Horning Geosciences

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Mark Barnes, Planning Director
City of Cannon Beach
P.O. Box 368
Cannon Beach, OR 97110

RE: Addendum to- Evaluation of Geologic Hazards for a 55-acre Site in Tolovana Park, east of Highway 101; Map 4 10 6B, northwest quadrant of Tax Lot 800.

Dear Sir:

In evaluating the above-referenced land for school construction, prevailing assumptions were that the school should be cited above tsunami run-up, but also in locations that are accessible and with fewest engineering and layout challenges, such as extensive cut & fill or utility improvements (e.g. pumping) related to elevation. This addendum addresses lands that are underlain by bedrock mudstone, generally in the east-southeast part of the subject property.

Lands that are underlain by mudstone tend to have more steeply walled incised gullies that are separated by narrow ridges. However, there are areas of generally broad, modestly sloping ground that are buildable, and those incised by narrow gullies also are buildable, provided that the gullies are filled or bridged by some means to provide building sites or road access. These are common solutions for ground such as this, but it does increase construction and design costs.

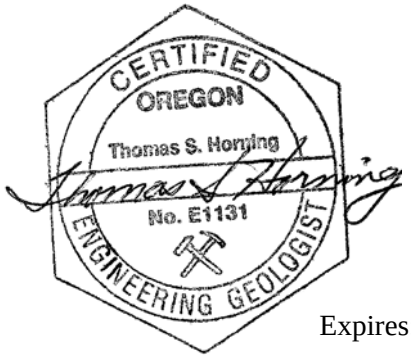
I have also commented on the soils map in the original report (Figure 3) that Klootchie-Necanicum complex soils (30 to 60 percent slopes) are unsuitable for construction. This is only partly true and based on the assumption that retaining walls and extensive groundwork add too many costs for school construction, as compared to terrace sites. However, many marginal lands with steep slopes, drainage control issues, and limited access can be made suitable for construction by investing in mitigation measures, such as cutting and filling the land, retaining slopes, winding roads around hills to obtain acceptable road grades, and collecting groundwater and piping it to lower elevations.

As a rule of thumb, land underlain by mudstone tends to have few development challenges if slopes are less than 20 percent. They tend to have substantial problems if slopes are in excess of 40 to 45 percent. Intermediate slopes pose certain development challenges. If lands have slopes of more than 45 percent, they should be avoided, as they likely already are landslides, or they may be modified by grading to gentler inclinations.

In general, areas underlain by mudstone bedrock can be developed, provided enough investment is made to offset the hazards. These steeper lands are not as suitable as terrace lands for development, but they can be developed, albeit at greater cost. The lands are similar to those of the City of Astoria, a community also underlain by mudstone and beset by landslides. In some cases, Astoria's landslides are caused, as well, by shoreline erosion at the toes of the hills, but weak mudstone soils also contribute to slope instability. Some of Astoria's problems are inherited from past poor judgment in the reckless filling of gullies with inadequate materials, plus lack of proper water control. These problems can be avoided through careful planning and design, and through diligent use of geologic investigations to recognize the hazardous areas and compensate for them.

I hope this clarifies any questions relating the original report. Please feel free to call or write if there are further questions.

Sincerely yours,



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