

EP-21-0051\_2 Waterbury PUD Preliminary Plan

SW ¼ SW ¼ Section 28, T12S, R64W, 6th P.M.  
38.9718, -104.5693

Colorado Geological Survey has reviewed the Waterbury PUD preliminary plan resubmittal. I understand the applicant proposes 201 single-family residential homes on approximately 62 acres located southeast of Highway 24 and Stapleton Road in Falcon. The available resubmittal documents include a Letter of Intent (William Guman & Associates, Ltd. (Guman), September 27, 2021), Grading and Erosion Control plans (Terra Nova Engineering, Inc., September 22, 2021), PUD Development Plan and Preliminary Plan (Guman, February 12, 2021), a Soil, Geology, and Geologic Hazard and Preliminary Subsurface Soil Investigation (Entech Engineering, Inc., October 18, 2021), Construction Documents (Terra Nova Engineering, Inc., September 2021), and a Final Drainage Report (Terra Nova Engineering, Inc., September 2021).

We previously reviewed this site and provided comments on May 24, 2021. Our comments have not been addressed and remain valid. Specifically,

**Shallow groundwater, basement feasibility, and underdrains.** Entech observed groundwater in all the borings drilled over the entire development at depths ranging from near the surface to 11.5 feet. Full-depth basements should not be considered unless mitigation measures are implemented to ensure a *minimum* separation distance of *three feet* between the shallowest seasonal water levels and lowermost floor and crawlspace elevations can be maintained year-round. Mitigation strategies could include: 1) placing fill to raise site grades and planned basement floor levels, 2) limiting basement floor depths through the use of walk-out or garden-level basement construction, and/or 3) constructing an area underdrain system if site geometry permits a permanent gravity outfall. Entech states on page 15, “*It is anticipated the majority of the areas where shallow groundwater exists on the site will be mitigated with the proposed grading.*” However, this mitigation strategy alone may not be effective in ensuring groundwater levels are at least three feet from the lowermost floor levels. According to sheet 6 of the grading and erosion control plans, minimal fill is anticipated in shallow groundwater areas (e.g., TB310 and TB6).

As recommended in our previous comments, seasonal groundwater monitoring has not been conducted. Without monitoring, potential impacts from groundwater are indeterminate. **CGS recommends the county require groundwater monitoring/observation to verify that proposed floor levels are at least three feet above maximum anticipated groundwater levels and maintained year-round.** This monitoring/observation program should be conducted prior to the preliminary plan’s approval to determine if basements are feasible and/or if an underdrain system could be employed for this site. To be effective, however, this monitoring should include observations through fall, winter, and spring and not merely during site-specific building investigations. It is outside the scope of CGS review to determine whether the 3-ft minimum separation distance exists. If site grades cannot be raised to maintain the minimum separation distance and an area groundwater collection system (underdrain) is determined to be unworkable, then full-depth basements should not be allowed.

Entech states on page 16, “*Subsurface drains may be necessary in some areas to prevent the intrusion of water below grade,*” and “*Dewatering systems may be necessary in some areas where seepage and perched water occurs.*” CGS agrees with Entech on page 11, “*In areas where high subsurface moisture conditions are anticipated periodically, a subsurface perimeter drain will be necessary to*

*help prevent the intrusion of water into areas located below grade.*” Individual foundation perimeter drains are needed around any below-grade (basement) space, **if determined to be feasible**, and may discharge to a positive outfall or connection to an underdrain system if constructed. Individual foundation perimeter drains are intended to handle small amounts of intermittent water and **should not be used to mitigate a persistent shallow groundwater condition**.

CGS disagrees with Entech on page 17, “*Final drainage recommendations should also be determined at the time of the observation*” (Foundation Excavation Observation). **CGS recommends that underdrain systems are determined and designed at the preliminary plan stage and noted on the plans.** In addition, floodplains are mapped along the western portion, and wetlands are mapped along the eastern portion of Phase 1. Both encroach on proposed lots within the development. As noted on page 11 of Entech’s report, “*The exact floodplain locations should be determined in a drainage study,*” and “*areas that currently lie within the FEMA floodplain area will require approval of the Drainage Report.*” The letter of intent states (page 4), “*The existence on site of a FEMA floodplain, as well as non-jurisdictional wetlands, have been documented and designated as non-disturbance/no-build areas of the site.*” **CGS recommends that these no-build areas and building setbacks from the mapped floodplain and wetland areas are noted on the project plans.**

**Geologic Hazard Disclosure Statement.** CGS recommends a geologic hazard disclosure statement is included on the preliminary plan referencing Entech’s October 18, 2021 report, “Geology/Engineering Geology Map” (figures 9 and 9A), with the hazards/constraints listed.

Note 28 of the construction documents (Terra Nova Engineering, Inc., September 2021) should include Entech’s October 18, 2021, or the most recent revision.

In summary, CGS recommends:

- The county requires groundwater monitoring/observation to verify that proposed floor levels are at least three feet, preferably five feet above maximum anticipated groundwater levels, and maintained year-round.
- Underdrain systems are determined and designed at the preliminary plan stage and noted on the plans.
- Setbacks from mapped floodplain and wetland areas are noted on the project plans.
- A geologic hazard disclosure statement is included in the preliminary plan.

Submitted 11/10/21 by Amy Crandall, Engineering Geologist, Colorado Geological Survey