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**ROCKY MOUNTAIN GROUP**  
EMPLOYEE OWNED

Job No. 165451

June 18, 2021

Landhuis Company  
212 N. Wahsatch Ave. Ste 301  
Colorado Springs, CO

Re: Underdrain Evaluation  
Paint Brush Hills, Filing No. 13E  
El Paso County, Colorado

Dear Landhuis Company:

RMG – Rocky Mountain Group has reviewed various geotechnical reports pertaining to the Paint Brush Hills subdivision, Filing No. 13E, as well as the adjacent Filings 13C and 14. The purpose of this review was to evaluate and address the need (or lack thereof) for an "underdrain" system located within the roadways (below the storm sewer and other utilities) to mitigate potential groundwater conditions. The reports reviewed in preparation of this evaluation are listed below:

1. *Soil, Geology, and Geologic Hazard Study, Paint Brush Hills, Phase 2, El Paso County, Colorado*, prepared by Entech Engineering, Inc., Job No. 11274, last dated March 5, 2004.
2. *Subsurface Soil Investigation, Lots 1-3, 18-44, 77-90, 105-118, 134-135, Paint Brush Hills, Filing No. 13C, El Paso County, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 161307, last dated March 15, 2018.
3. *Subsurface Soil Investigation, Lots 4-11, 59, 69-76 and 91-98, Paint Brush Hills, Filing No. 13C, El Paso County, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 161896, last dated December 4, 2018.
4. *Subsurface Soil Investigation, Lots 58-120, 130-132, and 145-148, Paint Brush Hills, Filing No. 13E, El Paso County, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 171983, last dated October 3, 2019.
5. *Subsurface Soil Investigation, Lots 2-4, 11-15, 121-129, 133-144, and 149-158, Paint Brush Hills, Filing No. 13E, El Paso County, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 173629, last dated January 22, 2020.
6. *Subsurface Soil Investigation, Lots 24-25, 34-35, and 57, Paint Brush Hills, Filing No. 13E, El Paso County, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 173692, last dated March 24, 2020.
7. *Subsurface Soil Investigation, Lots 16, 19-22, 27, 28, 30-32, 42, 44-49, 53, and 56, Paint Brush Hills, Filing No. 13E, El Paso County, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 180347, last dated March 30, 2021.

8. *Soils and Geology Study, Lots 1-224, Paint Brush Hills, Filing No. 14, El Paso County, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 179012, last dated October 16, 2020.
9. *Field Activity Reports*, prepared by RMG – Rocky Mountain Group, Job No. 156158, dated March 22, 2017 through May 25, 2018.
10. *Field Activity Reports*, prepared by RMG – Rocky Mountain Group, Job No. 165451, dated July 11, 2018 through July 6, 2020.

The findings, conclusions and recommendations contained in these reports were considered during the preparation of this evaluation.

The *Soil, Geology, and Geologic Hazard Study* report by Entech Engineering, Inc. indicates areas of seasonal high groundwater and potentially seasonal high groundwater across Phase 2 of Paint Brush Hills. However, they also note that the majority of these areas are within defined drainages or areas that did not indicate the yearly presence of shallow groundwater but that could experience high groundwater during high moisture periods or years. Furthermore, they state that groundwater was not encountered in any of the test borings drilled by Entech as part of their investigation, and that only 1 test boring drilled by Earth Engineering Consultants, Inc. for a prior investigation contained groundwater (at 4 feet below grade), but that this test boring was located within a defined drainageway on the site. They conclude that areas of groundwater seepage, if encountered, may require drainage systems in order to dewater the area. Entech did not recommend, nor did they provide any detailing for, the installation of subsurface drainage systems (typically referred to as "underdrains") within the roadways.

Regarding the areas of seasonal shallow groundwater and the potential for shallow groundwater mapped by Entech Engineering, Inc. in their *Soil, Geology and Geologic Hazard Study* referenced above, RMG disagrees with Entech's identification of this hazard. Entech's stated reasons for identifying these areas as "*Seasonal High Groundwater Area*" or "*Potentially seasonal High Groundwater Area*" are the presence of defined drainages and "*topography and site conditions*". However, defined drainages and/or surficial topography are not reliable indicators of subsurface water conditions.

Intermittent (or "seasonal") drainages such as those identified on the site are typically incised by surficial runoff during periods of high precipitation or snowmelt, not by subsurface groundwater conditions (whether a permanent water table, or a localized "perched" water condition). The pathway that these surface water conditions follow (and thus, the drainage channels that they incise) are based on surface topography, not on subsurface groundwater conditions. Surficial drainage channels such as the ones identified on this site can and do occur in areas with no subsurface groundwater conditions. Likewise, areas containing high groundwater conditions (either permanent or "perched") can and do occur in areas with no incised drainages on the ground surface. The two conditions, while both relating to the presence or movement of water, can and do occur independently of each other and the presence of one is not a reliable indication of the presence of the other.

Regarding this specific site, 228 test borings have been performed across Paint Brush Hills, Phase 2 and Paint Brush Hills, Filings 13C, 13E, and 14 during the course of the Entech Engineering and

the RMG investigations referenced above. Groundwater was encountered in 4 of these borings (none of them in Filing 13E), and only one had groundwater less than 15 feet below the ground surface (at approximately 11.75 feet). It's unclear at this time whether this was a highly localized "perched" groundwater reading or a result of a caved test boring and limited amount (several inches) of water collecting on top of the cave-in due to surface runoff. However, there were no indications of subsurface groundwater in any of the test borings on the surrounding lots. Furthermore, RMG performed several hundred site visits during the land-development phases of Filings 13C and 13E, as indicated in the field activity reports referenced above. There were no reports of subsurface groundwater collecting within the utility trenches during any of those site visits.

RMG disagrees with the use of surficial drainage conditions as an indicator of "high" subsurface groundwater conditions. We also disagree that the presence shallow, surficial drainageways is sufficient justification to require the installation of an "underdrain" system within the roadways, particularly when there are no indications of subsurface groundwater conditions in any of the test borings performed within this filing. It is our opinion that shallow groundwater, particularly pervasive and persistent shallow groundwater requiring mitigation, does not exist below Paint Brush Hills, Filing No. 13E. As such, there is not sufficient reason to require the installation of a subsurface "underdrain" drainage system within the roadways.

Should you have questions, please do not hesitate to call.

Cordially,

RMG – Rocky Mountain Group

Tony Munger, P.E.  
Geotechnical Project Manager

