

40 CFR §258 and the Arizona Law 49-767.A.2 contain location restrictions for existing municipal solid waste landfills (MSWLFs), new MSWLFs, and lateral expansions to MSWLFs.

#### **4.1 IRRIGATION GRANDFATHERED RIGHTS**

New MSWLFs may not be permitted if an irrigation grandfathered right is appurtenant to all or any part of the facility. There are no irrigation grandfathered rights pertaining to either the landfill site or the proposed lateral expansion (Arizona Department of Water Resources (ADWR), 1998). Therefore, no additional demonstration related to irrigation grandfathered rights is required.

#### **4.2 FLOODPLAINS**

The nearest 100-year floodplain to CLL is the Rio de Flag, located approximately 3 miles south of the landfill. Therefore, no additional demonstration related to floodplains is required.

#### **4.3 AIRPORT SAFETY**

All MSWLF units located within 10,000 feet of any airport runway end used by turbojet aircraft or within 5,000 feet of any airport runway used by only piston-type aircraft must demonstrate that the units are designed and operated so that the MSWLF unit does not pose a bird hazard to aircraft. The nearest airport is located approximately 13 miles southwest of CLL. Therefore, no additional demonstration related to airport safety is required.

#### **4.4 WETLANDS**

Environmental assessments (EAs) were prepared for the site in 1991 and in 1995 to support the installation of utility lines to the landfill site (Northland Research, 1991) and to support the proposed lateral expansion and land transfer (Woodward-Clyde, 1995), respectively. The analyses presented in the EAs indicate that no wetlands are present on the landfill site. This observation was confirmed by a review of aerial photographs and site reconnaissance.

#### **4.5 FAULT AREAS**

New MSWLF units and lateral expansions cannot be located within 200 feet of a fault that has had displacement in Holocene time. CLL site is located in the San Francisco Volcanic Field Neotectonic Domain as defined by Menges and Pearthree (1983). The nearest faults with suspected Quaternary displacement include elements of the Walnut Canyon Faults located about 6 miles due south of the site. These comprise short fault segments up to 6 miles in individual length with general northwest trends. Other faults in the region include elements of the Leupp Fault Set located 20 to 25 miles southeast and east of the site; elements of the Lake Mary Fault Zone located 10 to 15 miles south and southwest of the site; elements of the Oak Creek Fault Zone - North Segment, located about 12 miles southwest and west of the site; and elements of the Wupatki Fault Set located about 15 miles north of the site. All are interpreted as being part of

the San Francisco Peaks Volcanic Center which is seismically distinct from more regional fault systems.

Based on the information presented above, CLL area is at least 200 feet away from a fault or fault zone with demonstrated Holocene displacement.

#### **4.6 SEISMIC IMPACT ZONES**

New MSWLF units and lateral expansions cannot be located in a seismic impact zone unless the owner/operator demonstrates to the satisfaction of the Director of an approved state that all containment structures, including liners, leachate collection, and surface water control systems, are designed to resist maximum horizontal acceleration during a probable seismic event. A seismic impact zone is defined as an area with a 10 percent or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravitational pull will exceed 0.10g in 250 years.

CLL and the surrounding area is located in a seismic impact zone. The City of Flagstaff has conducted a seismic evaluation which includes landfill evaluation and design recommendations for the purpose of demonstrating to the Arizona Department of Environmental Quality (ADEQ) that the proposed lateral expansion can resist maximum horizontal acceleration during a probable seismic event. Discussion of these evaluations can be found in Section 8.8.

#### **4.7 UNSTABLE AREAS**

All MSWLF units located in an unstable area must demonstrate that engineering measures have been incorporated into the MSWLF unit's design to ensure that the integrity of the structural components of the MSWLF unit will not be disrupted. An "unstable area" is defined as "a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of the landfill structural components responsible for preventing release from a landfill. Unstable areas can include poor foundation condition, areas susceptible to mass movements, and Karst terrains." "Areas susceptible to mass movement" are defined as "those areas of influence (i.e., areas characterized as having an active or substantial possibility of movement) where the movement of earth material at, beneath, or adjacent to the MSWLF unit, because of natural or man-induced events, results in the downslope transport of soil and rock materials by means of gravitational influence. Areas of mass movement include, but are not limited to, landslides, avalanches, debris slides and flows, soil fluctuation, block sliding, and rock fall." "Karst terrains" are areas where "karst topography, with its characteristic surface and subterranean features, is developed as the result of dissolution of limestone, dolomite, or other soluble rock. Characteristic physiographic features present in karst terrains include but are not limited to, sinkholes, sinking streams, caves, large springs, and blind valleys."

Three factors to be considered in determining whether an area is unstable:

- On site or local soils conditions that may result in significant differential settling
- On site or local geologic or geomorphologic features
- On site or local man-made features or events

Soils found in the vicinity of CLL comprise interlayered cinder deposits and colluvial/alluvial soils which fill the shallow alluvial basin of Cinder lake, ranging in thickness from about 15 to 50 feet, and rest on hard volcanic rock beneath (WTI, 1992, and Woodward-Clyde, 1997). The soils consist predominately of sand and cinders with variable amounts of clay as matrix. The soils exhibit relatively low in place densities (68 to 101 pounds per cubic foot), but this appears to relate to the high percentage of vesicular cinders. The clay component is reportedly lean, meaning it is not conducive to deformation (either compression, expansion, or collapse). Furthermore, no groundwater is known to occur in the alluvial sediments in this area. Given these conditions, there is little likelihood that foundation soils will develop substantial differential settlements under static loads or be subject to liquefaction under seismic shaking.

Other on-site and local geologic or geomorphologic features, identified in §258.15, that could impact stability of landfills include areas susceptible to mass movement (landslides, avalanches, debris slides and flows, soil fluction, block sliding and rock fall) and karst terrains. By itself, the location of Cinder Lake Landfill precludes these issues because the ground around and within the landfill is relatively flat except for a few scattered cinder cones and bedrock pinnacles which rise out of the otherwise featureless surface. For this reason, there will be no potential for development of landslides, debris flows, or other forms of mass movement on natural slopes. On temporary or permanent cut or fill slopes created as part of the landfill, proper design can mitigate potential stability problems.

Karst terrains generally develop in rocks which solubilize in the presence of water such as limestone or dolomite. Regionally, there are limestone rock formations, most notably the Kaibab Limestone, but in areas where they are exposed elsewhere on the Mogollon Rim, they rarely exhibit skin holes or other evidence of karst development. Rock types found in the vicinity of the landfill comprise dense to vesicular basalt and other volcanic rocks which are not conducive to development of karst terrains. Volcanic terrains can contain underground openings such as lava tubes which, if they collapse, create sink holes similar to those found in karst terrains. However, no collapse features of this type have been reported in available literature on the San Francisco Volcanic Field.

Based on the available information discussed above, CLL site is not in an area characterized by soils, geological or geomorphic conditions associated with unstable areas. Additionally, no identified surface or subsurface man-made features or events that could contribute to destabilizing the landfill were observed at the site during site reconnaissance.