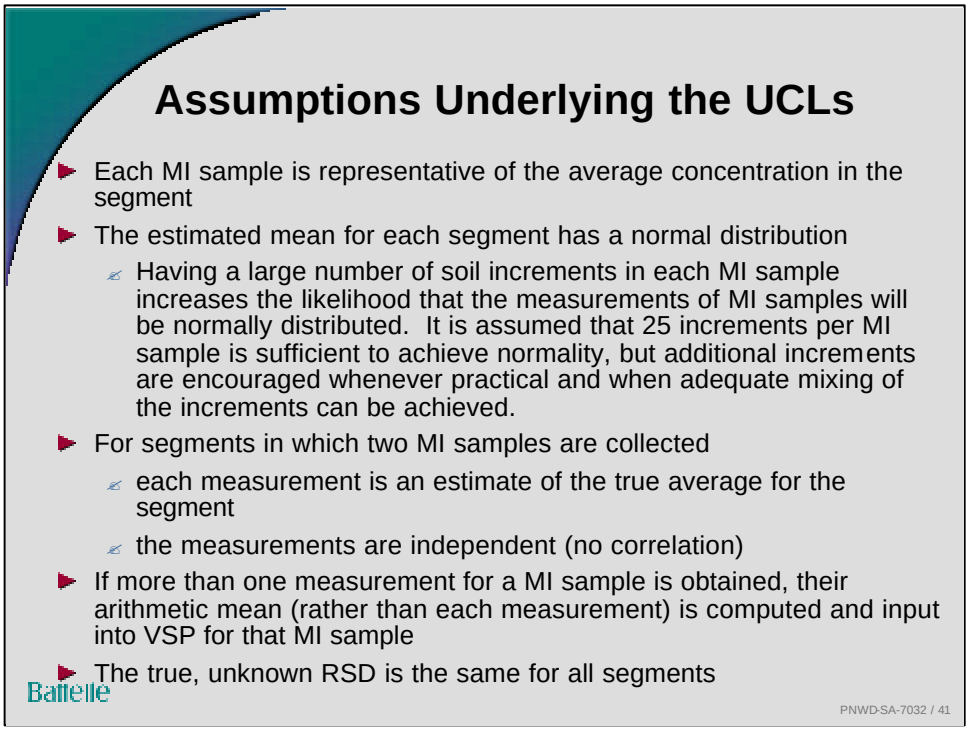

It is also assumed that explosives constitutes in surface soil are not resuspended and transported through the air to distinct isolated hot spots outside the boundary. That is it is assumed that the only way surface soil explosives constituents will breach the boundary is as a continuous plume across the boundary.

Power of the UCL test depends on magnitude of the difference in the true mean for the segment and the action level, the number of soil increments per MI sample, and the variability among MI samples in each segment. In contrast to most all other VSP modules, the RS VSP module does not ask the VSP user to specify the required power of the test. Hence, VSP presumes the user has verified previously that the number of increments and MI samples used is sufficient to achieve a sufficiently high power for the UCL test to reject Ho when Ho is false.

Hypothetical Case Study

- Suppose that surface soil samples are to be collected along the current (provisional) boundary of an active training range to determine if mean concentrations of RDX at the boundary exceed the action limit (4.4 ppm).
- If so, it will be necessary to determine if true mean concentrations greater than 4.4 ppm extend beyond the boundary, and if so, where along the boundary such contamination may exist.
- The goal would be to establish a new boundary beyond which there is high confidence that the action limit for the RDX mean (4.4 ppm) is not exceeded.

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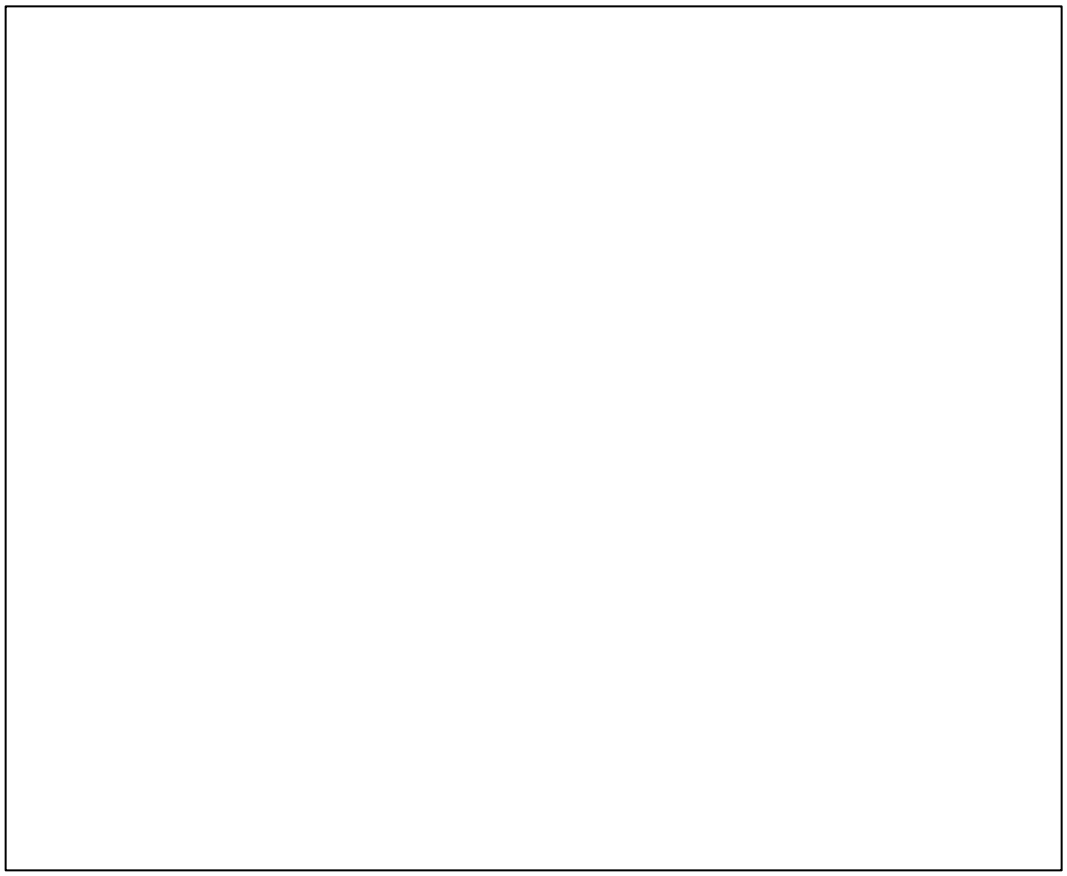
PNWD-SA-7032 / 42



Hypothetical Case Study (continued)

- Suppose that movement of RDX in surface soil to adjacent off-range areas would be most likely to occur on the downhill portion of the range
- Assuming that assumption to be true, the project planning team decides to sample only the current boundary on the downhill side of the training range
- Suppose a DXF file of the training range has been saved in the VSP folder
- The DXF file is loaded into VSP by clicking **Map** on the VSP menu bar, then clicking **Load Map from file**, and double clicking the appropriate DXF file

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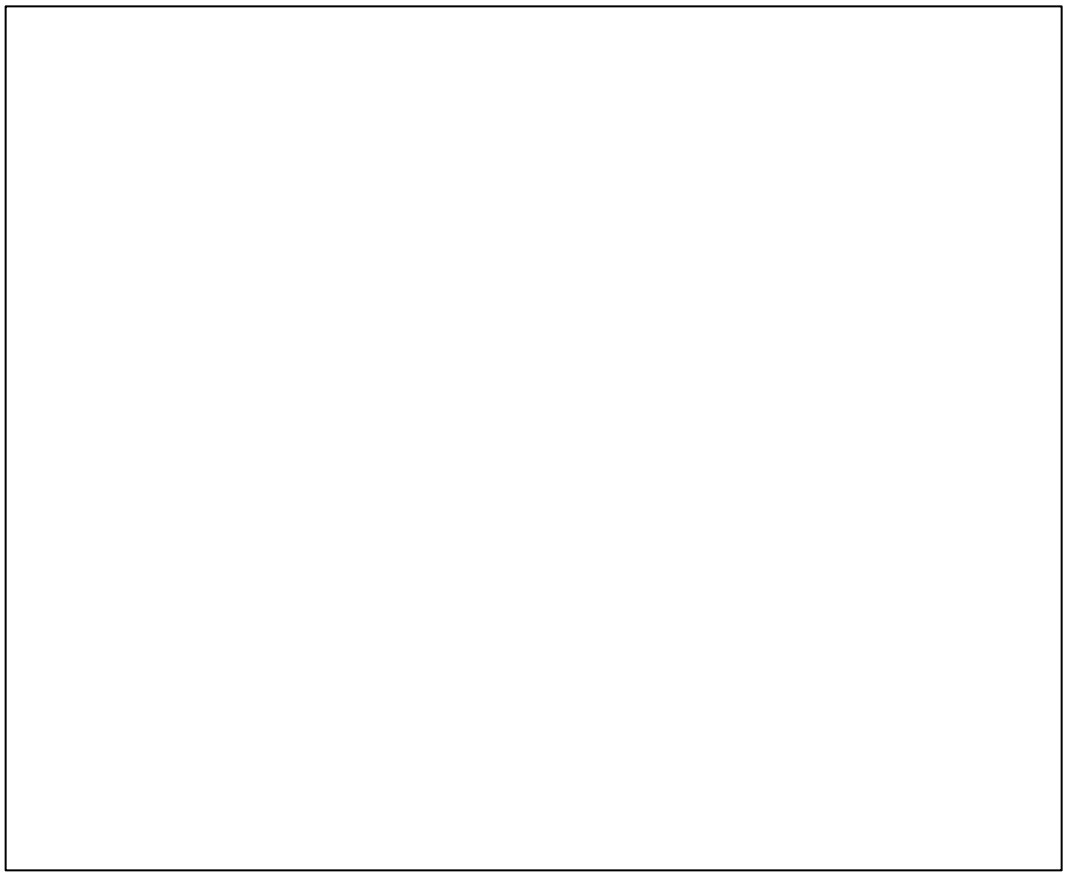
PNWD-SA-7032 / 43



Hypothetical Case Study (continued)

- The partial boundary is drawn on the map by
  - clicking **Edit** on the VSP menu bar
  - clicking **Sample Areas > Define New Open-Type Sample Area**
  - selecting a color (say, red) from the color box that appears
  - clicking the left mouse button at locations (the boundary beginning point, points of changing direction along the boundary, and the boundary end point) on the map to define the partial boundary
  - clicking the right mouse button to create the boundary, then
  - clicking **Edit** on the VSP menu bar
  - clicking **Sample Areas > Flip Direction** to reverse the arrow that VSP placed on the boundary to indicate the downhill direction

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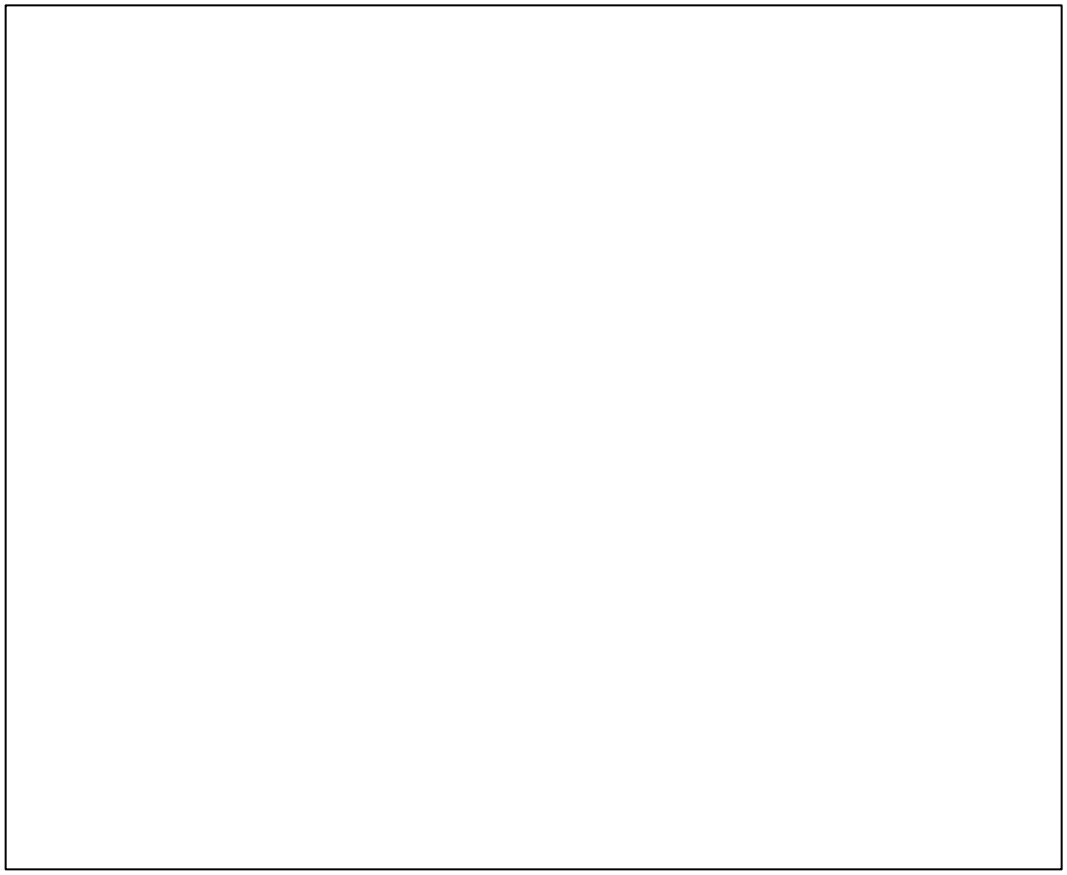
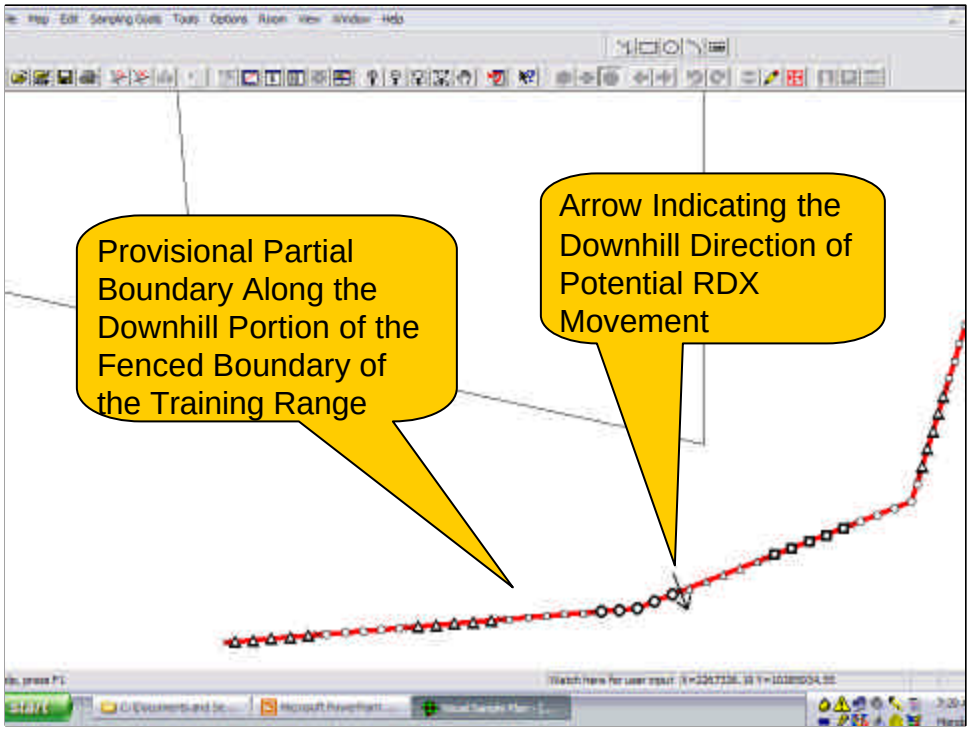
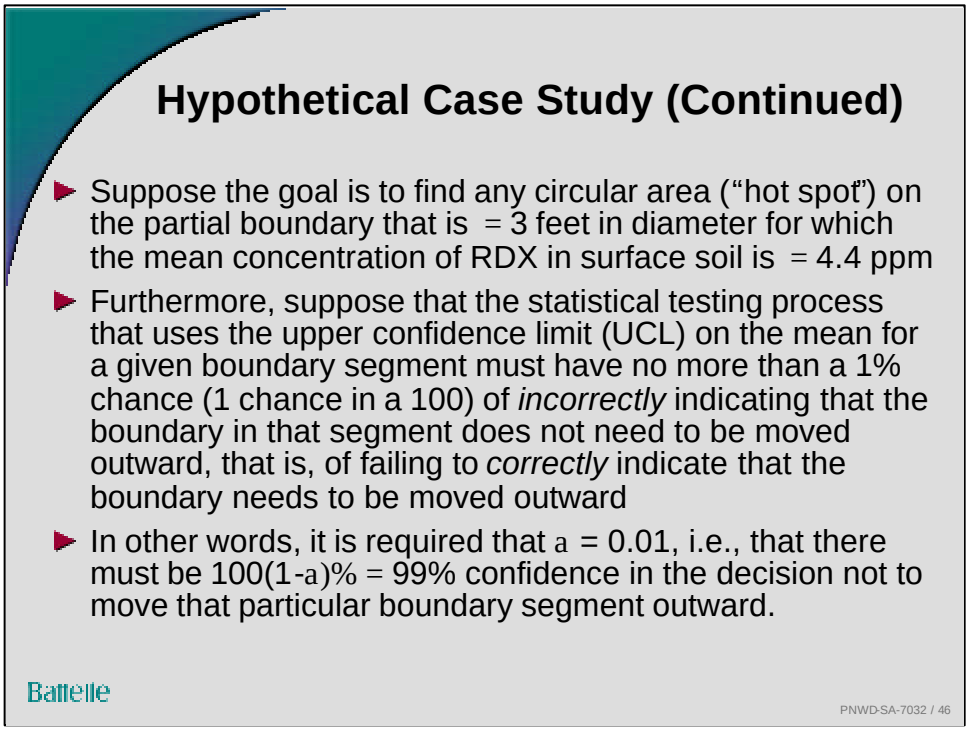
PNWD-SA-7032 / 44




Provisional Partial Boundary Along the Downhill Portion of the Fenced Boundary of the Training Range
Arrow Indicating the Downhill Direction of Potential RDX Movement



The 99% confidence statement applies to the decision made *separately* for each individual segment. If in truth none of the k segments along the boundary have hot spots, then the overall confidence that *all* the k UCL tests will correctly indicate that none of the k boundary segments should be moved outward will be (assuming the k tests are independent)

$$\text{Overall Confidence} = 100(1 - \alpha)^k$$

For example, if a = 0.01 for each of the k UCL tests, then

$$\text{Overall Confidence} = 100(1 - 0.01)^9 = 100(0.99)^9 = 91$$

that is, there is 91% confidence in the conclusion that none of the boundary segments need to be moved outward. Note that reducing a for each individual segment will increase the overall confidence level. For example, if a is set at 0.001 for each segment, then

$$\text{Overall Confidence} = 100(1 - 0.001)^9 = 100(0.999)^9 = 99$$

as desired. For additional discussion of this topic see page 305 in:

Millard, S.P. and N.K. Neerchal. 2001. *Environmental Statistics with S-Plus*, CRC Press, NY

Hypothetical Case Study (Continued)

- The requirements on the previous slide are entered into the VSP RS dialog box
- This box is accessed by clicking **Sampling Goals** on the VSP menu bar, then clicking

  Establish Boundary of Contamination > Partial Boundary

  as shown on the next slide.
- Click the **Apply** button after dialog box inputs are added.

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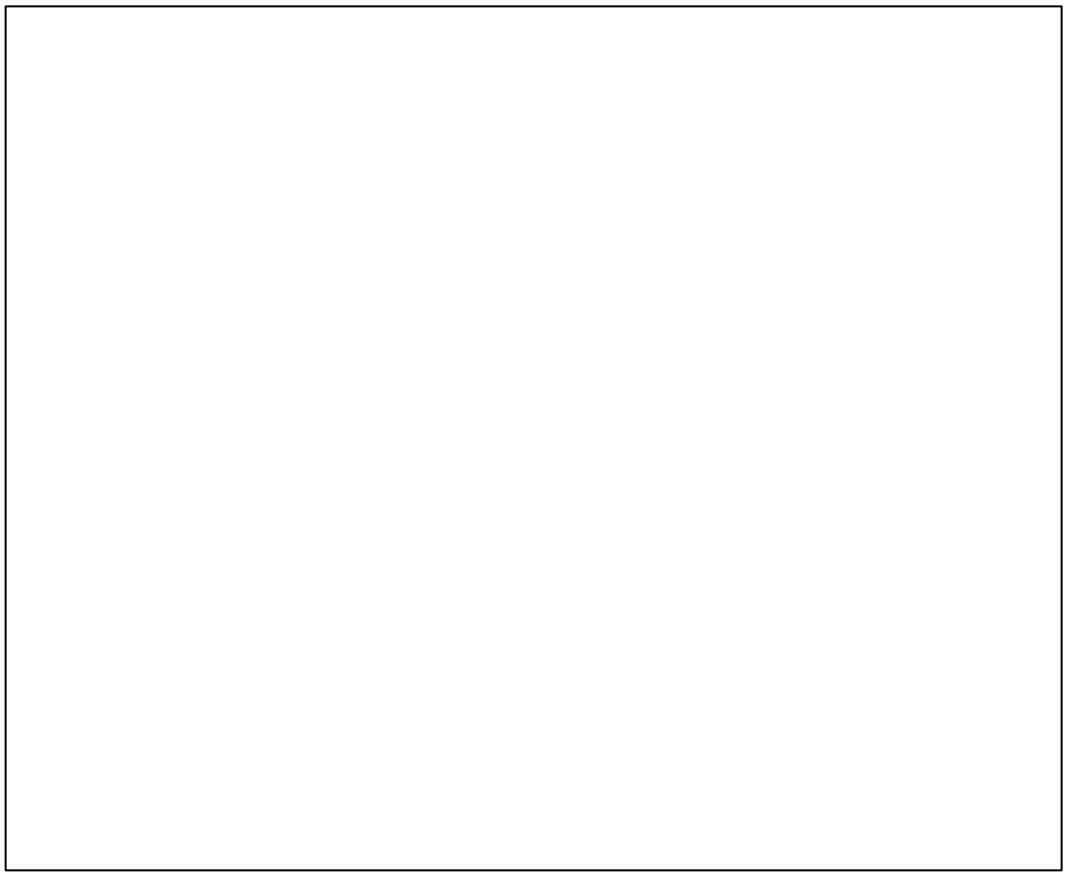
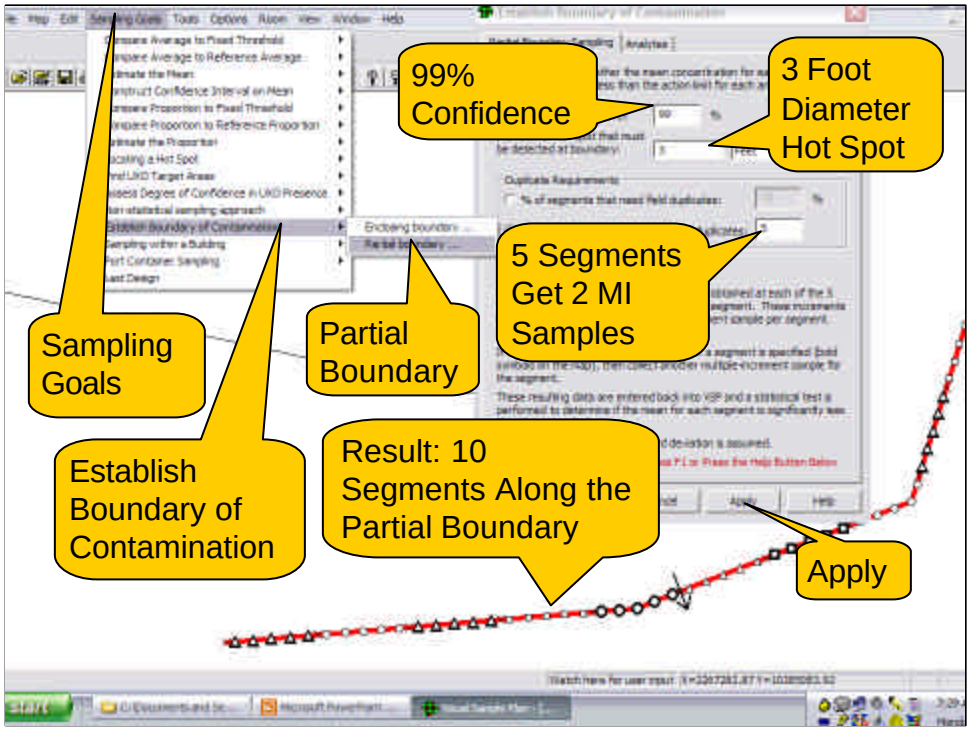
PNWD-SA-7032 / 47




99% Confidence
3 Foot Diameter Hot Spot
5 Segments Get 2 MI Samples
Sampling Goals
Partial Boundary
Establish Boundary of Contamination
Result: 10 Segments Along the Partial Boundary
Apply