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Ms. Juliet T. H. Walker, AICP
Planning Director
Planning Department
1 Junkins Avenue
Portsmouth, NH 03801

July 9, 2019

Ref. T0884

Re: Cate Street Extension Roadway Design Peer Review #3

Dear Ms. Walker:

On behalf of the City of Portsmouth, TEC, Inc. (TEC) has completed an engineering peer review of the revised Cate Street Extension roadway design based on updated and supplemental material submitted by the Applicant and dated June 2019, including responses to peer review comments previously offered by TEC in a letter dated June 4, 2019. The following details the results of this review:

Reference Documents:

The following documents provided by the City of Portsmouth Planning Department were included as part of this review:

- *Cate Street Roadway Plans,* prepared by Fuss & O'Neill – dated June 2019
- *West End Yards Site Plans,* prepared by Fuss & O'Neill – dated June 2019
- *Response to Cate Street Extension Roadway Design Peer Review,* letter prepared by Fuss & O'Neill – dated June 20, 2019
- City of Portsmouth Technical Advisory Committee (TAC) comments from Eric Eby, PE (Parking and Transportation Engineer) and David Desfosses (Construction Project Manager).

After review of the reference documents cited above, TEC offers the following comments and recommendations to be addressed by the Applicant, at the discretion and direction of the City:

Horizontal Alignment and Roadway Plan Review:

1. Typical Sections on Sheet CS-001 end at Station 15+20. Add typical sections to the limit of work on Cate Street and for work on Bartlett Street as necessary.

2. Clarify limits of proposed pavement treatment throughout the work limits (e.g. full depth pavement, cold plane & overlay, etc). While the Typical Sections indicate that Cate Street

/ Cate Street Extension will be full depth pavement, it is not clear if the same treatment is warranted or proposed on Bartlett Street and at the Cate Street intersections with US Route 1 Bypass and Bartlett Street. Add notes on the Roadway Plans and/or with corresponding shading included in legend on Sheet CN-003. Also label/shade the section of median island to be removed on US Route 1 Bypass.

3. It is noted that the intersection of Cate Street Extension and US Route 1 Bypass is improved; please consider the following comments (see attached sketch):

    a. Recommend a 75-foot taper for the exclusive right-turn lane, per NHDOT Standard Plans.

    b. Recommend continuing the eastbound widening beyond the U-Haul driveway to the next site driveway at Station 5+00. This would better accommodate the turning movement for U-Haul trucks turning right onto Cate Street Extension, and create a wider painted median for some separation between eastbound and westbound travel.

    c. Consider a painted island to protect the left turn lane approaching US Route 1 Bypass, with appropriate taper lengths per NHDOT Standard No. PM-6 (see attached sketch).

4. The Applicant continues to provide a sub-standard horizontal alignment within the reverse curve area of Cate Street and the right turn onto Bartlett Street. It is noted that horizontal alignment and advisory speed warning signs have been added to the plans; however, it appears that a few adjustments could be made to meet a design speed of 25 mph for the reverse curve and 20 mph for the right turn onto Bartlett Street. These adjustments would provide better turning movements and improve sight distances.

    a. Reverse curves on Cate Street have proposed radii of R=155'. We concur that the pinch point at Station 15+00 makes it difficult to flatten the curve without significant impact to the proposed residential town house units. The Applicant should consider adjusting the roadway alignment and adjacent site design to provide a wider roadway with 5' shoulders and use horizontal curves of R=198' to meet a 25 mph design speed, as suggested in the initial peer review letter dated May 13, 2019. It appears that the tangents before and after the reverse curves may be adjusted to create an alignment consistent with a 25 mph design speed (see attached sketch).

    b. The right turn from Cate Street to Bartlett Street (R=110') is very tight for this free flow movement. We concur that the existing railroad bridge is a design constraint that currently limits the size of trucks from this approach due to the vertical clearance; however, the bridge is proposed to be replaced in the future. In the latest design revision, the southern curb line does not meet the existing and appears to narrow the roadway through the bridge area. We recommended flattening the centerline radius as much as possible (a radius of R=120' appears to be feasible with adjusted tangents) and match into the existing granite curb on both sides just prior

to the bridge abutment at approximate Station 18+35. Consider using a short tangent parallel to the edge of the railroad bridge abutment instead of the reverse curve as shown. This option appears to accommodate 11' lanes and 4' shoulder on the west side. A minor amount of additional widening and sidewalk reconstruction may be necessary within the newly constructed residential development.

5. The tight curves and proximity of the town houses to the edge of the roadway severely limits sight lines along the roadway and for vehicles turning from the site driveways onto Cate Street.

    a. Minimum Stopping Sight Distance values from AASHTO Table 9-6 are: 115 feet (20 mph), 155 feet (25 mph), and 200 feet (30 mph), respectively.

        i. For the site driveway at Station 14+25, the sight distance provided for turns onto Cate Street is approximately 155 feet, which would meet the minimum for 25 mph.

        ii. For the site driveway at Station 15+75, the sight distance provided for turns onto Cate Street is approximately 120 feet, which is only adequate for 20 mph. Applicant should provide a minimum of 155 feet clear sight distance at this location.

    b. The location of the residential units should be adjusted (e.g. it appears that the unit at Station 12+50 would need to move back approximately 8 feet) to provide adequate sight distance.

    c. Plans should identify features in front of the town houses and the Applicant shall confirm that any vertical elements within the sight triangles will be low enough to not obstruct sight lines. Also provide note on Roadway Plans and Landscaping Plans indicating that only low height shrubs and ground cover shall be allowed within the sight triangles.

    d. Sight distance easement(s) will be needed to ensure that clear sight triangles may be maintained.

6. A minimum of 13 feet (lane plus outside shoulder) should be provided at the westbound right turn lane on Cate Street at US Route 1 Bypass to accommodate snow storage.

7. A minimum of 13 feet (lane plus outside shoulder) should be provided for the eastbound lane adjacent to the median island on Cate Street Extension to accommodate snow storage. Note: If the recommendation in Comment #3.b is incorporated, this should provide the minimum 13' width required for snow removal; otherwise, the median length may need to be reduced.

8. The turning path of a WB-62 appears to encroach on the entire width of the bike lane at the beginning of the multi-use path. A bicyclist could get caught and run over by a truck in this

area if it doesn't realize that a truck will be coming into its lane. Truck encroachment into the bike lane will not be allowed. The Applicant should explore all options to provide additional lane widening and/or revised alignment.

9. Please confirm at what speed the truck simulations were made. As currently shown, WB-62 vehicles are using the entire roadway width from curb to curb. If the modeled speed is not reflective of the actual driving conditions, trucks may need more room to navigate the roadway alignment. Note that software simulations typically default to low speeds for presumed intersection turning movements. Revised simulations should be provided for the reverse curve on Cate Street and the turns to/from the south leg of Bartlett Street utilizing the applicable design speed or advisory speed to show an accurate representation of actual driving conditions.

10. Please provide a truck turning simulation for the right turn into Ricci Lumber from Bartlett Street. Modifications may be needed to accommodate this turning movement (e.g. shorten the proposed left-turn lane on Bartlett Street).

Vertical Alignment Review:

11. The minimum length of vertical curves should be 3 times the desired design speed (30 mph). Adjust the profile vertical curve lengths accordingly.

12. The profile geometry from Station 1+00 to Station 5+50 should be simplified by eliminating unnecessary vertical curves:

    a. The tangent grade of 0.37% should revised and a minimum grade of 0.5% provided for drainage purposes. It appears that the 50-foot vertical curve at Station 2+25 can be removed by combining the tangents before and after.

    b. The 50-foot vertical curve at Station 4+82.7 can also be removed by combining the tangents before and after.

Traffic Signs & Pavement Markings

13. Alignment warning signs have been added to the plans per MUTCD Section 2C.07. Given that the reverse curves on Cate Street and the curve from Cate Street onto Bartlett Street have different design speeds, and in an effort to reduce sign clutter to the extent feasible, we recommend the following (presuming horizontal alignment adjustments are made to provide design speeds of 25 mph and 20 mph, respectively):

    a. Prior to reverse curves in both directions – W1-3R with W13-1P
    b. Prior to horizontal curve at Cate Street/Bartlett Street intersection, in each direction – W1-1R/L with W13-1P.
    c. At mid-point of horizontal curve at Cate Street/Bartlett Street intersection, outside of curve facing each direction – W1-6R/L (as currently proposed).

d. Eliminate currently proposed W1-6 signs at reverse curves, as these are optional if 25 mph design speed is accommodated.

14. Stop signs (R1-1) have been added; however, signs are either not labeled or not shown at the following locations:

    a. Station 5+40 RT – R1-1 sign not labeled
    b. Station 10+92 RT – R1-1 sign not shown or labeled
    c. Station 14+50 RT – R1-1 sign not labeled

15. The lane usage sign R3-8(145) at Station 2+60 LT is the appropriate sign; however, this lane use sign should be placed in advance of the lanes in the buffer strip between the roadway and the 10' side path, at approximate Station 3+50 LT.

16. All signs must be in the City ROW or on the Applicant's property, not on other private property.

    a. Sign at Station 16+65 LT appears to be on other property. Place this pedestrian sign in front of the existing utility pole and within City ROW.

    b. Show new stop sign at Station 23+10 RT outside of the proposed sidewalk.

    c. Move pedestrian sign at Station 19+26 into the ROW.

17. The W11-1 and W16-5R signs at Station 16+70 should be green bike route signs. Revise signs to D11-1 and M6-2 and update sign summary sheet accordingly.

18. There is a NO LEFT TURN (R3-2) sign proposed on the site development plans at the easternmost site driveway onto Cate Street (approximate Station 14+40 RT); please clarify the purpose of this turn restriction. To effectively prohibit left turns, it should be done physically, with a raised island. Also, the R3-2 sign should be shown on the Roadway Plans and sign summary sheet.

19. The Sign Details, sign summary sheet, CD-551 & CD552 should have the signs in correct order per the MUTCD identification number.

<u>Pedestrian and Bicycle Accessibility Review:</u>

20. A pedestrian curb tip-down should be added at a drive curb return at Station 22+90 LT on Bartlett Street.

21. The warning panel and crosswalk at Station 15+00 LT should line up; please revise accordingly.

22. The flashing beacons for the crosswalks should be rectangular rapid flashing beacons, not the circular style shown in the detail. Revise detail on Sheet CD-551.

23. A STOP AHEAD sign should be provided on Bartlett Street in advance of the reconfigured intersection with Cate Street at approximate Station 20+00 per MUCTD standards.

General Comments:

24. Overall, the plans are still missing curbing layout details, and lane and shoulder dimensions where changes in width occur. All plans should be checked for completeness.

    a. Add dimensions on Cate Street Extension westbound at changes in width, and label radii of curb.

    b. Label location of all shoulder width transitions (e.g. from 4' to 5' near Station 14+25 LT).

    c. Label lane widths within the Cate Street and Bartlett Street intersection.

25. The proposed drainage modifications in the Cate Street / Bartlett Street intersection should be shown on the plans.

26. The Bartlett Street intersection is the downstream end of the closed drainage system for Cate Street. More exiting detail, flow arrows etc., should be shown to illustrate where the stormwater is going.

27. The drainage design for the Bartlett Street intersection should seek to reduce the number of drain manholes within the travelled way. The proposed drainage system modifications should remove DMHs and old pipe and construct new CBs along the new curb lines.

28. The traffic study needs to be updated to reflect the new proposed lane usage on Cate Street Extension at the US Route 1 Bypass intersection.

29. For construction details of drain manholes shown on Sheet CD-530, use NHDOT Standard Details.

30. Add notes to Sheet CD-550 to address the following City requirements:

    a. Pavement mix designs in the ROW shall be approved by the Department of Public Works.

    b. No wire shall be used in concrete sidewalks. Use 4000 PSI cement concrete with fiber reinforcement.

c. The bituminous path shall consist of 3" hot bituminous pavement, comprised of two lifts of asphalt; mix design shall be approved by the Department of Public Works.

d. Truncated domes shall be cast iron; shape and configuration shall be approved by the Department of Public Works.

Upon the receipt of additional, revised, and/or new documentation for the project, TEC reserves the right to provide additional comments as needed. Please do not hesitate to contact us directly at 978-794-1792 if you should have any questions concerning this peer review. Thank you for your consideration.

Sincerely,
TEC, Inc.
"The Engineering Corporation"

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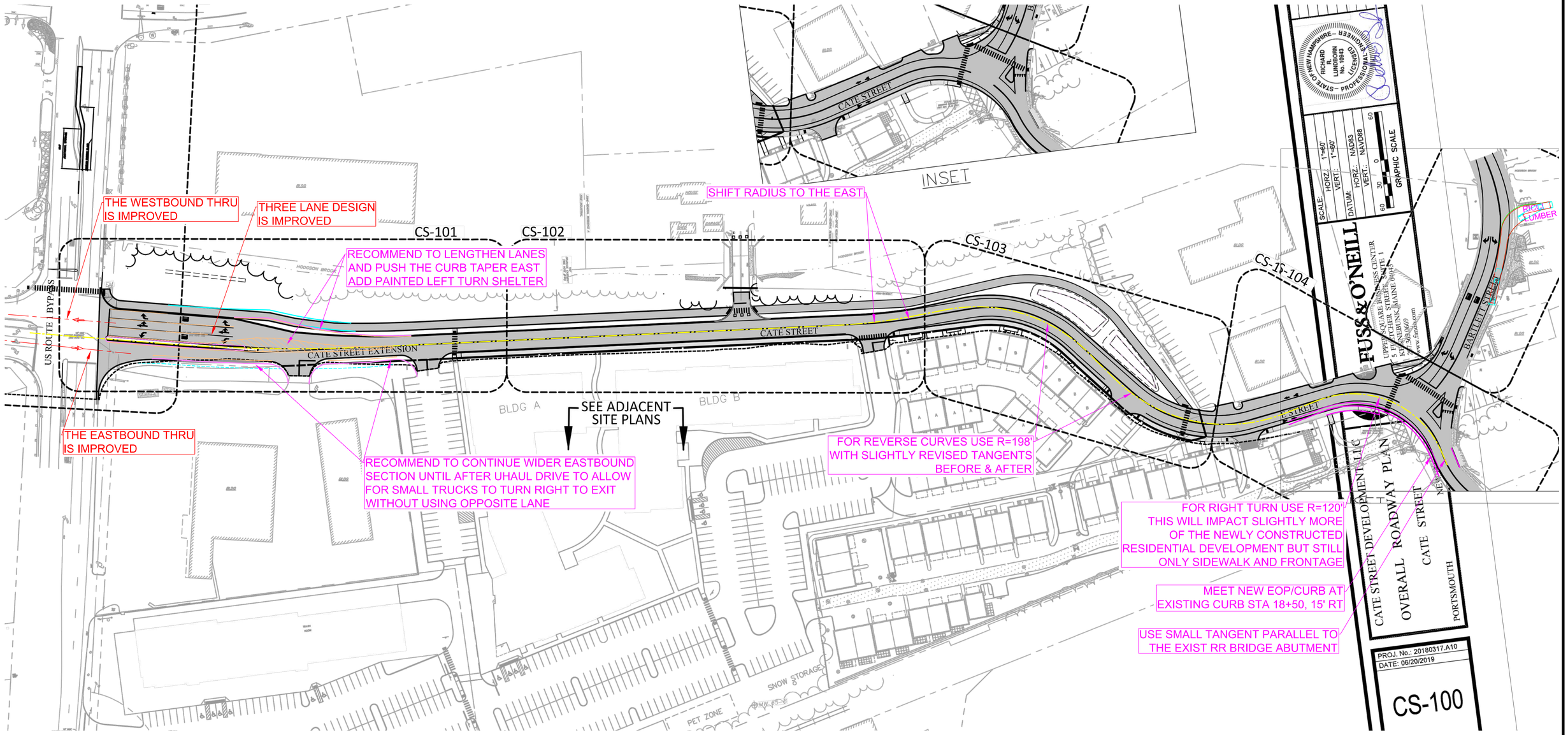

TEC The Engineering Corp

CATE STREET
REVERSE CURVE DESIGN OPTION

0 60 100 200 300
SCALE: 1" = 60'

JULY 8, 2019