

## Krivanec, Christopher

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**From:** Ray Costa [RCosta@kleinfelder.com]  
**Sent:** Friday, February 23, 2007 11:35 AM  
**To:** Krivanec, Christopher  
**Cc:** Johnson, Blake W.; Olsen, Randy  
**Subject:** Atterberg Limits Specification Requirements

This communication is intended to provide clarification of engineering considerations made by Kleinfelder concerning Atterberg limits specifications for the WPIC/Bear River levee construction.

The Design Team identified the need to perform slope reconstruction/levee raises along portions of the WPIC/Bear River levees. It is customary practice for the select levee fill to consist of a cohesive, low permeability material. This is generally achieved using specification limits of at least 20% passing the No. 200 sieve size (moving average greater than 30%) and a Liquid Limit less than 45 and a Plasticity Index of between 8 and 40. The California Reclamation Board standard permit requirements allow a Liquid Limit up to 50%.

The presence of medium to high plasticity materials within a levee embankment generally results in seasonal desiccation cracking of near surface materials. In some cases, there is slope creep and/or minor slumping which can occur. This is especially prevalent if shrinkage cracks are present and the first seasonal rainfall event fills the cracks with water.

It has been Kleinfelder's practice to try to reduce the presence of high plasticity soils within the levee embankment. Again, this is not necessarily for overall stability but mainly for maintenance purposes.

For this project, Kleinfelder provided a recommendation for the Liquid Limit to be less than 40 and the Plasticity Index between 8 and 30. We understand this specification was generally achieved for most of the project. As the Olivehurst Detention Basin was a primary borrow source, we investigated these materials in advance and found that most should meet this specification. In fact, we understand most borrow materials from this site achieved this requirement.

After this borrow source was exhausted, the Contractor began removing portions of the remnant Bear River levee which was remaining after construction of the new setback levee. Materials excavated from this area generally were of higher plasticity. Kleinfelder recommended the specifications be altered to the Reclamation Board permit requirements (primarily Liquid Limit up to 50%). We understand this was the specification was also used for construction of the Bear River Setback Levee. Where possible, we had the contractor selectively place these higher plasticity materials within the core of the embankment away from exposed slopes to reduce their potential to undergo seasonal wetting (expansion) and drying (shrinkage) cycles.

If you have any questions about Kleinfelder's recommendation for change to the project specification and use of higher plasticity soils, please contact us.

Ray Costa, PE