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24 December 2003

GEOTECHNICAL REVIEW MEMORANDUM

To: Karl Schwing, Orange County Permit Supervisor
From: Mark Johnsson, Staff Geologist
Re: Dana Point Local Coastal Plan Amendment DPT LCPA 2-02

In connection with the above referenced Local Coastal Plan Amendment, I have reviewed the following documents:

1) The Keith Companies, Inc. 2003, "Dana Point Headlands--Addendum No. 2 Recommendation", 1 p. letter dated 7 October 2003 and signed by P. S. Carey (PE).

2) Surfrider Foundation, San Clemente Chaper 2003, "Commission hearing follow-up, LCP Amendment, Dana Point Headlands," 4 p. letter dated 22 October 2003 and signed by M. R. Lewis (RG 7027).

3) AMEC Earth and Environmental, Inc. 2003, "Response to Surfrider Foundation letter (10/22/03), Local Coastal Plan Amendment DPT LCPA 2-02, Headlands Development Conservation Plan (HDCP), Dana Point, California", 3 p. letter dated 11 December 2002 and signed by D. Dahncke (GE 2279) and S. T. Kerwin (CEG 1267).

4) AMEC Earth and Environmental, Inc. 2003, "Addendum stability evaluations, 10-foot revetment setback alternative, Headlands Development and Conservation Plan (HDCP), Dana Point, California", 2 p. letter report dated 19 December 2003 and signed by D. Dahncke (GE 2279) and S. T. Kerwin (CEG 1267).

In addition, I have reviewed several conceptual grading plan exhibits prepared by The Keith Companies, some undated, some dated 10 December 2003, and some dated 17 December 2003. These documents represent various responses to issues raised by the Commission at their October 2003 hearing at which this Amendment was considered. Finally, I have participated in several meetings subsequent to the October 2003 hearing at which these reports were presented to staff by the property owners and the City.

As you are aware, prior to the October 2003 Commission hearing, the Keith Company prepared a revised conceptual grading plan that would avoid impacts to the Environmentally Sensitive Habitat Area (ESHA) located in "The Bowl" area on the site. No changes to the grading plan were made in "The Strand" area, where a large quantity of cut is necessary in order to remediate the landslide complex located there. Accordingly, by reducing the grading footprint in The Bowl, they indicated, there would be approximately 645,000 cubic yards of material that would have to be exported from the site. Although it is unclear to me to what extent this amount of export could be reduced if fill were to be built upward in The Bowl area, above the currently planned grades, I concur that a large amount of material would nevertheless need to be exported. This largely is due to the fact that The Bowl could only be filled upwards to a limited extent without creating

difficulties in maintaining appropriate grades for roads and in preserving viewsheds. At 12.5 cubic yards per truck, this amount of export would require approximately 51,600 truck trips (one way).

Reference (1) was prepared in response to what the developers believed was an error in Addendum 2 to the October staff report. The addendum indicated that if the grading footprint were to include up to 3 acres of the ESHA in The Bowl area, then a balanced grading plan may be achieved. Reference (1) indicates that this is in error; that even with the addition of three acres to the footprint proposed by staff, the grading remains out of balance, requiring export of between 545,000 and 565,000 cubic yards of material, or 43,600 truck loads. Staff does not have the resources to fully evaluate this calculation, but I concur that it is likely that a large amount of export would still be required if the footprint of the grading in the Bowl area is substantially smaller than that originally proposed in the Headlands Development Conservation Plan (HDCP), assuming the same grading plan on The Strand. These export quantities could be reduced somewhat, however, if the fill in The Bowl is built upwards, although that will likely only work to a limited extent for the reasons given above.

Reference (2) is a formalization of a presentation given at the Commission hearing by the Surfrider Foundation. This letter makes reference to a Philip Williams and Associates evaluation presented at the Commission hearing, in which are identified several long-term impacts of the revetment. It goes on to suggest that an alternative grading plan for The Strand might be possible such that no revetment would be necessary, and suggests three possible "conceptual grading plans." This letter was prepared by a California-licensed Registered Geologist, who states that in his opinion there exist grading and geotechnical solutions that would both balance the landslide forces and allow setback of the development to at least one of these seaward limits shown on a figure attached to the letter. The letter does not, however, contain specific engineering solutions, and it is unclear to me that landslide forces could be balanced sufficiently to raise the factor of safety of the manufactured slopes to the industry standard levels of 1.5 (static) and 1.1 (pseudostatic) within the proposed footprints.

As you will recall, the difficulty with development on The Strand is that the descending slope of the coastal bluff is comprised of a landslide complex that does not currently have an adequate factor of safety to allow new development according to the industry standards described above. To improve the stability of this slope, material that adds driving force (weight) to the landslides must be removed, and/or material that adds resisting force must be added. Given the configuration of these slopes, that means removing a large quantity of material, primarily from the upper slopes of The Strand. Staff has long been working with the developers' engineers and geotechnical consultants to try to determine whether there are alternative plans, such as those put forth at a conceptual level in the Surfrider letter, that would achieve the needed stability but at the same time be sufficiently set back as to not require a revetment to protect the manufactured slopes from marine erosion. As outlined in my previous review memos, the answer seems to be "no." As I summarized in my 8 July 2003 review memo:

> …it appears that final manufactured slopes that meet minimum slope stability guidelines and result in a setback consistent with 75 years of marine erosion could be envisioned and modeled. However, the construction of these slopes would not

> be possible given current technology and OSHA requirements. The temporary construction slopes would be very steep and extend to well below sea level, resulting in very low factors of safety. These temporary excavations could not be undertaken without extensive shoring and continual pumping, and have been deemed infeasible by the developers and their consultants. I concur in this assessment, but note that to date only two grading plans have been rigorously evaluated…. Although I remain unconvinced that it is impossible to produce a grading plan that both balances landslide forces and maintains an appropriate setback such that no revetment is necessary, the Commission's staff does not have the resources to design such a grading plan. Accordingly, the documents submitted by the developer would seem to indicate that the Strand area cannot be developed to the extent envisioned by the LCPA without the construction of a shoreline protective device.

Although it is possible that one of the alternative grading concepts as outlined in the Surfrider letter could achieve the desired results, without developing these concepts into a full-fledged grading plan, and without a geotechnical evaluation of the grading plan, I cannot attest to that fact. Reference (3), reiterates the opinion, described more fully in my 8 July 2003 review memo, that such a grading operation cannot, in fact, be carried out for the reasons described above.

In response to staff requests, the developers have analyzed to what extent the revetment could be moved landward while still maintaining an adequate factor of safety for the development. The Keith Company has prepared a conceptual plan allowing some landward setback for the revetment. Starting from the amount of setback that arguably might be gained if the revetment were replaced by a vertical seawall, the plan would set back the new revetment ten feet from the existing revetment at the center of the existing revetment. The proposed design would taper this setback to zero over the approximately 1,050 feet upcoast and downcoast of this center point, in order to tie into the existing revetments without the creation of acute angles. The proposed design would result in less fill material at the base of The Strand, and would tend to reduce the resisting forces. Reference (4) contains a slope stability analyses that demonstrates the reduced factor of safety relative to the original design, but notes that because of the relatively small change from the original grading plan, the calculated factor of safety still exceeds the accepted standards described above. I find these calculations adequate, and concur that the proposed realignment results in a design that is consistent with the geologic hazard provisions of the Coastal Act.

It is significant to note that moving the revetment landward as proposed reduces the amount of fill proposed for the toe of the manufactured slope. In addition to reducing the factor of safety, as described above, this also will result in an increase in the amount of material the must be exported from The Strand. Given the constraints on placing fill elsewhere on the property (i.e., The Bowl), this material may have to be exported from the property. I have seen no firm estimates of the quantity of export that the proposed setback of the revetment would generate.

To summarize, the developers continue to maintain that substantially the same grading plan as outlined in the HDCP, and analyzed in the reports reviewed in my previous memos, is the only plan that both assures slope stability and allows sufficient development to maintain the economic

viability of the project. Such a grading plan requires a shoreline protective device to ensure that future erosion will not result in the reactivation of the landslide complex through removal of buttressing forces at the toe of the manufactured slope. I concur that the landslide forces need to be balanced and that this need places severe constraints on the type of grading plan that can be accommodated. I do not have the resources to investigate what types of modifications to the HDCP grading plan may be possible, but I concur that the large changes proposed by Surfrider present geotechnical challenges.

The very small change that has been accommodated will result in a slight increase in available beach space. In my opinion, it is not necessary to taper the ten foot setback to tie in with the existing upcoast and downcoast revetments over the entire 1,050 feet described above. More beach space could be created if the ten foot setback of the revetment were extended over a greater length of the revetment, and the length over which the setback tapers to zero is reduced. There is no geotechnical reason why such a design could not be accommodated.

I hope that this review is helpful. Please do not hesitate to contact me if you have further questions.

Sincerely,

Mark Johnsson
Staff Geologist