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July 7, 2021

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

**RE: GRAND PARK, THE WILLOWS APARTMENTS 90% CONSTRUCTION DOCUMENTS  
DRAINAGE REVIEW**

Dear Mr. Pennington:

We have reviewed The Grand Park - Willows Apartments submittal received June 11, 2021. The submittal included the Grand Park – Willows Filing 1-3 & Willows Apartments Phase III Drainage Report (90% version) and 90% Construction Plans for Grand Park – The Willows Apartments, dated June 10, 2021 by TKE Civil & Structural Engineering. We also received a response letter dated June 10, 2021 by TKE Engineering. We have the following comments to offer related to the drainage improvements.

**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.
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.
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, fix the major contour labels in these basins.
  - b. On the Drainage Map, the basin boundary between DA-W09 and DA-W10 is not drawn correctly per the contours. It appears that the basin divide is located through the center of the large building and that at least half of the building and the circular driveway area flows to American Willows Drive. Fix the basin divide as defined by the proposed contours.
  - c. Per CDPHE criteria, a maximum of 1 acre of impervious area is allowed to runoff from a site without water quality treatment. The drainage area for Basins DA-W09 and DA-W10

is about 2 acres which exceeds the maximum allowable area, therefore, water quality treatment must be provided.

- d. With the basin boundary correction per Comment 3b, Basin DA-W09 will be reduced to less than 1 acre so this basin could drain to the meadow without water quality treatment.
  - e. For the remaining area that flows to Design Point 5, a permanent water quality pond must be provided. Upon approval of a variance by the Town, a temporary sediment trap could be provided for the interim condition until the future water quality pond is constructed with the roadway extension.
4. On Page 5, for Design Point 8, it states that Cozen's Ditch crosses Mountain Willow Drive, but it appears to cross American Willow Drive per the Drainage Map. Revise as needed.
  5. 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. Also, erosion protection for these curb overflows must be provided on the relatively steep slope.
  6. On Page 5, for Water Quality Pond 2, providing water quality storage for DP-OS runoff in lieu of treating the DP-2 runoff is proposed. This is not acceptable. Water quality storage must be sized for all of the runoff routed through a pond, regardless if the runoff is from offsite or onsite, otherwise the pond will not operate properly. In addition, runoff to DP-OS cannot be treated in lieu of the runoff to DP-2. Water quality storage must be provided for the runoff to DP-2 which includes buildings, roadways, and parking lot areas. We recommend locating the water quality storage control at Design Point 3 (upstream end of the proposed culvert) to provide water quality treatment for the runoff to DP-2.
  7. On Page 5, for Design Point 9, it indicates that 10 cfs in the 100-year storm event will be allowed to bypass Feature Pond 4, which exceeds the Ditch decreed flow of 5 cfs. Only 5 cfs should bypass this pond and the remaining runoff should be detained in the pond to reduce the 100-year peak flow to the historic flow rate.
  8. On Page 6, discuss the proposed culvert that outfalls near Design Point 1A
  9. From the response letter we understand that the amenity "ponds were previously approved". Clarify who previously approved the ponds. Also, if these ponds are still planned to permanently store stormwater, provide documentation that the State Engineers Office has approved the amenity ponds and an augmentation plan has been established since these ponds will not meet the requirements of Colorado Revised Statute (CRS) 37-92-602(8) that requires all stormwater for the 5 and 100-year storm events to be released within a maximum time period.

### ***Drainage Map***

10. Include copies of the Drainage Map Overall and Drainage Map (Sheets 3 and 4) in Appendix D.
11. On Sheet 3 (Drainage Map Overall), label the "No Name" channel, Cozen's Ditch, and the existing wetland/detention ponds. Also label the "northern" wetland mitigation/detention ponds if these are not the same as the "existing" wetland/detention ponds.

12. On Sheet 4, just north of the Mountain Willow Drive and Old Victory Road intersection, revise the existing culvert label to indicate 6-24" RCP's instead of 5 to match the report text and number of culverts shown.
13. On Sheet 4, label all of the proposed storm pipe and culvert sizes.
14. Show and label the existing Cozen's ditch culverts across the Bluestem Ct. cul-de-sac and across the trail near the Feature Pond (No Stormwater).
15. The tributary area for Basins DA-J, DA-K, and DA-L are all labeled to be 0.11 acres which does not appear to be correct. Correct these areas as needed.
16. Subdivide Basin DA-J to correctly account for runoff that must be directed to Feature Pond 4 at the diversion structure. Update the HEC-HMS analysis to account for this revision.
17. It appears that this project has the potential for disturbing existing wetlands areas/Waters of the U.S. Show the wetlands/Waters of the U.S. areas on the Drainage Map. If so, the proposed fill within the wetlands/Waters of the U.S. areas must be approved by the US Army Corp of Engineers (USACE) by obtaining a 404 wetlands permit. Provide documentation that a permit has been obtained or that it is not required.

### **Calculations**

18. For the Detention Pond analyses, we have the following comments:
  - a. The NOAA Atlas 60-minute (1 hour) rainfall duration was used to for the MHFD-Detention analysis, but per the Grand County Storm Drainage Design and Technical Criteria Manual, the 2-hour rainfall duration must be used. Revise the pond sizing analyses to use the 2-hour rainfall duration.
  - b. The first page of the pond sizing analysis uses the MHFD-Detention Detention Basin Stage-Storage Table Builder spreadsheet. Instead of switching to use a TKE developed spreadsheet, continue to use the MHFD-Detention spreadsheet to size the pond outlets. In addition, the MHFD-Detention spreadsheet must be used for the pond sizing analysis since it provides the 95% and 99% drain times for each storm event which is needed to verify that the Colorado Revised Statute (CRS) 37-92-602(8) criteria is met.
  - c. Provide the Detention Basin Stage-Storage Table Builder page for Ponds 2 and 3, not just Ponds 1 and 4.
  - d. For Ponds 1, 2, and 3, the WQCV drain times are all less than 40 hours. Revise the orifice sizing to increase the drain times to at least 40 hours.
  - e. For Pond 1, the 100-year drain time is only a few hours more than the WQCV drain time which is not reasonable. Revise the analysis as needed to determine reasonable results.
  - f. For both Pond 1 and Pond 4, the Pond Release rates (from HEC-HMS) indicate that the developed release rates are much higher than the historic release rates. Revise the pond outlets to reduce the 10-year and 100-year peak flows to the 100-year historic flow rates.
19. For the channel capacity calculations, also provide calculations for the swale located in Basins DA-W01 and DA-W19, at the outfall of the DP-2 culvert to Design Point 3, and at the outfall of the DP-3 culvert to Design Point 9.
20. Provide inlet and storm sewer sizing calculations for all of the proposed storm sewers, such as at DP-OS and for the Building J 18" RCP. We understand that these will be provided with the next submittal.

21. Provide culvert sizing calculations for all of the proposed culverts, not just for the triple 24" under Mountain Willow Drive. Also include calculations for the existing trail, roadway, and cul-de-sac crossings to verify they have adequate capacity. We understand that these will be provided with the next submittal.
22. Provide riprap sizing calculations. We understand that these will be provided with the next submittal.
23. At all storm sewer sump locations, provide emergency overflow calculations to determine the depth of overtopping assuming the inlets are plugged. Verify that the overflows will be contained within drainage easements and that there is at least 1 foot of freeboard to the finished grade for adjacent structures.

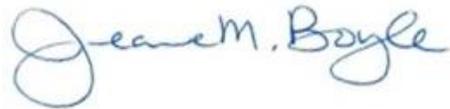
### **Construction Plans**

24. Update Sheets 3 and 4 Drainage Maps per the above comments.
25. There are several sheets that do not show the north end of the site at the intersection of Mountain Willow Drive and Old Victory Road. Adjust the view port or add another sheet to show this area for the Existing Conditions & Demolition, Site Plans, Horizontal Control Plan, Stormwater Management Plan, Grading Plans, Roadway Alignment Map, Signage & Striping Plan, and Utility Plans.
26. For all of the detention ponds, we have the following comments:
  - a. For all of the detailed detention pond grading drawings, label the existing and proposed contours.
  - b. Provide forebays at all storm sewer and culvert outfalls into the ponds.
  - c. Provide trickle channels. Include spot elevations to define the trickle channel inverts. Note that at the micropools, the trickle channel inverts must be at least 4 inches above the micropool water surface elevation.
  - d. Provide minimum 2% cross slopes to the trickle channels in the pond bottoms. Grading the bottoms flat, such as shown for Pond 4, is not acceptable.
  - e. At Pond 1 address the following:
    - i. Revise the embankment alignment on the east end to allow sufficient space for runoff from Narrowleaf Ct. to drain properly into the pond instead of directing flow at the pond embankment.
    - ii. It appears that some grading will be required at the western end of the pond to provide positive drainage to the outlet structure and eliminate potential sump areas in the pond bottom. Revise the grading as needed.
    - iii. Verify that a minimum of 1 foot of freeboard is available above the emergency spillway flow elevation to the existing structures, especially at the western end of the pond where the structures are at a lower elevation.
  - f. At Pond 4, for the diversion structure, extend the proposed riprap down to the toe of slope.
  - g. On Sheet 10, in Generic Section – Pond 1-3, the micropool must be shown to be 2.5' deep, not 1' deep.

- h. Provide trash racks/well screen to protect the orifice holes from plugging with debris.
  - i. For Pond 1, provide a control to reduce the 100-year flow to the historic rate.
27. On Sheet 11, update the existing conditions to only reflect the improvements that have already been constructed at the site. Do not show the new trails at Pond 1 and Pond 2 and proposed Ponds 3 and 4.
28. On Sheet 18 Grading Plan Overall, per the contours it appears that the available flow depth at the following structures is minimal. Verify that the finished floor elevations (including any proposed basements) for all structures are above the proposed 100-year water surface plus at least 1 foot of freeboard. Backwater at culverts must also be considered.
- a. Based on the existing condition contours, there appears to only be about 2 feet of depth (or less) from the existing Cozen Ditch invert to the existing structures along the east side of Mountain Willow Drive between Bluestem Ct. and American Willow Drive.

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, flowing style.

Jeanne M. Boyle, P.E., CFM