M67001.AR.002773
MCB CAMP LEJEUNE
5090.3a

Final

Vapor Intrusion Evaluation Report
Volume 2 of 6—Mainside

Marine Corps Base Camp Lejeune
Jacksonville, North Carolina

NAVFAC
Naval Facilities Engineering Command
NAVFAC MID-ATLANTIC

Prepared for
Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Contract No. N62470-03-D-0260
Task Order-0021

November 2009

Prepared by

AGVIQ
AGVIQ ENVIRONMENTAL SERVICES
CH2M HILL
JOINT VENTURE

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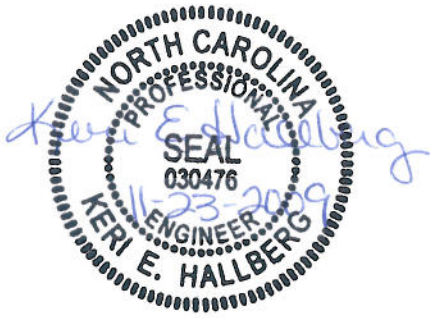

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Virginia Beach, Virginia

Contents

Abbreviations and Acronyms ..... **v**

1 Introduction **1-1**

2 Investigation Methods **2-1**
2.1 Phase I Sampling Event 2-1
2.1.1 Phase I Sample Locations 2-1
2.2 Phase II Sampling Event 2-3
2.2.1 Phase II Sample Locations 2-4

3 Quality Assurance **3-1**

4 Vapor Intrusion Evaluation Results and Conclusions **4-1**
4.1 Analytical Data 4-1
4.2 Outdoor Air 4-1
4.3 Aerobic Biodegradation Parameters 4-2
4.4 Building Specific Data Evaluations and Conceptual Site Model Discussions 4-4
4.4.1 Site 88 4-5
4.4.2 SWMU 118 4-18
4.4.3 SWMU 360 4-20
4.4.4 Site 820 4-25
4.4.5 UST LCH-4015 4-28

5 Overall Conclusions and Recommendations **5-1**
5.1 Recommendations for Additional Sampling 5-2
5.2 Recommendations for Building Use Restrictions 5-2
5.3 Recommendations for Remediation 5-3
5.4 Preferential Pathways 5-3

6 References **6-1**

Tables

V2-1 Phase I Sampling Summary
V2-2 Phase I Air Resampling Summary
V2-3 Phase II Air Sampling Summary
V2-4 Summary of Mainside Phase I Groundwater Constituent Detections
V2-5 Summary of Mainside Phase I Shallow Soil Gas Constituent Detections
V2-6 Summary of Mainside Phase I Deep Soil Vapor Constituent Detections
V2-7 Summary of Mainside Phase I Subslab Soil Gas Constituent Detections
V2-8 Summary of Mainside Phase I Indoor Air Constituent Detections
V2-9 Summary of Mainside Phase I Outdoor Air Constituent Detections
V2-10 Summary of Mainside Phase II Subslab Soil Gas Constituent Detections
V2-11 Summary of Mainside Phase II Indoor Air Constituent Detections
V2-12 Summary of Mainside Phase II Outdoor Air Constituent Detections

V2-13 Maximum Concentrations Detected in Outdoor Air
V2-14 Phase I Oxygen Measurements
V2-15 Phase II Oxygen and Carbon Dioxide Measurements
V2-16 Summary of Building 3 Investigation Results
V2-17 Summary of Building 3B Investigation Results
V2-18 Summary of Building 37 Investigation Results
V2-19 Summary of Building 43 Investigation Results
V2-20 Summary of Building 728 Investigation Results
V2-21 Summary of Building 1828 Investigation Results
V2-22 Summary of Building 1855 Investigation Results
V2-23 Summary of Building 820 Investigation Results
V2-24 Summary of Building LCH-4014 Investigation Results
V2-25 Summary of Recommendations

Figures

V2-1 Site 88 Phase I Sample Locations
V2-2 SWMU 118 Phase I Sample Locations
V2-3 SWMU 360 Phase I Sample Locations
V2-4 Site 820 Phase I Sample Locations
V2-5 Site LCH-4015 Phase I Sample Locations
V2-6 Site 88 Phase II Sample Locations
V2-7 SWMU 360 Phase II Sample Locations
V2-8 Mainside Building 3B Vapor Intrusion Conceptual Site Model
V2-9 Mainside Building 37 Vapor Intrusion Conceptual Site Model
V2-10 Mainside Building 43 Vapor Intrusion Conceptual Site Model
V2-11 SWMU 360 Buildings 1817, 1819, and Mainside Buildings 1828 and 1855 Vapor Intrusion Conceptual Site Model
V2-12 Site 88 Historical Groundwater Exceedances
V2-13 SWMU 118 Historical Groundwater Exceedances
V2-14 SWMU 360 Historical Groundwater Exceedances
V2-15 Site 820 Historical Groundwater Exceedances
V2-16 Site LCH 4015 Historical Groundwater Exceedances
V2-17 Site 88 Utility Locations

Appendices

V2-A Field Data Sheets
V2-B Data Quality Evaluation
V2-C Building Surveys
V2-D Chain of Custody Records
V2-E Laboratory Data

Abbreviations and Acronyms

AF	attenuation factor
AS	air sparge
AST	aboveground storage tank
bgs	below ground surface
BS	biosparge
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAP	Corrective Action Plan
COC	chain of custody record
CSA	crawl space air
CSI	confirmatory sampling investigation
CSM	conceptual site model
DCE	dichloroethene
DOD	Department of Defense
FSP	Field Sampling Plan
ft	feet/foot
GIS	geographic information system
GWSL	Groundwater Screening Level
HVAC	heating, ventilating, and air conditioning
IA	indoor air
IASL	Indoor Air Screening Level
ID	identification
IR	Installation Restoration
ITRC	Interstate Technology & Regulatory Council
J	estimated value
µg/L	microgram per liter
MCB	Marine Corps Base
MEK	methyl-ethyl-ketone
MTBE	methyl tert butyl ether
NCGWQS	North Carolina Groundwater Quality Standards
ND	Not detected
OA	outdoor air
OU	operable unit
PCE	tetrachloroethene
PMO	Project Management Office

ppbv	parts per billion by volume
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RSL	Regional Screening Level
SG	soil gas
SGSL	Soil Gas Screening Level
SVE	soil vapor extraction
SWMU	Solid Waste Management Unit
TCE	trichloroethene
U	undetected
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride
VOC	volatile organic compound

SECTION 1

Introduction

Mainside is the main area of Camp Lejeune and is located east of the New River. Hadnot Point, the industrial area, is located within Mainside. Mainside is home to the II Marine Expeditionary Force, 2nd Marine Division, three other major Marine commands, and a Naval hospital. There are barracks, residential housing, schools, and commercial areas in Mainside.

Mainside was one of six investigation areas evaluated as part of the basewide vapor intrusion evaluation at Marine Corps Base (MCB) Camp Lejeune that took place from September 2007 to March 2009. The basewide vapor intrusion evaluation at MCB Camp Lejeune was performed in accordance with the Vapor Intrusion Evaluation Work Plan (CH2M HILL, 2008a). Buildings of interest in Mainside were selected for Phase I sampling according to the process detailed in the Work Plan. One installation restoration (IR) site (Site 88), two Resource Conservation and Recovery Act (RCRA) sites (Solid Waste Management Unit 118 (SWMU 118) and SWMU 360), and two underground storage tank (UST) sites (Building 820 and Building LCH-4015) were retained for further evaluation of vapor intrusion pathways in the Mainside area. Volatile constituents of concern within Mainside include chlorinated solvents and petroleum-related compounds.

The following sections provide information on the investigation methods, the data obtained, and the conclusions and recommendations of the vapor intrusion evaluation in Mainside.

SECTION 2

Investigation Methods

2.1 Phase I Sampling Event

Nine buildings of interest were identified in Mainside for data collection during the Phase I sampling event. Each of these buildings is located within 100 feet of a shallow groundwater well with exceedances of the site-specific groundwater-to-indoor air screening levels. Samples collected in Mainside were located in the vicinity of one IR site (Site 88), two RCRA sites (Sites SWMU 118 and 360), and two UST sites (Building 820 and Building LCH-4015).

Sample collection procedures are provided in Volume 1.

2.1.1 Phase I Sample Locations

Sample locations from the Phase I sampling event are shown on Figures V2-1 through V2-5. The field data sheets associated with the samples collected are provided in Appendix V2-A. The chain of custody records (COCs), which log the samples collected, are provided in Appendix V2-D.

Eleven groundwater grab (sample type – GW), 13 exterior soil vapor (sample type – SV), 5 subslab soil gas (sample type – SG) 2 of which were crawl space samples, 4 indoor air (sample type IA), and 3 outdoor air (sample type – OA) samples were collected in Mainside during the Phase I field event. Quality control samples were collected in accordance with Section 2.7 of the Field Sampling Plan (FSP) (CH2M HILL, 2008a).

The Table V2-1 lists the samples that were proposed in the work plan and the deviations that occurred during the Phase I field event:

TABLE V2-1
Phase I Sampling Summary
Mainside, MCB Camp Lejeune, North Carolina

Site Name	Building	Sample Type	Sample Identification (ID)	Sample Collected Y/N)	Deviations
Site 88	3	GW	IR88-IS02-GW-15-17-08B	Y	–
		SV	IR88-IS02-SV-05-06-08B	Y	–
		SV	IR88-IS12-SV-XX-XX-08B	N	Could not locate existing point
		SV	IR88-IS13-SV-4.5-5.5-08B	Y	–
		SV	IR88-IS14-SV-4.5-5.5-08B	Y	–
	3B	GW	IR88-IS01-GW-13-15-08B	Y	–
		SV	IR88-IS01-SV-05-06-08B	Y	–
	37	GW	IR88-IS05-GW-11-12-08B	Y	–
		SV	IR88-IS05-SV-05-06-08B	Y	–
		GW	IR88-IS06-GW-09-10-08B	Y	–
		SV	IR88-IS06-SV-05-06-08B	Y	–
		GW	IR88-IS07-GW-10-11-08B	Y	–

TABLE V2-1
Phase I Sampling Summary
Mainside, MCB Camp Lejeune, North Carolina

Site Name	Building	Sample Type	Sample Identification (ID)	Sample Collected Y/N)	Deviations
		SV	IR88-IS07-SV-05-06-08B	Y	–
	43	GW	IR88-IS03-GW-12-13-08B	Y	–
		SV	IR88-IS03-SV-05-06-08B	Y	–
		GW	IR88-IS04-GW-11-12-08B	Y	–
		SV	IR88-IS04-SV-05-06-08B	Y	–
SWMU 118	728	SG	SWMU118-SG05-08B	N	Subslab exposed to ambient air; foundation elevated
		IA	SWMU118-IA05-08B	N	Subslab exposed to ambient air; foundation elevated
		OA	SWMU118-OA04-08B	N	(2) Crawl Space Samples taken
		CSA	SWMU118-CSA05-08B	Y	–
		SG	SWMU118-SG06-08B	N	Subslab exposed to ambient air; foundation elevated
		IA	SWMU118-IA06-08B	N	Subslab exposed to ambient air; foundation elevated
		CSA	SWMU118-CSA06-08B	Y	Due to canister failure, this sample was not analyzed
SWMU 360	1828	GW	SWMU360-IS08-GW-20-22-08B	Y	–
		SV	SWMU360-IS08-SV-17-18-08B	Y	–
		GW	SWMU360-IS11-GW-23-25-08B	Y	–
		SV	SWMU360-IS11-SV-17-18-08B	Y	–
	1855	GW	SWMU360-IS09-GW-23-25-08B	Y	–
		SV	SWMU360-IS09-SV-14-15-08B	Y	–
		GW	SWMU360-IS10-GW-23-25-08B	Y	–
		SV	SWMU360-IS10-SV-13-14-08B	Y	–
Site 820	820	SG	UST820-SG03-08B	Y	–
		IA	UST820-IA03-08B	Y	–
		OA	UST820-OA03-08B	Y	–
		SG	UST820-SG04-08B	Y	–
		IA	UST820-IA04-08B	Y	–
LCH-4015	LCH 4014	SG	LCH4015-SG01-08B	N	Asbestos Tiles
		IA	LCH4015-IA01-08B	Y	–
		OA	LCH4015-OA02-08B	Y	–
		SG	LCH4015-SG02-08B	Y	–
		IA	LCH4015-IA02-08B	Y	–
		OA	LCH4015-OA01-08B	Y	–

CSA = crawl space air. The sample ID naming convention for SV samples indicates the sample depth interval; the two sets of two-digit numbers following SV is the sample depth interval. Shallow samples are considered those from 0-6 feet below ground surface (ft bgs); deep samples are considered those intervals that exceed 6 ft bgs. Example: SWMU360-IS10-SV-**13**-**14**-08B indicates that this soil vapor sample was collected between 13 and 14 ft bgs and is therefore a deep soil vapor sample.

During the Phase I sampling event, there were several minor deviations to the Work Plan. For example, the method used to install subslab probes into a foundation requires drilling a

1-inch diameter hole into the floor of the structure. This creates a considerable amount of dust and was therefore infeasible in Building LCH4014B, where the entire floor surface is covered with asbestos floor tiles.

The subslab, indoor air, and outdoor air samples proposed for Building 728 (Site SWMU 118) were not collected. In their place, two crawl space air samples were collected to represent the area beneath the structure which was elevated 1 ft above the ground surface towards the south side of the building and 3 feet above ground surface towards the north side of the building. The sampling procedures for these two crawl space air samples are discussed further in Section 2.3.5 of Volume 1.

Upon the receipt of preliminary data results indicating elevated concentrations of tetrachloroethene (PCE) in groundwater and soil vapor samples (Section 4.4.1) collected on Site 88, a confirmatory set of indoor air samples were proposed for Buildings 3B, 37 and 43. The field data sheets associated with the samples collected are provided in Appendix V2-A. The COCs, which log the samples collected, are provided in Appendix V2-D. The following samples were collected on September 11 and 12 2008:

- Four indoor air samples were collected at Site 88:
  - One inside Building 3B
  - Two inside Building 37
  - One inside Building 43
- One outdoor air sample was collected at Site 88: adjacent to Building 43

Table V2-2 lists the samples that were proposed as follow-up confirmatory samples and the deviations which occurred during the sample collection in September 2008.

TABLE V2-2
Phase I Air Resampling Summary
Mainside, MCB Camp Lejeune, North Carolina

Site Name	Building	Sample Type	Sample ID	Sample Collected (Y/N)	Deviations
Site 88	3B	IA	IR88-IA04-08C	Y	Labeled 88-IA04 in the field
	37	IA	IR88-IA01-08C	Y	Labeled 88-IA01 in the field
		IA	IR88-IA02-08C	Y	Labeled 88-IA02 in the field
	43	IA	IR88-IA03-08C	Y	Labeled 88-IA03 in the field
		OA	IR88-OA05-08C	Y	Labeled 88-OA05 in the field

Each sample collected during this event was not labeled according to the predetermined IDs set forth in the field instructions.

2.2 Phase II Sampling Event

Of the nine buildings sampled in Mainside during Phase I, five were retained for Phase II sampling in accordance with the procedures described in Volume 1, Section 2 and the details provided in the refined conceptual site models (CSMs) for the buildings of interest

discussed in Section 4. The five buildings retained for Phase II sampling had exceedances in groundwater, soil vapor, soil gas. Samples collected in Mainside were located in the vicinity of IR Site 88 and Site SWMU 360.

Sample collection procedures are provided in Volume 1.

2.2.1 Phase II Sample Locations

Sample locations from the Phase II sampling event are shown on Figure V2-3. The field data sheets associated with the samples collected are provided in Appendix V2-A. The COCs, which log the samples collected, are provided in Appendix V2-D.

Nine subslab soil gas (SG), four indoor air (IA), and three outdoor (OA) samples were collected in Mainside during the Phase II field event. Quality control samples were collected in accordance with Section 2.7 of the FSP, Appendix A of the Final Vapor Intrusion Evaluation Work Plan (CH2M HILL, 2008a).

The air samples collected during the Phase II field event are listed in Table V2-3:

TABLE V2-3
Phase II Air Sampling Summary
Mainside, MCB Camp Lejeune, North Carolina

Site Name	Building	Sample Type	Sample ID	Sample Collected (Y/N)	Deviations
Site 88	3B	SG	IR88-SG05-08C	Y	—
		SG	IR88-SG13-08C	Y	Labeled SG09 in the field
		IA	IR88-IA07-08C	Y	—
		OA	IR88-OA01-08C	Y	—
	37	SG	IR88-SG07-08C	Y	—
		SG	IR88-SG08-08C	Y	—
		IA	IR88-IA09-08C	Y	—
		IA	IR88-IA10-08C	Y	—
		OA	IR88-OA03-08C	Y	—
	43	SG	IR88-SG06-08C	Y	—
		IA	IR88-IA08-08C	Y	—
		OA	IR88-OA02-08C	Y	—
SWMU 360	1828	SG	SWMU360-SG11-08C	Y	—
		SG	SWMU360-SG12-08C	Y	—
	1855	SG	SWMU360-SG09-08C	Y	—
		SG	SWMU360-SG10-08C	Y	—

During the Phase II sampling event, one minor deviation to the Work Plan occurred. One of the subslab soil gas samples collected in Building 3B was mislabeled as IR88-SG09-08C in the field but later corrected with the lab to reflect the correct sample ID: IR88-SG13-08C.

SECTION 3

Quality Assurance

The data quality evaluation assesses the effect of the overall analytical process on the "availability" of the analytical data. "Availability" in this context refers to whether results can be used by the project team based on their analytical soundness. If a result is analytically sound, it is available for use by the project team.

Evaluation of laboratory performance is a check for compliance with the method requirements. Additionally, an independent, third-party validator conducted a review of the laboratory data to assess whether the analytical methods were within required control limits at the time of analysis. Evaluation of potential matrix interferences involves the review of several areas of results, including surrogate spike recoveries, matrix spike recoveries, and duplicate sample results.

The data evaluation and validation is a multi-tiered process. The process begins with an internal laboratory review, continues with an independent review by a third-party validator, and ends with an overall review by the Navy contractor project chemistry team. While only the data validator is allowed to apply qualifiers to the data, the process provides a medium for essential communication between the laboratory, validator, and project team, and allows for data quality to be thoroughly evaluated. Details of the data quality evaluation are presented in Appendix V2-B.

All data collected in support of Phase I and Phase II sampling events were found to be of exceptional quality. No data were rejected because of quality assurance/quality control (QA/QC) deficiencies and all data were deemed available for use by the project team.

SECTION 4

Vapor Intrusion Evaluation Results and Conclusions

4.1 Analytical Data

Tables V2-4 through V2-9 present a summary of the results from Phase I groundwater, shallow soil vapor, deep soil vapor, subslab soil gas, indoor air, and outdoor air samples. Figures V2-1 through V2-5 present the Phase I sample locations in Mainside.

Tables V2-10 through V2-12 present a summary of the results from the Phase II groundwater, subslab soil gas, indoor air, and outdoor air samples. Figures V2-6 and V2-7 show the Phase II sample locations in Mainside.

The text tables (V2-16 through V2-24) identify the constituents that exceeded the screening levels. The other tables (V2-4 through V2-12) include only constituents that were detected in at least one sample of each sample type in the investigation area during that phase of investigation. The raw laboratory data tables are provided in Appendix V2-E.

4.2 Outdoor Air

Outdoor air samples were collected during Phase I for comparison with indoor air concentrations to evaluate the potential influence of outside air on indoor air quality. Table V2-9 (Phase I) and Table V2-12 (Phase II) present the outdoor air results. The maximum detected concentrations for each constituent which was detected in at least one outdoor air sample are presented in Table V2-13.

The following outdoor air samples were collected during Phase I:

- LCH4015-OA01-08B near Building LCH-4014A
- LCH4015-OA02-08B near Building LCH-4014 B
- IR820-OA03-08B near Building 820
- IR88-OA05-08C near Building 43

The following outdoor air samples were collected during Phase II:

- IR88-OA01-08C near Building 3B
- IR88-OA02-08C near Building 43
- IR88-OA03-08C near Building 37

TABLE V2-13
Maximum Concentrations Detected in Outdoor Air
Mainside, MCB Camp Lejeune, North Carolina

Detected Concentrations in Outdoor Air	Phase I Max Detect (ppbv)	Phase II Max Detect (ppbv)
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.096J	0.081J
2-Butanone	3.1	0.63J
Acetone	18	0.53J
Benzene	0.32	0.21
Carbon disulfide	0.39J	ND
Carbon tetrachloride	0.12J	0.095J
Chloromethane	1.7	1.7
Dichlorodifluoromethane (Freon-12)	0.68	0.58
Methylene chloride	ND	2
Tetrachloroethene	ND	0.21
Toluene	0.97	0.48
Trichlorofluoromethane(Freon-11)	0.42	0.28
m- and p-Xylene ND = not detected; J = estimated value ; ppbv = parts per billion by volume	0.5	ND

4.3 Aerobic Biodegradation Parameters

Petroleum hydrocarbons biodegrade under aerobic conditions in soil gas and groundwater near the top of the water table. Vadose zone oxygen concentrations above 4 percent are adequate for substantial degradation of benzene, toluene, ethylbenzene, and xylenes (BTEX) constituents (DeVaull et al. 1997). The rate of degradation in the vapor phase of each petroleum hydrocarbon is different and can vary based on site conditions and the presence of other constituents. The aerobic biodegradation of petroleum hydrocarbons consumes oxygen and generates carbon dioxide.

Field measurements of oxygen were collected during Phase I with a multiRae Five-gas meter to determine if sufficient oxygen is present in the subsurface to allow for aerobic biodegradation (Table 2-14).

TABLE V2-14
Phase I Oxygen Measurements
Mainside, MCB Camp Lejeune, North Carolina

Sample ID	O2 (%)
IR88-IS01-SV-05-06-08B	6.2
IR88-IS02-SV-05-06-08B	19.0
IR88-IS03-SV-05-06-08B	16.7
IR88-IS04-SV-05-06-08B	3.0
IR88-IS05-SV-05-06-08B	18.4

TABLE V2-14
Phase I Oxygen Measurements
Mainside, MCB Camp Lejeune, North Carolina

Sample ID	O2 (%)
IR88-IS06-SV-05-06-08B	15.1
IR88-IS07-SV-05-06-08B	20.9
IR88-IS13-SV-4.5-5.5-08B	18.8
IR88-IS14-SV-4.5-5.5-08B	18.5
SWMU360-IS01-SV-11-12-08B	15.8
SWMU360-IS02-SV-16-17-08B	7.3
SWMU360-IS03-SV-06-07-08B	18.4
SWMU360-IS08-SV-17-18-08B	20.9
SWMU360-IS09-SV-14-15-08B	12.5
SWMU360-IS10-SV-13-14-08B	15.3
SWMU360-IS11-SV-17-18-08B	17.6

Field measurements of oxygen were collected during Phase II with a Gem2000 landfill gas meter to determine if sufficient oxygen is present in the subsurface to allow for aerobic biodegradation. Field measurements of carbon dioxide were also collected with the Gem2000 meter to determine if aerobic biodegradation may already be occurring.

TABLE V2-15
Phase II Oxygen and Carbon Dioxide Measurements
Mainside, MCB Camp Lejeune, North Carolina

Sample ID	O2 (%)	CO2 (%)
IR88-SG05-08C	20.1	0.9
IR88-SG06-08C	17.4	3.8
IR88-SG07-08C	21.1	0.3
IR88-SG08-08C	19.7	1.5
IR88-SG13-08C	17.1	6.0
SWMU360-SG11-08C	5.4	15.3
SWMU360-SG12-08C	6.9	10.4
SWMU360-SG09-08C	20.6	0
SWMU360-SG10-08C	20.8	0

At least 4 percent oxygen was detected at all but one location (IR88-IS04, adjacent to Building 43). However, IR88-IS03 is also located adjacent to Building 43 and contained 16.7 percent oxygen. Therefore, the data indicate that there is the potential for aerobic biodegradation of hydrocarbons in the soil gas near each of the buildings evaluated within Mainside. The data also indicate that aerobic biodegradation may already be occurring at Building 1828 where decreased oxygen levels and increased carbon dioxide levels were observed at SWMU360-SG12 and –SG11. If petroleum hydrocarbons are determined to be

constituents of interest at these buildings, the potential for aerobic biodegradation will be considered as an additional line of evidence for the vapor intrusion evaluation.

4.4 Building-Specific Data Evaluations and Conceptual Site Model Discussions

A vapor intrusion CSM addresses three components: (1) the volatile organic compound (VOC) source (soil or groundwater contamination); (2) migration from the subsurface and through the slab; and (3) building characteristics and potential receptors (building occupants). Consistent with U.S. Department of Defense (DOD) (2009) Vapor Intrusion Handbook, multiple lines of evidence were incorporated into the vapor intrusion CSM. The initial or primary source in most cases is assumed to be related to a fuel or solvent spill or leak, with the secondary source being potentially impacted groundwater, soil, soil vapor, and soil gas.

Transport mechanisms for VOCs in the vadose zone primarily include diffusion and advection. VOCs migrate following concentration gradients from source areas of high concentration to surrounding areas of lower concentration by diffusion. Soil gas is pulled into the building through openings in the slab if the building is negatively pressurized in relation to the subsurface soil. Openings in the slab may include expansion joints, cracks, or utility conduits.

The building characteristics which affect vapor transport and VOC concentration include the pressurization of the building, indoor air volume, the rate of indoor-to-outdoor air exchange, and the integrity of the slab. Pressurization of the building is dependent on factors such as the air handling system and the construction and use of the building. The indoor air volume and indoor-to-outdoor air exchange rate affects how quickly VOCs in the building dissipate or are diluted. The location (above, on, or below grade) of the slab determines how close the building is to the source area. The integrity (thickness and presence of openings) of the slab determines how readily VOCs may enter the building.

Building surveys were completed during Phases I and II at buildings where interior samples were collected to gather information on building characteristics relevant to the vapor intrusion pathway. The building survey forms are presented in Appendix V2-C.

The information provided on the building survey forms was gathered during initial visits to the buildings and in some instances, was based only on rough estimates (e.g., dimensions were estimated, not measured). More complete and accurate information was gathered by the sampling team during other trips to the buildings during the Phase II sampling event. Building information was also obtained from building schematics provided by the Navy and/or photographs; however, these documents and photos were not included in the report due to their sensitive nature.

Groundwater and exterior soil vapor samples were associated primarily with individual buildings, as indicated in Table V2-1. However, select groundwater and exterior soil vapor samples were also considered in the evaluations at neighboring buildings.

4.4.1 Site 88

Site 88 is located within Operable Unit (OU) 15 and is the former Base Dry Cleaning Facility (former Building 25). The dry cleaning operations began in the 1940s and ceased in January 2004, and the building was demolished to the slab in August 2004. PCE was used as the dry cleaning fluid beginning in the 1970s. The remedial action performed at Site 88 in 2005 treated approximately 7,050 cubic yards of impacted soil with shallow soil mixing with clay/zero-valent iron and dual phase extraction. As a result, PCE concentrations in the soil were reduced by more than 99 percent. However, residual dissolved phase groundwater VOC contamination remains over a large portion of the surrounding and down-gradient areas. The Final Amended Remedial Investigation (RI) Report (CH2M HILL, 2008c), submitted in March 2008, identified a former leaking sanitary sewer line as a secondary source of chlorinated VOCs at Site 88.

More information about the status of this site and additional details from previous site reports are presented in Section 2.2.1 of the Work Plan (CH2M HILL, 2008a). Buildings 3, 3B, 37, and 43 are located in the southeastern portion of Site 88 (Figure V2-1). The groundwater flow direction in the shallow aquifer is complex, partially because of mounding created by the clay mixing. The subsurface at Site 88 consists primarily of sand. Depth to groundwater in shallow monitoring wells, measured during the August 2007 sampling event, ranged from approximately 7 to 15 ft bgs (CH2M HILL, 2008c).

Building 3

Building 3 is located within Site 88. It is used as the Project Management Office (PMO) Headquarters and primarily contains office space. It is classified as a large industrial building for this evaluation. Building 3 was included in Phase I because it is located within 100 ft of one shallow monitoring well (IR88-GW16) which had exceedances of the site-specific Groundwater Screening Levels (GWSLs) for large buildings, as shown in Table V2-16. The depth to groundwater at this well is approximately 8 ft. Shallow groundwater flow in the vicinity of Building 3 is radial.

Building Characteristics. Building 3 is a two-story, C-shaped brick and mortar building. The building is approximately 150 feet long by 35 feet wide. The building's foundation is elevated approximately 1 ft above the exterior ground surface. The slab thickness is unknown since no subslab samples were collected in this building. The building has approximately 7 doors, 1 double door, and 56 (approximately 2 by 4 feet) windows evenly placed around the building. Building 3 was under construction during Phase I and Phase II sampling events and doors and windows were not in place. A building survey was not performed because of the construction taking place within the structure. After construction is complete, approximately 50workers are expected to occupy the building during working hours, which are from 7 a.m. to 3 p.m. on weekdays.

Analytical Results. Historical (2002–2007) shallow groundwater VOC concentrations above the site-specific GWSLs within 100 ft of Building 3 are summarized in this section and were taken from the Work Plan (CH2M HILL, 2008a). Phase I groundwater sample locations are shown on Figure V2-1, and the Phase I groundwater sample results are provided in Table V2-4. Phase I soil vapor sample locations are shown on Figure V2-1, and the Phase I soil vapor sample results are provided in Table V2-5. Phase II sampling was not conducted at

this building due to the construction activities. Results for the GWSL, Soil Gas Screening Levels (SGSLs), and/or Indoor Air Screening Level (IASL) exceedances are provided in Table V2-16.

TABLE V2-16
Summary of Building 3 Investigation Results
Mainside, MCB Camp Lejeune, North Carolina

Building 3 Historical (2002 – 2007) Site-Specific Groundwater Screening Level Exceedances

Well ID	Screen Depth (ft bgs)	PCE (µg/L)
GWSL		*5.49*
IR88-GW16	4 – 14	55

Building 3 Phase I Generic Groundwater Screening Level Exceedances

Sample ID	PCE (µg/L)	Benzene (µg/L)
GWSL (based on industrial air RSL)	*2.79*	*7.05*
IR88-IS01-GW-13-15-08B	1,100	33U
IR88-IS02-GW-15-17-08B	-	-

Building 3 Phase I Shallow Soil Vapor Screening Level Exceedances

Sample ID	PCE (ppbv)	Benzene (ppbv)
SGSL (based on industrial air RSL; AF=1E-01)	*3.1*	*5.01*
Base-Specific SGSL (AF=1E-03)	*310*	*501*
IR88-IS01-SV-05-06-08B	**300,000**	**3,000 U**
IR88-IS02-SV-05-06-08B	**1,100**	6.3
IR88-IS13-SV-4.5-5.5-08B	120	-

BOLD indicates exceeds Base-Specific SGSL; AF = attenuation factor; U = undetected; µg/L = microgram per liter

- indicates the compound does not exceed the screening level

Refined CSM. Building 3 is located approximately 300 feet west and up-gradient of Building 25, the former dry cleaning facility. An industrial sewer extended northwest from Building 25 in the general direction of Building 3, and came within 75 feet of the northeast portion of Building 3. This sewer was determined to be an additional PCE source during the Site 88 RI.

Historical (2002-2007) PCE concentrations in a nearby cross-gradient shallow monitoring well (4 to 14 ft bgs screen depths) were approximately 10 times the site-specific GWSL. This historical groundwater monitoring well GWSL exceedance triggered the Phase I sampling.

Co-located groundwater grab and soil gas samples were collected at two locations near Building 3 during Phase I. Soil gas sampling at two existing permanent soil gas probes near Building 3 was also proposed for Phase I, but one of the soil gas probes could not be located. At the sample location north of Building 3, IR88-IS01, PCE in the water table groundwater sample was detected at 1,100 µg/L, approximately 390 times the generic GWSL. Benzene was not detected above the reporting limit (33U µg/L) at this location, but the reporting limit exceeded the GWSL due to the dilutions needed to quantify the PCE detection. PCE was detected in all three soil gas samples collected near Building 3 at concentrations which

exceeded the SGSL approximately 40 to 97,000 times. PCE also exceeded the base-specific screening level by 4 to 970 times. Benzene was also detected in one soil gas sample at a concentration of 6.3 ppbv, which slightly exceeded the screening criterion of 5.01 ppbv. Benzene was not detected (3,000U ppbv) above the reporting limit in sample IR88-IS02, but the reporting limit exceeded the SGSL because of dilution effects.

Subslab and indoor air sampling was not proposed for Phase II even though the Phase I PCE groundwater and soil gas exceedances were more than two orders of magnitude higher than the generic SGL. The building was undergoing construction and the windows and doors were not in place.

Conclusions. There is a potential that vapor intrusion pathway could cause unacceptable levels of constituents in indoor air, particularly in the northern portion of the building given the elevated concentrations of PCE present in the groundwater and exterior soil gas samples.

Recommended Further Actions

1. When building renovations are completed, a minimum of two rounds of concurrent indoor air and subslab soil gas sampling should be conducted to better determine the potential for vapor intrusion and to confirm that concentrations of PCE are not occurring at unacceptable cancer risk and/or non-cancer hazard levels in indoor air. The first round of sampling should be completed before the building is occupied.
2. Remedial actions to address the chlorinated VOC (e.g., PCE) source(s) at Building 3 and the neighboring Building 3B are recommended given the significant soil gas concentrations and the potential for future impacts. A monitoring program should be developed in alignment with the selected remedial actions. A more complete subsurface source area investigation may be needed to identify the source of the elevated PCE and trichloroethene (TCE) subslab soil gas concentrations at Building 3B if remedial actions are to be developed and implemented. TCE is a daughter product of PCE degradation and is known to be present at Site 88 at elevated concentrations. This compound will be included as a future contaminant of concern for Building 3.

Building 3B

Building 3B is located within Site 88. The eastern half of the building is used as an office for PMO operations, specifically traffic control and public safety. The western half of the building is used as office space and storage. The structure is classified as a small industrial building for this evaluation. Building 3B was included in Phase I since it is located within 100 ft of one shallow monitoring well (IR88-GW16) which had exceedances of the site-specific GWSLs for small industrial buildings, as shown in Table V2-17. The depth to groundwater at this well is approximately 8 ft. Shallow groundwater flow in the vicinity of Building 3B is radial.

Building Characteristics. Building 3B is a one-story concrete block and mortar building approximately 60 feet long by 12 feet wide by 8 ft high. The building is divided in half by a complete concrete block wall. The western side of the building exterior is brick and the eastern side of the exterior is vinyl siding. The entire floor surface is covered with vinyl tile.

The building likely has perimeter wall footings with additional footings underneath the pillars observed within the building. The concrete slab is level with the exterior ground surface; it is approximately 6 inches thick and contains wire mesh. There are no expansion joints in the building. There are floor drains/sumps present in the building. Building 3B does have a heating, ventilating, and air conditioning (HVAC) unit with one evaporator/condenser unit located on the east end of the building and a second evaporator/condenser unit located on the west end. The building has eight windows and three doors that typically remain closed.

Some of the items observed in the building during the Phase II building inspection included Windex® and Pledge®.

There are approximately five workers occupying the building during working hours, which are from 7 a.m. to 3 p.m. on weekdays and weekends.

Analytical Results. Historical (2002 – 2007) shallow groundwater VOC concentrations within 100 ft of Building 3B above the site-specific GWSLs are summarized in this section and were taken from the Work Plan (CH2M HILL, 2008a). The historical groundwater exceedances are shown on Figure V2-12. Phase I groundwater, shallow soil vapor, and indoor air sample locations are shown on Figure V2-1, and the Phase I results are provided in Tables V2-4, V2-5, and V2-8. Phase II subslab and indoor air sample locations are shown on Figure V2-6 and the results are provided in Tables V2-10 and V2-11. Results for the GWSL, SGSL, and/or IASLs exceedances are provided in Table V2-17.

TABLE V2-17
Summary of Building 3B Investigation Results
Mainside, MCB Camp Lejeune, North Carolina

Building 3B Historical (2002 – 2007) Site-Specific Groundwater Screening Level Exceedances

Well ID	Screen Depth (ft bgs)	PCE (µg/L)
GWSL		*4.17*
IR88-GW16	4 – 14	55

Building 3B Phase I Generic Groundwater Screening Level Exceedances

Sample ID	PCE (µg/L)	TCE (µg/L)
GWSL (based on industrial air RSL)	*2.79*	*14.5*
IR88-IS01-GW-13-15-08B	1,100	-

Building 3B Phase I Shallow Soil Vapor Screening Level Exceedances

Sample ID	PCE (ppbv)	TCE (ppbv)
SGSL (based on industrial air RSL;AF=1E-01)	*3.1*	*11.4*
IR88-IS01-SV-05-06-08B	300,000	3,000 U

Building 3B Phase I Indoor Air Screening Level Exceedances

Sample ID	PCE (ppbv)	TCE (ppbv)
IASL (industrial air RSL)	*0.31*	*1.14*
IR88-IA04-08C	12	1.2

Building 3B Phase II Subslab Soil Gas Screening Level Exceedances

Sample ID	PCE (ppbv)	TCE (ppbv)
SGSL (based on industrial air RSL;AF=1E-01)	*3.1*	*11.4*
Base-Specific SGSL (AF=1E-03)	*310*	*1,140*
IR88-SG05-08C	**24,000**	130 U
IR88-SG13-08C	**2,500,000**	**6,700**

Building 3B Phase II Indoor Air Screening Level Exceedances

Sample ID	PCE (ppbv)	TCE (ppbv)
IASL (industrial air RSL)	*0.31*	*1.14*
IR88-IA07-08C	2.4	-

BOLD indicates exceeds Base-Specific SGSL
- indicates the compound does not exceed the screening level

Refined CSM. A 3-D CSM is provided as Figure V2-8, which shows the Phase I and Phase II sample locations and results for VOCs with GWSL, SGSL, and/or RSL exceedances at Building 3B.

Building 3B is located approximately 350 feet northwest and up-gradient of Building 25, the former dry cleaning facility. An industrial sewer extended northwest from Building 25 in the general direction of Building 3B, coming within 60 feet of the building. This sewer line was determined to be an additional PCE source during the Site 88 RI.

Historical (2002-2007) PCE concentration in a nearby shallow monitoring well (4 to 14 ft bgs screen depths) was approximately 10 times the site-specific GWSL. This historical groundwater monitoring well GWSL exceedance triggered the Phase I sampling.

Co-located groundwater grab and soil gas samples were collected from one location on the east side of Building 3B during Phase I. The PCE groundwater concentration exceeded its GWSL by approximately 400 times and the soil gas concentration was approximately 100,000 times its SGSL at IR88-IS01. There is some uncertainty about the concentration of TCE and most of the other VOCs analyzed at IR88-IS01 because the reporting limits were elevated above the generic SGSLs due to the very high concentration of PCE.

A separate mobilization to the site was conducted to collect an indoor air sample in Building 3B because of the significant exceedances of PCE screening levels detected in the groundwater and soil gas samples collected during Phase I. The sample was collected to determine whether unacceptable levels of constituents were present in indoor air. The sample collected during this mobilization in early September 2008, on the west side of the building, contained TCE and PCE at concentrations of 12.0 and 1.2 ppbv, which exceeded the IASLs of 0.31 and 1.14 ppbv, respectively. The TCE concentration only slightly exceeded the RSL, while PCE exceeded the RSL by 40 times. However, the detected concentrations were within the target cancer risk range of 1E-06 to 1E-04.

Two subslab soil gas samples and one indoor air sample were collected concurrently at Building 3B during Phase II to further assess potential vapor intrusion impacts (Figure V2-6). Both subslab soil gas samples contained PCE at concentrations which exceeded the SGSLs. Sample IR88-SG05 contained PCE at a concentration of 24,000 ppbv, which was approximately 8,000 times and 80 times the generic and base-specific SGSLs, respectively. TCE was not detected (1,30U ppbv) above the reporting level, but the reporting limit was greater than the RSL. Sample IR88-SG13 contained PCE at a concentration of 2,500,000 ppbv, which exceeded the generic and base-specific SGSLs by approximately 833,000 and 8,330 times the generic and base-specific SGSLs, respectively. Sample IR88-SG13 also contained TCE at a concentration of 6,700 ppbv, which exceeded the generic SGSL by approximately 610 times and the base-specific SGSL by 6 times. There was significant (orders of magnitude) spatial variability observed in PCE subslab soil gas concentrations within the small footprint of Building 3B. The indoor air sample collected near IR88-SG13, on the east side of the building, contained a PCE concentration that exceeded the IASL by approximately 4 times but was within the target cancer risk range of 1E-06 to 1E-04.

Conclusions. The subslab concentrations of PCE at Building 3B exceeded the base-specific and generic SGSLs by up to 80 and 8,330 times and the potential vapor intrusion risk associated with the exceedance at IR88-SG13, in the absence of indoor air data, might be assumed to result in an estimated cancer risk greater than 1E-04 (assuming a basewide subslab-to-indoor air attenuation factor of 1E-03). However, the indoor air concentrations of PCE and TCE detected during Phase I and Phase II within Building 3B only exceed the IASL by up to 4 times and the estimated risks would be within the target cancer risk range of 1E-

06 to 1E-04 based on the data collected to date. Therefore, no significant vapor intrusion impacts are present based on current conditions and the Phase I and II data. The potential for future impacts will need to be considered given the elevated subslab concentrations.

Recommended Further Actions

1. An additional round of subslab/indoor air sample data should be collected at Building 3B to address temporal variability associated with soil gas sampling.
2. The Base should consider the vapor intrusion pathway during construction planning at Building 3B to ensure that the slab is not compromised. Air monitoring should be performed if construction activities that involve slab penetrations are necessary.
3. Remedial actions to address the chlorinated VOC (e.g., PCE) source(s) at Building 3B and the neighboring Building 3 are recommended given the significant subslab soil gas concentrations and the potential for future impacts. A monitoring program should be developed in alignment with the selected remedial actions. A more complete subsurface source area investigation may be needed to identify the source of the elevated PCE and TCE subslab soil gas concentrations if remedial actions are to be developed and implemented.
4. If remedial actions are being performed to address groundwater or soil contamination, the vapor intrusion pathway should be re-evaluated during and after remedial actions.

Building 37

Building 37 is located on Site 88. The building is used as office and classroom space and is classified as a large industrial building for this evaluation. Building 37 was included in Phase I because it is located within 100 ft of three monitoring wells (IR88-MW05, IR88-MW25, and IR88-MW26) which have exceedances of the site-specific GWSLs for large buildings. The depth to groundwater in the vicinity of Building 37 is approximately 8 ft bgs. Shallow groundwater in the vicinity of Building 37 is radial.

Building Characteristics. Building 37 is a one-story brick and mortar building. The building is approximately 180 feet long by 30 feet wide by 8 feet high. There are multiple offices, a kitchen, a classroom, and separate male and female restrooms within the building.

The building likely has perimeter wall footings with additional footings underneath the pillars observed within the building. The concrete slab is level with the exterior ground surface; it is approximately 6 inches thick and contains wire mesh.

Building 37 has an HVAC unit with two evaporator/condenser units located on the south side of the building. The building has 35 windows and 6 doors that typically remain closed.

A building survey was not performed at Building 37 during Phase I or Phase II because of security reasons, so specific structural characteristics are not known.

The number of workers who occupy the building during working hours, which are 7 am to 3 pm on weekdays, is unknown but is approximately 25.

Analytical Results. Historical (2002–2007) shallow groundwater VOC concentrations within 100 ft of Building 37 above the site-specific GWSLs are summarized in this section and were taken from the Work Plan (CH2M HILL, 2008a). The historical groundwater exceedances are

shown on Figure V2-13. Phase I groundwater, soil gas and indoor air sample locations are shown on Figure V2-1 and the Phase I groundwater, soil gas and indoor air sample results are provided in Tables V2-4, V2-5, and V2-8. Phase II subslab and indoor air sample locations are shown on Figure V2-6 and the results are provided in Tables V2-10 and V2-11. Results for the GWSL, SGSL, and/or IASL exceedances are provided in Table V2-18.

TABLE V2-18
Summary of Building 37 Investigation Results
Mainside, MCB Camp Lejeune, North Carolina

Building 37 Historical (2002 – 2007) Site-Specific Groundwater Screening Level Exceedances

Well ID	Screen Depth (ft bgs)	PCE (µg/L)
GWSL		*5.49*
IR88-MW05	8 – 23	800
IR88-MW25	15 – 20	3,700
IR88-MW26	15 – 20	400

Building 37 Phase I Generic Groundwater Screening Level Exceedances

Sample ID	PCE (µg/L)
GWSL (based on industrial air RSL)	*2.79*
IR88-IS05-GW-11-12-08B	11
IR88-IS06-GW-09-10-08B	-
IR88-IS07-GW-10-11-08B	-

Building 37 Phase I Generic Shallow Soil Vapor Screening Level Exceedances

Sample ID	PCE (ppbv)	TCE (ppbv)	Methylene Chloride (ppbv)	Chloroform (ppbv)
SGSL (based on industrial air RSL;AF=1E-01)	*3.1*	*11.4*	*74.8*	*1.09*
IR88-IS05-SV-05-06-08B	26,000	140	290J	150U
IR88-IS06-SV-05-06-08B	580	-	-	1.5J
IR88-IS07-SV-05-06-08B	-	-	-	2U

Building 37 Phase I Indoor Air Screening Level Exceedances

Sample ID	PCE (ppbv)	TCE (ppbv)	Methylene Chloride (ppbv)	Chloroform (ppbv)
IASL (industrial air RSL)	*0.31*	*1.14*	*7.48*	*0.109*
IR88-IA01-08C	-	-	-	0.2U
IR88-IA02-08C	-	-	-	0.2U

Building 37 Phase II Subslab Soil Gas Screening Level Exceedances

Sample ID	PCE (ppbv)	TCE (ppbv)	Methylene Chloride (ppbv)	Chloroform (ppbv)
SGSL(based on industrial air RSL;AF=1E-01)	*3.1*	*11.4*	*74.8*	*1.09*
Base-Specific SGSL (AF=1E-03)			*74,800*	*109*

	310	*1,140*		
IR88-SG07 -08C	**1,700**	-	-	9.1U
IR88-SG08 -08C	**11,000**	12J	150U	62U

Building 37 Phase II Indoor Air Screening Level Exceedances

Sample ID	PCE (ppbv)	TCE (ppbv)	Methylene Chloride (ppbv)	Chloroform (ppbv)
IASL (industrial air RSL)	*0.31*	*1.14*	*7.48*	*0.109*
IR88-IA09-08C	-	-	-	-
IR88-IA10-08C	-	-	-	0.2U

BOLD indicates exceeds the Base-Specific SGSL
- indicates the compound does not exceed the screening level

Refined CSM. A 3-D CSM is provided as Figure V2-9, which shows the Phase I sample locations and results for VOCs with GWSL, SGSL, or RSL exceedances for Building 37.

Building 37 is located approximately 100 feet northeast and cross-gradient of former Building 25, the dry cleaning facility. Historical (2002-2007) PCE concentrations in three nearby shallow monitoring wells (8- to 23-ft bgs screen depths) were 73 to 674 times the site-specific GWSL. These historical groundwater monitoring well GWSL exceedances triggered the Phase I sampling.

Co-located groundwater grab and soil gas samples were collected from three locations near Building 37 during Phase I (Figure V2-9). There was one exceedance of the generic GWSLs at IR88-IS05, which is located northwest of Building 37; PCE was detected at 4 times the generic GWSL. There were no exceedances of the generic GWSLs in the other two top of the water table grab groundwater samples along the southern side of Building 37 closest to the former Building 25. PCE was detected at 8,387 times the generic SGSL in the co-located soil gas sample at IR88-IS05. TCE and methylene chloride were also detected in exceedance of the generic SGSLs at IR88-IS05. PCE was 187 times the generic SGSL at IR88-IS06, which is south of Building 37. Chloroform was detected at 1.4 times the SGSL at IR88-IS06. There is some uncertainty about chloroform concentrations at the other two soil gas sample locations because the reporting limits were elevated above the generic SGSL. There were no exceedances of the generic SGSLs at IR88-IS07.

A separate mobilization to the site was conducted to collect an indoor air sample in Building 37 because of the significant SGSL exceedance of PCE in soil gas sample IR88-IS05 during Phase I. This September 2008 indoor air sample did not contain any constituents at concentrations above their corresponding IASLs. There is some uncertainty about chloroform concentrations in indoor air because the reporting limit was approximately 2 times the IASL for both indoor air samples. Concurrent subslab soil gas and indoor air samples were collected at Building 37 during Phase II to further assess potential vapor intrusion impacts.

Two subslab soil gas samples and two indoor air samples were collected at Building 37 during Phase II (Figure V2-6). PCE was detected above its generic and base-specific SGSL in both subslab soil gas samples. Sample IR88-SG07 was collected near the west end of the building, while sample IR88-SG08 was collected near the center of the building. Sample IR88-SG07 contained PCE at a concentration of 1,700 ppbv, which exceeded the generic

SGSL by approximately 500 times (5 times the base-specific SGSL). Sample IR88-SG08 contained PCE at a concentration of 11,000 ppbv, which exceeded the generic SGSL by approximately 3,500 times (35 times the base-specific SGSL). TCE was detected in IR88-SG08 at a concentration only slightly (1.1 times) above its generic SGSL, but was well below the base-specific SGSL. Methylene chloride was not detected (150U ppbv), but the reporting limit was approximately 2 times the SGSL. There is some uncertainty about chloroform concentrations in subslab soil gas sample because the reporting limits were elevated above the generic SGSL Neither indoor air sample contained any constituents above their IASLs; however, the reporting limit for chloroform was approximately 2 times the IASL for one of the two indoor air samples.

Conclusions. Although there were concentrations of PCE, TCE, methylene chloride, and chloroform in exterior soil gas and/or subslab soil gas samples which exceeded the generic and/or base-specific SGSLs, none of these VOCs were detected above their IASLs in the indoor air samples. Therefore, no significant vapor intrusion impacts are present based on current conditions and the Phase I and Phase II data. The potential for future impacts will need to be considered given the significantly elevated exterior soil gas and subslab soil gas concentrations of PCE.

Recommended Further Actions

1. An additional round of subslab/indoor air sample data should be collected at Building 37 to address temporal variability associated with soil gas sampling.
2. The Base should consider the vapor intrusion pathway during construction planning at Building 37 to ensure that the slab is not compromised. Air monitoring should be performed if construction activities that involve slab penetrations are necessary.
3. Although the subslab concentration of PCE was not more than 100 times its base-specific SGSL (i.e., not greater than the upper end of the 1E-06 to 1E-04 target cancer risk range), remedial actions to address the chlorinated VOC (e.g., PCE) source(s) at Building 37 are recommended given: (1) the subslab soil gas concentration of PCE was only 3 times less than a concentration that would have resulted in a future risk estimate above the 1E-04 target cancer risk range using the base-specific SGSL; and (2) the range of temporal variability observed in subslab sampling results is typically greater than 3 times. A monitoring program should be developed in alignment with the selected remedial actions. A more complete subsurface source area investigation may be needed to identify the source of the elevated PCE and TCE subslab soil gas concentrations if remedial actions are to be developed and implemented.
4. If remedial actions are being performed to address groundwater or soil contamination, the vapor intrusion pathway should be re-evaluated during and after remedial actions.

Building 43

Building 43 is located on Site 88. It is used for military police operations and as the military police motor pool. It is classified as a small industrial building for this evaluation. Building 43 was included in Phase I because it is located within 100 ft of three shallow monitoring wells which have exceedances of the site-specific GWSLs for large buildings. The depth to groundwater in the vicinity of Building 43 is approximately 10 ft bgs. Shallow groundwater flows to the southwest, toward the building.

Building Characteristics. Building 43 is a one-story brick and mortar building. The building is approximately 40 ft long by 20 ft wide by 8 ft high. The building is divided into two separate work areas. The southeast portion includes an open work space with three work areas, a restroom, and an office. The northeast section of the building contains a small office area with a closet and a small side room.

The building likely has perimeter wall footings with additional footings underneath the pillars observed within the building. The concrete slab is level with the exterior ground surface; it is approximately 6 inches thick and contains wire mesh. The entire floor is covered with linoleum tile.

Building 43 has an HVAC unit with one condenser/evaporator unit on the south side of the building. The building has 3 doors and 14 windows which are typically kept closed.

Building 43 is typically occupied by approximately 10 workers during normal business hours, which are from 7 a.m. to 3 p.m. on weekdays.

Analytical Results. Historical (2002–2007) shallow groundwater VOC concentrations within 100 ft of Building 43 above the site-specific GWSLs are summarized in this section and were taken from the Work Plan (CH2M HILL, 2008a). The historical groundwater exceedances are shown on Figure V2-13. Phase I groundwater, soil gas, and indoor air sample locations are shown on Figure V2-1 and the Phase I results are provided in Tables V2-4, V2-5, and V2-8. Phase II subslab and indoor air sample locations are shown on Figure V2-6 and the results are provided in Tables V2-10 and V2-11. Results for the GWSL, SGSL, and/or IASL exceedances are provided in Table V2-19.

TABLE V2-19
Summary of Building 43 Investigation Results
Mainside, MCB Camp Lejeune, North Carolina

Building 43 Historical (2002- 2007) Site-Specific Groundwater Screening Level Exceedances

Well ID	Screen Depth (ft bgs)	Benzene (µg/L)	PCE (µg/L)	TCE (µg/L)	Cis-1,2 DCE (µg/L)
GWSL		*8.65*	*4.17*	*20.0*	*1,320*
IR88-MW27	15-20	-	500	590	30,000
IR88-MW28	15-20	-	2,400	130	-
IR88-MW30	3-18	10	-	-	-

Building 43 Phase I Generic Groundwater Screening Level Exceedances

Sample ID	Benzene (µg/L	PCE (µg/L)	TCE (µg/L)	Cis-1,2 DCE (µg/L)	VC (µg/L)	Chloroform (µg/L)
GWSL (based on industrial air RSL)	*7.05*	*2.79*	*14.5*	*N/A*	*2.54*	*3.53*
IR88-IS03-GW-12-13-08B	-	750	130	800	89	16U
IR88-IS04-GW-11-12-08B	13	52	17	200	71	10U

Building 43 Phase I Generic Shallow Soil Gas Screening Level Exceedances

Sample ID	Benzene (µg/L	PCE (ppbv)	TCE (ppbv)	Cis-1,2 DCE (ppbv)	VC (ppbv)	Chloroform (ppbv)
SGSL (based on industrial air RSL;AF=1E-01)	*5.01*	*3.1*	*11.4*	*N/A*	*11*	*1.09*
IR88-IS03-SV-05-06-08B	-	170	-	5.8	-	2U
IR88-IS04-SV-05-06-08B	78	49	16	360	670	4U
IR88-IS14-SV-4.5-5.5-08B	13U	3,500	600	3,700	18	12

Building 43 Phase I Indoor Air Screening Level Exceedances

Sample ID	Benzene (µg/L	PCE (ppbv)	TCE (ppbv)	Cis-1,2 DCE (ppbv)	VC (ppbv)	Chloroform (ppbv)	1,4-Dichloro-benzene (ppbv)
IASL (industrial air RSL)	*0.501*	*0.31*	*1.14*	*N/A*	*1.1*	*0.109*	*0.183*
IR88-IA03-08C	-	1.6	-	-	-	0.11	0.2U

Building 43 Phase II Generic (AF = 0.1) Subslab Soil Gas Screening Level Exceedances

Sample ID	Benzene (µg/L	PCE (ppbv)	TCE (ppbv)	Cis-1,2 DCE (ppbv)	VC (ppbv)	Chloroform (ppbv)	1,4-Dichloro-benzene (ppbv)	Methylene Chloride (ppbv)
SGSL (based on industrial air RSL;AF=1E-01)	*5.01*	*3.1*	*11.4*	*N/A*	*11*	*1.09*	*1.83*	*74.8*
Base-Specific SGSL (AF=1E-03)	*501*	*310*	*1,140*	*N/A*	*1,100*	*109*	*183*	*74,800*
IR88-SG06-08C	150	**36,000**	310U	-	310U	**310U**	100	9,000

Building 43 Phase II Indoor Air Screening Level Exceedances

Sample ID	Benzene (µg/L	PCE (ppbv)	TCE (ppbv)	Cis-1,2 DCE (ppbv)	VC (ppbv)	Chloroform (ppbv)	1,4-Dichloro-benzene (ppbv)	Methylene Chloride (ppbv)
IASL (industrial air RSL)	*0.501*	*0.31*	*1.14*	*N/A*	*1.1*	*0.109*	*0.183*	*7.48*
IR88-IA08-08C	-	2	-	-	-	0.4U	0.4U	-

BOLD indicates exceeds the Base-Specific SGSL; VC = vinyl chloride; DCE = dichloroethene
- indicates the compound does not exceed the screening level

Refined CSM. A 3-D CSM is provided as Figure V2-10, which shows the Phase I sample locations and results for VOCs with GWSL, SGSL, or RSL exceedances for Building 43.

Building 43 is located approximately 100 feet northwest and up-gradient of Building 25, the former dry cleaning facility. Historical (2002-2007) benzene, PCE, TCE, and/or cis-1,2-DCE concentrations in the nearby monitoring wells were observed at concentrations 1.2 to 575 times their corresponding site-specific GWSLs. These historical groundwater monitoring well GWSL exceedances triggered the Phase I sampling.

Co-located groundwater grab and soil gas samples were collected at two locations near Building 43 during Phase I. A soil gas sample was also collected from one existing permanent soil gas probe approximately 100 feet south of Building 43 during Phase I.

Chlorinated VOCs were observed in both groundwater samples at concentrations that exceeded the generic GWSLs: PCE at 269 and 19 times, TCE at 9 and 1.2 times, and VC at 35 and 28 times the generic GWSL. Cis-1,2-DCE was also detected (200 to 400 µg/L) in both groundwater samples; however, an RSL-based GWSL was not available. The highest detections of chlorinated VOCs were at IR88-IS03 on the south side of Building 43. Chloroform was not detected in either sample above the reporting limit, but the reporting limit exceeded the GWSL. The groundwater sample at IR88-IS04 also contained benzene at a concentration that slightly (<2 times) exceeded the GWSL.

Chlorinated VOCs were also detected in the three Phase I exterior soil gas samples. PCE concentrations exceeded the generic SGSL by 16 to 1,129 times. TCE and chloroform concentrations in two of the three soil gas samples (IR88-IS04 and IR88-IS14) exceeded the SGSLs from 1.1 to 53 times and 1 to 61 times, respectively. Sample IR88-IS14 contained VC at concentrations which exceeded the SGSLs. VC was not detected (2U and 4U ppbv, respectively) in samples IR88-IS03 and IR88-IS04, but the reporting limit exceeded the generic SGSL. Cis-1,2-DCE was also detected (5.8 to 3,700 ppbv) in the three exterior soil gas samples; however, an RSL-based SGSL was not available. IR88-IS04 contained benzene at a concentration that exceeded the generic SGSL and the oxygen measurement at this location was only 3 percent, indicating that benzene may have been aerobically degraded in soil gas at this location until it consumed the majority of the available oxygen. Benzene was not detected at IR88-IS14, but the reporting limit exceeded the SGSLs by approximately 2 times.

A separate mobilization to the site was proposed to collect an indoor air sample in Building 43 because of the GWSL and SGSL exceedances of PCE in the Phase I groundwater and soil gas samples. The indoor air sample was collected in early September 2008 and contained PCE at 5 times the IASL and chloroform at approximately the same level as its IASL. These detections were within the target cancer risk range of 1E-06 to 1E-04 and the non-cancer hazard quotient of 1 and, therefore, adverse health effects are not anticipated. Although cis-1,2-DCE was detected in the exterior soil gas and groundwater samples and a corresponding SGSL and GWSL were not available, it was not detected in the Phase I indoor air sample. 1,4-Dichlorobenzene was not detected (0.2U ppbv), but the reporting limit exceeds the RSL. Concurrent subslab soil gas and indoor air sampling were proposed for Phase II at Building 43 to further assess potential vapor intrusion impacts.

One subslab soil gas sample and one indoor air sample were collected at Building 43 during Phase II. The subslab soil gas sample contained benzene, PCE, 1,4-dichlorobenzene, and methylene chloride at concentrations that exceeded the generic and/or base-specific SGSLs. PCE was detected in subslab soil gas at 116 times the base-specific SGSL and methylene chloride was detected at a level similar to the base-specific SGSL. Benzene and 1,4-dichlorobenzene were detected in the subslab soil gas sample approximately 30 to 55 times the generic SGSLs, but were 2 to 3 times below the base-specific SGSLs. TCE, VC, and chloroform were not detected but the reporting limits exceeded the generic SGSLs and the chloroform reporting limit (310U ppbv) exceeded its base-specific SGSL by approximately 3 times.

PCE was detected in the Phase II indoor air sample at 7 times the IASL, but this exceedance results in an estimated risk within the target cancer risk range of 1E-06 to 1E-04. Chloroform and 1,4-dichlorobenzene were not detected (0.4U ppbv), but the reporting limit exceeds the RSL by approximately 2 to 4 times.

Conclusions. The subslab concentrations of PCE at Building 43 exceeded the base-specific SGSL by 116 times and the potential vapor intrusion risk associated with this exceedance could be greater than 1E-04 (assuming a base-specific subslab-to-indoor air attenuation factor of 1E-03). Although the Phase I and II indoor air concentrations of PCE within Building 43 exceeded the IASL, these concentrations would not result in risk estimates above the target cancer risk range of 1E-06 to 1E-04. Therefore, significant vapor intrusion impacts are not anticipated based on current conditions and Phase I and Phase II data. The potential for future impacts will need to be considered given the elevated subslab concentrations.

Recommended Further Actions

1. An additional round of subslab/indoor air sample data should be collected at Building 43 to address temporal variability associated with soil gas sampling.
2. The Base should consider the vapor intrusion pathway during construction planning at Building 43 to ensure that the slab is not compromised. Air monitoring should be performed if construction activities that involve slab penetrations are necessary.
3. Remedial actions to address the chlorinated VOC (e.g., PCE) source(s) at Building 43 are recommended given the significant subslab soil gas concentrations and the potential for future impacts. A monitoring program should be developed in alignment with the selected remedial actions. A more complete subsurface source area investigation may be needed to identify the source of the elevated chlorinated VOC subslab soil gas concentrations if remedial actions are to be developed and implemented.
4. If remedial actions are being performed to address groundwater or soil contamination, the vapor intrusion pathway should be re-evaluated during and after remedial actions.

4.4.2 SWMU 118

SWMU 118 has been identified as a former 1,000-gallon UST and fuel line location at the Gottschalk Marina of MCB Camp Lejeune. The UST, historically used for storing and supplying fuels for the marina, was removed in July 2005 under State UST guidelines.

A soil and groundwater investigation was conducted during the UST removal in 2005. Elevated gasoline range organics were reported in a soil sample collected adjacent to the fuel line and near Building S195 (Gazebo). Benzene and methyl-ethyl-ketone (MEK) were reported in groundwater at concentrations above the GWSLs. Because MEK is not considered a petroleum constituent, the site was transferred to the RCRA program in 2006. A Confirmatory Sampling Investigation (CSI) was conducted in June 2007. Results of the CSI indicate the presence of VOCs above North Carolina Groundwater Quality Standards (NCGWQS). Within the vicinity of SWMU 118, the uppermost undifferentiated formation consists of an assortment of sands, silts, and clays. Groundwater flow direction in the shallow aquifer at the site is north/northwest towards Wallace Creek and the New River. Water level elevations from the wells ranged from approximately 8 ft to 13 ft bgs (CH2M HILL, 2008a). Building 728 was the only building within the vicinity of SWMU 118 that was retained for this evaluation.

Building 728

Building 728 is located on SWMU 118. It is used as a nautical gift and rental shop and is classified as a small industrial building for this evaluation. Building 728 was included in Phase I because it is located within 100 ft of one shallow monitoring well (SWMU118-TW01) which had an exceedance of a site-specific GWSL, as shown in Table V2-20. Groundwater flows north-northwest toward Wallace Creek, away from Building 728.

Building Characteristics. Building 728 is a one-story post and beam building constructed on stilts. The building is approximately 30 ft long by 30 ft wide by 8 ft high. The building is elevated approximately 1 ft above the ground surface towards the south side of the building and approximately 3 ft above ground surface towards the north side of the building. Building 728 does not have an HVAC unit. The building has 2 doors and 18 windows which are typically kept closed.

A building survey was not performed at Building 728 during Phase I or Phase II because sampling was not performed within the building. Several oxygen tanks used for diving activities were stored on the exterior of the building.

Building 728 is typically occupied by approximately 10 people or less during normal business hours, which are from 7 a.m. to 3 p.m. on weekdays.

Analytical Results. Historical (2002–2007) shallow groundwater VOC concentrations within 100 ft of Building 728 above the site-specific GWSLs are summarized in this section and were taken from the Work Plan (CH2M HILL, 2008a). The historical groundwater exceedances are shown on Figure V2-13. Phase I subslab soil gas sample location is shown on Figure V2-4 and the Phase I subslab soil gas sample result is provided in Table V2-7. Results of the GWSL and SGSL exceedances are provided in Table V2-20.

TABLE V2-20
Summary of Building 728 Investigation Results
Mainside, MCB Camp Lejeune, North Carolina

Building 728 Historical (2002 – 2007) Site-Specific Groundwater Screening Level Exceedances		
Well ID	**Screen Depth (ft bgs)**	**Benzene (µg/L)**
GWSL		*8.65*
SWMU118-TW01	7-12	13,000

Building 728 Phase I Indoor Air Screening Level Exceedances	
Sample ID	**Benzene (ppbv)**
Industrial air RSL	*0.501*
SWMU118-CSA05-08B	0.66

BOLD indicates exceeds Base-Specific SGSL
- indicates the compound does not exceed the screening level

Refined CSM. The historical (from 2002 to 2007) benzene concentration in a nearby monitoring well, SWMU118-TW01, was 1,500 times greater than the site-specific GWSL and triggered the Phase I sampling.

The subslab, indoor air, and outdoor air samples proposed for Building 728 were not collected during Phase I. In their place, two crawl space air samples were collected to assess air concentrations beneath the structure and above the ground surface. One of the crawl space air samples was not analyzed because of canister failure. The other crawl space air sample did not contain VOCs above their corresponding generic SGSLs.

Conclusions. Although the historic benzene concentration from the nearby monitoring well exceeded the site-specific GWSL, this compound was not detected in the crawl space air sample. Therefore, vapor intrusion into Building 728 is not a concern. These results are consistent with the assumption that the building construction (i.e. elevated floor with ambient air below the building) precludes completion of the vapor intrusion pathway. No further action is required at this building.

4.4.3 SWMU 360

SWMU 360 is the location of a former 300-gallon waste oil UST near Building 1817. The former UST was located in the eastern portion of the compound, which is being used as a temporary staging area for batteries, refrigeration units, and other used equipment before disposal and/or reutilization. The 300-gallon waste oil UST was removed in July 1997. PCE and TCE were detected in groundwater samples collected within SWMU 360 during the RCRA Facility Investigation (RFI) and amended RFI, which took place in 2005 and 2006, respectively. The maximum concentrations of PCE and its degradation products in groundwater were detected from samples collected at the original UST location. No remedial actions have been implemented to date. The predominant soil type at the site is sands with some clay lenses present. Shallow groundwater flows to the southeast. The depth to groundwater at SWMU 360 is approximately 15 to 22 ft bgs.

Within the vicinity of SWMU 360, Buildings 1828 and 1855 in Mainside and Buildings 1817 and 1819 at Hadnot Point were retained for this evaluation.

Building 1828

Building 1828 is located at SWMU 360. It is used for food service and combat logistics regiment operations and storage. The two storage areas are kept separate from one another and are organized in chicken wire mesh rooms. The building is classified as a large industrial building for this evaluation. Building 1828 was included in Phase I because it is located within 100 ft of one shallow monitoring well that had an exceedance of a site-specific GWSL for PCE, as shown in Table V2-21. The depth to groundwater at SWMU360-MW04 is approximately 20 feet bgs. Shallow groundwater flows to the southeast, away from the building.

Building Characteristics. Building 1828 is a one-story corrugated steel building. The building is approximately 300 ft long by 45 ft wide by 30 ft high. The majority of the building is a large storage space divided with chain link fence. One office is located at the northwest side of the building and a classroom area is located at the southeast side of the building.

The building likely has a perimeter wall footing system with several footings underneath the pillars observed within the building. The concrete slab is level with the exterior ground surface; it is approximately 6 inches thick and contains wire mesh. Multiple expansion joints are present, mostly in good condition but some cracked or damaged. The entire floor surface is bare concrete.

Building 1828 has an HVAC unit in the building with two exhaust units visible on the east and west sides of the building. The building also has two large fans on the narrower ends of the building near the rafters. The building has two doors and five double warehouse doors, all on the northeast side of the building, that are routinely left open. There are no windows in the building. There was a discrepancy on the building survey form, which indicates that there were windows in Building 1828. However, this indication was shown to be inaccurate when the absence of windows was verified by reviewing the photographs of the perimeter of Building 1828.

The only potential indoor source of VOCs observed during the Phase II sampling event was 11 gallons of Simple Green (non-toxic all-purpose cleaner).

Building 1828 is typically occupied by 10 people or less during normal business hours, which are from 7 a.m. to 3 p.m. on weekdays.

Analytical Results. Historical (2002–2007) shallow groundwater VOC concentrations within 100 ft of Building 1828 above the site-specific GWSLs are summarized in this section and were taken from the Work Plan (CH2M HILL, 2008a). The historical groundwater exceedances are shown on Figure V2-15. Phase I groundwater and soil gas sample locations are shown on Figure V2-3 and the Phase I groundwater and soil gas sample results are provided in Tables V2-4 and V2-5. Phase II subslab sample locations are shown on Figure V2-7 and the results are provided in Table V2-10. Results for the GWSL and SGSL exceedances are provided in Table V2-21.

TABLE V2-21
Summary of Building 1828 Investigation Results
Mainside, MCB Camp Lejeune, North Carolina

Building 1828 Historical (2002 – 2007) Site-Specific Groundwater Screening Level Exceedances

Well ID	Screen Depth (ft bgs)	PCE (µg/L)
GWSL		*5.49*
SWMU360-MW04	18 – 28	13

Building 1828 Phase I Generic Groundwater Screening Level Exceedances

Well ID	PCE (µg/L)
GWSL (based on industrial air RSL)	*2.79*
SWMU360-IS08-GW-20-22-08B	-
SWMU360-IS10-GW-23-25-08B	6.1
SWMU360-IS11-GW-23-25-08B	12

Building 1828 Phase I Generic Deep Soil Vapor Screening Level Exceedances

Well ID	PCE (ppbv)	Chloroform (ppbv)
SGSL (based on industrial air	*31*	*10.9*

RSL;AF=1E-02)		
SWMU360-IS08-SV-17-18-08B	38	-
SWMU360-IS10-SV-13-14-08B	320	160
SWMU360-IS11-SV-17-18-08B	490	-

Building 1828 Phase II Subslab Soil Gas Screening Level Exceedances

Sample ID	PCE (ppbv)	Chloroform (ppbv)
Generic SGSL (based on industrial air RSL and AF=1E-01)	*3.1*	*1.09*
Base-specific SGSL (based on industrial air RSL and AF=1E-03)	*310*	*109*
SWMU360-SG11-08C	7.3	2U
SWMU360-SG12-08C	57	-

BOLD indicates exceedance of the base specific SGSL

- indicates the compound does not exceed the screening level

Refined CSM. The historical (from 2002 to 2007) PCE concentration in a nearby monitoring well, SWMU360-MW04, was 2 times greater than its site-specific GWSL, which triggered the Phase I sampling.

Groundwater grab and soil gas samples were collected from three locations near Building 1828 during Phase I. PCE was detected in two of the three groundwater samples at concentrations 2 to 4 times its generic GWSL. PCE concentrations in all three of the exterior Phase I soil gas samples exceeded the generic deep SGSL by up to 16 times. Chloroform was detected in one of the three soil gas samples at 15 times its generic SGSL. These data indicate that chlorinated VOCs are present in the groundwater at the top of the water table and in the deep soil gas. Subslab soil gas sampling was proposed for Phase II at Building 1828 to further assess potential vapor intrusion impacts.

Two Phase II subslab soil gas samples were collected inside Building 1828. PCE subslab concentrations exceeded its generic SGSL in both samples by 2 to 18 times, but were at least 5 times less than the base-specific SGSL. Although chloroform was not detected, the reporting limit (2 ppbv) slightly (2 times) exceeded the generic SGSL, but was well below the base-specific SGSL.

Conclusions. Subslab soil gas concentrations of PCE measured during Phase II exceeded the generic SGSL, but were less than the base-specific SGSL. Therefore, significant vapor intrusion impacts are not expected based on current conditions and Phase I and Phase II data. This conclusion is consistent with the assumption that significant vapor intrusion impacts were not anticipated given the physical characteristics of Building 1828 (e.g., large air volume and significant outdoor air exchange through the large open bay doors).

Recommended Further Actions

1. An additional round of subslab sample data should be collected at Building 1828 to confirm that subslab soil gas concentrations are below the base-specific SGSLs. This is necessary because of the temporal variability associated with soil gas sampling.
2. The Base should consider the vapor intrusion pathway during construction planning at Building 1828 to ensure that the slab is not compromised given the generic SGSL subslab exceedances. Air monitoring should be performed if construction activities that involve slab penetrations are necessary.

3. Recommended actions to remediate the soil gas source at Building 1828 will impact this neighboring building. The vapor intrusion pathway should be re-evaluated during and after remedial actions.

Building 1855

Building 1855 is located in SWMU 360. It is used as the Second Tank Battalion, Second Marine Division Headquarters for storage of sleeping bags, tents, ready-to-eat meals, and other items for deployment. It is classified as a large industrial building for this evaluation. Building 1855 was included in Phase I because it is located within 100 ft of one shallow monitoring well (SWMU360-MW04) which had an exceedance of the site-specific GWSL for PCE, as shown in Table V2-22. The depth to groundwater is approximately 20 ft bgs. Shallow groundwater flows to the southeast; Building 1855 is up-gradient of SWMU360-MW04.

Building Characteristics. Building 1855 is a one-story brick and mortar building. The building is 175 ft long by 80 ft wide by 30 ft high. The interior of the building is primarily one large storage space. There is a small amount of office space and a restroom.
The building likely has a perimeter wall footing system with several footings underneath the pillars observed within the building. The foundation on the northwest corner of the building appears to be level with the exterior ground surface, while the foundation on the southeast corner is elevated approximately 3.5 ft above the ground surface. The slab is approximately 6 inches thick and contains wire mesh. The entire floor surface is bare concrete and contains expansion joints that are sealed and appeared to be in good condition.

The building does not appear to have an HVAC unit but does have two vented ceiling fan units. The building has four windows, one warehouse bay door, and three single doors. These doors and the bay door are routinely left open when people occupy the building.

No potential indoor VOC sources were observed inside Building 1855 during the Phase II event.

The building is typically occupied by 13 to 15 people during business hours, which are from 7 a.m. to 3 p.m. on weekdays.

Analytical Results. Historical (2002–2007) shallow groundwater VOC concentrations within 100 ft of Building 1855 above the site-specific GWSLs are summarized in this section and were taken from the Work Plan (CH2M HILL, 2008a). The historical groundwater exceedances are shown on Figure V2-15. Phase I groundwater and soil gas sample locations are shown on Figure V2-3 and the Phase I groundwater and soil gas sample results are provided in Tables V2-4 and V2-6. Phase II subslab sample locations are shown on Figure V2-7 and the results are provided in Table V2-10. Results for the GWSL and SGSL exceedances are provided in Table V2-22.

TABLE V2-22
Summary of Building 1855 Investigation Results
Mainside, MCB Camp Lejeune, North Carolina

Building 1855 Historical (2002 – 2007) Site-Specific Groundwater Screening Level Exceedances

Well ID	Screen Depth (ft bgs)	PCE (µg/L)
GWSL		*5.49*
SWMU360-MW04	18 – 28	13

Building 1855 Phase I Generic Groundwater Screening Level Exceedances

Well ID	PCE (µg/L)
GWSL (based on industrial air RSL)	*2.79*
SWMU360-IS09-GW-23-25-08B	22
SWMU360-IS10-GW-23-25-08B	6.1

Building 1855 Phase I Deep Soil Vapor Screening Level Exceedances

Well ID	PCE (ppbv)	Chloroform (ppbv)
SGSL (based on industrial air RSL;AF=1E-02)	*31*	*10.9*
SWMU360-IS09-SV-14-15-08B	4,100	83
SWMU360-IS10-SV-13-14-08B	320	160

Building 1855 Phase II Subslab Soil Gas Screening Level Exceedances

Sample ID	PCE (ppbv)	Chloroform (ppbv)
Generic SGSL (based on industrial air RSL;AF=1E-01)	*3.1*	*1.09*
Base-specific SGSL (AF=1E-03)	*310*	*100*
SWMU360-SG09-08C	5.1	-
SWMU360-SG10-08C	5	-

BOLD indicates exceeds the base-specific SGSL
- indicates the compound does not exceed the screening level

Refined CSM. The historical (2002-2007) PCE concentration in nearby monitoring well SWMU360-MW04 was 2 times the site-specific GWSL, which triggered the Phase I sampling.

Co-located groundwater grab and deep soil gas samples were collected at two locations near Building 1855 during Phase I. PCE was detected in both of the Phase I groundwater samples (23 to 25 feet bgs) at concentrations 2 to 8 times its generic GWSL. PCE also exceeded its generic deep SGSL by 10 to 132 times in both of the deep (13 to 15 ft bgs) Phase I soil gas samples. Chloroform was also detected in the Phase I soil gas samples at 7 and 14 times its generic SGSL. Subslab sampling was proposed for Phase II because of the groundwater and soil gas exceedances.

Two subslab soil gas samples were collected inside Building 1855 during Phase II. PCE subslab concentrations were 2 to 18 times the generic SGSL, but were 62 times less than the base-specific SGSL.

Conclusions. Although PCE top of the water table groundwater and deep soil gas concentrations near Building 1855 exceeded the generic GWSL and SGSL, subslab soil gas concentrations of PCE were less than the base-specific SGSLs. Therefore, significant indoor air impacts are not expected based on current conditions and Phase I and Phase II data. This conclusion is consistent with the assumption that significant vapor intrusion impacts within the warehouse are not expected given the building characteristics (e.g., large air volume and significant outdoor air exchange through the large open bay doors).

Recommended Further Actions

1. An additional round of subslab sample data should be collected at Building 1855 to confirm that subslab soil gas concentrations are below the base-specific SGSLs. This is necessary because of the temporal variability associated with soil gas sampling.

2. The Base should consider the vapor intrusion pathway during construction planning at Building 1855 to ensure that the slab is not compromised given the generic SGSL subslab exceedances. Air monitoring should be performed if construction activities that involve slab penetrations are necessary.

3. If remedial actions are being performed to address groundwater or soil contamination, the vapor intrusion pathway should be evaluated during and after remedial actions.

4.4.4 Site 820

Site 820 is located in the Berkeley Manor residential area of MCB Camp Lejeune. Building 820 is currently an active Marine Corps Exchange gas station. Four USTs are located south of the building. These include three 10,000-gallon gasoline USTs and one 10,000-gallon diesel UST. The USTs were upgraded in the late summer of 1995. Petroleum constituents, including BTEX and methyl tert butyl ether (MTBE), are present in groundwater above NCGWQS. A passive free product recovery system recovered approximately 43 gallons of free product from March 1994 through February 1997. An air sparge (AS)/soil vapor extraction (SVE) system was installed in 1997 and is presently in operation. Groundwater data from February 2006 indicate that BTEX and MTBE still exceed NCGWQS; however, no free product is present. The shallow groundwater flow direction is generally to the south. The remediation system layout is provided in the work plan. Depth to groundwater, measured in shallow monitoring wells during the October 2006 sampling event, ranged from approximately 10 to 14 ft bgs (CH2M HILL, 2008a).

Building 820 is the only building retained on Site 820 for this evaluation.

Building 820

Building 820 is located on Site 820. It is used as a gas station and convenience store and is classified as a large industrial building for this evaluation. Building 820 was included in Phase I because it is located within 100 ft of one shallow monitoring well (UST820-MW17) which had an exceedance of the site-specific GWSL for benzene, as shown in Table V2-23. The depth to groundwater in this well is approximately 13 ft bgs. Shallow groundwater flows to the southeast, away from the building.

Building Characteristics. Building 820 is a one-story concrete block building approximately 80 ft long by 80 ft wide by 12 ft high. The majority of the building is a convenience store. A

small area at the west end of the building is used for storage and receiving and there is a small office in the southwest corner of the building.

The building likely has perimeter wall footings with additional footings underneath the pillars observed within the building. The concrete slab is level with the exterior ground surface; it is approximately 10 inches thick and contains wire mesh. The entire floor surface in the convenience store area is covered with tile. The back stockroom floor is bare concrete and contains expansion joints which are sealed and appeared to be in good condition.

The building has an HVAC unit. The front entrance to the convenience store is glass-enclosed with two mechanical automatic sliding double doors. These doors are used when the store is open for business and create significant air exchange with the interior of the building. The rear of the building has one other exterior door for employees and deliveries. This door remains closed at most times.

There were several VOC-containing items observed for sale in Building 820 during the building inspection, including motor oil, butane gas lighters for barbeque grills, air fresheners, cleaning products, etc.

The building is typically occupied by 10 people during business hours, which vary on weekdays and weekends.

Analytical Results. Historical (2002–2007) shallow groundwater VOC concentrations within 100 ft of Building 820 above the site-specific GWSLs are summarized in this section and were taken from the Work Plan (CH2M HILL, 2008a). The historical groundwater exceedances are shown on Figure V2-15. Phase I soil gas and indoor air sample locations are shown on Figure V2-4 and the Phase I soil gas and indoor air sample results are provided in Tables V2-5 and V2-8. Results for the GWSL, SGSL, and/or IASL exceedances are provided in Table V2-23.

TABLE V2-23
Summary of Building 820 Investigation Results
Mainside, MCB Camp Lejeune, North Carolina

Building 820 Historical (2002 – 2007) Site-Specific Groundwater Screening Level Exceedances

Well ID	Screen Depth (ft bgs)	Benzene (µg/L)
GWSL		*11.9*
UST820-MW17	44.5 - 49.5	53.4

Building 820 Phase I Subslab Soil Gas Screening Level Exceedances

Sample ID	Benzene (ppbv)	Ethylbenzene (ppbv)	Carbon Tetrachloride (ppbv)	1,4-Dichlorobenzene (ppbv)	Chloroform (ppbv)
Generic SGSL (based on industrial air RSL;AF=1E-01)	*5.01*	*11.3*	*1.3*	*1.83*	*1.09*
Base-specific SGSL (AF=1E-03)	*500*	*1,130*	*130*	*183*	*109*
UST820-SG03-08B	-	13	2U	2U	2U
UST820-SG04-08B	-	-	2U	2U	2U

Building 820 Phase I Indoor Air Screening Level Exceedances

Sample ID	Benzene (ppbv)	Ethylbenzene (ppbv)	Carbon Tetrachloride (ppbv)	1,4-Dichlorobenzene (ppbv)	Chloroform (ppbv)
IASL (industrial air RSL)	*0.501*	*1.13*	*0.13*	*0.183*	*0.109*
UST820-IA03-08B	1.2	-	0.24	0.53	0.28
UST820-IA04-08B	-	-	0.2U	0.2U	-

BOLD indicates exceeds the Base-Specific SGSL
- indicates the compound does not exceed the screening level

Refined CSM. The historical (2002-2007) benzene concentration in a nearby monitoring well, UST820-MW17, was 4 times greater than the site-specific GWSL, which triggered the Phase I sampling.

Two subslab soil gas samples and two indoor air samples were collected in Building 820 during Phase I. Exterior sampling was not performed at Building 820 because of its proximity to an AS remediation system, as discussed in the Work Plan (CH2M HILL 2008a). The subslab soil gas sample collected on the east side of the building in the store area did not have any exceedances of the generic SGSLs. The soil gas sample collected on the west side of the building in the storage area, IR820-SG03, included a detection of ethylbenzene that slightly exceeded the generic SGSL, but was 87-time less than the base-specific SGSL. Ethylbenzene was not detected above the IASL in the concurrent indoor air sample collected within the vicinity of IR820-SG03. IR820-IA03 did contain concentrations of benzene, carbon tetrachloride, 1,4-dichlorobenzene, and chloroform that were 2 to 3 times the IASLs; however, these exceedances result in estimated risks that would fall within the target cancer risk range of 1E-06 to 1E-04 and below the non-cancer hazard quotient of 1. Although 1,4-dichlorobenzene and carbon tetrachloride were not detected in the indoor air sample collected at IR820-IA04, the reporting limit (0.2 ppbv) was slightly above the IASLs. Although carbon tetrachloride, 1,4-dichlorobenzene, and chloroform were not detected in either subslab samples, their reporting limits (2 ppbv) were 2 times the generic SGSL, but well below the base-specific SGSL.

Additional subslab soil gas and indoor air sampling was not deemed a priority for the Phase II sampling event because the one exceedance of the generic SGSLs was less than 2 times the generic SGSL and the exceedances in indoor air are likely unrelated to vapor intrusion and would result in an estimated risk within the target cancer risk range of 1E-06 to 1E-04 and below the non-cancer hazard quotient of 1.

Conclusions. Although select VOC indoor air concentrations exceeded the IASLs, significant vapor intrusion impacts are not currently expected at Building 820 based on a review of the Phase I data and the following lines of evidence: (1) ethylbenzene concentrations in subslab soil gas at Building 820 exceeded the generic SGSL, but were well below the base-specific SGSL and ethylbenzene was not detected above the IASL in indoor air; (2) it is unlikely that the indoor air detections of benzene, carbon tetrachloride, 1,4-dichlorobenzene, and chloroform above IASLs are related to vapor intrusion because these constituents were not detected in subslab soil gas above the generic SGSLs; and (3) these background-related

indoor air exceedances would result in an estimated risk within the target cancer risk range of 1E-06 to 1E-04 and below the non-cancer hazard quotient of 1.

Recommended Further Actions

1. An additional round of subslab and indoor air sample data should be collected at Building 820 to address temporal variability associated with soil gas sampling.
2. The Base should consider the vapor intrusion pathway during construction planning at Building 820 to ensure that the slab is not compromised given the generic SGSL subslab exceedance. Air monitoring should be performed if construction activities that involve slab penetrations are necessary.
3. Once the remedial actions that are being performed to address groundwater contamination near Building 820 are completed, the vapor intrusion pathway should be re-evaluated.

4.4.5 UST LCH-4015

The UST LCH-4015 site contains the community center building (LCH-4014), former fueling and maintenance area (LCH-4015, removed), Marine Corps Exchange Convenience Store (LCH-4034), and the former fuel tank farm. A former aboveground storage tank (AST) system began operation in 1945 at the site. Gasoline, diesel, and fuel oil were stored in the ASTs. A number of smaller storage tanks were also located at the site. Fuel was distributed through a number of underground product piping systems. ASTs at former Building LCH-4015 were emptied of product and were removed from the site.

In 1996, a Corrective Action Plan (CAP) was prepared and recommended installation of a biosparge (BS)/SVE system for the remedial action (Law, 1996). The treatment system was constructed and began remediation activities in November 1998. The groundwater treatment system has operated continuously since 1998, with the exception of occasional maintenance repairs and groundwater sampling events.

The LCH-4015 remediation system includes 38 vertical BS wells and 5 SVE wells. The BS wells reportedly were installed with a 1.5- to 3.5-ft screen interval ranging from 4.5 to 8.0 ft bgs. The SVE wells consist of a 2-inch diameter 0.02-inch slot width polyvinyl chloride (PVC) horizontal well screen reportedly installed slightly above the shallow groundwater table.

The remediation system layout is provided in the work plan (CH2M HILL, 2008a). The shallow groundwater flow direction is generally to the southeast. Depth to groundwater, measured during the February 2007 sampling event, ranged from approximately 1 to 5 ft bgs. The shallow groundwater elevations are likely influenced by operation of the remediation system (CH2M HILL, 2008a).

Building LCH-4014 is the only building on site UST LCH-4015 retained for evaluation.

Building LCH-4014

Building LCH-4014 is located on UST LCH-4015. The building is used as a community center which contains a fitness center, a movie theater, a thrift store, a laundromat,, and a post office. It is classified as a large industrial building for this evaluation. Building LCH-

4014 was included in Phase I because it is located within 100 ft of one shallow monitoring well (USTLCH4015-MW21) which had an exceedance of the site-specific GWSL for large industrial buildings for benzene, as shown in Table V2-24. The depth to groundwater at this well is approximately 11 ft bgs. Shallow groundwater flows in several directions near the building: to the southwest and to the north-northeast.

Building Characteristics. Building LCH-4014 is an L-shaped brick and mortar building that is approximately 200 ft long by 200 ft wide. The building is divided into several separate areas. There is a fitness center in the north section and a movie theater at the southwest side. Building LCH-4014 also contains a thrift store, movie theater, and post office.

The movie theater is approximately 100 ft long by 75 ft wide by 20 ft high in the seating area and 10 ft high backstage and in the concession area. The thrift store is approximately 50 feet long by 15 ft wide by 8 ft high.

The building likely has perimeter wall footings with additional footings underneath the pillars observed within the building. The concrete slab is level with the exterior ground surface. It is approximately 6 inches thick and contains wire mesh. No expansion joints or sumps were observed within the building. The restrooms contain floor drains. A large portion of the building floor is covered with vinyl tile, carpet, or tile. In the movie theater, the entire floor surface in the backstage, concession stand, and seating areas are bare concrete, but the aisles are covered with carpet. In the thrift store, the entire floor surface is covered with asbestos tile.

The building has a multi-zone HVAC unit. There are multiple doors and windows in each of the areas of Building LCH4014 and typically remain closed.

No potential indoor VOC sources were observed inside the movie theater during the Phase I sampling event; however, a strong disinfectant/air deodorizer odor was observed. There were no potential indoor VOC sources observed inside the thrift store during the Phase I sampling event.

Less than 100 people typically occupy the entire building. Less than 75 employees and customers typically occupy the movie theater during business hours, which include afternoons and evenings on weekdays and weekends. The thrift store is typically occupied by two workers during business hours, which are usually only during 1 or 2 days per month.

Analytical Results. Historical (2002–2007) shallow groundwater VOC concentrations within 100 ft of Building LCH-4014 above the site-specific GWSLs are summarized in this section and were taken from the Work Plan (CH2M HILL, 2008a). The historical groundwater exceedances are shown on Figure V2-16. Phase I soil gas and indoor air sample locations are shown on Figure V2-5 and the Phase I soil gas and indoor air sample results are provided in Tables V2-7 and V2-8. Results for the GWSL, SGSL, and/or IASL exceedances are provided in Table V2-24.

TABLE V2-24
Summary of Building LCH-4014 Investigation Results
Mainside, MCB Camp Lejeune, North Carolina

Building LCH-4014 Historical (2002 – 2007) Site-Specific Groundwater Screening Level Exceedances

Well ID	Screen Depth (ft bgs)	Benzene (µg/L)
GWSL		*11.9*
USTLCH4015-MW21	26.5 - 31.5	21.0

Building LCH-4014 Phase I Subslab Soil Gas Screening Level Exceedances

Sample ID	Benzene (ppbv)	Ethylbenzene (ppbv)	Chloroform (ppbv)	1,2-Dichloroethane (ppbv)
Generic SGSL (based on industrial air RSL; AF=1E-01)	*5.01*	*11.3*	*1.09*	*1.16*
Base-specific SGSL (AF=1E-03)	*500*	*1,130*	*101*	*116*
LCH4015-SG02-08B	-	37	2U	2U

Building LCH-4014 Phase I Indoor Air Screening Level Exceedances

Sample ID	Benzene (ppbv)	Ethylbenzene (ppbv)	Chloroform (ppbv)	1,2-Dichloroethane (ppbv)	PCE (ppbv)
IASL (industrial air RSL)	*0.501*	*1.13*	*0.109*	*0.116*	*0.31*
LCH4015-IA01-08B (thrift store)	-	3.3	3	0.22	4.6
LCH4015-IA02-08B (movie theater)	3.3U	3.3U	3	-	-

BOLD indicates exceedance of the base-specific SGSL
- indicates the compound does not exceed the screening level

Refined CSM. The historical (2002-2007) benzene concentration in nearby shallow monitoring well USTLCH4015-MW21 was 2 times greater than the site-specific GWSL, which triggered the Phase I sampling.

Two subslab soil gas and two indoor air samples were proposed at Building LCH-4014 for Phase I; however, subslab soil gas sampling could not be performed in the thrift store because of the presence of asbestos floor tiles. One subslab soil gas sample and one indoor air sample were collected from the movie theater area. The subslab soil gas sample contained ethylbenzene at a concentration that exceeded the generic SGSLs by 3 times, but was 30 times less than the base-specific SGL. Although there is some uncertainty about the indoor concentration of ethylbenzene in the movie theater because the reporting limit was 3 times greater than the IASL, it does not affect vapor intrusion conclusions since the subslab concentration of ethylbenzene was well below the base-specific SGLS. The indoor air sample collected in the movie theater contained chloroform at a concentration that exceeded the IASL by 27 times; however, chloroform was not detected in the subslab soil gas sample, with a reporting limit slightly above the generic SGSL and 50 times less than the base-specific SGSL.

One indoor air sample was collected in the thrift store during Phase I. The sample contained 1,2-dichloroethane, chloroform, ethylbenzene, and PCE at concentrations that exceeded the IASLs by 2, 28, 3, and 15 times, respectively. However, these exceedances result in estimated risks that are within the target cancer risk range of 1E-06 to 1E-04.

Additional sampling during Phase II at Building LCH-4014 was not deemed a priority given the potential contribution from above-ground background sources and because none of the Phase I exceedances in either of the indoor air samples would result in an estimated risk above the target cancer risk range of 1E-06 and 1E-04 and/or the non-cancer hazard quotient of 1.

Conclusions. Although select VOC indoor air concentrations exceeded the IASLs, significant vapor intrusion impacts are not currently expected at Building LCH-4014 based on a review of the Phase I data and the following lines of evidence: (1) benzene was not detected above the generic SGSL or IASL in the subslab or indoor air samples, even though the historical groundwater concentration of benzene exceeded the site-specific GWSL; (2) the subslab concentration of ethylbenzene did not exceed the base-specific SGSL; and (3) the indoor air concentrations above IASLs would result in an estimated risk within the target cancer risk range of 1E-06 to 1E-04 and/or the non-cancer hazard quotient of 1 and a significant portion of the estimated risk may be due to above-ground background sources.

Recommended Further Actions

1. An additional round of subslab sample data should be collected at Building LCH-4014 to address temporal variability associated with soil gas sampling. An additional subslab soil gas sample should be collected at Building LCH-4014 because only one of two subslab soil gas samples proposed for Phase I was collected and, for a building this size, more than one subslab soil gas sample is necessary to evaluate the potential vapor intrusion pathway.

2. The Base should consider the vapor intrusion pathway during construction planning at Building LCH-4014 to ensure that the slab is not compromised given the generic SGSL subslab exceedance. Air monitoring should be performed if construction activities that involve slab penetrations are necessary.

3. Once the remedial actions that are being performed to address subsurface contamination near Building LCH-4014 are completed, the vapor intrusion pathway should be re-evaluated.

SECTION 5

Overall Conclusions and Recommendations

The purpose of this section is to summarize the overall conclusions and recommendations of the vapor intrusion evaluation for Mainside that was performed as part of a phased basewide vapor intrusion evaluation of six investigation areas. Groundwater, exterior soil gas, and subslab soil gas samples were collected within or near nine buildings of interest to evaluate the potential for significant vapor intrusion impacts. Consistent with the DOD Tri-Services Handbook (2009), the Interstate Technology & Regulatory Council (ITRC) Vapor Intrusion Guidance documents (2007), and the recently released United States Environmental Protection Agency (USEPA) TCE Toxicity and Vapor Intrusion memorandum (2009), multiple lines of evidence were used in Section 4 to evaluate potential vapor intrusion impacts at each of the nine buildings. Conclusions and recommended further actions were based on the multiple-lines-of-evidence evaluation and the refined CSMs. The conclusions and recommended further actions for the buildings investigated in Mainside during Phase I and II are summarized in Table V2-25.

Overall, the subslab and/or indoor air data collected to date, along with the additional supporting lines of evidence, indicate that vapor intrusion is not a current significant pathway of concern for any of the Mainside buildings investigated during Phase I or Phase II. However, due to the magnitude of temporal variability associated with vapor intrusion sampling, an additional round of subslab soil gas data should be collected to confirm the conclusions at all buildings where only one round of subslab soil gas data was collected. Concurrent indoor air sampling is also recommended for select buildings.

In general, collecting indoor air samples during the heating season is considered more conservative because a building's windows and doors are more likely to be kept shut and the operation of the heating system may create a negative pressure differential between the indoor air and the subslab soil gas. The Phase I and II sampling events were performed in the summer and fall, respectively. If feasible, sampling during the winter should be considered for the Phase III sampling event.

If recommendations were not made for moving or adding sampling locations, then it is assumed that the location and number of sampling locations from Phases I and II were sufficient for that building. However, the final decision on whether sufficient data have been collected for each building should be considered by the partnering team.

Although current vapor intrusion impacts are not indicated based on the data collected to date, site-related VOCs were detected in subslab samples from select buildings at concentrations well above generic and/or basewide vapor intrusion screening levels. Construction planning considerations, source identification, active remediation, and/or monitoring are recommended for select buildings to address the potential for future vapor intrusion concerns.

TABLE V2-25
Summary of Recommendations
Mainside, MCB Camp Lejeune, North Carolina

Bldg #	Additional Round of Subslab Sampling	Concurrent Indoor Air Sampling	Consider Vapor Intrusion Pathway During Construction Planning	Remediate VOC Source	Install and Sample Subslab Probes
Buildings of Interest Sampled During Phase I and Phase II					
3	X	X	X	X	
3B	X	X	X	X	
37	X	X	X	X	
43	X	X	X	X	
728			No Further Action		
1828	X		X		
1855	X		X		
820	X	X	X		
LCH-4014	X		X		X
Buildings Recommended for Sampling based on the Preferential Pathway Analysis					
4					X
HP-57					X

5.1 Recommendations for Additional Sampling

The conclusions discussed in Section 4 were based primarily on data from a single round of soil gas, subslab, indoor, and/or outdoor air sampling. As discussed in the DOD Tri-Services (2009) and ITRC vapor intrusion guidance documents (2007) and at multiple USEPA and other vapor intrusion conferences (e.g., http://iavi.rti.org/WorkshopsAndConferences.cfm), both temporal and spatial variability are important factors to consider during vapor intrusion investigations. The current conditions and conclusions should be confirmed at all buildings where only one round of subslab and/or indoor sampling was conducted given the magnitude of temporal variability and uncertainty generally observed during vapor intrusion investigations. Therefore, an additional round of subslab, indoor, and/or outdoor air sampling should be conducted in 2009 at eight of the buildings in Mainside that were sampled once during Phase I or Phase II. Concurrent indoor air samples should be collected at five buildings (Buildings 3, 3B, 37, 43, and 820). An additional subslab sampling location is needed at Building LCH-4014 because one of the two proposed subslab probes could not be installed during Phase I and more than one subslab soil gas sample is necessary for vapor intrusion evaluation at a building of this size.

5.2 Recommendations for Construction Planning

Although current risks have not been identified, the Base should consider the vapor intrusion pathway during construction planning at buildings that had exceedances of the generic and/or basewide SGSLs to ensure that the slab is not compromised since cracks,

holes, or other penetrations of the slab have the potential to invalidate the use of the base-specific empirically derived attenuation factor. The Base should consider air monitoring for construction activities that involve slab penetrations, such as removal of part of the slab or drilling holes through the slab. Additional data collection at the conclusion of construction may be warranted to ensure the base-specific AF remains appropriate. In addition, buildings currently used as industrial should remain industrial pending additional evaluation. Currently, these buildings include Buildings 3, 3B, 37, 43, 1828, 1855, 820, and LCH-4014.

5.3 Recommendations for Remediation

Although the data and lines of evidence evaluated to date indicate current vapor intrusion impacts are not occurring at the Mainside buildings evaluated, source identification, active remediation, and monitoring are recommended at Buildings 3, 3B, 37 and 43 to address the potential for future vapor intrusion concerns. This recommendation is based on the observation that site-related VOCs were detected in subslab or exterior soil gas samples at concentrations exceeding the base-specific SGSLs by more than 100 times and the generic SGSLs by more than 10,000 times.

5.4 Preferential Pathways

A preferential pathway is defined by ITRC (2007) as a subsurface feature that would increase the likelihood that there would be significant flow of soil gas into a building. Per ITRC (2007), "Most buildings have subsurface utility penetrations, so their presence alone is not considered 'preferential.' For this guidance, some increased component of soil gas flow into the building is usually required to consider the pathway to be preferential. Anthropogenic preferential pathways include building sumps or drainage pits (that can serve as conduits for soil gas to enter buildings) or subsurface utility conduits or drains (that intersect vapor sources or soil gas migration routes and a building foundation)."

Since underground utilities can serve as conduits for vapor migration in the subsurface, they were identified and mapped using a geographic information system (GIS) in areas where exceedances of the base-specific SGSLs were observed (Figure V2-17). The locations of utilities with the greatest potential for significant horizontal vapor transport in the backfill material (e.g., stormwater and wastewater lines) were reviewed relative to the areas with elevated shallow groundwater, exterior soil gas, and/or subslab soil gas concentrations during Phase I or Phase II. A preliminary review of Phase I and Phase II data from nearby buildings was conducted to determine if the utility lines were creating significant preferential pathways for horizontal transport. This preliminary evaluation did not identify any obvious cases where significant vapor transport was occurring via preferential transport in utility corridors. However, there are two buildings (Buildings 4 and HP-57) that were not sampled during Phase I or II that are recommended for future sampling based on this preferential pathway analysis. The rationale for selecting these two buildings is provided below.

The utilities in the vicinity of Building 4 are shown on Figure V2-17. As shown on this figure, Building 4 is located within the vicinity of Buildings 3, 3B, 37 and 43, which were

sampled during Phase I or Phase II. There are steam and water lines that pass through the area of the former Building 25 dry cleaning facility and these utility lines connect to Buildings 4. As discussed in Section 4, significant exceedances of PCE and TCE vapor intrusion screening levels were observed in the exterior and subslab soil gas samples collected outside of Buildings 3, 3B, 37, and 43. Subslab sampling at Building 4 is recommended to address the possibility that the steam and water lines connecting to Building 4 may be preferential migration pathways for VOCs.

The utilities in the vicinity of Building HP-57 are shown on Figure V2-17. Building HP-57 is located within the vicinity of Buildings 3, 3B, 37, and 43, which were sampled during Phase I or Phase II. There are wastewater and water lines that pass through the area of the former Building 25 dry cleaning facility and these utility lines connect to Buildings HP-57. As discussed in Section 4, significant exceedances of PCE and TCE vapor intrusion screening levels were observed in the exterior and subslab soil gas samples collected outside of Buildings 3, 3B, 37, and 43. Subslab sampling at Building HP-57 is recommended to address the possibility that the wastewater and water lines connecting to Building HP-57 may be preferential migration pathways for VOCs.

SECTION 6

References

CH2M HILL. 2008a. Vapor Intrusion Evaluation Work Plan.

CH2M HILL. 2008b. Field Sampling Plan.

CH2M HILL, 2008c. *Final Amended Remedial Investigation (RI) Report*. Marine Corps Base Camp Lejeune, Jacksonville, North Carolina. March.

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USEPA. 2009. TCE Toxicity and Vapor Intrusion Memorandum.

Tables

TABLE V2-4
Summary of Mainside Phase I Groundwater Analytical Results
Vapor Intrusion Report
Mainside, MCB Camp Lejeune, North Carolina

Station ID	**Industrial Generic GW SL (AF=0.1)**	**Unrestricted Generic GW SL (AF=0.1)**	IR88-IS01	IR88-IS02	IR88-IS03	IR88-IS04	IR88-IS05	IR88-IS06	IR88-IS07
Sample ID			IR88-IS01-GW-13-15-08B	IR88-IS02-GW-15-17-08B	IR88-IS03-GW-12-13-08B	IR88-IS04-GW-11-12-08B	IR88-IS05-GW-11-12-08B	IR88-IS06-GW-09-10-08B	IR88-IS07-GW-10-14-08B
Sample Date			06/17/08	06/17/08	06/16/08	06/16/08	06/17/08	06/17/08	06/17/08
Chemical Name									
Volatile Organic Compounds (UG/L)									
1,1-Dichloroethane	33.5	6.53	33 U	1 U	16 U	10 U	1 U	1 U	1 U
1,1-Dichloroethene	824	197	33 U	1 U	1.9 J	0.62 J	1 U	1 U	1 U
Benzene	7.05	1.37	33 U	1 U	**2.6 J**	**13**	1 U	1 U	1 U
Bromomethane	86.2	20.4	67 U	2 U	32 U	20 U	0.17 J	0.15 J	2 U
Carbon disulfide	5,300	1,200	33 U	0.33 J	16 U	10 U	1 U	1 U	0.58 J
Chlorobenzene	1,450	344	33 U	1 U	16 U	0.55 J	1 U	1 U	1 U
Chloroethane	122,000	27,700	67 U	2 U	9.1 J	45	2 U	2 U	2 U
Chloroform	3.53	0.733	33 U	1 U	16 U	10 U	1 U	0.11 J	1 U
Ethylbenzene	15.2	3.01	33 U	1 U	16 U	0.84 J	1 U	1 U	1 U
Isopropylbenzene	37.9	8.85	33 U	1 U	16 U	10 U	1 U	1 U	1 U
Methylcyclohexane	3,084	735	33 U	1 U	16 U	10 U	1 U	1 U	1 U
Tetrachloroethene	2.79	0.545	**1,100**	0.13 J	**750**	**52**	**11**	0.16 J	1 U
Trichloroethene	14.5	2.85	**9.8 J**	1 U	**130**	**17**	0.053 J	1 U	0.23 J
Trichlorofluoromethane(Freon-11)	781	184	67 U	2 U	32 U	20 U	2 U	2 U	2 U
Vinyl chloride	2.54	0.145	33 U	1 U	**89**	**71**	1 U	1 U	1 U
cis-1,2-Dichloroethene	--	--	8.8 J	1 U	800	200	1 U	1 U	1 U
trans-1,2-Dichloroethene	678	164	33 U	1 U	6.9 J	1.3 J	1 U	1 U	1 U

Notes:

J - Analyte present, value may or may not be accurate or precise

NA - Not analyzed

U - The material was analyzed for, but not detected

UG/L - Micrograms per liter

SL - Screening Levels

Shading indicates exceedance of Industrial Generic criteria

Bold text indicates exceedance of Unrestricted Generic criteria

TABLE V2-4
Summary of Mainside Phase I Groundwater Analytical Results
Vapor Intrusion Report
Mainside, MCB Camp Lejeune, North Carolina

Station ID	**Industrial Generic GW SL (AF=0.1)**	**Unrestricted Generic GW SL (AF=0.1)**	SWMU360-IS08	SWMU360-IS09	SWMU360-IS10		SWMU360-IS11
Sample ID			SWMU360-IS08-GW-20-22-08B	SWMU360-IS09-GW-23-25-08B	SWMU360-IS10-GW-08B	SWMU360-IS10D-GW-08B	SWMU360-IS11-GW-23-25-08B
Sample Date			06/19/08	06/18/08	06/19/08	06/19/08	06/19/08
Chemical Name							
Volatile Organic Compounds (UG/L)							
1,1-Dichloroethane	33.5	6.53	1 U	0.45 J	0.59 J	0.58 J	0.67 J
1,1-Dichloroethene	824	197	1 U	0.15 J	0.18 J	0.19 J	0.32 J
Benzene	7.05	1.37	0.17 J	1 U	0.042 J	0.041 J	1 U
Bromomethane	86.2	20.4	2 U	2 U	2 U	2 U	2 U
Carbon disulfide	5,300	1,200	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	1,450	344	1 U	1 U	1 U	1 U	1 U
Chloroethane	122,000	27,700	2 U	2 U	2 U	2 U	2 U
Chloroform	3.53	0.733	1 U	0.29 J	0.61 J	**0.79 J**	0.22 J
Ethylbenzene	15.2	3.01	1 U	1 U	1 U	1 U	1 U
Isopropylbenzene	37.9	8.85	0.058 J	1 U	1 U	1 U	1 U
Methylcyclohexane	3,084	735	1 U	1 U	1 U	0.037 J	1 U
Tetrachloroethene	2.79	0.545	0.24 J	**22**	**6.1**	**6.9**	**12**
Trichloroethene	14.5	2.85	0.099 J	2.3	2.5	2.6	**4.4**
Trichlorofluoromethane(Freon-11)	781	184	2 U	0.1 J	0.12 J	0.14 J	2 U
Vinyl chloride	2.54	0.145	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	--	--	0.36 J	11	14	13	18
trans-1,2-Dichloroethene	678	164	1 U	0.3 J	0.37 J	0.38 J	0.53 J

Notes:

J - Analyte present, value may or may not be accurate or precise
NA - Not analyzed
U - The material was analyzed for, but not detected
UG/L - Micrograms per liter
SL - Screening Levels
Shading indicates exceedance of Industrial Generic criteria
Bold text indicates exceedance of Unrestricted Generic criteria

TABLE V2-5
Summary of Mainside Phase I Shallow Soil Vapor Analytical Results
Vapor Intrusion Report
Mainside, MCB Camp Lejeune, North Carolina

Station ID	**Industrial Shallow Generic SVSL (AF=0.1) (ppbv)**	**Unrestricted Shallow Generic SVSL (AF=0.1) (ppbv)**	IR88-IS01	IR88-IS02	IR88-IS03	IR88-IS04	IR88-IS05		IR88-IS06	IR88-IS07	IR88-IS13	IR88-IS14
Sample ID			IR88-IS01-SV-05-06-08B	IR88-IS02-SV-05-06-08B	IR88-IS03-SV-05-06-08B	IR88-IS04-SV-05-06-08B	IR88-IS05-SV-05-06-08B	IR88-IS05D-SV-05-06-08B	IR88-IS06-SV-05-06-08B	IR88-IS07-SV-05-06-08B	IR88-IS13-SV-4.5-5.5-08B	IR88-IS14-SV-4.5-5.5-08B
Sample Date			06/18/08	06/18/08	06/18/08	06/18/08	06/18/08	06/18/08	06/18/08	06/17/08	06/18/08	06/18/08
Chemical Name												
Volatile Organic Compounds (ppbv)												
1,1,1-Trichloroethane	40,300	9,530	3,000 U	6.9 U	2 U	0.76 J	140 U	150 U	1.8 J	2.3	2 U	13 U
1,1-Dichloroethene	2,220	530	3,000 U	6.9 U	2 U	1.1 J	140 U	150 U	2 U	2 U	2 U	5.7 J
2-Butanone	74,600	17,600	15,000 U	15 J	10 U	20 U	680 U	730 U	19	25	10 U	65 U
2-Hexanone	31,700	7,570	7,500 U	17 U	5 U	10 U	340 U	360 U	0.83 J	1.5 J	5 U	33 U
4-Methyl-2-pentanone	31,700	7,560	7,500 U	17 U	5 U	10 U	340 U	360 U	5 U	1 J	5 U	33 U
Acetone	589,000	135,000	75,000 U	61 J	26 J	32 J	1,000 J	3,600 U	160	240	24 J	330 U
Benzene	5.01	0.97	3,000 U	**6.3 J**	0.92 J	**78**	140 U	150 U	**3.4**	**2.3**	2 U	13 U
Carbon disulfide	9,950	2,340	7,500 U	3.4 J	5 U	10 U	340 U	360 U	0.92 J	5 U	5 U	33 U
Chlorobenzene	478	113	3,000 U	6.9 U	2 U	1.8 J	140 U	150 U	2 U	2 U	2 U	13 U
Chloroethane	167,000	37,900	3,000 U	6.9 U	2 U	4.8	140 U	150 U	2 U	2 U	2 U	13 U
Chloroform	1.09	0.225	3,000 U	6.9 U	2 U	4 U	140 U	150 U	**1.5 J**	2 U	**0.63 J**	**12 J**
Chloromethane	32.9	6.78	7,500 U	17 U	5 U	10 U	340 U	360 U	2.8 J	5 U	5 U	33 U
Cyclohexane	75,500	18,300	7,500 U	4.5 J	5 U	10 U	340 U	360 U	5 U	5 U	5 U	33 U
Ethylbenzene	11.3	2.23	3,000 U	**3.5 J**	2 U	**5.9**	140 U	150 U	0.75 J	2 U	2 U	13 U
Methylene chloride	74.8	15	7,500 U	17 U	5 U	10 U	**290 J**	360 U	5 U	5 U	5 U	33 U
Tetrachloroethene	3.1	0.605	**300,000**	**1,100**	**170**	**49**	**12,000**	**26,000**	**580**	**2.2**	**120**	**3,500**
Toluene	58,400	13,800	3,000 U	8.1	1.1 J	29	140 U	150 U	3.4	2.8	2 U	13 U
Trichloroethene	11.4	2.23	3,000 U	**6.3 J**	**5.8**	**16**	**120 J**	**140 J**	1.9 J	2 U	2 U	**600**
Trichlorofluoromethane(Freon-11)	5,520	1,300	3,000 U	6.9 U	0.35 J	1 J	17 J	52 J	0.33 J	0.25 J	0.43 J	13 U
Vinyl chloride	11	0.626	3,000 U	6.9 U	2 U	**670**	140 U	150 U	2 U	2 U	2 U	**18**
cis-1,2-Dichloroethene	--	--	3,000 U	2.1 J	5.8	360	140 U	150 U	2 U	2 U	2 U	3,700
m- and p-Xylene	1,010	230	3,000 U	6.9 U	2 U	4	140 U	150 U	2 U	2 U	2 U	13 U
o-Xylene	7,140	1,680	3,000 U	6.9 U	2 U	1.8 J	140 U	150 U	2 U	2 U	2 U	13 U
trans-1,2-Dichloroethene	656	159	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	68

Notes:

J - Analyte present, value may or may not be accurate or precise
NA - Not analyzed
U - The material was analyzed for, but not detected
ppbv - parts per billion volume
SVSL - Soil Vapor Screening Level
Shading indicates exceedance of Industrial Generic criteria
Bold text indicates exceedance of Unrestricted Generic criteria

TABLE V2-6
Summary of Mainside Phase I Deep Soil Vapor Analytical Results
Vapor Intrusion Report
Mainside, MCB Camp Lejeune, North Carolina

Station ID	**Industrial Deep Generic SVSL (AF=0.01) (ppbv)**	**Unrestricted Deep Generic SVSL (AF=0.01) (ppbv)**	SWMU360-IS08	SWMU360-IS09	SWMU360-IS10		SWMU360-IS11
Sample ID			SWMU360-IS08-SV-17-18-08B	SWMU360-IS09-SV-14-15-08B	SWMU360-IS10D-SV-08B	SWMU360-IS10-SV-08B	SWMU360-IS11-SV-17-18-08B
Sample Date			06/19/08	06/18/08	06/19/08	06/19/08	06/19/08
Chemical Name							
Volatile Organic Compounds (ppbv)							
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	1,700,000	404,000	0.39 J	13 U	0.33 J	0.32 J	3.6 U
1,1-Dichloroethane	190	37.1	2 U	13 U	0.62 J	0.51 J	1.8 J
1,1-Dichloroethene	22,200	5,300	1 J	13 U	2 U	2 U	3.6 U
2-Butanone	746,000	176,000	21	40 J	10	12	31
2-Hexanone	317,000	75,700	2.7 J	32 U	0.67 J	0.89 J	1.8 J
4-Methyl-2-pentanone	317,000	75,600	1.2 J	32 U	5 U	5 U	0.98 J
Acetone	5,890,000	1,350,000	180	210 J	97	130	210
Benzene	50.1	9.7	**45**	5.3 J	4.7	4.1	**27**
Carbon disulfide	99,500	23,400	5.5	6 J	4.2 J	3 J	3.9 J
Chloroform	10.9	2.25	0.38 J	**83**	**170**	**160**	**8.5**
Cyclohexane	755,000	183,000	16	32 U	2.8 J	3.1 J	9.1 U
Dichlorodifluoromethane (Freon-12)	17,800	4,250	2.1	88	220	200	1.4 J
Ethylbenzene	113	22.3	11	13 U	0.82 J	0.68 J	3.3 J
Isopropylbenzene	36,600	8,540	8	26 U	4 U	4 U	7.3 U
Styrene	103,000	23,500	3.1	13 U	0.66 J	2 U	1.5 J
Tetrachloroethene	31	6.05	**38**	**4,100**	**360**	**320**	**490**
Toluene	584,000	138,000	42	5.1 J	5.6	4	18
Trichloroethene	114	22.3	2.3	**29**	5.1	4.4	12
Trichlorofluoromethane(Freon-11)	55,200	13,000	0.72 J	190	490	430	2 J
Vinyl chloride	110	6.26	0.99 J	13 U	2 U	2 U	3.6 U
cis-1,2-Dichloroethene	--	--	3.1	5.5 J	0.65 J	0.64 J	5.9
m- and p-Xylene	10,100	2,600	11	13 U	2 U	2 U	3.2 J
o-Xylene	71,400	16,800	7	13 U	2 U	2 U	1.7 J
trans-1,2-Dichloroethene	6,560	1,590	2 U	3.3 J	2 U	2 U	3.6 U

Notes:

J - Analyte present, value may or may not be accurate or precise

NA - Not analyzed

U - The material was analyzed for, but not detected

ppbv - parts per billion volume

SVSL - Soil Vapor Screening Level

Shading indicates exceedance of Industrial Generic criteria

Bold text indicates exceedance of Unrestricted Generic criteria

TABLE V2-7
Summary of Mainside Phase I Subslab Soil Gas Analytical Results
Vapor Intrusion Report
Mainside, MCB Camp Lejeune, North Carolina

Station ID	**Industrial Shallow Generic SGSL (AF=0.1) (ppbv)**	**Unrestricted Shallow Generic SGSL (AF=0.1) (ppbv)**	UST820-SG03	UST820-SG04	LCH4015-SG02
Sample ID			IR820-SG03-08B	IR820-SG04-08B	LCH4015-SG02-08B
Sample Date			06/24/08	06/24/08	06/22/08
Chemical Name					
Volatile Organic Compounds (ppbv)					
4-Methyl-2-pentanone	31,700	7,560	5 U	5 U	3.5 J
Acetone	589,000	135,000	20 J	50 U	18 J
Benzene	5.01	0.97	2 U	2 U	**1.1 J**
Bromomethane	56.7	13.4	2 U	2 U	0.34 J
Cyclohexane	75,500	18,300	5 U	5 U	1.9 J
Dichlorodifluoromethane (Freon-12)	1,780	425	190	2 U	0.85 J
Ethylbenzene	11.3	2.23	**13**	**4.1**	**37**
Isopropylbenzene	3,660	854	0.99 J	4 U	3.5 J
Methylene chloride	74.8	15	1.5 J	5 U	7.8
Toluene	58,400	13,800	2.4	1.3 J	4.8
Trichloroethene	11.4	2.23	2 U	2 U	0.46 J
Trichlorofluoromethane(Freon-11)	5,520	1,300	4.5	2 U	1.4 J
m- and p-Xylene	1,010	230	28	7.9	90
o-Xylene	7,140	1,680	9.3	2.2	34

Notes:

J - Analyte present, value may or may not be accurate or precise

NA - Not analyzed

U - The material was analyzed for, but not detected

SGSL - Soil Gas Screening Level

Shading indicates exceedance of Industrial Generic criteria

Bold text indicates exceedance of Unrestricted Generic criteria

TABLE V2-8
Summary of Mainside Phase I Indoor Air Analytical Results
Vapor Intrusion Report
Mainside, MCB Camp Lejeune, North Carolina

Station ID	**Industrial Air RSL (ppbv)**	**Unrestricted Air RSL (ppbv)**	IR820-IA03	IR820-IA04	IR88-IA01		IR88-IA02	IR88-IA03	IR88-IA04	LCH4015-IA01	LCH4015-IA02	SWMU118-CSA05
Sample ID			IR820-IA03-08B	IR820-IA04-08B	IR88-IA01-08C	IR88-IA01D-08C	IR88-IA02-08C	IR88-IA03-08C	IR88-IA04-08C	LCH4015-IA01-08B	LCH4015-IA02-08B	SWMU118-CSA05-08B
Sample Date			06/24/08	06/24/08	09/12/08	09/12/08	09/12/08	09/12/08	09/12/08	06/24/08	06/23/08	06/22/08
Chemical Name												
Volatile Organic Compounds (ppbv)												
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	17,000	4,040	0.09 J	0.2 U	0.084 J	0.082 J	0.08 J	0.09 J	0.1 J	0.092 J	3.3 U	0.36
1,1-Dichloroethene	222	53	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	3.3 U	0.2 U
1,2-Dichloroethane	0.116	0.0232	**0.096 J**	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**0.08 J**	**0.22**	3.3 U	0.2 U
1,4-Dichlorobenzene	0.183	0.0366	**0.53**	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**0.1 J**	3.3 U	0.2 U
2-Butanone	7,460	1,760	4.9	0.23 J	0.55 J	0.38 J	0.73 J	0.49 J	0.8 J	1.7	17 U	0.96 J
2-Hexanone	3,170	757	0.42 J	0.5 U	0.5 UJ	0.5 UJ	0.061 J	0.5 UJ	0.5 UJ	0.08 J	8.3 U	0.1 J
4-Methyl-2-pentanone	3,170	756	0.31 J	0.5 U	0.15 J	0.5 U	0.13 J	0.051 J	0.22 J	0.46 J	8.3 U	0.5 U
Acetone	58,900	13,500	45	3.1 J	12	13	19	16	21	31	260	8.9
Benzene	0.501	0.097	**1.2**	**0.15 J**	**0.16 J**	0.073 J	**0.17 J**	**0.19 J**	**0.12 J**	**0.34**	3.3 U	**0.66**
Carbon disulfide	995	234	0.19 J	0.034 J	0.075 J	0.5 U	0.051 J	0.045 J	0.06 J	0.046 J	8.3 U	0.19 J
Carbon tetrachloride	0.13	0.0254	**0.24**	0.2 U	**0.098 J**	**0.082 J**	**0.097 J**	**0.11 J**	**0.091 J**	**0.12 J**	3.3 U	**0.093 J**
Chloroform	0.109	0.0225	**0.28**	**0.045 J**	0.2 U	0.2 U	0.2 U	**0.11 J**	**0.041 J**	**3**	**3 J**	0.2 U
Chloromethane	3.29	0.678	**1.3**	0.5 U	**0.83**	**0.94**	**1.2**	**0.99**	**1.2**	**1.3**	8.3 U	0.5 U
Cyclohexane	7,550	1,830	1.1	0.072 J	0.081 J	0.058 J	0.09 J	0.075 J	0.14 J	0.22 J	8.3 U	3.6
Dichlorodifluoromethane (Freon-12)	178	42.5	12	0.65	0.52	0.5	0.52	3.2	5.2	0.66	3.3 U	0.54
Ethylbenzene	1.13	0.223	**0.52**	0.2 U	0.069 J	0.2 U	0.069 J	0.2 U	0.072 J	**3.3**	3.3 U	0.072 J
Isopropylbenzene	366	85.4	0.075 J	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.14 J	6.7 U	0.4 U
Methylene chloride	7.48	1.5	0.87 U	0.5 U	0.5 U	0.56 U	0.5 U	0.5 U	0.5 U	0.68 U	8.3 U	0.5 U
Styrene	1,030	235	0.9	0.2 U	0.064 J	0.2 U	0.065 J	0.06 J	0.2 U	0.064 J	3.3 U	0.2 U
Tetrachloroethene	0.31	0.0605	0.2 U	0.2 U	**0.11 J**	0.2 U	**0.099 J**	**1.6**	**12**	**4.6**	3.3 U	0.2 U
Toluene	5,840	1,380	11	0.6	1.7	0.14 J	2.1	0.69	1.4	6	1.4 J	0.24
Trichloroethene	1.14	0.223	0.047 J	0.2 U	0.2 U	0.2 U	0.2 U	0.055 J	**1.2**	0.1 J	**0.81 J**	0.2 U
Trichlorofluoromethane(Freon-11)	552	130	7.4	0.3	0.24	0.24	0.23	0.27	0.25	0.48	0.89 J	0.32
Vinyl chloride	1.1	0.0626	**0.096 J**	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	3.3 U	0.2 U
cis-1,2-Dichloroethene	--	--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	3.3 U	0.14 J
m- and p-Xylene	101	23	1.5	0.2 U	0.19 J	0.2 U	0.21	0.17 J	0.16 J	8.7	3.3 U	0.17 J
o-Xylene	714	168	0.53	0.2 U	0.071 J	0.2 U	0.075 J	0.065 J	0.2 U	2.2	3.3 U	0.089 J

Notes:

J - Analyte present, value may or may not be accurate or precise
NA - Not analyzed
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
ppbv - parts per billion volume
SL - Screening Levels
Shading indicates exceedance of Industrial Generic criteria
Bold text indicates exceedance of Unrestricted Generic criteria

TABLE V2-9
Summary of Mainside Phase I Outdoor Air Analytical Results
Vapor Intrusion Report
Mainside, MCB Camp Lejeune, North Carolina

Station ID	**Industrial Air RSL (ppbv)**	**Unrestricted Air RSL (ppbv)**	IR820-OA03	IR88-OA05	LCH4015-OA01	LCH4015-OA02
Sample ID			IR820-OA03-08B	IR88-OA05-08C	LCH4015-OA01-08B	LCH4015-OA02-08B
Sample Date			06/24/08	09/12/08	06/23/08	06/24/08
Chemical Name			IR820-OA03			
Volatile Organic Compounds (ppbv)						
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	17,000	4,040	0.078 J	0.078 J	0.084 J	0.096 J
1,1-Dichloroethene	222	53	0.05 J	0.2 U	0.2 U	0.2 U
1,2-Dichloroethane	0.116	0.0232	0.2 U	0.2 U	0.2 U	0.066 J
1,4-Dichlorobenzene	0.183	0.0366	0.2 U	0.2 U	0.2 U	0.2 U
2-Butanone	7,460	1,760	1.7	0.48 J	1.3	3.1
2-Hexanone	3,170	757	0.067 J	0.5 UJ	0.5 U	0.12 J
4-Methyl-2-pentanone	3,170	756	0.052 J	0.5 U	0.12 J	0.16 J
Acetone	58,900	13,500	17	5.5	8.6	18
Benzene	0.501	0.097	0.17 J	0.12 J	0.15 J	0.32
Carbon disulfide	995	234	0.053 J	0.083 J	0.14 J	0.39 J
Carbon tetrachloride	0.13	0.0254	0.077 J	0.09 J	0.11 J	0.12 J
Chloroform	0.109	0.0225	0.2 U	0.045 J	0.2 U	0.039 J
Chloromethane	3.29	0.678	1.2	1.7	0.94	1.3
Cyclohexane	7,550	1,830	0.5 U	0.056 J	0.5 U	0.089 J
Dichlorodifluoromethane (Freon-12)	178	42.5	0.58	0.52	0.61	0.68
Ethylbenzene	1.13	0.223	0.2 U	0.2 U	0.12 J	0.15 J
Isopropylbenzene	366	85.4	0.4 U	0.4 U	0.4 U	0.4 U
Methylene chloride	7.48	1.5	0.51	0.68 U	0.51 U	0.87 U
Styrene	1,030	235	0.2 U	0.2 U	0.2 U	0.087 J
Tetrachloroethene	0.31	0.0605	0.2 U	0.18 J	0.2 U	0.073 J
Toluene	5,840	1,380	0.42	0.48	0.97	0.78
Trichloroethene	1.14	0.223	0.2 U	0.2 U	0.2 U	0.2 U
Trichlorofluoromethane(Freon-11)	552	130	0.32	0.25	0.42	0.41
Vinyl chloride	1.1	0.0626	0.2 U	0.2 U	0.2 U	0.2 U
cis-1,2-Dichloroethene	--	--	0.2 U	0.2 U	0.2 U	0.2 U
m- and p-Xylene	101	23	0.2 U	0.14 J	0.47	0.5
o-Xylene	714	168	0.2 U	0.2 U	0.14 J	0.18 J

Notes:

J - Analyte present, value may or may not be accurate or precise

NA - Not analyzed

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

ppbv - parts per billion volume

SL - Screening Levels

Shading indicates exceedance of Industrial Generic criteria

Bold text indicates exceedance of Unrestricted Generic criteria

* Outdoor air has not been compared to any criteria

TABLE V2-10
Summary of Mainside Phase II Subslab Soil Gas Analytical Results
Vapor Intrusion Report
Mainside, MCB Camp Lejeune, North Carolina

Station ID	**Industrial Shallow Generic SGSL (AF=0.1) (ppbv)**	**Industrial Shallow Base-Specific SGSL (AF=0.001) (ppbv)**	**Unrestricted Shallow Generic SGSL (AF=0.1) (ppbv)**	**Unrestricted Shallow Base Specific SGSL (AF=0.001) (ppbv)**	IR88-SG05		IR88-SG06	IR88-SG07	IR88-SG08	IR88-SG13	SWMU360-SG09
Sample ID					IR88-SG05-08C	IR88-SG05D-08C	IR88-SG06-08C	IR88-SG07-08C	IR88-SG08-08C	IR88-SG13-08C	SWMU360-SG09-08C
Sample Date					10/06/08	10/06/08	09/28/08	10/06/08	10/06/08	10/06/08	10/06/08
Chemical Name											
Volatile Organic Compounds (ppbv)											
1,4-Dichlorobenzene	1.83	183	0.366	36.6	130 U	200 U	**100 J**	9.1 U	62 U	11,000 U	2 U
2-Butanone	74,600	7,460,000	17,600	1,760,000	660 U	1,000 U	1,600 U	46 U	310 U	53,000 U	10 U
Acetone	589,000	58,900,000	135,000	13,500,000	3,300 UJ	5,100 UJ	4,600 J	230 U	1,500 UJ	270,000 UJ	50 U
Benzene	5.01	501	0.97	97	130 U	200 U	**150 J**	9.1 U	62 U	11,000 U	2 U
Chloroform	1.09	109	0.225	22.5	130 U	200 U	310 U	9.1 U	62 U	11,000 U	**0.78 J**
Cyclohexane	75,500	7,550,000	18,300	1,830,000	330 U	510 U	780 U	23 U	150 U	27,000 U	5 U
Dichlorodifluoromethane (Freon-12)	1,780	178,000	425	42,500	130 U	200 U	310 U	9.1 U	62 U	11,000 U	7.7
Ethylbenzene	11.3	1130	2.23	223	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U
Methylene chloride	74.8	7480	15	1500	330 U	510 U	**9,000**	23 U	150 U	27,000 U	5 U
Tetrachloroethene	3.1	310	0.605	60.5	**24,000**	**16,000**	**36,000**	**1,700**	**11,000**	**2,500,000**	**5.1**
Toluene	58,400	5,840,000	13,800	1,380,000	130 U	200 U	430	9.1 U	62 U	11,000 U	2 U
Trichloroethene	11.4	1140	2.23	223	130 U	200 U	310 U	2.1 J	**12 J**	**6,700 J**	2 U
Trichlorofluoromethane(Freon-11)	5,520	552,000	1,300	130,000	130 U	200 U	180 J	9.1 U	62 U	11,000 U	16
m- and p-Xylene	1,010	101,000	230	23,000	130 U	200 U	310 U	9.1 UJ	62 U	11,000 U	2 U
o-Xylene	7,140	714,000	1,680	168,000	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U

Notes:

J - Analyte present, value may or may not be accurate or precise

NA - Not analyzed

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

SGSL - Soil Gas Screening Level

Shading indicates exceedance of Industrial Generic criteria

Bold text indicates exceedance of Unrestricted Generic criteria

Bold box indicates exceedance Industrial Base-Specific criteria

Underline indicates exceedance of Unrestricted base Specific criteria

TABLE V2-10
Summary of Mainside Phase II Subslab Soil Gas Analytical Results
Vapor Intrusion Report
Mainside, MCB Camp Lejeune, North Carolina

Station ID	**Industrial Shallow Generic SGSL (AF=0.1) (ppbv)**	**Industrial Shallow Base-Specific SGSL (AF=0.001) (ppbv)**	**Unrestricted Shallow Generic SGSL (AF=0.1) (ppbv)**	SWMU360-SG10	SWMU360-SG11	SWMU360-SG12
Sample ID				SWMU360-SG10-08C	SWMU360-SG11-08C	SWMU360-SG12-08C
Sample Date				10/06/08	10/06/08	10/06/08
Chemical Name						
Volatile Organic Compounds (ppbv)						
1,4-Dichlorobenzene	1.83	183	0.366	2 U	2 U	2 U
2-Butanone	74,600	7,460,000	17,600	10 U	10 U	2.7 J
Acetone	589,000	58,900,000	135,000	50 U	50 U	27 J
Benzene	5.01	501	0.97	2 U	2 U	**2.3**
Chloroform	1.09	109	0.225	**0.41 J**	2 U	**0.69 J**
Cyclohexane	75,500	7,550,000	18,300	5 U	5 U	0.93 J
Dichlorodifluoromethane (Freon-12)	1,780	178,000	425	4.9	2 U	2.1
Ethylbenzene	11.3	1130	2.23	2 U	2 U	1.2 J
Methylene chloride	74.8	7480	15	5 U	5 U	5 U
Tetrachloroethene	3.1	310	0.605	**5**	**7.3**	**57**
Toluene	58,400	5,840,000	13,800	2 U	2 U	8.4
Trichloroethene	11.4	1140	2.23	2 U	2 U	2 U
Trichlorofluoromethane(Freon-11)	5,520	552,000	1,300	13	2 U	3
m- and p-Xylene	1,010	101,000	230	2 U	2 U	3.7
o-Xylene	7,140	714,000	1,680	2 U	2 U	1.4 J

Notes:

J - Analyte present, value may or may not be accurate or precise

NA - Not analyzed

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

SGSL - Soil Gas Screening Level

Shading indicates exceedance of Industrial Generic criteria

Bold text indicates exceedance of Unrestricted Generic criteria

Bold box indicates exceedance Industrial Base-Specific criteria

Underline indicates exceedance of Unrestricted base Specific criteria

TABLE V2-11

Summary of Mainside Phase II Indoor Air Analytical Results

Vapor Intrusion Report

Mainside, MCB Camp Lejeune, North Carolina

Station ID	**Industrial Air RSL (ppbv)**	**Unrestricted Air RSL (ppbv)**	IR88-IA07		IR88-IA08	IR88-IA09	IR88-IA10
Sample ID			IR88-IA07-08C	IR88-IA07D-08C	IR88-IA08-08C	IR88-IA09-08C	IR88-IA10-08C
Sample Date			10/08/08	10/08/08	09/28/08	10/07/08	10/07/08
Chemical Name							
Volatile Organic Compounds (ppbv)							
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	17,000	4,040	0.1 J	0.1 J	0.084 J	0.081 J	0.043 J
1,2-Dichloroethane	0.116	0.0232	**0.053 J**	**0.061 J**	0.4 U	0.2 U	0.2 U
1,4-Dichlorobenzene	0.183	0.0366	0.2 U	**0.094 J**	0.4 U	0.2 U	0.2 U
2-Butanone	7,460	1,760	1.4	1.3	6.8	1.1	1 U
2-Hexanone	3,170	757	0.5 U	0.5 U	1 U	0.12 J	0.5 U
4-Methyl-2-pentanone	3,170	756	0.056 J	0.5 U	0.38 J	1.1	0.5 U
Acetone	58,900	13,500	20 J	20	40	17 J	16 J
Benzene	0.501	0.097	**0.12 J**	**0.15 J**	**0.26 J**	**0.21**	0.2 U
Bromomethane	5.67	1.34	0.2 U	0.2 U	0.4 U	0.2 U	0.15 J
Carbon disulfide	995	234	0.5 U	0.5 U	2.4	0.047 J	0.5 U
Carbon tetrachloride	0.13	0.0254	**0.061 J**	**0.078 J**	**0.09 J**	**0.098 J**	0.2 U
Chloroform	0.109	0.0225	0.2 U	0.2 U	0.4 U	**0.1 J**	0.2 U
Chloromethane	3.29	0.678	0.5	0.64	**2**	**0.71**	**0.96**
Cyclohexane	7,550	1,830	0.14 J	0.14 J	0.14 J	0.13 J	0.5 U
Dichlorodifluoromethane (Freon-12)	178	42.5	0.44	0.46	3.4	0.56	0.58
Ethylbenzene	1.13	0.223	0.2 U	0.13 J	0.4 U	0.075 J	0.2 U
Methylene chloride	7.48	1.5	0.99 U	0.57 U	**4.8**	**1.7**	0.5 U
Styrene	1,030	235	0.2 U	0.15 J	0.4 U	0.078 J	0.2 U
Tetrachloroethene	0.31	0.0605	**1.3**	**2.4**	**2**	**0.26**	0.2 U
Toluene	5,840	1,380	0.45	0.8	1.2	2.7	0.2 U
Trichloroethene	1.14	0.223	**0.6**	**0.64**	0.4 U	0.2 U	0.2 U
Trichlorofluoromethane(Freon-11)	552	130	0.22	0.23	0.58	0.25	0.23
m- and p-Xylene	101	23	0.2 U	0.21 J	0.25 J	0.22	0.2 U
o-Xylene	714	168	0.2 U	0.096 J	0.4 U	0.08 J	0.2 U

Notes:

J - Analyte present, value may or may not be accurate or precise

NA - Not analyzed

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

SL - Screening Level

Shading indicates exceedance of Industrial Screening Levels

Bold text indicates exceedance of Unrestricted Screening Levels

TABLE V2-12
Summary of Mainside Phase II Outdoor Air Analytical Results
Vapor Intrusion Report
Mainside, MCB Camp Lejeune, North Carolina

Station ID	**Industrial Air RSL (ppbv)**	**Unrestricted Air RSL (ppbv)**	IR88-OA01	IR88-OA02	IR88-OA03	IR88-OA05
Sample ID			IR88-OA01-08C	IR88-OA02-08C	IR88-OA03-08C	IR88-OA05-08C
Sample Date			10/06/08	10/07/08	10/07/08	09/12/08
Chemical Name						
Volatile Organic Compounds (ppbv)						
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	17,000	4,040	0.081 J	0.073 J	0.072 J	0.078 J
1,2-Dichloroethane	0.116	0.0232	0.2 U	0.2 U	0.2 U	0.2 U
1,4-Dichlorobenzene	0.183	0.0366	0.2 U	0.2 U	0.2 U	0.2 U
2-Butanone	7,460	1,760	0.37 J	0.63 J	0.48 J	0.48 J
2-Hexanone	3,170	757	0.5 U	0.5 U	0.5 U	0.5 UJ
4-Methyl-2-pentanone	3,170	756	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	58,900	13,500	3.1 J	5.3 J	3.4 J	5.5
Benzene	0.501	0.097	0.13 J	0.21	0.17 J	0.12 J
Bromomethane	5.67	1.34	0.2 U	0.11 J	0.14 J	0.2 U
Carbon disulfide	995	234	0.5 U	0.5 U	0.5 U	0.083 J
Carbon tetrachloride	0.13	0.0254	0.093 J	0.095 J	0.085 J	0.09 J
Chloroform	0.109	0.0225	0.057 J	0.2 U	0.042 J	0.045 J
Chloromethane	3.29	0.678	0.75	0.75	0.72	1.7
Cyclohexane	7,550	1,830	0.5 U	0.5 U	0.5 U	0.056 J
Dichlorodifluoromethane (Freon-12)	178	42.5	0.58	0.56	0.58	0.52
Ethylbenzene	1.13	0.223	0.2 U	0.2 U	0.2 U	0.2 U
Methylene chloride	7.48	1.5	0.5 U	1.8	2	0.68 U
Styrene	1,030	235	0.2 U	0.2 U	0.2 U	0.2 U
Tetrachloroethene	0.31	0.0605	0.21	0.11 J	0.13 J	0.18 J
Toluene	5,840	1,380	0.19 J	0.4	0.37	0.48
Trichloroethene	1.14	0.223	0.2 U	0.2 U	0.2 U	0.2 U
Trichlorofluoromethane(Freon-11)	552	130	0.26	0.27	0.28	0.25
m- and p-Xylene	101	23	0.2 U	0.2 U	0.2 U	0.14 J
o-Xylene	714	168	0.2 U	0.2 U	0.2 U	0.2 U

Notes:

J - Analyte present, value may or may not be accurate or precise

NA - Not analyzed

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

SL - Screening Level

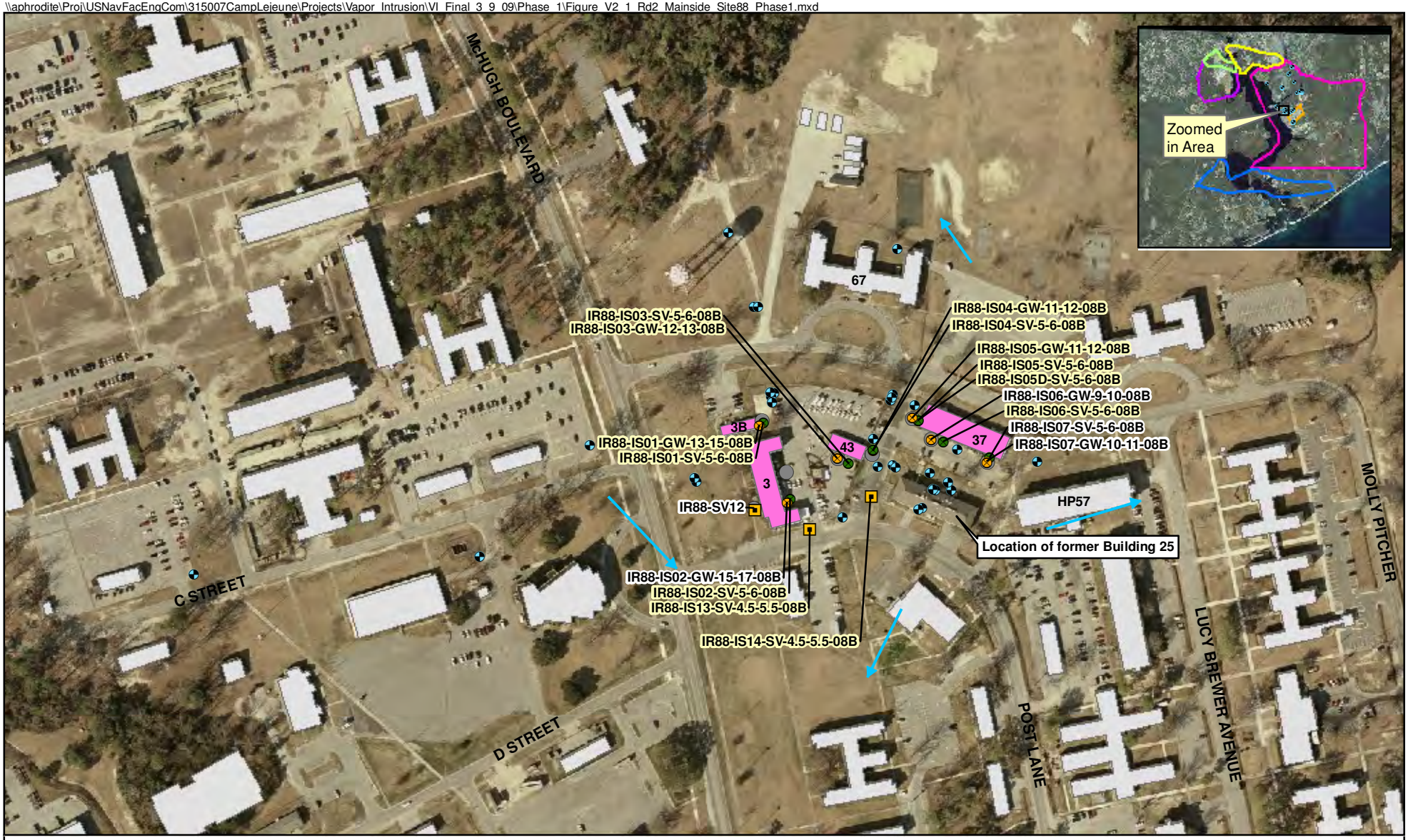
Shading indicates exceedance of Industrial Screening Levels

Bold text indicates exceedance of Unrestricted Screening Levels

* Outdoor air has not been compared to any criteria

Figures

\\aphrodite\Proj\USNavFacEngCom\315007CampLejeune\Projects\Vapor_Intrusion\VI_Final_3_9_09\Phase_1\Figure_V2_1_Rd2_Mainside_Site88_Phase1.mxd



Legend

- Groundwater Sample Location
- Soil Vapor Sample Location
- Existing Soil Gas Sample Locations
- Proposed Groundwater and Soil Gas Sample Location
- Monitoring Well with exceedances
- Shallow Groundwater Flow
- Buildings Investigated
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace

IR88-IS05-SV-5-6-08B
Sample with one or more exceeding constituents AF = 0.1

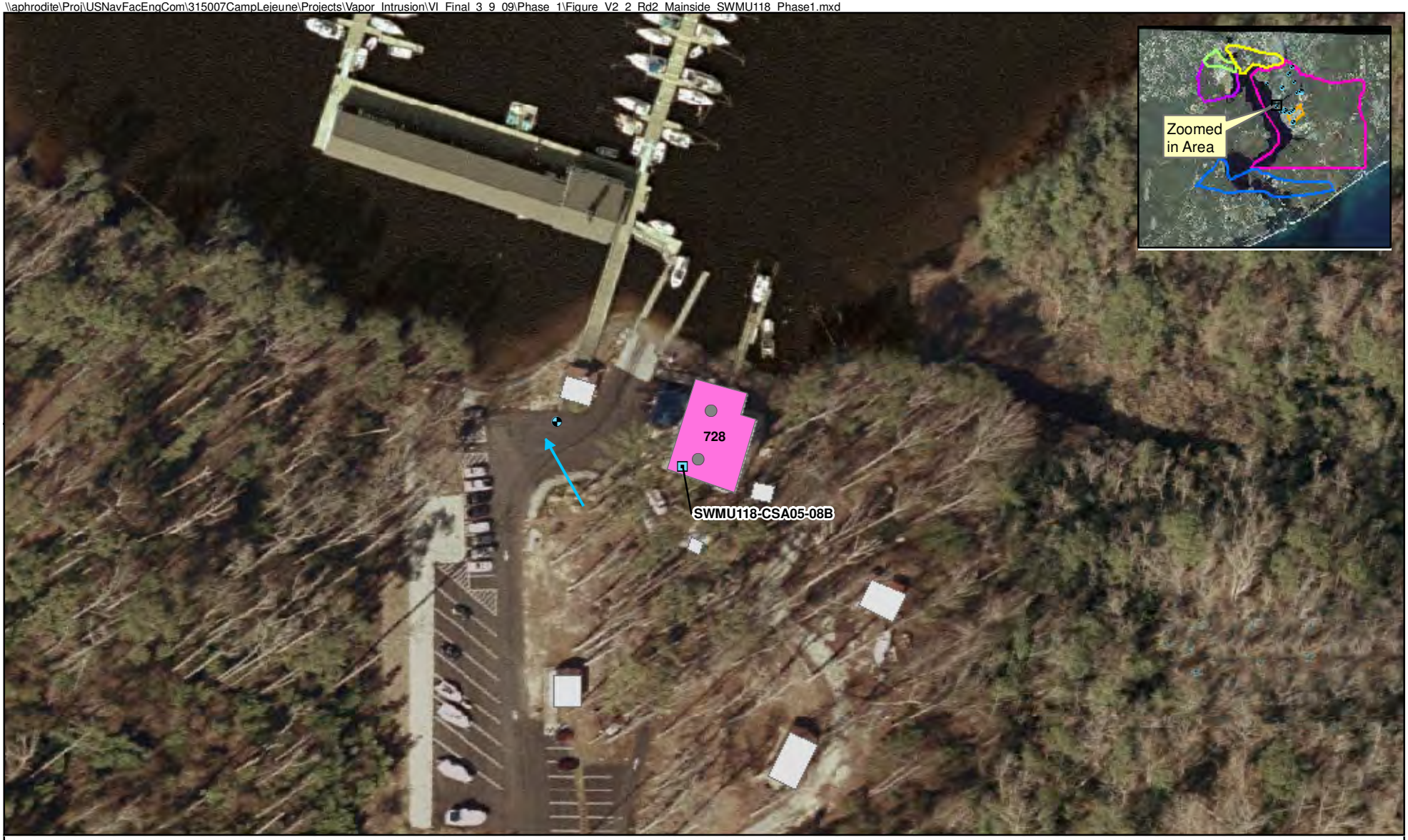
N

0 150 300 Feet

Figure V2-1
Site 88 Phase I Sample Locations
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

AGVIO CH2M HILL

\\aphrodite\Proj\USNavFacEngCom\315007CampLejeune\Projects\Vapor_Intrusion\VI_Final_3_9_09\Phase_1\Figure_V2_2_Rd2_Mainside_SWMU118_Phase1.mxd



Legend

- Crawl Space Air Sample Location
- Monitoring Well with exceedances
- Proposed Subslab/ Indoor Air Sample Locations
- Shallow Groundwater Flow
- Buildings Investigated
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace

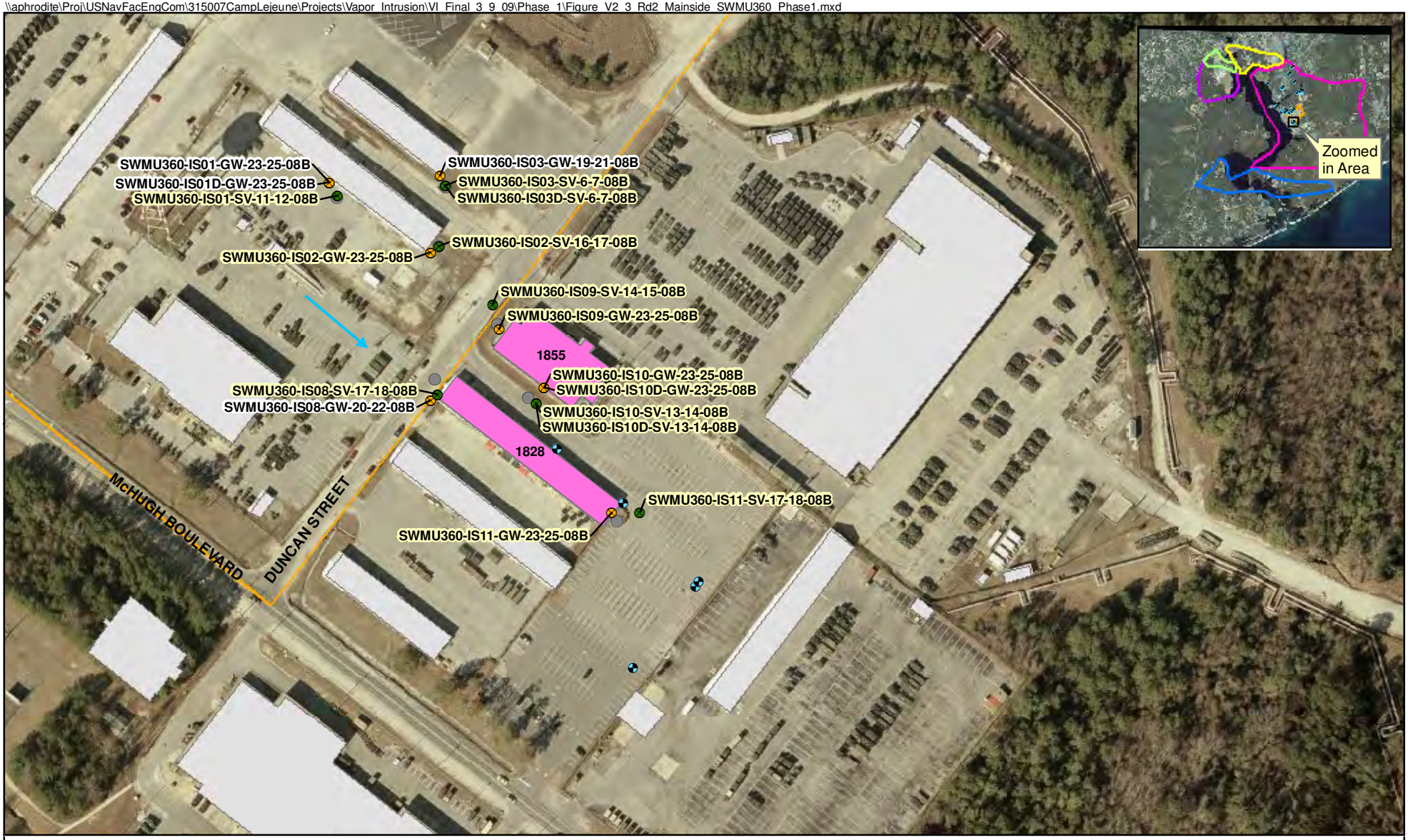
N

0 50 100 Feet

Figure V2-2
SWMU 118 Phase I Sample Locations
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

AGVIO
CH2M HILL

\\aphrodite\Proj\USNavFacEngCom\315007CampLejeune\Projects\Vapor_Intrusion\VI_Final_3_9_09\Phase_1\Figure_V2_3_Rd2_Mainside_SWMU360_Phase1.mxd



Legend

- Monitoring Well with exceedances
- Groundwater Sample Location
- Soil Vapor Sample Location
- Shallow Groundwater Flow
- Buildings Investigated
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace
- Proposed Groundwater and Soil Gas Sample Locations

SWMU360-IS11-SV-17-18-08B - Sample with one or more exceeding constituents AF = 0.1

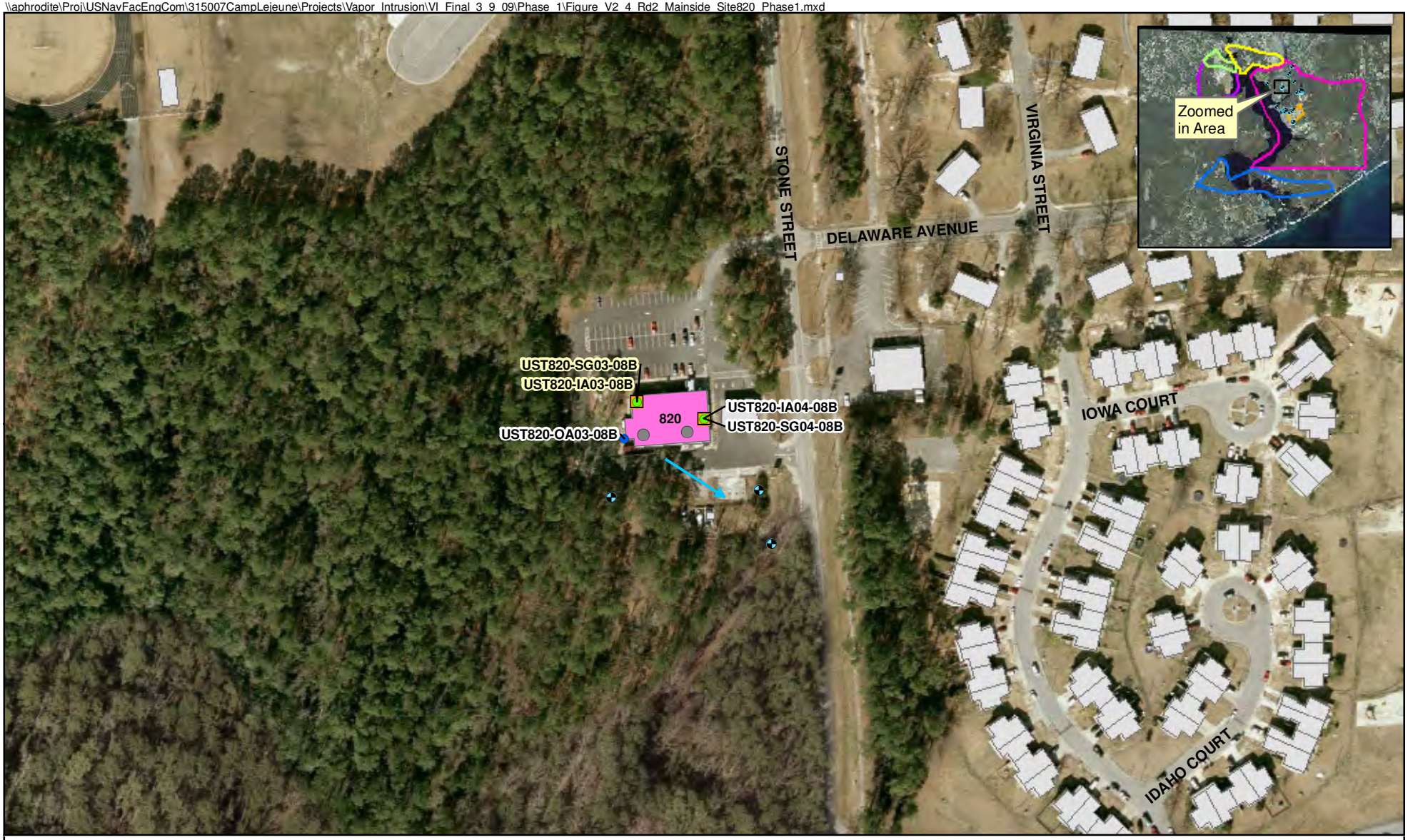
N

0 100 200 Feet

Figure V2-3
SWMU 360 Phase I Sample Locations
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

AGVIO CH2M HILL

\\aphrodite\Proj\USNavFacEngCom\315007CampLejeune\Projects\Vapor_Intrusion\VI_Final_3_9_09\Phase_1\Figure_V2_4_Rd2_Mainside_Site820_Phase1.mxd



Legend

- Indoor Air Sample Location
- Outdoor Air Sample Location
- Soil Gas Sample Location
- Monitoring Well with exceedances
- Proposed Subslab/ Indoor Air Sample Locations
- Shallow Groundwater Flow
- Buildings Investigated
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace

UST820-SG03-08B - Sample with one or more exceeding constituents AF = 0.1

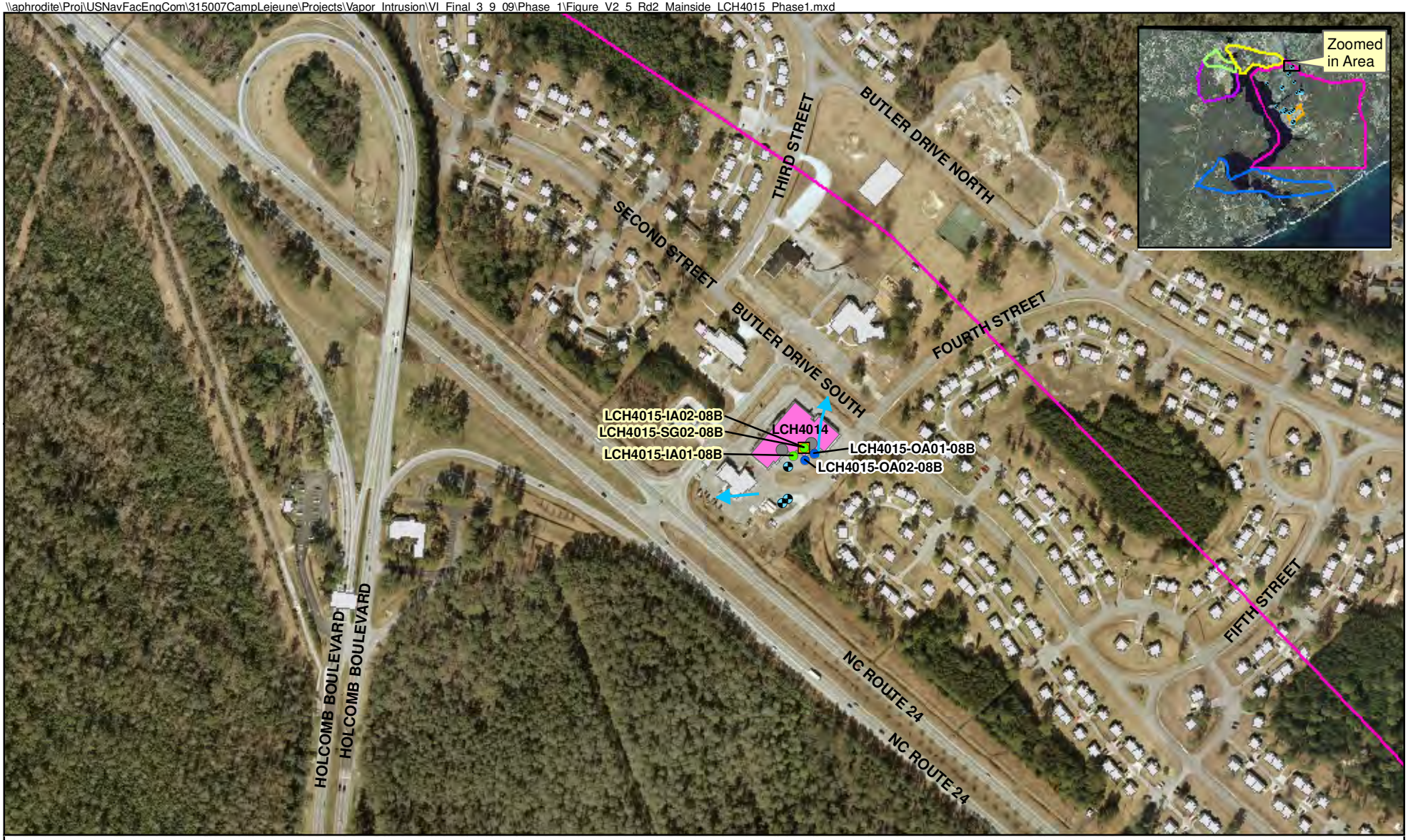
N

0 100 200 Feet

Figure V2-4
Site 820 Phase I Sample Locations
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

AGVIO
CH2M HILL

\\aphrodite\Proj\USNavFacEngCom\315007CampLejeune\Projects\Vapor_Intrusion\VI_Final_3_9_09\Phase_1\Figure_V2_5_Rd2_Mainside_LCH4015_Phase1.mxd



Legend

- Indoor Air Sample Location
- Outdoor Air Sample Location
- Soil Gas Sample Location
- Monitoring Well with exceedances
- Proposed Subslab/ Indoor Air Sample Locations
- Shallow Groundwater Flow
- Buildings Investigated
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace

LCH4015-IA01-08B - Sample with one or more exceeding constituents AF = 0.1

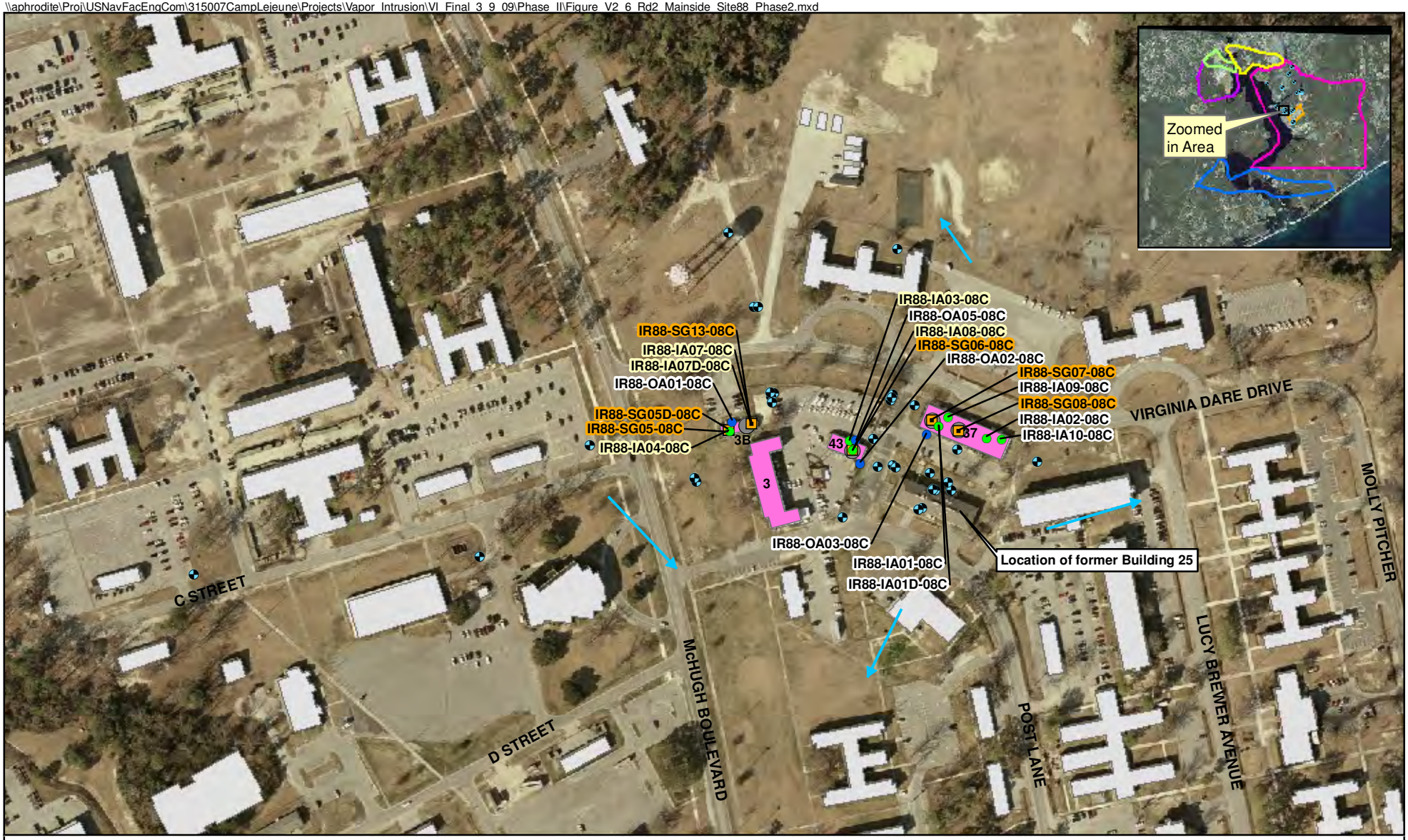
N

0 200 400 Feet

Figure V2-5
LCH 4015 Phase I
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

AGVIO
CH2M HILL

\\aphrodite\Proj\USNavFacEngCom\315007CampLejeune\Projects\Vapor_Intrusion\VI_Final_3_9_09\Phase_II\Figure_V2_6_Rd2_Mainside_Site88_Phase2.mxd



Legend

- Indoor Air Sample Location
- Outdoor Air Sample Location
- Soil Gas Sample Location
- Proposed Soil Gas Sample Location
- Monitoring Well with exceedances
- Shallow Groundwater Flow
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace
- Buildings Investigated - Phase II

IR88-IA08-08C - Sample with one or more exceeding constituents AF = 0.1

IR88-SG08-08C - Sample with one or more exceeding constituents AF = 0.001

N

0 150 300 Feet

Figure V2-6
Site 88 Phase II Sample Locations
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

AGVIO CH2M HILL

\\aphrodite\Proj\USNavFacEngCom\315007CampLejeune\Projects\Vapor_Intrusion\VI_Final_3_9_09\Phase_II\Figure_V2_7_Rd2_Mainside_SWMU360_Phase2.mxd

Legend

- Monitoring Well with exceedances
- Indoor Air Sample Location
- Outdoor Air Sample Location
- Proposed Soil Gas Sample Location
- Soil Gas Sample Location
- Shallow Groundwater Flow
- Buildings Investigated - Phase II
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace

SWMU360-SG09-08C - Sample with one or more exceeding constituents AF = 0.1

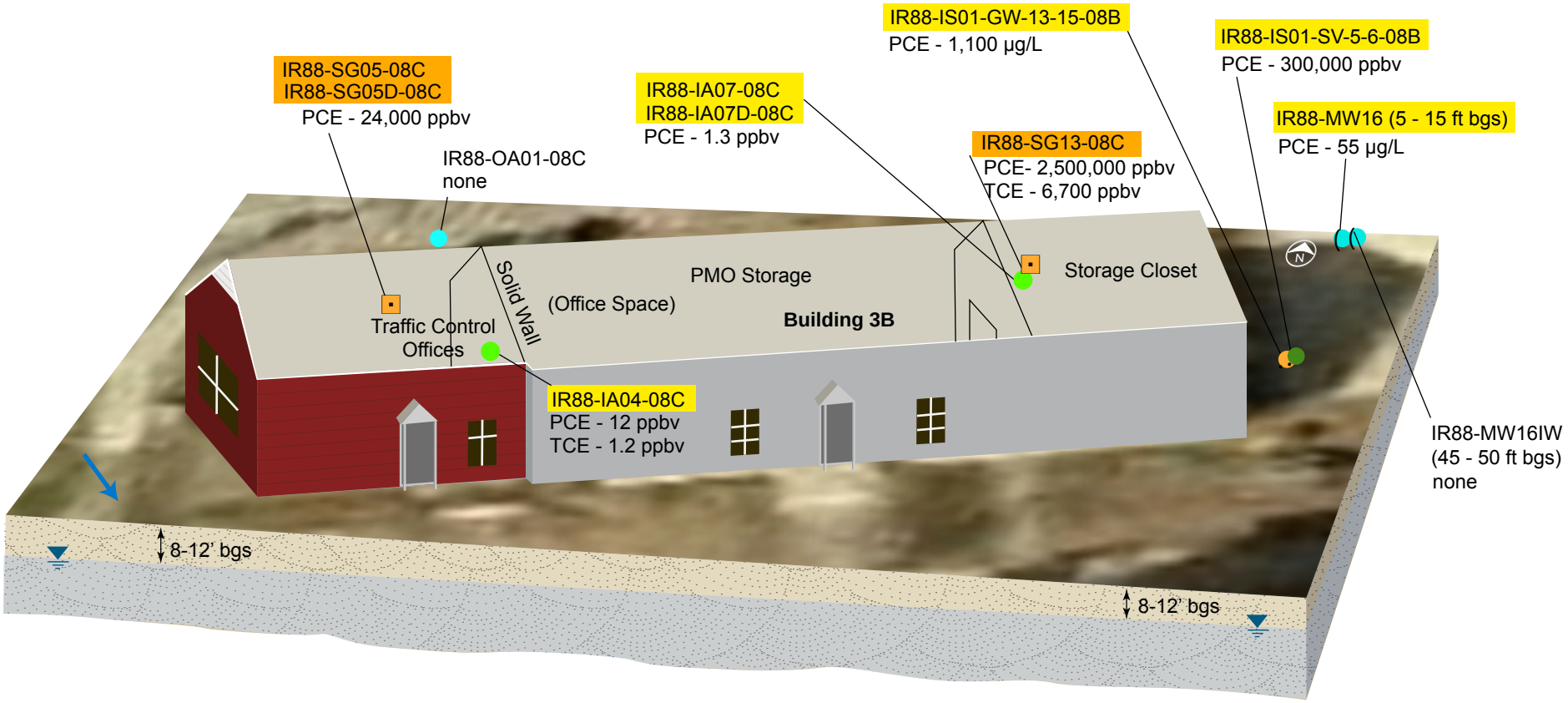
HPFF-SG33-08C - Sample with one or more exceeding constituents AF = 0.001

N

0 100 200 Feet

Figure V2-7
SWMU 360 Phase II Sample Locations
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

AGVIO
CH2M HILL



LEGEND

- Primary Groundwater Flow Direction
- Water Table
- Mix of sand and sandy clay with areas of clay
- Sample with one or more exceeding constituents
- Sample with one or more exceeding constituents of Base-specific SGSLs
- Soil Gas Sample Location
- Indoor Air Sample Location
- Outdoor Air Sample Location
- Shallow Monitoring Well (Sampled between 2002 and 2007)
- Groundwater Sample Location
- Soil Vapor Sample Location

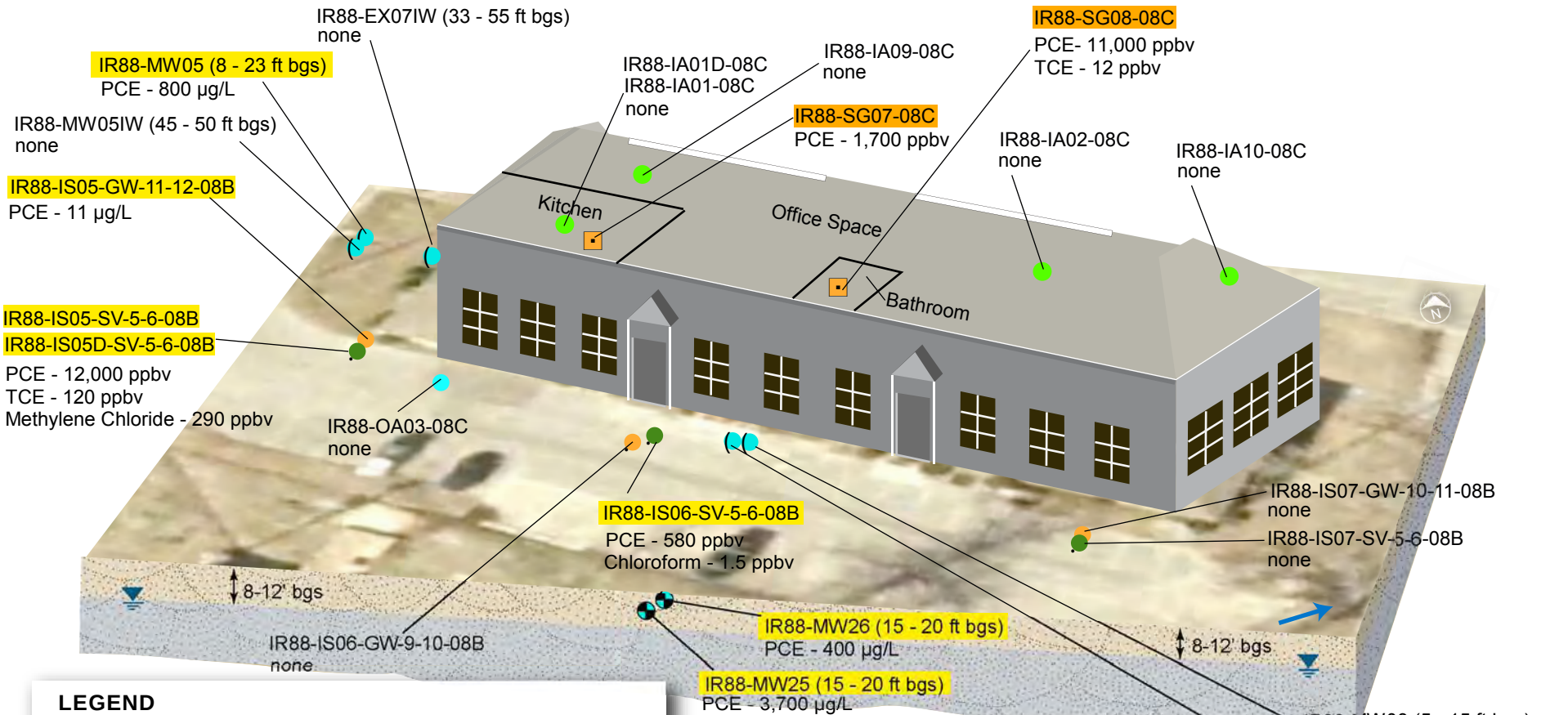
Screening Levels

Site Specific GWSLs (µg/L)	Generic GWSLs (µg/L)
PCE - 4.17	PCE - 2.79
Generic SGSLs (ppbv)	**Base-Specific SGSLs (ppbv)**
PCE - 3.1	PCE - 310
TCE - 11.4	TCE - 1,140
Generic Indoor Air SLs (ppbv)	
PCE - 0.31	
TCE - 1.14	

FIGURE V2-8
Mainside Building 3B Vapor Intrusion Conceptual Site Model
MCB Camp Lejeune, North Carolina

ES122008038MKE V2-8_CL_MS_Bldg3B_VaporIntrusionCSM_v13.ai 3-24-09 mlb/jls/lk

AGVIO CH2M HILL



LEGEND

- Primary Groundwater Flow Direction
- Water Table
- Mix of sand and sandy clay with areas of clay
- Sample with one or more exceeding constituents
- Sample with one or more exceeding constituents of Base-specific SGSLs
- Soil Gas Sample Location
- Indoor Air Sample Location
- Outdoor Air Sample Location
- Shallow Monitoring Well (Sampled between 2002 and 2007)
- Groundwater Sample Location
- Soil Vapor Sample Location

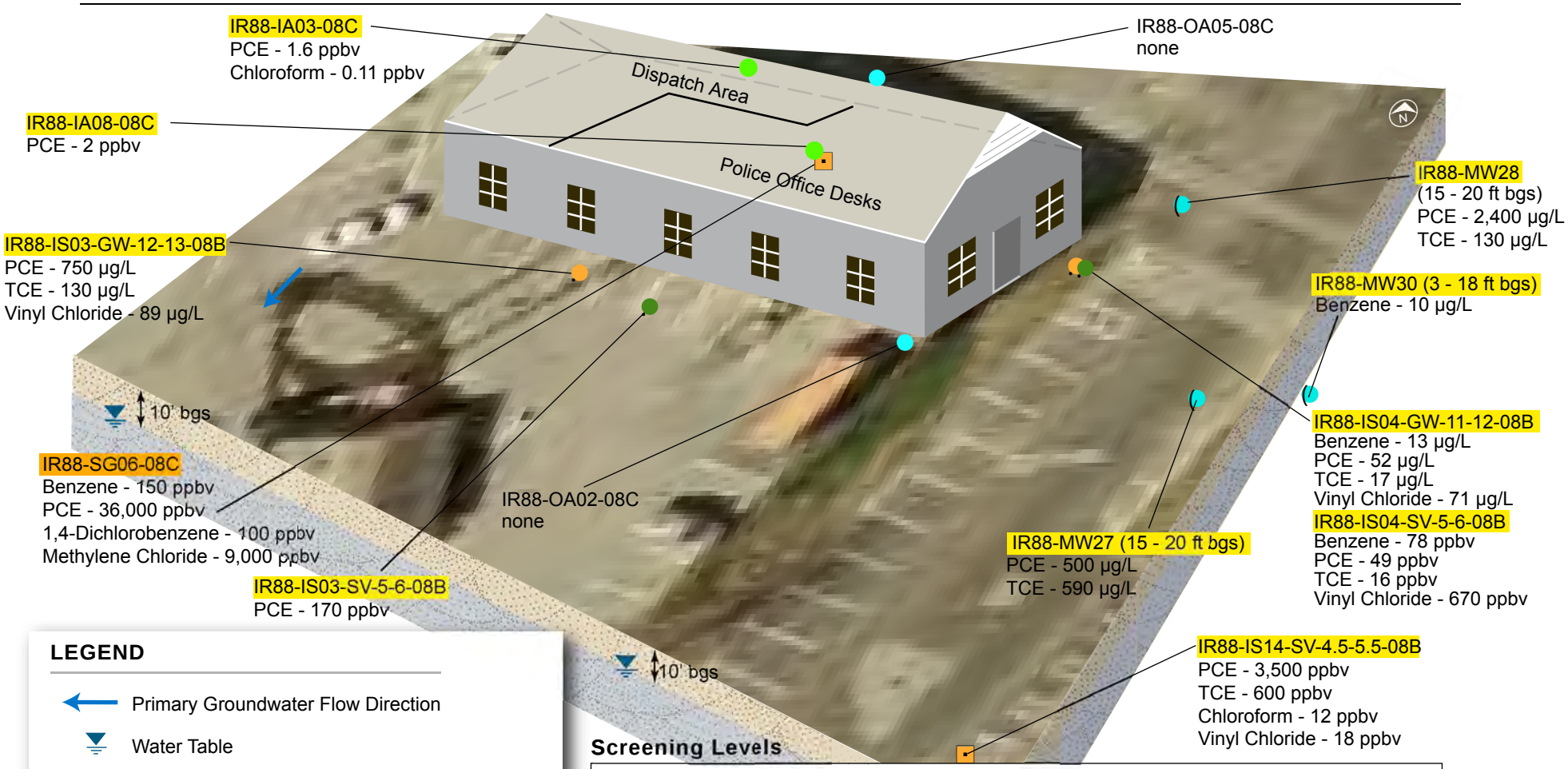
Screening Levels

Site Specific GWSLs (µg/L)	Generic GWSLs (µg/L)
PCE - 5.49	PCE - 2.79
Generic SGSLs (ppbv)	**Base-Specific SGSLs (ppbv)**
PCE - 3.1	PCE - 310
TCE - 11.4	TCE - 1,140
Chloroform - 1.09	Chloroform - 109
Methylene Chloride - 74.8	Methylene Chloride - 7,480
Generic Indoor Air SLs (ppbv)	
PCE - 0.31	
TCE - 1.14	
Chloroform - 0.109	
Methylene Chloride - 7.48	

FIGURE V2-9
Mainside Building 37 Vapor Intrusion Conceptual Site Model
MCB Camp Lejeune, North Carolina

ES122008038MKE V2-9_CL_MS_Bldg37_VaporIntrusionCSM_v12.ai 3-17-09 AEG/js/lk

AGVIO CH2M HILL



LEGEND

- Primary Groundwater Flow Direction
- Water Table
- Mix of sand and sandy clay with areas of clay
- Sample with one or more exceeding constituents
- Sample with one or more exceeding constituents of Base-specific SGSLs
- Soil Gas Sample Location
- Indoor Air Sample Location
- Outdoor Air Sample Location
- Monitoring Well With Exceedances
- Groundwater Sample Location
- Soil Vapor Sample Location

Screening Levels

Site-Specific GWSLs (µg/L)

Benzene - 8.65
PCE - 4.17
TCE - 20.0

Generic Deep SGSLs (ppbv)

Benzene - 5.01
PCE - 3.1
TCE - 11.4
Chloroform - 1.09
Vinyl Chloride - 11
1,4-Dichlorobenzene - 1.83
Methylene Chloride - 74.8

Generic Shallow SGSLs (ppbv)

Benzene - 0.501
PCE - 0.31
TCE - 1.14
Chloroform - 0.109
Vinyl Chloride - 1.1
1,4-Dichlorobenzene - 0.183
Methylene Chloride - 7.48

Generic GWSLs (µg/L)

Benzene - 7.05
PCE - 2.79
TCE - 14.5
Vinyl Chloride - 2.54

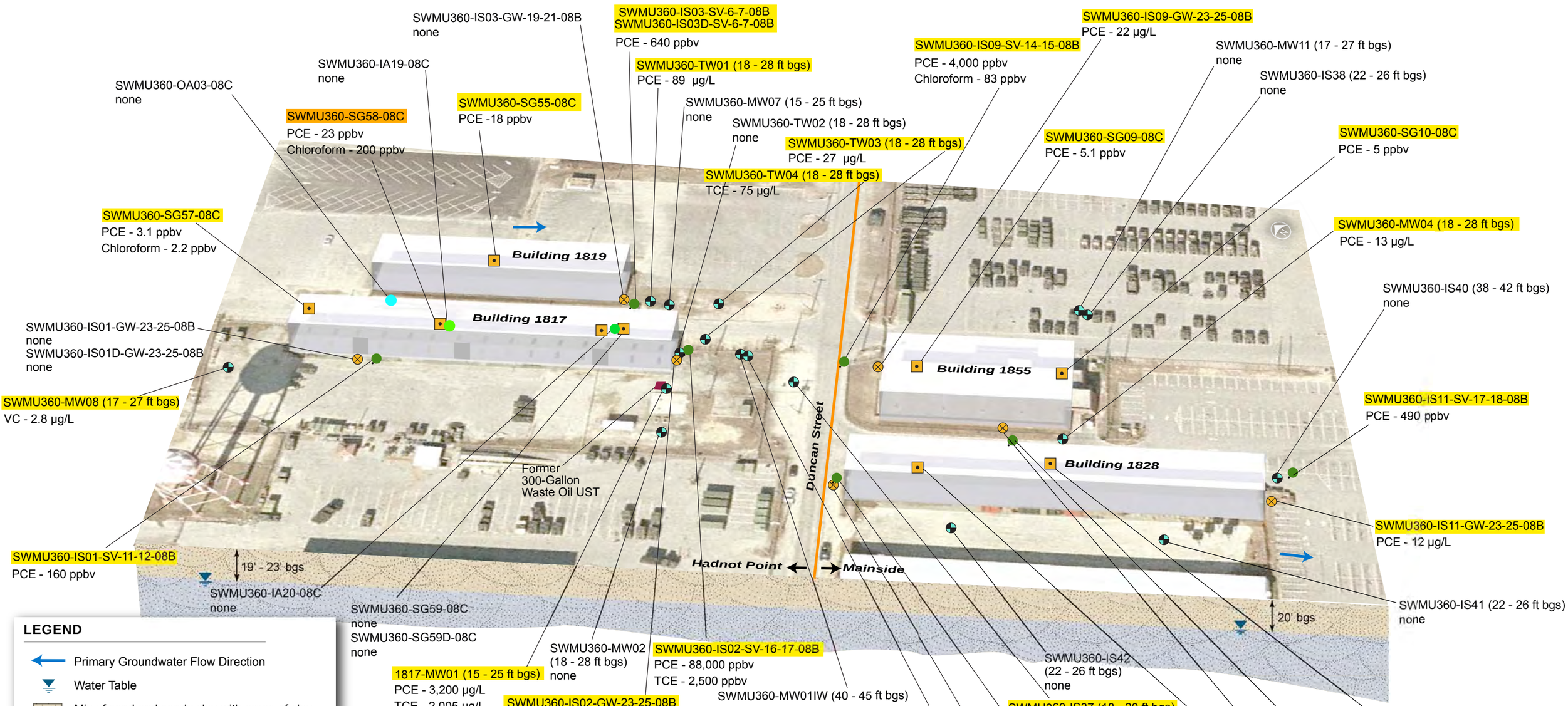
Base-Specific SGSLs (ppbv)

Benzene - 501
PCE - 310
TCE - 1,140
Chloroform - 109
Vinyl Chloride - 1,100
1,4-Dichlorobenzene - 183
Methylene Chloride - 7,480

FIGURE V2-10
Mainside Building 43 Vapor Intrusion Conceptual Site Model
MCB Camp Lejeune, North Carolina

AGVIO
CH2M HILL

ES122008038MKE V2-10_CL_MS_Bldg43_VaporIntrusionCSM_v10.ai 3-17-09 mlb/jls



LEGEND

- Primary Groundwater Flow Direction
- Water Table
- Mix of sand and sandy clay with areas of clay
- Groundwater Sample Location
- Soil Vapor Sample Location
- Soil Gas Sample Location
- Indoor Air Sample Location
- Outdoor Air Sample Location
- Shallow Monitoring Well (Sampled between 2002 and 2007)
- Sample with one or more exceeding constituents
- Sample with one or more exceeding constituents of Base-specific SGSLs

Screening Levels

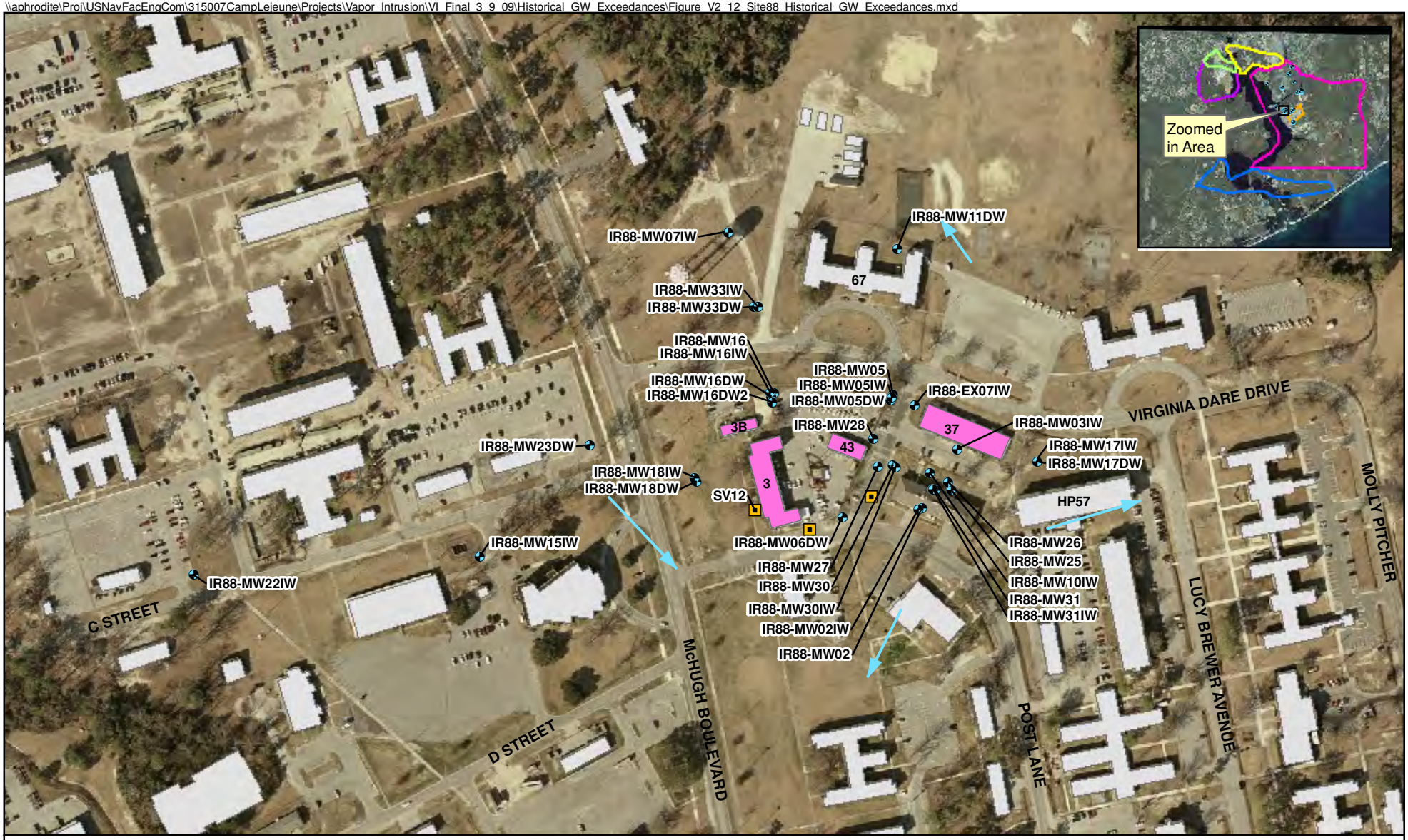
Site-Specific GWSLs (µg/L)	Industrial Air RSLs (ppbv)	Base-Specific SGSLs (ppbv)
VC - 2.53	VC - 1.1	VC - 1,100
TCE - 35.5	TCE - 1.14	TCE - 1,140
PCE - 7.19	PCE - 0.31	PCE - 310
	Chloroform - 0.109	Chloroform - 109
Generic SGSLs (ppbv)	**Generic GWSLs (µg/L)**	
VC - 11	VC - 2.54	
TCE - 11.4	TCE - 14.5	
PCE - 3.1	PCE - 2.79	
Chloroform - 1.09		

FIGURE V2-11
SWMU 360 Buildings 1817, 1819, and Mainside Buildings 1828 and 1855 Vapor Intrusion Conceptual Site Model
Camp Lejeune, North Carolina

AGVIQ CH2M HILL

ES122008016MKE V2-11CL_HP_SWMU360_Bldg1817_1819_1828_1855_VaporIntrusionCSM_v3.ai 3-24-09 mlb/mjl/lk/jls

\\aphrodite\Proj\USNavFacEngCom\315007CampLejeune\Projects\Vapor_Intrusion\VI_Final_3_9_09\Historical_GW_Exceedances\Figure_V2_12_Site88_Historical_GW_Exceedances.mxd



Legend

- Monitoring Well with exceedances
- Existing Soil Gas Sample Locations
- Shallow Groundwater Flow
- Buildings Selected for Further Evaluation
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace

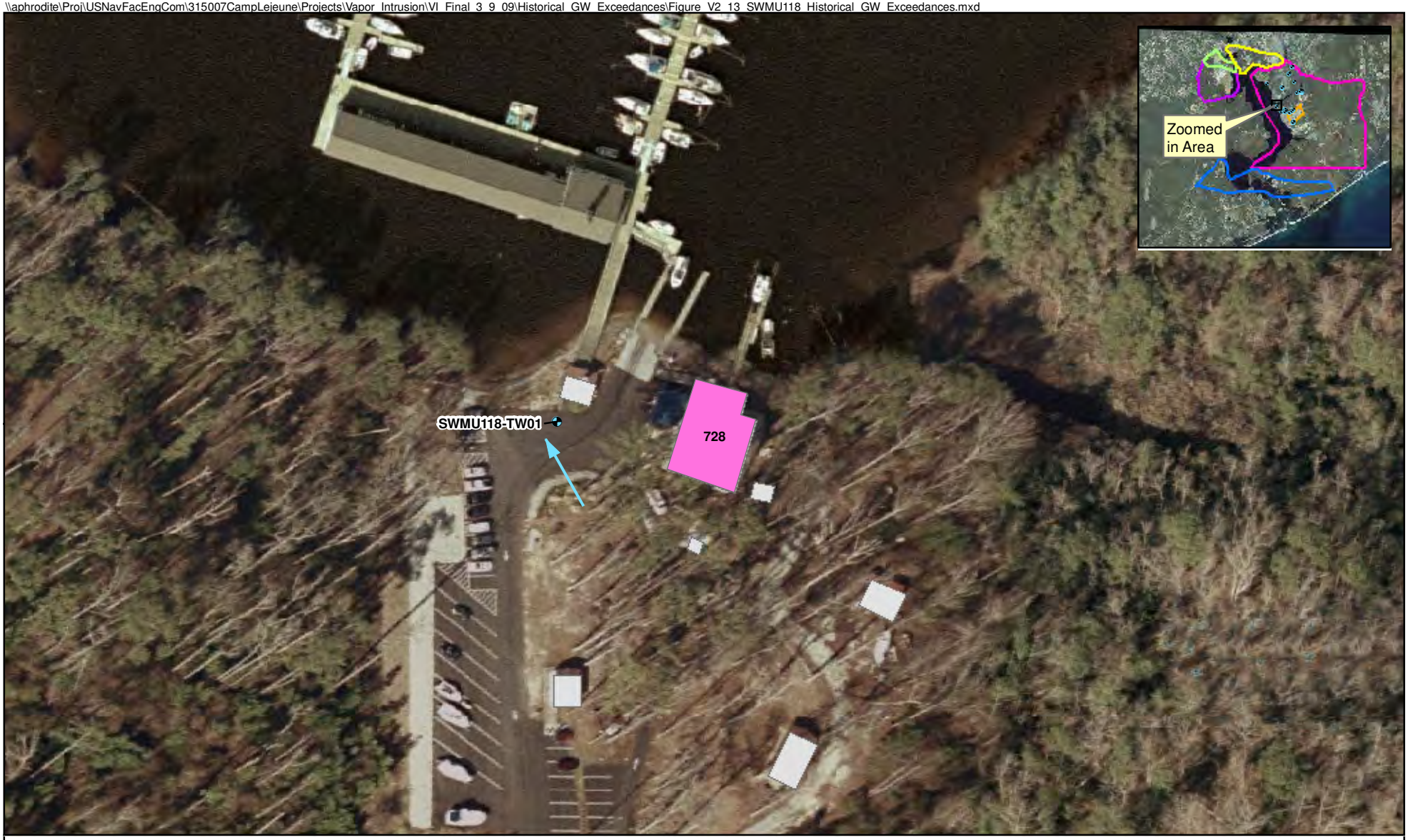
N

0 150 300 600 Feet

Figure V2-12
Site 88 Historical Groundwater Exceedances
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

AGVIO
CH2M HILL

\\aphrodite\Proj\USNavFacEngCom\315007CampLejeune\Projects\Vapor_Intrusion\VI_Final_3_9_09\Historical_GW_Exceedances\Figure_V2_13_SWMU118_Historical_GW_Exceedances.mxd



Legend

- Monitoring Well with exceedances
- Shallow Groundwater Flow
- Buildings Selected for Further Evaluation
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace

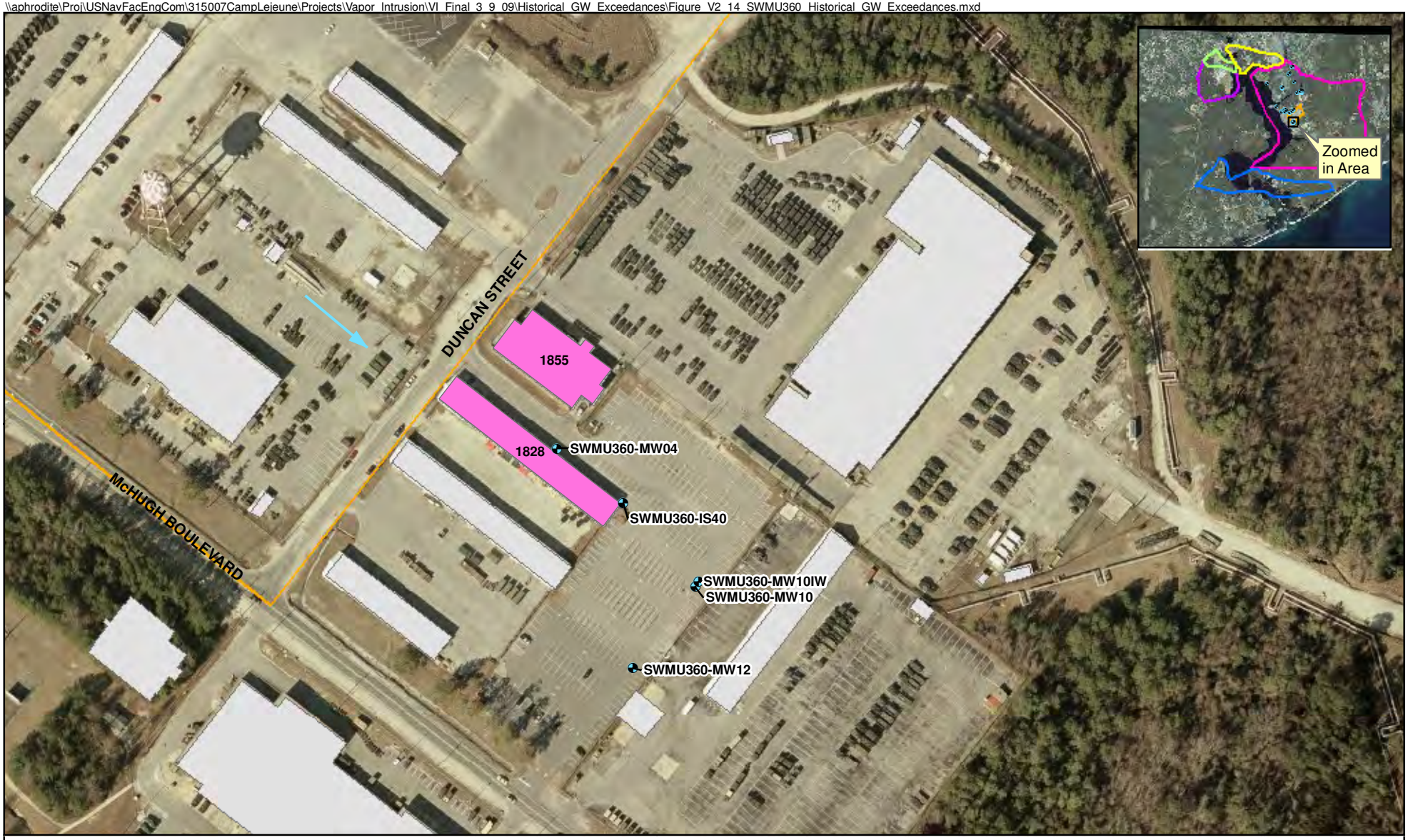
N

0 50 100 200 Feet

Figure V2-13
SWMU 118 Historical Groundwater Exceedances
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

AGVIO CH2M HILL

\\aphrodite\Proj\USNavFacEngCom\315007CampLejeune\Projects\Vapor_Intrusion\VI_Final_3_9_09\Historical_GW_Exceedances\Figure_V2_14_SWMU360_Historical_GW_Exceedances.mxd



Legend

- Monitoring Well with exceedances
- Shallow Groundwater Flow
- Buildings Selected for Further Evaluation
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace

N

0 100 200 400 Feet

Figure V2-14
SWMU 360 Historical Groundwater Exceedances
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

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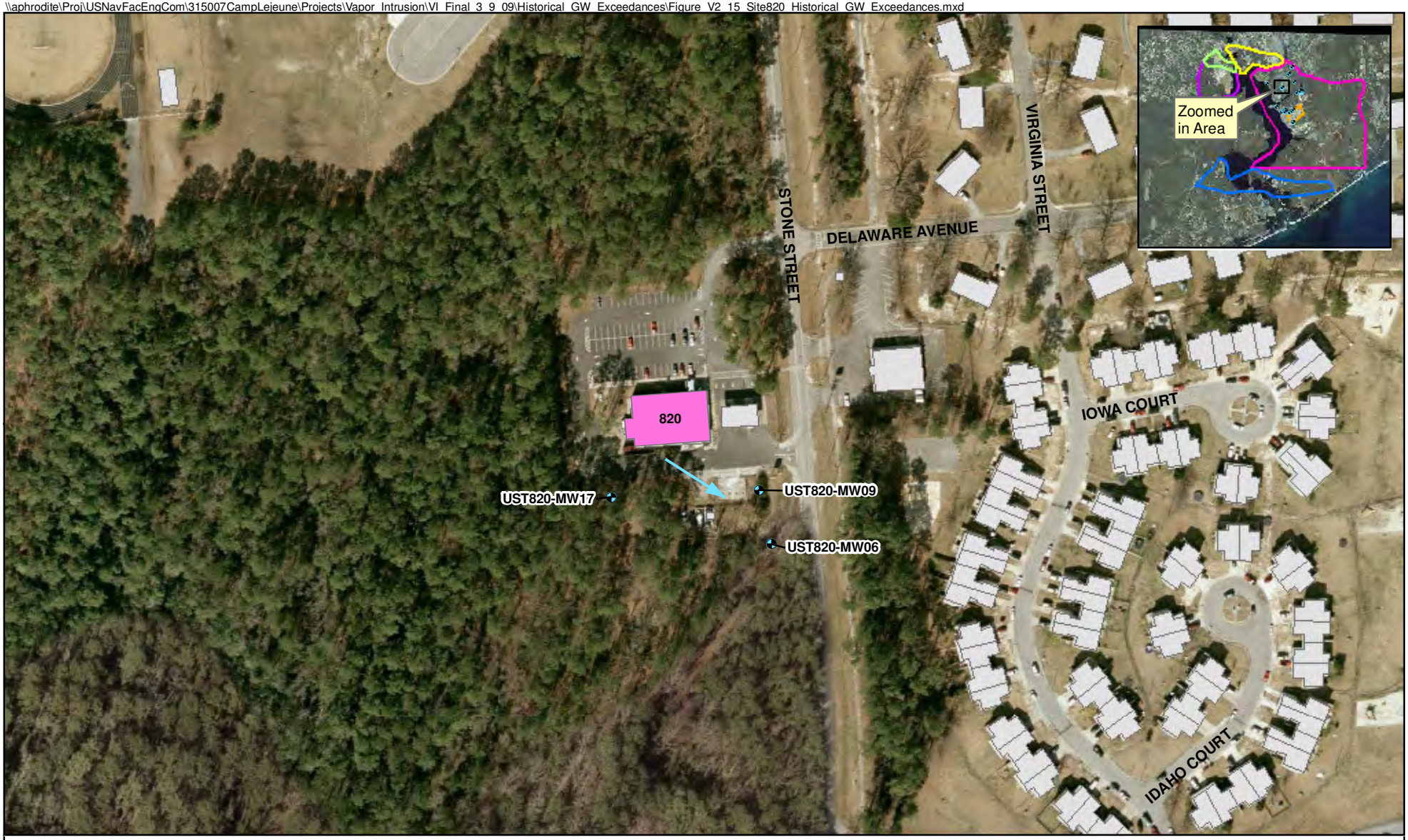
\\aphrodite\Proj\USNavFacEngCom\315007CampLejeune\Projects\Vapor_Intrusion\VI_Final_3_9_09\Historical_GW_Exceedances\Figure_V2_15_Site820_Historical_GW_Exceedances.mxd



Legend

- Monitoring Well with exceedances
- Shallow Groundwater Flow
- Buildings Selected for Further Evaluation
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace

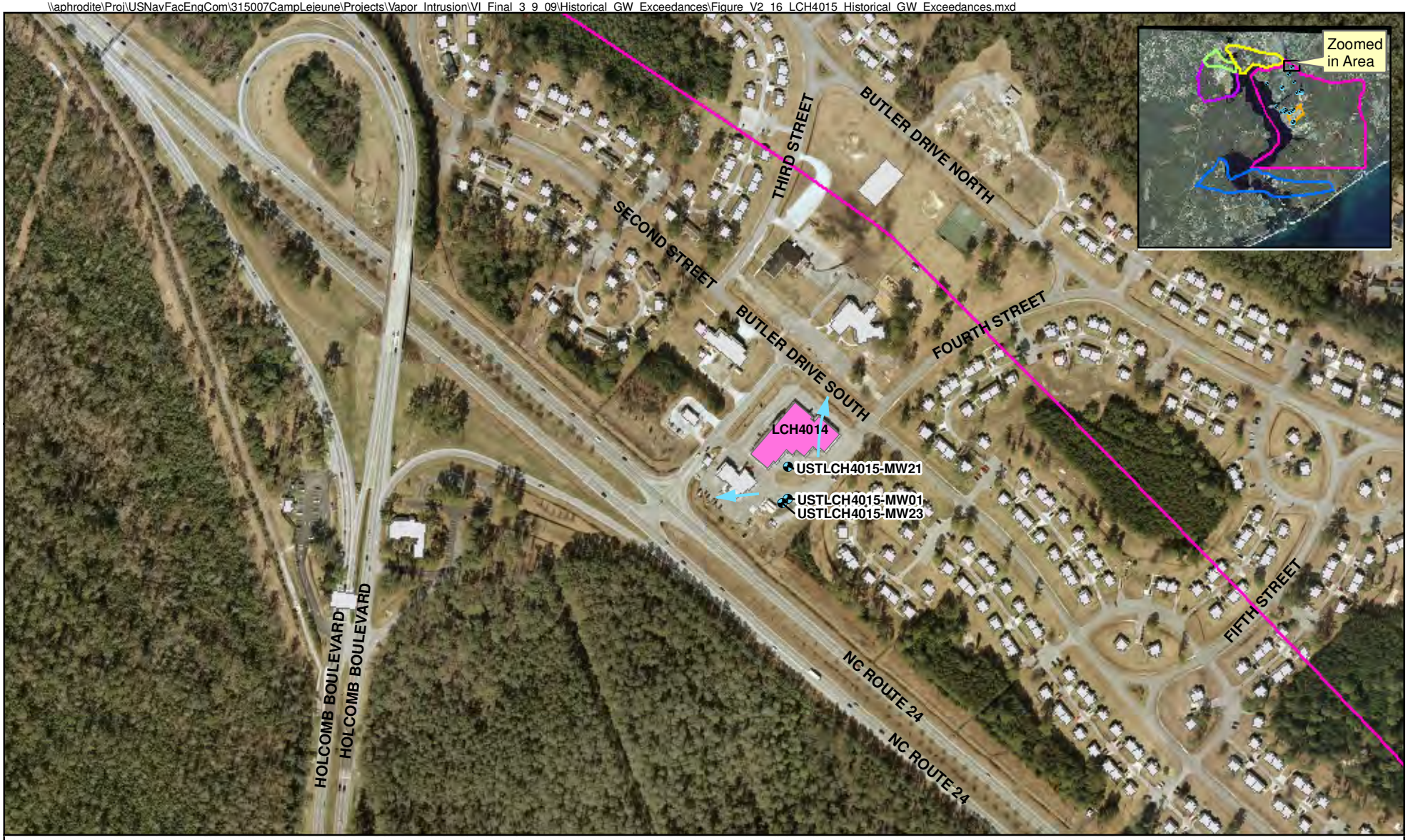
N

0 100 200 400 Feet

Figure V2-15
Site 820 Historical Groundwater Exceedances
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

AGVIO CH2M HILL

\\aphrodite\Proj\USNavFacEngCom\315007CampLejeune\Projects\Vapor_Intrusion\VI_Final_3_9_09\Historical_GW_Exceedances\Figure_V2_16_LCH4015_Historical_GW_Exceedances.mxd



Legend

- Monitoring Well with exceedances
- Shallow Groundwater Flow
- Buildings Selected for Further Evaluation
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace

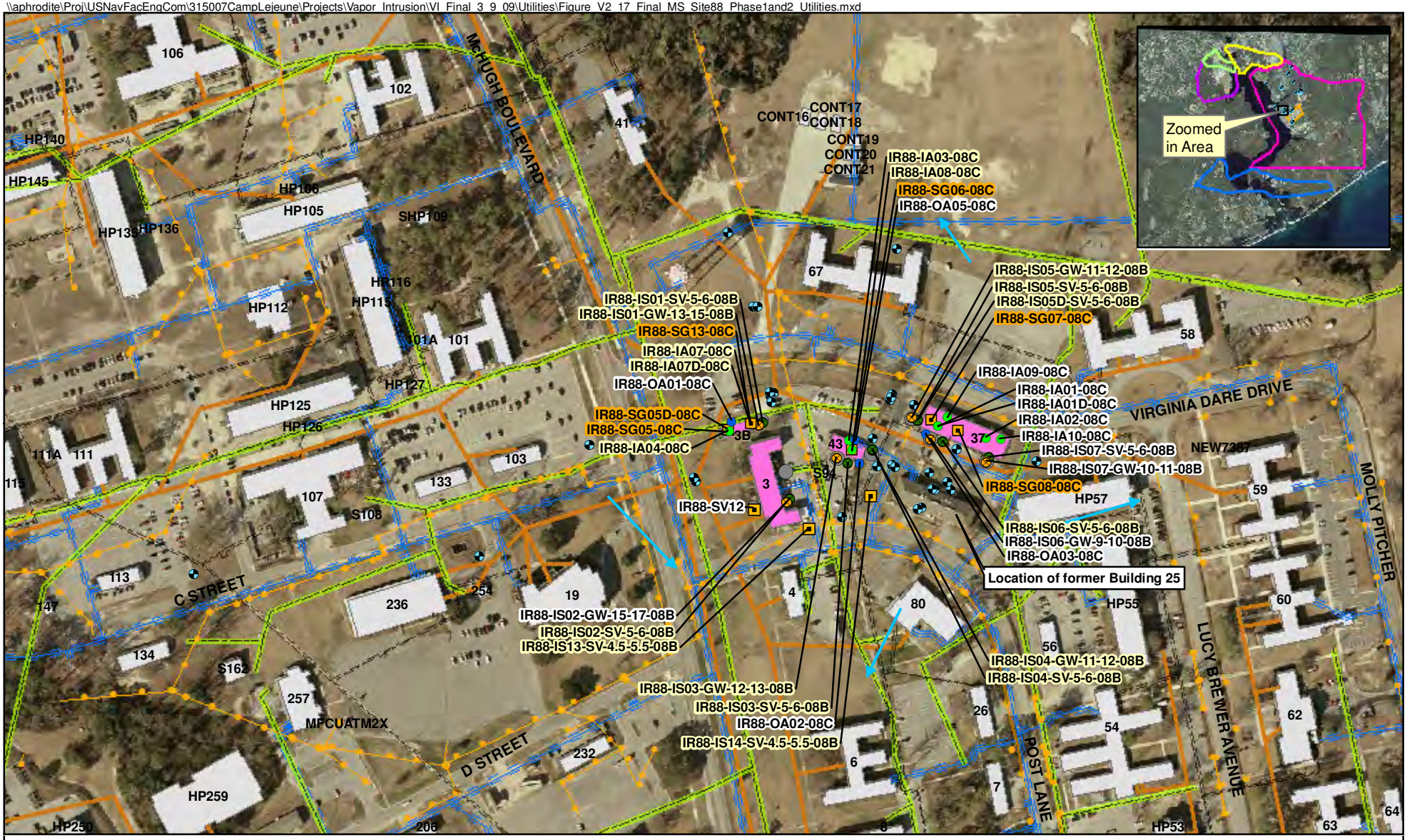
N

0 200 400 800 Feet

Figure V2-16
LCH 4015 Historical Groundwater Exceedances
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

AGVIO CH2M HILL

\\aphrodite\Proj\USNavFacEngCom\315007CampLejeune\Projects\Vapor_Intrusion\VI_Final_3_9_09\Utilities\Figure_V2_17_Final_MS_Site88_Phase1and2_Utilities.mxd



Legend

- Indoor Air Sample Location
- Outdoor Air Sample Location
- Soil Gas Sample Location
- Groundwater Sample Location
- Soil Vapor Sample Location
- Proposed Groundwater and Soil Gas Sample Location
- Monitoring Well with exceedances
- Shallow Groundwater Flow
- Steam Line
- Storm Sewer Drainage Line
- Storm Sewer Utility Line
- Electrical Utility Line
- Water Utility Line
- Wastewater Utility Line
- Buildings Investigated
- MCAS, New River
- Camp Geiger
- Courthouse Bay
- Hadnot Point
- Mainside
- Tarawa Terrace

IR88-IA08-08C - Sample with one or more exceeding constituents AF = 0.1

IR88-SG08-08C - Sample with one or more exceeding constituents AF = 0.001

N

0 150 300 Feet

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Figure V2-17
Site 88 Utility Locations
Vapor Intrusion Report
MCB Camp Lejeune
North Carolina

Appendix V2-A
Field Data Sheets

Figure 2-5

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Sheet 1 of __

Indoor Air Sampling Log (Summa Canister)

Project Information

Project Name: MCB Camp Lejeune

Project #: 364167

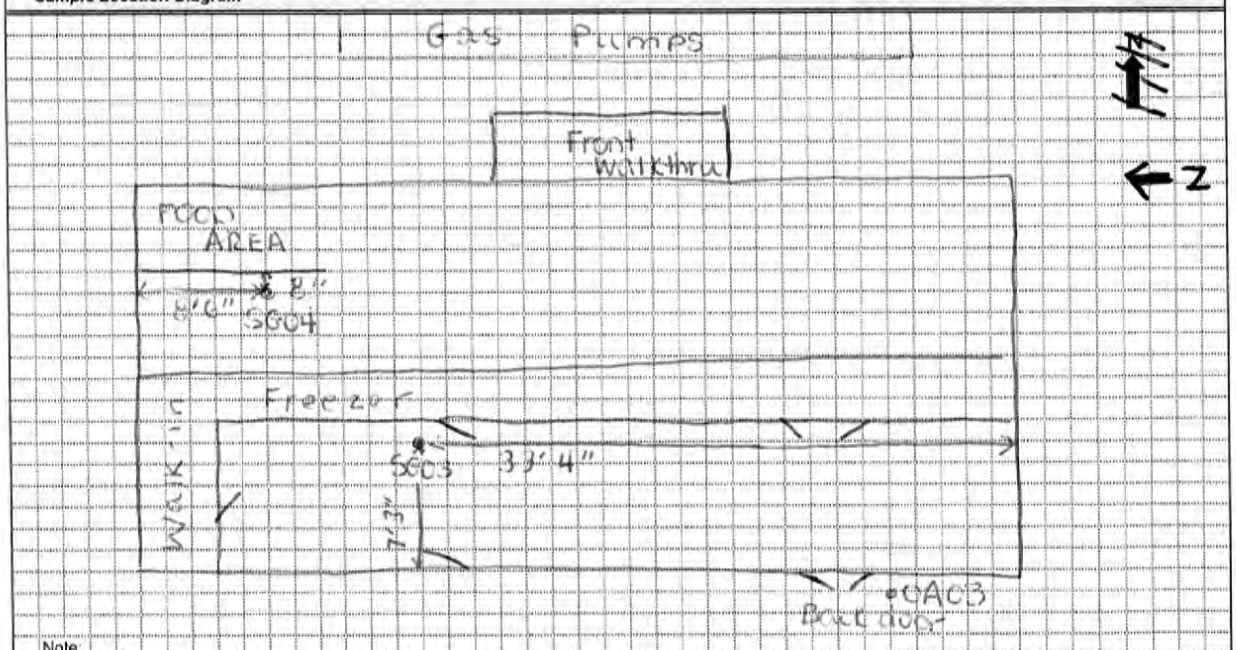
By: K Stokes

Date: 6/23/08

Sampling Data Log

Sample Location	Field ID	Canister ID	Flow Controller ID	Initial Canister Pressure ("Hg)	Initial Flow Controller Rate (ml/min)	Start Date & Time	End Data & Time	Final Pressure ("Hg)	Final Flow Controller Rate (ml/min)
IR820-IA03	IR820-IA03-08B	6628	K460	-30	3.5	6/23/08 1458	6/24/08 1439	-7	3.5
IR820-IA04	IR820-IA04-08B	7481	K101	-30	3.5	6/23/08 1511	6/24/08 1509	-6	3.5
IR820-OA03	IR820-OA03-08B	7486	K115	-32	3.5	6/23/08 1526	6/24/08 1523	-5	3.5

Sample Location Diagram



Note:
Draw in outline the structure's foundation and interior walls, identify rooms, and note other defining features. Show location of canister relative to physical objects, etc.

Other Observations and Comments (note any unique circumstances): Convenience store - Sells VCC containing items. Bldg 820

Figure 2-4
CH2MHILL

Indoor Vapor Intrusion Assessment
Sub-slab Vapor Field Sampling Log - Summa Canister Method

Project Info

Project Name: MCB Camp Lejeune **Project #:** 364167
By: K Stokes **Date:** 6/23/08

Structure

Identification: Bldg 820 - Gas Station
Address: Stone St.
Slab Information:
- [x] Concrete slab on grade (directly on top of soil)
- [ ] Concrete slab on gravel underlayment
- [ ] Other (describe)

Condition of slab: good
Type of Sub Slab Soil: unknown
Is water present in the soil: unknown

Sub-slab Probe Installation, Leak Checking, Probe Purging, & Sampling Log

	Sample location (show in diagram)	1	2	3	4
	Sample Identification (field ID)	IR820-SG03-08B	IR820-SG04-08B		
Probe Installation	Depth of slab (inches)	10"	10"		
	Depth of hole drilled (inches below slab surface)	12"	12"		
	Depth of installed probe (inches below slab surface)	10.5"	10.5"		
Manifold Leak check	Leak check (sampling manifold) - Pass/No Pass	Pass (100 ppm)	Pass (3625 ppm)		
Probe Purge	Purge rate, cc/min	200 mL/min	200 mL/min		
	Purge Start (time of day)	14:37	15:01		
	Purge vacuum, " Hg	n/a	n/a		
	Purge completed (time of day)	14:42	15:05		
Helium Leak Check (optional)	Leak check (Helium) - %	0%	0%		
Canister Sampling	Canister & flow controller ID (if used)	B4388/61	B3838/15		
	Initial Canister Pressure (" Hg)	-32	-30		
	Sampling rate, cc/min	200 mL/min	200 mL/min		
	Sampling period started (time of day)	14:42	15:05		
	Sampling vacuum, " Hg	n/a	n/a		
	Sampling period ended (time of day)	14:49	15:10		
	Final Canister Pressure (" Hg)	-3	-3		

Observations and Comments: SG-03 in back of store on bare concrete to one side of freezer. ; SG-04 in front of store behind food counter wall and next to aisle freezer.

SG-03: CO = 0
LEL = 0
VOC = 0.0
H_2S = 0
O_2 = 20.9

SG-04: CO = 0
LEL = 0
VOC = 0
H_2S = 0
O_2 = 20.9

Figure 2-5

CH2M HILL

Sheet 1 of __

Indoor Air Sampling Log (Summa Canister)

Project Information

Project Name: MCB Camp Lejeune

Project #: 364167

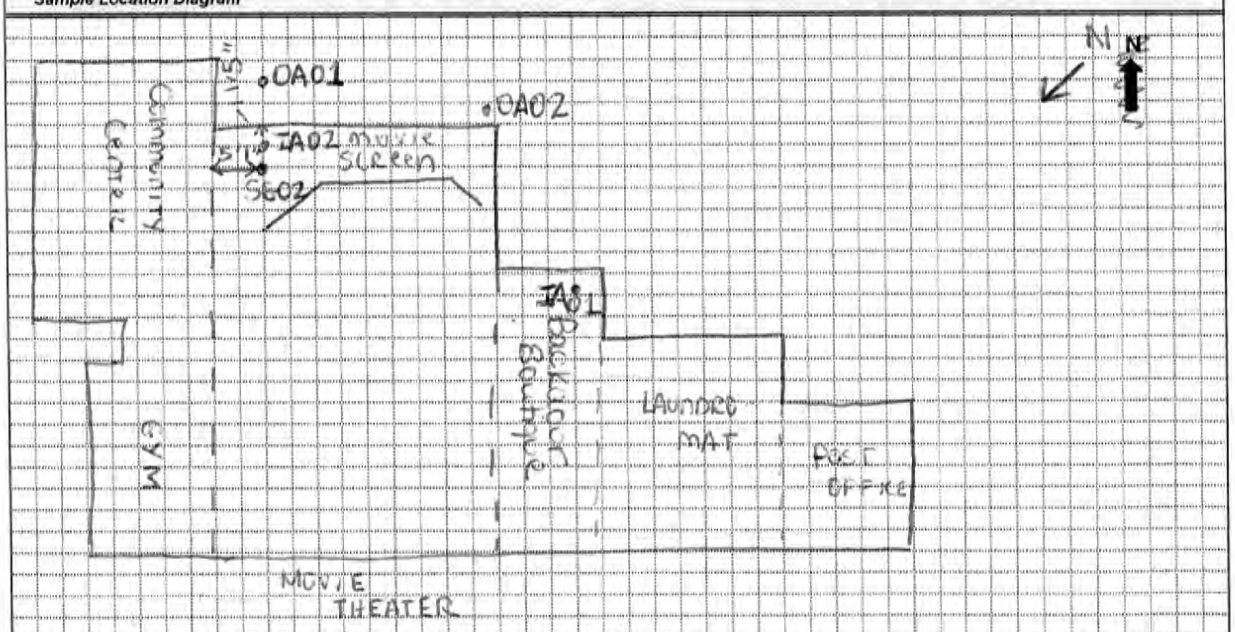
By: K Stokes

Date: 6/22/08

Sampling Data Log

Sample Location	Field ID	Canister ID	Flow Controller ID	Initial Canister Pressure ("Hg)	Initial Flow Controller Rate (ml/min)	Start Date & Time	End Data & Time	Final Pressure ("Hg)	Final Flow Controller Rate (ml/min)
LCH-4015	LCH-4015-OA02-08B	63841	K297	-32	3.5	6/22/08 1457	6/23/08 1341	-7	3.5
LCH-4015	LCH4015-OA01-08B	12187	K270	-30	3.5	6/22/08 1506	6/23/08 1345	-7	3.5

Sample Location Diagram



Note:
Draw in outline the structure's foundation and interior walls, identify rooms, and note other defining features. Show location of canister relative to physical objects, etc.

Other Observations and Comments (note any unique circumstances):

Figure 2-4
CH2MHILL

Indoor Vapor Intrusion Assessment
Sub-slab Vapor Field Sampling Log - Summa Canister Method

Project Info

Project Name: NAVFAC MCB Camp Lejeune **Project #:** 364167
By: K Stokes / J Shim **Date:** 6/21/08

Structure

Identification: LCH4015-SG02-OB3 Bldg LCH-4014A
Address: Butler Dr South off NC Rte 24
Slab Information:
- [x] Concrete slab on grade (directly on top of soil)
- [ ] Other (describe)
- [ ] Concrete slab on gravel underlayment

Condition of slab: older w/ expansion joints
Type of Sub Slab Soil: unknown
Is water present in the soil: unknown

Sub-slab Probe Installation, Leak Checking, Probe Purging, & Sampling Log

	Sample location (show in diagram)	1	2	3	4
	Sample Identification (field ID)	LCH4015 SG02-OB3			
Probe Installation	Depth of slab (inches)	6"			
	Depth of hole drilled (inches below slab surface)	8"			
	Depth of installed probe (inches below slab surface)	6.5"			
Manifold Leak check	Leak check (sampling manifold) - Pass/No Pass	Pass (675ppm)			
Probe Purge	Purge rate, cc/min	200 mL/min			
	Purge Start (time of day)	1449			
	Purge vacuum, " Hg	n/a			
	Purge completed (time of day)	1454			
Helium Leak Check (optional)	Leak check (Helium) - %	0%			
Canister Sampling	Canister & flow controller ID (if used)	L-5119/73			
	Initial Canister Pressure (" Hg)	-30			
	Sampling rate, cc/min	200 mL/min			
	Sampling period started (time of day)	1455			
	Sampling vacuum, " Hg	n/a			
	Sampling period ended (time of day)	1500			
	Final Canister Pressure (" Hg)	-3			

Observations and Comments:

Figure 2-5

CH2M HILL

Sheet 1 of __

Indoor Air Sampling Log (Summa Canister)

Project Information

Project Name: MCB Camp Lejeune

Project #: 364167

By: K. Stokes

Date: 6/23/08

Sampling Data Log

Sample Location	Field ID	Canister ID	Flow Controller ID	Initial Canister Pressure ("Hg)	Initial Flow Controller Rate (ml/min)	Start Date & Time	End Data & Time	Final Pressure ("Hg)	Final Flow Controller Rate (ml/min)
LCH4015	LCH4015-0A02-088	1574	K384	-35	3.5	6/23/08 13:26	6/24/09 13:10	-10	3.5
LCH4015	LCH4015-1A01-088	6361	K147	-22	3.5	6/23/08 13:30	6/24/08 1309	-8	3.5

Sample Location Diagram

N

See LCH4015 Bldg 4014A.

Note:
Draw in outline the structure's foundation and interior walls, identify rooms, and note other defining features. Show location of canister relative to physical objects, etc.

Other Observations and Comments (note any unique circumstances): Could not perform subslab sampling due to asbestos tiles.

Bldg 4014 B

Figure 2-5

CH2M HILL

Sheet 1 of __

Indoor Air Sampling Log (Summa Canister)

Project Information

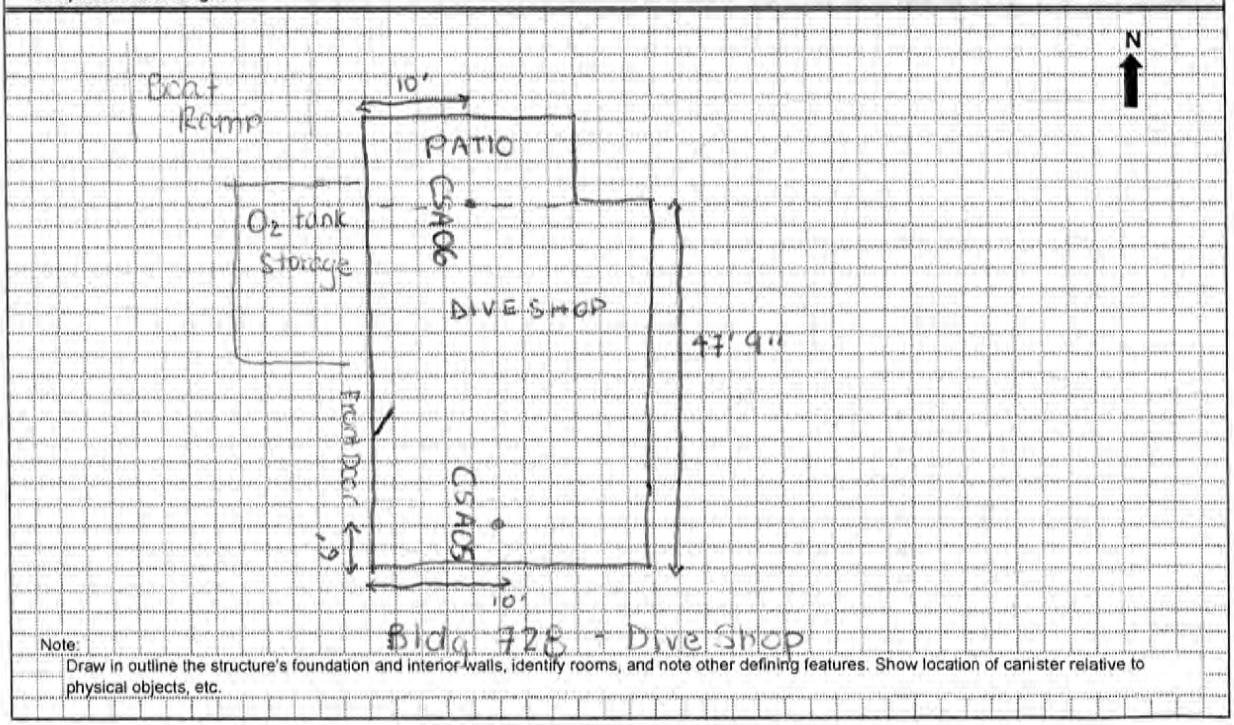
Project Name: NAVFAC MCB Camp Lejeune Project #: 364167

By: K Stokes / J Shim Date: 6/21/08

Sampling Data Log

Sample Location	Field ID	Canister ID	Flow Controller ID	Initial Canister Pressure ("Hg)	Initial Flow Controller Rate (ml/min)	Start Date & Time	End Data & Time	Final Pressure ("Hg)	Final Flow Controller Rate (ml/min)
SWMU118-	SWMU118-CSA06-08B	04174	K279	-32	3.5	6/21/08 10:43	6/22/08 9:54	-8	3.5
SWMU118	SWMU118-CSA05-08B	12267	K251	-32	3.5	6/21/08 10:39	6/22/08 9:57	-6	3.5

Sample Location Diagram



Note:
Draw in outline the structure's foundation and interior walls, identify rooms, and note other defining features. Show location of canister relative to physical objects, etc.

Other Observations and Comments (note any unique circumstances):

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Sheet 1 of __

Indoor Air Sampling Log (Summa Canister)

Project Information

Project Name: Vapor Intrusion

Project #: TO 21

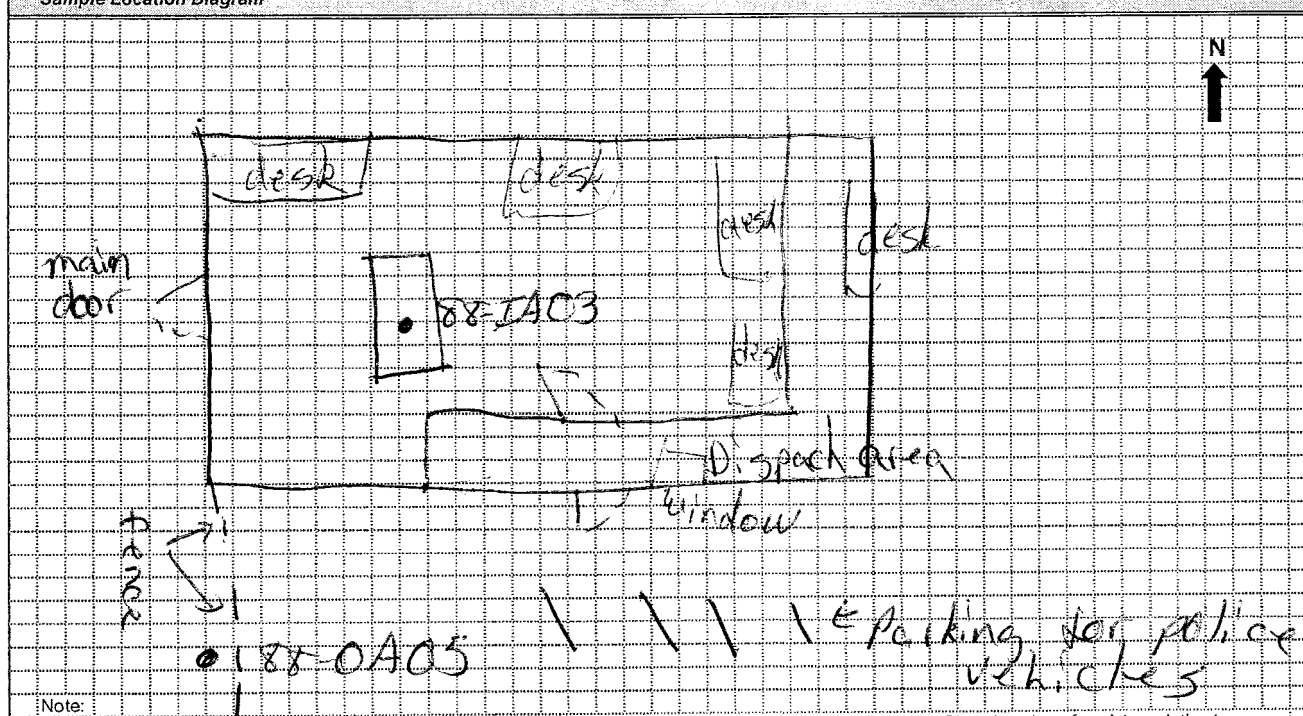
By: K. Riggs

Date: 9/11/08

Sampling Data Log

Sample Location	Field ID	Canister ID	Flow Controller ID	Initial Canister Pressure ("Hg)	Initial Flow Controller Rate (ml/min)	Start Date & Time	End Data & Time	Final Pressure ("Hg)	Final Flow Controller Rate (ml/min)
Bldg 43	88-IA03	5-1491	K370	-30	4.95	9/11/08 1310	9/12/08 0915	-1	4.95
outdoor - Bldg 43	88-OA05	12571	K133	-30	4.95	9/11/08 1350	9/12/08		4.95

Sample Location Diagram



Note:

Draw in outline the structure's foundation and interior walls, identify rooms, and note other defining features. Show location of canister relative to physical objects, etc.

Other Observations and Comments (note any unique circumstances): Officers come in and out at dispach door. Others go in and out main door.

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Indoor Air Sampling Log (Summa Canister)

Project Information

Project Name: Vapor Intrusion

Project #: TO 21

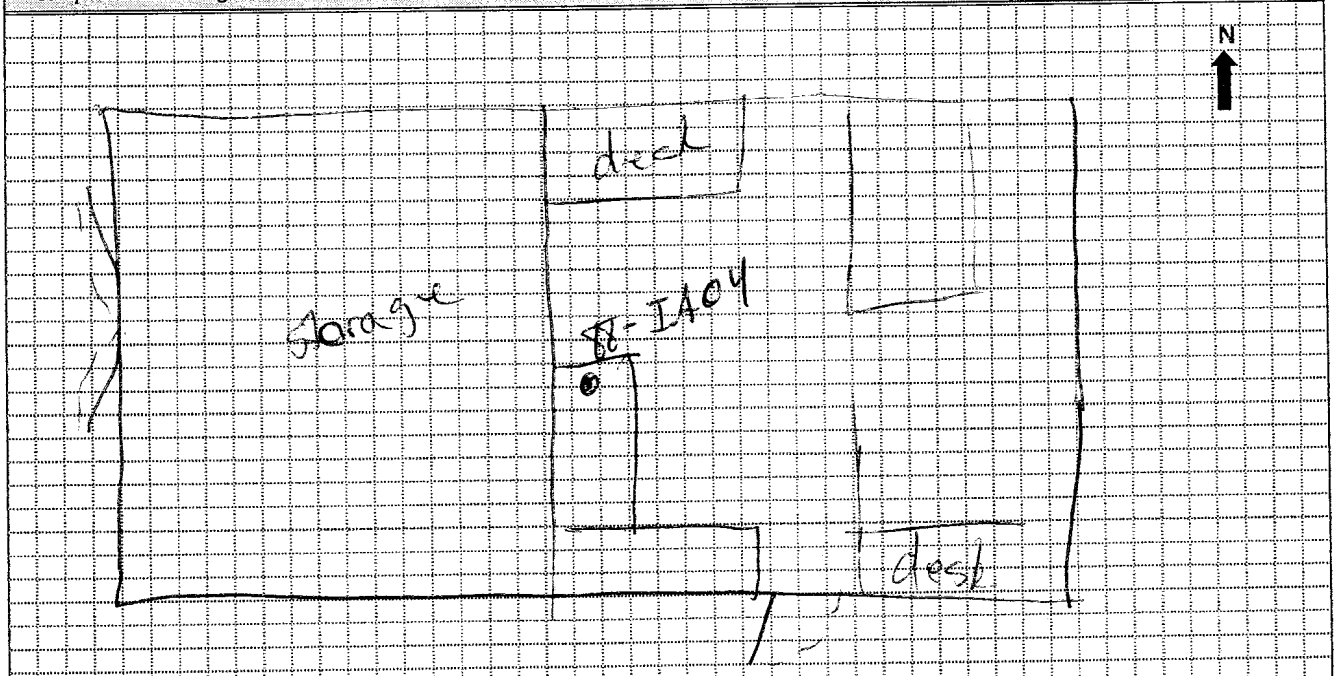
By: K. Riggs

Date: 9/11/05

Sampling Data Log

Sample Location	Field ID	Canister ID	Flow Controller ID	Initial Canister Pressure ("Hg)	Initial Flow Controller Rate (ml/min)	Start Date & Time	End Data & Time	Final Pressure ("Hg)	Final Flow Controller Rate (ml/min)
Bldg 3B office ~~88-IA04~~	88-IA04	0133	K253	-30	4.95	9/11/05 1340	9/12/05 0940	-2	4.95

Sample Location Diagram



Note: Draw in outline the structure's foundation and interior walls, identify rooms, and note other defining features. Show location of canister relative to physical objects, etc.

Other Observations and Comments (note any unique circumstances):

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Indoor Air Sampling Log (Summa Canister)

Project Information

Project Name: Vapor Intrusion

Project #: TO 21

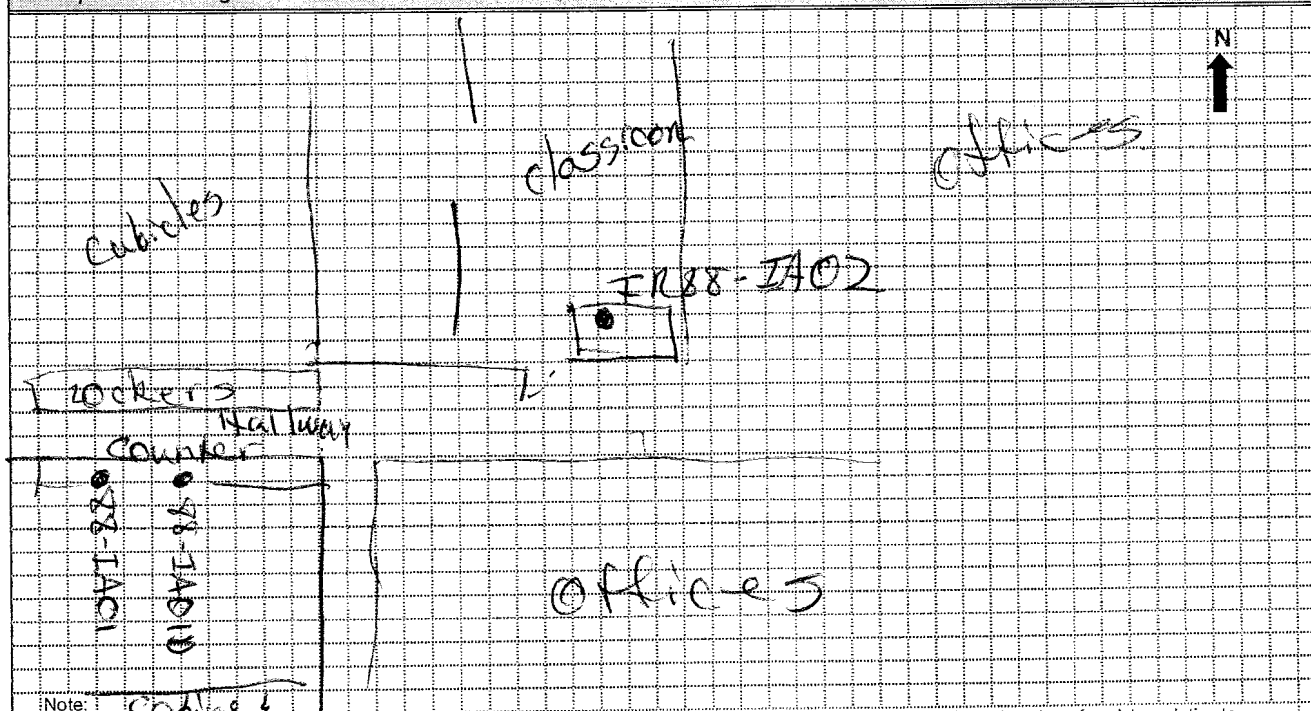
By: Kristi Riggs

Date: 9/11/08

Sampling Data Log

Sample Location	Field ID	Canister ID	Flow Controller ID	Initial Canister Pressure ("Hg)	Initial Flow Controller Rate (ml/min)	Start Date & Time	End Data & Time	Final Pressure ("Hg)	Final Flow Controller Rate (ml/min)
Bldg 37 Break Room	IR88-IA01	12157	K343	-30	4.95	9/11/08 1245	9/12/08 0855	-1	4.95
Bldg 37 Break Room	IR88-IA01D	03843	K443	-30	4.95	9/11/08 1245	9/12/08 1245	-1	4.95
Bldg. 37 Classroom	IR88-IA02	1372	K382	-30	4.95	9/11/08 1250	9/12/08 0905	-1	4.95

Sample Location Diagram



Note: Draw in outline the structure's foundation and interior walls, identify rooms, and note other defining features. Show location of canister relative to physical objects, etc.

Other Observations and Comments (note any unique circumstances): Canisters (IA01) on counter. Counter is open to Kitchen and to Hallway / locker area

CH2MHILL

Indoor Vapor Intrusion Assessment
Sub-slab Vapor Field Sampling Log - Summa Canister Method

Project Info

Project Name: CLVI Phase II — Project #: 364167

By: E. Barclay/K. Stokes — Date: 10/6/08

Structure

Identification: Bldg 1855

Address:

Slab Information:

- [x] Concrete slab on grade (directly on top of soil)
- [ ] Other (describe)
- [ ] Concrete slab on gravel underlayment

Condition of slab

Type of Sub Slab Soil

Is water present in the soil

Sub-slab Probe Installation, Leak Checking, Probe Purging, & Sampling Log

	Sample location (show in diagram)	1	2	3	4
	Sample Identification (field ID)	Sum0360-S6C9-08C	Sum0360-S6C10-08C		
Probe Installation	Depth of slab (inches)	6"	6"		
	Depth of hole drilled (inches below slab surface)	7"	7"		
	Depth of installed probe (inches below slab surface)	4"	4"		
Manifold Leak check	Leak check (sampling manifold) - Pass/No Pass	Pass	PASS		
Probe Purge	Purge rate, cc/min.	—	—		
	Purge Start (time of day)	1303	1327		
	Purge vacuum, " Hg	Ø	Ø		
	Purge completed (time of day)	1308	1330		
Helium Leak Check (optional)	Leak check (Helium) - %	475	Ø ppm		
Canister Sampling	Canister & flow controller ID (if used)	541234 / 38	L3841/98		
	Initial Canister Pressure (" Hg)	-29	-29.5		
	Sampling rate, cc/min	200	200 mL/min		
	Sampling period started (time of day)	1308	1332		
	Sampling vacuum, " Hg	Ø	Ø		
	Sampling period ended (time of day)	1313	1337		
	Final Canister Pressure (" Hg)	-3	-3		

Observations and Comments:

CO_2	Ø	Ø
O_2	20.6	20.8
NOCs	12.8	17.7

CH2MHILL

Indoor Vapor Intrusion Assessment
Sub-slab Vapor Field Sampling Log - Summa Canister Method

Project Info

Project Name: CLVI Phase II Project #: 364167
By: KStokes Date: 10/6/08

Structure

Identification: Bldg 1828
Address:
Slab Information:
- [x] Concrete slab on grade (directly on top of soil)
- [ ] Other (describe)
- [ ] Concrete slab on gravel underlayment

Condition of slab
Type of Sub Slab Soil
Is water present in the soil

Sub-slab Probe Installation, Leak Checking, Probe Purging, & Sampling Log

	Sample location (show in diagram)	1	2	3	4
	Sample Identification (field ID)	SWMU360-SG11-08C	SWMU360-SG12-08C		
Probe Installation	Depth of slab (inches)	6"	6"		
	Depth of hole drilled (inches below slab surface)	7"	7"		
	Depth of installed probe (inches below slab surface)	4"	4"		
Manifold Leak check	Leak check (sampling manifold) - Pass/No Pass	PASS	Pass		
Probe Purge	Purge rate, cc/min.	—	—		
	Purge Start (time of day)	1048	1107		
	Purge vacuum, " Hg	Ø	Ø		
	Purge completed (time of day)	1052	1112		
Helium Leak Check (optional)	Leak check (Helium) - %	0 ppm	2150 ppm		
Canister Sampling	Canister & flow controller ID (if used)	L5192/04	L5174/107		
	Initial Canister Pressure (" Hg)	-29	-31		
	Sampling rate, cc/min	200mL/min	200mL/min		
	Sampling period started (time of day)	1054	1116		
	Sampling vacuum, " Hg	Ø	Ø		
	Sampling period ended (time of day)	1059	1122		
	Final Canister Pressure (" Hg)	-3	-3		

Observations and Comments: VOC = 850 ppm 304
O_2 = 5.4% 6.9
CO_2 = 15.3% 10.4

CH2MHILL

Indoor Vapor Intrusion Assessment
Sub-slab Vapor Field Sampling Log - Summa Canister Method

Project Info

Project Name: CL VI Phase II Project #: 364167
By: K Stokes Date: 10/5/08

Structure

Identification: Bldg 3B
Address: mainside
Slab Information:
- [x] Concrete slab on grade (directly on top of soil)
- [ ] Concrete slab on gravel underlayment
- [ ] Other (describe)

Condition of slab
Type of Sub Slab Soil
Is water present in the soil

Sub-slab Probe Installation, Leak Checking, Probe Purging, & Sampling Log

	Sample location (show in diagram)	1	2	3	4
	Sample Identification (field ID)	1R88-SG05	1R88-SG05D		
Probe Installation	Depth of slab (inches)	6"	6"		
	Depth of hole drilled (inches below slab surface)	7"	7"		
	Depth of installed probe (inches below slab surface)	5"	5"		
Manifold Leak check	Leak check (sampling manifold) - Pass/No Pass	Pass	Pass		
Probe Purge	Purge rate, cc/min.	—	—		
	Purge Start (time of day)	925	925		
	Purge vacuum, " Hg	Ø	Ø		
	Purge completed (time of day)	928	928		
Helium Leak Check (optional)	Leak check (Helium) - %	0 ppm	0 ppm		
Canister Sampling	Canister & flow controller ID (if used)	L5189/114	SL-1231/39		
	Initial Canister Pressure (" Hg)	-29.5	-30		
	Sampling rate, cc/min	200mL/min	200mL/min		
	Sampling period started (time of day)	945	945		
	Sampling vacuum, " Hg	Ø	Ø		
	Sampling period ended (time of day)	949	950		
	Final Canister Pressure (" Hg)	-4	-4		

Observations and Comments: VOCs = 9999 ppm
O_2 = 20.1%
CO_2 = 0.9%

Figure 2-4
CH2MHILL

Indoor Vapor Intrusion Assessment
Sub-slab Vapor Field Sampling Log - Summa Canister Method

Project Info

Project Name: Camp Lejeune VI Eval. **Project # :**
By: Jen Simms **Date:** 09/28/08

Structure

Identification: Building 43
Address:
Slab Information:
- [x] Concrete slab on grade (directly on top of soil)
- [ ] Other (describe)
- [ ] Concrete slab on gravel underlayment

Condition of slab: good
Type of Sub Slab Soil: yellow sand then brown clayey dirt
Is water present in the soil: no

Sub-slab Probe Installation, Leak Checking, Probe Purging, & Sampling Log

		1	2	3	4
	Sample location (show in diagram)				
	Sample Identification (field ID)	IR88-SG06			
Probe Installation	Depth of slab (inches)	6"			
	Depth of hole drilled (inches below slab surface)	3"			
	Depth of installed probe (inches below slab surface)	4"			
Manifold Leak check	Leak check (sampling manifold) - Pass/No Pass	Pass			
Probe Purge	Purge rate, ~~cc/min~~	200 ml/min			
	Purge Start (time of day)	11:00			
	Purge vacuum " Hg	0			
	Purge completed (time of day)	11 10			
Helium Leak Check (optional)	Leak check (Helium) - %	0 ppm			
Canister Sampling	Canister & flow controller ID (if used)	L-5137/44			
	Initial Canister Pressure (" Hg)	-29.5			
	Sampling rate, ~~cc/min~~	200 ml/min			
	Sampling period started (time of day)	11:15			
	Sampling vacuum, " Hg	0			
	Sampling period ended (time of day)	11:21			
	Final Canister Pressure (" Hg)	-2			

Observations and Comments:

PID - 29.5 ppm
CO_2 - 3.8%
O_2 - 17.4%

Bldgs 37 & 43
Phase I
Bldg
Survey

CH2MHILL

Indoor Vapor Intrusion Assessment
Sub-slab Vapor Field Sampling Log - Summa Canister Method

Project Info

Project Name: CL VI
Project # : TO C1
By: K Riggs P. VanThiel
Date: 10/6/08

Structure

Identification: Bldg 3B
Address: MCB Camp Lejeune
Slab Information:
- [x] Concrete slab on grade (directly on top of soil)
- [ ] Concrete slab on gravel underlayment
- [ ] Other (describe)

Condition of slab: good
Type of Sub Slab Soil: sand
Is water present in the soil: no

Sub-slab Probe Installation, Leak Checking, Probe Purging, & Sampling Log

		1	2	3	4
	Sample location (show in diagram)				
	Sample Identification (field ID)	88-SG09			
Probe Installation	Depth of slab (inches)	6"			
	Depth of hole drilled (inches below slab surface)	9"			
	Depth of installed probe (inches below slab surface)	6"			
Manifold Leak check	Leak check (sampling manifold) - Pass/No Pass	Pass			
Probe Purge	Purge rate, cc/min.	.2L			
	Purge Start (time of day)	0910			
	Purge vacuum, " Hg	-2			
	Purge completed (time of day)	0920			
Helium Leak Check (optional)	Leak check (Helium) - %	50			
Canister Sampling	Canister & flow controller ID (if used)	L514/10, 22			
	Initial Canister Pressure (" Hg)	-30			
	Sampling rate, cc/min	.2			
	Sampling period started (time of day)	0927			
	Sampling vacuum, " Hg	-1			
	Sampling period ended (time of day)	0932			
	Final Canister Pressure (" Hg)	-3			

Observations and Comments:
PID = 1210
CO_2 = 6.0
O_2 = 17.9

* IR88-SG13-08C (Should be labeled

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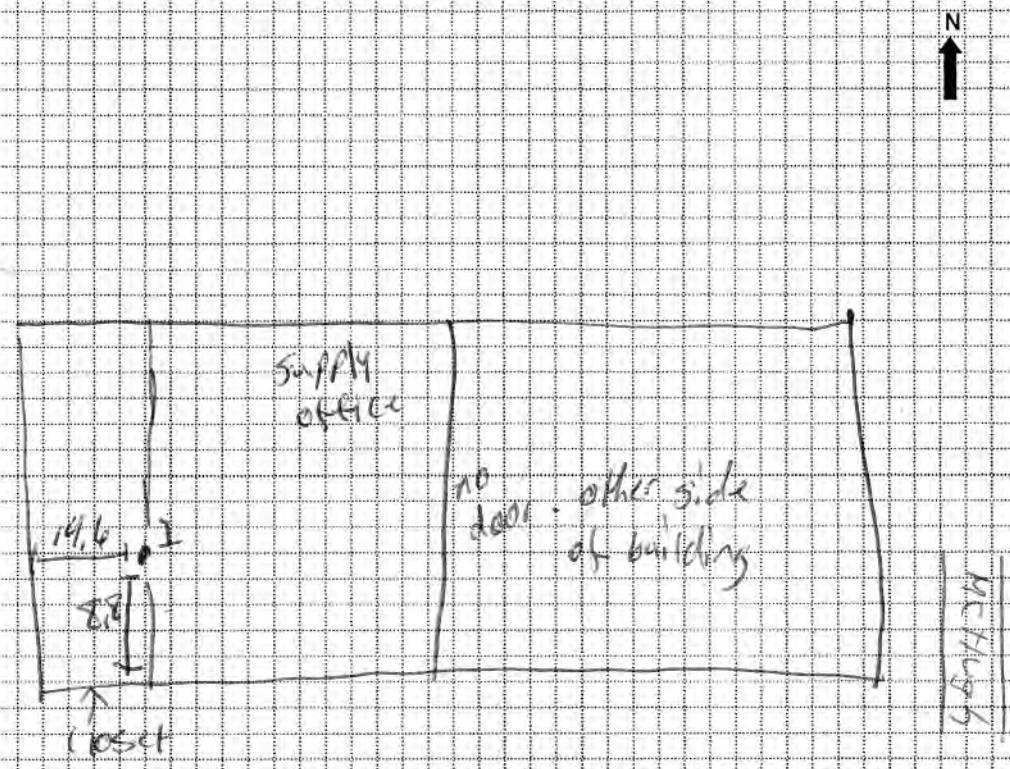
Indoor Vapor Intrusion Assessment
Sub-slab Vapor Sampling Field Log

Diagram - Outline of Structure Foundation & Location of Sub-slab Sampling Probes



Note:
Show the location of each soil probe and indicate distances from the foundation edge and other significant features.
Note location of sumps, drains, cleanouts, cracks, etc.

Other observations and comments:

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Indoor Vapor Intrusion Assessment
Sub-slab Vapor Field Sampling Log - Summa Canister Method

Project Info

Project Name: CL - VI
Project # : 702
By: ZRiggs
Date: 10/06/06

Structure

Identification: Building 37
Address: MCB Camp Lejeune

Slab Information:

- [x] Concrete slab on grade (directly on top of soil)
- [ ] Other (describe)
- [ ] Concrete slab on gravel underlayment

Condition of slab: good
Type of Sub Slab Soil: sand
Is water present in the soil: no

Sub-slab Probe Installation, Leak Checking, Probe Purging, & Sampling Log

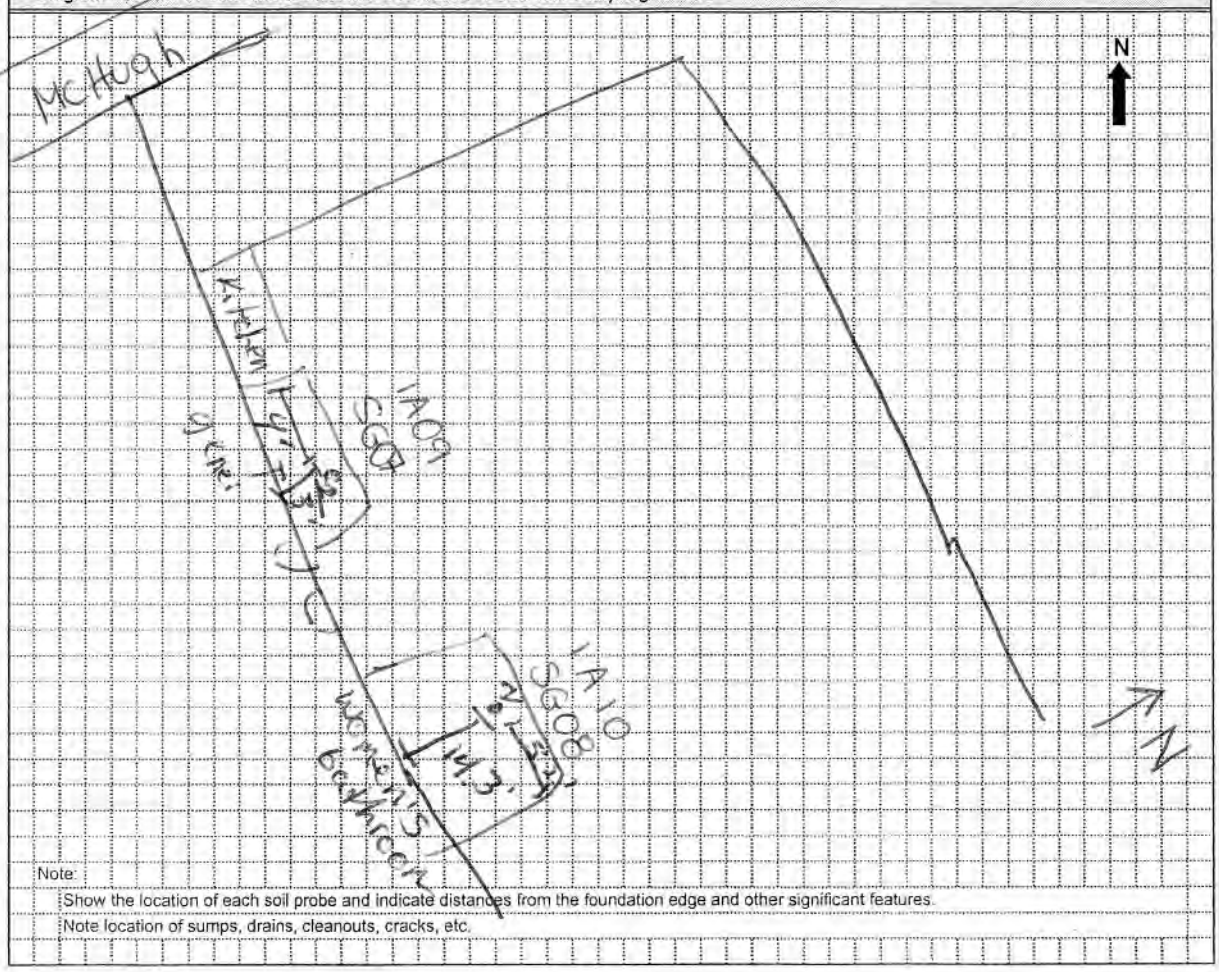
		1	2	3	4
	Sample location (show in diagram)				
	Sample Identification (field ID)	88-SG08	88-SG07		
Probe Installation	Depth of slab (inches)	6"	6"		
	Depth of hole drilled (inches below slab surface)	9"	9"		
	Depth of installed probe (inches below slab surface)	6"	6"		
Manifold Leak check	Leak check (sampling manifold) - Pass/No Pass	Pass	Pass		
Probe Purge	Purge rate, cc/min.	.2	.2		
	Purge Start (time of day)	1032	~~1107~~ 1118		
	Purge vacuum, " Hg	-1	-1		
	Purge completed (time of day)	1044	1121		
Helium Leak Check (optional)	Leak check (Helium) - %	0.0	0.0		
Canister Sampling	Canister & flow controller ID (if used)	5L-1214, 112	L-5146, 67		
	Initial Canister Pressure (" Hg)	-29	-30		
	Sampling rate, cc/min	.2	.2		
	Sampling period started (time of day)	1051	1132		
	Sampling vacuum, " Hg	-1	-1		
	Sampling period ended (time of day)	1056	1136		
	Final Canister Pressure (" Hg)	-4	-4		

Observations and Comments: PID = 50.6 PID = 11.3
CO = 1.5 CO = 0.3
O_2 = 19.7 O_2 = 21.1%

CH2MHILL *Applied Sciences Group*

Indoor Vapor Intrusion Assessment
Sub-slab Vapor Sampling Field Log

Diagram - Outline of Structure Foundation & Location of Sub-slab Sampling Probes



Note:

Show the location of each soil probe and indicate distances from the foundation edge and other significant features.

Note location of sumps, drains, cleanouts, cracks, etc.

Other observations and comments:

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Sheet 1 of __

Ambient Air, Outdoor Air & Crawl Space Air Sampling Log (Summa Canister)

Project Information

Project Name: CLVI Phase II

Project # 364167

By: K Stokes

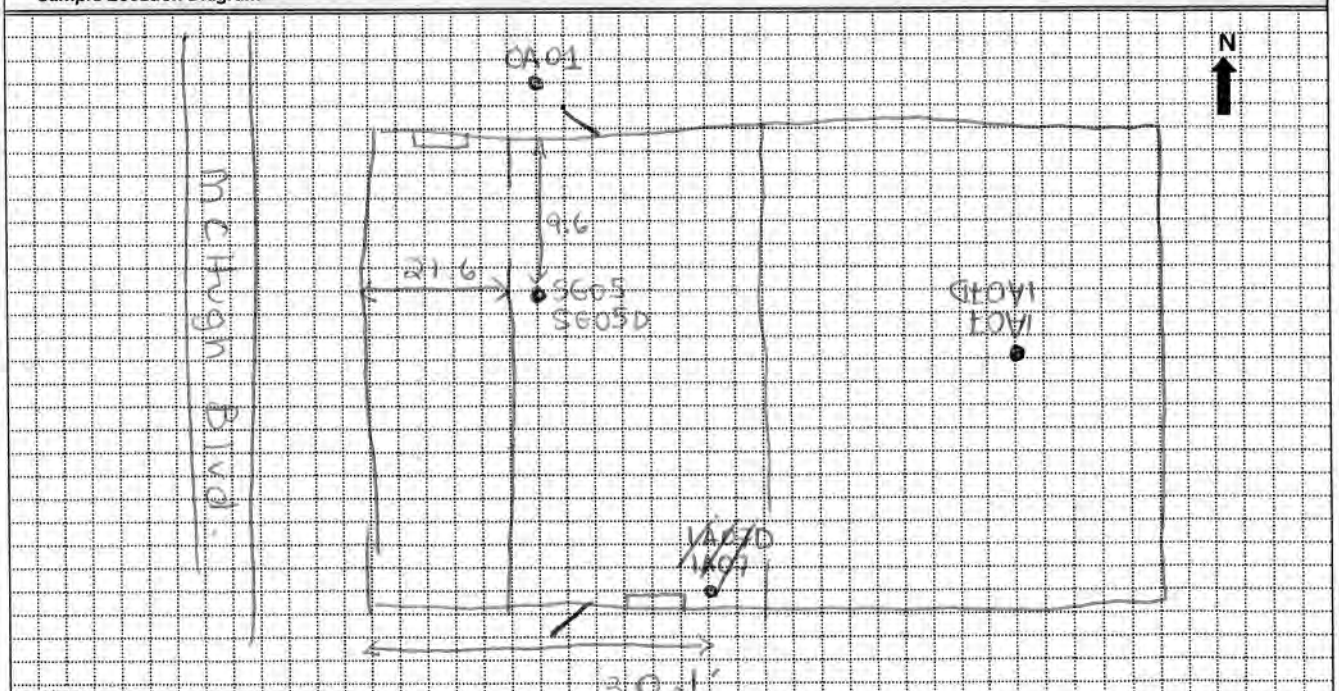
Date: 10/5/08

Sampling Data Log

Sample Location	Field ID	Canister ID	Flow Controller ID	Initial Canister Pressure ("Hg)	Initial Flow Controller Rate (ml/min)	Start Date & Time	End Data & Time	Final Pressure ("Hg)	Final Flow Controller Rate (ml/min)
IR88-1A07	IR88-1A07-08C	21639	K219	-40	4.17	10/5/08 940	10/6/08 0940	-8	4.17
IR88-1A07	IR88-1A07D-08C	11362	K379	-35	4.17	10/5/08 940	10/6/08 0940	-6	4.17
IR88-0A01	IR88-0A01-08C	1153	K263	-32	4.17	10/5/08 955	10/6/08 0951	-3	4.17

not analyzed - placed in incorrect location.

Sample Location Diagram



Note: Draw in outline the structure's foundation and interior walls, identify rooms, and note other defining features. Show location of canister relative to physical objects, etc.

Other Observations and Comments (note any unique circumstances): Office Space Bldg 3B

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Sheet 1 of __

Indoor Air Sampling Log (Summa Canister)

Project Information

Project Name: CL VI

Project # : TO 21

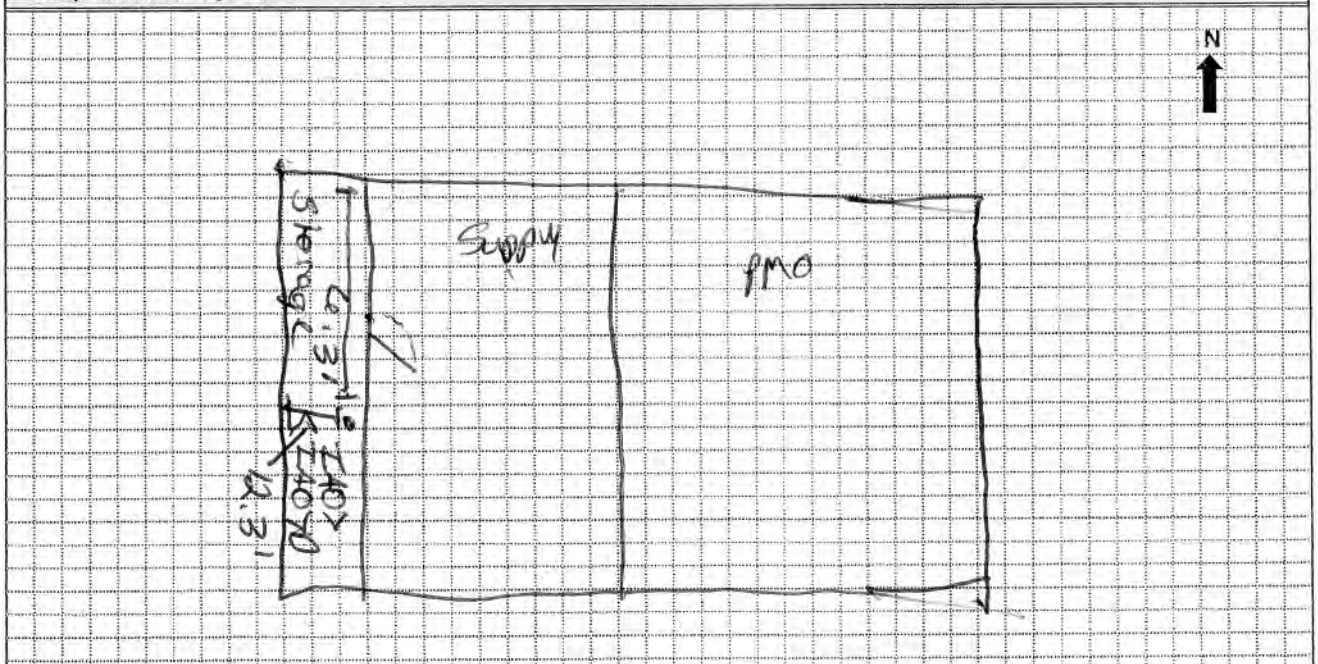
By: K Riggs

Date: 10/7/08

Sampling Data Log

Sample Location	Field ID	Canister ID	Flow Controller ID	Initial Canister Pressure ("Hg)	Initial Flow Controller Rate (ml/min)	Start Date & Time	End Data & Time	Final Pressure ("Hg)	Final Flow Controller Rate (ml/min)
Bldg 3B	JR88-IA07	C381	K226	-33	4.17	9/7/08 1210	9/8/08 0925	-10	4.17
Supply	JR88-IA07D	C676	K270	-32	4.17	9/7/08 1210	9/8/08 0925	-7	4.17

Sample Location Diagram



Note:

Draw in outline the structure's foundation and interior walls, identify rooms, and note other defining features. Show location of canister relative to physical objects, etc.

Other Observations and Comments (note any unique circumstances):

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Indoor Air Sampling Log (Summa Canister)

Project Information

Project Name: CL VI

Project # : TO 41

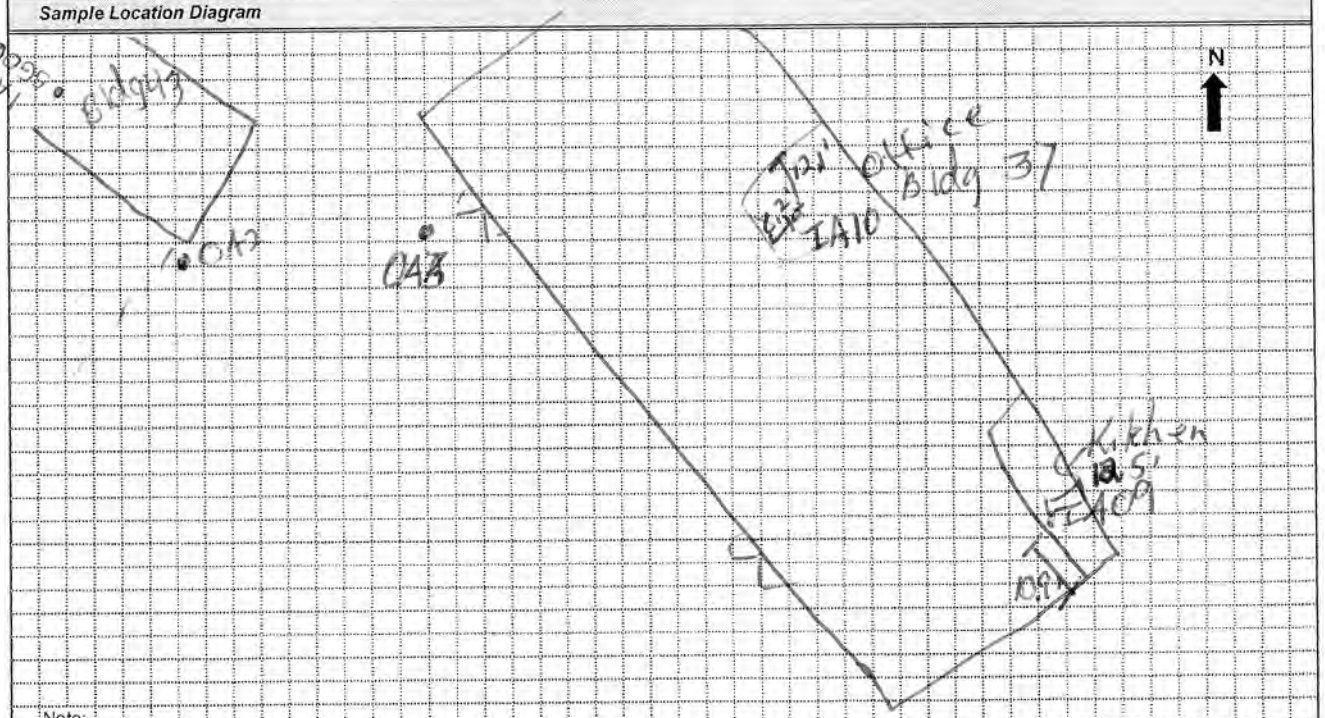
By: A. Riggs, P. VanThiel

Date: 10/6/08

Sampling Data Log

Sample Location	Field ID	Canister ID	Flow Controller ID	Initial Canister Pressure ("Hg)	Initial Flow Controller Rate (ml/min)	Start Date & Time	End Data & Time	Final Pressure ("Hg)	Final Flow Controller Rate (ml/min)
Bldg 43	88-0402	7465	K311	-30	4.17	9/6/08 1010	9/7/08 0800	-7	4.17
Bldg 37	88-0403	12340	K432	-30	4.17	9/6/08 1015	9/7/08 0810	-9	4.17
Bldg 37	88-IA10	11352	K308	-30	4.17	9/6/08 1012	9/7/08 0805	-9	4.17
Bldg 37	88-IA09	1411	K249	-30	4.17	9/6/08 1015	9/7/08 0752	0	4.17

Sample Location Diagram



Note:
Draw in outline the structure's foundation and interior walls, identify rooms, and note other defining features. Show location of canister relative to physical objects, etc.

Other Observations and Comments (note any unique circumstances):

* several people were smoking around IR88-0403-08C!

Figure 2-5

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Sheet 1 of __

Indoor Air Sampling Log (Summa Canister)

Project Information

Project Name: Camp Lejeune VI Eval

Project # :

By: Jen Simms

Date: 09/28/08

Sampling Data Log

Sample Location	Field ID	Canister ID	Flow Controller ID	Initial Canister Pressure ("Hg)	Initial Flow Controller Rate (ml/min)	Start Date & Time	End Data & Time	Final Pressure ("Hg)	Final Flow Controller Rate (ml/min)
~~IR88-IA08~~	~~IR88-IA08~~ -08C	62278N	K303	-30	4.17	09/28 1501	09/29 1415	-5	4.17

Sample Location Diagram

N

Note:
Draw in outline the structure's foundation and interior walls, identify rooms, and note other defining features. Show location of canister relative to physical objects, etc.

Other Observations and Comments (note any unique circumstances):

Bldg 43

~~Sample in Side room with Bed and TV on chair next to TV~~

Sample in Storage room next to Fridge & Storage Cabinet. door will be kept shut

Appendix V2-B
Data Quality Evaluation

Data Quality Evaluation

1 Data Quality Assessment

This data quality evaluation assesses the effect of the overall analytical process on the "availability" of the analytical data. "Availability" in this context refers to whether results can be used by the project team based on their analytical soundness. If a result is analytically sound, it is available for use by the project team.

Evaluation of laboratory performance is a check for compliance with the method requirements; in other words, a check of whether the laboratory analyzed the samples within the limits of the analytical method. Additionally, an independent, third-party validator conducted a review of the laboratory data to assess whether the analytical methods were within required control limits at the time of analysis. Evaluation of potential matrix interferences involves the review of several areas of results, including surrogate spike recoveries, matrix spike recoveries, and duplicate sample results.

The data evaluation and validation is a multi-tiered approach. The process begins with an internal laboratory review, continues with an independent review by a third-party validator, and ends with an overall review by the Navy contractor project chemistry team. This process provides a medium for essential communication between the laboratory, validator, and project team, and allows for data quality to be thoroughly evaluated.

1.1 Laboratory Internal Quality Control Review

Prior to releasing the analytical data, the laboratory reviewed both the sample and QC data to verify sample identity, instrument calibration, quantitation limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. In addition, the QC data were tabulated and the results reviewed to ascertain whether they were within the contract-required or laboratory-defined limits for accuracy and precision. Any non-conforming data were discussed in the data package cover letter and case narrative. The case narrative was then reviewed by the data validator and incorporated into the data validation report. If necessary, qualifiers were applied based on this information.

1.2 Data Validation

An independent data validator reviewed all data packages using the validation criteria defined by USEPA National Functional Guidelines, analytical methods, and applicable laboratory SOPs. These criteria help the validator create a thorough and systematic approach to the validation process. As stated above, the data validation process was independent and separate from the laboratory's internal review. The process was specifically focused on the effects of the laboratory's performance and sample matrix on the analytical results. Areas of review consisted of holding time compliance, surrogate recovery accuracy, matrix spiked sample precision and accuracy, blank contamination, initial and continuing calibration accuracy and precision, laboratory control sample accuracy, internal standard response and retention time accuracy, instrument tune criteria accuracy, and

duplicate sample precision (laboratory and field duplicates). Additionally, the analytical spectrum and raw data output were reviewed and laboratory results selected by the validator were recalculated from the raw data to verify final laboratory quantitation.

When multiple analyses were performed, the analytical run with the lowest quantitation limits was selected by the validator if the QC criteria were met for that analysis. If a sample was analyzed more than once as a result of concentrations exceeding the calibration range, the data validator selected results from the appropriate dilution. When multiple analyses were performed and QC criteria were outside of control limits for all analyses, the data validator selected results from the analytical run with the least number of exceptions or best possible QC.

Qualification of data is not an unusual occurrence. To define a laboratory QC exceedance and when a laboratory QC exceedance occurs, the laboratory refers to its in-house SOPs. The SOPs are based on DOD requirements, the requested analytical method, and accumulated laboratory experience. When a laboratory QC exceedance occurs, the situation may be acceptable or it may require further action by the laboratory, such as application of a laboratory qualifier or reanalysis of the sample. The data validator uses a separate set of QC criteria, based on guidance from the EPA region that applies to the samples. Data validation criteria exceedances may result in the qualification of or rejection of data, as deemed appropriate by the third-party data validator.

The data validator examines each data point and determines any effects that QC exceedances have had. Most often, these effects dictate that the result or quantitation limit should be considered estimated, but is still available for use. The J-qualification, UJ-qualification, NJ-qualification, and U-qualification of results are common occurrences and have no adverse effect on the availability of that result to the project team for making decisions. J-qualified and NJ-qualified results are available, at the reported result, for use as detects as long as they are considered "estimated" by the project team. Human health risk assessment guidance suggests that these qualifiers "indicate uncertainty in the reported concentration of the chemical, but not in its assigned identity. Therefore, these data can be used just as positive data with no qualifiers or codes." In addition, one should use "J-qualified concentrations the same way as positive data that do not have this qualifier" (Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual. (Part A) EPA/540/1-89/002. Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C. 1989). U-qualified and UJ-qualified results are available, at the reported quantitation limit, for use as non-detects as long as they are considered "non-detect," "attributable to blank contamination," or "non-detect, estimated quantitation limit," as appropriate.

In extreme cases, a result is rejected and deemed to be unusable. "Unusable" in this instance is defined as a result that is not analytically sound and is not generally considered available for use by the project team. In some cases, the project team may still decide to use a rejected result. An example of this occurrence would be if a result is rejected because it is biased extremely high, yet it is still below the project action limits. A conservative decision may be made to consider this result a non-exceedance, even if its concentration was rejected. For that reason, it is important to examine why a result was rejected. For the most part, however, rejected results are not usable, and the R-qualifier is the only qualifier that has an adverse effect on the availability of data.

In large data sets, rejected results are often inconsequential because there is sufficient non-rejected data available to the project team. If there are enough non-rejected data or the project team is able to infer results from adjacent sampling locations or there is other site-specific information that can provide additional lines of evidence, it may not be necessary to know the concentrations of some rejected constituents. It may also not be necessary to prove a constituent's absence if there are sufficient additional lines of evidence.

1.2.1 Primary Data Validation Qualifiers

The following data validation qualifiers were applied to one or more analytical results:

- **U** - Not detected. Sample was analyzed for this parameter, but it was not detected at greater than reported quantitation limit. The data validator may also apply this qualifier to indicate that a concentration is attributed to blank contamination, but this qualifier does not necessarily indicate a quality control problem.
- **UJ** – Not detected, quantitation limit is estimated. Sample was analyzed for this parameter, but it was not detected above the reported quantitation limit. The quantitation limit for this parameter is estimated due to a quality control issue.
- **J** - Concentration estimated. The parameter was positively identified and the associated numerical value is the approximate concentration of the parameter in the sample.
- **R** - Rejected. The result was rejected due to a quality control issue. The presence or absence of the parameter cannot be verified and the result generally is not usable as detected or not detected. R is also used to indicate an analytical result that is redundant because of reanalysis or dilution, in which case, there is no effect on the quality or usability of data.
- **[No qualifier present] -** Detected. Qualification was not warranted.

2 Impact of Data Quality on Project Data Quality Objectives and Data Usability

The laboratories analyzed the samples in accordance with EPA methods. The data packages were reviewed by an independent data validator using USEPA National Functional Guidelines, analytical methods, and applicable laboratory SOPs.

The laboratory utilized various qualifiers to represent "below reporting limit," "non-detect," and "detected." The data validator utilized J-qualifiers, NJ-qualifiers, UJ-qualifiers, U-qualifiers, and R-qualifiers to represent "estimated," "presumptively present at approximate quantity," "non-detect, estimated quantitation limit," "non-detect" or "attributable to blank contamination," and "rejected," respectively.

The J- and UJ-qualifiers indicate that some results are estimated. These qualifiers indicate that data are available for use as detects and non-detects, respectively. These qualifiers do not necessarily indicate a problem that adversely affects the availability of data. For example, J-qualifiers are often applied simply because results are below the quantitation limit.

Region IV data validation guidance mandates the use of J- and UJ-qualifiers when QA/QC exceedances dictate their necessity. In general, J-, UJ-, and U-qualified results are available for use as qualified.

3 Phase I Sampling – Mainside

The purpose of this data quality evaluation is to summarize the findings of the data validation and any effects on the availability of the data for the Phase I sampling at Mainside as well as to provide an assessment of data usability.

3.1 Groundwater Data

This evaluation assesses the analytical results of the groundwater samples collected on June 16 through June 19, 2008.

3.1.1 Volatile Organic Compounds

Volatiles were analyzed by SW-846 method 8260B. Excluding field quality control samples, 588 distinct data points were generated. There were no rejected results. The volatiles data set is 100% percent complete (all volatiles results are available for use). The validation process resulted in the following qualifiers for results in the volatiles fraction:

- 9.0 percent (53 of 588 results) were U-qualified as "attributable to blank contamination" (see section 3.1.1.1, below)
- 7.8 percent (46 of 588 results) were J-qualified as "estimated" because the results were below the quantitation limit (see section 3.1.1.2 below)

3.1.1.1 Blank Contamination

A total of 53 results were U-qualified as "attributable to blank contamination" because 2-butanone, acetone, chloroform, chloromethane, ethylbenzene, methyl acetate, methylene chloride, m, p, and o-xylene, as well as toluene were detected in associated blank samples. Of these, acetone and methylene chloride are common laboratory contaminants. The U-qualification of detects to indicate that they are "attributable to blank contamination" does not affect the availability of results because they are available for use as nondetects at the adjusted quantitation limit.

3.1.1.2 Quantitation Limits

A total of 46 results were J-qualified as "estimated" simply because the results were lower than the quantitation limit. The J-qualification of detects does not affect the availability of results because they are available for use as detects at the reported concentration.

3.2 Indoor and Outdoor Air Data

This evaluation assesses the analytical results of the indoor and outdoor air samples collected on June 22 through June 24, 2008 and on September 12, 2008.

3.2.1 Volatile Organic Compounds

Volatiles were analyzed by EPA method TO-15. Excluding field quality control samples, 644 distinct data points were generated. There were no rejected results. The volatiles data set is

100% percent complete (all volatiles results are available for use). The validation process resulted in the following qualifiers for results in the volatiles fraction:

- 2.0 percent (13 of 644 results) were U-qualified as "attributable to blank contamination" (see section 3.2.1.1, below)
- 1.7 percent (11 of 644 results) were UJ-qualified as "nondetect, estimated quantitation limit" because of high continuing calibration recovery (see section 3.2.1.2, below)
- 0.2 percent (1 of 644 results) were J-qualified as "estimated" due to high continuing calibration recovery (see section 3.2.1.2 below)
- 19.1 percent (123 of 644 results) were J-qualified as "estimated" because the results were below the quantitation limit (see section 3.2.1.3 below)

3.2.1.1 Blank Contamination

A total of 13 results were U-qualified as "attributable to blank contamination" because methylene chloride was detected in associated blank samples. Methylene chloride is a common laboratory contaminant. The U-qualification of detects to indicate that they are "attributable to blank contamination" does not affect the availability of results because they are available for use as nondetects at the adjusted quantitation limit.

3.2.1.2 Calibration

A total of 11 results were UJ-qualified as "nondetect, estimated quantitation limit" because of high continuing calibration recoveries. The UJ-qualification of nondetects does not affect the availability of results because they are available for use as nondetects at the reported quantitation limit.

A total of one result was J-qualified as "estimated" due to high continuing calibration recovery for 2-hexanone. The J-qualification of detects does not affect the availability of results because they are available for use as detects at the reported concentration; however, the data user should consider the result as possibly biased high. This compound did not exceed any screening criteria.

3.2.1.3 Quantitation Limits

A total of 123 results were J-qualified as "estimated" simply because the results were lower than the quantitation limit. The J-qualification of detects does not affect the availability of results because they are available for use as detects at the reported concentration.

3.3 Soil Gas Data

This evaluation assesses the analytical results of the soil gas samples collected on June 22 and June 24, 2008.

3.3.1 Volatile Organic Compounds

Volatiles were analyzed by EPA method TO-15. Excluding field quality control samples, 138 distinct data points were generated. There were no rejected results. The volatiles data set is 100% percent complete (all volatiles results are available for use). The validation process resulted in the following qualifiers for results in the volatiles fraction:

- 0.7 percent (1 of 138 results) were U-qualified as "attributable to blank contamination" (see section 3.3.1.1, below)
- 9.4 percent (13 of 138 results) were J-qualified as "estimated" because the results were below the quantitation limit (see section 3.3.1.2 below)

3.3.1.1 Blank Contamination

A total of one result was U-qualified as "attributable to blank contamination" because methylene chloride was detected in an associated blank samples. Methylene chloride is a common laboratory contaminant. The U-qualification of detects to indicate that they are "attributable to blank contamination" does not affect the availability of results because they are available for use as nondetects at the adjusted quantitation limit.

3.3.1.2 Quantitation Limits

A total of 13 results were J-qualified as "estimated" simply because the results were lower than the quantitation limit. The J-qualification of detects does not affect the availability of results because they are available for use as detects at the reported concentration.

3.4 Shallow Soil Vapor Data

This evaluation assesses the analytical results of the shallow soil vapor samples collected on June 17 and 18 2008.

3.4.1 Volatile Organic Compounds

Volatiles were analyzed by EPA method TO-15. Excluding field quality control samples, 460 distinct data points were generated. There were no rejected results. The volatiles data set is 100% percent complete (all volatiles results are available for use). The validation process resulted in the following qualifiers for results in the volatiles fraction:

- 2.0 percent (9 of 460 results) were U-qualified as "attributable to blank contamination" (see section 3.4.1.1, below)
- 8.7 percent (40 of 460 results) were J-qualified as "estimated" because the results were below the quantitation limit (see section 3.4.1.2 below)

3.4.1.1 Blank Contamination

A total of nine results were U-qualified as "attributable to blank contamination" because methylene chloride was detected in associated blank samples. Methylene chloride is a common laboratory contaminant. The U-qualification of detects to indicate that they are "attributable to blank contamination" does not affect the availability of results because they are available for use as nondetects at the adjusted quantitation limit.

3.4.1.2 Quantitation Limits

A total of 40 results were J-qualified as "estimated" simply because the results were lower than the quantitation limit. The J-qualification of detects does not affect the availability of results because they are available for use as detects at the reported concentration.

3.5 Deep Soil Vapor Data

This evaluation assesses the analytical results of the deep soil vapor samples collected on June 18 and 19 2008.

3.5.1 Volatile Organic Compounds

Volatiles were analyzed by EPA method TO-15. Excluding field quality control samples, 230 distinct data points were generated. There were no rejected results. The volatiles data set is 100% percent complete (all volatiles results are available for use). The validation process resulted in the following qualifiers for results in the volatiles fraction:

- 2.2 percent (5 of 230 results) were U-qualified as "attributable to blank contamination" (see section 3.5.1.1, below)
- 17.0 percent (39 of 230 results) were J-qualified as "estimated" because the results were below the quantitation limit (see section 3.5.1.2 below)

3.5.1.1 Blank Contamination

A total of five results were U-qualified as "attributable to blank contamination" because methylene chloride was detected in associated blank samples. Methylene chloride is a common laboratory contaminant. The U-qualification of detects to indicate that they are "attributable to blank contamination" does not affect the availability of results because they are available for use as nondetects at the adjusted quantitation limit.

3.5.1.2 Quantitation Limits

A total of 39 results were J-qualified as "estimated" simply because the results were lower than the quantitation limit. The J-qualification of detects does not affect the availability of results because they are available for use as detects at the reported concentration.

4 Phase II Sampling – Mainside

4.1 Indoor and Outdoor Air Data

This evaluation assesses the analytical results of indoor and outdoor air samples collected on September 28 and October 6 through 8, 2008.

4.1.1 Volatile Organic Compounds

Volatiles were analyzed by EPA method TO-15. Excluding field quality control samples, 368 distinct data points were generated. There were no rejected results. The volatiles data set is 100% percent complete (all volatiles results are available for use). The validation process resulted in the following qualifiers for results in the volatiles fraction:

- 1.6 percent (6 of 368 results) were U-qualified as "attributable to blank contamination" (see section 4.1.1.1, below)
- 1.1 percent (4 of 368 results) were UJ-qualified as "nondetect, estimated quantitation limit" because of high continuing calibration recovery (see section 4.1.1.2, below)
- 1.9 percent (7 of 368 results) were J-qualified as "estimated" due to high continuing calibration recovery (see section 4.1.1.2 below)
- 13.6 percent (50 of 368 results) were J-qualified as "estimated" because the results were below the quantitation limit (see section 4.1.1.3 below)

4.1.1.1 Blank Contamination

A total of six results were U-qualified as "attributable to blank contamination" because carbon disulfide and methylene chloride were detected in associated blank samples. Methylene chloride is a common laboratory contaminant. The U-qualification of detects to indicate that they are "attributable to blank contamination" does not affect the availability of results because they are available for use as nondetects at the adjusted quantitation limit.

4.1.1.2 Calibration

A total of four results were UJ-qualified as "nondetect, estimated quantitation limit" because of high continuing calibration recoveries. The UJ-qualification of nondetects does not affect the availability of results because they are available for use as nondetects at the reported quantitation limit.

A total of seven results were J-qualified as "estimated" due to high continuing calibration recoveries. The affected compounds Acetone, Styrene, and m- and p-Xylene did not exceed any of the screening criteria. The J-qualification of detects does not affect the availability of results because they are available for use as detects at the reported concentration. However, the data user should consider these results as possibly biased high.

4.1.1.3 Quantitation Limits

A total of 50 results were J-qualified as "estimated" simply because the results were lower than the quantitation limit. The J-qualification of detects does not affect the availability of results because they are available for use as detects at the reported concentration.

4.2 Soil Gas Data

This evaluation assesses the analytical results of soil gas samples collected on September 28 and October 6, 2008.

4.2.1 Volatile Organic Compounds

Volatiles were analyzed by EPA method TO-15. Excluding field quality control samples, 460 distinct data points were generated. There were no rejected results. The volatiles data set is 100% percent complete (all volatiles results are available for use). The validation process resulted in the following qualifiers for results in the volatiles fraction:

- 3.9 percent (18 of 460 results) were U-qualified as "attributable to blank contamination" (see section 4.2.1.1, below)
- 2.2 percent (10 of 460 results) were UJ-qualified as "nondetect, estimated quantitation limit" because of high continuing calibration recovery (see section 4.2.1.2, below)
- 3.3 percent (15 of 460 results) were J-qualified as "estimated" because the results were below the quantitation limit (see section 4.2.1.3 below)

4.2.1.1 Blank Contamination

A total of 18 results were U-qualified as "attributable to blank contamination" because carbon disulfide and methylene chloride were detected in associated blank samples. Methylene chloride is a common laboratory contaminant. The U-qualification of detects to indicate that they are "attributable to blank contamination" does not affect the availability of results because they are available for use as nondetects at the adjusted quantitation limit.

4.2.1.2 Calibration

A total of ten results were UJ-qualified as "nondetect, estimated quantitation limit" because of high continuing calibration recoveries. The UJ-qualification of nondetects does not affect the availability of results because they are available for use as nondetects at the reported quantitation limit.

4.2.1.3 Quantitation Limits

A total of 15 results were J-qualified as "estimated" simply because the results were lower than the quantitation limit. The J-qualification of detects does not affect the availability of results because they are available for use as detects at the reported concentration.

5 Overall Assessment

All data collected in support of Phase I and Phase II sampling events are found to be of exceptional quality. No data was rejected due to QA/QC deficiencies and all data is available for use by the project team.

Appendix V2-C
Building Surveys

Figure 2-1
Preliminary Building Survey for Vapor Intrusion Investigation

CH2MHILL

Date: 6/23/08
Preparer: K Stokes

Facility: LCH-4014B
Address: Holcomb Ave @ Midway Park

Contact Person: Doris Langley
Phone Number:
e-mail address:

Building Description

Building or Room Identifier: Bldg 4014B
Primary Activity within Building (select one):

- [ ] Manufacturing
- [x] Storage
- [ ] Other
- [ ] Chemical processing
- [ ] Chemical Storage
- [ ] Administrative
- [ ] Instrumentation/Control

Notes: Thrift shop

Approximate floor space 50' x 15'
Number of floors 1

Multi-room building [x] or Single room [ ]

Ceiling height 8'

Aboveground Construction
- [ ] Wood
- [ ] Concrete
- [x] Brick
- [ ] Cinderblock
- [ ] Other

Floor plan attached? [x] Yes [ ] No

Notes:

Evaluation of Potential Conduits from Soil

Floor/foundation description (check all that apply)

- [ ] Wood
- [x] Concrete
- [ ] Elevated above grade?
- [ ] Below grade?
- [ ] Other Covered in asbestos tile, bare concrete covered in mastic

Expansion joints present (if concrete floor)?	[ ] Yes	[ ] No	[x] N/A
Are expansion joints sealed?	[ ] Yes	[ ] No	[x] N/A
Are sumps or floor drains present?	[ ] Yes	[ ] No	[x] N/A
Are basements or subsurface vaults present?	[ ] Yes	[ ] No	[x] N/A
Are there subsurface drainage problems?	[ ] Yes	[ ] No	[x] N/A

Notes:

Evaluation of Potential Pathways/Driving Forces

Are there locations with elevated positive or negative pressure (look for doors not opening/closing properly, perceptible airflow, audible fan noise)

none

Is there one air conditioning zone or multiple zones (if in a multi-room building)?

- [x] Single zone
- [ ] Multi-zone
- [ ] Other

(building management may know; another tip-off is the presence of multiple thermostats = multiple zones)

Figure 2-1
Preliminary Building Survey for Vapor Intrusion Investigation

Sources of outdoor air

[X] Mechanical (air handling unit) [X] Doors
[X] Windows

Are windows/doors left open routinely? [ ] Yes [ ] No

Notes: Front door is propped open

Evaluation of Potential Existing Chemical Sources Indoors

List principal solvent or VOC-containing products used (obtain MSDSs if available)

none

Are any of the target analytes used in this building/room?

[ ] Yes [X] No

Are pesticides used indoors for pest control? [ ] Yes [X] No

Names of pesticide products used?

Has there been a pesticide application within the past 6 months? [ ] Yes [X] No

Is smoking permitted in the building? [ ] Yes [X] No

Description of Vapor Mitigation Systems

Has a radon or vapor mitigation system been installed in this building/room? [ ] Yes [X] No

Date of installation?

Type of system? [ ] Passive venting [ ] Active subslab depressurization
[ ] Crack/crevice sealing [ ] Dilution ventilation control

Figure 2-1
Preliminary Building Survey for Vapor Intrusion Investigation

☐ N/A

Notes: _____

Additional Notes

_____

Figure 2-1
Preliminary Building Survey for Vapor Intrusion Investigation

Additional Notes

Figure 2-1
Preliminary Building Survey for Vapor Intrusion Investigation

Figure 2-1
Preliminary Building Survey for Vapor Intrusion Investigation

CH2MHILL

Date: 6/23/08
Preparer: K Stokes

Facility: LCH-4014A Movie Theater
Address: Holcomb Ave in Midway Park

Contact Person: Doris Langley
Phone Number:
e-mail address:

Building Description

Building or Room Identifier: LCH-4014A
Primary Activity within Building (select one):

- [ ] Manufacturing
- [ ] Storage
- [X] Other
- [ ] Chemical processing
- [ ] Chemical Storage
- [ ] Administrative
- [ ] Instrumentation/Control

Notes: Operating movie theater

Approximate floor space
Number of floors 1
Multi-room building [X] or Single room [ ]
Ceiling height movie theater ≈30', sample room ~10'
Aboveground Construction
- [ ] Wood
- [ ] Concrete
- [X] Brick
- [ ] Cinderblock
- [ ] Other

Floor plan attached? [X] Yes [ ] No
Notes:

Evaluation of Potential Conduits from Soil

Floor/foundation description (check all that apply)

☐ Wood ☐ Concrete ☐ Elevated above grade?
☐ Below grade?

☐ Other _____

Expansion joints present (if concrete floor)?	☐ Yes	☐ No	☐ N/A
Are expansion joints sealed?	☐ Yes	☐ No	☐ N/A
Are sumps or floor drains present?	☐ Yes	☐ No	☐ N/A
Are basements or subsurface vaults present?	☐ Yes	☐ No	☐ N/A
Are there subsurface drainage problems?	☐ Yes	☐ No	☐ N/A

Notes: _____

Evaluation of Potential Pathways/Driving Forces

Are there locations with elevated positive or negative pressure (look for doors not opening/closing properly, perceptible airflow, audible fan noise)

Is there one air conditioning zone or multiple zones (if in a multi-room building)?

☐ Single zone ☐ Multi-zone ☐ Other _____

(building management may know; another tip-off is the presence of multiple thermostats = multiple zones)

Figure 2-1
Preliminary Building Survey for Vapor Intrusion Investigation

Sources of outdoor air

☐ Mechanical (air handling unit) ☐ Doors

☐ Windows

Are windows/doors left open routinely? ☐ Yes ☐ No

Notes: _____

Evaluation of Potential Existing Chemical Sources Indoors

List principal solvent or VOC-containing products used (obtain MSDSs if available)

_____ _____

_____ _____

_____ _____

Are any of the target analytes used in this building/room?

☐ Yes ☐ No

_____ _____

_____ _____

Are pesticides used indoors for pest control? ☐ Yes ☐ No

Names of pesticide products used? _____

_____

Has there been a pesticide application within the past 6 months? ☐ Yes ☐ No

Is smoking permitted in the building? ☐ Yes ☐ No

Description of Vapor Mitigation Systems

Has a radon or vapor mitigation system been installed in this building/room? ☐ Yes ☐ No

Date of installation? _____

Type of system? ☐ Passive venting ☐ Active subslab depressurization

☐ Crack/crevice sealing ☐ Dilution ventilation control

Figure 2-1
Preliminary Building Survey for Vapor Intrusion Investigation

☐ N/A

Notes: _____

Additional Notes

_____

Figure 2-1
Preliminary Building Survey for Vapor Intrusion Investigation

Additional Notes

Figure 2-1
Preliminary Building Survey for Vapor Intrusion Investigation

Figure 2-1
Preliminary Building Survey for Vapor Intrusion Investigation

CH2MHILL

Date: 6/21/08
Preparer: K. Stokes

Facility: Bldg. 728 Mainside SWMU 118
Address: Marina - Dive Shop

Contact Person: Doris Langley
Phone Number: 451-5694
e-mail address:

Building Description

Building or Room Identifier: Bldg 728
Primary Activity within Building (select one):

- [ ] Manufacturing
- [ ] Storage
- [X] Other
- [ ] Chemical processing
- [ ] Chemical Storage
- [ ] Administrative
- [ ] Instrumentation/Control

Notes: Dive Shop - Kayak rentals, merchandise/ retail shop

Approximate floor space 1600 ft 2
Number of floors 1
Multi-room building [X] or Single room [ ]
Ceiling height 8'
Aboveground Construction [X] Wood [ ] Concrete [ ] Brick [ ] Cinderblock [ ] Other

Floor plan attached? [X] Yes [ ] No
Notes: Building elevated w/ lattice around base.

Figure 2-1
Preliminary Building Survey for Vapor Intrusion Investigation

Northern side of building is 3' elevation
Southern side of building is 5" elevation

Evaluation of Potential Conduits from Soil

Floor/foundation description (check all that apply)

- [ ] Wood
- [ ] Concrete
- [x] Elevated above grade?
- [ ] Below grade?
- [ ] Other unknow

Expansion joints present (if concrete floor)?	[ ] Yes	[ ] No	[x] N/A
Are expansion joints sealed?	[ ] Yes	[ ] No	[x] N/A
Are sumps or floor drains present?	[ ] Yes	[ ] No	[x] N/A
Are basements or subsurface vaults present?	[ ] Yes	[ ] No	[x] N/A
Are there subsurface drainage problems?	[ ] Yes	[ ] No	[x] N/A

Notes:

Evaluation of Potential Pathways/Driving Forces

Are there locations with elevated positive or negative pressure (look for doors not opening/closing properly, perceptible airflow, audible fan noise)

Is there one air conditioning zone or multiple zones (if in a multi-room building)?

- [x] Single zone
- [ ] Multi-zone
- [ ] Other

(building management may know; another tip-off is the presence of multiple thermostats = multiple zones)

Figure 2-1
Preliminary Building Survey for Vapor Intrusion Investigation

Sources of outdoor air

[X] Mechanical (air handling unit) [X] Doors
[X] Windows

Are windows/doors left open routinely? [ ] Yes [X] No

Notes: _____

Evaluation of Potential Existing Chemical Sources Indoors

List principal solvent or VOC-containing products used (obtain MSDSs if available)

none visible

Are any of the target analytes used in this building/room?

[ ] Yes [ ] No

n/a

Are pesticides used indoors for pest control? [ ] Yes [ ] No

Names of pesticide products used? _____

Has there been a pesticide application within the past 6 months? [ ] Yes [ ] No

Is smoking permitted in the building? [ ] Yes [X] No

Description of Vapor Mitigation Systems

Has a radon or vapor mitigation system been installed in this building/room? [ ] Yes [X] No

Date of installation? _____

Type of system? [ ] Passive venting [ ] Active subslab depressurization
[ ] Crack/crevice sealing [ ] Dilution ventilation control

☐ N/A

Notes: _____

Additional Notes

_____

Additional Notes

Figure 2-1
Preliminary Building Survey for Vapor Intrusion Investigation

Preliminary Building Survey for Vapor Intrusion Investigation

CH2MHILL

Date: 9/11/08

Preparer: Kristi Riggs

Facility: Bldg 3B

Address: PMO facilities admin

Contact Person: Amanda

Phone Number: 951-7906

e-mail address:

Building Description

Building or Room Identifier: office

Primary Activity within Building (select one):

- [ ] Manufacturing
- [x] Storage
- [ ] Other
- [ ] Chemical processing
- [ ] Chemical Storage
- [x] Administrative
- [ ] Instrumentation/Control

Notes: Admin on one half building, storage on other side

Approximate floor space 20' x 50'

Number of floors 1

Multi-room building [x] or Single room [ ]

Ceiling height 10'

Aboveground Construction
- [ ] Wood
- [x] Concrete
- [x] Brick
- [ ] Cinderblock
- [ ] Other

Floor plan attached? [x] Yes [ ] No

Notes:

Evaluation of Potential Conduits from Soil

Floor/foundation description (check all that apply)

- [ ] Wood
- [x] Concrete
- [ ] Elevated above grade?
- [ ] Below grade?
- [ ] Other _____

Expansion joints present (if concrete floor)?	[ ] Yes	[ ] No	[x] N/A
Are expansion joints sealed?	[ ] Yes	[ ] No	[x] N/A
Are sumps or floor drains present?	[ ] Yes	[ ] No	[x] N/A
Are basements or subsurface vaults present?	[ ] Yes	[ ] No	[x] N/A
Are there subsurface drainage problems?	[ ] Yes	[ ] No	[x] N/A

Notes: Area is tiled

Evaluation of Potential Pathways/Driving Forces

Are there locations with elevated positive or negative pressure (look for doors not opening/closing properly, perceptible airflow, audible fan noise)

No

Is there one air conditioning zone or multiple zones (if in a multi-room building)?

- [ ] Single zone
- [x] Multi-zone
- [ ] Other _____

(building management may know; another tip-off is the presence of multiple thermostats = multiple zones)

Sources of outdoor air

- [ ] Mechanical (air handling unit)
- [x] Doors
- [x] Windows

Are windows/doors left open routinely? [X] Yes [ ] No

Notes: Main door left open on "nice" days

Evaluation of Potential Existing Chemical Sources Indoors

List principal solvent or VOC-containing products used (obtain MSDSs if available)

None

Are any of the target analytes used in this building/room?

[ ] Yes [X] No

Are pesticides used indoors for pest control? [ ] Yes [X] No

Names of pesticide products used? NA

Has there been a pesticide application within the past 6 months? [ ] Yes [X] No

Is smoking permitted in the building? [ ] Yes [X] No

Description of Vapor Mitigation Systems

Has a radon or vapor mitigation system been installed in this building/room? [ ] Yes [X] No

Date of installation? NA

Type of system?

[ ] Passive venting
[ ] Active subslab depressurization
[ ] Crack/crevice sealing
[ ] Dilution ventilation control
[ ] N/A

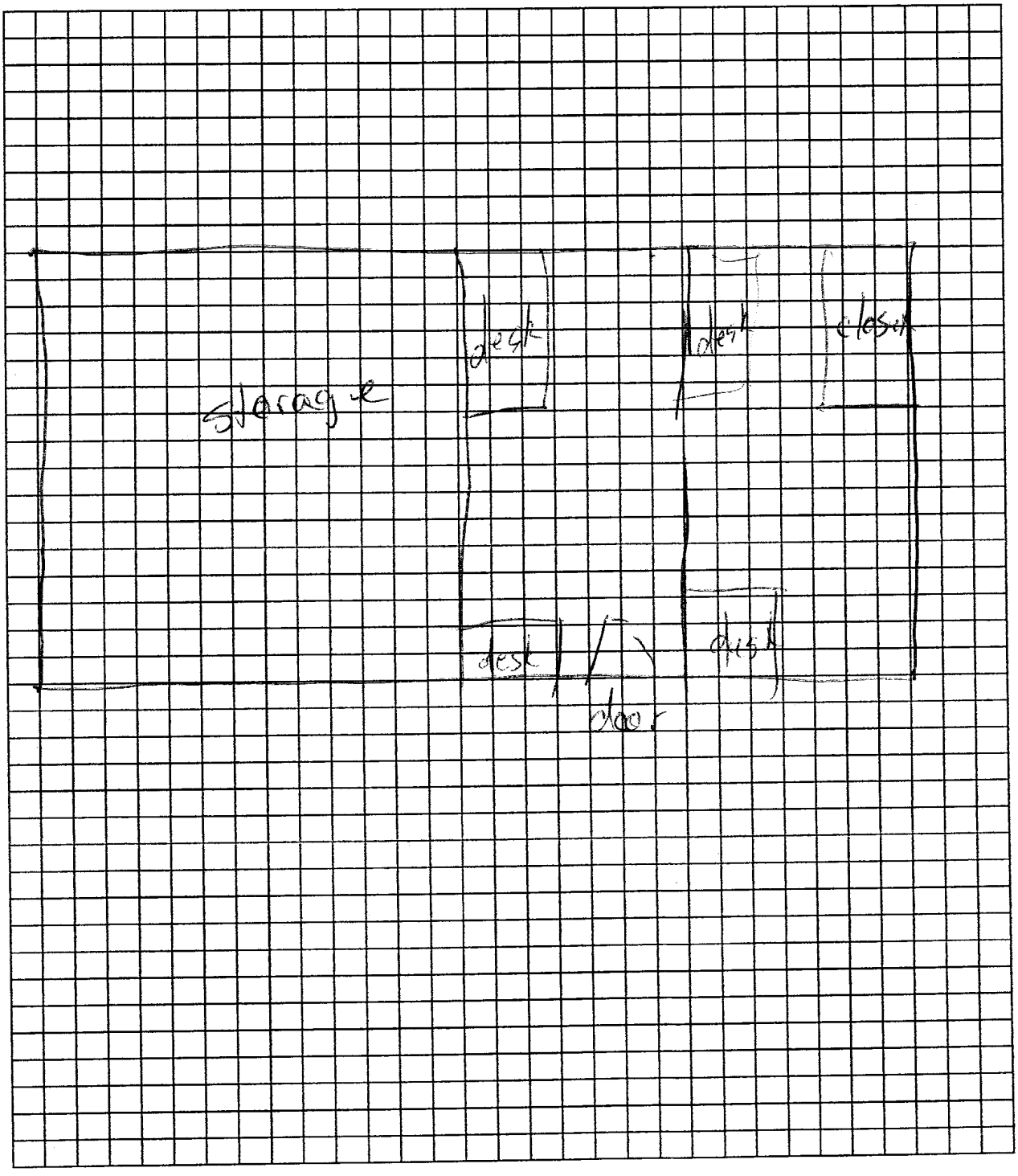
Notes:

Date: 9/11/07
Preparer: R. Riggs

Facility: Admin Support
Description (floor): File / office & storage

CH2MHILL

Floor Plan Information



Preliminary Building Survey for Vapor Intrusion Investigation

CH2MHILL

Date: 9/11/08

Preparer: Kristi Riggs

Facility: Building 37

Address: CT 1 HUMINT CO
2D Intelligence BN

Contact Person: ~~Cy Sgt Link~~ ~~1st Lt~~ 1SGT Moree

Phone Number: ~~451-2690~~ 451-1537

e-mail address:

Building Description

Building or Room Identifier: Break Room (IA01) / Classroom (IA02)

Primary Activity within Building (select one):

- [ ] Manufacturing
- [ ] Storage
- [ ] Other
- [ ] Chemical processing
- [ ] Chemical Storage
- [x] Administrative
- [ ] Instrumentation/Control

Notes: Classified info in building

Approximate floor space 30' x 75'

Number of floors 1

Multi-room building [x] or Single room [ ]

Ceiling height 15'

Aboveground Construction
- [ ] Wood
- [x] Concrete
- [x] Brick
- [ ] Cinderblock
- [ ] Other

Floor plan attached? [x] Yes [ ] No

Notes:

Evaluation of Potential Conduits from Soil

Floor/foundation description (check all that apply)

- [ ] Wood
- [x] Concrete
- [ ] Elevated above grade?
- [ ] Below grade?
- [x] Other 1" foot concrete pad

Expansion joints present (if concrete floor)?	[ ] Yes	[ ] No	[x] N/A
Are expansion joints sealed?	[ ] Yes	[ ] No	[x] N/A
Are sumps or floor drains present?	[ ] Yes	[x] No	[ ] N/A
Are basements or subsurface vaults present?	[ ] Yes	[x] No	[ ] N/A
Are there subsurface drainage problems?	[ ] Yes	[x] No	[ ] N/A

Notes: Carpet on floor

Evaluation of Potential Pathways/Driving Forces

Are there locations with elevated positive or negative pressure (look for doors not opening/closing properly, perceptible airflow, audible fan noise)

None

Is there one air conditioning zone or multiple zones (if in a multi-room building)?

- [ ] Single zone
- [x] Multi-zone
- [ ] Other

(building management may know; another tip-off is the presence of multiple thermostats = multiple zones)

Sources of outdoor air

- [ ] Mechanical (air handling unit)
- [x] Doors
- [x] Windows

Are windows/doors left open routinely? ☐ Yes ☒ No

Notes: Building contains classified info - windows are never opened. Doors never proped open however, a lot of people go in and out.

Evaluation of Potential Existing Chemical Sources Indoors

List principal solvent or VOC-containing products used (obtain MSDSs if available)

~~No~~ General cleaning products in a storage room.

Are any of the target analytes used in this building/room?

☐ Yes ☒ No

Are pesticides used indoors for pest control? ☐ Yes ☒ No

Names of pesticide products used? N/A

Has there been a pesticide application within the past 6 months? ☐ Yes ☒ No

Is smoking permitted in the building? ☐ Yes ☒ No

Description of Vapor Mitigation Systems

Has a radon or vapor mitigation system been installed in this building/room? ☐ Yes ☒ No

Date of installation? N/A

Type of system?

☐ Passive venting ☐ Active subslab depressurization

☐ Crack/crevice sealing ☐ Dilution ventilation control

☐ N/A

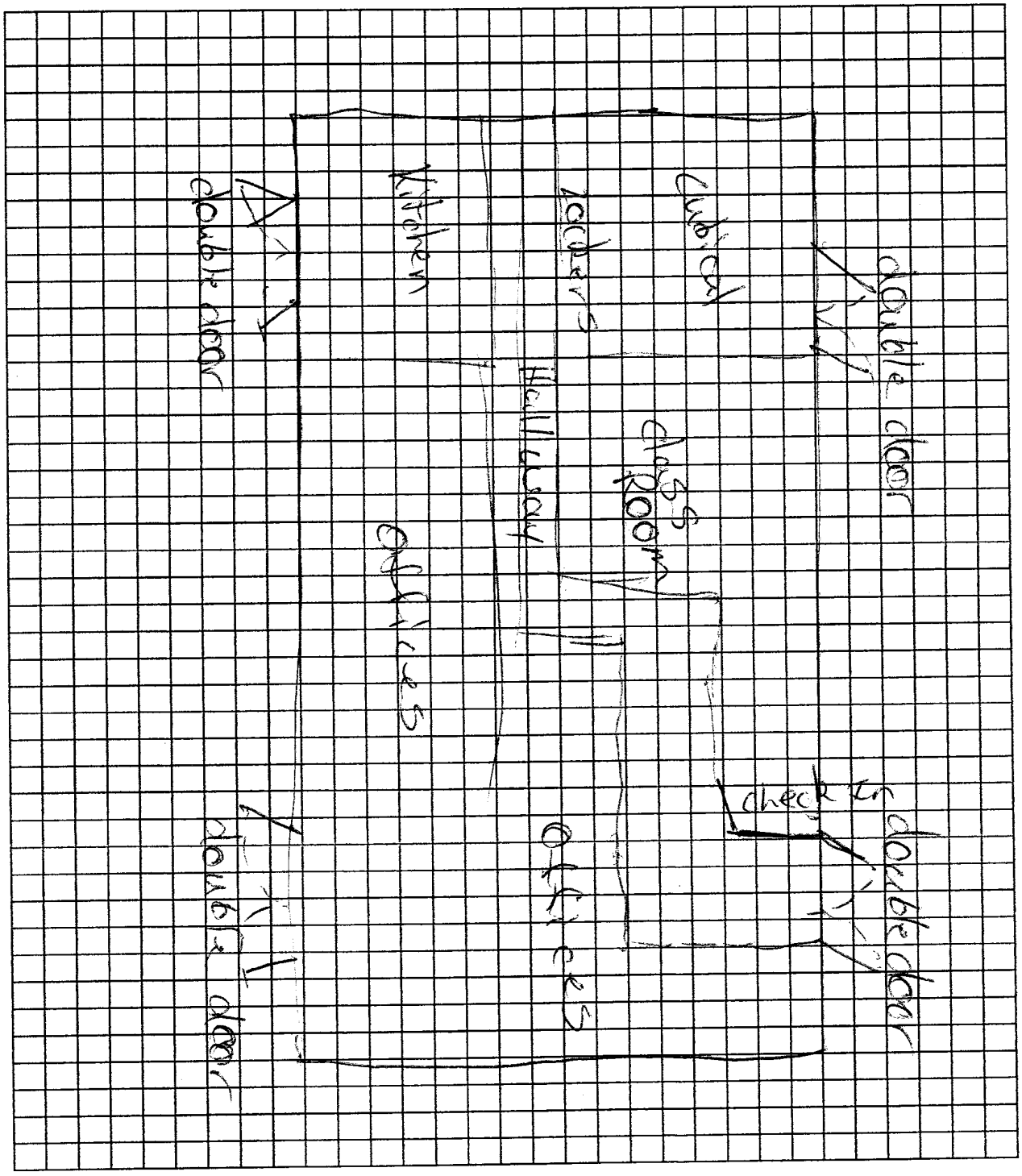
Notes:

Date: 9/11/08
Preparer: K. Riggs

Facility: 2D Intelligence BN
Description (floor): carpet / tile

CH2MHILL

Floor Plan Information



Preliminary Building Survey for Vapor Intrusion Investigation

CH2MHILL

Date: 9/11/08

Preparer: Kristi Riggs

Facility: PMO

Address: Bldg 43

Mainside, MCB Camp Lejeune

Contact Person: Kenny

Phone Number: 451-5702

e-mail address:

Building Description

Building or Room Identifier: Central "command" area

Primary Activity within Building (select one):

- [ ] Manufacturing
- [ ] Storage
- [ ] Other
- [ ] Chemical processing
- [ ] Chemical Storage
- [x] Administrative
- [ ] Instrumentation/Control

Notes: Dispatch for military Police

Approximate floor space 30' x 50'

Number of floors 1

Multi-room building [x] or Single room [ ]

Ceiling height 15'

Aboveground Construction

- [ ] Wood
- [x] Concrete
- [x] Brick
- [ ] Cinderblock
- [ ] Other

Floor plan attached? [x] Yes [ ] No

Notes:

Evaluation of Potential Conduits from Soil

Floor/foundation description (check all that apply)

- [ ] Wood
- [x] Concrete
- [ ] Elevated above grade?
- [ ] Below grade?
- [ ] Other 1 foot concrete pad

Expansion joints present (if concrete floor)?	[ ] Yes	[ ] No	[x] N/A
Are expansion joints sealed?	[ ] Yes	[ ] No	[x] N/A
Are sumps or floor drains present?	[ ] Yes	[ ] No	[x] N/A
Are basements or subsurface vaults present?	[ ] Yes	[ ] No	[x] N/A
Are there subsurface drainage problems?	[ ] Yes	[ ] No	[x] N/A

Notes: ~~Carpet on floor~~ Tile on floor

Evaluation of Potential Pathways/Driving Forces

Are there locations with elevated positive or negative pressure (look for doors not opening/closing properly, perceptible airflow, audible fan noise)

None

Is there one air conditioning zone or multiple zones (if in a multi-room building)?

- [x] Single zone
- [ ] Multi-zone
- [ ] Other _____

(building management may know; another tip-off is the presence of multiple thermostats = multiple zones)

Sources of outdoor air

- [ ] Mechanical (air handling unit)
- [x] Doors
- [x] Windows

Are windows/doors left open routinely? ☐ Yes ☒ No

Notes: Secure building - windows stay closed. Door is opened several times a day

Evaluation of Potential Existing Chemical Sources Indoors

List principal solvent or VOC-containing products used (obtain MSDSs if available)

None

Are any of the target analytes used in this building/room?

☐ Yes ☒ No

Are pesticides used indoors for pest control? ☐ Yes ☒ No

Names of pesticide products used? NA

Has there been a pesticide application within the past 6 months? ☐ Yes ☒ No

Is smoking permitted in the building? ☐ Yes ☒ No

Description of Vapor Mitigation Systems

Has a radon or vapor mitigation system been installed in this building/room? ☐ Yes ☒ No

Date of installation? NA

Type of system?

☐ Passive venting ☐ Active subslab depressurization

☐ Crack/crevice sealing ☐ Dilution ventilation control

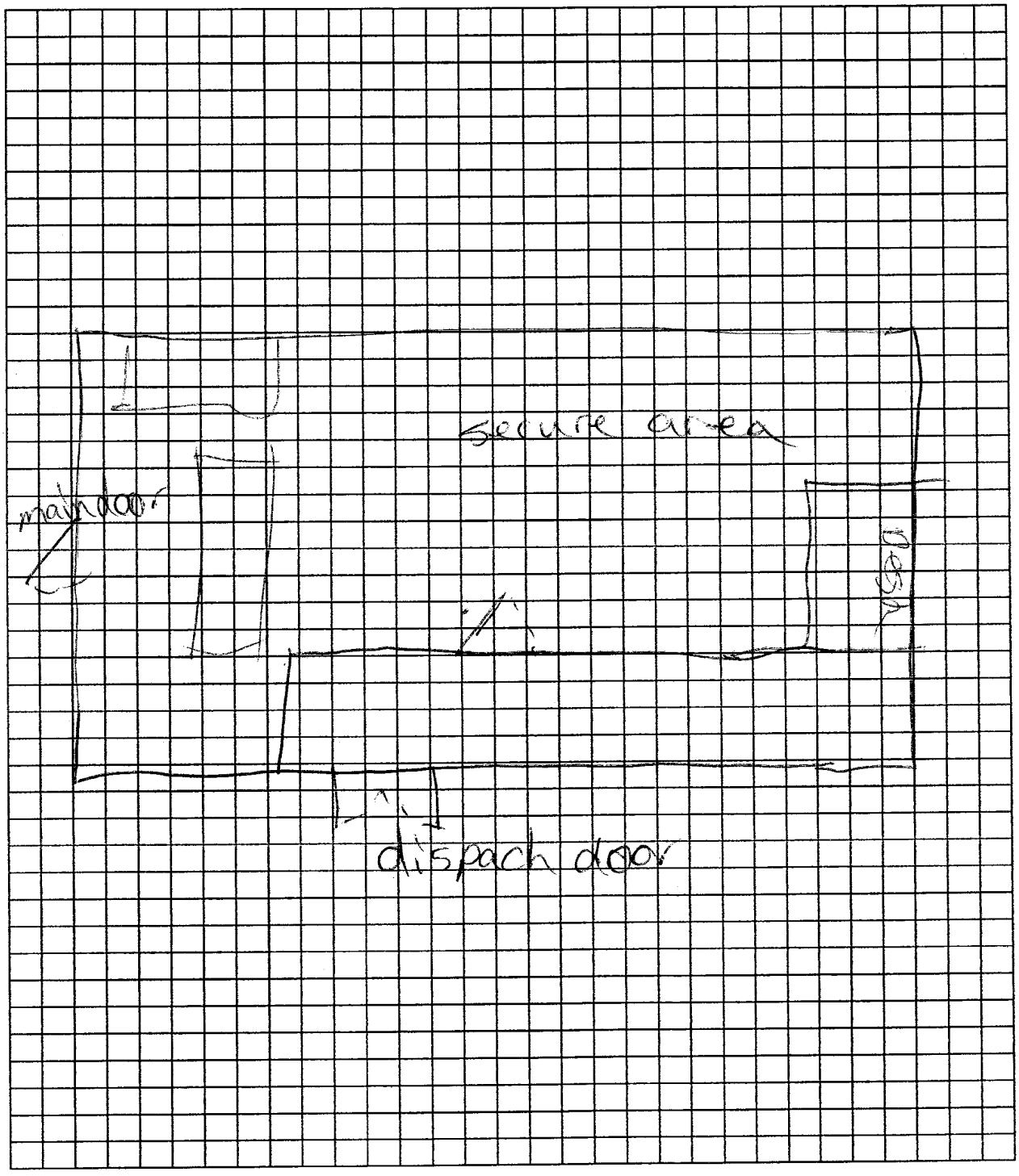
☐ N/A

Notes:

Date: 9/11/07
Preparer: K. Riggs
Facility: PMO Office
Description (floor): 2nd floor

CH2MHILL

Floor Plan Information



Preliminary Building Survey for Vapor Intrusion Investigation

Date: 10/6/08

Preparer: K Stokes

Facility: CL

Address:

CH2MHILL

Contact Person:

Phone Number:

e-mail address:

Building Description

Building or Room Identifier: Bldg 1828

Primary Activity within Building (select one):

- [ ] Manufacturing
- [X] Storage
- [ ] Other
- [ ] Chemical processing
- [ ] Chemical Storage
- [X] Administrative
- [ ] Instrumentation/Control

Notes: Offices Classrooms

Approximate floor space

Number of floors 1

Multi-room building [ ] or Single room [X]

Ceiling height ~30' pitched roof

Aboveground Construction
- [ ] Wood
- [ ] Concrete
- [ ] Brick
- [ ] Cinderblock
- [ ] Other Corrugated metal

Floor plan attached? [X] Yes [ ] No

Notes: Food service building
- connection swagelok part stuck in SG12 - placed blue cap on probe to protect.

Evaluation of Potential Conduits from Soil

Floor/foundation description (check all that apply)

- [ ] Wood
- [x] Concrete
- [ ] Elevated above grade?
- [ ] Below grade?
- [ ] Other _____

Expansion joints present (if concrete floor)?	[x] Yes	[ ] No	[ ] N/A
Are expansion joints sealed?	[x] Yes	[ ] No	[ ] N/A * some have gaps
Are sumps or floor drains present?	[ ] Yes	[x] No	[ ] N/A
Are basements or subsurface vaults present?	[ ] Yes	[x] No	[ ] N/A
Are there subsurface drainage problems?	[ ] Yes	[x] No	[ ] N/A

Notes: _____

Evaluation of Potential Pathways/Driving Forces

Are there locations with elevated positive or negative pressure (look for doors not opening/closing properly, perceptible airflow, audible fan noise)

(2) large fans on side ends of bldgs by rafters

Is there one air conditioning zone or multiple zones (if in a multi-room building)?

- [x] Single zone
- [x] Multi-zone
- [ ] Other _____

(building management may know; another tip-off is the presence of multiple thermostats = multiple zones)

Sources of outdoor air

- [x] Mechanical (air handling unit)
- [x] Doors
- [x] Windows

Are windows/doors left open routinely? [X] Yes [ ] No

Notes:

Evaluation of Potential Existing Chemical Sources Indoors

List principal solvent or VOC-containing products used (obtain MSDSs if available)

(11) gallons Simple Green

Are any of the target analytes used in this building/room?

[ ] Yes [X] No

no gas cylinders

Are pesticides used indoors for pest control? [X] Yes [ ] No

Names of pesticide products used? 1 x / month

Has there been a pesticide application within the past 6 months? [X] Yes [ ] No

Is smoking permitted in the building? [ ] Yes [X] No

Description of Vapor Mitigation Systems

Has a radon or vapor mitigation system been installed in this building/room? [ ] Yes [X] No

Date of installation?

Type of system?

[ ] Passive venting
[ ] Active subslab depressurization
[ ] Crack/crevice sealing
[ ] Dilution ventilation control
[ ] N/A

Notes:

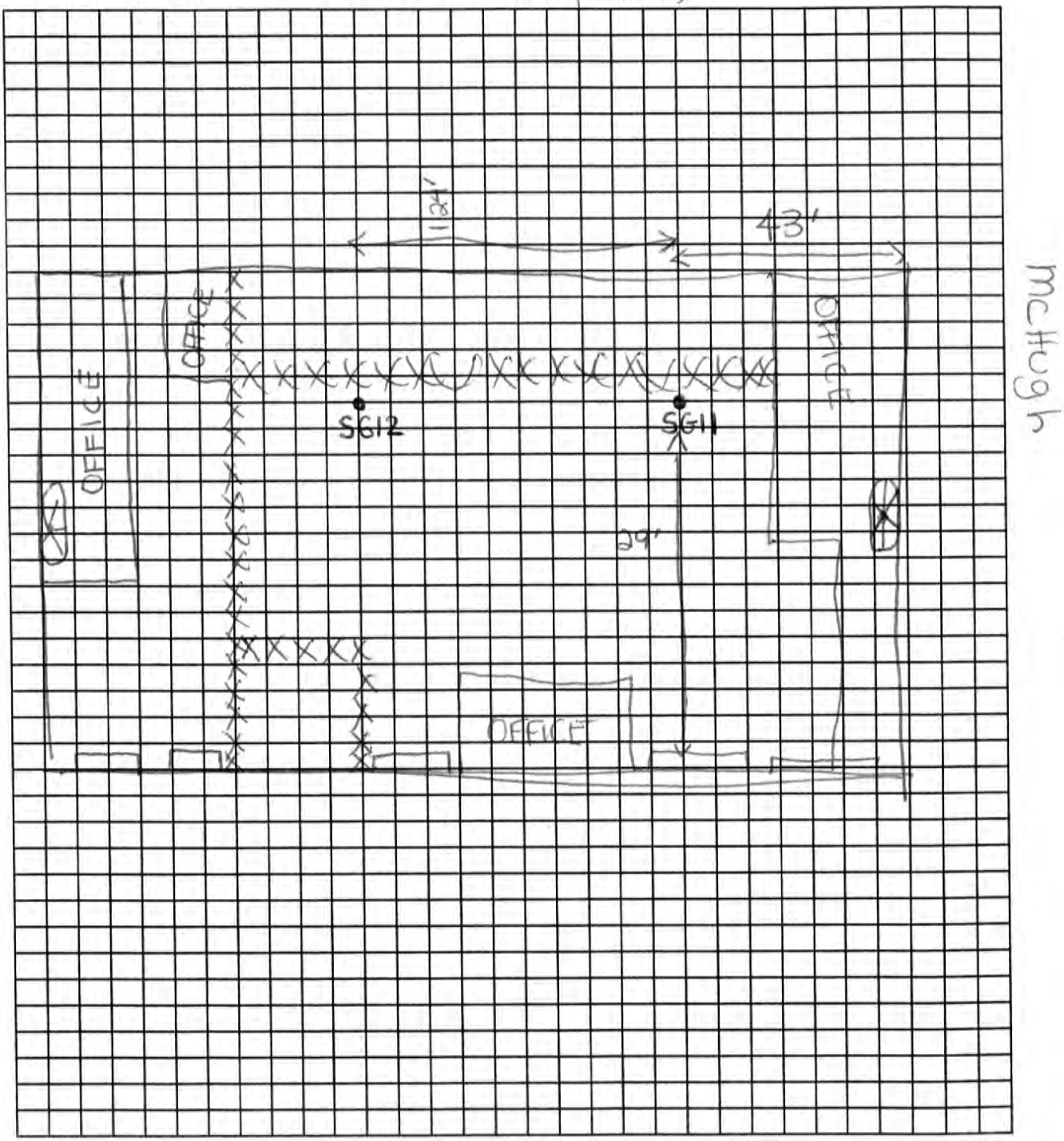
Additional Notes

Date: 10/6/08
Preparer: K Stokes

Facility: Bldg 1828
Description (floor):

CH2MHILL

Floor Plan Information 5 (8' x 10' baydoors)



Duncan

Preliminary Building Survey for Vapor Intrusion Investigation

CH2MHILL

Date: 10/6/08

Preparer: E. Barclay

Facility: Bldg 1855

Address:

Contact Person:

Phone Number:

e-mail address:

Building Description

Building or Room Identifier:

Primary Activity within Building (select one):

- [ ] Manufacturing
- [x] Storage
- [ ] Other
- [ ] Chemical processing
- [ ] Chemical Storage
- [ ] Administrative
- [ ] Instrumentation/Control

Notes:

Approximate floor space

Number of floors 1

Multi-room building [x] or Single room [ ]

Ceiling height 30' flat Corrogated

Aboveground Construction
- [ ] Wood
- [ ] Concrete
- [ ] Brick
- [x] Cinderblock
- [ ] Other

Floor plan attached? [X] Yes [ ] No

Notes:

Evaluation of Potential Conduits from Soil

Floor/foundation description (check all that apply)

- [ ] Wood
- [x] Concrete
- [ ] Elevated above grade?
- [ ] Below grade?
- [ ] Other 1/2 on grade 1/2 elevated 1'

Expansion joints present (if concrete floor)?	[x] Yes	[ ] No	[ ] N/A
Are expansion joints sealed?	[x] Yes	[ ] No	[ ] N/A
Are sumps or floor drains present?	[ ] Yes	[x] No	[ ] N/A
Are basements or subsurface vaults present?	[ ] Yes	[x] No	[ ] N/A
Are there subsurface drainage problems?	[ ] Yes	[ ] No	[ ] N/A

Notes:

Evaluation of Potential Pathways/Driving Forces

Are there locations with elevated positive or negative pressure (look for doors not opening/closing properly, perceptible airflow, audible fan noise)

(2) piped ceiling fans

Is there one air conditioning zone or multiple zones (if in a multi-room building)?

- [ ] Single zone
- [ ] Multi-zone
- [ ] Other no A/C

(building management may know; another tip-off is the presence of multiple thermostats = multiple zones)

Sources of outdoor air

- [ ] Mechanical (air handling unit)
- [x] Doors
- [ ] Windows no windows 1 bay door 2 others

Are windows/doors left open routinely? ☐ Yes ☐ No N/A

Notes: Bay door usually closed, exit doors left open for ventilation

Evaluation of Potential Existing Chemical Sources Indoors

List principal solvent or VOC-containing products used (obtain MSDSs if available)

none

Are any of the target analytes used in this building/room?

☐ Yes ☐ No

Are pesticides used indoors for pest control? ☐ Yes ☒ No

Names of pesticide products used?

Has there been a pesticide application within the past 6 months? ☐ Yes ☒ No

Is smoking permitted in the building? ☐ Yes ☒ No

Description of Vapor Mitigation Systems

Has a radon or vapor mitigation system been installed in this building/room? ☐ Yes ☒ No

Date of installation?

Type of system?

☐ Passive venting ☐ Active subslab depressurization

☐ Crack/crevice sealing ☐ Dilution ventilation control

☐ N/A

Notes:

Additional Notes

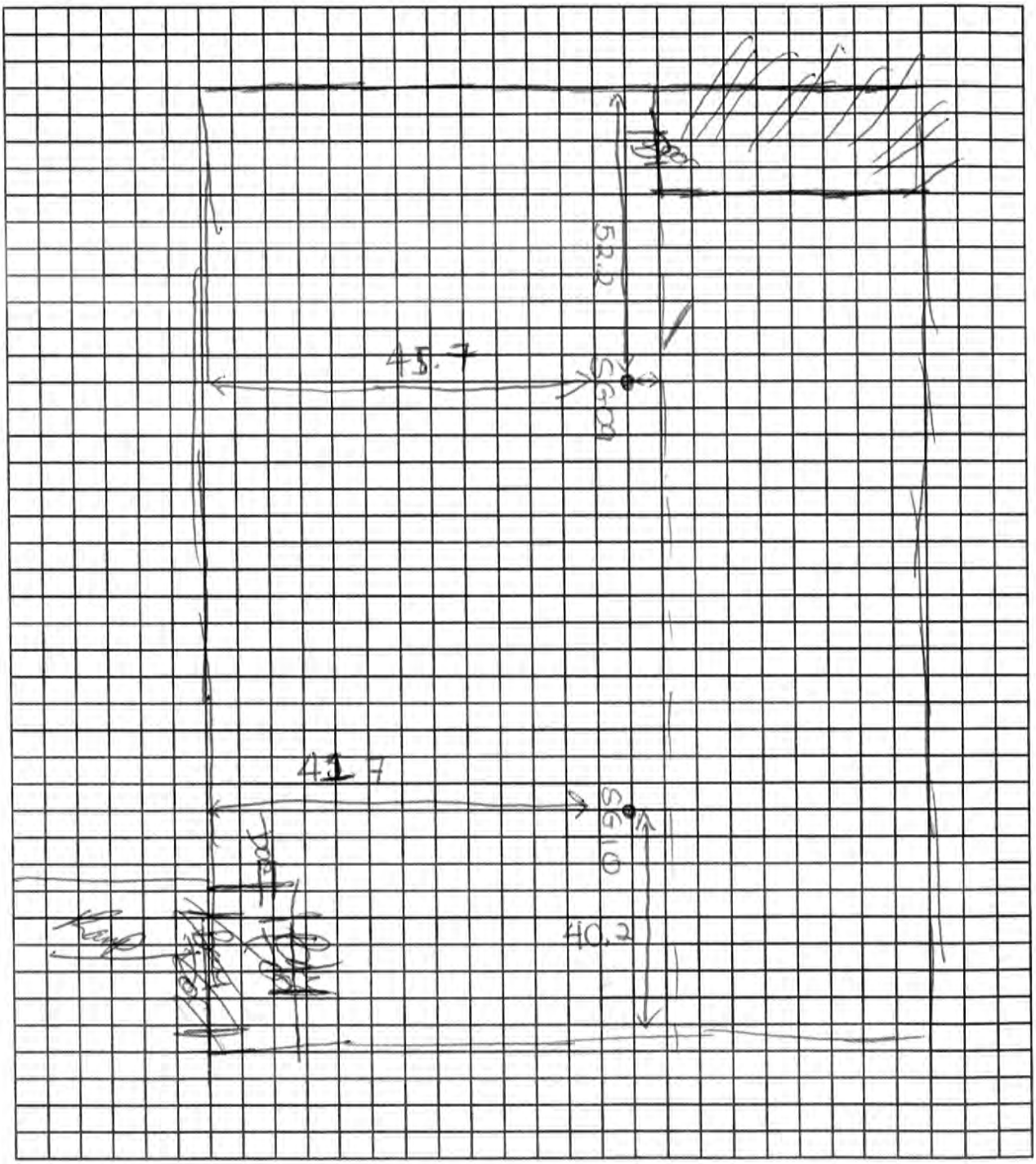
Storage for Cammie Support Systems, Sleeping bags, tents, ready-to-eat meals.

Date: 10/10/08
Preparer: E. Barclay

Facility: 1855
Description (floor):

CH2MHILL

Floor Plan Information



Preliminary Building Survey for Vapor Intrusion Investigation

CH2MHILL

Date: 10/5/2008

Preparer: K. Stokes

Facility: CL - Bldg 3B

Address: McHugh Blvd.

Contact Person:

Phone Number: 451-1666

e-mail address:

Building Description

Building or Room Identifier: Bldg 3B (west side)

Primary Activity within Building (select one):

- [ ] Manufacturing
- [ ] Storage
- [ ] Other
- [ ] Chemical processing
- [ ] Chemical Storage
- [X] Administrative
- [ ] Instrumentation/Control

Notes: Traffic control office with monitors, desks

Approximate floor space

Number of floors 1

Multi-room building [X] or Single room [ ]

Ceiling height 8'

Aboveground Construction

- [ ] Wood
- [ ] Concrete
- [ ] Brick
- [X] Cinderblock
- [ ] Other

Floor plan attached? [X] Yes [ ] No

Notes:

Evaluation of Potential Conduits from Soil

Floor/foundation description (check all that apply)

- [ ] Wood
- [x] Concrete
- [ ] Elevated above grade?
- [ ] Below grade?
- [x] Other Covered in vinyl tile

Expansion joints present (if concrete floor)?	[ ] Yes	[x] No	[ ] N/A
Are expansion joints sealed?	[ ] Yes	[ ] No	[x] N/A
Are sumps or floor drains present?	[x] Yes	[ ] No	[ ] N/A
Are basements or subsurface vaults present?	[ ] Yes	[x] No	[ ] N/A
Are there subsurface drainage problems?	[ ] Yes	[x] No	[ ] N/A

Notes:

Evaluation of Potential Pathways/Driving Forces

Are there locations with elevated positive or negative pressure (look for doors not opening/closing properly, perceptible airflow, audible fan noise)

no

Is there one air conditioning zone or multiple zones (if in a multi-room building)?

- [x] Single zone
- [ ] Multi-zone
- [ ] Other

(building management may know; another tip-off is the presence of multiple thermostats = multiple zones)

Sources of outdoor air

- [ ] Mechanical (air handling unit)
- [x] Doors
- [x] Windows

Are windows/doors left open routinely? ☐ Yes ☒ No

Notes: _____

Evaluation of Potential Existing Chemical Sources Indoors

List principal solvent or VOC-containing products used (obtain MSDSs if available)

Windex _____ _____
Pledge _____ _____
_____ _____

Are any of the target analytes used in this building/room?

☐ Yes ☐ No

_____ _____
_____ _____

Are pesticides used indoors for pest control? ☐ Yes ☒ No

Names of pesticide products used? _____

Has there been a pesticide application within the past 6 months? ☐ Yes ☒ No

Is smoking permitted in the building? ☐ Yes ☒ No

Description of Vapor Mitigation Systems

Has a radon or vapor mitigation system been installed in this building/room? ☐ Yes ☒ No

Date of installation? _____

Type of system?
- ☐ Passive venting
- ☐ Active subslab depressurization
- ☐ Crack/crevice sealing
- ☐ Dilution ventilation control
- ☐ N/A

Notes: _____

Additional Notes

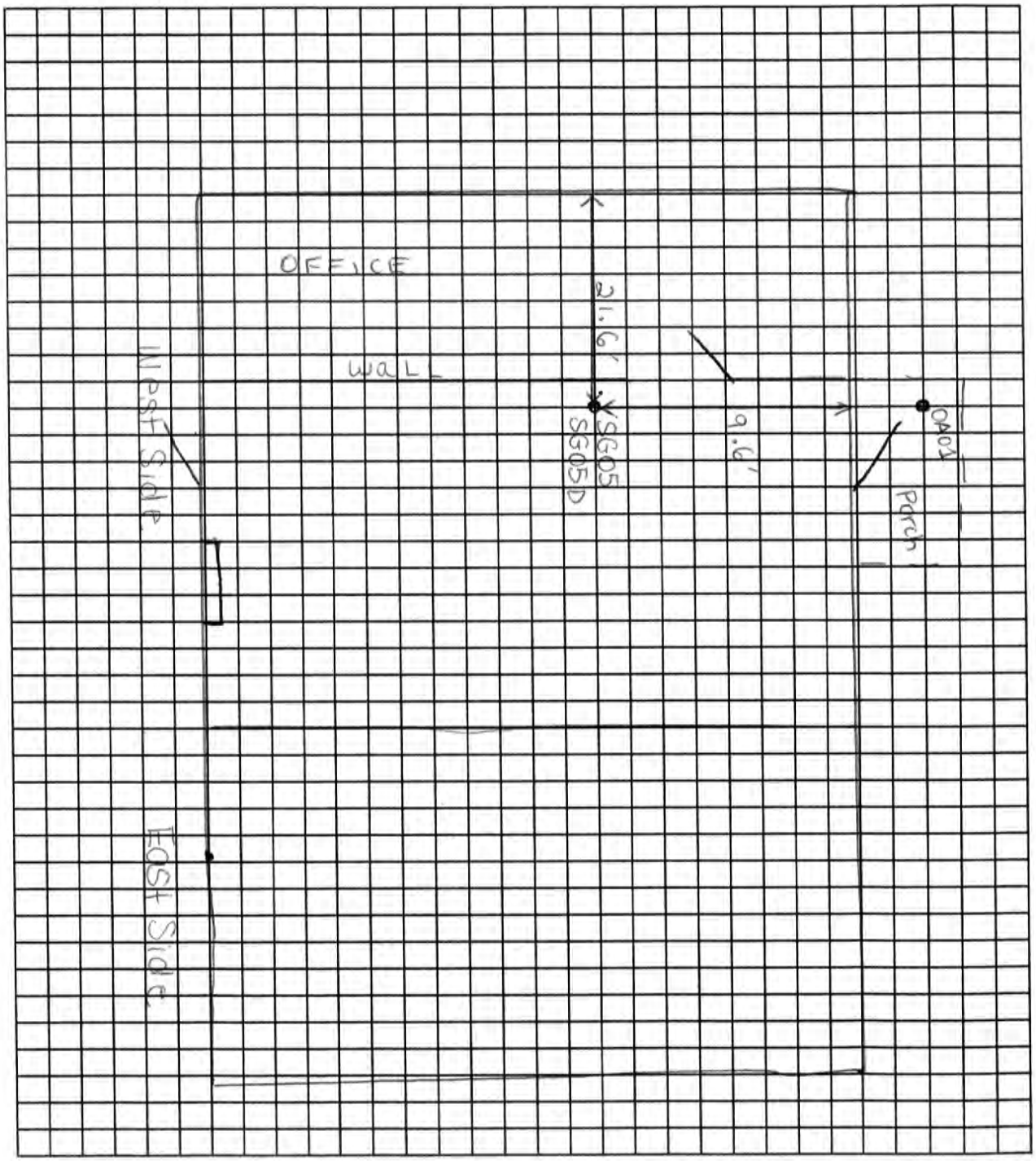
Set up 1R88 - 1A07 & 1R88 - 1A07D
in west side building office; however
analysis was cancelled and samples
re-set up at east side of bldg.
in Storage closet on 10/7/08.

Date: 10/5/08
Preparer: K Stokes

Facility: Bldg 3B Mainside
Description (floor):

CH2MHILL

Floor Plan Information



→Z

Appendix V2-D
Chain of Custody Records

TestAmerica Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
Phone 865 291-3000 (Main)
Phone 865-291-3031 (Receiving)

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Contact	Project Manager: Bob Brown	Site Contact: Kristi Riggs	COC Record 1 of 4
Company Name AGVIQ	Tel/Mobile: 757-544-3006	Lab Contact:	Carrier: FedEx	COC No: 00196
Address 4610 Westgrove Ct.	Analysis Turnaround Time	Analysis (Attach list if more space is needed)	Lab Use Only:
City/State/Zip VA Beach VA 23455	Calendar (C) or Work Days (W) _____		Custody Seals Intact? Y N NA
Phone 757-544-7392	TAT if different from Below _____		Number of Packages: _____
Project Name/Number: TO 21	☐ 2 weeks		Temperature: _____ deg C
Site: Camp Lejeune NC	☐ 1 week		Shipper: __ FedEx __UPS __ Other:
PO #	☐ 2 days		Tracking Number:
Sampled by: K Riggs, P Brown	☐ 1 day		Recorded by: _____ Date: _____

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Field Filtered Sample	VOC 8260B	Sample Specific Notes:
IR88-IS04-GW-11-12-08B	6/16/08	1620	GW	GW	3		X	
IR88-IS03-GW-12-13-08B	6/16/08	1710	GW	GW	3		X	
IR88-TB061608	6/16/08	1630	TB	TB	3		X	
IR88-IS05-GW-11-12-08B	6/17/08	0900	GW	GW	3		X	
IR88-IS06-GW-9-10-08B	6/17/08	0955	GW	GW	3		X	
IR88-IS07-GW-10-11-08B	6/17/08	1050	GW	GW	3		X	
IR88-EB061608 ~~0830~~	6/16/08	1820	GW	RB	3		X	
IR88-EB061708	6/17/08	1450	GW	RB	3		X	

Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= $Na_2S_2O_3$ Other _____

Possible Hazard Identification
☑ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☑ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	AGVIQ	6/19/08		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:

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KEEP YELLOW COPY FOR YOUR RECORDS

TAL-0046-140 (0208)

TestAmerica Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
Phone 865 291-3000 (Main)
Phone 865-291-3031 (Receiving)

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Contact	Project Manager: Bob Brown	Site Contact: Kristi Riggs	COC Record 2 of 4
Company Name CH2M Hill AGVIC	Tel/Mobile: 757-544-3006	Lab Contact: / Carrier:	COC No: 00203
Address 4610 Westgrove Ct	Analysis Turnaround Time	Analysis (Attach list if more space is needed)	Lab Use Only:
City/State/Zip VA Beach VA 23455	Calendar (C) or Work Days (W) _____		Custody Seals Intact? Y N NA
Phone 757-317-9420	TAT if different from Below _____		Number of Packages: _____
Project Name/Number: TO 21 Vapor Intrusion	☐ 2 weeks		Temperature: _____ deg C
Site: Site 89 / SWMU 360	☐ 1 week		Shipper: _FedEx _UPS _Other:
P O #	☐ 2 days		Tracking Number:
Sampled by: BS / JS	☐ 1 day		Recorded by: _____ Date: _____

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Field Filtered Sample	8260	Sample Specific Notes:
IR88-ISO2-GW-15-17-08B	6/17/08	910	G	GW	3		X	
IR87-ISO1-GW-13-15-08B		1000					X	
SWMU360-ISO1-GW-23-25-08B		1405					X	
SWMU360-ISO1D-GW-23-25-08B		1405					X	
SWMU 360-ISO3-GW-19-21-08B		1600					X	
SWMU 360-ISO2-GW-23-25-08B		1705					X	
SWMU 360-ISO7-GW-23-25-08B	6/18/08	1115					X	
IR78-FB061908	6/19/08	1445					X	

Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= $Na_2S_2O_3$ Other _____

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☒ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	ACUIQ	6/19/08		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:

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Knoxville, TN 37921
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Phone 865-291-3031 (Receiving)

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Contact	Project Manager: Bob Brown	Site Contact: Kristi Riggs	COC Record 4 of 4
Company Name CH2M HILL / ACVIQ	Tel/Mobile: 757-544-3006	Lab Contact: / Carrier:	COC No: 00206
Address 4610 Westgrove Ct.	Analysis Turnaround Time	Analysis (Attach list if more space is needed)	Lab Use Only:
City/State/Zip VA Beach VA 23455	Calendar (C) or Work Days (W) _____		Custody Seals Intact? Y N NA
Phone 757-318-9420	TAT if different from Below _____		Number of Packages: _____
Project Name/Number: TB 11, 50, 1 Vapor Intrusion	☐ 2 weeks		Temperature: _____ deg C
Site: SWMU 360, Lejeune	☐ 1 week		Shipper: __FedEx __UPS __Other:
PO#	☐ 2 days		Tracking Number:
Sampled by: BB, JS	☐ 1 day		Recorded by: _____ Date: _____

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Field Filtered Sample	8260B	Sample Specific Notes:
SWMU360-IS10-GW-23-25-0813	6/19/08	905	G	GW	3		X	
SWMU360-IS10D-GW-23-25-0813		905					X	
SWMU360-IS11-GW-23-25-0813		1120					X	
SWMU360-IS06-GW-20-22-0813		1425					X	
SWMU360-IS08MS-GW-20-22-0813		1425					X	
SWMU360-IS08MSD-GW-20-22-0813		1425					X	MS/MSD

Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= $Na_2S_2O_3$ Other _____

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	ACVIQ	6/19/08		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:

TAL-0046-140 (0208)

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5815 Middlebrook Pike
Knoxville, TN 37921
phone 865-291-3000 fax 865-584-4315

JVII T021

Canister Samples Chain of Custody Record

TestAmerica assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Contact Information
Company: CH2MHILL/ADVIQ
Address: 1700 Arch St. Suite 4400
City/State/Zip Phila., PA 19103
Phone: 215-640-9072
FAX: 215-640-9271
Project Name: MCB Camp Lejeune
Site/location: Camp Lejeune, NC
PO #

Project Manager: Keri Hallberg
Phone: 404-975-9300
Site Contact: Robert Lauder
TAL Contact: LINDA

Sampled By: KStokes/JShim

1 of 1 COCs

Analysis Turnaround Time
Standard (Specify)
Rush (Specify)

Sample Identification	Sample Date(s)	Time Start	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, "Hg (Stop)	Flow Controller ID	Canister ID	TO-15	TO-14A	EPA 3C	EPA 25C	ASTM D-1946	Other (Please specify in notes section)	Sample Type	Indoor Air	Ambient Air	Soil Gas	Landfill Gas	Other (Please specify in notes section)
IR820-0A03-08B	6/23-6/24/08	1526	1523	-32	-5	K115	7486	X								X			
IR820-SE03-08B	6/24/08	1442	1449	-32	-3	61	B4388	X									X		

Sampled by :
CH2MHILL/ADVIQ

Temperature (Fahrenheit)	Interior	Ambient
Start		
Stop		

Pressure (inches of Hg)	Interior	Ambient
Start		
Stop		

Special Instructions/QC Requirements & Comments:
*Shipped back w/ (4) 6L unused canisters

Canisters Shipped by: Kim Stokes	Date/Time: 6/26/08 1200	Canisters Received by:
Samples Relinquished by: [signature]	Date/Time: 6/25/08 1700	Received by:
Relinquished by:	Date/Time:	Received by:

TAL Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
phone 865-291-3000 fax 865-584-4315

JVII T021

Canister Samples Chain of Custody Record

TestAmerica assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Contact Information
Company: CH2MHILL/ADVIQ
Address: 1700 Arch St. Suite 4400
City/State/Zip: Phila., PA 19103
Phone: 215-640-9072
FAX: 215-640-9271
Project Name: MCB Camp Lejeune
Site/location: Camp Lejeune, NC
PO #

Project Manager: Keri Hallberg
Phone: 704-975-9381
Site Contact: Robert Lowder
TAL Contact: LINDA

Analysis Turnaround Time
Standard (Specify)
Rush (Specify)

Sampled By: KStokes/

3 of 3 COCs

Sample Identification	Sample Date(s)	Time Start	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, "Hg (Stop)	Flow Controller ID	Canister ID	TO-15	TO-14A	EPA 3C	EPA 25C	ASTM D-1946	Other (Please specify in notes section)	Sample Type	Indoor Air	Ambient Air	Soil Gas	Landfill Gas	Other (Please specify in notes section)
UST1613-SG01-08B	6/24/08	1107	1112	-31	-3	63	L-5200	X									X		
IR35-SG05-08B	6/24/08	1000	1006	-30	-3	70	L-5190	X									X		
IR820-SG04-08B	6/24/08	1505	1510	-30	-3	15	B3838	X									X		
IR820-IA04-08B	6/23/08 6/24/08	1511	1509	-30	-6	K101	7481	X							X				

Sampled by :
CH2MHILL/AGVIQ

Temperature (Fahrenheit)	Interior	Ambient	
Start			
Stop			

Pressure (inches of Hg)	Interior	Ambient	
Start			
Stop			

Special Instructions/QC Requirements & Comments:

Canisters Shipped by: Kim Stokes	Date/Time: 6/25/08 1200	Canisters Received by:
Samples Relinquished by: Kimberly L Stokes	Date/Time: 6/24/08 1700	Received by:
Relinquished by:	Date/Time:	Received by:

TAL Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
phone 865-291-3000 fax 865-584-4315

JVII T021

Canister Samples Chain of Custody Record

TestAmerica assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Contact Information	Project Manager: Keri Hallberg	Sampled By: KStokes/J Shim	1 of 1 COCs
Company: CH2MHILL/ADVIQ	Phone: 704-975-9381		
Address: 1700 Arch St. Suite 4400	Site Contact: Robert Lowder		
City/State/Zip Phila., PA 19103	TAL Contact: LINDA		
Phone: 215-640-9072			
FAX: 215-640-9271			
Project Name: MCB Camp Lejeune	Analysis Turnaround Time		
Site/location: Camp Lejeune, NC	Standard (Specify)		
PO #	Rush (Specify)		

Sample Identification	Sample Date(s)	Time Start	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, "Hg (Stop)	Flow Controller ID	Canister ID	TO-15	TO-14A	EPA 3C	EPA 25C	ASTM D-1946	Other (Please specify in notes section)	Sample Type	Indoor Air	Ambient Air	Soil Gas	Landfill Gas	Other (Please specify in notes section)
1R89-IA04-08B	6/23-6/24/08	0843	0904	-32	-7	K157	12468	X							X				
1R89-IA03-08B	6/23-6/24/08	0853	0906	-31	-4	K444	12521	X							X				
LCH4015-OA01-08B	6/23-6/24/08	1326	1310	-35	-10	K384	1574	X								X			
1R35-IA05-08B	6/23/08-6/24/08	1004	0956	-31	-7	K265	6690	X							X				
1R89-OA02-08B	6/23-6/24/08	0902	0907	-32	-22	K172	12460	X								X			
1R820-IA03-08B	6/23-6/24/08	1458	1439	-30	-7	K460	6628	X							X				

Sampled by : CH2M HILL / AGVIQ

Temperature (Fahrenheit)	Interior	Ambient	
Start			
Stop			

Pressure (inches of Hg)	Interior	Ambient	
Start			
Stop			

Special Instructions/QC Requirements & Comments:
Sample 1R89-OA02-08B may have gotten water-logged w/ heavy rains - flow controller read -22 after 24 hour elapse time.

Canisters Shipped by: Kim Stokes	Date/Time: 6/25/08 12 00	Canisters Received by:
Samples Relinquished by: Kim Stokes	Date/Time: 6/24/08 17 00	Received by:
Relinquished by:	Date/Time:	Received by:

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Knoxville, TN 37921
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Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Contact	Project Manager: Bob Brown	Site Contact: Kristi Riggs	COC Record 1 of 4
Company Name AGVIQ	Tel/Mobile: 757-544-3006	Lab Contact:	Carrier: FedEx	COC No: 00196
Address 4610 Westgrove Ct.	Analysis Turnaround Time	Analysis (Attach list if more space is needed)	Lab Use Only:
City/State/Zip VA Beach VA 23455	Calendar (C) or Work Days (W) _____		Custody Seals Intact? Y N NA
Phone 757-544-7392	TAT if different from Below _____		Number of Packages: _____
Project Name/Number: TO 21	☐ 2 weeks		Temperature: _____ deg C
Site: Camp Lejeune NC	☐ 1 week		Shipper: __FedEx __UPS __Other:
P O #	☐ 2 days		Tracking Number:
Sampled by: R. Riggs, P. Brown	☐ 1 day		Recorded by: _____ Date: _____

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Field Filtered Sample	VOC 8260B										Sample Specific Notes:
IR88-IS04-GW-11-12-08B	6/16/08	1620	GW	GW	3		X										
IR88-IS03-GW-12-13-08B	6/16/08	1710	GW	GW	3		X										
IR88-TB061608	6/16/08	1630	TB	TB	3		X										
IR88-IS05-GW-11-12-08B	6/17/08	0900	GW	GW	3		X										
IR88-IS06-GW-9-10-08B	6/17/08	0955	GW	GW	3		X										
IR88-IS07-GW-10-11-08B	6/17/08	1050	GW	GW	3		X										
IR88-EB061608 ~~08B~~	6/16/08	1820	GW	RB	3		X										
IR88-EB061708	6/17/08	1650	GW	RB	3		X										

Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= $Na_2S_2O_3$ Other _____

Possible Hazard Identification
☒ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☒ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	AGVIQ	6/19/08		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:

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TestAmerica Knoxville
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Knoxville, TN 37921
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Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Contact	Project Manager: Bob Brown	Site Contact: Kristi Riggs	COC Record 2 of 4
Company Name CH2M Hill AGVIQ	Tel/Mobile: 757-544-3006	Lab Contact: / Carrier:	COC No: 00203
Address 4610 Westgrove Ct	Analysis Turnaround Time		Lab Use Only:
City/State/Zip VA Beach VA 23455	Calendar (C) or Work Days (W) _____		Custody Seals Intact? Y N NA
Phone 757-318-9420	TAT if different from Below _____		Number of Packages: _____
Project Name/Number: TO 21, Vapor Intrusion	☐ 2 weeks		Temperature: _____ deg C
Site: Site 88 / SWMU 360	☐ 1 week		Shipper: __FedEx __UPS __Other:
PO#	☐ 2 days		Tracking Number:
Sampled by: BS / JS	☐ 1 day		Recorded by: _____ Date: _____

Analysis (Attach list if more space is needed): 8260

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Field Filtered Sample	8260	Sample Specific Notes:
IR88-IS02-GW-15-17-08B	6/17/08	910	G	GW	3		X	
IR88-IS01-GW-13-15-08B		1000					X	
SWMU360-IS01-GW-23-25-08B		1405					X	
SWMU360-IS01D-GW-23-25-08B		1405					X	
SWMU360-IS03-GW-19-21-08B		1600					X	
SWMU360-IS02-GW-23-25-08B		1725					X	
SWMU360-IS09-GW-23-25-08B	6/18/08	1415					X	
IR78-FB061908	6/19/08	1445					X	

Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= $Na_2S_2O_3$ Other _____

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☒ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	AGVIQ	6/19/08		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:

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Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Contact	Project Manager: Bob Brown	Site Contact: Kristi Riggs	COC Record 4 of 4
Company Name CH2MHill / AGVIQ	Tel/Mobile: 757-544-3006	Lab Contact:	Carrier:	COC No: 00206
Address 4610 Westgrove Ct.	Analysis Turnaround Time		Lab Use Only:
City/State/Zip VA Beach VA 23455	Calendar (C) or Work Days (W) _____		Custody Seals Intact? Y N NA
Phone 757-318-9420	TAT if different from Below _____		Number of Packages: _____
Project Name/Number: TO 21, Soil Vapor Intrusion	☐ 2 weeks		Temperature: _____ deg C
Site: SWMU 360, Lejeune	☐ 1 week		Shipper: __FedEx __UPS __Other:
PO #	☐ 2 days		Tracking Number:
Sampled by: BS, JS	☐ 1 day		Recorded by: _____ Date: _____

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Field Filtered Sample	Analysis (Attach list if more space is needed): 8260B	Sample Specific Notes:
SWMU360-IS10-GW-23-25-08B	6/19/08	905	G	GW	3		X	
SWMU360-IS10D-GW-23-25-08B		905					X	
SWMU360-IS11-GW-23-25-08B		1120					X	
SWMU360-IS08-GW-20-22-08B		1425					X	
SWMU360-IS08MS-GW-20-22-08B		1425					X	
SWMU360-IS08MSD-GW-20-22-08B		1425					X	MS/MSD

Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= $Na_2S_2O_3$ Other _____

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	AGVIQ	6/19/08		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:

RETURN WHITE COPY TO LAB WITH SAMPLES
KEEP YELLOW COPY FOR YOUR RECORDS

TAL-0046-140 (0208)

TAL Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
phone 865-291-3000 fax 865-584-4315

JVII T021

Canister Samples Chain of Custody Record

TestAmerica assumes no liability with respect to the collection and shipment of these samples

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Contact Information
Company: CH2MHILL/ADVIQ
Address: 1700 Arch St. Suite 4400
City/State/Zip: Phila., PA 19103
Phone: 215-640-9072
FAX: 215-640-9271
Project Name: MCB Camp Lejeune
Site/location: Camp Lejeune, NC
PO #

Project Manager: Keri Hallberg
Phone: 704-975-9381
Site Contact: Robert Lowder
TAL Contact: LINDA

Analysis Turnaround Time
Standard (Specify)
Rush (Specify)

Sampled By: KStokes/J Shim

1 of 1 COCs

Sample Identification	Sample Date(s)	Time Start	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, "Hg (Stop)	Flow Controller ID	Canister ID	TO-15	TO-14A	EPA 3C	EPA 25C	ASTM D-1946	Other (Please specify in notes section)	Sample Type	Indoor Air	Ambient Air	Soil Gas	Landfill Gas	Other (Please specify in notes section)
IR89-IA01-08B	6/20-6/21/08	17:07	1613	-29	-9	K459	93186	X							X				
IR89-IA02-08B	6/20/08 6/21/08	17:08	1525	-30	-8	K113B	92387	X							X				
HPFF-IA07D-08B	6/20-6/22/08	08 47	0830	-32	-8	K441	0163	X							X				
HPFF-IA07-08B	6/20-6/22/08	0847	0830	-28	-9	K298	93268	X							X				
SWMU118-CSA05-08B	6/20-6/22/08	1039	0957	-32	-6	K251	10267	X											X
SWMU118-CSA06-08B	6/21/08 6/22/08	1043	0954	-32	-8	K279	04174	X											X

Sampled by: CH2m HILL/ADVIQ

Temperature (Fahrenheit)

	Interior	Ambient	
Start			
Stop			

Pressure (inches of Hg)

	Interior	Ambient	
Start			
Stop			

Special Instructions/QC Requirements & Comments:
SWMU118-CSA05-08B and SWMU118-CSA06-08B were collected in the crawl space of an elevated building that was open to outdoor air; these samples were labelled CSA for CRAWL SPACE AIR.

Canisters Shipped by: Kim Stokes	Date/Time: 6/23/08 1800	Canisters Received by:
Samples Relinquished by: Kim Stokes	Date/Time: 6/22/08 1100	Received by:
Relinquished by:	Date/Time:	Received by:

TAL Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
phone 865-291-3000 fax 865-584-4315

JVII TO-21

Canister Samples Chain of Custody Record

TestAmerica assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Contact Information
Company: CH2M Hill
Address: 4824 Parkway Plaza Blvd
City/State/Zip Charlotte NC 28217
Phone: 704-320-5712
FAX:
Project Name: JVII-TO21
Site/location: MCB Camp Lejeune
PO #

Project Manager: Keri Hallberg
Phone:
Site Contact:
TAL Contact:

Analysis Turnaround Time
Standard (Specify)
Rush (Specify)

Sampled By: Brooke Sprouse, Patrick Brown

___ of ___ COCs

Sample Identification	Sample Date(s)	Time Start	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, "Hg (Stop)	Flow Controller ID	Canister ID	TO-15	TO-14A	EPA 3C	EPA 25C	ASTM D-1946	Other (Please specify in notes section)	Sample Type	Indoor Air	Ambient Air	Soil Gas	Landfill Gas	Other (Please specify in notes section)
IR86-IS01-SV-8-9-08B	6/22/08	~~1547~~ 1545	1551	-30	-1	123	L-5166	X									X		
IR86-IS02-SV-6-7-08B	1	1233	1238	-30	-3	19	L-3841	X									X		
IR89-SG03-08B	6/23/08	0845	0851	-30	-3	42	5088D	X									X		
LCH4015-IA02-08B	~~6/22/08~~ 6/23/08	1457	1341	-32	-7	K297	6384	X							X				
LCH4015-OA01-08B	~~6/22/08~~ 6/23/08	1506	1345	-30	-7	K270	12187	X								X			
IR89-SG04-08B	6/23/08	0830	0836	-30	-2	44	1877D	X									X		

Sampled by :
Brooke Sprouse
Patrick Brown

Temperature (Fahrenheit)	Interior	Ambient	
Start			
Stop			

Pressure (inches of Hg)	Interior	Ambient	
Start			
Stop			

Special Instructions/QC Requirements & Comments:

Canisters Shipped by: Kim Stokes	Date/Time: 6/24/08 1730	Canisters Received by:
Samples Relinquished by: Kimberly Stokes	Date/Time: 6/23/08 1700	Received by:
Relinquished by:	Date/Time:	Received by:

TAL Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
phone 865-291-3000 fax 865-584-4315

JVII T021

Canister Samples Chain of Custody Record

TestAmerica assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Contact Information	Project Manager: Keri Hallberg	Sampled By: KStokes/JShim	2 of 2 COCs
Company: CH2MHILL/ADVIQ	Phone: 704-975-9381		
Address: 1700 Arch St. Suite 4400	Site Contact: Robert Lowder		
City/State/Zip Phila., PA 19103	TAL Contact: LINDA		
Phone: 215-640-9072			
FAX: 215-640-9271			
Project Name: MCB Camp Lejeune	Analysis Turnaround Time		
Site/location: Camp Lejeune, NC	Standard (Specify)		
PO #	Rush (Specify)		

Sample Identification	Sample Date(s)	Time Start	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, "Hg (Stop)	Flow Controller ID	Canister ID	TO-15	TO-14A	EPA 3C	EPA 25C	ASTM D-1946	Other (Please specify in notes section)	Sample Type	Indoor Air	Ambient Air	Soil Gas	Landfill Gas	Other (Please specify in notes section)
LCH4015-SG02-08B	6/22/08	1455	1500	-30	-3	73	L-5119	X									X		
1R35-SG06-08B	6/24/08	0930	0935	-30	-4	99	L-5136	X									X		
1R35-1A06-08B	6/23/08 6/24/08	0945	0918	-30	-6	K437	2149	X							X				
LCH4015-IA02-08B	6/23-6/24/08	1457	1341	-32	-7	K297	63841	X							X				

Sampled by : CH2MHILL / ADVIQ

Temperature (Fahrenheit)	Interior	Ambient	
Start			
Stop			

Pressure (inches of Hg)	Interior	Ambient	
Start			
Stop			

Special Instructions/QC Requirements & Comments:

Canisters Shipped by: Kim Stokes	Date/Time: 6/24/08 1730	Canisters Received by:
Samples Relinquished by: [signature]	Date/Time: 6/24/08 1400	Received by:
Relinquished by:	Date/Time:	Received by:

JV II - TO-21

TAL Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
phone 865-291-3000 fax 865-584-4315

Canister Samples Chain of Custody Record

TestAmerica assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Contact Information
Company: CHam HILL
Address: 1700 Arch St Suite 4400
City/State/Zip Phila, PA 19090
Phone: 215-640-9071
FAX: 215-640-9271
Project Name: Camp Lejeune TO-21
Site/location: Camp Lejeune, NC
PO # 364167

Project Manager: Keri Hallberg
Phone: 704-975-9381
Site Contact: Bob Lowder
TAL Contact: Linda McWhirter

Analysis Turnaround Time
Standard (Specify)
Rush (Specify)

Sampled By: K Stokes/K Riggs

1 of 3 COCs

Sample Identification	Sample Date(s)	Time Start	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, 'Hg (Stop)	Flow Controller ID	Canister ID	TO-15	TO-14A	EPA 3C	EPA 25C	ASTM D-1946	Other (Please specify in notes section)	Sample Type	Indoor Air	Ambient Air	Soil Gas	Landfill Gas	Other (Please specify in notes section)
IR86-SG03-08C	10/6/08	1402	1407	-30	-4	19	L-5178	X									X		
IR88-SG09-08C	10/6/08	0927	0932	-30	-3	22	L-5140	X									X		
IR88-SG08-08C	10/6/08	1051	1056	-29	-4	112	SL-1216	X									X		
IR88-SG07-08C	10/6/08	1132	1136	-30	-4	67	L-5146	X									X		
IR88-SG05-08C	10/6/08	945	949	-29.5	-4	114	L5189	X									X		
IR88-SG05D-08C	10/6/08	945	950	-30	-4	39	SL-1231	X									X		

Sampled by :
K Stokes/K Riggs

Temperature (Fahrenheit)

	Interior	Ambient	
Start			
Stop			

Pressure (inches of Hg)

	Interior	Ambient	
Start			
Stop			

Special Instructions/QC Requirements & Comments:

Canisters Shipped by:	Date/Time:	Canisters Received by:
Samples Relinquished by:	Date/Time:	Received by:
Relinquished by:	Date/Time:	Received by:

JVII TO-21

TAL Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
phone 865-291-3000 fax 865-584-4315

Canister Samples Chain of Custody Record

TestAmerica assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Contact Information	Project Manager: Keri Hallberg	Sampled By: K Stokes/K Riggs	3 of 3 COCs
Company: CHam HILL	Phone: 704-975-9381		
Address: 1700 Arch St Suite 4400	Site Contact: Bob Lowder		
City/State/Zip Phila, PA 19090	TAL Contact: Linda McWhirter		
Phone: 215-640-9071			
FAX: 215-640-9271			
Project Name: Camp Lejeune TO-21	Analysis Turnaround Time		
Site/location: Camp Lejeune, NC	Standard (Specify)		
PO # 364167	Rush (Specify)		

Sample Identification	Sample Date(s)	Time Start	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, 'Hg (Stop)	Flow Controller ID	Canister ID	TO-15	TO-14A	EPA 3C	EPA 25C	ASTM D-1946	Other (Please specify in notes section)	Sample Type	Indoor Air	Ambient Air	Soil Gas	Landfill Gas	Other (Please specify in notes section)
SWMU360-SG11-08C	10/6/08	1054	1059	-29	-3	04	5192	X									X		
SWMU360-SG10-08C	↓	1332	1337	-29.5	-3	98	L3841	X									X		
SWMU360-SG09-08C	↓	1308	1313	-29	-3	38	SL1234	X									X		
SWMU360-SG12-08C	↓	1116	1122	-31	-3	107	L5174	X									X		
SWMU360-SG55-08C	↓	1008	1013	-29	-4	82	SL1222	X									X		
HPFF-SG35-08C	↓	0900	0905	-28	-3	K240	L4152	X									X		

Sampled by:
K Stokes/K Riggs

Temperature (Fahrenheit)	Interior	Ambient	
Start			
Stop			

Pressure (inches of Hg)	Interior	Ambient	
Start			
Stop			

Special Instructions/QC Requirements & Comments:

Canisters Shipped by:	Date/Time:	Canisters Received by:
Samples Relinquished by:	Date/Time:	Received by:
Relinquished by:	Date/Time:	Received by:

Appendix V2-E
Laboratory Data

TO - 21
Camp Lejuene - Mainside
Groundwater Raw Analytical Results June 2008

Station ID	IR88-IS01	IR88-IS02	IR88-IS03	IR88-IS04	IR88-IS05	IR88-IS06	IR88-IS07	SWMU360-IS08	SWMU360-IS09	SWMU360-IS10		SWMU360-IS11
Sample ID	IR88-IS01-GW-13-15-08B	IR88-IS02-GW-15-17-08B	IR88-IS03-GW-12-13-08B	IR88-IS04-GW-11-12-08B	IR88-IS05-GW-11-12-08B	IR88-IS06-GW-09-10-08B	IR88-IS07-GW-10-14-08B	SWMU360-IS08-GW-20-22-08B	SWMU360-IS09-GW-23-25-08B	SWMU360-IS10-GW-08B	SWMU360-IS10D-GW-08B	SWMU360-IS11-GW-23-25-08B
Sample Date	06/17/08	06/17/08	06/16/08	06/16/08	06/17/08	06/17/08	06/17/08	06/19/08	06/18/08	06/19/08	06/19/08	06/19/08
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,1,1-Trichloroethane	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	0.45 J	0.59 J	0.58 J	0.67 J
1,1-Dichloroethene	33 U	1 U	1.9 J	0.62 J	1 U	1 U	1 U	1 U	0.15 J	0.18 J	0.19 J	0.32 J
1,2,4-Trichlorobenzene	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromo-3-chloropropane	67 U	2 U	32 U	20 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,2-Dibromoethane	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2-Butanone	170 U	5 U	81 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
2-Hexanone	170 U	5 U	81 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-pentanone	170 U	5 U	81 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	330 U	10 U	160 U	100 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	33 U	1 U	2.6 J	13	1 U	1 U	1 U	0.17 J	1 U	0.042 J	0.041 J	1 U
Bromodichloromethane	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromoform	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromomethane	67 U	2 U	32 U	20 U	0.17 J	0.15 J	2 U	2 U	2 U	2 U	2 U	2 U
Carbon disulfide	33 U	0.33 J	16 U	10 U	1 U	1 U	0.58 J	1 U	1 U	1 U	1 U	1 U
Carbon tetrachloride	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	33 U	1 U	16 U	0.55 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroethane	67 U	2 U	9.1 J	45	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Chloroform	33 U	1 U	16 U	10 U	1 U	0.11 J	1 U	1 U	0.29 J	0.61 J	0.79 J	0.22 J
Chloromethane	67 U	2 U	32 U	20 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Cyclohexane	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane (Freon-12)	67 U	2 U	32 U	20 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Ethylbenzene	33 U	1 U	16 U	0.84 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Isopropylbenzene	33 U	1 U	16 U	10 U	1 U	1 U	1 U	0.058 J	1 U	1 U	1 U	1 U
Methyl acetate	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methyl-tert-butyl ether (MTBE)	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylcyclohexane	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	0.037 J	1 U
Methylene chloride	67 U	2 U	32 U	20 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Styrene	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	1,100	0.13 J	750	52	11	0.16 J	1 U	0.24 J	22	6.1	6.9	12
Toluene	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethene	9.8 J	1 U	130	17	0.053 J	1 U	0.23 J	0.099 J	2.3	2.5	2.6	4.4
Trichlorofluoromethane(Freon-11)	67 U	2 U	32 U	20 U	2 U	2 U	2 U	2 U	0.1 J	0.12 J	0.14 J	2 U
Vinyl chloride	33 U	1 U	89	71	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	8.8 J	1 U	800	200	1 U	1 U	1 U	0.36 J	11	14	13	18
cis-1,3-Dichloropropene	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
m- and p-Xylene	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
o-Xylene	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,2-Dichloroethene	33 U	1 U	6.9 J	1.3 J	1 U	1 U	1 U	1 U	0.3 J	0.37 J	0.38 J	0.53 J
trans-1,3-Dichloropropene	33 U	1 U	16 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

Notes:

J - Analyte present, value may or may not be accurate or precise

NA - Not analyzed

U - The material was analyed for, but not detected

UG/L - Micrograms per liter

TO - 21
Camp Lejeune - Main Side
Shallow Soil Vapor Raw Analytical Results
June 2008

Station ID	IR88-IS01	IR88-IS02	IR88-IS03	IR88-IS04	IR88-IS05		IR88-IS06	IR88-IS07	IR88-IS13	IR88-IS14
Sample ID	IR88-IS01-SV-05-06-08B	IR88-IS02-SV-05-06-08B	IR88-IS03-SV-05-06-08B	IR88-IS04-SV-05-06-08B	IR88-IS05-SV-05-06-08B	IR88-IS05D-SV-05-06-08B	IR88-IS06-SV-05-06-08B	IR88-IS07-SV-05-06-08B	IR88-IS13-SV-4.5-5.5-08B	IR88-IS14-SV-4.5-5.5-08B
Sample Date	06/18/08	06/18/08	06/18/08	06/18/08	06/18/08	06/18/08	06/18/08	06/17/08	06/18/08	06/18/08
Chemical Name										
Volatile Organic Compounds (ppbv)										
1,1,1-Trichloroethane	3,000 U	6.9 U	2 U	0.76 J	140 U	150 U	1.8 J	2.3	2 U	13 U
1,1,2,2-Tetrachloroethane	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
1,1,2-Trichloroethane	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
1,1-Dichloroethane	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
1,1-Dichloroethene	3,000 U	6.9 U	2 U	1.1 J	140 U	150 U	2 U	2 U	2 U	5.7 J
1,2,4-Trichlorobenzene	15,000 U	35 U	10 U	20 U	680 U	730 U	10 U	10 U	10 U	65 U
1,2-Dibromoethane	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
1,2-Dichlorobenzene	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
1,2-Dichloroethane	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
1,2-Dichloropropane	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
1,3-Dichlorobenzene	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
1,4-Dichlorobenzene	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
2-Butanone	15,000 U	15 J	10 U	20 U	680 U	730 U	19	25	10 U	65 U
2-Hexanone	7,500 U	17 U	5 U	10 U	340 U	360 U	0.83 J	1.5 J	5 U	33 U
4-Methyl-2-pentanone	7,500 U	17 U	5 U	10 U	340 U	360 U	5 U	1 J	5 U	33 U
Acetone	75,000 U	61 J	26 J	32 J	1,000 J	3,600 U	160	240	24 J	330 U
Benzene	3,000 U	6.3 J	0.92 J	78	140 U	150 U	3.4	2.3	2 U	13 U
Bromodichloromethane	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
Bromoform	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
Bromomethane	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
Carbon disulfide	7,500 U	3.4 J	5 U	10 U	340 U	360 U	0.92 J	5 U	5 U	33 U
Carbon tetrachloride	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
Chlorobenzene	3,000 U	6.9 U	2 U	1.8 J	140 U	150 U	2 U	2 U	2 U	13 U
Chloroethane	3,000 U	6.9 U	2 U	4.8	140 U	150 U	2 U	2 U	2 U	13 U
Chloroform	3,000 U	6.9 U	2 U	4 U	140 U	150 U	1.5 J	2 U	0.63 J	12 J
Chloromethane	7,500 U	17 U	5 U	10 U	340 U	360 U	2.8 J	5 U	5 U	33 U
Cyclohexane	7,500 U	4.5 J	5 U	10 U	340 U	360 U	5 U	5 U	5 U	33 U
Dibromochloromethane	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
Dichlorodifluoromethane (Freon-12)	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
Ethylbenzene	3,000 U	3.5 J	2 U	5.9	140 U	150 U	0.75 J	2 U	2 U	13 U
Isopropylbenzene	6,000 U	14 U	4 U	8 U	270 U	290 U	4 U	4 U	4 U	26 U
Methyl-tert-butyl ether (MTBE)	15,000 U	35 U	10 U	20 U	680 U	730 U	10 U	10 U	10 U	65 U
Methylene chloride	7,500 U	17 U	5 U	10 U	290 J	360 U	5 U	5 U	5 U	33 U
Styrene	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
Tetrachloroethene	300,000	1,100	170	49	12,000	26,000	580	2.2	120	3,500
Toluene	3,000 U	8.1	1.1 J	29	140 U	150 U	3.4	2.8	2 U	13 U
Trichloroethene	3,000 U	6.3 J	5.8	16	120 J	140 J	1.9 J	2 U	2 U	600
Trichlorofluoromethane(Freon-11)	3,000 U	6.9 U	0.35 J	1 J	17 J	52 J	0.33 J	0.25 J	0.43 J	13 U
Vinyl chloride	3,000 U	6.9 U	2 U	670	140 U	150 U	2 U	2 U	2 U	18
cis-1,2-Dichloroethene	3,000 U	2.1 J	5.8	360	140 U	150 U	2 U	2 U	2 U	3,700
cis-1,3-Dichloropropene	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U
m- and p-Xylene	3,000 U	6.9 U	2 U	4	140 U	150 U	2 U	2 U	2 U	13 U
o-Xylene	3,000 U	6.9 U	2 U	1.8 J	140 U	150 U	2 U	2 U	2 U	13 U
trans-1,2-Dichloroethene	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	68
trans-1,3-Dichloropropene	3,000 U	6.9 U	2 U	4 U	140 U	150 U	2 U	2 U	2 U	13 U

Notes:

J - Analyte present, value may or may not be accurate or precise

NA - Not analyzed

U - The material was analyed for, but not detected

ppbv - parts per billion volume

TO - 21
Camp Lejeune - Main Side
Deep Soil Vapor Raw Analytical Results
June 2008

Station ID	SWMU360-IS08	SWMU360-IS09	SWMU360-IS10		SWMU360-IS11
Sample ID	SWMU360-IS08-SV-17-18-08B	SWMU360-IS09-SV-14-15-08B	SWMU360-IS10D-SV-08B	SWMU360-IS10-SV-08B	SWMU360-IS11-SV-17-18-08B
Sample Date	06/19/08	06/18/08	06/19/08	06/19/08	06/19/08
Chemical Name					
Volatile Organic Compounds (ppbv)					
1,1,1-Trichloroethane	2 U	13 U	2 U	2 U	3.6 U
1,1,2,2-Tetrachloroethane	2 U	13 U	2 U	2 U	3.6 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.39 J	13 U	0.33 J	0.32 J	3.6 U
1,1,2-Trichloroethane	2 U	13 U	2 U	2 U	3.6 U
1,1-Dichloroethane	2 U	13 U	0.62 J	0.51 J	1.8 J
1,1-Dichloroethene	1 J	13 U	2 U	2 U	3.6 U
1,2,4-Trichlorobenzene	10 U	64 U	10 U	10 U	18 U
1,2-Dibromoethane	2 U	13 U	2 U	2 U	3.6 U
1,2-Dichlorobenzene	2 U	13 U	2 U	2 U	3.6 U
1,2-Dichloroethane	2 U	13 U	2 U	2 U	3.6 U
1,2-Dichloropropane	2 U	13 U	2 U	2 U	3.6 U
1,3-Dichlorobenzene	2 U	13 U	2 U	2 U	3.6 U
1,4-Dichlorobenzene	2 U	13 U	2 U	2 U	3.6 U
2-Butanone	21	40 J	10	12	31
2-Hexanone	2.7 J	32 U	0.67 J	0.89 J	1.8 J
4-Methyl-2-pentanone	1.2 J	32 U	5 U	5 U	0.98 J
Acetone	180	210 J	97	130	210
Benzene	45	5.3 J	4.7	4.1	27
Bromodichloromethane	2 U	13 U	2 U	2 U	3.6 U
Bromoform	2 U	13 U	2 U	2 U	3.6 U
Bromomethane	2 U	13 U	2 U	2 U	3.6 U
Carbon disulfide	5.5	6 J	4.2 J	3 J	3.9 J
Carbon tetrachloride	2 U	13 U	2 U	2 U	3.6 U
Chlorobenzene	2 U	13 U	2 U	2 U	3.6 U
Chloroethane	2 U	13 U	2 U	2 U	3.6 U
Chloroform	0.38 J	83	170	160	8.5
Chloromethane	5 U	32 U	5 U	5 U	9.1 U
Cyclohexane	16	32 U	2.8 J	3.1 J	9.1 U
Dibromochloromethane	2 U	13 U	2 U	2 U	3.6 U
Dichlorodifluoromethane (Freon-12)	2.1	88	220	200	1.4 J
Ethylbenzene	11	13 U	0.82 J	0.68 J	3.3 J
Isopropylbenzene	8	26 U	4 U	4 U	7.3 U
Methyl-tert-butyl ether (MTBE)	10 U	64 U	10 U	10 U	18 U
Methylene chloride	5 U	32 U	5 U	5 U	9.1 U
Styrene	3.1	13 U	0.66 J	2 U	1.5 J
Tetrachloroethene	38	4,100	360	320	490
Toluene	42	5.1 J	5.6	4	18
Trichloroethene	2.3	29	5.1	4.4	12
Trichlorofluoromethane(Freon-11)	0.72 J	190	490	430	2 J
Vinyl chloride	0.99 J	13 U	2 U	2 U	3.6 U
cis-1,2-Dichloroethene	3.1	5.5 J	0.65 J	0.64 J	5.9
cis-1,3-Dichloropropene	2 U	13 U	2 U	2 U	3.6 U
m- and p-Xylene	11	13 U	2 U	2 U	3.2 J
o-Xylene	7	13 U	2 U	2 U	1.7 J
trans-1,2-Dichloroethene	2 U	3.3 J	2 U	2 U	3.6 U
trans-1,3-Dichloropropene	2 U	13 U	2 U	2 U	3.6 U

Notes:

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ppbv - parts per billion volume

TO - 21
Camp Lejeune - Mainside
Soil Gas Raw Analytical Results
June 2008

Station ID **Sample ID** **Sample Date**	IR820-SG03 IR820-SG03-08B 06/24/08	IR820-SG04 IR820-SG04-08B 06/24/08	LCH4015-SG02 LCH4015-SG02-08B 06/22/08
Chemical Name			
Volatile Organic Compounds (ppbv)			
1,1,1-Trichloroethane	2 U	2 U	2 U
1,1,2,2-Tetrachloroethane	2 U	2 U	2 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	2 U	2 U	2 U
1,1,2-Trichloroethane	2 U	2 U	2 U
1,1-Dichloroethane	2 U	2 U	2 U
1,1-Dichloroethene	2 U	2 U	2 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U
1,2-Dibromoethane	2 U	2 U	2 U
1,2-Dichlorobenzene	2 U	2 U	2 U
1,2-Dichloroethane	2 U	2 U	2 U
1,2-Dichloropropane	2 U	2 U	2 U
1,3-Dichlorobenzene	2 U	2 U	2 U
1,4-Dichlorobenzene	2 U	2 U	2 U
2-Butanone	10 U	10 U	10 U
2-Hexanone	5 U	5 U	5 U
4-Methyl-2-pentanone	5 U	5 U	3.5 J
Acetone	20 J	50 U	18 J
Benzene	2 U	2 U	1.1 J
Bromodichloromethane	2 U	2 U	2 U
Bromoform	2 U	2 U	2 U
Bromomethane	2 U	2 U	0.34 J
Carbon disulfide	5 U	5 U	5 U
Carbon tetrachloride	2 U	2 U	2 U
Chlorobenzene	2 U	2 U	2 U
Chloroethane	2 U	2 U	2 U
Chloroform	2 U	2 U	2 U
Chloromethane	5 U	5 U	5 U
Cyclohexane	5 U	5 U	1.9 J
Dibromochloromethane	2 U	2 U	2 U
Dichlorodifluoromethane (Freon-12)	190	2 U	0.85 J
Ethylbenzene	13	4.1	37
Isopropylbenzene	0.99 J	4 U	3.5 J
Methyl-tert-butyl ether (MTBE)	10 U	10 U	10 U
Methylene chloride	1.5 J	5 U	7.8
Styrene	2 U	2 U	2 U
Tetrachloroethene	2 U	2 U	2 U
Toluene	2.4	1.3 J	4.8
Trichloroethene	2 U	2 U	0.46 J
Trichlorofluoromethane(Freon-11)	4.5	2 U	1.4 J
Vinyl chloride	2 U	2 U	2 U
cis-1,2-Dichloroethene	2 U	2 U	2 U
cis-1,3-Dichloropropene	2 U	2 U	2 U
m- and p-Xylene	28	7.9	90
o-Xylene	9.3	2.2	34
trans-1,2-Dichloroethene	2 U	2 U	2 U
trans-1,3-Dichloropropene	2 U	2 U	2 U

Notes:

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NA - Not analyzed

U - The material was analyed for, but not detected

ppbv - parts per billion volume

Camp Lejeune - Main Side
Camp Lejeune - Main Side
Indoor and Outdoor Air Raw results
2008

Station ID	IR820-IA03	IR820-IA04	IR88-IA01		IR88-IA02	IR88-IA03	IR88-IA04
Sample ID	IR820-IA03-08B	IR820-IA04-08B	IR88-IA01-08C	IR88-IA01D-08C	IR88-IA02-08C	IR88-IA03-08C	IR88-IA04-08C
Sample Date	06/24/08	06/24/08	09/12/08	09/12/08	09/12/08	09/12/08	09/12/08
Chemical Name							
Volatile Organic Compounds (ppbv)							
1,1,1-Trichloroethane	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1,2,2-Tetrachloroethane	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.09 J	0.2 U	0.084 J	0.082 J	0.08 J	0.09 J	0.1 J
1,1,2-Trichloroethane	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1-Dichloroethane	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1-Dichloroethene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2,4-Trichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2-Dichlorobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2-Dichloroethane	0.096 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.08 J
1,2-Dichloropropane	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,3-Dichlorobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,4-Dichlorobenzene	0.53	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Butanone	4.9	0.23 J	0.55 J	0.38 J	0.73 J	0.49 J	0.8 J
2-Hexanone	0.42 J	0.5 U	0.5 UJ	0.5 UJ	0.061 J	0.5 UJ	0.5 UJ
4-Methyl-2-pentanone	0.31 J	0.5 U	0.15 J	0.5 U	0.13 J	0.051 J	0.22 J
Acetone	45	3.1 J	12	13	19	16	21
Benzene	1.2	0.15 J	0.16 J	0.073 J	0.17 J	0.19 J	0.12 J
Bromodichloromethane	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Bromoform	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Bromomethane	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Carbon disulfide	0.19 J	0.034 J	0.075 J	0.5 U	0.051 J	0.045 J	0.06 J
Carbon tetrachloride	0.24	0.2 U	0.098 J	0.082 J	0.097 J	0.11 J	0.091 J
Chlorobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chloroethane	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chloroform	0.28	0.045 J	0.2 U	0.2 U	0.2 U	0.11 J	0.041 J
Chloromethane	1.3	0.5 U	0.83	0.94	1.2	0.99	1.2
Cyclohexane	1.1	0.072 J	0.081 J	0.058 J	0.09 J	0.075 J	0.14 J
Dibromochloromethane	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Dichlorodifluoromethane (Freon-12)	12	0.65	0.52	0.5	0.52	3.2	5.2
Ethylbenzene	0.52	0.2 U	0.069 J	0.2 U	0.069 J	0.2 U	0.072 J
Isopropylbenzene	0.075 J	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Methyl-tert-butyl ether (MTBE)	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylene chloride	0.87 U	0.5 U	0.5 U	0.56 U	0.5 U	0.5 U	0.5 U
Styrene	0.9	0.2 U	0.064 J	0.2 U	0.065 J	0.06 J	0.2 U

Camp Lejeune - Main Side
Camp Lejeune - Main Side
Indoor and Outdoor Air Raw results
2008

Station ID	IR820-IA03	IR820-IA04	IR88-IA01		IR88-IA02	IR88-IA03	IR88-IA04
Sample ID	IR820-IA03-08B	IR820-IA04-08B	IR88-IA01-08C	IR88-IA01D-08C	IR88-IA02-08C	IR88-IA03-08C	IR88-IA04-08C
Sample Date	06/24/08	06/24/08	09/12/08	09/12/08	09/12/08	09/12/08	09/12/08
Chemical Name							
Tetrachloroethene	0.2 U	0.2 U	0.11 J	0.2 U	0.099 J	1.6	12
Toluene	11	0.6	1.7	0.14 J	2.1	0.69	1.4
Trichloroethene	0.047 J	0.2 U	0.2 U	0.2 U	0.2 U	0.055 J	1.2
Trichlorofluoromethane(Freon-11)	7.4	0.3	0.24	0.24	0.23	0.27	0.25
Vinyl chloride	0.096 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
cis-1,2-Dichloroethene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
cis-1,3-Dichloropropene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
m- and p-Xylene	1.5	0.2 U	0.19 J	0.2 U	0.21	0.17 J	0.16 J
o-Xylene	0.53	0.2 U	0.071 J	0.2 U	0.075 J	0.065 J	0.2 U
trans-1,2-Dichloroethene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
trans-1,3-Dichloropropene	0.2 U	0.2 U	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ

Notes:

J - Analyte present, value may or may not be accurate or precise

NA - Not analyzed

U - The material was analyed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

ppbv - parts per billion volume

Camp Lejeune - Main Side
Camp Lejeune - Main Side
Indoor and Outdoor Air Raw results
2008

Station ID	LCH4015-IA01	LCH4015-IA02	IR820-OA03	IR88-OA05	LCH4015-OA01	LCH4015-OA02	SWMU118-CSA05
Sample ID	LCH4015-IA01-08B	LCH4015-IA02-08B	IR820-OA03-08B	IR88-OA05-08C	LCH4015-OA01-08B	LCH4015-OA02-08B	SWMU118-CSA05-08B
Sample Date	06/24/08	06/23/08	06/24/08	09/12/08	06/23/08	06/24/08	06/22/08
Chemical Name							
Volatile Organic Compounds (ppbv)							
1,1,1-Trichloroethane	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1,2,2-Tetrachloroethane	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.092 J	3.3 U	0.078 J	0.078 J	0.084 J	0.096 J	0.36
1,1,2-Trichloroethane	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1-Dichloroethane	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1-Dichloroethene	0.2 U	3.3 U	0.05 J	0.2 U	0.2 U	0.2 U	0.2 U
1,2,4-Trichlorobenzene	1 U	17 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2-Dichlorobenzene	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2-Dichloroethane	0.22	3.3 U	0.2 U	0.2 U	0.2 U	0.066 J	0.2 U
1,2-Dichloropropane	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,3-Dichlorobenzene	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,4-Dichlorobenzene	0.1 J	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Butanone	1.7	17 U	1.7	0.48 J	1.3	3.1	0.96 J
2-Hexanone	0.08 J	8.3 U	0.067 J	0.5 UJ	0.5 U	0.12 J	0.1 J
4-Methyl-2-pentanone	0.46 J	8.3 U	0.052 J	0.5 U	0.12 J	0.16 J	0.5 U
Acetone	31	260	17	5.5	8.6	18	8.9
Benzene	0.34	3.3 U	0.17 J	0.12 J	0.15 J	0.32	0.66
Bromodichloromethane	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Bromoform	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Bromomethane	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Carbon disulfide	0.046 J	8.3 U	0.053 J	0.083 J	0.14 J	0.39 J	0.19 J
Carbon tetrachloride	0.12 J	3.3 U	0.077 J	0.09 J	0.11 J	0.12 J	0.093 J
Chlorobenzene	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chloroethane	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chloroform	3	3 J	0.2 U	0.045 J	0.2 U	0.039 J	0.2 U
Chloromethane	1.3	8.3 U	1.2	1.7	0.94	1.3	0.5 U
Cyclohexane	0.22 J	8.3 U	0.5 U	0.056 J	0.5 U	0.089 J	3.6
Dibromochloromethane	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Dichlorodifluoromethane (Freon-12)	0.66	3.3 U	0.58	0.52	0.61	0.68	0.54
Ethylbenzene	3.3	3.3 U	0.2 U	0.2 U	0.12 J	0.15 J	0.072 J
Isopropylbenzene	0.14 J	6.7 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Methyl-tert-butyl ether (MTBE)	1 U	17 U	1 U	1 U	1 U	1 U	1 U
Methylene chloride	0.68 U	8.3 U	0.51	0.68 U	0.51 U	0.87 U	0.5 U
Styrene	0.064 J	3.3 U	0.2 U	0.2 U	0.2 U	0.087 J	0.2 U

Camp Lejeune - Main Side
Camp Lejeune - Main Side
Indoor and Outdoor Air Raw results
2008

Station ID	LCH4015-IA01	LCH4015-IA02	IR820-OA03	IR88-OA05	LCH4015-OA01	LCH4015-OA02	SWMU118-CSA05
Sample ID	LCH4015-IA01-08B	LCH4015-IA02-08B	IR820-OA03-08B	IR88-OA05-08C	LCH4015-OA01-08B	LCH4015-OA02-08B	SWMU118-CSA05-08B
Sample Date	06/24/08	06/23/08	06/24/08	09/12/08	06/23/08	06/24/08	06/22/08
Chemical Name							
Tetrachloroethene	4.6	3.3 U	0.2 U	0.18 J	0.2 U	0.073 J	0.2 U
Toluene	6	1.4 J	0.42	0.48	0.97	0.78	0.24
Trichloroethene	0.1 J	0.81 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Trichlorofluoromethane(Freon-11)	0.48	0.89 J	0.32	0.25	0.42	0.41	0.32
Vinyl chloride	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
cis-1,2-Dichloroethene	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.14 J
cis-1,3-Dichloropropene	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
m- and p-Xylene	8.7	3.3 U	0.2 U	0.14 J	0.47	0.5	0.17 J
o-Xylene	2.2	3.3 U	0.2 U	0.2 U	0.14 J	0.18 J	0.089 J
trans-1,2-Dichloroethene	0.2 U	3.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
trans-1,3-Dichloropropene	0.2 U	3.3 U	0.2 U	0.2 UJ	0.2 U	0.2 U	0.2 U

Notes:

J - Analyte present, value may or may not be accurate or precise

NA - Not analyzed

U - The material was analyed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

ppbv - parts per billion volume

TO - 21
Camp Lejeune - Mainside
Phase II Soil Gas Raw Analytical Results
Ocotober 2008

Station ID	IR88-SG05		IR88-SG06	IR88-SG07	IR88-SG08	IR88-SG13	SWMU360-SG09	SWMU360-SG10	SWMU360-SG11	SWMU360-SG12
Sample ID	IR88-SG05-08C	IR88-SG05D-08C	IR88-SG06-08C	IR88-SG07-08C	IR88-SG08-08C	IR88-SG13-08C	SWMU360-SG09-08C	SWMU360-SG10-08C	SWMU360-SG11-08C	SWMU360-SG12-08C
Sample Date	10/06/08	10/06/08	09/28/08	10/06/08	10/06/08	10/06/08	10/06/08	10/06/08	10/06/08	10/06/08
Chemical Name										
Volatile Organic Compounds (ppbv)										
1,1,1-Trichloroethane	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
1,1,2,2-Tetrachloroethane	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
1,1,2-Trichloroethane	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
1,1-Dichloroethane	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
1,1-Dichloroethene	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
1,2,4-Trichlorobenzene	660 U	1,000 U	1,600 U	46 U	310 U	53,000 U	10 UJ	10 UJ	10 UJ	10 UJ
1,2-Dibromoethane	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
1,2-Dichlorobenzene	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
1,2-Dichloroethane	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
1,2-Dichloropropane	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
1,3-Dichlorobenzene	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
1,4-Dichlorobenzene	130 U	200 U	100 J	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
2-Butanone	660 U	1,000 U	1,600 U	46 U	310 U	53,000 U	10 U	10 U	10 U	2.7 J
2-Hexanone	330 U	510 U	780 U	23 U	150 U	27,000 U	5 U	5 U	5 U	5 U
4-Methyl-2-pentanone	330 U	510 U	780 U	23 U	150 U	27,000 U	5 U	5 U	5 U	5 U
Acetone	3,300 UJ	5,100 UJ	4,600 J	230 U	1,500 UJ	270,000 UJ	50 U	50 U	50 U	27 J
Benzene	130 U	200 U	150 J	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2.3
Bromodichloromethane	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
Bromoform	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
Bromomethane	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
Carbon disulfide	330 U	510 U	780 U	23 U	150 U	27,000 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
Chlorobenzene	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
Chloroethane	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
Chloroform	130 U	200 U	310 U	9.1 U	62 U	11,000 U	0.78 J	0.41 J	2 U	0.69 J
Chloromethane	330 U	510 U	780 U	23 U	150 U	27,000 U	5 U	5 U	5 U	5 U
Cyclohexane	330 U	510 U	780 U	23 U	150 U	27,000 U	5 U	5 U	5 U	0.93 J
Dibromochloromethane	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
Dichlorodifluoromethane (Freon-12)	130 U	200 U	310 U	9.1 U	62 U	11,000 U	7.7	4.9	2 U	2.1
Ethylbenzene	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	1.2 J
Isopropylbenzene	260 U	410 U	620 U	18 U	120 U	21,000 U	4 U	4 U	4 U	4 U
Methyl-tert-butyl ether (MTBE)	660 U	1,000 U	1,600 U	46 U	310 U	53,000 U	10 U	10 U	10 U	10 U
Methylene chloride	330 U	510 U	9,000	23 U	150 U	27,000 U	5 U	5 U	5 U	5 U
Styrene	130 U	200 U	310 U	9.1 UJ	62 U	11,000 U	2 U	2 U	2 U	2 U
Tetrachloroethene	24,000	16,000	36,000	1,700	11,000	2,500,000	5.1	5	7.3	57
Toluene	130 U	200 U	430	9.1 U	62 U	11,000 U	2 U	2 U	2 U	8.4
Trichloroethene	130 U	200 U	310 U	2.1 J	12 J	6,700 J	2 U	2 U	2 U	2 U
Trichlorofluoromethane(Freon-11)	130 U	200 U	180 J	9.1 U	62 U	11,000 U	16	13	2 U	3
Vinyl chloride	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
cis-1,3-Dichloropropene	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
m- and p-Xylene	130 U	200 U	310 U	9.1 UJ	62 U	11,000 U	2 U	2 U	2 U	3.7
o-Xylene	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	1.4 J
trans-1,2-Dichloroethene	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U
trans-1,3-Dichloropropene	130 U	200 U	310 U	9.1 U	62 U	11,000 U	2 U	2 U	2 U	2 U

Notes:

J - Analyte present, value may or may not be accurate or precise

NA - Not analyzed

U - The material was analyed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

TO - 21
Camp Lejeune - Main Side
Phase II Indoor Outdoor Air Raw Results
October 2008

Station ID	IR88-IA07		IR88-IA08	IR88-IA09	IR88-IA10	IR88-OA01	IR88-OA02	IR88-OA03	IR88-OA05
Sample ID	IR88-IA07-08C	IR88-IA07D-08C	IR88-IA08-08C	IR88-IA09-08C	IR88-IA10-08C	IR88-OA01-08C	IR88-OA02-08C	IR88-OA03-08C	IR88-OA05-08C
Sample Date	10/08/08	10/08/08	09/28/08	10/07/08	10/07/08	10/06/08	10/07/08	10/07/08	09/12/08
Chemical Name									
Volatile Organic Compounds (ppbv)									
1,1,1-Trichloroethane	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1,2,2-Tetrachloroethane	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.1 J	0.1 J	0.084 J	0.081 J	0.043 J	0.081 J	0.073 J	0.072 J	0.078 J
1,1,2-Trichloroethane	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1-Dichloroethane	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1-Dichloroethene	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2,4-Trichlorobenzene	1 U	1 U	2 U	1 UJ	1 UJ	1 U	1 UJ	1 UJ	1 U
1,2-Dibromoethane	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2-Dichlorobenzene	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2-Dichloroethane	0.053 J	0.061 J	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2-Dichloropropane	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,3-Dichlorobenzene	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,4-Dichlorobenzene	0.2 U	0.094 J	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Butanone	1.4	1.3	6.8	1.1	1 U	0.37 J	0.63 J	0.48 J	0.48 J
2-Hexanone	0.5 U	0.5 U	1 U	0.12 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ
4-Methyl-2-pentanone	0.056 J	0.5 U	0.38 J	1.1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	20 J	20	40	17 J	16 J	3.1 J	5.3 J	3.4 J	5.5
Benzene	0.12 J	0.15 J	0.26 J	0.21	0.2 U	0.13 J	0.21	0.17 J	0.12 J
Bromodichloromethane	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Bromoform	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Bromomethane	0.2 U	0.2 U	0.4 U	0.2 U	0.15 J	0.2 U	0.11 J	0.14 J	0.2 U
Carbon disulfide	0.5 U	0.5 U	2.4	0.047 J	0.5 U	0.5 U	0.5 U	0.5 U	0.083 J
Carbon tetrachloride	0.061 J	0.078 J	0.09 J	0.098 J	0.2 U	0.093 J	0.095 J	0.085 J	0.09 J
Chlorobenzene	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chloroethane	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chloroform	0.2 U	0.2 U	0.4 U	0.1 J	0.2 U	0.057 J	0.2 U	0.042 J	0.045 J
Chloromethane	0.5	0.64	2	0.71	0.96	0.75	0.75	0.72	1.7
Cyclohexane	0.14 J	0.14 J	0.14 J	0.13 J	0.5 U	0.5 U	0.5 U	0.5 U	0.056 J
Dibromochloromethane	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Dichlorodifluoromethane (Freon-12)	0.44	0.46	3.4	0.56	0.58	0.58	0.56	0.58	0.52
Ethylbenzene	0.2 U	0.13 J	0.4 U	0.075 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Isopropylbenzene	0.4 U	0.4 U	0.8 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Methyl-tert-butyl ether (MTBE)	1 U	1 U	2 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylene chloride	0.99 U	0.57 U	4.8	1.7	0.5 U	0.5 U	1.8	2	0.68 U
Styrene	0.2 U	0.15 J	0.4 U	0.078 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Tetrachloroethene	1.3	2.4	2	0.26	0.2 U	0.21	0.11 J	0.13 J	0.18 J
Toluene	0.45	0.8	1.2	2.7	0.2 U	0.19 J	0.4	0.37	0.48
Trichloroethene	0.6	0.64	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Trichlorofluoromethane(Freon-11)	0.22	0.23	0.58	0.25	0.23	0.26	0.27	0.28	0.25
Vinyl chloride	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
cis-1,2-Dichloroethene	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
cis-1,3-Dichloropropene	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
m- and p-Xylene	0.2 U	0.21 J	0.25 J	0.22	0.2 U	0.2 U	0.2 U	0.2 U	0.14 J
o-Xylene	0.2 U	0.096 J	0.4 U	0.08 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
trans-1,2-Dichloroethene	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
trans-1,3-Dichloropropene	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UJ

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