1.0 RISK ASSESSMENT SCENARIOS DECISION TREE

Scenario One:

1. All Chemicals of Potential Concern (COPC) are below Screening Criteria, i.e. there are no Chemicals of Concern (COC).
2. There are no complete exposure pathways in the Site Conceptual Model (SCM) for both human or ecological receptors.

If either 1 or 2 are true, then a "De Minimis" risk assessment can be included in the Site Assessment

Minimum Requirements for De Minimis Risk Assessment:

- Human Health Risk Assessment
  - HH checklist
  - Screening of COPCs Table
  - Site Conceptual Model
- Ecological Risk Assessment
  - Eco checklist
  - Site Conceptual Model
  - No evidence of readily apparent harm
  - No exceedences of Surface Water Standards or Benchmarks
  - No threatened or endangered species or habitat

Scenario Two:

There are COCs and complete exposure pathways, but the risks are acceptable. Then a Site-specific Baseline Risk Assessment is sufficient. Baselines assess risk under current conditions, without any remediation.

Scenario Three:

There are COCs and complete exposure pathways, and risks are unacceptable under current conditions at the site. However, with limited remediation such as hot spot removal, and/or institutional controls such as land-use covenants or deed restrictions, and/or engineering controls, the risks are acceptable. This would require both a Site-specific "Baseline" risk assessment to estimate risks under current conditions, and a "Residual" risk assessment to estimate risks after the implementation of remediation and/or controls. The "Residual" would be De Minimis if De Minimis screening criteria were used as the remediation goals; the "Residual" would be "Uniform" if risk-based remediation goals were calculated based on site-specific pathways.

Scenario Four:

There are COCs and complete exposure pathways, and risks are unacceptable under current conditions at the site. A more extensive remediation effort is required to attain acceptable risk levels. This would require both a "Baseline" and a "Residual" risk assessment.

2.0 GROUNDWATER SCREENING DECISION TREE

Note:

- **ALWAYS FIRST, REMEDIATE OR CONTROL ALL SOURCES OF CONTAMINATION IN ORDER TO PREVENT FURTHER CONTAMINATION OF GROUNDWATER AND OTHER MEDIA.**

- Detection Limits must be less than or equal to Screening Levels whenever possible.

- For comparisons, use maximum detected concentration or Upper 95% Confidence Interval

- The de minimis groundwater screening process does not include the vapor intrusion into buildings exposure pathway; therefore, even if volatile organics pass de minimis groundwater screening levels, it may be necessary to evaluate risks associated with volatiles if vapor intrusion pathways are viable under the Site Conceptual Model.

- The de minimis groundwater screening process does not include the migration into surface water pathway. This pathway must be evaluated separately if it is viable under the Site Conceptual Model. Recharge of groundwater into surface water must be considered under current conditions by analyzing the surface water for COPCs in the groundwater, and under potential future conditions by comparing groundwater COPC concentrations to Surface Water Quality Standards (SWQSs) or Benchmarks, if SWQSs are not available. If SWQSs or SW Benchmarks are exceeded in groundwater, then site-specific conditions may be considered (such as geologic or hydrogeologic conditions, equilibrium between groundwater and surface water, overall degradation of the surface water) or groundwater modeling may be necessary. Consultation with WVDEP is strongly suggested in this situation.

SCREENING GROUNDWATER:

Section A

1. Do on-site Groundwater chemical concentrations exceed De Minimis Levels?

2. Do off-site Groundwater chemical concentrations exceed De Minimis Levels?

If the answers to both #1 and #2 are no, then contaminant passes De Minimis groundwater screening. (However see above bullets, other evaluations may be required depending on site conditions).

If the answer to either #1 or #2 is yes, go to Section B.

Section B

1. Do groundwater modeling results indicate a future exceedences of De Minimis Levels in groundwater at the property boundary or reasonably anticipated receptor within nearest migrating distance?

If no, then either:

- select a remedial action for on-site groundwater and submit a Remediation Action Work Plan, or
- restrict groundwater use, and allow passive natural attenuation and consult with WVDEP.

If yes, then either:

- select a remedial action for on-site and off-site groundwater mitigation and submit a Remediation Action Work Plan, or
- assess site-specific risks associated with on-site and off-site groundwater use and land use, and submit Risk Assessment.

Natural Attenuation as a Remedial Action (See 60CSR3 9.9)

A remediation plan based upon natural processes of degradation and attenuation of contaminants may be requested and shall include a description of site-specific conditions including

- written documentation of projected groundwater use in the contaminated area based on current state or local government planning efforts;
- technical basis for the request;
- any other information requested by WVDEP to thoroughly evaluate the request.

Additionally, the requestor must demonstrate the following:

- the contaminant has the capacity to degrade or attenuate under the site-specific conditions;
- the contaminant area, such as a groundwater plume or soil volume, is not increasing in size, or because of natural attenuation processes, that the rate of contaminant degradation is demonstrably more rapid than the rate of contaminant migration; and that all sources of contamination and free product have been controlled or removed where practicable;
- the time and direction of contaminant travel can be predicted with reasonable certainlty;
- the contaminant migration will not result in any violation of applicable groundwater standards at any existing or reasonable foreseeable receptor;
- If the contaminants have migrated onto adjacent properties, the owner must demonstrate that:
    - Such properties are served by an existing public water supply system dependent on surface waters or hydraulically isolated groundwater, or
    - The owners of such properties have consented in writing to allow contamination migration onto their property.

- If the contaminant plume is expected to intercept surface waters, the groundwater discharge beyond the sediment/water interface will not possess contaminant concentrations that would result in violations of standards for surface waters contained in 46CSR1;
- The requestor will put in place a groundwater monitoring program sufficient to track the degradation and attenuation of contaminants and contaminant by-products within and down-gradient of the plume and to detect contaminants and contaminant by-products prior to their reaching any existing or foreseeable receptor. Such monitoring program shall provide for placing one or more monitoring wells at least one year's time of travel upgradient or the receptor, and at least one monitoring well shall be placed at location no farther away from the leading edge of the contaminate groundwater at the site than such contamination is likely to travel in five years;
- All necessary access agreements needed to monitor groundwater quality have been or can be obtained;
- The proposed corrective action plan would be consistent with all other environmental laws.

3.0 SOIL SCREENING DECISION TREE

Directions: Begin with Section A for Inorganics; Begin with Section B for Organics.

Note:

- Detection Limits must be less than or equal to Screening Levels whenever possible.
- For comparisons, use maximum detected concentration or Upper 95% Confidence Interval
- The de minimis soil screening process does not include the vapor intrusion into buildings exposure pathway; therefore, even if volatile organics pass de minimis soil screening levels, it may be necessary to evaluate risks associated with volatiles if vapor intrusion pathways are viable under the Site Conceptual Model.

SCREENING SOIL:

Section A. Background for Inorganics

1. Does concentration of inorganic exceed background concentration?

If no, then contaminant passes soil screening for Residential Land Use.
If yes, then proceed to Section B soil screening.

Note: Background levels can be the highest of:
natural site-specific,
natural state-wide, or
site-specific anthropogenic.

Section B. De Minimis Levels

1. Does concentration exceed "Migration to Groundwater" De Minimis Level?

If no, proceed with screening in question B-2.

If yes, determine if contaminant is present in on-site groundwater ?

a. If no, then address potential migration from soil to groundwater by either discussing the geological and hydrogeological conditions of the site that would limit this migration; or by modeling the potential future migration.

b. If yes, then address groundwater contamination.

2. Does concentration exceed "Residential Soil" De Minimis Level?

If no, then contaminant passes soil screening for Residential Land Use.

If yes, then proceed to question B-3 screening.

3. Does concentration exceed "Industrial Soil" De Minimis Level?

If no, then contaminant passes "Industrial Soil" screening; however, a land-use covenant or deed restriction must be implemented permitting industrial land use only.

If yes, then either:

a. proceed with more detailed risk assessment, either Uniform or Site-specific;

b. remediate to Residential Soil De Minimis Levels;

c. remediate to Industrial Soil De Minimis Levels and implement land-use restrictions.

4.0 SURFACE WATER SCREENING DECISION TREE

Note:

- Surface water should be analyzed for COPCs (chemical detected) in soils, groundwater, and sediment.
- Detection limits must be less than or equal to screening levels whenever possible.
- For comparison, use maximum detected concentration or Upper 95% Confidence Interval
- WV Surface Water Standards do not allow for comparison to natural or anthropogenic background; however, WVDEP may evaluate surface water degradation at it's discretion.
- The lowest Surface Water Standard is used for screening comparisons, which is usually the value in column Protection of Human Health for drinking water and fish ingestion; however, the columns under Protection of Aquatic Life should be discussed in the Ecological Risk Assessment.

SCREENING SURFACE WATER:

1. Does a WV Surface Water Standard exist for the contaminant detected?

If no, then either:

a. ascertain a Federal Water Quality Standard
b. ascertain a Benchmark already developed from another state
c. ascertain a Benchmark already developed from the scientific literature
b. develop a Benchmark according to the WV VRRP Guidance Manual

then proceed with question 2 in screening.

If yes, proceed with question 3 in screening.

2. Does concentration exceed Benchmark?

If no, then contaminant passes surface water screening.
If yes, then consult with WVDEP as to need for remediation or futher risk assessment.

3. Does concentration exceed lowest WV Surface Water Standard?

If no, then contaminant passes surface water screening.
If yes, then consult with WVDEP as to need for remediation or futher risk assessment.

5.0 SEDIMENT SCREENING DECISION TREE

Directions: Begin with Section A for Inorganics: Begin with Section B for Organics.

Notes:

- Sediment should be analyzed for COPCs (chemical detected) in soils, groundwater, and surface water.
- Detection limits must be less than or equal to screening levels whenever possible.
- For comparison, use maximum detected concentration or Upper 95% Confidence Interval if there are more than 10 samples.

SCREENING SEDIMENT:

Section A. Background for Inorganics

1. Does concentration of inorganic exceed background concentration?

If no, then contaminant passes sediment screening.
If yes, then proceed to Section B sediment screening.

Note: Background levels can be:
natural site-specific sediment
natural state-wide sediment
natural site-specific soil
natural state-wide soil
site-specific anthropogenic sediment.

Section B. Sediment Benchmarks

2. Does concentration exceed Benchmark?

If no, then contaminant passes sediment screening.
If yes, then consult with WVDEP as to need for remediation or further risk assessment.

Note: Because no WV De Minimis Levels exist for sediment, benchmark criteria can be developed from:

a. Benchmark already developed from another state, such as EPA Region IV Sediment Criteria
b. Benchmark already developed from the scientific literature
c. develop a Benchmark according to the WV VRRP Guidance Manual