



September 10, 2015

Mr. Paul S Herskowitz
Grand Cove, LLC
4582 S Ulster St Pkwy, Ste 1200
Denver, CO 80237 Ed Darrow

Re: Updated Geologic Hazard Evaluation
OCMC Chap 17.44 Geologic Hazards
The Cove Development
Oregon City, Oregon
1195-00

Dear Mr. Herskowitz,

Apex Companies, LLC (formerly Ash Creek Associates) has prepared this letter to address specific requirements of the City of Oregon City Municipal Code (OCMC) with respect to Geologic and Geotechnical Hazards.

We have previously completed a number of geotechnical studies on the project site, related to past developments. The recommendations included in our comprehensive geotechnical report, entitled "Geotechnical Assessment, Clackamette Cove Development, Oregon City, Oregon," and issued on May 26, 2011. Although project details have changed over time, our recommendations and overall site development approach have remained essentially the same.

We have also reviewed the Grading Plans developed by CardnoWRG for the Cove Garden Apartments on Parcel 2 and the Amphitheater portion of the Cove development. The grading within the Cove uses 3H:1V slopes and upland slope gradients are at 3H:1V or flatter (with 5H:1V within the amphitheater grading). The grading plans appear to be consistent with Apex's recommendations for grading, graded slopes and erosion control. These grading plans also appear to have been completed in significant compliance with the OCMC.

Consistency of Documentation with City Requirements

The requirements cited in the OCMC are summarized below.

16. Geologic Assessment Report

A preliminary engineering geologic assessment report, prepared by a suitably qualified and experienced engineering geologist who is registered in the state of Oregon and who derives his or her livelihood principally from that profession, containing a description of:

- a. Geologic formations, bedrock and surficial materials including artificial fill;
- b. Location of any faults, folds, etc.;
- c. Structural data including bedding, jointing, and shear zones;

17. Geotechnical Report

A geotechnical report demonstrating compliance with the Geologic Hazards Overlay District. The report(s) will be peer reviewed (OCMC 17.44.060 K, L) by the City's Geotechnical Engineer. Comments from the City's Geotechnical Engineer will be addressed by the applicant's engineering geologist and geotechnical engineer. Costs for City's geotechnical review and consultation shall be paid by the applicant. The report

shall be prepared by a suitably qualified and experienced geotechnical engineer who is licensed in Oregon and who derives his or her livelihood principally from that profession, discussing:

- a. Engineering feasibility of the proposed development and addressing strength properties of surface and subsurface soils with regard to stability of slopes
- b. Appropriate types of foundations together with bearing values and settlement criteria for foundation design, soil erosion potential, permeability and infiltration rates
- c. Excavation, filling and grading criteria including recommended final slopes
- d. Surface and subsurface drainage
- e. Planting and maintenance of slopes
- f. Other identified soil or subsurface constraints together with geotechnical remediation and other recommendations to alleviate or minimize their effects
- g. Signature and seal of the geotechnical engineer.
- h. The report shall also contain a statement as to whether the proposed development, constructed in accordance with the recommended methods, is reasonably likely to be safe and prevent landslide or other damage to other properties over the long term, and whether any specific areas should not be disturbed by construction.

We have detailed in the following sections where the prepared documents meet the requirements of the code.

a. *Geologic formations, bedrock and surficial materials including artificial fill*

Geologic conditions as well as site specific materials are described in depth in Section 3.0 Geologic Setting and Section 4.0 Subsurface Conditions. Further, extensive subsurface exploration logs have been included in Appendix A.

b. *Location of any faults, folds, etc.;*

The seismic section of the report addresses the seismic setting of the project. No active or inactive faults have been mapped in or around the site.

c. *Structural data including bedding, jointing, and shear zones;*

This is addressed in the geologic setting portion of the report.

a. *Engineering feasibility of the proposed development and addressing strength properties of surface and subsurface soils with regard to stability of slopes*

Existing slopes that would trigger slope stability review are located on the banks of Clackamette Cove, adjacent to the drainage the passes between the Cove Garden Apartments project and the Oregon City Shopping Center, and various localized oversteepened fill piles throughout the development. Development along the Cove will result in significant flattening of the existing slopes (to 3H:1V or flatter) in accordance with our recommendations. On the Cove Garden Apartments site, a combination of site grading and retaining wall construction will eliminate mapped slope hazards.

b. *Appropriate types of foundations together with bearing values and settlement criteria for foundation design, soil erosion potential, permeability and infiltration rates*

Foundation design is addressed in Section 5.6 of the report. Erosion potential and control is discussed in Section 5.5. Due to the presence of random fill soils at the surface throughout the site, infiltration potential has not been tested. This is discussed in Section 5.10 of the report..

c. *Excavation, filling and grading criteria including recommended final slopes*

The Geotechnical Report includes extensive grading recommendations in Section 5.2 and recommendations for finished cut and fill slope gradients in Section 5.3.

d. *Surface and subsurface drainage*

Drainage issues are addressed in throughout the report.

e. *Planting and maintenance of slopes*

The Erosion Control section of the report (Section 5.5) addresses planting and vegetation on slopes.

f. *Other identified soil or subsurface constraints together with geotechnical remediation and other recommendations to alleviate or minimize their effects*

A number of constraints are identified in the report including the presence of undocumented fills. These are addressed in the discussion section as well as the recommendations.

g. *Signature and seal of the geotechnical engineer.*

The Geotechnical Report was signed and sealed by Stuart Albright, P.E. who is registered in Oregon as a Geotechnical and a Civil Engineer.

h. *The report shall also contain a statement as to whether the proposed development, constructed in accordance with the recommended methods, is reasonably likely to be safe and prevent landslide or other damage to other properties over the long term, and whether any specific areas should not be disturbed by construction.*

The specific developments currently under consideration differ somewhat from what was anticipated at the time the report was written. However, based on our review of the current scheme, it is our opinion that the development is appropriate for the site and that landslide hazards have been adequately addressed.

Nature of Exported Fill Materials

It is our understanding that material proposed to be excavated from Lot 1 and the North Park will be used (to the extent practical) for structural fill on the Garden Apartments site. In their preliminary geotechnical report for the Garden Apartments site, GeoPacific address the requirements for engineered fill associated with the development. At the request of the Oregon City Planners, we have prepared additional discussions with respect to the suitability of those materials for use as structural fill within the Garden Apartments project.

Unsuitable soils (predominately organics, debris, and highly clayey soils) will not be placed on the sites as structural fill but rather will be exported and disposed of outside of the 100 year flood plain.

Lot 1. Lot 1 is located in an area that was completely mined out to lake depths. Subsequent to that mining, material was dumped into the lagoon. Unlike the majority of the Clackamette Cove site, it does not appear that the fill placed on Lot 1 was controlled. The proximity of the site to McLaughlin Boulevard and Main Street and the distance from the mining operations in later years likely made it susceptible to random dumping.

Our initial test pit on the far north end of the peninsula encountered debris within a foot of the ground surface. To the depth explored, we encountered material that was almost entirely debris. This material would not be suitable for use as engineered fill. The other test pits and borings completed within Lot 1 encountered silt, sand, and gravel fills with some limited debris. Based on our observations, it appears that more than half of the material excavated from this site would be suitable for use as structural fill, with the caveat that debris removal would be necessary on a periodic basis.

North Park. The North Park site (also known as Tract D) was previously in use as settling ponds for the gravel quarry operation. The exact location and depths of the ponds is not known but they occupied the majority of the parcel. The settling pond soils typically consist of very soft to soft silts and clays with varying organic contents. We anticipate that most of the settling pond soils (in excess of 70 percent) would be reusable as structural fill, although significant moisture processing and some organic removal will be necessary. In general, the ponds appear to have been covered by 3 to more than 10 feet of general site fill which appeared to be relatively free of organics and debris and as such, could be used as structural fill.

Lots 3 through 7 and Cove Banks. Lots 3 through 7 were quarried and then subsequently filled. The western edge was quarried to lake levels and then subsequently filled to current grades. The majority of the site was not quarried to lake levels. That portion of the site was in operation as a gravel processor and asphalt plant for a number of decades. Based on our understanding of the site history and subsequent explorations, we believe that the fills placed within the site were generally placed under observation of the quarry operators. As such, we did not encounter significant quantities of debris within this area. The majority of the soils encountered in Lots 3 through 7 consisted of silts and sands. Additionally, significant quantities of clays and processed material (pea gravel, screenings, crushed rock) were encountered. The northernmost portions of Lots 3 through 7 were likely in use as settling ponds. These areas will be similar to Tract D. We anticipate that most of the soils excavated from Lots 3 through 7 (in excess of 90 percent) would be reusable as structural fill.

Geologic Hazards

The attached Figure 1 is excerpted from the 2015 edition of the City of Oregon City's Geologic Hazards Map. The map indicates steep slopes and buffer zones developed from aerial photography interpretation. We have annotated each of the slope hazards by their source and provided a discussion of each.

Stockpiles. A number of large, temporary fill stockpiles are present throughout the site. These stockpiles were placed at their angle of repose and as such, feature steep sides that trigger the geologic hazard designation. The geologic hazards associated with stockpiles will be completely eliminated through removal. The stockpiles will be excavated and where appropriate, the materials will be placed as compacted, engineered fills.

Cut Slopes in Fill. The Garden Apartments site has been extensively filled. Those fills continued above the adjacent road grades. Over time as the batch plant was developed, The perimeter fills were excavated to expand the working area and to provide fill. This borrowing generally occurred near the perimeter of the site, and resulted in steep cut slopes in random fill. Those cut slopes also trigger the geologic hazard designation. The geologic hazards associated with stockpiles will be completely eliminated through removal. The grading plan indicates that the slopes will be excavated to provide fill for the lower portions of the site.

Cove Banks. The banks of Clackamette Cove generally consist of granular fills that were dumped or pushed into the original quarry excavation in order to create upland. The banks generally raveled off into final slopes of approximately 1.5V:1H or steeper. Vegetation eventually established itself and the Cove banks have, for the most part, been as found today for decades, in spite of periodic inundation such as during the 1996 floods. Over the past 10 years during which Apex representatives have been associated the project, the banks have shown little to no evidence of sloughing or erosion. The steepness of the banks triggers the Geologic Hazard Designation.

Within the proposed grading for the Cove site, the banks are proposed to be graded to a finish slope of 3H:1V. The geologic hazards associated with the Cove slopes will be completely eliminated through the proposed grading.

River Bank. The south bank of the Clackamas River intersects the far northern edge of the project site. The oversteepened nature of this bank triggers the hazard designation. The required setbacks from the Clackamas will result in avoidance of this slope and as such, it will not impact the project.

Drainage Bank. As previously noted, the Garden Apartments site has been extensively filled. On the west border of the site, those fills were completed short of the property boundary with the adjacent shopping center. This resulted in a steep drainage ditch that provides surface water conveyance for the site. The steepness of the fill slopes triggers the geologic hazard designation. The Garden Apartments site will address impacts of that slope through retaining walls and grading.

Slope Stability

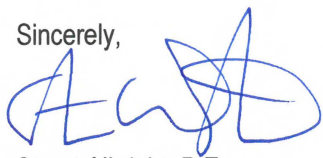
At the request of the Oregon City Planners, we have prepared additional discussions with respect to the stability of finished slopes within the project.

Amphitheater Excavation. The majority of the North Park site will be excavated in a bowl shape to create a landscaped amphitheater. The soils present within the amphitheater excavation consist of silty, sand and gravel fills overlying former crusher washout ponds. The crusher washout soils consist of silts and clays settled in still ponds with varying organic contents. In general, those soils possess relatively low shear strengths. This is one of the reasons that the site is proposed for park use rather than structures. Groundwater within the area will be controlled by water levels in the Clackamas River and Clackamette Cove. The toes of the slopes will be subject to inundation under extreme high water events. In order to address the low shear strength, the proposed final slopes within the zone of proposed inundation will be graded at 7H:1V (8 degrees). The remaining slopes are graded at 5H:1V (11 degrees). Those slopes will result in a stable configuration under flooding.

Cove Bank. The redevelopment of the Cove site will require providing a higher level of stability and also fill removal to offset fill placement elsewhere. As such, the Cove banks are proposed to be graded to a finish slope of 3H:1V. These slopes will be completed within the fill soils present which generally consist of sands and gravels with varying fill contents. The slopes will be subject to periodic inundation during extreme high water events. The banks of Clackamette Cove have stood at 1:5H to 1V for decades, in spite of periodic inundation such as during the 1996 floods. The current banks show no signs of instability or ongoing failures.

Closure. We hope that this letter meets your needs at this time. If you have any questions or need clarification, please contact me at your convenience.

Sincerely,



Stuart Albright, P.E.
Principal Geotechnical Engineer



