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| <input type="checkbox"/> Additional names on page _____ of document. |
| GRANTEE(S) (Last name, first name, middle initial) <i>Angel Heights Subdivision - Phase 1</i> |
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| LEGAL DESCRIPTION (Abbreviated: i.e., Lot, Block, Plat or Section, Township, Range, Quarter/Quarter) <i>lots 1-32 Angel Heights Subdivision - Phase 1</i> |
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Report of Geotechnical Considerations for
PHASE 1
ANGEL HEIGHTS SUBDIVISION
Stevenson, WA 98648

Prepared for

Angel Heights, LLC
Attention: Ms. Mimi Morissette
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PHASE 1
ANGEL HEIGHTS SUBDIVISION
Stevenson, WA 98648

BDC Project No. 04B183

Dear Ms. Morissette,

Bell Design Company is pleased to submit our findings report for the proposed 32 Lot, Angel Heights Subdivision, Phase I, located off Iman Cemetery Road in Stevenson, Washington.

We appreciate the opportunity to serve you on this project. Please call if you have any questions regarding this report.

Sincerely,

Bell Design Company


Devry A. Bell, PE

Attachments

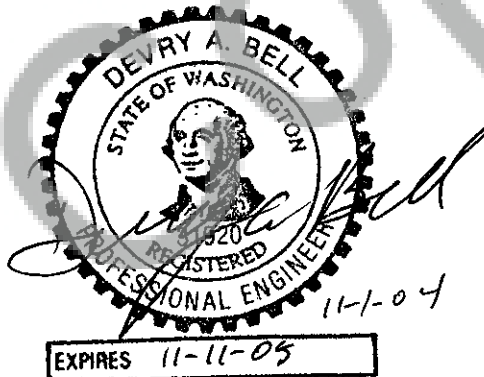


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INTRODUCTION

This report represents the findings of our geotechnical investigation for Phase I of the proposed Angel Heights Subdivision located off Iman Cemetery Road in Stevenson, Washington. The purpose of our investigation was to provide geotechnical recommendations for the proposed 32 lots of the Angel Heights Subdivision Phase I.

Our Scope of work includes the following:

1. Conduct a visual site surface exploration.
2. Perform a limited geological assessment of the site and review pertinent geological survey maps of the area.
3. Provide geotechnical-engineering recommendations for the proposed subdivision.

PROJECT INFORMATION AND SITE DESCRIPTION

Project Information

Phase I of the irregularly shaped 24 +/- acre proposed Angel Heights Subdivision is bounded on the East and North by Rock Creek, the South by the Catholic Church as well as Rock Creek Drive, and the West by the Nicklaus Subdivision and Dudley Short plat as well as various other private smaller parcels. The majority of the parcel is vegetated with many varieties of underbrush, black berries and fir trees. The parcel is exposed to the south with views of the Columbia River Gorge. The parcel has natural slopes that average between 10% - 100%. A natural sloped plateau will serve as the base level for most of the proposed lot's building areas. Several steep ravines and ephemeral creek beds cross the parcel and help to drain higher elevations near the existing Dudley home and Nicklaus Subdivision areas as well as other regions near the Iman Cemetery Road and Iman Loop Road. Phase I of the Subdivision is intended to create 32 new residential lots. These lots all are a minimum of 15,000 square feet and shall be served with public road, water and sanitary sewer. Stormwater will be collected from the streets and controlled by a designed system. An existing home and garage will remain on one of the newly created lots.

Historically, the Stevenson area receives somewhere between 70 and 100 inches of rainfall per year. Rock Creek Canyon drains regions to the north with even greater amounts of rainfall and accumulated snow. Rock Creek is prone to flooding and scour along the toe of the canyon occurs constantly. Possible landslide damming along the adjacent bank of Rock Creek makes for greater possible scour potentials on this development's shores.

A 200-ft setback along Rock Creek has been established according to the Skamania County Shoreline Management Master Program dated June 1974. Two separate Environmental Zones here are present along Rock Creek. The *Urban* and *Natural* Environment Zones are present.

Regional Geology

The site is located north of Cascade Locks within the western Cascade geologic province in Stevenson, Washington. The Cascade Mountains were formed with eruptions from a chain of volcanoes originating just east of the Willamette Valley Trough. Large accumulations of lava and ash built-up the western Cascade Mountains and years of erosion moved much of the mountain materials to the ancient coastlines. As North American landmasses continued to uplift near the Cascade Mountains, the coastline continued to move westward. The Miocene and Pliocene geologic time periods marked the Cascades with folding and tilting of land masses with continued volcanic eruptions and mass building. Eventually the Cascades were tilted creating a steep face along their eastern side. Continued volcanic activity created the volcanic cones known today, such as Mount Adams, Mount St Helens, Mount Hood and others. Continued volcanic activity together with landmass movement caused troughs and grabens to form which typify the many ups and down seen today throughout the Cascade Mountain Range. The Pleistocene ice ages produced glaciers and carved out many valleys, dammed lakes and eroded volcanic peaks such as Mt. Washington. It is believed that during this time not many years ago, geologically speaking, catastrophic floodwaters originating near Lake Missoula flowed over western Idaho and eastern Washington and down the Columbia

River trough. These flood waters scoured the Columbia River and cut the Columbia River Gorge as we know it today. Sand and gravel bars were deposited in eddies along the flood paths, toes of mountains were cut allowing massive landslides to flow into the river's path. (Orr et al, 1992)

Site Geology

Mapping by Squire Associates shows the area underlain by Undifferentiated Ohanapecosh masses which include younger volcanoclastic rocks and lava of Stevens Ridge. Other maps show a large inferred and unnamed seismic fault along Rock Creek which separated the Ohanapecosh material from a mass known as the Eagle Creek Formation. Several large ancient landslides commonly known as the Bonneville (Cascade) Landslide all terminate within a half mile of the subject property. This property sits on top of the debris flow run-out of the Red Bluff Landslide. The very recent (1996) Maple Hill Landslide is located just 1.5 miles to the northeast.

The Ohanapecosh and associated Stevens Ridge andesite lava flows are the oldest bedrock units in the Stevenson area but are not generally exposed to the surface. However, these formations are exposed along Rock Creek in many places. Their sedimentary components consist of bedded mudstone, sandstone, siltstone and conglomerates. Mudstones are generally reddish brown. The siltstone/sandstone portions are more stratified with low to moderate strength. Conglomerate formations of larger cobbles and boulders tend to be fairly high strength while the ash/silt and clay formations tend to be lower strength and add to landslide potential. (Squire, 1999)

Site Surface Conditions

An on-site visual evaluation of the project was conducted on October 25, 2004 by Bell Design Company. Contour Mapping obtained by Taylor Engineering was used for reference during the on-site evaluation. Specific attention was made along the upper slopes of Rock Creek. The State of Washington's Department of Natural Resource DEM Relief Slope Stability Model was utilized to conduct a preliminary Slope Stability Review of the site. This model combines soils types, land slopes, known landslides, and rainfall data to determine areas that *may* be prone to landslides. The output of the model indicated that the steep slopes with toes along Rock Creek were definitely prone to landslides; however, the model did not indicate high probability of slope instability of lands not directly adjacent to Rock Creek. This means that while the high steep slopes that can be undermined by Rock Creek high water flows are potentially unstable and will most likely remain unsuitable building areas, the remainder of the acreage appears to be stable and buildable with reasonable cautions. It should be noted that these models do not always see every minor landslide and therefore site and project specific stability evaluations should be made prior to any development.

In order to locate existing landslide along the Rock Creek a mid-slope exploration was conducted. This exploration resulted in the identification of four specific active landslide potential areas. These areas are shown in Figure A. The steep terrain and heavy rainfall make these areas very prone for continued landslide activity.

Photos taken in July of 1997 indicated grading activities along the western edges of Phase I. These photos seem to indicate that native fill material has been deposited along the western edges of the proposed subdivision. Field observations along with topographic mapping developed by Taylor Engineer, indicate that these fills may have depths as high as 20-ft.

Site Subsurface Exploration

No subsurface exploration was conducted for this report.

CONCLUSIONS

Slope Stability

Based on the results of our investigations, site assessments, and field development cross sections, the site has definite locations where potential localized landslides should be avoided. These shallow landslides are indicated by the presence of bedrock hollows, tree root ball depressions or undercutting of existing trees or pasture land. These shallow landslides are indicated on Figure A. Increased storm water runoff generally associated with residential build-out can saturate materials near these features and cause instability and should be limited.

Native Fill Zones

Review of photos and field observations revealed that caution should be utilized when placing foundations on or near fill materials located along the western edges of the Phase I development. It is unlikely that these soils were ever compacted and should be expected to settle unevenly when loaded. Fill soils tend to be more prone to instability during seismic events. Increased storm water runoff generally associated with residential build-out can saturate fill materials and cause instability and should be limited.

Rock Outcroppings

Several weathered rock outcroppings were located mid-slope within the Rock Creek canyon. Though generally more stable than the looser materials associated with landslides, these outcrops seem to be portions of larger fractured block failures typical along fault regions. A single large rock outcrop is located at the top of the Rock Creek canyon. This feature appears stable but highly weathered. Very steep, almost cliff like, topography is present along the creek side of the feature. Normal construction (without additional evaluation) should be avoided on top of this outcropping due to potential fracturing of the feature.

General Conclusion

Based on review of the surface of the parcel and its adjacent properties, there is little reason to believe that it is in any more danger from abnormal or untimely geological and geotechnical failure than any other buildable site located along the Rock Creek Canyon. No adverse impacts are expected due to drainage systems or drain fields. In the opinion of Bell Design Company the current 24 acre site is suitable for the creation of 32 new lots as proposed. Each new lot will be suitable for placement of a modular or conventional home with little additional risk of landslides, or additional risk to the safeguard of life, limb, health, property, or public welfare, providing the following recommendations are utilized.

RECOMMENDATIONS

Setback Lines

Three line delineations have been made in order to provide guidelines for future building on the proposed subdivision. See Figure A.

The *Apparent Top of Slope Line* roughly follows the existing top of either the Rock Creek Canyon or the western edge of the upper sloping plateau of Phase I where new residential building are likely to be constructed. This line roughly signifies a starting point in which other setback lines are defined from. Construction located on the steep downhill sides of this line is at high risk of slope instability and should be avoided without significant geotechnical evaluation. Building below this line along the Rock Creek Canyon is beyond the scope of this report.

The *Safety Setback Line* along Rock Creek Canyon is roughly a minimum of 20-ft away from the *Apparent Top of Slope Line*. This line attempts to be at least 50-ft away from the head of active or apparent landslide features and should be adjusted if new landslide features develop. This line provides a limit for a general safe distance line for building.

Any building or proposed development on the canyon side of this line will require additional geotechnical evaluation not covered within the scope of this report.

The *Caution Setback Line* establishes an additional setback from the *Safety Setback Line* for normal building conditions. This line is generally 15-ft beyond the *Safety Setback Line*. Additional considerations should be made when planning for construction when working beyond this line.

Safety Setback Zone

In conjunction with the setback lines mentioned above, a *Safety Setback Zone* has been defined between the *Apparent Top of Slope Line* and the *Safety Setback Line*. This zone defines a minimum setback from the apparent top of slope line along Rock Creek Canyon. This report does not recommend construction within this zone, but does not limit it if proper geotechnical considerations and evaluations are made which are beyond the scope of this report. Generally this area should be limited to light duty activity and should be protected from heavy construction activities. Residential run-off of storm waters should be prohibited and directed away from the *Apparent Top of Slope Line*. Foundations proposed within this area should be designed with landslide prone or potential soils in mind. Deep piling or other landslide stabilizing methods must be considered.

Caution Setback Zone

The *Caution Zone* is defined as a strip of land between the *Caution Setback Line* and the *Safety Setback Line*. This zone is defined in order to provide additional setback protection for normal buildings located near potential landslides or apparent landslide. Buildings planned for construction within this zone should be designed to protect against potential loss of soil due to slope instability. This may include deep spread footing placed below the likely zone of instability caused by local landslides, full basements, rigid or floating foundations or pinned foundations. Additional design should consider

slope instability potentials. Surface waters should be directed away from Rock Creek Canyon. Additional geotechnical evaluations should be made within this zone.

Fill Caution Zone

The Fill Caution Zone is a strip of land which appears to contain fill material that may have re-graded sometime around 1997 as indicated by dated photos taken by City of Stevenson staff. This material may be uncompacted and caution should be used when constructing buildings within this zone. Conventional compaction methods should be utilized to insure that proper compaction has been achieved within this area. No apparent landslide dangers are present within this zone. Surface waters should be directed away from fill slopes and seismic events tend to influence fill material greater than non-fill areas. Verify soil conditions prior to construction of any permanent structures.

General Site Development

In all areas development should occur with consideration for wet weather and possible saturated soils. Frost protection of spread foundations should be a least 2-ft below grade. Non-rock soils should be designed for International Residential Code factored loads of 1500 psf in non-setback zones. Any retaining structures should be designed for sloped soils prone to saturation. Any improvement made on this parcel must consider surface drainage as a high priority and limit excavation of existing slope bases. It is recommended that normal manufactured home and conventional residential home placement procedures be followed. It should be noted that no building or foundation should be placed on any non-engineered noncompacted fill. All foundation systems should be placed so that all building and live loads are directed to native soils. It is recommended that all drainage of surface water be directed away from the building sites by the use of surface ditches or underground drainpipes. Drainage pipes for gutters should be installed and directed away from new structures. Proper drainage ditches along roadways should be considered to prevent erosion. All earth fills for roads and structures should have their slopes planted with vegetation suitable for the reduction of erosion. It

is further recommended that additional geotechnical evaluations be made to each proposed lot encumbered by any of the above defined safety or caution zones by a qualified Washington State Licensed Engineer prior to construction of permanent facilities

LIMITATIONS

Bell Design Company makes these recommendations based solely on evidence as seen in the visual inspection of the premises on the date stated above. No other information, data, soil borings, slope indicator reports, slippage monitors, density tests, or any other test was performed by Bell Design Company in order to produce this memorandum. Bell Design Company can not and does not guarantee that this parcel will never experience slope instability caused by natural catastrophes. No warranty, express or implied, should be understood

REFERENCES

Bell Design Company. Report for Ginger Townsend/Glenn Taylor Realtor, Dated May 6, 2004 by Devry A. Bell

Bell Design Company. Report for Father Lappe/Star by the Sea Church, Dated June 13, 2003 by Devry A. Bell

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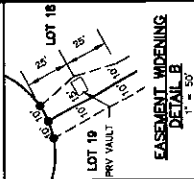
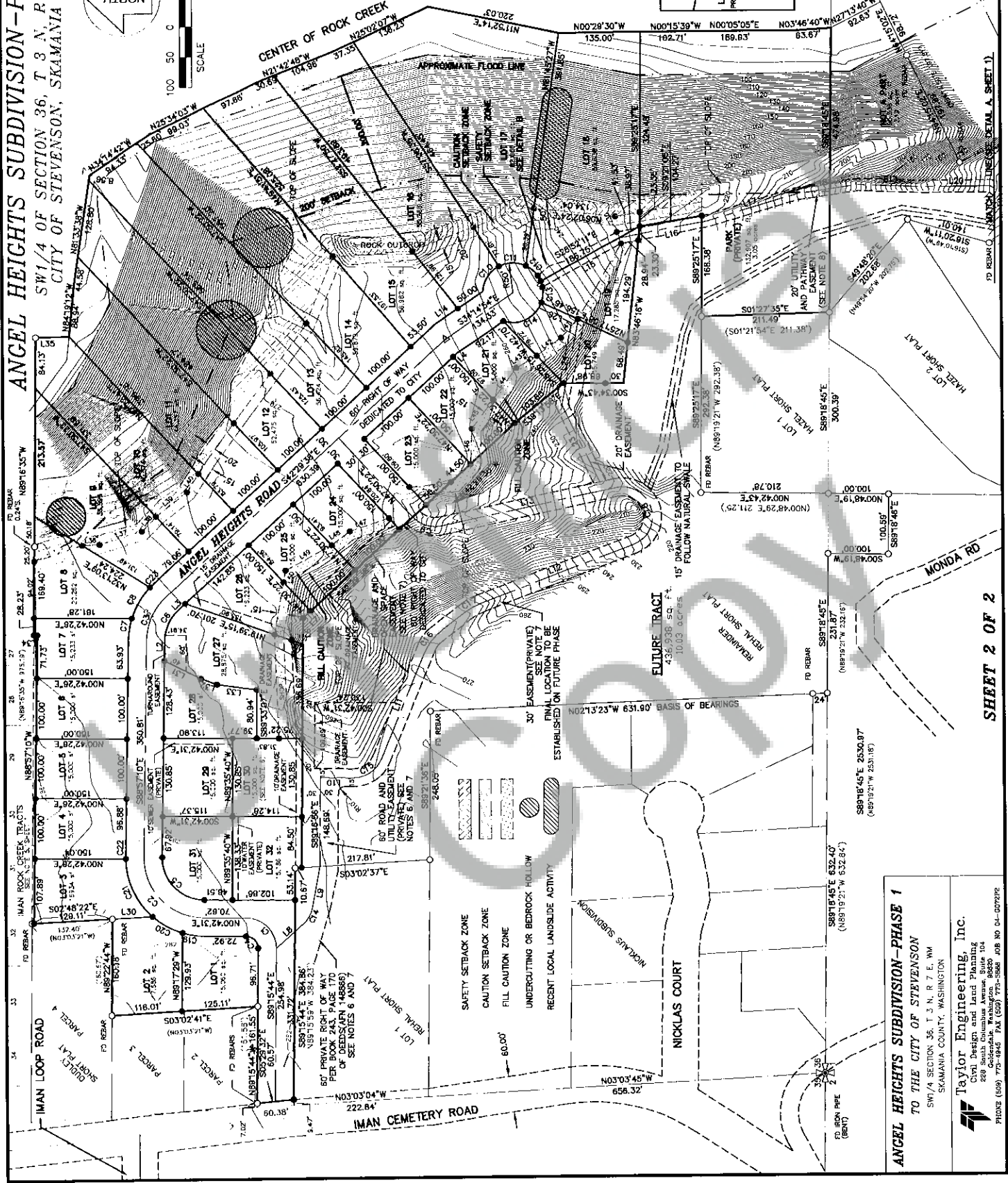
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Geology of Oregon, (4th Ed.) by William N Orr, Elizabeth Orr and Ewart M Baldwin, Dated 1992

ANGEL HEIGHTS SUBDIVISION-PHASE 1

SW1/4 OF SECTION 36, T 3 N, R 7 E, WM
CITY OF STEVENSON, SKAMANIA CO, WA



EASEMENT WIDENING
DETAIL B
11'-5.0'

ANGEL HEIGHTS SUBDIVISION-PHASE 1

TO THE CITY OF STEVENSON
SW1/4 SECTION 36, T 3 N, R 7 E, WM
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