

The minutes were approved by RAB members via email on Sept. 27, 2016.

Hill Air Force Base Restoration Advisory Board

Meeting Minutes August 11, 2016

Members Present:	Organization:	Members Present:	Organization:
Loren Allen	Davis County Health Dept.	Stephen Jackson	Layton City
Earnest Aycok	Clearfield Community Alternate	Douglas Johnson	Hill AFB Community
Travis Bonsteel	Clinton Community	Tim Lane	Roy Community
Sandra Bourgeois	Environmental Protection Agency	TJ Mitchell	Clinton City
Louis Cooper	Weber-Morgan Health Dept.	Vern Phipps	Clearfield City
Buck Ekstrom	Clearfield Community	Rick Smith	Davis & Weber Counties Canal Company
Bambi Gibson	Sunset Community	Ed Sorensen	Roy City
Clint Holm	Layton Community	Darrin Wray	Hill AFB RAB Co-Chair
Facilitator:	Organization:		
Tim Sueltenfuss	Galen Driscoll, LLC		
Members Absent:	Organization:	Members Absent:	Organization:
Summer Day	Weber-Morgan Health Dept.	Rich Sirken	Weber State University
Tamara Long	South Weber City	Muhammad Slam	Utah Department of Environmental Quality
Jeff MacFarlane	North Davis Sewer District	Jan Ukena	South Weber Community
Joe Maylin	Sunset City	Brian Wesoloski	Riverdale Community
Brad Nelson	Weber Basin Water	Scott Zigich	Davis County School District
Brett Nelson	Central Weber Sewer District		
Other Attendees:	Organization:	Other Attendees:	Organization:
Kathleen Bradley	AFCEC	Mark Roginske	AFCEC-Hill
Jarrod Case	AFCEC-Hill	Corey Schwabenlander	CH2M
Randy Gates	CH2M	Kalem Sessions	AEEC
Dave Harris	AGEISS	Carly Siddoway	AGEISS
Dr. Chuck Holbert	CH2M	Sandy Staigerwald	EA Engineering
Carol MacKenzie	AFCEC-Hill	Jason Wilde	AFCEC-Hill

Handouts Distributed at Meeting:

Pre-RAB Training: Long-term monitoring well network optimization
Updated Hill AFB Basewide Plume Map
Operable Units Site Summary Spreadsheet
Cleanup System Glossary

Agenda Item #1. Welcome

Mr. Darrin Wray, the Hill Air Force Base (Hill AFB) Restoration Advisory Board (RAB) Air Force co-chair, called the meeting to order and welcomed RAB members to the meeting. He said the Air Force appreciates the RAB members' feedback and welcomes their input at the meeting.

Agenda Item #2. RAB Business

Mr. Tim Sueltenfuss, RAB Facilitator, briefly went through the packet distributed at the meeting. The meeting agenda is attached (Attachment 1).

Utah Department of Environmental Quality (UDEQ) Representation. Mr. Jarrod Case, the Remedial Project Manager, standing in for the Restoration Lead, Mr. Mark Loucks, excused Mr. Loucks due to a family commitment. He proceeded to read a prepared statement written by Mr. Loucks regarding an issue between the Air Force and UDEQ. It read:

"You may have noticed that the RAB representative for the Utah Department of Environmental Quality is not in attendance tonight.

According to the Federal Facility Agreement which we have signed with the Environmental Protection Agency (EPA) and UDEQ, the Air Force is required to reimburse the State of Utah for work done by UDEQ staff on Hill AFB restoration projects.

Over the last several months the Air Force has had some difficulties navigating ever changing fiscal management requirements, resulting in payments to the UDEQ being significantly delayed. Naturally, this has caused problems for the UDEQ and their ability to balance their books. As a result, those working on Hill AFB projects cannot do so until the Air Force can get all the past invoices paid.

While the Air Force has made most of the payments, some of the invoices from 2015 are still outstanding. Because these invoices are from a prior fiscal year, finding the funds to pay them is a little more complicated in an already complex federal payment system. But we are working on it.

This issue has been elevated to Restoration leaders and we are working to make the last payments as soon as possible so we can get UDEQ back at the table with us and continue moving forward. UDEQ, Air Force and EPA folks all want this to be resolved as soon as possible.

The Air Force has looked at the cause of this miscue and we are making the appropriate changes so that this will not happen again. Sincerely, Mark D. Loucks, Restoration Lead"

EPA Technical Assistance Grant (TAG). Ms. Sandra Bourgeois announced that the EPA's TAG associated with Hill AFB environmental restoration, in place since 1992, expired at the end of July. The South Weber Coalition (SWC) has managed the TAG during that time and is in the process of preparing its final report and closing out the documents associated with the TAG. Ms. Bourgeois said the EPA is considering reissuing the TAG or offering a Technical Assistance Services for Communities (TASC) grant to stakeholders involved with the Hill AFB cleanup. She asked RAB members if they would be interested in learning more about the different types of grants and the grant process from an EPA specialist at the next Hill AFB RAB meeting. RAB members indicated they were interested in learning more.

Mr. Travis Bonsteel asked if the SWC would have an opportunity to apply for the new TAG or TASC grant and if the grant would be advertised in some way. Ms. Bourgeois said she believed the SWC would have that option and that the communication about the potential grant at this RAB meeting and the next meeting would probably be the extent of the advertisement.

Action Item List. Mr. Sueltenfuss said that a current action item list was included in the packet (Attachment 2). Mr. David Harris provided an update on the RAB website (Item 2015-1), saying that the Air Force has completed their transition to the new platform so the upload of environmental and RAB content can begin soon. He will be working with Public Affairs to upload the content as soon as he can speak with the new person appointed to that position. Mr. Harris noted that the website will not have the same functionality as the previous RAB website, but there will be content for RAB members to share with members of the public. It is anticipated that content will be available on the website by the October RAB meeting, at which time Mr. Harris will provide a tutorial on where it is located on the Hill AFB website.

Schedule. A schedule of upcoming RAB meetings and a list of potential future training and tour events were provided to the RAB (Attachment 3). Mr. Sueltenfuss said there were quite a few tours and events since the April RAB meeting and he passed the time over to RAB members for reports on a couple of the tours that took place.

Mr. Doug Johnson attended the annual Operable Unit (OU) tour and said that he found it beneficial to see the sites in person. He said Mr. Loucks provided an informative narrative about each site including the history, remediation efforts and status of each OU. He said he appreciated the opportunity and encouraged RAB members to attend the tour in the future.

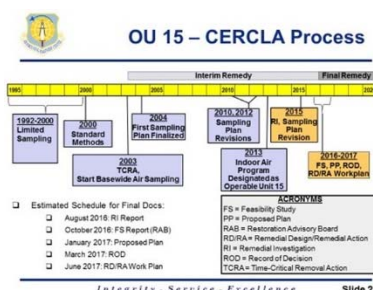
Mr. Rick Smith attended the tour of Enhanced Reductive Dechlorination (ERD) injections near the base golf course. He said it was interesting to see the process of the ERD mixture entering the injection wells.

Mr. Buck Ekstrom said he appreciated the opportunity to attend the Thunderbirds performance in June and wanted to express his gratitude for all those who helped to make it possible.

Operable Unit 12 (OU12) Explanation of Significant Differences (ESD). Mr. Jason Wilde said the OU12 ESD has been through most of the regulatory and Air Force review process and is currently awaiting signatures of Air Force, EPA and UDEQ representatives. The ESD documents the removal of the requirement in the OU12 Record of Decision agreement between the Air Force, the EPA and UDEQ to treat groundwater contamination at the Permeable Reactive Barrier in Roy. Once all parties have signed the OU12 ESD, a public notice will be published in a local newspaper to notify the public and RAB of the change to the OU12 ROD and the availability of the final OU12 ESD document.

Operable Unit 4 (OU4) Updated Revised Proposed Plan Update. Mr. Case said the OU4 Updated Revised Proposed Plan was presented to the public at a meeting held in June. While there were only a few members of the public in attendance, both of the mayors from the affected cities (Riverdale and South Weber) were present. No comments were received on the Air Force's revised proposal for cleanup at OU4.

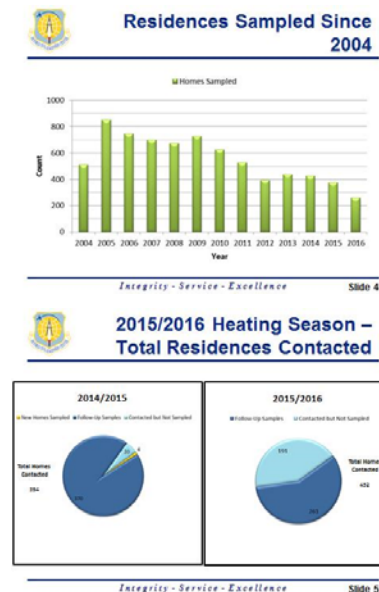
Agenda Item #3. Operable Unit 15 (Indoor Air Sampling Program) Review of 2015-2016 Program



Mr. Mark Roginske and Mr. Corey Schwabenlander provided an update on the Indoor Air Sampling Program (Operable Unit 15) and findings from the 2015/2016 heating season to the RAB (Attachment 4).

The timeline for Operable Unit 15 (OU15) was provided on Slide 2. Mr. Roginske said the time critical removal action (TCRA) in 2003 is

considered the start of the current basewide indoor air sampling program. In 2013, the indoor air sampling program was designated as OU15. A schedule for upcoming cleanup documents was included.



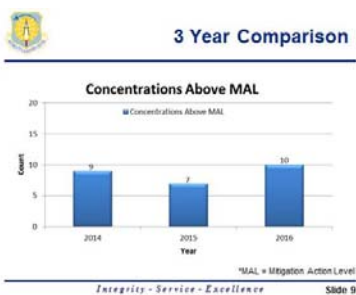
Since January 2001, more than 2,000 homes have been sampled and more than 9,000 samples have been collected. Mr. Schwabenlander said that the number of homes sampled has declined each year, as shown on Slide 4, with approximately 260 homes sampled during the 2015/2016 program. Slide 5 compared the number of homes contacted and sampled in the 2014/2015 program to this past year's program. Mr. Schwabenlander noted that more homes were contacted this year (452 homes), but fewer homes were sampled (261 homes versus 370 homes in the 2014/2015 program year). He reminded the RAB that there was some discussion leading up to this past sampling program about graduating homes with four consecutive non-detect samples from the program and not sampling them this past program year. It was decided at the last minute to include those homes in this round of sampling to collect a sample with the long-term sampler (24-26 days compared to previous 24-hour samplers). Mr. Schwabenlander said that many of the homes that would have graduated due to four consecutive non-detect samples opted not to participate in this year's program.

During the 2015/2016 season, 299 samples were collected from the 261 homes sampled. Due to quality control purposes, some homes had more than one sample collected to ensure samples are accurate and that they are being analyzed by the laboratory correctly. Of the 299 samples collected, 10 of them detected contaminants above the mitigation action level (MAL). The MAL is the lowest level at which the Air Force would recommend a course of action to mitigate the vapors inside the home, if the detection is determined to have come from vapor intrusion.

Below are the follow-up actions that have been taken at the 10 homes where detections were found above the MAL.

- Roy home – Mr. Schwabenlander said it is fairly certain this detection is due to an inside source; however, the resident has not granted permission for the air sampling contractor to verify the removal of the potential source before sampling was conducted.
- South Weber home – Mr. Schwabenlander said it has been verified that a few homes have had detections of contaminants due to vapors from a sewer line along South Weber Drive that is permitted to carry discharged contaminated groundwater from a base extraction system. A sewer vent fan is currently being installed to address this issue and additional samples will be collected to ensure it is working.
- Sunset home – An investigation was under way to determine if the detection was due to actual vapor intrusion or an inside source, but was halted when the resident of the home became ill. The investigation will resume once the resident is able to do so.
- Layton homes – Mr. Schwabenlander noted that the affected area in Layton has a larger footprint than the other cities, which may account for a higher number of detections. Seven Layton homes had detections above the MAL.
 - Four homes were found to have interior sources by using the HAPSITE, a portable real-time air sampling monitoring device. (Once the interior source is identified, it is up to the resident to decide whether or not to remove the source from the home.)

- Two homes were determined to have trichloroethene (TCE) above the MAL due to vapor intrusion so vapor intrusion mitigation systems (VIMS) were installed to address the vapors.
- One home has chronic issues with groundwater entering the home. The home has a sump and drains to address these issues, and a VIMS to address indoor vapors, but had indoor air detections above the MAL when one of the drains backed up. The dewatering system has since been upgraded and results of a confirmation sample showed vapors are now below the MAL.



Slide 9 provided a three-year comparison of the results above the MAL. Mr. Schwabenlander noted that four of the detections in Operable Unit 8 (OU8) in Layton from last year's program were 1,2-dichloroethane (1,2-DCA). Although 1,2-DCA is found in the groundwater in some areas of Layton, it was not tested for in the 2014 and 2015 sampling rounds because it is a common indoor source found in decorative plastic resin items. Mr. Schwabenlander said it was added back to the 2016 season for selected areas in OU8 where it is found at the water table, making it a possible source of vapor intrusion. Each of the four

homes with 1,2-DCA detections above the MAL were determined to come from an inside source. TCE is still the primary contaminant that is found in homes due to vapor intrusion from the groundwater in each of the OUs.



The indoor air program trends were shown on a graph on Slide 11. Mr. Schwabenlander said the graph illustrates that over the years, fewer residents have agreed to air sampling. In fact, many residents turned down the request to sample in their homes this year, most of those being homes with four consecutive non-detect samples. He attributed the slight increase in detections above the MAL to adding 1,2-DCA back to select portions of OU8 in Layton, all four of which were determined to come from an inside source. Although many of the homes with four previous non-detect samples declined sampling this

year, all of those that did allow sampling had non-detect or below action level results.

Mr. Buck Ekstrom asked how aggressive the Air Force has been in contacting residences possibly affected by the sewer vapors in South Weber. Mr. Schwabenlander said some of the potentially affected homes have already been sampled, and all would have received mailers in the past. He said the pilot test on the additional sewer vent fan that is being installed shows great promise that it will fix the problem in South Weber homes.

Ms. Carly Siddoway said that air sampling summaries for each of the communities were provided in the breakout session packet. Also, Mr. Roginske and Mr. Schwabenlander would be available during the breakout sessions to address indoor air sampling program questions from RAB members.

Agenda Item #4. Break/Breakout Sessions

RAB members broke into small groups, by community, to meet with AFCEC-Hill project managers to discuss items in more detail and any other issues of concern. Informational material provided during the breakout sessions is attached (Attachment 5).

Mr. Schwabenlander presented the OU15 Remedial Investigation (RI) (Attachment 6). The RI is one of the milestones in the cleanup process and examines all the data that has been collected about the site. The RI combines conceptual site models, operable unit-specific data evaluation and a baseline risk assessment and summarizes the findings into a final conclusion so future decisions about the site can be made.

The OU15 investigative areas are almost exclusively off-base in the surrounding communities; but, vapor intrusion has also been investigated on-base. The CSM components examined for each area include the following:

- Vapor sources – Where are the vapors coming from?
- Chemicals of potential concern – Primarily TCE, but also other site-specific compounds
- Receptors – Off-base receptors are residents in local communities and on-base receptors are workers
- Migration pathways – How do the vapors get from the source to receptors?

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Contaminants of potential concern for each OU were listed on Slide 8. This lists the chemicals that are analyzed by the laboratory, depending on the location of the home.

The diagram illustrates a cross-section of a passive solar house. Key components and energy flows include:

- Roof:** Features a solar collector (solar panel) and a solar chimney.
- Walls:** Thick masonry walls with thermal mass, labeled "HEAT UP BY SUNLIGHT".
- Floors:** Thick concrete floors with thermal mass, labeled "HEAT UP BY SUNLIGHT".
- Windows:** Large south-facing windows labeled "GLASS IN FRONT".
- Interior:** Shows a living area with a fireplace, a kitchen, and a bedroom. A circular arrow indicates "CIRCULATING AIR".
- Exterior:** Includes a "SHEDDED GARAGE" with a red car, a "GLASS IN COURT", and a "SHEDDED PORCH".
- Foundation:** A "GRAVEL FILL" layer is shown below the foundation.
- Energy Flow:** Arrows indicate "SOLAR RADIATION" entering through the windows and roof, and "HEAT LOSS" occurring through the walls, roof, and floor.
- Labels:** "PASSIVE SOLAR HOUSE", "SOLAR CHIMNEY", "SOLAR COLLECTOR", "THERMAL MASS", "HEAT UP BY SUNLIGHT", "GLASS IN FRONT", "SHEDDED GARAGE", "GLASS IN COURT", "SHEDDED PORCH", "GRAVEL FILL", "SOLAR RADIATION", "HEAT LOSS".

A diagram of the migration pathways was provided on Slide 9. Contaminant vapors from the groundwater can enter the home through cracks and gaps in the foundation, or through utility lines such as the sewer drain lines in South Weber.

- Indoor air samples
- Outdoor air samples
- Crawl space air samples
- Soil gas samples
- Water table samples
- Residential water sampling (e.g., sumps)
- Real-time analytical survey (i.e., HAPSITE)
- Preferential pathway sampling (e.g., field drains, sewer headspace) – wherever it may be easier for the vapors to move through than soil

Mr. Schwabenlander said there are no residential buildings affected by vapor intrusion on base. Receptors include workers in shops, offices, warehouse and other buildings related to industrial and military

operations on the base. Because the receptors do not live in the buildings that are potentially affected, the exposure is different (less time spent at work versus a residence).

The primary data collected to build the on-base CMS include the following:

- Indoor air samples
- Outdoor air samples
- Real-time analytical survey (i.e., HAPSITE)
- Building pressure manipulation – In buildings identified as susceptible to vapor intrusion, air pressure was manipulated to try and simulate worse conditions, thus showing vapor intrusion, if present.

Operable Unit-Specific Data Evaluation

Off-base Evaluation. Data collected between January 2000 and April 2013 were evaluated as part of the indoor air sampling effort. More than 8,500 indoor air samples were collected from approximately 2,000 residences. Of these, 233 residences (12 percent) had a detection above the MAL. Mr. Schwabenlander noted that many of these detections occurred prior to the widespread use of the real-time air monitoring HAPSITE. He said it is probable that many of these detections could be attributed to indoor sources, but without the HAPSITE data, it is difficult to be sure. “Significant” vapor intrusion has not been detected at 90 to 95 percent of the approximately 2,000 residences. “Significant” in this context means a detection above an action level caused by vapor intrusion.

Mr. Schwabenlander provided a map of Operable Unit 6 (OU6) in Riverdale as an example of an off-base evaluation on Slide 15. The map indicated the indoor air sampling results for each home that was sampled. Homes with non-detect results were indicated by a white box while homes with detections were indicated by a colored box. Homes with detections that were verified and attributed to vapor intrusion were colored differently from homes that were not.

After conducting the OU-specific evaluations, Mr. Schwabenlander said they looked at all the data and came to the overall conclusions:

- Significant vapor intrusion is not occurring in OU4 (Riverdale/South Weber), OU9 (Sunset) or OU10 (Clearfield/Sunset)
- Significant vapor intrusion is occurring via a preferential pathway (a sewer line that is receiving contaminated groundwater from a base groundwater extraction system) in OU1 and OU2 (both in South Weber)
- Significant vapor intrusion is occurring in some residences in OU5 (Sunset/Clinton), OU6 (Riverdale), OU8 (Layton) and OU12 (Roy)
 - Primarily occurs where contaminated groundwater is near the ground surface
 - May also occur via preferential pathways (a sewer or drain line that has received contaminated groundwater), but has only been confirmed in one home in OU8

On-base Evaluation. Mr. Schwabenlander said vapor intrusion has been investigated in some structures and buildings on base, but only two structures warrant additional investigation or remediation.

- Western Office Trailer (OU2) – Vapor intrusion may be occurring at this trailer, but it is occupied less than one hour a week. Mr. Schwabenlander said that remediation at this trailer is not warranted at this time, but if needed, the skirt may be removed off the trailer to allow venting.
- Building 265 (OU8) – This building was put under pressurized conditions beyond what would be considered normal to determine if vapor intrusion could ever occur at this site. During the pressurization there were uncertainties about the results, which warrants additional monitoring for TCE in the building.

Baseline Risk Assessment

Mr. Schwabenlander said a baseline risk assessment is conducted to determine risk, both cancer and non-cancer, for OU15 as a whole. He said the assessment evaluates all the data collected (all types of samples, even those collected prior to the installation of a VIMS) and takes the most conservative and worst-case detection at each home or structure (prior to the installation of a VIMS) to calculate risk.

- Cancer Risk Output
 - Excess lifetime cancer risk (ELCR) – The risk of developing cancer due to a chemical exposure beyond the normal risk of an individual developing cancer in a lifetime
 - American Cancer Society states that the average lifetime risk of developing cancer is around 42 percent for men and 37 percent for women
 - National Oil and Hazardous Substances Pollution Contingency Plan (NCP) defines acceptable range as between 1 in 1,000,000 to 1 in 10,000
 - Action level for OU15 ELCR was conservatively set at 1 in 100,000
 - Mr. Case explained that if a home was at the OU15 ELCR action level of 1 in 100,000, for a man with a 42 percent risk of cancer it would make the risk increase to 42.00001 percent
- Non-cancer Risk Output
 - Hazard index (HI)
 - NCP specified an HI value of 1.0 as the OU15 action level

In order to know if significant vapor intrusion is occurring and causing unacceptable risk, a comparison of the actual sampling data that was evaluated at each home or structure is made against the ELCR and HI action levels.

Major Uncertainties. Mr. Schwabenlander said the risk assumptions made for OU15 are complex and are likely conservative (overestimated). This is due to the following reasons:

- Some detections corresponding to unacceptable risks or hazards may be attributed to indoor sources and not actual vapor intrusion.
- Looking at the worst-case detections at each home, rather than an average over time, may have overestimated risk for that location.

Key Findings of the Risk Assessment.

- Off-base
 - ELCRs greater than 1 in 100,000 or HIs greater than 1.0
 - OUs 1, 5, 6, 8 and 12
 - TCE and 1,2-DCA were identified as risk drivers (1,2-DCA only in select areas of OU8)
 - Only one exceedance of the HI criteria at OU1, most likely from sewer-gas vapor intrusion
 - At OU2 there were no buildings (homes) with exceedances; however, the same sewer line affecting OU1 is causing intermittent detections in OU2
 - ELCRs less than 1 in 100,000 or HIs less than 1.0
 - OU4 or OU9: No vapor intrusion-related detections to calculate risk
 - OU10: There was one location with an HI greater than 1.0 but it was attributed to an indoor source
- On-base
 - No on-base buildings were found to have significant vapor intrusion
 - Further air monitoring at Building 265 (OU8) is warranted

Summary and Conclusions

Now that the RI is completed, the next phase is the Feasibility Study (FS), which will be presented to the RAB at this meeting. The OU15 FS will focus on the following:

- TCE at off-base OUs 1, 2, 5, 6 and 12
- TCE at OUs 1 and 2 need only be addressed in terms of sewer gas intrusion, not the traditional subsurface to indoor air pathway
- TCE and 1,2-DCA at off-base OU8
- Further monitoring of indoor air TCE at on-base Building 265

Mr. Travis Bonsteel asked how the HI value of 1.0 is calculated, particularly because “non-cancer risks” would seem to be a big umbrella of possible risks. Mr. Schwabenlander said it is a risk value used to evaluate human health effects (noncancer) from chemicals to which an individual is exposed, but he was unsure how it was determined. Mr. Wray said that an example of a non-cancer risk would be something like liver problems, fetal heart issues, or low birth weight. Mr. Harris suggested that Mr. Bonsteel speak with a risk assessor from the EPA to ask how the HI is calculated. [Mr. Harris provided Mr. Bonsteel with the contact information for an EPA Risk Assessor who was referred by Ms. Bourgeois.]

Agenda Item #6. Operable Unit 15 Feasibility Study

Mr. Schwabenlander presented the OU15 FS to the RAB (Attachment 7). Now that the RI is completed, the next phase in the cleanup process is the FS. The FS identifies remedial action objectives and general response actions for contaminated indoor air due to vapor intrusion. The FS identifies potential treatment technologies and screens them based on effectiveness, implementability and relative cost, and assembles those technologies into remedial alternatives capable of meeting the objectives. Once alternatives are assembled, the FS conducts a detailed analysis of the remedial technologies based on the nine NCP criteria (listed later in the presentation).

OU15 Background. OU15 focuses on the contaminated indoor air due to vapor intrusion, addressing both on- and off-base areas identified as having potential for vapor intrusion. The current and future exposure scenarios for both the on- and off-base areas are listed below:

- On-base Exposure Scenarios
 - Current scenario: Building 265 – only building with potential for vapor intrusion
 - Future scenario: New construction in on-base areas with potential for vapor intrusion (OUs 1, 2, 4, 5, 6, 8, 10, 11, 12 – and any new areas that may be identified)
- Off-base Exposure Scenarios
 - Current and future scenarios:
 - OUs 1, 2, 5, 6, 8 and 12
 - OUs 1 and 2 only need to address sewer gas intrusion
 - No significant vapor intrusion to be addressed at OUs 4, 9 and 10



Preliminary COCs

Scenario	Operable Unit(s)	Preliminary COCs
Off-Base Current and Future	OUs 1 and 2 (sewer gas intrusion only) OUs 5, 6 and 12	Trichloroethene (TCE) TCE
On-Base Current	OU 8 (imp. only)	1,2-dichloroethane and TCE
On-Base Future	OUs 1, 2, 4, 5, 6, 8, 10, 11 and 12*	TCE

* In addition to the known on-base areas with the potential to cause VI, the on-base future scenario also includes areas that may be identified in the future.

Mr. Schwabenlander said the 2003 TCRA is an important piece of the OU15 background to consider. The TCRA specified the interim mitigation measures to be taken and is what the base has been operating under to sample and install VIMS since then. More than 120 VIMS (previously called vapor removal systems or VRSs) have been installed under the TCRA.

Chemicals of Concern. The FS identifies the preliminary chemicals of concern, which are listed on Slide 13.

Objectives and Goals. The remedial action objective at OU15 is to “prevent human exposure to OU15 indoor air chemicals of concern concentrations that are present due to vapor intrusion and are above their respective risk-based action levels.” A list of on- and off-base preliminary remediation goals, or action levels, is shown on Slide 16.

Preliminary Remediation Goals

Preliminary Chemical of Concern	Indoor Air Action Level (ppbv)		Applicable Scenarios		
	Residential	Commercial	Off-Base Current/Future	On-Base Current	On-Base Future
Benzene	1.1	5.0			■
Carbon Tetrachloride	0.75	3.2			■
1,1-dichloroethane (DCA)	4.4	19			■
1,2-dichloroethane (DCE)	0.27	1.2	■		
1,1-dichloroethene (DCE)	53	220			■
cis-1,2-dichloroethene (DCE)	N/A	N/A			■
Tetrachloroethene (PCE)	6.2	27			■
1,1,1-trichloroethene (TCE)	950	4,000			■
Trichloroethene (TCE)	0.39	1.6	■	■	
trans-1,2-dichloroethene (DCE)	N/A	N/A			■
1,2,3-trichloropropene	0.051	0.21			■
Vinyl Chloride	0.67	11			■

N/A: Toxicity data not available. ppbv=Parts per billion by volume.
 ■ Action levels are based on a cancer risk of 1 in 100,000 or a Hazard Quotient of 1.0.
 ■ Not all preliminary COCs are applicable to each OU and exposure scenario.
 ■ Indoor Air Action Levels are presented as two significant figures.

Slide 16

Screening of Remedial Alternatives

- ✓ No Action: for comparison purposes
- ✗ Institutional Controls
- ✓ Indoor Air Monitoring
- ✓ Building VI Mitigation
 - ✓ Subslab depressurization, floor sealing
 - ✗ Vapor Barrier and high-permeability Vapor Layer
- ✓ Building Environmental Controls
- ✓ Sewer Drain VI Mitigation
- ✓ Dewatering Measures
- ✗ VI Contaminant Source Removal-Addressed at each OU

Integrity • Service • Excellence Slide 18

Screening of Remedial Activities. The next step in the FS process is to screen remedial alternatives by identifying a host of response remedies. Slide 18 shows the general list of potential alternatives that made it through initial screening and a few that were rejected from the list.

Mr. Schwabenlander said Institutional Controls were screened out because they would be difficult to implement. At other OUs it is easy to build a fence around contaminated areas to restrict use, but because OU15 deals solely with indoor air the only equivalent would be preventing people from breathing the air in their own home, which is not possible. Vapor barriers and high-permeability vapor layers were screened out because the technologies only apply to new construction. Vapor Intrusion Source Removal was screened out because it is already addressed at each individual OU.

Development of Remedial Alternatives. Once potential alternatives are identified and screened, the remaining alternatives are further defined and developed, so a preferred alternative can be selected in the Proposed Plan. Before proceeding, Mr. Schwabenlander said it is important to note a few things about OU15:

- OU15 is unique in that there is only one contaminated medium (indoor air) and one exposure pathway (inhalation)
- Vapor sources are addressed as part of OUs that address soil and groundwater contamination
- Alternative development focused on preventing exposure, not treating the vapor sources
- Remedy must be flexible enough to address a wide variety of structures/site conditions so the base can mitigate vapor intrusion and outline plan in one Record of Decision and one Remedial Design/Remedial Action report (one big toolbox with a variety of tools at hand)
- Interim remedy under the TCRA (monitoring and mitigation) has been successful

As a result, there are two alternatives being considered in the FS. While other alternatives were considered, Mr. Schwabenlander said these were the only ones that made sense.

Alternative 1: No Action

Alternative 2: Monitoring and Mitigation

Mr. Schwabenlander said the No Action alternative is included for baseline comparison only and will obviously not be selected as the remedy. Alternative 2 is very similar to the interim remedy set forth in the TCRA in 2003. He said that it includes a large mitigation component that allows the base to select the most appropriate treatment option to mitigate concentrations that exceed the action levels, making it a very robust alternative.

Evaluation of Remedial Alternatives. The NCP requires that remedial alternatives developed in the FS be evaluated against nine criteria:

- Threshold Criteria
 1. Protection of human health and the environment

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs), or rules and regulations established by state and federal regulators
- Balancing Criteria
 3. Long-term effectiveness and permanence
 4. Reduction of toxicity, mobility or volume of contaminants through treatment
 5. Short-term effectiveness (while implementing)
 6. Implementability
 7. Cost
- Modifying Criteria
 8. State acceptance
 9. Community acceptance (solicited during Proposed Plan phase)

Operable Unit 15 Remedial Alternative Evaluation		Alternatives		
		1	2	
		No Action	Monitoring and Mitigation	
NCP Alternative Evaluation Criteria	Threshold	Overall Protection of Human Health and the Environment	Not Protective	Protective
		Compliance with ARARs	Compliant	Compliant
		Long-Term Effectiveness and Permanence	Poor	Moderate/Adequate
	Balancing	Reduce Toxicity, Mobility, or Volume	Poor	Good
		Short-Term Effectiveness	Poor	Good
		Implementability	Good	Good
	Modifying	Present Value Cost (millions of dollars)	\$0	\$8.1
		Regulatory Acceptance	--	--
		Community Acceptance	--	--

ARARs = Applicable or relevant and appropriate requirement.
NCP = National Contingency Plan.

Slide 25

Slide 25 shows a table with the OU15 Remedial Alternative Evaluation. Alternative 2 received a moderate/adequate on long-term effectiveness and permanence because the VIMS that are installed to mitigate indoor air are not permanent, but are effective at mitigating vapors. The cost of \$8.1 million was based on assumptions on the number of samples to collect and VIMS installed, plus or minus 15 percent.

Summary and Conclusions. Alternative 2 meets the threshold and balancing criteria and is essentially the same as what has been done since the TCRA in 2003. The FS is currently in review and once final, the Proposed Plan will be prepared to provide an opportunity for public comment of the proposed remedial alternative. Once the Proposed Plan is completed and public comments are considered, the selected remedy will be presented in a Record of Decision that will be issued.

Mr. Schwabenlander said the schedule for the documents is currently as follows, but may slip depending on review time periods:

- October 2016: FS Report
- January 2017: Proposed Plan, 30-day public comment period and public meeting
- March 2017: Record of Decision

Mr. Roginske said the RAB has the opportunity to provide early feedback and input on the FS which could help in the preparation of the Proposed Plan. Once the FS is through regulator review and finalized, the RAB will be notified and will have an opportunity to review the document. Mr. Roginske said the Air Force would greatly appreciate any input from the RAB.

Agenda Item #7. Public Comment Opportunity

Mr. Sueltenfuss asked if there were any members of the public in the audience who would like an opportunity to comment. There were no comments at this time.

Agenda Item #8. Potential Agenda Items for Next Hill AFB RAB Meeting

Potential Agenda Items for the October 27 Hill AFB RAB Meeting

- Operable Unit 15 (Indoor Air Sampling Program) Proposed Plan
- Environmental Protection Agency – Technical Assistance Grant Process
- Operable Unit 8 (On-base) Treatability Study Results
- Status of Zero Valent Iron (ZVI)/Clay Mixing in Operable Unit 2 (On-base/South Weber)
- Operable Unit 10 (Clearfield) Treatability Study Results

- Operable Unit 14 (On-base) Removal Action
- Performance-based Remediation (PBR) Contract Status Update
- Operable Unit 5 (Sunset/Clinton) Update

Item #9. Adjournment

Mr. Wray thanked Mr. Schwabenlander for providing interesting and informative presentations as the sole presenter at the meeting. Mr. Wray told RAB members that the Air Force could not do what they need to do without the EA team and that he appreciates their support. He encouraged RAB members to contact the Air Force with any questions or concerns.

Meeting adjourned at 8:45 p.m.

Attachments:

1. Agenda
2. Action Item List
3. RAB Schedule
4. Presentation Slides – Operable Unit 15 – 2016 Indoor Air Program Update
5. Breakout Materials
6. Presentation Slides – Operable Unit 15 – Remedial Investigation
7. Presentation Slides – Operable Unit 15 – Feasibility Study

**Hill AFB
Restoration Advisory Board
Meeting**

6:30 p.m., Aug. 11, 2016

**Sunset City Building (Sunset Room)
200 West 1300 North
Sunset, Utah**

Pre-RAB Meeting Training Session

6 p.m. **Long-term Monitoring Well Network – Optimization**
..... Dr. Chuck Holbert, CH2M

RAB Meeting Agenda

6:30 p.m. **Welcome**..... Darrin Wray, RAB Air Force Co-Chair

RAB Business Tim Sueltenfuss, RAB Facilitator

- Action Items
 - Action Item List
 - RAB Schedule
 - Operable Unit Tour Report
 - Enhanced Reductive Dechlorination (ERD) Injection Tour Report
- Operable Unit 12 (Roy) Explanation of Significant Differences Update
..... Jason Wilde, AFCEC-Hill
- Operable Unit 4 (South Weber/Riverdale) Updated Revised Proposed Plan Update
..... Mark Loucks, AFCEC-Hill

Operable Unit 15 (Indoor Air Sampling Program) – Review of 2015-2016 Program
..... Mark Roginske (AFCEC-Hill) and Corey Schwabenlander (CH2M)

Breakout Sessions

OU 15 Remedial Investigation
..... Mark Roginske (AFCEC-Hill) and Corey Schwabenlander (CH2M)

Break

OU 15 Feasibility Study
..... Mark Roginske (AFCEC-Hill) and Corey Schwabenlander (CH2M)

Public Comment Opportunity

Agenda Items for Oct. 27, 2016 Meeting

Adjourn

Acronym Definitions

The following acronyms are commonly used in cleanup program reports and documents.

AFB: Air Force Base	MPO: Minimum Performance Objectives
AFCEC: Air Force Civil Engineering Center	MRL: Minimal Risk Level
ARA: Alliance for Risk Assessment	NAS: National Academies of Science
ARARs: Applicable or Relevant and Appropriate Requirements	NIT: North Interceptor Trench
ASTP: Air Stripper Treatment Plant	NDSID: North Davis Sewer Improvement District
ASU: Arizona State University	NPL: National Priorities List
ATSDR: Agency for Toxic Substances and Disease Registry	O&M: Operations and Maintenance
BTEXN: Benzene, Toluene, Ethylbenzene, Xylenes, and Naphtalene	OU: Operable Unit
BRA: Baseline Risk Assessment	OES: Optimized Exit Strategy
CE: Civil Engineering	PA/SI: Preliminary Assessment/Site Inspection
CERCLA: Comprehensive Environmental Response, Compensation and Liability Act	PBR: Performance-Based Remediation
CRP: Community Relations Plan	PCB: Polychlorinated Biphenyls
CWSID: Central Weber Sewer Improvement District	PCE: Perchloroethylene (tetrachloroethene)
DCA: Dichloroethane	PMP: Performance Monitoring Plan
DCE: Dichloroethene	PP: Proposed Plan
DNAPL: Dense Non-aqueous Phase Liquid	PPB: Parts per billion
DOD: Department of Defense	PPBV: Parts per billion by volume
EA: Enhanced Attenuation	PPM: Parts per million
EA: Environmental Assessment	PRB: Permeable Reactive Barrier
EE/CA: Engineering Evaluation/Cost Analysis	QA/QC: Quality Assurance/Quality Control
EPA: Environmental Protection Agency	RAB: Restoration Advisory Board
ERA: Environmental Restoration Account	RCRA: Resource Conservation and Recovery Act
ERD: Enhanced Reductive Dechlorination	RA: Remedial Action
ERP-O: Environmental Restoration Program Optimization	RC: Response Complete
EVO: Emulsified Vegetable Oil	RD: Remedial Design
EUL: Enhanced Use Lease	RfC: Reference Concentration
FFA: Federal Facilities Agreement	RFP: Request for Proposal
FS: Feasibility Study	RI: Remedial Investigation
FY: Fiscal Year	RIP: Remedy in Place
FYR: Five-Year Review	ROD: Record of Decision
GIS: Geographic Information System	RPM: Remedial Project Manager
IRA: Interim Remedial Action	RSL: Regional Screening Level
IRP: Installation Restoration Program	SC: Site Closeout
IST: Installation Support Team	SRS: Source Recovery System
IWTP: Industrial Wastewater Treatment Plant	SVE: Soil Vapor Extraction
LNAPL: Light Non-aqueous Phase Liquid	SVOC: Semi-volatile Organic Compound
LTM: Long-term monitoring	TAG: Technical Assistance Grant
LUST: Leaking Underground Storage Tank	TARS: Tooele Army Rail Shop
MAL: Mitigation Action Level	TCA: Trichloroethane
MCL: Maximum Contaminant Level	TCE: Trichloroethene
MD: Munitions Debris	TPH: Total Petroleum Hydrocarbons
MEC: Munitions and Explosives of Concern	UDEQ: Utah Department of Environmental Quality
MMRP: Military Munitions Response Program	UTTR: Utah Test and Training Range
MRS: Munitions Response Site	VI: Vapor Intrusion
MTBE: Methyl Tertiary Butyl Ether	VOC: Volatile Organic Compound
MNA: Monitored Natural Attenuation	VIMS: Vapor Intrusion Mitigation System
	VRS: Vapor Removal System
	ZVI: Zero-Valent Iron
	µg/L: Micrograms per liter

Hill Air Force Base 2016 RAB Action Items

Item No.	Action Item	Requester	Date Requested	Action Taken	Responsible Party	Target Completion Date	Status
2016-2	Ask RAB if they would like to form a work group to review the 2018 Five-year Review.	C. Brown	4/28/2016 RAB Mtg		C. Brown	8/1/2017	In progress
2016-1	Notify RAB when Operable Unit 12 Explanation of Significant Differences (ESD) is available	C. Brown	4/28/2016 RAB Mtg		C. Brown	6/15/2016	In progress
2015-1	Request for information (cleanup site info, RAB schedule, RAB mtg material, etc.) easily accessible from web	Various RAB members	8/27/15 RAB Mtg	1/2016: In progress, working with Hill PA to create link on Hill AFB website 1/28/16: Hill Public Affairs will build the site in Feb. 2016 3/1/16: Air Force is migrating to different format and would require all linked pages (environmental included) to re-load all documents. Decision was made to wait until migration is completed. 6/1/2016: AF migration in next few weeks.	M. Loucks B. Fisher D. Harris	9/1/2016	In progress
2015-9	Post air sampling notice on Hill AFB website	Various RAB members	10/29/2015 RAB Mtg	12/29/2015: Request made to add to webpage being created on Hill AFB website 1/28/2016: Will post once website up and running	B. Fisher	1/28/2016	In progress
2015-5	Provide tour opportunity for RAB members to see bio-remediation injections	B. Gibson D. Johnson E. Sorensen	10/29/2015 RAB Mtg	6/22/2016: OU 9 1100 Area (late July) OU 12 On-base (July) EA/CH2M will look into possible dates 8/1/2016: ERD Injection tour at OU 9 Golf Course	M. Loucks C. Brown	8/1/2016	Complete
2015-7	Provide revised BASAP report to RAB once approved	B. Ekstrom	10/29/2015 RAB Mtg	1/2016: BASAP still in review 6/29/2016: Emailed RAB members link to AFCEC admin record website to access BASAP.	M. Roginske	3/1/2016	Complete
2016-4	Provide link to early environmental policy for Hill AFB.	D. Johnson	6/15/2016 OU Tour	Mark Loucks responded to Mr. Johnson's request and provided the information he requested.	M. Loucks	7/1/2016	Complete
2016-3	Research excavation work taking place along the south side of South Weber Drive near Operable Unit 4 to determine if it is associated with Hill AFB.	T. Long	4/28/2016 RAB Mtg	Jarrod looked into the work taking place in that location and reported back to Mayor Long that the work is not associated with Hill AFB or the environmental work.	C. Brown	5/1/2016	Complete

2015-8	Provide more information about the methodology used to make air sampling determinations (specifically in regards to graduation?)	B. Ekstrom	10/29/2015 RAB Mtg	1/2016 - Decision to graduate residents has been postponed to allow time to collect additional data	M. Roginske C. Schwablander	1/1/2016	Postponed
2015-11	Revise RAB Operating Procedures to reflect current status (website & membership)	C. Brown		1/13/2016: Changes have been made and approved internally, sent out to AFCEC PA, facilitator and RAB co-chairs for review 1/21/2016: Postponed to allow time to review and consider other options 3/1/2016: Directed to reopen 4/2016: Emailed revisions to RAB for review prior to vote at 4/28 RAB meeting.	Various	4/28/2016	Complete
2015-2	Provide OU site summary spreadsheet at RAB mtgs	Various RAB members	8/27/15 RAB Mtg & 10/29/2015 RAB Mtg	10/2015: Working to add exposure pathways column 1/28/2016: Provided at Hill AFB RAB Mtg	Various	1/28/2016	Complete
2015-6	Provide confidence interval about air sampling data to Clint Holm.	C. Holm	10/29/2015 RAB Mtg	1/12/2016: In progress - should be completed before RAB meeting 1/22/2016: Mark Roginske emailed Mr. Holm the data that was requested.	M. Roginske C. Schwablander	1/1/2016	Complete
2015-12	Conduct email vote for community member positions expiring end of 2015, according to current RAB OP	C. Brown	10/29/2015 RAB Mtg	12/15/15: Emailed RAB members to vote for community member positions. Vote due by Dec. 20	C. Brown	12/12/2015	Complete
2015-10	Email air sampling fact sheet to RAB members so they are aware of what residents are receiving	Various RAB members	10/29/2015 RAB Mtg	Emailed fact sheet to RAB members.	C. Brown	12/9/2015	Complete

Restoration Advisory Board Calendar

August 2016

RAB Meetings

2016	Thursday, Aug. 11	Sunset City Building
	Thursday, Oct. 27	Sunset City Building
2017	Thursday, Jan. 26	Sunset City Building
	Thursday, April 27	Sunset City Building

RAB Training

Aug. 11 Long-term Monitoring Well Optimization 6 p.m. (prior to RAB meeting)

Potential Future Trainings

- Cleanup Technologies – Pre-meeting Training
 - Bio-reactors
- Geology/Hydrogeology
- How plume maps are created

RAB Tours

July ?? Enhanced Reduction Dechlorination (ERD) Injection Tour

- Operable Unit 9 – 1100 Area (Late July)
- Operable Unit 12 – On-base (July)

Potential Future Tours

- Operable Unit 2 ZVI Implementation (Sept 2016)
- Operable Unit 4 Bio-reactors (Summer 2016)

Air Force Civil Engineer Center

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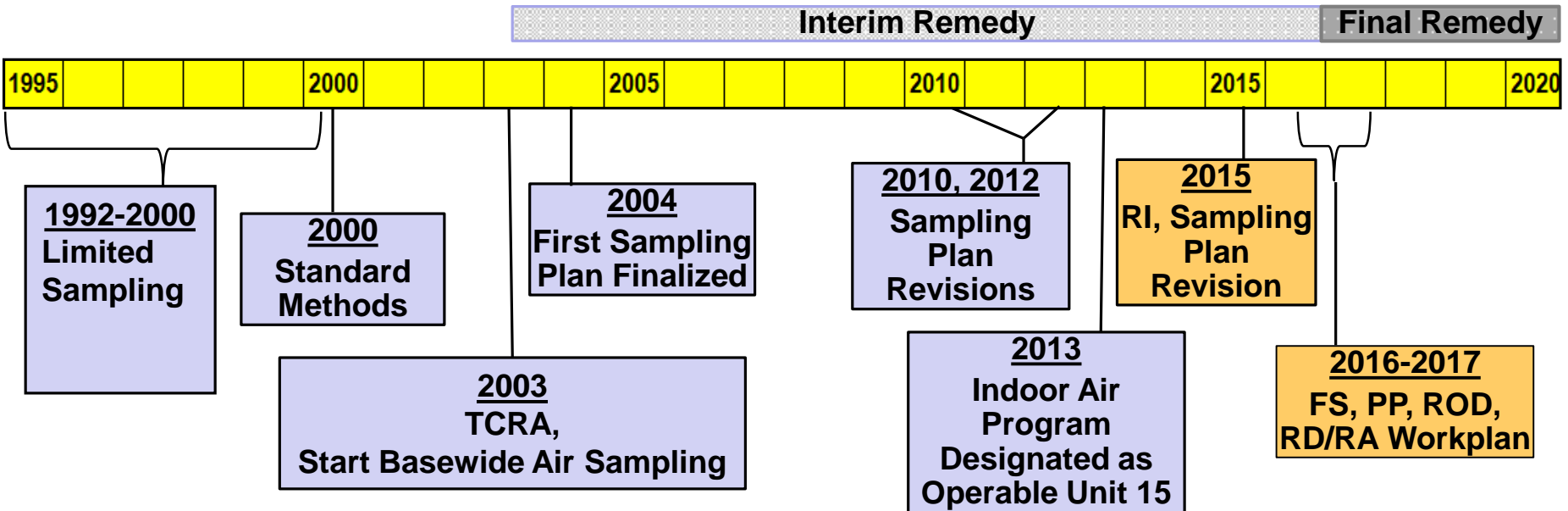


Indoor Air Sampling Program: *2015/2016 Heating Season Update*

**Mark Roginske, P.E. – AFCEC/CZOM Hill Section
Corey Schwabenlander, P.G. – EA Team
August 11, 2016**



OU 15 – CERCLA Process



- ❑ Estimated Schedule for Final Docs:
 - ❑ August 2016: RI Report
 - ❑ October 2016: FS Report (RAB)
 - ❑ January 2017: Proposed Plan
 - ❑ March 2017: ROD
 - ❑ June 2017: RD/RA Work Plan

ACRONYMS

FS = Feasibility Study
PP = Proposed Plan
RAB = Restoration Advisory Board
RD/RA = Remedial Design/Remedial Action
RI = Remedial Investigation
ROD = Record of Decision
TCRA = Time-Critical Removal Action



Indoor Air Program

■ Since January 2001...

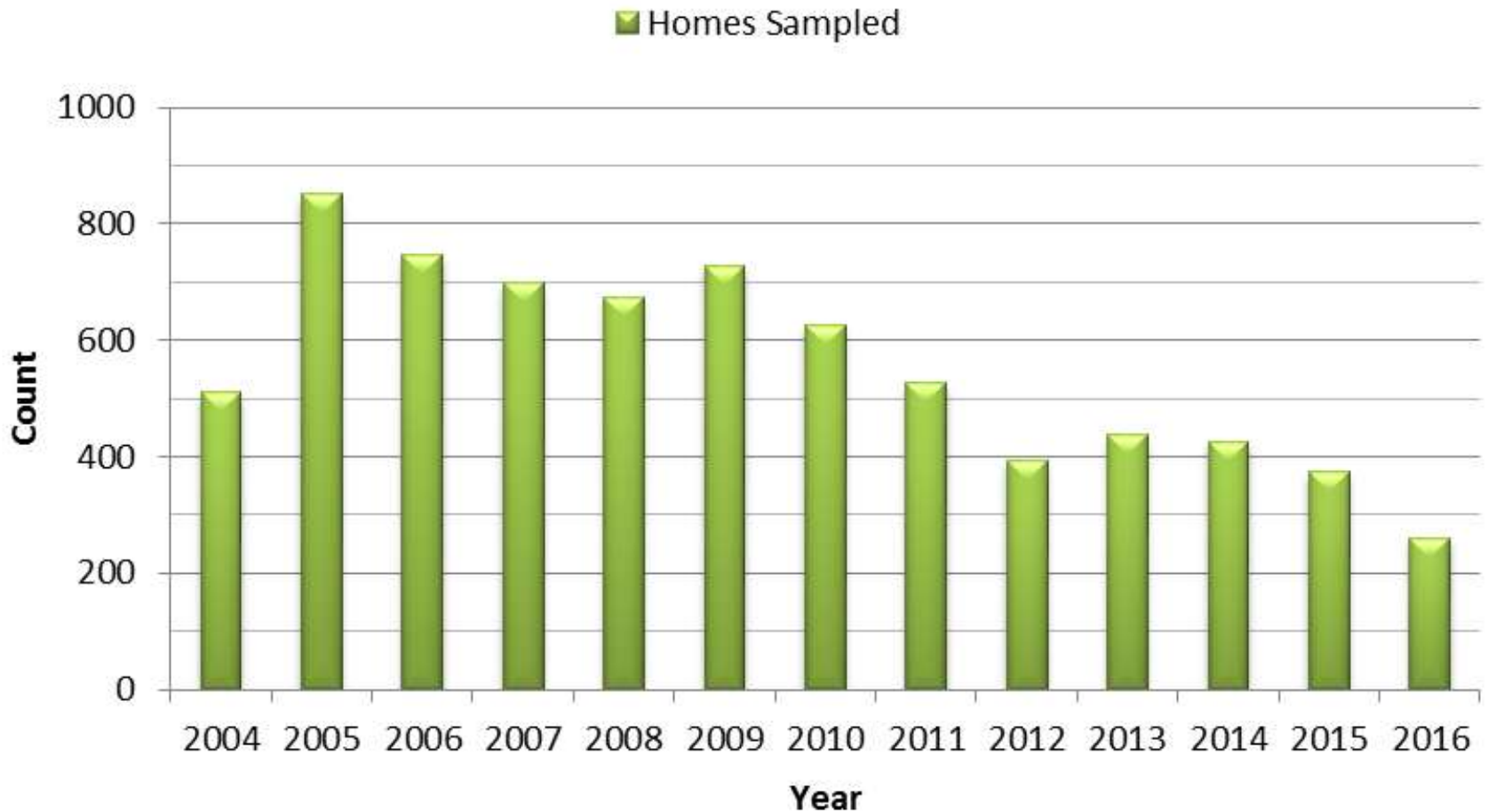
2,000+ homes sampled

9,000+ samples collected





Residences Sampled Since 2004





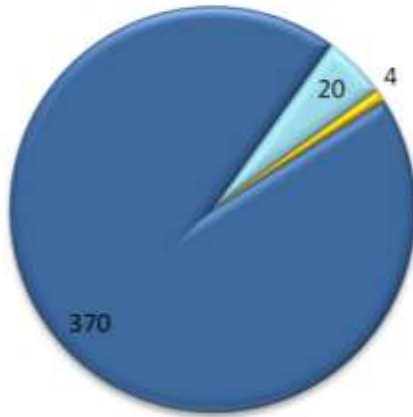
2015/2016 Heating Season – Total Residences Contacted

2014/2015

■ New Homes Sampled ■ Follow-Up Samples ■ Contacted but Not Sampled

**Total Homes
Contacted**

394

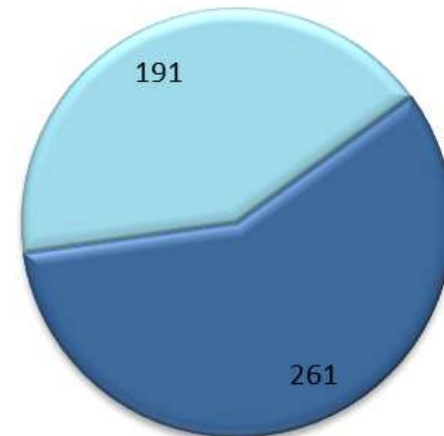


2015/2016

■ Follow-Up Samples ■ Contacted but Not Sampled

**Total Homes
Contacted**

452





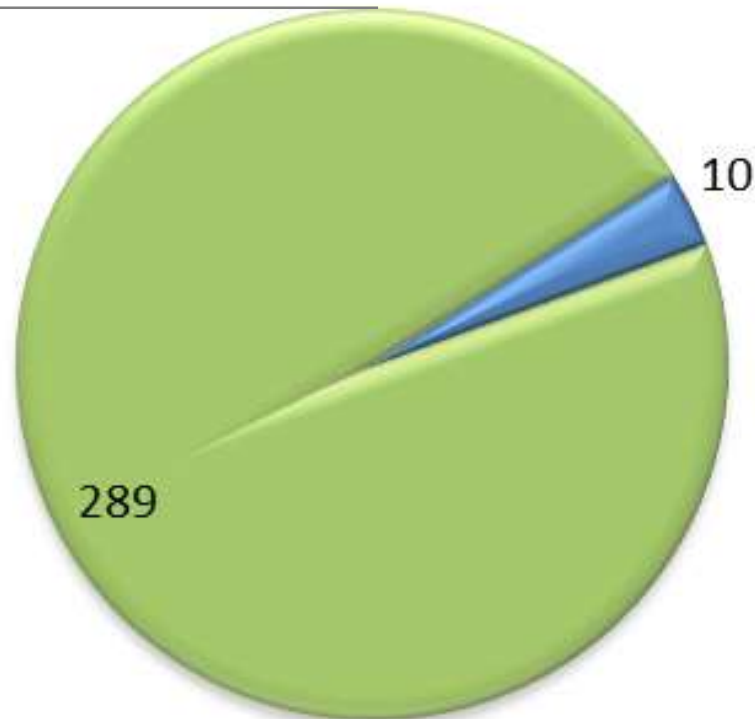
2014/2015 Heating Season – Total Samples Collected

■ Concentrations Below MAL ■ Concentrations Above MAL

**Total Homes
Contacted = 452**

**Total Homes
Sampled = 261**

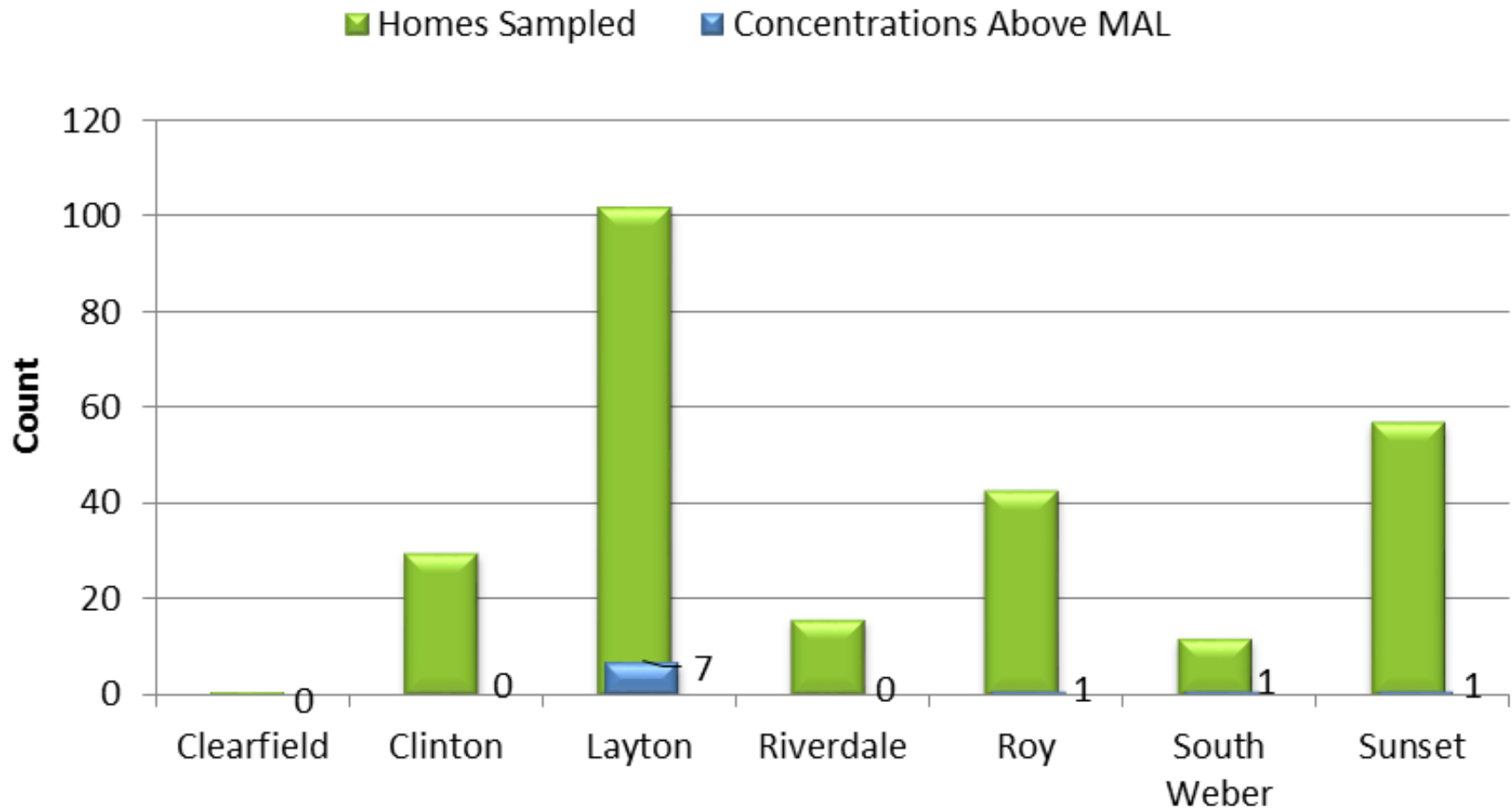
**Total Samples
Collected = 299**



*MAL = Mitigation Action Level



Detections by Location





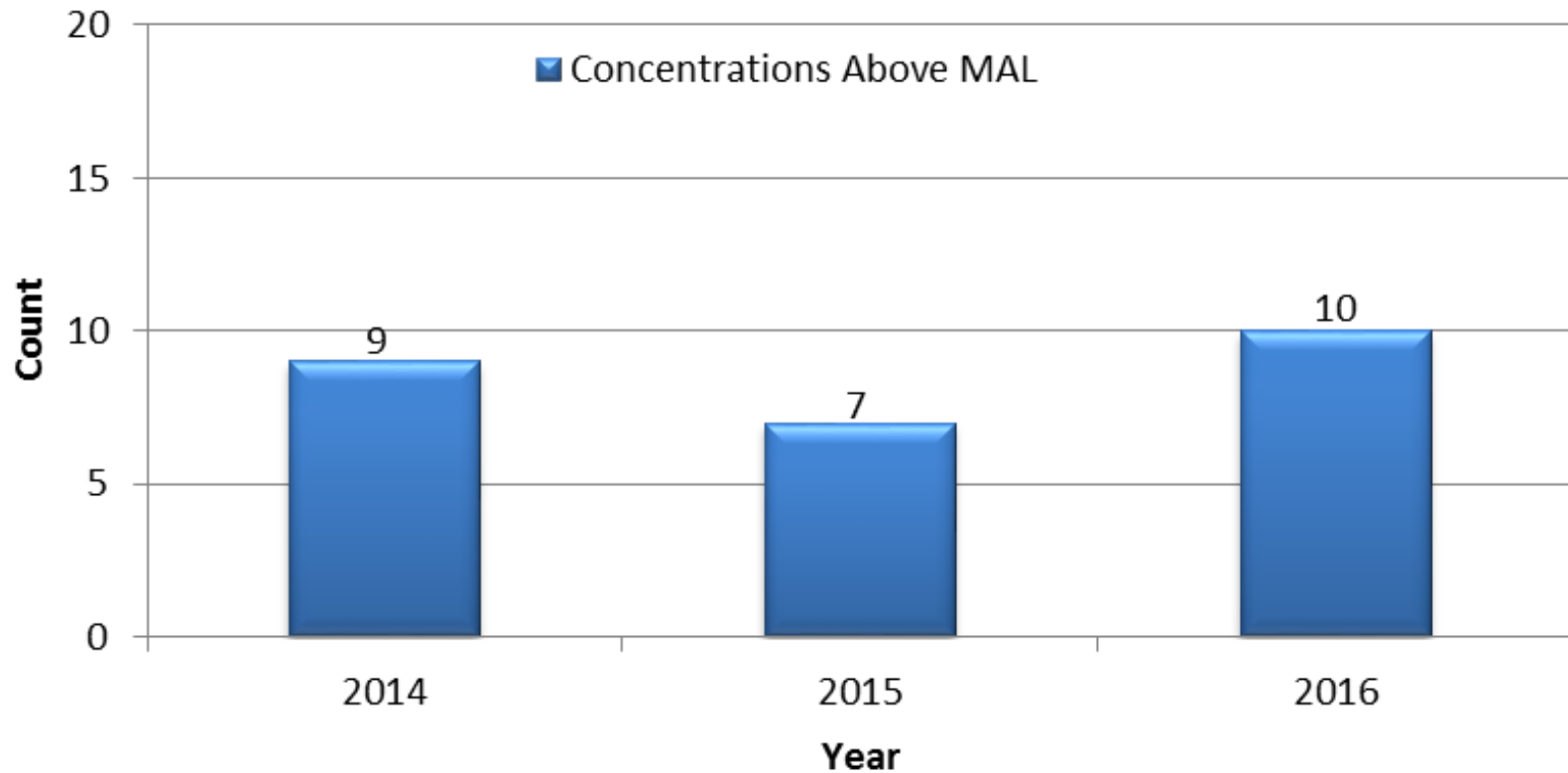
Detections above MAL Follow-up

- **Roy (OU 12) → 1 detection > MAL**
 - Resident did not grant permission to verify known products containing TCE have been removed.
- **South Weber (OU 2) → 1 detection > MAL**
 - Residence is located on the OU 1/OU 2 sewer line. Vent fan installation is in progress.
- **Sunset (OU 5) → 1 detection > MAL**
 - Further investigation is currently underway.
- **Layton (OU 8) → 7 detections > MAL**
 - Residence #1, #2, and #3: Background source identified.
 - Residence #4: Additional investigation is pending based on resident's availability.
 - Residence #5: VRS has been installed.
 - Residence #6: VRS has been installed.
 - Residence #7: Dewatering system has been upgraded. Confirmation sample result was less than the MAL.



3 Year Comparison

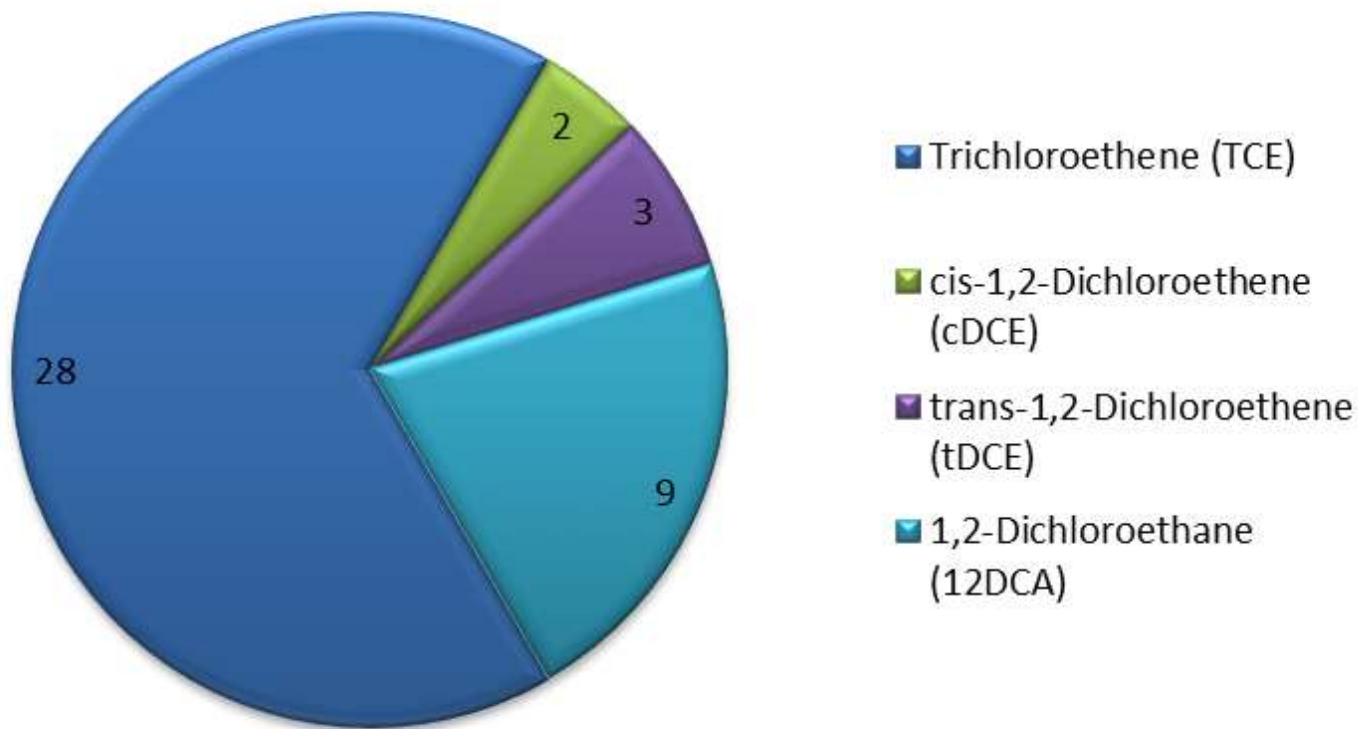
Concentrations Above MAL



*MAL = Mitigation Action Level

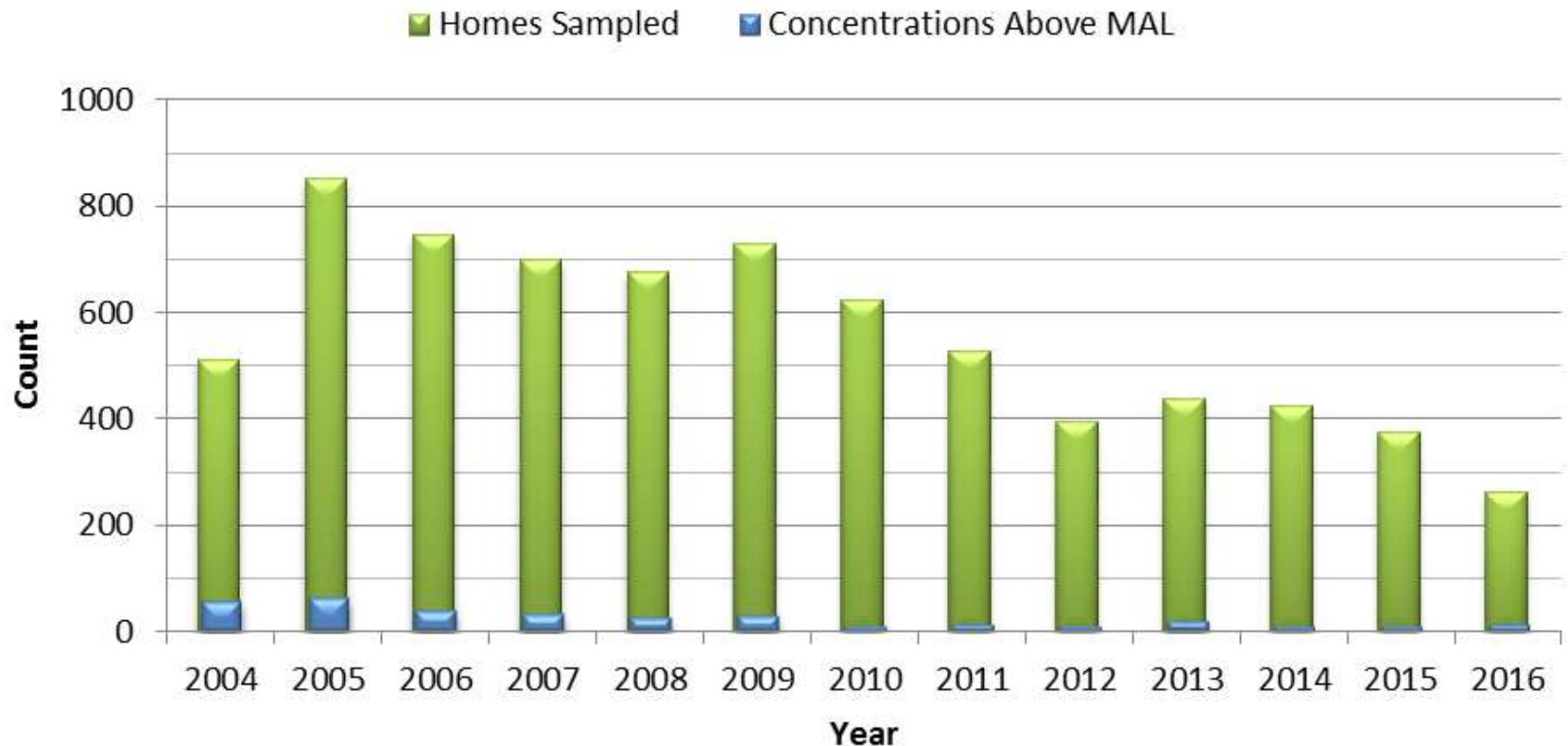


Chemicals Detected





Indoor Air Program Trends



*MAL = Mitigation Action Level



2015/2016 Results Summary

- Large number of residents declined additional sampling (many of those were residents with 4 previous consecutive NDs)
- Overall increased number of detections above the MAL is due to adding 1,2-DCA back to select portions of OU 8
- Background sources identified at all locations with 1,2-DCA detections above the MAL
- No houses with 4 previous consecutive NDs had a detection above the MAL



Questions?

Air Force Civil Engineer Center

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Operable Unit 15 – RI Report Summary

Mark Roginske, P.E. – AFCEC/CZOM Hill Section
Corey Schwabenlander, P.G. – EA Team
August 11, 2016



Outline

Outline



Outline

- ❑ **Hill AFB-Specific VI Conceptual Site Model (CSM)**
- ❑ **Operable Unit-Specific Data Evaluation**
- ❑ **Baseline Risk Assessment**
- ❑ **Summary and Conclusions**



Hill AFB-Specific VI CSM

Hill AFB-Specific VI Conceptual Site Model



Hill AFB-Specific VI CSM

☐ **Key Components**

☐ **Investigation Areas**

- ☐ **Off-Base**
- ☐ **On-Base**

☐ **CSM Components**

- ☐ **Vapor Sources**
- ☐ **Chemicals of Potential Concern (COPCs)**
- ☐ **Receptors**
- ☐ **Migration Pathways**

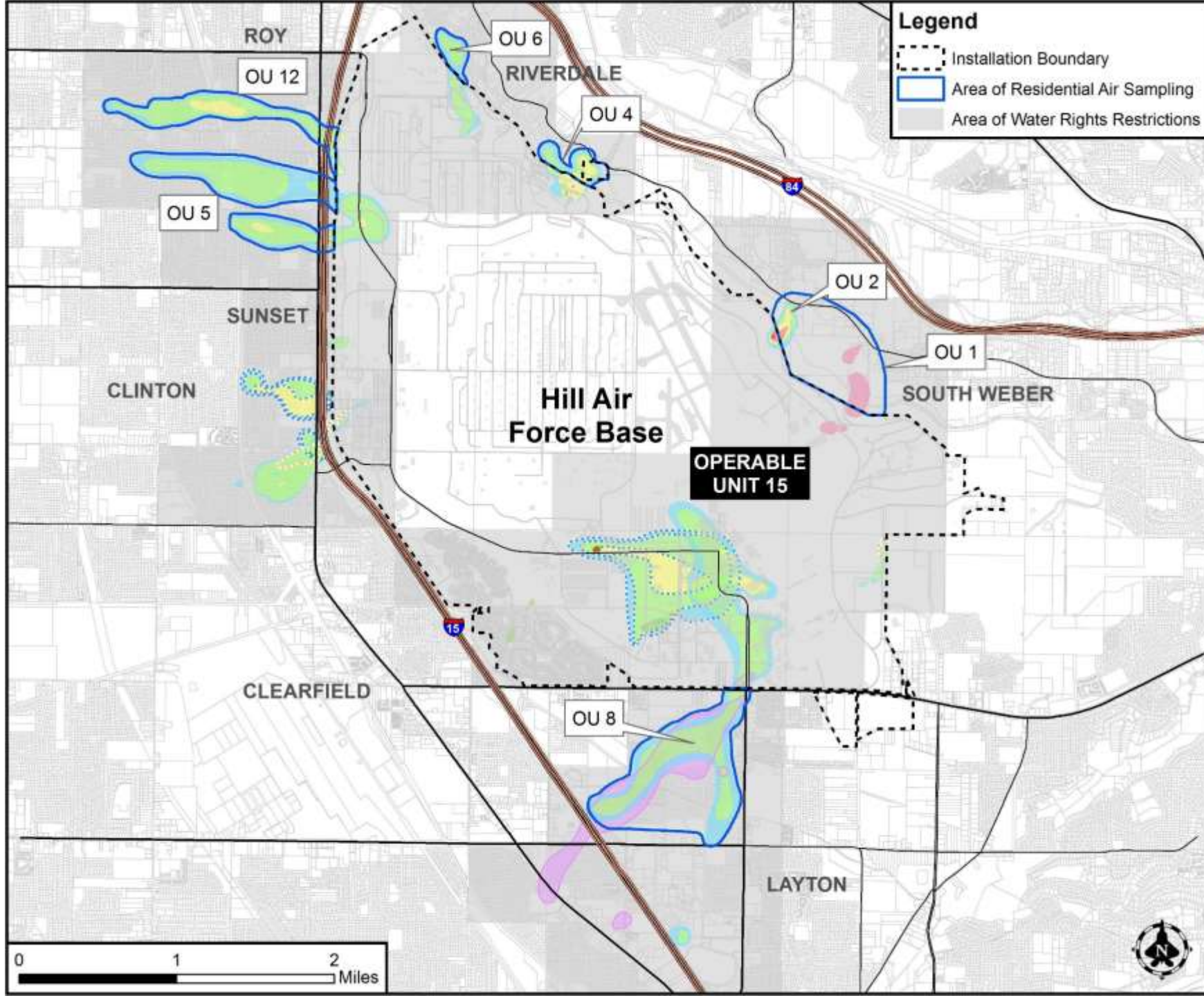


Hill AFB-Specific VI CSM

❑ Off-Base VI CSM

- ❑ Vapor Sources: VOC GW plumes**
- ❑ COPCs: Chemicals in specific groundwater plumes**
- ❑ Receptors: Residential communities surrounding the Base**
- ❑ Migration Pathways**

Off-Base Vapor Sources

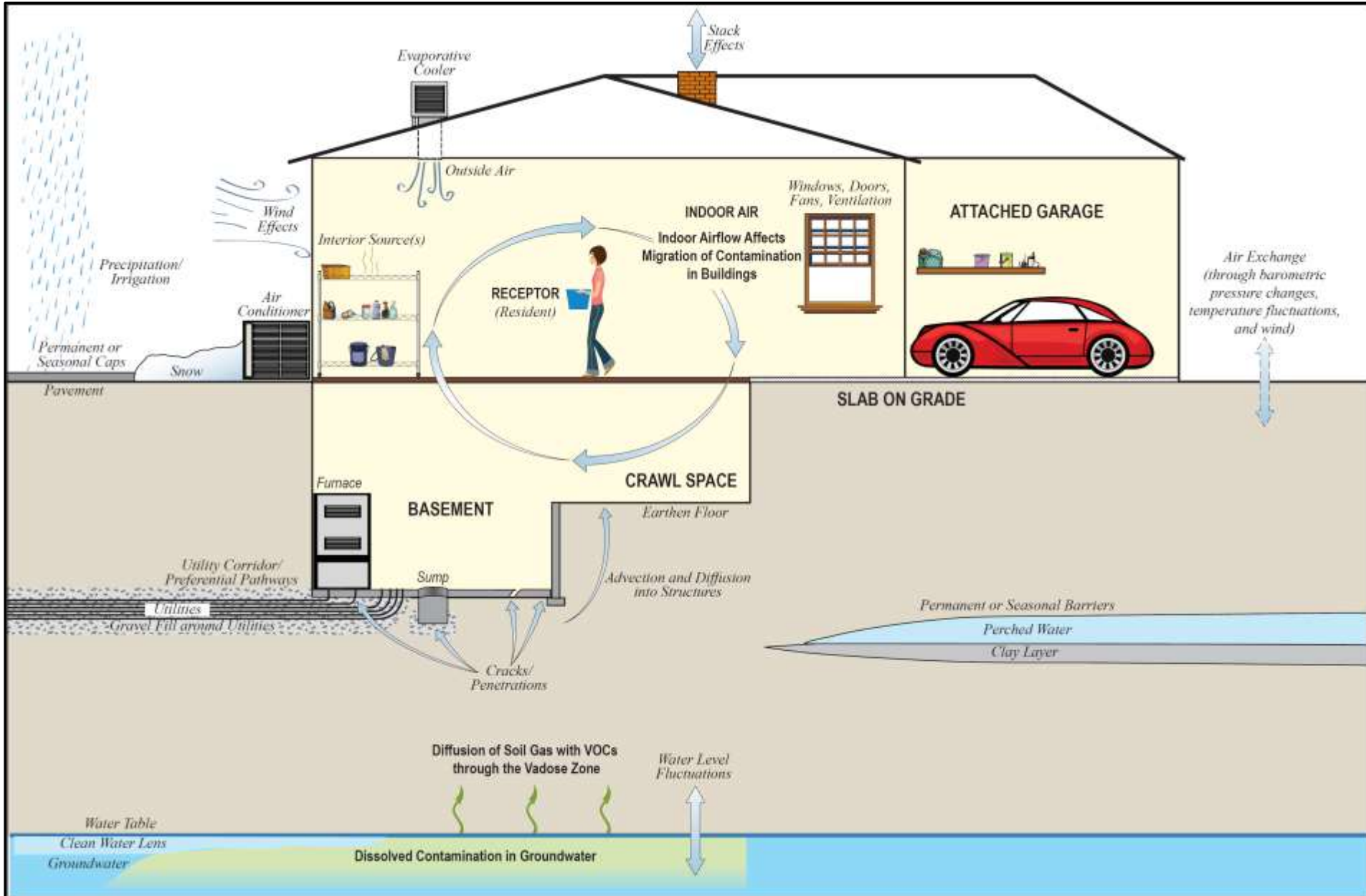


Contaminants of Potential Concern

	Trichloroethene (TCE)	1,1-dichloroethane (DCA)	1,1-dichloroethene (DCE)	cis-1,2-dichloroethene (DCE)	trans-1,2-dichloroethene (DCE)	Vinyl Chloride	Tetrachloroethene (PCE)	1,2-dichloroethane (DCA)
OU1 (South Weber)	●	●	●	●	●	●		
OU2 (South Weber)	●	●	●	●	●	●		
OU4 (South Weber/Riverdale)	●			●	●			
OU5 (Sunset/Clinton)	●		●	●				
OU6 (Riverdale)	●		●	●				
OU8 (Layton)	●	●	●	●	●	●		○
OU10 (Clearfield) (Removed from sampling program in 2016)	●		●	●	●	●	○	
OU12 (Roy)	●			●	●			
On Base	●	●	●	●	●	●	●	●

○ In selected areas

Migration Pathways





Hill AFB-Specific VI CSM

❑ Off-Base VI CSM (cont.)

❑ Data collected to build CSM

- ❑ Indoor Air**
- ❑ Outdoor Air**
- ❑ Crawl Space Air**
- ❑ Soil gas (exterior and subslab)**
- ❑ Water table sampling**
- ❑ Residential water sampling (e.g., sumps)**
- ❑ Real-time Analytical Survey (i.e., HAPSITE)**
- ❑ Preferential pathway sampling (e.g., field drains, sewer headspace)**



Hill AFB-Specific VI CSM

❑ On-Base VI CSM

- ❑ Vapor Sources: Vadose zone and groundwater contamination**
- ❑ COPCs: Chemicals associated with specific Operable Units or sites (soil and groundwater)**
- ❑ Receptors**
 - ❑ Shops, offices, warehouses, and other buildings related to industrial and military operations at the Base.**
 - ❑ No residential buildings were among these buildings.**
- ❑ Migration Pathways**



Hill AFB-Specific VI CSM

- ☐ **On-Base VI CSM (cont.)**
 - ☐ **Data collected to build CSM**
 - ☐ **Indoor Air**
 - ☐ **Outdoor Air**
 - ☐ **Real-time Analytical Survey (i.e., HAPSITE)**
 - ☐ **Building pressure manipulation**



OU-Specific Data Evaluation

Operable Unit-Specific Data Evaluation



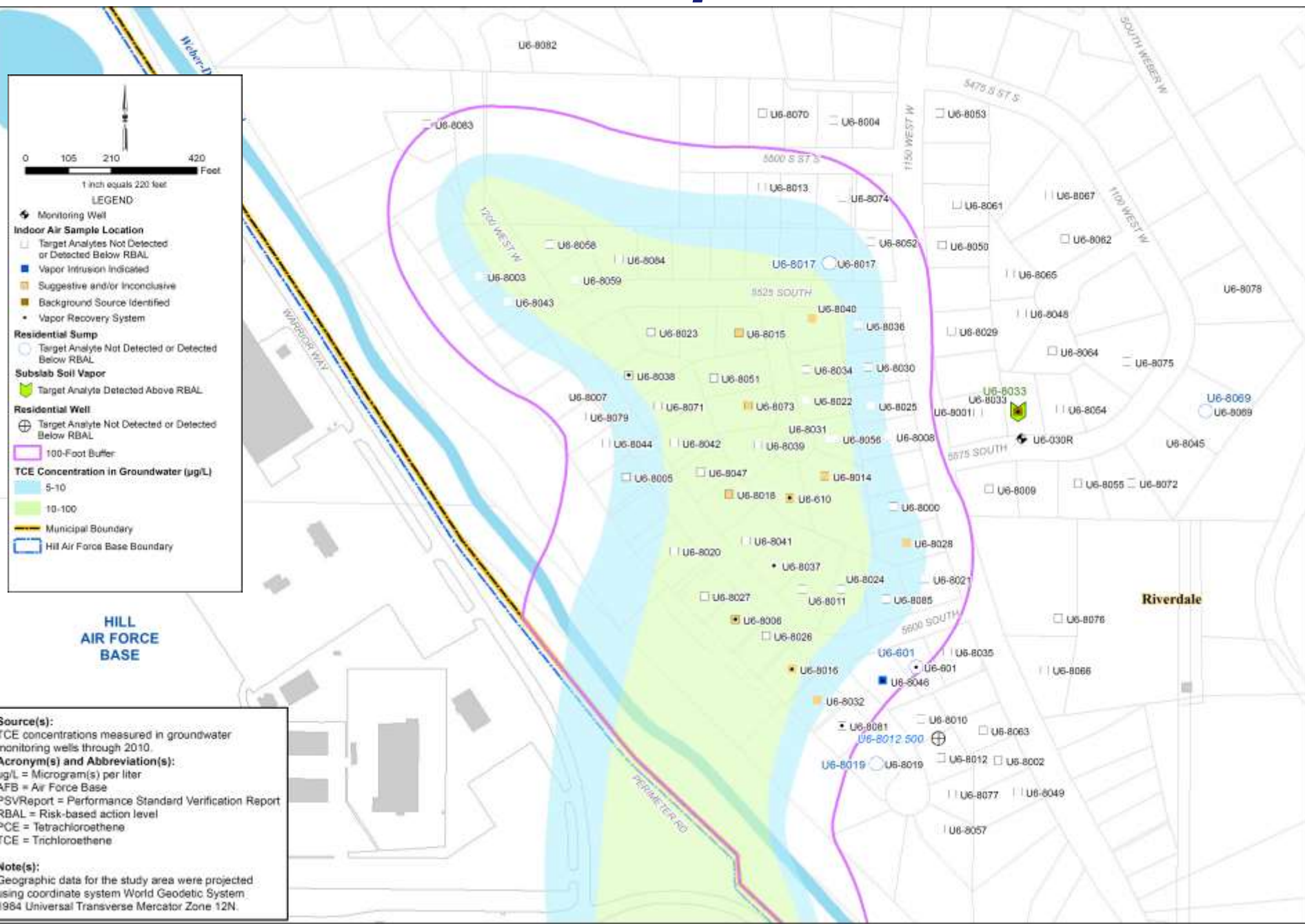
OU-Specific Data Evaluation

☐ **Off-Base Evaluation**

☐ **Off-Base indoor air sampling effort**

- ☐ **Data between January 2000 thru April 2013**
- ☐ **More than 8,500 indoor air samples**
- ☐ **Approximately 2,000 residences**
- ☐ **233 residences (12%) had detection above action level**
 - ☐ Many of these detections occurred prior to widespread use of the HAPSITE
 - ☐ Significant VI has not been detected at approximately 90 to 95 percent of the approximately 2,000 residences
 - ☐ “Significant” in this context means: **a detection above an action level caused by VI**

EXAMPLE: Operable Unit 6





OU-Specific Data Evaluation

☐ **Off-Base Evaluation (cont.)**

☐ **Overall conclusions:**

☐ No Significant VI:

- ☐ **OU 4** (Riverdale and South Weber)

- ☐ **OU 9** (Sunset)

- ☐ **OU 10** (Clearfield and Sunset)

☐ VI occurring via a Preferential Pathway

- ☐ **OU 1** (South Weber): VI at one location (U1-8021) was likely due to a sewer line that is receiving contaminated groundwater from a Base groundwater extraction system.

- ☐ **OU 2** (South Weber): VI at one location (U1-8037) likely due to the same sewer line.



OU-Specific Data Evaluation

☐ **Off-Base Evaluation (cont.)**

☐ **Overall conclusions (cont.):**

- ☐ Significant VI is occurring in some structures in:
 - ☐ **OU 5** (Sunset and Clinton) ☐ **OU 8** (Layton)
 - ☐ **OU 6** (Riverdale) ☐ **OU 12** (Roy)
- ☐ Shallow Groundwater: VI occurring primarily where contaminated groundwater is near the ground surface.
- ☐ Preferential Pathways:
 - ☐ In some areas of OU 8, VI is occurring via sewers/drains that contain contaminated groundwater.
 - ☐ At OUs 5, 6, and 12, it is possible that VI could be occurring via preferential pathways, but it is not a significant uncertainty in this RI (because of indoor air data).



OU-Specific Data Evaluation

❑ On-Base Evaluation

❑ Western Office Trailer (OU 2)

- ❑ Potentially complete VI, but the trailer is occupied less than 1 hour per week
- ❑ Further actions to address VI are not warranted at this time.

❑ Building 265 (OU 8)

- ❑ VI is insignificant under normal operating conditions, but there were some uncertainties with that investigation.
- ❑ Further monitoring of TCE in indoor air monitoring is warranted at Building 265.



Baseline Risk Assessment

Baseline Risk Assessment



Baseline Risk Assessment

□ General Methodology

□ Input:

- Building-specific maximum indoor air concentrations**
- Samples collected prior to installation of a VRS**

□ Output:

□ Cancer Risks

- Output = excess lifetime cancer risk (ELCR)**
- ELCR = The risk of developing cancer due to a chemical exposure beyond the normal risk of an individual developing cancer in a lifetime.**
- National Oil and Hazardous Substances Pollution Contingency Plan (NCP) defines acceptable range as between 1 in 1,000,000 to 1 in 10,000**
- OU 15 ELCR threshold = 1 in 100,000 (i.e., action levels)**



Baseline Risk Assessment

❑ General Methodology

❑ Output (cont.):

❑ Non-cancer Risks

❑ Output = hazard index (HI).

❑ As specified in the NCP, a value of 1.0 was applied at OU 15 as the threshold

❑ Comparing calculated ELCRs and HIs to threshold ELCRs and HIs supports conclusions regarding “unacceptable risk” or “significant VI”.



Baseline Risk Assessment

❑ Major Uncertainties

- ❑ Indoor Sources – Some detections corresponding to unacceptable risks or hazards may be due to indoor VOC sources and not VI.**
- ❑ Maximum Concentrations**
 - ❑ Using maximum concentrations instead of an “average” concentration over time may overestimate risk**
 - ❑ As a result, the calculated risk/hazards at OU 15 are likely conservative**



Baseline Risk Assessment

❑ Key Findings – Off-Base

❑ ELCRs greater than 1 in 100,000 or HIs greater than 1.0 :

❑ OUs 1, 5, 6, 8, and 12

- ❑ Only TCE and 1,2-DCA were identified as risk drivers, with 1,2-DCA only identified as a risk driver at OU 8.
- ❑ There was a single exceedance of the HI criteria at OU 1 (primary contributor = TCE), most likely from sewer gas VI.
- ❑ At OU 2, there were no buildings with ELCRs exceeding one in hundred thousand or HIs exceeding 1.0. However, the same sewer line that is affecting the residence in OU 1 is causing intermittent indoor air detections at OU 2.



Baseline Risk Assessment

❑ Key Findings – Off-Base (cont.)

- ❑ ELCRs less than 1 in 100,000 or HIs less than 1.0:**
 - ❑ OU 4 or OU 9:** no VI-related detections to calculate risk
 - ❑ OU 10:** there was a single location with an HI greater than 1.0 at OU 10 (primary contributor = PCE), but Hill AFB contamination is not the source of PCE in the indoor air at this location. As a result, PCE was not identified as a risk driver at OU 10.



Baseline Risk Assessment

❑ Key Findings – On-Base

- ❑ No on-Base buildings were found to have complete and significant VI.**
- ❑ However, due to some uncertainties at Building 265, further indoor air monitoring at that building is warranted.**



Summary and Conclusions

Summary and Conclusions



Summary and Conclusions

- ❑ The OU 15 FS will focus on the following:**
 - ❑ TCE at off-Base OUs 1, 2, 5, 6, and 12.**
 - ❑ TCE at OUs 1 and 2 need only be addressed in terms of sewer gas intrusion, not the typical subsurface to indoor air pathway.**
 - ❑ TCE and 1,2-DCA at off-Base OU 8.**
 - ❑ Further monitoring of indoor-air TCE at on-Base Building 265 is also warranted.**



Questions?

Air Force Civil Engineer Center

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Operable Unit 15 – Feasibility Study Report Summary

Mark Roginske, P.E. – AFCEC/CZOM Hill Section
Corey Schwabenlander, P.G. – EA Team
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Outline

Outline



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- ☐ **Feasibility Study Methodology**
 - ☐ **OU 15 Background**
 - ☐ **Preliminary Chemicals of Concern**
 - ☐ **Remedial Action Objective and Preliminary Remediation Goals**
 - ☐ **Screening of Remedial Alternatives**
 - ☐ **Development of Remedial Alternatives**
 - ☐ **Evaluation of Remedial Alternatives**
 - ☐ **Summary and Conclusions**
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Feasibility Study Methodology

Feasibility Study Methodology



Feasibility Study Methodology

- ❑ **Step 1**—Identify the remedial action objectives (RAOs) and general response actions (GRAs) for VOC-contaminated indoor air due to VI.
- ❑ **Step 2**—Identify potential treatment technologies and screen them based on effectiveness, implementability, and relative cost.
- ❑ **Step 3**—Assemble retained treatment technologies into remedial alternatives capable of meeting the RAOs.
- ❑ **Step 4**—Conduct a detailed analysis of the remedial alternatives based on the nine NCP criteria.



OU 15 Background

OU 15 Background



OU 15 Background

- ❑ OU 15 focuses on VOCs in indoor air due to VI**
- ❑ OU 15 addresses off- and on-Base areas or sites managed under CERCLA with the potential for VI.**



OU 15 Background

❑ On-Base Exposure Scenarios

- ❑ Current Scenario: Building 265 (OU 8)**
- ❑ Future Scenario: New construction in on-Base areas with the potential to cause VI**
 - ❑ OUs 1, 2, 4, 5, 6, 8, 10, 11, and 12**
 - ❑ New areas or sites that may be identified.**

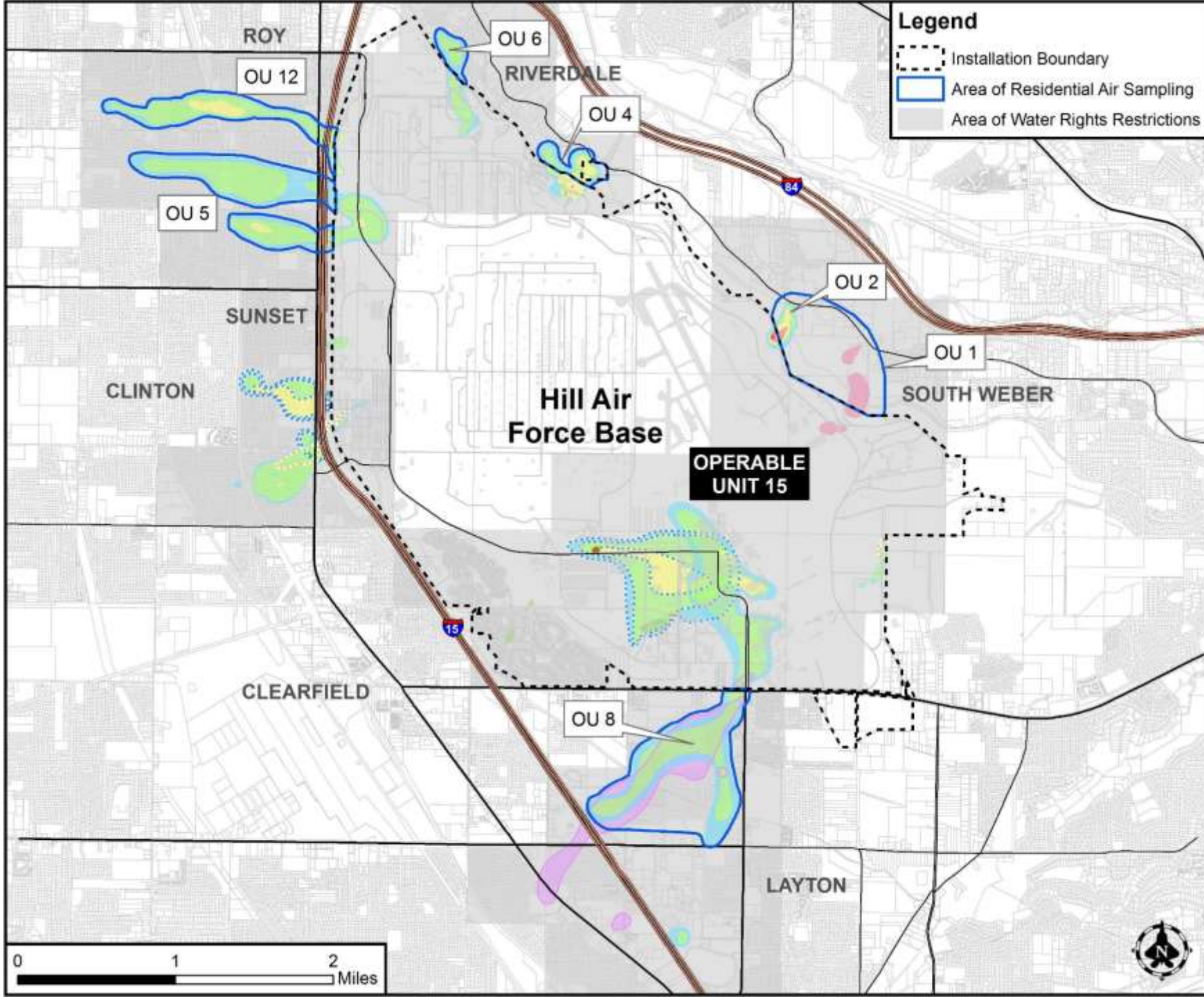


OU 15 Background

❑ Off-Base Exposure Scenarios

❑ Current and Future Scenarios:

- ❑ OUs 1, 2, 5, 6, 8, and 12.**
- ❑ OUs 1 and 2 need only be addressed in terms of sewer gas intrusion, not the typical subsurface to indoor air pathway.**
- ❑ No significant VI to be addressed in OUs 4, 9, and 10.**





OU 15 Background

- ❑ Time Critical Removal Actions (TCRA) for Indoor Air (September 2003)**
 - ❑ Specified interim mitigation measures.**
 - ❑ More than 120 vapor intrusion mitigation systems (VIMSs; previously referred to as vapor removal systems [VRSs]) have been installed.**



Preliminary COCs

Preliminary Chemicals of Concern



Preliminary COCs

Scenario	Operable Unit(s)	Preliminary COCs
Off-Base Current and Future	OUs 1 and 2 (sewer gas intrusion only)	Trichloroethene (TCE)
	OUs 5, 6 and 12	TCE
	OU 8	1,2-dichloroethane and TCE
On-Base Current	OU 8 (Bldg. 265)	TCE
On-Base Future	OUs 1, 2, 4, 5, 6, 8, 10, 11 and 12 ^a	Site-related volatile organic compounds (VOCs)

^a In addition to the known on-Base areas with the potential to cause VI, the on-Base future scenario also includes areas that may be identified in the future



RAOs and PRGs

Remedial Action Objectives and Preliminary Remediation Goals



RAOs and PRGs

- ❑ Remedial Action Objective:**
 - ❑ *Prevent human exposure to OU 15 indoor air COC concentrations that are present due to VI and are above their respective Risk-Based Action Levels.***

Preliminary Remediation Goals

Preliminary Chemical of Concern	Indoor Air Action Level		Applicable Scenarios		
	Residential (ppbv)	Commercial/Industrial (ppbv)	Off-Base Current/Future	On-Base Current	On-Base Future
Benzene	1.1	5.0			■
Carbon Tetrachloride	0.75	3.2			■
1,1-dichloroethane (DCA)	4.4	19			■
1,2-dichloroethane (DCA)	0.27	1.2	■		■
1,1-dichloroethene (DCE)	53	220			■
cis-1,2-dichloroethene (DCE)	N/A	N/A			■
Tetrachloroethene (PCE)	6.2	27			■
1,1,1-trichloroethane (TCA)	950	4,000			■
Trichloroethene (TCE)	0.39	1.6	■	■	■
trans-1,2-dichloroethene (DCE)	N/A	N/A			■
1,2,3-trichloropropane	0.051	0.21			■
Vinyl Chloride	0.67	11			■

N/A-Toxicity data not available pppv-Parts per billion by volume

- Action levels are based on a cancer risk of 1 in 100,000 or a Hazard Quotient of 1.0.
- Not all preliminary COCs are applicable to each OU and exposure scenario.
- Indoor Air Action Levels are presented as two significant figures.



Screening of Remedial Alternatives

Screening of Remedial Alternatives



Screening of Remedial Alternatives

- ✓ **No Action: for comparison purposes**
- ✗ **Institutional Controls**
- ✓ **Indoor Air Monitoring**
- ✓ **Building VI Mitigation**
 - ✓ **Subslab depressurization, floor sealing**
 - ✗ **Vapor Barrier and High-permeability Vapor Layer**
- ✓ **Building Environmental Controls**
- ✓ **Sewer Drain VI Mitigation**
- ✓ **Dewatering Measures**
- ✗ **VI Contaminant Source Removal-Addressed at each OU**



Development of Remedial Alternatives

Development of Remedial Alternatives



Development of Remedial Alternatives

❑ Development of Alternatives

- ❑ OU 15 is unique in that there is only one contaminated medium (indoor air) and one exposure pathway (inhalation)**
- ❑ Remediation of vapor sources is addressed as part of OUs or sites in which the soil/groundwater contamination is associated**
- ❑ Alternative development for OU 15 focused on preventing exposure, not treating the vapor sources.**
- ❑ The remedy for OU 15 must be flexible enough to address a wide variety of structures/site conditions**
- ❑ The interim remedy implemented under the TCRA (Monitoring and Mitigation) has been successful**



Development of Remedial Alternatives

- ☐ **Development of Alternatives (cont.)**
 - ☐ **Alternative 1: No Action**
 - ☐ **Alternative 2: Monitoring and Mitigation**



Evaluation of Remedial Alternatives

Evaluation of Remedial Alternatives



Evaluation of Remedial Alternatives

- ❑ **National Contingency Plan Requirements:** the NCP requires that remedial alternatives developed in the FS be evaluated against nine criteria
 - ❑ **Threshold Criteria**
 - ❑ **Criterion 1 – Protection of human health and the environment**
 - ❑ **Criterion 2 – Compliance with ARARs**



Evaluation of Remedial Alternatives

❑ National Contingency Plan Requirements (cont.)

❑ Balancing Criteria

- ❑ Criterion 3 – Long-term effectiveness and permanence**
- ❑ Criterion 4 – Reduction of toxicity, mobility, or volume of contaminants through treatment**
- ❑ Criterion 5 – Short-term effectiveness**
- ❑ Criterion 6 – Implementability**
- ❑ Criterion 7 – Cost**

❑ Modifying Criteria

- ❑ Criterion 8 – State acceptance**
- ❑ Criterion 9 – Community acceptance.**

Operable Unit 15 Remedial Alternative Evaluation			Alternatives	
			1	2
			No Action	Monitoring and Mitigation
NCP Alternative Evaluation Criteria	Threshold	Overall Protection of Human Health and the Environment	Not Protective	Protective
		Compliance with ARARs	Compliant	Compliant
	Balancing	Long-Term Effectiveness and Permanence	Poor	Moderate/Adequate
		Reduce Toxicity, Mobility, or Volume	Poor	Good
		Short-Term Effectiveness	Poor	Good
		Implementability	Good	Good
		Present Value Cost (millions of dollars)	\$0	\$8.1
	Modifying	Regulatory Acceptance	--	--
		Community Acceptance	--	--

ARAR = Applicable or relevant and appropriate requirement.
NCP = National Contingency Plan.



Summary and Conclusions

Summary and Conclusions



Summary and Conclusions

- ❑ Alternative 1 (No Action) did not meet the threshold criteria evaluation – it is not protective of human health and the environment.**
- ❑ Alternative 2 (Monitoring and Mitigation) meets the threshold and balancing criteria. Modifying criteria are not specifically addressed in the FS Report.**
 - ❑ Alternative 2 is effectively what is being implemented under the current Indoor Air Program**



Summary and Conclusions

- ❑ A Proposed Plan will be prepared to provide the opportunity for state acceptance and public comment of the proposed remedial alternative.**
- ❑ The selected remedy for Hill AFB OU 15 will be presented in a Record of Decision that will be issued after public comments are considered.**



Questions?