

# VRP GUIDANCE MANUAL TRAINING

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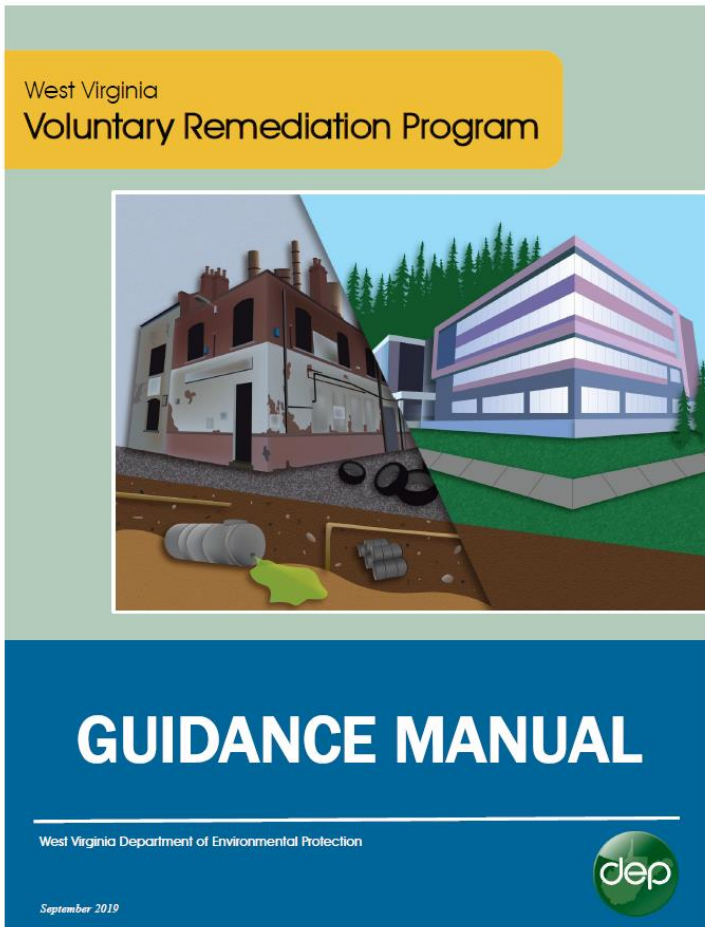
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# HOUSEKEEPING AND MISCELLANEOUS

**SCHEDULE**

**BREAKS**

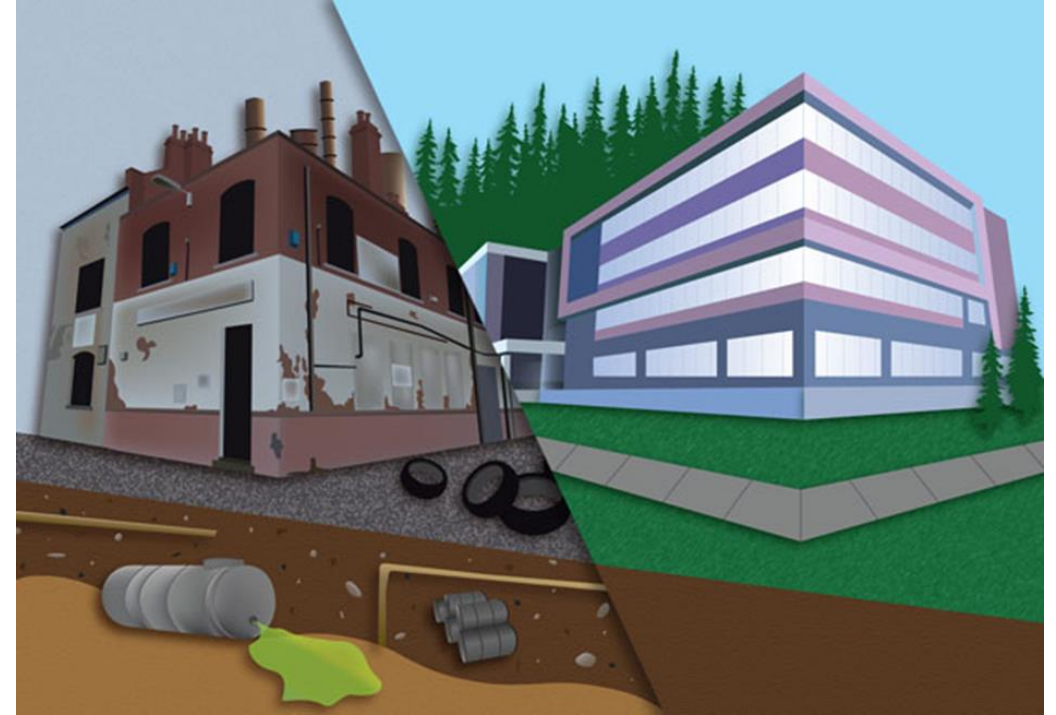
**LUNCH**

**QUESTIONS**

**SPEAKUP**

**MAY ASK FOR EMAIL FOLLOWUP**

**DIRECTPOLL - <http://etc.ch/4bpX>**



# VRP Guidance Manual Changes

## ORGANIZATION

- 1.0 Program Overview
- 2.0 Application and Agreement
- 3.0 Site Assessment
- 4.0 Risk Assessment
- 5.0 Remedy Selection and Remedial Action
- 6.0 Land Use Covenants
- 7.0 Final Report
- 8.0 Certificate of Completion
- 9.0 Reopeners
- 10.0 UECA-LUST Program



# VRP Guidance Manual Changes

## ORGANIZATION

- Appendix A Determining Background Concentrations
- Appendix B Non-Point Source Impacts to Surface Water
- Appendix C Exposure Factors & Chemical Parameters
- Appendix D Relative Absorption Factors & Bioavailability
- Appendix E LNAPL Sites Closure Policy
- Appendix F Cover and Cap Guidance
- Appendix G Rail Trail Guidance



# VRP Guidance Manual Changes

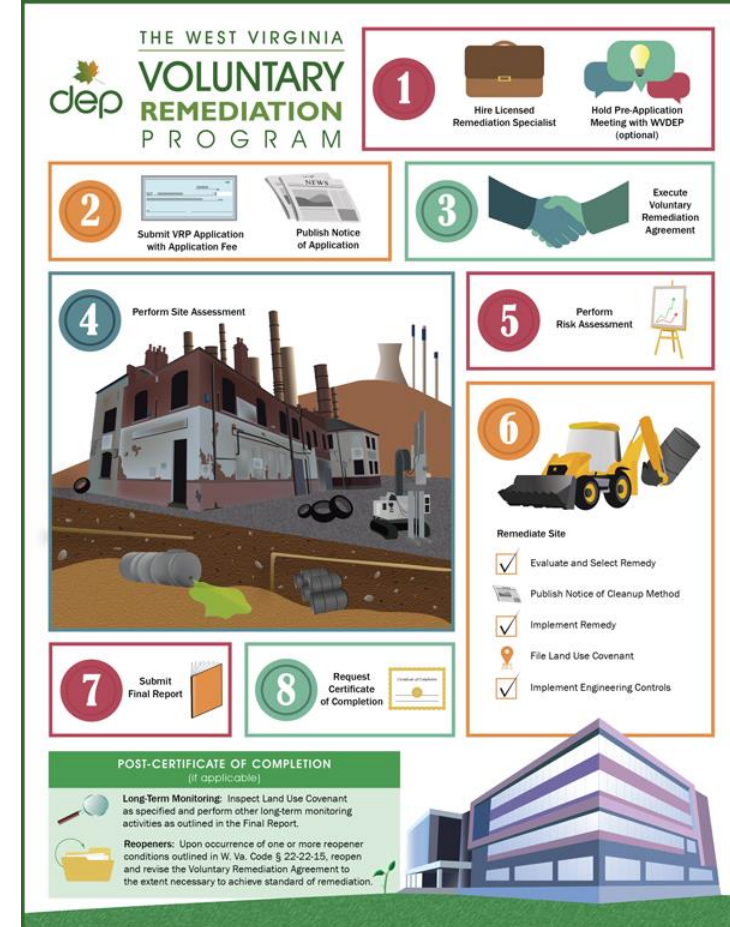
## ORGANIZATION

- Att 1 Figures and Tables Formatting Guidance
- Att 2 Site Assessment Work Plan (SAWP) Checklist
- Att 3 Quality Assurance Project Plan (QAPP) Checklist
- Att 4 Data Validation Report Checklist
- Att 5 Checklist to Determine Applicable Remediation Standards
- Att 6 VRP Decision Trees
- Att 7 Risk Assessment Report Format Guidance
- Att 8 UECA-LUST Process Checklist



# VRP Process Overview

- VRPGM Section 1.4.2 LRS
- LRS Responsibilities
  - Duty to protect the safety, health, and welfare of the public
  - Must only perform the tasks that you are qualified to do
  - May have a project manager to oversee the project; however, reports must be reviewed and signed by the LRS
    - Ensures consistent report submittals and the process is being followed correctly
    - Allows for shorter DEP review timeframes and fewer comments



# VRP Process Overview



- VRP Process Flow Chart:  
<https://dep.wv.gov/dlr/oer/brownfieldsection/technicalguidanceandtemplates/Documents/VRP%20Process%20Flow%20Chart.pdf>
- VRP Process Outline:  
<https://dep.wv.gov/dlr/oer/brownfieldsection/technicalguidanceandtemplates/Documents/VRP%20Process%20Outline.pdf>



# Reminders

- Electronic submittals, including VRP Applications, Agreements, Reports, etc.
  - **EXCEPT** Land Use Covenants – original signatures, hard copy, only one copy needed, **blue ink**
- Email reports to the project manager and copy [OERFileCopy@wv.gov](mailto:OERFileCopy@wv.gov)
- Please COMMUNICATE, COMMUNICATE, COMMUNICATE
- Remember to give advance notice to OER project managers for split sampling
- Have a question? Start with the VRA!



\*Note - Remediation Standards must be stated in VRA before Final Report can be approved





# UECA-LUST Tiers

- Section 10.8 Closure Tiers – **NEW**
- **Initial Criteria:**
  - ✓ Site fully assessed, including VI
  - ✓ Site assessment data representative of worst-case
  - ✓ Contaminant concentrations and aerial extent of groundwater plume stable via data and modeling
  - ✓ LNAPL not present
  - ✓ Laboratory analysis performed by WV Certified Lab and 10% of the data for each media validated to Stage 4



# UECA-LUST Tiers



- **Tier 1 (groundwater use restriction)**
  - Concentrations in surface soil less than res. De Minimis
  - Concentrations in subsurface soil (2-10 ft bgs) less than ind. De Minimis
  - Groundwater impacts not present off-site
  - VI evaluated less than residential standards
- If site meets Initial Criteria and Tier 1 criteria, LRS may submit a Final Report and draft LUC
- When approved, complete public participation requirements in 40CFR280.67, records LUC, provide documentation of monitoring well closure and OER will issue NFA



# UECA-LUST Tiers



- **Tier 1a (off-site groundwater impacts)**
  - Concentrations in surface soil less than res. De Minimis
  - Concentrations in subsurface soil (2-10 ft bgs) less than ind. De Minimis
  - Groundwater use restriction for all off-site properties (LUC or governmental restriction/ordinance)
  - VI evaluated less than residential standards (off-site and on-site)
- If site meets Initial Criteria and Tier 1a criteria, LRS may submit a Final Report and draft LUC
- When approved, complete public participation requirements in 40CFR280.67, records LUC(s), provide documentation of monitoring well closure and OER will issue NFA



# UECA-LUST Tiers



- **Tier 2 (residential and groundwater use restrictions)**
  - Concentrations in surface soil less than ind. De Minimis
  - Concentrations in subsurface soil (2-10 ft bgs) less than ind. De Minimis
  - Groundwater impacts not present off-site
  - VI evaluated less than industrial standards
- If site meets Initial Criteria and Tier 2 criteria, LRS may submit a Final Report and draft LUC
- When approved, complete public participation requirements in 40CFR280.67, records LUC, provide documentation of monitoring well closure and OER will issue NFA



# UECA-LUST Tiers



- **Tier 2a (residential and groundwater use restrictions; off-site groundwater impacts)**
  - Concentrations in surface soil less than ind. De Minimis
  - Concentrations in subsurface soil (2-10 ft bgs) less than ind. De Minimis
  - Groundwater use restriction for all off-site properties (LUC or governmental restriction/ordinance)
  - VI evaluated less than industrial standards on-site and less than residential standards off-site
- If site meets Initial Criteria and Tier 2a criteria, LRS may submit a Final Report and draft LUC
- When approved, complete public participation requirements in 40CFR280.67, records LUC(s), provide documentation of monitoring well closure and OER will issue NFA



# UECA-LUST Tiers



- **Tier 3 (residential, groundwater, and excavation restrictions)**
  - Concentrations in surface soil less than ind. De Minimis
  - Concentrations in subsurface soil (2-10 ft bgs) does not meet industrial standards
  - Groundwater impacts not present off-site
  - VI evaluated less than industrial standards
- If site meets Initial Criteria and Tier 3 criteria, LRS may submit a Final Report and draft LUC
- When approved, complete public participation requirements in 40CFR280.67, records LUC, provide documentation of monitoring well closure and OER will issue NFA



# UECA-LUST Tiers

The Symbol  
of Assurance



- **Tier 3a (residential, groundwater, excavation restrictions; off-site groundwater impacts)**
  - Concentrations in surface soil less than ind. De Minimis
  - Concentrations in subsurface soil (2-10 ft bgs) does not meet industrial standards
  - Groundwater use restriction for all off-site properties (LUC or governmental restriction/ordinance)
  - VI evaluated less than industrial standards on-site and less than residential standards off-site
- If site meets Initial Criteria and Tier 3a criteria, LRS may submit a Final Report and draft LUC
- When approved, complete public participation requirements in 40CFR280.67, records LUC(s), provide documentation of monitoring well closure and OER will issue NFA



# Conceptual Site Model (CSM)

## WHAT?

2.6 “Conceptual Site Model” means a description of possible contaminant sources, migration pathways, exposure routes, and human and/or ecological receptors. The Conceptual Site Model depicts complete exposures, as well as exposures that have been, or are presumed to be, severed using activity and use limitations and/or engineering controls (e.g., land-use covenants, caps, and covers).





# CSM - Simply This

**SOURCES**



**MIGRATION PATHWAYS**



**RECEPTORS**



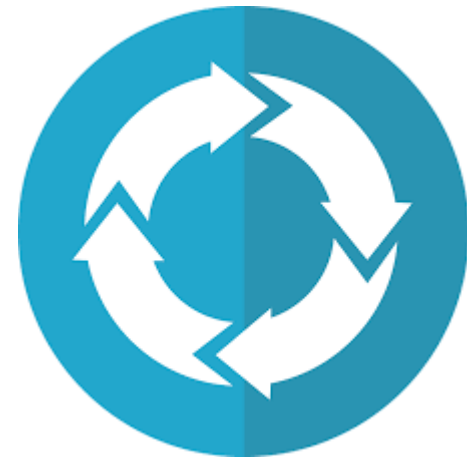
# CSM – Why?

- Identify Data Gaps
  - Which Migration Pathways are complete?
- Communicate Conclusions
  - Site Assessment and Risk Assessment
- Support/Justify Proposed Actions
  - Remedial Action Work Plan
- Document that Standards Have Been Achieved
  - RA Completion Report or Final Report

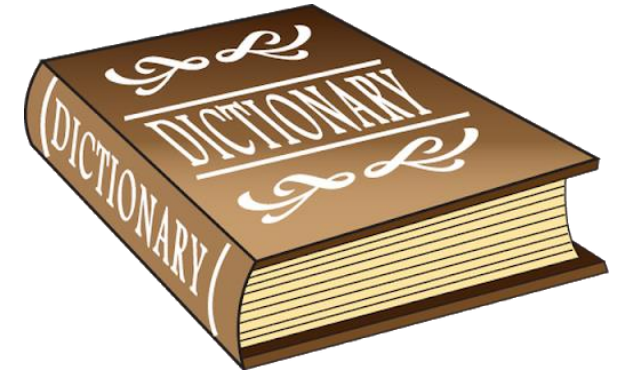


# CSM – An Iterative Process

1. Preliminary or Baseline CSM – Provided in the SAWP
  - Repeats the CSM from the VRP Application
2. Characterization CSM – Provided in the SAR
  - Defines Migration Pathways, Exposure Media, and Receptors
3. Remediation CSM – Provided in the Risk Assessment
  - Differentiates between significant and insignificant risks
4. Post-Remedy CSM – Provided in RAWP/RACR or Final Report
  - Documents that significant risks have been eliminated



# CSM - Terminology



- Contaminant Sources
- Contaminants of Potential Concern
- Release Mechanisms
- Impacted Media
  - Not Primary Media
- Migration Pathways
- Exposure Media
  - Not Secondary Media
- Exposure Routes
- Human Receptors
- Ecological Receptors



# CSM - Terminology

- **Contaminant Source:** What specific physical sources and/or activities resulted in the release?
  - Diesel Fuel storage and dispensing (vs LUST)
  - Equipment degreasing using TCE (vs degreasing)
  - Arsenical Pesticide storage, mixing, and application (vs orchard)
- **Contaminants of Potential Concern:** Physical/chemical properties
  - Diesel-related VOCs and SVOCs
  - Chlorinated organic compounds and degradation products
  - Arsenic compounds



# CSM - Terminology

- **Release Mechanisms**

- Leaks from underground tanks and underground piping
- Surface spills from material handling

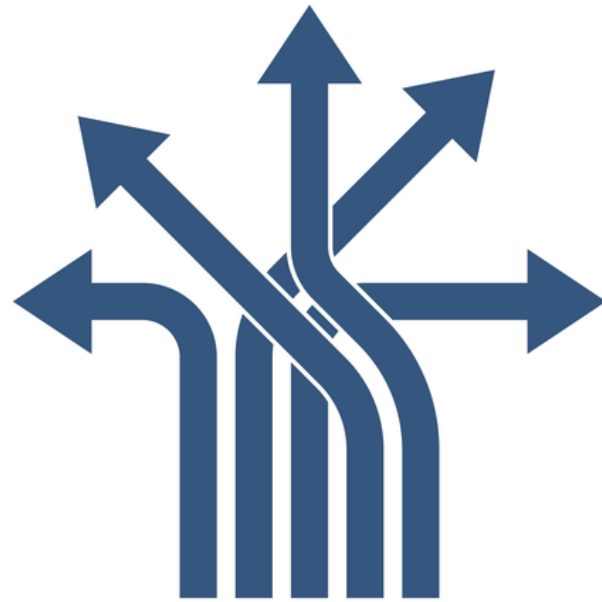
- **Impacted Media**

- Surface soil
- Subsurface soil
- Not typically GW
- Not air/vapor



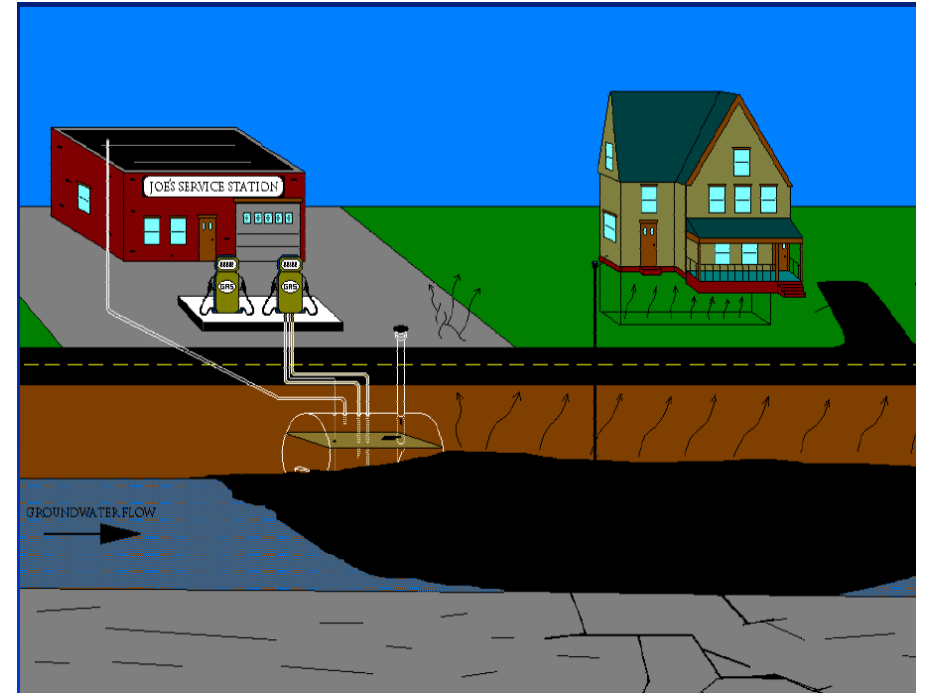
# CSM - Terminology

- **Migration Pathways:** How do COPCs move through the environment?
  - Volatilization from soil and groundwater
  - Wind dispersion of soil particles
  - Run-off
  - Infiltration
  - Groundwater transport



# CSM - Terminology

- **Exposure Media**
  - Surface Soil and Subsurface Soil
  - Groundwater
  - Vapor
  - Sediment
  - Surface water

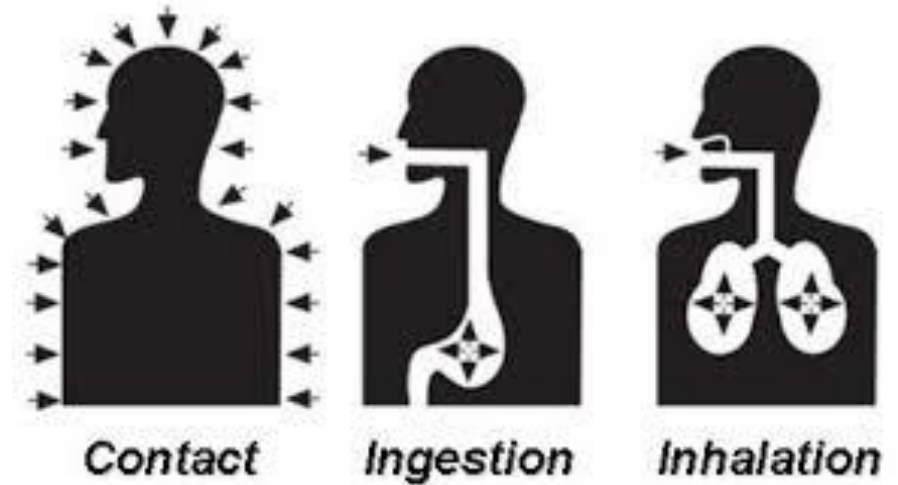




# CSM - Terminology

- **Exposure Routes**

- Dermal
- Oral (Ingestion)
- Inhalation



- **Human Receptors**

- Distinguish Before vs After Remediation
  - List presumptive remedies in CSM
- Depict unknown, insignificant, and significant exposures



# CSM - Terminology

- **Ecological Receptors**
  - Terrestrial vs Aquatic
  - If Ecological RA is conducted provide separate Ecological CSM



# CSM - Pathway Analysis Diagram

## Characterization CSM - Retail Gasoline Station

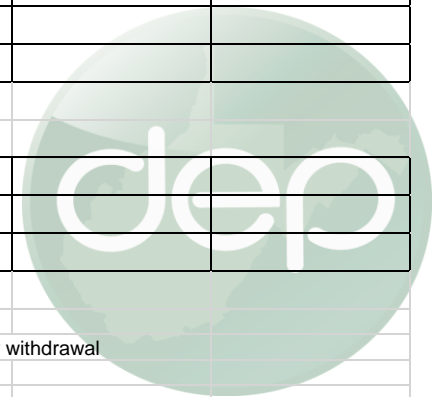
Contaminant Source	Contaminants of Potential Concern (COPCs)	Release Mechanism	Impacted Media	Migration Pathways	Exposure Media	Exposure Routes	Human Receptors			Ecological Receptors	
							Site Worker	Construction & Utility Workers	Site Visitor/Trespasser	Terrestrial	Aquatic
Storage of Gasoline in Underground Tanks and Dispensing for Retail Sale	Petroleum-related VOCs and SVOCs	Overfills/Spills Piping Leaks	Surface Soil	→	Surface Soil	Dermal	?	?	n/a		
						Ingestion	?	?	n/a		
						Inhalation	?	?	n/a		
		Leaks from tanks	Subsurface Soil	→	Subsurface Soil	Dermal	n/a	?			
						Ingestion	n/a	?			
						Inhalation	n/a	?			
		→	Groundwater	Dermal							
				Ingestion							
				Inhalation							
		→	Soil Vapor	Dermal	?	?	n/a				
				Ingestion	?	?	n/a				
				Inhalation	?	?	n/a				

**LEGEND:**

n/a	Pathway is not complete: No data required.
?	Pathway is or may be complete, but insignificant or unlikely: No data required.
	Pathway is or may be complete, and significance unknown
	Pathway is complete and risk is significant.

**NOTES:**

1. Exposure routes shown assume implementation of LUC prohibiting residential land use and groundwater withdrawal



# CSM – Common Problems

- Treating the CSM as an administrative task rather than a planning and communication tool
- Dispersing CSM components throughout multiple locations in project documents (Conclusions/Recommendations)
- Using an overly generic CSM that is not sufficiently site-specific to be useful
- Creating an overly detailed CSM that presents data rather than a concise synopsis of site conditions



# CSM – Written CSM

- Generally follows the organization of the graphical CSM: Source to Receptor
- Provides explanation and detail necessary to support the graphical CSM
- Focus is on physical, chemical, and biological characteristics of the model
  - Characteristics of COPCs, Soils/Geology
  - Groundwater Flow
  - Attenuation from Biological/Physical/Chemical factors
- Answers these questions:
  - Why do the COPCs behave in this manner?
  - Why are certain Receptors included/excluded (e.g., residential)?



# CSM - De Minimis Risk Assessment

- Risk Assessment Requirements: 60CSR3, Section 8.4
- First phase of Risk Assessment = Exposure Assessment
  - 60CSR3, Section 8.4.b.3
- Move on to Risk Characterization only if there is a potential for exposure to contaminants



# Section 3.0 Site Assessment



# Section 3.0 Site Assessment

FIRST, What Does the updated RULE say...?

**TITLE 60, SERIES 3: VOLUNTARY REMEDIATION AND REDEVELOPMENT RULE**

8.2. Sampling Protocol, Data Requirements, and Sampling Methods. –  
The applicant shall use **sampling approaches, data quality requirements, and statistical methods** set forth in the **Voluntary Remediation Program Guidance Manual** as approved by the Secretary to support the risk assessment and remedy selection process.





# Section 3.0 Site Assessment

FIRST, What Does the updated RULE say...?

**TITLE 60, SERIES 3: VOLUNTARY REMEDIATION AND REDEVELOPMENT RULE**

8.2.a. Characterization of Site Contamination. – The applicant shall collect and analyze a sufficient number of environmental media samples so as to provide a reasonable characterization of the nature and distribution of site contaminants, horizontally, vertically, and temporally. Therefore, it may be necessary to sample media such as surface water and groundwater on multiple occasions to assess temporal distribution. The number and location of the samples collected shall be of sufficient quantity and quality to calculate the appropriate exposure point concentration as defined in subparagraph 8.4.b.3.B and subdivision 8.5.c of this rule.



# Section 3.0 Site Assessment

## TITLE 60, SERIES 3: VOLUNTARY REMEDIATION AND REDEVELOPMENT RULE

8.2.b. Media to be Sampled. – The applicant shall collect and analyze samples from those media that are reasonably anticipated to have been impacted from contaminants at the site, considering the nature of the site operations and the nature of the contaminants of potential concern at the site.

8.2.c. Contaminants for Analyses. – The applicant may not need to analyze all samples for the same contaminants. The applicant shall analyze collected samples for those contaminants that are reasonably anticipated to be encountered, considering the nature of the site operations and the nature of the substances used or disposed of at the site.



# Section 3.0 Site Assessment

## TITLE 60, SERIES 3: VOLUNTARY REMEDIATION AND REDEVELOPMENT RULE

8.2.d. **Data Validation**. – The applicant shall **validate the quality of the analytical data** to be used *in establishing exposure point concentrations* by **review of at least ten percent (10%) of the data** or some other percentage agreed to by the Secretary in accordance with ~~standard~~ **current EPA protocols**. *and data quality considerations presented in the Voluntary Remediation Program Guidance Manual.* **Standard EPA protocols for validation may require modification**, with the Secretary's approval, depending on the type of analyses performed (e.g., Contract Laboratory Protocol or SW-846).



# Section 3.0 Site Assessment

## TITLE 60, SERIES 3: VOLUNTARY REMEDIATION AND REDEVELOPMENT RULE

8.2.e. The 95th percentile upper confidence limit ~~on the mean concentration~~ of the most appropriate frequency distribution of the site data as determined by statistical software (e.g., ProUCL) or the maximum value of the site contaminant concentration data shall be a reasonable estimate of a plausible exposure point concentration for this contaminant. If a contaminant can be shown to have dissimilar distributions of concentrations in different areas, then the areas should be subdivided. For example, "hot spots" may be considered separately.



# Section 3.0 Site Assessment

## 3.10 SITE ASSESSMENT REPORT – SECTION 12: FIGURES & TABLES

In general, each SAR should include the following figures:

- Site Location Map
- Site Plan
- Sample Location Map (by media if appropriate)
- Contaminants of Potential Concern Concentration Map
- Groundwater Potentiometric Surface Map
- Geologic Cross Sections (if appropriate)
- Conceptual Site Model

**Note:** More detailed guidance is provided in Attachment 1: Formatting Figures and Tables in VRP



# Section 3.0 Site Assessment

## 3.10 SITE ASSESSMENT REPORT – SECTION 12: FIGURES & TABLES

In general, each SAR should include the following tables:

- Analytical laboratory results in separate tables for each medium (e.g., soil, groundwater, etc.) and pathway (e.g., vapor)
- Groundwater gauging information, including NAPL thickness
- Geophysical and aquifer test results when appropriate



# Section 3.0 Site Assessment

## 3.10 SITE ASSESSMENT REPORT – SECTION 12: FIGURES & TABLES

In general, each SAR should include the following tables:

- Also:
  - Present data in consistent manner (ug/L for groundwater, mg/kg for soil)
  - **Screening table (COPCs to COCs)**: frequency of detection, range of quantitation limits, minimum and maximum concentrations, 95 % UCL on the most appropriate distribution as identified by ProUCL (as applicable), arithmetic mean (for lead only), screening criteria (De Minimis values, VISL, WQS, etc) and COC? (Y/N)
  - Hot spots: Use separate tables or exclude from statistical analysis

**Note:** More detailed guidance is provided in Attachment 1: Formatting Figures and Tables in VRP



# Section 3.0 Site Assessment

## HANDLING OF CORE SAMPLES FOR VOC ANALYSIS (see Section 3.6.1.1)

- Documented loss of volatiles using Ambient Temperature Headspace (ATH) method (transferring soil to “baggies” & screening after heating/agitation)

### OPTION 1:

- Core should be screened with a PID at 12” intervals as soon as the direct-push sleeve is cut open and screening values recorded
- As soon as screening is complete, wrap the core in plastic wrap as airtight as possible and store at  $<6^{\circ}\text{C}$
- Continue screening entire core run to TD
- Select sample(s) interval from undisturbed cores based on highest PID reading, staining, soil characteristics and other factors and sample via EPA Method 5035





# Section 3.0 Site Assessment

## HANDLING OF CORE SAMPLES FOR VOC ANALYSIS (see Section 3.6.1.1)

### OPTION 2:

- Collocated borings: Initial boring used for screening and soil description/classification; 2<sup>nd</sup> boring installed immediately adjacent to first to collect sample



# Section 3.0 Site Assessment

## MANAGING NAPHTHALENE AND BENZO(A)ANTHRACENE AS VOCS (See 3.6.1.2)

- Naphthalene and Benzo(a)anthracene in soil show significant loss via volatilization at ambient temperature and when homogenized or warmed (Naphthalene is often risk-driver)
- If sampling from cores, use methods described above to preserve core until ready for sampling
- Samples should be placed in airtight jars with as little headspace as possible and stored at  $<6^{\circ}\text{C}$



# Section 3.0 Site Assessment

## ASSESSMENT OF TEMPORAL VARIATION IN GROUNDWATER QUALITY (See 3.6.2)

- Spatial and temporal variations of COC concentrations in groundwater are both important
- To account for temporal variations, all VRP and UECA-LUST sites are required to have a **minimum** of two groundwater sampling events on a quarterly schedule
- Fluctuations of groundwater levels often cause significant changes in concentrations → additional sampling events required
- Data must be sufficient to characterize seasonal variations in concentrations
- “Significant variation” may be determined by statistically comparing the variance of each sampling event



# Section 3.0 Site Assessment

## TRIMETHYLBENZENES ARE COPCS FOR UECA-LUST SITES – See Section 10.3

- Specifically referring to 1,2,4-Trimethylbenzene and 1,3,5-Trimethylbenzene which are common components of gasoline and diesel fuel
- Recently added to COPC lists for gasoline and diesel fuel releases; historic data will almost certainly not include these constituents unless a full VOC scan was requested
- Data will be required for all potentially impacted media
- Migration to Groundwater criteria and risk-based groundwater screening levels are fairly low
- See UECA-LUST Checklist – Attachment 8 – Analyte Table



# Section 3.0 Site Assessment

## OFF-SITE MIGRATION: RPs vs INNOCENT LANDOWNERS

- VRRRA enacted to encourage *voluntary* redevelopment of contaminated property
- Established limitations on environmental liability (DEP, 3<sup>rd</sup> party liability)
- Two classes of VRP Applicants:
  - **Responsible Parties (RPs)**: conducted commercial or industrial operations at the site – purpose for entering VRP is to obtain liability protection for contamination caused by their actions
  - **Innocent Landowners/Redevelopers**: Purchased property for economic development – purpose for entering VRP is to establish liability protection for future uses of contaminated properties that are unused/underused



# Section 3.0 Site Assessment

## OFF-SITE MIGRATION: RPs vs INNOCENT LANDOWNERS

- Off-Site Contamination (adjacent properties or Waters of the State)
  - **RPs** must remove/mitigate all on-site sources *and* remediate off-site impacts
  - **Innocent Landowners/Redevelopers** did not cause the site contamination and cannot be expected to remediate off-site impacts (disincentive to redevelopment); however, it is appropriate for them to remove/mitigate on-site sources to prevent further off-site impacts



# Section 3.0 Site Assessment

## SCREENING AGAINST BOTH RESIDENTIAL AND INDUSTRIAL DE MINIMIS LEVELS

SOIL – See Section 4.4.1 (De Minimis Standards for Soil)

VAPOR – See Section 4.4.2 (De Minimis Standards for Groundwater)

- A Land Use Covenant restricting residential land use is required for portions of a site where the Industrial De Minimis Standards are the selected soil standards, and where Industrial VISL values are used for screening soil gas or indoor air
- The Applicant must list the contaminants of concern (COCs) that exceed Residential De Minimis Standards on the **LUC and COC** to justify the need to restrict residential use
- Therefore, for commercial/industrial use scenarios, the site soil and soil gas/indoor air (if applicable) COPCs must always be screened against both the Residential and Industrial De Minimis Standards



# Section 3.0 Site Assessment

CONTAMINANTS OF POTENTIAL CONCERN (COPCs) vs  
CONTAMINANTS OF CONCERN (COCs) – See Section 3.9

**COPCs:** Contaminant of potential concern means a chemical that may be present at a site based on current or historical site use;  
Contaminants detected in at least one sample [including at levels below the Practical Quantitation Limits (PQL)] should be considered COPCs and carried through the screening assessment or risk assessment unless there is a specific, justifiable rationale for excluding the contaminant

**Note:** the underlined text is the actual definition from the rule: §60-3-2 – 2.7 & 2.8





# Section 3.0 Site Assessment

**CONTAMINANTS OF POTENTIAL CONCERN (COPCs) vs  
CONTAMINANTS OF CONCERN (COCs) – See Section 3.9**

**COCs:** Contaminant of concern means a Contaminant of potential concern that is present at a site at a concentration that requires implementation of a remedy to achieve the desired remediation standard; The final list of COPCs remaining after conducting the screening process in accordance with Section 3.9. These are the contaminants that are carried through to the human health and ecological risk assessments



# Section 3.0 Site Assessment

## SELECTION OF CONTAMINANTS OF CONCERN (COCs) – See Section 3.9

- COC Selection Process (screening of COPCs to COCs) may be included in either the Site Assessment or Risk Assessment Report (OER preference is the SAR)
  - Section 3.9 outlines acceptable reasons for eliminating COPCs
  - The process of identifying COCs/eliminating COPCs must be documented
  - The decision process should be documented in both the text of the report and in a table
  - Some compounds may cause health risks at levels below the detection limit of some standard methods – don't rule out COPCs prematurely
  - "J"-qualified data – identification of the contaminant is uncertain/approximate or concentration is estimated – EPA recommends use of J-qualified data, but don't let qualified data drive risk



# Background Comparisons

## New Soil Default Values on the OER Technical Guidance and Templates webpage

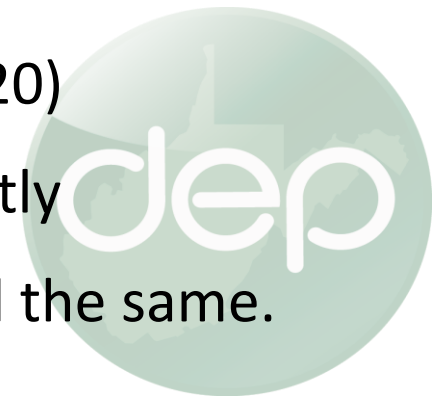
- <https://dep.wv.gov/dlr/oer/brownfieldsection/technicalguidanceandtemplates/Pages/default.aspx>.
- Inorganic Data from the USGS Geochemical and Mineralogical Data for Soils on the Conterminous United States (<https://pubs.usgs.gov/ds/801/downloads/>).
- Compare the max or 95% UCL to the 90<sup>th</sup> percentile background value (mg/kg).
- **Arsenic = 13.1**
- Iron = 39,380
- Lead = 38.0
- Mercury = 0.09
- **Vanadium = 98.8**
- Zinc = 103



# Background Comparisons

**Follow Appendix A from VRPGM for all other COPCs and media**

- Need data from the potentially contaminated areas on the site.
- Need background data from areas on-site or off-site **unimpacted** by release
  - Groundwater should be from upgradient within the same aquifer
  - Soils should be from the same soil type/strata/depth (NRCS Soil Surveys)
  - Surface water/Sediment should be from upstream of the site
- Need at least 10 similarly-situated soil samples for background.
- Water is tricky, need to account for spatial and temporal variability ( $\geq 20$ )
  - Fewer wells sampled frequently vs. more wells sampled infrequently
- Background and potentially contaminated samples must be processed the same.



# Background Comparisons

## Tier 1: Compare site mean to background mean + $\Delta$

- Both site mean and background mean must be known precisely (lots of data)
- $\Delta$  is subjective value (typically 20% of background mean)
- Standard errors of site mean and background mean must be smaller than  $\Delta/5$
- A possible alternative for  $\Delta$  is the Standard Deviation
- If the site mean of a COPC is below background mean +  $\Delta$  then they are considered essentially the same and the COPC is not a COC for the site.



# Background Comparisons

## Tier 2: Statistically compare the two samples in ProUCL ( $\alpha = 0.05$ )

- Determine the distribution of both samples (normal, gamma, lognormal, non-parametric)
- If both samples are normally distributed, use a two-sample hypothesis t-test
  - Follow Appendix A Tier 2 Step 3
- If either sample is  $\Gamma$ , Log, or non-parametric, use a Wilcoxon Mann-Whitney test
  - Follow Appendix A Tier 2 Step 4 (for log, can log-transform and use t-test)
- Note that groundwater and vapor may require ANOVA or Kruskal-Wallis tests
- Alternately, can use the Upper Tolerance Limit (UTL) method from EPA
  - Compare all data to UTL and at least 95% should be below UTL



# Background Comparisons

## Non-detections

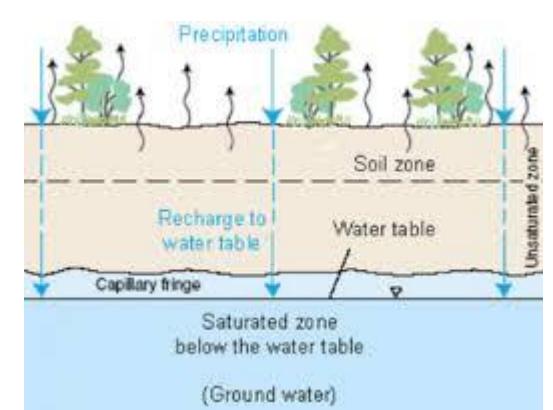
- $\frac{1}{2}$  the DL (okay when  $\leq 10\%$  of data is non-detect)
- Sign test for non-parametric data
- Wilcoxon Mann-Whitney test
- The Gehan test
- **Kaplan Meier test (preferred)**
- Regression order statistics
- Maximum likely estimation

Please contact Ross Brittain, OER Toxicologist, to discuss statistical methods  
304-918-7456, [ross.a.brittain@wv.gov](mailto:ross.a.brittain@wv.gov)



# Migration to Groundwater (MTG)

- Section 9.2.a.3. Migration of Soil Contaminants to Groundwater
- New language in the Rule
- When the Rule is passed, MTG will be removed from De Minimis Table 60-3B and the VRPGM will be revised accordingly
- MTG is still an option
- Considerations for groundwater:
  1. Sample groundwater
  2. Utilize MTG table in VRPGM (from De Minimis table)
  3. Calculate site-specific MTG
  4. Utilize SPLP
  5. For acidic environments, utilize TCLP



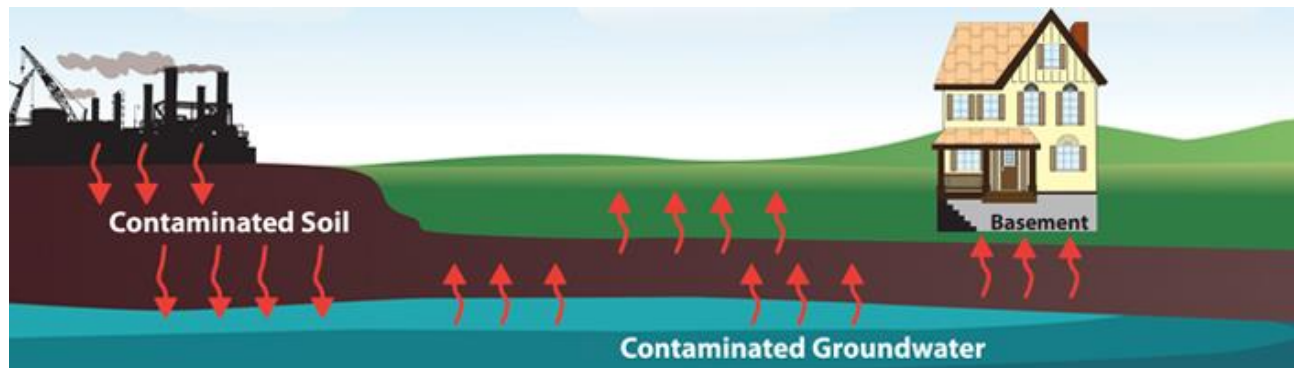


# Vapor Intrusion Best Practice

## Decision Trees in VRPGM Attachment 6

### TIER ONE – GROUNDWATER:

1. Collect field samples
2. Analyze for VOC and SVOC Chemicals of Potential Concern (COPC) – (Hg?)
3. Calculate Exposure Point Concentrations (see De Minimis Risk Assessment)
4. Screen against the Residential and Industrial VISL values
  - ELCR = 1E-06 and HI = 1.0 for Residential
  - ELCR = 1E-05 and HI = 1.0 for Industrial
  - Can use site-specific groundwater temperature (WV default = 13°C)
  - Attach output as an Appendix
5. Beware of false negatives (deep aquifers and shallow soil contamination)



# Groundwater

## **TIER ONE – CONTINUED:**

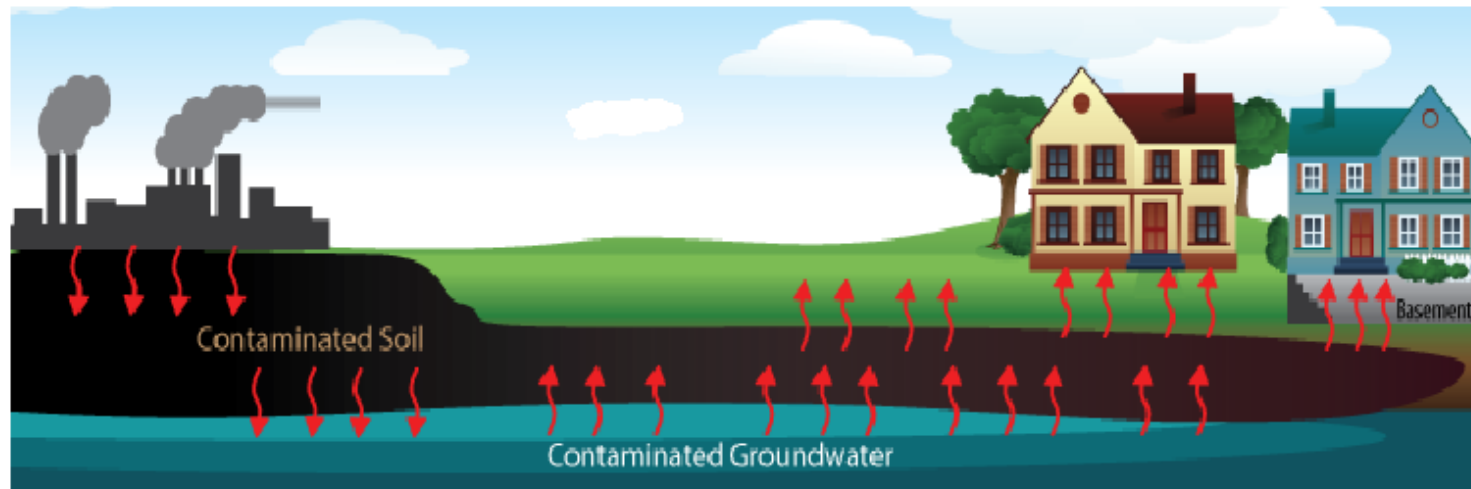
If no EPCs exceed Residential VISL → no further vapor assessment needed

If any EPC exceeds Residential VISL →

- Implement remedy for current and future residential receptors, or
- Collect Near-source/Sub-slab (and Indoor Air samples?)

If any EPC exceeds Industrial VISL →

- Implement remedy for current and future industrial receptors, or
- Collect Near-source/Sub-slab (and Indoor Air samples?)



## Near-source / Sub-slab

### **TIER TWO – NEAR-SOURCE/SUB-SLAB:**

1. Collect samples from Near-source wells (~5 ft bgs), and/or
2. Collect samples from Sub-slab sources in buildings
3. Calculate Exposure Point Concentrations (see De Minimis Risk Assessment)
4. Screen against the Residential and Industrial VISL values (attach output)
  - ELCR = 1E-06 and HI = 1.0 for Residential
  - ELCR = 1E-05 and HI = 1.0 for Industrial

If no EPCs exceed Residential VISL → no further vapor assessment needed

If any EPC exceeds Residential VISL →

- Implement remedy for current and future residential receptors, or
- Sample Indoor Air (for current receptors only)

If any EPC exceeds Industrial VISL →

- Implement remedy for current and future industrial receptors, or
- Sample Indoor Air (for current receptors only)



# Indoor Air



## **TIER THREE – INDOOR AIR (current receptors only):**

1. Collect Indoor Air samples
2. Calculate EPCs (see section on De Minimis Risk Assessment)
3. Screen against the Residential and Industrial VISL values (attach output)
  - ELCR = 1E-06 and HI = 1.0 for Residential
  - ELCR = 1E-05 and HI = 1.0 for Industrial

If no EPCs exceed Residential VISL → no current vapor assessment needed

If any EPC exceeds Residential VISL →

- Implement remedy for current residential receptors

If any EPC exceeds Industrial VISL →

- Implement remedy for current industrial receptors

Use Groundwater or Near-source/Sub-slab results to screen for future buildings.



# Considerations for Vapor Intrusion

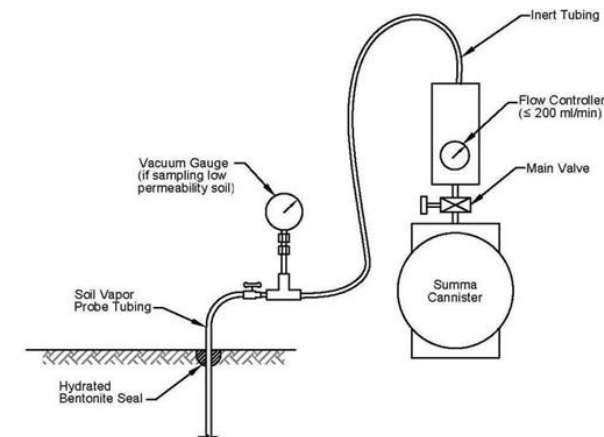
- Remedies can be ICs (vapor assessment) or ECs (vapor mitigation system)
- May need both groundwater and soil vapor with surface source and deep GW
- Temperature
  - Indoor Air samples should be collected during winter months
  - Near-source/Sub-slab samples should be collected during warm months
- Naphthalene and likely Benzo(a)anthracene (*Hayes et al. 2005*)
  - Reduced recovery when sampled in cool ambient air temperatures (50° F).
- Seasonal soil temps can cause soil gas concentrations to vary by factor of two (*Luo et al. 2009, USEPA 2010, Hers et al. 2014, Johnson and Deeb 2014*).
  - If SVOCs are COPCs then sample vapor when air > 70° F.
  - If vapor samples are collected when air < 70° F

Check detection limits

If detection limit is more than half the VISL value

Evaluate conditions (conversation with DEP)

May need more samples, or remediate



# De Minimis Risk Assessment

## §4.1 EXPOSURE ASSESSMENT (**LRSs can do this themselves!!!**)

Finish the Site Assessment

Update the CSM in SAR to include all potentially complete pathways to receptors!

### All potential media

#### *Impacted media*

- Surface soil
- Subsurface soil

#### *Exposure media*

- Groundwater
- Vapor
- Surface water
- Sediment

### All potential receptors

- Residents
  - Recreators
  - Trespassers
- Commercial/Industrial
  - (Indoor & Outdoor)
- Construction/Utility
- Terrestrial ecological
- Aquatic ecological
- Current and Future!!!

### All potential routes of exposure

- Ingestion
- Inhalation
- Dermal contact



# Calculate Exposure Point Concentrations (EPCs)

**For each medium**, the EPC will be the lower of:

- Maximum value, or
- 95% UCL calculated in current ProUCL (normal, gamma, logarithm)

Surface soil, Subsurface soil and Sediment need:

at least 8 samples (duplicates/splits = max or discrete)

Groundwater and Surface water need:

at least 8 samples (duplicates/splits = max)

from at least two different years

no more than 50% of samples from the same season

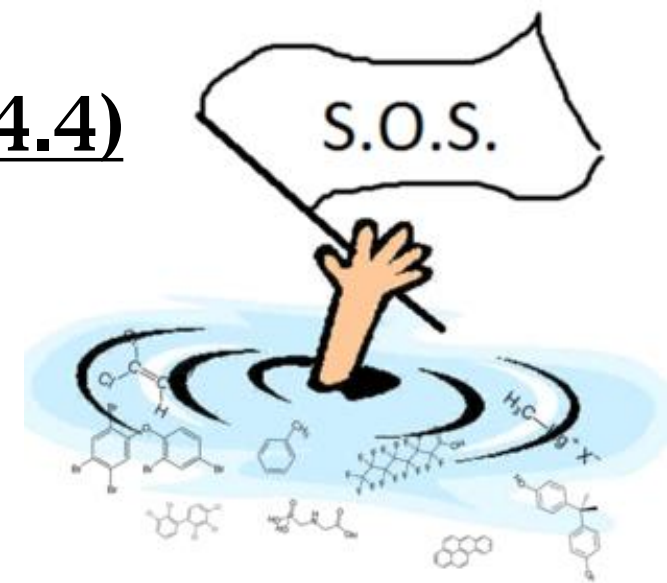
SW should capture low flow and high flow events equally

Attach ProUCL output as an Appendix

Be sure to complete the Checklist to Determine the Applicable Standards in the VRPGM (Human Health and Ecological sections). Address Ecological Risks separately.



# Screen EPCs against Relevant Benchmarks (§4.4)



## **Surface Soils**

Residential & Industrial De Minimis (MTG?)

## **Subsurface Soils**

Industrial De Minimis (MTG?)

## **Sediment**

Human: Residential & Industrial De Minimis

Eco (if needed): EPA Region 3 BTAG → Region 4 ERASG → NOAA SQuiRTs

## **Groundwater**

Groundwater De Minimis

## **Surface Water (as applicable to Human Health and/or Eco as needed)**

WV WQS → EPA Region 3 BTAG → Region 4 ERASG → NOAA SQuiRTs

## **Vapor (*attach VISL output as an Appendix*)**

Residential & Industrial Groundwater VISL →

Residential & Industrial Near Source/Sub Slab VISL →

Residential & Industrial Indoor Air VISL





# Complete Pathways?

If the EPCs are all below the relevant benchmarks for the CSM receptor pathways:

- No more assessment is needed, assuming Eco Risks are acceptable
- Submit Risk Assessment Report and Final Report

If any EPC exceeds the relevant benchmark for a receptor exposure pathway:

- Pathway is considered complete

If pathways can be broken by ICs or ECs (e.g., cap/cover or vapor barrier)

- Update the CSM to show the pathways being broken by controls
- Submit combined Risk Assessment Report & Remedial Action Work Plan
- Implement remedies → Remedial Action Completion Report

If pathways cannot be broken by ICs or Ecs, remediate or...

- Proceed with a Uniform or Site-specific Risk Assessment

Note that Uniform Standards now use the EPA RSL equations  
(<https://www.epa.gov/risk/regional-screening-levels-rsls>)



# Considerations for De Minimis Risk Assessments

Does VRA allow for combined reports (e.g., RAR and RAWP)? Modification?

Chapter 22 Article 12 - Groundwater Protection Act

Natural Attenuation (by the VRRP Rule)

- 4 years of semiannual samples and LUC restricting GW use
- Can still get COC and monitor afterwards (Reopener?)

LNAPL Closure Policy (Transmissivity)

Off-site migration (LUC on adjacent parcel?)

Annual Inspections

Maintenance of cap/cover

Save



# Recreation Exposure Factors

**Currently assume Recreators = Residents**

Overly conservative exposure assumptions

Exposure Frequency (EF) = 350 days/year

Exposure Time (ET) = 24 hours/day

**What about Industrial De Minimis?**

Recreator ELCR =  $1E-06$  vs. Industrial ELCR =  $1E-05$

Industrial EF = 250 days/year

Industrial ET = 8 hours/day



# EPA Regional Screening Levels (RSL)

**RSL Calculator** ([https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search))

Recreator equations are available

No default values for EF and ET (site-specific)



How do you get over this hurdle?



# WVDEP Default Recreator Exposure Factors (Appendix C)

**Activity-specific Default EF and ET based on ~90<sup>th</sup> percentile from literature review**

Recreational Activity	EF (days/year)	ET (hours/day)
Rail Trail and Other Trails	250	4.0
ATV and OHV	46	3.0
Swimming, boating, water-skiing and zip-lining	42	3.0
Horseback riding	62	3.0
Skiing, tubing and sledding	26	3.0
Fishing, hunting and wildlife-watching	50	3.0
Community parks	52	3.0
Camping	14	24
Athletic fields (e.g., soccer, football, baseball)	117	3.0



# WVDEP Default Recreator Exposure Factors

## General Default EF and ET

Recreational Activity	EF (days/year)	ET (hours/day)	Description
<b>Unrestricted Recreation</b>	250	4.0	Any recreation activity that has unrestricted public access throughout the year, including; rail trails, ATV/OHV, fishing, community parks, camping, athletic fields, wildlife-watching.
<b>Restricted Recreation</b>	100	3.0	Includes all recreational activities not in the <b>Unrestricted Recreation</b> category. Also includes <b>Unrestricted Recreation</b> activities that have WVDEP-approved restrictions in place, such as locked fences, natural barriers or other access controls.



# Considerations for Recreation Exposure Factors

Can use either

- General Default values based on access restrictions, or
- Activity-specific Default values

Enter the EF and ET values into the RSL Calculator

Assume the default values for all other parameters in RSL Calculator

Run the analysis

Report the results in the Risk Assessment Report

Attach output as an Appendix

Example? Arsenic in park surface soils at 15 mg/kg [https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)



# Rail Trail Guidance

Option 1: Use RSL Recreator Rail Trail scenario, or

Option 2: **VRPGM Appendix G** Expedited Rail Trail Guidance

- Only common COPCs or uses of rail property (no machine shop)
- Assume Arsenic, Lead and PAHs are in surface and subsurface soils
- Need confirmatory soil samples
- Screen for potential groundwater issues (MTG or SPLP)
- De Minimis Risk Assessment based on presumptive remedies
- Implement presumptive remedies
  - Cap/cover of rail bed and working areas
  - Restrict to Recreational trail use only (LUC)
  - Restrict potable groundwater use (LUC), pending MTG/SPLP results
  - Restrict excavation activities? (LUC), pending soil results
- Submit Remedial Action Completion Report and Final Report (combined?)
- How to handle GW based on exceedances of MTG/SPLP?





# VURAM for Construction Workers in a Trench

Use **Virginia Unified Risk Assessment Model (VURAM)** – Microsoft Access based.

Available here: <https://www.deq.virginia.gov/Programs/LandProtectionRevitalization/RemediationProgram/RiskAssessment.aspx>

- Choose “Quantitative Risk Assessment” and enter name of project
- Select “RCRA Corrective Action” for the Program
- Select “Construction” for the Study Area
- Select 1E-05 for Individual Chemical Risk and Cumulative Risk
- Select the COPCs from the Chemical List and select “Add”
- Select “Next” and then select “Add All” of the Selected Chemicals on next page
- Enter Soil Concentrations (surface/subsurface EPCs) for your site
- Click “Calculate Soil” and then select the Groundwater tab (if GW is  $\leq 10$  ft bgs)
- Select “Direct Less than 15ft” for Groundwater Contact Depth
- Enter Groundwater EPCs and Click “Calculate Groundwater”
- Click “Calculate Total Risk/Hazard Report”
- Discuss results in Risk Characterization
- Attach VURAM Report as Appendix



# Section 5.2 Remedial Action Work Plan



# Section 5.2 Remedial Action Work Plan

## VRP GUIDANCE MANUAL CONTENT - RAWP

- Summary of Information Required
- Remediation Standards
- Remediation Measures
  - Selection of Alternatives
  - Natural Attenuation
  - Uncertainty or Risks
- Organization and Content
- Submittal and Approval



# Section 5.2 Remedial Action Work Plan

## NEW REMEDIAL ACTION WORK PLAN (RAWP) OUTLINE

- Will be added to VRPGM
- Will be available on OER – Brownfields Section – Technical Guidance and Templates Webpage
- Good “quick-check” to ensure all Sections of plan are included before submitting
- Should lead to faster reviews and approvals
- More detailed guidance planned



# Section 5.2 Remedial Action Work Plan

## NEW REMEDIAL ACTION WORK PLAN (RAWP) OUTLINE

Title Page

Table of Contents

List of Acronyms and Abbreviations

- 1) Introduction (summarize purpose of report with respect to the VRP) – per Voluntary Remediation Program Guidance Manual (VRPGM), Section 5.2.1
- 2) Site Investigation Summary (sampling/analysis, i.e., summary of SAR; other applicable investigations/reports may be referenced (bullet points) and included in References) – per VRPGM, Section 5.2.1



# Section 5.2 Remedial Action Work Plan

## NEW REMEDIAL ACTION WORK PLAN (RAWP) OUTLINE

- 3) Risk Assessment Summary (to document the appropriateness of the selected remedy) – per VRPGM, Section 5.2.1
  
- 4) Listing of Remediation Standards (Human Health and Ecological) – per VRPGM Section 5.2.2, and the VRP Rule – Section 60-3-9)
  
- 5) Remedial Alternatives Evaluation (per VRPGM, Attachment 6 – VRP Decision Trees, VRPGM Section 5.2.3.1 and the VRP Rule – Section 60-3-9.8.a)
  - Remedy Selection and Justification (per the above evaluation)\*
  - Remediation/Mitigation Conceptual Site Model (CSM) – per VRPGM, Section 5.1
  - Uncertainty or Risks Associated with the Selected Remedy – per VRPGM, Section 5.2.3.3



# Section 5.2 Remedial Action Work Plan

## NEW REMEDIAL ACTION WORK PLAN (RAWP) OUTLINE

- 6) Statement of Work to Accomplish the Remediation – Sections 5.2.1 and 5.2.4
  - Details of Engineering Measures (as applicable) – per VRPGM, Section 5.2.4
  - Verification Sampling Protocol and Sampling Plan (consistent with SAWP) – per VRPGM, Section 5.2.4
  - Additional Information or Supporting Plans – per VRPGM, Section 5.2.4
  - Implementation Schedule – per VRPGM, Sections 5.2.1 and 5.2.4

References

Tables/Figures

Appendices/Attachments

\*If the selected remedy includes Natural Attenuation, VRPGM Section 5.2.3.2 applies and the criteria in the VRP Rule (Section 9.9.a thru 9.9.a.i), must be addressed in the RAWP



# Section 5.3 Remedial Action Completion Report

## WHEN IS A REMEDIAL ACTION COMPLETION REPORT (RACR) REQUIRED?

Any time active remediation has been implemented:

- Soil excavation (5.3.3)
- Groundwater containment/remediation (5.3.2.3/5.3.4)
- Engineering Controls, e.g., Caps/Covers (5.3.2.2)
- Institutional Controls - when combined with active remediation or engineering controls (5.3.1)

A Remedial Action Completion Report is **NOT** required when a Land Use Covenant (**LUC**) is the only remedy

- The Remedial Action Work Plan (RAWP) will detail the site use restrictions
- The Draft LUC should be included in the RAWP





# Public Notification for Higher Risk Levels

- See Section 4.6.2: Implementing Site-Specific Standards
- See also 60CSR3, Section 7.3: Public Involvement/Public Notification in Development of Remediation Goal
- Public notification is required if:
  - Calculated residual cancer risks exceed the one in one million level ( $1 \times 10^{-6}$ ) for residential land use
  - Calculated residual cancer risks exceed the one in one hundred thousand ( $1 \times 10^{-5}$ ) level for industrial land use



# Public Notification for Higher Risk Levels

- 30-day comment period and informational meeting required
  - Public Notice in local newspaper starts the public comment period; ad must be printed 1/week for 4 consecutive weeks
  - Applicant must send copy of ad to the municipality, the county commission, and either the county and/or municipal land use agency or the area's Regional Planning and Development Council
  - Informational meeting must occur by day 21 of public comment period, with 15 days' notice given for meeting
  - Applicant must respond to any comments received and send both comments and responses to Secretary



# Cover and Cap Guidance

## TERMINOLOGY

- Covers and Caps are Remedies (Engineering Controls)
- Cover: Prevents direct contact exposure to contaminated media that exceeds a VRP remediation standard
- Cap: A cover that also minimizes infiltration of water into contaminated media that may cause migration of contaminants into groundwater or underlying soil



# Cover and Cap Guidance

## REGULATORY APPLICABILITY

- VRP covers and caps are generally not required to meet requirements of RCRA or TSCA
- Where RCRA or TSCA has precedent, cap system design must meet requirements of that regulatory program
- Cap systems that meet RCRA or TSCA requirements are acceptable to the VRP



# Cover and Cap Guidance

## SUBMITTAL REQUIREMENTS

- Design details submitted with RAWP
- Amount of supporting data and calculations depend on complexity of the design and function
- Construction documentation submitted with RACR or FR



# LNAPL Sites Closure Policy

## **INFORMATION REQUIREMENTS – (See SECTION E.4)**

- Site Assessment
  - 12 LNAPL-related criteria to be met
- LNAPL Conceptual Site Model (LCSM)
  - 6 criteria to develop a thorough LCSM

## **CLOSURE REQUIREMENTS – (See SECTION E.5)**

- Remedial Action Work Plan (RAWP)
  - Includes information above
  - Multiple lines of evidence
    - ❖ Primary and Secondary criteria



# LNAPL Sites Closure Policy

## ❖ Primary Criteria:

- ✓ Must be addressed under VRP or UECA-LUST - Institutional Controls Required
- ✓ Sufficient MW Network – LNAPL body not increasing/migrating
- ✓ Monitoring data from within plume demonstrates decreasing thickness
- ✓ Dissolved-phase plume stable or decreasing along with LNAPL body
- ✓ Recovery efforts indicate declining trend; continued recovery unnecessary
- ✓ Alternate technology would not significantly increase LNAPL recovery
- ✓ Natural Source Zone Depletion (NSZD) is comparable to or exceeds depletion rate via active recovery
- ✓ Transmissivity values  $< 0.8 \text{ ft}^2/\text{day}$
- ✓ Site meets Natural Attenuation criteria in the VRP Rule



# LNAPL Sites Closure Policy

## ❖ Secondary Criteria:

- ✓ Soil data from various points in time indicates a decrease in LNAPL saturation
  - ✓ Compositional LNAPL data from various points in time demonstrates reduction of primary risk drivers (e.g., benzene, naphthalene, etc.)
  - ✓ Where soil vapor extraction has been conducted, soil vapor recovery data indicate a declining trend in mass recovered
- RAWP will be reviewed by OER LNAPL Closure Review Team
  - Resources: API, ASTM, EPA and ITRC





# Natural Attenuation (MNA)

- Natural Attenuation is a Remediation Measure (60CSR3, Section 9.8):  
“The applicant may attain any of the remediation standards through one or more remediation activities that can include treatment, removal, engineering or institutional controls, and natural attenuation...”
- Section 9.9 - Natural Attenuation:  
“The applicant may request that the Secretary approve a remediation plan based upon natural processes of degradation and attenuation of contaminants.”
- Submit MNA proposals in a Remedial Action Work Plan



# MNA - Groundwater Protection Act

- Groundwater Protection Act 22-12-2 (b)

“...the Legislature establishes that it is the public policy of the State of West Virginia to maintain and protect the state's groundwater so as to support the present and future beneficial uses and further to maintain and protect groundwater...”
- 22-12-4 (b)

“...every reasonable effort shall be made to ... strive where practical to reduce the level of contamination over time to support drinking water use”
- MNA represents a reasonable level of effort
- Address impacts only where practical



# MNA - Requirements

- Capacity to degrade or attenuate under site conditions
- Plume is not increasing in size
- Sources controlled or removed where practicable (NAPL)
- Time and direction of travel can be reasonably predicted
- Migration will not violate groundwater standards at a receptor



# MNA - Requirements

- Adjacent properties served by public water or consent to contaminant migration onto their property
- Access agreements to monitor groundwater can be obtained
- Discharge to surface water will not violate water quality standards
  - VRPGM Appendix B
- Monitoring in place to track attenuation and detect impacts prior to reaching a receptor
- The proposed plan is consistent with all other environmental laws
  - Groundwater Protection Act



# MNA – Data Requirements

- Unless a robust dataset has been developed and is supported using natural attenuation models, and a sensitive receptor is not present, a natural attenuation monitoring plan is necessary:
  - Monitor plume migration
  - Verify that natural attenuation is ongoing
  - Attenuation rate adequate to preclude impact to receptors
- Data Set: Minimum of four years, at least semiannually
- All parameters used to support the natural attenuation strategy:
  - Parent and daughter compounds
  - Dissolved gasses ( $O_2$  -  $CH_4$ )
  - Electron donors and electron acceptors



# MNA – Historical Data

- Validation not required for MNA support data (Not usually an EPC)
- Data from LUST investigations is acceptable where quality adequate
- Be careful where data quality is unknown or suspect
- Evaluate with respect to project Data Quality Objectives
- Discuss data quality with OER staff prior to using historical data
- Be prepared to justify and defend any historical data that is used



# MNA – Little or No Data

- Begin monitoring program immediately
- Sample quarterly to build a larger dataset sooner
- Include MNA indicator parameters:
  - Dissolved oxygen, nitrate, ferric iron, sulfate, and methane
- Analyze for dichlorination products:
  - PCE to TCE
  - TCE to cDCE
  - cDCE to VC



# MNA - Evaluate the Data

- Demonstrate that concentrations are decreasing over time
- Predict time when MCL is reached
- Graphical Analysis (Plot concentration/time)
  - Include groundwater levels
  - Provide separate graphs for different COCs
  - Separate graphs for each well?





# MNA – Evaluate the Data

- Statistical Analysis (Be aware of small dataset limitations)
  - Mann Kendall Test (Including Seasonal Kendall)
    - Go-To Method
  - Regression analyses (Large datasets)
  - Sen Test
  - Mann-Whitney U Test (Least preferred – Not time related)
- Software packages:
  - XLSTAT
  - Natural Attenuation Software (NAS)
  - Monitoring and Remediation Optimization System (MAROS)



# Land Use Covenants

## Reminders

- Go to OER's website for most up-to-date templates
- LUCs should be drafted and submitted with the Remedial Action Work Plan, and should be finalized and signed prior to submitting the Final Report
- Instruction pages for the LUC and site map:
- <https://dep.wv.gov/dlr/oer/brownfieldsection/technicalguidanceandtemplates/Documents/LUC%20Template%20Instructions%20Page%20%282019.05.14%29.pdf>
- Instruction pages for the Inspection Form:
- <https://dep.wv.gov/dlr/oer/brownfieldsection/technicalguidanceandtemplates/Documents/LUC%20Inspection%20Form%20Instructions%20Page%20%282019.09.26%29.pdf>

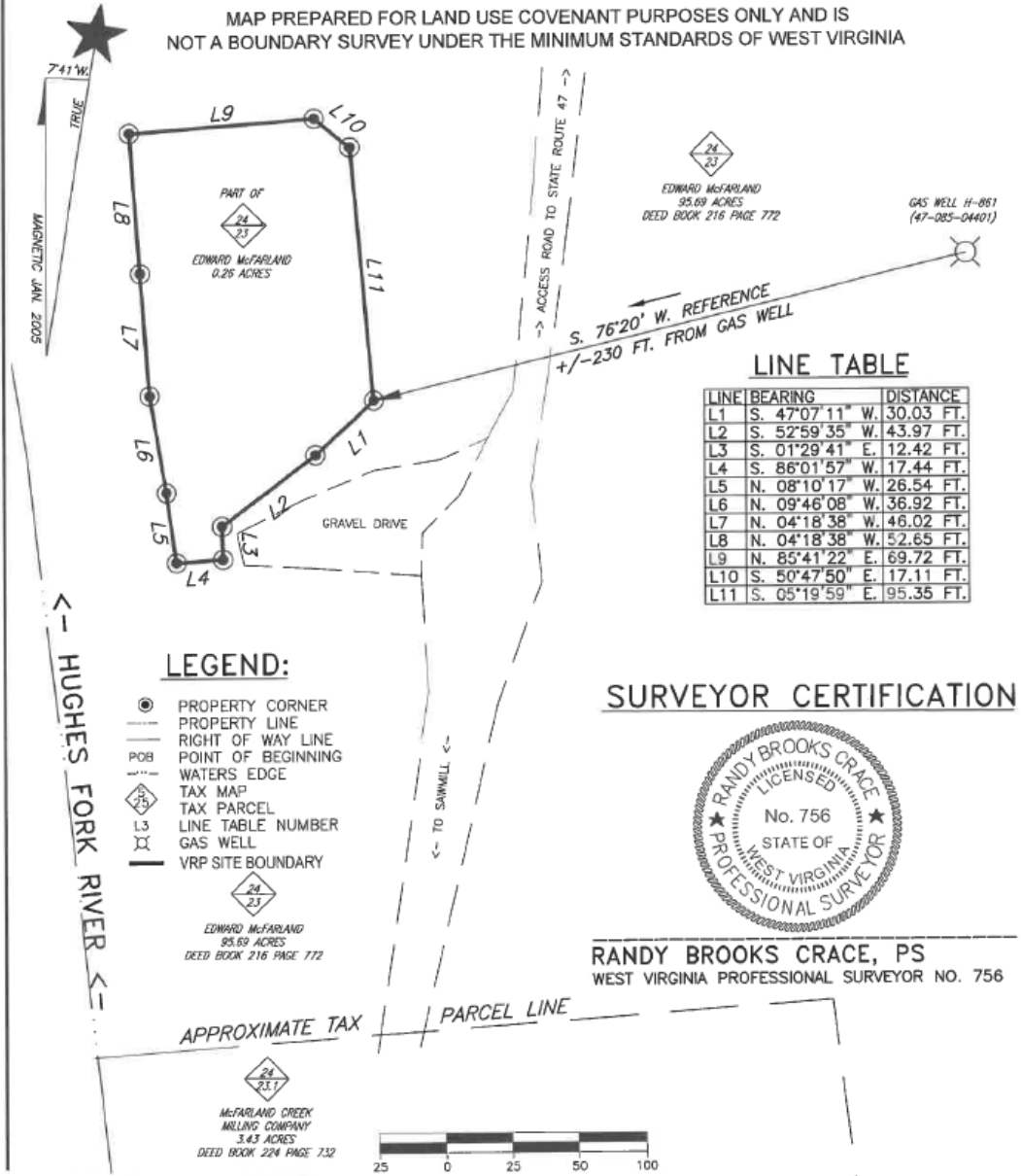


# Land Use Covenants

- Site map instructions include:
  - ✓ Title
  - ✓ Scale
  - ✓ North arrow
  - ✓ Legend
  - ✓ Property boundary
  - ✓ VRP site boundary
  - ✓ Specific activity and use limitation boundaries
  - ✓ Engineering control boundaries
  - ✓ 8.5x11
  - ✓ Black and white
  - ✓ Minimum 300 DPI resolution
  - ✓ No aerial or dark backgrounds or environmental sample points



MAP PREPARED FOR LAND USE COVENANT PURPOSES ONLY AND IS NOT A BOUNDARY SURVEY UNDER THE MINIMUM STANDARDS OF WEST VIRGINIA



**LINE TABLE**

LINE	BEARING	DISTANCE
L1	S. 47°07'11" W.	30.03 FT.
L2	S. 52°59'35" W.	43.97 FT.
L3	S. 01°29'41" E.	12.42 FT.
L4	S. 86°01'57" W.	17.44 FT.
L5	N. 08°10'17" W.	26.54 FT.
L6	N. 09°46'08" W.	36.92 FT.
L7	N. 04°18'38" W.	46.02 FT.
L8	N. 04°18'38" W.	52.65 FT.
L9	N. 85°41'22" E.	69.72 FT.
L10	S. 50°47'50" E.	17.11 FT.
L11	S. 05°19'59" E.	95.35 FT.

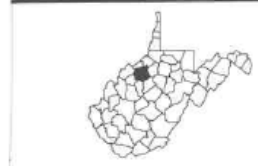
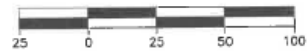
**LEGEND:**

- PROPERTY CORNER
- PROPERTY LINE
- - - RIGHT OF WAY LINE
- POB POINT OF BEGINNING
- WATERS EDGE
- TAX MAP
- TAX PARCEL
- LINE TABLE NUMBER
- GAS WELL
- VRP SITE BOUNDARY

**SURVEYOR CERTIFICATION**



**RANDY BROOKS CRACE, PS**  
WEST VIRGINIA PROFESSIONAL SURVEYOR NO. 756



MAP REFERENCE:  
McFARLAN QUAD, RITCHIE COUNTY, WEST VIRGINIA

**EXHIBIT A - SITE MAP**  
SHOWING ACTIVITY AND USE LIMITATIONS  
PENNZOIL QUAKER STATE COMPANY  
dba SOPUS PRODUCTS  
McFARLAN STATION - 171294  
NEAR THE COMMUNITY OF McFARLAN  
MURPHY DISTRICT, RITCHIE COUNTY, WEST VIRGINIA

SCALE: 1"=50'      DATE: NOV. 21, 2018



# Land Use Covenants



Inspection Form:

<https://dep.wv.gov/dlr/oer/brownfieldsection/technicalguidanceandtemplates/Pages/default.aspx>

- Inspection Form content:

- ✓ Inspection date
- ✓ Site information
- ✓ Person conducting inspection's contact information
- ✓ Property owner at time of inspection
- ✓ Current status – abandoned or active
- ✓ Ownership transfer – **important!**
- ✓ Only include restrictions applicable to the site – delete the rest
- ✓ Only include engineering controls applicable to the site – delete the rest
- ✓ Include inspector's signature and date
- ✓ Can email the form to [OERFileCopy@wv.gov](mailto:OERFileCopy@wv.gov)



# Land Use Covenants

## New DOH LUC

- For non-DOH applicant sites where contamination migrated into a DOH right-of-way
- Specific DOH-approved language
- DOH District Engineer will sign as a holder
- DOH LUC template not on OER's website to avoid confusion – please ask OER staff to email the DOH template
- \*Note: DOH requires a fee to place LUCs on their properties



# Final Reports

## Reminders

- Reference previous reports in a Bibliography
- No Lab Reports or data needed
- May combine Final Report with the Remedial Action Completion Report
- Must include certification statement and be signed by LRS, Applicant and Applicant's Authorized Agent



# Final Reports

## VRP Guidance Manual Section 7.0

- Contents
  - Request for COC
  - Site Information
  - Assessment and Remediation Summary
  - Remediation Standards
  - Bibliographic Reference
  - Contact Information
  - Ongoing work related to the remediation project
  - Institutional Controls
  - Certification





# Questions?

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**\*Note:  
Charleston  
extension  
numbers have  
recently  
changed!**

