Bear Valley Design, Ltd.

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June 27, 2019

Mr. Carrol Moran
PO Box 209
Chatfield, Texas, 75105

Subject: Soil investigation and LTAR evaluation for a two buildings and an Onsite Wastewater Treatment System (OWTS) on a 100.94 acre tract of land on the Lonesome Bear Ranch in T5N R868W, in Routt County, Colorado.

Dear Mr. Moran,

Per your request, we performed a soil investigation and evaluation on the subject site earlier in June of this year. The investigation was performed for the purpose of providing soil design parameters for the foundations for a steel building and for a residence, and the evaluation was performed the purpose of designing an Onsite Wastewater Treatment System (OWTS) for use by the steel building (which will include a bunkhouse).

The proposed steel structure is anticipated to be of typical, single story, red iron steel framed construction, including a slab on grade main floor and a bunkhouse upper floor, all to be founded on reinforced concrete stem walls which bear upon reinforced concrete spread footers. The proposed residence is anticipated to be of typical wood framed construction, with a slab on grade lower (walk-out) lower floor, a main floor and an upper floor. The building site is located on top of a hogback with slopes downward to the north, aouth, and east, and a slope upward to the west. The vegetation on the site consists of grass and oak brush. Although the building site is nearly level, the slopes downward to the south and east are relatively steep, and the slope upward to the west is fairly steep.

Three test pits and a profile hole (four pits total) were advanced on the lot, three in the relatively flat area where the buildings are expected to be situated. The profile hole was advances somewhat downslope to the north of the proposed building pad, in the logical location for the OWTS absortion field. The pits were advanced using a crawler mounted excavator.

All three test pit revealed 12 to 24 inches of very slightly moist, medium brown sandy, slightly silty loam, topsoil overlying a native, moderately dense, very slightly moist medium sand subsoil which extended to the maximum depth explored of eight feet.

The fourth test pit (the profile hole) revealed approximately 30 inches of similar, moderately moist topsoil overlying subsoils similar to those exposed in the first three test pits, but less dense, and containing small amounts of silt and clay . The profile hole was advanced to a depth of nine feet, and revealed no signs of free ground water and no bedrock.

No bedrock or free water was encountered in any of the four test pits.

Our experience with similar soils, taken together with our observations in the test pits, have led us to form the opinion that the moderately dense sand subsoil observed in the first three test pits will provide stable bearing for the foundations of both of the proposed structures. We also concluded that the site and the subsoil observed in the profile hole are, in fact, suitable for the installation of an OWTS with a leach field of the type of design detailed below.

Spread footers for both of the proposed structures should be designed to bear on the moderately dense sand subsoil observed in the first three test pits, with a maximum net bearing pressure of 2.0 KSF. No minimum dead load will be necessary on any of the footers. Any retaining structures should be designed to retain pressure equivalent to that which would be exerted by a fluid weighing 40 PCF.

The footers for both foundations must be surrounded with a footer drain ccnstructed using 4" diameter D-2729 perforated PVC pipe (with the perforations located at 4 and 8 'o'clock'), bedded and covered with ¾" screened rock, which in turn must be wrapped in a geo-fabric such as 'Mirafi' #140N. Both footer drains must run from a pair of clean-outs, have a minimum 1% slope around the foundation to a corner opposite the clean-outs, and at that point be wyed together to drain to daylight via a non-perforated 4" diameter PVC pipe. These drains must be located at a low enough grade so that it will prevent

water which might penetrate the backfill from soaking the bearing soil beneath the footers. The daylighted end of these drains should be protected from intrusion by critters by means of a screen and cobbles.

Frost protection for the foundations must be provided by maintaining a minimum of 48" of earth cover over them, measured in any direction. The finish grade should provide for a minimum of 2% slope away from the structures in all directions for a minimum of 10 feet , as well as for positive and continuous drainage away from the buildings without any ponding. Native subsoil materials will provide appropriate backfill. It is anticipated that a large portion of both buildings' perimeters will be surrounded with a graveled driving surface. Backfill not situated beneath a graveled driving surface may be capped with a maximum six inch thick layer of topsoil. The native backfill material must be placed in lifts a maximum of 10 inches thick, with each lift moistened and compacted to 93% of its Standard Proctor density.

In order to control moisture as well as to minimize heating costs for the proposed building, as well as to provide for proper curing of the concrete, all slab on grade floors must be placed directly on top of a minimum six mil thick sheet of visquene. The slabs on grade must be isolated from the subgrade by a minimum twelve inch thick layer of compacted ¾" road base gravel. This gravel fill must be isolated from the underlying material by means of a sheet of 'Mirafi' #140N (or equal). It is anticipated that the slab on grade floors will be provided with hydronic, in floor heating. In this case, underslab insulation per energy code requirements must be provided. We highly recommend the use of foam insulation provided with 'buttons' for positively locating the (O2 barrier type) Ppex tubing, and providing a layer of 'Barrier' insulating vapor barrier beneath the foam insulation.

All structural elements of the building must be isolated so that the slab on grade floors are free to float with respect to the rest of the buildings. All partitions located directly above any slab on grade floors must be constructed with a minimum 1-½ inch high expansion joint, built per typical local practice, at the bottom of the framing of said partitions.

The native slightly clayey sand subsoil encountered in the profile hole classifies as a Type 3 soil per CDOPH& E Regulation #43. Therefore, absorption trenches for the proposed OWTS should be designed based on a Long Term Acceptance Rate (LTAR) of 0.35 gallons per square foot per day.

We re-emphasize that no free ground water was observed in either the profile hole or in the other test pits, and the observed subsoil in the profile hole extended more than four feet below the expected design elevation of the bottom of the proposed absorption trenches without encountering any free ground water.

Thank you for the opportunity to have been of professional service to you in this matter.

Sincerely,
Bear Valley Design, Ltd.

COLORADO LICENSED
GREGORY H. HERMANN
17422
PROFESSIONAL ENGINEER

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Structural Notes--Lonesome Bear Ranch, Barn/Bunkhouse, Routt County, Colorado

1. All concrete shall contain six 90 pound sacks of Type II cement per cubic yard, ¾ inch maximum size aggregate, 2% to 4% entrained air, and shall be placed in full accordance with all provisions of the current version of ACI-318.

2. All reinforcing steel shall conform to ASTM A-615, Grade 60

3. Design slab on grade floor load is 250 lbs./sq. ft., live;

.4. Design nominal snow load is 80 lbs./sq. ft.

5. Design wind load is 90 mph, per IRC 'Exposure B' requirements at a density altitude of 7,200 ft., mean sea level.

6. Design earthquake is per IRC 'Zone B' requirements.

7. Design soil conditions are 2.0 KiP/sq. ft., maximum net bearing and 0.0 KiP/sq. ft., minimum dead load, per Bear Valley Design, Ltd. Letter dated June 27, 2019.

8. All details enumerated in the letter referenced in 7. Must be executed in full.

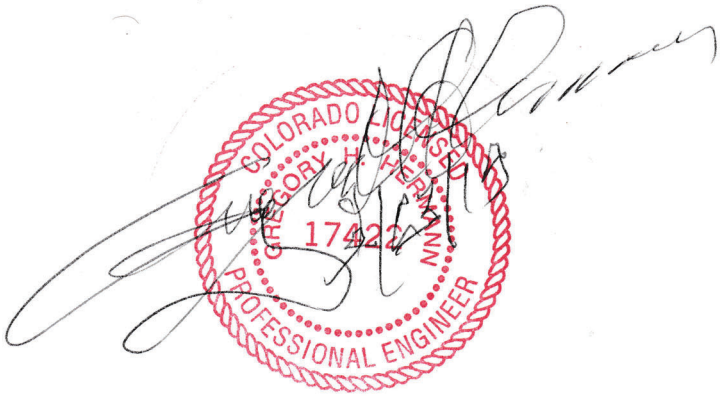
9. The steel ('red iron') frame building above the foundation is to be designed, engineered, certified, and fabricated by others. Installation of the building and anchor bolts in the foundation is to be per the building mfgr's. sizing and layout dimensions and specifications

10. Heating plans to be provided on a design/build basis by mechanical contractor.

11. Electrical plans to be provided on a design/build basis by electrical contractor.

12. Plumbing plans to be provided on a design/build basis by plumbing contractor.

13. All above grade, enclosed portions of the building are to be insulated using spray-on, 2 part urethane foam insulation, with minimum R values of R-50 in the roof and R-30 in the exterior walls.



100.94 Acre Parcel on Lonesome Bear Ranch, Routt County, OWTS Calculations

Proposed Barn and Bunkhouse:

4 Bedrooms = 7 persons @ 75 Gallons/ day/ person= 525 Gal./day design flow

Minimum tank size = 1,250 Gallons, with 2 chambers and an approved effluent filter plus a 500 Gallon Dosing Tank with a Fluid Dynamics, Inc., #216 Auto-siphon, giving average 30 gpm flow for an approx. 250 gallon dose.

Leach Field Sizing : 'Infiltrator' Quick 4 chambers in center fed trenches.

Long Term Acceptance Rate (LTAR) = 0.35 Gal./ sq. ft. / day into Type 3 Soil, sandy clay loam (per Bear Valley Design, Ltd., letter, dated 6/27/19)

(525 Gal./day) x (.7 (reduction factor for use of chambers)) x (.9 (reduction factor for dosing)) / (0.35 Gal./day/ sq. ft.) = 945 sq. ft. (required absorption area)

System will be designed to use 'Infiltrator' 'Quick 4' chambers. Said chambers provide an effective absorption area 48" x 34". (48 x 34)/144 = 11.33 sq. ft./ chamber

945 sq. ft./ (11.33 sq. ft./ chamber) = 84 chambers required (4 rows of 21), center fed