

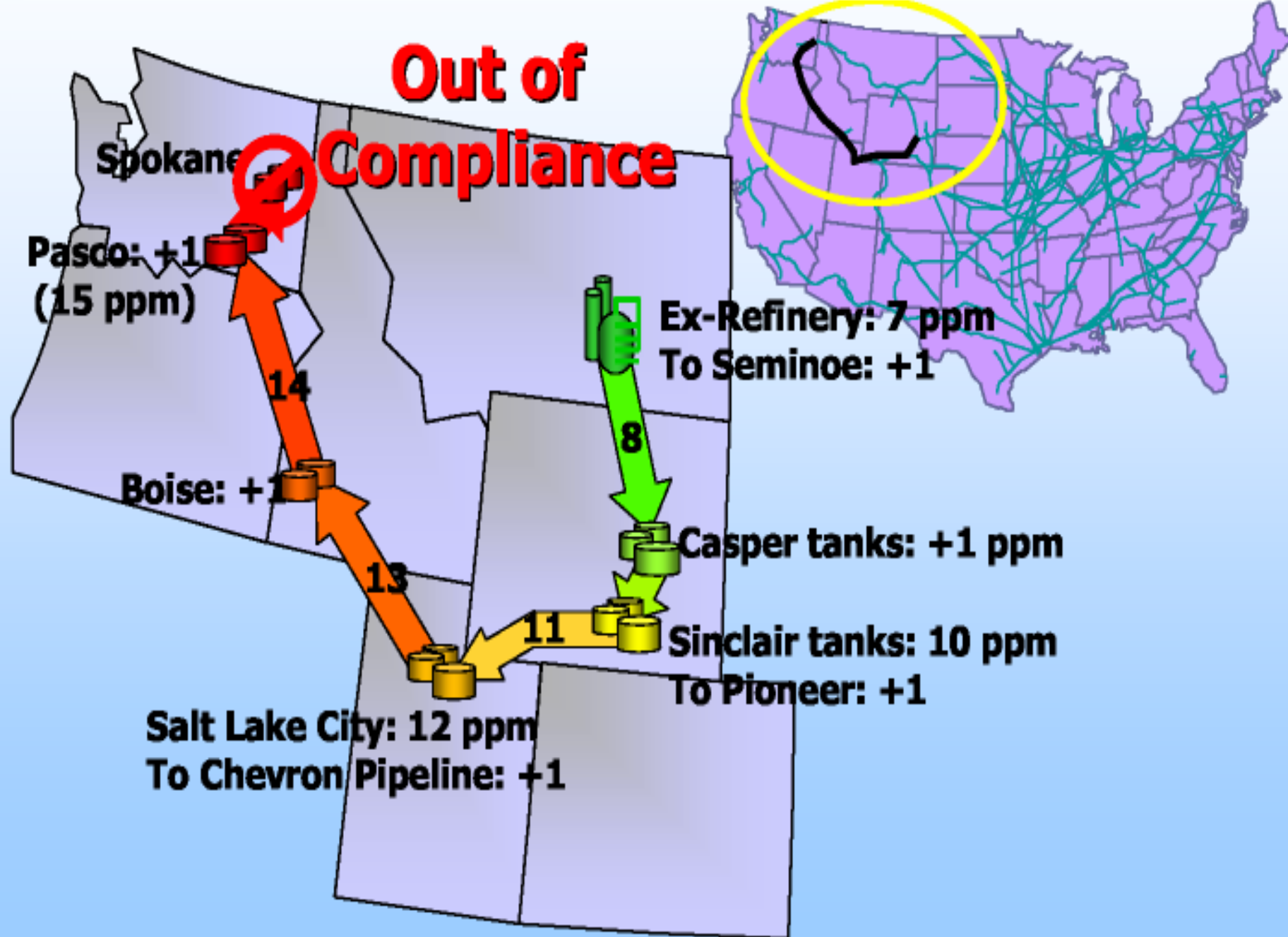
# Alaska Distribution of ULSD

- Challenge all modes of transportation
  - Rail, Barge, Pipeline, Truck
- No Single mode will carry entire burden
- Cost and time schedule dependent on domestic Alaska supply
- Regional Distribution Tanks will need to be present in all key areas
  - ANC, FBX, Prudhoe
- Common goal keep Alaska running
  - Rail Belt
  - Bush Alaska

# Alaska Transportation Network is Complex

- Multiple hand offs occur between pipelines, intermediate tank farms, other modes of transportation
- 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

# Out of Compliance



Source: API

# Ultra Low Sulfur Diesel Handling

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

## Movement

## Contamination

Depart Refinery

7 ppm

Pipeline

<1ppm

Tank Farm

<1ppm

Truck Transport

<1ppm

Retail

<1ppm

Sub Total

9-13 ppm

Test Reproducibility

2-4 ppm

Total Sulfur

13-19ppm

EPA Test Tolerance

-2ppm

Final Sulfur

11-17ppm

2nd Shipment

12-22ppm

3rd Shipment

13-27ppm

# Current Product Distribution System

- Barges, Pipelines, Terminals, Transports have little or no experience in handling ultra low sulfur diesel product
- Protecting the sulfur quality of ULSD while transporting it presents a more of a challenge than handling Jet Fuel
- Industry has a new distribution challenge that has not been completely quantified. Additional transportation system testing and sharing of test data will be required.
- Industry will spend millions of dollars to make facility and procedural changes to our transportation systems to minimize the risk of sulfur contamination

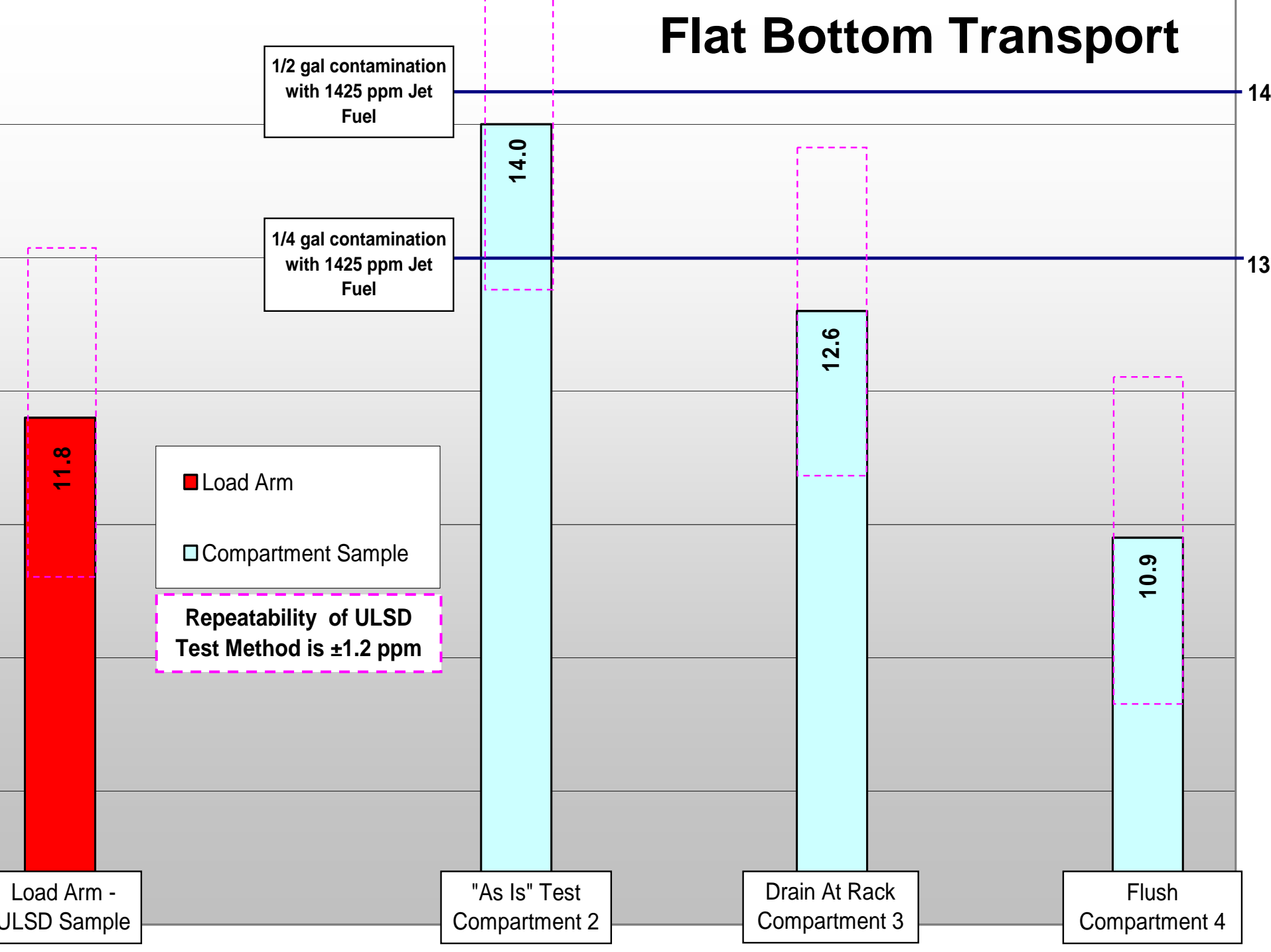
# Marathon Ashland Petroleum Transport Test

- Determine the sulfur contamination impact of transport
- Establish if the transport type, flat vs. slope bottom, contributes differently to contamination

# Transport Testing Background

- Two scenarios included transport testing
  - Louisville 4/16/04
  - Macon 5/31/04
- Previous contents of the transports were jet fuel at 1425 ppm sulfur
- Transports were compartmented
  - One loaded “as is”
  - One drained down at rack prior to loading
  - One flushed at rack prior to loading
- 300 gallons loaded in each compartment

# Flat Bottom Transport



# Slope Bottom Transport

1/2 gal contamination with  
1425 ppm Jet Fuel

1/4 gal contamination with  
1425 ppm Jet Fuel

■ Load Arm

□ Compartment Sample

Repeatability of ULSD  
Test Method is  $\pm 1.2$  ppm

11.8

12.3

11.7

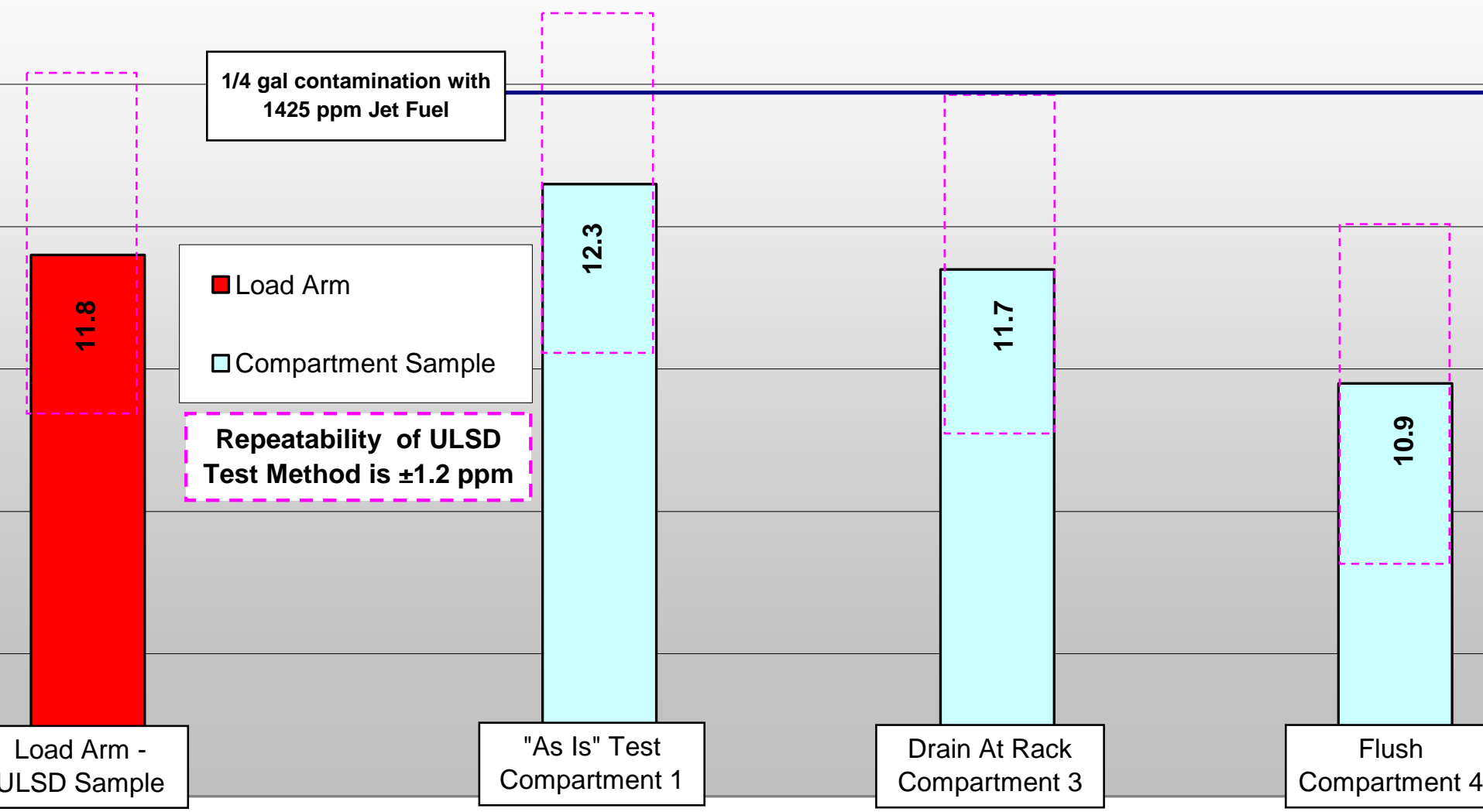
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Load Arm -  
ULSD Sample

"As Is" Test  
Compartment 1

Drain At Rack  
Compartment 3

Flush  
Compartment 4



# Transport Operations Observations

- Transports need to be completely drained when switching from higher sulfur products to ULSD
- A flat bottom transport can present significant contamination issues when loading ULSD
- Sloped bottom transports had little if any contribution to contamination
- Draining compartments at the loading rack reduced flat bottom contamination
- Flushing compartments with ULSD prior to loading effectively removed any residual sulfur contamination in both transport types

# Switch Loading

- Feasible only if terminal sulfur content is less than 15 ppm.
- May require use of high sulfur conductivity improver.
- Dyed product introduces further complexity.
- All trailer compartments must be completely drained.

# Switch Loading

- Experience suggests that trailers are generally well drained now
- If reasonable care is taken, drainage should not be a problem
- Consideration of previous product carried is important
- 5 gallons of 30 ppm gas will cause a 0.5% increase in sulfur level (.075 ppm) in 1,000 gallons of ULSD
- 1 gallon of 3,000 ppm fuel will cause a 20.0% increase in sulfur level (2.98 ppm) in 1,000 gallons of ULSD

<b>From</b>	<b>To Gasoline</b>	<b>To LS Diesel</b>	<b>To LS Diesel</b>	<b>To Home Heat</b>	<b>To Clear Kero</b>	<b>To Dyed Kero</b>	<b>To ULSD #1 or #2</b>	<b>To Jet A</b>
<b>Gasoline</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>	<b>OK</b>	<b>NO</b>
<b>LS Diesel Clear</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>NO</b>
<b>LS Diesel Dyed</b>	<b>OK</b>	<b>NO</b>	<b>OK</b>	<b>OK</b>	<b>NO</b>	<b>OK</b>	<b>NO</b>	<b>NO</b>
<b>Home Heat</b>	<b>OK</b>	<b>NO</b>	<b>OK</b>	<b>OK</b>	<b>NO</b>	<b>OK</b>	<b>NO</b>	<b>NO</b>
<b>Clear Kerosene</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>NO</b>
<b>Dyed Kerosene</b>	<b>OK</b>	<b>NO</b>	<b>OK</b>	<b>OK</b>	<b>NO</b>	<b>OK</b>	<b>NO</b>	<b>NO</b>
<b>ULSD #1 or #2</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>NO</b>
<b>Jet A</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>OK</b>	<b>NO</b>	<b>OK</b>

# Segregated Tankers

- Would require separate hoses, piping, tanks and arms at the loading rack
- Capital investment would not be justified because the segregated systems would not be needed after 2010.
- Terminals may opt to carry only one highway diesel fuel
- Terminals usually are set up to grades they routinely handle. Difficult to accommodate an occasional batch of 500ppm.

# Separate Tankers

- Chances of inadvertent contamination are greater at a facility that carries 15ppm and higher sulfur products (products above 500ppm)
- Terminals with several facilities may consider moving the nonroad, locomotive or marine fuels to one location and distributing highway fuel from another.
- Such an approach may reduce possible contamination but it may render the terminal selling the higher sulfur products (greater than 500ppm) inefficient and underutilized.
- Demand at such a location may be sporadic because use of such fuels is seasonal and based on weather.

# Violations and Liability

- Presumptive liability scheme like other fuels programs
- Liability for distributing/dispensing fuel not meeting the applicable standard/requirements at a party's facility
- Liability for downstream violations

# Distribution Guidelines

- System with one fuel
- If a company opts for one highway fuel (15ppm), it will have to take significant measures to minimize contamination and downgrading of product
- Tanks will regularly have to flush its system, including hoses and piping
- Operations will have to search routinely for “dead legs,” valves and spots where small volumes of higher sulfur product may collect that can contaminate the 15ppm fuel and make costly modifications to remove sources of potential contamination
- Some may have to have barges washed every time fuel with different sulfur content is carried
- All these processes are very costly

# Assessment 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

# Future Solutions

- Each company must analyzed its realistic potential to handle ULSD
- Clean and segregate tanks
- Two turns, emptying tanks between receipts may be required to protect USLD
- Transport operators will need to adopt procedures to protect ULSD quality
- Transport operators should consider complete drain down capability prior to loading ULSD
- More testing needs to be done