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December 16, 2021

Russell Pennington, P.E., Public Works Director
Town of Fraser
P.O. Box 370
153 Fraser Avenue
Fraser, Colorado 80442

**RE: GRAND PARK, ALPENGLow APARTMENTS 100% CONSTRUCTION DOCUMENTS
DRAINAGE REVIEW**

Dear Mr. Pennington:

We have reviewed the Alpenglow at Grand Park submittal received November 30, 2021. The submittal included the Alpenglow at Grand Park – Planning Areas 2W.1 & 2W.2 Phase III Drainage Report and 100% Construction Plans for Alpenglow at Grand Park, dated November 18, 2021 by TKE Civil & Structural Engineering. We also received a response letter dated November 18, 2021 by TKE Engineering. We have the following comments to offer related to the drainage improvements, including numerous repeated comments that were not adequately addressed.

Drainage Report

Text

1. At the bottom of Page 3 in Section III, it states that this site “is located within drainage basin E7” and that “this basin is to drain to the northwest to Design Point 7”. Provide excerpts and the Drainage Map from the 2006 High Country Engineering report to show the proposed drainage route and where these features are located. These excerpts are required to have a complete report since the older reports are not readily available by all and this information must be documented.
2. At the top of Page 4, it states that this development is located within the Carrol & Lange drainage Basin H and will be combined with runoff from the No Name channel and directed to DP7 located adjacent to Old Victory Road north of the Cozens Meadow detention pond. Provide excerpts and the Drainage Map from the 2005 Carrol & Lange report to show the proposed drainage route and where these features are located. These excerpts are required to have a complete report since the older reports are not readily available by all and this information must be documented.
3. On Page 5, for Design Point 5, it states that the tributary area will drain into the meadow without water quality treatment until the roadway is extended in the future. We have the following comments:
 - a. On the Drainage Map (Sheet 4), fix the major contour labels in these basins since the labels are randomly shown.
 - b. On the Drainage Map (Sheet 4), the area for Basin DA-09B should be about 0.5 acres, not 1.78 acres. Fix this area on the map and in the runoff analysis.

- c. Per CDPHE criteria, a maximum of 1 acre of impervious area is allowed to runoff from an entire site without water quality treatment. Since Basin DA-W09B (about 0.5 acres) and several other backlot areas will be routed directly to the meadow, a permanent water quality pond must be provided for the runoff from Basin DA-W10. This is also required since streets and parking lot areas have a higher potential for sediment in runoff. Upon approval of a variance by the Town, a temporary sediment trap could be provided for the interim condition until the future water quality/detention pond is constructed with the roadway extension.
4. On Page 5, from the drainage map it appears that runoff from DA-W14 and DA-W15 flow to a low point in the driveway/parking lot, which then spills over the curb and is routed overland to a swale. At the swale, the runoff is combined with the Design Point 2 runoff, then routed to Design Point 3. Describe this in the text. Per the response to comments, the text was updated to include this discussion, but we could not find it.
5. On Page 5, for Design Point 9, it indicates that 10 cfs in the 100-year storm event will be allowed to bypass Pond 2, which exceeds the Ditch decreed flow of 5 cfs. Only 5 cfs should bypass this pond and the remaining runoff must be detained in the pond to reduce the 100-year peak flow to the historic flow rate. Increasing the bypass flow from 5 cfs to 10 cfs is significant when compared to the total tributary flow in Cozen's Ditch from Design Point 4 (i.e., about 16 cfs) and will not be allowed. Per the response to comments, we agree that the diversion method proposed is reasonable, although, it is not clear why the overflow bench into Pond 2 could not be lowered to allow stormwater in excess of 5 cfs to be routed into the pond, but still maintain the 5 cfs normal flow depth (i.e., about 0.5 feet) in Cozen's Ditch. Note that a weir across Cozen's Ditch may not be required if the overflow elevation is lowered adjacent to the pond to limit the capacity of the ditch to 5 cfs.
6. On Page 6, discuss the proposed culvert that outfalls near Design Point 1A. Per the response to comments, this culvert will only carry minor flows. Include this in the discussion.
7. The drainage plan indicates that two feature ponds are still planned to permanently store stormwater. The response letter indicates that approval was obtained from the State Engineer's Office. Provide the documentation obtained from the State Engineers' Office indicating approval to satisfy the requirements of Colorado Revised Statute (CRS) 37-92-602(8) that requires all stormwater for the 5 and 100-year storm events be released within a maximum time period.
8. On Page 5 and in the HEC-HMS Flow Results table on Page 7 and in the calculations section, please make it clear that the HEC-HMS analysis does not reflect the reduction in peak flows at Pond1 and Pond 2 and that the spreadsheet flows are Inflows to the ponds, not Outflows. For example, POA-B MEADOW indicates developed flows that are more than twice the historic flow rates since the HEC-HMS model does not include modeling the ponds.

Drainage Map

9. On Sheet 4, label the proposed Pond 1 outlet pipe size.
10. On Sheet 4, label the existing Cozen's ditch culvert across the trail near the Feature Pond (No Stormwater).
11. Subdivide Basin DA-J to correctly account for runoff that will be intercepted by Cozen's Ditch and be directed to Pond 2 at the diversion structure based on the proposed and existing contours. Update the HEC-HMS analysis to account for this revision. Per the response letter,

meeting onsite is not necessary since this analysis is based on the proposed grading plan that shows that runoff from the southern portion of this basin will be directed to Pond 2.

Calculations

12. For the Detention Pond analyses, we have the following comments:
 - a. On the Drainage Basin Map that shows the HEC-HMS connectivity, Basin DA-J must be routed into DP-9 POND 2 (or at least the portion of Basin DA-J tributary to Pond 2). Also include Basin DA-J in the BASINS USED FOR PONDS LISTED BELOW spreadsheet to account for the tributary area and imperviousness and update the pond volume sizing calculations to account for this additional tributary area. See Comment 11 above.
 - b. On the Pond Volume Stage Storage Discharge calculation pages for both ponds, the POND RELEASES (FROM HEC-HMS) for the Developed condition do not reflect the reduction in flow with detention. This is confusing. Please revise this to show the Pond Design Release Rates instead of the HEC-HMS pond inflows.
 - c. The Pond/Outlet Data Summary page indicates two 1.5" diameter holes for the WQ and 100-year outlets, but the Volume Stage Storage Discharge calculation page indicates a rectangular orifice for the WQ control and a 2' long weir for the 100-year control. Revise as needed, including the details on Sheet 8 in the construction plans.
13. The sizing calculations for the Cozen's Ditch diversion do not match the details on Sheets 7 and 8 in the construction plans. Also, it appears that the total flow to the diversion has changed since the double pipe from Design Point 3 was extended into the pond. Revise the calculations and details as needed. In addition, see Comment 5 above that suggests the concrete weir across the ditch may not be needed. If a side channel spillway is provided instead of the weir, we recommend ensuring the spillway length is sufficient to allow all of the excess flow above 5 cfs to spill to the pond. If you would like to make sure we're on the same page for this design, please call me.
14. For the OVR-DP-OS Culvert Sizing calculation, a Headwater Surface Elevation of 8693.87 was used to determine the inlet/outlet control flow. This elevation is above the adjacent low point elevation in Old Victory Road (8692.7 +/-). Also, per the Type C Inlet calculation at this location, the required headwater would be about elevation 8692.5. Revise this design to provide adequate freeboard.
15. Provide pipe/culvert sizing calculations for the storm sewer at Design Point 7 and for the storm sewer system for the Clubhouse.
16. For the Grate Inlet Chart sizing calculations, Sheet 34 in the construction plans shows a 2x2 Inlet for the Building J location, not a 3x3. Verify the proposed size and revise to match.

Construction Plans

17. For the detention ponds, we have the following comments:
 - a. On Sheet 7, label the existing contours.
 - b. For Pond 1 and Pond 2, Sheets 5, 6 and 7 indicate Type M Riprap for the overflow spillway, but the Spillway Cross Section on Sheet 8 indicates Type L Riprap. Verify the riprap size and revise to match.
 - c. Provide trash racks/well screen to protect the orifice holes from plugging with debris. Per the response to comments, the concern is not that debris will float through the openings,

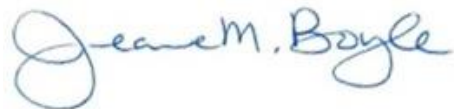
but is that the openings will plug without protection and need frequent maintenance to operate properly.

18. On Sheet 6, use a minimum 18" thickness for Type L Riprap. This should also be corrected on Sheets 7, 34, and 35.
19. On Sheets 8 and 41, there is a detail for Cozen's Ditch. Provide the slope for the reaches analyzed in the drainage report (i.e., from DP-4 to DP-9 at 1% and Downstream Diversion at 0.5%). Also, the proposed ditch grading shows only a 0.5% slope on the grading plan drawings (Sheets 22 and 23) and the ditch profile (Sheet 41) which does not match the calculations. Revise the calculations and/or the ditch grading to match.
20. On Sheet 41, provide profiles for the storms sewers at DP-7 (18"), DP-3 (2-24"), and for the storm sewer system for the Clubhouse.

Please let us know if you have any questions.

Sincerely,

MERRICK & COMPANY

A handwritten signature in blue ink that reads "Jeanne M. Boyle". The signature is written in a cursive style with a large, looped initial "J".

Jeanne M. Boyle, P.E., CFM