

5.0 Recommendations

Based on the results of sampling, laboratory analyses and modeling, the following recommendations are presented below.

5.1 Site Selection

Detonation locations for disposal of UXO's collected at TCRA site should be located at least 500 meters from running water or permanent ponding areas. If total NEW is greater than 500kg (UXO and initiator explosives), a new site should be selected for each 500 kg increment. This site should be at least 500 meters from current sites. If this is not possible, soil sampling procedures should be followed and for large detonations (order of 2000kg), air sampling is suggested.

Explosives and UXO's totaling 50 to 200kg should be placed in a trench or pit at least two feet deep and mounded with clean sand to a appropriate depth of burial (6 feet for 100 to 150kg) taking care to mound beyond the edge of the trench or pit to prevent excessive side leakage of the blast. Scaling to other NEW goes as $(NEW)^{1/3}$. For small NEW in the order of 5kg or less, mounding with sand may be used without a trench or pit although it is recommended that pits still be used.

5.2 Sampling

It is recommended that several (2 to 5) background samples be taken and analyzed to determine if the site is clean or contaminated. There is no need to collect and analyze soil samples for small explosive NEW (<500kg total UXO and initiator charges). This assumes the use of initiator explosives such as T-100 Slurran, KINEPAC and similar mixtures. Where samples are to be collected and analyzed, it is recommended that the sampling plan in 6.0 be used.

Sampling should be in a repeatable geometric pattern for easier correlation of background, post detonation or post disposal measurements. Unless there is reason to believe that contamination exists and that it is highly variable in the site selected, samples in the same geometric configuration should themselves be sampled to create a composite for subsequent analysis. For example, four samples from the four compass cardinal directions on a 25 meter radius ring would be composited. The remaining samples (4 in this case) should be taken back to the laboratory and frozen in case they are needed to explain anomalies.

Water which is flowing or is part of permanent ponds or lakes should be sampled along with the soil samples. For NEW of 2000kg and above, it is recommended that air samples be taken with a requirement that samples be taken for 10,000kg NEW detonations.

5.3 Laboratory Analyses

It is recommended that the target analyte list in Table 2.4 be used as a baseline. Additional metals can be added as well as explosive products. These additional metals include arsenic, beryllium, cobalt, magnesium, antimony, selenium, thallium and vanadium. Inorganics such as cyanide which can result from poor mixing of T-100 components, for example, may also be added. Metals assay in the laboratory is inexpensive and adding metals does not add materially to the expense. Additional semivolatiles include Dibenzofuran, and 2-Nitrodiphenylamine.

The following laboratory methods are recommended:

- metals: SW-846-6010
- semivolatiles: SW-846-8270/625 using GC/MS
- nitroaromatics/nitramines: HPLC, USEPA Method SW-846-8330
- nitrate-nitrogen: 4110B
- mercury - SW-846-7471.

Frozen backup samples are to be retained until the final documentation on the site has been reviewed and then disposed of (unless needed to explain results further).

5.4 Modeling

Dispersion codes described in Section 2.2.5 are recommended only if a NEW is above 2000kg and is expected to contain about 1/2 of the NEW as UXO's. Use of predictive models for NEW in the 10,000kg range is mandatory. OF the codes listed in Table 2.6, INPUFF is recommended. Emission factors can be obtained from the BangBox test series referenced in the cited and uncited references. Emission factors for initiator explosives such as T-100 Slurran and KINEPAC are not available from the BangBox and are not planned any time soon. Estimates may be made using the results from the equilibrium combustion code EQM for Ammonium Nitrate/Nitromethane mixtures. For small NEW (100-200kg), relations supplied in section 2.2.3 through 2.2.5 are recommended for approximate, worse case analysis.

To determine fallout collecting pan locations and other sampling locations, the relations given in Sections 2.2.3 and 2.2.4 are recommended.

5.5 Miscellaneous

Wherever possible, video taping of activities is recommended. This should be performed before, during and after the TCRA action and should show:

- Terrain around the site and ground zero;
- Trenches, pits dug;
- Layout of UXO and explosives prior to and after mounding with soil/sand;
- Detonation with FOV large enough to encompass dust and ejecta cloud for each shot (two cameras are best: one as close as safety allows, the second at least 1km away and hand held);
- Crater and throwout after each shot;
- Sampling pans and points, sample collection, and
- Final remediation to original terrain level.
- In all cases, standard of measure should appear in each frame.

After the final detonation and end of activities, the crater should be filled with extra sand first and then with local top soil, and graded to slightly above original grade. For aesthetics, seeding should be performed as selected by personnel responsible for the land.