BROWN TREE CARE SITE STUMP DUMP
Options for Extinguishing the Subterranean Dump Fire

Site History

Due to citizen's complaints received by Arkansas Department of Environmental Quality (ADEQ) and Arkansas Department of Health (ADH), on September 19, 2018, the State of Arkansas requested EPA assistance in determining if any hazards were involved with an underground fire at the Brown Tree Care Site in Bella Vista, AR (Brown Tree Care Site). The site is the location of a stump dump where stumps, vegetation and possibly other materials have been dumped in the past. The dump is not compacted and contains gaps between the debris which is allowing air to feed the fire. The site is also located in a ravine with unsecured and steep sites. The existing cap is unstable due to the lack of compaction and active subsidence.

The site is approximately 5 acres in area and is estimated to be 60 feet deep in some areas. The site is located on the 8000 block Trafalgar Rd, Benton County, Arkansas (Latitude 36.461346° North and Longitude 94.209098° West). The property is surrounded by residential properties to the north, east, south, and west amongst trees and rolling topography. A commercial storage facility, Blue Mountain Storage, is located directly south of the property.

EPA Activities

Starting around August 1, 2018, the State began receiving calls from citizens in the area regarding the odor and the smoke coming from the site. In mid-September, EPA was asked to sample the air at the site and the surrounding area.

EPA mobilized to the site on October 1, 2018 to collect 5 air samples for semi-volatile organic compounds (SVOCs) (i.e. naphthalene) and volatile organic compounds (VOCs) (i.e. benzene). One sample was collected on-site, three were collected in areas downwind of the site and an additional background sample was collected. The results for VOCs were all below their respective Agency for Toxic Substances and Disease Registry(ATSDR) levels. The SVOC samples were unable to be analyzed due to sampling media issues.

Based on conversations with the State of Arkansas and the need to collect SVOC data, EPA remobilized to the site on November 10, 2018 for a VOC and SVOC re-sampling effort. EPA collected 5 air samples for semi-volatile organic compounds (SVOCs) (i.e. naphthalene) and volatile organic compounds (VOCs) (i.e. benzene). One sample was collected on-site, three were collected in areas downwind of the site and an additional background sample was collected. Due to a wind direction shift from the October sampling event, different downwind sites were used. All of the SVOC analytical results from the November 10, 2018, sampling event were at acceptable levels and below the chronic RSLs. In addition, all of the off-site VOC sampling results were also below the chronic RSLs. However, the result from the on-site VOC sample indicated a Benzene concentration of 100 $\mu g/m^3$ which exceeds the chronic RSL of 31 $\mu g/m^3$. However, the on-site benzene level of 100 $\mu g/m^3$ is within a factor of two of the subchronic RCL of 82 $\mu g/m^3$ and therefore does not represent an immediate health concern.

EPA presented these results to ADEQ and ADH. Due to the one elevated level of Benzene on-site the State of Arkansas requested EPA conduct an additional VOC sampling event for a longer timeframe and to also conduct particulate matter data due to community concerns.

On December 10, 2018 EPA again mobilized to the site for 3 days of sampling for VOCs and monitoring for particulate matter (PM). The validated results for this round of sampling will be available on December 21, 2018.

Options for extinguishing the underground fire at the Brown Tree Care Site

The siting conditions described in the site history section will complicate all of these options because additional site preparations will be required to access the dump safely with equipment. Technical experts from the Office of Research and Development (ORD) have provided the following preferred options to extinguish the underground fire quickly and with the lowest possible environmental and public health consequences.

Three Categories

1) Insertion of Inert Gas into Stump Dump
    a. Description - An injection of inert gas through a drilled bore hole would choke off the oxygen that is being supplied to the fire and as a result the put out the fire.
    b. Issues - While this may work in theory, in practice it seems to be a challenge as the facility has stumps in it that create voids; as well as concrete and asphalt that are rather hard to drill. Municipal solid waste landfills are softer, so one can use an auger and drill through the landfill. Here there are stumps, concrete, and asphalt therefore difficult to drill through those with a regular auger. Plus, there is a limited sphere of influence with an inert gas injection. The one location that we are aware of that used liquid nitrogen, worked for a short duration but the effectiveness went away after injection was ceased.
    c. Overall - Inert gas works in practice, but it is doubtful that at this site, the fire would be able to be controlled. It will be problematic to place bore holes through the dump to apply the inert gas and volume require due to lack of compaction and voids in the dump would further limit this methods effectiveness. The economics of putting a fire out of this size with an inert gas injection is something that has not been researched before and assumptions are it would be costly specifically with the drilling and getting the gas into the waste mass.

2) Foam or Chemical Treatment
    a. Description – The application of Foams or Chemicals through drilled bore-holes to suppress or stop the fire.
    b. Issue - While this may work in theory, in practice it seems to be a challenge as the facility has stumps in it that create voids; as well as concrete and asphalt that are rather hard to drill. Municipal solid waste landfills are softer, so one can use an auger and drill through the landfill. Here there are stumps, concrete, and asphalt therefore difficult to drill through those with a regular auger. In addition, using foams and chemicals in a watershed to a recreational lake. The fear would be that the behavior of these chemicals in this environment are unknown. The type of chemicals or foams are unknown, and the fear would be that those chemicals would make it into the waterways and then into the lake and cause another problem. Any treatment through drilling and applying internally does not address the issues with the uncapped sides of the dump and would require a containment area to be constructed to capture any foams or chemicals that would be released.

c. Overall - While foams or chemicals have been used before in a landfill setting, it will be problematic to place bore holes through the dump to apply the foams or chemicals and volume require due to lack of compaction and voids in the dump would further limit this methods effectiveness. In addition, the unintended consequences of using these compounds may be an issue and in the long term this is not an effective way of putting out the fire.

3) Excavation and Douse with Water
   a. Description - Excavation and dousing is possibly one way of going at putting the fire out at the site. While the perimeter of the site is inaccessible now, potentially putting a 20 to 25 feet fire break around the site would allow trucks and excavator and water trucks to go down there to excavate the site. The excavator would pull out the pieces of wood or other debris from the site and if there's a fire that erupted or flared the water truck could be used to put that fire out.
   b. Issues - The positive of this approach is that it has been used at other landfill sites in Ohio. These are not tree stump sites but are municipal solid waste sites. Also, due to the lack of compaction, this may be the only way to ensure all the hot spots are being accessed by the response action. The negative of such an approach is that the odor and smoke will get worse before they get better. The local citizenry would have to be contacted and made aware of such a move prior to making it so that they can take appropriate cautions. A temporary collection area would need to be constructed for waters used to control flames as well as water used to douse the waste.
   c. Overall - Winter-time probably would be better to do this than summer because people are mainly indoors in winter and as a result there are less exposed to the smoke. It is a costly approach but it is an approach that has been utilized before successfully. One option for the waste after it is doused is replacement of the waste at the site in a manner engineered to ensure proper placement and prevent a future fire. The second is for the waste to be shipped offsite or destroyed on-site, when applicable.