

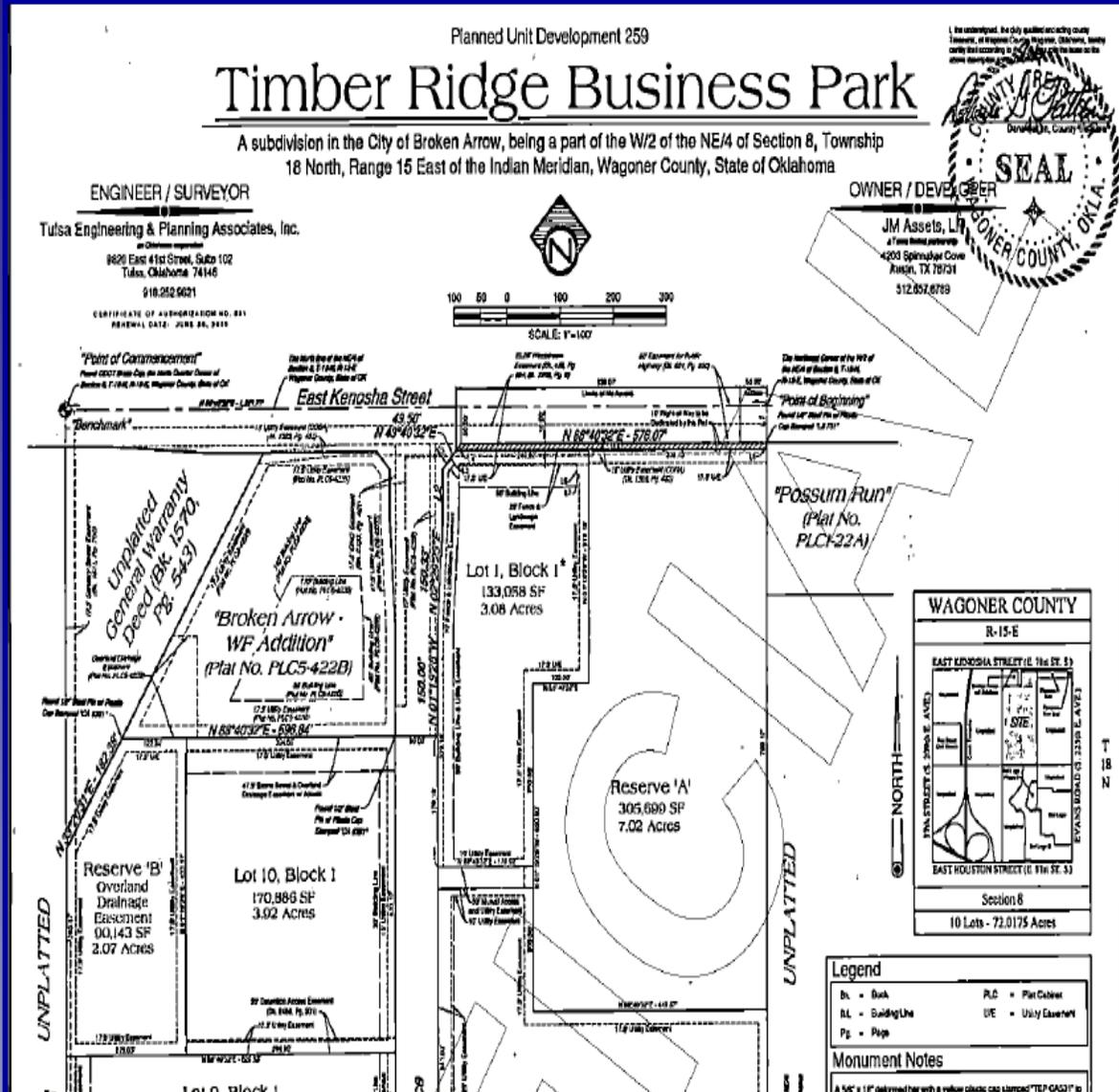


STATUS UPDATE BROKEN ARROW LANDFILL SITE BROKEN ARROW, OK

EPA VIRTUAL COMMUNITY MEETING

AUGUST 11, 2022

BROKEN ARROW LANDFILL SITE



BEFORE WE GET STARTED

- Welcome to those participants that dialed in on a phone line and/or joined using the Web browser.
- This presentation is being recorded using Teams.
- All lines will be muted during the presentation to prevent background noise.
- Any attendees having issues joining the meeting in the browser can join through the 'audio only' meeting using the Phone Number and Conference ID below:
- Phone Number: [\(844\) 608-7693](tel:8446087693) United States (Toll-free)
 - Conference ID: [640 918 111#](#).

SMALL SCREENS – VISIBILITY ISSUES

- Cell Phone – Zoom in using two fingers. Start by placing two fingers side-by-side on the screen and then separate them.
- Small Computer Screen – Zoom in by holding Ctrl + and rolling your mouse up or down.



MEETING AGREEMENT

- Separate the person from the problem – avoid personal attacks, name calling, or questioning people’s motives.
- Keep remarks brief, to the point, and non-repetitive of comments others have made.
- One person speaks at a time.
- Trust that our intention is to ensure that everyone has an opportunity to ask a question.
- Limit questions to 2-3 minutes so ensure others have a chance to ask a question.
- The subject matter for this meeting is specifically about Broken Arrow. EPA is unable to address issues outside of the Broken Arrow.

FEDERAL AND STATE AGENCY COLLABORATION



PARTICIPATING GOVERNMENT OFFICIALS

U.S. ENVIRONMENTAL PROTECTION AGENCY

DAVID ROBERTSON – On-Scene Coordinator, Superfund and Emergency Management Division

CHERYL NICHOLS – Community Involvement Coordinator, Office of the Regional Administrator

JASON MCKINNEY -- Community Involvement Coordinator, Office of the Regional Administrator

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

RACHEL FRANCKS – Environmental Programs Specialist

ALISHA GRAYSON – Environmental Programs Specialist

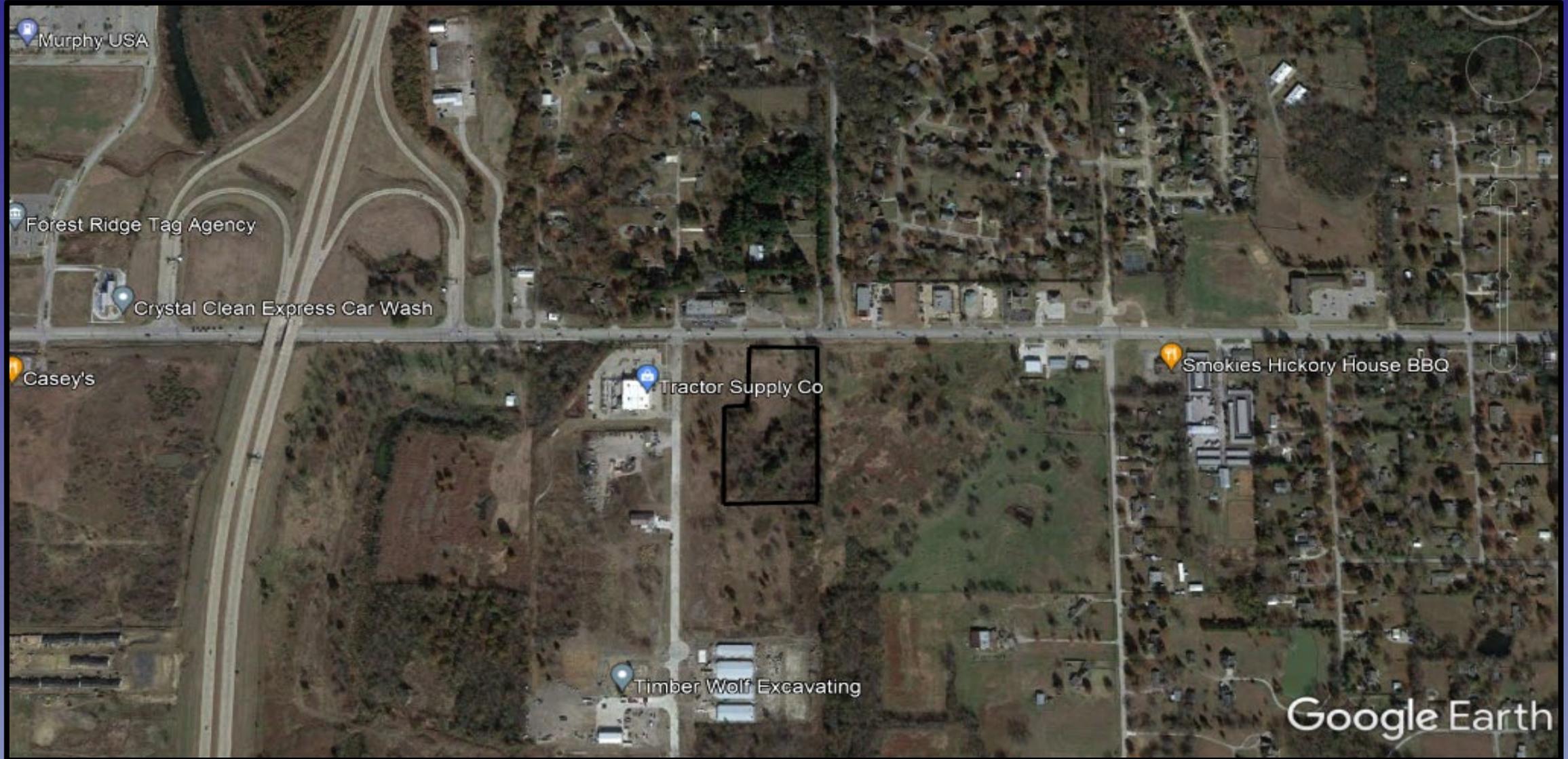
CITY OF BROKEN ARROW

KENNETH SCHWAB – Assistant City Manager

NUCLEAR REGULATORY COMMISSION

DR. ROB EVANS -- Sr. Health Physicist

SITE LOCATION



PROCESS OF RADIOLOGICAL SITE CLEANUP

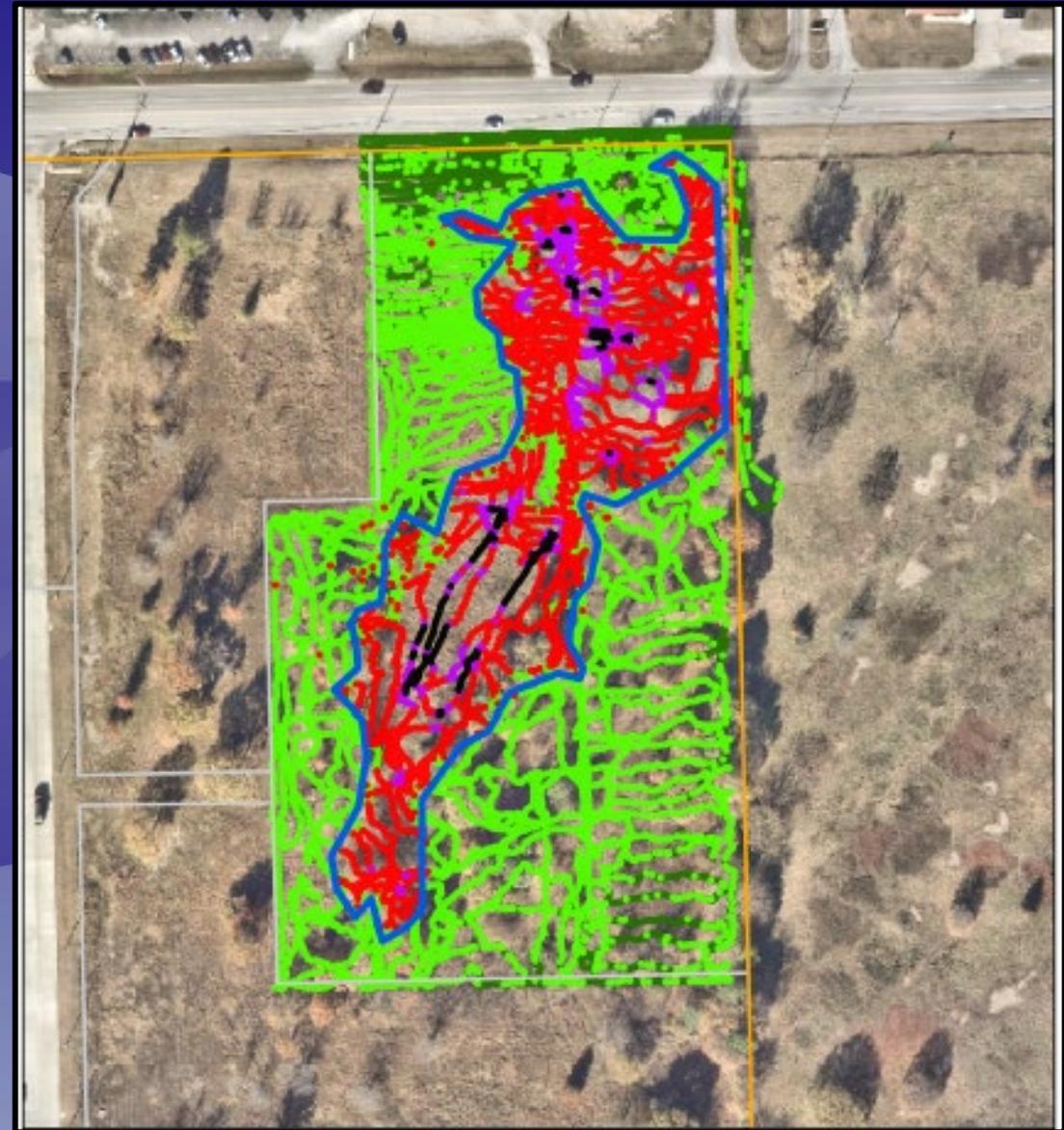
- 1. Historical Review-
 - Determine the previous site activities to determine the types of contamination
- 2. Perform Assessment protocols
 - Determine Background based on MARSSIM recommendations
 - Determine site radionuclides of concern (ROCs)
 - Develop Scenario for PRG to Calculate Cleanup levels
 - Data collection – Perform Walkover gamma survey
 - Collect soil samples to develop Gamma (cpm) to sample (pCi/g) correlation
- 3. Removal Action
 - Remove contaminated soils based on cpm values derived during assessment
 - Perform verification soil sampling based on MARSSIM statistical methodology

HISTORICAL REVIEW/TIMELINE

- 1920-30's- Coal strip mining in the Broken Bow Area
- Up to 1960's- Limited amount of coal mining
- 1973 - Oklahoma State Department of Health (OSDH) issued a permit for a sanitary landfill in 1973
- 1976 – Permit was Closed
- 2008+ - Entered into the Oklahoma Department of Environmental Quality (ODEQ) Brownfields program sometime after 2008. During this process the radioactive materials were discovered in the Northeastern section of the property.

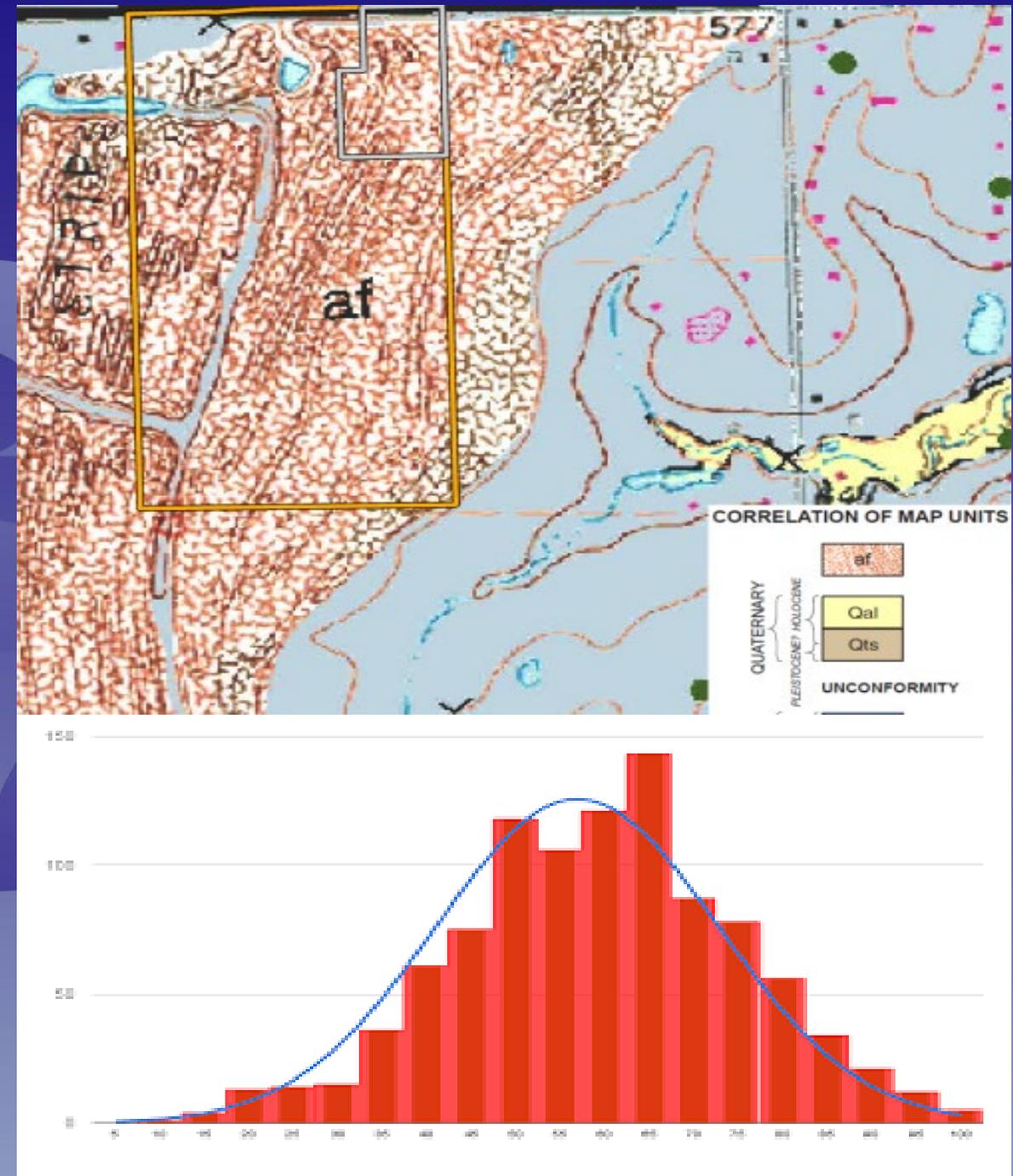
SO HOW DO WE COLLECT THE DATA?

- WALKOVER SURVEY
- MESA GPS SYSTEMS COUPLE WITH RADIATION METER
- REAL TIME BACKPACK SYSTEM THAT ALLOWS FIELD TEAMS TO DELINEATE HORIZONTAL
- FIRST USE AN INVESTIGATION LEVEL



SITE SPECIFIC BACKGROUND

- MARSSIM DERIVED BACKGROUND SELECTION CRITERIA:
 - MULTIPLE AREAS ARE INITIALLY SELECTED FOR:
 - GEOLOGY: QUATERNARY ALLUVIUM AND COLLUVIUM SEDIMENTS, STRIPE MINING
 - SIMILAR ELEVATIONS
 - NON-IMPACTED BY CONTAMINATION SCENARIO
 - AN AREA WILL BE SELECTED THEN:
 - GAMMA SCAN OF BACKGROUND TO DETERMINE HOMOGENEITY
 - 20 SAMPLES ARE COLLECTED WITHIN A 0.5 ACRE SITE
 - ONE MINUTE READINGS AT EACH SAMPLE LOCATION
 - STATISTICAL ANALYSIS ON SOIL SAMPLES TO DETERMINE IF THE BACKGROUND AREA IS ACCEPTABLE



ASSESSMENT SOIL SAMPLING



DETERMINE RADIONUCLIDES OF CONCERN

COLLECT SAMPLES TO DETERMINE WHAT RADIONUCLIDES AND WHETHER OR NOT THE MATERIAL IS IN EQUILIBRIUM

BASED ON SAMPLES COLLECTED AT BROKEN ARROW IT WAS DETERMINED THAT THE CONTAMINATION IS FROM RADIONUCLIDES IN THE TH-232 DECAY CHAIN

CONTAMINATION IS FROM AN UNKNOWN ORIGIN

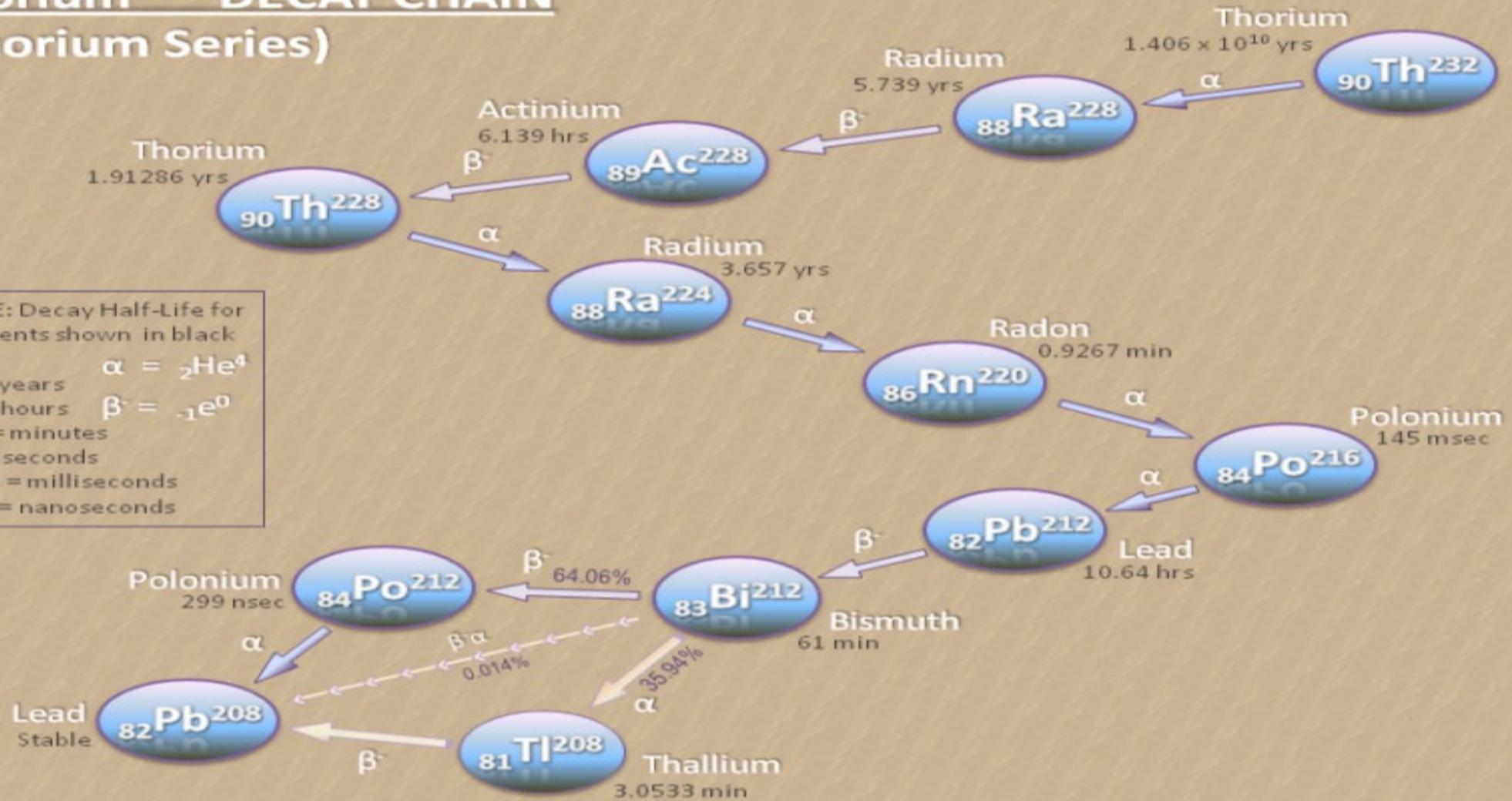
TH-232 DECAY CHAIN

Thorium ²³² DECAY CHAIN (Thorium Series)

NOTE: Decay Half-Life for elements shown in black

$\alpha = {}_2\text{He}^4$
 $\beta^- = {}_{-1}\text{e}^0$

yrs = years
 hrs = hours
 min = minutes
 sec = seconds
 msec = milliseconds
 nsec = nanoseconds



EPA CLEANUP LEVEL DEVELOPMENT

- MODEL USED: CERCLA COMPLIANT PRG CALCULATOR FOR RADIONUCLIDES EXCESS RISK
- FUTURE LAND-USE SCENARIO: NON-RESIDENTIAL, INDUSTRIAL(COMPOSITE) WORKER
- TARGET CANCER MORBIDITY RISK OF 1 IN 10,000. (1×10^{-4}) WITH MAXIMUM RISK OF (3×10^{-4})
- **THE MAIN CONTAMINANTS OF CONCERN ARE THE RADIONUCLIDES IN THE THORIUM-232 DECAY CHAIN, PREDOMINATELY RADIUM(Ra)-228 AND THALLIUM(Tl)-208.**
- FINALLY, AN ASSESSMENT OF THE SECULAR EQUILIBRIUM STATUS OF THE TH-232 IN THE AREA-OF-INTEREST SOILS WAS CONDUCTED BY COMPARING RA-228 AND THALLIUM-208 (TL-208) ANALYTICAL SAMPLE RESULTS. VIA DEVELOPMENT OF THE REMOVAL ACTION LEVEL USING THE PRG CALCULATOR FOR RADIONUCLIDES (SECTION 5.4), IT WAS DETERMINED THAT RA-228 CONTRIBUTES 35% [RA-228 PLUS SHORT-LIVED DAUGHTER PROGENY AC-228] OF THE RISK FROM THE TH-232 DECAY CHAIN AND TL-208 CONTRIBUTES 56% OF THE RISK, WHILE NO OTHER RADIOISOTOPE CONTRIBUTED MORE THAN 4% OF THE RISK.

PRG MODEL SCENARIO

THREE EXPOSURE PATHWAYS WERE CONSIDERED TO DEVELOP THE ACTION LEVEL FOR AN INDUSTRIAL LAND USE:

1. INCIDENTAL INGESTION OF SOIL
2. INHALATION OF SOIL PARTICULATES
3. EXTERNAL EXPOSURE TO GAMMA RADIATION IN SOIL.

THESE WERE CONSIDERED TO BE THE ONLY EXPOSURE PATHWAYS APPLICABLE FOR THE SITE, TAKING INTO ACCOUNT A POTENTIAL INDUSTRIAL FUTURE LAND USE. START USED THE “COMPOSITE WORKER” LAND-USE SCENARIO TEMPLATE AVAILABLE IN THE PRG CALCULATOR FOR RADIONUCLIDES TO MODEL EXPOSURE AND RISK OF AN INDUSTRIAL WORKER. THIS TEMPLATE IS MORE CONSERVATIVE THAN THE TWO OTHER INDUSTRIAL LAND-USE TEMPLATES AVAILABLE WITH DEFAULT VALUES, “INDOOR WORKER” AND “OUTDOOR WORKER”; THE “COMPOSITE WORKER” TEMPLATE COPIES THE “OUTDOOR WORKER” TEMPLATE IN EVERY ASPECT SAVE FOR THE EXPOSURE FREQUENCY IN DAYS PER YEAR ON SITE, WHERE THIS VALUE IS INCREASED FROM 225 DAYS PER YEAR TO 250 DAYS PER YEAR TO MATCH THE EXPOSURE FREQUENCY OF THE “INDOOR WORKER” TEMPLATE. PRG CALCULATOR DEFAULT VALUES REPRESENTING A COMPOSITE WORKER WERE USED FOR ALL INPUT PARAMETER VALUES EXCEPT FOR SITE AREA AND CLIMATIC ZONE, WHERE SITE-SPECIFIC VALUES OF 10,000 SQUARE METERS (APPROXIMATELY 2.5 ACRES) AND ZONE 5 – LINCOLN, NEBRASKA WERE USED. PRG CALCULATOR DEFAULT VALUES REPRESENT REASONABLE MAXIMUM EXPOSURE TO BROAD-BASED POPULATIONS, TYPICALLY 90 TO 95 PERCENTILE VALUES, WHICH ARE WELL ABOVE THE MEAN.

PRG CALCULATOR RESULT/ DCGL = **4.8** pCi/g

BACKGROUND THRESHOLD VALUE = **2.0** pCi/g

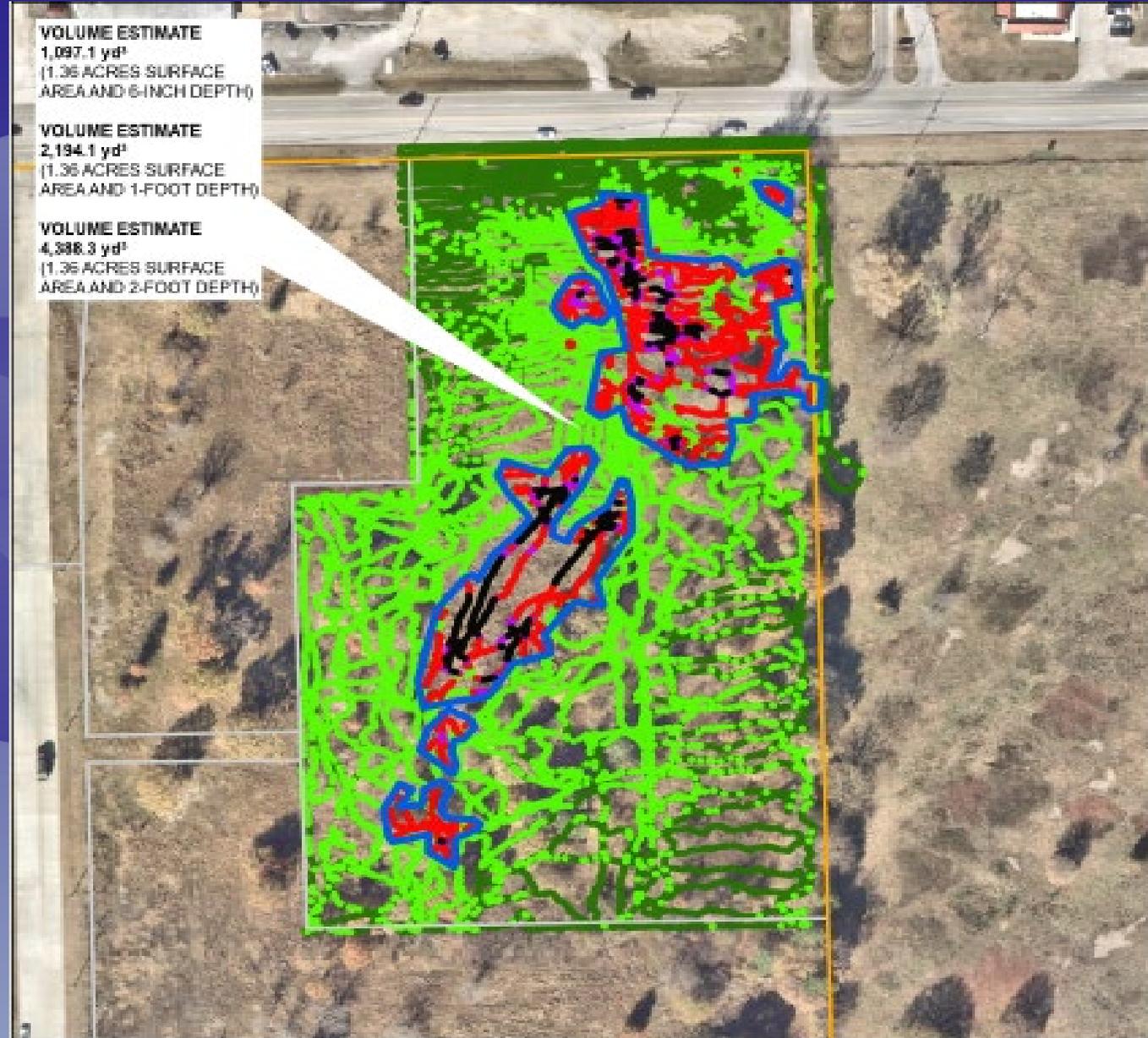
REMOVAL ACTION LEVEL = 4.8 pCi/g TH-232/RA-228

REMOVAL PROCESS

- EXCAVATE IDENTIFIED MATERIALS FROM ASSESSMENT
- EXCAVATION WILL STOP ONCE BELOW THE CPM REMOVAL VALUE
- DURING EXCAVATION AIR SAMPLING WILL BE CONDUCTED ON THE PERIMETER OF THE SITE FOR COMMUNITY AND ON WORKERS
- AIR SAMPLES WILL BE ANALYZED ON-SITE FOR GROSS ALPHA AND BETA RADIATION
 - ANY EXCEEDANCES WILL BE SHIPPED TO THE LAB TO CONFIRM CONCENTRATIONS
- AT A MINIMUM 10% OF THE AIR SAMPLES COLLECTED WILL BE SENT FOR OFF-SITE ANALYSIS
- DUST MONITORING WILL BE CONDUCTED
- IF DUST MONITORING IS ELEVATED WETTING OF SOILS WILL BE IMPLEMENTED
- PERSONNEL AND EQUIPMENT WILL BE SCANNED OUT OF RADIATION CONTROL AREA TO ENSURE THAT CONTAMINATION IS NOT BEING RELEASED

REMOVAL VOLUME ESTIMATE

- THE LATERAL AND VERTICAL EXTENT OF AREAS EXCEEDING THE ACTION LEVEL WERE DETERMINED VIA GAMMA SCANNING AND SOIL SAMPLING, RESPECTIVELY, THEN PLOTTING THE RESULTS GEOGRAPHICALLY USING ESRI'S ARCGIS ARCMAP VERSION 10.3. THE LATERAL AND VERTICAL EXTENT OF CONTAMINATION THAT REQUIRES CORRECTIVE ACTION IS BASED ON COMPARISONS TO THE ACTION LEVEL, (SUMS OF 18,957 CPM [LATERAL EXTENT] AND 4.8 PCI/G [VERTICAL EXTENT]). EPA EMPLOYED THE INVERSE DISTANCE WEIGHTED (IDW) INTERPOLATION METHOD TO DEMARCATATE THE AREAL EXTENT OF VERTICAL CONTAMINATION ABOVE THE ACTION LEVEL, GIVEN THE NATURE OF SOIL SAMPLING PROVIDING LESS THAN 100 PERCENT ASSESSMENT COVERAGE.
- THE TOTAL SURFACE AREA EXCEEDING THE SCANNING-EQUIVALENT ACTION LEVEL WAS ESTABLISHED TO BE 54,878,068 SQUARE FEET OR 1,260 ACRES. THE TOTAL VOLUME OF SOIL EXCEEDING THE ACTION LEVEL WAS DETERMINED TO BE 2,382,555 CUBIC YARDS (CY), CONSISTING OF A SURFACE AREA OF APPROXIMATELY 1,043 ACRES AT A 1-FOOT-DEPTH AND APPROXIMATELY 217 ACRES AT A 2-FOOT-DEPTH. THE AREAL EXTENT OF CONTAMINATION AND THE ASSOCIATED REMOVAL-VOLUMETRIC CALCULATIONS ARE ILLUSTRATED IN FIGURE 2-1.



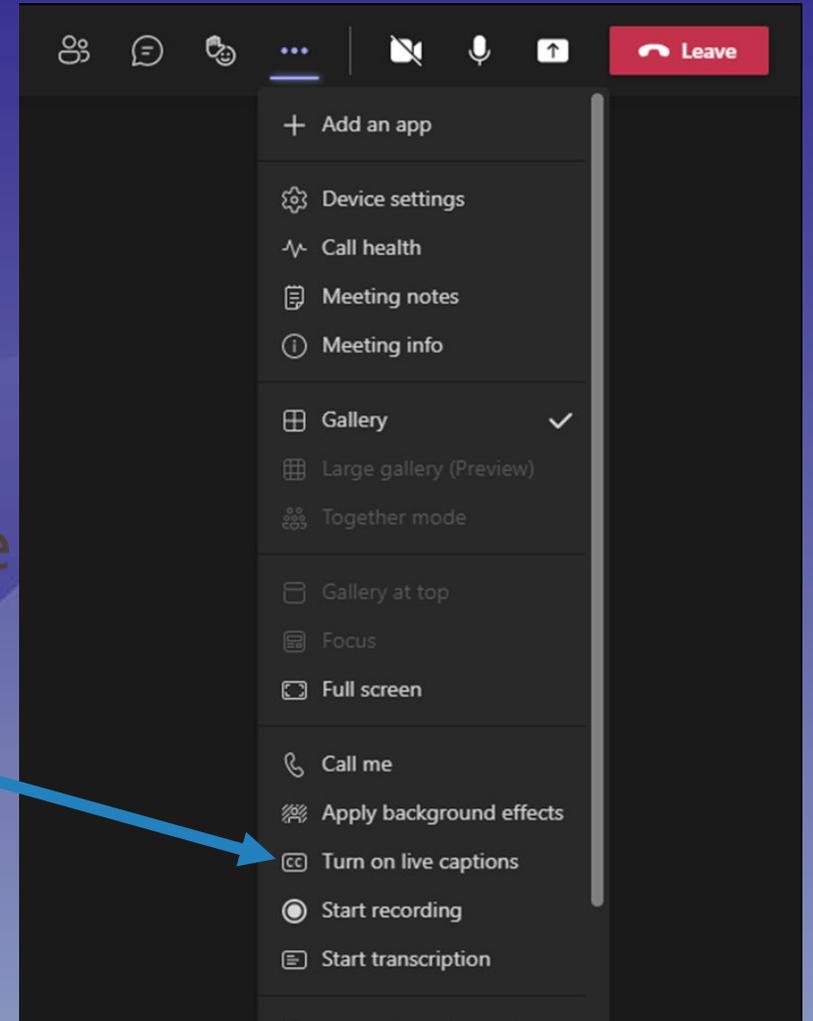
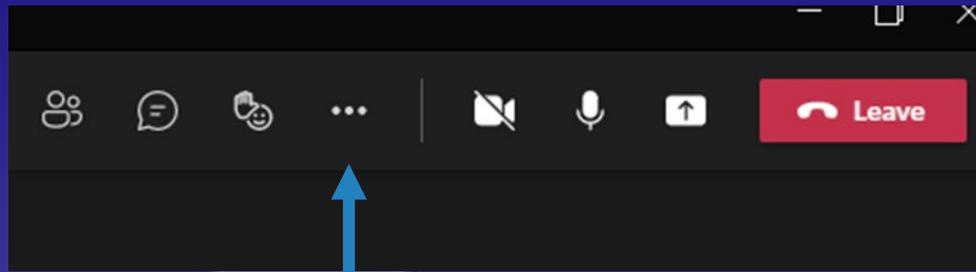


COLLECT VERIFICATION SAMPLES

- COLLECT SOIL SAMPLES:
 - ANALYSIS FOR:
 - GAMMA SPEC
- ASSUMPTIONS:
 - IF AN AREA EXCEEDS THE DCGL COUNT RATE, THEN CONTAMINATION EXTENDS TO A MINIMUM DEPTH OF 6 INCHES BELOW GROUND SURFACE(FT-BGS)
- UTILIZE (MANUFACTURER) VIRTUAL SAMPLING PLAN (VSP) TO:
 - DEVELOP DENSITY (NEED DENSITY) OF SAMPLES TO BE COLLECTED
 - RANDOMLY DETERMINE SAMPLE LOCATIONS EQUIDISTANCE FROM EACH OTHER
 - COLLECT SAMPLES
 - MINIMAL SAMPLING OF SURFACE CONTAMINATION TO CONFIRM ASSESSMENT RESULTS

CLOSED CAPTIONS

For closed captioning:
1. Click the 3 "..."
2. Click the "Turn on live captions"



HOW TO USE THE CHAT BOX

1. Click "Show Conversation".
2. Type your question on the panel on the right and hit "Enter".

The screenshot shows a Zoom meeting window titled "Meeting with Davis, Heather". The top toolbar contains several icons: a group of people, a document with a checkmark (highlighted with a green box), a hand, a screen, and a red "Leave" button. Below the toolbar, a circular profile picture of a woman is shown with the text "Invite people to join you" underneath. On the right side, the "Meeting chat" panel is open, displaying a message from "Davis, Heather" and a system message "11:18 AM Meeting started". A blue chat bubble contains the text: "This meeting is the EVR-Wood Treating/Evangeline Refining Superfund Site Public Meeting on May 27, 2021." Below this, a question is typed: "What is involved in the superfund process?". At the bottom of the chat panel, there is a text input field with a placeholder: "You will enter your question here and then hit enter or click the arrow on the bottom right." The send button (a white arrow in a green box) is highlighted with a green box. Two green arrows point from the text instructions to the "Show Conversation" icon and the send button.



CLOSED CAPTIONS



Waiting for others to join...

1. "Click" the Hand to be acknowledged.
2. Then your name will appear on the right with your hand raised."

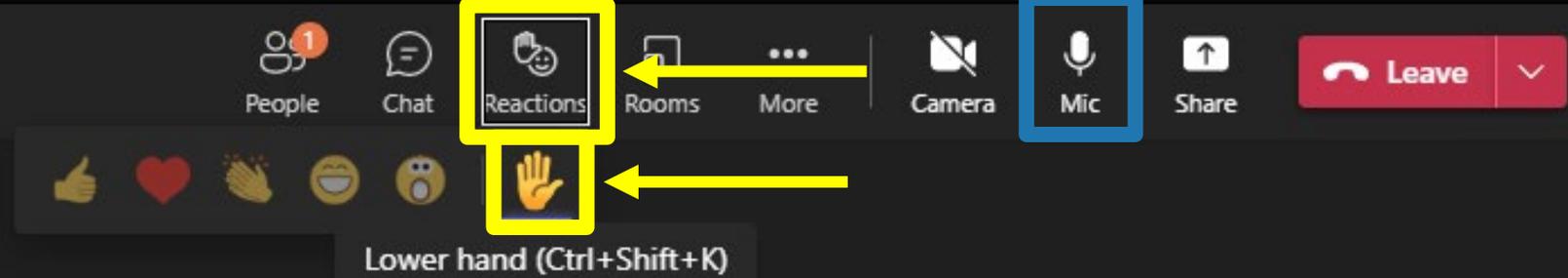


3. When your name is called, please click the mic to unmute yourself.



HOW TO RAISE YOUR HAND:

TEAMS UPDATE



1. Click "Reactions"
2. Click the "Raise Hand" button
3. Unmute yourself to speak when you are called on.



Invite people to join you

PRESS *6 TO UNMUTE THE PHONE LINE



A large, semi-transparent blue logo in the background. It features a central circle with a smaller circle inside it, and two curved shapes below, resembling a stylized flower or a person's head and shoulders.

QUESTIONS AND ANSWERS