

JOINT FLORIDA
Model Task Force & Transportation
Data and Analytics Workshop



Florida Statewide Model Strategic Intermodal System

(FLSWM) – (SIS) Prioritization and Integration





FLSWM – SIS Prioritization and Integration

Support SIS Work Program Process

- Additional information for the SIS project ranking process
 - Measures of Effectiveness (MOE) Reporting
- Add travel demand estimates to SIS Work Program projects
 - Plots of Network Differences
 - Plots of Model Volumes
- Analyze project phasing
 - Definition of project phasing





FLSWM – SIS Prioritization and Integration - Data Sources

Data Sources:

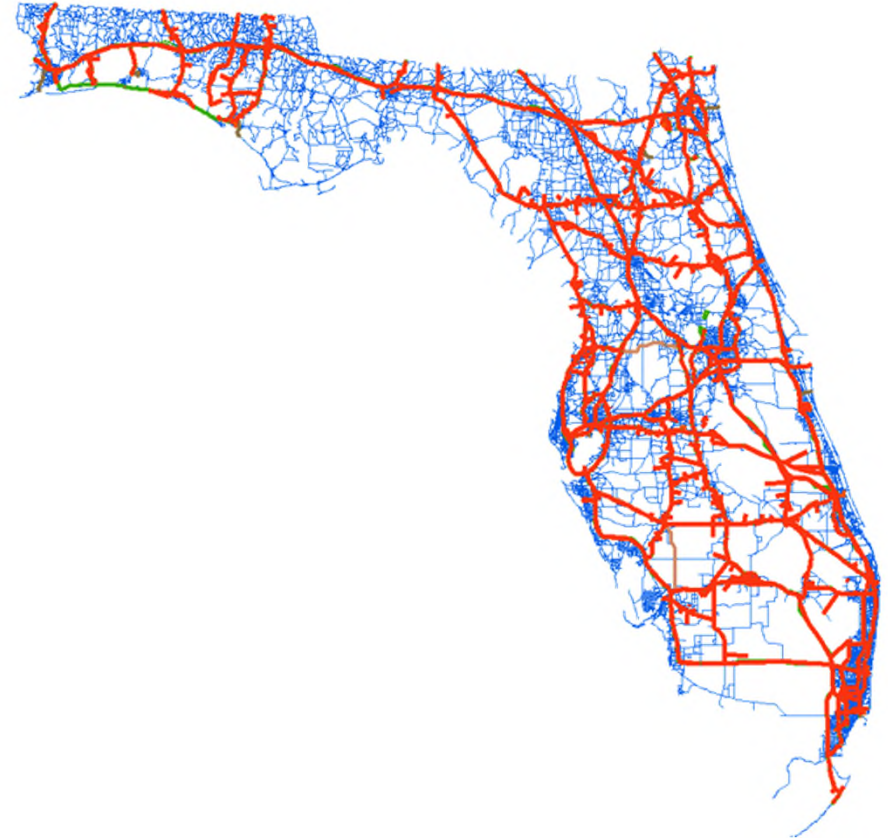
- Florida Statewide Model Master Network (Cube format)
 - Network used for statewide traffic forecasts
 - TrueShape shapefile
- Strategic Intermodal System Plans and Project Shapefiles
 - Inventory of SIS facilities and future year plans
- Roadway Characteristics Inventory (RCI)
 - Maintained inventory of all State and Federal roadway Systems





FLSWM – SIS Prioritization and Integration - Data Sources

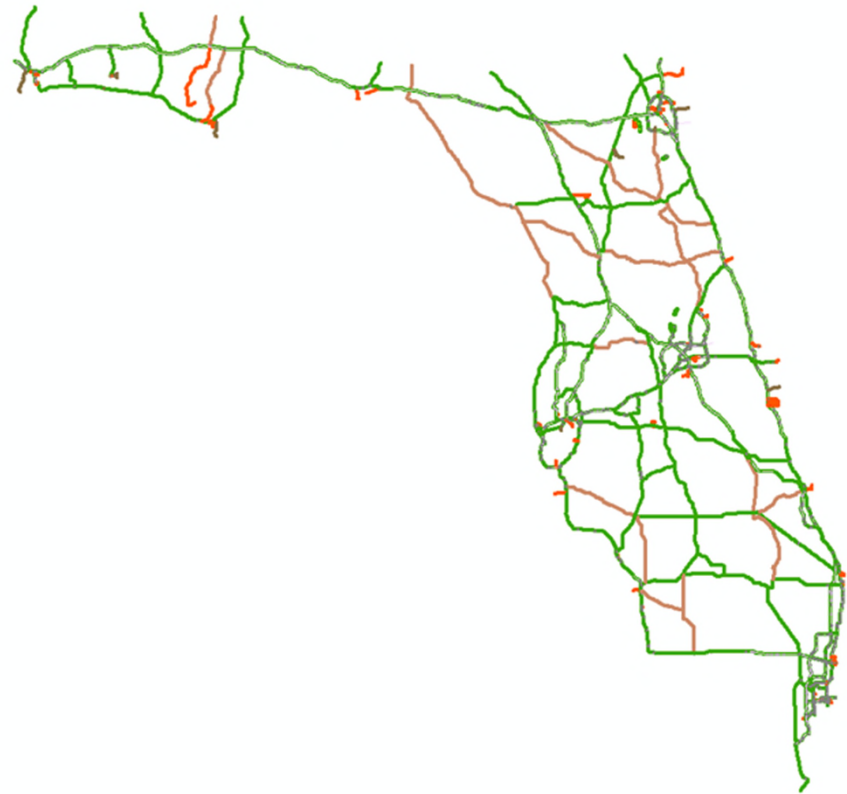
- Florida Statewide Model Master Network
 - ~15,900 links in FLSWM with SIS / RCI reference
 - ~12,340 directional miles for SIS network represented





FLSWM – SIS Prioritization and Integration - Data Sources

- Strategic Intermodal System Shapefile
 - ~4,150 links with RCI reference
 - ~7,990 centerline miles identified as SIS facilities





FLSWM – SIS Prioritization and Integration - Data Sources

- Roadway Characteristics Inventory (RCI)
 - ~15,700 Roadway Segmental Routes with mile measurements
 - ~40,700 Centerline miles (except freeways and tollways with dual-lines represented)
 - ~7,820 Centerline miles identified in RCI as SIS facilities





FLSWM – SIS Prioritization and Integration

Methodology to Apply the FLSWM for SIS Work Program Analyses

- First Approach
 - Linking the RCI with FLSWM network links
 - Match the FLSWM network links to the RCI shapefile/database using the “Roadway ID”
 - Hard to verify all links and Route IDs
- Second Approach
 - Create a new FLSWM network from the RCI GIS/database files
 - Use existing data source for modeling purposes
 - Add additional minor roadways without attribution in RCI
 - Add/adjust centroids and connectors from existing FLSWM network
- RCI = data source is extensive and updated regularly





FLSWM – SIS Prioritization and Integration

Role and Use of FLSWM

- Provide Performance Comparison of System Networks or Projects
 - Base year network
 - Base year and future year SE data
 - A list of SIS projects
- Performance Measures Based on Model Runs
 - Single project run
 - A group of projects run
- Analysis of Travel Characteristics and Modes
 - Identify modes other than highway if necessary (airport, seaport, military, industrial warehouse)

Table I: Generation Statistics by County

- Table 1a: Total Population
- Table 1b: Total Dwelling Units
- Table 1c: Total Households
- Table 1d: Total Employment

Table II: Productions & Attractions by County

- Table 2a: Total Productions
- Table 2b: Total Attractions
- Table 2c: Total Productions Inside USA/Urban
- Table 2d: Total Attractions Inside USA/Urban
- Table 2e: Total Productions Outside USA/Urban

Table III: Highway Overall Unweighted Volume over Capacity Ratios

- Table 3a: Hillsborough
- Table 3b: Pinellas
- Table 3c: Pasco
- Table 3d: TMA
- Table 3e: Hernando
- Table 3f: Citrus
- Table 3g: District 7 Total
- Table 3h: Manatee Segment
- Table 3i: Regional Total

County	2015 Base Trad	2015 Base CS	2023 EC 40 SE	2023 EC 45 SE	2040 CA 45 SE	2040 Needs 46 SE
Hillsborough	0.58	0.58	0.79	0.82	0.79	
Pinellas	0.54	0.54	0.59	0.59	0.59	
Pasco	0.49	0.49	0.77	0.67	0.59	
TMA	0.55	0.55	0.73	0.67	0.59	
Hernando	0.40	0.40	0.56	0.56	0.56	
Citrus	0.35	0.35	0.44	0.44	0.44	
District 7 Total	0.54	0.54	0.65	0.65	0.65	
Manatee Segment	0.43	0.43	0.73	0.73	0.73	
Regional Total	0.54	0.54	0.65	0.65	0.65	

Table 5b: Highway Volume over Capacity Ratios Weighted by VMT

County	2015 Base Trad	2015 Base CS	2023 EC 40 SE	2023 EC 45 SE	2040 CA 45 SE	2040 Needs 46 SE
Hillsborough	0.72	0.72	0.94	0.94	0.94	
Pinellas	0.68	0.68	0.74	0.74	0.74	
Pasco	0.63	0.63	0.93	0.93	0.93	
TMA	0.70	0.70	0.85	0.85	0.85	
Hernando	0.53	0.53	0.65	0.65	0.65	
Citrus	0.45	0.45	0.53	0.53	0.53	
District 7 Total	0.68	0.68	0.86	0.86	0.86	
Manatee Segment	0.74	0.74	1.01	1.01	1.01	
Regional Total	0.68	0.68	0.86	0.86	0.86	

Table 5c: Highway Volume over Capacity Ratios Weighted by VHT

County	2015 Base Trad	2015 Base CS	2023 EC 40 SE	2023 EC 45 SE	2040 CA 45 SE	2040 Needs 46 SE
Hillsborough	0.75	0.74	0.96	0.96	0.96	
Pinellas	0.69	0.69	0.77	0.77	0.77	
Pasco	0.64	0.64	1.02	1.02	1.02	
TMA	0.72	0.71	0.95	0.95	0.95	
Hernando	0.53	0.53	0.75	0.75	0.75	
Citrus	0.48	0.48	0.56	0.56	0.56	
District 7 Total	0.70	0.69	0.92	0.92	0.92	
Manatee Segment	0.79	0.79	1.17	1.17	1.17	
Regional Total	0.70	0.70	0.93	0.93	0.93	

Table 1a: Total Population

County	2015 Base Trad	2015 Base CS	2023 EC 40 SE	2023 EC 45 SE	2040 CA 45 SE	2040 Needs 46 SE
Hillsborough	1,295,315	1,295,315	1,815,964	2,006,245	2,006,245	1,815,964
Pinellas	942,778	942,778	980,440	1,030,000	1,030,000	980,440
Pasco	483,997	483,997	916,400	795,001	795,001	916,400
TMA	2,722,090	2,722,090	3,712,884	3,831,246	3,831,246	3,712,884
Hernando	1,768,819	1,768,819	2,627,400	2,699,600	2,699,600	2,627,400
Citrus	141,501	141,501	191,504	186,000	186,000	191,504
District 7 Total	3,840,410	3,840,410	4,166,708	4,286,846	4,286,846	4,166,708
Manatee Segment	14,440	14,440	25,725	25,725	25,725	25,725
Regional Total	3,854,858	3,854,858	4,192,433	4,312,571	4,312,571	4,192,433

Table 1b: Total Dwelling Units

County	2015 Base Trad	2015 Base CS	2023 EC 40 SE	2023 EC 45 SE	2040 CA 45 SE	2040 Needs 46 SE
Hillsborough	562,012	562,012	790,843	856,322	856,322	790,843
Pinellas	509,394	509,394	539,755	561,108	561,108	539,755
Pasco	236,820	236,820	435,255	372,409	372,409	435,255
TMA	1,308,226	1,308,226	1,765,983	1,789,839	1,789,839	1,765,983
Hernando	85,330	85,330	126,110	124,973	124,973	126,110
Citrus	78,558	78,558	104,307	101,522	101,522	104,307
District 7 Total	1,472,112	1,472,112	1,996,370	2,016,364	2,016,364	1,996,370
Manatee Segment	5,995	5,995	12,588	12,588	12,588	12,588
Regional Total	1,478,107	1,478,107	2,008,958	2,028,952	2,028,952	2,008,958

Table 4a: Highway Volume over Capacity Ratios Weighted by VMT

County	Facility Type	2015 Base Trad	2015 Base CS	2023 EC 40 SE	2023 EC 45 SE	2040 CA 45 SE	2040 Needs 46 SE
Hillsborough	Freeways and Expressways	35,779	35,743	184,808	238,451	237,226	207,226
	Divided Arterials	67,407	68,054	219,720	283,418	213,973	213,973
	Undivided Arterials	15,847	15,794	49,533	72,989	55,787	55,787
	Collectors	80,849	23,291	87,770	47,789	394,185	394,185
	One-Way Facilities	2,025	2,078	7,778	14,783	33,518	33,518
	Passage	11,319	11,662	37,066	45,788	28,084	28,084
	HOV Facilities	-	-	-	-	-	-
	Toll Facilities	0,000	0,000	37,700	42,755	44,488	44,488
	All Facilities	149,081	149,172	609,266	1,311,233	856,240	856,240
	Freeways and Expressways	4,814	4,868	19,000	9,589	11,014	11,014
Pinellas	Divided Arterials	11,134	59,876	73,451	54,378	44,817	44,817
	Undivided Arterials	3,387	3,379	5,768	5,062	4,394	4,394
	Collectors	3,877	3,898	2,488	2,075	2,088	2,088
	One-Way Facilities	893	898	2,438	2,394	4,380	4,380
	Bypass	967	1,083	3,423	2,825	3,134	3,134
Pasco	HOV Facilities	-	-	-	-	-	-
	Toll Facilities	353	354	16,480	15,844	33,574	33,574
	All Facilities	64,820	64,870	117,469	117,477	108,022	108,022
	Freeways and Expressways	4,177	4,170	28,460	27,280	8,881	8,881
	Divided Arterials	13,487	13,167	177,735	213,134	489,587	489,587
TMA	Divided Arterials	4,588	4,534	39,188	18,134	4,381	4,381
	Collectors	2,284	2,388	39,733	14,214	7,581	7,581
	One-Way Facilities	4	4	34	34	38	38
	Bypass	735	714	15,441	5,778	8,831	8,831
	HOV Facilities	-	-	-	-	-	-
Hernando	Toll Facilities	-	-	17,000	9,767	774	774
	All Facilities	16,247	16,087	205,704	139,842	78,897	78,897
	Freeways and Expressways	44,574	44,481	233,472	270,980	278,718	278,718
	Divided Arterials	113,986	110,969	422,615	418,919	324,145	324,145
	Undivided Arterials	11,011	10,087	94,118	96,182	84,517	84,517
Manatee Segment	Collectors	65,880	27,038	112,291	581,813	310,846	310,846
	One-Way Facilities	3,874	3,911	9,852	17,380	17,821	17,821
	Bypass	11,872	12,781	48,252	24,571	38,181	38,181
	HOV Facilities	-	-	-	-	-	-
	Toll Facilities	4,418	6,424	71,188	81,509	38,811	38,811
Regional Total	All Facilities	290,284	290,689	762,469	1,439,843	1,044,101	1,044,101
	Freeways and Expressways	-	-	-	-	-	-





FLSWM – SIS Prioritization and Integration - Next Steps

Create an automated process to develop an SIS network from RCI information

- Accuracy and consistency
 - Networks and shapes
 - Roadway characteristics and features
 - Data sources



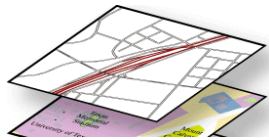


Automate Network Creation



RCI Conversion Synopsis

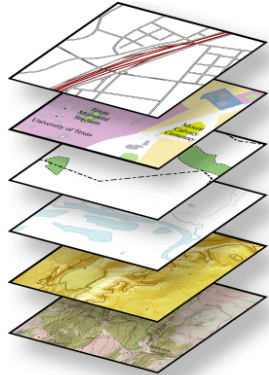
RCI GIS Layers



RCI Routes
RCI Basemap Arcs



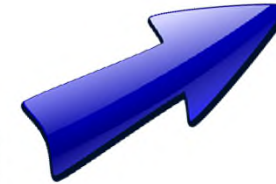
RCI Data Layers



RCI Routes
SIS References
Functional Class
Number of Lanes
Speed
Road Type



Consolidated Layers



Roadway and Node Layers



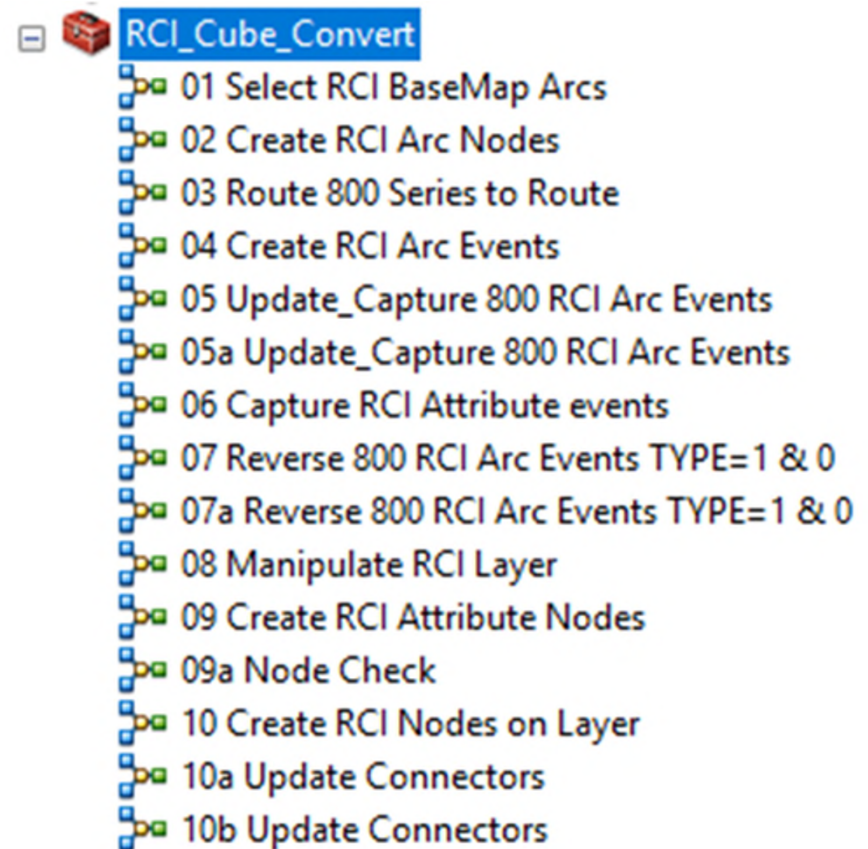
Prod	Paths	Days	aND	aOT	aPD	aPH	aSP	aSW	cDrug	
A06Z	16	533	271	474			1,994	283	209	12,837
C06Z	38	38								81
D13Z	26	29								360
D13Z	21	21								2
D40Z	134	144				3			36	690
D67Z	21	41	4	29		12	12	9		637
E09C	27	43	1			3				190
F06A	30	240		115		662		18	1,247	
F15Z	39	87		6		23		5	2,071	
F42B	43	91	2							499
F74Z	72	110	23	11		48		16	1,516	
G07B	22	60				9		5	74	
G08Z	23	48	13			66		42	409	
G09Z	26	38				7				70
G44C	168	168								70
G46B	179	179				5				84
G67B	64	142	6	55		44	18	9	1,858	
H04B	27	47				25				220
I13C	29	118	3	78		208		12	213	
I18Z	30	57	42	18		73		7	180	
J23Z	17	25				11		2	7	
J26Z	47	71				33		17	1,965	
J59C	10	15		5		2				13,770
J11Z	91	194		79		127		26	193	





RCI Base Map Automation to CUBE Tools

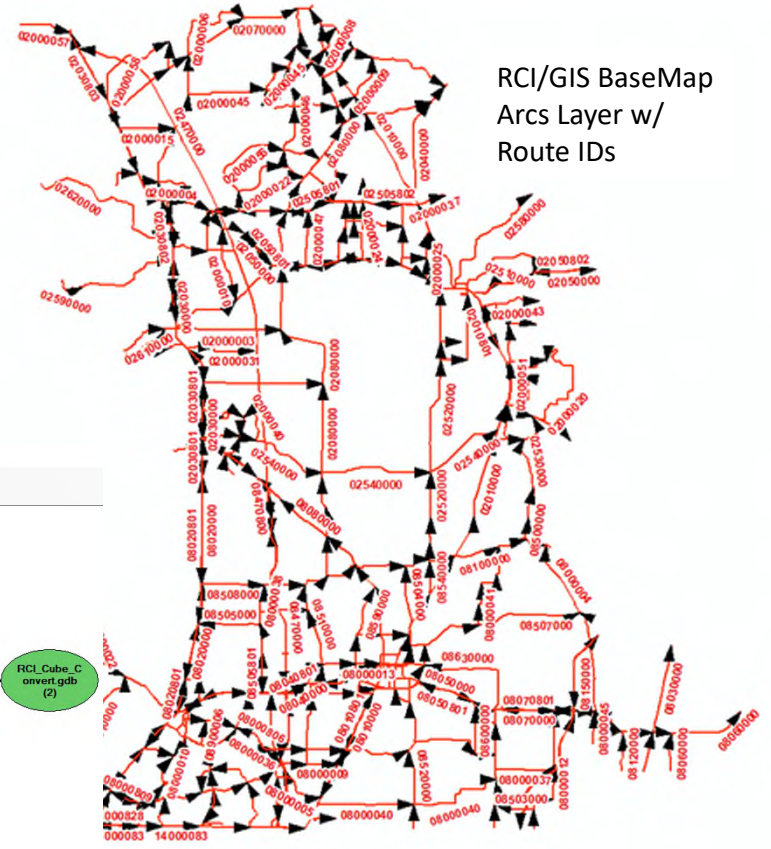
- Tools to convert RCI attribute layers to a combined GIS layer ready to use as a Cube Network



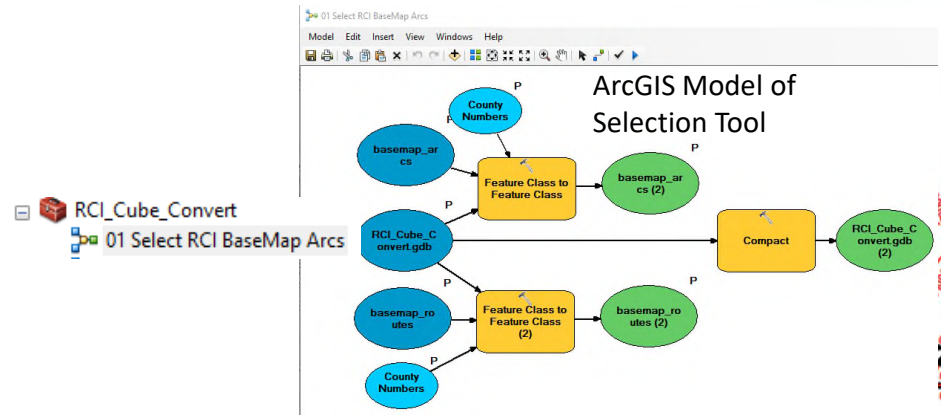


RCI Base Map Automation to CUBE Tools

- Proof of Concept demo, sub-select RCI Basemap Routes and Arcs
 - Tool could be used to select any sub-selection of counties within the State (e.g. Districts by County)
 - For Demo, Hernando & Citrus Counties were selected



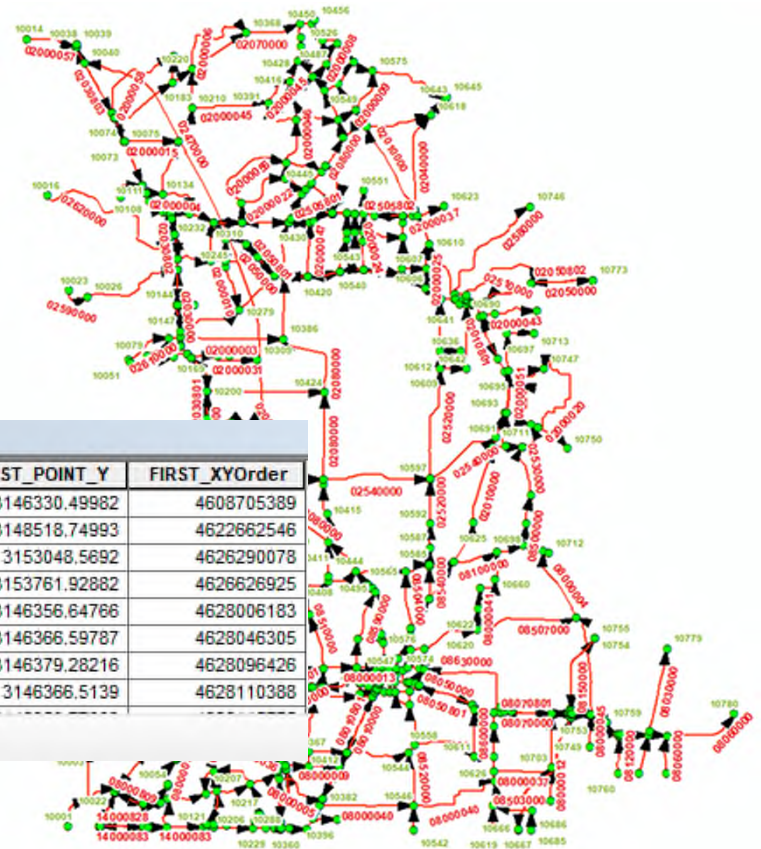
RCI/GIS BaseMap Arcs Layer w/ Route IDs





RCI Base Map Automation to CUBE Tools

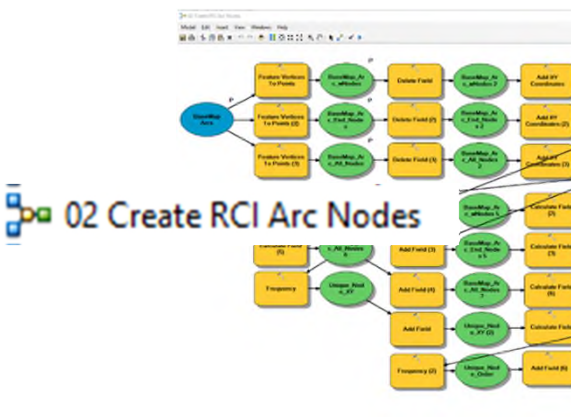
- Tool developed to create node features for Basemap Arcs
 - Redundant nodes are removed
- Preserves RCI Basemap intersections and points of connectivity



BaseMap_Nodes

OBJECTID *	Shape *	NODE	FIRST_POINT_X	FIRST_POINT_Y	FIRST_XYOrder
1	Point	10001	336760.59376	3146330.49982	4608705389
2	Point	10002	338464.74993	3148518.74993	4622662546
3	Point	10003	338538.69207	3153048.5692	4626290078
4	Point	10004	338518.27722	3153761.92882	4626626925
5	Point	10005	339394.7713	3146356.64766	4628006183
6	Point	10006	339399.31991	3146366.59787	4628046305
7	Point	10007	339404.97853	3146379.28216	4628096426
8	Point	10008	339408.06589	3146366.5139	4628110388

(0 out of 780 Selected)

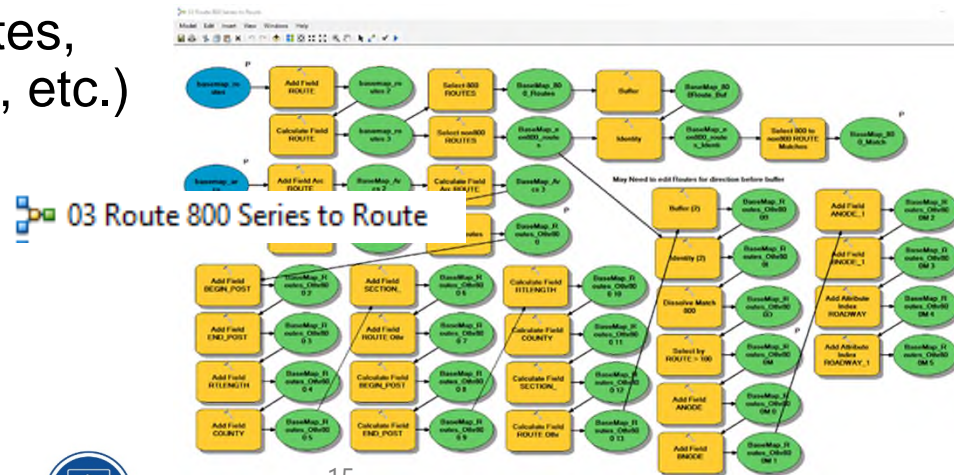
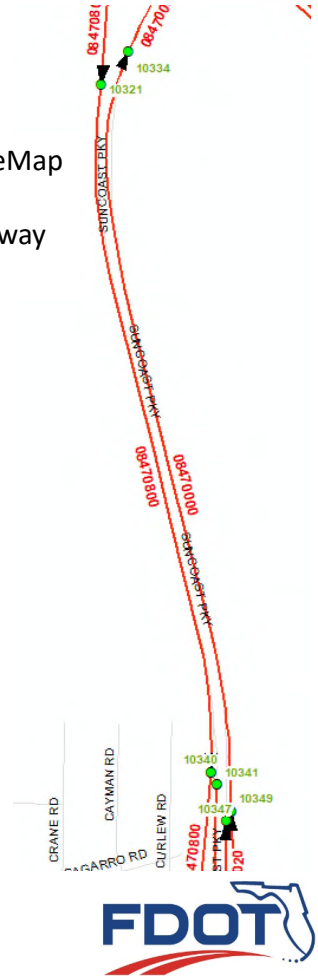




RCI Base Map Automation to CUBE Tools

- RCI attribute layers are oriented and stored in a Centerline format
- Tool developed to analyze RCI / GIS routes layer relationships to process divided roadways and reverse Arc connections based on traffic flow (e.g. interstates, tollways, major arterials, etc.)

RCI GIS BaseMap
Arcs Layer
Divided Tollway
example

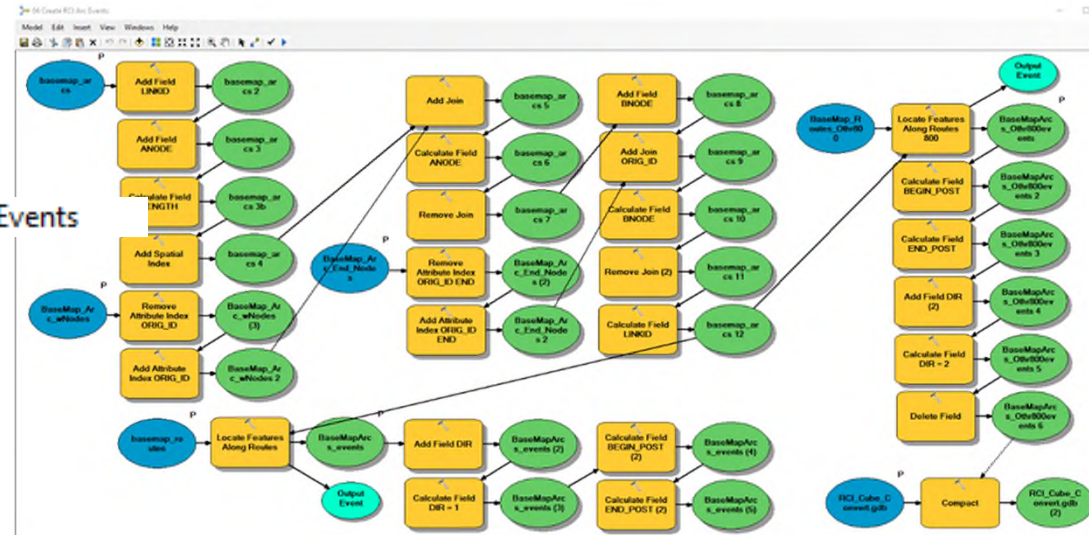




RCI Base Map Automation to CUBE Tools

- Tool developed to add unique node pairs (ANODE - BNODE) references to the BaseMap Arcs
- Tool also creates an RCI based events table for the Arcs layer

04 Create RCI Arc Events





RCI Base Map Automation to CUBE Tools

- Basemap Arcs with unique node (ANODE - BNODE) pairs added
- New Events Table of ARCs layer with RCI linear reference

OBJECTID*	Shape*	LENGTH	ROADWAY	EXCEPT1	EXCEPT2	EXCEPT3	TEMP	NEW	ROADWAY2	CONNECTOR	TYPE	CO_NUM	TPIKE	OID2	Shape*	LINKID	ANODE	BNODE	ROUTE
105	Polyline	1047.979837	02000001				N	0	02md14dc	0	0	02	00	6103	1047.97994	010674010688	10674	10680	02000
136	Polyline	1473.799364	02000001				N	0	02md14dc	0	0	02	00	6103	1473.799364	010688010701	10688	10701	02000
716	Polyline	12.073224	02000002				N	0	02md14dc	0	0	02	00	19215	12.073224	010199010200	10199	10200	02000
616	Polyline	9883.403527	02000002				N	0	02md14dc	0	0	02	00	6122	9883.403527	010200010424	10200	10424	02000
617	Polyline	8659.939984	02000003				N	0	02md14dc	0	0	02	00	6123	8659.939984	010142010386	10142	10386	02000
891	Polyline	3855.036455	02000004				N	0	02md14dc	0	0	02	00	6201	3855.036455	010134010197	10134	10197	02000
892	Polyline	1420.130954	02000004				N	0	02md14dc	0	0	02	00	6202	1420.130954	010108010134	10108	10134	02000
1017	Polyline	10.122366	02000004				N	0	02md14dc	0	0	02	00	219	10.122366	010107010108	10107	10108	02000
616	Polyline	2156.346427	02000005				N	0	02md14dc	0	0	02	00	6090	2156.346427	010183010195	10183	10195	02000
685	Polyline	8568.35896	02000006				N	0	02md14dc	0	0	02	00	257	8568.35896	010220010368	10220	10368	02000
666	Polyline	1486.062712	02000007				N	0	02md14dc	0	0	02	00	258	1486.062712	010417010416	10417	10416	02000
703	Polyline	1386.974723	02000007				N	0	02md14dc	0	0	02	00	550	1386.974723	010428010433	10428	10433	02000
818	Polyline	1218.741163	02000007				N	0	02md14dc	0	0	02	00	127	1218.741163	010435010436	10435	10436	02000
819	Polyline	732.786736	02000007				N	0	02md14dc	0	0	02	00	128	732.786736	010433010435	10433	10435	02000
620	Polyline	1913.854279	02000007				N	0	02md14dc	0	0	02	00	129	1913.854279	010416010428	10416	10428	02000
821	Polyline	1978.469857	02000007				N	0	02md14dc	0	0	02	00	130	1978.469857	010417010417	10417	10417	02000
615	Polyline	2211.677033	02000008				N	0	02md14dc	0	0	02	00	609	2211.677033	010422010417	10422	10417	02000

OBJECTID*	ROADWAY	BEGIN_POST	END_POST	LENGTH	ROADWAY2	EXCEPT1	EXCEPT2	EXCEPT3	TEMP	NEW	ROADWAY22	CONNECTOR	TYPE	CO_NUM	TPIKE	OID2	LINKID	ANODE	BNODE	ROUTE
1	02000001	0	0.6463	1047.979837	02000001				N	0	02md14dc	0	0	02	00	15357	010674010688	10674	10680	02000
2	02000001	0.6463	1.555	1473.799364	02000001				N	0	02md14dc	0	0	02	00	6103	010688010701	10688	10701	02000
3	02000002	0	0.0075	12.073224	02000002				N	0	02md14dc	0	0	02	00	19215	010199010200	10199	10200	02000
4	02000002	0.0075	6.151	9883.403527	02000002				N	0	02md14dc	0	0	02	00	6122	010200010424	10200	10424	02000
5	02000003	0	5.379	8659.939984	02000003				N	0	02md14dc	0	0	02	00	6123	010142010386	10142	10386	02000
6	02000004	0.8887	3.284	3855.036455	02000004				N	0	02md14dc	0	0	02	00	6201	010134010197	10134	10197	02000
7	02000004	0.0063	0.8887	1420.130954	02000004				N	0	02md14dc	0	0	02	00	6202	010108010134	10108	10134	02000
8	02000004	0	0.0063	10.122366	02000004				N	0	02md14dc	0	0	02	00	19219	010107010108	10107	10108	02000
9	02000005	0	1.342	2156.346427	02000005				N	0	02md14dc	0	0	02	00	6090	010183010195	10183	10195	02000
10	02000007	0	5.336	8568.35896	02000007				N	0	02md14dc	0	0	02	00	257	010220010368	10220	10368	02000
11	02000007	1.2275	2.1494	1486.062712	02000007				N	0	02md14dc	0	0	02	00	13258	010417010416	10417	10416	02000
12	02000007	3.3368	4.1973	1386.974723	02000007				N	0	02md14dc	0	0	02	00	17550	010428010433	10428	10433	02000
13	02000007	4.1973	4.6519	1218.741163	02000007				N	0	02md14dc	0	0	02	00	6127	010435010436	10435	10436	02000
14	02000007	4.1973	4.6519	732.786736	02000007				N	0	02md14dc	0	0	02	00	6128	010433010435	10433	10435	02000
15	02000007	2.1494	3.3368	1913.854279	02000007				N	0	02md14dc	0	0	02	00	6129	010416010428	10416	10428	02000
16	02000007	0	5.379	1978.469857	02000007				N	0	02md14dc	0	0	02	00	6130	010422010417	10422	10417	02000





RCI Base Map Automation to CUBE Tools

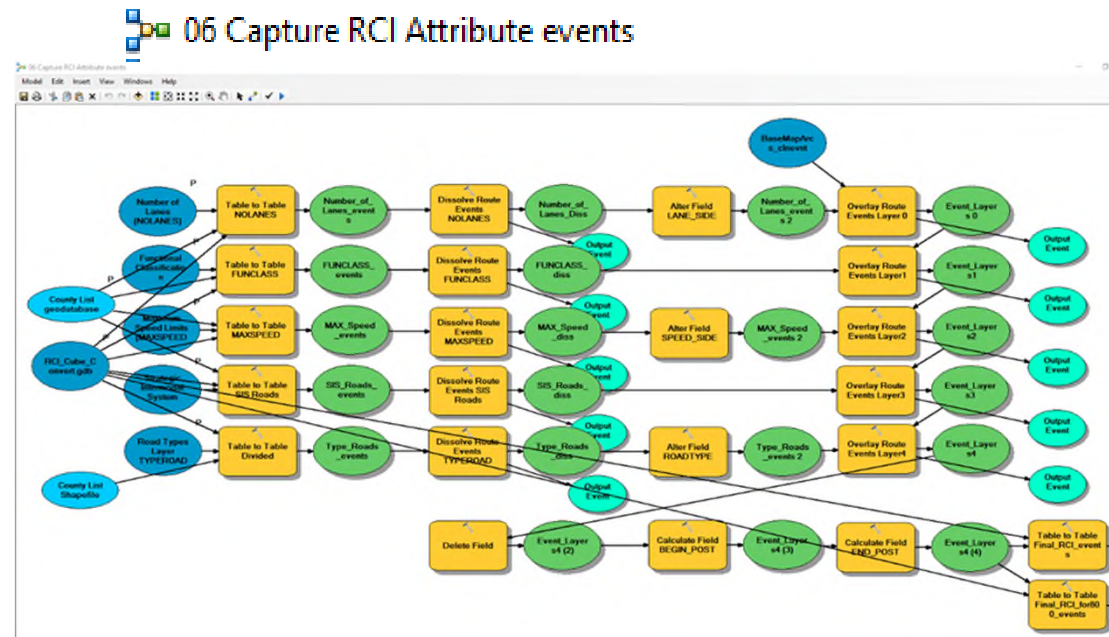
- Arcs for reverse traffic flow of divided roadways are processed further and added to RCI based events table





RCI Base Map Automation to CUBE Tools

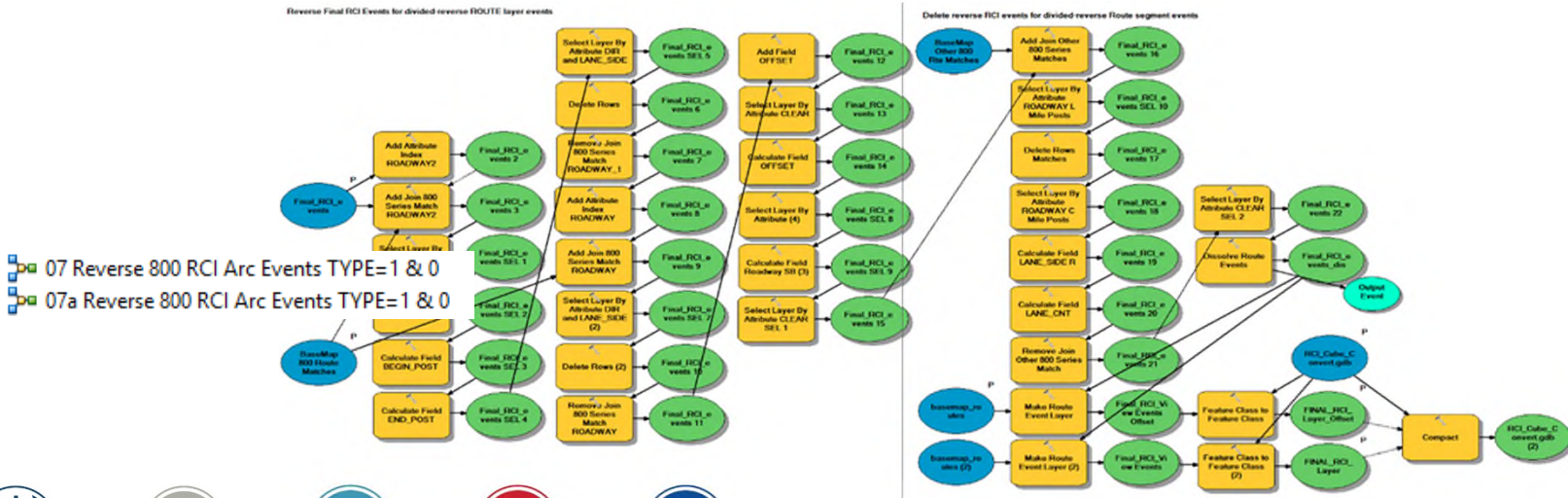
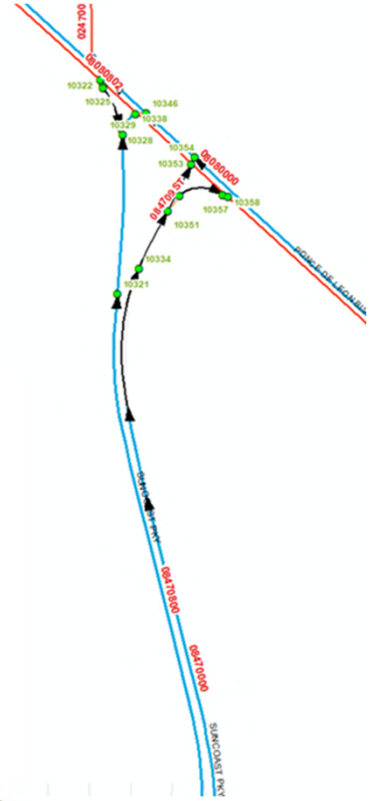
- For demo, five RCI-layer attribute events tables were chosen (SIS, Functional Classification, Number of Lanes, Max Speed, and Road Type)
 - More RCI Events Tables will be selected for modeling needs
- Tool was developed to merge the RCI layer events tables with the Arcs events table into a single master events table of Arcs, Nodes, and RCI attributes





RCI Base Map Automation to CUBE Tools

- Tool developed to process reverse traffic-flow attributes into RCI “800” routes to represent opposite-side divided roadway features (e.g. interstates, tollways, major divided arterials, etc.)
 - RCI uses side attribute types L, R & C for distinction of side-of-road
 - L-Left, R-Right, and C-Composite values





RCI Base Map Automation to CUBE Tools

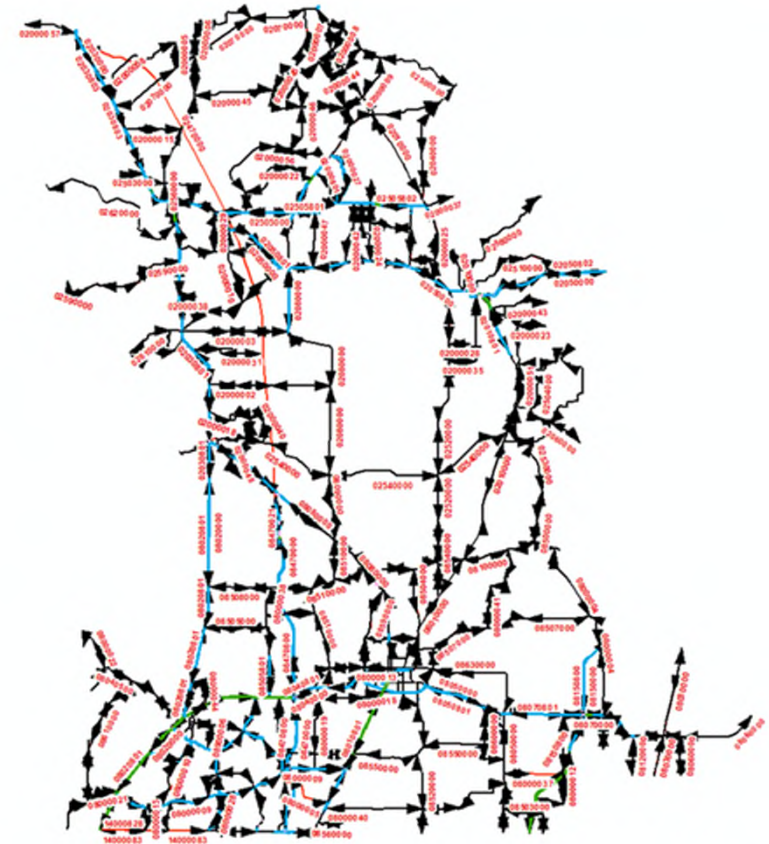
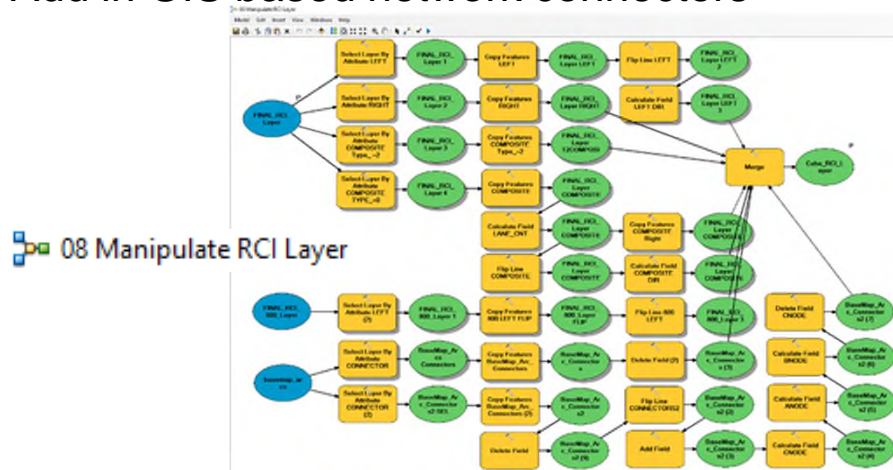
- Tool also applies the changes to a combined Events Table for RCI routes





RCI Base Map Automation to CUBE Tools

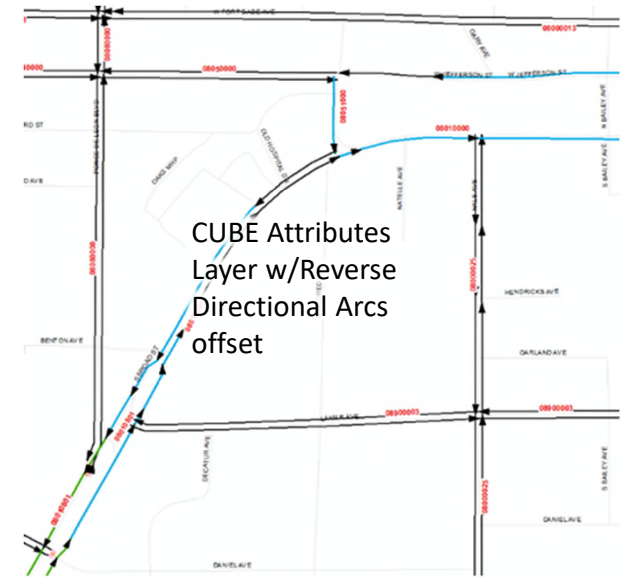
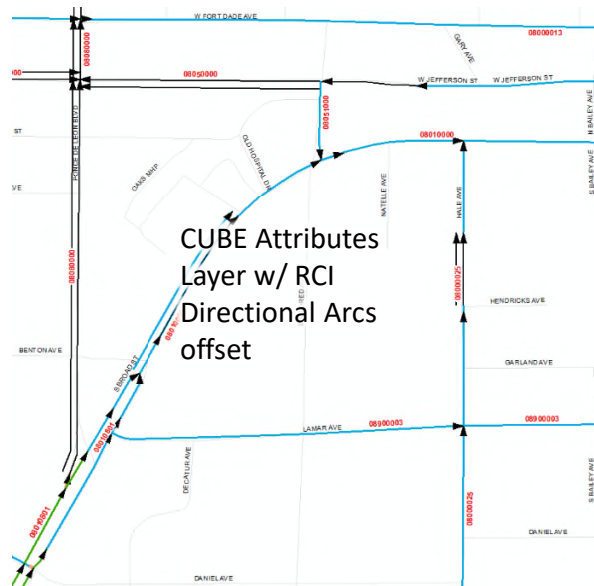
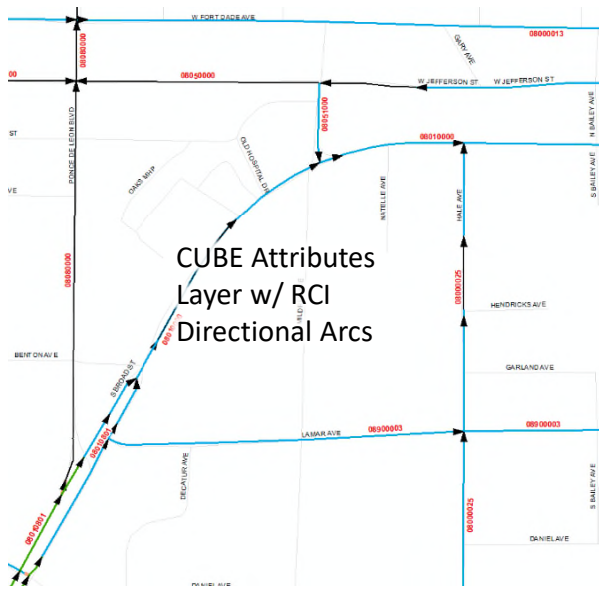
- Tool developed to make graphic adjustments for CUBE
 - Change C-Composite link information to directional
 - Adjust CUBE links directionality
 - Add in GIS based network connectors





RCI Base Map Automation to CUBE Tools

- Change C-Composite link information to directional
- Adjust Arcs directionality





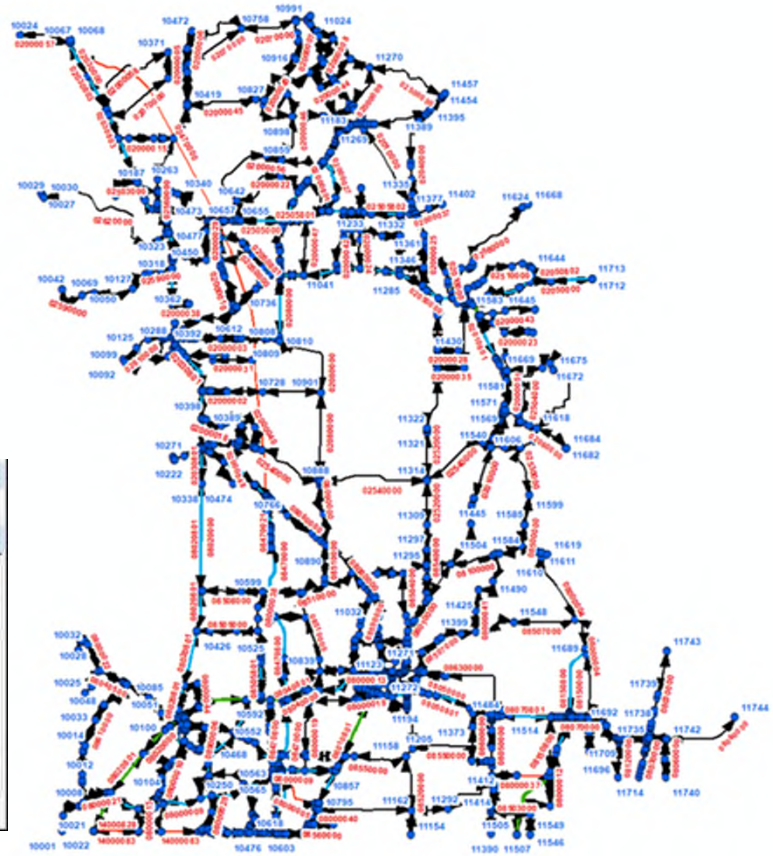
RCI Base Map Automation to CUBE Tools

- Tool developed to create a new node structure / nodes layer for the new Arcs with the RCI attributes

09 Create RCI Attribute Nodes

OBJECTID *	Shape *	POINT_X	POINT_Y	XYOrder	NODE
1	Point M	333252.15062	3212373.73623	4628719543	10019
2	Point M	335035.94839	3199267.21206	4632517606	10022
3	Point M	335115.80538	3199094.11213	4632975657	10024
4	Point M	335256.67454	3198900.25568	4633860877	10025
5	Point M	336780.59376	3146330.49982	4608705389	10001
6	Point M	336792.62551	3191297.74978	4639753074	10034
7	Point M	336850.15715	3146748.56948	4609645257	10002
8	Point M	336860.99114	3147627.35334	4610324359	10003

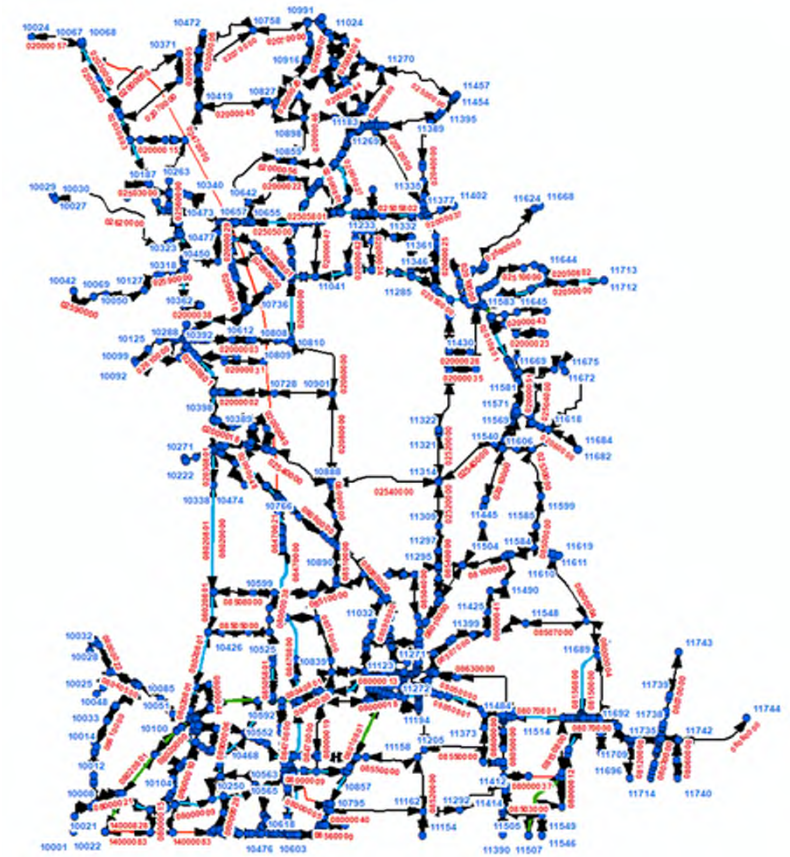
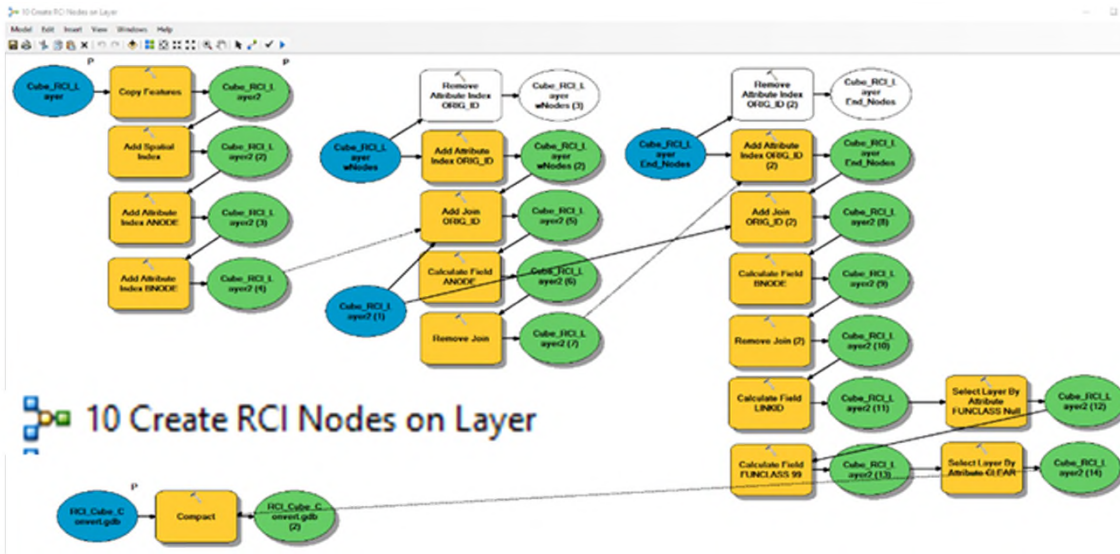
Cube_RCI_Nodes (0 out of 1844 Selected)





RCI Base Map Automation to CUBE Tools

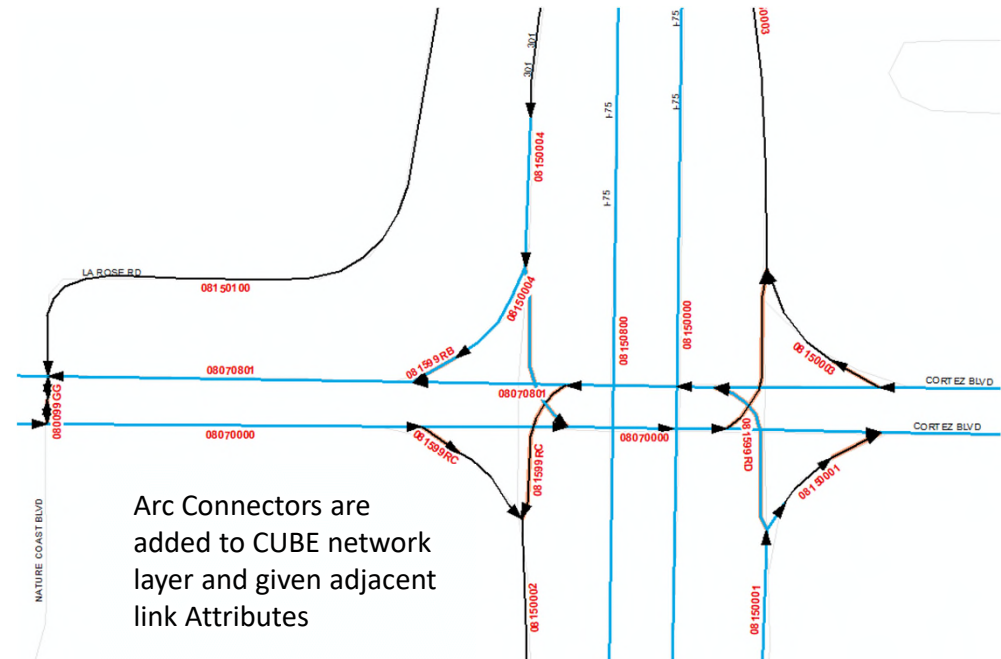
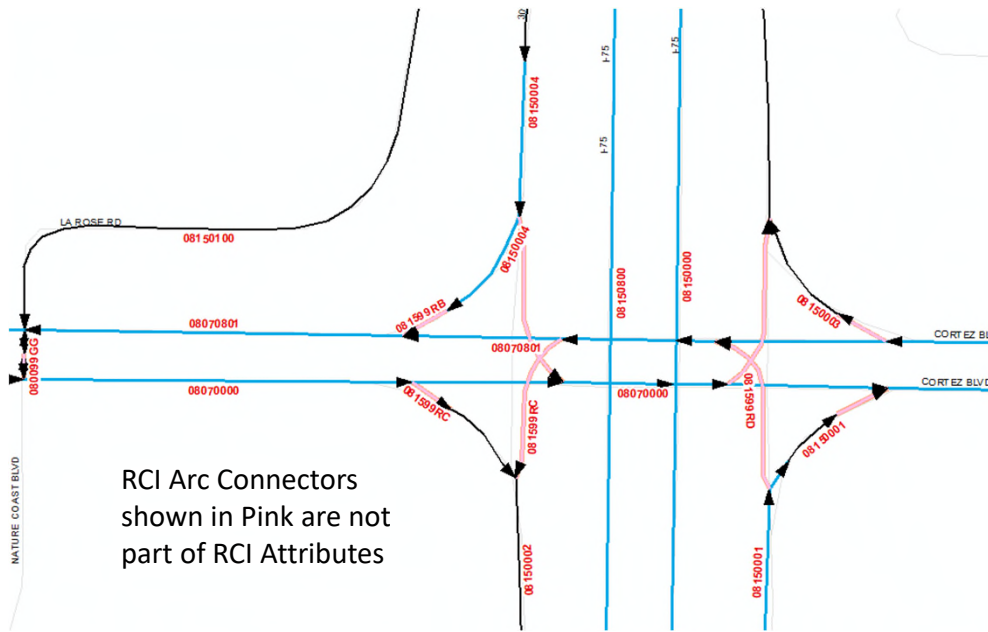
- Tool developed to add new node structure back to Arcs with RCI attributes





RCI Base Map Automation to CUBE Tools

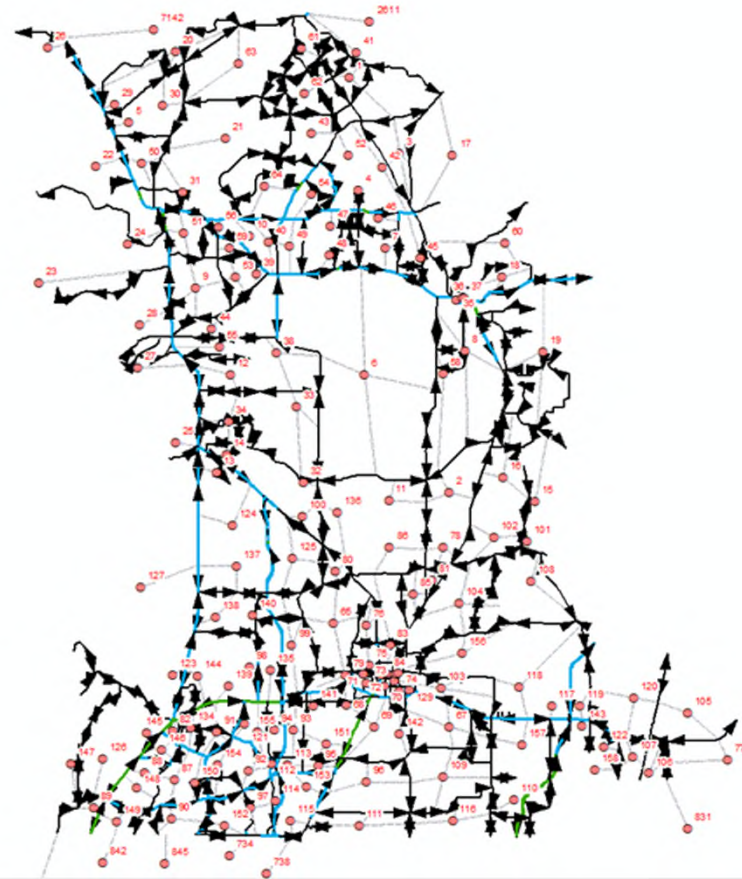
- Tool developed to add / update Arcs GIS layer with network connectors





RCI Base Map Automation to CUBE Tools

- **Next Steps**
- Refine RCI attribute data/route calibration in coordination with any connectivity issues
- Add other local road connections as needed for FLSWM / SIS
- Add centroids and centroid connectors
- Build CUBE network





Questions?

