ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

March 30, 1984

Kaiser Steel Corporation
P.O. Box D
Sunnyside, UT 84539

Attn: Doug Pierce

Gentlemen:

This letter will supplement our report relative to the stability analysis of the Kaiser Steel dikes. In our report, submitted to you dated March 23, 1984, no consideration was given to the seismic stability of the existing dikes.

In the past, the earthquake stability of embankments have been assessed by applying a lateral force corresponding to some fraction of the gravitational acceleration. This procedure has been designated as a pseudo-static analysis, and the present state of the art in seismic stability analysis does not consider this procedure an acceptable method to determine the performance of an embankment under seismic conditions.

It is well known that loose, saturated sands and sensitive-type clays exhibit a substantial loss in strength when these materials are subjected to vibratory action; and massive failure usually accompanies seismic activity where such soils exist. The loss in strength in loose, saturated sands is due to the high pore pressures which develop in these materials under vibratory action and is termed liquefaction.

It should be noted that no groundwater was encountered in test holes drilled at either of the dikes during our investigations. Since the materials within the dikes are not saturated, the possibility of liquefaction of the subsurface materials is not possible. Furthermore, no sensitive-type clays were encountered in either of the test holes drilled in the dikes. As a consequence of this situation, the likelihood of a massive failure due to seismic activity is relatively remote for the existing dikes.

To further evaluate the seismic stability of the existing dikes, the comparison method developed by the Division of Water

Resources of the State of California has also been applied to the existing dikes. Figure No. 1, attached hereto, defines the basic criteria relative to the behavior of embankments according to the California method. It will be noted that the basic criteria includes the state of compaction, the peak ground acceleration, and the type of soils.

Based upon the results of the standard penetration tests performed in the refuse material in the two test holes drilled at this site, the existing materials appear to be in at least a medium-dense condition. In the area where the dikes are located, the U.S. Geological Survey has established that the acceleration, having a 90 percent probability of not being exceeded in 250 years is 0.2g. The material existing within the dikes would generally fall into Soil Group I according to the California Method. It is apparent from the table shown in Figure No. 1, that a medium-dense material having a peak acceleration equal to or less than 0.2g falls into Zone 7, which indicates that no stability problems will exist for the existing facilities under seismic activity.

Based upon the above considerations, it is our opinion that the potential for seismic instability is very low for the refuse dikes in this area. If there are any questions relative to the information contained above, please advise us.

Yours truly,

ROLLINS, BROWN AND GUNNELL, INC.

Ralph L. Rollins

RLR/lah

Enclosure