

Preemption - The Rest of the Story.



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Creative People, Practical Solutions.

2017
FRA Rail Program Delivery
Meeting



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Definition of Preemption:

When an adjacent intersection has a traffic signal or hybrid beacon that is interconnected with the active railroad warning devices.

- Normal operation – Efficient flow of traffic is ideal
- Preemption – Preventing a fatality is primary



Is Preemption Needed? So where do we go from here?



We go to Simultaneous or Advance, Right?:

- **Simultaneous Preemption (short throat solution)** – Start up of traffic signal and railroad signal happen at the same time.
- **Advanced Preemption (long throat solution)** – Start up of traffic signal occurs prior to activation of railroad flashers and gates.

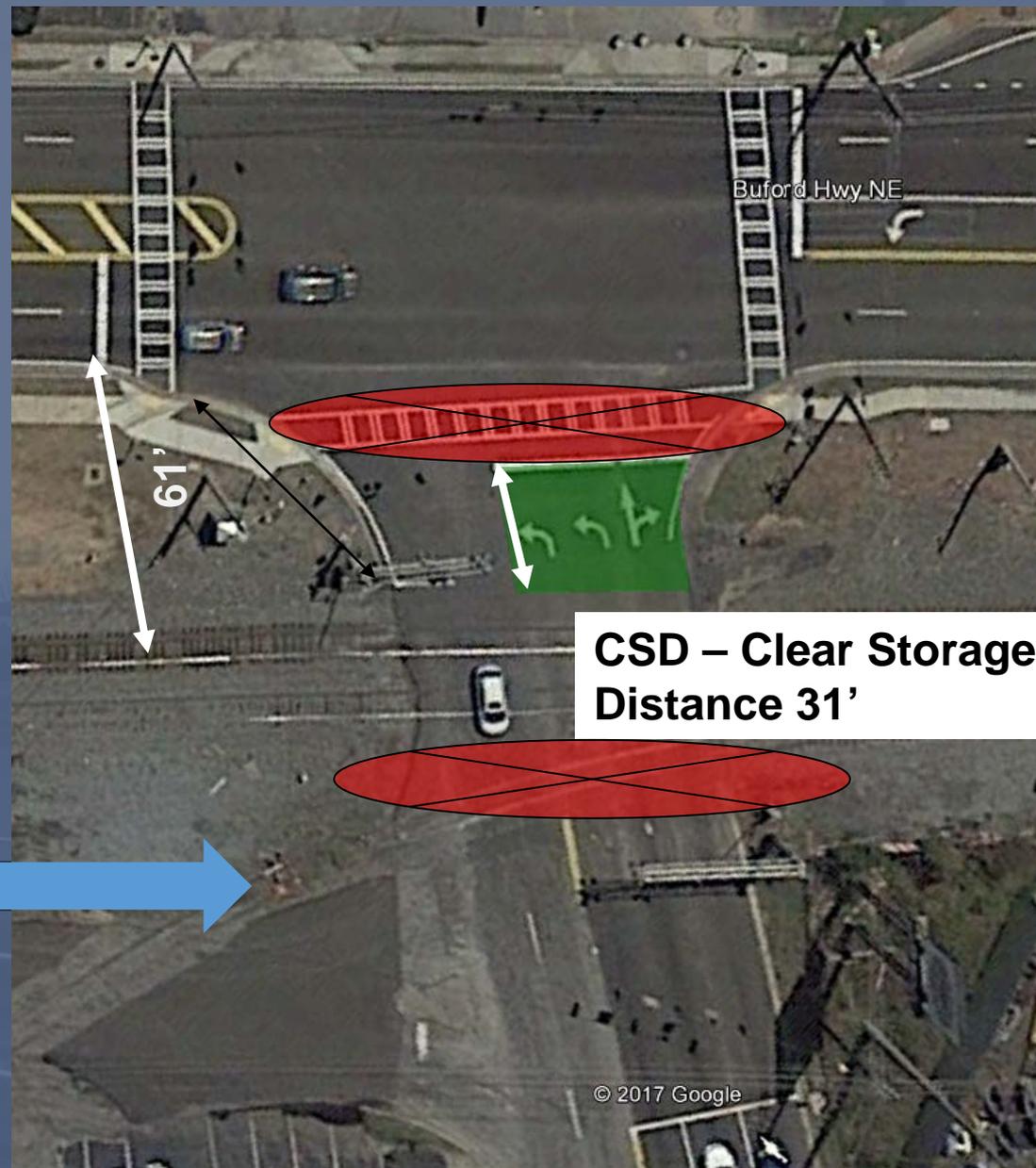


Preemption: Typical Short Throat Scenario



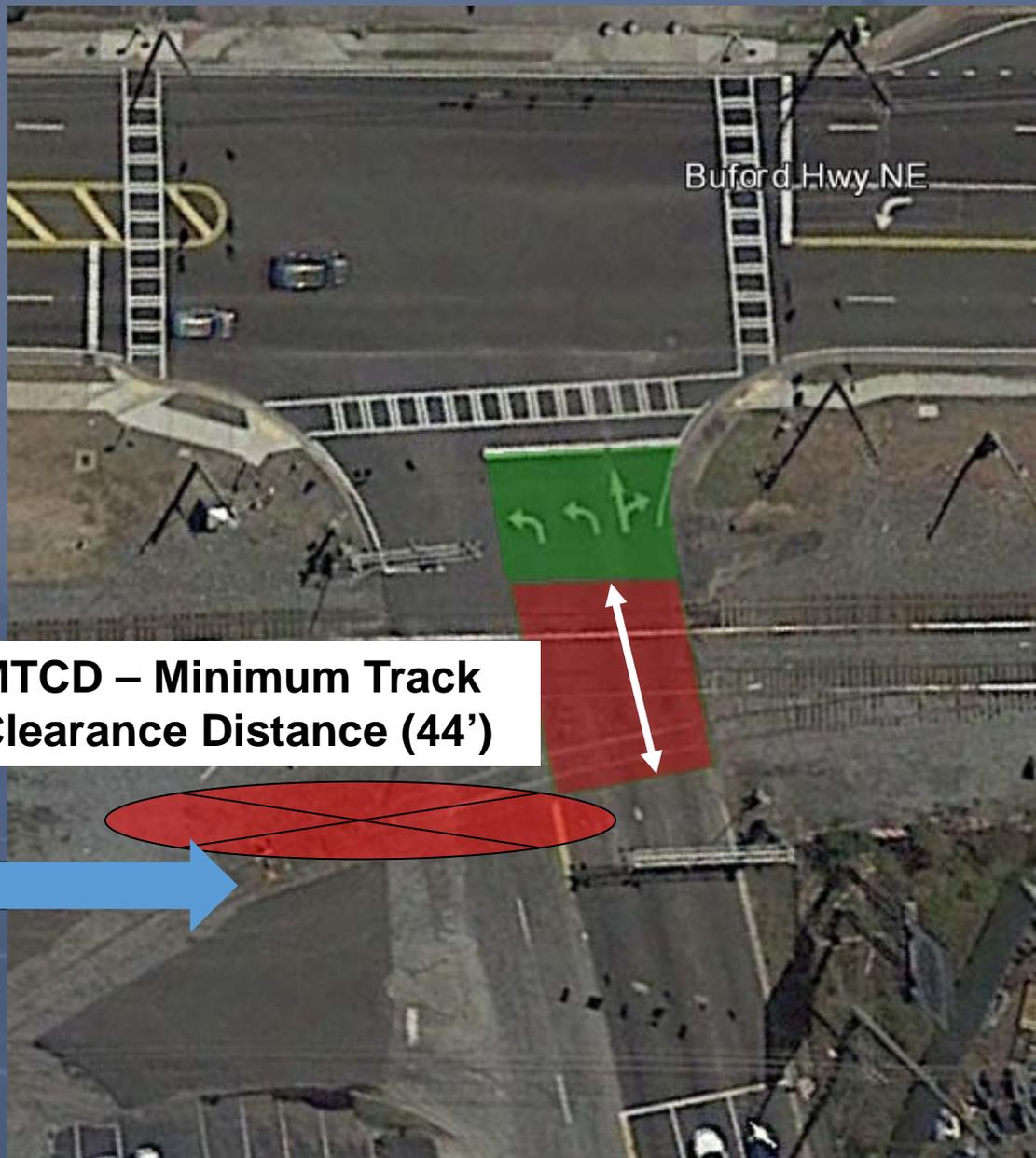
Preemption: Typical Short Throat Scenario

- Throat = 61' (Track Center to edge of Road)
- Ped Clear truncated and overlaps with yellow
- CSD – Distance 6' T from near rail to stop line.
- For simplicity of our example, assume the spur is deleted.

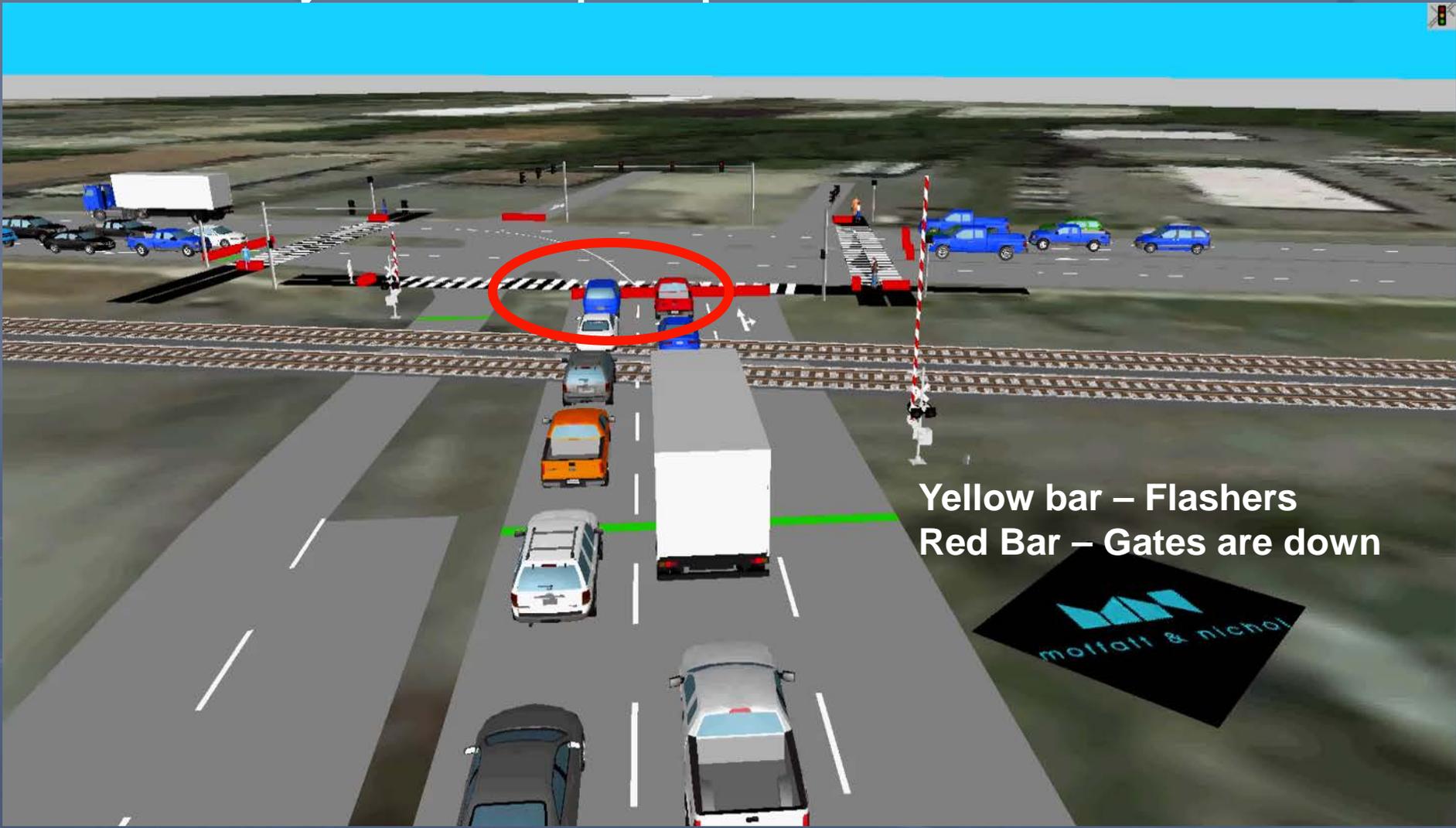


Preemption: Typical Short Throat Scenario

- MTCDD is measured from the largest variable:
 - 12' T to track center
 - the warning device
 - the stop line
- This can vary the Track Clearance area length.
- Again, assume there is no spur here.

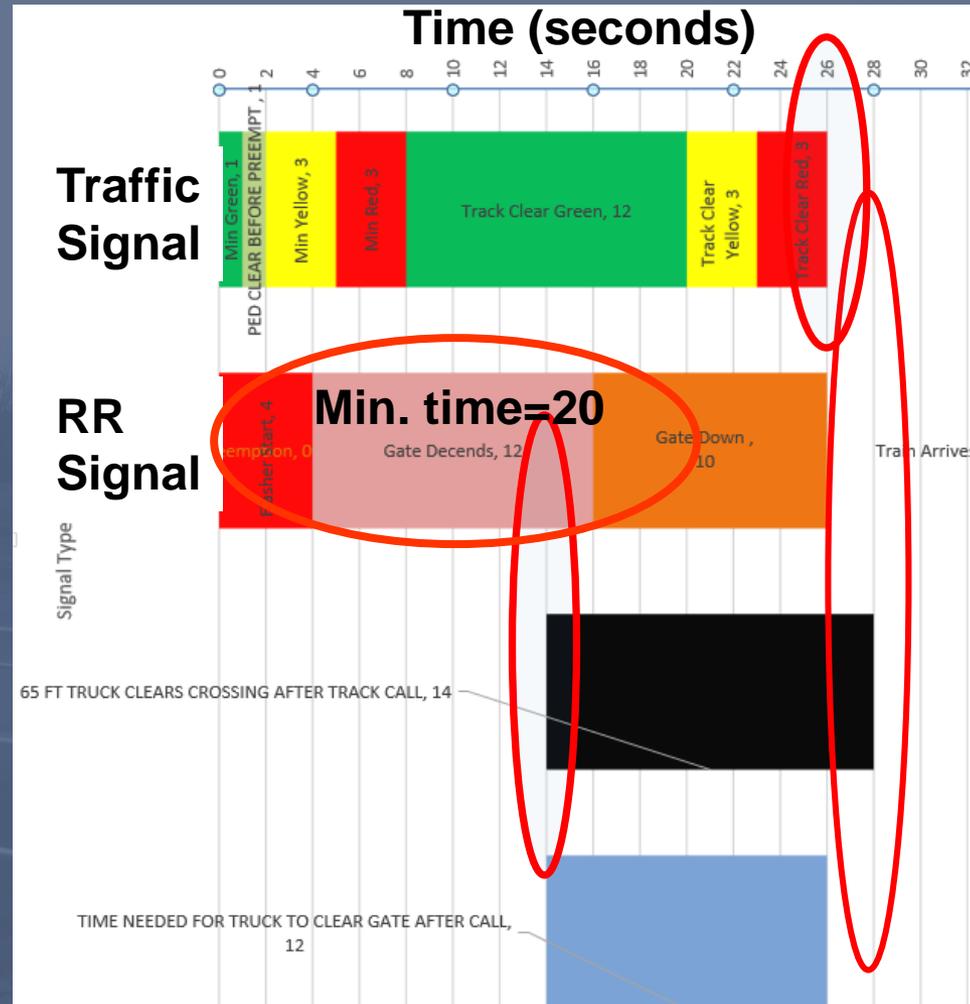


Let's try Simultaneous Preemption and truncate ped clearance to end with minimum yellow before preemption....

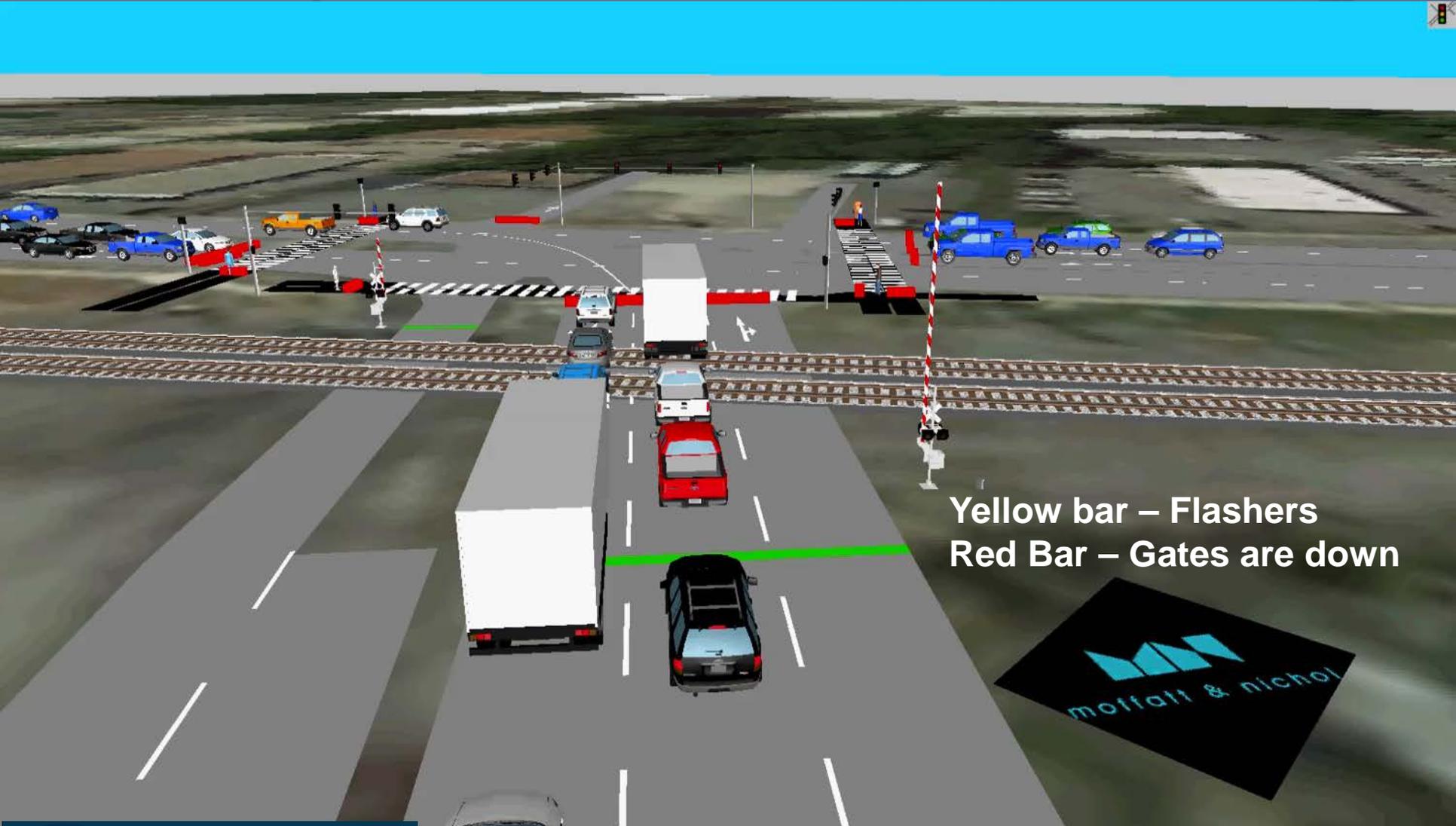


Issues to consider?

- Truncate Ped Time?
 - Increase track clear green to accommodate the handing pedestrian?
- What about trucks making poor decisions?



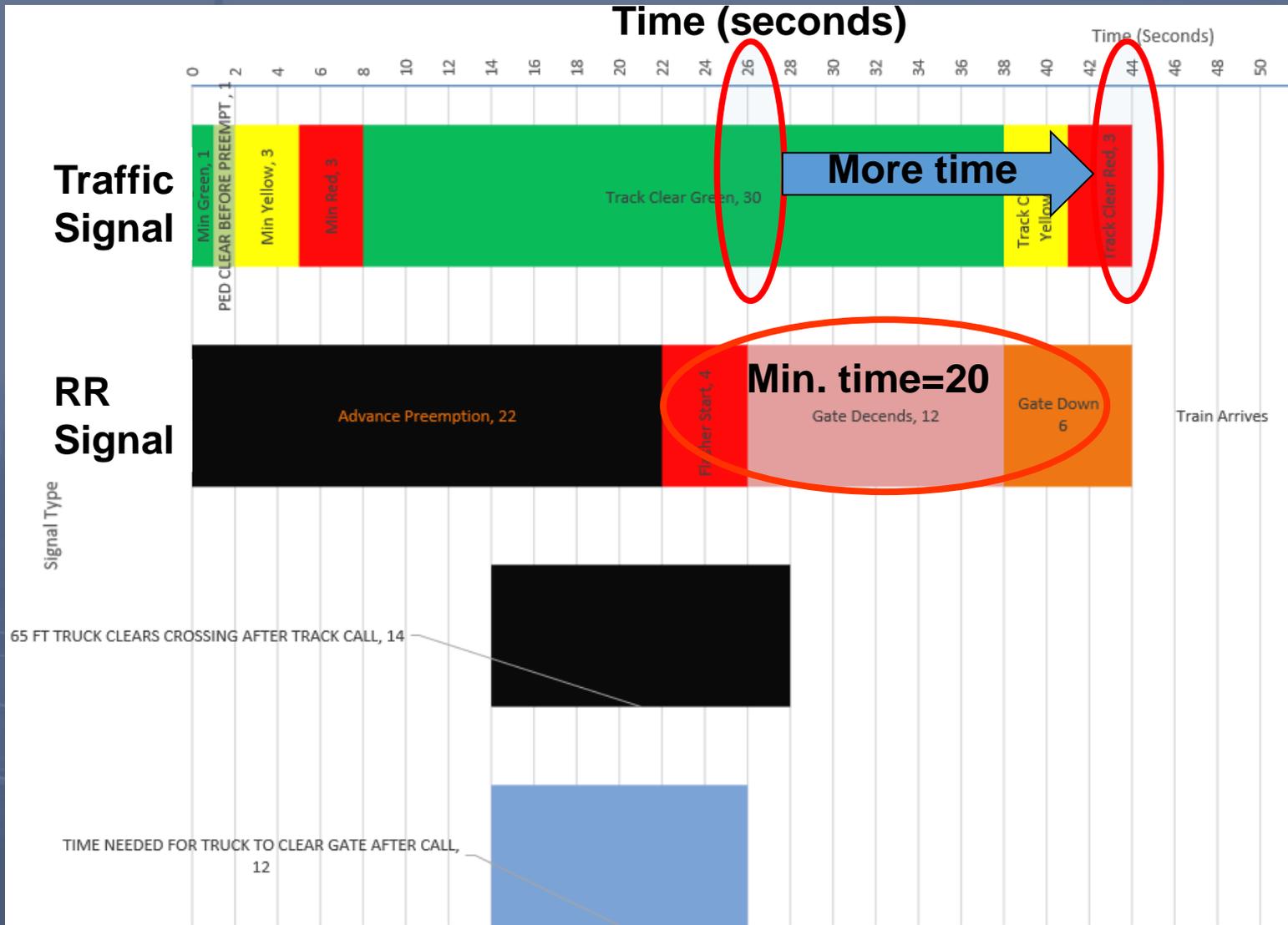
So let's go to Advance Preemption to clear the truck.



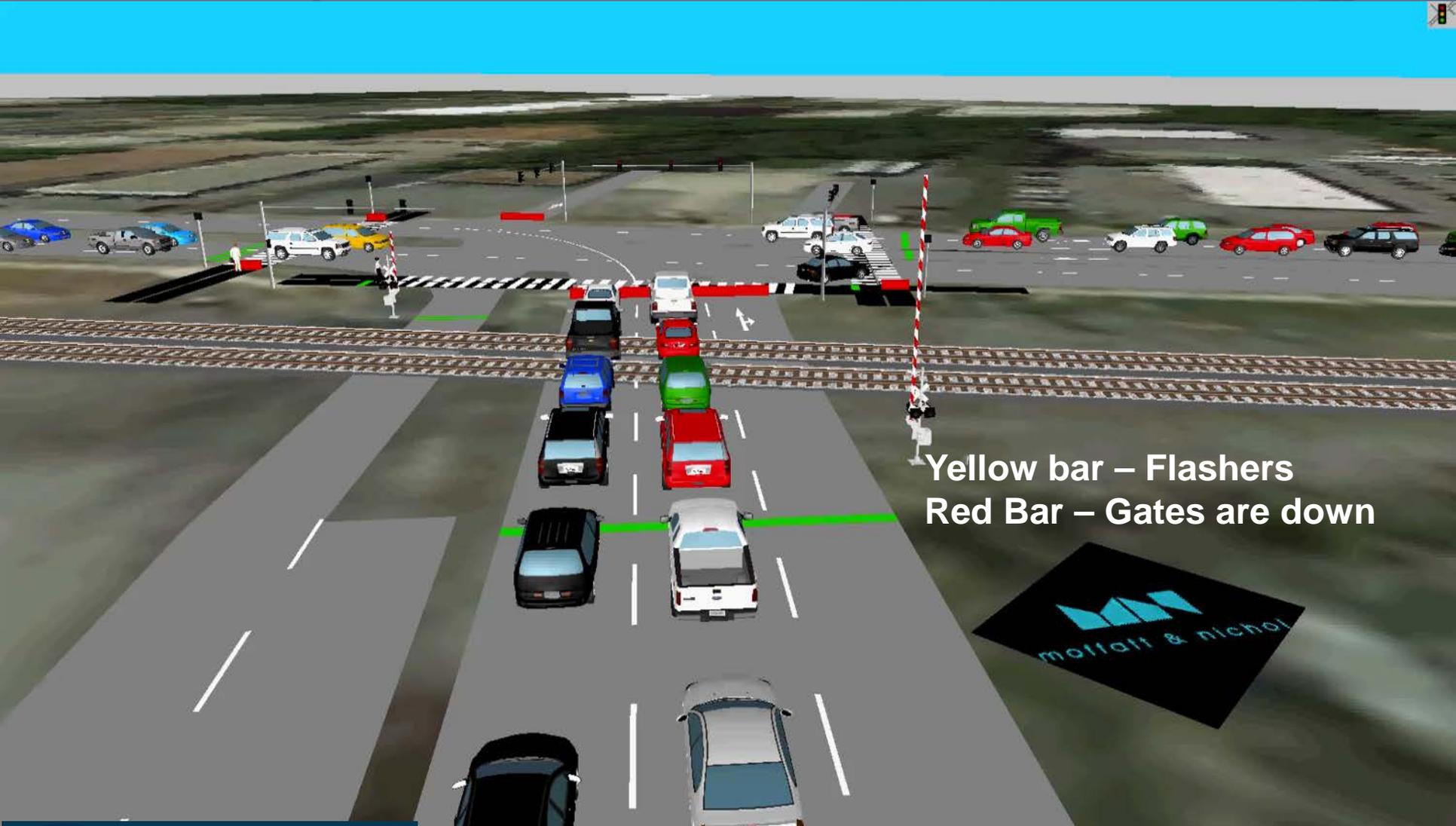
Yellow bar – Flashers
Red Bar – Gates are down



Issues?

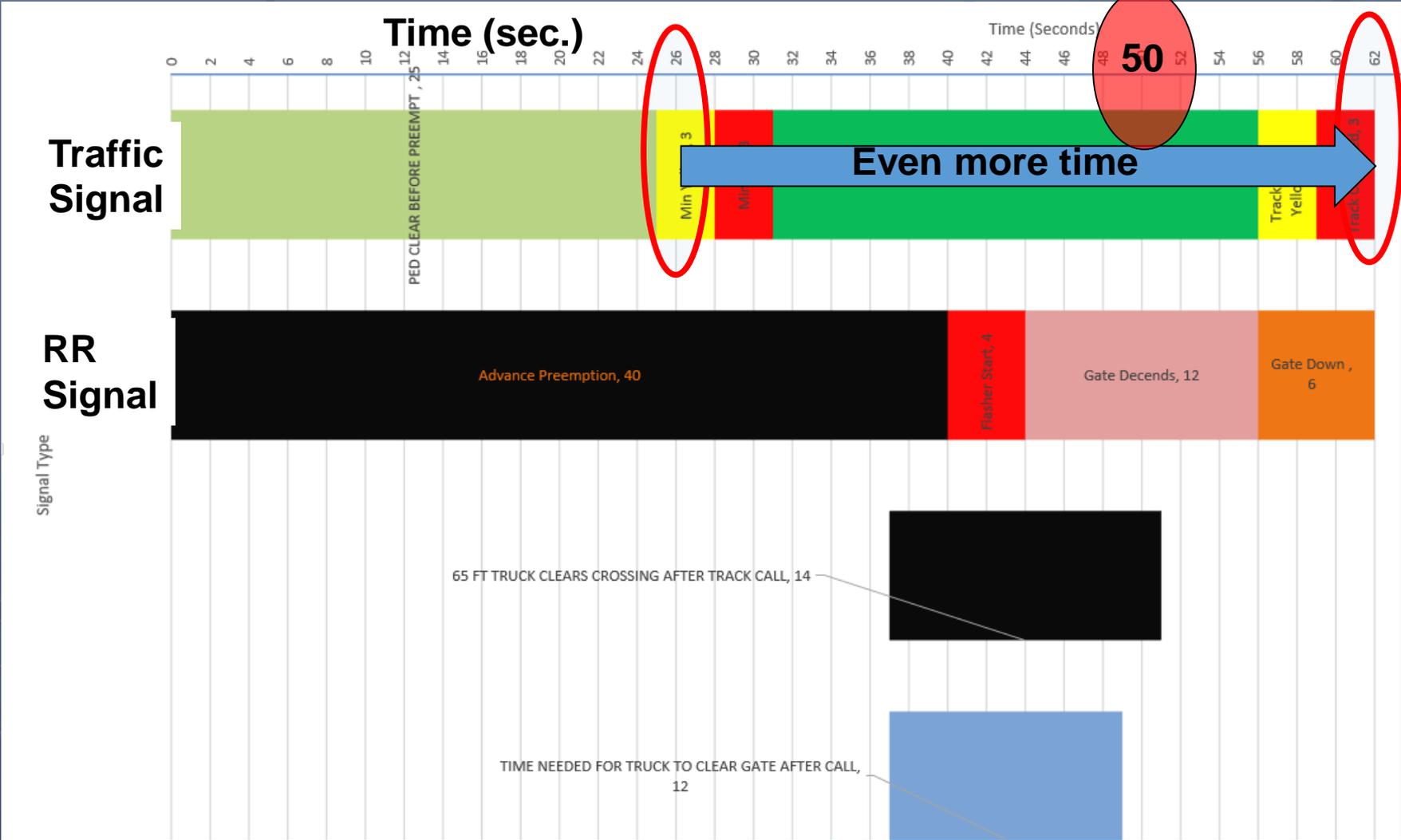


Now let's do Advance Preemption to clear peds and clear the truck.



Yellow bar – Flashers
Red Bar – Gates are down

Now it's a perfect world. Or is it?



Maximum Track Circuit Length per AREMA = 50 SECONDS

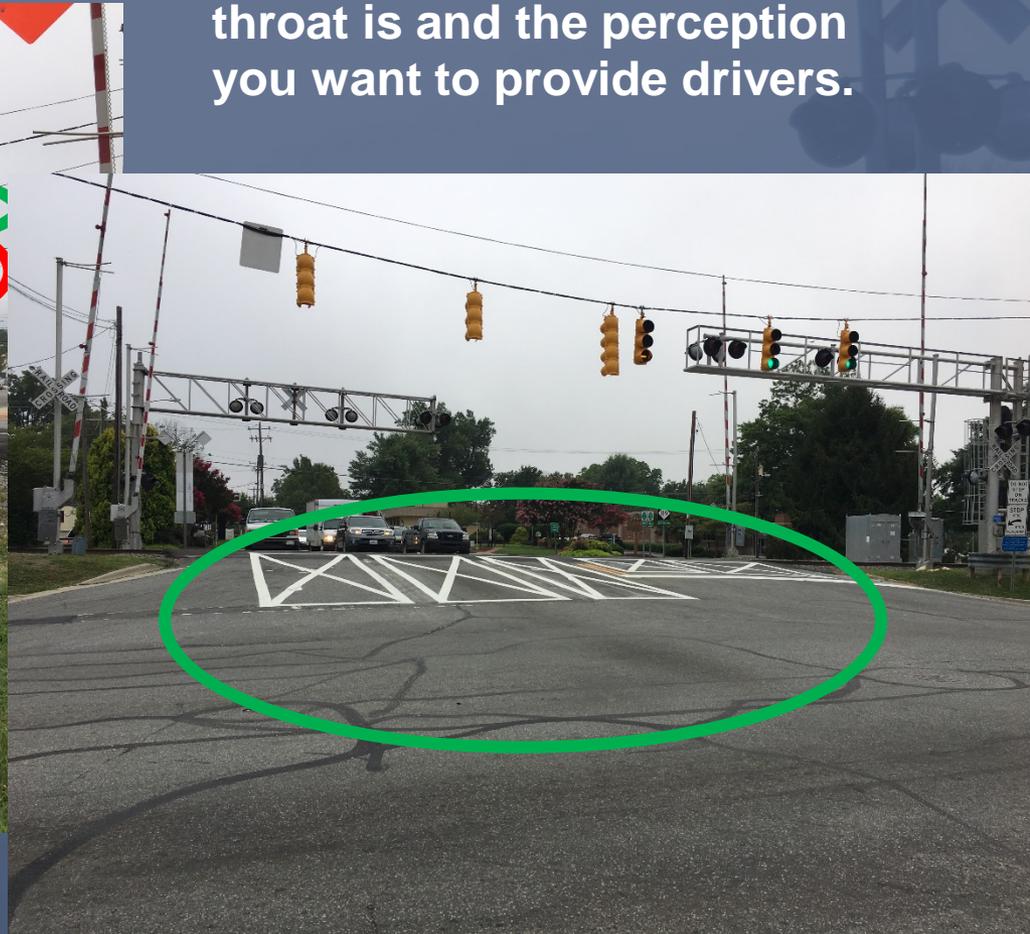
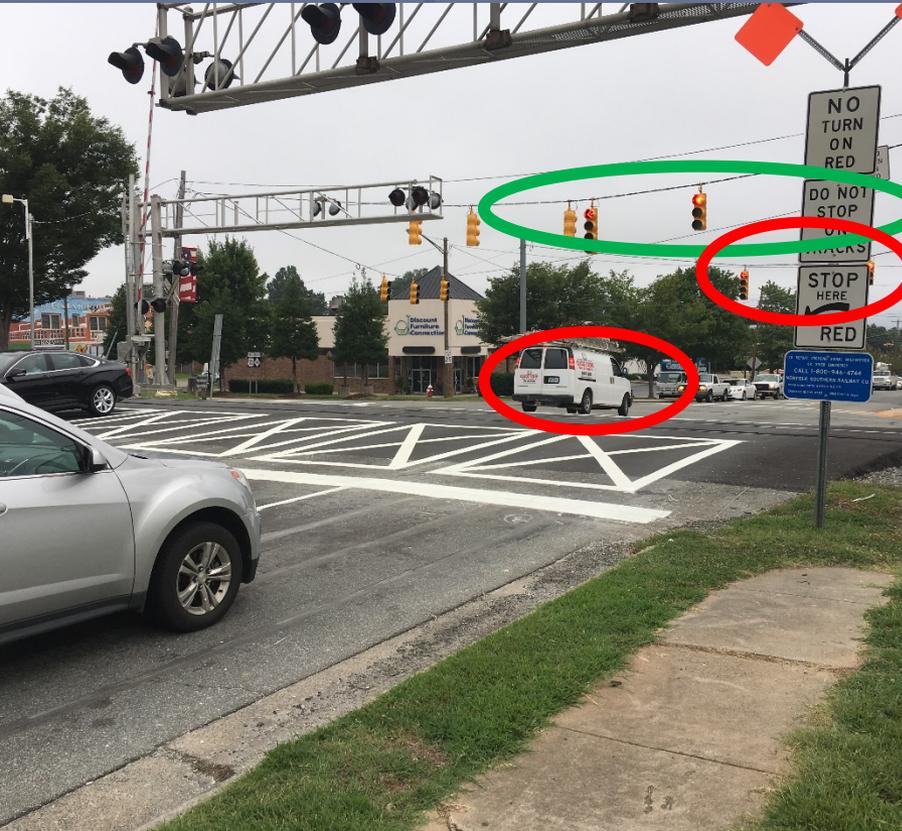
Is it really worth it to store one car between the track and the parallel roadway traffic? Is it smart?



Relocate the stop line and control it.

- Need to do more education and enforcement...
- Should we provide the second set of signals just in case?

It depends on how long the throat is and the perception you want to provide drivers.



Note the use of yellow flashing left turn arrows with the Track Clear Green left turn arrow.



What is the actual problem we face?

- Cars are backing up across the track.
- Cars are backing up **through the adjacent intersection.**



Now let's ENGINEER a BETTER solution.



Yellow bar – Flashers
Red Bar – Gates are down



It does work if it is Engineered correctly.



Pre Signal < 200 ft
Shorter preemption time
needed.



Kept clear

It does work if it is Engineered correctly.



Don't forget the age old concerns with Preemption...

- Track Clear Green Trap - Use of “dummy timer phase” when you use a split phase across the track
- Left Turn Yellow Trap - Use of flashing yellow in both directions so you can run protected left turn with preemption
- More time = more \$.
 - AREMA now dictates 50 Seconds Maximum Track Circuit Length



Ok, so 61 feet was a challenge, what if we have 431 feet of queue backing up from a signal?

- Let's dig into that question.... And model the possibilities

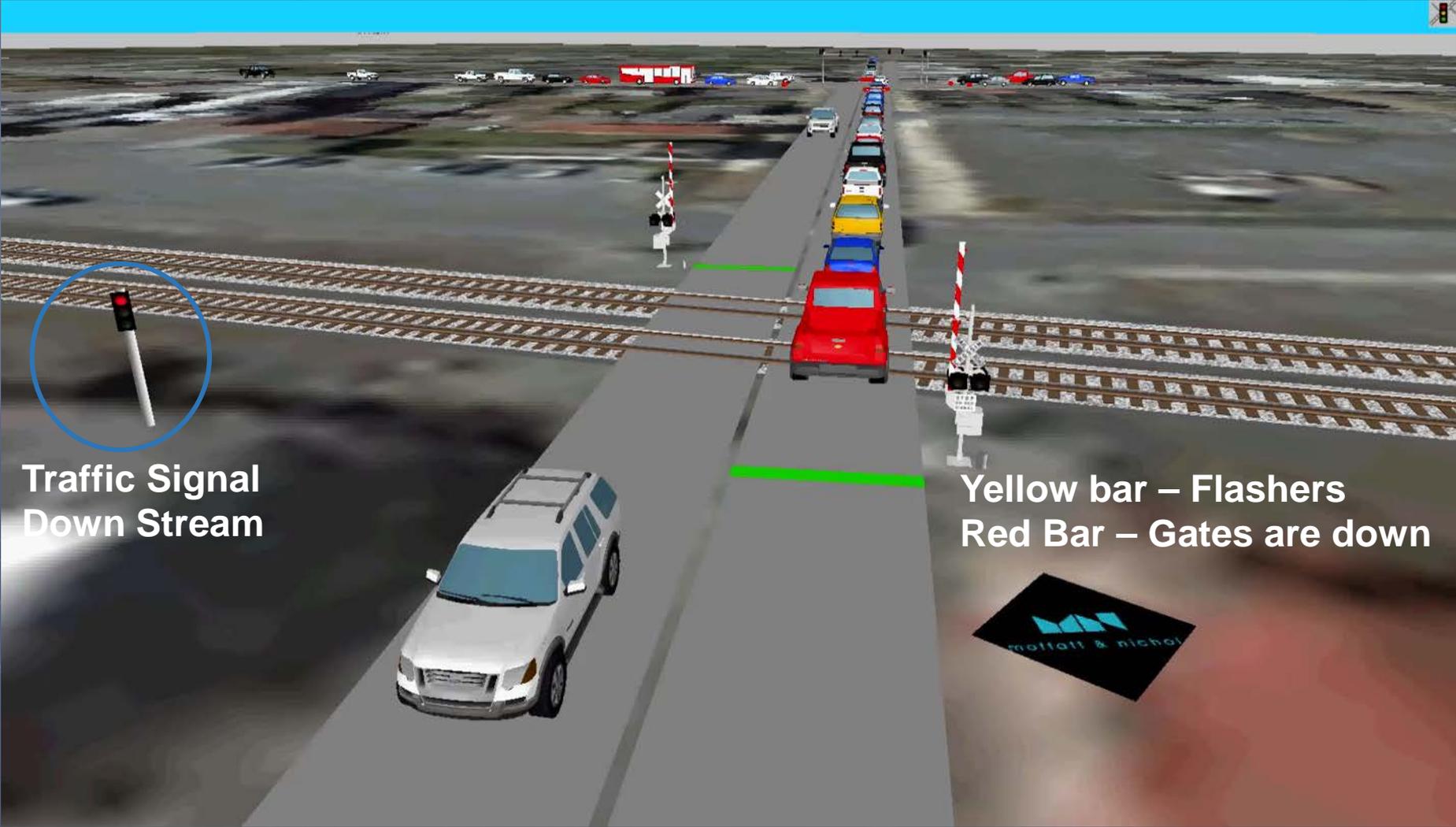


Clearly this is too long (> 400 feet) to consider Simultaneous Preemption.

But let's model it anyway for kicks!



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But let's model it anyway for kicks!



Traffic Signal
Down Stream

Yellow bar – Flashers
Red Bar – Gates are down

Ok, we figured that would happen. So let's model Advance Preemption, and cut the Track Clear Green just to move the queue.

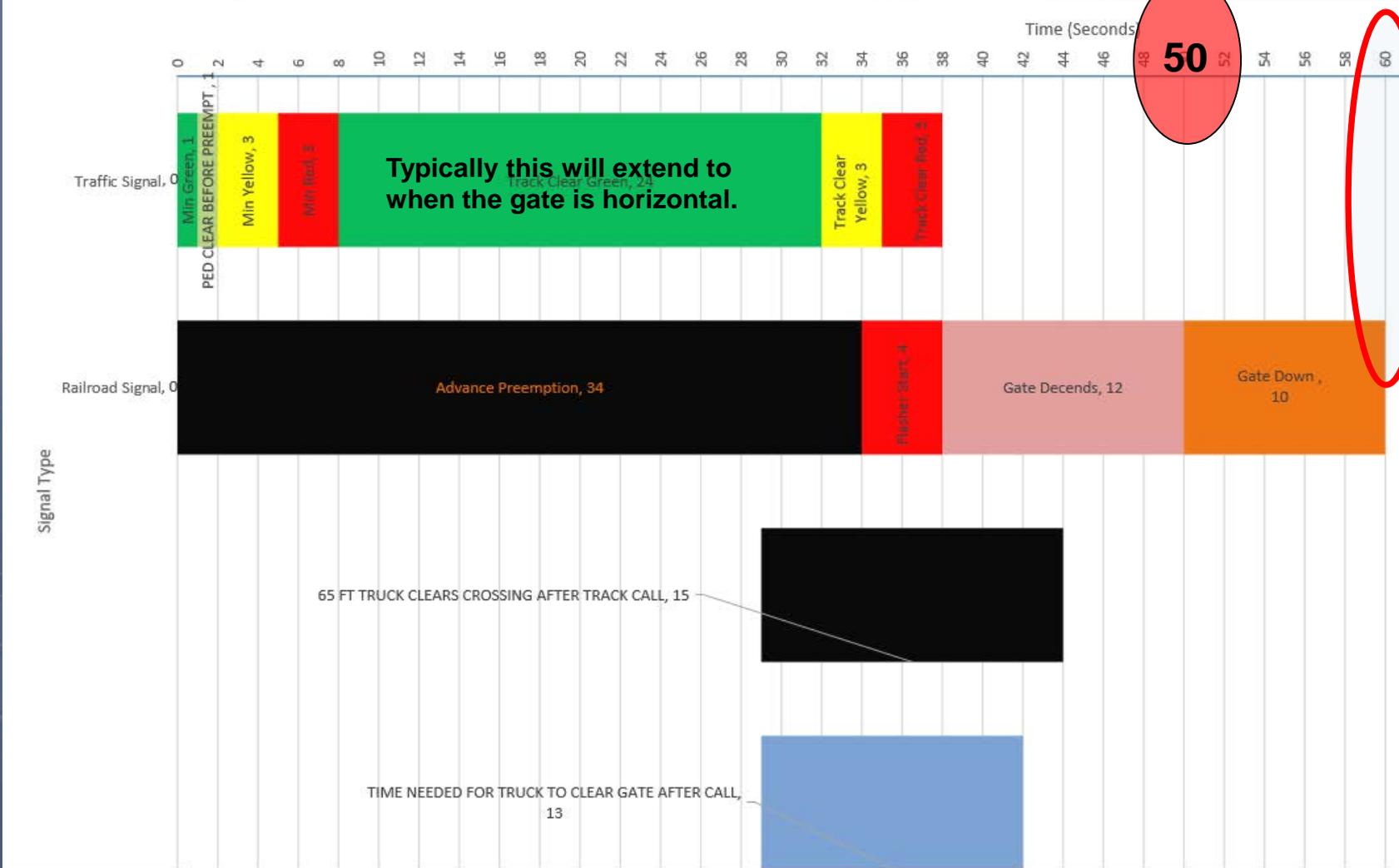


Traffic Signal
Down Stream

Yellow bar – Flashers
Red Bar – Gates are down

Typically you extend the Track Clear Green to when the gate is dropped.

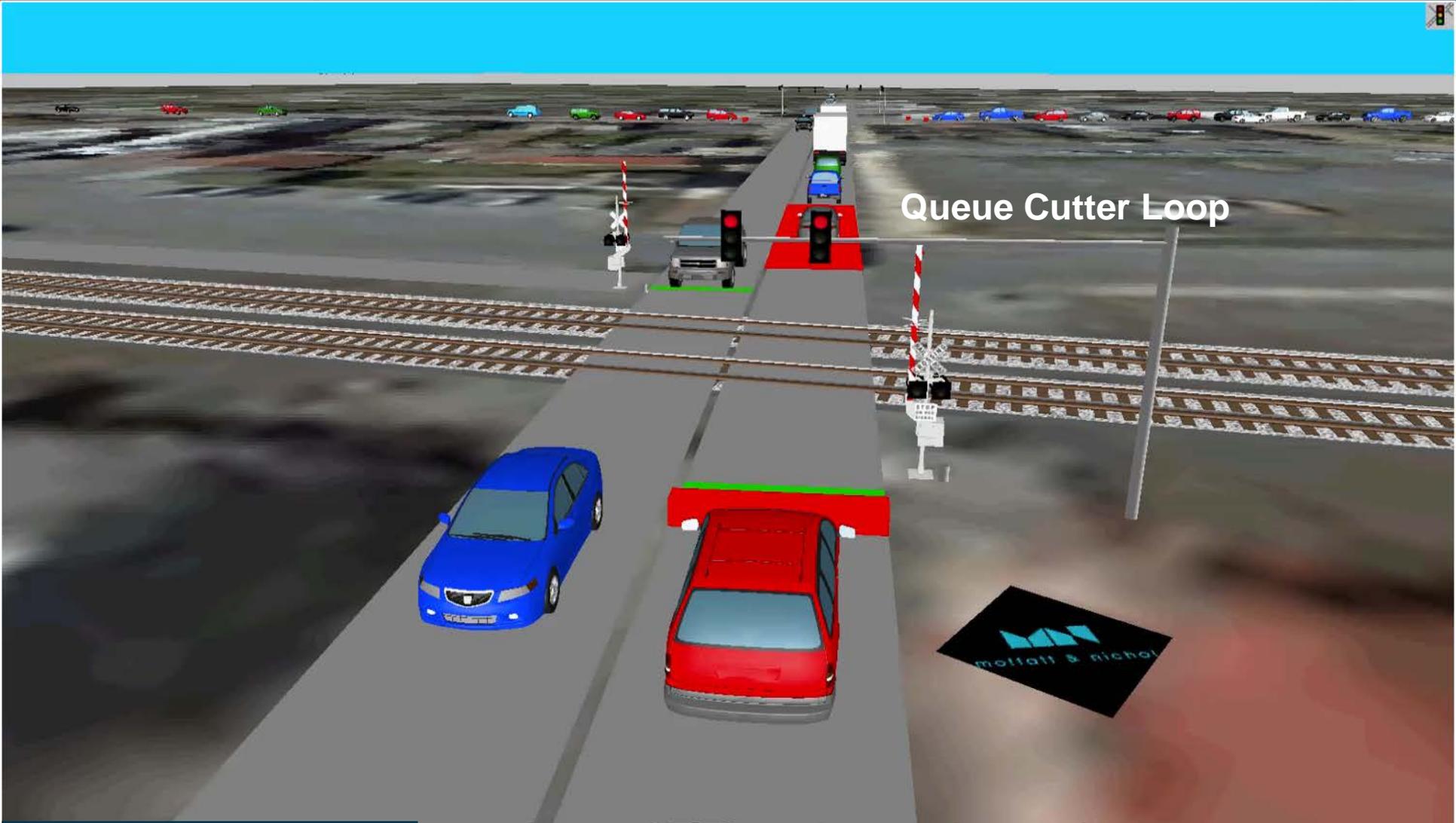
Ok, we figured that would happen. So let's model Advance Preemption.



But Advance Preemption will always bail us out. Right?

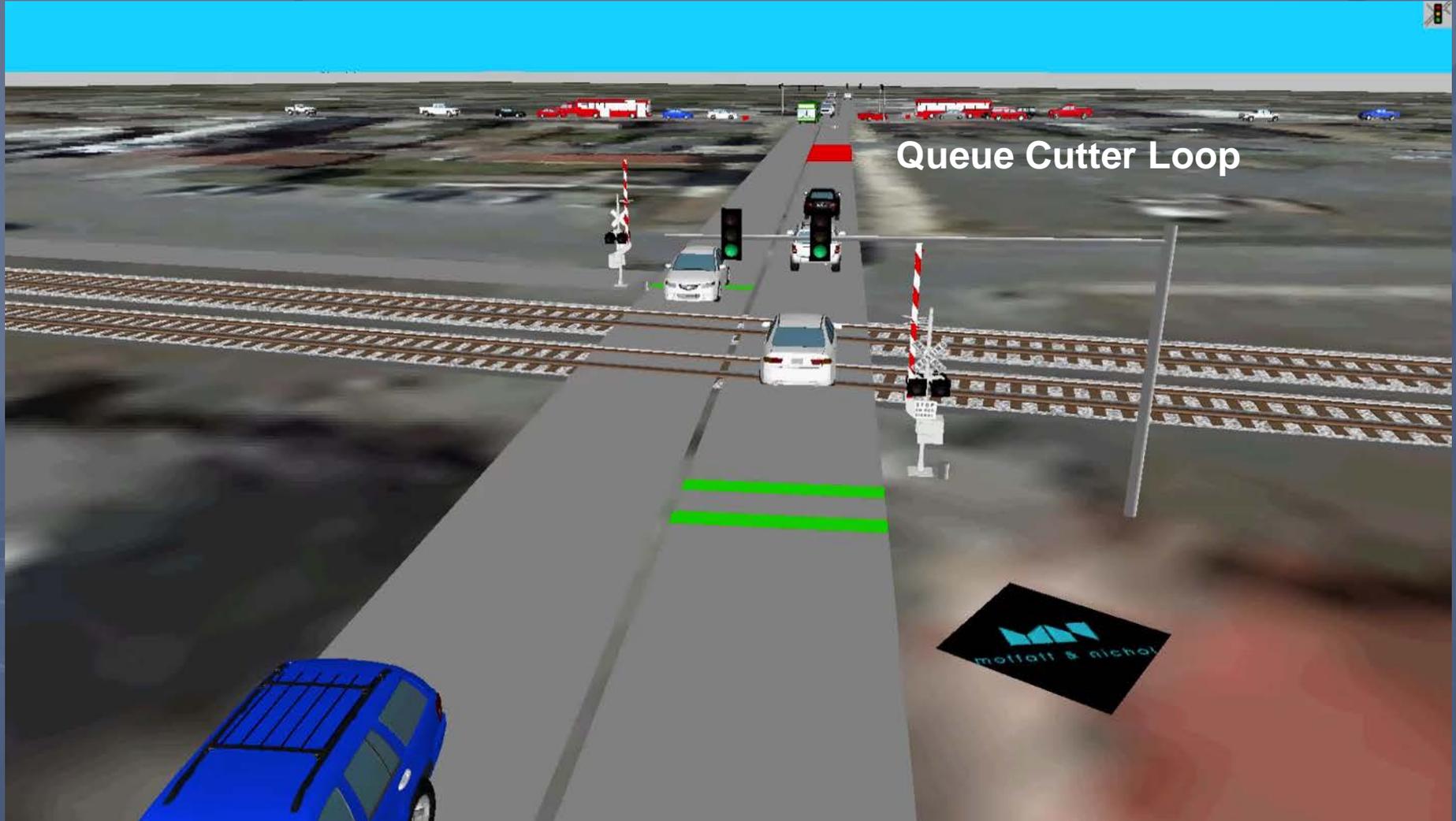


Now let's ENGINEER a BETTER solution.



Queue Cutters – Actuated > 400 ft
- Non actuated 200 – 400 ft

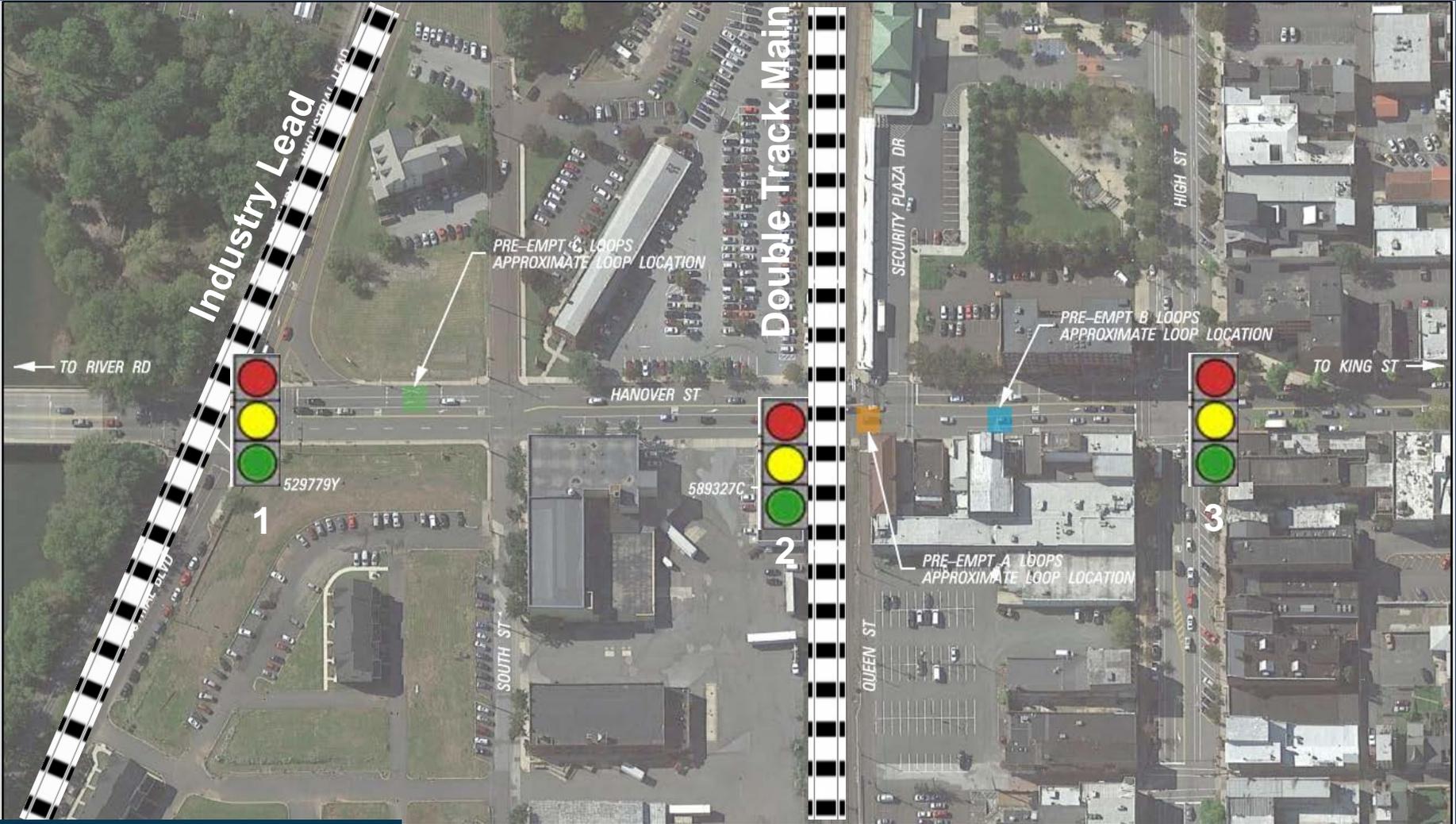
Oops. The queue cutter was too close to the track. Let's move it down stream a little bit.



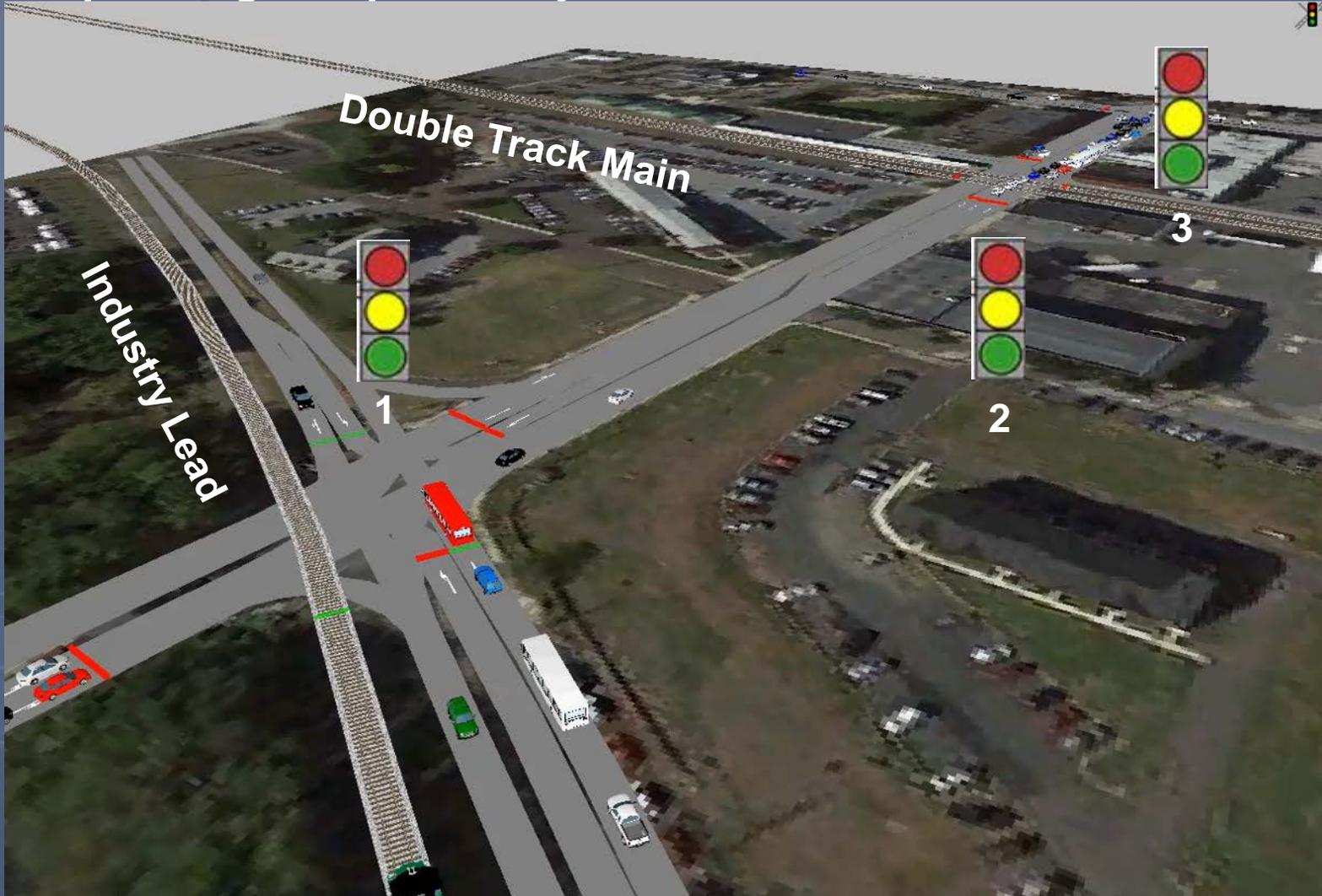
Preemption: So what should we consider?

- Treatment of the tracks as the intersection it is
- Better stop line placement and control
- Consider where you put crosswalks
- Coordinated signal timing
- Pre-signals < 200'
 - Hybrid beacons (flashing)
- Timed Queue Cutter – between 200' and 400'
- Actuated Queue Cutter > 400'
- Build an escape route

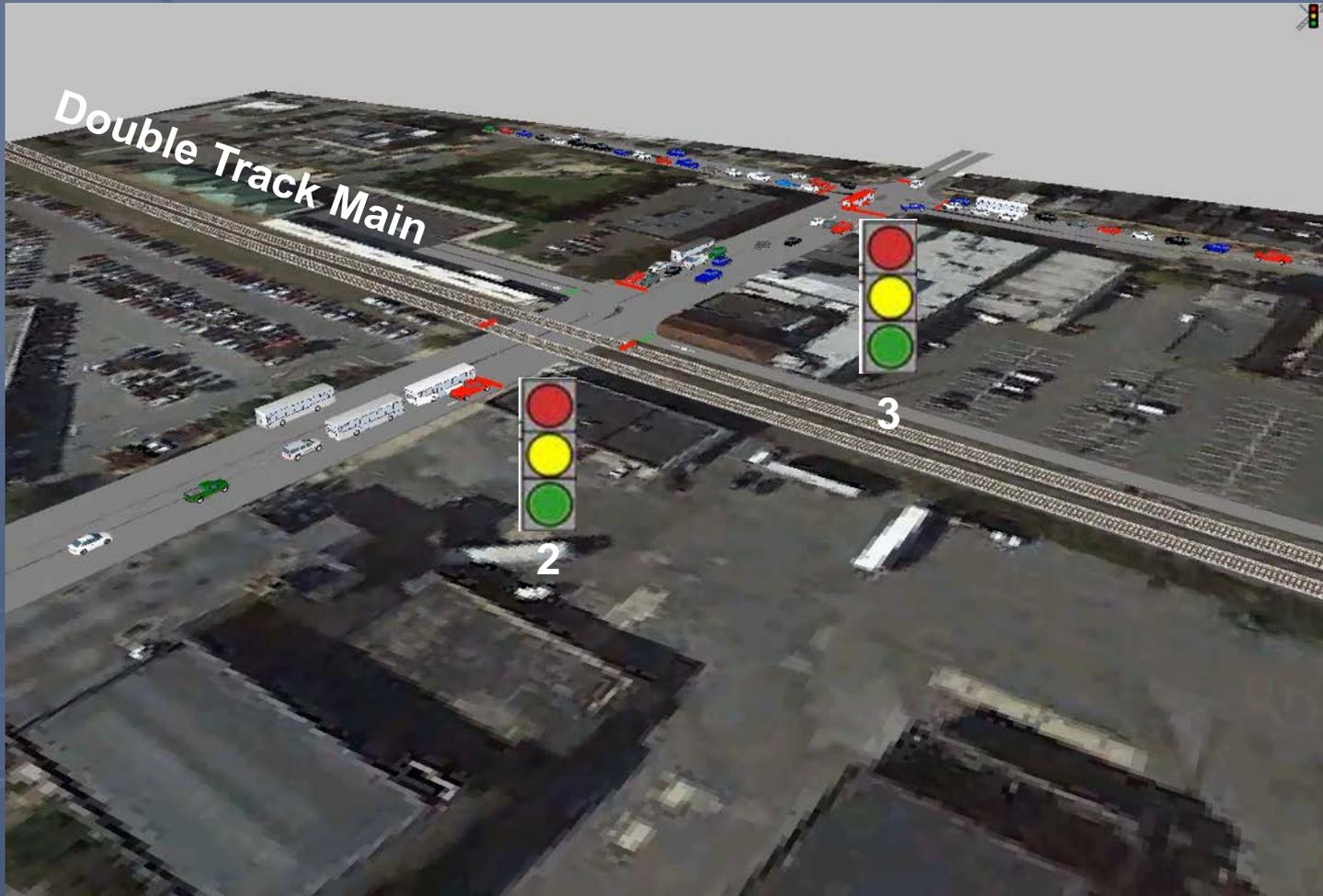
Why Not Build a BETTER SYSTEM? Coordinated Timing? 2 crossings, 3 signals (2 preempted), All operating independently.



Why Not Build a BETTER SYSTEM? Coordinated Timing? Signals operating independently.

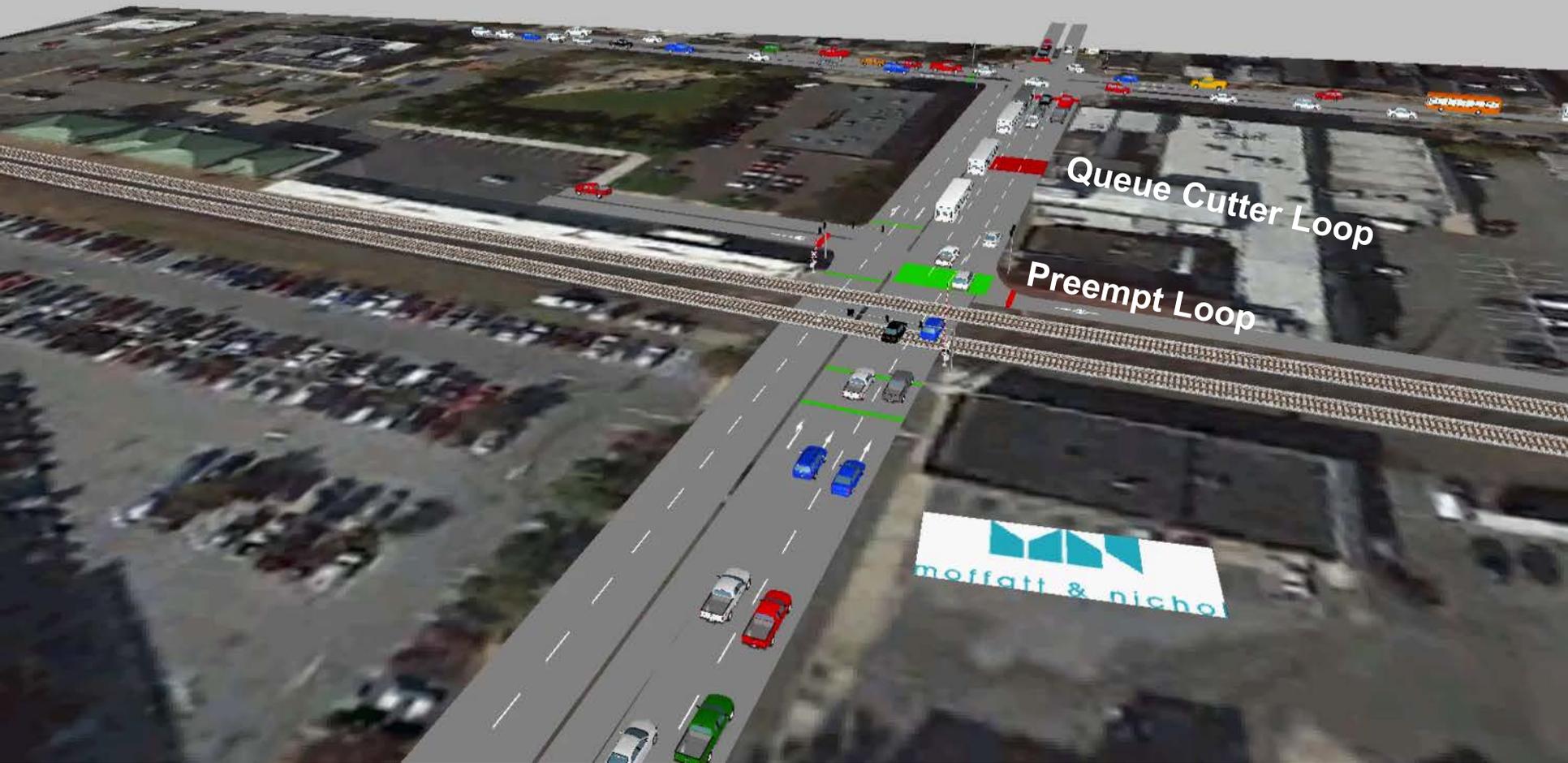


Why Not Build a BETTER SYSTEM? Coordinated Timing? Pre-timed coordination.

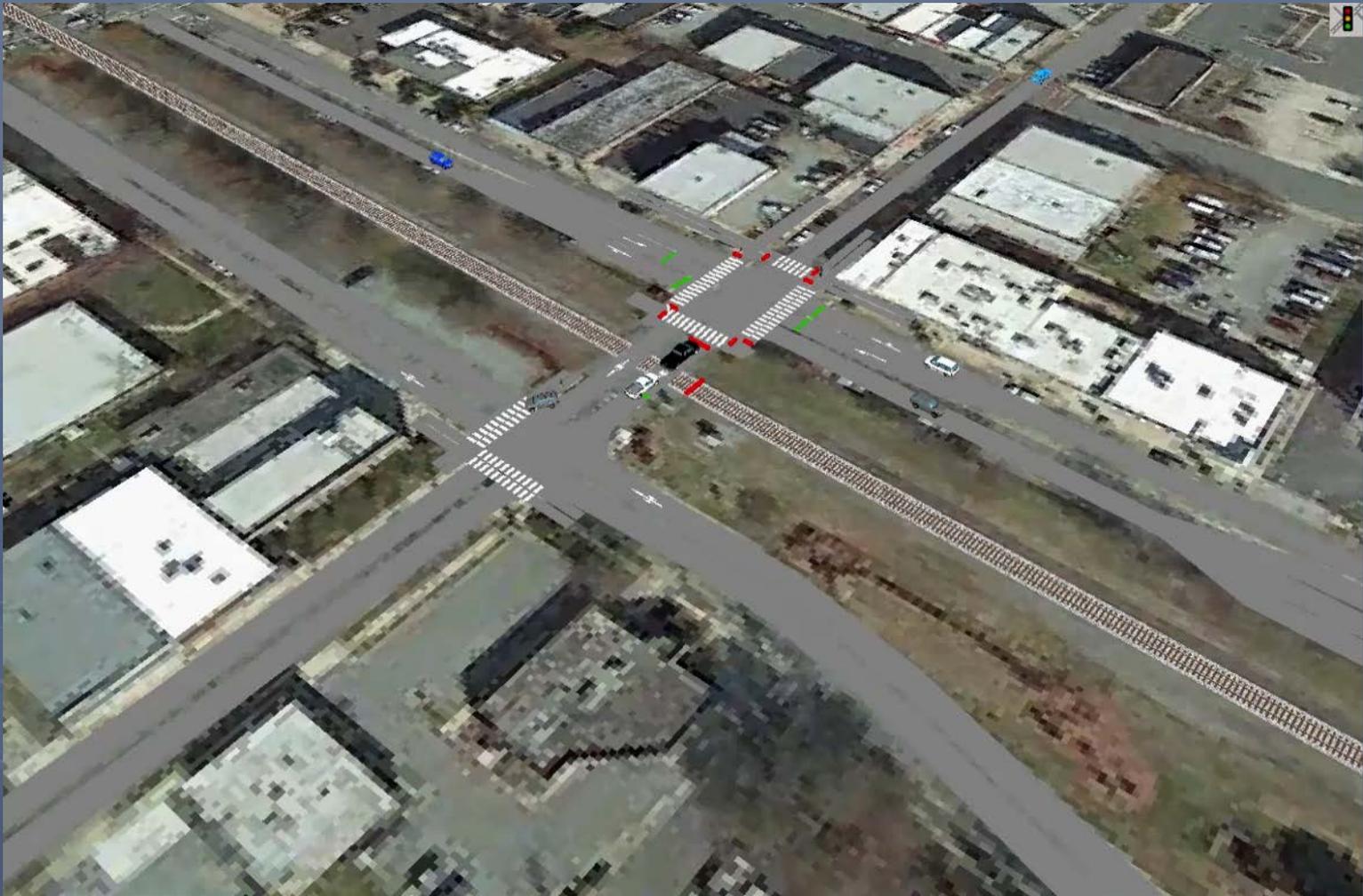


Why Not Build a BETTER SYSTEM?

Pre-timed coordination with a queue cutter and a preemption loop.



Why Not Build a BETTER SYSTEM? Adjacent Intersections? Remember – The track is an intersection too.



Why Not Build a BETTER SYSTEM? Coordinated Timing? Pre-timed coordination.



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Questions?



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