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Date: October 28, 1996

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Subject: Effective shear resistance to erosion TAUFAIL

The effective shear resistance to erosion TAUFAIL represents the threshold value of surface shear stress required to initiate erosion at the borehole wall. In the absence of knowledge on the state of decomposed waste at WIPP, and of direct experimental data on waste surrogates, the range of values for TAUFAIL for use in the 1996 CCA calculations was assumed to be on the order of values required to erode seabed or channel sediments.

Parthenaides (1970), in discussing investigations on erosion of seabed sediments and in channels, has noted that this effective soil shear resistance to erosion is not related to the soil shear strength as normally determined from conventional soil tests. The effective shear resistance to erosion is smaller by several orders of magnitude than the macroscopic soil shear strength.

The shear stress required to erode sediments is dependent on numerous factors including the type and quantity of clay constituents, clay properties on a microscopic and macroscopic scale, pH, water content and temperature among others (Kamphuis, 1983)

Large releases of solid waste to the accessible environment due to a drillbit intrusion into a waste panel correlate with small values of TAUFAIL. Thus the lower bound for this value takes on a special importance The experimental work of Sargunam (1973) on erosion of cohesive soils consisting primarily of montmorillonite clays show the initiation of erosion occurring at approximately 1 Pa. For Mackenzie river bottom sediments Kamphuis, et al., 1983 found minimum values of the effective shear resistance to erosion of 0.2 Pa, while research on the scouring of soft clay deposits (Partheniades, 1970) indicated a minimum scouring stress (equivalent to TAUFAIL) on the order of 0.001 lb/ft^2 or 0.05 Pa. While there is a considerable amount of data for minimum resistance to erosion occurring above these values the lowest value observed in the literature cited was chosen as the low end of the range for sampling purposes for the 1996 CCA (i.e. 0.05 Pa). The upper bound value chosen for the range on TAUFAIL, based on the same literature, was arbitrarily chosen to be 10 Pa, a value less than the highest threshold values reported.

RWCF-A: 1.1.1.1.5: QA: REP

References

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Sargunam, A., Riley, P., Arulanadum, K., Krone, R.B., Physico-Chemical Factors in Erosion of Cohesive Soils, Proceedings of the American Society of Civil Engineers, Journal of the Hydraulics Division 99: 555-558, March 1973.