

**“Work Zone Crash
Analysis”
&
“Traffic Management in
Work Zones –The ODOT
MOT Process”**

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Work Zone Crash Analysis

The Question

- ODOT is embarking on the largest construction program(s) in our history (More of a statement than a question)
- Director was concerned about the impact our work zones will have on crashes (Again, more of a statement)
- Question - Are the ODOT work zones causing more accidents?
 - If so, can we do more to limit the increase?

The “Knee Jerk” Reaction

- “Well of course we have more crashes in work zones. Narrow lanes, barriers next to lanes, and on... and on.... and on....”
- Turns out there were things we could do better!!

The Analysis

- Began analyzing work zone crashes
- Performed “Before/After” comparison of crash rates
- Results were startling:

The Analysis (cont.)

County	Route	Project	Begin SLM	End SLM	Length	Begin Month	End Month	Time Period (Days)	2003 Average ADT	Work Zone Crashes	Work Zone Rate	Work Zone Cost	Fatal	Injury	PDO
HAM	0275	32(02)	28.08	32.20	4.12	1	12	348	114,985	429	2.60	\$5,500,494	0	83	346
CLE	275	2(02)	4.29	9.79	5.50	1	10	287	69,120	155	1.42	\$3,034,793	1	32	122
		172(02)	9.79	13.58	3.79	1	12	358	59,890	255	3.14	\$4,633,355	1	61	193
BUT	0075	420(02)	0.00	6.41	6.41	03	12	289	135,463	415	1.65	\$6,721,326	0	107	389
HAM	0075	420(02)	15.27	17.40	2.13	03	12	289	140,495	162	1.87	\$2,762,640	0	40	184
STA	0077	3008(00)	11.59	12.76	1.17	01	04	127	86,022	37	2.89	\$338,094	0	3	34
		467(02)	12.76	14.81	2.05	05	10	180	87,148	79	2.46	\$1,233,036	0	22	57
CUY	0480	485(02)	12.61	15.97	3.36	03	9	208	158,802	157	1.41	\$2,394,036	0	42	115
MOT	0075	560(01)	18.20	19.79	1.59	01	12	365	98,970	50	0.87	\$815,670	0	15	35
		100(03)	19.79	21.41	1.62	03	12	289	94,161	123	2.79	\$1,878,714	0	33	90
MED	0071	239(00)	20.40	21.40	1	01	04	122	37,965	12	2.60	\$208,872	0	4	8
		239(00)	23.52	24.52	1	03	07	152	48,663	9	1.22	\$91,098	0	1	8
RIC	0071	116(01)	18.90	20.40	1.5	04	11	243	40,640	20	1.35	\$1,242,209	1	4	15
								3,257		AVE.	2.02	\$30,854,337		Ave. Cost / Day	\$9,473

Comp. Crashes	Comp Year	Comp Year ADT	Comp. Rate	Percent Difference	Free Flow Cost	Fatal	Injury	PDO	Cost Difference	Hot Spot	Congested	HSP - I	HSP - NI
259	00	109,353	1.65	58%	#####	0	48	211	#####	Y	19	52	124
106	00	78,100	0.86	65%	#####	0	33	73	#####	Y	242	336	348
115	00	60,990	1.39	126%	#####	1	24	90	#####				
312	02	129,109	1.30	27%	#####	0	51	261	#####	Y	90	168	11
135	02	135,303	1.62	16%	#####	0	27	108	#####				
22	99	82,379	1.80	61%	\$339,228	0	6	16	-\$1,134	Y	96	--	187
25	99	81,604	0.83	196%	#####	1	8	16	-\$172,685				
101	02	153,809	0.94	51%	#####	0	27	74	\$854,550	Y	212	328	143
48	02	98,670	0.84	4%	\$802,710	0	15	33	\$12,960	Y	40	507	133
71	02	92,077	1.65	69%	#####	0	24	47	\$631,962				
5	99	40,965	1.00	159%	\$97,956	0	2	3	\$110,916	N	--	607	424
8	99	53,250	0.99	23%	\$117,396	0	2	6	-\$26,298	--	--	--	--
10	00	42,380	0.65	109%	\$195,912	0	4	6	#####	N	--	--	--
		AVE.	1.19	74%	#####				Ave. difference \$932,488				

Work Zone Rate

No Work

Zone Rate

The Analysis (cont.)

CO	RTE	Project No.	Begin SLM	End SLM	Length	Begin Month	End Month	Time Period (Days)	Average ADT	Work Zone Crashes	Work Zone Rate	Work Zone Cost	Fatal	Injury	PDO	
HAM	275	32(02)	28.08	32.20	4.12	03	12	304	113,108	174	1.23	\$1,979,748	0	26	148	
		3012(00)	32.20	35.40	3.20	04	12	274	84,947	163	2.19	\$1,908,468	0	26	137	
CLE	275	3012(00)	0.00	4.29	4.29	04	12	274	86,397	134	1.32	\$1,523,880	0	20	114	
		2(02)	4.29	9.79	5.50	03	12	304	71,116	140	1.18	\$1,923,318	0	31	109	
		172(02)	9.79	13.58	3.79	06	12	213	60,257	100	2.06	\$1,336,338	0	21	79	
MIA	75		4.94	10.84	5.90	01	12	365	63,656	212	1.55	\$3,012,660	0	50	162	
MED	71		15.80	26.38	10.58	01	12	365	46,761	272	1.51	\$4,317,401	1	48	223	
STA	77	3008(00)	11.59	12.76	1.17	06	12	207	85,111	84	4.08	\$1,265,436	0	22	62	
ASD	71	151(00)	2.30	6.30	4.00	05	11	213	41,470	48	1.36	\$769,932	0	14	34	
			6.30	9.00	2.70	05	08	122	41,192	23	1.70	\$1,327,205	1	6	16	
SUM	77		24.19	28.37	4.18	01	11	335	63,032	117	1.33	\$1,839,834	0	33	84	
RIC	71	166(01)	13.40	16.40	3.00	01	04	122	41,865	21	1.37	\$2,197,408	2	3	16	
			16.40	18.90	2.50	04	11	243	41,487	43	1.70	\$540,864	0	8	35	
LUC	280		0.36	5.78	5.42	01	12	365	55,334	125	1.14	\$1,695,006	0	27	98	
SUM	76	323(00)	15.06	17.98	2.92	04	10	213	60,681	55	1.46	\$815,292	0	14	41	
									3,918		AVE.	1.68	\$26,452,790	Ave Cost / Day \$6,752		

Comp. Crashes	Comp Year	Comp Year ADT	Comp. Rate	Percent Difference	Free Flow Cost	Fatal	Injury	PDO	Cost Difference	Hot Spot	Congested	HSP - I	HSP - NI	
130	00	109,353	0.95	23%	#####	1	35	94	-\$991,379	Y	19	52	124	
120	00	79,835	1.72	22%	#####	1	30	89	-\$833,969					
82	00	92,180	0.76	43%	#####	0	17	65	\$435,294	Y	242	336	348	
129	00	75,107	1.03	13%	#####	0	32	97	\$38,502					
76	00	60,990	1.54	25%	#####	0	16	60	\$319,410					
103	99	58,161	0.82	47%	#####	1	25	77	\$544,273	N	229	403	--	
166	99	49,156	0.87	42%	#####	0	34	132	#####	N	--	607	424	
53	99	82,379	2.66	35%	\$703,998	0	11	42	\$561,438	Y	96		187	
17	99	42,730	0.47	66%	\$175,716	0	2	15	\$594,216	N	--	--	--	
10	99	40,989	0.74	56%	\$163,134	0	3	7	#####					
99	00	59,128	1.20	10%	#####	0	26	73	\$346,086	Y	--	--	488	
10	01	43,035	0.64	54%	\$163,134	0	3	7	#####	N	--	--	--	
17	02	43,360	0.64	62%	\$339,606	0	7	10	\$201,258					
57	00	52,601	0.55	52%	\$965,466	0	17	46	\$729,540	N	261	377	449	
32	99	52,915	0.97	33%	\$404,028	0	6	26	\$411,264	N	265	--	557	
									Ave					
			AVE.	1.04	39%	#####	Ave Cost/Day \$4,791			\$512,103				

Work Zone Rate

No Work

Zone Rate

Next Step → More Analysis

- Logged and analyzed hundreds of work zone crashes. Looked for “abnormally” high concentration of crashes.
- Compared these work zone high crash locations with crashes prior to construction

Next Step → More Analysis → The Conclusions

1. Geometrics

The “abnormally” high concentrations of crashes showed there are major geometric contributing factors to work zone crashes:

- (a) Inadequate off-ramp capacity
- (b) Inadequate ramp merges
- (c) Insufficient paved shoulders

Next Step → More Analysis → The Conclusions

2. Speed

Possibly a victim of our own success. Work Zone Policy ensures sufficient mainline capacity that may encourage speeding. Average speed in 2004 major work zones is 11 mph higher than the posted speed limit.

The Geometric Problems

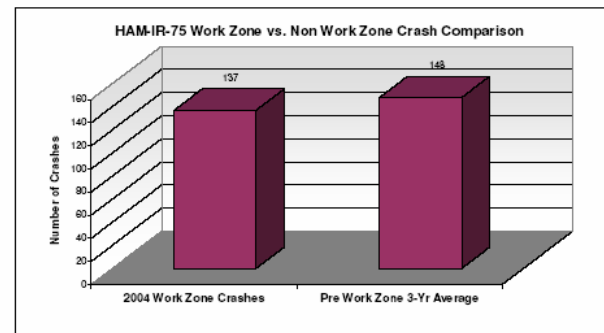
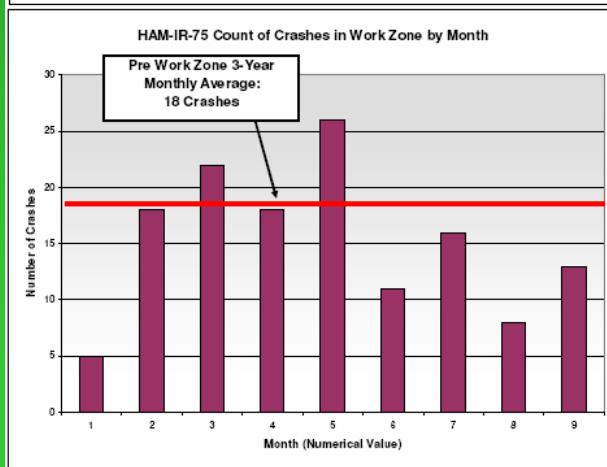
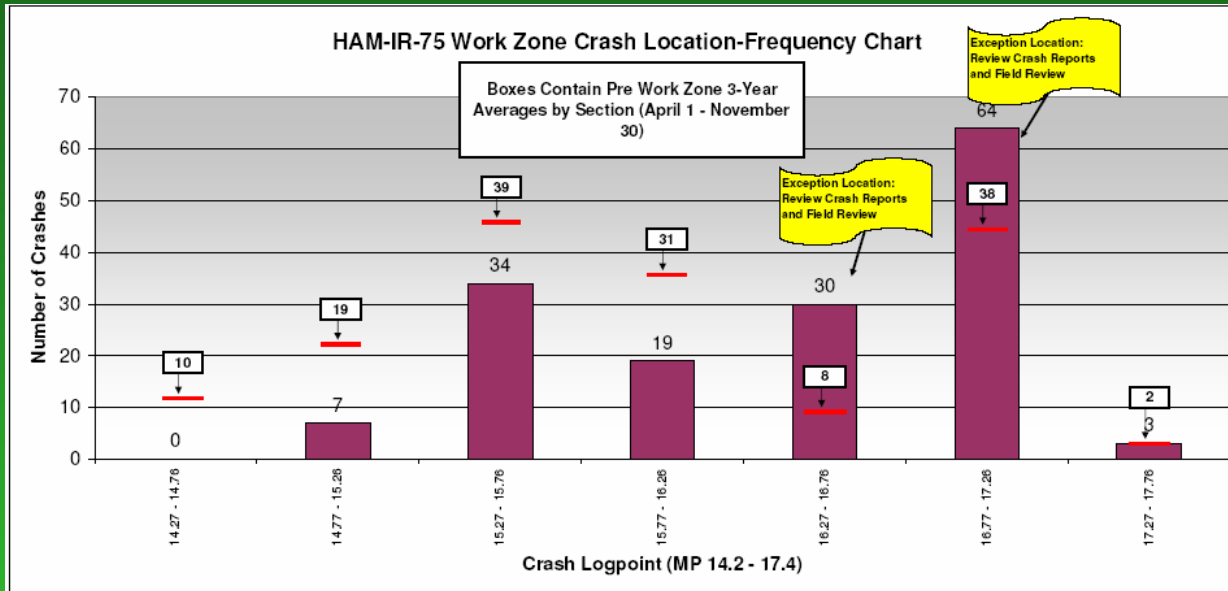
- Ramp merges – Created new standards for work zone on ramp merges. Merges are now required to be detailed in plans.
- Paved shoulders – Created “desired” cross section that requires a 2’ paved shoulder
- Off-ramp-capacity – Explicitly looked for in Maintenance of Traffic Alternative Analysis (MOTAA).
- More on the MOTAA later

**New Process Developed
Work Zone Crash Tracking
In Near Real Time**

Work Zone Crash Tracking

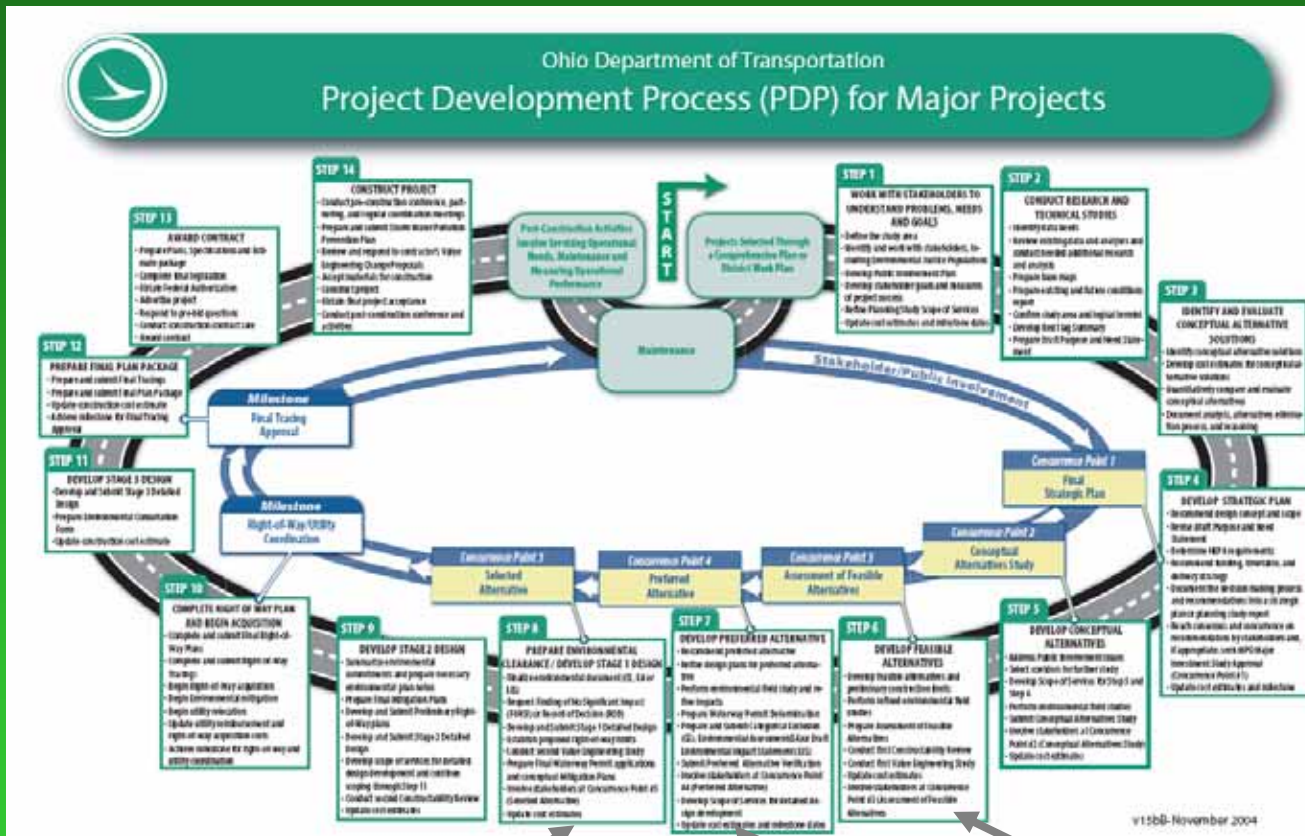
- Candidate projects identified in winter
- Coord. w/local enforcement to have WZ crashes put aside for pickup twice/month
- Crashes sorted into 1/2 mile segments
- Compared to historical “non-construction” frequencies
- “Problem” locations investigated

Work Zone Crashes



**End Crash Analysis
Start MOT Policy**

ODOT MOT Policy & Alternatives Analysis



Stage 1 Design

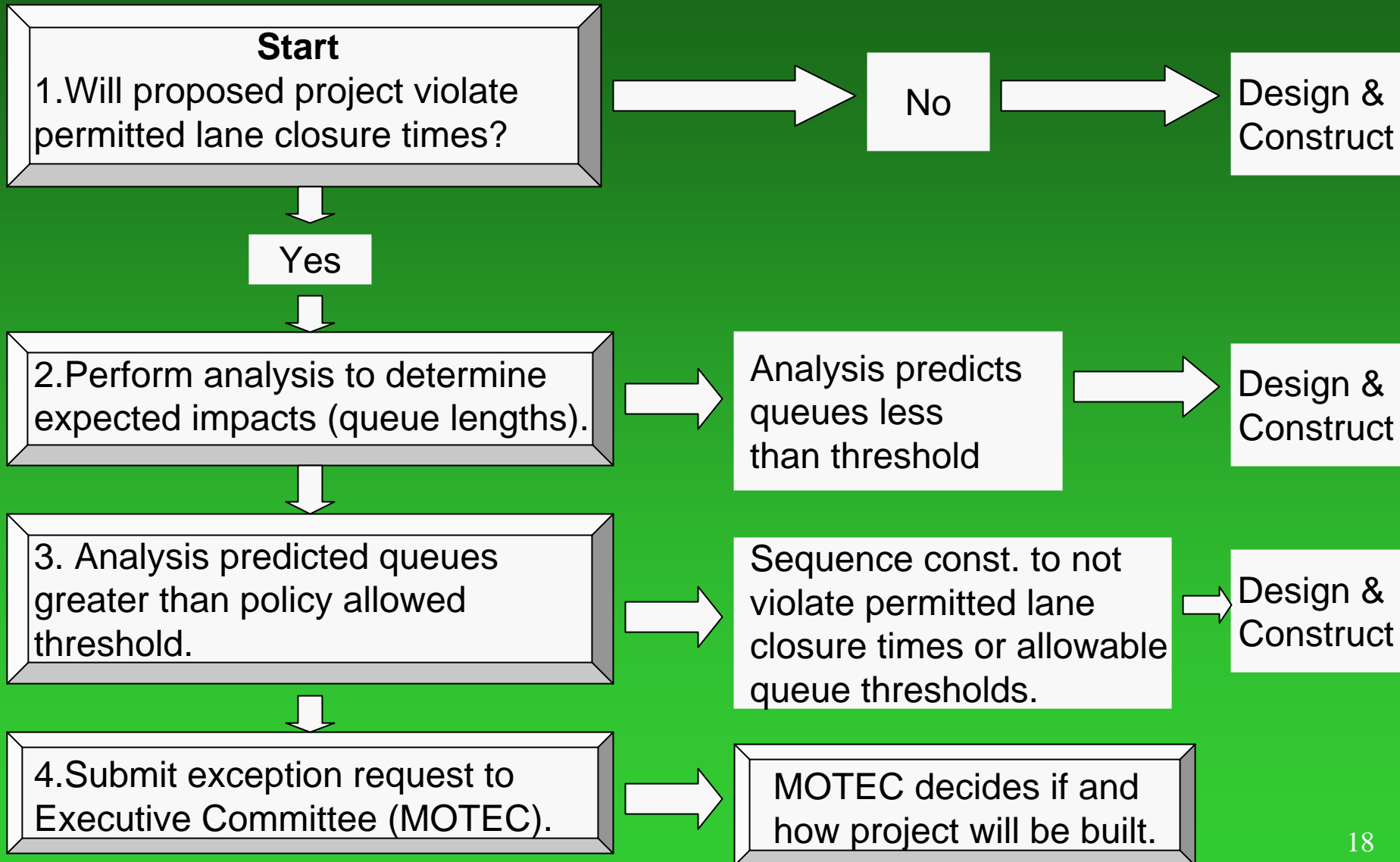
MOT Policy Exception

MOTAA

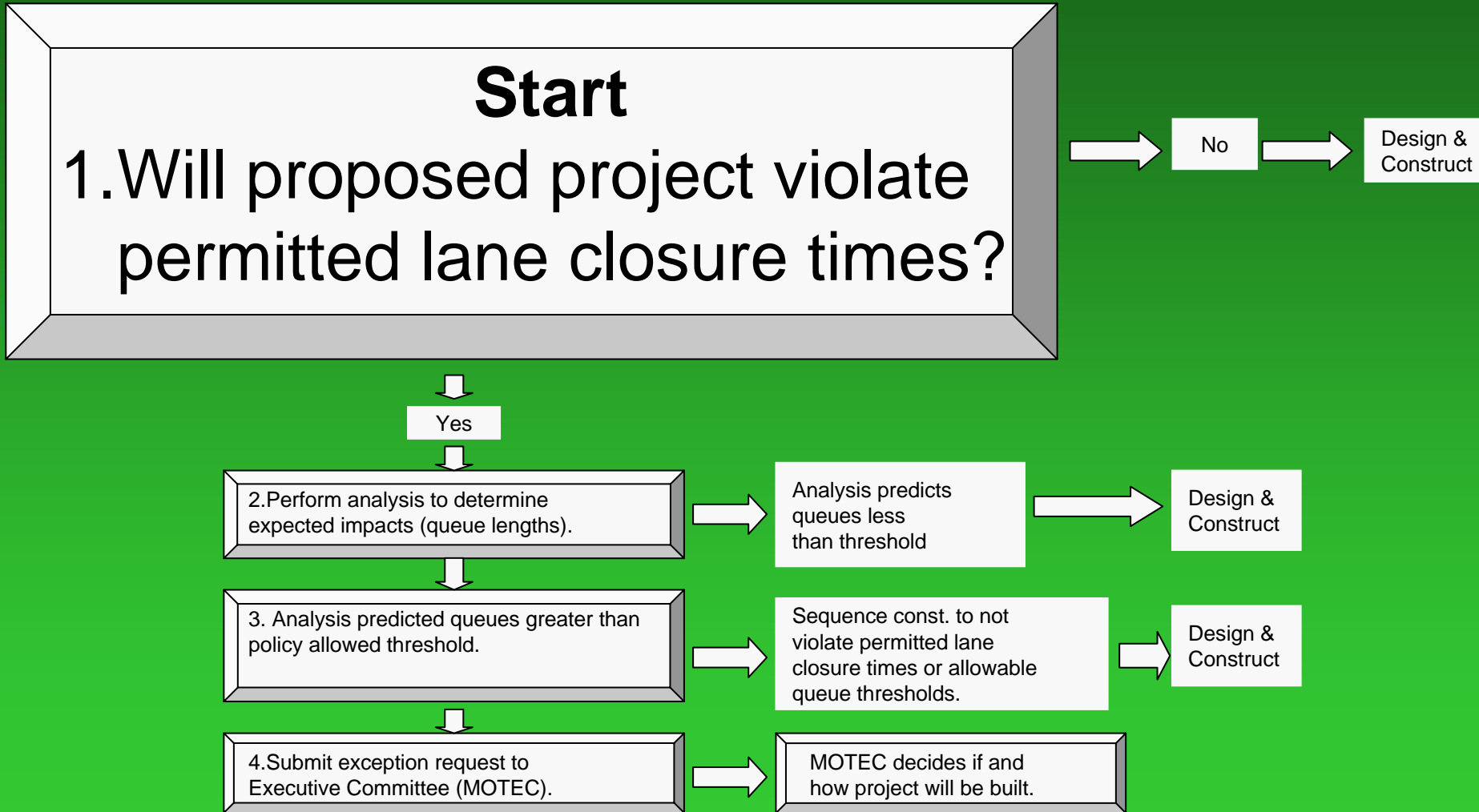
Important Elements of the MOT Policy

- Permitted Lane Closure Map (Times)
 - Pre-defined times when any section of the Interstate or look alike system can have the number of lanes reduced
 - Based upon work zone capacity (volumes, % of trucks, terrain type)
- Maximum Allowable Queue Thresholds
- Detailed Analysis
- Applicable to both contract construction and maintenance work

The MOT Policy Process



The MOT Policy Process



MOT Policy Process Details

1. Will proposed project violate permitted lane closure times?

Permitted Lane Closure Map - Microsoft Internet Explorer

Address: http://dotaw100/plcm/plcm_web%20search.jsp

Permitted Lane Closure

Search

Year: 2003 District: []

County: [] Route: []

Section: []

Begin Log: [] End Log: []

Go Clear

For any Maintenance (lane(s)) closure or any Construction project (lane(s)) closure, outside of plan note times, a Lane Closure Application request form must be submitted to the Work Zone Traffic Manager and the Highway Management Administrator for approval. In addition a copy of the request form must be submitted to the Roadway Services Manager for ODOT maintenance work or to the Construction Engineer for construction projects. The request must be submitted, in writing, three(3) working days in advance of the lane(s) closure. No lane closures will be permitted during Holidays or Special Events, see Special Events / Holiday note. Traffic flow must be monitored and lanes re-opened if any backup begins to occur.

ODOT Permitted Lane Closure

District: [] County: [] Route: [] SR: [] BOTH: [] Calculation Year: 2003 Section: []

Calculation Method: [] ADT using alternate distribution

Road Class: [] (Urban or Rural)

ADT Year: 2001

Percent Trucks: []

Annualized ADT: 99470

Capacity: 1310 per lane

Season: []

Construction Start: []

Construction End: []

Rate of Lanes: []

Available Lanes: []

Lane(s) Closed: []

Rate of Lanes	3:2	Traffic Volume per open lane
Season	Construction	Construction
Weekday	Weekend	Weekday
Mon-Fri	Sat-Sun	Mon-Fri
Sat-Sun		
0-1AM	207	207
1-3AM	209	195
3-5AM	179	173
5-8AM	209	195
8-9AM	207	203
9-9:30AM	693	693
9:30AM	883	1131
10AM	1105	1444
10:30AM	1108	1441
11-11:30AM	1184	1242
11:30AM	1246	931
12-12PM	1184	1242
12-12PM	1184	1242
1-2PM	1105	1444
2-3PM	1108	1441
3-3:30PM	1184	1242
3:30PM	1246	931
4-4:30PM	1184	1242
4:30PM	1105	1444
5-5PM	1108	1441
5-6PM	1246	931
6-7PM	1184	1242
7-8PM	1246	931
8-9PM	1000	754
9-10PM	969	730
10-11PM	741	564
11-12AM	684	421

Home Search

<https://dotaw100.dot.state.oh.us/plcm>

MOT Policy Process Details

http://dotas201/plcm/plcMLoadAction.do - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Discuss Messenger

Address http://dotas201/plcm/plcMLoadAction.do

Google Search Web 216 blocked AutoFill Options

ODOT Permitted Lane Closure Print

District: 6	County: FRA	Route: IR-270	DIR: BOTH	Calculation Year: 2003	Section: US33 (Dublin) to Sewmill Rd
BEGIN LOG: 17.290	Calculation Method: D (ADT using statewide distribution)	Road Class: URBAN (Urban or Rural)	Terrain: ROLLING	ATRA: 0	Seasonal Traffic Adjustment
END LOG: 19.830	Lanes per direction: 3	ADT Year: 2001	Percent Trucks: 12	Annualized ADT: 98470	Capacity: 1310 per lane
				Weekday ADT: 118639	Weekend ADT: 88712 Construction
					Weekend ADT: 109411 Non-Construction

There shall be no lane closures on Holidays or Holiday weekends. The following are considered holidays: Memorial Day, Fourth of July, Labor Day, Thanksgiving, Christmas, New Years, Easter. No lane closures are allowed after 12 noon on the day preceding a holiday. For holiday weekends no lane closures are allowed after 12 noon on the day preceding the Holiday weekend until 6 am the day after the holiday weekend. Ex. Holiday falls on a Monday then no lane closures from 12 noon on Friday until 6 am Tuesday

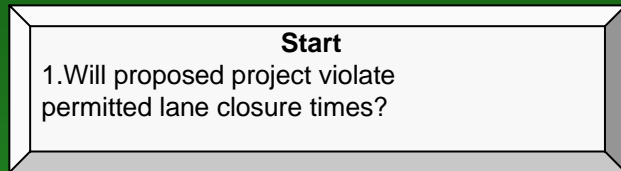
Ratio of Lanes: 3:2		Traffic Volume per open lane				Legend <div style="background-color: orange; width: 15px; height: 10px; display: inline-block; margin-right: 5px;"></div> Lane Closure(s) Not Permitted 3:2: Ratio Of Lanes 3: Available Lanes 2: Lanes Open	Ratio of Lanes: 3:1		Traffic Volume per open lane			
Season	Construction Weekday	Construction Weekend	Non-Const. Weekday	Non-Const. Weekend	Season		Construction Weekday	Construction Weekend	Non-Const. Weekday	Non-Const. Weekend		
Hour of the Day	Mon-Fri	Sat-Sun	Mon-Fri	Sat-Sun	Hour of the Day		Mon-Fri	Sat-Sun	Mon-Fri	Sat-Sun		
0-1AM	297	222	274	212	0-1AM	593	444	547	424			
1-2AM	208	155	191	149	1-2AM	415	310	363	297			
2-3AM	178	133	164	127	2-3AM	356	266	326	255			
3-4AM	208	155	191	149	3-4AM	415	310	363	297			
4-5AM	267	200	246	191	4-5AM	534	399	492	382			
5-6AM	653	488	602	467	5-6AM	1305	976	1204	934			
6-7AM	* 1513	1131	* 1395	1082	6-7AM	* 3625	* 2762	* 2798	* 2165			
7-8AM	* 2195	* 1641	* 2024	* 1570	7-8AM	* 4390	* 3282	* 4048	* 3141			
8-9AM	* 1780	* 1331	* 1641	1273	8-9AM	* 3559	* 2661	* 3282	* 2547			
9-10AM	* 1394	1042	1286	997	9-10AM	* 2788	* 2085	* 2571	* 1995			
10-11AM	1246	931	1149	891	10-11AM	* 2491	* 1863	* 2298	* 1783			
11-12PM	* 1394	1042	1286	997	11-12PM	* 2788	* 2085	* 2571	* 1995			
12-1PM	* 1424	1065	* 1313	1019	12-1PM	* 2847	* 2129	* 2626	* 2037			
1-2PM	* 1542	1153	* 1422	1104	1-2PM	* 3685	* 2787	* 3446	* 2707			
2-3PM	* 1780	* 1331	* 1641	1273	2-3PM	* 3559	* 2661	* 3282	* 2547			
3-4PM	* 2165	* 1619	* 1997	* 1549	3-4PM	* 4330	* 3238	* 3994	* 3098			
4-5PM	* 2432	* 1819	* 2243	* 1740	4-5PM	* 4864	* 3637	* 4486	* 3480			
5-6PM	* 2580	* 1929	* 2380	* 1846	5-6PM	* 5161	* 3859	* 4759	* 3693			
6-7PM	* 1869	* 1397	* 1723	* 1337	6-7PM	* 3737	* 2794	* 3446	* 2674			
7-8PM	1275	954	1176	913	7-8PM	* 2551	* 1907	* 2352	* 1825			
8-9PM	1008	754	930	722	8-9PM	* 2817	* 1908	* 1860	* 1443			
9-10PM	949	710	875	679	9-10PM	* 1898	* 1419	* 1751	* 1358			
10-11PM	741	554	684	531	10-11PM	* 1483	1109	* 1368	1061			
11-12AM	564	421	520	403	11-12AM	1127	843	1039	806			

Last Updated: 10/31/03 1:32 PM

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Done Local intranet

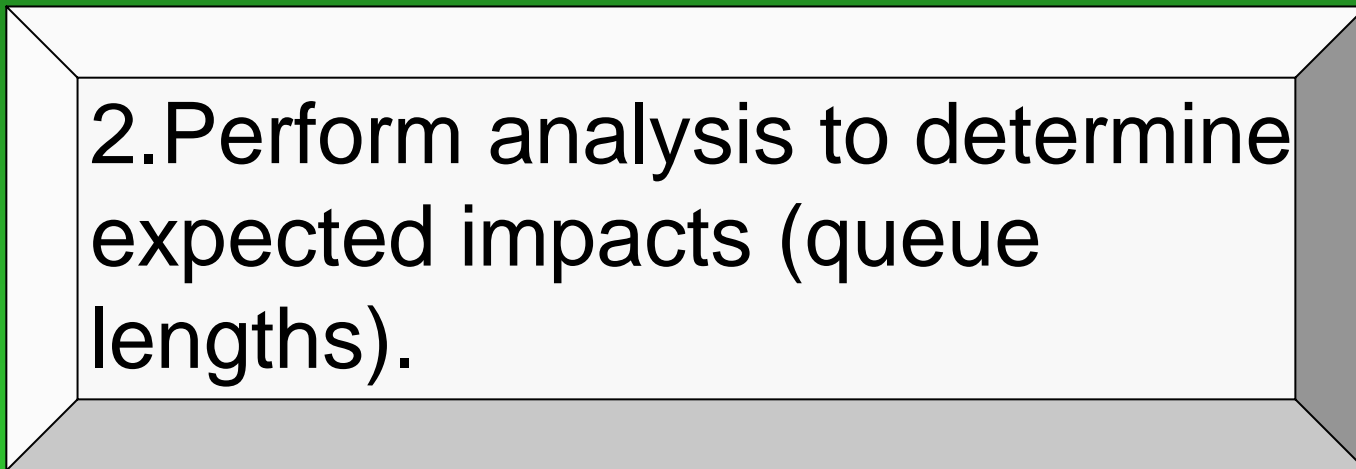
The MOT Policy Process



No

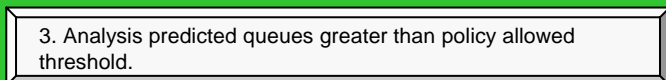
Design & Construct

Yes



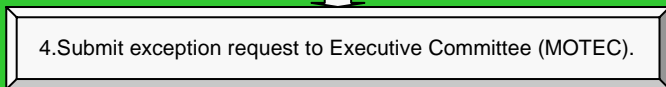
Analysis predicts than threshold

Design & Construct



Sequence const. to not violate permitted lane closure times or allowable queue thresholds.

Design & Construct



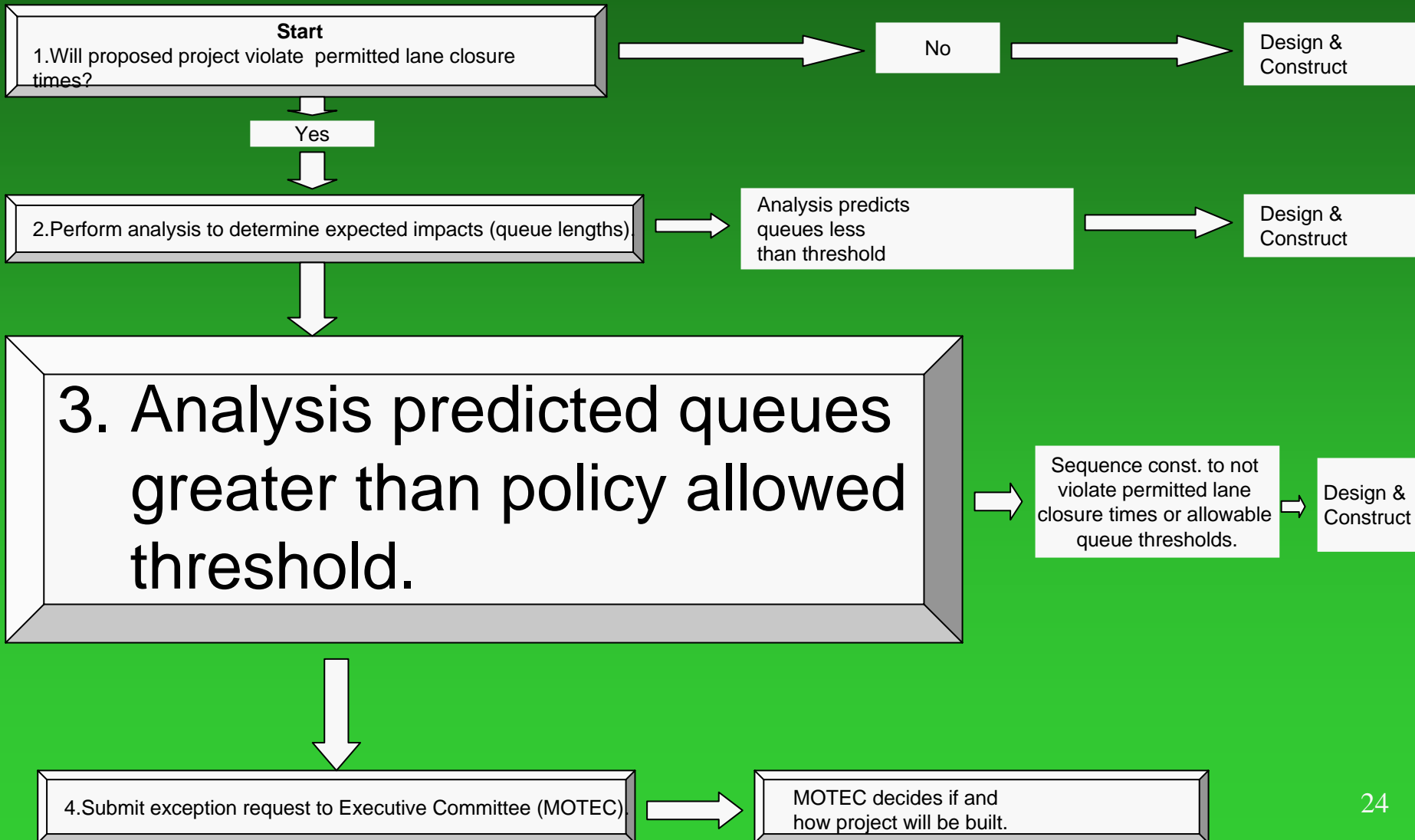
MOTEC decides if and how project will be built.

MOT Policy Process Details

2. Perform analysis to determine expected impacts (queue lengths).

- Use QUEWZ-98 program to calculate the capacity of a work zone option
- Apply adjustment factors in calculation process based on ODOT research.
- Apply these capacity volumes and the traffic data to the ODOT developed queue calculation spreadsheet

The MOT Policy Process

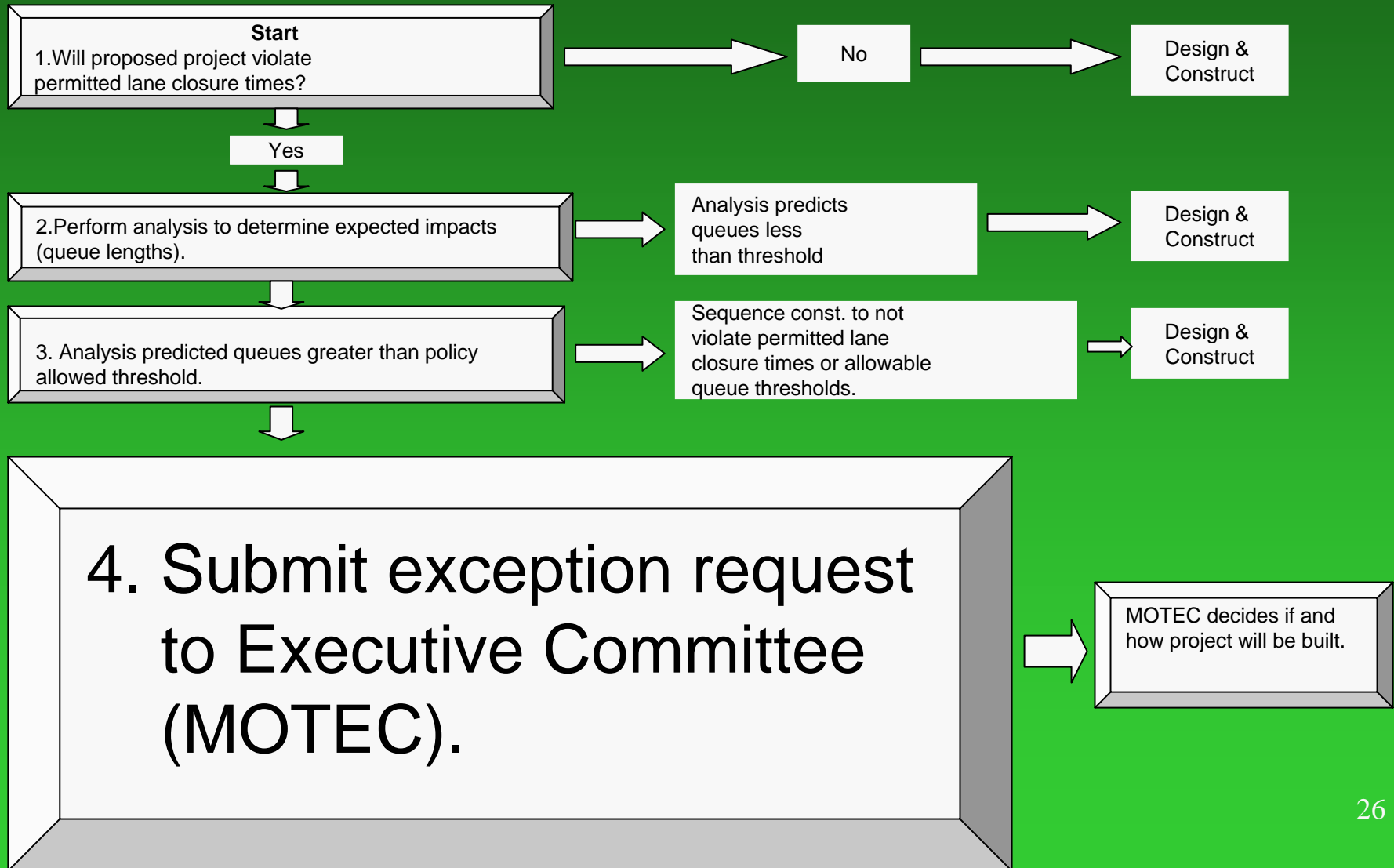


MOT Policy Process Details

3. Analysis predicted queues greater than policy allowed threshold..

- Allowable queue thresholds
 - Queues less than 0.75 miles are acceptable
 - Queues greater than 0.75 miles and less than 1.5 miles if the queue exceeds 0.75 for two hours or less
 - 0.75 mile queues with a duration greater than 2 hours or longer than 1.5 miles are unacceptable

The MOT Policy Process



MOT Policy Process Details

4. Submit exception request to Executive Committee
Maintenance of Traffic Exception Committee
(MOTEC)

- MOTEC compromised of Executive Management because of fiscal implications
- Exception requests include the following information for multiple alternatives:
 - Queue lengths, queue durations, construction costs, construction schedules and mitigation strategies
- Mitigation Strategies Can Include:
 - ITS, web cams, incident response, extensive detour planning, extensive public information campaigns, innovative contracting techniques, on-ramp closures
- Bottom line – Very few exceptions granted

**End MOT Policy
Begin MOTAA**

ODOT MOT Alternatives Analysis

- What is it?
- Analysis of potential work zone impacts “constraints” that occurs **PRIOR** to the first detail plan submissions
- It occurs early enough so that MOT can be used to:
 - Pick between feasible project alternatives
 - Size structure widths
 - Highlight WZ right-of-way and environmental impacts early enough to do something about them

The ODOT MOTAA

- Designer is given a specific “desired” foot print (cross section) and then reports on a given list of potential problems
- The number of lanes are based on the PLC
- “Desired” foot print (cross section) is overlaid at defined location for both a crossover and part width alternatives.

The ODOT MOTAA

- Designer reports (for both crossovers and width) if any of the following problems would be expected:
 - **Work zone policy**
 - **Maintain access (off-ramp capacity)**
 - **Ramp merges**
 - Environmental impacts
 - Construction cost/duration
 - Maintenance of existing lighting/drainage
 - Construction joint location (concrete)
 - Crossover location
 - R/W impacts
 - Bridge widths
 - Earthwork, retaining walls, profiles
 - Constructability/ Constr. Access
 - **Provide “desirable” “footprint/cross section”**

The ODOT MOTAA

Factor to be Considered	Option	
	1	2
	Part-Width Construction (with partial demolition at bridges)	X-over Construction (without partial demolition at bridges)
Ability to Meet Work Zone Policy	Full closure of I-75 may be required at night, during partial demolition of the structures.	Meets policy at all times.
Ability to maintain all accesses	Simple access provided, utilizing two-step construction.	Access to SR 63 will be provided using crossovers in Stage 3.
Ability to provide on-ramp Decision Sight Distances	Meets TEM requirements.	Meets TEM requirements. See strip maps, Exhibits A through G.
Right-of-way and environmental impacts	MOT scheme would not increase R/W or environmental impacts along I-75. Additional (minor) temporary easements are anticipated along SR 63, to facilitate placement of temporary pavement for part-width construction.	MOT scheme would not increase R/W or environmental impacts along I-75. Additional (minor) temporary easements are anticipated along SR 63, to facilitate placement of temporary pavement for part-width construction.
Final bridge widths	MOT scheme does not impact proposed final bridge widths (approx. 78.5' face-to-face of barrier in both directions on I-75).	MOT scheme does not impact proposed final bridge widths (approx. 78.5' face-to-face of barrier in both directions on I-75).
Significant impacts for construction duration (see note 2).	Shortest construction duration on I-75. Bridges are constructed in two sequential steps, in the second construction season.	Moderate. Construction of I-75 median area would occur in the first construction season (with minimal impact to existing traffic I-75). Most construction would be completed in the second construction season (similar to Option 1). However, an additional one to three months would likely be required (in a third construction season) to complete median construction along I-75.
Significant impacts to permanent earthwork, retaining walls, etc.	No impacts to these permanent design features are anticipated.	No impacts to these permanent design features are anticipated.
Ability to maintain existing drainage and lighting systems	No special provisions required.	Temporary drainage features and ditch work will be required in Stage 3 to maintain drainage in areas adjacent to x-over access to the SR 63 interchange ramps.
Constructability and construction equipment access	Adequate and safe work zones along I-75. Potentially difficult contractor access is common with part-width construction.	Improves contractor access and work space for construction of NB I-75. Facilitates efficient construction zones. Design of access to and from interchange ramps becomes more complicated, although is routine work for most contractors.

End MOTAA

Begin Misc. MOT Subjects

Related MOT Topics

OPI

- Every Interstate and look-alike work zone is inspected and rated by Central Office for adherence to standards, specifications and for safety concerns
 - Any safety concerns are immediately brought to the attention of the district for correction
 - Results of these inspections are part of Organization Performance Index (OPI)
 - Each District Deputy Director is held accountable for their OPI performance

Related MOT Topics (Cont.)

Training

- ODOT undertaking largest training initiative in our history
 - One of the many required classes (for 2500 ODOT highway workers, project inspectors, etc) is work zones
 - Testing and certification are part of the training classes
- Consultants now required to attend ODOT WZ Design training class as part of their prequalifications. Testing & certification required.

Misc. MOT Topics

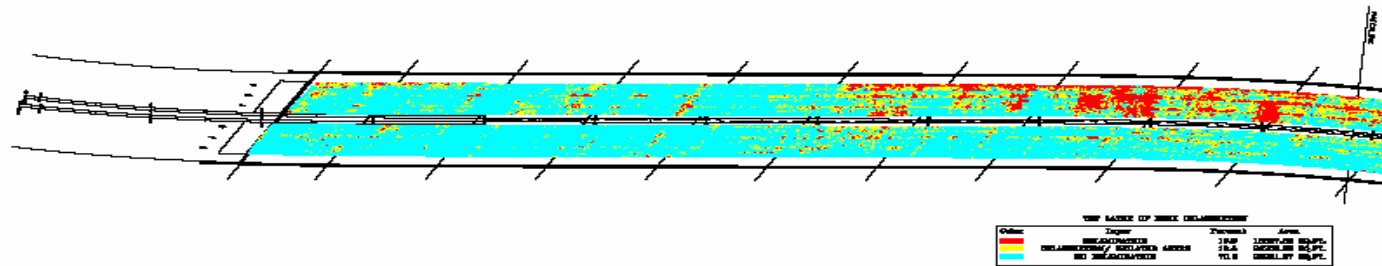
- More open to complete closures; particularly for urban bridge overlays.
- Maximum deck area is currently 23,000 square feet
 - Close Friday @ 8 pm
 - Open for Monday rush hour
 - Must be cautious of “blow throughs”

Misc. MOT Topics

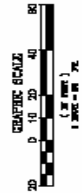
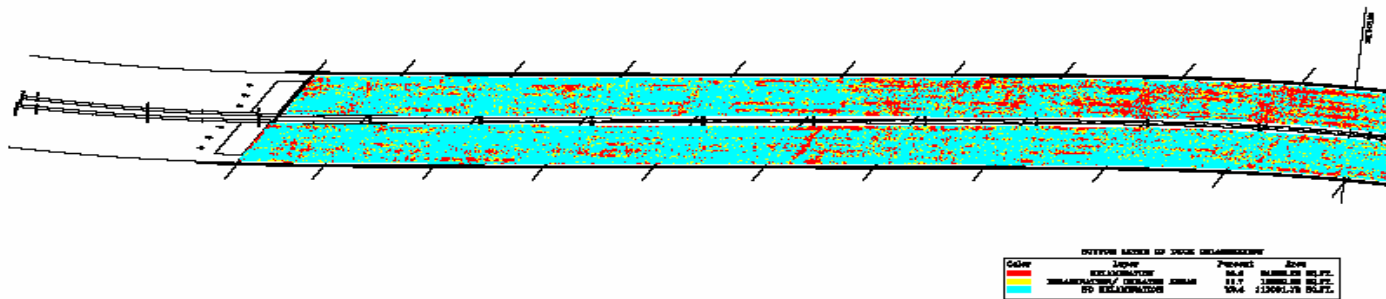
- Ground Penetrating Radar

S.R. 315
FRA-315-2.78

DELAMINATION MAP \ TOP OF DECK



DELAMINATION MAP \ BOTTOM OF DECK



DELAMINATION
MAP OF
BRIDGE # 15-278
CLINTON COUNTY, OHIO
CLINTON COUNTY, OHIO



DATE	12/20/04
REV	
DESIGNED BY	CHY
CHECKED BY	MSD-027
DATE	08-3
PROJECT	1 & 2

Summary

Summary

Work Zone Crashes

- Showed need for detailed design standards for WZ on ramp merges (Big Problem)
- Showed need for min. paved shoulders
- Showed minimum paved shoulders needed
- WZ off ramp capacity needs considered
- Speeding is an issue in work zones

Summary

Work Zone Policy

- Defines hours a lane closure can happen
- Established max. allowable queues
- Created standard impact analysis
- Created exception process (not often granted)
- Applicable to construction and maintenance

Summary

MOT Alternative Analysis

- Forced MOT considerations to be evaluated early in design process
- Used as a major consideration in picking preferred alt that is designed and built

Summary

MOT Alternative Analysis

- Ensures past problems not repeated:
 - * Ramp merges adequate
 - * Off ramp capacity considered
 - * Work zone cross section is adequate

Summary

MOT Alternative Analysis

- Identifies WZ issues in time to do something about them:
 - * Bridge dimensions
 - * R/W needs (including temporary)
 - * Environmental impacts
 - * Local access

QUESTIONS??