

1.0 Executive Summary

The purpose of this report is to review and assess the conceptual layout and mode of construction for the on-airport segment of the proposed Automated People Mover (APM) at Fort Lauderdale-Hollywood International Airport. The report focuses on the following four areas of interest:

1. Review the interface between the construction of the Busway and future APM construction in the area of the Rental Car Facility (RAC).
2. Evaluate APM horizontal alignment including bent type and location West of the RAC to just South of Terminal 3.
3. Review the interface between the future APM support structure and Terminal 2 Pedestrian Bridge Project.
4. Review the interface between the future APM support structure and Terminal 3 Pedestrian Bridge Project.

In reviewing the interface between the future APM support structure and the Busway support structure at the RAC we have determined that it is desirable to construct a combined support structure for the Busway and future APM. This will allow for future construction of the APM directly on top of the Busway substructure while at the same time reducing the impact that the APM construction would have on the operation of the Airport. A detailed discussion of this can be found in Section 4 of this report.

An evaluation of the current proposed horizontal alignment of the future APM in the area West of the RAC to just South of Terminal 3 has determined that in order to eliminate the need for eccentrically loaded support structures a slight shift south of the alignment is desirable. This shift is only necessary in the area West of the RAC to East of Terminal 2. In general the APM guideway will be supported by bents spaced at no more than 90 feet apart. These bents shall have either one or two columns supporting a transverse member that in turn will support the elevated guideway. A detailed discussion of this can be found in Section 5 of this report.

The review of the interface between the future APM support structure and Terminal 2 and Terminal 3 Pedestrian Bridge Projects has indicated that it is desirable to construct combined support structures for the future APM guideway and the pedestrian walkway at these locations. A detailed discussion of this can be found in Section 6 and Section 7 of this report.

2.0 Introduction

The proposed Automated People Mover (APM) consists of an elevated guideway structure that will ultimately provide a seamless link between the Fort Lauderdale-Hollywood International Airport and Port Everglades. The on-airport segment of the APM is proposed to be routed within a corridor between the parking garages and the double-decked terminal roadways. Single columns and straddle bents support the elevated guideway structure and stations as proposed by the 2020 Vision project. RCT Engineering has been commissioned to do structural review of the conceptual arrangement of the columns and bents for Phase I (on-airport segment) of the APM System. Goals established for this review include the following:

1. Review of Automated People Mover Conceptual Support Structure at the Rental Car Facility (RAC)
 - a) Structural analysis of the proposed bent configuration and layout as proposed by EAC Consulting in the report dated May 15, 2002.
 - Verify that column and beam sizes as shown by EAC will work as per the proposed design.
 - Determine reactions developed at the foundations of the bents as a result of the APM incorporation in the design. These reactions are to be used by EAC for the foundation design.
 - b) Identify possible conflicts between the structural members of the Busway and APM structures with the Terminal 1 station construction.
 - Identify conflict between intermediate Busway bents and Terminal 1 escalator between second and third level.
 - c) Make observations and recommendations regarding constructability of items a) and b) above.
2. Establish bent type and locations for the support the APM from West of the RAC to just South of Terminal 3.
 - a) Establish structural support requirements.
 - Bent spacing
 - Bent type
 - Anticipated column and beam sizes.
 - b) Coordinate location and type of bents with the construction of Terminal 2 and Terminal 3 Pedestrian Bridges Project. (Item 3 and 4).
 - c) Identify conflicts between future APM structural support and underground utilities.
3. Review of the interface between future APM support structure and Terminal 2 Pedestrian Bridge Project.

- a) Identify structural elements of the future APM construction that can be incorporated into the construction of the proposed pedestrian bridge to Terminal 2 and Palm Garage.
 - b) Identify structural elements of the future APM construction that can be incorporated into the construction of the proposed bridge to Hibiscus garage, including the platform to Level 4.
 - c) Identify structural elements of the future APM construction that can be incorporated into the construction of the proposed elevators and stairs connections between levels 1,2,3,4 and future APM level above.
 - d) Make observations and recommendations regarding constructability of items a), b) and c) above.
4. Review of the interface between future APM support structure and Terminal 3 Pedestrian Bridge Project.
- a) Identify structural elements of the future APM construction that can be incorporated into the construction of the proposed pedestrian bridge to Terminal 3 and Palm Garage.
 - b) Identify structural elements of the future APM construction that can be incorporated into the construction of the proposed elevators and stairs connections between levels 1,2,3,4 and future APM level above.
 - c) Make observations and recommendations regarding constructability of items a) and b) above.

In obtaining a complete understanding of the project scope and requirements RCT Engineering has conducted an extensive review of existing project data and information as well as held coordination meetings with the URS staff. Additional information was also obtained from the Progress Report and Project Update prepared by 2020 Vision (March 2002 to June 2002) as provided by URS.

3.0 Design Assumptions

The preliminary design assumptions, loads and criteria are as follows:

1. APM-generic Hybrid of 82 kips of total vehicle weight of 82 kips per car shall be used (4 cars per train).
2. Trains operate on both guideways simultaneously.
3. For dead load considerations, APM columns and bent caps may be conservatively assumed to be reinforced concrete or structural steel
4. Impact factor is 0.30.
5. Longitudinal load
 - Service load-max longitudinal force = $0.15 \times AW^2$ (cruise load/total weight)

- Emergency braking – max. longitudinal force = $0.31 \times A W_o$ (Vehicle empty weight)
6. Centrifugal force per AASHTO Section 3.10
 7. Design live loads of stations and Pedestrian Bridges:
 - Roofs = 30 psf
 - Floors and walkways = 100 psf
 8. Design Dead loads:
 - Roofs = 100 psf
 - Floors = 200 psf
 9. Wind Loads = 140 mph (3 sec. Gust) = 120 mph fastest mile or 60 psf (Hurricane wind loads on structure as per AASHTO Specifications are less stringent and will not be used :Wind Loads = 110 mph or 50 psf)
 10. Connection of columns bases to footing = Fixed
 11. Loading combinations. Loads are to be combined based on provisions of AASHTO Specifications loading combinations Groups I, II and III shall be investigated.
 12. Deflection:
 - Vertical = $L/800$
 - Horizontal for columns = $L/360$
 13. Continuity Factor of 1.2 applied to vertical reactions obtained assuming simply supported condition.
 14. Reinforced concrete columns and structural steel beams.
 15. Piles:
 - 14” allowable compression capacity =70 tons.
 - 14” allowable uplift capacity = 10 tons.
 - 18” allowable compression capacity =100 tons.
 - 18” allowable uplift capacity = 15 tons.
 - 24” allowable compression capacity =150 tons.
 - 24” allowable uplift capacity = 30 tons.
 16. Drilled Shafts:
 - 36” allowable compression capacity = 250 tons.

- 36” allowable uplift capacity = 125 tons.
- 42” allowable compression capacity = 350 tons.
- 42” allowable uplift capacity = 175 tons.
- 48” allowable compression capacity = 450 tons.
- 48” allowable uplift capacity = 225 tons.

17. Augercast Piles:

- 14” allowable compression capacity = 95 tons.
- 14” allowable uplift capacity = 45 tons.
- 18” allowable compression capacity = 150 tons.
- 18” allowable uplift capacity = 75 tons.

4.0 Review of Automated People Mover Conceptual Support Structure at Rental Car Facility (RAC)

The purpose of this section is to evaluate the proposed layout and bent type established by EAC Consulting Inc. in their report dated May 15, 2002. The report recommended that the APM system be incorporated into the design and construction of the Consolidated Rental Car Facility (CRCF) along with the Busway substructure. This will allow for the future construction of the APM directly on top of the Busway substructure while at the same time reducing the impact that the APM construction would have on the operation of the Airport. This method was also considered by EAC Consulting Inc. to be a more aesthetically pleasing option for the period of time prior to the construction of the APM (See report entitled “Study for Incorporation of Automated People Mover Substructure Into Busway Construction” dated May 15, 2002 for additional information). Their recommendation was to construct the APM columns up to the Busway level as shown on Figures 5, 6 and 7 and to provide mechanical couplers with threaded rebar in order to extend the APM columns in the future.

The EAC Consulting Inc. report established three distinct types of bents that are to be used for the support of the Busway and APM guideway:

1. Bent designed to support APM and Busway loads combined.
2. Bent designed to support Busway loads only.
3. Bent designed to support APM loads only.

The layout and configuration of these bents is reflected on Figures 1 and 2. Bents 1 through 6, 11, 12, 14, 15,17 and 19 are bents designed to support Busway loads only. Bents 6A through 10, 13, 16, 18, and 20 through 23 are designed to support both Busway and APM loads (See Figures 5 and 6). The only bent shown in their report as required to

support APM loads only is located just West of bent 5 (See Figure 7). Of the bents required to support Busway and APM loads combined, bents 13, 16 and 18 also support the loads generated by the APM platform on levels 2, 3 and 4 (See Figure 5).

In order to verify the constructability of the proposed system RCT Engineering has developed a STAAD model for the bents required to support both Busway and APM loads. The design parameters and criteria for the model were as described in Section 2. The loads applied to the model are only those loads generated by the APM and APM landing (Level 4). The reactions reflected in this report do not include the forces generated by the Busway or any of the lower level landings. These reactions are intended to be used in conjunction with the reactions established independently by EAC Consulting Inc. in their design of the Busway support. Figure 5 and Figure 6 are representative of the bent configurations in the area of the RAC (Bent Type "A" and "B"). The Busway members shown on these figures are for reference only. Although the STAAD model included these members it did not include any Busway loading. See the attached STAAD report for APM reaction forces.

The design near the RAC calls for straddled bents, which are more stable than single column bents. A preliminary analysis of a straddled bent carrying two APM tracks results in 60" diameter concrete columns or 36"x72" elliptical columns. The elliptical columns would be more cost effective however site constraints may dictate that the circular columns be used. These columns however will have to be increased due to the additional loads generated by the Busway. We anticipate that the diameter required to support all of the loads will be around 84".

In the above analysis the columns require sixteen (16) auger cast piles of 250-ton capacity. The proposed size of foundations is 16' x 16'. Hence the thirty (30) piles proposed in the report submitted by EAC Consultants seems to be in excess. A possible reason for this is that the highest reactions developed anywhere along the proposed alignment was used for the design of all the foundations. This would be consistent with our analysis for the bent type shown on Figure 7 where a single column with a cantilever beam carries two APM guideways.

The EAC design calls for the single column bent with cantilevered beam to be used at the location just West of bent 5. Our analysis has indicated that due to the eccentric loading at this bent the superstructure as well as the foundations required would be excessively large. This would make the construction of this type of bent undesirable from both economically as well as from a constructability standpoint. There are two options for accomplishing this. The first one is to construct a portal frame, which will carry both the Busway and the APM loads as shown on Figure 8, Option 1. The plan layout for this option is shown on Figure 3. The second option is to shift the APM alignment further South in order to eliminate the eccentricity of the bent (Figure 8, Option 2). The second option would only require that one column be extended in the future for support of the APM guideway. The plan view of Option 2 is shown on Figure 3A.

The EAC design also calls for bents 1, 2, 3 and 5 to only carry Busway loads. Due to the fact that the horizontal alignment of the APM guideway falls virtually on top of the Busway at bents 3 and 5, we believe that a combined bent would be more desirable option (See Figure 3). This would reduce the future construction cost of the APM as well as reduce the impact that future construction would have on the operations of the Airport.

EAC also suggested that intermediate bents be used at Terminal 1 in order to support the Busway at 30' centers instead of 60' and 90'. Using bents spaced at greater spans at the Terminal locations may lead to higher structural depth reducing the clearance that can be achieved. Prestressed/precast slabs may be substituted for 18" thick cast-in place concrete slab for ease of construction. The foundation system for these intermediate bents calls for 5' diameter caissons at several locations for the North side columns in the vicinity of the 84" RCP sewer line. Drilling at this narrow space for a five-foot diameter caisson is not recommended.

Another possible conflict appears to exist between the framing system of the Busway/APM structure and the escalator penetrations at Terminal 1. The head room required by the escalator leading from the 2nd floor to the 3rd floor of the Terminal can not be achieved at bent 15. We have identified the following possible solutions to this problem:

1. Maintain the proposed bent spacing of 30' and design a shallower transverse member for this bent. This could be accomplished by incorporating a double beam design that would straddle the pier cap at this location (steel beams would be required).
2. Eliminate bent 15 in its entirety and move bent 14 fifteen feet further West (See Figures 4 and 4A). This would generate a bent spacing of 45' at this location instead of 30'. Bents 14 and 17 would support both APM and busway loads and bent 16 would now support the busway only.

These options require that the Busway design team perform an additional analysis in order to establish construction feasibility. Option 2 is primarily controlled by the Architectural requirements of Terminal 1. From an economic and constructability standpoint option 2 above would be the preferred option.

In addition to performing a structural analysis of the support structure for the APM and Busway construction we have also reviewed the layout of the foundation system for the proposed APM support structure with a view of identifying any conflicts with site utilities (See Figures 9 and 10). The following is an outline of possible conflicts

identified between the proposed APM and Busway support system and underground structures and utilities(N=Bent North column; S=Bent South column):

- Bent 1N – conflict with 12” DIP WM.
- Bent 2S – conflict with 8” DIP reclaimed water.
- Bent 2N – conflict with 12” DIP WM and 84” RCP.
- Bent 3N – 84” RCP.
- Bent 3S – conflict with 8” DIP reclaimed water.
- Bent 5S – conflict with 8” DIP reclaimed water.
- Bent 5N – conflict with BCAD and 84” RCP.
- Bent 6aN – conflict with 12” DIP WM and FPL duct bank.
- Bent 7N – conflict with BCAD and 12” DIP WM.
- Bent 10N – conflict with 84” RCP, 8” DIP FM and FPL duct bank.
- Bent 10S – conflict with 8” DIP FM and FPL duct bank.
- Bent 11N – conflict with foundation system of elevated upper deck roadway at the North.
- Bent 12N – conflict with foundation system of elevated upper deck roadway at the North.
- Bent 13N – conflict with 84” RCP.
- Bent 14N – conflict with 84” RCP.
- Bent 15N – conflict with 84” RCP and foundation system of elevated upper deck roadway at the North.
- Bent 16N – conflict with 84” RCP.
- Bent 17N – conflict with 84” RCP.
- Bent 18N – conflict with 84” RCP and foundation system of elevated upper deck roadway at the North.
- Bent 19N – conflict with 84” RCP and foundation system of elevated upper deck roadway at the North.
- Bent 20N – conflict with 84” RCP.
- Bent 21N – conflict with 84” RCP.
- Bent 21S – conflict with 12” DIP.
- Bent 22N – conflict with 84” RCP.
- Bent 22S – conflict with 12” DIP and FPL duct bank.
- Bent 23N – conflict with 42” RCP.
- Bent 23S – conflict with 12” DIP and BCAD bank.

Upon a review of the existing underground utility locations and the proposed location of the foundation system for the APM we have determined that underground utility relocation is necessary at virtually every proposed column location due to space constraints. The relocation of these utilities is more economical than the alternative which would entail new column locations and thus possibly a larger more expensive and visually unappealing structure. Although it is possible to protect these utilities in place it would not be cost effective to do so for the smaller utility lines, however protection should be considered for the larger utility lines such as the 84” RCP sewer.

5.0 Bent type and location for the support of the APM from West of the RAC to just South of Terminal 3

The initial horizontal alignment of the APM guideway from West of the RAC to the East of Terminal 2 would require cantilever bents in order to avoid a conflict between the elevated roadway to the North of the APM and the APM. These bents would be difficult to construct. The following are two options that we have identified in order to avoid this type of construction:

1. Construct the piers for the APM support through the deck of the existing elevated roadway.
2. Re-align the APM guideway in this area so that it travels south of the existing elevated roadway.

The first option is difficult to construct and it will also significantly impact on the operations of the Airport due to the fact that some of the lanes of the existing elevated roadway will have to be closed throughout construction. This type of construction should only be considered as a last resort and in isolated cases only. Option 2 on the other hand will allow for the construction of hammer head type piers which will be more economical as well as minimize the impact to the operation of the Airport. Option 2 is therefore recommended.

The initial and proposed revised alignment of the guideway for the future construction of the Automated People Mover (APM) in the area West of the Consolidated Rental Car Facility (RAC) to just South of Terminal 3 is shown on Figures 11 through 15. This guideway will necessitate the construction of support piers and bents that need to be incorporated into the existing landscape of the Airport. It is also necessary to take into account current project slated to take place prior to the construction of the APM and to incorporate as much of the future APM support structure into these projects. This will not only reduce the future cost of the APM but it will also minimize the impact that the proposed construction will have on the operations of the Airport.

The proposed layout attempts to introduce the structural members required for the support of the APM with minimal interference to the existing structures or operation of the Airport. We have determined that a maximum bent spacing of 90' is the most optimized spacing for the support bents of the APM from a constructability as well as aesthetic point of view. See Figure 12 for Option 2 suggested bent spacing.

The remainders of the bents required for the support of the APM guideway are portal type bents consisting of two columns with a top transverse member that can be cantilevered up to 30'. The type of construction is similar that that of the bents located in the RAC/Terminal 1 area. A more extensive design will have to be performed in order to establish the exact size and type of members required for these structures. As a

preliminary indication the columns can be reinforced concrete 60” diameter and the transverse members can be constructed of either steel or reinforced concrete.

The available background documents did not show any underground utilities present in the proposed revised area, that would interfere with the APM construction.

A more detailed description of the interface between the proposed APM support structure and the Pedestrian Bridge Projects at Terminal 2 and 3 follow in Section 5.0 and Section 6.0 of this report. An isometric representation of the bent layout in the area of these two terminals is shown on Figure 16.

6.0 Review of interface between future APM support structure and Terminal 2 Pedestrian Bridge Project

The layout and placement of support structures for the future APM guideway in the area of Terminal 2 necessitates that special attention be given to the interface between these future supports and construction of the pedestrian bridges (See Figure 13). For additional information concerning this area refer to the Progress Report and Project Update prepared by 2020 Vision (March 2002 to June 2002) Figures A-200 to A-202. In order to minimize the future impact of the APM construction on both the operations of the Airport as well as to the structures of the pedestrian bridges it is recommended that some of the construction for the future APM be incorporated into the Pedestrian Bridge Project. See Figures 13 and 14 for bent layout location in the vicinity of the Terminal 2.

It is recommended that the partial construction of bents 34 through 38 be incorporated into the Pedestrian Bridge Project (See Figure 16). This will assure that operational impacts to the Airport, which will have to reoccur during the Pedestrian Bridge Project, will not have to take place in the future when the APM is constructed. Another advantage is that the support structure for the APM can also be used to support the pedestrian bridges. Future construction of the APM will be made easier by extending the APM columns to just above the pedestrian bridges and providing mechanical couplers with threaded rebar in order to extend the APM columns in the future. Whether future APM bents are partly incorporated into the construction of the pedestrian bridges or they are built at a later date, it is important to observe the relationship between these bents and the existing and proposed structures.

The future APM platforms and the pedestrian bridge levels will be connected in the future by glass backed elevators and egress stairs. These are located between bents 37 and 38. It is not necessary that the elevator shafts and the stairwells be initially extended to the future APM level. It is however recommended that provision be made so that future extensions of these structures occur with minimal impact. The following items should be taken into consideration:

1. The structural design of the elevator shaft and stair well must accommodate the future loads generated by the additional levels.

2. The construction of the elevator shaft and stair well be terminated above the level of the pedestrian bridges so that future construction will not necessitate closure.
3. It is recommended that the elevator equipment be capable of reaching the top APM level without requiring replacement.

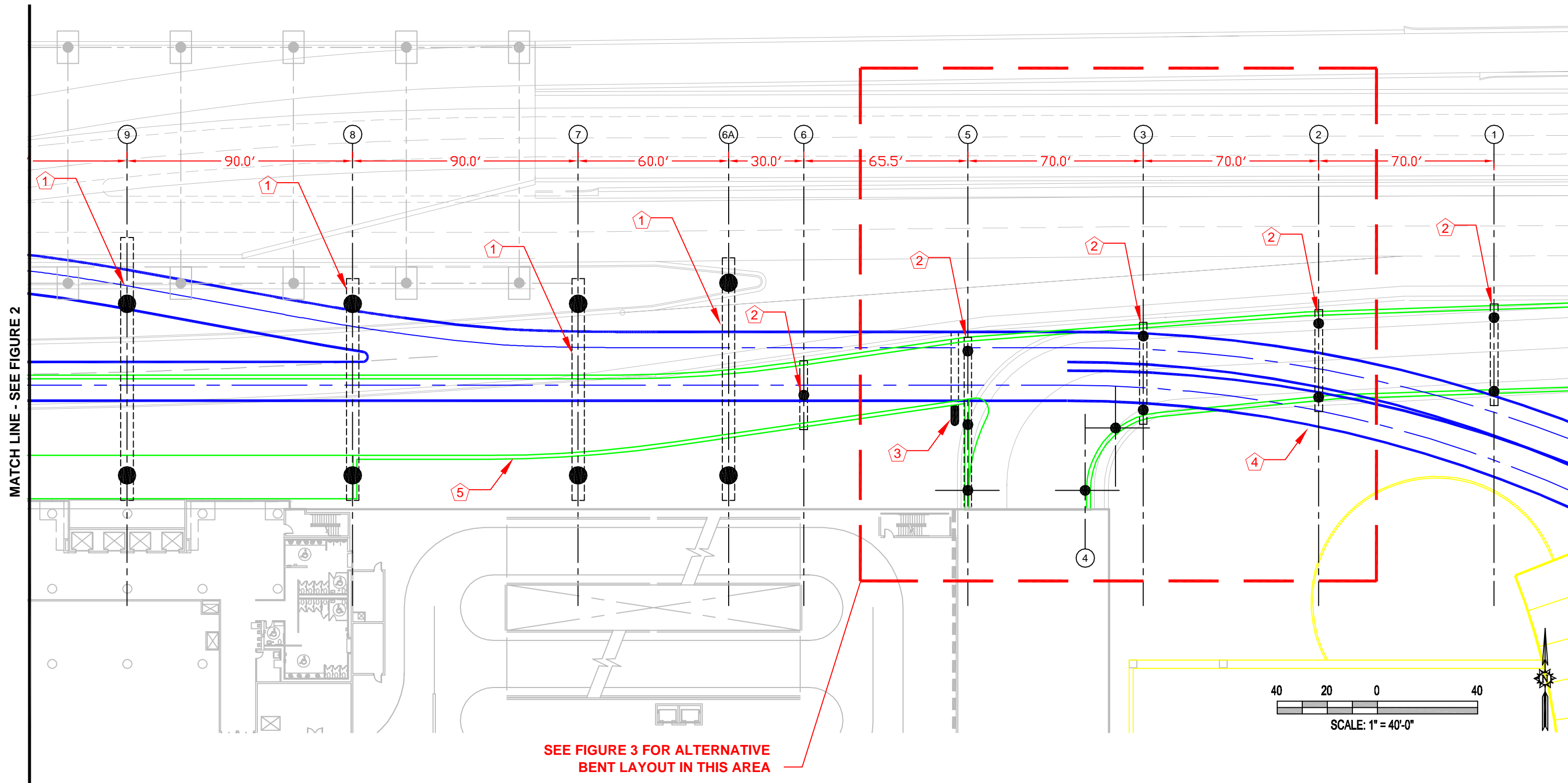
7.0 Review of interface between future APM support structure and Terminal 3 Pedestrian Bridge Project

The layout and placement of support structures for the future APM guideway in the area of Terminal 3 is much the same as that discussed for Terminal 2 in Section 5.0 above. For additional information concerning this area refer to the Progress Report and Project Update prepared by 2020 Vision (March 2002 to June 2002) Figures A-300 to A-301. In order to minimize the future impact of the APM construction on both the operations of the Airport as well as to the structures of the pedestrian bridges it is recommended that some of the construction for the future APM be incorporated into the Pedestrian Bridge Project. See Figures 15 for bent layout location in the vicinity of the Terminal 3 and Figure 16 for an isometric representation of the interface between the APM structure and the terminal.

It is recommended that the partial construction of bents 45 and 46 be incorporated into the Pedestrian Bridge Project (See Figure 15) for the same reasons discussed in Section 5.0 above.

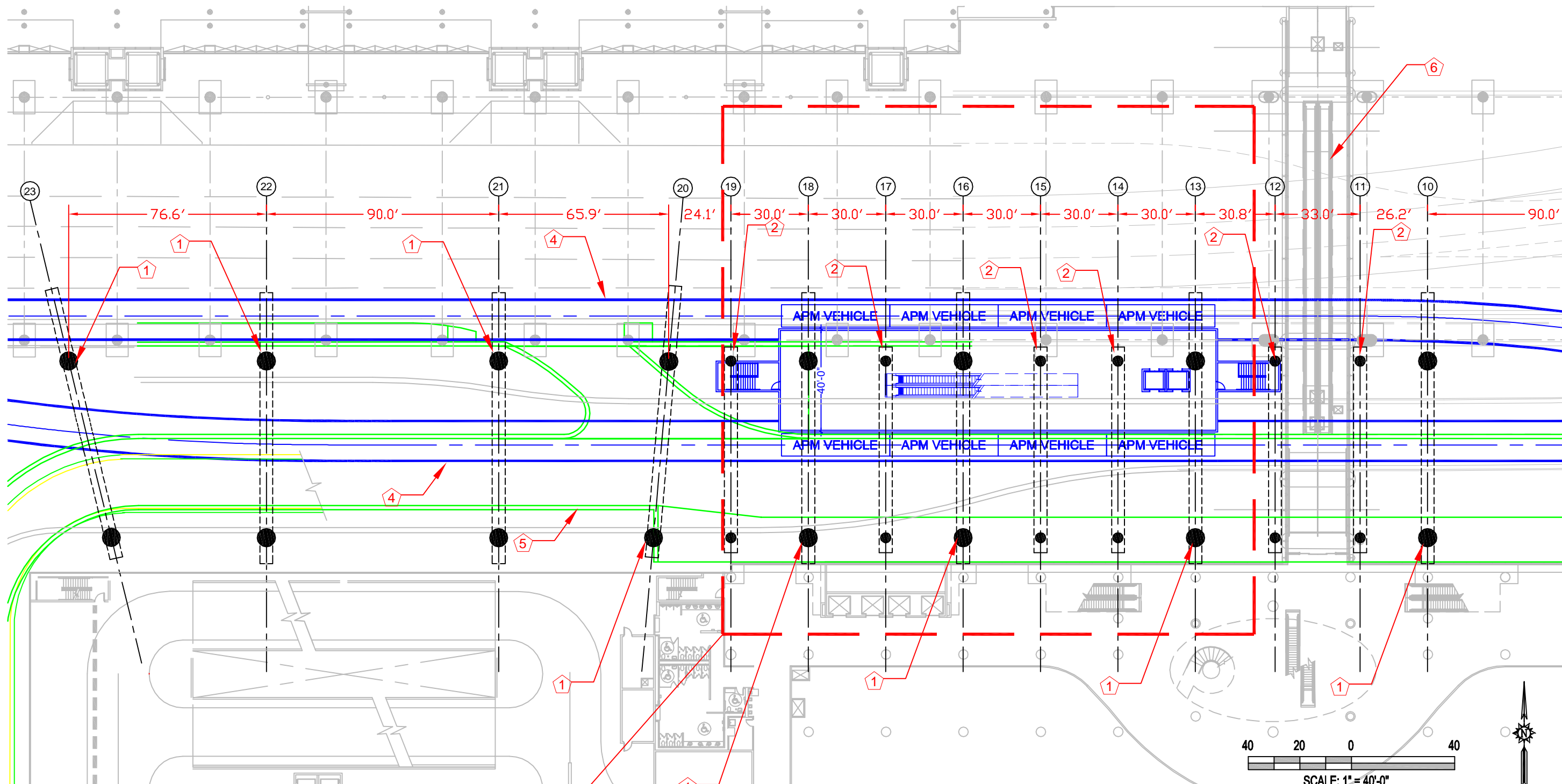
The future APM platforms and the pedestrian bridge levels will be connected in the future by glass backed elevators and egress stairs. These are located between bents 45 and 46. It is not necessary that the elevator shafts and the stairwells be extended to the future APM level. It is however recommended that provision be made so that future extension of these structures be allowed with minimal impact to the existing levels. See Section 5 above for items that should be taken into consideration during the design and construction of the elevator shafts and stairwells.

Figures



KEY NOTES	
① BENT DESIGNED TO SUPPORT APM AND BUSWAY LOADS	④ APM GUIDEWAY
② BENT DESIGNED TO SUPPORT BUSWAY LOADS ONLY	⑤ ELEVATED BUSWAY
③ BENT DESIGNED TO SUPPORT APM LOADS ONLY	

FIGURE 1
 BENT TYPE AND LAYOUT AT RAC
 AS PROPOSED BY EAC CONSULTANTS
 (BENT 1 THROUGH 9)



SEE FIGURE 4 FOR ALTERNATIVE BENT LAYOUT IN THIS AREA

KEY NOTES	
① BENT DESIGNED TO SUPPORT APM AND BUSWAY LOADS	④ APM GUIDEWAY
② BENT DESIGNED TO SUPPORT BUSWAY LOADS ONLY	⑤ ELEVATED BUSWAY
③ BENT DESIGNED TO SUPPORT APM LOADS ONLY	⑥ EXISTING PEDESTRIAN OVERPASS

FIGURE 2
 BENT TYPE AND LAYOUT AT RAC
 AS PROPOSED BY EAC CONSULTANTS
 (BENT 10 THROUGH 23)

KEY NOTES	
①	BENT DESIGNED TO SUPPORT APM AND BUSWAY LOADS
②	BENT DESIGNED TO SUPPORT BUSWAY LOADS ONLY
③	BENT DESIGNED TO SUPPORT APM LOADS ONLY
④	APM GUIDEWAY
⑤	ELEVATED BUSWAY
⑥	SINGLE COLUMN DESIGNED TO SUPPORT BUSWAY LOADS ONLY

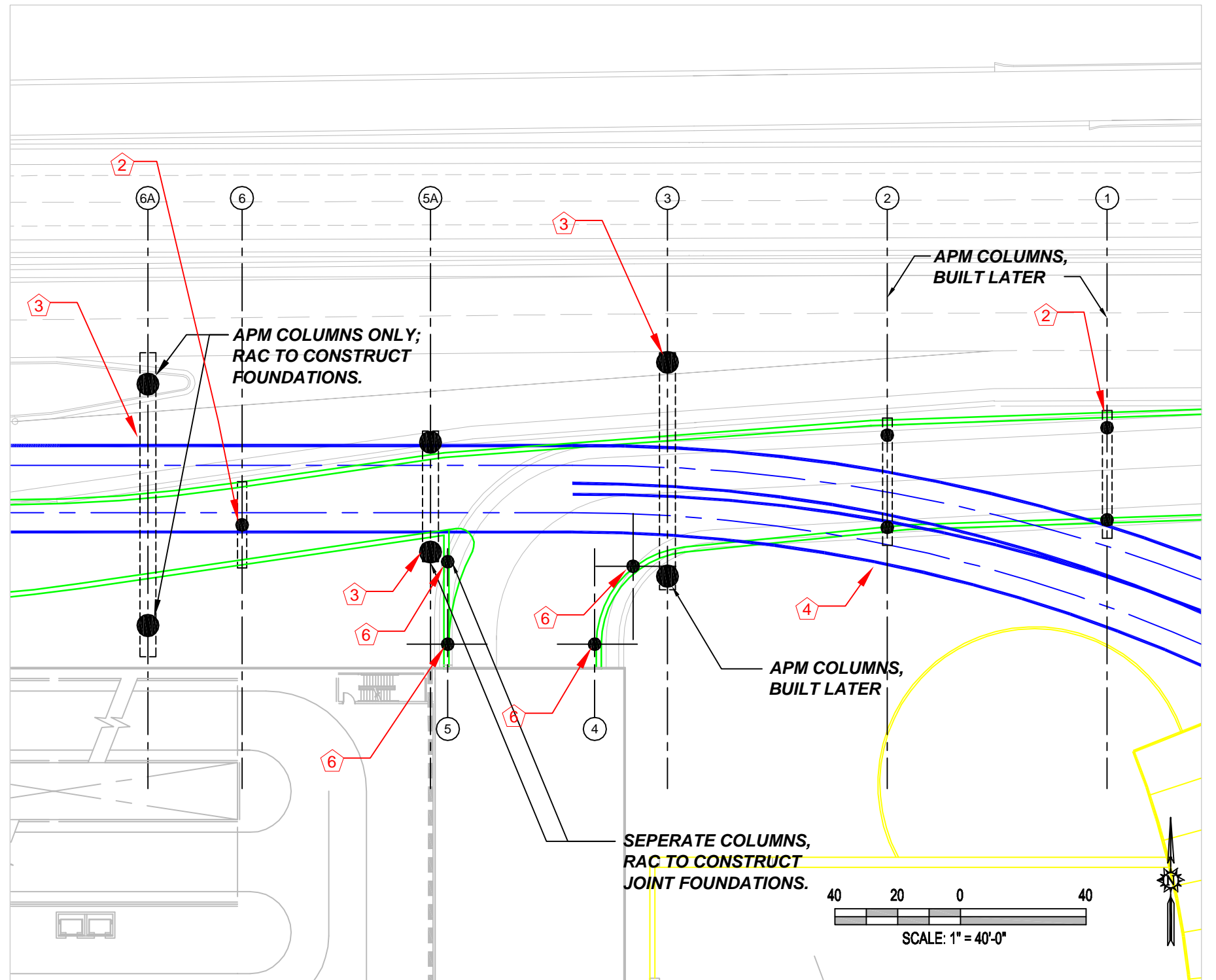


FIGURE 3
 ALTERNATIVE BENT LAYOUT
 (BENT 3 AND 5A)

- KEY NOTES**
- ① BENT DESIGNED TO SUPPORT APM AND BUSWAY LOADS
 - ② BENT DESIGNED TO SUPPORT BUSWAY LOADS ONLY
 - ③ BENT DESIGNED TO SUPPORT APM LOADS ONLY
 - ④ APM GUIDEWAY
 - ⑤ ELEVATED BUSWAY
 - ⑥ PROPOSED PEDESTRIAN OVERPASS
 - ⑦ ESCALATOR FROM SECOND TO THIRD LEVEL

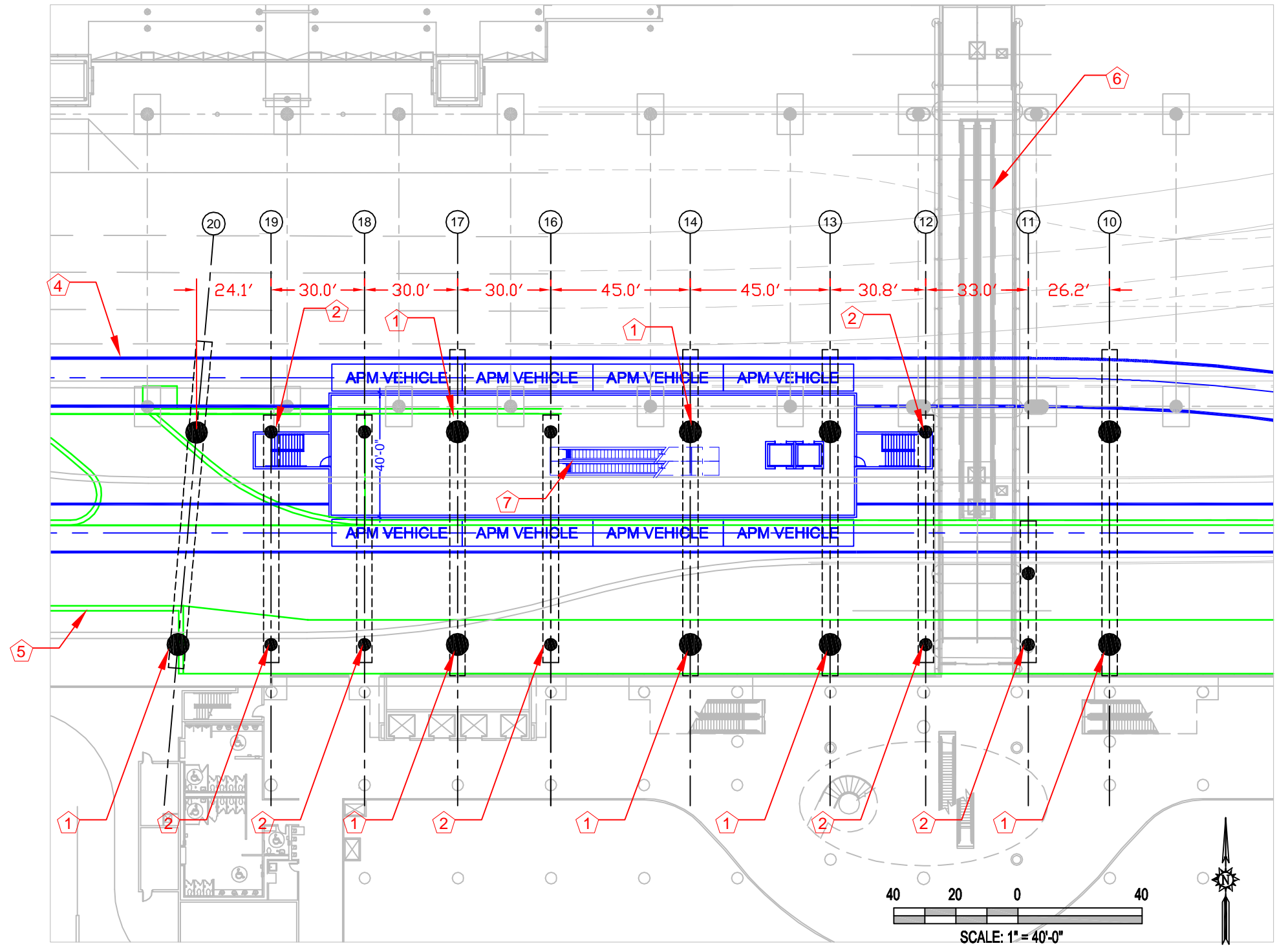
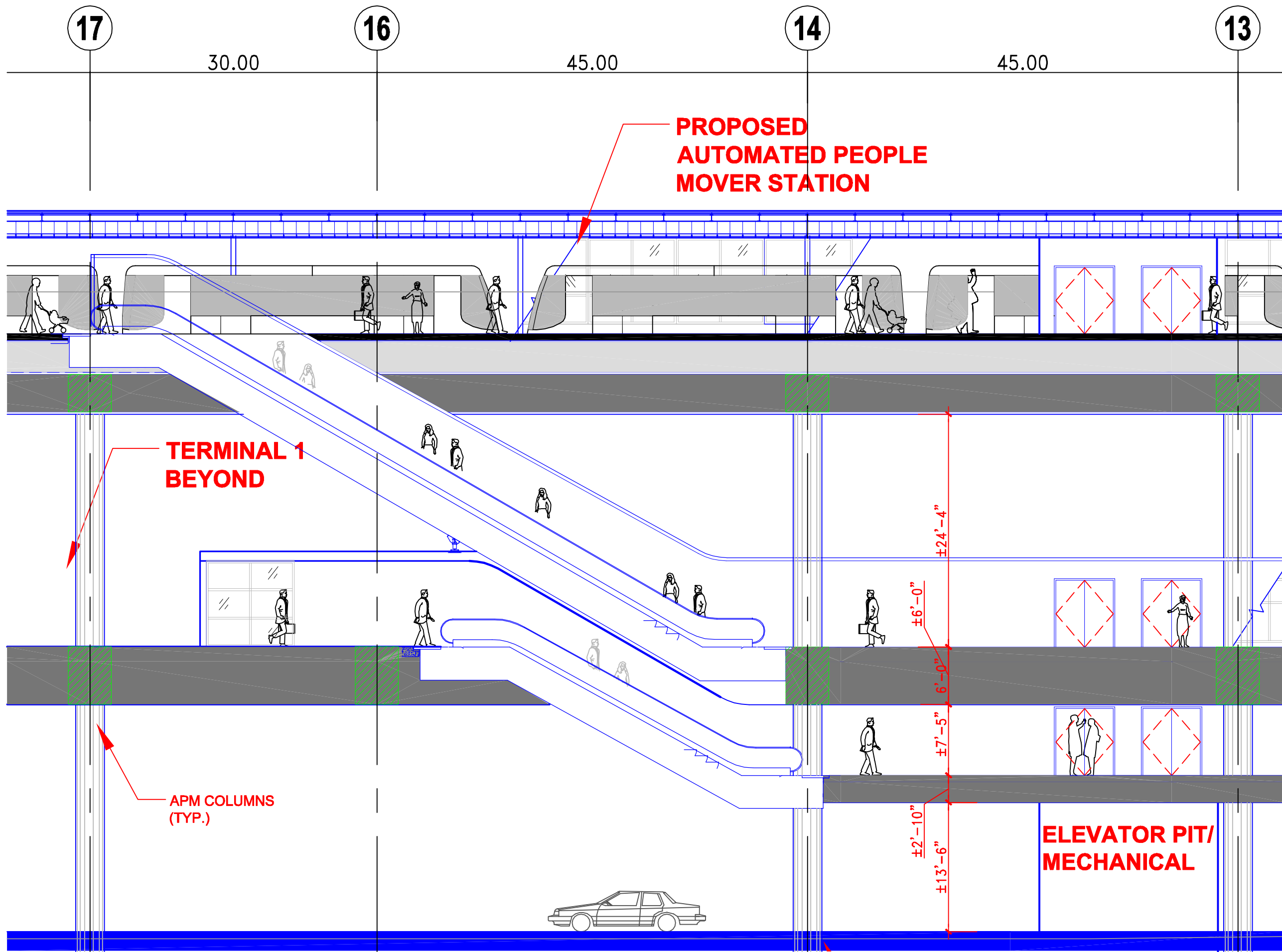


FIGURE 4
 ALTERNATIVE BENT LAYOUT
 (BENT 14 AND 15)



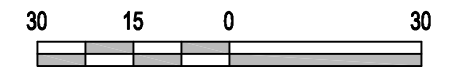
L.A.S.

1" = 30'-0"

OCT. 1, 2002

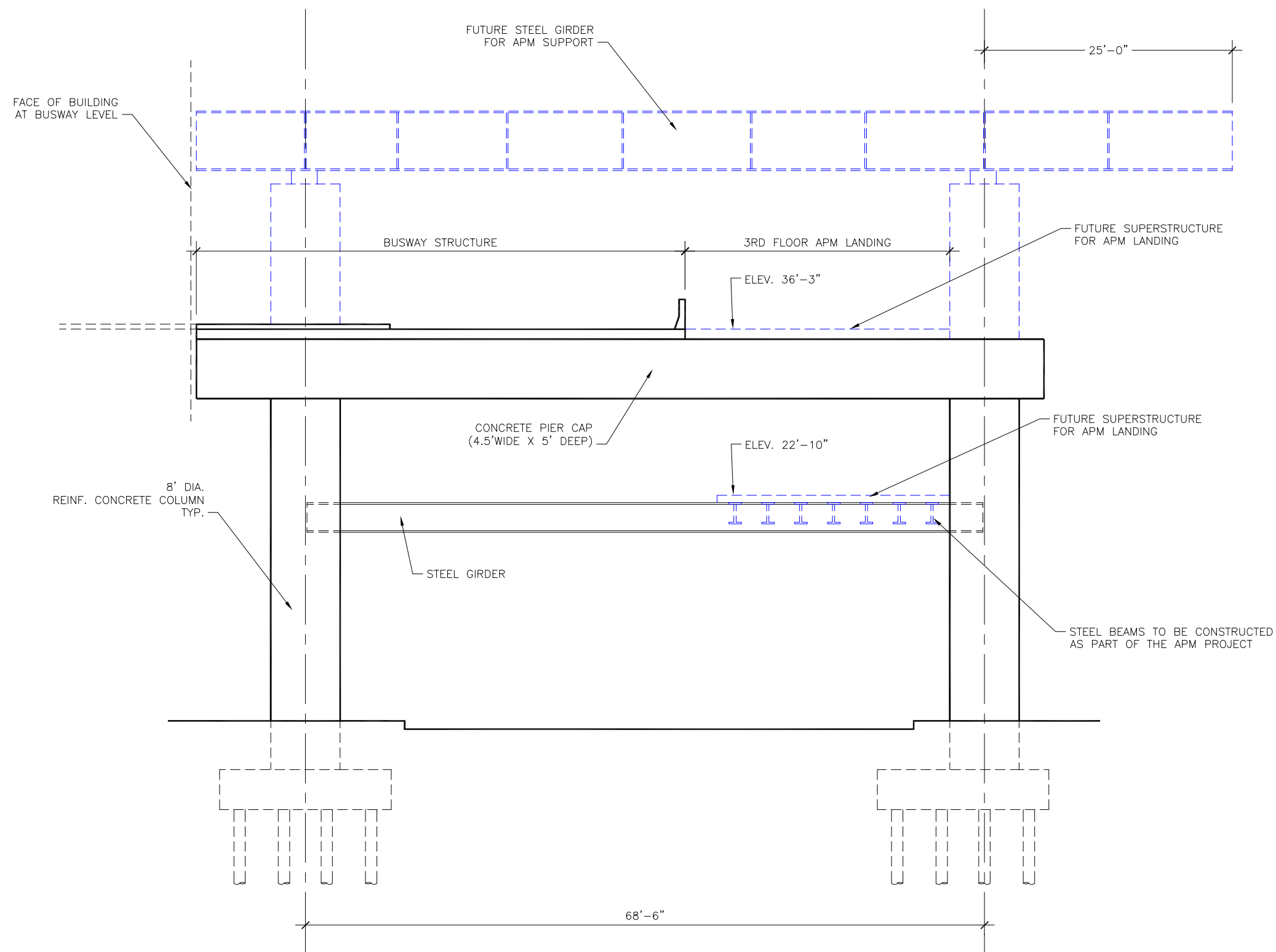
FIGURE 4A

LOGITUDINAL SECTION
FUTURE ESCALATOR
PENETRATIONS



SCALE: 1" = 30'-0"





LEGEND

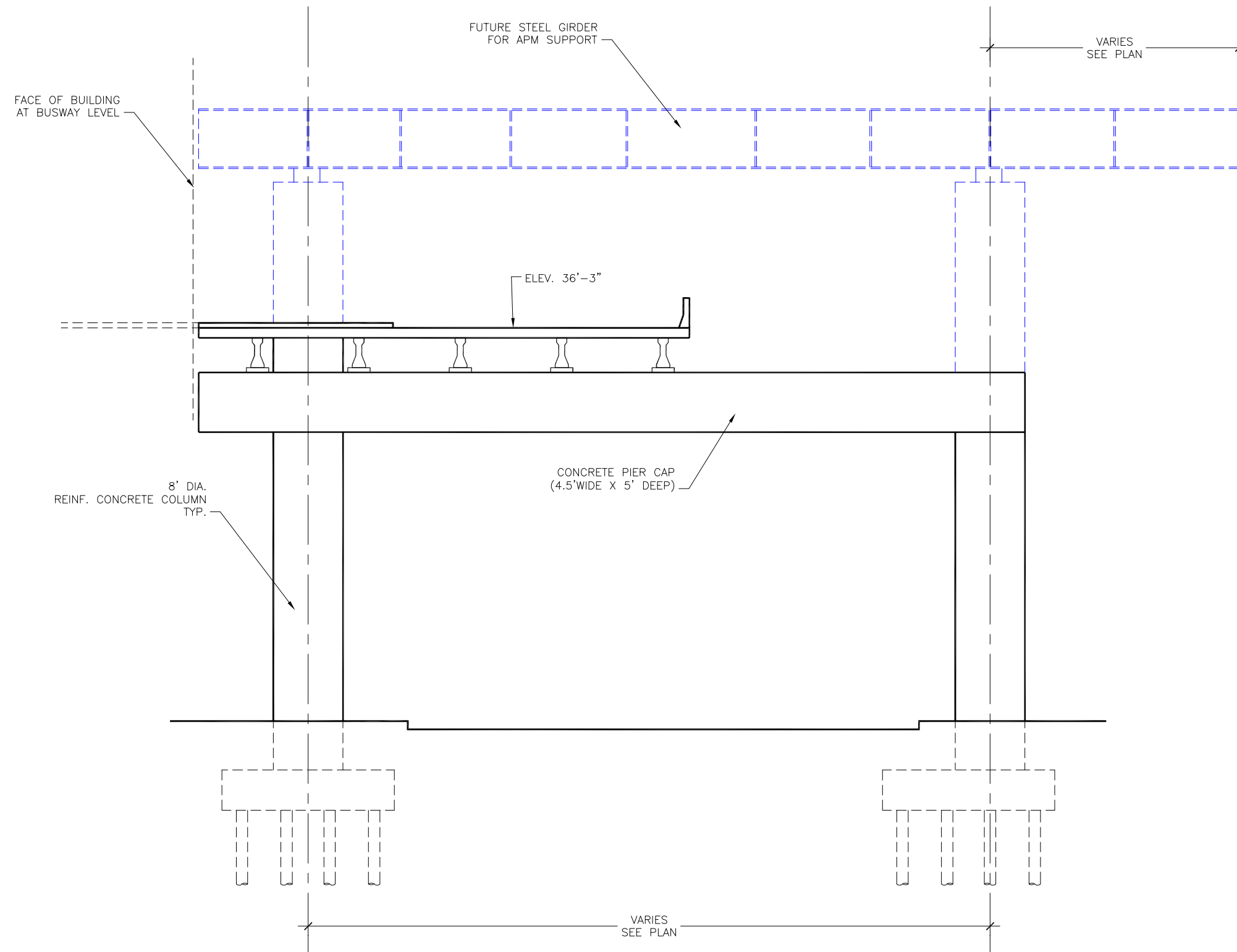


-ITEMS TO BE COMPLETED AS PART OF THE FUTURE APM CONSTRUCTION PROJECT



-ITEMS TO BE COMPLETED AS PART OF THE BUSWAY CONSTRUCTION PROJECT

FIGURE 5
TYPE "A" BENT
TYPICAL BENT SUPPORTING BUSWAY
AND FUTURE APM AT TERMINAL NUMBER 1
(BENT 13, 16 AND 18)



LEGEND



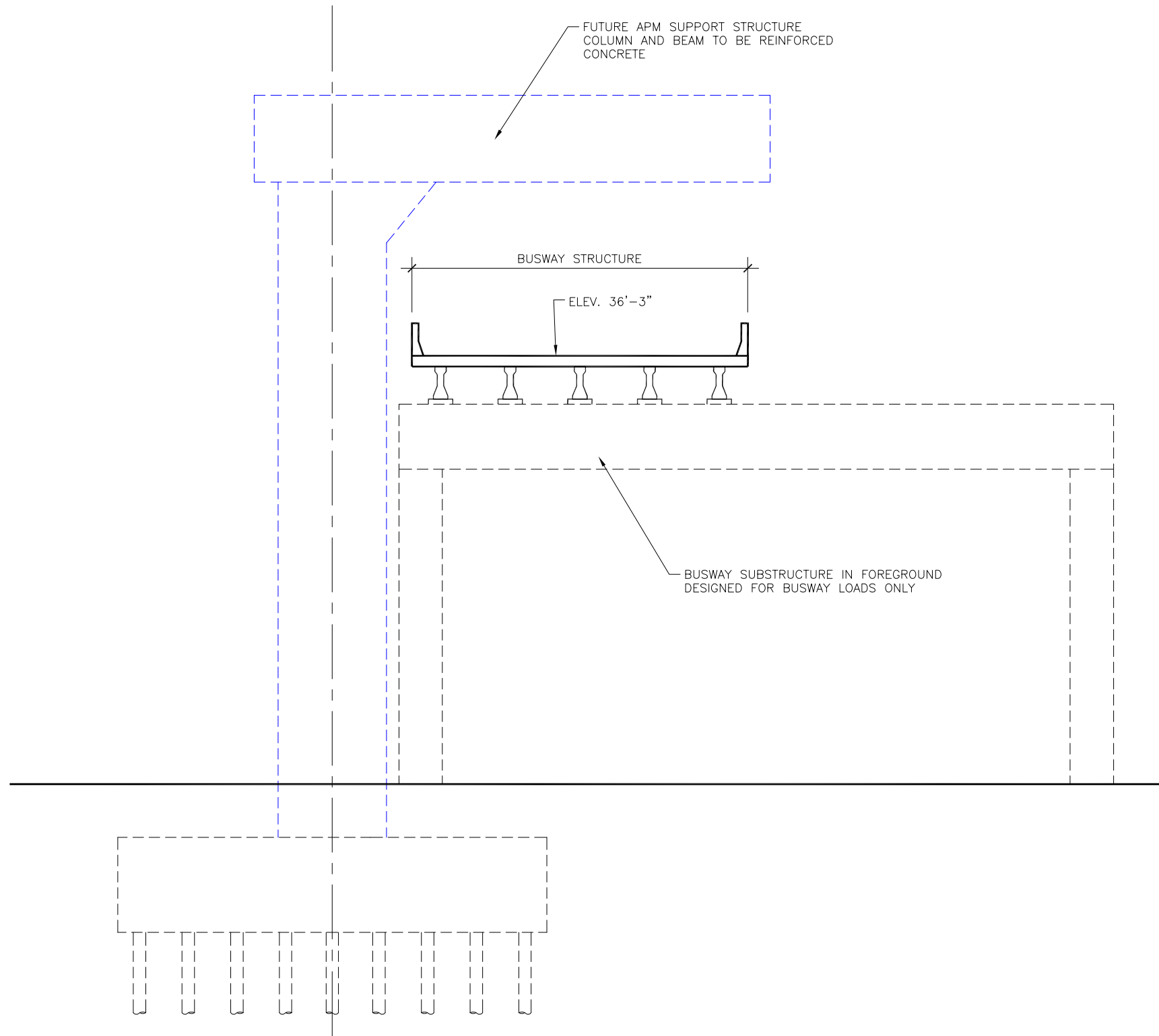
-  -ITEMS TO BE COMPLETED AS PART OF THE FUTURE APM CONSTRUCTION PROJECT
-  -ITEMS TO BE COMPLETED AS PART OF THE BUSWAY CONSTRUCTION PROJECT

FIGURE 6
TYPE "B" BENT
TYPICAL BENT SUPPORTING
BUSWAY AND FUTURE APM
(BENT 6A THROUGH 10 AND 20 THROUGH 23)



LEGEND

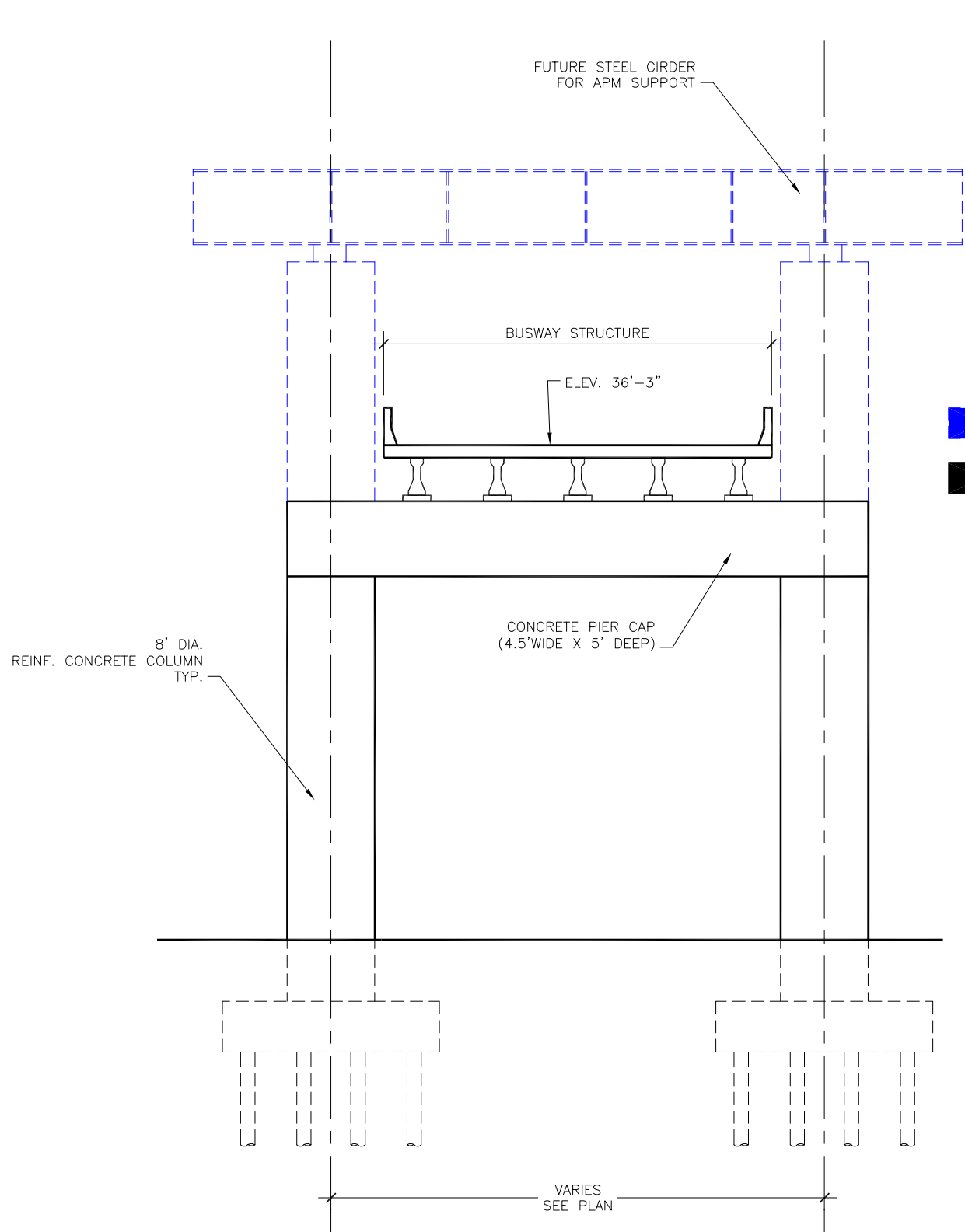


-ITEMS TO BE COMPLETED AS PART OF THE FUTURE APM CONSTRUCTION PROJECT

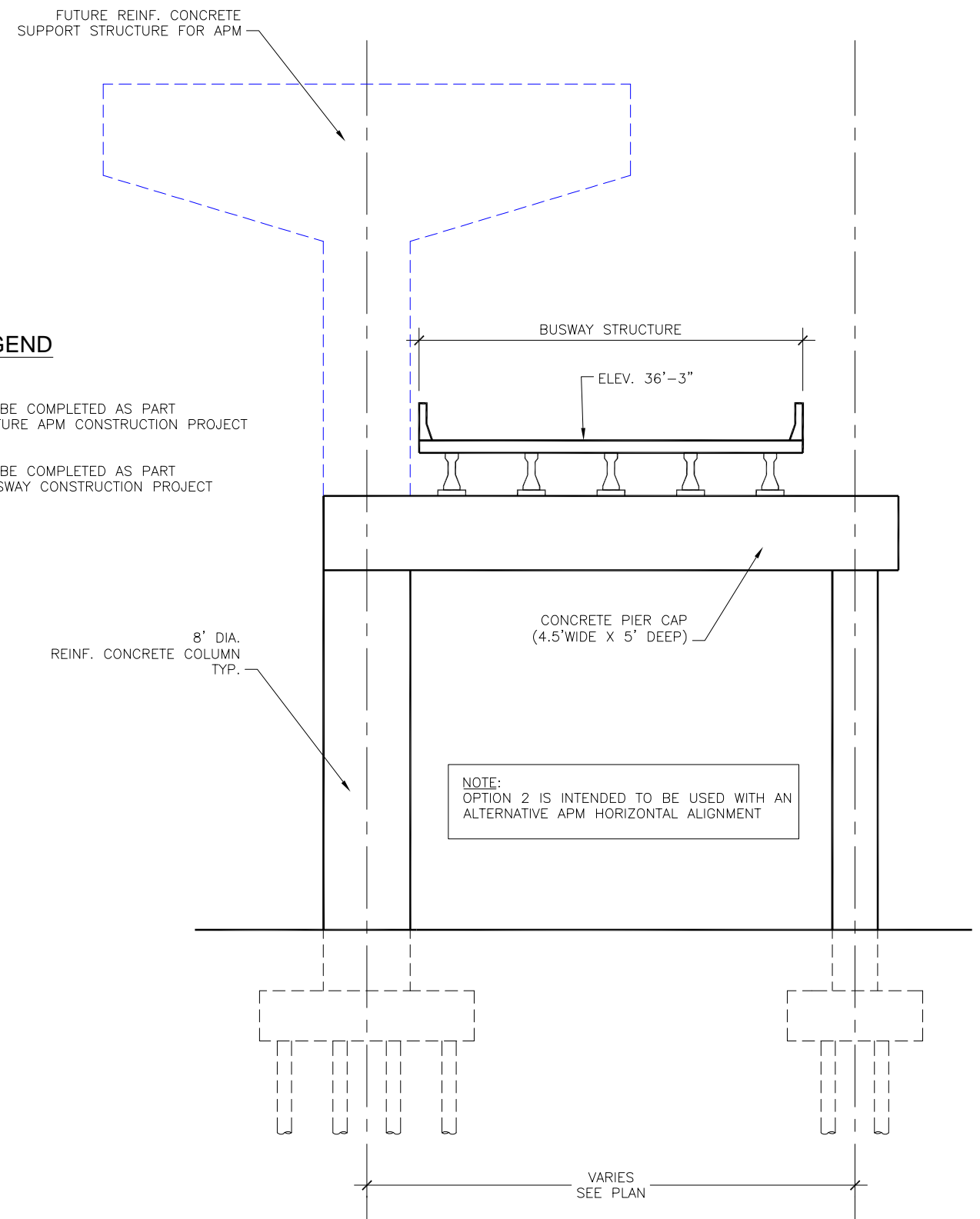


-ITEMS TO BE COMPLETED AS PART OF THE BUSWAY CONSTRUCTION PROJECT

FIGURE 7
TYPE "C" BENT
TYPICAL BENT SUPPORTING
FUTURE APM ONLY
(BENT 5A)



OPTION 1



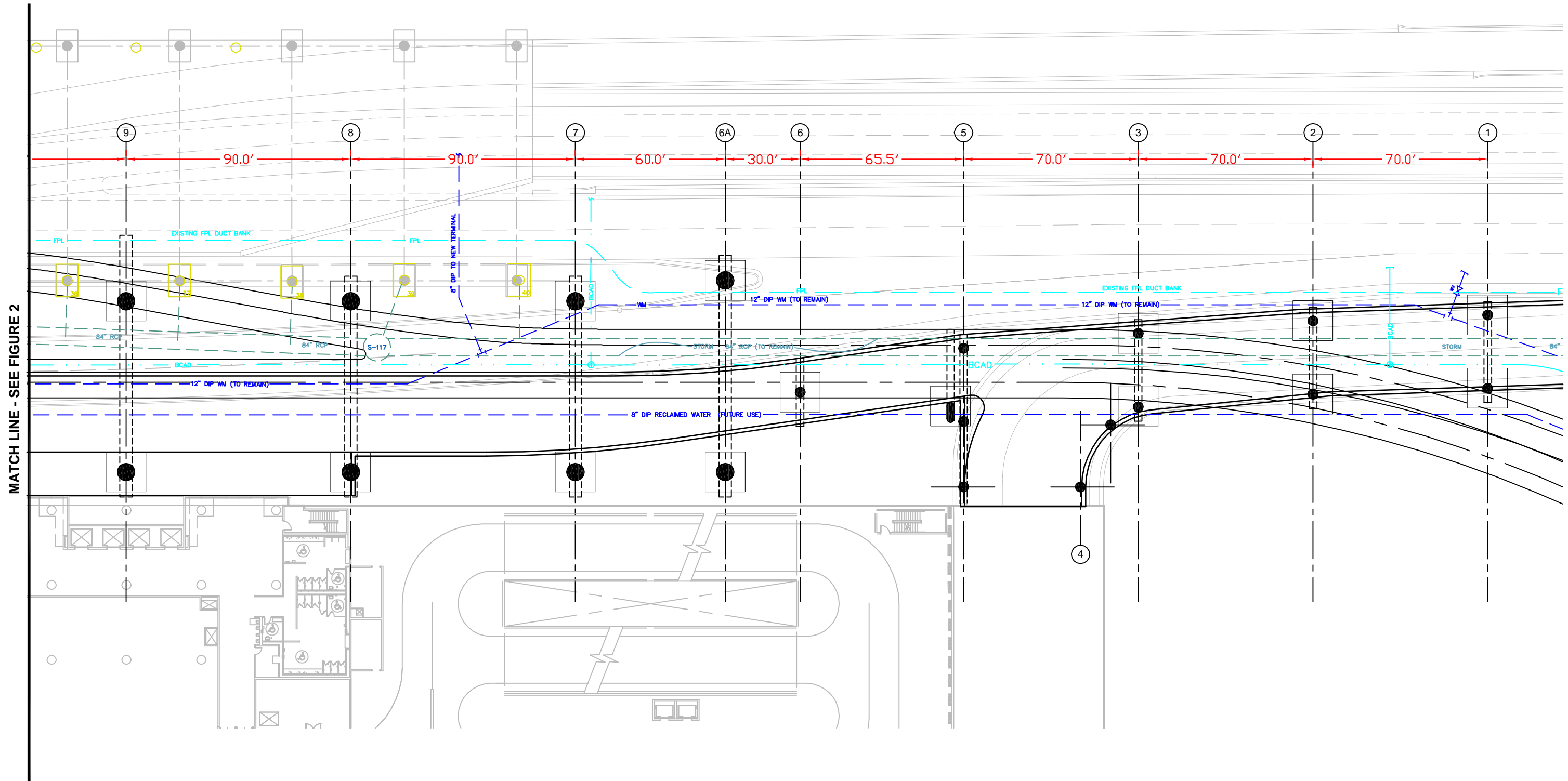
OPTION 2

LEGEND



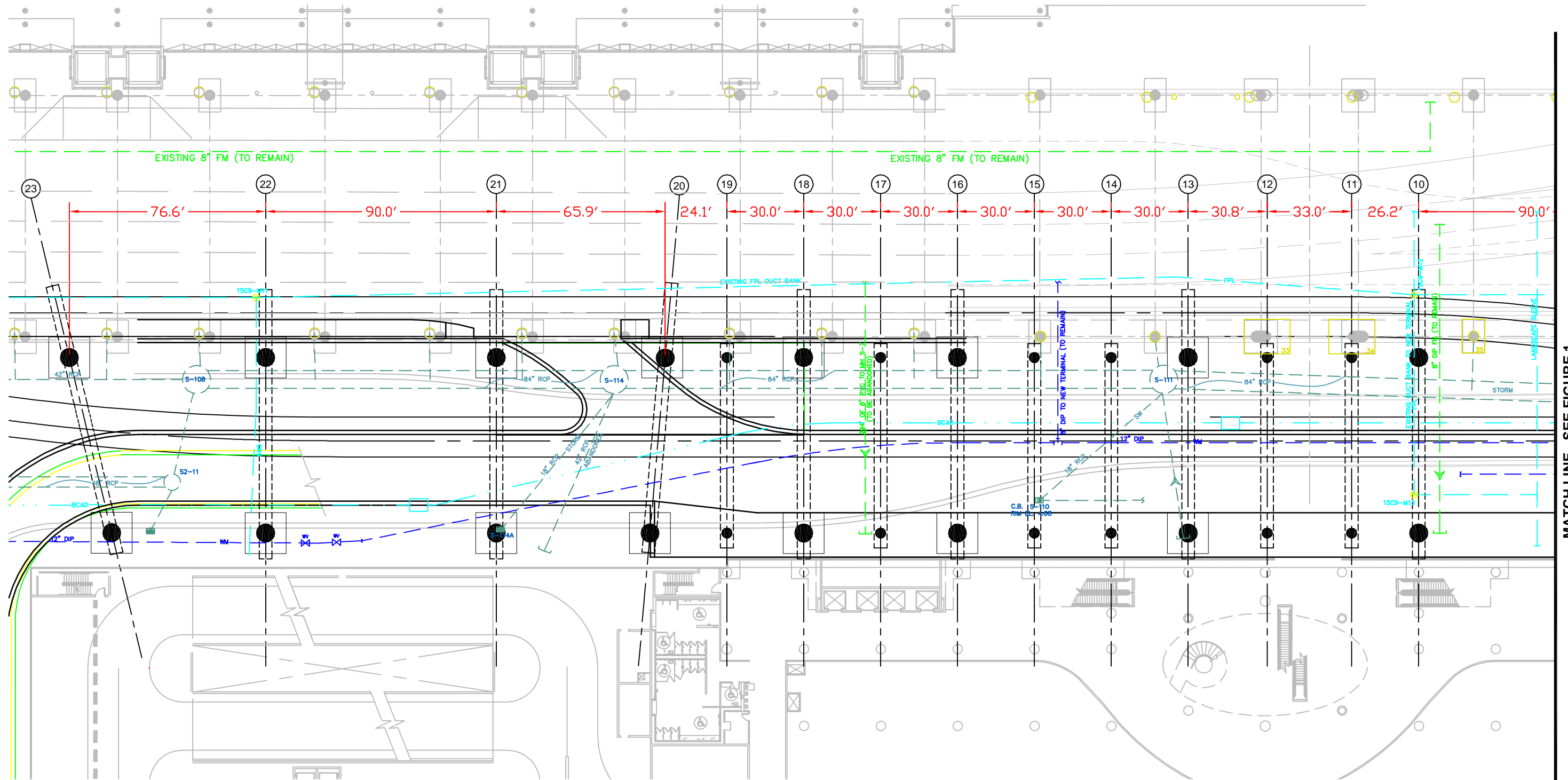
- ITEMS TO BE COMPLETED AS PART OF THE FUTURE APM CONSTRUCTION PROJECT
- ITEMS TO BE COMPLETED AS PART OF THE BUSWAY CONSTRUCTION PROJECT

FIGURE 8
 TYPE "D" BENT
 SUGGESTED BENT TYPE SUPPORTING
 BUSWAY AND FUTURE APM
 (BENT 3 AND 5)



MATCH LINE - SEE FIGURE 2

FIGURE 9
 UTILITY COORDINATION IN RAC AREA
 FOR LAYOUT PROPOSED BY EAC CONSULTANTS
 (BENT 1 THROUGH 9)



MATCH LINE - SEE FIGURE 1

FIGURE 10
 UTILITY COORDINATION IN RAC AREA
 FOR LAYOUT PROPOSED BY EAC CONSULTANTS
 (BENT 10 THROUGH 23)

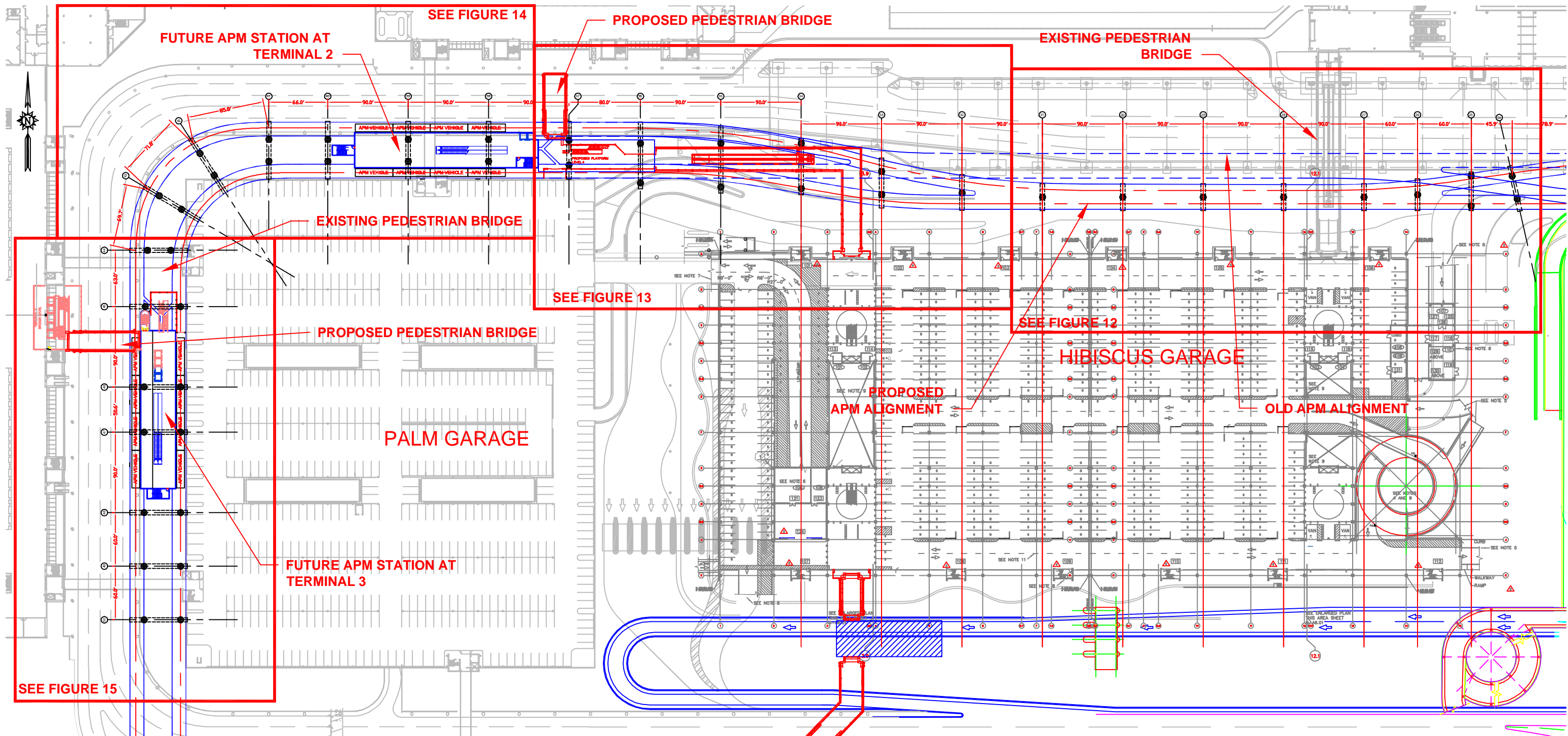
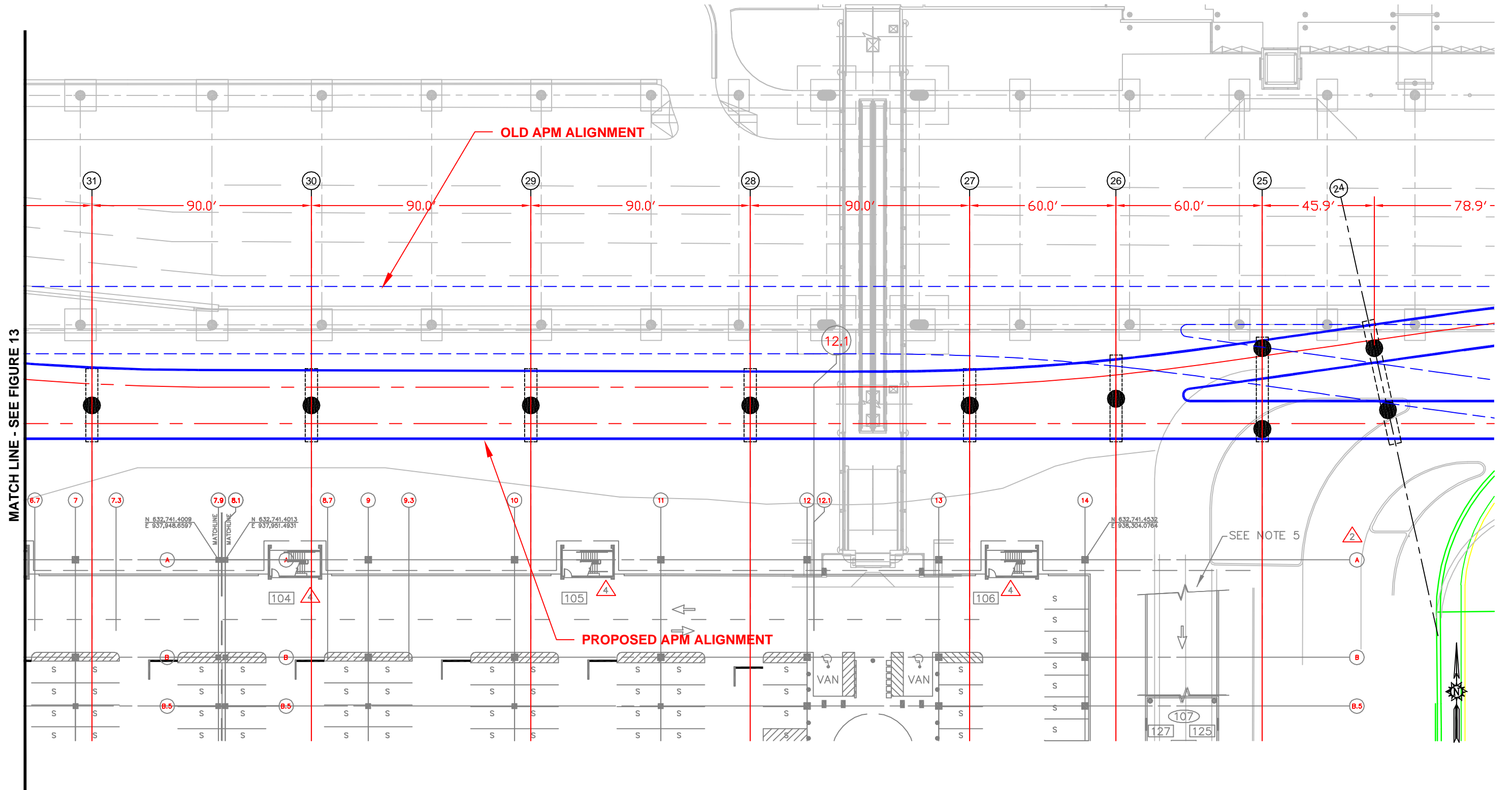


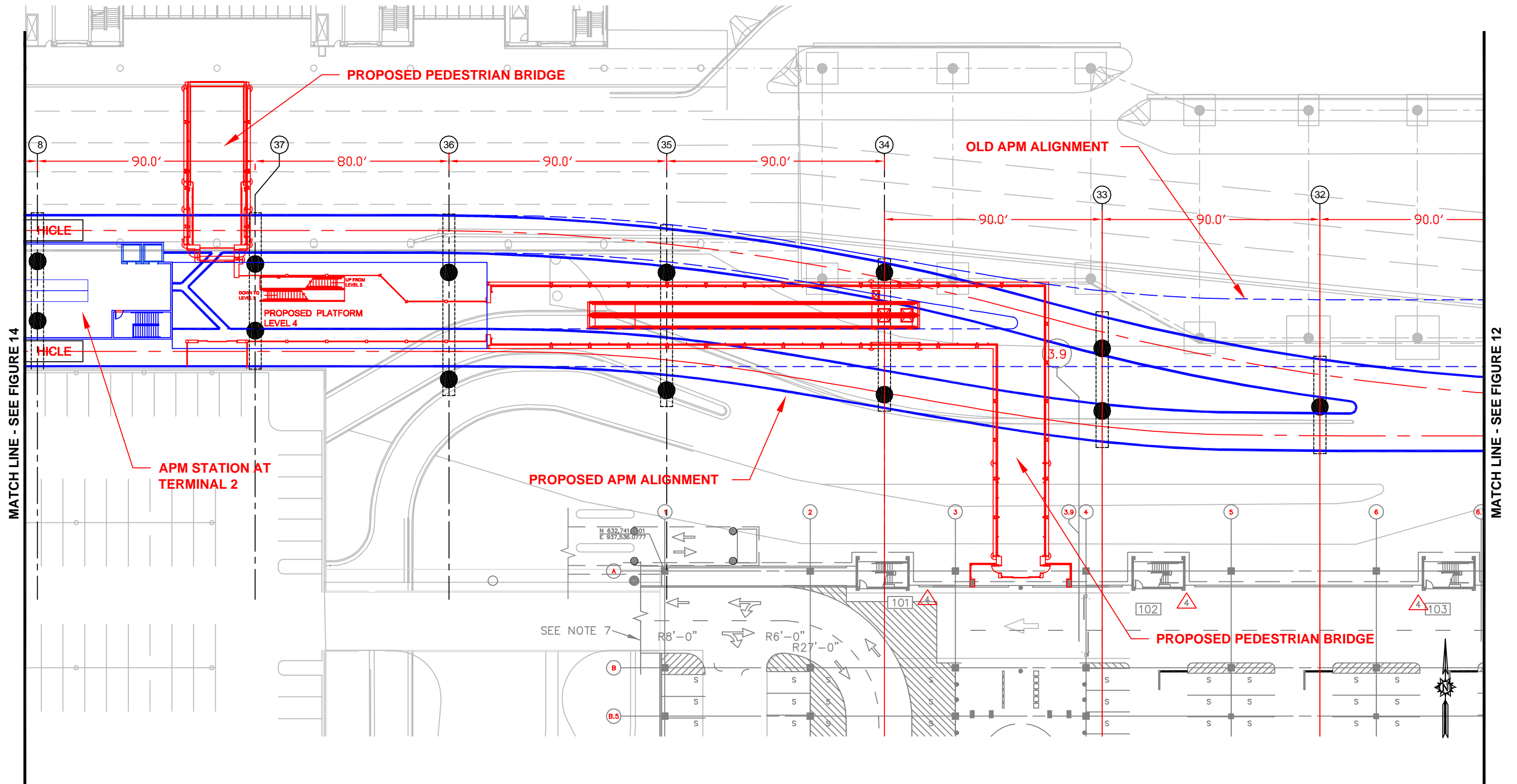
FIGURE 11
 PROPOSED BENT LAYOUT FROM WEST OF RAC
 TO JUST SOUTH OF TERMINAL 3
 (BENT 24 THROUGH 50)



MATCH LINE - SEE FIGURE 13

FIGURE 12

PROPOSED BENT LAYOUT FROM WEST OF RAC
TO JUST SOUTH OF TERMINAL 3
(BENT 24 THROUGH 31)



MATCH LINE - SEE FIGURE 14

MATCH LINE - SEE FIGURE 12

FIGURE 13

PROPOSED BENT LAYOUT FROM WEST OF RAC
TO JUST SOUTH OF TERMINAL 3
(BENT 32 THROUGH 37)

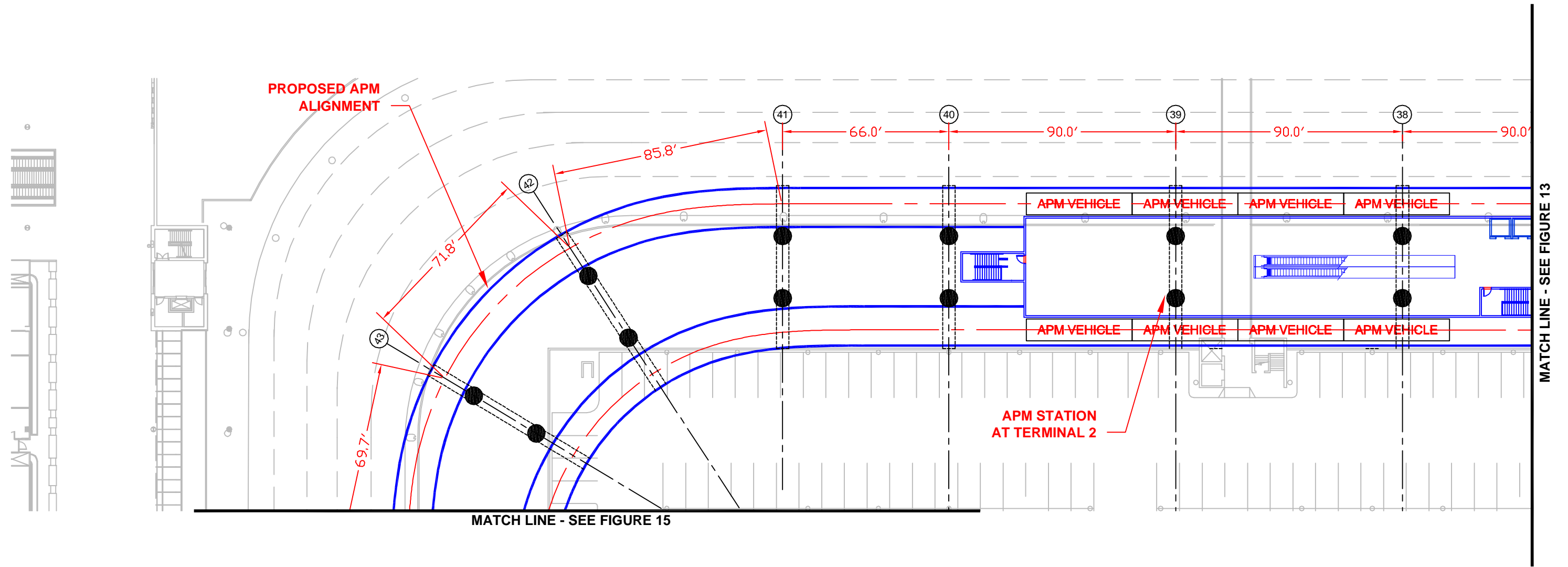


FIGURE 14
 PROPOSED BENT LAYOUT FROM WEST OF RAC
 TO JUST SOUTH OF TERMINAL 3
 (BENT 38 THROUGH 43)

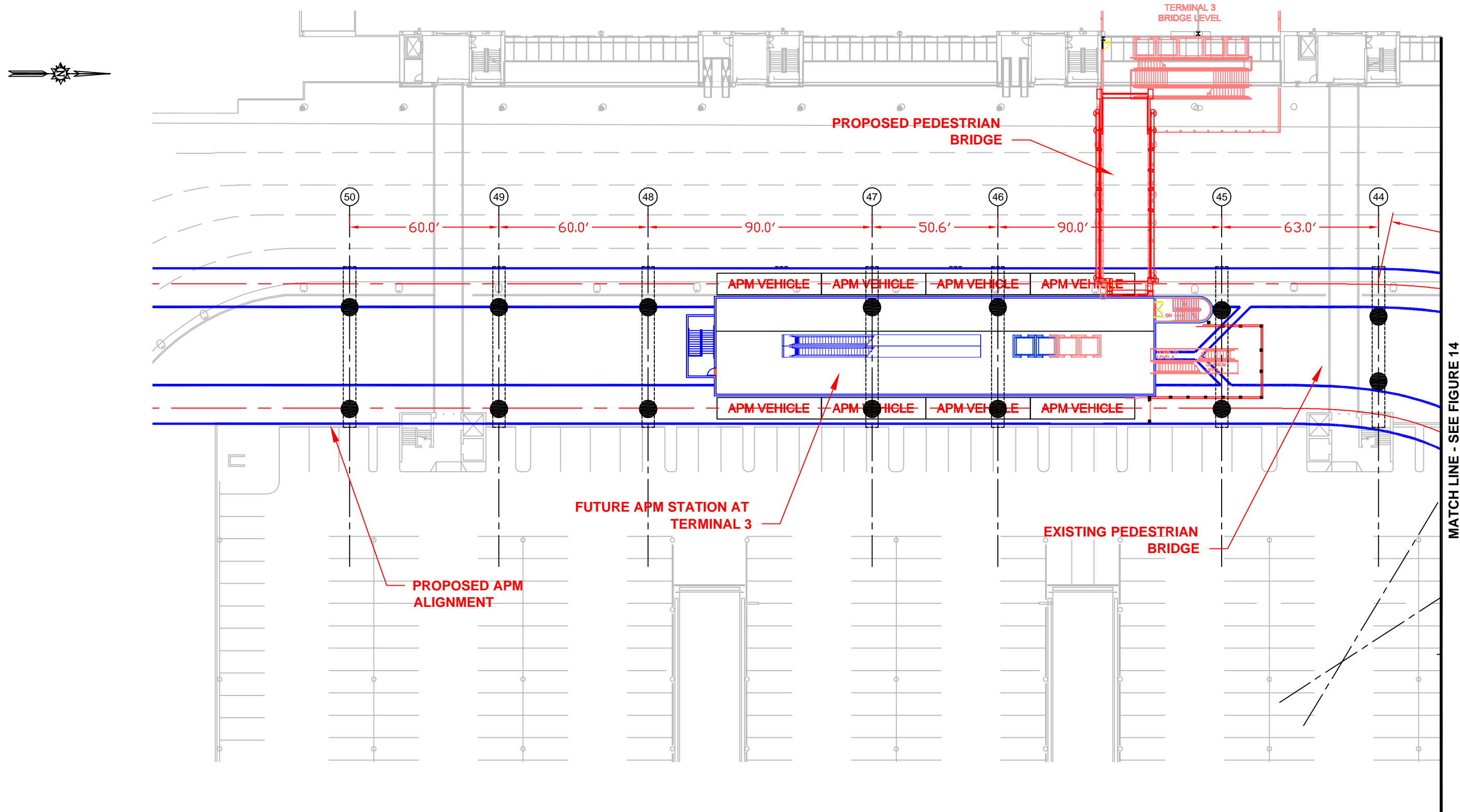
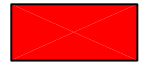


FIGURE 15
 PROPOSED BENT LAYOUT FROM WEST OF RAC
 TO JUST SOUTH OF TERMINAL 3
 (BENT 44 THROUGH 50)

LEGEND



-ITEMS TO BE COMPLETED AS PART OF THE FUTURE APM CONSTRUCTION PROJECT



-ITEMS TO BE COMPLETED AS PART OF THE PEDESTRIAN BRIDGE PROJECT

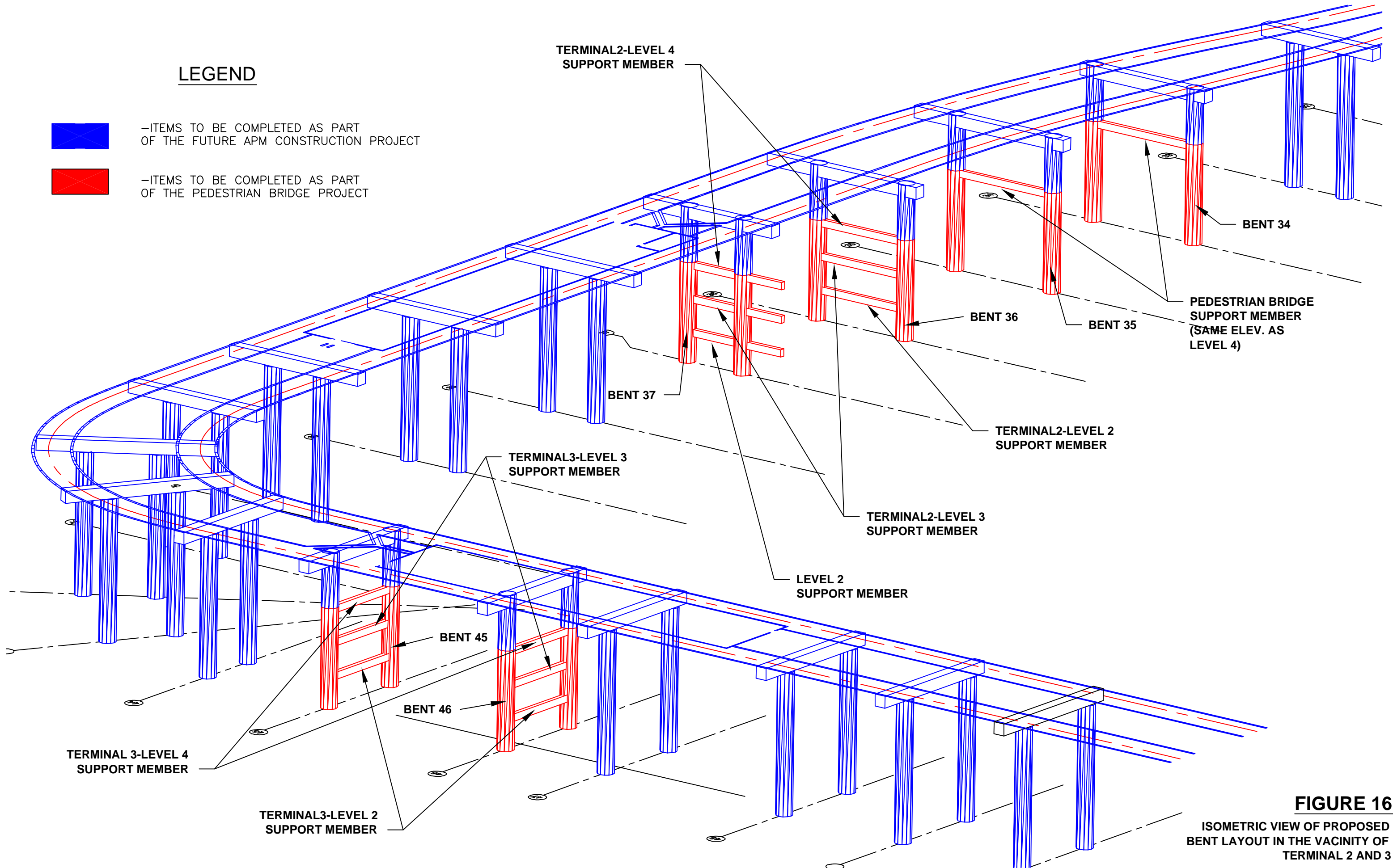


FIGURE 16

ISOMETRIC VIEW OF PROPOSED BENT LAYOUT IN THE VICINITY OF TERMINAL 2 AND 3

STAAD Report

Bent Type "A"

Job Information

Structure Type	SPACE FRAME
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Number of Nodes	15	Highest Node	15
Number of Elements	17	Highest Beam	17

Number of Basic Load Cases	6
Number of Combination Load Cases	8

Included in this printout are data for:

All	The Whole Structure
------------	---------------------

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	SELF WEIGHT
Primary	2	DL
Primary	3	LL
Primary	4	WIND ON STRUCTURE
Primary	5	WIND LOAD ON LIVE LOAD
Primary	6	LONGITUDINAL FORCE
Combination	7	I
Combination	8	I-A
Combination	9	II
Combination	10	II-A
Combination	11	III
Combination	12	III-A
Combination	13	III-B
Combination	14	III-C

Nodes

Node	X (ft)	Y (ft)	Z (ft)
1	0.000	0.000	0.000
2	0.000	32.500	0.000
3	76.000	0.000	0.000
4	76.000	32.500	0.000
5	0.000	54.500	0.000
6	76.000	54.500	0.000
7	-25.000	54.500	0.000
8	-4.000	54.500	0.000
9	16.000	54.500	0.000
10	-4.000	74.500	0.000
11	16.000	74.500	0.000
12	26.000	74.500	0.000
13	-14.000	74.500	0.000
14	0.000	19.500	0.000
15	76.000	19.500	0.000

Beams

Beam	Node A	Node B	Length (ft)	Property	b (degrees)
1	1	14	19.500	3	0
2	3	15	19.500	3	0
3	2	4	76.000	1	0
4	5	9	16.000	1	0
5	4	6	22.000	3	0
6	2	5	22.000	3	0

7	5	8	4.000	1	0
8	8	7	21.000	1	0
9	9	6	60.000	1	0
10	8	10	20.000	2	90
11	13	10	10.000	2	0
12	10	11	20.000	2	0
13	11	12	10.000	2	0
14	9	11	20.000	2	90
15	14	2	13.000	3	0
16	15	4	13.000	3	0
17	14	15	76.000	1	0

Supports

Node	X (lbf/ft)	Y (lbf/ft)	Z (lbf/ft)	rX (kip·ft/deg)	rY (kip·ft/deg)	rZ (kip·ft/deg)
1	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
3	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed

Basic Load Cases

Number	Name
1	SELF WEIGHT
2	DL
3	LL
4	WIND ON STRUCTURE
5	WIND LOAD ON LIVE LOAD
6	LONGITUDINAL FORCE

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
7	I	2	DL	1.00
		3	LL	1.00
		1	SELF WEIGHT	1.00
8	I-A	2	DL	0.67
		3	LL	1.33
		1	SELF WEIGHT	0.67
9	II	2	DL	0.80
		4	WIND ON STRUCTURE	0.80
		1	SELF WEIGHT	0.80
10	II-A	2	DL	0.80
		4	WIND ON STRUCTURE	-0.80
		1	SELF WEIGHT	0.80
11	III	2	DL	0.80
		3	LL	0.80
		6	LONGITUDINAL FORCE	0.80
		4	WIND ON STRUCTURE	0.24
		5	WIND LOAD ON LIVE LOAD	0.80
		1	SELF WEIGHT	0.80
12	III-A	2	DL	0.80
		1	SELF WEIGHT	0.80
		3	LL	0.80
		6	LONGITUDINAL FORCE	-0.80
		4	WIND ON STRUCTURE	0.24
		5	WIND LOAD ON LIVE LOAD	0.80
13	III-B	2	DL	0.80
		1	SELF WEIGHT	0.80
		3	LL	0.80
		6	LONGITUDINAL FORCE	0.80
		4	WIND ON STRUCTURE	-0.24

		5	WIND LOAD ON LIVE LOAD	-0.80
14	III-C	1	SELF WEIGHT	0.80
		2	DL	0.80
		3	LL	0.80
		6	LONGITUDINAL FORCE	-0.80
		4	WIND ON STRUCTURE	-0.24
		5	WIND LOAD ON LIVE LOAD	-0.80

Selfweight : 1 SELF WEIGHT

Direction	Factor
Y	-1.000

Beam Loads : 2 DL

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
3	UNI kips/ft	GY	-12.000	0.000	-	33.000	-
	UNI kips/ft	GY	-13.700	33.000	-	-	-
4	UNI kips/ft	GY	-12.000	0.000	-	-	-
7	UNI kips/ft	GY	-12.000	-	-	-	-
8	UNI kips/ft	GY	-12.000	0.000	-	14.000	-
	CON kip	GY	-228.600	15.000	-	-	-
9	UNI kips/ft	GY	-12.000	0.000	-	10.000	-
	CON kip	GY	-228.600	15.000	-	-	-
11	UNI kips/ft	GY	-6.000	-	-	-	-
12	UNI kips/ft	GY	-6.000	-	-	-	-
13	UNI kips/ft	GY	-6.000	-	-	-	-

Beam Loads : 3 LL

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
3	UNI kips/ft	GY	-6.000	0.000	-	33.000	-
	UNI kips/ft	GY	-6.000	57.000	-	-	-
	CON kip	GY	-171.200	39.000	-	-	-
	CON kip	GY	-171.200	51.000	-	-	-
4	UNI kips/ft	GY	-6.000	0.000	-	-	-
7	UNI kips/ft	GY	-6.000	-	-	-	-
8	UNI kips/ft	GY	-6.000	0.000	-	14.000	-
	CON kip	GY	-171.200	15.000	-	-	-
9	UNI kips/ft	GY	-6.000	0.000	-	10.000	-
	CON kip	GY	-171.200	15.000	-	-	-
11	UNI kips/ft	GY	-1.800	-	-	-	-
12	UNI kips/ft	GY	-1.800	-	-	-	-
13	UNI kips/ft	GY	-1.800	-	-	-	-

Node Loads : 4 WIND ON STRUCTURE

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip`ft)	MY (kip`ft)	MZ (kip`ft)
2	-	-	-8.640	-	-	-
	34.460	-	-	-	-	-
5	-	-	-8.640	-	-	-
7	34.460	-	-	-	-	-
8	-	-	-5.900	-	-	-
	23.620	-	-	-	-	-

Beam Loads : 4 WIND ON STRUCTURE

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
1	UNI kips/ft	GZ	-0.240	-	-	-	-
	UNI kips/ft	GX	0.240	-	-	-	-
2	UNI kips/ft	GZ	-0.240	-	-	-	-
	UNI kips/ft	GX	0.240	-	-	-	-
3	UNI kips/ft	GZ	-0.270	-	-	-	-
4	UNI kips/ft	GZ	-0.270	-	-	-	-
5	UNI kips/ft	GZ	-0.240	-	-	-	-
	UNI kips/ft	GX	0.240	-	-	-	-
6	UNI kips/ft	GZ	-0.240	-	-	-	-
	UNI kips/ft	GX	0.240	-	-	-	-
9	UNI kips/ft	GZ	-0.270	-	-	-	-
15	UNI kips/ft	GZ	-0.240	-	-	-	-
	UNI kips/ft	GX	0.240	-	-	-	-
16	UNI kips/ft	GZ	-0.240	-	-	-	-
	UNI kips/ft	GX	0.240	-	-	-	-
17	UNI kips/ft	GZ	-0.270	-	-	-	-

Beam Loads : 5 WIND LOAD ON LIVE LOAD

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
3	CMO kip-ft	GZ	-82.080	43.000	-	-	-
	CMO kip-ft	GX	-34.200	43.000	-	-	-
9	CMO kip-ft	GZ	-82.080	15.000	-	-	-
	CMO kip-ft	GX	-34.200	15.000	-	-	-

Beam Loads : 6 LONGITUDINAL FORCE

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
3	CMO kip-ft	GX	-30.400	39.000	-	-	-
	CMO kip-ft	GX	-30.400	51.000	-	-	-
8	CMO kip-ft	GX	-102.600	15.000	-	-	-
9	CMO kip-ft	GX	-102.600	15.000	-	-	-

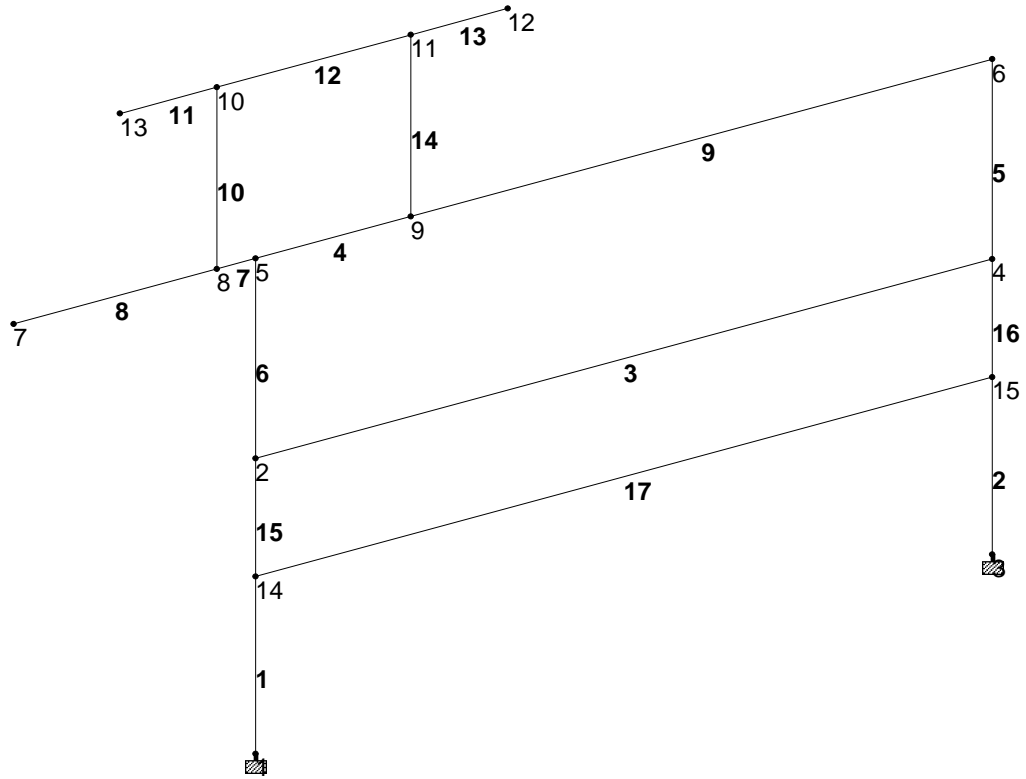
Reactions

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
1	1:SELF WEIGHT	15.910	352.150	0.000	0.000	0.000	-104.799
	2:DL	-8.103	1.62E 3	0.000	0.000	0.000	-36.882
	3:LL	-5.920	940.205	0.000	0.000	0.000	-28.007
	4:WIND ON	-59.051	-47.999	64.803	2.39E 3	-97.066	673.640
	5:WIND LOAD ON	0.004	-2.168	-0.006	34.618	0.233	-0.247
	6:LONGITUDINAL	0.000	0.000	-0.333	165.214	12.656	0.000
	7:I	1.887	2.91E 3	0.000	0.000	0.000	-169.688
	8:I-A	-2.643	2.57E 3	0.000	0.000	0.000	-132.175
	9:II	-40.995	1.54E 3	51.843	1.91E 3	-77.653	425.567
	10:II-A	53.486	1.61E 3	-51.843	-1.91E 3	77.653	-652.256
	11:III	-12.659	2.32E 3	15.281	733.066	-12.985	25.725
	12:III-A	-12.659	2.32E 3	15.814	468.723	-33.234	25.725
	13:III-B	15.679	2.34E 3	-15.814	-468.723	33.234	-297.226
	14:III-C	15.679	2.34E 3	-15.281	-733.066	12.985	-297.226
3	1:SELF WEIGHT	-15.910	303.789	0.000	0.000	0.000	102.036
	2:DL	8.103	591.965	0.000	0.000	0.000	-17.281
	3:LL	5.920	392.595	0.000	0.000	0.000	-10.781
	4:WIND ON	-59.649	47.999	46.097	1.58E 3	290.664	676.578

	5:WIND LOAD ON	-0.004	2.168	0.006	33.782	0.233	-0.323
	6:LONGITUDINAL	0.000	0.000	0.333	100.786	12.655	0.000
	7:I	-1.887	1.29E 3	0.000	0.000	0.000	73.975
	8:I-A	2.643	1.12E 3	0.000	0.000	0.000	42.448
	9:II	-53.965	755.003	36.877	1.27E 3	232.531	609.067
	10:II-A	41.474	678.204	-36.877	-1.27E 3	-232.531	-473.458
	11:III	-15.829	1.04E 3	11.335	487.607	80.070	221.300
	12:III-A	-15.829	1.04E 3	10.802	326.350	59.821	221.300
	13:III-B	12.809	1.02E 3	-10.802	-326.350	-59.821	-102.941
	14:III-C	12.809	1.02E 3	-11.335	-487.607	-80.070	-102.941

Reaction Summary

			Horizontal	Vertical	Horizontal	Moment		
	Node	L/C	FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
Max FX	1	10:II-A	53.486	1.61E 3	-51.843	-1.91E 3	77.653	-652.256
Min FX	3	4:WIND ON	-59.649	47.999	46.097	1.58E 3	290.664	676.578
Max FY	1	7:I	1.887	2.91E 3	0.000	0.000	0.000	-169.688
Min FY	1	4:WIND ON	-59.051	-47.999	64.803	2.39E 3	-97.066	673.640
Max FZ	1	4:WIND ON	-59.051	-47.999	64.803	2.39E 3	-97.066	673.640
Min FZ	1	10:II-A	53.486	1.61E 3	-51.843	-1.91E 3	77.653	-652.256
Max MX	1	4:WIND ON	-59.051	-47.999	64.803	2.39E 3	-97.066	673.640
Min MX	1	10:II-A	53.486	1.61E 3	-51.843	-1.91E 3	77.653	-652.256
Max MY	3	4:WIND ON	-59.649	47.999	46.097	1.58E 3	290.664	676.578
Min MY	3	10:II-A	41.474	678.204	-36.877	-1.27E 3	-232.531	-473.458
Max MZ	3	4:WIND ON	-59.649	47.999	46.097	1.58E 3	290.664	676.578
Min MZ	1	10:II-A	53.486	1.61E 3	-51.843	-1.91E 3	77.653	-652.256



Whole Structure

Bent Type "B"

Job Information

Structure Type	SPACE FRAME
-----------------------	-------------

Number of Nodes	7	Highest Node	7
Number of Elements	7	Highest Beam	7

Number of Basic Load Cases	6
Number of Combination Load Cases	8

Included in this printout are data for:

All	The Whole Structure
------------	---------------------

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	SELF WEIGHT
Primary	2	DL
Primary	3	LL
Primary	4	WIND ON STRUCTURE
Primary	5	WIND LOAD ON LIVE LOAD
Primary	6	LONGITUDINAL FORCE
Combination	7	I
Combination	8	I-A
Combination	9	II
Combination	10	II-A
Combination	11	III
Combination	12	III-A
Combination	13	III-B
Combination	14	III-C

Nodes

Node	X (ft)	Y (ft)	Z (ft)
1	0.000	0.000	0.000
2	0.000	32.500	0.000
3	76.000	0.000	0.000
4	76.000	32.500	0.000
5	0.000	54.500	0.000
6	76.000	54.500	0.000
7	-25.000	54.500	0.000

Beams

Beam	Node A	Node B	Length (ft)	Property	b (degrees)
1	1	2	32.500	3	0
2	3	4	32.500	3	0
3	2	4	76.000	1	0
4	5	6	76.000	2	0
5	4	6	22.000	3	0
6	2	5	22.000	3	0
7	5	7	25.000	2	0

Supports

Node	X (lbf/ft)	Y (lbf/ft)	Z (lbf/ft)	rX (kip·ft/deg)	rY (kip·ft/deg)	rZ (kip·ft/deg)
------	---------------	---------------	---------------	--------------------	--------------------	--------------------

1	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
3	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed

Basic Load Cases

Number	Name
1	SELF WEIGHT
2	DL
3	LL
4	WIND ON STRUCTURE
5	WIND LOAD ON LIVE LOAD
6	LONGITUDINAL FORCE

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
7	I	2	DL	1.00
		3	LL	1.00
		1	SELF WEIGHT	1.00
8	I-A	2	DL	0.67
		3	LL	1.33
		1	SELF WEIGHT	0.67
9	II	2	DL	0.80
		4	WIND ON STRUCTURE	0.80
		1	SELF WEIGHT	0.80
10	II-A	2	DL	0.80
		4	WIND ON STRUCTURE	-0.80
		1	SELF WEIGHT	0.80

11	III	2	DL	0.80
		3	LL	0.80
		6	LONGITUDINAL FORCE	0.80
		4	WIND ON STRUCTURE	0.24
		5	WIND LOAD ON LIVE LOAD	0.80
		1	SELF WEIGHT	0.80
12	III-A	2	DL	0.80
		1	SELF WEIGHT	0.80
		3	LL	0.80
		6	LONGITUDINAL FORCE	-0.80
		4	WIND ON STRUCTURE	0.24
		5	WIND LOAD ON LIVE LOAD	0.80
13	III-B	2	DL	0.80
		1	SELF WEIGHT	0.80
		3	LL	0.80
		6	LONGITUDINAL FORCE	0.80
		4	WIND ON STRUCTURE	-0.24
		5	WIND LOAD ON LIVE LOAD	-0.80
14	III-C	1	SELF WEIGHT	0.80
		2	DL	0.80
		3	LL	0.80
		6	LONGITUDINAL FORCE	-0.80
		4	WIND ON STRUCTURE	-0.24
		5	WIND LOAD ON LIVE LOAD	-0.80

Selfweight : 1 SELF WEIGHT

Direction	Factor
Y	-1.000

Beam Loads : 2 DL

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
4	CON kip	GY	-411.000	31.000	-	-	-
7	CON kip	GY	-411.000	19.000	-	-	-

Beam Loads : 3 LL

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
4	CON kip	GY	-285.000	31.000	-	-	-
7	CON kip	GY	-285.000	19.000	-	-	-

Node Loads : 4 WIND ON STRUCTURE

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
2	-	-	-12.960	-	-	-
	51.800	-	-	-	-	-
5	-	-	-12.960	-	-	-
7	51.800	-	-	-	-	-

Beam Loads : 4 WIND ON STRUCTURE

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
------	------	-----------	----	---------	----	----	-----------

1	UNI kips/ft	GZ	-0.240	-	-	-	-
	UNI kips/ft	GX	0.270	-	-	-	-
2	UNI kips/ft	GZ	-0.240	-	-	-	-
	UNI kips/ft	GX	0.270	-	-	-	-
3	UNI kips/ft	GZ	-0.240	-	-	-	-
4	UNI kips/ft	GZ	-0.240	-	-	-	-
5	UNI kips/ft	GZ	-0.240	-	-	-	-
	UNI kips/ft	GX	0.270	-	-	-	-
6	UNI kips/ft	GZ	-0.240	-	-	-	-
	UNI kips/ft	GX	0.270	-	-	-	-
7	UNI kips/ft	GZ	-0.240	-	-	-	-

Beam Loads : 5 WIND LOAD ON LIVE LOAD

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
3	CMO kip-ft	GZ	-123.120	43.000	-	-	-
	CMO kip-ft	GX	-51.300	43.000	-	-	-
4	CMO kip-ft	GZ	-123.120	31.000	-	-	-
	CMO kip-ft	GX	-51.300	31.000	-	-	-

Beam Loads : 6 LONGITUDINAL FORCE

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
3	CMO kip-ft	GX	-39.900	31.000	-	-	-
	CMO kip-ft	GX	-39.900	43.000	-	-	-
4	CON kip	GX	28.000	43.000	-	-	-
	CMO kip-ft	GX	-304.000	43.000	-	-	-
7	CON kip	GX	28.000	19.000	-	-	-

	CMO kip-ft	GX	-304.000	19.000	-	-	-
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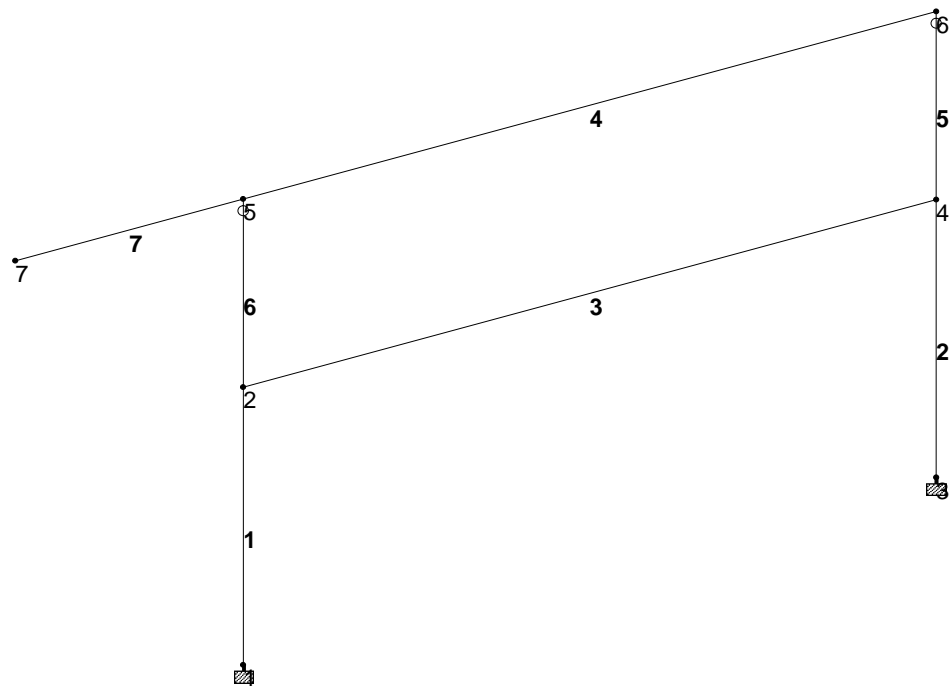
Reactions

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
1	1:SELF WEIGHT	9.443	312.039	0.000	0.000	0.000	-100.905
	2:DL	0.000	756.758	0.000	0.000	0.000	-13.215
	3:LL	0.000	524.759	0.000	0.000	0.000	-9.164
	4:WIND ON	-66.799	-39.611	60.930	2.55E 3	54.303	1.15E 3
	5:WIND LOAD ON	-0.110	-3.291	0.018	22.895	-0.702	-0.764
	6:LONGITUDINAL	-27.960	-26.172	-0.006	40.757	0.218	531.058
	7:I	9.443	1.59E 3	0.000	0.000	0.000	-123.284
	8:I-A	6.327	1.41E 3	0.000	0.000	0.000	-88.648
	9:II	-45.885	823.349	48.744	2.04E 3	43.442	832.035
	10:II-A	60.994	886.726	-48.744	-2.04E 3	-43.442	-1.01E 3
	11:III	-30.933	1.24E 3	14.633	662.457	12.646	602.608
	12:III-A	13.802	1.28E 3	14.642	597.246	12.296	-247.085
	13:III-B	1.307	1.27E 3	-14.642	-597.246	-12.296	49.831
	14:III-C	46.042	1.31E 3	-14.633	-662.457	-12.646	-799.862
3	1:SELF WEIGHT	-9.443	264.183	0.000	0.000	0.000	99.076
	2:DL	0.000	65.243	0.000	0.000	0.000	-13.215
	3:LL	0.000	45.241	0.000	0.000	0.000	-9.164
	4:WIND ON	-66.231	39.611	33.630	1.21E 3	196.290	1.14E 3
	5:WIND LOAD ON	0.110	3.291	-0.018	28.405	-0.702	-3.098
	6:LONGITUDINAL	-28.040	26.172	0.006	39.043	0.218	531.892
	7:I	-9.443	374.667	0.000	0.000	0.000	76.697
	8:I-A	-6.327	280.886	0.000	0.000	0.000	45.339
	9:II	-60.539	295.229	26.904	964.957	157.032	983.889
	10:II-A	45.430	231.852	-26.904	-964.957	-157.032	-846.511
	11:III	-45.794	332.810	8.061	343.445	46.723	758.953
	12:III-A	-0.930	290.935	8.052	280.976	46.373	-92.074

	13:III-B	-14.180	308.532	-8.052	-280.976	-46.373	214.789
	14:III-C	30.685	266.657	-8.061	-343.445	-46.723	-636.238

Reaction Summary

			Horizontal	Vertical	Horizontal	Moment		
	Node	L/C	FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
Max FX	1	10:II-A	60.994	886.726	-48.744	-2.04E 3	-43.442	-1.01E 3
Min FX	1	4:WIND ON	-66.799	-39.611	60.930	2.55E 3	54.303	1.15E 3
Max FY	1	7:I	9.443	1.59E 3	0.000	0.000	0.000	-123.284
Min FY	1	4:WIND ON	-66.799	-39.611	60.930	2.55E 3	54.303	1.15E 3
Max FZ	1	4:WIND ON	-66.799	-39.611	60.930	2.55E 3	54.303	1.15E 3
Min FZ	1	10:II-A	60.994	886.726	-48.744	-2.04E 3	-43.442	-1.01E 3
Max MX	1	4:WIND ON	-66.799	-39.611	60.930	2.55E 3	54.303	1.15E 3
Min MX	1	10:II-A	60.994	886.726	-48.744	-2.04E 3	-43.442	-1.01E 3
Max MY	3	4:WIND ON	-66.231	39.611	33.630	1.21E 3	196.290	1.14E 3
Min MY	3	10:II-A	45.430	231.852	-26.904	-964.957	-157.032	-846.511
Max MZ	1	4:WIND ON	-66.799	-39.611	60.930	2.55E 3	54.303	1.15E 3
Min MZ	1	10:II-A	60.994	886.726	-48.744	-2.04E 3	-43.442	-1.01E 3



Whole Structure

Bent Type "C"

Job Information

Structure Type	SPACE FRAME
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Number of Nodes	3	Highest Node	3
Number of Elements	2	Highest Beam	2

Number of Basic Load Cases	6
Number of Combination Load Cases	8

Included in this printout are data for:

All	The Whole Structure
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Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	SELF WEIGHT
Primary	2	DL
Primary	3	LL
Primary	4	WIND ON STRUCTURE
Primary	5	WIND ON LIVE LOAD
Primary	6	LONGITUDINAL FORCE
Combination	7	I
Combination	8	I-A
Combination	9	II
Combination	10	II-A
Combination	11	III
Combination	12	III-A
Combination	13	III-B
Combination	14	III-C

Nodes

Node	X (ft)	Y (ft)	Z (ft)
1	0.000	0.000	0.000
2	0.000	54.500	0.000
3	27.000	54.500	0.000

Beams

Beam	Node A	Node B	Length (ft)	Property	b (degrees)
1	1	2	54.500	2	0
2	2	3	27.000	1	0

Basic Load Cases

Number	Name
1	SELF WEIGHT
2	DL
3	LL
4	WIND ON STRUCTURE
5	WIND ON LIVE LOAD
6	LONGITUDINAL FORCE

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
7	I	2	DL	1.00
		3	LL	1.00
		1	SELF WEIGHT	1.00
8	I-A	2	DL	0.67
		3	LL	1.33
		1	SELF WEIGHT	0.67
9	II	2	DL	0.80
		4	WIND ON STRUCTURE	0.80
		1	SELF WEIGHT	0.80
10	II-A	2	DL	0.80
		4	WIND ON STRUCTURE	-0.80
		1	SELF WEIGHT	0.80
11	III	2	DL	0.80
		3	LL	0.80
		6	LONGITUDINAL FORCE	0.80
		4	WIND ON STRUCTURE	0.24
		5	WIND ON LIVE LOAD	0.80
		1	SELF WEIGHT	0.80
12	III-A	2	DL	0.80
		1	SELF WEIGHT	0.80
		3	LL	0.80
		6	LONGITUDINAL FORCE	-0.80
		4	WIND ON STRUCTURE	0.24
		5	WIND ON LIVE LOAD	0.80
13	III-B	2	DL	0.80
		1	SELF WEIGHT	0.80
		3	LL	0.80
		6	LONGITUDINAL FORCE	0.80
		4	WIND ON STRUCTURE	-0.24
		5	WIND ON LIVE LOAD	-0.80
14	III-C	1	SELF WEIGHT	0.80

		2	DL	0.80
		3	LL	0.80
		6	LONGITUDINAL FORCE	-0.80
		4	WIND ON STRUCTURE	-0.24
		5	WIND ON LIVE LOAD	-0.80

Selfweight : 1 SELF WEIGHT

Direction	Factor
Y	-1.000

Beam Loads : 2 DL

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
2	CON kip	GY	-411.000	3.500	-	-	-
	CON kip	GY	-411.000	19.500	-	-	-

Beam Loads : 3 LL

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
2	CON kip	GY	-285.000	3.500	-	-	-
	CON kip	GY	-285.000	19.500	-	-	-

Node Loads : 4 WIND ON STRUCTURE

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
2	43.200	-	-	-	-	-

Beam Loads : 4 WIND ON STRUCTURE

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
1	UNI kips/ft	GZ	-0.220	-	-	-	-
	UNI kips/ft	GX	0.200	-	-	-	-
2	UNI kips/ft	GZ	-0.220	-	-	-	-

Beam Loads : 5 WIND ON LIVE LOAD

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
2	CMO kip-ft	GZ	-102.600	3.500	-	-	-
	CMO kip-ft	GZ	-102.600	19.500	-	-	-
	CMO kip-ft	GX	-42.750	3.500	-	-	-
	CMO kip-ft	GX	-42.750	19.500	-	-	-

Beam Loads : 6 LONGITUDINAL FORCE

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
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2	CON kip	GX	28.000	3.500	-	-	-
	CON kip	GX	28.000	19.500	-	-	-
	CMO kip-ft	GX	-304.000	3.500	-	-	-
	CMO kip-ft	GX	-304.000	19.500	-	-	-

Reactions

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
1	1:SELF WEIGHT	0.000	457.080	0.000	0.000	0.000	623.516
	2:DL	0.000	822.000	0.000	0.000	0.000	9.45E 3
	3:LL	0.000	570.000	0.000	0.000	0.000	6.55E 3
	4:WIND ON	-54.100	0.000	17.930	650.458	-80.190	2.65E 3
	5:WIND ON LIVE	0.000	0.000	0.000	85.500	-0.000	205.200
	6:LONGITUDINAL	-56.000	-0.000	0.000	608.000	0.000	3.05E 3
	7:I	0.000	1.85E 3	0.000	0.000	0.000	16.6E 3
	8:I-A	0.000	1.62E 3	0.000	0.000	0.000	15.5E 3
	9:II	-43.280	1.02E 3	14.344	520.366	-64.152	10.2E 3
	10:II-A	43.280	1.02E 3	-14.344	-520.366	64.152	5.94E 3
	11:III	-57.784	1.48E 3	4.303	710.910	-19.246	16.5E 3
	12:III-A	31.816	1.48E 3	4.303	-261.890	-19.246	11.7E 3
	13:III-B	-31.816	1.48E 3	-4.303	261.890	19.246	14.9E 3
	14:III-C	57.784	1.48E 3	-4.303	-710.910	19.246	10.1E 3

Reaction Summary

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)

Max FX	1	14:III-C	57.784	1.48E 3	-4.303	-710.910	19.246	10.1E 3
Min FX	1	11:III	-57.784	1.48E 3	4.303	710.910	-19.246	16.5E 3
Max FY	1	7:I	0.000	1.85E 3	0.000	0.000	0.000	16.6E 3
Min FY	1	6:LONGITUDINAL	-56.000	-0.000	0.000	608.000	0.000	3.05E 3
Max FZ	1	4:WIND ON	-54.100	0.000	17.930	650.458	-80.190	2.65E 3
Min FZ	1	10:II-A	43.280	1.02E 3	-14.344	-520.366	64.152	5.94E 3
Max MX	1	11:III	-57.784	1.48E 3	4.303	710.910	-19.246	16.5E 3
Min MX	1	14:III-C	57.784	1.48E 3	-4.303	-710.910	19.246	10.1E 3
Max MY	1	10:II-A	43.280	1.02E 3	-14.344	-520.366	64.152	5.94E 3
Min MY	1	4:WIND ON	-54.100	0.000	17.930	650.458	-80.190	2.65E 3
Max MZ	1	7:I	0.000	1.85E 3	0.000	0.000	0.000	16.6E 3
Min MZ	1	5:WIND ON LIVE	0.000	0.000	0.000	85.500	-0.000	205.200

Whole Structure

