the final report. A generic digital data format is presented in Table 1 of this letter. The format is intended to facilitate data transfer with as little transcription from paper records as possible, and therefore is negotiable on a project by project basis. Please contact Dave Jenkins (404-562-8462, jenkins.dave@epamail.epa.gov) at EPA Region 4 with questions or suggestions regarding the recommended data exchange format.**

As discussed in Response to Comment 13, future evaluation of MNA will follow the current EPA Protocol to the extent possible.

All field procedures have been conducted consistent with the USEPA-approved OU 4 RI Work Plan and the USEPA-approved NTC, Orlando Project Operations Plan. Electronic data exchange of RI data is normally not provided. The requirement for such a deliverable was not indicated during USEPA's review of the OU 4 RI Work Plan. Storage and reporting of all data collected in a digital format would require considerable additional effort, and unfortunately is not in the scope of the RI program at OU 4.

Table 1. Recommended Generic Formats for Digital Data Exchange EPA Region 4.

Four types of data should be stored in a digital format:

1. Depth to water in monitoring wells,
2. Location of monitoring wells (X-Y Coordinates),
3. Construction of monitoring wells,
4. Field and laboratory analysis results.

DEPTH TO WATER DATA

The depth to water data should include all measurements ever made in any of the area wells which are available to the consultants. These can be submitted in any of the following formats, listed in order of preference:

1. (Most Desirable) A file created by a common database program containing fields for:

   UNIQUE WELL NAME
   DATE OF MEASUREMENT
   TIME OF MEASUREMENT
   DEPTH TO WATER
   COMMENTS

2. (Almost as desirable) A common spreadsheet program containing columns for:

   UNIQUE WELL NAME
   DATE OF MEASUREMENT
   TIME OF MEASUREMENT
   DEPTH TO WATER
   COMMENTS

WELL CONSTRUCTION DATA AND WELL LOCATION DATA

The data necessary include:

Boring Name or Number	if not same as Well Name or Number
Well Name or Number	Same unique name as for depth to water measurements
Date Drilled	
Date Abandoned	defines valid range of well data

Table 1 (Cont.). Recommended Generic Formats for Digital Data Exchange EPA Region 4.

Depth to Screen Top	ft	
Screen Length	ft	
Total Depth	ft	may be different from screen bottom
Ground Elev.	ft msl	
Reference Elev1	ft msl	Top PVC or measuring point elevation
Reference Elev Change Date		Date of elevation resurvey
Reference Elev2	ft msl	New measuring point elevation
X Coordinate		Easting
Y Coordinate		Northing
Screen Slot Size	mm	
Mean Grain Size	mm	in screened interval
Comments		TEXT

It would be best if the data were in a dBASE type file or spreadsheet in the format shown, but these data are only entered only once for each sample location, so the construction data could be entered manually from paper copies of the well construction records.

FIELD ANALYTICAL DATA AND LABORATORY ANALYTICAL DATA

The analytical data could be better utilized if it were available in a dBASE type file. This usually is a little more difficult than for water level or well construction data. The format requirements are somewhat flexible because some data conversion always is necessary. An ideal minimum analytical data format for EPA use would resemble the following:

Laboratory #	Lab Sample ID number
Sample Name	Common location or well name
Date	Sample Collection Date
Time	Sample Collection Time
Sample ID	Sample ID from Chain of Custody
Matrix	Water (W), Soil (S) or other as defined
Analyte	Chemical or compound name
Units	Analysis units
Concentration	as text or "<" detection limit for non-detects
Qualifiers	Analysis Qualifiers & Flags
Method	Method Description or Number
Top	Soil Sample Interval Top
Bottom	Soil Sample Interval Bottom

References

McAllister and C.Y Chiang, 1994, A Practical Approach to Evaluating Natural Attenuation of Contaminants in Groundwater, Ground Water Monitoring and Remediation, Spring, 1994, pp. 161-173.

USEPA, 1996, Region 4, Science and Ecosystem Support Division, Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, May, 1996. http://www.epa.gov/region04/sesd/eib/eisopqam.html

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U.S. Environmental Protection Agency, Region 4 – Nancy Rodriguez

Human Health Risk Comments:

1. **Exposure Point Concentrations for Groundwater and Identification of wells and DPT locations - A large number of monitoring wells and DPT points provided groundwater data at this very well characterized site. Unfortunately, the description of these locations in the text (p. 8-20 and 8-36) does not match the maps. The DPT points in the text are labeled U4GO2012 for example. On figure 5-6, the DPT points are labeled U4QO41 for example. I could not make the correspondence between the text and the maps. Figure 5-14 was missing. This figure shows the northern and southern VOC plumes and is critical for review.**

   Region 4 risk guidance indicates that the exposure point concentration for groundwater should be the average of the wells in the most concentrated part of the plume. Three plumes were identified here - a northern VOC plume, a southern VOC plume, and an antimony plume. I suspect that the calculation of the EPCs for groundwater gave results that were too low because too many wells were included. With the data reference and missing map problems, I could not recalculate these values.

   However, risk levels for groundwater were considerably above levels of concern both for EPA and FDEP. Because remediation is likely, recalculation of the risks is somewhat of a moot exercise. Nonetheless, the RI and BRA are public documents that should characterize

risk in an accurate and consistent manner. At the very least, I think the document should be redone to correct the well identification, map problems and to identify the sample points and the time of sampling for the wells or DPT locations used to calculate EPCs.

The text on pages 8-20 and 8-36 refers to groundwater sample identification (ID) numbers, which are closely related to the individual monitoring well IDs. Because of the large number of wells at OU 4, and the various investigations during which the wells were installed, the relationship between sample IDs and well IDs are not all obvious. However, Appendix D, Table D-3 correlates sample ID with well ID, and also provides sampling dates and averages when multiple samples were available. Also please note that no DPT data was used in the risk assessment; all groundwater data was collected from permanent monitoring wells. Figure 5-6 will be modified to indicate which wells were included in the EPC calculation for each plume.

The omission of Figure 5-14 was found shortly after the Final Draft RI Report was issued. The text was revised and a new Figure 5-14 representing the extent of the northern and southern VOC plumes was added. These errata pages were issued to the recipients of the final draft report in a letter dated October 8, 1998.

The groundwater EPCs for each plume include analytical data for the wells that had detects; wells that did not have any detected COCs were excluded from the EPC calculations, even if they were within the groundwater plume. In general, the majority of wells included in the EPC for each plume had substantially elevated concentrations of COCs; there are few wells with "low levels" of COCs relative to the total number of wells within the plumes. Therefore, it is unlikely that the EPCs would significantly change if the wells with "low levels" of COCs were excluded from the EPC calculations. Moreover, since the total receptor risks for groundwater already exceed the USEPA and FDEP risk threshold criteria, increasing the EPCs (and therefore the risks) by removing some wells from the EPC data set would not change the conclusions of the risk assessment. However, to address USEPA concerns regarding potential "dilution" of the EPC and underestimation of risks, the EPCs for the COPCs contributing the greatest groundwater risks (i.e., TCE, PCE, DCE) will be revised to include only the "most contaminated" wells in each plume. The revised EPCs and associated risks will be presented and discussed in the risk assessment uncertainty section. The uncertainty discussion will emphasize that, although revising the EPCs may increase risk estimates, RGOs and the remedial objectives will not be affected.

2. **Toxicity of Antimony - There is considerable uncertainty regarding the toxicity of antimony. The critical effects in the toxicity study on which the RfD was based include changes in blood glucose and cholesterol levels and changes in life span in rats. In the critical study, only a single dose of antimony was administered to rats. Hence, the RfD is based on a "hanging"**

LOAEL. The considerable uncertainty in the RfD is expressed by the use of an uncertainty factor of 1000. The lack of severity of the critical effects of antimony should be considered during risk management decision.

Uncertainties associated with the derivation of the antimony RfD will be discussed in the risk assessment uncertainty and summary sections.

3. **The Occurrence of Vinyl Chloride - On page 7-7, the text suggests that VC does not form. However, VC is found in surface water and sediment in Lake Druid. It seems unlikely that there is another source of VC and the statement on page 7-7 is incorrect and should be removed.**

The text on page 7-7 will be revised to clarify that VC does not appear to form in groundwater. Instead, it appears that VC is only forming when the groundwater plume discharges through the lake sediment.

4. **Exposure Point Concentrations for Soil - The same EPCs were used for all receptors. This procedure is appropriate if the maximum detected concentration was used for the EPC. However, EPCs should be based on a given receptor's exposure unit. An exposure unit is the geographic area contacted by a receptor during the time of interest. For Superfund risk assessment, this means the area contacted by a receptor in a day. For a child, this area would be 0.25 to 0.5 acres, the size of a residential yard and should include the most contaminated soil on site. For a maintenance worker or other industrial receptor, the entire site may be considered an exposure unit. EPCs for surface soil should be recalculated based on the exposure unit concept.**

Surface soil samples at three locations (U4S00601, U4S01101, and U4S01501) are associated with levels of organic and inorganic constituents that are elevated with respect to the remainder of the site. In general, elevated COPC risks were attributable to the concentrations at these locations. These three locations are not within the same ¼ to ½ acre area and, therefore, there is not a "most contaminated" portion of the site that would more conservatively represent the EP for the residential scenario. Regardless, the soil associated with samples U4S00601, U4S01101, and U4S01501 will be removed as an interim action prior to finalizing the RI/RA. Therefore, EPCs and risks associated with surface soil will be revised to reflect the post-remediation analytical data. It is not expected that any areas of "elevated concentrations" will remain after the soil remediation. Therefore, the EPC for residential exposures will be based on the entire soil analytical data set (replacing analytical data for the excavated soils with analytical data for the confirmatory soil samples).

5. **Page 5-5 and elsewhere. Throughout this chapter on "Nature and Extent of Contamination", on-site concentrations were compared with FDEP soil cleanup goals. This practice is inappropriate in this chapter. Nature and extent of contamination should be discussed here without consideration of risk-based levels.**

   Agreed. However, FDEP has come to expect a comparison to soil cleanup goals (revised to the Soil Cleanup Target Levels) when discussing Nature and Extent.

6. **Page 5-34. Figure 5-13 is labeled as the antimony plume. The text suggests it represents the northern and southern VOC plumes.**

   As discussed in Response to Comment 1, this error was found shortly after the Final Draft RI Report was issued. The text was revised and a new Figure 5-14 representing the extent of the northern and southern VOC plumes was added. These errata pages were issued to the recipients of the final draft report in a letter dated October 8, 1998.

7. **Page 6-6. EPA has withdrawn the oral slope factor for Beryllium and does not believe this metal to be carcinogenic by the oral route. Beryllium is still believed to be carcinogenic by the inhalation route. The Florida SCG for Beryllium should be recalculated considering this information. As a number close to what the recalculated SCG would be, the Region 3 RBC for Beryllium in residential soil is 160 mg/kg based on noncancer effects to a child.**

   The oral slope factor for beryllium will be removed from the risk assessment. The dose-response tables and risk calculations will be revised to reflect this. The Florida Soil Cleanup Target Level (SCTL) for beryllium will be used in the COPC selection. Since the maximum detected concentration of beryllium in soil will not exceed the SCTL, beryllium will no longer be a COPC. Text, tables, and risk calculations will be revised accordingly.

8. **Page 8-8. The text states that Florida Surface Water Quality Standards (SWQS) were used for screening COPCs in surface water. Are these standards risk-based? If not, they should not be used to screen COPCs. The reason Federal MCLs are not used for screening COPCs is that they are not risk-based.**

   Florida Department of Environmental Protection (FDEP) requires use of FDEP values. The lesser of the FDEP and Region IV water quality values were used for COPC selection to provide a conservative approach. The recently published Florida Soil Cleanup Target Levels for surface water will be used for COPC selection in the revised risk assessment. Text, tables, and risk calculations will be revised accordingly.

Ecological Risk Comments:

1. **The Final Draft RI Report describes the collection and results of 20 surface soil samples. Two of these samples, Stations *U4SO0501* and *U4SO0601,* are located in a drainage ditch or creek on Figure 5-1. They appear to be sediment samples and should be screened against ecotoxicity screening values for sediments. Please resolve this discrepancy.**

   The samples, U4S00501 and U4S00601, were collected from a drainageway that does not provide aquatic habitat for receptors. The areas around U4S00501 and U4S00601 contain water only during storm events, when runoff is directed through the Port Hueneme Avenue culvert. U4S00601 was collected at the mouth of the Port Hueneme Avenue culvert; the culvert daylights in a grassy swale that does not support aquatic life. Surface drainage from this point is ill defined as it fans out downgradient of U4S00601. U4S00501 was collected in a downgradient forested swamp where there is a network of small drainageways, but the sample itself was located on higher ground in the vicinity of the Lake Druid shore. The exact location where U4S00501 was collected could not support aquatic habitat.

   Given the nature of these areas, receptor exposures at U4S00501 and U4S00601 are more likely terrestrial. Risks to terrestrial wildlife receptors common to bottomland forested areas were evaluated. Aquatic organisms evaluated in the OU 4 ERA (e.g., fish, aquatic invertebrates, and amphibians) would not be exposed to soil at U4S00501 or U4S00601.

   Some text describing the area where U4S00501 and U4S00601 were collected will be added to the ecological characterization, subsection 9.1.3.

2. **Several places in the ecological risk assessment (Pages 9-1, 9-12, and 9-13) focus too early on volatile organic compounds associated with the former dry-cleaners. Dry cleaning was only one of many activities at OU4 that may have released contaminants to the environment. For example, Study Area (SA) 12 was formerly used to store insecticides, paints, and small quantities of hazardous materials. Text describing the source of contamination and exposure pathways should be revised to add a broader description of potential waste-generating activities to maintain consistency with other parts of the document such as Section 2-3, which begins on Page 2-3. More importantly, contaminants of concern like pesticides, metals, PAHs, and PCBs should not be eliminated for not being associated with dry cleaning.**

   The introduction of the ERA will be revised to discuss other sources of contamination at OU 4. However, the purpose of the problem formulation is to focus the reader on what is believed to be the exposure pathways primarily of concern at the site. Given the history of OU 4, that VOCs have been detected in groundwater at elevated concentrations (prior to the installation of the recirculation wells), and that VOCs are most mobile in the environment

and may be reaching Lake Druid (which has been identified as the most sensitive ecological habitat downgradient of OU 4), this exposure pathway is the most critical. The Remedial Investigation for OU 4 focused on VOCs as well.

Pesticides, heavy metals, PAHs, and PCBs were not eliminated from the OU 4 ERA. Rather, these chemicals were evaluated in the ERA because they were detected in soil, surface water, and sediment. Since the concentrations of these chemicals were low, professional judgement suggested that they were not a likely threat to the environment and, therefore, were not discussed in detail in the problem formulation. However, a general discussion of the potential impacts to ecological receptors from exposure to these chemicals is provided in the problem formulation. By evaluating the potential effects to receptors via food chain modeling and direct comparisons against toxicity benchmarks, the ERA concludes that pesticides, metals, PAHs, and PCBs are (for the most part) not risk contributors. Given the low likelihood of risks to wildlife, a discussion of all these chemicals throughout the ERA would be exhaustive and unfocused.

3. **The risk assessment could be improved by strengthening the Problem Formulation. Once the screening-level ecological risk assessment identifies chemicals of potential concern, insert a brief discussion of their ecotoxicity. Assessment endpoints should relate to the expected mechanism of toxicity for the given COPC chemical or chemical class. Chemicals, such as PAHS, for example, have direct toxicity on aquatic life. Protection of herbivorous mammals or herbivorous birds is irrelevant to this site because the chemicals of concern (VOCs, pesticides, and PAHs) do not accumulate significantly in vegetation. The cotton mouse and mourning dove are not likely to be chiefly at risk. The ecological risk assessment should focus on assessment endpoints that are expected to be sensitive to exposure and effects of the particular COPCs identified in the screen.**

A general discussion of the ecotoxic effects of chemicals detected at OU 4 (including pesticides, PCBs, and metals) is provided on Pages 9-12 (third paragraph) and 9-17 (subsection 9.2.3). Assessment endpoints have been chosen to be consistent with these chemical's modes of toxicity (e.g., reproductive effects and mortality). Subsection 9.2.3 will be revised to include a general statement about the toxic effects that PAHs have in the environment.

Given the variety of chemicals detected in site media and retained as ECPCs, a variety of receptors representing different trophic guilds is appropriate for the OU 4 ERA. While it is true that herbivores are not likely to be at risk from exposure to the chemicals chiefly of concern at OU 4, this cannot be ascertained without evaluation. Therefore, herbivorous receptors were included in the ERA, in addition to insectivorous receptors (e.g., the short-tailed shrew and the American woodcock), to evaluate uptake of ECPCs via the food chain.

4. **The ecological risk assessment is illogical. It started by stating a purpose to assess risks from chlorinated VOCs to aquatic and semi-aquatic species, however, all but one of the receptor species chosen (cotton mouse, short-tailed shrew, mourning dove, American woodcock, red fox, raccoon, and great blue heron) are terrestrial. The risk assessment correctly states that chlorinated VOCs do not accumulate in the food chain, however, much of the report is devoted to food chain modeling. The ecological risk assessment should provide a rational, scientific argument for why the chosen assessment approach was taken. The Problem Formulation step is critical to writing a scientifically-defensible risk assessment. Ultimately, scientific evidence will provide justification for risk management decisions made at the site.**

The introduction to the OU 4 ERA states two goals: (1) to evaluate potential risks to semi-aquatic and aquatic receptors from exposure to VOCs in groundwater, surface water, and sediment, and (2) to evaluate potential risks to terrestrial receptors from exposure to chemicals in soil. This statement will be further clarified to state the chemicals of concern in surface water and sediment (VOCs, PAHs, pesticides, and metals) and in soil (e.g., PAHs, pesticides, and metals).

Since VOCs were detected at very high concentrations in OU 4 groundwater, and because there is a clear VOC migration pathway from OU 4 to Lake Druid (the most sensitive downgradient habitat), it is reasonable to focus on the groundwater exposure pathway as the primary pathway of concern in the OU 4 ERA (as per the Process Document). This exposure pathway is discussed in Subsection 9.2.2, and is shown in Figure 9-3. The receptors evaluated for this pathway are listed in Tables 9-7 and 9-2, and are discussed in more detail in subsections 9.1.4 and 9.2.1.

However, it is also necessary to evaluate all pathways of concern in an ERA. As stated in the problem formulation (subsection 9.2.2 under Terrestrial and Semi-Aquatic Wildlife), pesticides, PCBs, and several metals are known to bioaccumulate via the food chain, and these chemicals were detected in OU 4 soil. Therefore, discussions regarding food chain exposures are germane to this ERA. The terrestrial and semi-aquatic receptors listed by the reviewer were used in the ERA to evaluate potential food chain exposures to contaminants detected in surface soil, surface water, and sediment (which is discussed in the problem formulation, subsection 9.2.2).

5. **After the screening-level risk assessment is complete instead of proceeding directly into the food chain modeling, discuss the magnitude, pattern, and frequency of detection of COPCs identified in the screen. Discuss how some are eliminated as having concentrations below background screening values or for being essential nutrients. Discuss which samples were taken from under the pavement or in the drainage ditch. Present this information to managers in such a way that they can make educated decisions whether or not to eliminate a**

chemical as a COPC. Interpretation of the existing chemistry data is more important than food chain modeling and rescreening the data with a new set of ecotoxicity reference values.

The magnitude, pattern, and frequency of detection of chemicals in site media are discussed in detail in Chapter 5; therefore, the reader will be directed to this section for this information in the second paragraph of subsection 9.2 (Problem Formulation). The problem formulation will also include a brief analysis of the potential migration of chemicals from OU 4 surface soil to Lake Druid sediment, and then relate the levels found in these two media to levels detected in control samples collected in other portions of Lake Druid. This analysis will show that levels of certain chemicals (e.g., pesticides and mercury) are fairly consistent in all these areas, suggesting that low-level contamination of these bioaccumulating compounds are common throughout the area. Furthermore, the relatively low levels of exceedances in the risk characterization show that potential risks are minimal.

Section 9.3.1 (the Hazard Assessment and Selection of ECPCs) and Tables 9-3 through 9-6 discuss ECPC elimination based on background comparisons and nutrient status.

Subsection 9.3.1.1 will be revised to explain which surface soil samples were collected from under pavement, and that all surface soil samples (including those collected under pavement) were included in the ERA. This subsection will also state that because the future land use for this area is unknown, soils currently under pavement may someday be exposed.

6. **Most of the contaminants detected at elevated levels, with respect to ecotoxicity screening values, are located in the drainage ditch. The ditch discharges to Lake Druid. Chemicals detected in the ditch are not VOCs but aluminum, pesticides, and PAHs. Most upland samples are relatively clean. The ecological risk assessment should direct attention to contamination in this ditch. The assessment endpoint should highlight aquatic or semi-aquatic species that inhabit the drainage ditch. Since the gopher turtle is an endangered species that lives on parts of the NTC, it may be appropriate to use a species of turtle that lives at OU4 as an assessment endpoint. (However, toxicity reference values for turtles are generally lacking.) Another group of semi-aquatic receptor species that has close association with the sediment would make a good choice if turtles are not found at OU4. Assessment endpoints should be chosen with consideration of the location of the contamination with respect to ecological receptor groups. For example, the robin might not be expected to forage in the drainage ditch when water is present.**

As discussed in Response to Comment 1, samples U4S00501 and U4S00601 collected from the ill-defined drainageway east of Port Hueneme Avenue were not collected from aquatic habitat and, therefore, are not sediment. These locations contain water only during storm events, when runoff is directed through the Port Hueneme Avenue culvert. Therefore, truly

aquatic receptors would not be exposed to contaminants at these locations. The receptors that may be exposed to contaminants at U4S00501 and U4S00601 would include those wildlife receptors that are common to bottomland forests (e.g., shrews, woodcocks, and possibly foxes), and that were evaluated in the ERA. Gopher tortoises would not inhabit this area due to the gradual grade (gopher tortoise burrows are typically found in sandy hillsides or banks) and because the water table is too close to the surface.

7. **The food chain modeling missed the point. The only reason to do food chain modeling would be to address potential exposures through the food chain to chemicals that bioaccumulate like pesticides, mercury, and PCBs. However, exposures to many of the most bioaccumulative chemicals were excluded in the food chain modeling. The food chain modeling for aquatic organisms used an exposure point concentration for sediments from Lake Druid (Table 9-5), which did not consider exposure to chemicals detected in the ditch where these chemicals were detected at maximum concentration. The food chain modeling for terrestrial organisms excluded many of the chemicals detected in soils from the ditch, because BAF values were either lacking or assigned a value of zero in Table F.1-2. Therefore, the really important chemicals, that happened to be in the ditch, were missed. This is why metals (such as cadmium, mercury, and zinc) are turning up as "risk drivers" on Table 9-11 instead of pesticides and PCBs. A BAF value of 1 should be used when a value is lacking from the literature. Sediments in the drainage ditch should be considered with respect to food chain modeling for aquatic receptors.**

Bioaccumulative chemicals were included in the food chain modeling. Food chain exposures for wildlife receptors were evaluated for Aroclor-1254 (a PCB), methoxychlor (a pesticide), cadmium, lead, mercury, and selenium in soil, and for numerous pesticides, Aroclor-1254, and mercury in surface water and sediment. These chemicals have a strong tendency to bioaccumulate.

Food chain modeling for semi-aquatic receptors (e.g., the raccoon and great blue heron) appropriately used an exposure point concentration from Lake Druid, where these receptors would likely forage. Herons would not be found foraging in a bottomland forest or at the Port Hueneme Avenue culvert outfall, where the dense underbrush would restrict their mobility or limited foraging opportunities exist. While raccoons are opportunistic feeders and may be found foraging in these areas, the shrew (a smaller omnivore with a voracious appetite) is a more conservative receptor to use in the model. Food chain exposures to shrews were evaluated at these locations.

The only BAFs that are missing in Table F.1-2 were for the following groups:

- VOCs (which the reviewer agreed do not bioaccumulate), and
- bird BAFs for PAHs, aluminum, beryllium, lead, manganese, silver, vanadium, and zinc (information for avian receptors is generally lacking for these chemicals).

Furthermore, the only BAF for which a value of "0" was assigned is the lead BAF for plants, which is supported by the literature (see explanation provided in Table 9-10).

The confusion about missing BAFs in Table F.1-2 may be due to the predominance of footnote "h", which implies that the chemical listed is not an ECPC for that receptor group. Information was not presented in Table F.1-2 for chemicals that were not selected as CPCs. Only the entries of "NA" indicate that a chemical was retained as an ECPC, but that a BAF was not available.

8. **There is a discrepancy with the surface soil data for samples *BO101* through *BO401* from the Site Screening Report. These samples were from soil borings advanced through the pavement. They are not what we typically think of as soil but may represent some other medium. The composition of major elements like aluminum, iron and magnesium is unlike that of soil. Metals concentrations collected in 1995 for the Site Screening report differ substantially from those collected in 1997 for the RI. The data from the Site Screening Report, also, have not been validated.**

Numerous surface soil samples from under pavement were included in the ERA because the future use of the site, and therefore, the presence of pavement, are unknown. To be conservative, the ERA assumed that all areas would be unpaved in the future, thus representing a larger exposure area than is currently present. This effectively increases the site foraging frequency for each receptor, which increases the likelihood of potential risks. This will be clarified in subsections 9.1.3 and 9.3.1.1, the ecological characterization and selection of surface soil ECPCs (respectively).

The composition of the elements aluminum, iron, and magnesium are consistent with soil. These samples do not represent any other type of medium. However, the aluminum values may lead to the perception that the site screening data are unusual. The concentration of aluminum in samples collected during site screening was erroneously divided by 1,000. This will be corrected in the Final RI Report.

The site screening data were validated in 1995. These data were included in the Site Screening Report (ABB-ES, 1996), and a PARCC report was not included in the Draft RI. In 1995, the validators chose to indicate inorganic results between the IDL and the CRDL with a "B" qualifier. Inorganic RI data collected in 1997-1998 was qualified using a "J".

Some unvalidated groundwater VOC data collected for performance monitoring of the IRA was used in the risk assessment. As per USEPA, 1992d (Data Usability for Risk Assessment), data are not required to be validated for use in risk assessments. However, some level of data review must be performed to assure their usability for risk assessment. This review occurred.

9. **Page 9-1. The introduction to the ecological risk assessment should be broad at this point. The purpose of the ERA should not be restricted to evaluation of the risks posed by the presence of chlorinated VOCs. VOCs were not the only chemicals detected at OU4. VOCs in soil were detected under pavement, but not in the grassed areas where ecological receptors can be exposed. VOCs should not be the primary ecological focus in soils.**

Refer to Response to Comment 2.

10. **The pesticides at OU4 were detected at their highest levels in the drainage ditch/creek, which receives discharges from the culvert draining the area around Building 1100. The pattern of location of the pesticides at OU4 suggests a release associated with site-related activities versus historical pesticide land application, as suggested on Page 9-12.**

Building 1100, the industrial laundry and dry cleaning facility, does not have a history of pesticide manufacturing or storage. The area used for pesticide storage is located southwest of Building 1100, topographically upgradient of the drainage swale leading to the Port Hueneme Avenue outfall. Only very low concentrations of pesticides (none above screening criteria) were detected in the three soil samples (12B00401, U4S01501, and 13B00501) between the former storage area and the swale, and few pesticides detected in surface soil sample U4S01201, located in the swale itself. In addition, the few pesticides detected at U4S01201 were found at much lower concentrations than those detected at U4S00601, at the Port Hueneme Avenue outfall. This suggests that there is not a substantial pesticide migration pathway via surficial run-off between the former pesticide storage area and the culvert outfall. Nor is there any evidence of pesticide releases at OU 4.

The laundry facility is surrounded by maintained grass where pesticides were likely to have been applied in the past. However, as with U4S01201, the levels of pesticides detected in surface soil samples collected from around Building 1100 (U4S00701 through U4S01101) are also lower than those detected in U4S00601. Since there are no known point sources in

OU 4 soil (related to historical site practices) that explain the pesticide levels observed at outfall location U4S00601, the likely explanation for the pesticides at U4S00601 is historical application at OU 4, subsequent run-off, and deposition at this location.

As explained in Response to Comment 5, a brief analysis of pesticide migration from OU 4 soil to Lake Druid sediment will be performed in the ERA.

11. **Page 9-2. Terrestrial habitats at OU4 are described starting on this page. The discussion is restricted to current land use. Please include a discussion of proposed future land use. Will the upland areas of OU4 always be industrial?**

The proposed future land use is unknown at this time. The site characterization will be revised to include future land use if this information becomes available.

12. **Chapter 7 on fate and transport needs to be expanded to include a discussion of surface water and stormwater runoff as a transport pathway. A culvert is shown on Figure 9-1. What part of OU4 does this culvert drain?**

Some discussion of runoff will be added to Chapter 7. The culvert shown on Figure 9-1 connects a drainage swale that is parallel to Port Hueneme Avenue in the grassy area to the east with the wooded area. The "creek" shown on this figure will also be revised. The creek is actually an expression of groundwater, beginning approximately 50 feet east of Lake Druid. Flow from the creek into the lake is almost imperceptible. During storm events, water discharging from the culvert spreads out in the wooded area before discharging into the creek.

13. **Page 9-17, bottom. Pesticides, PCBs, and some metals may be site-related due to the past practice of storing insecticides, transformer carcasses, and small quantities of hazardous waste at OU4. These chemicals should not be discounted in the Conceptual Site Model discussion.**

Refer to Response to Comments 2 and 10.

14. **Assessment endpoints presented in Table 9-2 are too broad and general for anything but a screening-level ecological risk assessment.**

The OU 4 ERA is a combination of a screening-level and baseline risk assessment because the remedial investigation process for this site was initiated several years ago (prior to the integration of the "Process Document" as the preferred USEPA Region IV ecological risk guidance document into the remedial investigative process at OU 4). The endpoints selected

for the OU 4 ERA are consistent with the Process Document (USEPA, 1997), and with previous ERAs conducted at this and many other Navy facilities. To satisfy the purposes of a screening-level ERA, endpoints that are likely to have impacts at the population-level (i.e., reproduction and mortality) were selected. These endpoints are consistent with the level of detail specified by the USEPA for other Navy sites in Florida that are (or were) at the same stage of the remedial investigative process (e.g., NAS Jacksonville). To bridge the gap between screening-level and baseline evaluations, the ERA presented several hypotheses to better gauge the likelihood of impacts to both the individual and the community. Had a high likelihood of risks to ecological receptors been predicted in the ERA, then these hypotheses would be refined for a more detailed baseline risk assessment, for which site-specific data would have been collected. The assessment endpoints presented in Table 9-2 are discussed in detail in Section 9.2.3 (Identification of Endpoints) of the ecological risk assessment.

15. **Please identify what stage this ecological risk assessment is at in EPA's *Process for Designing and Conducting Ecological Risk Assessments under Superfund* (USEPA, 1997). It appears to be at a screening level, yet chemicals were screened for being essential nutrients, below background screening values, and infrequently detected analytes. The screening-level risk assessment is to be completed prior to refinement of chemicals of potential concern. Note that Steps 1 and 2 of EPA's ERA Process do not include background screening or elimination of essential nutrients. Refinement of COPCs occurs in Step 3. Please keep tables on selection of COPCs the same, but separate the discussion of chemicals exceeding screening values from the discussion of refinement of COPCs. Provide a justification in the text for any chemical that is being proposed for elimination as a COPC.**

As stated in Response to Comment 14, the OU 4 ERA is a combination of a screening-level and baseline risk assessment. Because both goals of a screening-level ERA and baseline-level ERA are accomplished together under one cover, the separation of these two phases seemed repetitive. This streamlined ERA does not eliminate any ECPCs from the evaluation that would not otherwise be eliminated by the two-step process prescribed in the Process Document (USEPA, 1997). The justification for elimination of ECPCs is provided in detail in Tables 9-3 through 9-6.

16. **The area of OU4 is defined by the extent of contamination not by the property boundaries. Page 9-18, 1st numbered paragraph, implies that only the portion of Lake Druid within the property boundaries is part of OU4. Please correct this misleading statement.**

The hypothesis was intended to focus on OU 4-related impacts to aquatic organisms. The text will be revised to state: "....aquatic receptor populations along the OU 4 groundwater discharge zone of Lake Druid.".

17. **At OU4, given the nature and pattern of the contamination detected, it is more appropriate to look at protecting aquatic species from direct exposures to contaminants than to model food chain exposures to higher-trophic level organisms that eat aquatic species.**

    Direct exposures to aquatic organisms were evaluated in the ERA. These evaluations are presented in Tables 9-13 through 9-15. Furthermore, given the ECPCs that were retained in sediment, including PCBs, pesticides, and mercury, evaluation of food chain exposures to higher trophic level organisms are appropriate.

18. **In Appendix F, the table that presents BAFs distinguishes between chemicals detected in soils and chemicals detected in sediments by not providing a BAF value for aquatic receptors if a chemical was not detected in sediments. (See footnote *h* on Table F.1-2.) Sediment samples such as Station *U4SO0601* (the ditch) should be screened against Region 4's ecotoxicity screening values for sediment.**

    Refer to Response to Comment 1.

19. **Table F.1-2 should include BAFs for several pesticides that were detected in soil and/or sediment. For example, DDT was detected in soil at Station *U4SO0901,* but lacks BAFs for terrestrial receptors. The same could be said of may other pesticides on Table F.1-2. When a receptor is receiving exposure through many routes, exposures routes associated with an environmental medium should not be eliminated because that chemical is not a COPC in that particular medium.**

    The ERA employed the screening values recommended by USEPA Region IV to screen ECPCs. Since these values are regarded as being conservative, exposure levels below these values should not present a risk to ecological receptors. Many pesticides in surface soil were eliminated from further evaluation in the ERA during the screening process, but were retained for sediment. The appropriate pesticide BAFs have been included for aquatic organisms exposed to sediment. The inclusion of pesticide BAF information for chemicals in soil that have been eliminated as ECPCs is not warranted. Refer also to Response to Comment 7.

20. **Page 9-53. The factor of 10 conversion between the LOAEL and NOAEL is not an uncertainty factor but is derived from a study, cited in USEPA (1997), that indicated that 96 percent of chemicals had a ratio for the LOAEL to NOAEL of 5 or less, and all were less than 10.**

    Comment noted. However, the fact that 96% of the chemicals have LOAEL:NOAEL ratios of 5 or less suggests that the common application of a factor of 10 is likely to be overly

conservative, thus adding uncertainty to the evaluation. The reference to this factor of 10 as an "uncertainty factor" will be changed to "application factor", but an uncertainty will be included in section 9.5 regarding the potential overestimate of risk due to the application of this factor.

21. **The low concentrations of aluminum in surface soil (e.g., 0.0088 mg/kg) are too low to have been detected by the commonly used method for metals in 1995. The 1995 samples in Table C-1 *(BO101* through *BO401)* might be data for another medium. The major element composition of these samples is inconsistent with what we would expect to find in soils. This data has not been validated. The "B" laboratory qualifier flags remain. It should not be used in the risk assessment unless this discrepancy can be resolved.**

As discussed in Response to Comment 8, the analytical results for aluminum were erroneously divided by 1,000. These data will be corrected, and the ERA will be revised accordingly. The site screening data were validated in 1995; the "B" qualifiers represent inorganic concentrations detected between the IDL and the CRDL.

22. **The ecological risk assessment tells us over and over that the major concern at this site is the ground water plume of VOCs that is discharging to surface water. Yet in the final analysis, risks to aquatic organisms due to exposure to VOCs are not addressed quantitatively due to lack of available toxicity reference values. This is especially true when concentrations detected in sediment are compared to NOAA effects ranges, which lack values for VOCs. Therefore, the purpose of the ERA to assess potential risks to aquatic receptors from exposures to chlorinated VOCs in ground water, which discharges to surface water, could not be adequately addressed. At the end of Step 2 of the screening-level ecological risk assessment in EPA's risk assessment guidance (USEPA, 1997) there is a scientific and management decision point with three outcomes: (1) There is adequate information to conclude that ecological risks are negligible, (2) The information is inadequate to make a decision at this point and the ecological risk assessment process will continue to Step 3, or (3) The information indicates that the potential for adverse ecological effects is real. From what is presented in the RI report, one would have to conclude that information is inadequate to make a decision at this point. The conclusion should be that information in inadequate rather than that there are no risks to aquatic receptors.**

Agreed. However, although toxicity benchmarks for chlorinated VOCs in sediment are lacking (which is acknowledged in Section 9.5, the Uncertainty Analysis), there are ample data (i.e., AWQC and effects concentrations from AQUIRE) for evaluating potential risks from exposure to chlorinated VOCs in surface water and groundwater. It is the partitioning of these chemicals from sediment to water, and the presence of these chemicals in the sediment pore water that is most toxic to aquatic life. As explained in Subsection 9.2.2, under Aquatic Receptors, the groundwater concentrations from samples collected along the

shoreline of Lake Druid were used in the ERA to represent exposures to benthic organisms from pore water. The conclusions will be clarified accordingly.

23. **The volatile organic compounds detected in sediments of Lake Druid should be carried through into the baseline risk assessment Problem Formulation when no screening value is available. The chemical 1,1-dichloroethene was detected at a maximum concentration of 1.3 mg/kg in sediment.**

    1,2-Dichloroethene (not 1,1-dichloroethene) was detected at the maximum concentration of 1.3 mg/kg in sediment, and was retained in the ERA. 1,1-Dichloroethene was detected at a concentration of 13J ug/kg in sediment, and was also retained in the ERA. Refer to Response to Comment 15. No additional refinement of the Problem Formulation is required based on the conclusions of the ERA.

24. **It is inappropriate to conclude that benthic organisms are not at risk to metals detected in sediments above screening ecotoxicity values just because these pesticides and PAHs are not considered to be site related. Dry cleaning is not the only activity that occurred at OU4. Pesticides and other hazardous materials were stored there. High concentrations of these same pesticides and PAHs were found in the drainage ditch, where a gradient of contamination leaving the site was detected.**

    The text will be revised to state that although a low probability of adverse effects are possible, chemicals are not believed to be site related because PAHs, pesticides, and metals detected in the ditch are not commensurate with the levels detected in upgradient OU 4 soil (that have been impacted by site activities). The ditch samples were collected from locations that would not provide adequate habitat to support benthic organisms (Refer to Response to Comment #1).

Reference:

USEPA, 1997. *Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments,* U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, DC, EPA 540-R-97-006.

Florida Department of Environmental Protection – David P. Grabka

Draft Treatability Study Comments

1. **Site-specific sample collection and analysis indicate that natural attenuation is not sufficient by itself to obtain groundwater cleanup criteria in a reasonable time. The Navy proposes as an alternative site-specific risk-based target levels to be presented in the subsequent OU 4 RFI report. If it is not technically feasible to cleanup the contaminated aquifer in a reasonable time and the risk-based target levels exceed the State primary MCLs, the Navy will need to obtain a waiver from Chapter 62-520.410(1), Florida Administration Code.**

   Remedial alternatives have been evaluated in the *Draft OU 4 Feasibility Study*, issued in late January 1999. It is expected that some form of deed restriction limiting groundwater use will be required. Implementation of the deed restriction and any necessary reclassification of groundwater will be executed in cooperation with FDEP and the Orlando Partnering Team.

2. **A containment strategy should be investigated if there is a completed exposure pathway between groundwater and surface water that can pose a potential risk to receptors, human or otherwise. A containment strategy may be applicable if source removal and contaminant reduction strategies are not feasible.**

   The current OU 4 interim remedial action (IRA) consists of two recirculation wells between the source area and Lake Druid. The IRA intercepts and treats the portion of the groundwater plume with the highest VOC concentrations, and then discharges the treated water to continue the migration to Lake Druid. This system is essentially providing containment for groundwater with the highest VOC concentrations.

   The *Draft OU 4 Feasibility Study* was issued in late January 1999. An evaluation of various remedial alternatives, including containment, can be found in that document.

3. **Dilution factors, reduction factors, compound half-lives, and other contaminant fate and transport factors are assumed in the analysis. The report's conclusions and recommendations, as appropriate as they may be, would be even more defensible if the source or rationale for these assumptions were presented.**

   Assumptions and sources for fate and transport factors used in this evaluation are included in Appendix C, "Fate and Transport Modeling". The text of the document and Appendix C will be revised to better reference the derivation of these parameters.

RI Report Comments

1. **Figure 2-1 on page 2-5 shows two wells located in Area "C", an abandoned production well and a drainage well. These wells are not described adequately in the text. Specifications on these wells and their history should be provided in Chapter 3.**

   The production well located 75 feet south of the laundry was installed in February 1943 to supply the laundry. This well was 655 feet deep, and was cased down to 383 feet. In December 1995, representatives from the City of Orlando purged and sampled groundwater from this well. No VOCs were detected. The well was then properly abandoned by the St. John's Water Management District.

   The drainage well shown on Figure 2-1 was also installed in the 1940s, presumably to regulate the Lake Druid water level. Lake overflow is now directed to Lake Rowena via a weir constructed on the western bank of the lake, and the old drainage well is not in use. A trench that once connected the well structure to the lake is now bermed. Presently, the former drainage well is covered by a square, brick enclosure. In 1997 HLA personnel probed the well using a PVC pipe, and encountered what appeared to be a concrete plug approximately 6 feet bls. This was interpreted as evidence that the drainage well had been abandoned, although no records of the abandonment have been located.

   Further details will be included in Chapter 3.

2. **A well survey should be conducted in the vicinity (1/4 to 1/2 mile) of OU4. Well locations should be shown on a figure and specifications of the wells, including their history, should be provided in a table.**

   According to City of Orlando records, no permitted irrigation or domestic wells are present within the vicinity of OU 4. Similarly, there are no production wells within 1/2 mile of OU 4. These details will be included in the Final RI Report.

3. **Chapter 4 should be expanded to include a summarization of samples that failed holding times, matrix spike duplicates, field and laboratory blanks, laboratory duplicates, etc. This could be a summary of the PARCC Report in Appendix J. Also, a discussion of data qualifiers and overall quality and usefulness of the data should be included in this section. Finally, a discussion of contaminants detected in laboratory and field blanks should be included to determine which contaminants may be excluded on that basis.**

A brief discussion of the data quality will be added to Chapter 4. The details will remain in the PARCC report in Appendix J. In general, the brevity of Chapter 4 was due to overall data quality that was suitable for characterizing the nature and extent of contamination at OU 4. No specific problems were identified that may have caused the rejection of critical data.

4. **Possible sources of antimony should be discussed in Section 5.1.**

As discussed in Response to EPA Comment 8, potential sources for antimony include lead-acid batteries, munitions, and flame retardants for clothing. There is no evidence that munitions were ever present at OU 4. Batteries are an unlikely source, as no lead was detected in groundwater. It is likely, however, that the Navy laundry treated recruit clothing to make it flame retardant. A review of the chemical inventory of the laundry and nearby buildings did not identify any such chemical, but this hypothesis remains the most likely. This discussion will be added to Chapter 5.

5. **The Remedial Investigation Report repeatedly references the Florida Soil Cleanup Goals (FDEP, 1985). These numbers are obsolete. The Soil Cleanup Target Levels (SCTLs) for Chapter 62-785, Florida Administrative Code, should be used as these are the latest risk-based cleanup levels.**

As recommended, the draft final RI Report will be revised to incorporate the use of SCTLs.

6. **The residential SCTL for beryllium is 120 mg/kg. The increase in this number from the previous SCG may drop this contaminant as a chemical of concern in soil.**

Comment noted. The residential SCTL will be used in the COPC selection. The change in the screening value will cause beryllium to be eliminated as a COPC.

7. **A table should be included in Chapter 4 listing the contaminants detected in the DPT groundwater sampling and the depths at which the samples were taken.**

Chapter 4 addresses data management, and is not an appropriate place for a reference to DPT groundwater data. This information, including sample depths, has been provided in Appendix C, Tables C-3 and C-4. As discussed below, sample depths will also be added to Figure 5-6.

8. **Figure 5-6 does not indicate at what depths the contaminants were detected in the chemboxes.**

   Figure 5-6 will be revised to show the depth intervals sampled during the DPT screening program.

9. **In Section 5.2.3.5, it is stated that antimony is dispersed and probably not plume shaped, possibly the result of a non-point source release or a natural occurrence. This statement is not supported by the analytical data.**

   The description of the distribution of antimony in Paragraph 5.2.3.5 as "dispersed and probably not plume shaped" will be revised, as Figures 5-13 and L-8 suggest a definite plume shape.

10. **The chembox for sample U4D010 on figure 5-11 incorrectly has cadmium at a concentration of 7,080 mg/kg. That is the concentration of calcium. The correct concentration (average) is .39 mg/kg.**

    Figure 5-11 will be revised to list the correct average concentration of cadmium detected in sample U4D010, 0.39 J mg/kg.

11. **Sediment sample U4D050 and surface water sample U4W050 cannot be considered as true control samples as volatile organic halocarbon (VOH) contaminants associated with the site were detected. A control sample would need to be obtained from an area of the lake not impacted by the site.**

    Chlorinated VOCs were detected at low concentrations in the surface water and sediment control samples. Cis-1,2-DCE was present in the surface water control sample, 1,2-DCE (total) was detected in the sediment control sample, and PCE and TCE were detected in both the surface water and sediment control samples.

    While these VOCs are potentially site-related, the low concentrations at which they were detected are well below applicable surface water and sediment criteria. For example, PCE was present in the surface water control sample at a concentration of 2 ug/L, which is below the Florida Class III Surface Water Quality Standard (SWQS) of 8.85 ug/L for PCE. The detected TCE concentration in the surface water control sample, 18 ug/L, is well below the SWQS of 80.7 ug/L. There is no Class III SWQS for cis-1,2-DCE, which was detected in the control at a concentration of 14 ug/L.

Similarly, the chlorinated VOCs detected in the sediment control sample are consistent with the sediment concentrations detected in surface water. It is likely that the control location is close to where the southern edge of the southern VOC plume discharges to Lake Druid.

While these VOCs were detected in the control samples, the low concentrations at which they are present should not preclude the control samples from consideration as a qualitative screening tool. The primary purpose of the control samples was to provide non-VOC and inorganic data for Lake Druid away from the area where the majority of the VOCs are located. Lake Druid is an urban lake, and receives a tremendous volume of stormwater from the surrounding urban neighborhood. City of Orlando records indicate that the 19 acre Lake Druid receives runoff from a surrounding 152 acre drainage basin. There is no evidence to suggest that the presence of inorganic or PAH contamination (for example) in the lake is related to site activities.

12. **It is stated on page 7-8 that migration of the volatile organic halocarbon (VOH) plume beyond the near shore of Lake Druid likely does not occur. This has not been verified by actual sample collection and analysis. Surface water sample U4W019, further from the shoreline and directly out from sample U4W010, had appreciable amounts of VOHs. A sediment sample taken at that location also had appreciable amounts of VOHs. Furthermore, "control" samples U4D050 and U4W050, collected from an area not believed to be impacted by the VOH plume, also had detected VOHs. It is possible that contaminants are migrating from groundwater to sediment and surface water further from the shoreline than is predicted in the report.**

VOC concentrations in surface water and sediment were delineated during the 1996 Focused Field Investigation (FFI). Figures 2-6 and 2-7 in the OU 4 RI/FS Work Plan (ABB-ES, 1997) summarize total VOC concentrations in Lake Druid surface water and sediment. The majority of this data was generated using an onsite GC, with an appropriate QA/QC program that included confirmatory analyses at an offsite fixed laboratory. These figures will be added to the OU 4 RI Report.

The objective of the Lake Druid surface water and sediment sampling program, as defined in the approved RI Work Plan for OU 4, was to obtain current, validated, CLP-quality data to support the human health and ecological risk assessments. Further delineation of the VOC contamination in Lake Druid beyond that conducted in during the FFI was not necessary.

As discussed in Response to Comment 11, the presence of low levels of VOCs in the Lake Druid control samples should not preclude their consideration as a qualitative screening tool. It is likely that the control location is close to where the southern edge of the southern VOC plume discharges to Lake Druid.

13. **Section 8.3.1 discusses the demographics and land usage around the Main Base. This discussion should focus on demographics and land usage around Area C.**

Demography and land use in the vicinity of Area C are discussed in Subsection 3.7, and will be restated in Paragraph 8.3.1.

14. **The extent of contaminants in surface water and sediments does not appear to have been adequately characterized. The lateral extent of VOHs has not been determined. Also, only two sample locations were analyzed for full TAL/TCL, one location being where the "control" samples U4D050/U4W050 were collected. Because the "control" samples appear to have been impacted by site contaminants (see comment 12), the rationale for not addressing contaminants other than VOHs because they were detected in the "control" sample at similar concentrations is not valid.**

As discussed in Response to Comment 12, the intent of the RI sampling program for Lake Druid was not to delineate the extent of VOH contamination, because that had been adequately completed during the FFI. The full suite samples were collected at the request of USEPA. It was expected that anthropogenic contaminants would be detected in the lake (such as PAHs and pesticides) because of the volume of stormwater flowing into the lake from the surrounding neighborhood. There is no evidence that these compounds would have discharged to the lake from OU 4. Anticipating the results of the full suite sampling, the control location was added to demonstrate that anthropogenic compounds were present in the lake away from the majority of the VOC contamination. This approach was discussed and approved by the Orlando Partnering Team (OPT). The presence of low concentrations of VOCs in the control are irrelevant, as inorganics, SVOCs, pesticides, etc. present in the control are unrelated to the VOC release. None of the non-VOC organic compounds present in the control have been detected in OU 4 groundwater. Overland migration of contaminants from OU 4 to Lake Druid is not supported by surface soil data and/or site topography. Also see the Response to USEPA Ecological Risk Assessment Comment 10 for a further discussion of overland contaminant migration.

University of Florida – Christopher J. Saranko and Stephen M. Roberts

Human Health Risk Assessment Comments

1. **Section 8.2.1.2 Risk Based Screening**

1A. On page 8-6, HLA identifies Florida Soil Cleanup Goals (SCGs) and EPA Region III risk-based concentrations (RBCs) for residential soil as the source of screening levels for

contaminants in surface soil. The SCGs were cited from a September 27, 1995 FDEP Technical Guidance document. However, since the distribution of the 1995 tables, guidance from the USEPA has resulted in the modification of the equations and formulas used to derive health-based soil cleanup target levels. As a result, the soil cleanup target levels have changed somewhat. More current soil cleanup target levels for contaminants at this site can be found in Chapter 62-785, F.A.C. Although these cleanup levels were developed for the Brownfield program, the methodology used to develop the numbers is broadly applicable to other sites. As a matter of practice, soil screening levels should be the lower of the Region III RBCs for residential soils, Florida Soil Cleanup Target Levels (SCTLs) based on residential exposure, or Florida SCTLs based on leachability. In this case, two additional chemicals, aldrin and heptachlor, should be included as COPCs in the surface soil. Beryllium, however, can be removed from the COPC list (Table 8-2).

The risk assessment will be revised to use the Soil Cleanup Target Levels per Chapter 62-785, Florida Administrative Code. COPC screening tables and associated text and risk calculations will be revised accordingly. However, the leaching-based SCTLs will not be used for COPC selection. Leaching of soil constituents to groundwater is a concern related to source area characterization and contaminant fate and transport To address this concern, soil data were compared to leaching-based screening values in Section 5. Soil constituents selected as COPCs for the risk assessment based on leaching potential (rather than direct contact risks) would pose de minimus risks and, therefore, would not measurably increase the calculated risks.

1B. On page 8-7, HLA identifies Florida Surface Water Quality Standards (SWQs) as a source of screening levels for surface water. While most of the SWQs are cited correctly, no value for aluminum is cited. The Florida SWQ for aluminum is 13 ug/L. Using this screening value, aluminum should be included as a surface water COPC.

The value for aluminum is for Class II surface water; Lake Druid surface water is Class III. There is no FDEP aluminum screening value for Class III surface water. Regardless, the FDEP surface water values will be replaced with the FDEP SCTLs in the revised risk assessment.

1C. In Table 8-1 (Essential Nutrient Screening Concentrations for Surface Soil, Subsurface Soil, Groundwater, Surface Water, and Sediment), the groundwater screening concentration developed for sodium is listed as 396,022 ug/L. The Florida primary standard for sodium in groundwater (160,000 ug/L) should be listed instead. This standard was correctly used in the COPC screening process (Table 8-5) so it is unclear how the value reported in this Table 8-1 was used.

The FDEP primary standard for sodium in groundwater was used as the screening value for COPC selection. A footnote will be added to the essential nutrient screening table (Table 8-1) to indicate that the FDEP primary standard, not the essential nutrient screening value, was used for COPC selection.

2. **Figure 8-1 Complete Exposure Pathways for Human Receptors**

Figure 8-1 on page 8-33 illustrates complete exposure pathways for human receptors at OU4. Ingestion of groundwater is not considered a complete exposure pathway for future occupational workers, and dermal contact with groundwater is not considered a complete exposure pathway for future residents. If the area is developed for residential or commercial use, groundwater may be used as a potable water source for residences as well as industry. In addition, in the residential scenario, if groundwater is used as potable water, then dermal exposure could also be a complete exposure pathway.

The risk assessment evaluated the exposure pathways presented in the workplan (residential ingestion and inhalation) that was agreed upon by the Orlando Partnering Team, including USEPA and FDEP. The residential scenario was evaluated as the most conservative potential exposure pathway and, therefore, is protective of commercial workers as well. The only circumstances where evaluation of commercial groundwater use might provide valuable information would be if the remedial objectives for groundwater were other than compliance with MCLs. Since the remedial objectives for the groundwater at OU 4 are compliance with MCLs (which are protective for unrestricted use of the water), evaluation of commercial groundwater use does not contribute necessary information to the risk characterization. Dermal exposure to groundwater contributes exposures that are insignificant compared to ingestion and inhalation exposures. For example, the adult resident cancer and non-cancer risks for dermal contact exposures to TCE in water (based on exposure 0.2 hours per day – equal to the length of time spent showering) would be more than one order of magnitude lower than the ingestion risks, and nearly one order of magnitude lower than the inhalation risks. Therefore, quantification of dermal exposures would not measurably change the risk estimates for potential exposures to groundwater.

3. **Section 8.3.3 Quantification of Exposures**

3A. <u>Chemical-Related Variable</u> HLA states on page 8-36 that the EPC for groundwater "is the arithmetic mean concentration of wells within the groundwater plume." EPCs for groundwater are shown in Table 8-10 for the northern VOC plume, in Table 8-11 for the southern VOC plume, and in Table 8-12 for the antimony plume. The EPCs in these tables appear to be arithmetic mean of all samples within the respective plumes, calculated using one-half the reporting limit for nondetects. This is contrary to Region IV guidance, which

allows for the use of the arithmetic mean for groundwater only in the "highly concentrated area of the plume." Including marginally contaminated samples, (and, in this case, one-half the reporting limit for nondetects) has the potential to inappropriately lower the EPC. Risk calculations for exposure to groundwater at this site may therefore be substantially lower than those calculated according to the recommended methodology. HLA should determine which of the samples are representative of the most highly contaminated areas of the respective plumes and recalculate the EPCs accordingly.

The groundwater EPCs for each plume include analytical data for the wells that had detects; wells that did not have any detected COCs were excluded from the EPC calculations, even if they were within the groundwater plume. In general, the majority of wells included in the EPC for each plume had substantially elevated concentrations of COCs; there are few wells with "low levels" of COCs relative to the total number of wells within the plumes. Therefore, it is unlikely that the EPCs would significantly change if the wells with "low levels" of COCs were excluded from the EPC calculations. Moreover, since the total receptor risks for groundwater already exceed the USEPA and FDEP risk threshold criteria, increasing the EPCs (and therefore the risks) by removing some wells from the EPC data set would not change the conclusions of the risk assessment. However, to address USEPA concerns regarding potential "dilution" of the EPC and underestimation of risks, the EPCs for the COPCs contributing the greatest groundwater risks (i.e., TCE, PCE, DCE) will be revised to include only the "most contaminated" wells in each plume. The revised EPCs and associated risks will be presented and discussed in the risk assessment uncertainty section. The uncertainty discussion will emphasize that, although revising the EPCs may increase risk estimates, RGOs and the remedial objectives will not be affected.

3B. <u>Population-Related Variables</u> HLA discusses population-related variables on page 8-45 and parameters describing potentially exposed receptors are presented in Appendix E-4. Tables E-4-1 and E-4-13 present exposure parameters for the RME and central tendency resident adult and child, respectively, exposed to surface soil. The equation variables and units for dermal intake should be consistent with guidance in RAGS. However, the dermal surface area used by HLA for a child age 1-6 is 766 cm^2-year/kg. The derivation of this value is shown in Appendix E-7 (Table E-7.1); one-fourth of the total surface areas for males ages 1-6 are divided by average body weights of males and females of the same age. These values are then summed from age 1-6 to produce an age-weighted surface area. The intake equation already accounts for body weight, and cannot be used with a weight-adjusted surface area. Therefore, the child surface area should be the average of the surface area available for contact for males and females ages 1-6. The average area available for dermal contact preferred by FDEP is to assume the exposure of the hands, one-half the arms and one-half the legs. It is not unreasonable, given the climate in Florida, that a receptor would wear shorts and a short-sleeve shirt most of the year. Using data in the

Exposure Factors Handbook (1997) this value for children ages 1-6 is derived as 1869 cm^2. Age-weighted surface areas are also used in equations for the adolescent trespasser/recreational user. These should be adjusted to reflect the average surface area of the trespasser/recreator (in cm^2) available for contact.

The dermal intake equation used to evaluate exposures to children and adolescents does not take into account body weight (see risk calculations spreadsheets in Appendix E-6). Therefore, use of the age- and weight-normalized surface area value is appropriate. USEPA Region IV risk assessment guidance refers to the USEPA dermal exposure guidance (USEPA, 1992) for quantification of dermal exposures. The methods used to quantify dermal exposures for the OU 4 HHRA are consistent with this guidance. With respect to the dermal contact area used in the risk assessment, the risk assessment incorporated the assumption that 25% of the body surface area would be exposed to soils. This assumption is consistent with USEPA dermal exposure assessment guidance (USEPA, 1992; USEPA, 1997). The FDEP body surface area assumptions for soil contact (½ area of arms, ½ area of legs, and area of hands) correspond to a value equal to 25.4% of the total body surface area. This value is consistent with the surface area value of 25% that was used in the risk characterization. Using a value of 25.4% would not change the results of the risk characterization. Therefore, no revisions to the risk characterization are proposed.

3C. <u>Assessment-Related Variable</u> **On Page 8-45 and in Table E-4-3, equation variables are given for the RME site maintenance worker exposed to surface soil. The exposure frequency is listed as 30 days/year, with the source listed as 'assumption.' Some justification for this, such as a review of records and employee duties, should be given.**

Table E-4-4 presents equation variables for the excavation worker exposed to surface soil. The exposure frequency is 30 days/year and the exposure duration is one year. As we have expressed to FDEP previously, we are concerned that risks for carcinogens calculated using standard procedures, but based on very short or intermittent exposures, such as the excavation worker presented here, may be invalid. Therefore, risk based on non-cancer health effects should be performed for the excavation worker, and the higher of the two risks should be presented in the risk characterization portion of the RI. Additionally, when considering non-carcinogenic effects for the excavation worker scenario, an AT of 42 days (30 consecutive working days plus weekends) should be used. HLA uses an AT of 1 year, corresponding to the improbable situation in which a construction worker visits the site only 1 out of every 12 days over the course of a year.

Because NTC Orlando is closing, the site maintenance worker exposure scenario is a hypothetical scenario; therefore, a records search or review of employee duties is not feasible. HLA believes that the exposure parameters used for the site maintenance worker are

appropriate and reasonable assumptions given the forthcoming base closure, and the possible land reuse of this area. The exposure frequency for the excavation worker should be 5 days per week (equivalent to 250 work-days per 365 calendar-day year). The exposure duration should be one month (30 days). The tables, text, and risk calculations will be revised accordingly.

3D. Inhalation of Particulates from Soil HLA discusses the inhalation of contaminated soil on page 8-47 and the equations describing intake from inhalation of contaminated soil are given in the tables of Appendix E-4. HLA only considers inhalation of particulate matter, neglecting inhalation of contaminants volatilizing from soil. Considering the volatile COPCs in surface soil, it is appropriate to omit this exposure pathway. The CA term in the inhalation intake equations should be adjusted to account for volatilization as follows:

CA = C x CF (1/PEF + 1/VF)

The derivation of the volatilization factor (VF) can be found in the USEPA's *Soil Screening Guidance: Technical Background Document* (EPA/540/R-95/128, 1996)

Possible inhalation exposures to volatiles in soil will be evaluated. The volatilization factor will be derived in accordance with the USEPA Soil Screening Guidance (USEPA, 1996). Tables, text, and risk calculations will be revised accordingly.

3E. Inhalation of Vapors while Showering On page 8-48 and in Appendix E-8, HLA cites a shower model by Foster and Chrostowski (1987) which they use to characterize inhalation exposure of future residential receptors to volatile chemicals present in the groundwater. The only reference provided for the Foster and Chrostowski model is a presentation at the 1987 annual meeting of the APCA. If a shower volatilization model is to be used, we would prefer the use of a model that has undergone more extensive peer review. It should be noted that Region IV guidance states that it should be assumed that showering exposure is equivalent to exposure from ingestion of two liters of contaminated water per day. Using this assumption would result in a greater inhalation exposure to VOCs in the northern, southern and antimony groundwater plumes. This results in cancer risks of 1E-3 rather than 2E-5 for the northern plume; 3E-5 rather than 1E-6 for the southern plume; and 2E-6 rather than 7E-8 for the antimony plume.

The Foster and Chrostowski shower model (1987) is the exposure model most commonly used in risk assessment for evaluating possible inhalation exposures to VOCs during water spraying/dispersion activities. Although USEPA Region IV guidance suggests using the oral exposure risks for VOCs to estimate the inhalation exposure risks for VOCs, use of the shower model provides an exposure estimate that is associated with less uncertainty.

Moreover, because the health risks associated with possible ingestion exposures exceed FDEP risk criteria, and because the groundwater remedial objectives are to reduce groundwater concentrations to meet MCLs, any increases in total receptor risks will not affect the conclusions of the risk assessment. Nevertheless, total receptors risk estimates that are based on the Region IV approach (i.e., doubling the ingestion risks for VOCs to estimate inhalation risks) will be presented and discussed in the risk assessment uncertainty section.

4. **Section 8.4.2 Dose-Response Assessment**

4A. Beginning on page 8-49, HLA discusses the dose-response assessment for COPCs at OU4 and Appendix E-11 presents the toxicity factors for COPCs. However, within section 8.4.2, several references are made to toxicity information located in "Appendix E-8." These references are incorrect and should be changed to read "Appendix E-11."

The text in Section 8.4.2 will be corrected to refer to Appendix E-11, where appropriate.

4B. Inhalation slope factors and reference doses were taken primarily from HEAST. If no inhalation slope factor (or unit risk) or reference dose (or RfC) was available, one was not extrapolated and apparently no inhalation risk or hazard was calculated for those chemicals. To account for risks via this pathway HLA should extrapolate inhalation toxicity values. Alternatively, in the section on site-specific uncertainties, HLA should provide a more thorough, quantitative treatment of the potential underestimates of risk and hazard resulting from the lack of inhalation toxicity data.

USEPA does not approve nor recommend using oral dose-response values as surrogates for COPCs that do not have published inhalation dose-response values. Therefore, the suggested change will not be made to the risk assessment. However, even if oral dose-response values were used as surrogates to evaluate inhalation risks, the total receptor risk estimates for surface soil and subsurface soil would not substantially increase. This is because the COPC intakes received via inhalation exposures are three to five orders of magnitude lower than the ingestion and dermal intakes. Moreover, even if inhalation intakes were equal to ingestion intakes, the HIs for surface soil and subsurface soil would not exceed one (i.e., doubling the ingestion HIs to account for absent inhalation dose-response data would not result in HIs above 1). For groundwater, even if non-cancer inhalation risks were equal to ingestion risks, the HIs would still be greater than one. Therefore, the conclusions of the risk assessment would not change.

5. **Section 8.7 Remedial Goal Options**

On page 8-96, HLA illustrates the calculation of RGOs for COPCs at OU4. The calculated RGOs are given in Table 8-19. When using the type ratio method for the calculation of RGOs, Region IV guidance states that "it is important to include all significant pathways and routes of exposure." Since HLA has omitted several potentially important pathways and routes of exposure, as outlined above (e.g., the omission of the dermal pathway for exposure to groundwater and the omission of inhalation of VOCs from the soil), the RGOs for some chemicals may be inappropriate. It should be noted that the RGOs for some chemicals fall below the FDEP SCTLs. In these cases, it would probably not be necessary to cleanup to levels below the SCTLs.

Human Health Risk Assessment Summary

Risks calculated by HLA at OU4 are above FDEP target risk levels for both current and future land use for soils and surface water. Since no groundwater is currently being used at OU4 there are no risks to current users from this exposure medium. However, contaminated groundwater presents the greatest risk to future industrial or residential receptors at OU4. HLA has done a good job of characterizing the extent of the contamination at OU4, yet due to the omission and/or appropriate characterization of several potentially important pathways of exposure, the risks to all receptors at OU4 may be underestimated.

FDEP has cited three situations where risks may have been underestimated for some exposure media. However, for the reasons provided below, HLA does not believe that the magnitude of underestimation and/or the affect on the results and conclusions of the risk assessment are significant enough to justify revising the risk assessment or revising the RGOs.

- Quantification of inhalation risks for COPCs that lack published inhalation dose-response values: As demonstrated in the Response to Comment 10, even if the inhalation risks for surface soil and subsurface soil were assumed to be equal to the ingestion risks, the total non-cancer risks would not exceed a HI of 1. Therefore, the conclusions of the risk assessment would not change. In addition, since no RGOs were developed based on non-cancer risks, RGOs would not change. If non-cancer inhalation risks for groundwater were assumed to be equal to ingestion risks (Response to Comments 9 and 10), HIs would still exceed 1 and, therefore, the conclusions of the risk assessment would not change. Moreover, if non-cancer risks were doubled (due to the assumption that inhalation risks were equal to ingestion risks), and risk-based groundwater RGOs were subsequently divided in half, the risk-based RGOs would still be higher than the FDEP groundwater SCTLs and/or MCLs. Since the SCTLs and MCLs are the remedial

objectives for groundwater, changing (i.e., reducing) the risk-based RGOs would not change the groundwater remedial objectives.

- Quantification of inhalation exposures to volatile COPCs in soil: As discussed in the Response to Comment 8, possible inhalation exposures to COPCs that may volatilize from soil will be quantified. The additional risks associated with this exposure pathway are not anticipated to measurably change the total receptor risks.

- Quantification of dermal exposures/risks to groundwater: As demonstrated in the Response to Comment 4, the additional risks posed by dermal contact with groundwater would not add measurable risk to the total receptor risk estimates. Therefore, evaluating this pathway does not provide a value-added attribute to the risk assessment.

Ecological Risk Assessment Comments

Specific Comments

1. **On page 9-24 HLA cites the Dutch Soil Criteria "A" presented in Beyer (1990) as the source for soil ecological screening levels. Table 9-3 lists these values for chemicals detected at OU4. There have been changes in the Dutch Soil Cleanup Levels since the Beyer publication. The new Dutch list can be found on the Internet at www.ContaminatedLAND.co.uk. In the future, HLA should use this updated list as the source for its soil ecological screening values.**

   Comment noted. Future ERAs will use the new Dutch Soil Criteria.

2. **Table 9-5 presents the selection of ecological chemicals of potential concern (ECPCs) in Sediment at OU4. For sediment, HLA screened contaminant concentrations against Region IV sediment screening criteria. As a matter of practice, sediment screening values should be the lower of Region IV sediment screening criteria or FDEP's sediment quality assessment guidelines (SQAGs). When the SQAGs are applied to the sampling data from OU4, gamma-BHC (lindane) and silver should be included as sediment ECPCs.**

   The CPC selection process for sediment did not utilize the FDEP's sediment quality assessment guidelines (SQAGs) as these guidelines are marine-based and, therefore, not applicable for screening ECPCs in freshwater systems.

3. **Table 9-9 (page 9-45), describes the equations used to estimate contaminant exposures to the representative wildlife species. A reference should be provided for these equations.**

   The equations used to model contaminant exposures to representative wildlife species were developed by Harding Lawson Associates. The equations are based on the principals and procedures prescribed in the guidance documents listed in the ERA introduction. Further clarification will be provided in the Final RI Report.

4. **In Table 9-9, the equation for total exposure related to surface soil is shown along with a similar equation for total exposure related to surface water and sediment. In these equations, the variable "site foraging factor" (SFF) is defined as the site area (in acres) divided by the home range of a predator (in acres). For some predators, the SFF is much less than 1. This is contrary to guidance from *Ecological Risk Assessment Guidance for Superfund* which states that in screening level risk assessments, area use factors should be assumed to be 1 (100%). Thus, for this screening level ERA, HLA should change their SFF accordingly.**

   Refer to response to USEPA Comment 15. The OU4 ERA is a combination of a screening-level and baseline ERA. In this streamlined approach, the duplication of ERA processes was eliminated. The incorporation of a calculated SFF more accurately represents the percentage of time a receptor would likely use a contaminated area, thus eliminating the conservative assumption that all receptors would spend all their time at the site. Being that the small mammals with home ranges less than the site area are typically the most sensitive receptors in the model, the risk estimates for these receptors would not change.

General Comments

1. **HLA did a poor job of characterizing the levels of contaminants in the Lake Druid surface water and sediment. Few samples were taken, and only one of each was analyzed for contaminants other than VOCs. A sampling plan that better characterized the distribution of all contaminants in the Lake Druid surface water and sediment on the area of OU4 should have been prepared. As is, the data for analytes such as inorganics, pesticides, and SVOCs are not very helpful.**

   The objective of the Lake Druid surface water and sediment sampling program, as defined in the approved RI Work Plan for OU 4, was to obtain data needed to complete the risk assessment. The intent was not to fully delineate VOCs as part of the RI. The OU 4 Work Plan had originally proposed analyzing samples for VOCs only. At the request of the USEPA, the Navy agreed to analyze the sample collected at the mouth of the OU 4 drainage

area for the full suite of analyses. This approach was agreed upon by all members of the OPT. The OU 4 Work Plan includes the number of samples and types of analyses, which are commensurate with historic use, migration of site contaminants, and exposure potential at the site.

VOC concentrations in surface water and sediment were delineated during the 1996 Focused Field Investigation (FFI). Figures 2-6 and 2-7 in the OU 4 RI/FS Work Plan (HLA, 1997) summarize total VOC concentrations in Lake Druid surface water and sediment.

2. **The finding by HLA that site-related VOCs pose little risk to ecological receptors seems justified. However, the dismissal of other ECPCs is troubling. Several inorganic ECPCs, including mercury, exceeded the RTVs for particular receptors. In these cases, the risks to the receptors were dismissed because the ECPCs were deemed not to be "site-related." Whether due to site-related activities or not, several ECPCs may present a risk to ecological receptors at OU4 and should undergo a more extensive evaluation.**

The ERA, which is based on multiple conservative assumptions, concluded that risk estimates for these chemicals were low. Risks were predicted for small gramnivorous and omnivorous mammals, however the magnitude of risks are low and, therefore, would not likely result in adverse population-level effects. An extensive evaluation of chemicals that show no evidence of migration from OU 4 is not warranted; particularly since there is no basis as per the ERA conclusions.