



Whiz Bang Concepts 2 and 4 Preliminary Traffic Analysis Memorandum

DATE: 12.02.2015

HNTB conducted preliminary traffic operational analyses to identify potential fatal flaws for two concepts under investigation for the Brent Spence Bridge (BSB) project. These concepts are referred to as “Whiz Bang Concept 2” and “Whiz Bang Concept 4” and are variations of Preferred Alternative I, as described in the project’s Finding of No Significant Impact (FONSI) dated August 2012. Typical sections and schematic line drawings for the concepts are included in **Attachment A**.

The preliminary analysis showed that traffic operations for Concepts 2 and 4 were comparable to Preferred Alternative I, and no fatal flaws were identified. Further, detailed travel demand modeling, traffic forecasting and operational analyses are required to fully evaluate the concepts.

Methodology

Traffic volumes and truck percentages were developed for Concepts 2 and 4 by manually redistributing the 2040 Build Toll-Free Certified Traffic previously developed for the BSB project (see **Attachment A**). The toll-free traffic volumes were utilized because they represent the greatest amount of traffic anticipated for the project corridor. Therefore, the toll-free traffic volumes provided the most conservative estimate of traffic operations when evaluating the concepts for fatal flaws. The preliminary traffic analyses did not include modifications to the approved Travel Demand Model (TDM) or new traffic forecasts. The methodology used to develop the traffic volumes and truck percentages is outlined below:

- Traffic volumes were manually redistributed for the AM peak hour, the PM peak hour and daily traffic.
- Volumes on I-71 and I-75 were combined by direction over the Brent Spence Bridge.
- Concepts 2 and 4 do not include an entrance from 9th Street to the I-71 NB mainline in Kentucky. This traffic was redistributed to the 9th Street entrance to the local NB collector-distributor (C-D) road, which connects to I-71 NB in Ohio.
- Although Concepts 2 and 4 carry vehicles across the river in different configurations, the access points are the same for both concepts. Thus, the traffic volumes were assumed to be the same for both concepts.



- Truck percentages were calculated as the average of the two adjacent segments, weighted by their volumes. Truck percentages were developed for the AM peak hour, PM peak hour and daily traffic.

Highway Capacity Software (HCS) 2010 was used to analyze traffic operations for Concepts 2 and 4 and to provide a direct comparison to the levels of service reported for Preferred Alternative I in the approved *Access Point Request Document* (August, 2011) and *Access Point Request Document Addendum* (September, 2012). The analysis focused on the freeway segments and ramps where the manual redistribution resulted in volume changes when compared to the 2040 Build Toll-Free Certified Traffic previously developed for the BSB project. The analysis also evaluated segments and ramps introduced in the new concepts but not included in Preferred Alternative I. The HCS analysis was based on several assumptions:

- The analysis for Concept 2 was valid for the corresponding portions of Concept 4. Both concepts include the same freeway segments, lane use, access points and ramps.
- The most severe profile grade in each segment was used. Where no profile was designated, the grade from the approved *Access Point Request Document* was used (F-13). For segments not analyzed in the *Access Point Request Document*, rolling terrain was assumed (F-4, F-15, R-1 and R-2).
- Since HCS restricts freeway segments to two or more lanes, single-lane freeway segments were modeled as two-lane segments with double the volume (F-2, F-4, F-6, F-9, F-11 and F-15).
- The lowest allowable free-flow speed (FFS) in HCS, 55 mph, was used for all segments.
- The maximum grade allowable in HCS is 6-percent. Where grades exceeded 6-percent, the E_T was manually edited (F-6, F-10 and R-1).
- The entrance/exit ramp methodology described in the Highway Capacity Manual (HCM) was used for ramps that required merges or diverges. When ramps resulted in add lanes or drop lanes, the freeway segments leading to and coming from the ramp were analyzed separately.

Results

In total, fifteen segments and two ramps were analyzed. Graphics depicting the levels of service are included in **Attachment B**. The results are shown in **Table 1-1, page 4**.



While the traffic operations for Concepts 2 and 4 were compared to those for Preferred Alternative I, it is important to note that not all segments were analyzed in the approved *Access Point Request Document*. In addition, the *Access Point Request Document* utilized a 2035 design year, while this analysis utilized 2040 traffic and an updated TDM. As a result, the levels of service for several of the freeway elements were different when Concepts 2 and 4 were compared to Preferred Alternative I. For the purposes of this analysis, only those elements projected to operate below acceptable levels (LOS E or F) were noted.

The analyses indicated that the majority of the freeway and ramp elements in Concepts 2 and 4 operated at LOS D or better, with two exceptions:

- The I-71 NB diverge from the local NB C-D road operated at LOS F in the AM peak hour. This segment was shown as LOS E in the approved *Access Point Request Document*. (F-9)
- I-71 NB after the merge from the local NB C-D road operated at LOS E in the AM peak hour. This segment has the same LOS in the approved *Access Point Request Document*. (F-12)

Concepts 2 and 4 only resulted in two areas that operated below acceptable levels. However, the approved *Access Point Request Document* for preferred Alternative I reported five areas that operated below acceptable levels.

Conclusion

The preliminary analysis showed that traffic operations for Concepts 2 and 4 were comparable to Alternative I, and no fatal flaws were identified. From a traffic operational perspective, both concepts are viable for further development and analysis. The analysis described in this memorandum was intended to identify fatal flaws only. Detailed travel demand modeling, traffic forecasting and operational analyses are required to fully evaluate the concepts.

Table 1-1: Traffic Volumes and Levels of Service

ID	Description	Whiz Bang (2040)				Preferred Alternative I (2035)			
		AM Volume	PM Volume	AM LOS	PM LOS	AM Volume	PM Volume	AM LOS	PM LOS
<i>Freeway Segments</i>									
F-1	I-71/I-75 SB after Local SB merge	6400	8300	C	C	6600	8700*	C	D
F-2	Local SB to I-71/I-75 SB	700	1400	B	D	300	3000*	**	**
F-3	I-71/I-75 SB on BSB	5700	6900	C	D	3900	2700*	D (I-75)	C (I-75)
						2300	2900*	C (I-71)	D (I-71)
F-4	Local NB ramp from KY 9th St	1200	800	C	B	1400	600	**	**
F-5	Local NB after KY 9th St ramp	2700	1800	D	C	3000	1200	D	B
F-6	Local NB ramp from KY 4th St	1400	1500	D	D	1200	1100	**	**
F-7	I-71/I-75 NB before Local NB split	6500	6300	D	D	2500	4000	B (I-75)	C (I-75)
						3700	2400	E (I-71)	C (I-71)
F-8	Local NB after KY 4th St ramp	4100	3300	D	C	4200	2300	D	B
F-9	Local NB to I-71 NB	2200	1400	F	D	2000	700	E	B
F-10	Local NB to I-75 NB	1900	1900	C	C	2200	1600	C	B
F-11	C-D NB after OH 2nd St exit	800	700	B	B	800	300	**	**
F-12	I-71 NB after Local NB merge	3400	3400	E	D	3900*	2700	E	C
F-13	I-75 SB ramp to I-71 NB	2800	2700	D	D	3000	2400	D	C
F-14	I-71 NB after I-75 SB ramp merge	6200	6100	D	D	7000*	5000	E	C
F-15	I-71 NB exit to OH 2nd St	1400	700	D	B	1200	400	**	**
<i>Ramps</i>									
R-1	Merge of C-D NB and ramp from KY 9th St	-	-	C	B	-	-	C	A
R-2	Merge of I-71 NB and CD NB	-	-	D	D	-	-	F	C

* Constrained by capacity

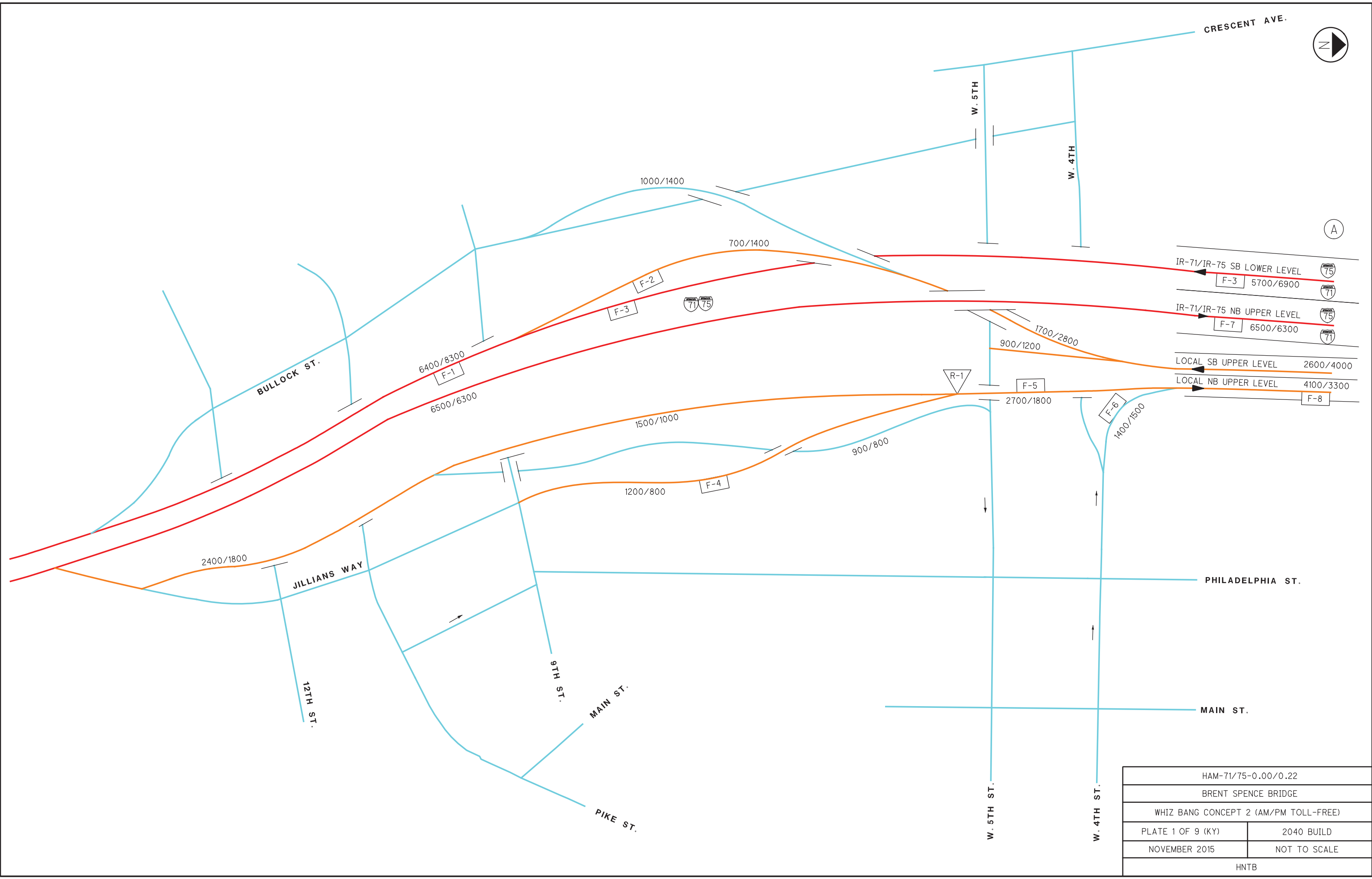
** The IMS did not analyze one lane freeway segments



Attachment A
Concept 2 and Concept 4 Traffic Volumes



CRESCENT AVE.



(A)

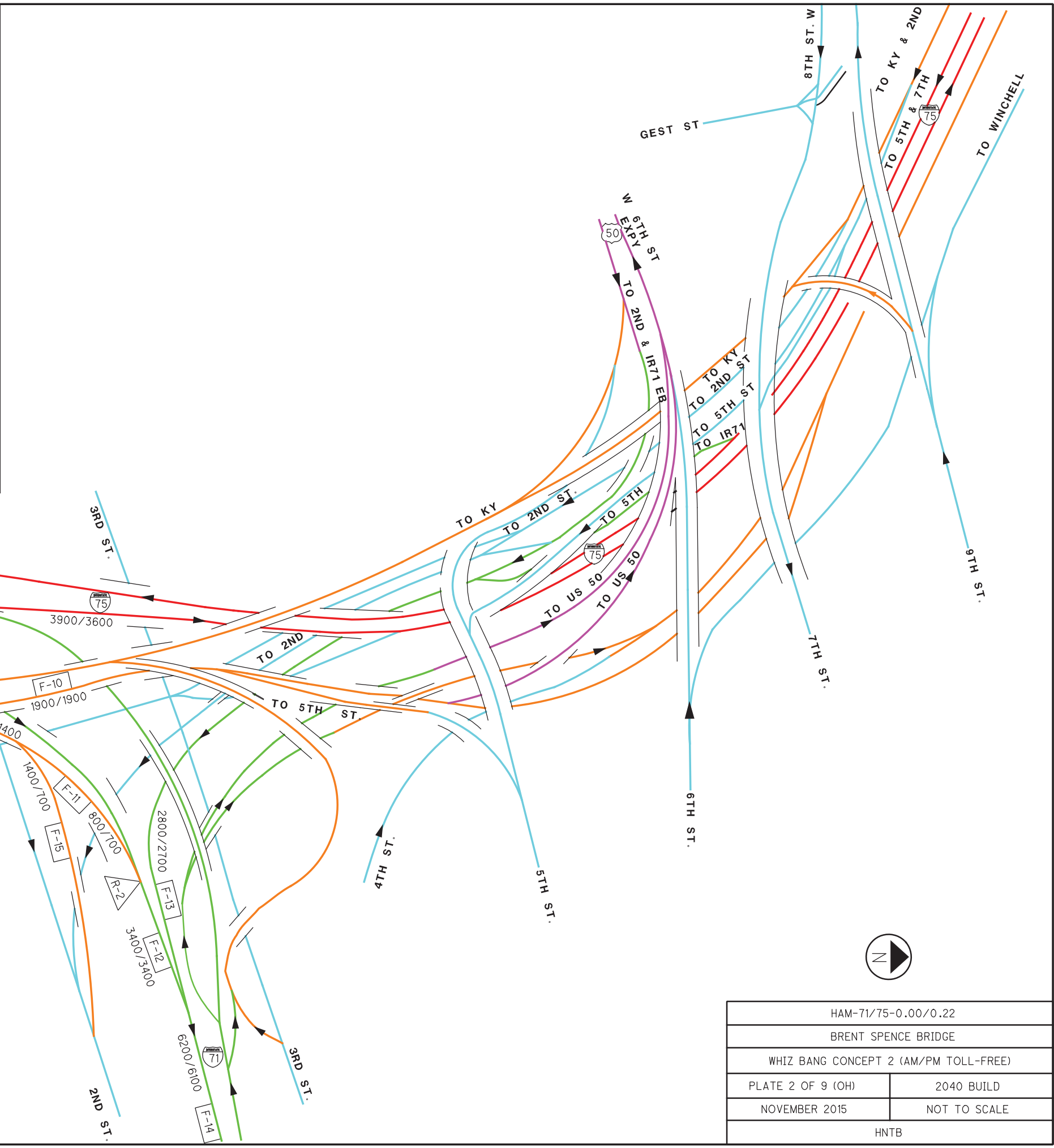
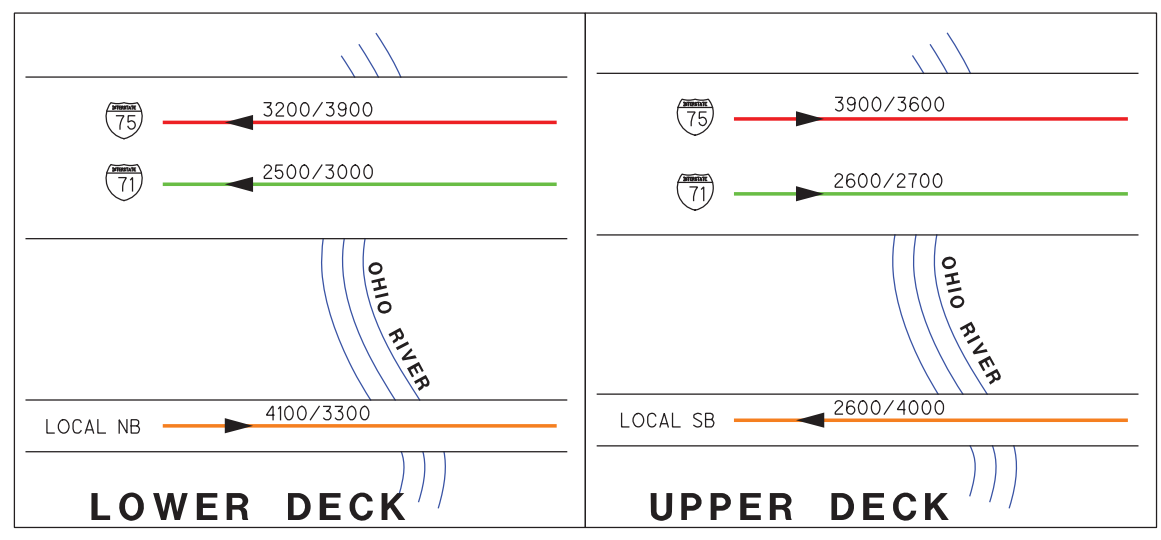
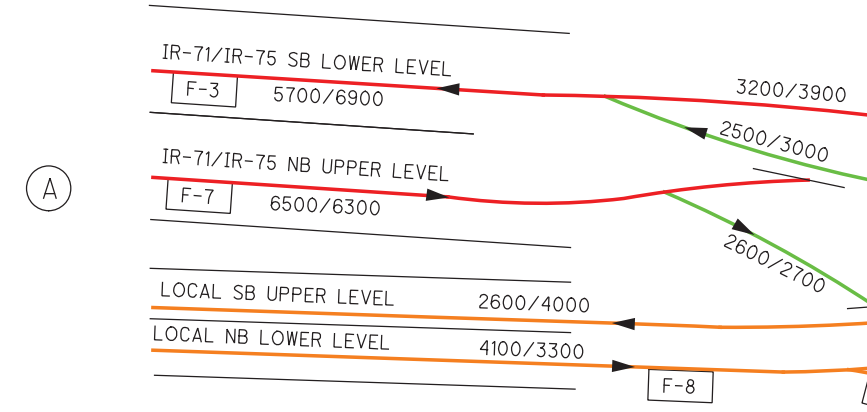
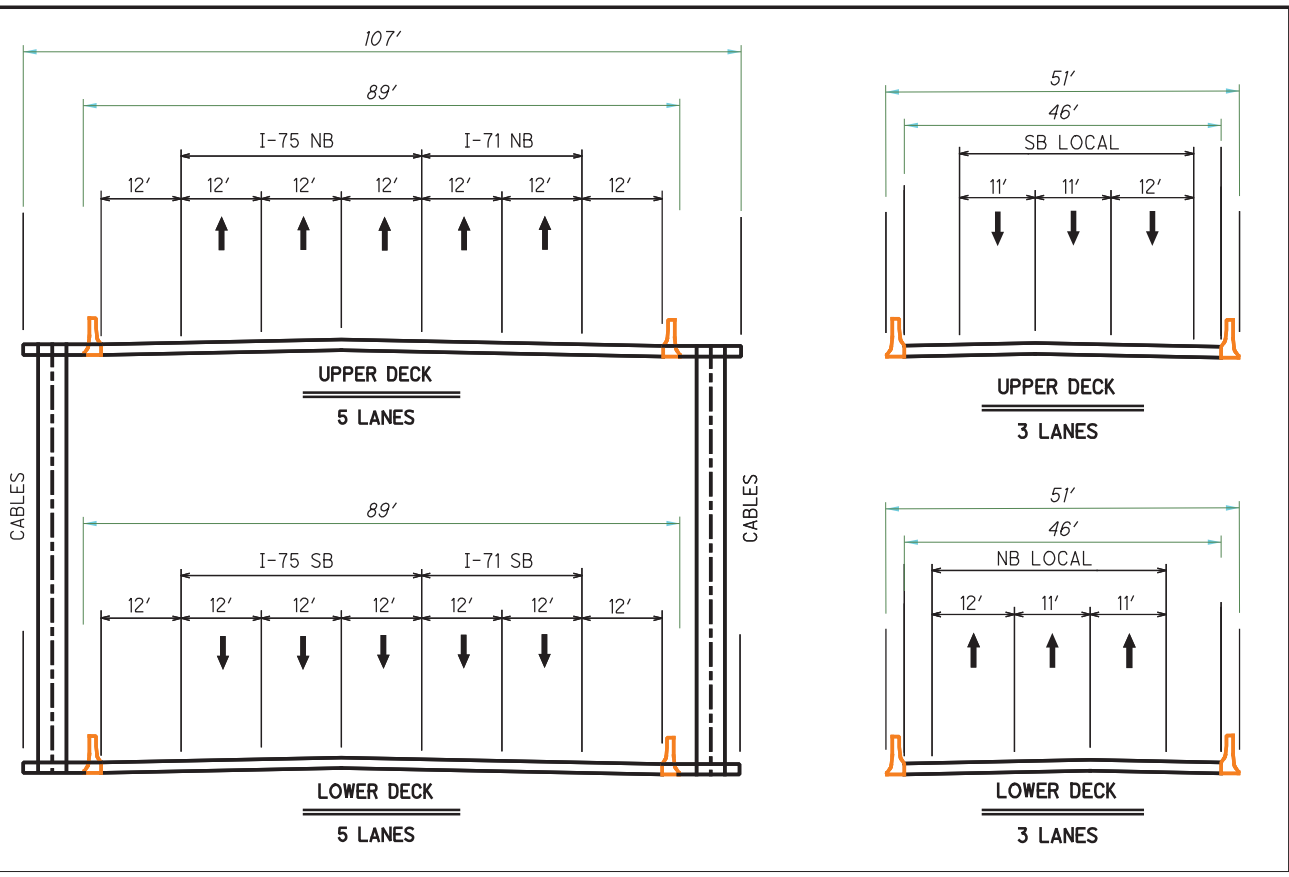
IR-71/IR-75 SB LOWER LEVEL (I-75, I-71) F-3 5700/6900

IR-71/IR-75 NB UPPER LEVEL (I-75, I-71) F-7 6500/6300

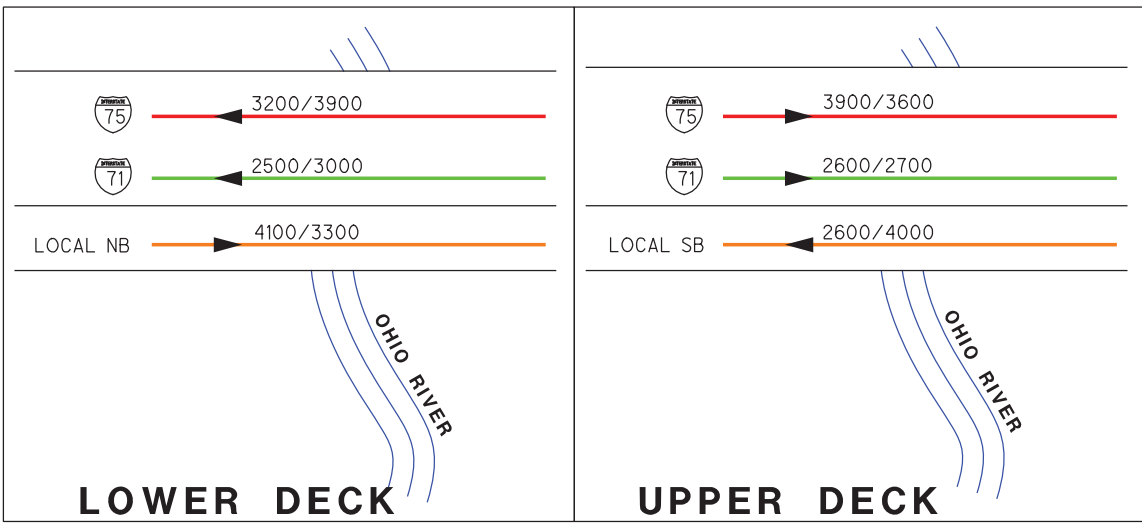
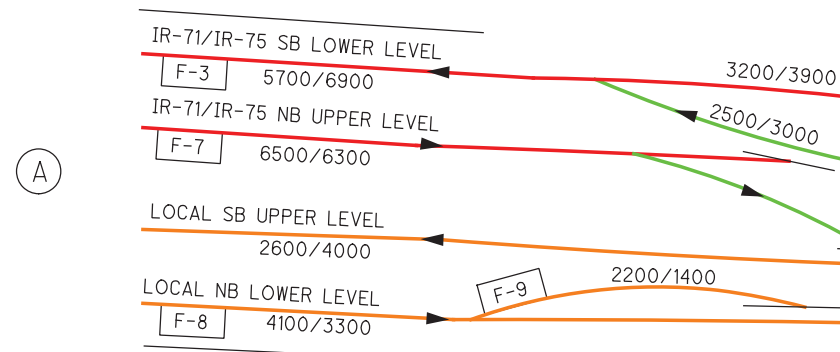
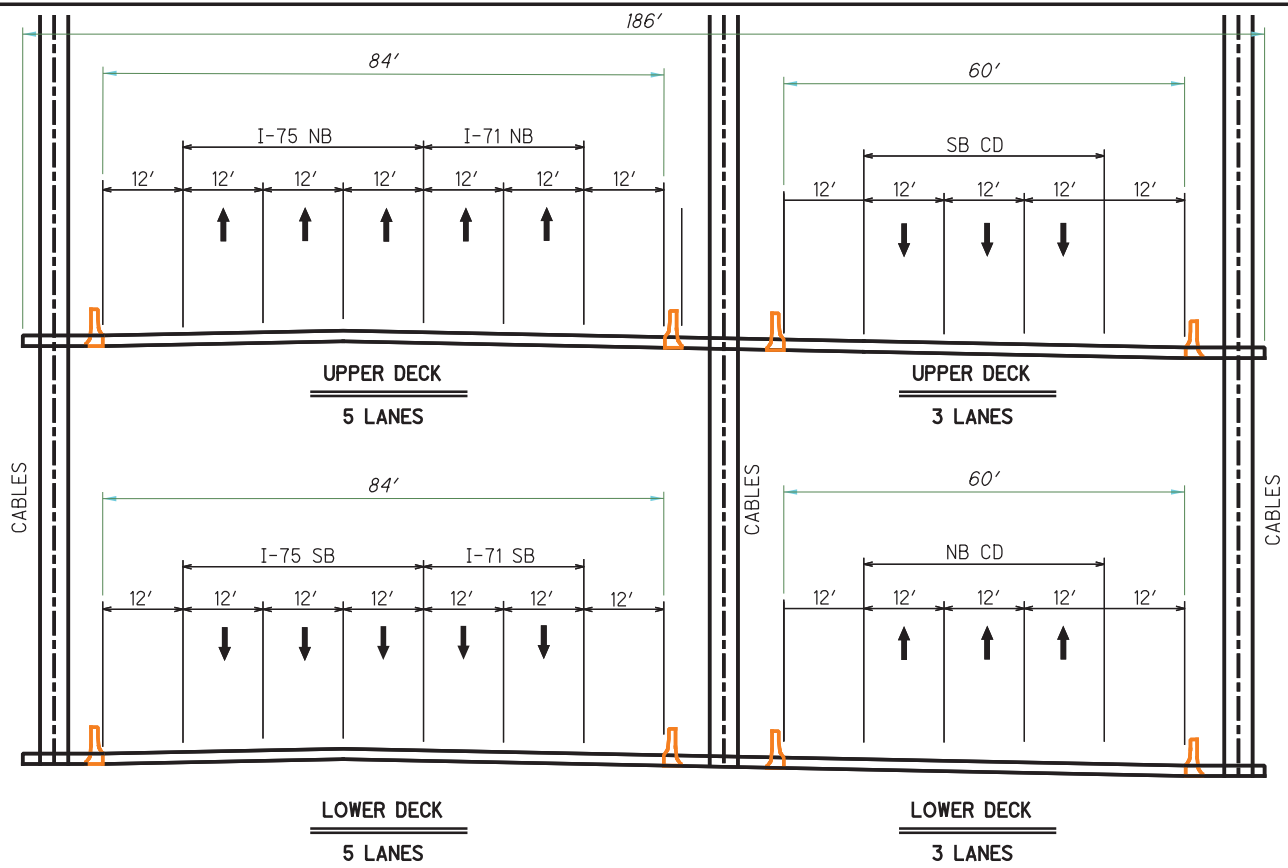
LOCAL SB UPPER LEVEL 2600/4000

LOCAL NB UPPER LEVEL 4100/3300 F-8

HAM-71/75-0.00/0.22	
BRENT SPENCE BRIDGE	
WHIZ BANG CONCEPT 2 (AM/PM TOLL-FREE)	
PLATE 1 OF 9 (KY)	2040 BUILD
NOVEMBER 2015	NOT TO SCALE
HNTB	



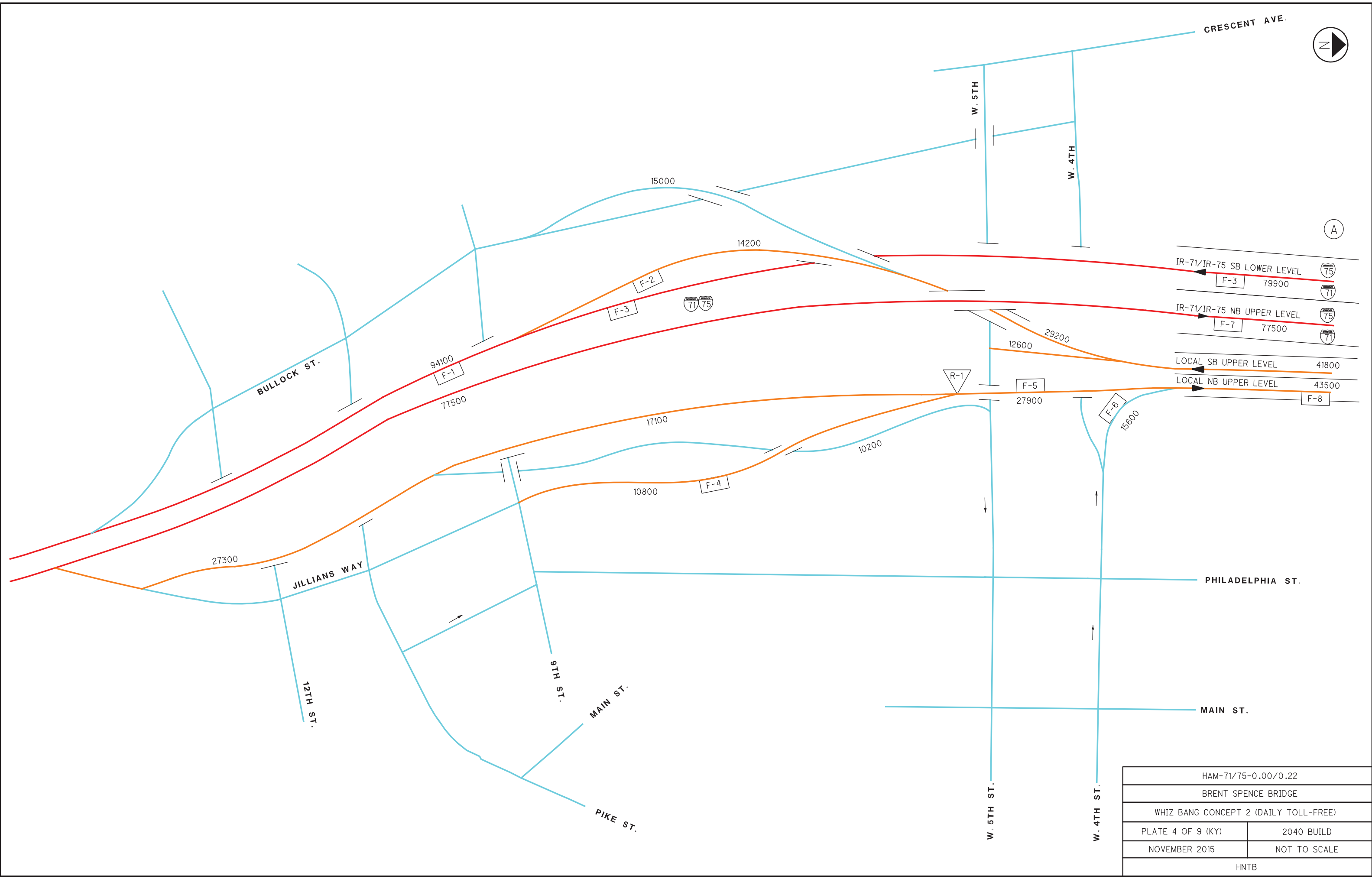
HAM-71/75-0.00/0.22	
BRENT SPENCE BRIDGE	
WHIZ BANG CONCEPT 2 (AM/PM TOLL-FREE)	
PLATE 2 OF 9 (OH)	2040 BUILD
NOVEMBER 2015	NOT TO SCALE
HNTB	



HAM-71/75-0.00/0.22	
BRENT SPENCE BRIDGE	
WHIZ BANG CONCEPT 4 (AM/PM TOLL-FREE)	
PLATE 3 OF 9 (OH)	2040 BUILD
NOVEMBER 2015	NOT TO SCALE
HNTB	



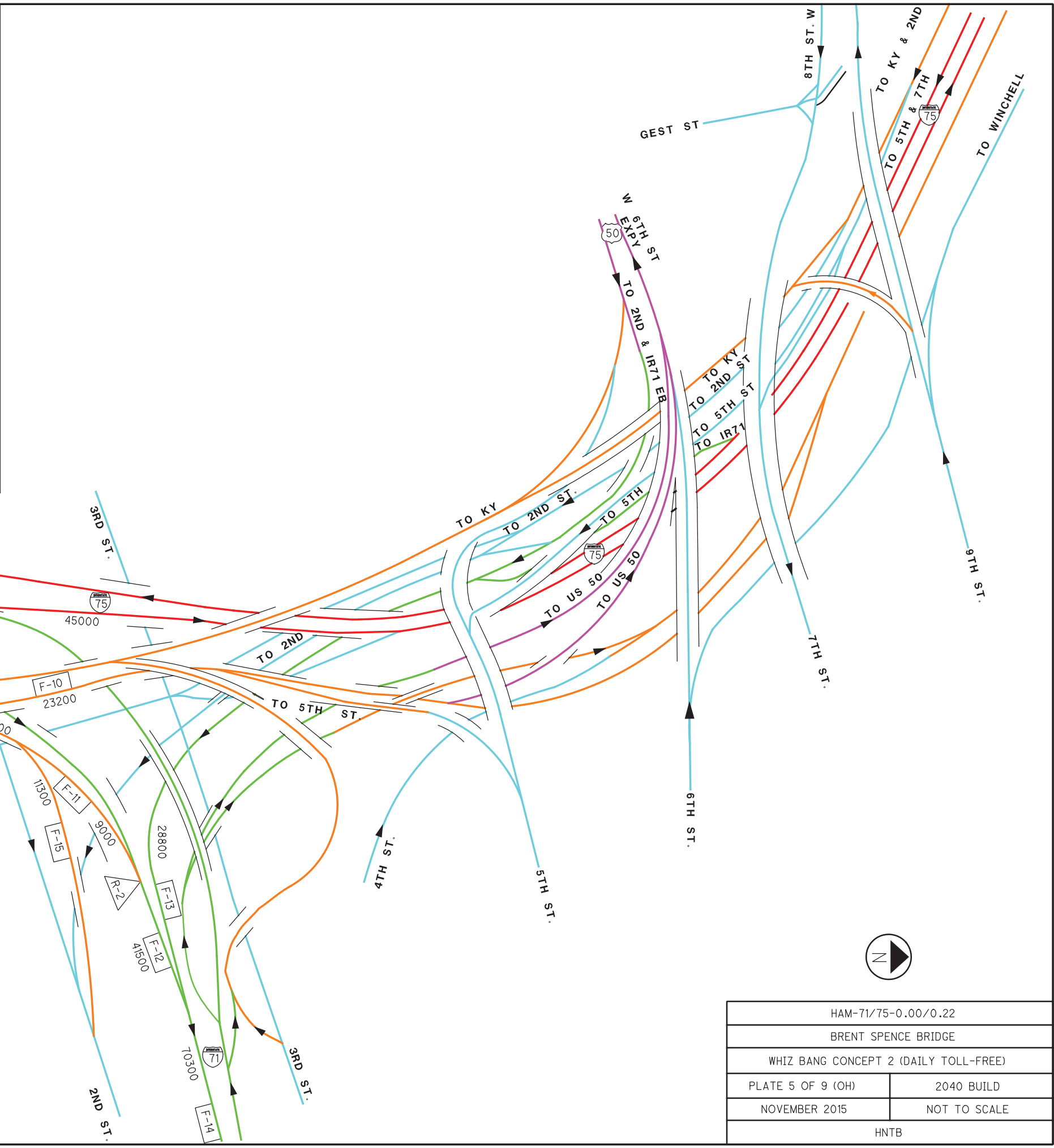
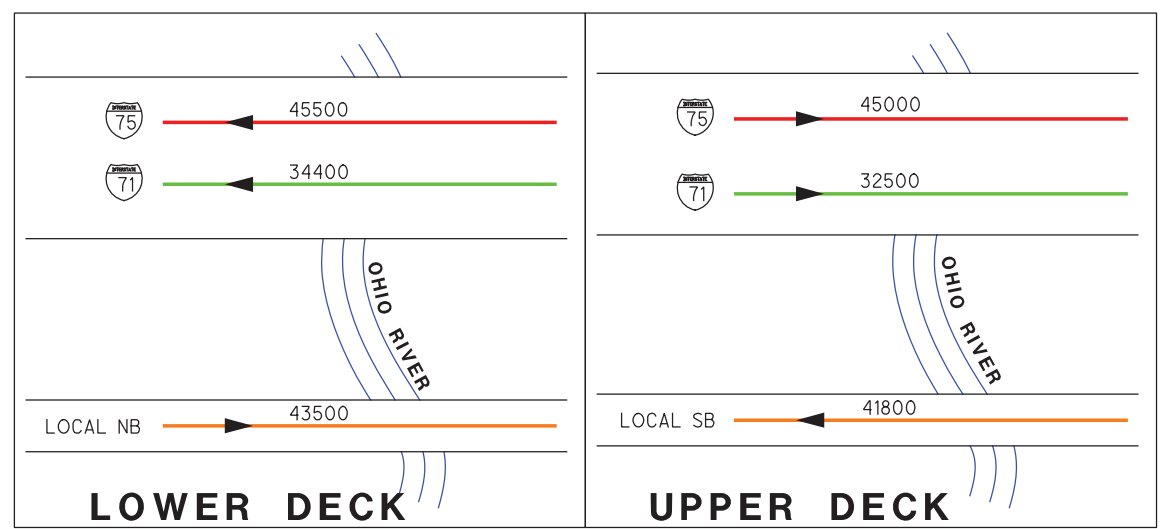
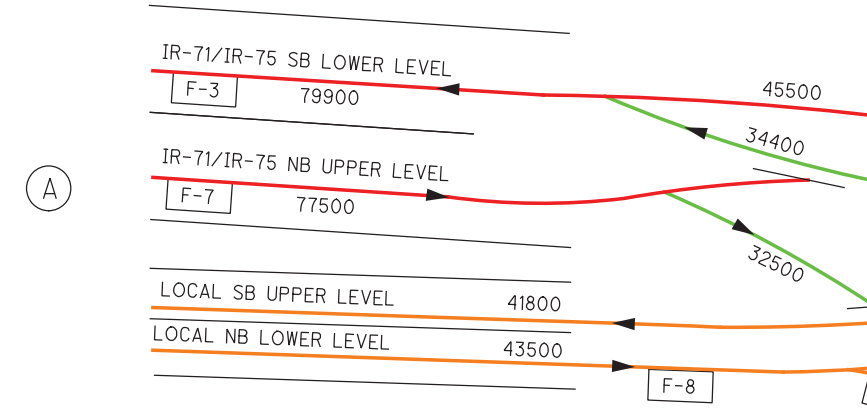
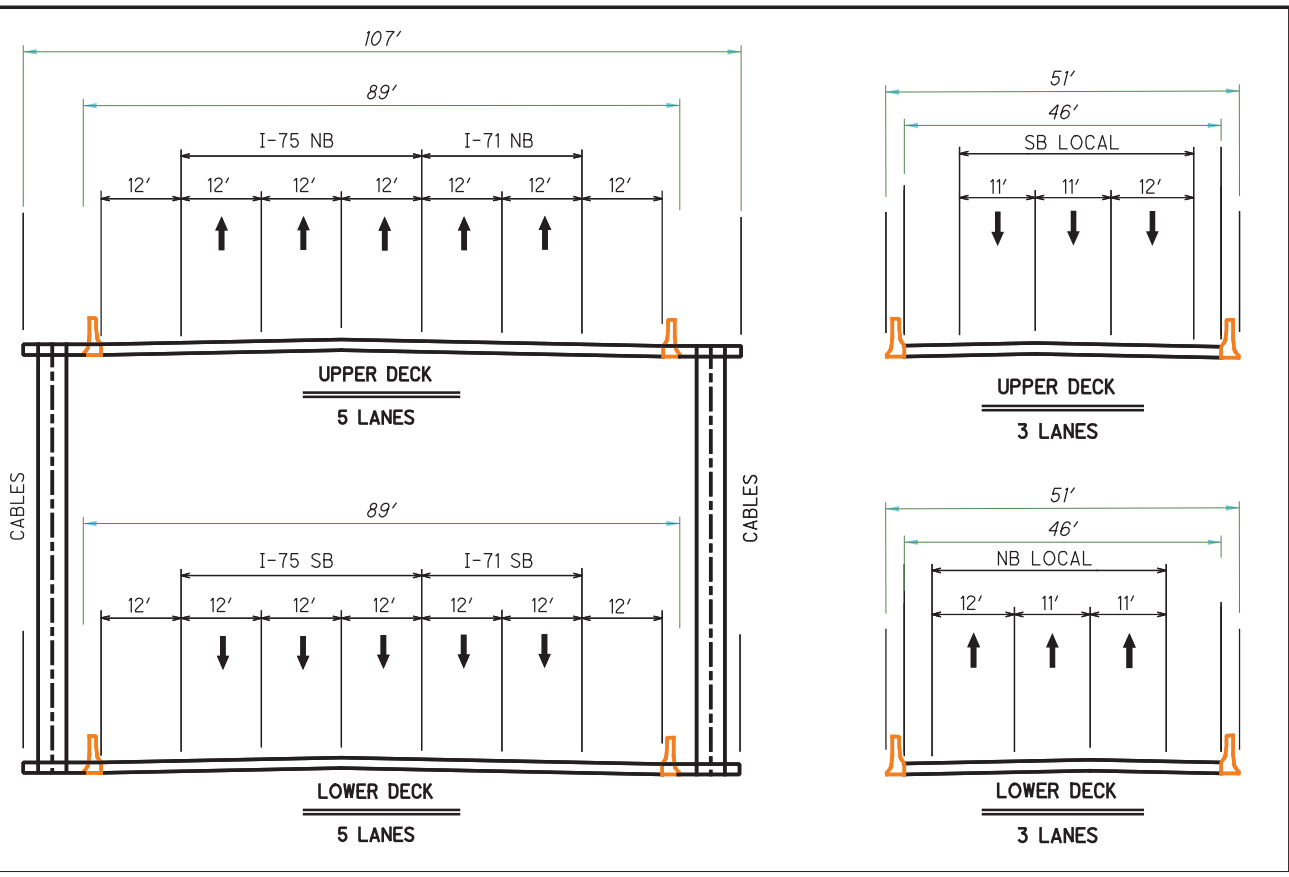
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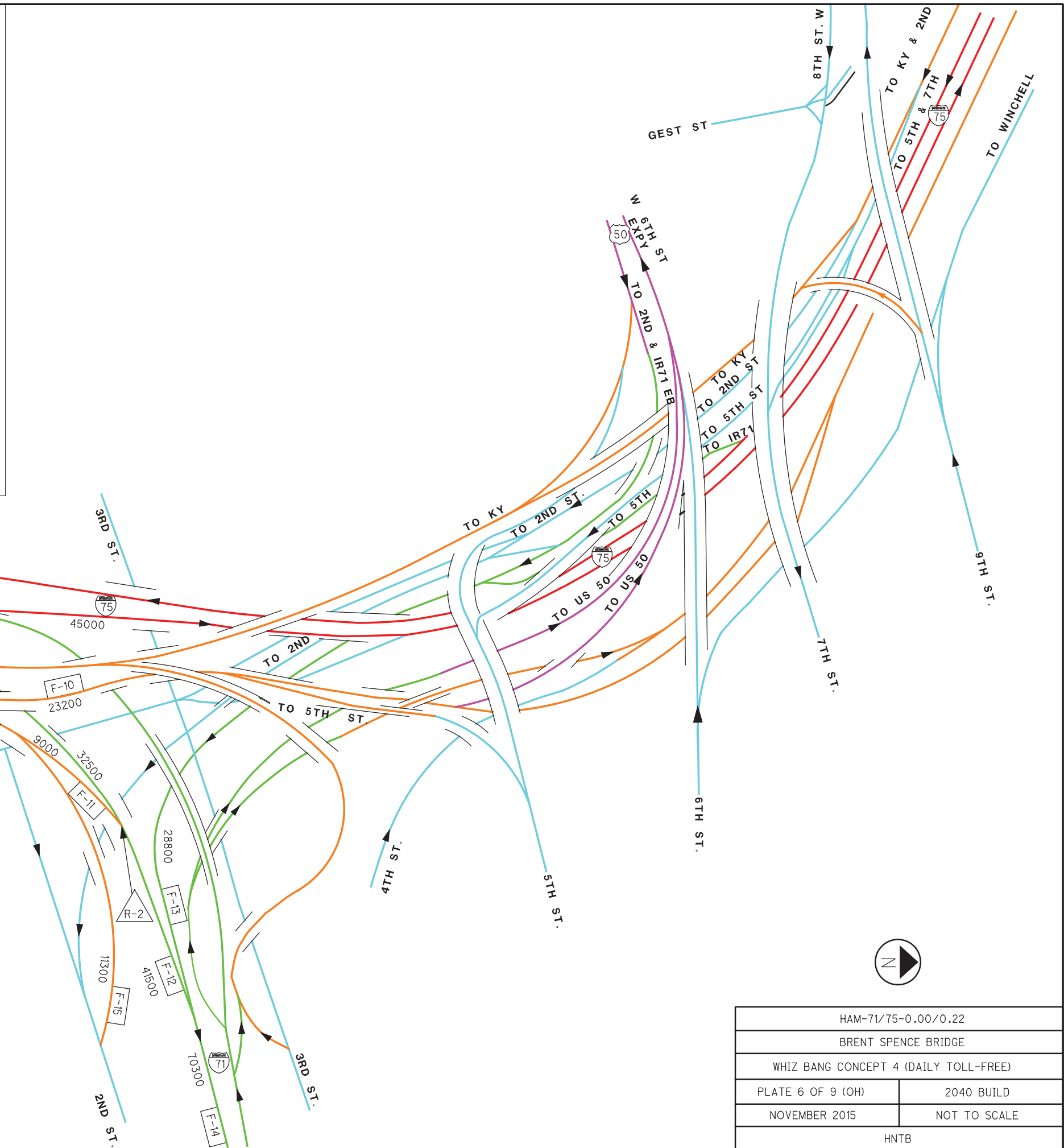
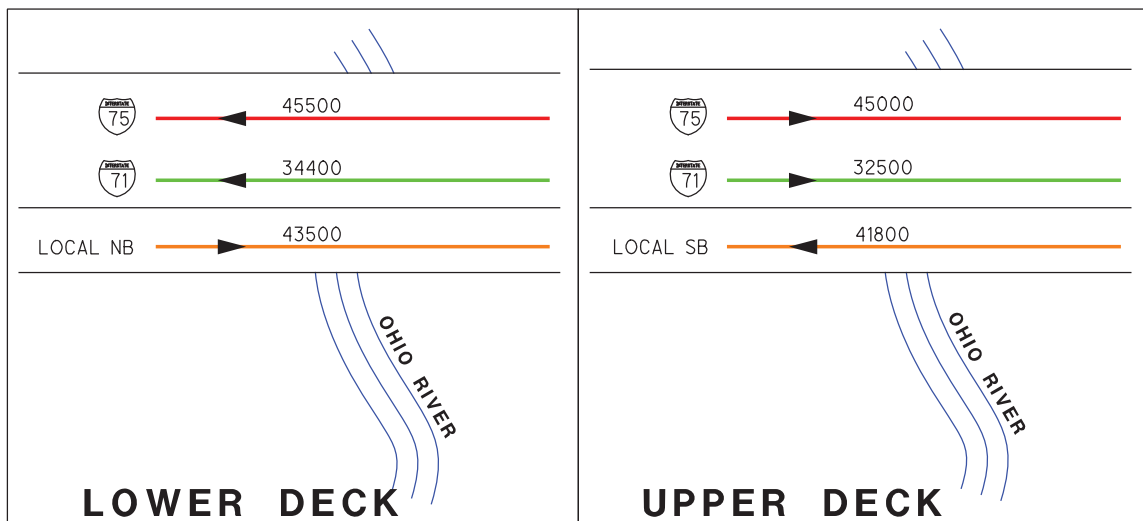
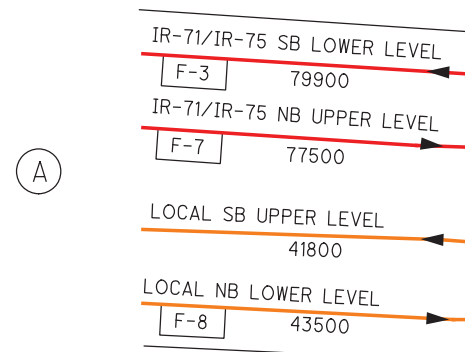
(A)

IR-71/IR-75 SB LOWER LEVEL	79900	
IR-71/IR-75 NB UPPER LEVEL	77500	
LOCAL SB UPPER LEVEL	41800	
LOCAL NB UPPER LEVEL	43500	

HAM-71/75-0.00/0.22	
BRENT SPENCE BRIDGE	
WHIZ BANG CONCEPT 2 (DAILY TOLL-FREE)	
PLATE 4 OF 9 (KY)	2040 BUILD
NOVEMBER 2015	NOT TO SCALE
HNTB	



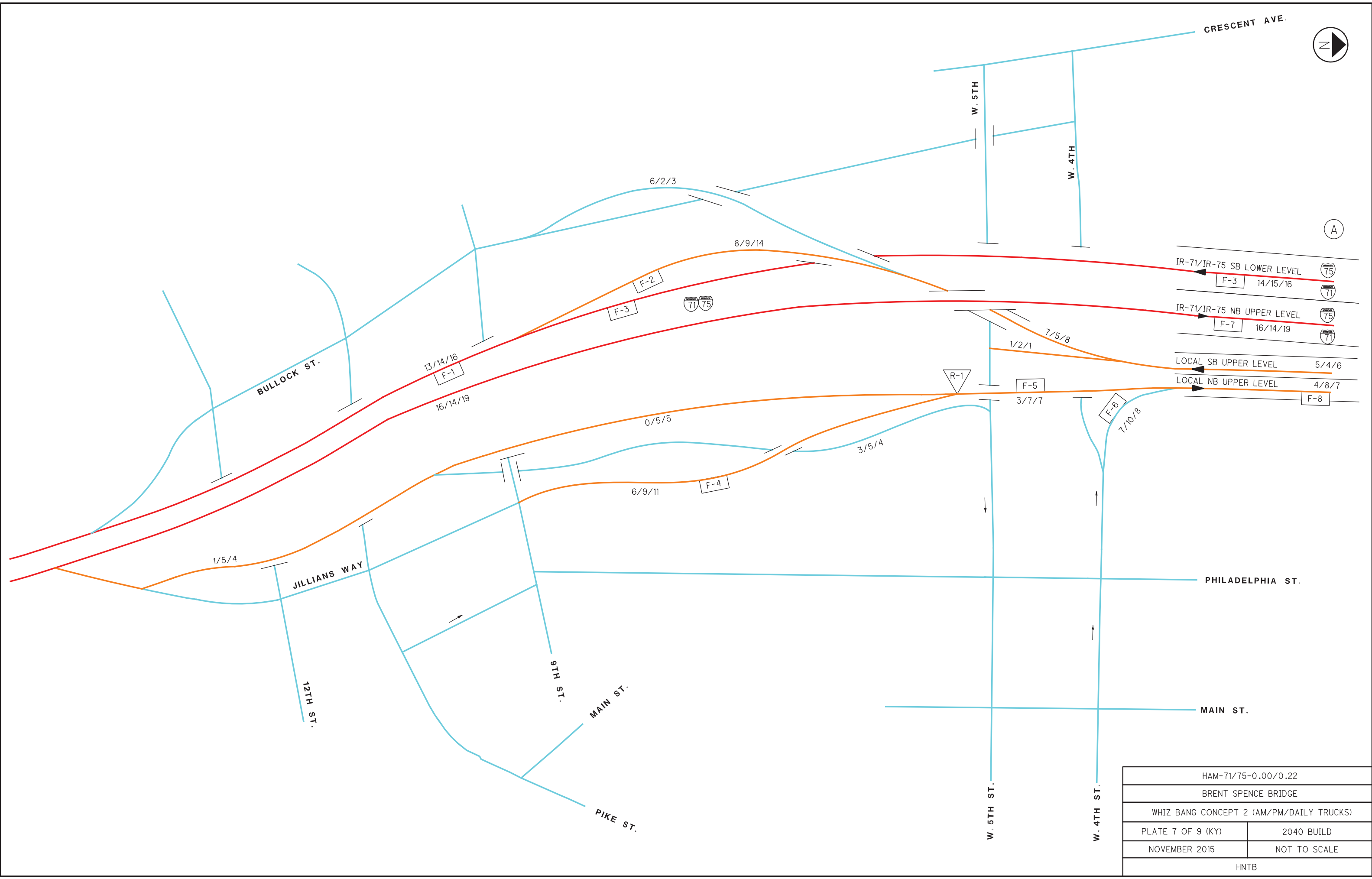
HAM-71/75-0.00/0.22	
BRENT SPENCE BRIDGE	
WHIZ BANG CONCEPT 2 (DAILY TOLL-FREE)	
PLATE 5 OF 9 (OH)	2040 BUILD
NOVEMBER 2015	NOT TO SCALE
HNTB	



HAM-71/75-0.00/0.22	
BRENT SPENCE BRIDGE	
WHIZ BANG CONCEPT 4 (DAILY TOLL-FREE)	
PLATE 6 OF 9 (OH)	2040 BUILD
NOVEMBER 2015	NOT TO SCALE
HNTB	



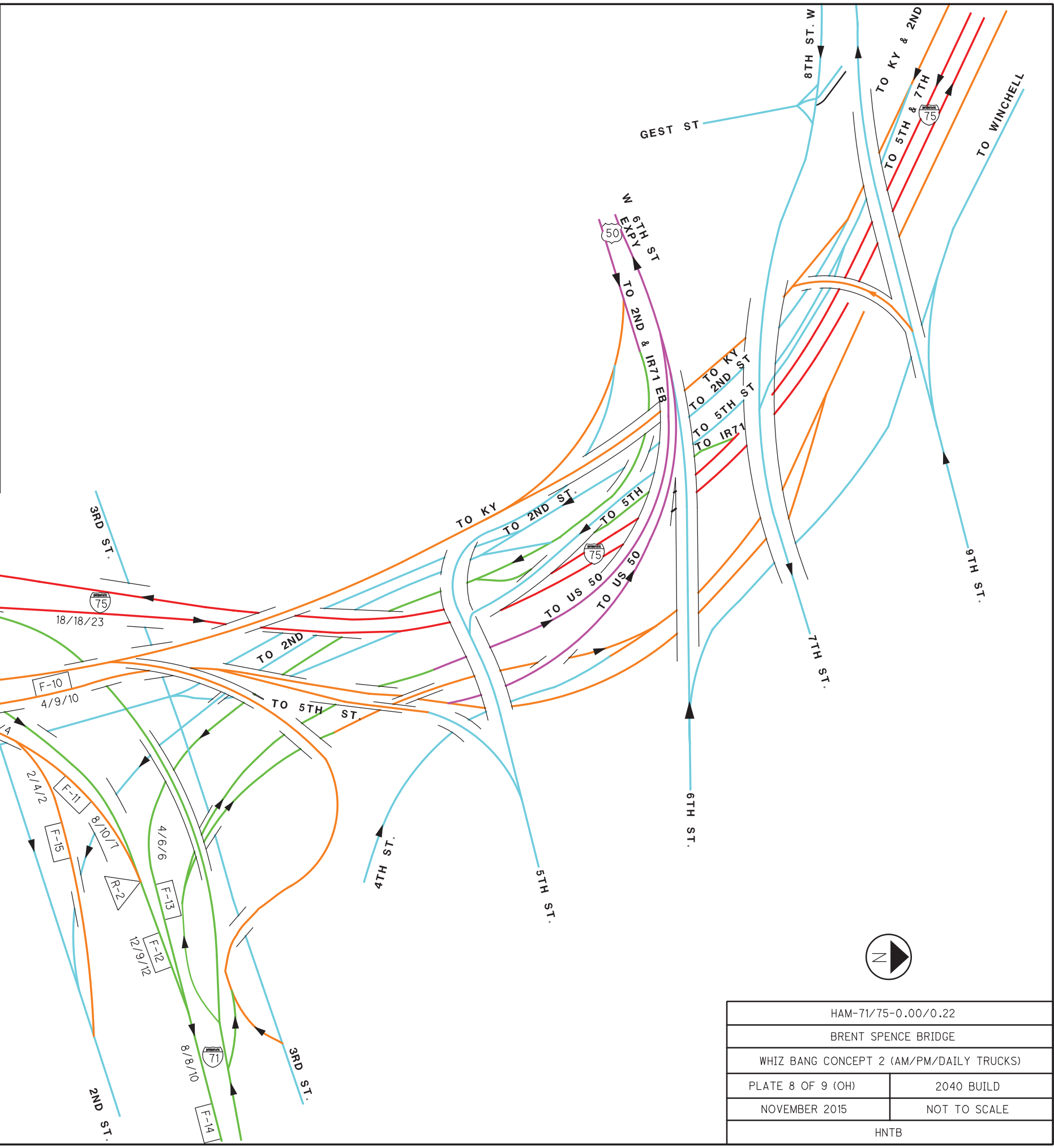
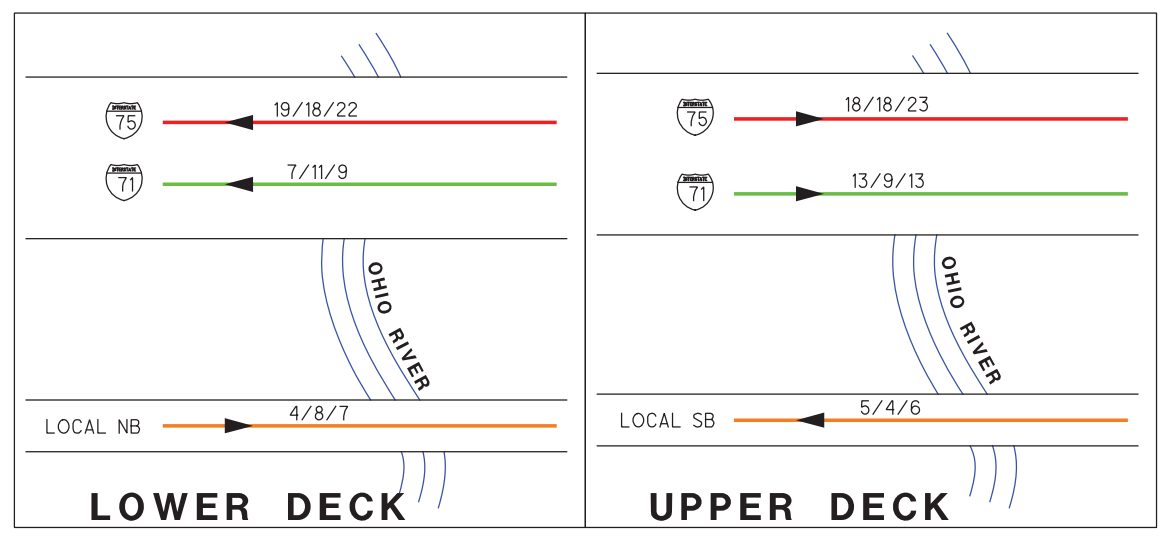
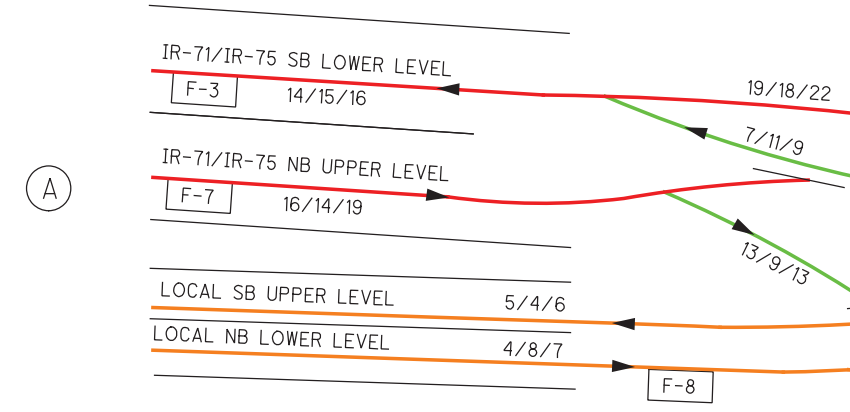
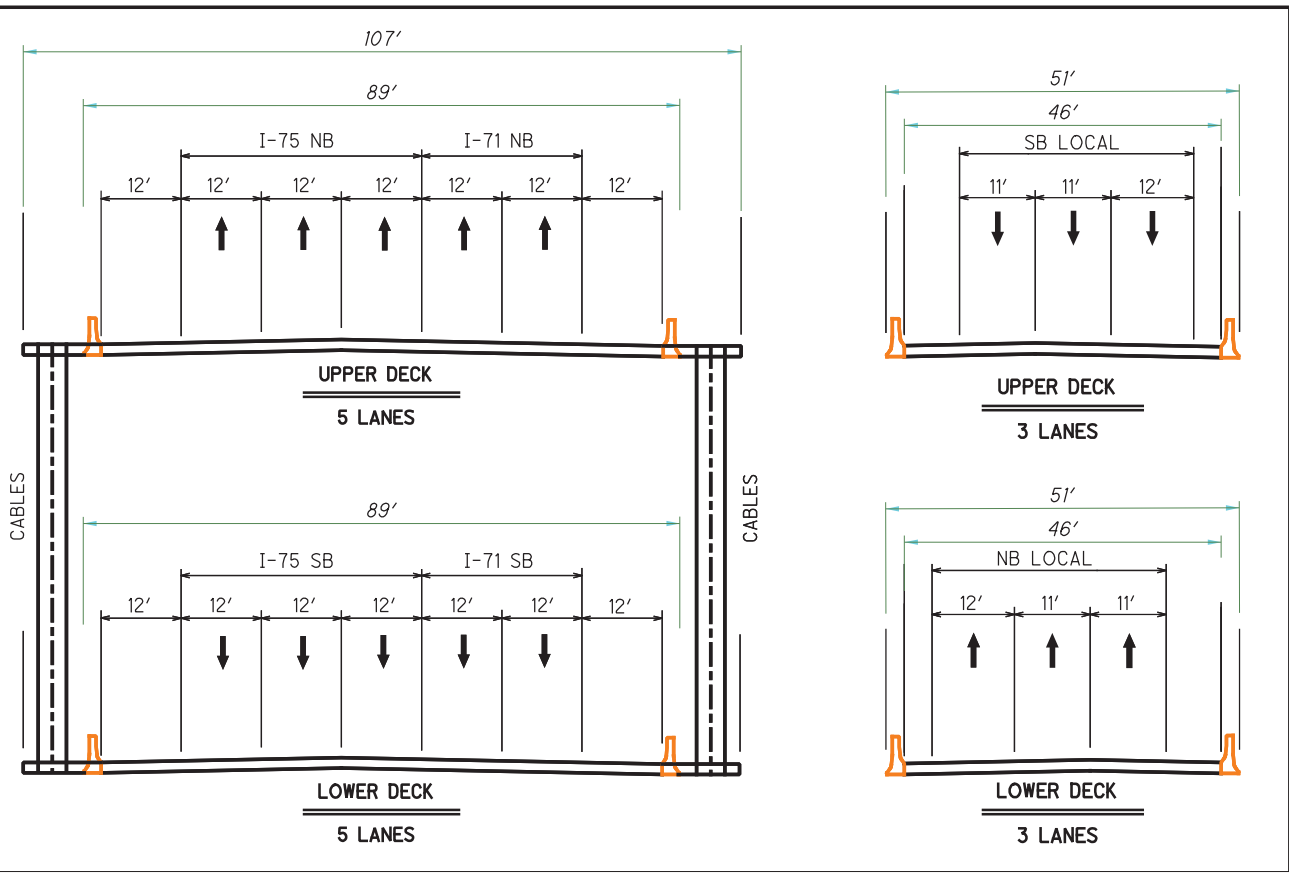
CRESCENT AVE.



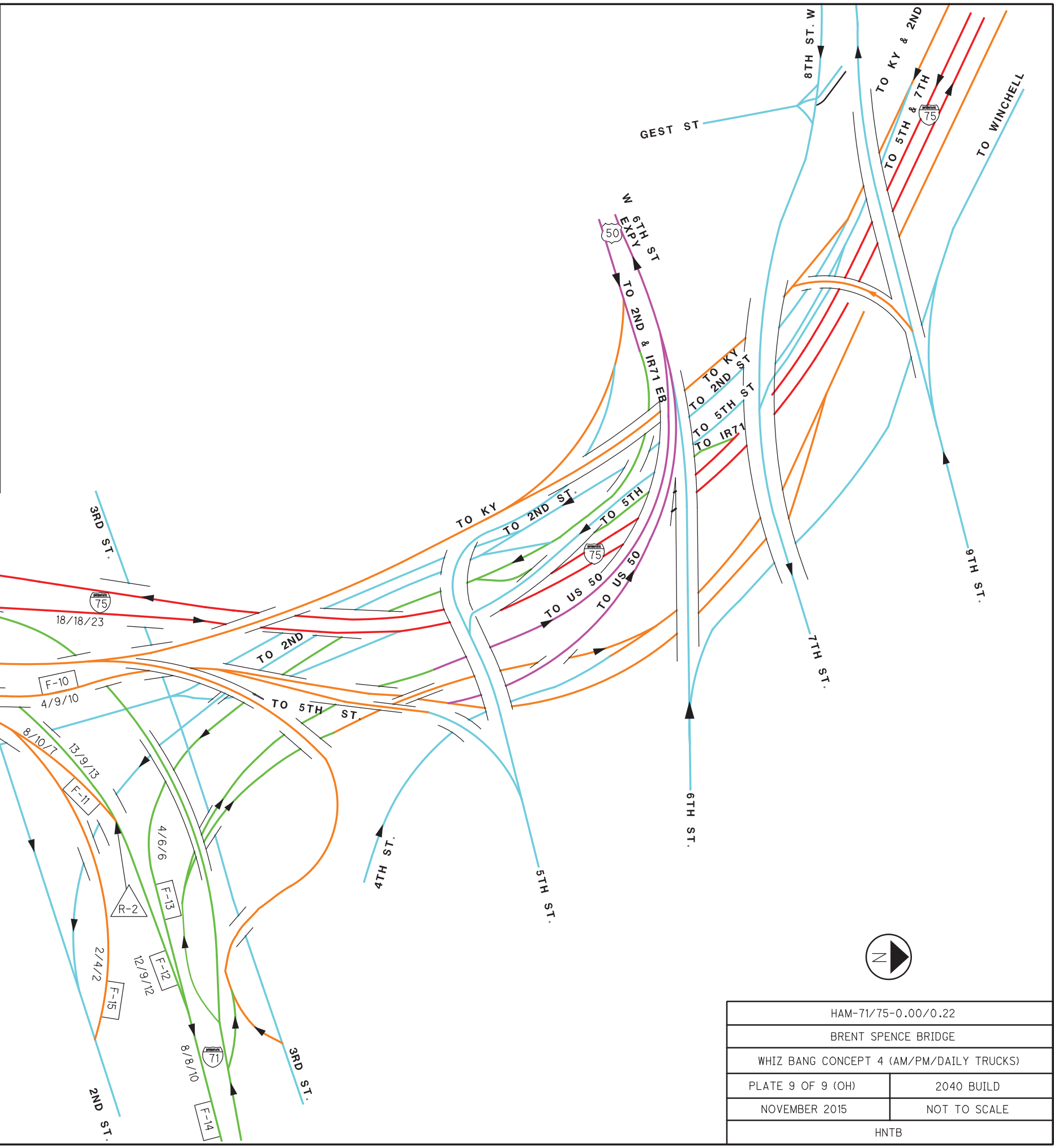
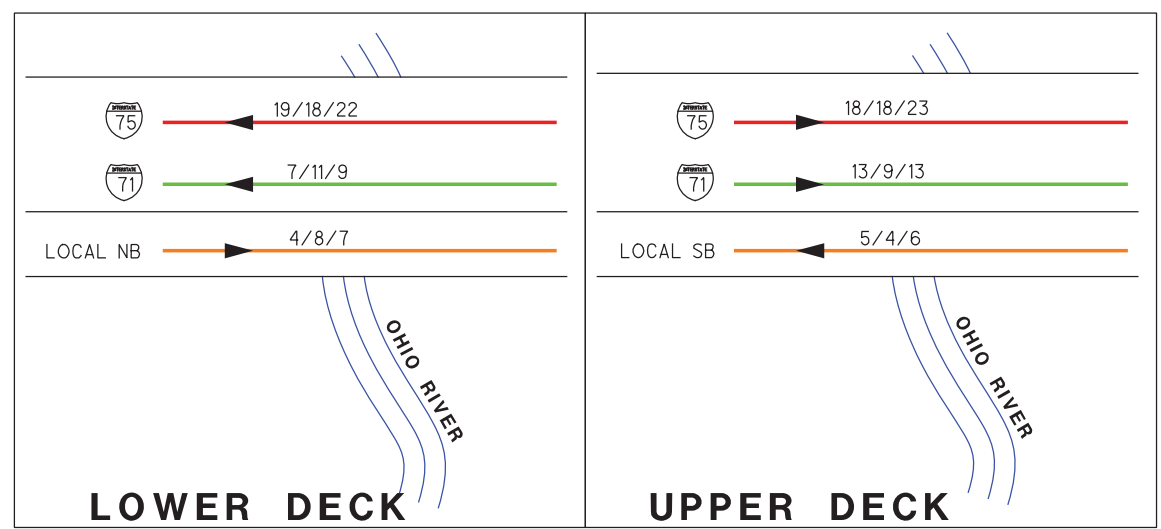
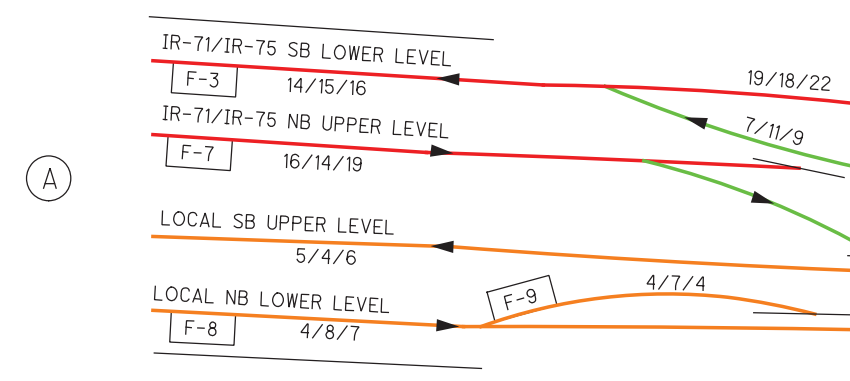
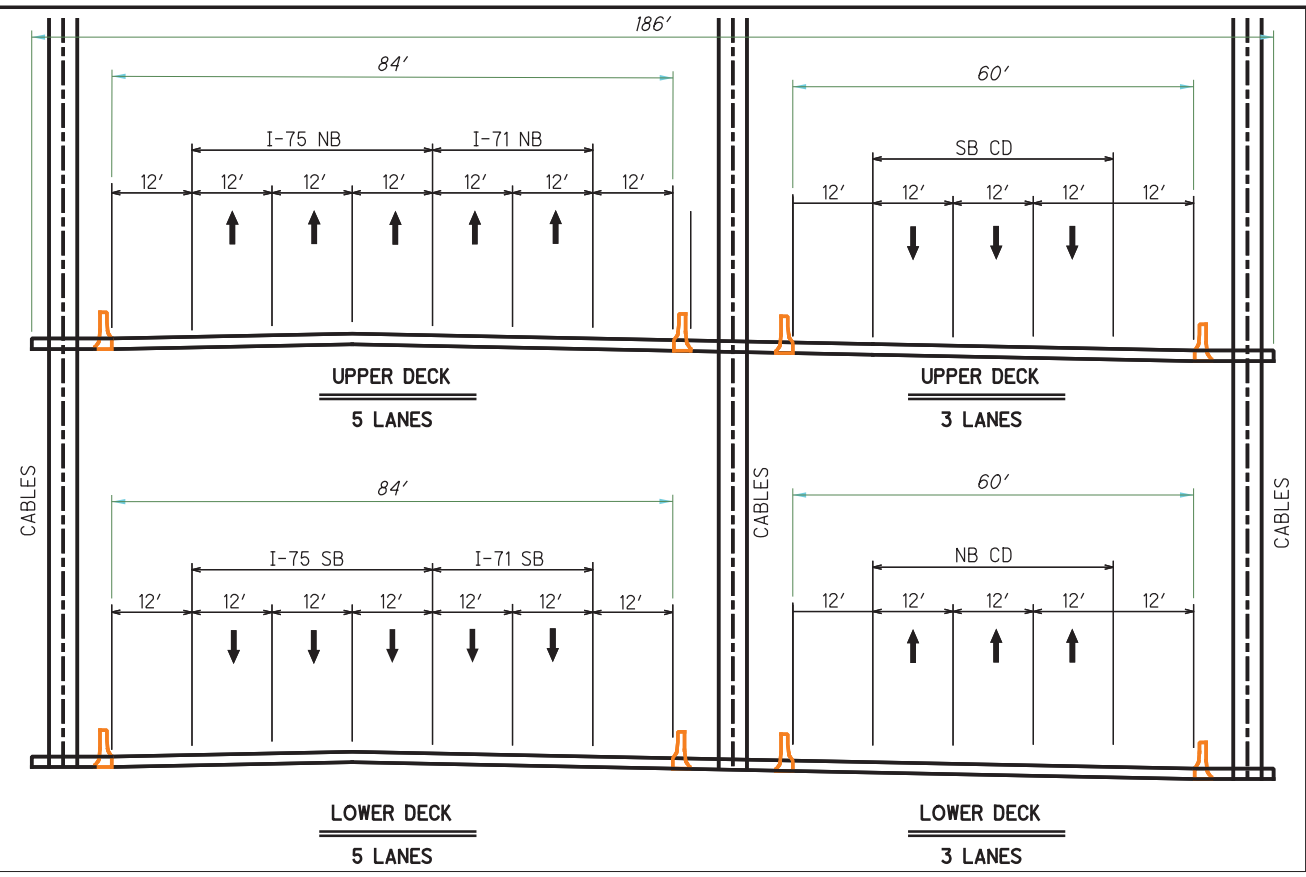
(A)

IR-71/IR-75 SB LOWER LEVEL	75
F-3	14/15/16
IR-71/IR-75 NB UPPER LEVEL	75
F-7	16/14/19
LOCAL SB UPPER LEVEL	5/4/6
LOCAL NB UPPER LEVEL	4/8/7
F-8	

HAM-71/75-0.00/0.22	
BRENT SPENCE BRIDGE	
WHIZ BANG CONCEPT 2 (AM/PM/DAILY TRUCKS)	
PLATE 7 OF 9 (KY)	2040 BUILD
NOVEMBER 2015	NOT TO SCALE
HNTB	



HAM-71/75-0.00/0.22	
BRENT SPENCE BRIDGE	
WHIZ BANG CONCEPT 2 (AM/PM/DAILY TRUCKS)	
PLATE 8 OF 9 (OH)	2040 BUILD
NOVEMBER 2015	NOT TO SCALE
HNTB	



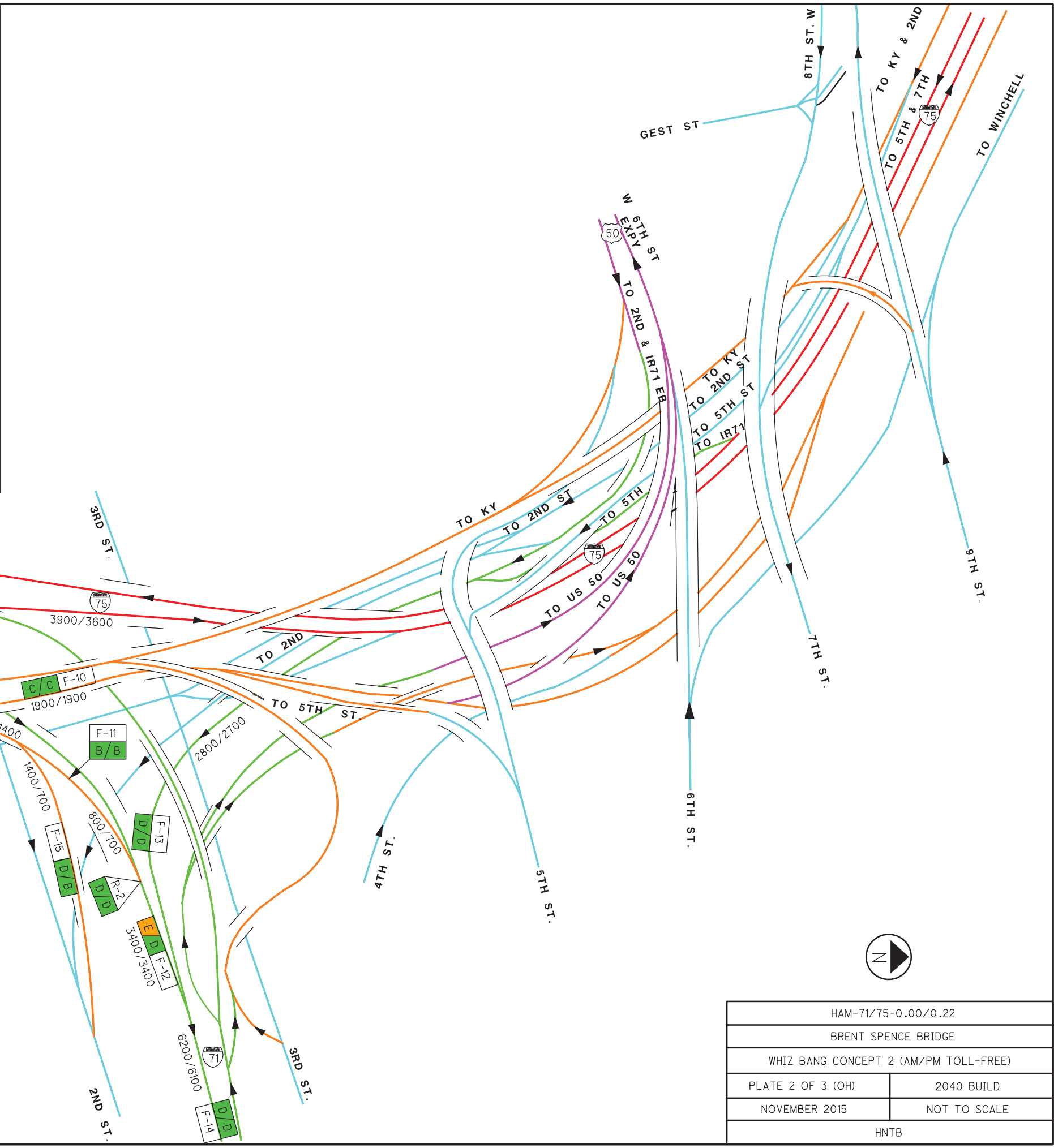
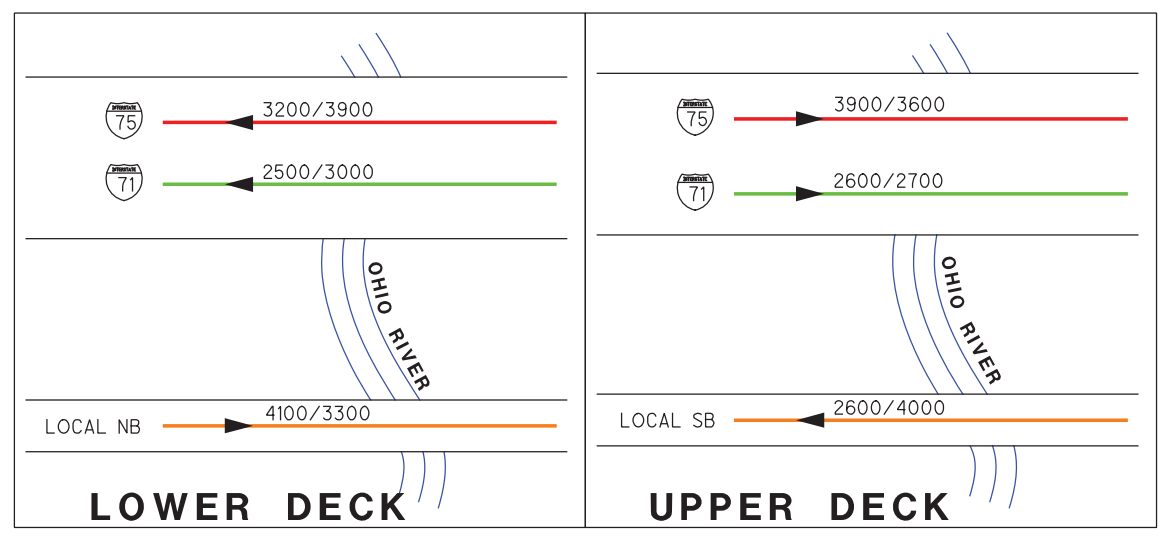
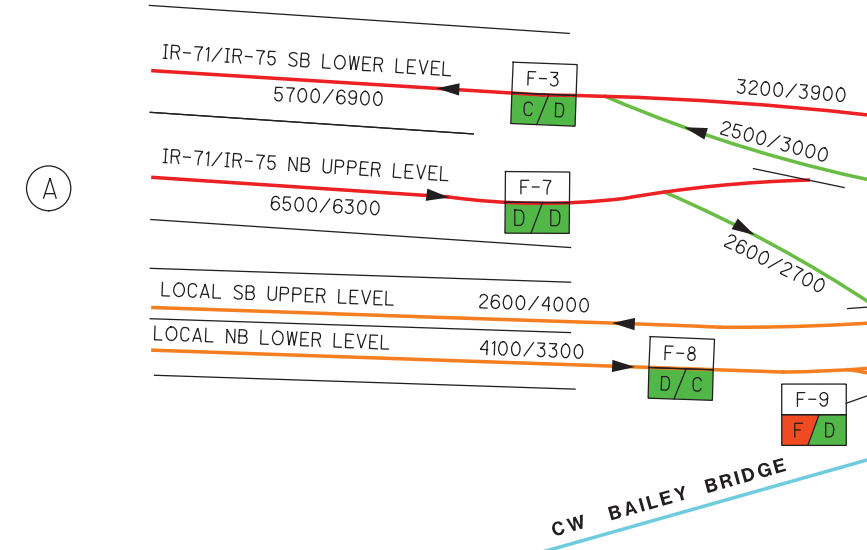
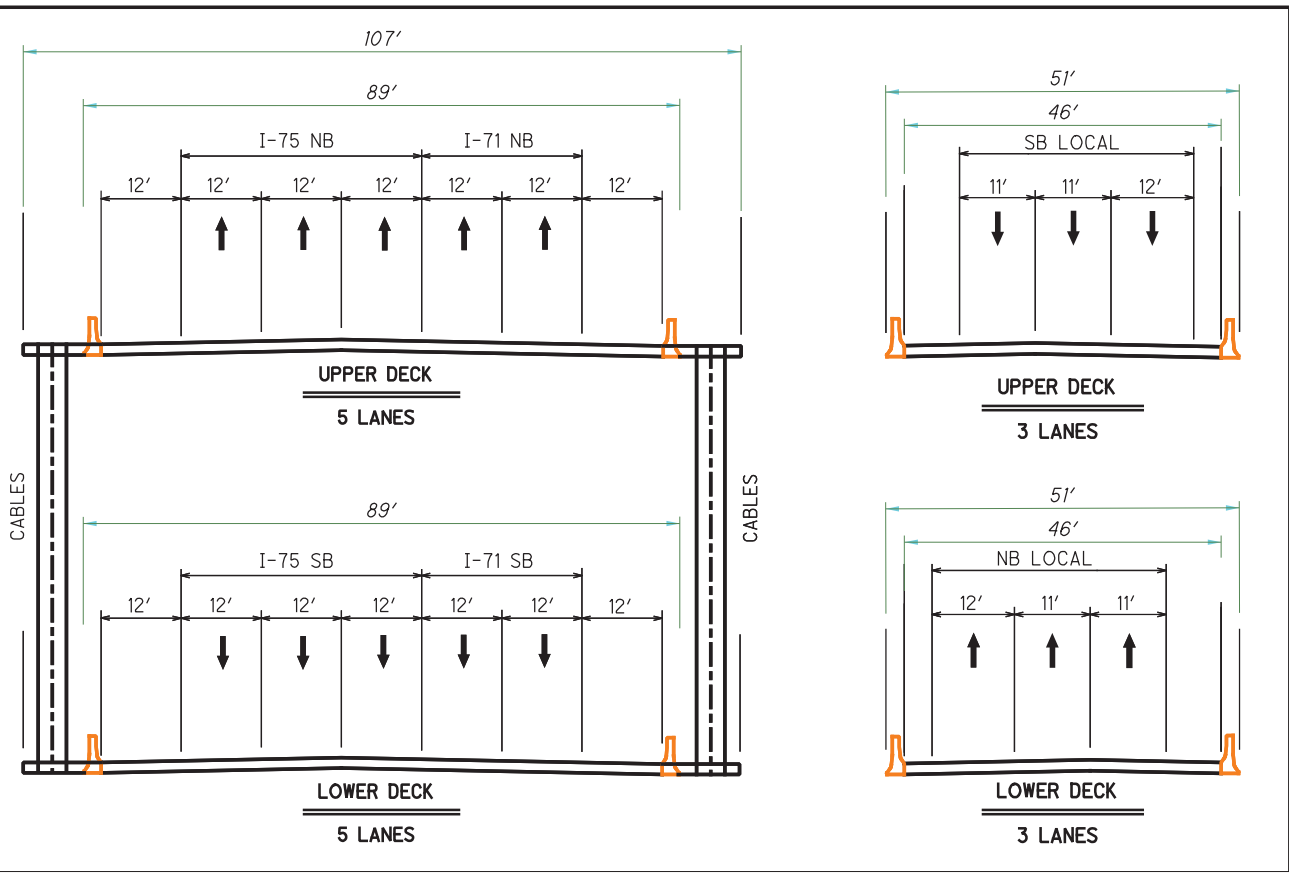
HAM-71/75-0.00/0.22	
BRENT SPENCE BRIDGE	
WHIZ BANG CONCEPT 4 (AM/PM/DAILY TRUCKS)	
PLATE 9 OF 9 (OH)	2040 BUILD
NOVEMBER 2015	NOT TO SCALE
HNTB	



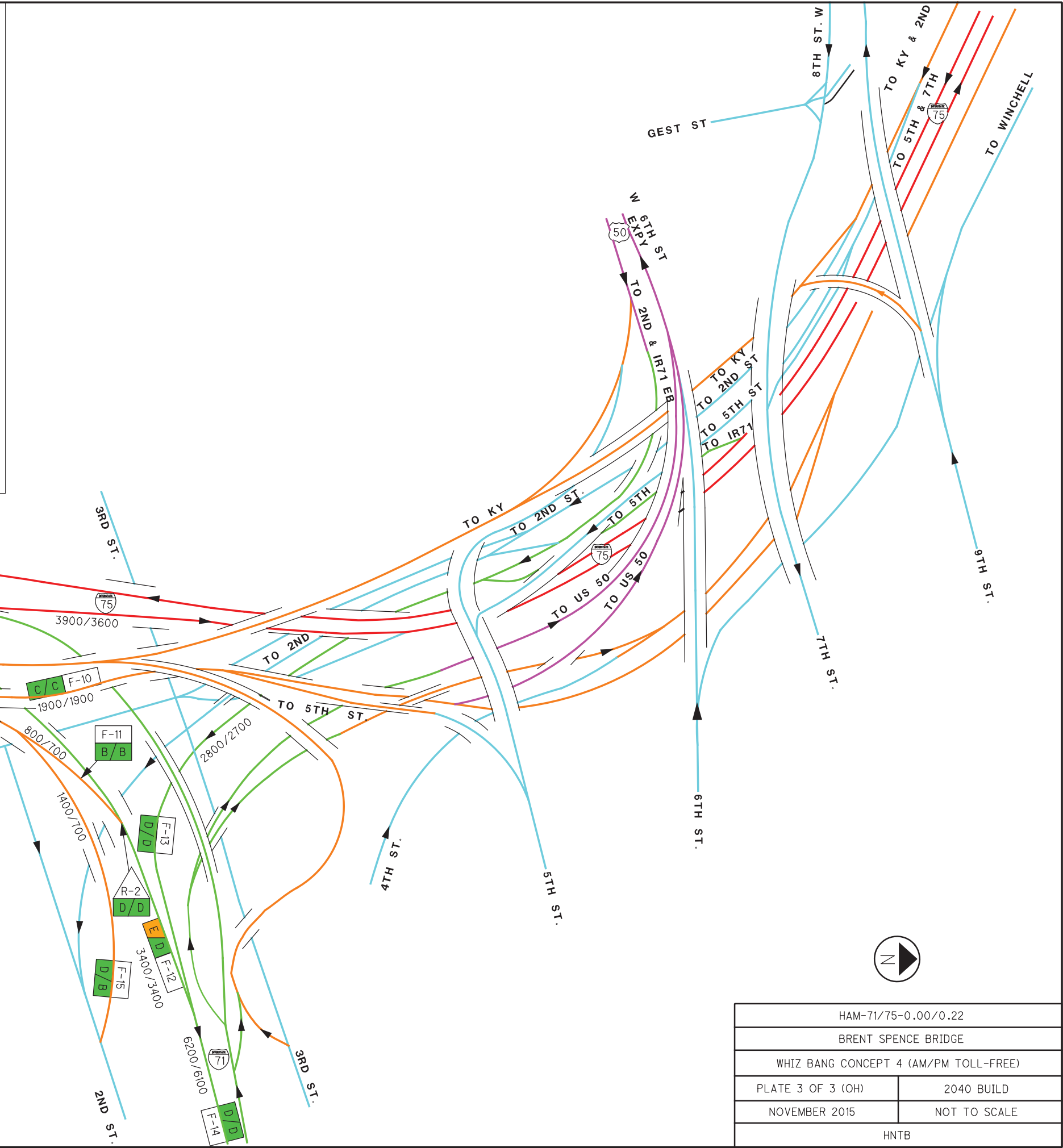
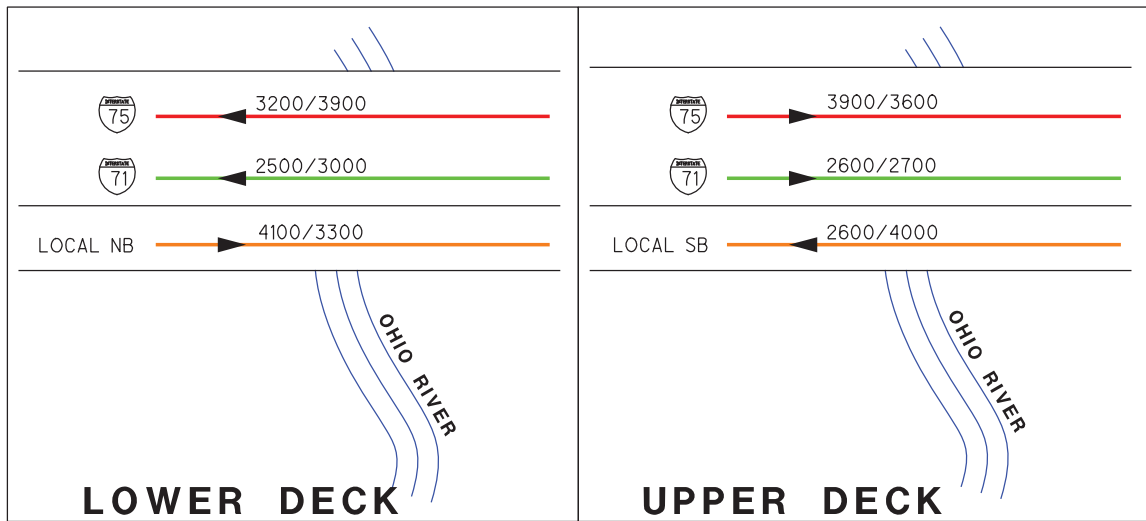
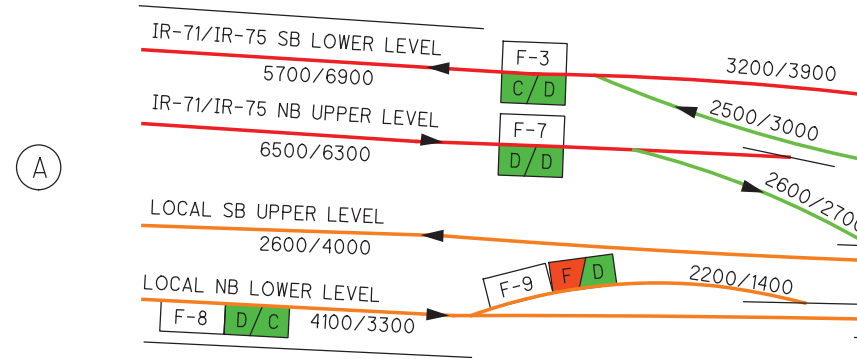
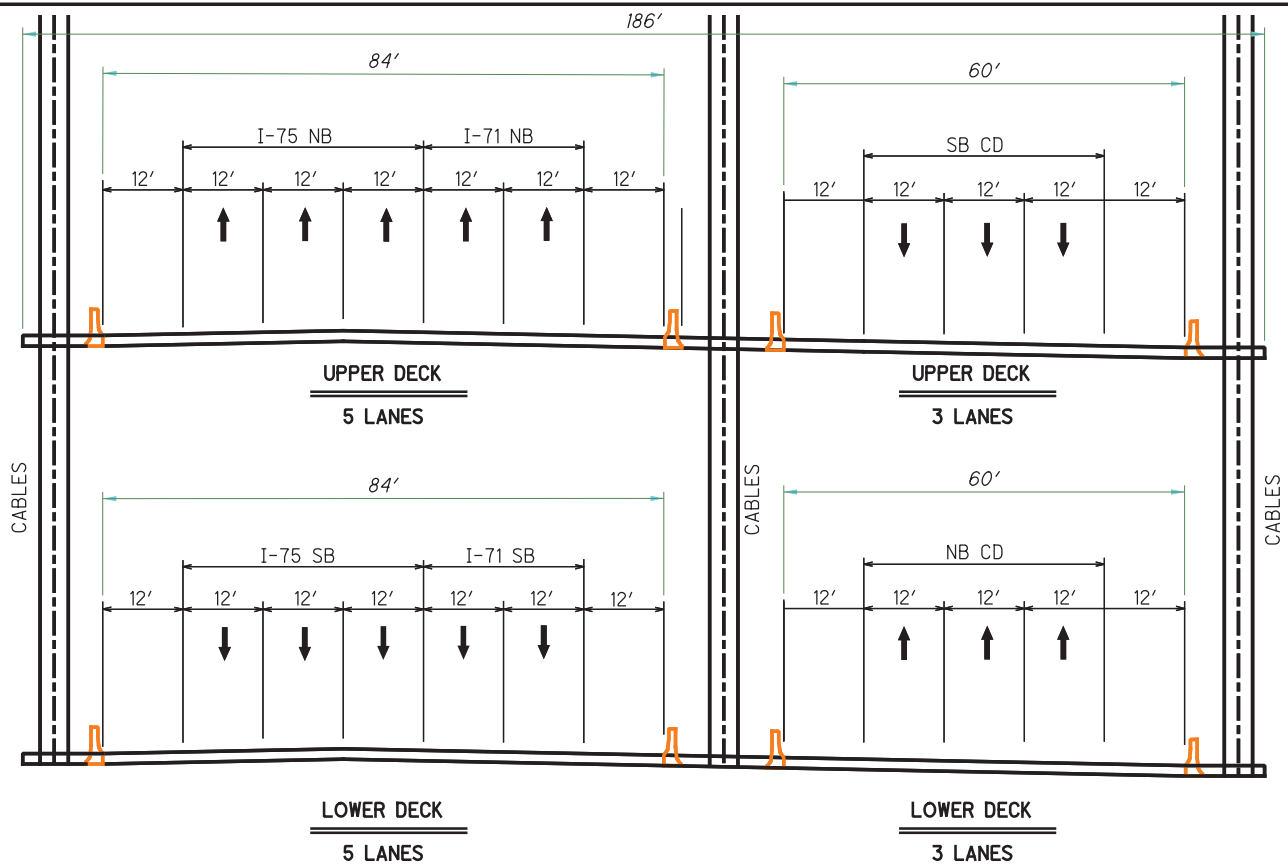
Attachment B
Concept 2 and Concept 4 Levels of Service



HAM-71/75-0.00/0.22	
BRENT SPENCE BRIDGE	
WHIZ BANG CONCEPT 2 (AM/PM TOLL-FREE)	
PLATE 1 OF 3 (KY)	2040 BUILD
NOVEMBER 2015	NOT TO SCALE
HNTB	



HAM-71/75-0.00/0.22	
BRENT SPENCE BRIDGE	
WHIZ BANG CONCEPT 2 (AM/PM TOLL-FREE)	
PLATE 2 OF 3 (OH)	2040 BUILD
NOVEMBER 2015	NOT TO SCALE
HNTB	



HAM-71/75-0.00/0.22	
BRENT SPENCE BRIDGE	
WHIZ BANG CONCEPT 4 (AM/PM TOLL-FREE)	
PLATE 3 OF 3 (OH)	2040 BUILD
NOVEMBER 2015	NOT TO SCALE
HNTB	