738 Upper Mountain Road Removal Site

Eric Daly, On-Scene Coordinator
USEPA Region 02

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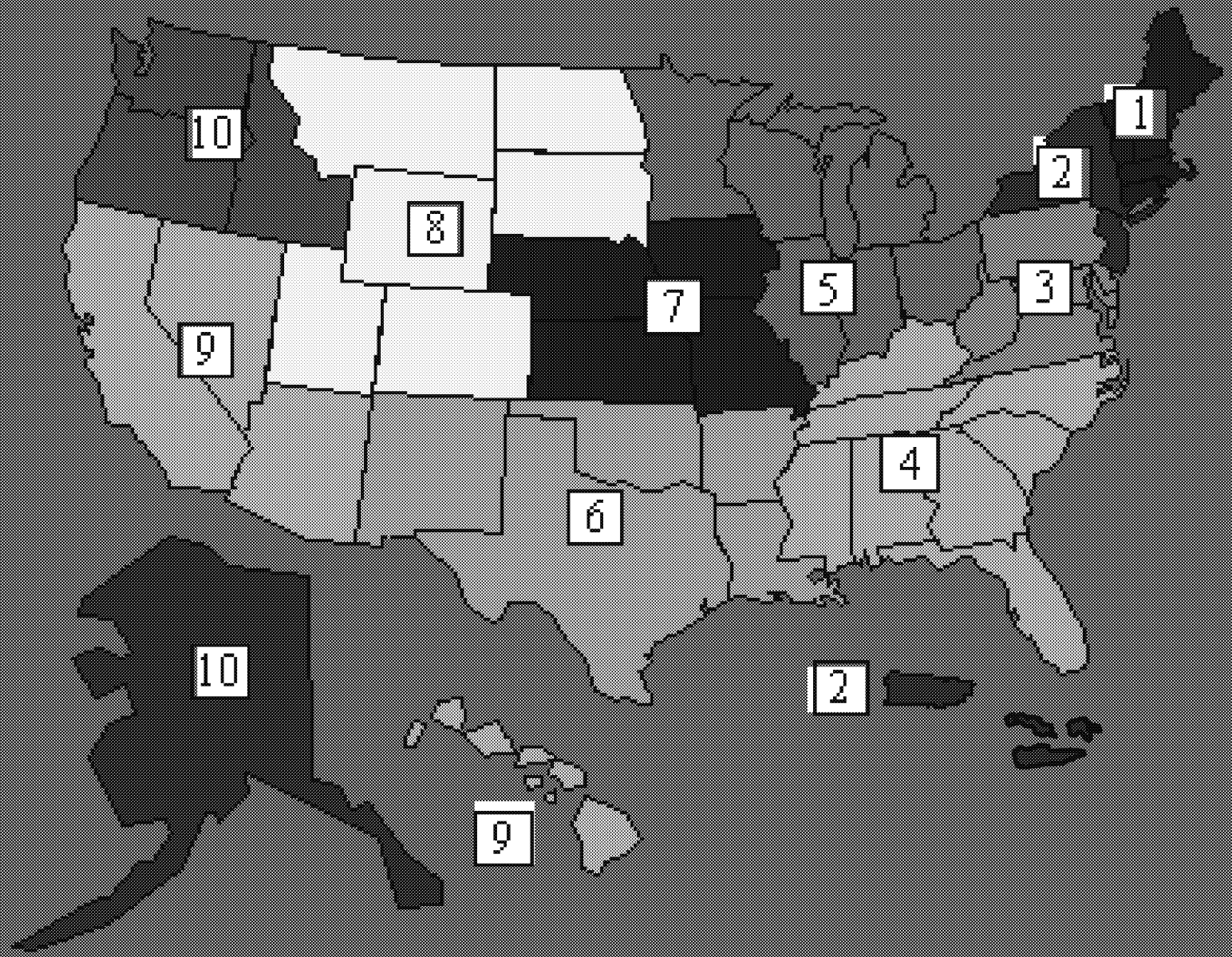
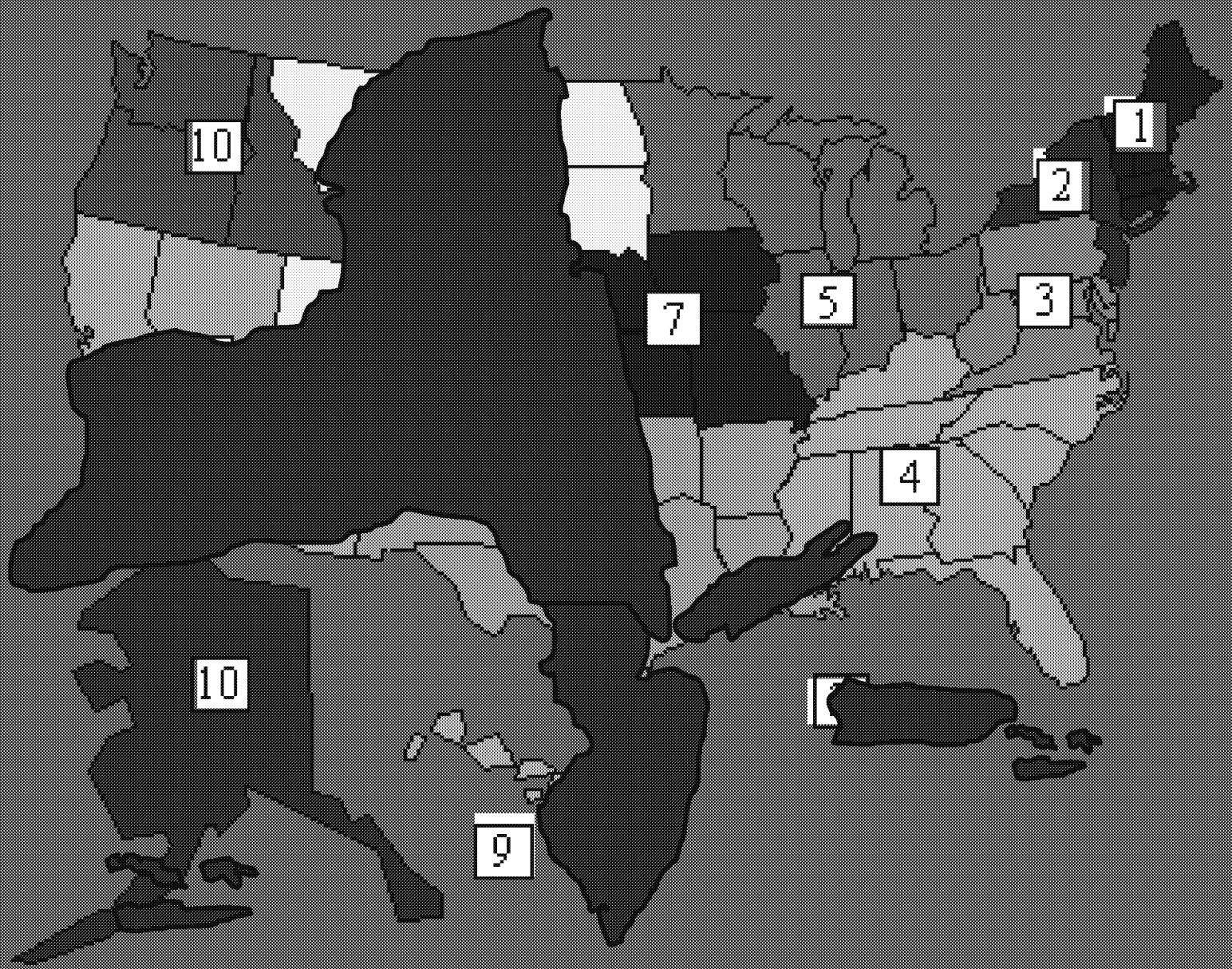
USEPA Environmental Response Team—West

October 24, 2019

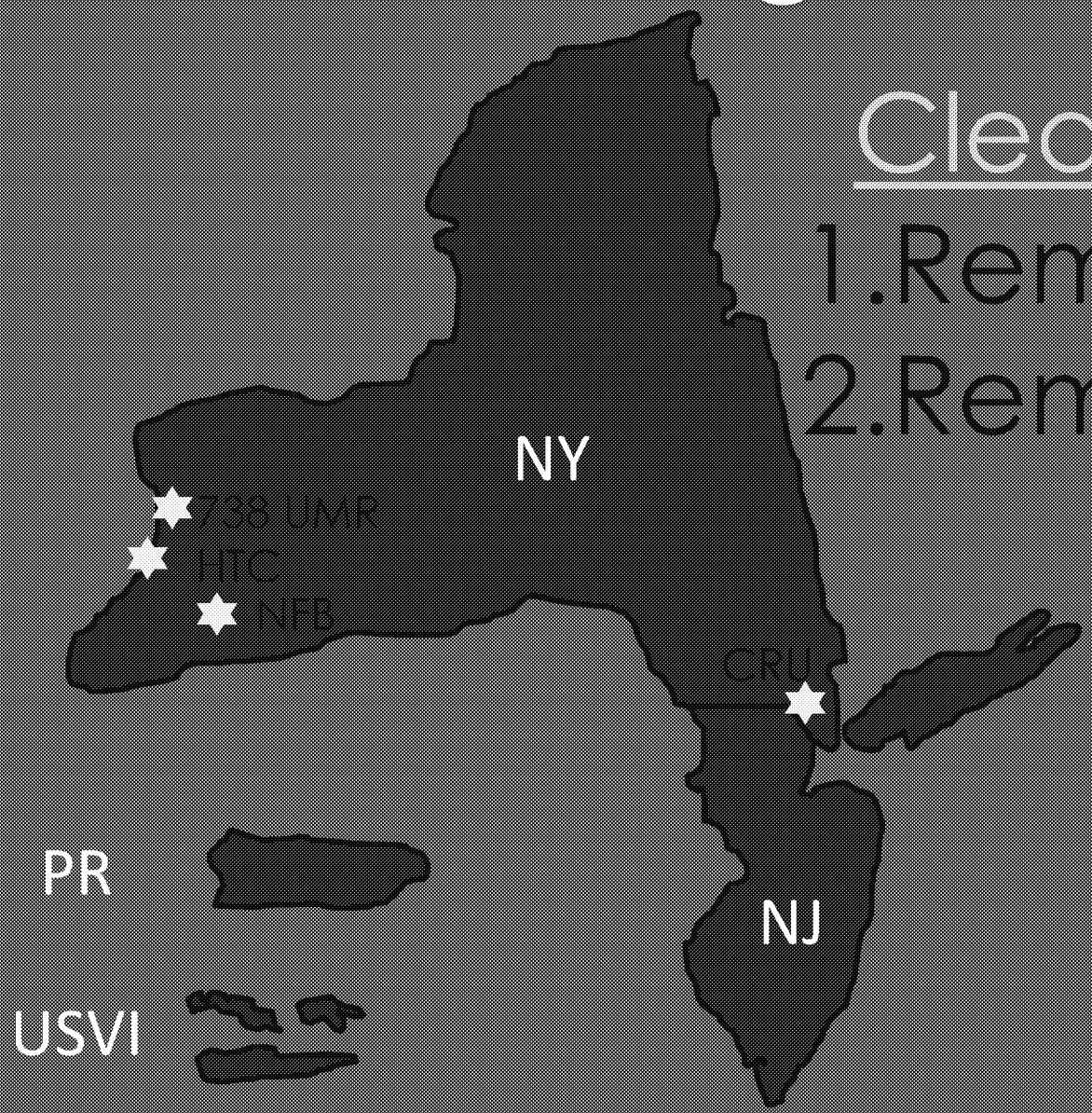
Who we are?



Who we are?



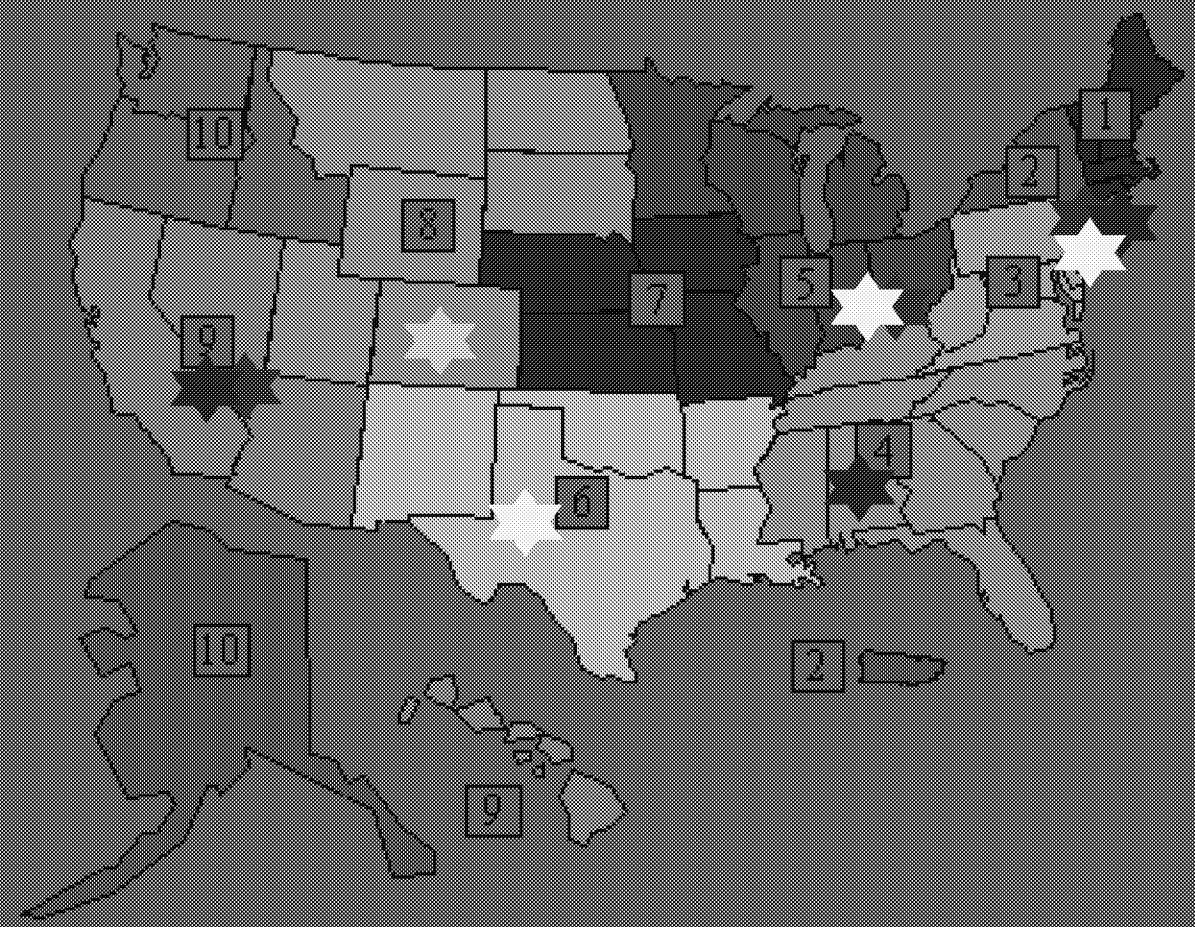
Region 2



Clean up:

1. Removal–OSC
2. Remedial–RPM

Special Teams



Environmental Response Team (ERT)

Consequence Management Advisory Team (CMAT)

Radiological Emergency Response Team (RERT)

National (NCERT)

Site:
738 UMR

History

- In July 1985, members of the Radiological Survey Activities (*RASA*) *Group* at Oak Ridge National Laboratory (ORNL) performed a radiological survey of the Site for the U.S. Department of Energy (DOE), which documented a maximum gamma exposure rate of 710 microroentgens per hour (µR/hr). Biased surface soil samples collected during the survey indicated the presence of Radium-226 (Uranium-238, and Thorium-232 at the Site.
  - In general, background gamma is roughly 10-20 µR/hr
  - Roughly about 50 times background
  - Rule of thumb: EPA starts investigating at roughly 3 times background
- During a reconnaissance performed by the New York State Department of Health (NYSDOH) and the New York State Department of Conservation (NYSDEC) on July 9, 2013, screening activities showed radiation levels at 300 µR/hr with a hand-held pressurized ion chamber. The background readings for this Site were approximately 10 µR/hr.
  - Readings from the State were 30 times background

Contaminant: “Slag”

Radioactive Rock or “Slag” was used as fill dirt for roadways and parking lots throughout the Niagara Falls region

Qualitative vs. Quantitative

- pCi/g

Quantitative Measurements

- cpm
- µR/hr
- mrem/hr

Qualitative Measurements

Base the removal eligibility off of Quantitative Data

EPA Site Assessment

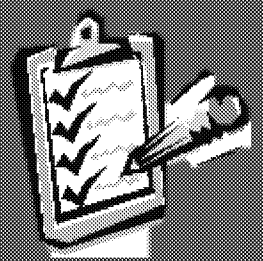
- The NYSDEC and NYSDOH referred the Site to EPA on July 21, 2013 for further assessment.
- From September 2013 through May 2014, the EPA Region 2 Pre-Remedial Section (PRS) initiated a preliminary assessment (PA) and site inspection (SI) to assess whether the Site posed a threat to human health and the environment.

How does it work?

Immediate Threat?
Emergence aspect?

Removal ⟷ Remedial

Pre-Remedial



Meet the
National Priority List?

No

Yes

Removal ⟷ Remedial

EPA Site Assessment

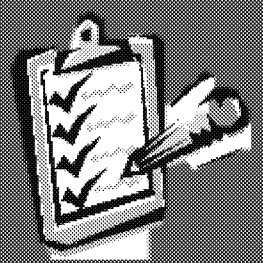
- Based on the PA and SI results, a Hazardous Ranking System (HRS) score was calculated. The calculated HRS score for the Site was less than 28.5 and, as a result, the Site did not qualify for inclusion on the NPL. In May 2015, the Site was referred to the Emergency and Remedial Response Division, now the Superfund and Emergency Management Division (SEMD), Removal Action Branch (RAB) for a determination as to whether the Site warranted a CERCLA removal action.
- Initially, 738 Upper Mountain Road was deemed ineligible for a removal action based on information at the time. However, after EPA OSC and ERT Health Physicist assessed the three other radiological site, the same assessment criteria was applied to 738 UMR Site.

738 UMR

Immediate Threat?
Emergence aspect?

Removal ⟷ Remedial

Pre-Remedial



Meet the
National Priority List?

No

Yes

Removal → Remedial

Pre-Remedial Data:

Removal Assessment Process

First Steps:

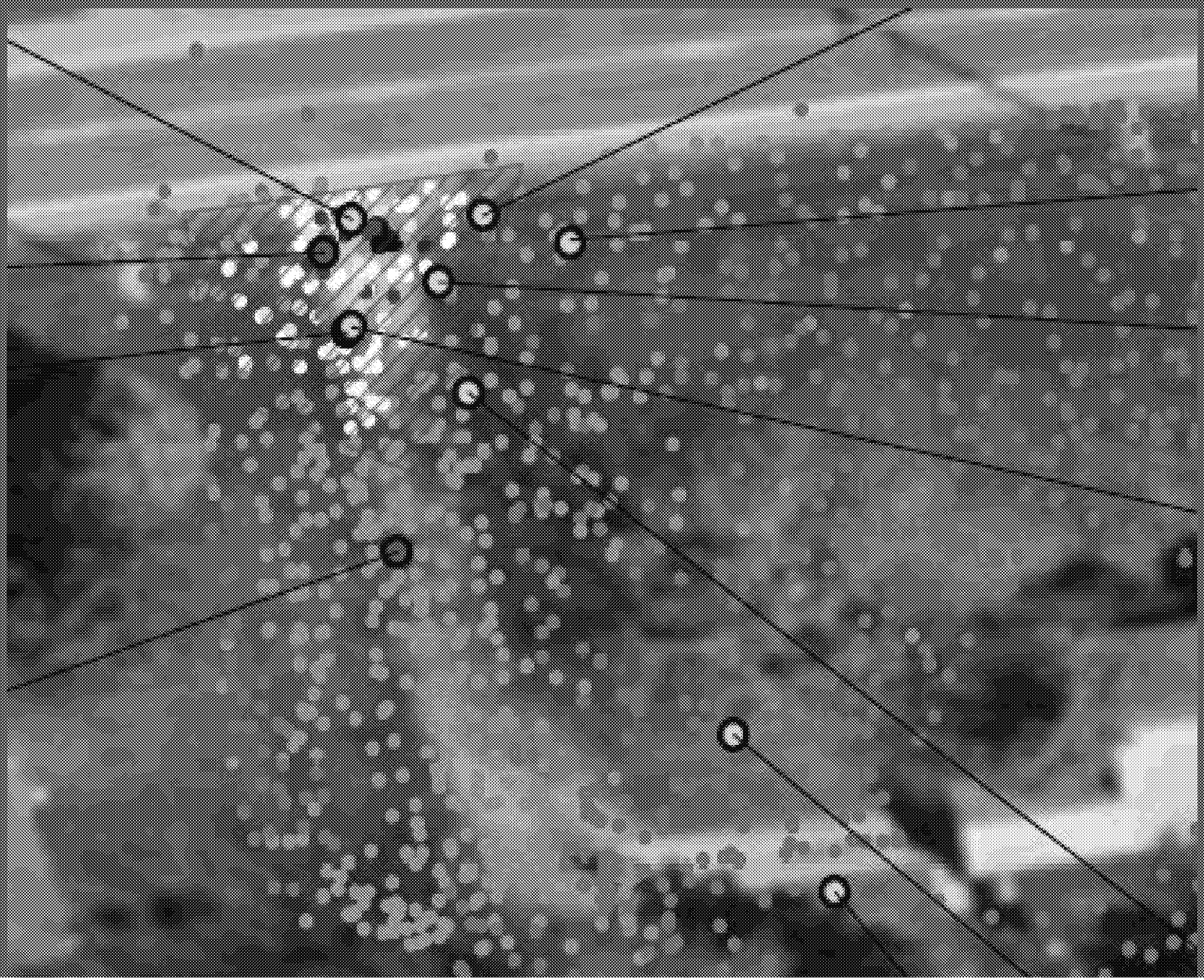
- Ground Truthing:
  - How far does it extend past the property
  - Depth of contamination
  - Radon/Thoron measurements
- Verifying the contaminant(s)

Removal Assessment:

Specifying Site Boundary

Removal Scan

Sampling Locations

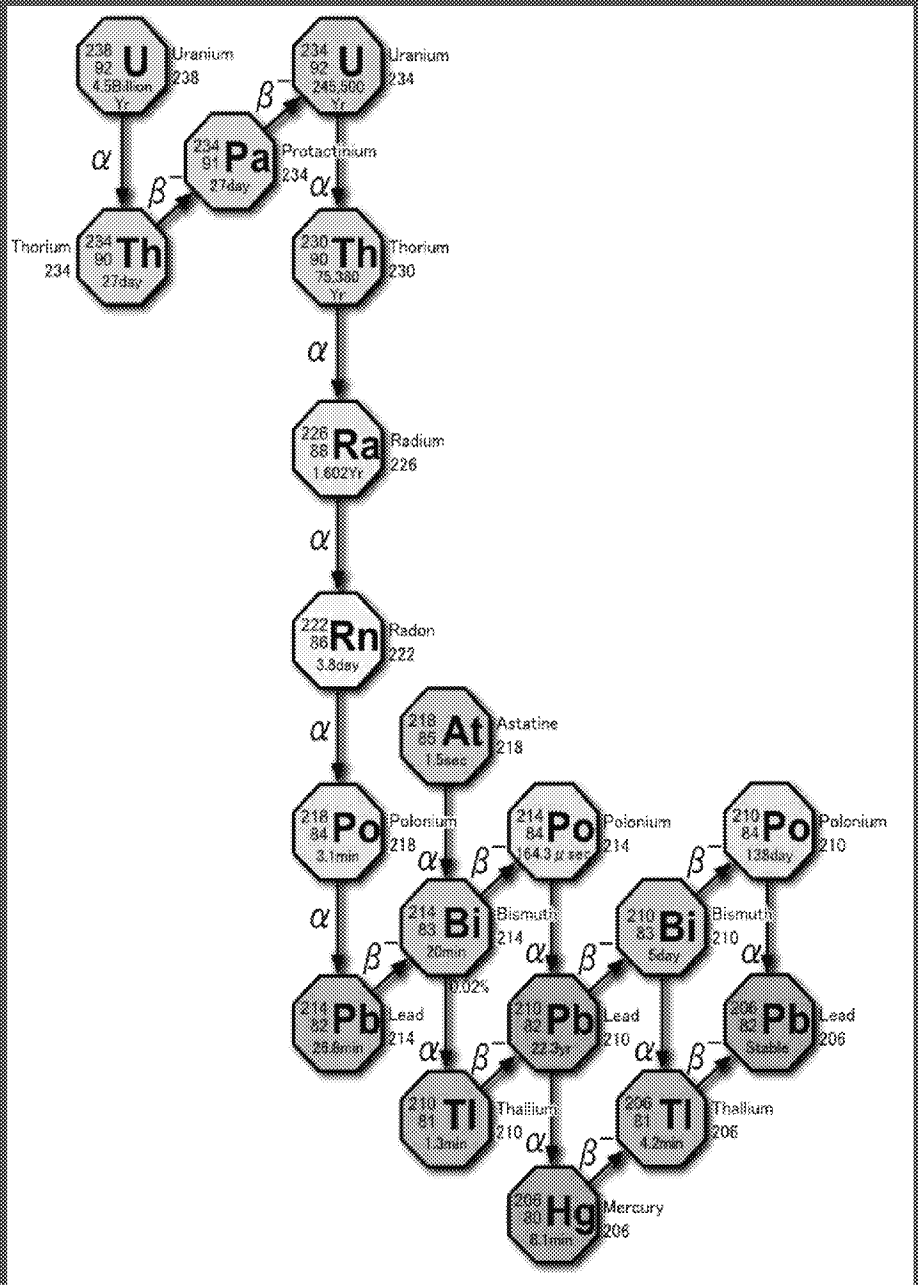


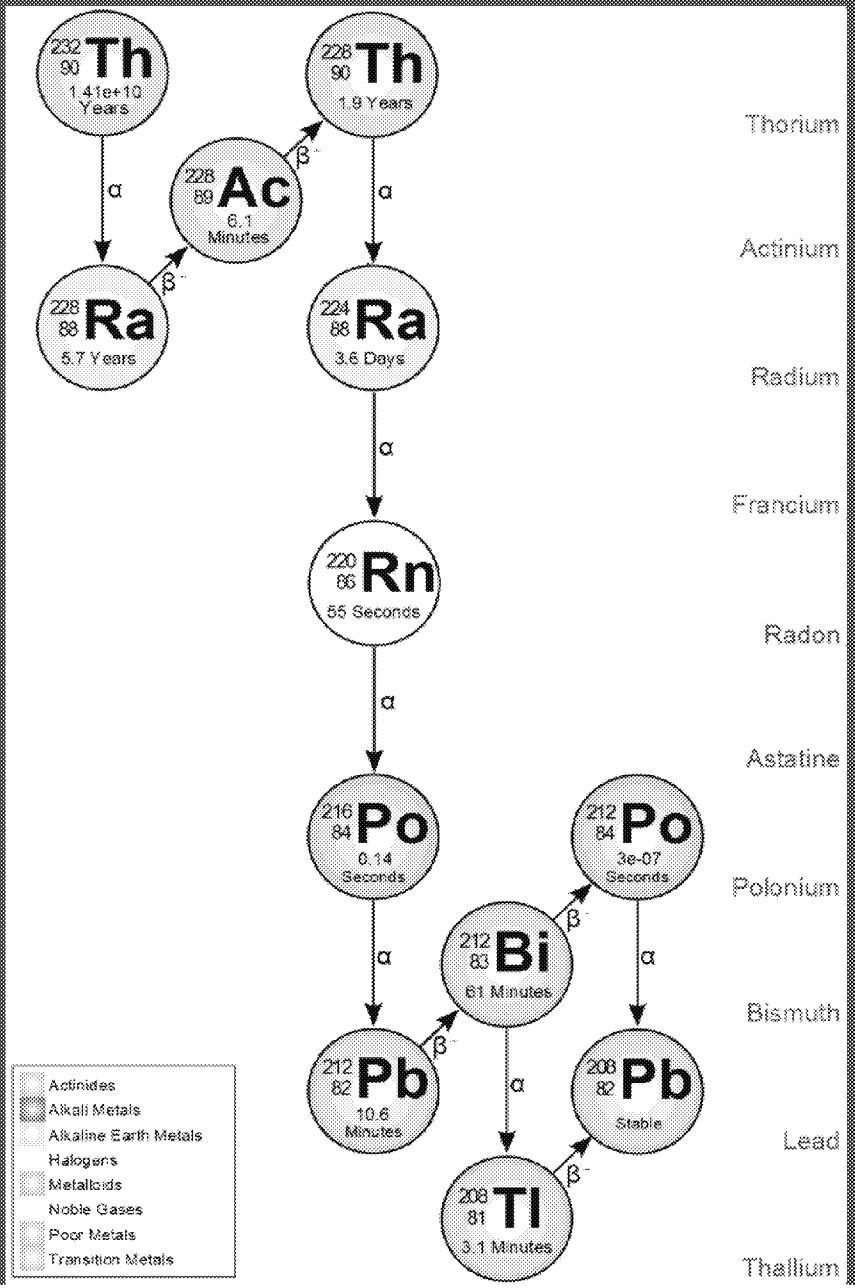
Analytical Results

Radioisotope	Analytical Data RST Data pCi/g
Actinium-228 (Ac-228)	NA
Bismuth-212 (Bi-212)	244.51
Cesium-137 (Cs-137)	0.489
Lead-212 (Pb-212)	232.95
Potassium-40 (K-40)	29.895
Protactinium-234M	32.995
Radium-226* (Ra-226)	36.575
Radium-228 (Ra-228)	221.46
Thallium-208 (Tl-208)	78.922
Thorium-228 (Th-228)	323.85
Thorium-234 (Th-234)	22.436
Uranium-235 (U-235)	2.401
Thorium-228 (Th-228)	74.7
Thorium-230 (Th-230)	12.2
Thorium-232 (Th-232)	59.1
U-233/234	23.5
U-235/236	1.68
Uranium-238 (U-238)	24.2

Ra-226* (21 days ingrowth)
Yellow Highlight indicates the highest concentration in the Th-232 decay chain
Pink Highlight indicates the highest concentration in the U-238 decay chain

Secular Equilibrium





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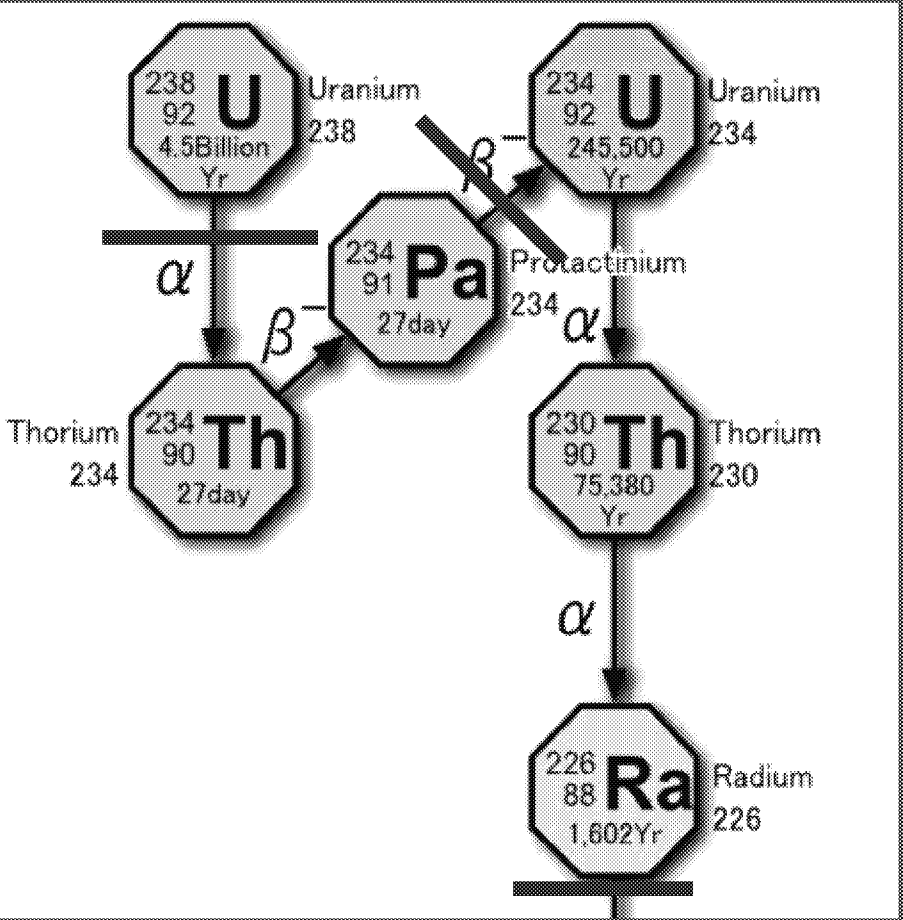

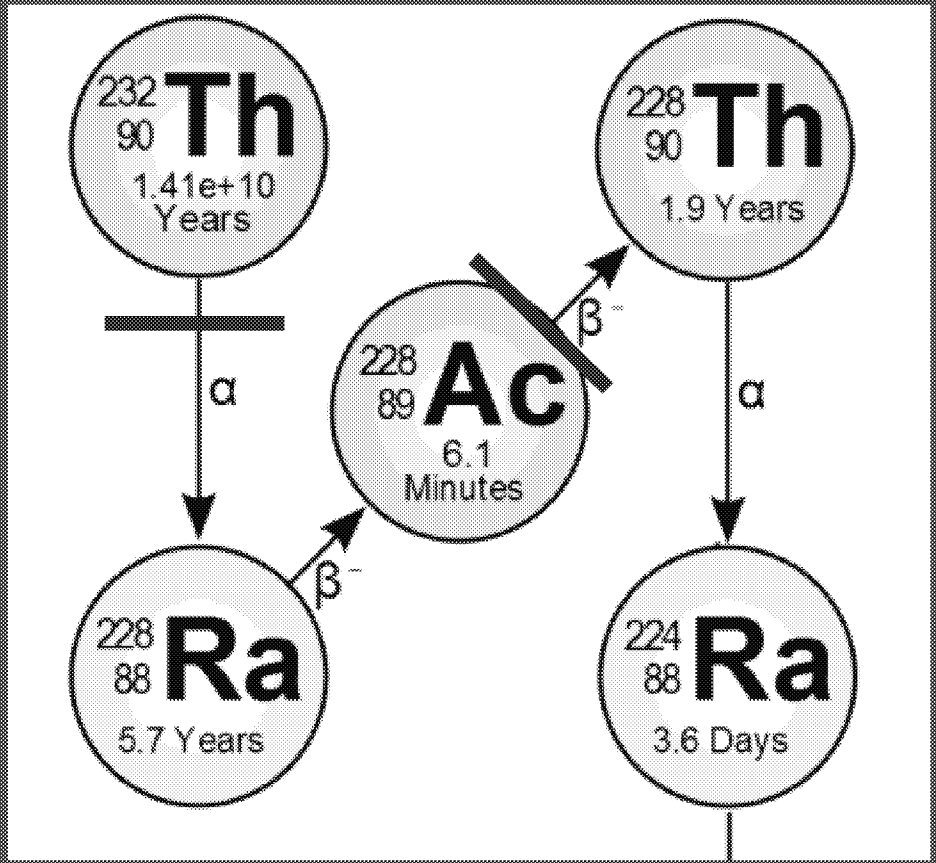

Remember: Limitations of the analysis

Contaminant of Concern vs. Highest Values

Radioisotope	Analytical Data
	pCi/g
Actinium-228 (Ac-228)	NA
Bismuth-212 (Bi-212)	244.51
Cesium-137 (Cs-137)	0.489
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Yellow Highlight indicates the highest concentration in the Th-232 decay chain
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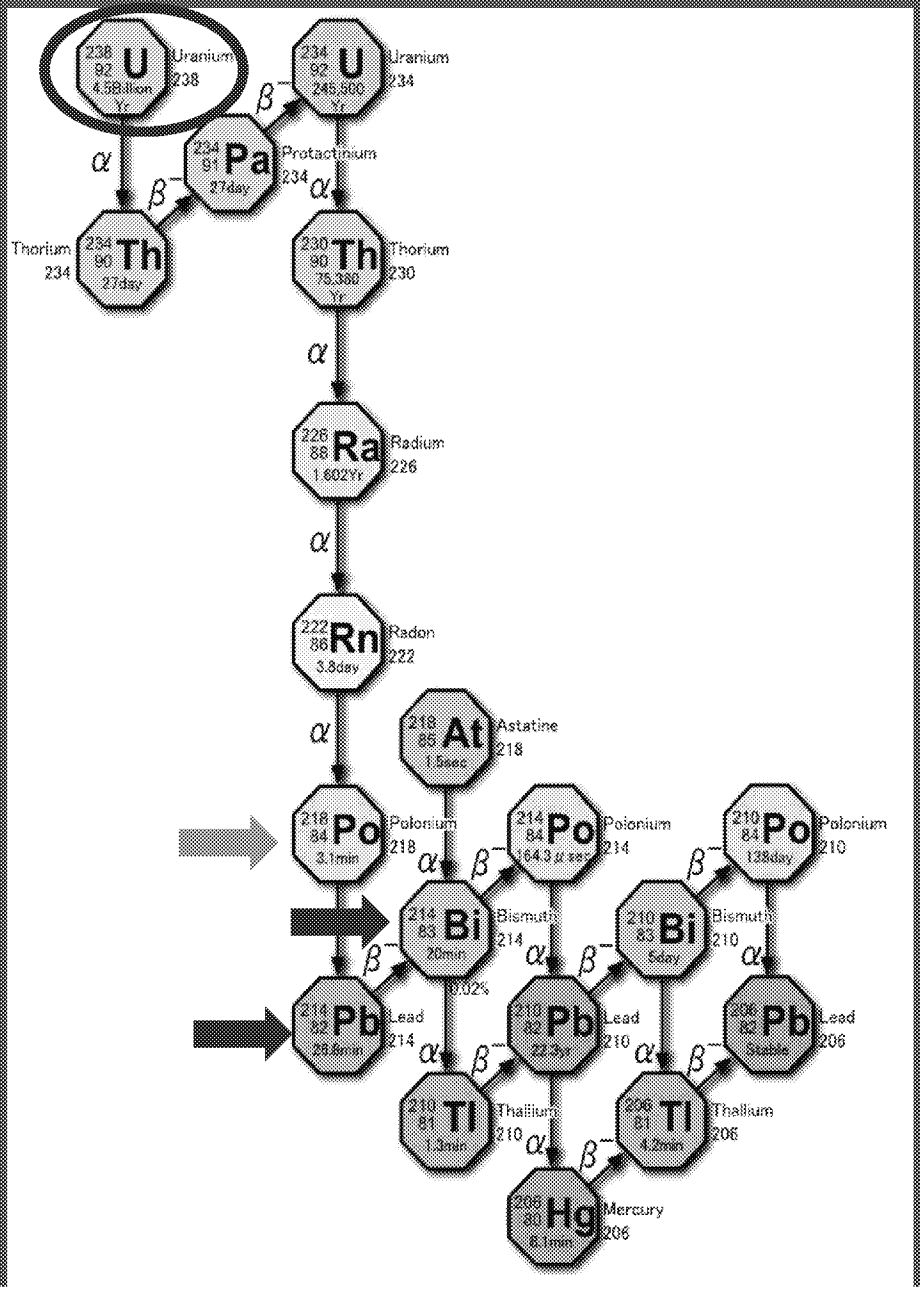
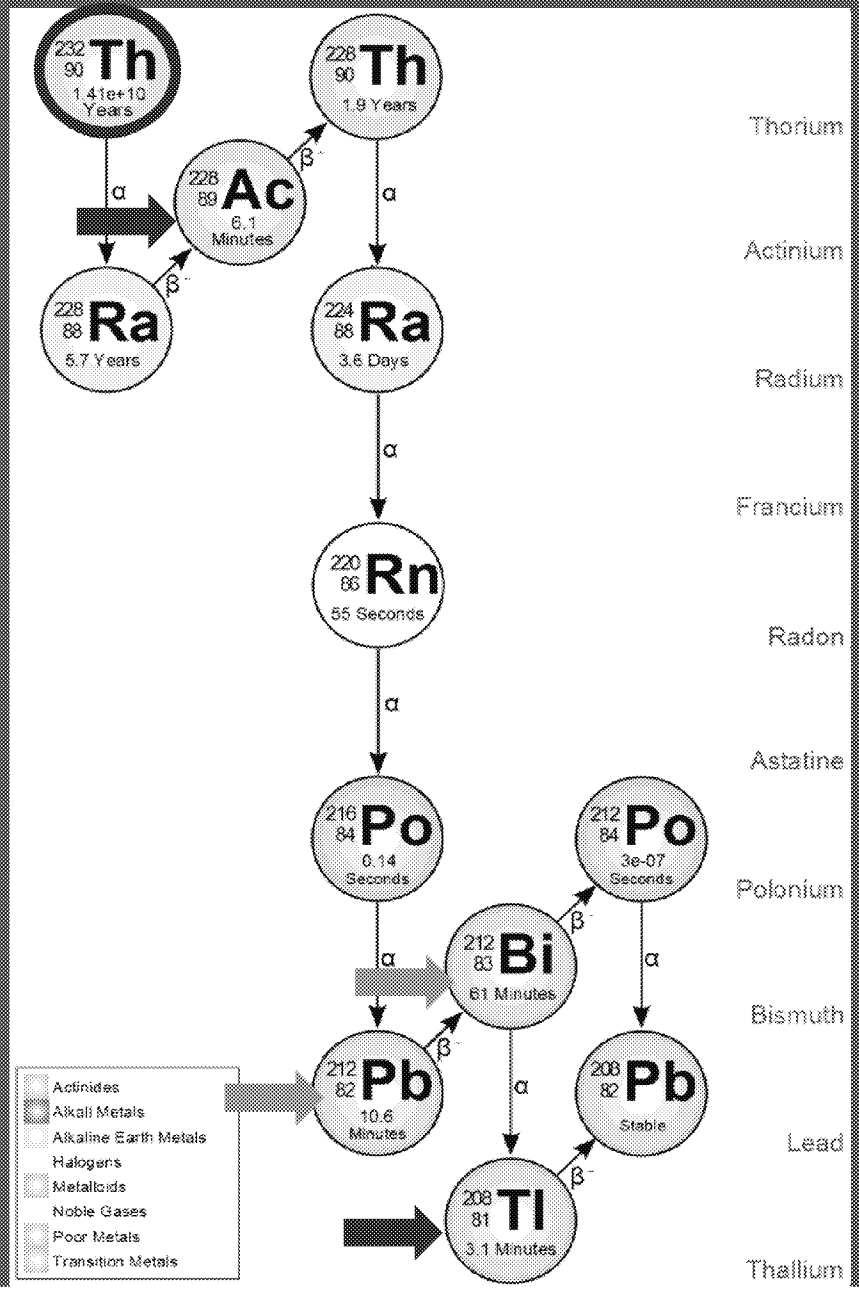
Contaminant of Concern vs. Progeny Surrogate





Is this contamination?

- Three approaches for setting an action limit:
  - Applicable or Relevant and Appropriate Requirements (ARARs)
    - UMTRCA ARAR = 5pCi/g for Radium
  - Dose Based Modeling—ResRad (12mrem/yr)
  - Risk Based Modeling—PRG (10^{-4} to 10^{-6} risk)

The acceptable risk was set to 10^{-4}

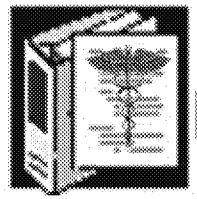
(Or you could think of it as 1 in 10,000 excess risk of developing cancer)

Our Risk Approach

- Internal Risk
  - Inhalation—soil (i.e. pCi/g units)
  - Ingestion—soil (i.e. pCi/g units)
  - Absorption
  - Injection
- External Risk
  - Exposure—gamma (i.e. μR/hr)
  - Dose—gamma (i.e. mrem/hr)

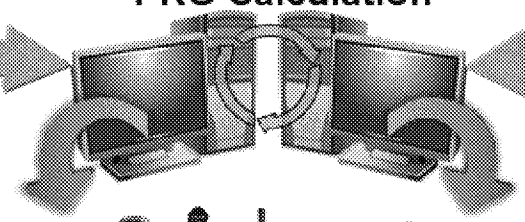
PRG Overview

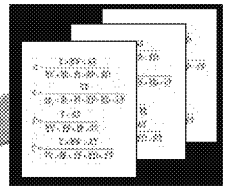
Preliminary Remediation Goals for Radionuclies (PRG)



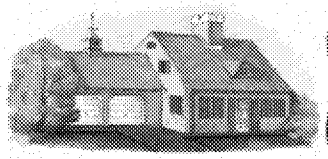
Slope Factors

PRG Calculation

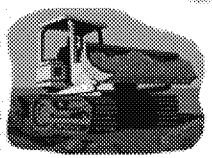




PRG Equations

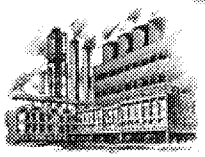


Resident



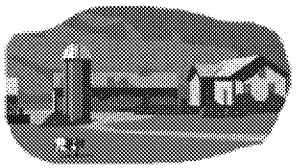
Construction Worker

Outdoor Worker



Indoor Worker

Recreator



Farmer

Resident

- **Soil**: *ingestion*, *inhalation*, *external*, *ingestion of produce*
- **Fish**: *consumption*
- **Tap Water**: *ingestion*, *inhalation*, *immersion*, *ingestion of produce*
- **Air**: *inhalation*, *submersion*
- **Soil Screening Levels** (for protection of groundwater)

Construction Worker

- **Soil**: *ingestion*, *inhalation*, *external*
- **Air**: *inhalation*, *submersion*

Outdoor Worker

- **Soil**: *ingestion*, *inhalation*, *external*
- **Air**: *inhalation*, *submersion*

Indoor Worker

- **Soil**: *ingestion*, *inhalation*, *external*
- **Air**: *inhalation*, *submersion*

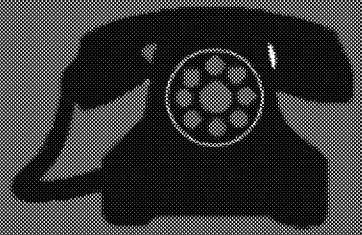
Recreator

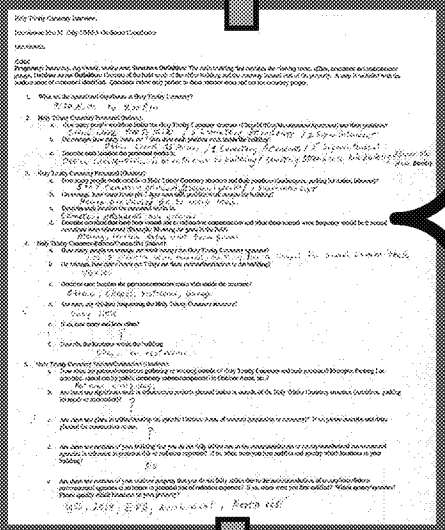
- **Soil/Sediment**: *ingestion*, *inhalation*, *external*
- **Surface Water**: *ingestion*, *immersion*
- **Air**: *inhalation*, *submersion*
- **Biota**: *game*

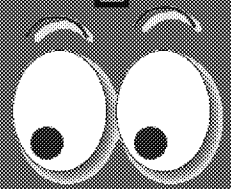
Farmer

- **Soil**: *ingestion*, *inhalation*, *external*, *consumption of produce*
- **Air**: *inhalation*, *submersion*
- **Tap Water**: *ingestion*, *inhalation*, *immersion*, *consumption of produce*
- **Biota**: *poultry*, *eggs*, *beef*, *milk*, *swine*, *fish*

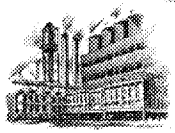
How to choose?



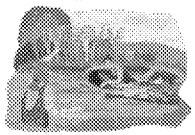




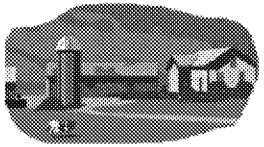
Resident



Indoor Worker

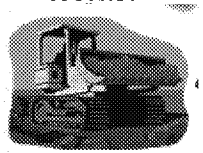


Recreator



Farmer

Outdoor Worker



Construction Worker

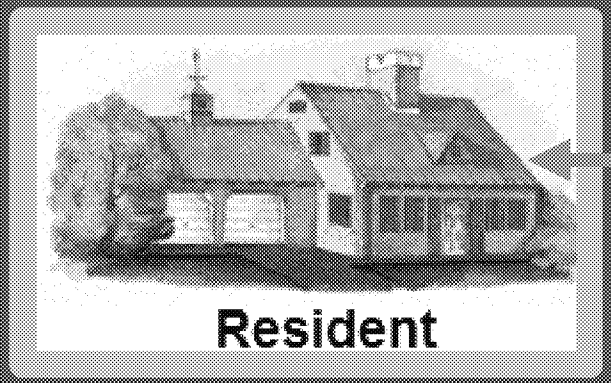
1 Minimal

2 Realistic

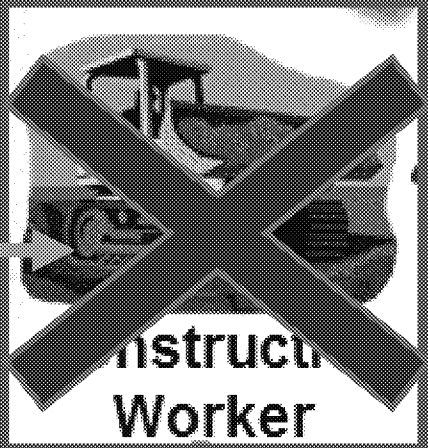
3 Maximum

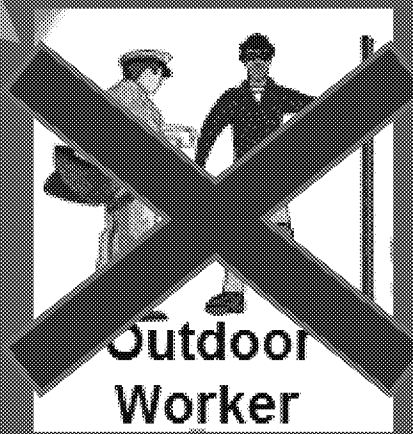
Test out all receptors!

Remember this report is only for one receptor!



Which other receptors are present at your site with the greatest risk?

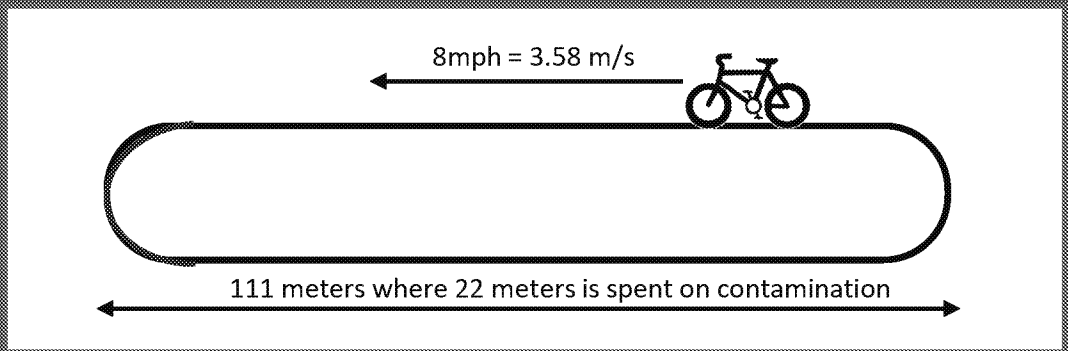




Residential

	Scenarios	mins/day	hours/day	days/year
Child	Child waiting for Bus	30	0.5	180
	Child Playing during School Year (3 hours after school of play)	72	0.6	180
	Child Playing during Summer (5 hours of play)	120	1	120
Adult	Adult Shoveling Snow	60	1	40
	Adult Mowing the Lawn	10	0.417	20
	Adult Landscaping	15	0.625	20
	Adult in Driveway (waiting with child for bus)	30	0.083	365

Child Scenarios of "Play"



Conclusion:

3 hours of play
- 72 mins on top of the contamination

5 hours of play
- 120 mins on top of the contamination

738 UMR Risk Output

Isotope	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
*Secular Equilibrium Risk for Th-232	1.10E-03	5.77E-08	5.37E-03	-	**6.46E-03**

Isotope	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
*Secular Equilibrium Risk for U-238	2.65E-04	4.08E-09	4.41E-04	-	**7.06E-04**

EPA's acceptable risk is 10^{-4} to 10^{-6}

The acceptable risk was set to 1x10-4 as a starting point

(Or you could think of it as 1 in 10,000 excess risk of developing cancer)

738 UMR PRG Output

Site-Specific

Resident PRGs for Soil - Secular Equilibrium

Isotope	Ingestion PRG TR=0.0001 (pCi/g)	Inhalation PRG TR=0.0001 (pCi/g)	External Exposure PRG TR=0.0001 (pCi/g)	Produce Consumption PRG TR=0.0001 (pCi/g)	Total PRG TR=0.0001 (pCi/g)
**Secular Equilibrium PRG for Th-232*	*2.95E+01*	*2.98E+07*	*6.03E+00*	-	***5.01E+00***
**Secular Equilibrium PRG for U-238*	*1.38E+01*	*4.77E+07*	*8.29E+00*	-	***5.18E+00***

Removal Site Evaluation (RSE)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION II

DATE: DEC 14 2018

SUBJECT: Removal Site Evaluation for the 738 Upper Mountain Road Site, Lewiston, New York

FROM: Eric M. Daly, On-Scene Coordinator
Response Prevention Branch

TO: Joseph D. Rotola, Chief
Removal Action Branch

Introduction

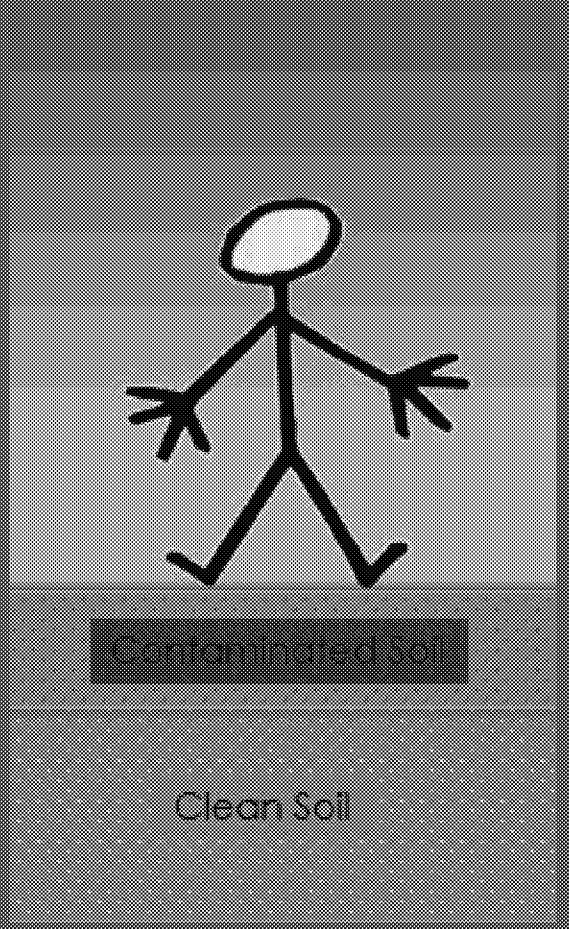
The United States Environmental Protection Agency (EPA) Region II Removal Action Branch (RAB) was requested to conduct a Removal Site Evaluation (RSE) at the 738 Upper Mountain Road Site (Site) by the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH).

In July 1985, members of the Radiological Survey Activities (RASA) group at Oak Ridge National Laboratory (ORNL) performed radiological surveys of properties throughout Niagara County. The results of the surveys were recorded in a November 1986 report, which specifically documented elevated gamma exposure rates at the driveway of the Site, among other sites in Niagara Falls and Lewiston, New York. The NYSDEC and NYSDOH referred 738 Upper Mountain Road to EPA on July 21, 2013 for further assessment.

The EPA Pre-Remedial Section (PRS) screened the Site in December 2013 and as of May 2014 recommended a "No Further Remedial Action Planned" (NFRAP) determination. The NFRAP determination signifies that no additional remedial steps will be taken to list the Site on the National Priorities List (NPL) unless new information warranting further Superfund consideration or conditions not previously known to EPA regarding the Site are disclosed. The NYSDEC and NYSDOH requested RAB to assess the Site for a potential Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) removal action. In response to this, RAB initiated a RSE to determine Site eligibility.

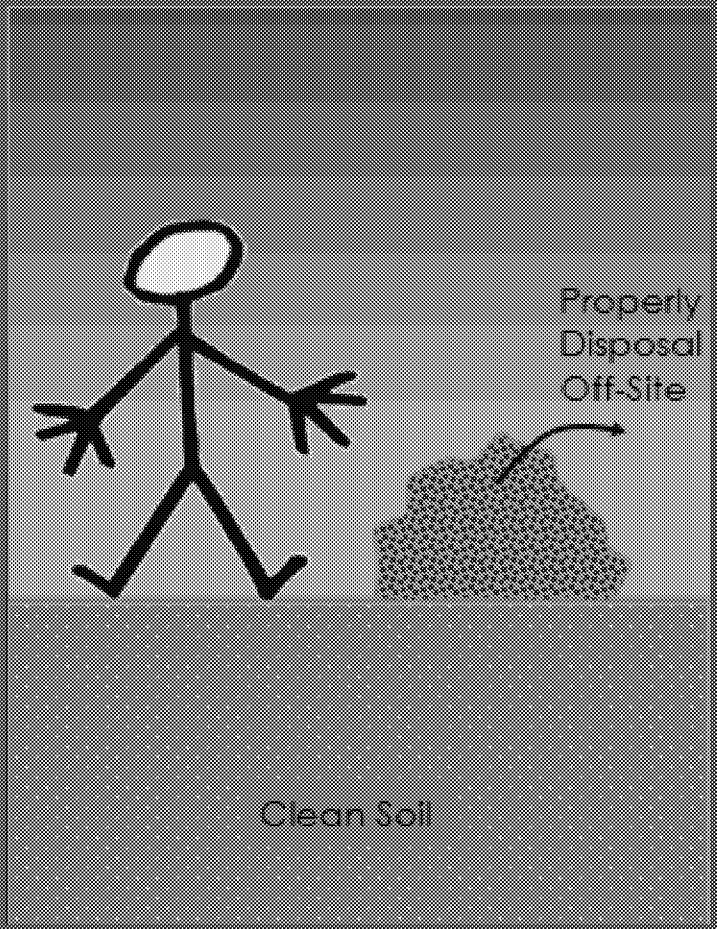
It should be noted that a Removal Site Evaluation, dated 06/12/2018, previously determined that the Site did not warrant a CERCLA removal action. Due to an adjustment and recalculation of the PRG calculator, and the resultant increase in the calculated risk, it was determined that the Site does warrant a CERCLA removal action. This document supersedes the Removal Site Evaluation dated 06/12/2018.

We determined a need for removal… Now what?



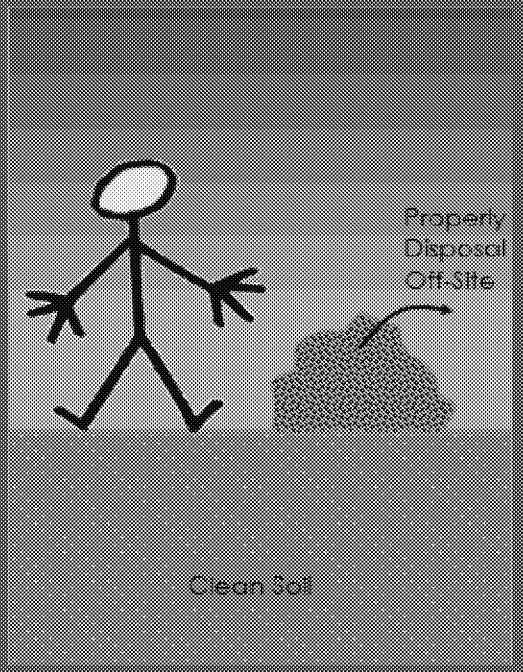
The Site as is

Full/Partial Shielding



Removal

Full Removal



- Pros:
  - Once the contaminant is removed, the site is "CLEAN"
  - No upkeep/maintenance
  - Maybe able to do a combined removal
- Cons:
  - Need a better picture of the extent of contamination
  - Cost
  - Time / Interfere with property owners/businesses

Write our Action Memo

Action Memo Layout

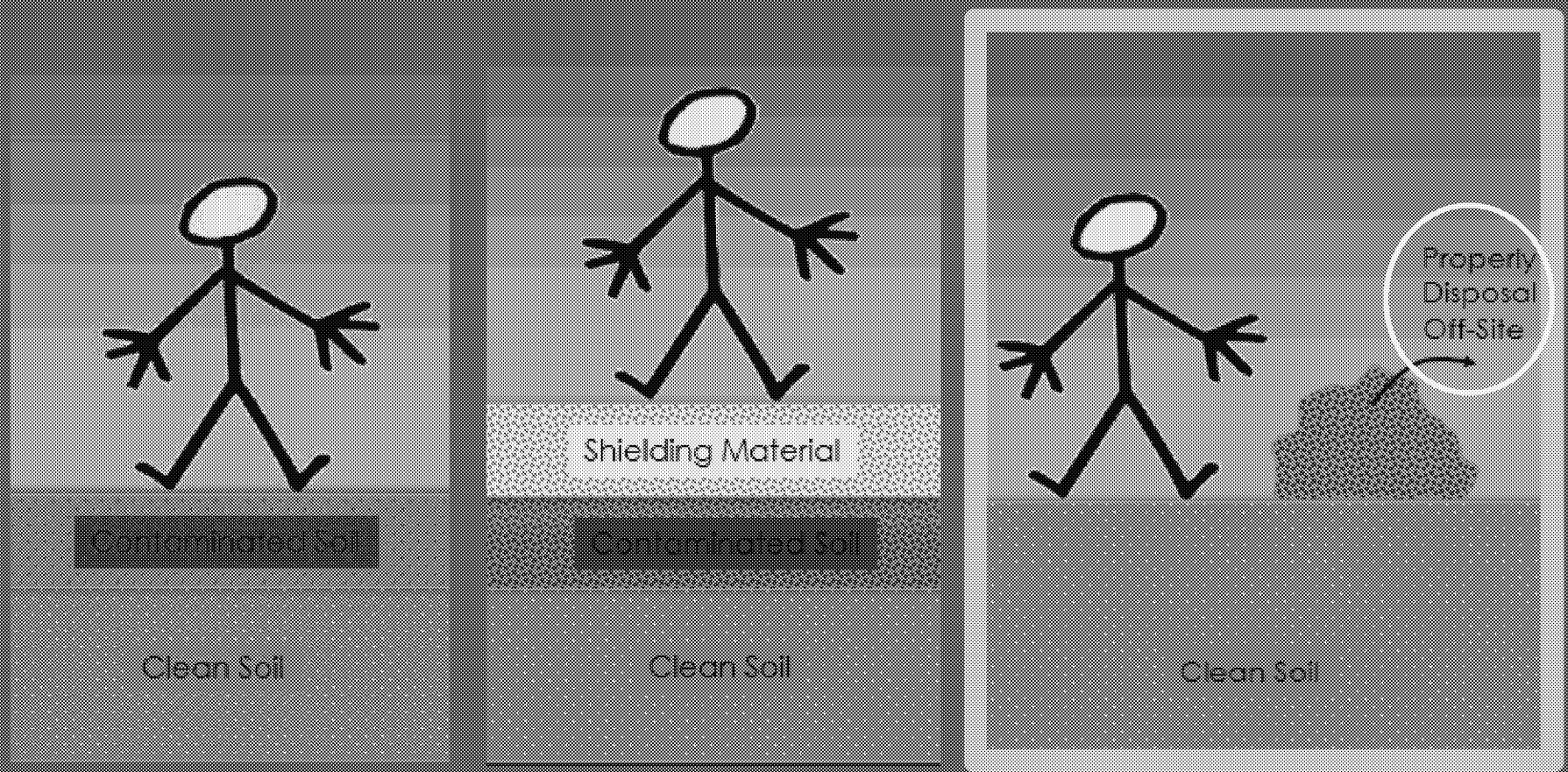
- Basic layout:
  - Background of the site
  - History
  - Terms
  - "Threat to Public Health or Welfare" and "Threat to Environment"
  - Proposed Action
  - Estimated Cost

RSE

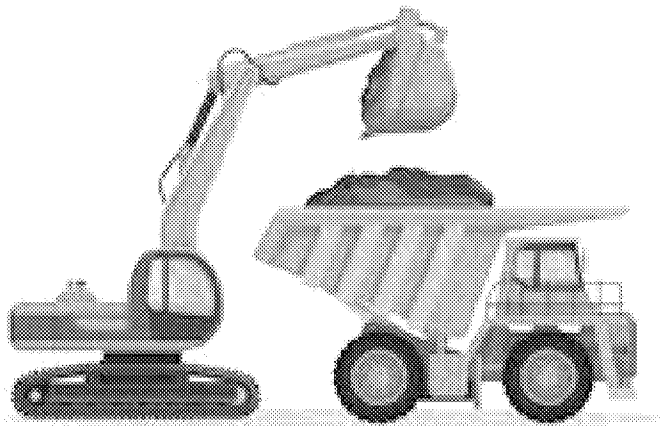
Proposed Statement of Work

- Establish support facilities on the site property (clearing foliage, vehicle parking area, staging areas for equipment, sanitation facilities, and foliage removal);
- Secure and restrict access to the work areas;
- Excavate approximately 102 cubic yards of radioactive material from the identified area of concern on the Site;
- Perform post-excavation gamma surveying, soil sampling, and analysis as per the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) plan;
- Off-Site disposal of hazardous waste and/or substances in compliance with the CERCLA Off-Site Disposal Rule, 40 C.F.R 300.440, and specific disposal acceptance criteria as per the approved radiological disposal facility; and
- Restore excavated area to pre-excavation condition with clean fill.

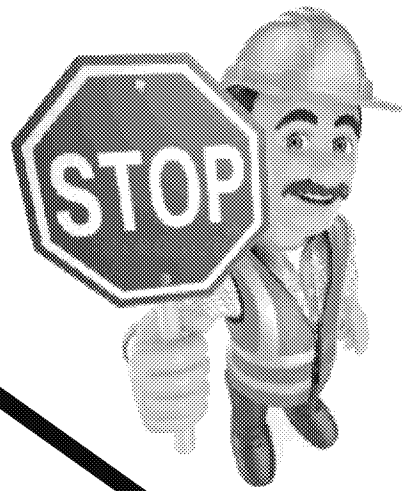
But, how do we do that?

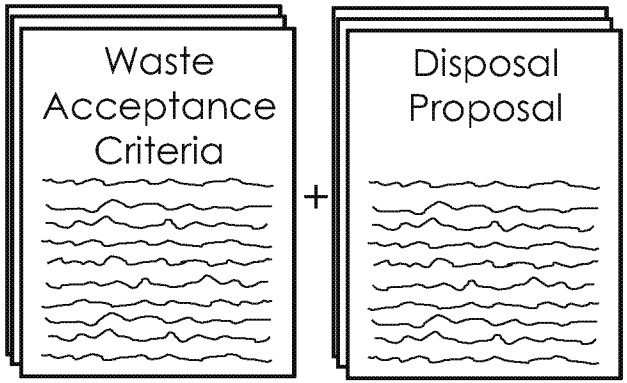


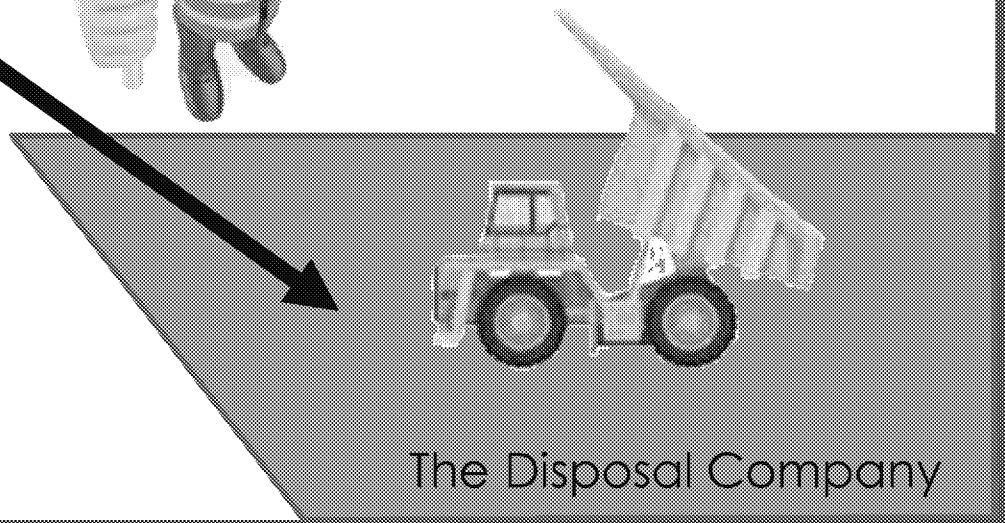
Disposal Operations



The Site: 738 UMR







The Disposal Company

Example WAC

2. Source Material Sum of Fractions (SOF) Formulas:

Natural Uranium + Thorium	Refined Uranium + Thorium	Depleted Uranium + Thorium
$\frac{Conc_{U\text{-}238}}{167\ pCi/g} + \frac{Conc_{Th\text{-}232}}{55\ pCi/g} \leq 1$	$\frac{Conc_{U\text{-}Total}}{333\ pCi/g} + \frac{Conc_{Th\text{-}Total}}{110\ pCi/g} \leq 1$	$\frac{Conc_{U\text{-}238}}{169\ pCi/g} + \frac{Conc_{Th\text{-}232}}{55\ pCi/g} \leq 1$

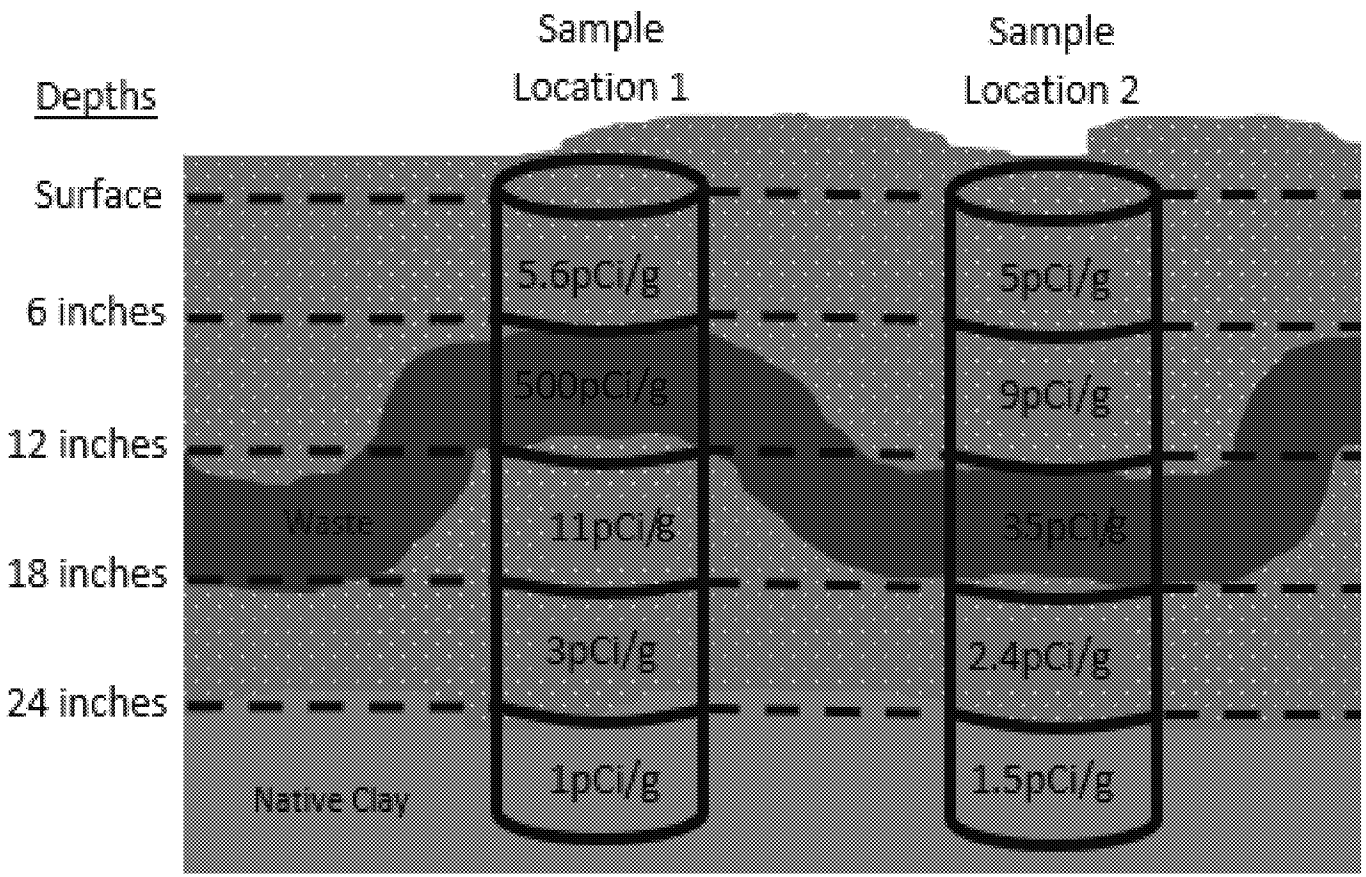
Notes:
1. *Unless otherwise noted, use parent nuclide in equations*
2. *Th-232 will routinely be considered to be in equilibrium with all progeny.*
3. *Total Uranium = U-234 + U-235 + U-238.*
4. *Total Thorium = Th-232 + Th-228*
5. *Refined Uranium refers to chemical forms where the equilibrium state of the uranium decay chain has been disrupted.*
6. *Depleted Uranium contains U-235 at < 0.71% by weight*

D. NORM/TENORM other than Source Material Dispersed in Soil or Other Media

1. Does the waste contain:	☑ Ra-226	☐ Pb-210	☐ K-40	☐ Other(s)
2. Waste Concentration (pCi/g):	46	N/A	N/A	N/A
3. WDI Site Disposal Limits: (Note 1)	*50*	*260*	*(Note 2)*	*(Note 3)*

Notes:
1. MDI may receive higher concentrations for treatment or blending. All treated waste intended for disposal at WDI must meet the limits shown in D.3.
2. K-40 may not be enriched beyond its natural concentration.
3. Contact WDI Waste Approvals.

Meeting the WAC

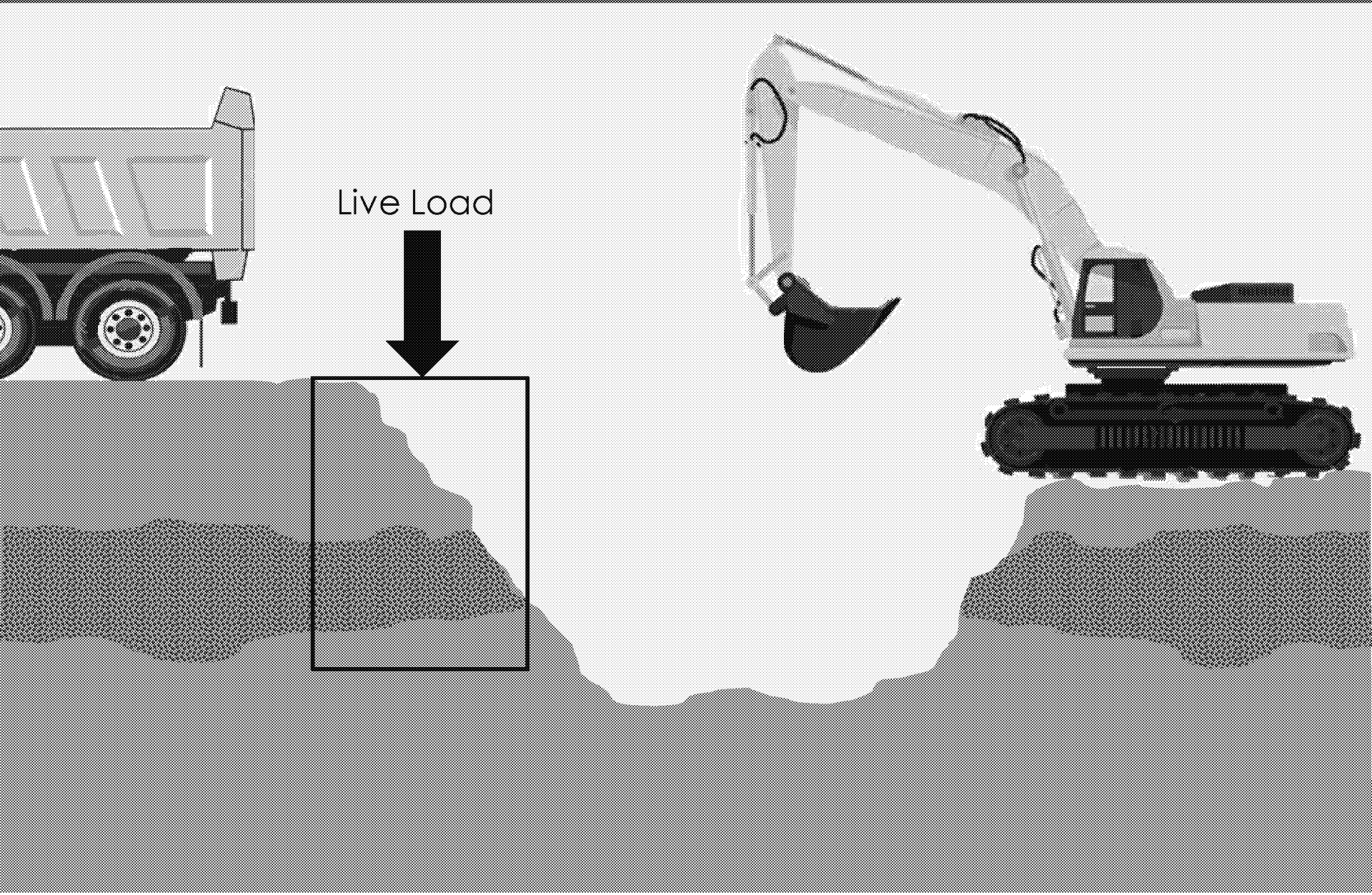


Soil including top soil, native soil, and or fill dirt in background levels

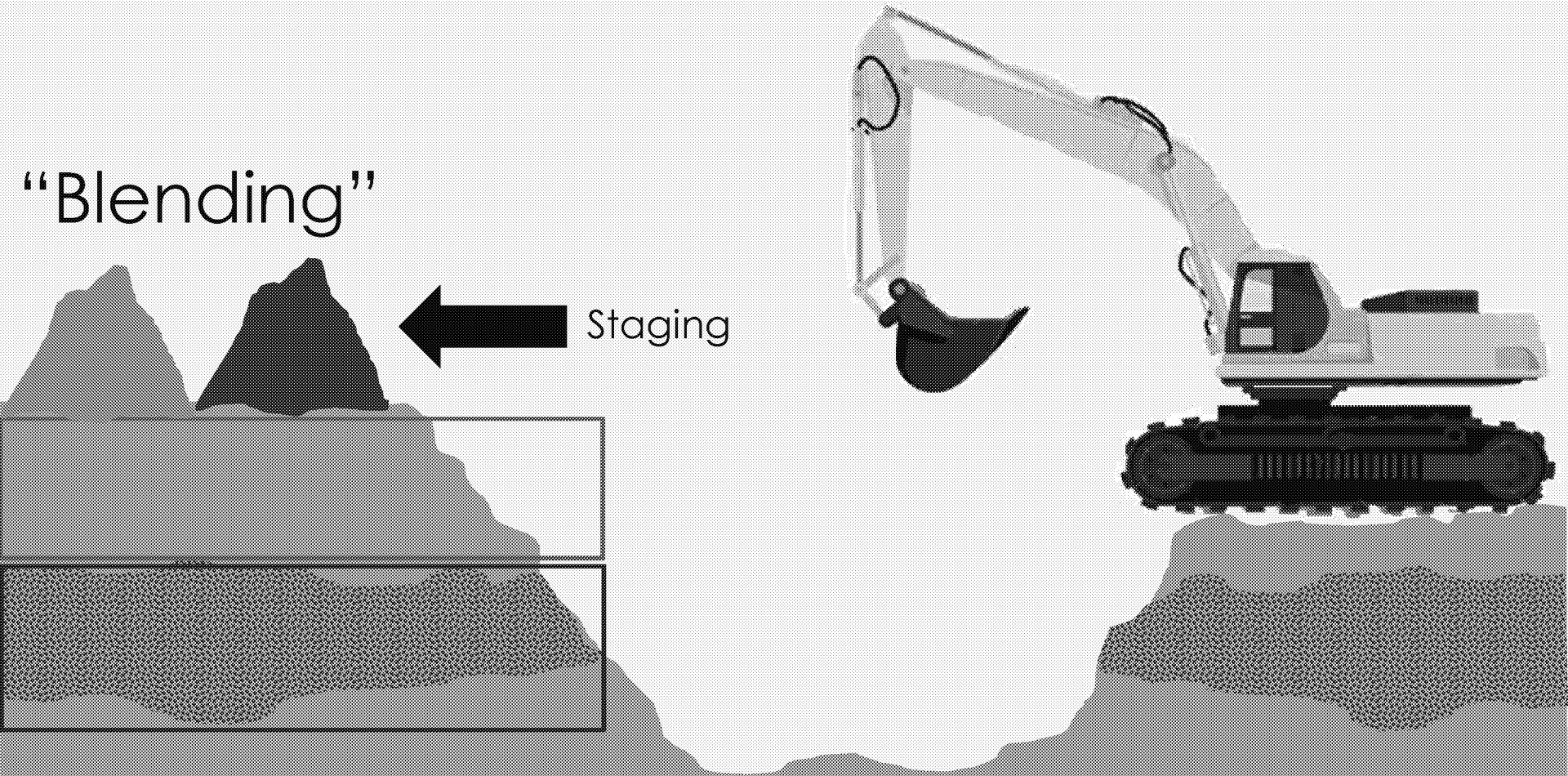
Waste / Contamination with elevated levels

Native Soil / Clay at background levels

Live Loading vs. Staging



Live Loading vs. Staging



Major concern to consider: Logistics

Blending "Recipe"

$$(Concentration_{Area})(Volume_{Area}) = (Concentration_{WAC})(Volume_{WAC})$$

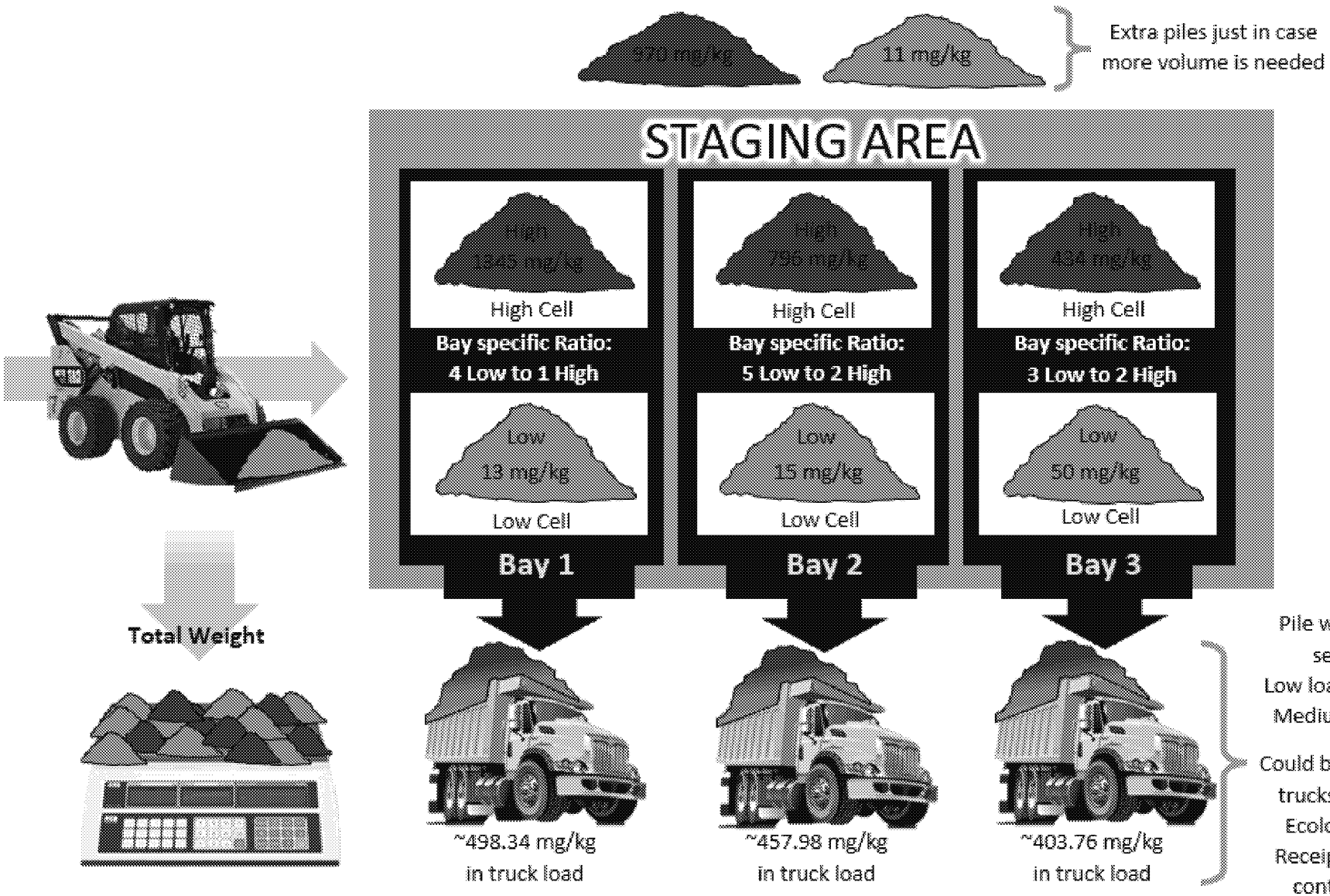
or for multiple blending:

$$(Concentration_{High})(Volume_{High}) + (Concentration_{Low})(Volume_{Low}) = (Concentration_{WAC})(Volume_{WAC})$$

Where $Volume_{WAC}$ is the sum of $Volume_{High}$ + $Volume_{Low}$

Remember: Each TRUCK must meet the WAC

Disposal Proposal: Logistics



Disposal Proposal: Flowchart

Scan each Area with NaI

Identify High Level Spots vs. Low Level Spots
Or
Identify High Level Layers vs. Low Level Layers

Ex. Roughly 60,000cpm = 30mg/kg of U+Th
Identify areas as "High" above 130,000cpm

Take Samples within the Area in various parts of the scans

Analyze Samples with OnSite HpGe making assumptions about disequilibrium in Table 1

If On-site HpGe assumptions from Table 1 shows accurate results compared to the certified fixed lab data, soil samples could be analyzed solely by On-site HpGe upon US Ecology's approval.

Send Samples to Fixed Lab. This data will serve as comparison of onsite HpGe results.

Using Scan and samples data

Delineate High Level Spots vs. Low Level Spots
Or
Delineate High Level Layers vs. Low Level Layers

Remove / Separate / Stage High Level Spots/Layer from Low Level Spot/Layers using NaI

Pile or Bag Low

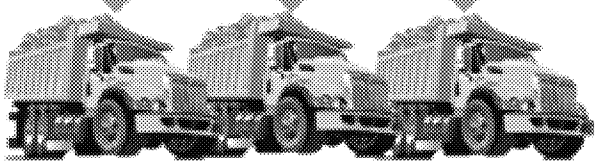
Blend material may come from a different area

Pile or Bag High

Blend to get concentrations below 500mg/kg of total Uranium + Thorium 50pCi/g of Ra-226

Pile or Bag Low

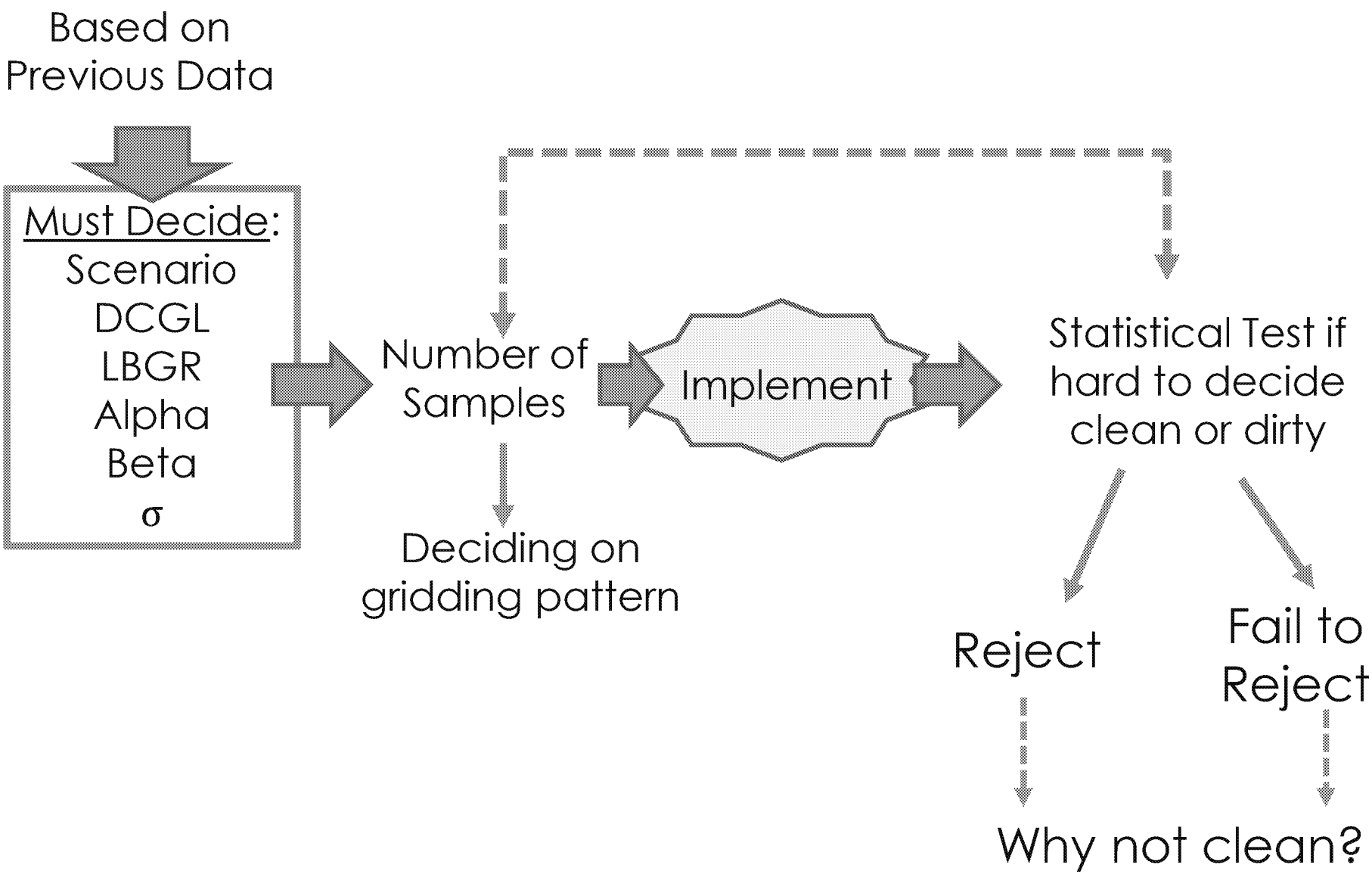
Designate Staging Areas per truck load to ensure concentrations, weight, and physical capacity are below limits.



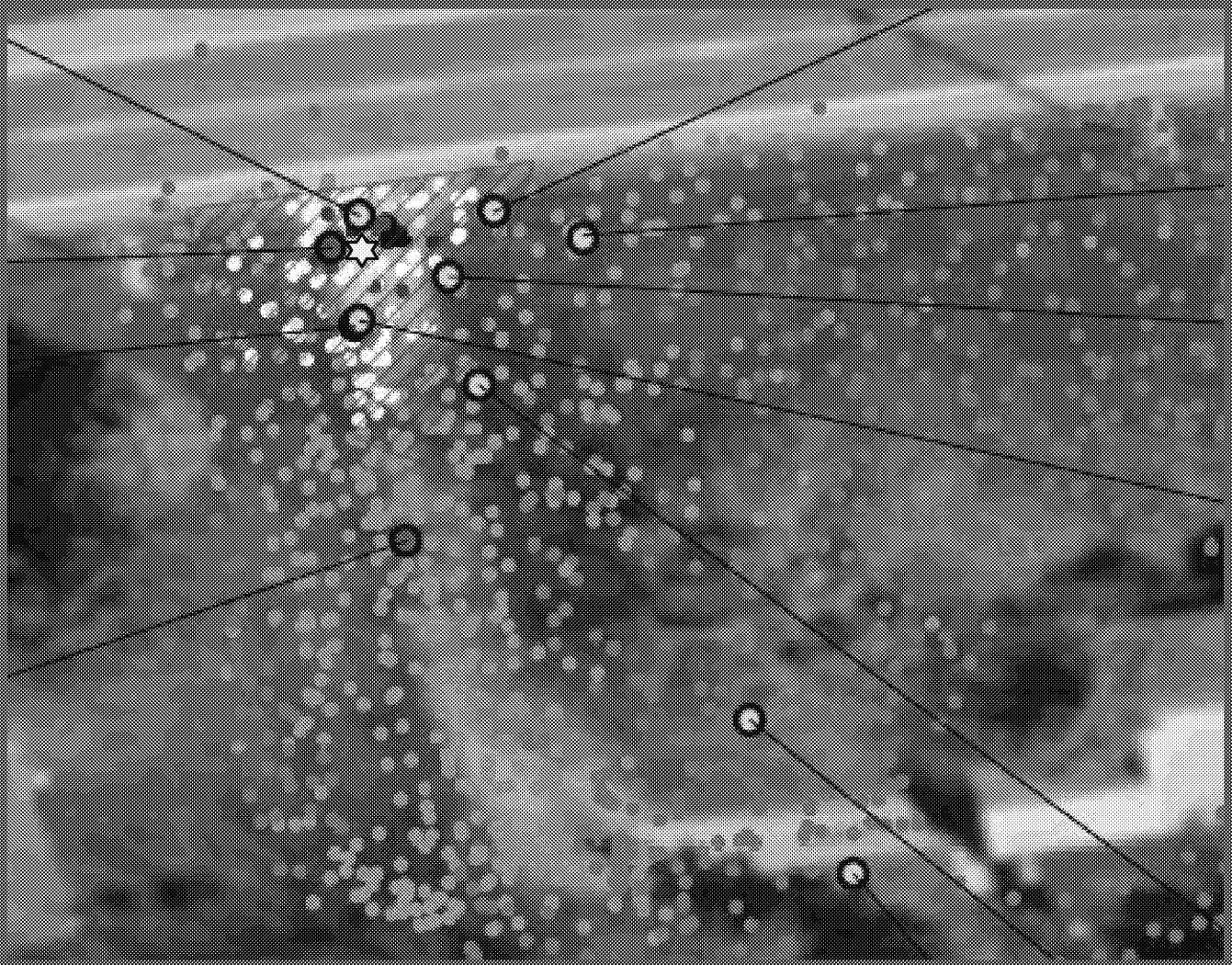
Process for determining clean / Post-Disposal

- How do we determine if site is clean?
- Go down to native (background)
- Gamma surveys
- Post excavation sampling
- Backfill with clean material—sampled
- Analytical
- MARSSIM process to determine if clean
- If not, area will be re-excavated

MARSSIM

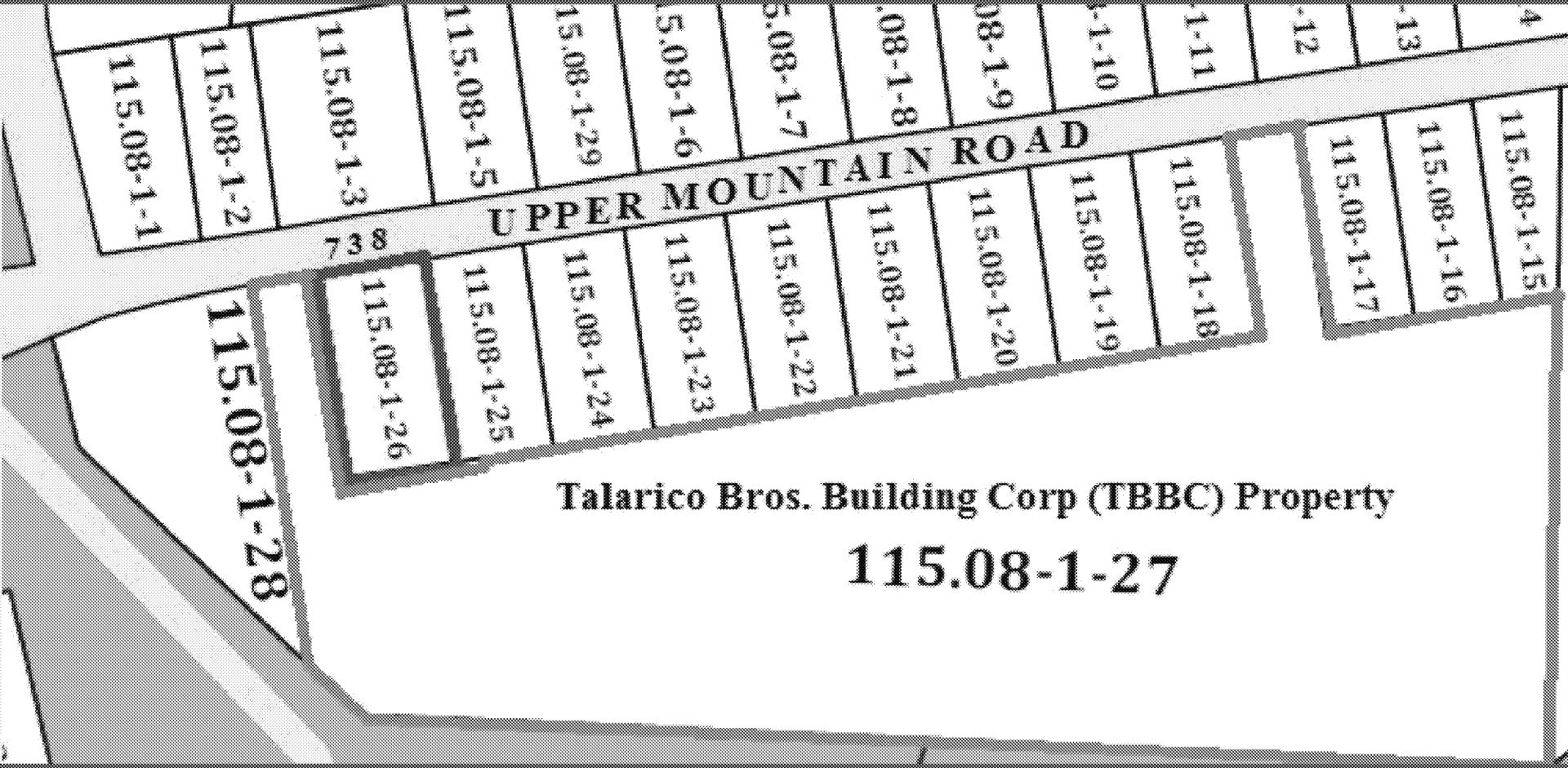

Based on Previous Data
Must Decide:
Scenario
DCGL
LBGR
Alpha
Beta
σ
Number of Samples
Deciding on gridding pattern
Implement
Statistical Test if hard to decide clean or dirty
Reject
Fail to Reject
Why not clean?

Work this Week: Additional Sample Location



Work this Week:

Property Boundary Identification



Work this Week:

Preliminary Foliage Removal Planning

Work this Week:

Preliminary Foliage Removal Planning

Work this Week:

Driveway Installation Planning

Proposed Timeline:

- **Action Memo**
  - October 22, 2019: Attorney Review
  - Beginning of November 2019: Regional Management Review
  - Estimated Approval: Mid-November 2019
- **Administrative Record File**
  - Documents that explains all information and data up until the action memo is approved
  - The Administrative Record File will be finalized after the action memo is signed
  - The documents will be placed into a Lewiston public repository (i.e. Public Library) and possibly available online
- **Enforcement**
  - EPA Council and Enforcement Team continues to search for Potentially Responsible Parties (PRP)

Proposed Timeline:

- **EPA Lead Removal**
  - **Selection of Removal Contractor: Mid-November 2019**
    - Removal Manager Site Walk: December 2019
    - Coordination with Town of Lewiston and Niagara County
    - Meet the spirit of the permit requirements (ROW, Driveway)
    - Revise Proposed Statement of Work (SOW)
    - Subcontractor Selection
      - Transportation and Disposal Facility
      - Equipment/Storage Container
      - Foliage Removal
      - Clean Fill/Driveway Stone
- **EPA OSC Oversight of Removal**
  - When PRP or Property Owner conducts removal activity
  - OSC and Technical Team will review and approve SOW
  - OSC will oversee removal activities with PRP removal team

Proposed Timeline:

- **Public Affairs**
  - A fact sheet will be developed by the OSC and the EPA Public Affairs Official. This will be distributed to the property owners, local/county/state agencies, and local politicians.
  - Determine the need for a public meeting
- **Tentative EPA Lead Removal Mobilization-January 2020**
- **After the removal is complete, EPA produces a Removal Action Report**

Any Questions?