

Ultra Low Sulfur Diesel Handling

NASEO Summer Fuels Outlook
Conference

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Products Transported

- Pipelines move multiple products with wide variances in maximum sulfur levels
 - Heating Oil – up to 5000ppm
 - Jet Fuel – up to 3000ppm
 - Gasoline – up to 300ppm
 - LSD – up to 500ppm
 - ULSD – up to 15ppm
- Keeping additional sulfur away from ULSD is a significant challenge

United States Transportation Network is Complex

- Multiple hand offs occur between pipelines, intermediate tank farms, other modes of transportation
- Particularly complex in the Mid Continent and East Coast
- The potential for sulfur increase occurs at each hand off shrinking the ULSD batch
- Best case, as much as 1-2ppm is added each hand off

What are Pipelines Doing ?

- Developed a handling practices guideline focused on thorough examination of each Pipeline's link(s) in the supply chain
- Developing check lists
- Working on round robin testing on analytical equipment reproducibility
- Analyzing each hand off point to understand the potential for sulfur contamination

Review of Suppliers

- Identify points of contamination within each supplier's facility
- Dedicate systems to ULSD wherever practical
- Calculate line displacements
- Update displacement procedures
- Modify batch sequencing
- Enhance training

Sulfur Contamination by Equipment

- Valves, manifolds, pumps, dead leg piping, drain lines, flush lines, relief lines, pump line ups, meters, provers, filter vessels, sumps, etc.
 - Preventive maintenance
 - Isolate/dedicate lines & equipment when possible
 - Modify operating procedures
 - Line and equipment labeling

Managing Interface Generation

- Recalculate optimal line flush volumes to protect product
- Minimize transmix and interface
- Pursue interface detection equipment and techniques

In-Transit Contamination

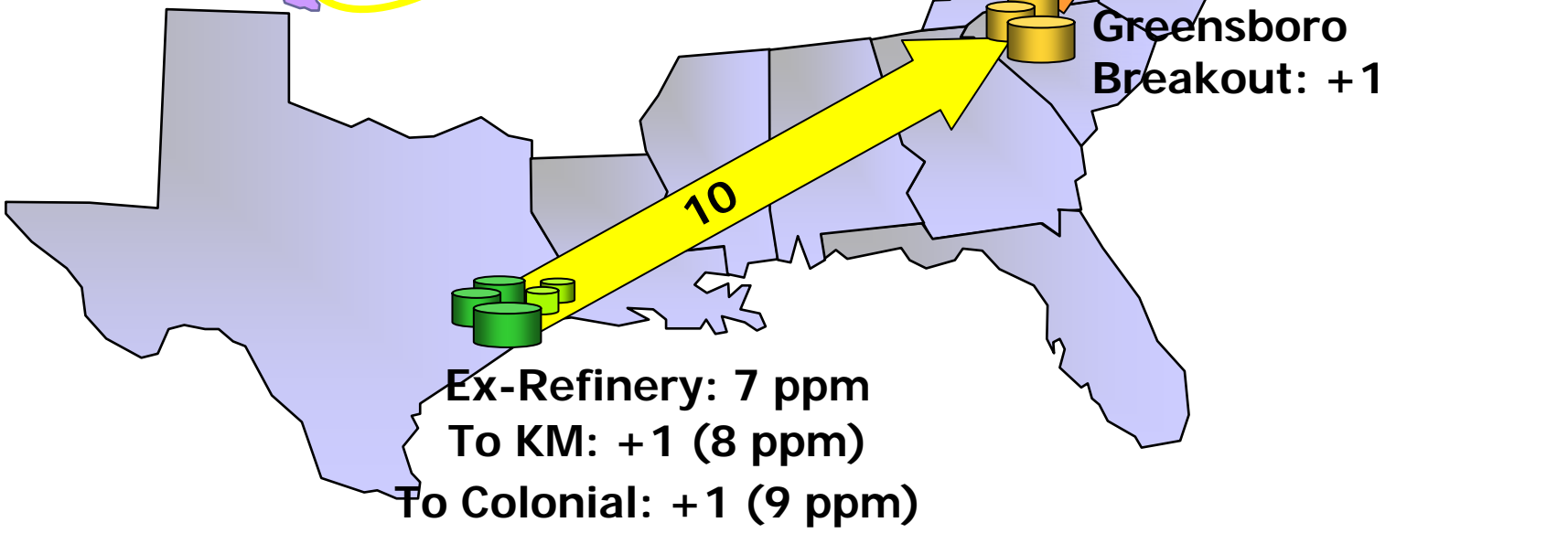
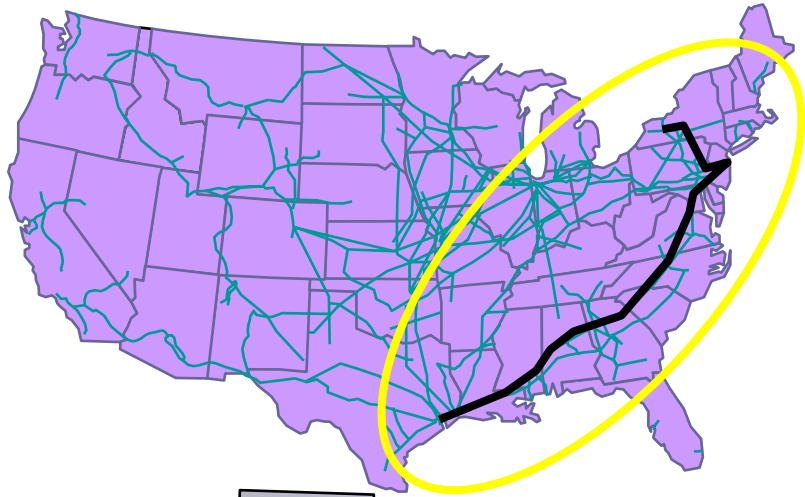
- Starting/stopping pumps
- Pipeline hydraulics
 - Laminar versus turbulent flow
 - Line pack
 - Elevation changes
- Pipeline maintenance and repair
 - Purges
 - Drain ups
 - Re-injections
- Pigging
- Batch sequencing
 - Can be used to transition sulfur levels
 - Limited to the market demands of the pipeline's service area

Sulfur Sources, Downgrades

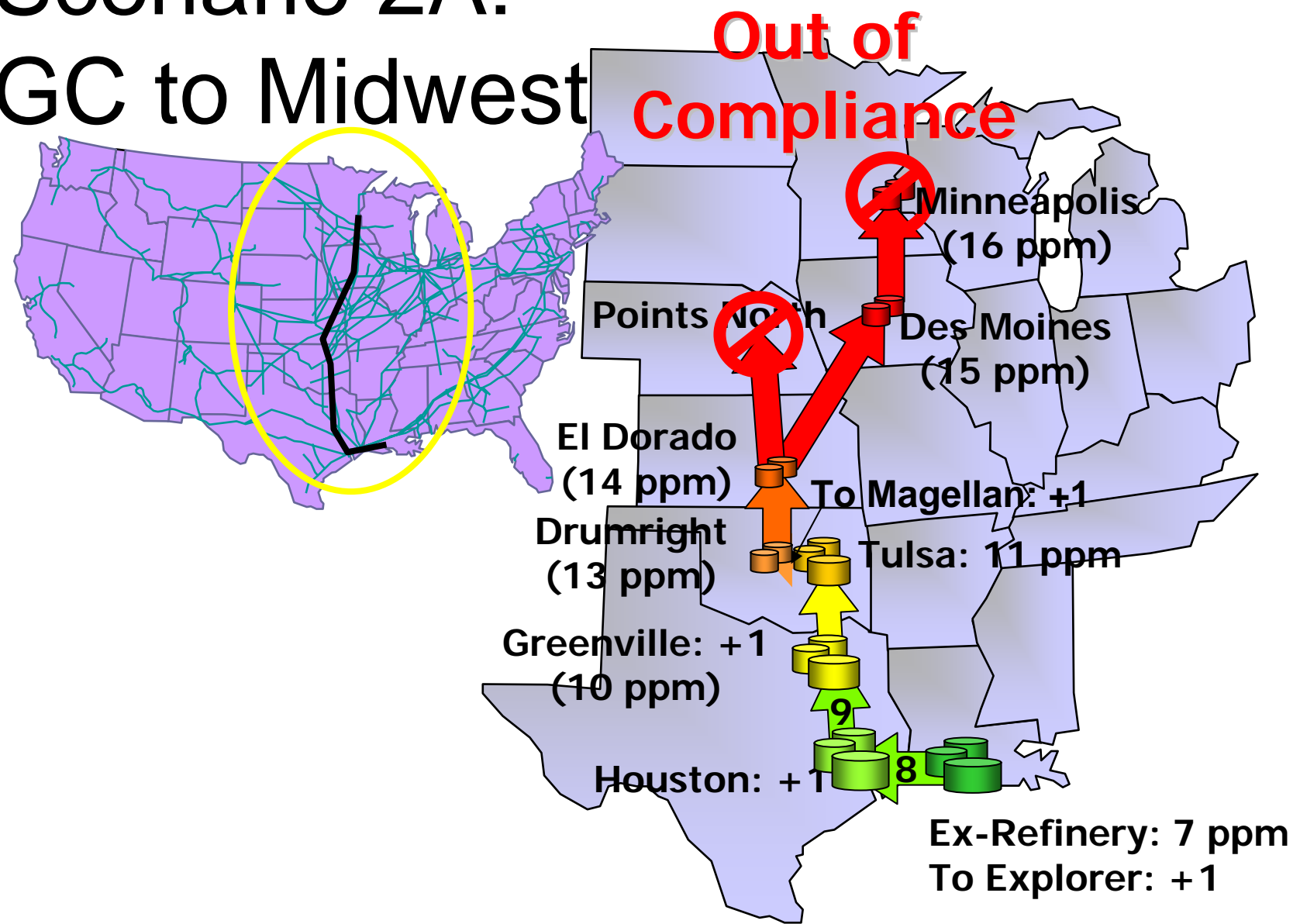
<u>Movement</u>		<u>Sulfur Contamination</u>	<u>Downgrade in Barrels</u>	
			<u>12" Pipeline</u>	<u>36" Pipeline</u>
Refinery Gate		7 ppm	100,000	100,000
Pipeline		<1 ppm	(1,100)	(9,600)
Tank Farm		1 - 5 ppm		
Truck		<1 ppm	(100)	(100)
Retail		<1 ppm		
Subtotal		9 -13 ppm	98,800	90,300
Test Reproducibility		4 - 6 ppm		
Total Sulfur		13 -19 ppm		
EPA Test Tolerance		-2 ppm		
Final Sulfur		11 -17 ppm		
A 2 nd shipment		12 - 22 ppm	97,600	80,600
A 3 rd shipment		13 - 27 ppm	96,400	78,400

Scenario 1: Houston to NY State

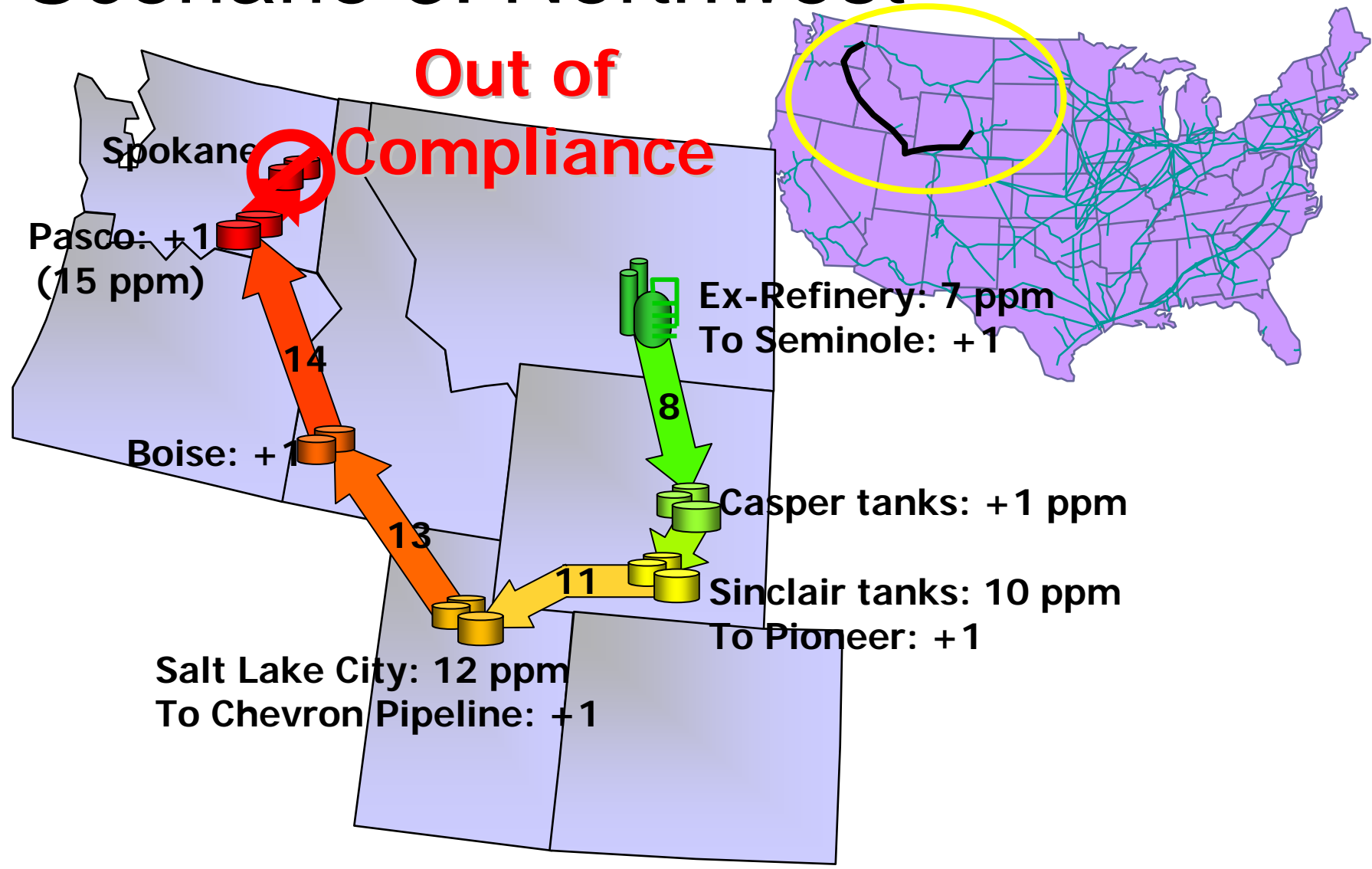
**Out of
Compliance**



Scenario 2A: GC to Midwest



Scenario 3: Northwest



High Sulfur Glut?

- ULSD volumes will shrink in transit and the balance will go to the 500 ppm on-road (up to 20%) or off-road pool
- How much ULSD will be re-graded and what kind of effect will this have on the 500 ppm or high sulfur pools?
- Terminals may not be willing or able to take significant volumes of 500 ppm or high sulfur diesel above the normal demand volume

Transportation Testing Network

- Small pockets of 15ppm in production now but much of it is not where it's needed to provide test movement opportunities
- More ratable volumes are needed now to test the handling practices of the industry
- Capital expenditures are needed to manage sulfur contamination
 - How much capital?
 - On what should it be spent?
- Testing is an iterative process

How Much ULSD for Testing

- Pipelines are actively seeking ULSD volumes now
- Gulf Coast origin – 1.2 million barrels
- West Coast origin – 300 thousand barrels
- Midwest origin – 300 thousand barrels
- East Coast origin – 200 thousand barrels
- TOTAL – Approx 2 million barrels

Summary

- Additional testing critical to success
- Increase ULSD batch sizes in anticipation of downgrades
- Implement an oversight program to monitor suppliers and manage contamination downstream
- Need better interface detection and batch tracking capabilities
- Reduce sulfur in or elect not to transport products with high sulfur contents
- Consider not accepting LSD since this will be generated in-transit
- Pipeline realities may dictate new distribution patterns
- Pipeline receipt sulfur specs to reflect new realities
- More flexibility is needed during the transition period