

## Hogelin, Thomas

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**From:** Dave Nicholson <dknicholson@q.com>  
**Sent:** Tuesday, March 07, 2017 12:08 PM  
**To:** Hogelin, Thomas  
**Cc:** Johnson, Derek  
**Subject:** Evaluation of Nutrient Levels in O-36B Landfarm

Tom

The lab report for the nutrients for the O-36B landfarm shows that ammonia and nitrate is present in excess concentrations and ortho-phosphate and phosphorous are not present. Ammonia ranges from 6.0 - 54.5 mg/kg and nitrate is at 32.5 -172 mg/kg. This indicates that considerable nitrate is being formed due to nitrification processes. This level of ammonia is potentially toxic to microorganisms. The ideal concentrations of organic carbon, nitrogen, and phosphorous should be close to the ratio of 100:10:4. If we assume that total carbon in the O-36B landfarm is equal to the latest TPH concentration, then we have a ratio of about 882:134:0, or approximately 100:15:0. Levels of nitrate over 30 mg/kg are considered to be excessive for normal soils.

It is likely that the absence of orthophosphate is limiting microbial activity at this time. I recommend that we apply a high-phosphorous, low-nitrogen fertilizer to the O-36B landfarm this time. Phosphate levels should ideally be over 20 mg/kg. About 300 pounds of phosphate per acre is needed to achieve that level of phosphate.

For future nutrient sampling, we should include potassium and total organic carbon in the testing protocol. For many of the landfarms without TPH impacts, the amount of organic carbon present is likely very low. The amount of PAHs present is likely not by itself sufficient to allow for strong bacterial growth. For landfarms where TOC is low, carbon could be added in addition to fertilizer as shown by the testing. We should evaluate potential sources of added carbon. It appears from our previous testing that the sawdust added to some of the piles acted as a supplemental carbon source and allowed co-metabolism of the hydrocarbons to occur.

Dave

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