LEGAL ISSUES ASSOCIATED WITH LANDFILL SLOPES

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ABSTRACT: On March 9, 1996, the largest slope failure in a United States municipal solid waste landfill occurred near Cincinnati, Ohio. The events leading up to the wasteslide, the geological setting and relevant geotechnical engineering properties, and the cause of the wasteslide are described herein. This slope failure will be used to discuss some of the factors that owners/operators should consider before allowing other entities to utilize a landfill site for other economic purposes such as methane gas extraction, recycling, or mining activities. These factors include site history and topography, geological setting, previous occurrence(s) of slope failure and/or earthquakes, geotechnical engineering properties, landfill capacity and management, and applicable environmental regulations and zoning requirements. These factors should be considered so the economic benefit derived from other entities is not exceeded by the risk/liability incurred by allowing the non-landfilling activity. In addition, the contract or lease should be drafted to cover all possible risks and potential exposure to the lessor and limitation of damages in both tort or contract litigation.

INTRODUCTION

An existing municipal solid waste (MSW) landfill occupies 546 km^2 (135 acres) approximately 15.3 km (9 miles) northwest of Cincinnati, Ohio. This facility is currently permitted for 546 km^2 (135 total acres) of waste placement and encompasses a total of 1765 km^2 (436 acres) of contiguous property. The site lies on rolling terrain between the Ohio and Great Miami River valleys. The landfill is the largest facility in the State of Ohio based on annual waste receipts and accepts an average of 4.5x10^6 kg (5,000 tons) of residential, commercial, and industrial solid wastes per day. The landfill handles approximately 12% of the total amount of Ohio derived solid waste disposed of in Ohio landfills and is an important piece of infrastructure in southwestern Ohio. On March 9, 1996, the largest slope failure (based on volume of waste involved) in a United States MSW landfill (see Figure 1) occurred. The slide involved approximately 1.2 million m^3 (1.5 million) of waste making it the largest waste slope failure by a factor of two. This article describes the landfill site, wasteslide event, cause of the failure, and the risk/liability incurred by allowing non-landfilling activities to occur at the site.

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Figure 1. Aerial view of wasteslide on March 11, 1996 (two days after wasteslide).

Disposal at this site began in 1945 as part of a swine farm. The landfilling operation initially consisted of pushing waste over the edge of an existing ravine. It is important to note that the brown native soil, consisting of colluvium and residual soil, on the bottom and sides of the ravine were not excavated prior to solid waste placement. It will be shown subsequently that failure occurred through the weak native soil, underlying the waste. At present the native soils are excavated and used for purposes such as a compacted clay liner (CCL).

LANDFILL EXPANSION

In February 1994 the landfill owner/operator was granted a permit for a 486,000 m^2 (120 acre) lateral expansion. The north slope lateral expansion involved creating an excavation adjacent to the existing landfill with a maximum depth of 45 m (145 feet) and installing a composite liner system in the expansion area (Rumpke 1992). The composite liner system was to consist of a 1.5 m (five feet) thick CCL, 1.5 mm (60 mils) thick geomembrane, and a leachate collection and removal system. At the time of the failure, the depth of the excavation near the north slope toe was 30 to 35 m (see Figure 2). In addition, a 2.5 to 6.0 m (8 to 20 foot) high nearly vertical excavation was constructed through the MSW and brown native soil at the toe of the existing slope (see dotted line in Figure 2) in September 1995 to create an access road and to allow the composite liner system to be anchored near the existing landfill. A seepage collection trench was constructed about 9 to 12 m (30 to 40 feet) below the access road to collect continual leachate exiting the landfill and/or seepage from the intact or weathered bedrock.

The areal extent and geometry of the lateral expansion on February 6, 1996, 32 days prior to the failure, are shown in Figure 2. The outline of the existing landfill involved in the wasteslide is superimposed in Figure 2 (see dashed line), which is south of the access road. In addition, the dashed line depicts the furthest extent of the waste after the slide. It can be seen that the slide mass essentially filled the deep excavation except for a small area at the northeastern edge of the excavation.

Another important feature in Figure 2 is the vehicle turnaround at the top of the landfill. Approximately one-half of the daily 4.5×10^6 kg (5,000 tons) of waste was being placed at the top of the slope in the months preceding the slide. Placement activities were evident from the presence of three compactors that remained at the top of the landfill after the wasteslide. The other two compactors that were being used at the time of the slide were located at the west ridge placement area and are shown in Figure 2 with the presence of four unloading trucks.

The large and deep excavation was being continued at the time of the failure after being started in 1993 and being open for approximately forty months prior to the wasteslide. Placement of the CCL for the composite liner system had started on a portion of the 3 Horizontal: 1 Vertical slope adjacent to the toe of the existing landfill in December 1995 or approximately three months prior to the slide. The continual collection of leachate and surface water contaminated by the leachate in the deep excavation caused many construction delays. Site personnel had to activate a leachate pump approximately once every hour to remove liquid from a manhole at the bottom of

Figure 2. Aerial view of landfill on February 6, 1996 (32 days prior to the wasteslide).

the 3H:1V slope adjacent to the landfill. This pumping was required year round. In addition, it usually required several days for the leachate pools around the manhole in the excavation to dry before construction could proceed.

In summary, the composite liner system and subsequent regulatory certification process were not going to be completed for many months. This delay in construction, and thus new disposal capacity, resulted in a shortage of disposal capacity at the site. Thirty-two days prior to the failure, i.e., on February 6, 1996, the site was overbuilt/overfilled by at least 944,300 m^3 (1,236,000 cubic yards) (Civil 1996). The north slope was overbuilt by 731,100 m^3 (957,000 ft^3) on February 6, 1996 (Civil 1996). Based on a conservative estimate, i.e., $9.0x10^5$ to $1.8x10^6$ kg/day (1,000 to 2,000 tons/day), of the waste being placed at the top of the north slope from February 6, 1996 through March 9, 1996, the overbuild and maximum height of the landfill on March 9, 1996 were estimated to be at least 776,940 m^3 (1,017,000 ft^3) and +338 to 340 m (1108 to 1115 feet), respectively.

As part of the 1994 expansion permit, the maximum allowable elevation of waste placement was increased from +317.2 to +324.8 m (1040 to 1065 feet). As a result, the top of the landfill exceeded the permitted elevation by 13 to 15 m (45 to 50 feet) at the time of the failure. Figure 3 shows the waste grades from the owner/operator's annual aerial surveys dated February 1, 1994, December 21, 1994, and February 6, 1996. (Cross-section B-B' in Figure 3 passes through the arrow indicating the vehicle turnaround in Figure 2 and the furthest northward movement of the slide mass, see dashed line, where two conveyors are shown.) It can be seen that the slope inclination increased from February 1, 1994 to December 21, 1994, but the maximum elevation did not increase significantly. However, from December 21, 1994 to March 9, 1996, both the slope inclination and maximum elevation increased significantly. In fact a 9 to 20 m (30 to 65 feet) thick layer of waste was placed over the majority of the slope between December 21, 1994 and March 9, 1996. This resulted in a significant increase in slope height and inclination. In addition to waste placement, the owner/operator stockpiled processed soil at the top of the landfill for daily cover operations. The secant slope inclination, i.e., inclination of a straight line from the toe to the crest, was 2.6H:1V. However, the slope inclination near the toe of the slope was 1.85H:1V (Figure 3) and at the toe the slope was at or near vertical after construction of the access road. Figure 3 also shows the ground surface at the toe of the landfill prior to construction of the deep excavation estimated *from a 1955 U.S.G.S. Quadrangle sheet and daylighting of the brown native soil* underlying the waste.

WASTESLIDE EVENT

On the morning of Monday, March 4, 1996 (five days prior to the wasteslide), landfill operating personnel noticed substantial cracking in recently placed cover soil just north of the vehicle turnaround (see Figure 2). The cracking extended across the top of the landfill with a vertical offset of 25 to 50 mm (1 to 2 inches) as waste placement and soil stockpiling activities continued on March 4, 1999. The longest crack had a width of 75 to 125 mm (3 to 5 inches) and extended 15 to 20 m (50 to 65 feet) across the crest of the slope. The location of this cracking essentially corresponds to the location of the

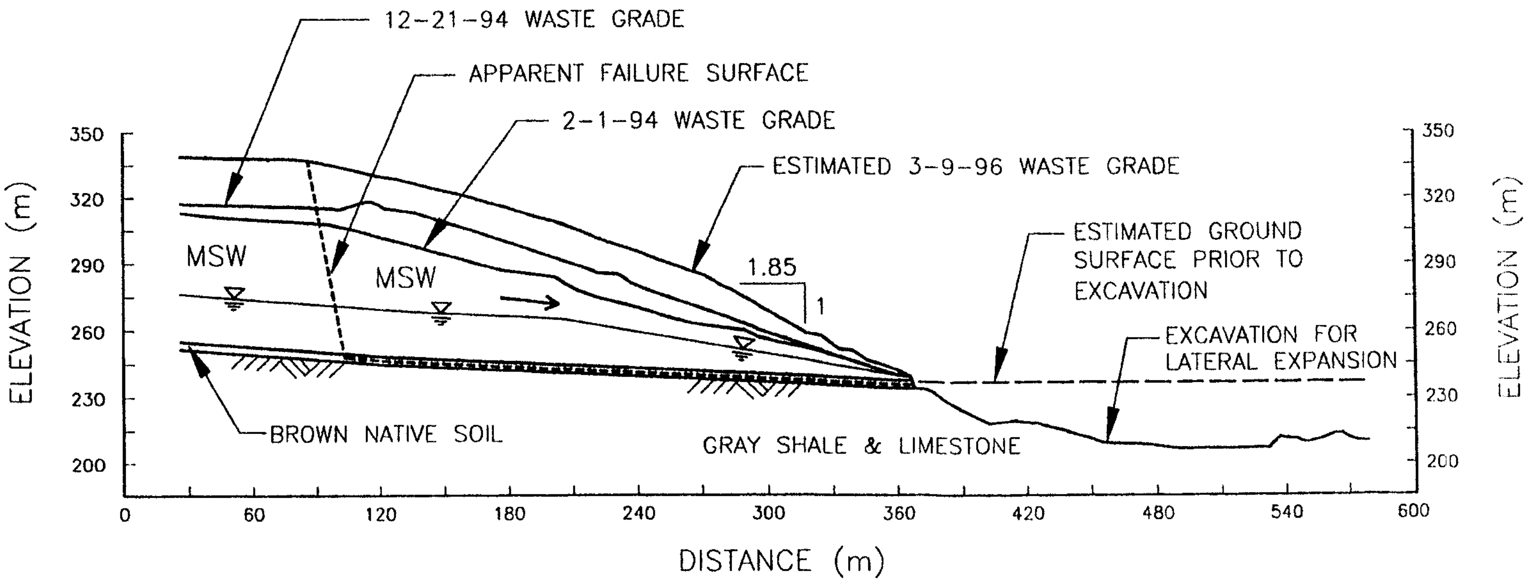

Figure 3. Slope Cross-Section B-B' Showing Recent Waste Placement

scarp that resulted from the wasteslide (note truncated vehicle turnaround at top of landfill in Figure 1) and thus delineated the extent of the slide mass. Owner/operator personnel reviewed the entire slope including the toe below the cracking to determine if the cracks were an indication of slope instability. No other cracks or other indications of slope movement were identified on the slope or at the toe on March 4. Consequently, the owner/operator concluded that the cracks were caused by landfill settlement and ongoing visual monitoring and covering the area with soil to control infiltration was deemed appropriate. As a result, waste placement continued at the top of the landfill until the failure occurred and blasting in the excavation resumed on March 5.

The cracking re-appeared each day in the same location until the wasteslide occurred on Saturday, March 9, 1996. This cracking was a manifestation of the translational movement that was occurring in the brown native soil underlying the waste. Between the end of work on Friday, March 8 and approximately 7:00 a.m. on Saturday, March 9 the cracks at the top opened again, widened substantially, and 0.45 to 0.75 m of vertical displacement had occurred at the northern edge of the vehicle turnaround. In addition, the cracking had extended down the entire east side of the slope towards the Toter Barn (see Figure 2) and steam was emanating from the cracks. The cracks were estimated to be at least 3 m deep and widening.

Between 8:00 and 8:30 a.m., the toe of the landfill started moving slowly towards the access road. The movement was occurring in the brown native soil between the waste and underlying gray shale. This initial toe movement was observed on the eastern flank of the ravine near the Toter Barn (see Figure 1 or 2). Cracking and the associated vertical displacement accelerated and extended across the top of the landfill and down the west side of the north slope by 11:00 to 11:30 a.m. This vertical displacement was probably the start of the graben formation (Figure 4) and the crack forming approximately 30 to 60 m down the north slope was probably the downslope or northern edge of the graben. (Cross-section A-A' in Figure 4 passes through the eastern edge of the location of the initial cracking, see Figure 2, and the deep excavation not filled by the slide mass, see Figure 1.) At this time a large slide block accelerated towards the deep excavation and the entire slide occurred in one to three minutes. After movement of the large slide block and formation of a graben and scarp, some sloughing occurred at the top of the landfill, which resulted in the final scarp truncating the vehicle turnaround.

An area of approximately 81,000 m^2 (870,970 ft^2) of waste slid into the 44,500 m^2 (478,500 ft^2) excavation at the toe of the existing slope resulting in a total of about 125,500 m^2 (1,349,500 ft^2) of exposed solid waste. The toe of the existing slope moved approximately 245 to 275 m (800 to 900 feet) to the northern edge of the deep excavation where it was stopped by the northern wall of the excavation or came to rest in an open part of the excavation. Fortunately, no injuries or loss of life were incurred but some of the large mining and earth moving equipment being used in the excavation were damaged. In addition, the extensive gas recovery system was damaged and rendered inoperable, which lead to the litigation that is discussed subsequently.

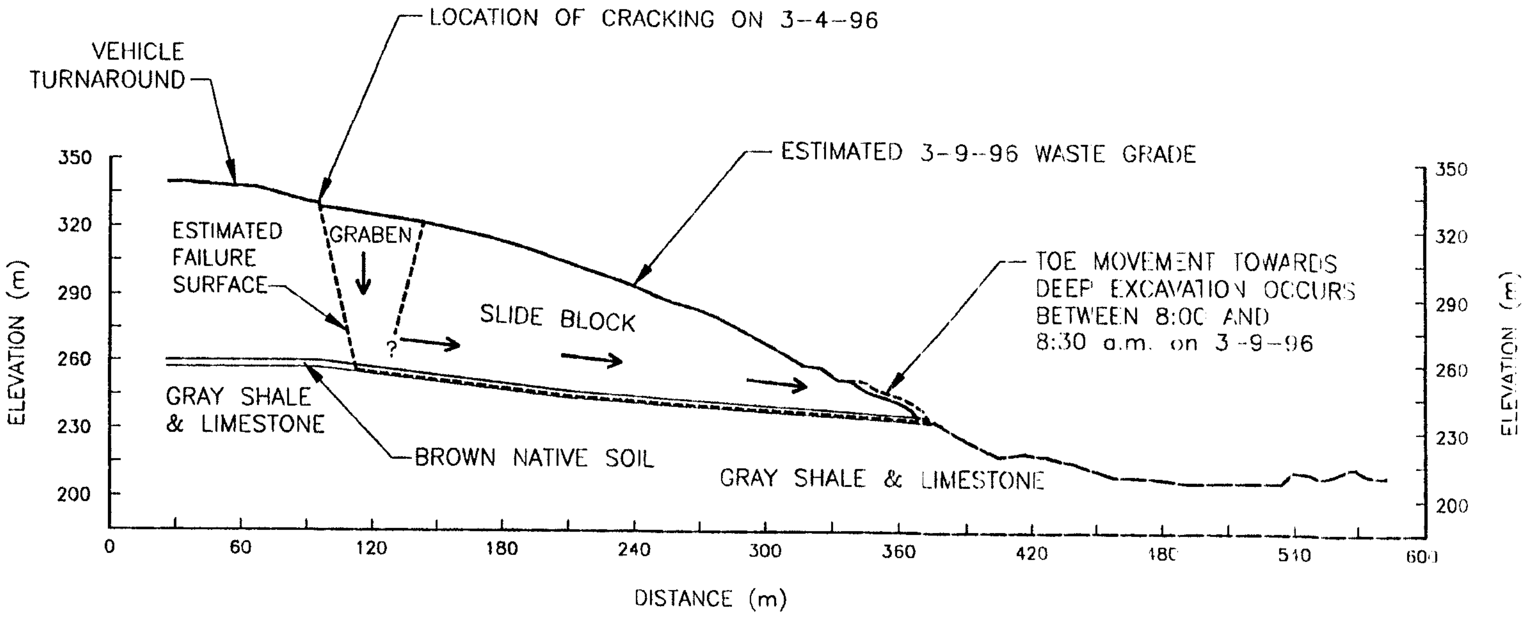

Figure 4. Cracking and Translational Movement of Waste Slope Along Cross-Section A-A'

Translational Failure Mechanism

The appearance of substantial cracking initially at the top of the slope and formation of a large slide block, graben, and nearly vertical scarp (Figure 1) are characteristic of a translational failure. In addition, observations at the slope toe and slope inclinometer readings after the slide suggest that the failure was translational and occurred through the weak brown native soil underlying the MSW. Based on field observations and the results of a subsurface investigation, the failure surface was estimated to have passed through the solid waste at a steep inclination to the underlying weak, saturated brown native soil (Figure 4). The failure surface continued along the brown native soil until it daylighted at the vertical excavation at the slope toe, which exposed the MSW and soil.

SLOPE RECONSTRUCTION

The slope was reconstructed using two rock berms at the toe of the slide mass and rebuilding the slope from the toe of the slide mass up towards the scarp. This involved placing new solid waste at the toe of the slope and in the graben area and excavating the overbuilt waste from the top of the slope to achieve the final slope of approximately 5H:1V. The majority of the slope reconstruction was completed by January 1997.

BACK ANALYSIS OF WASTE SLIDE

A three-dimensional (3-D) back-analysis of the wasteslide was conducted to investigate the shear behavior of the brown native soil. A 3-D analysis was used to account for the complex geometry of the scarp (Figure 1), slide mass, original ground surface, e.g., the presence of a ravine under the MSW, landfill geometry, and piezometric level that varied due to the underlying topography. In addition, a 3-D analysis was used to account for the end effects (i.e., shear forces along the sides of the slide mass) and thus yield a back-calculated shear strength that is in agreement with the field or mobilized strength. Two-dimensional (2-D) analyses do not account for the 3-D end effects and thus yield estimates of the mobilized shear strength that are too high, or unconservative (Stark and Eid 1998). Janbu's simplified method of slices (Janbu 1968) was used to conduct the 3-D limit equilibrium back analysis. Janbu's simplified method was extended to three-dimensions and coded in the microcomputer program CLARA 2.31 (Hungr 1988). The 3-D geometry of the slide mass and piezometric level were described using eighteen 2-D cross-sections. (Stark et al. 2000 and Eid et al. 2000 provide additional details of the back analysis and case history, respectively.)

Back-Calculated Shear Strength of Brown Colluvium

The 3D back-analysis revealed that the shear strength of the brown native soil at the time of failure could be characterized using an average effective stress angle of internal friction of approximately 13.5 degrees and an effective stress cohesion of zero. Since the measured fully softened friction angle of the brown native soil is 23 degrees (Eid et al. 2000), it was thought that the 2-D and 3-D mobilized friction angles (14 to 18 and 11.5 to 14 degrees, respectively) correspond to a post-peak condition. Laboratory test results (Eid et al. 2000) and an empirical correlation (Stark and Eid 1994) show that the drained residual friction angle of the brown native soil from Boring G is approximately 10 degrees. Since the 3-D back-analysis estimated the average mobilized friction angle to be 13.5 degrees, it was concluded that the brown native soil mobilized a shear strength in between the fully softened (23 degrees) and residual (10 degrees) values at the time of failure.

This slope had not experienced extensive sliding after the start of landfilling, which would suggest that a full softened shear strength should have been mobilized and not a post-peak value. Therefore, mobilization of a post-peak shear strength at a site that had not undergone sliding was perplexing and could have a large impact on the stability of other existing landfills in similar geologic environments. The Cincinnati area has a long history of slope failures due to the low shear strength of the native/colluvial materials. This has resulted in Cincinnati and vicinity having one of the highest annual per capita costs of damage due to landsliding in the United States (Fleming and Taylor 1980; Fleming 1983). Most of these landslides occur in slopes underlain by colluvium. The bedrock composition, i.e., shale, and a number of factors in the weathering, formation, deposition, and aging processes of similar deposits have resulted in mobilization of a post-peak shear strength at other sites. A literature review yielded a number of references, e.g., D'Appolonia et al. (1967), that conclude colluvial soil primarily derived from shale often mobilizes a shear strength that is significantly less than the peak value and thus a residual or post-peak shear strength is recommended for the design of colluvial slopes. This is in agreement with the findings of the 3-D back-analysis.

CAUSE OF THE WASTESLIDE

The main cause of the wasteslide is the mobilization of a post-peak shear strength in the brown native soil. A number of additional causes for the wasteslide and possibilities for mobilizing a post-peak strength were investigated including weak layers of sludge or waste and seismicity. In addition, a number of possibilities for mobilizing a post-peak strength were investigated including shear behavior of the brown native soil, strain incompatibility and progressive failure, lateral displacement of MSW, slope overbuild, rock blasting in the adjacent excavation, and toe excavation. The following paragraphs investigate the significance of each of these phenomena on the cause of the wasteslide and mobilization of a post-peak strength in the brown native soil.

There is a history of sludge disposal at the site, but the slide was translational occurring through the brown native soil underlying the waste, as discussed previously, and not through the waste. Therefore, failure of a continuous, weak waste layer was not considered to be a causative factor. No seismic activity was reported or measured within a 170 km radius of the site for thirty days prior to the wasteslide. Therefore, seismicity was not considered to be a significant factor.

Mobilization of a post-peak shear strength at this site initially was perplexing and thus a study was conducted to determine the shear strength mobilized in other slope failures involving similar geologic and colluvial soil conditions. As noted in Eid et al. (2000), the parent material, i.e., weakly bonded shale, and a number of other factors such as weathering, soil formation, deposition, shear displacement prior to waste placement, and aging processes of similar deposits have resulted in mobilization of a post-peak shear strength at other sites. Other significant causes for shear displacement and mobilization of a post-peak strength in the brown native soil include strain incompatibility between the MSW and brown native soil and subsequent progressive failure, time-dependent lateral displacement of the MSW, slope overbuild, blasting activities, stress concentration(s) caused by a toe excavation, and waste placement activities that usually involved pushing waste from the top to the bottom of the ravine.

Strain Incompatibility and Progressive Failure

The large difference between the stress-strain characteristics of the MSW and brown native soil increased the likelihood of strain incompatibility between the two materials. As a result, failure probably occurred first in the native soil when only a fraction of the MSW peak strength was mobilized. After failure occurred in the native soil, the peak strength of the MSW was mobilized at a time when the shear strength of the native soil had declined to a value significantly less than the fully softened value. Chirapuntu and Duncan (1975) show that the reduction in shear strength caused by strain incompatibility for a foundation soil and overlying embankment can range from 0 to 20% and 20 to 90%, respectively. In summary, strain incompatibility probably facilitated development of a post-peak strength in the brown native soil and the observed progressive failure from March 4 to March 9. Brandl (1998) concluded that strain incompatibility must be considered in landfill stability analyses, especially if the subsoil consists of clays or silts with a low residual friction angle. If the subsoil has a low residual friction angle, Brandl (1998) recommends comprehensive monitoring of slope deformations to warn of potential failure.

Lateral Displacement of MSW

Data from slope inclinometer F (see Figure 1) on the eastern slope from 9 July 1996 to 17 January 1997 showed a consistent out-of-slope movement. The out-of-slope movement is inducing shear displacement in the brown native soil that underlies the eastern slope. The corresponding shear displacements may have been even greater under the north slope because the toe was excavated and the underlying topography dips toward the deep excavation. In summary, the time dependent lateral displacement of MSW also may have induced shear displacement in the brown native soil that could have facilitated mobilization of a post-peak shear strength.

Slope Overbuild

Another major contributor to the wasteslide was the overbuild of at least 776,940 m^3 (1,017,000 yd^3) on the north slope at the time of failure. A 3-D analysis showed that the factor of safety decreased from slightly less than 1.2 at elevation +320 m to unity at elevation +339 m. An elevation of +339 m is in agreement with the estimated maximum elevation of +338 to +340 m at the time of failure. Therefore, it was concluded that the overbuild was a factor in the cause of the wasteslide because it reduced the FS to near unity. This marginal stability condition allowed the rock blasting in the adjacent excavation to have a greater impact on the progressive failure, i.e., transfer of shear stress along the failure surface and strength loss, in the brown native soil.

Rock Blasting in Adjacent Excavation

To investigate the possibility of blast-induced displacement, and thus strength loss, in the brown native soil, a multiple sliding block analysis (Dowding 1996) was conducted. Using the typical maximum charge per delay of 91.7 kg for the March 1, 1996 blast, a shear displacement of roughly 7 to 11 mm was estimated for the interface between the bedrock and brown native soil. This is significant because the laboratory shear displacement required to mobilize the fully softened shear strength of the brown native soil is only 2 to 6 mm. In summary, the combination of the March 1 blast and continued waste placement at the top of slope helped accelerate the observed progressive failure mechanism.

Since the cracking, and thus the progressive failure, started on March 4, the March 5 blast caused an even greater shear displacement and shear stress transfer in the brown native soil. (The amount of shear displacement and strength loss due to blasting increases with decreasing factor of safety.) The March 5 blast was the largest in the past 33 days and accelerated the progressive failure, which resulted in increased cracking at the slope crest in the following days leading to the global failure on March 9, 1996. If no blasting had occurred on March 5, global failure may not have occurred after March 9.

Blasting started at the site in 1987 to increase airspace or capacity by removal of the shale and limestone bedrock at the slope toe. As the factor of safety of the slope decreased due to strain incompatibility and overbuilding of the slope, the blast-induced shear displacement increased and caused additional shear strength loss in the brown native soil. In summary, the continuous blasting at the excavated slope toe probably reduced the shear strength of the brown native soil by causing an accumulation of localized shear displacement. The magnitude of shear displacement induced during each blast increased as the factor of safety of the slope approached unity. Therefore, the blasts shortly before and on March 1, and certainly the March 5 blast, contributed to the occurrence of the slope failure because the slope was already marginally stable.

Toe Excavation

Toe excavations create a large stress concentration at the base of a slope that can lead to localized shear deformations, progressive failure, and finally slope instability. The toe excavation also removed some buttressing force, but more importantly daylighted the weak brown native soil and allowed the waste to descend into the excavation. Clearly, the time that a toe excavation is left unbuttressed should be minimized to increase slope stability.

In summary, the main cause of the wasteslide was mobilization of a post-peak strength condition in the brown native soil. The blasting adjacent to the slope accelerated the progressive failure mechanism and contributed to the occurrence of the wasteslide on March 9. If blasting had not occurred on March 1 and 5, global failure may have occurred after March 9. Since the site had exceeded capacity and waste placement was going to continue at the top of the slope for the foreseeable future, the failure would have occurred eventually.

LEGAL ISSUES ASSOCIATED WITH LANDFILL SLOPES

The damage to and lost revenues from the extensive gas recovery system resulted in litigation. The damage resulted from a number of gas wells, collection trenches, and the associated plumbing and pumps being in the slide mass and thus rendered inoperable. A major portion of the system had to be rebuilt after the slope reconstruction was completed approximately nine months after the failure. The resulting litigation was eventually settled but it suggests that a landfill owner/operator should consider the legal issues related to allowing a non-landfilling activity at a site so the economic benefit derived from the other entities is not exceeded by the incurred risk/liability.

In general, the duties imposed on an owner or occupier of the site are based on the right to control the premises. McFeely v. U.S., 700 F. Supp. 414, 421 (S.D. Ind. 1988). A lessor of land is not liable to his lessee for physical harm caused by any dangerous condition which existed when the lessee took possession. Restatement (Second) of Torts, section 356. However, a lessor who conceals or fails to disclose to his lessee any condition of the land which involves an unreasonable risk of physical harm to persons on the land, is subject to liability for the harm caused by the condition after the lessee has taken possession, if (a) the lessee is unaware of the condition or risk and (b) the lessor is aware of the condition, realizes the risk, and has reason to believe the lessee will not discover the condition of the risk. (*Id.*, section 358). Where a lessor leases a part of the land and retains control of the other parts which the lessee is entitled to use, the lessor is subject to liability to the lessee for physical harm caused by a dangerous condition upon that part of the land retained in lessor's control, if lessor by the exercise of reasonable care could have discovered the condition and risk and could have made it safe. (*Id.* Section 360). Some of the considerations of risk at this site include (1) history of landsliding in the area, (2) usual occurrence of weak soil layers in colluvial slopes, (3) presence of seismic activity that can destabilize a slope, (4) potential for an excavation at the slope toe, (5) continued waste placement above the permitted elevation which reduces slope stability, (6) potential for sludge or other low strength waste disposal that might result in slope instability, and (7) lack of a leachate removal and collection system that can control the amount of leachate in the waste and brown native soil.

The overbuild, blasting, and toe excavation described herein were required for additional disposal capacity to handle waste receipts that were greater than the existing facility could reasonably accommodate. However, the required slope stability analyses needed to determine the factor of safety for the overbuild, blasting, and toe excavation conditions were not performed. This allowed a marginally stable slope condition to develop that resulted in the March 9 slope failure. Because the owner/lessor could have discovered the condition in the exercise of reasonable care, litigation ensued and resulted in a settlement for the damages sustained by the lessee.

Landfill Litigation

In a landfill operation, a lease typically permits a lessee to collect and process refuse gas that is generated by waste decomposition. If, during the lease, a landslide were to occur because of the negligence of the lessor and/or its employees, resulting in damage or injury to persons or property of the lessee, it could then be expected that the lessee would bring suit against the lessor in tort, alleging a negligent operation of the landfill, and/or in contract, alleging a breach of the lease. Although the landfill owner may have attempted to limit its liability by drafting the lease to include an exemption of liability for lessor's negligence, that protection may be illusory if the lease is not carefully written. The royalty received for allowing a lessee to process refuse gas may, on balance, not be worth the risk of a catastrophic failure, such as a landslide, that could result in liability and significant financial responsibility to a landfill owner.

Leases

A typical lease will require that the landfill owner/lessor not unreasonably interfere with the lessee's gas collection operations. Lessor's typically have attempted to limit liability for any damage caused by lessor to a specified amount, i.e. $500,000. Leases have been drafted to provide that in the event of damage to lessee's property caused by lessor's operations, lessee's recovery would be limited to the liability limitation provision. When damage to lessee's property has occurred, lessors have historically claimed that since the only relationship between the parties arose out of the lease, and since the parties negotiated to limit the lessor's liability, then the lessor's liability should be limited to the $500,000 limit. Lessors have claimed that lessee's sole remedy is for a breach of contract, and that tort liability has been waived or has no application. For example the lease for this site stated "Lessor's liability to Lessee for any damage (including compensatory damages for loss of revenue) caused by Lessor's activities and/or activities of its agents, representatives, tenants, contractors, or assignees to Lessee's Refuse Gas Collection System or Gas Processing Plant and related facilities shall be limited to $500,00 per occurrence; provided, however, that this limitation on liability shall have no force or effect in the event that any such damage is caused by intentional or willful acts."

Contract v. Tort Remedies

Tort law permits recovery from a manufacturer for foreseeable physical harm to property caused by product defects. Saratoga Fishing Co. v. J.M. Martinac & Co., 520 U.S. 875, 117 S. Ct. 1783, 1786, 138 L.Ed. 2d 76 (1997). Tort law does not permit recovery for purely economic losses, i.e. damage to the product itself or lost profits. (*Id.*). Contracts are well suited to set the responsibilities of a seller and the terms of compensation for a product that fails. (*Id*).

A contract, however, does not govern the entire relationship between commercial parties, but governs only the sale of the product. Sun Refining v. Crosby Valve, 68 Ohio St. 3d 397, 627 N.E. 2d 552, 555 (1994). A seller still owes the buyer the same noncontractual duty that he owes to everyone else, i.e. that the seller's product will not cause the destruction of another's property. (*Id.*) If persons or property outside the original bargain are damaged, the terms of the bargain no longer control. (*Id.*) At that point, a duty outside the contract has been breached and that duty is governed by tort law. (*Id.*)

In Sun Refining, supra, when a disc manufactured and sold to plaintiff by defendant ruptured, it caused an explosion which destroyed plaintiff's other property. Plaintiff did not seek recovery under the contract for "economic damages," i.e. for damage to the product itself (the disc) or for loss of profits, but rather it sought damages to its other property including real estate and fixtures caused by the explosion. Since the damages the plaintiff sought were not economic losses, they were recoverable in tort. (*Id.* at 554). The Court held that the character of the loss determines whether a commercial party may recover in tort. (*Id.*) If the loss is an economic one, a cause of action will lie only in contract. (*Id.*) If the loss is for other property damage, a cause of action will lie in tort. (*Id.* at 555). This is applicable to the gas recovery system because of the damage to the recovery wells, trenches, pumps, and piping.

Because there is a duty imposed by law, independent of a contract, to refrain from injuring persons or damaging other property, a contract for the sale of a product will not necessarily limit the lessor's liability. Since the controlling policy consideration underlying the law of contracts is the protection of expectations bargained for, the safety and protection of persons and other property damaged by lessor's activities will likely be outside the scope of the provisions of a contract.

In general, a contract for the sale of a product will probably contain provisions dealing with the potential failure or unsuitability of the product and the buyer's remedies when that might occur. If the lessor intends to limit lessee to those remedies or damages expressed in the contract, it must be specifically and unequivocally stated. The lessee must be shown to have agreed that all liability in tort or in contract, for damages to the product, e.g., gas quality, gas contamination, reduction of gas flow, and limited site access for gas collection purposes due to gas plant damage or explosion, blasting by the lessor, slope failure, or explosion due to gas buildup in the waste, or to other property, e.g., recovery wells, trenches, pumps, and piping, for economic losses and for all consequential damages, was properly bargained for and limited by the lease. A clause in the same lease that allows the lessee "to pursue all other available remedies at law or in equity," creates an ambiguity and an inference that seller's liability for all of buyer's damages may not be limited by the provisions in the lease. However, a contractual exemption of liability for negligence, even if valid, is not favored, and will be strictly construed against the party relying on it. Motorist Mutual Ins. Co. v. Jones, 9 Ohio Misc. 113, 223, N.E. 2d 381, 384 (1966). Therefore, unless the lease is carefully drafted by counsel to cover all possible risks and potential exposure, and unless the limitation of damages clearly references all claims in tort or contract, then the lessee may have tort remedies available beyond the lease agreement to pursue.

Willful Misconduct

A lessor may also attempt to limit its liability for damages unless caused by intentional or willful acts of the lessor. Requiring lessee to prove that lessor was willful, rather than just negligent, will require proof of a higher degree of culpability and be more difficult to prove in court. However, in some jurisdictions, although willful misconduct implies intent, the intention relates to the misconduct, not to the result, and therefore, an intent to injure need not be shown. Brockman v. Bell, 78 Ohio App 3d 508, 605 N.E. 2d 445, 449 (1st Dist. 1992). If Plaintiff is merely required to prove that the lessor intended a specific act, but not an intention to injure, it will be far easier for the Plaintiff to prevail at trail. A lessee who needs only to prove that lessor "willfully" intended to overbuild the landfill or blasting at the slope toe, but does not have to prove that lessor "willfully" intended to injure the lessee, will have a much easier opportunity to prove his case. In that situation, the protection afforded by the lease to the lessor may be far less than he is willing to sacrifice for limited royalties.

CONCLUSIONS

On March 9, 1996, the largest U.S. slope failure in a municipal solid waste landfill occurred near Cincinnati, Ohio. A forensic analysis concluded that the slope overbuild and rock blasting in the adjacent excavation were the main triggering mechanisms for the wasteslide and the main cause was the mobilization of a post-peak shear strength in the brown native soil. This case history is used to illustrate the factors that can increase the risk/liability incurred by an owner/operator/lessor when a non-landfilling activity is allowed on the site. These factors include geological/geotechnical history and properties, landfill capacity and management, and regulatory issues and should be considered so the economic benefit derived from the other entities is not exceeded by the incurred risk/liability. In addition, the contract or lease should be drafted to cover all possible risks and potential exposure to the lessor and limitation of damages in both tort or contract litigation.

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References

Brandl, H. (1998). "Risk Analyses, Quality Assurance, and Regulations in Landfill Engineering and Environmental Protection." *Proceedings of Enviromental Geotechnics,* edited by Seco e Pinto, Balkema Publishers, Rotterdam, pp. 1299-1328.

Chirapuntu, S. and Duncan, J.M. (1976). "The Role of Fill Strength in the Stability of Embankments on Soft Clay Foundations," Technical Report S-76-6, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, June, 231 pp.

Civil and Environmental Consultants (1996). "Overbuild Analysis: Rumpke Sanitary Landfill, Inc., Hamilton County, Ohio." Consulting report prepared for Rumpke Waste, Incorporated, Project No. 96221, June 20, 20 pp.

D'Appolonia, E., Alperstein, R., and D'Appolonia, D.J. (1967). "Behavior of a Colluvial Slope." *Journal of Soil Mechanics and Foundations Division*, ASCE, Vol. 93, No. SM4, pp. 447-473.

Dowding, C.H. (1996). Construction Vibrations, Prentice-Hall, Inc., Upper Saddle River, NY, 610 p.

Eid, H.T., Stark, T.D., Evans, W.D., and Sherry, P.E. (2000). "Solid Waste Slope Failure I: Waste and Foundation Properties." *Journal of Geotechnical*, ASCE, Vol. 126, No. 4, April.

Fleming, R.W. (1983). "Landslides in the Greater Cincinnati, Ohio, Area." *U.S. Geological Survey Professional Paper 1375,* 34 p.

Fleming, R.W. and Taylor, F.A. (1980). "Estimating the Costs of Landslide Damage in the United States." *U.S. Geological Survey Circular 832*, 21 p.

Hungr, O. (1988). "User's Manual: CLARA 2.31, Slope Stability Analysis in Two or Three Dimensions for IBM Compatible Microcomputers." Oldrich Hungr Geotechnical Research, Inc., Vancouver, British Columbia, Canada, 88 pp.

Janbu, N. (1968). "Slope Stability Computations." Soil Mechanics and Foundation Engineering Report. Technical University of Norway, Trondheim.

Rumpke Engineering and Environmental Affairs Department. (1992). "Permit Application Narrative, Part I: Site Summery and Permit Criteria." Report prepared for Rumpke Sanitary Landfill, Inc., Hamilton County, Ohio, December, Volumes 1 and 2.

Stark, T.D. and H.T. Eid (1994). "Drained Residual Strength of Cohesive Soils." *Journal of Geotechnical Engineering*, ASCE, Vol. 120, No. 5, May, 1994, pp. 856-871.

Stark, T.D. and Eid, H.T. (1998). "Performance of Three-Dimensional Slope Stability Methods in Practice." *Journal of Geotechnical Engineering*, ASCE, Vol. 124, No. 11, November, pp. 1049-1060.

Stark, T.D., Eid, H.T., Evans, W.D., and Sherry, P.E. (2000). "Solid Waste Slope Failure II: Stability Analyses." *J. of Geotechnical Engrg.*, ASCE, Vol. 126, No. 4, April.