Better Predicting Pavement Response to Increased Freight Loads

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Villanova University

Presentation Outline

- Pavement design…then
- Pavement design…now
- How can AASHTO's new pavement design approach help freight planning?
- Sample simulation for Port of Camden, NJ

Pavement Design: where we were…

- AASHTO or State DOT design procedures
  - Empirical (based on field observations)
  - Layered elastic (doesn't include distress growth)
  - Uniform traffic conditions & loading rates
  - One temperature, one climate (1950's AASHO road test)
  - Subjective user assessment of road condition (dashboard inspections)

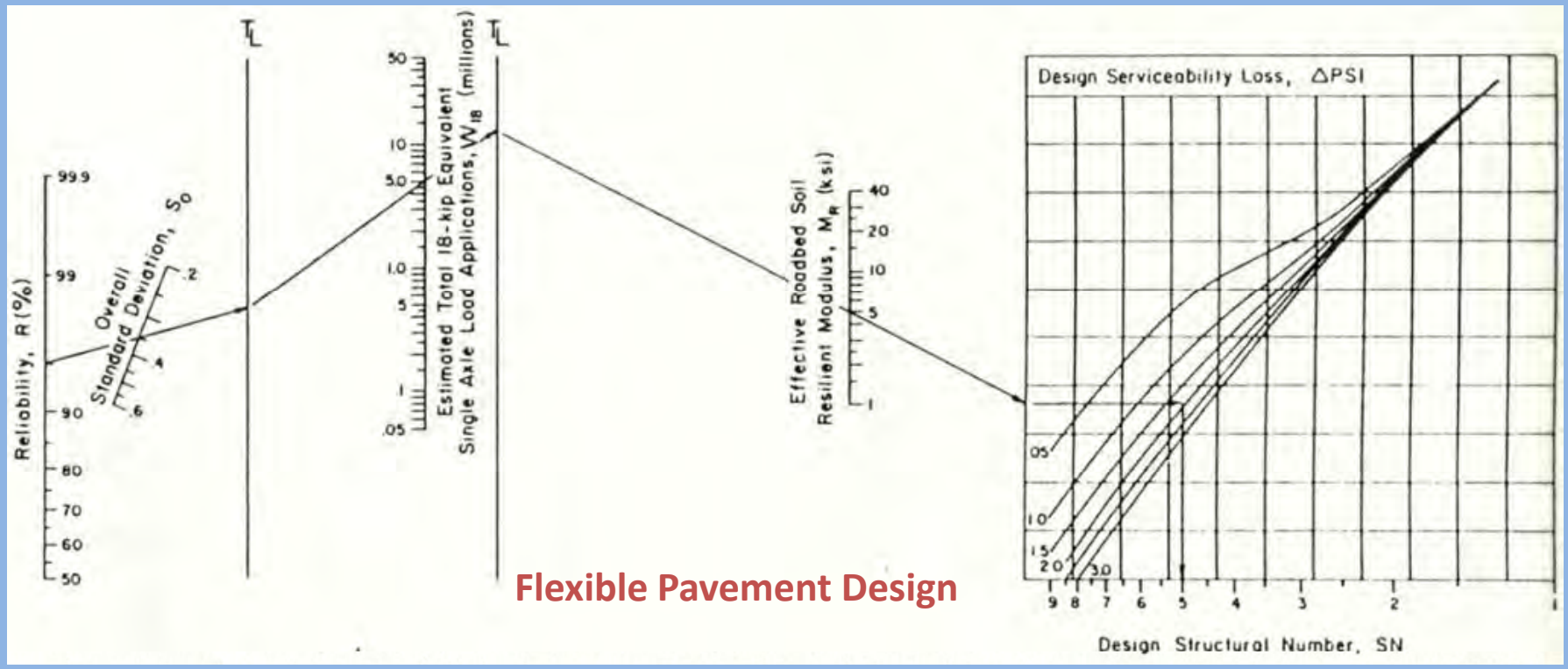
USER ASSESSMENT		
0-1	–	V. Poor
1-2	–	Poor
2-3	–	Fair
3-4	–	Good
4-5	–	V. Good

$\propto$

PERFORMANCE INDICATORS
Measure of Roughness
Measure of Rutting
Measure of Cracking

Remember the AASHTO Nomographs?

- Empirical (based on 1950's AASHO Road Test)
- Significant potential for subjectivity

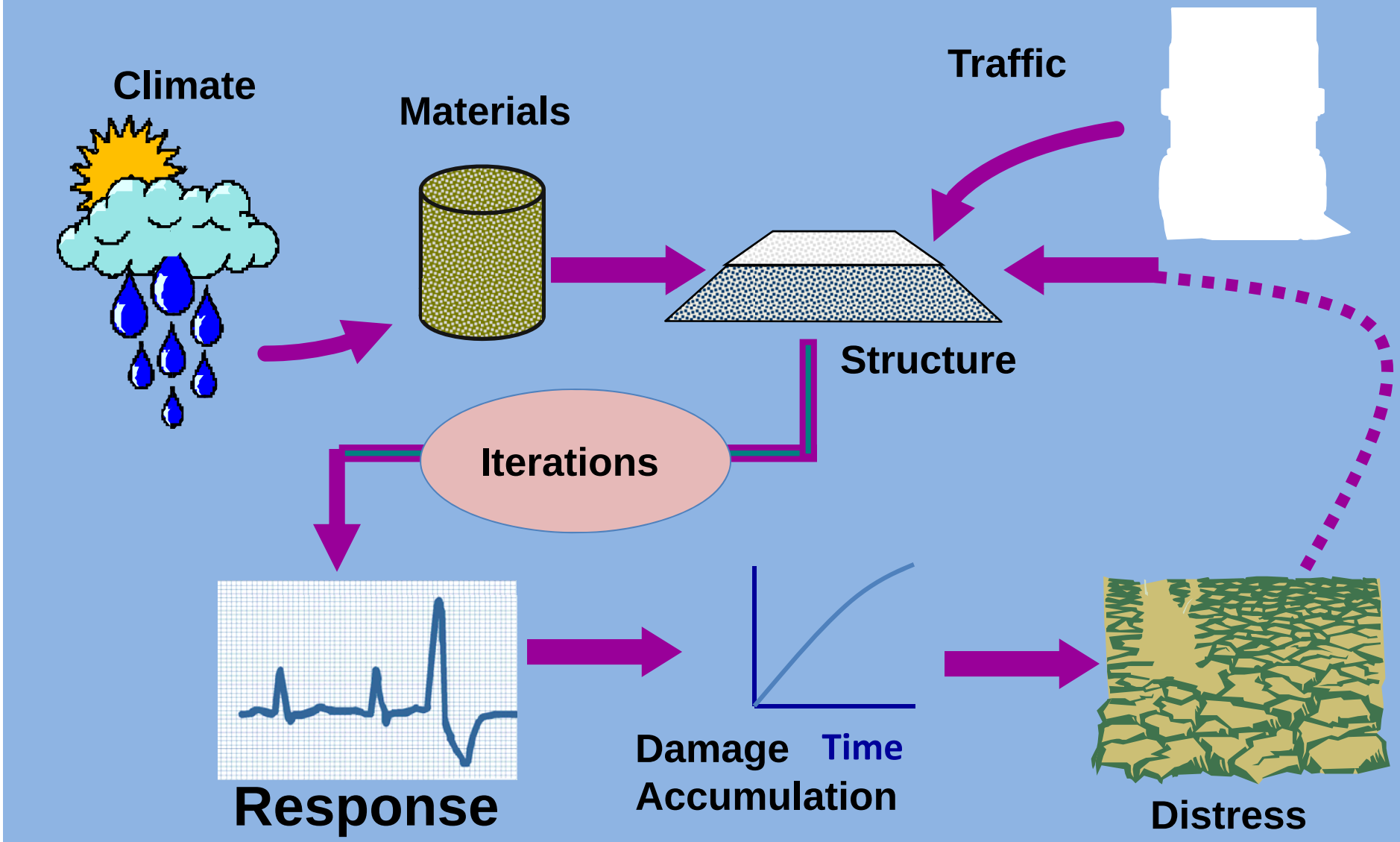


Pavement Design…Now

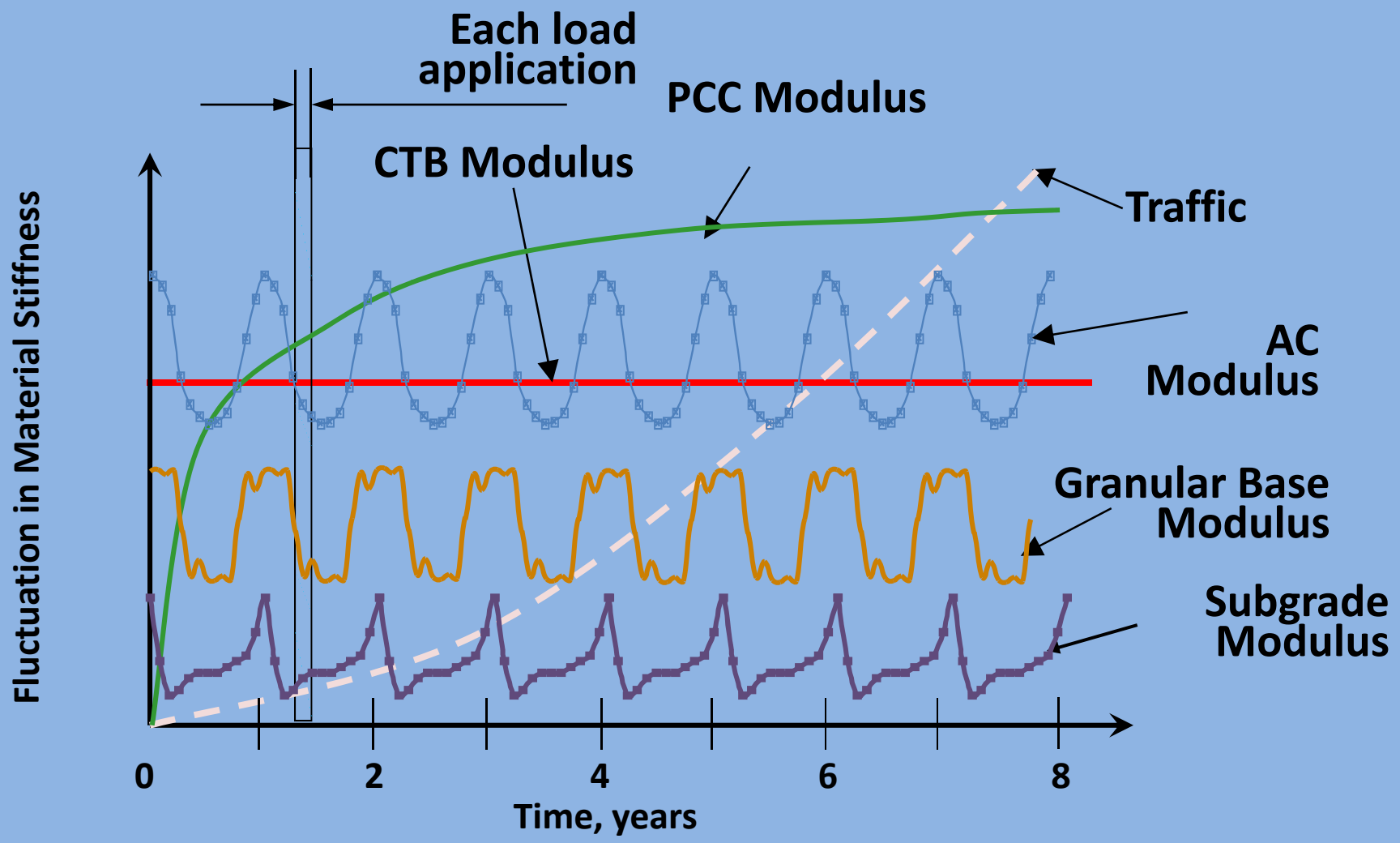
- **AASHTO Mechanistic-Empirical Pavement Design**
  - Research and FHWA deployment from 2002 – present
  - DARWin-ME software (sold by AASHTOWare)
- **Basics of Mechanistic-Empirical Pavement Design Guide (MEPDG)**
  - Materials properties change with time and environment
  - Calculates incremental damage for each load
  - Damaged dependent upon stress strain and material properties at time of loading

Note: Does not predict pavement layer thickness!!

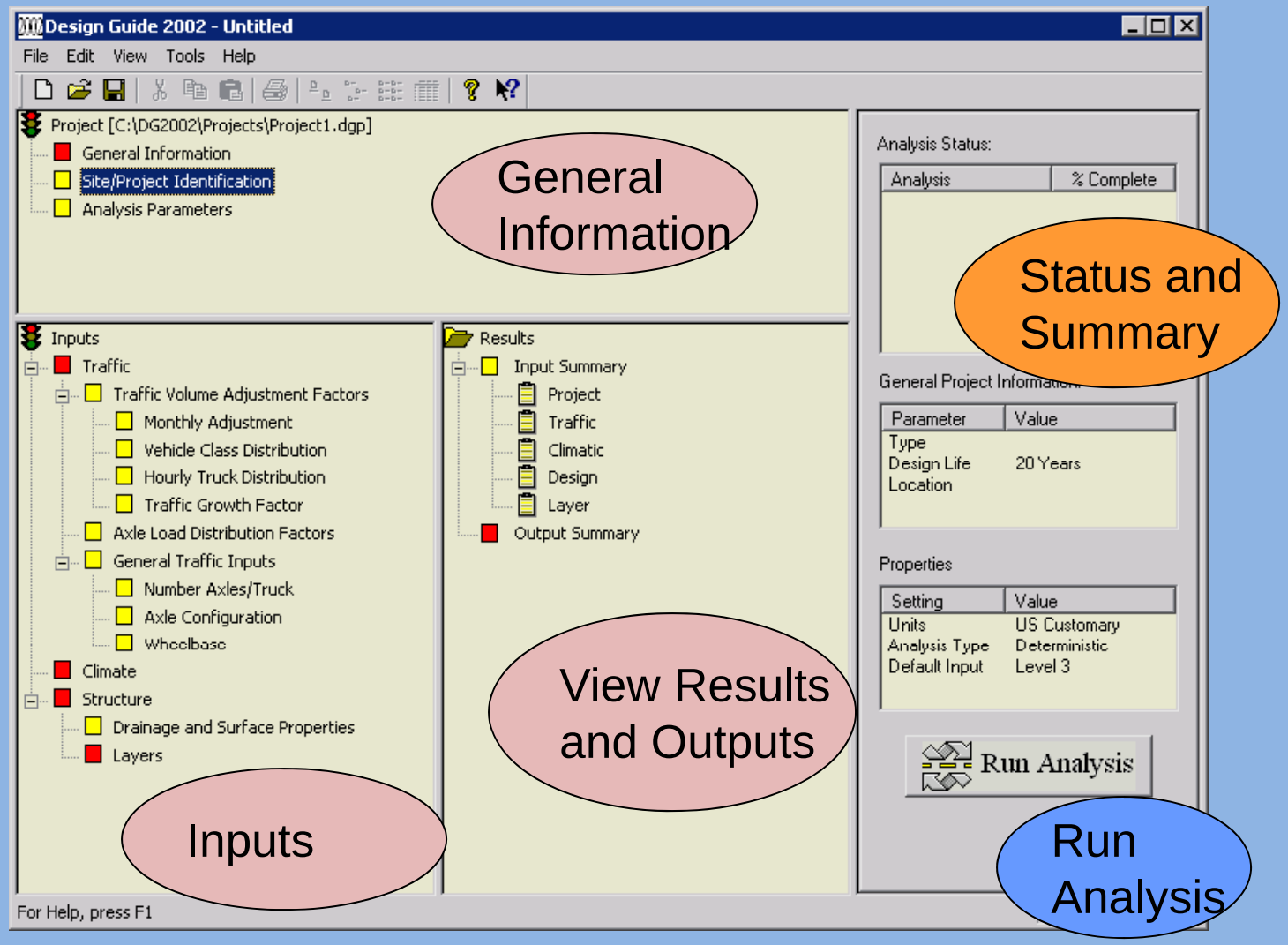
M-E Pavement Design Process



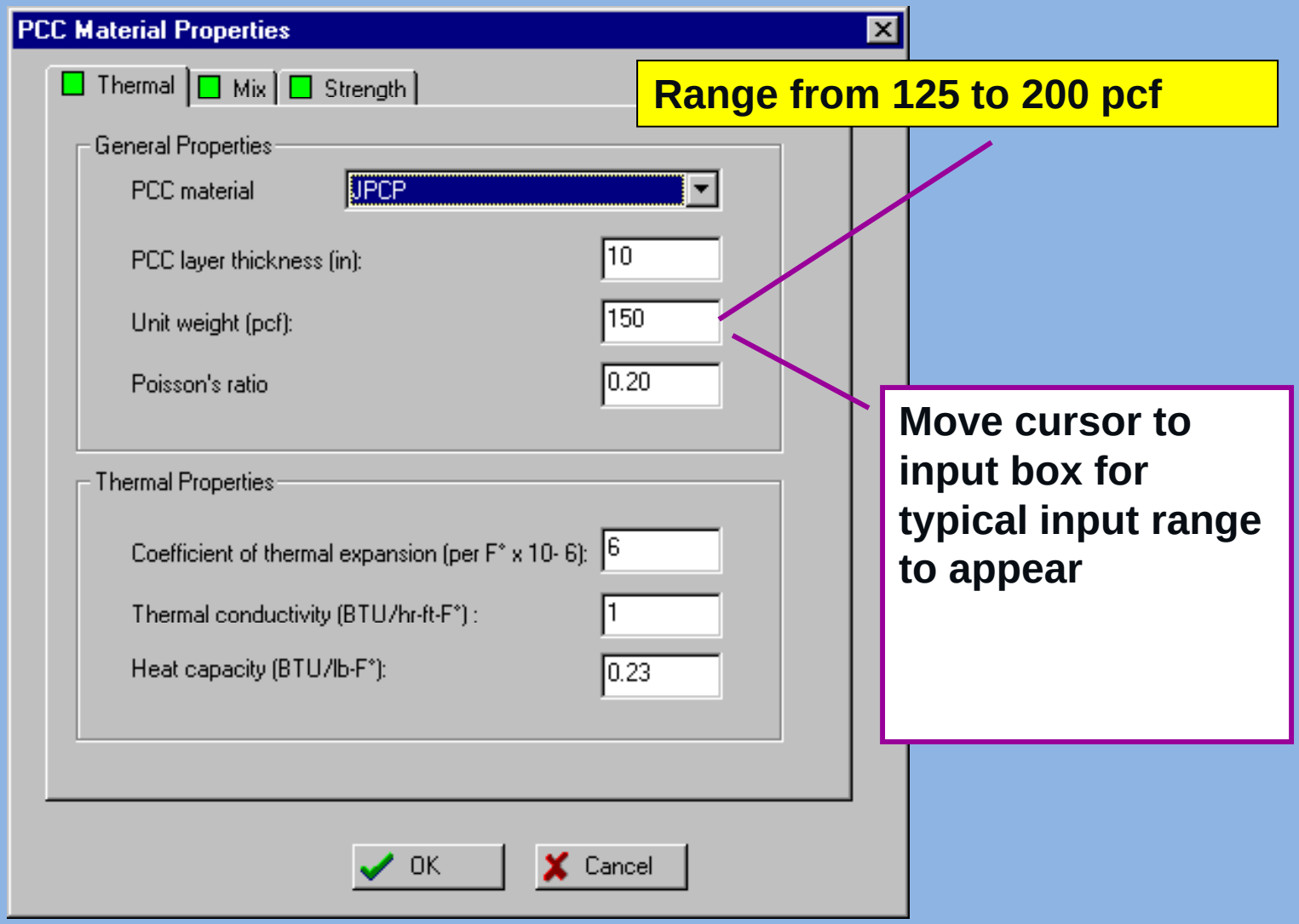
Pavement Design Variables



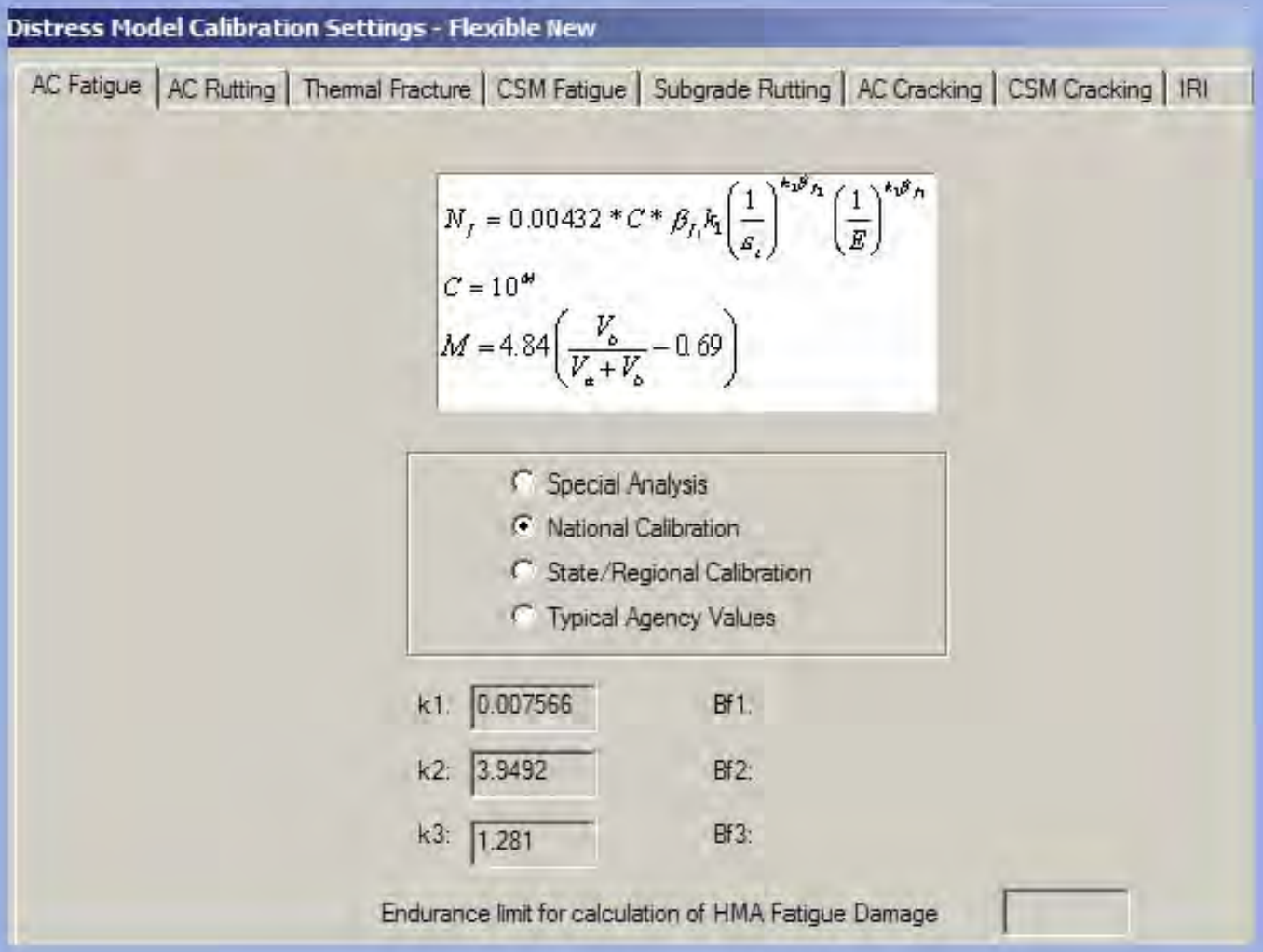
Convenient Input Layout



Typical Range Tool Tip



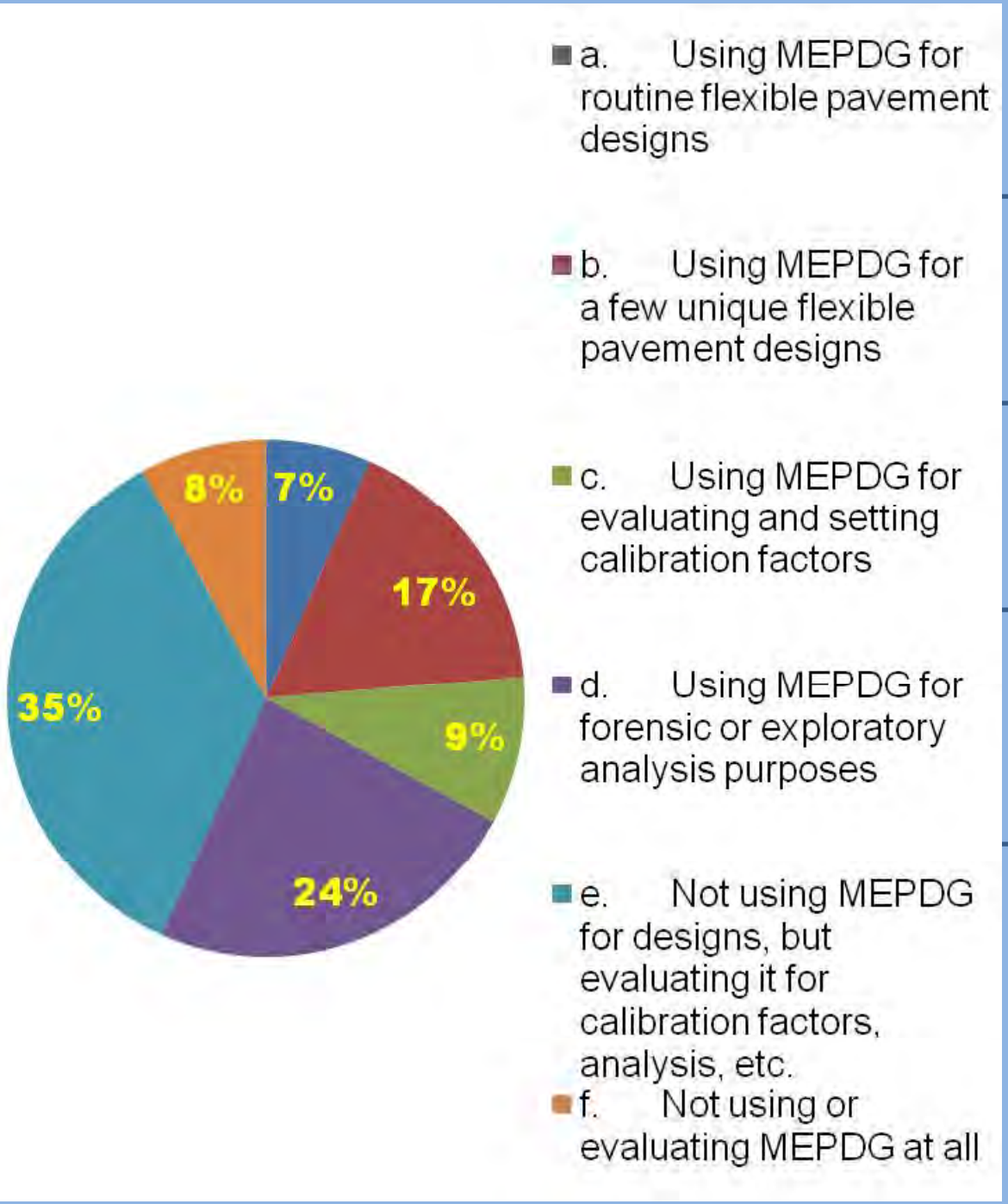
Software Output: Distress over Pavement Life



How can MEPDG help freight planning?

- Plan for more sustainable construction and maintenance of pavements in freight corridors
  - Avoid overdesign ("too thick") by predicting distress over life of pavement in advance
- More accurately predict effects of truck loads on infrastructure
  - Temporary work zone detours or for designated routes
  - Assist in value pricing or other financing schemes eg: tolling
- Evaluate long-term impacts of raising weight limit on highways

How MEPDG currently being used by State DOTs?



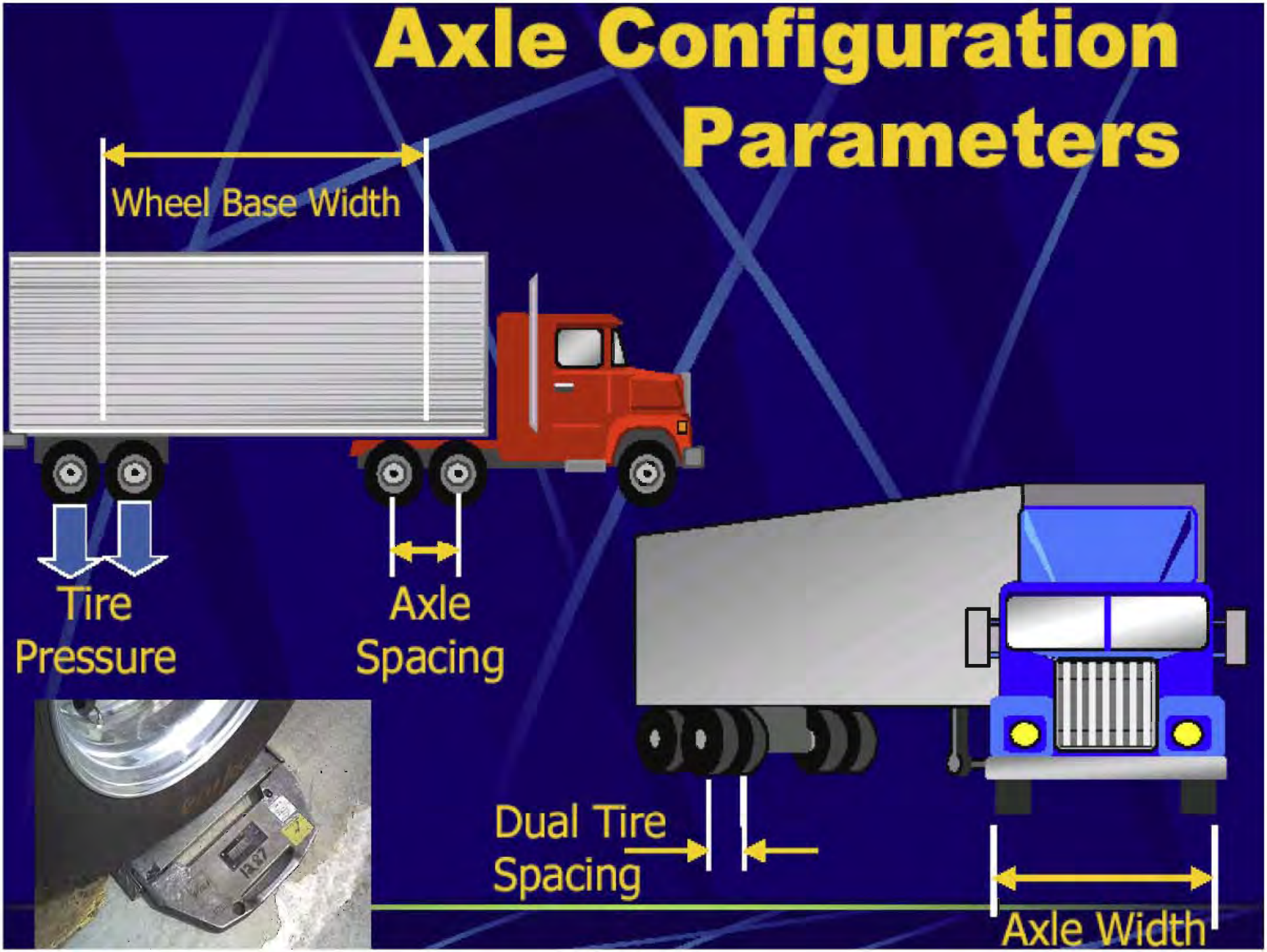
Traffic Hierarchical Input Levels

Level 3 – AADT & % trucks with TTC Group

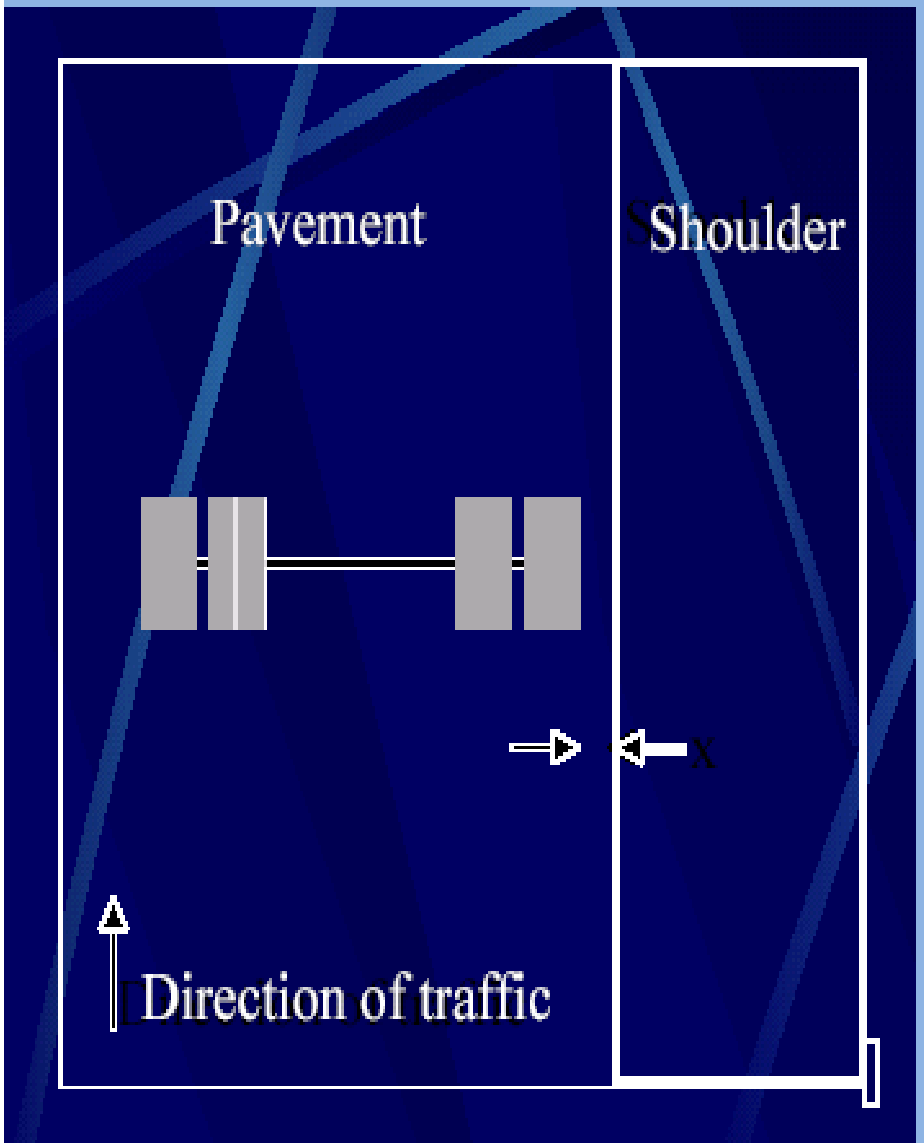
Level 2 – AADTT with Regional/Statewide AVC & WIM data

Level 1 – AADTT with site specific AVC & WIM data

Axle Configuration Parameters



Capturing Truck Traffic Wander



Used to calculate pavement responses
&
number of axle load applications
over a point for predicting
distress and performance

NCHRP Project 1-39

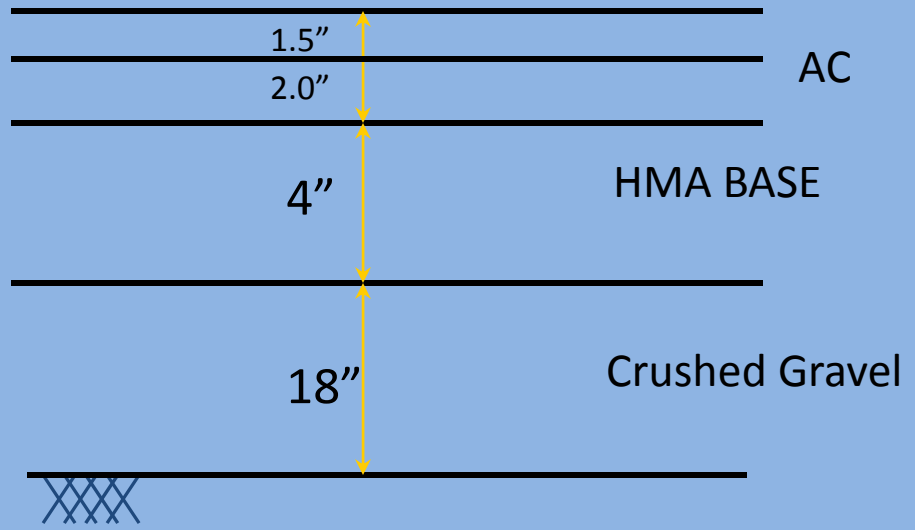
Traffic Data Collection

Traffic Analysis & Forecasting for MEPD

- Developed Software called *TrafLoad*
- Beta version under review
  - Reads C-card and W-card data
  - Manipulates data into MEDPG software format
  - Intended to supply traffic data directly into software, converting from WIM or other traffic equipment

Sample simulation for Port of Camden

- Assume a section of I-676 between Port of Camden to I-76 or points further south
  - 6-lane highway, flexible pavement, 20 year design life
  - Assumed a structural profile



Classify Amount of Traffic

- **328,500 trucks per year** travel through South Camden neighborhoods.

- Data needs:
  - Truck traffic directed to the Port of Camden
  - Quantity (%) of truck traffic using I-676
  - AADT counts for I-676

Modeling Truck Traffic

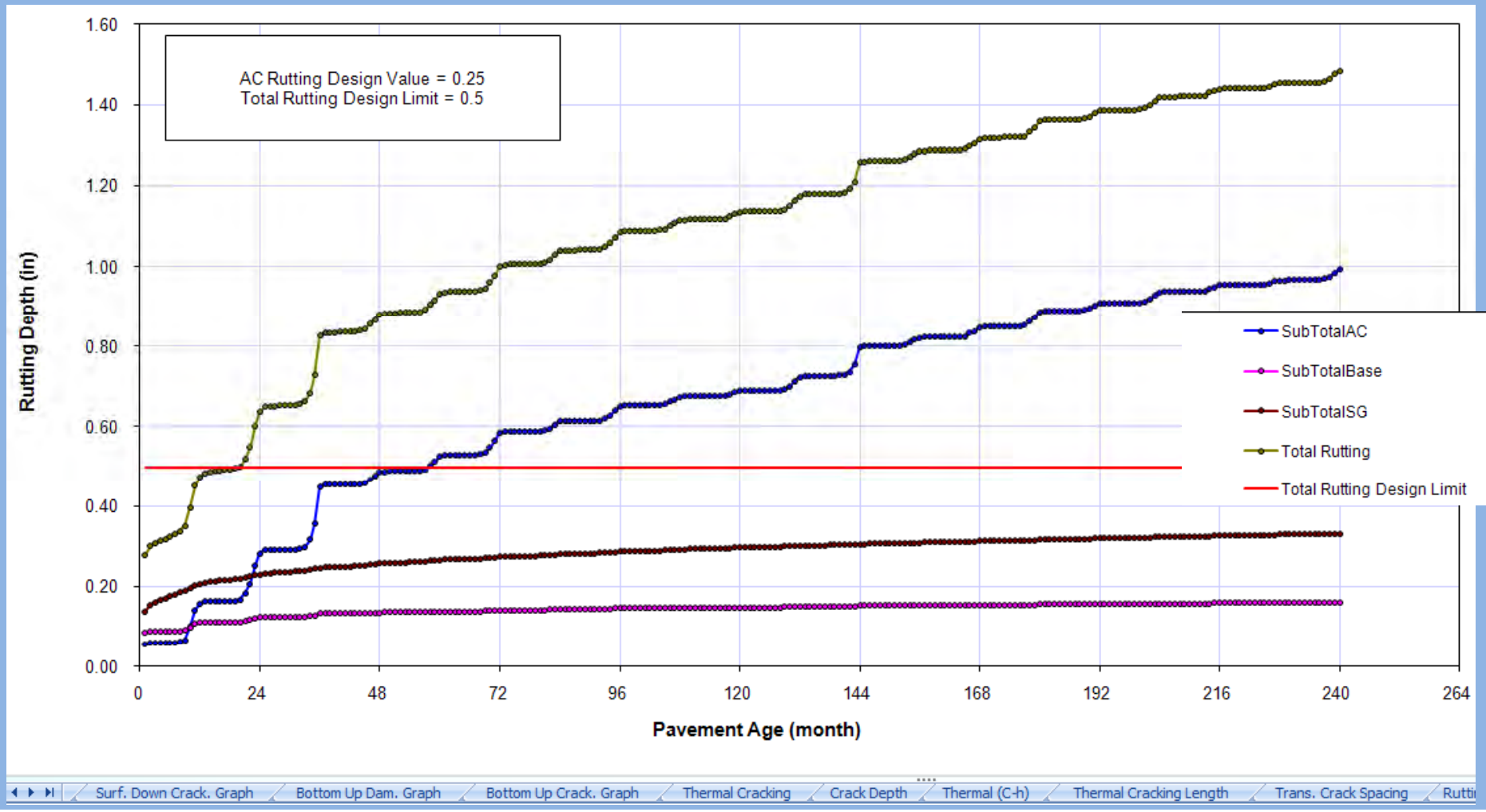
For Example:

Cargo types being carried to NY and NJ port terminals

- *Tankers (TA) (30%),* (usually CLASS 9 trucks carry material for this type of cargo)
- *Cargo containers (CC) (15%)*, (usually CLASS 10 trucks)
- *Bulk vessels (BU) (14%),* (usually CLASS 10 trucks)
- *Refrigerated vessels (RF) (11%)*, (usually CLASS 10 trucks)
- *Vehicle vessels (VE) (10%),* (do not consider – regular cars)
- *General cargo vessels (GC) (8%)* (usually CLASS 4 thru CLASS 8 trucks)

Results of Sample Analysis

- Rutting will be a problem
- Thermal & alligator cracking not predicted



Summary

- New tool exists that hasn't reached freight industry nor MPOs/RPOs for the most part

- More information can be found at:

AASHTO's website http://www.aashtoware.org/Pages/DARWin-ME.aspx

FHWA's website http://www.fhwa.dot.gov/pavement/dgit/

FOCUS FORWARD

Campbell Supply Chain Overview

Adolfo Jimenez – Sr. Manager Finance

Campbell North America

April 18, 2012

Agenda

- About Campbell
- International Presence
- North America Manufacturing
- North America Network Overview
- Transportation Overview
- Service Overview
- Challenges and Trends
- Questions

About Campbell

- **History**
  - Started in 1869 by Joseph A. Campbell, a fruit merchant, and Abraham Anderson, an icebox manufacturer in Camden, NJ
  - Each year, the Campbell Foundation (founded in 1953) donates approximately $1 million to a variety of organizations that are positively impacting the lives of Camden residents, especially through hunger relief, childhood obesity and youth-related programming.
- **Operational Footprint**
  - 26+ worldwide brands
  - 20+ market-leading brands
  - Operating in 120+ countries
  - 18,000+ employees worldwide

About Campbell - Businesses

Campbell North America

- U.S. Retail
- North America Foodservice
- Canada

Pepperidge Farm

Campbell International

- –Asia Pacific
- –Europe
- –Mexico and Latin America
- –China

About Campbell - Winning in the Community

American Heart Association®

Alliance for a Healthier Generation

Stamp Out Hunger FOOD DRIVE

Go Red for women℠

shaping america's youth

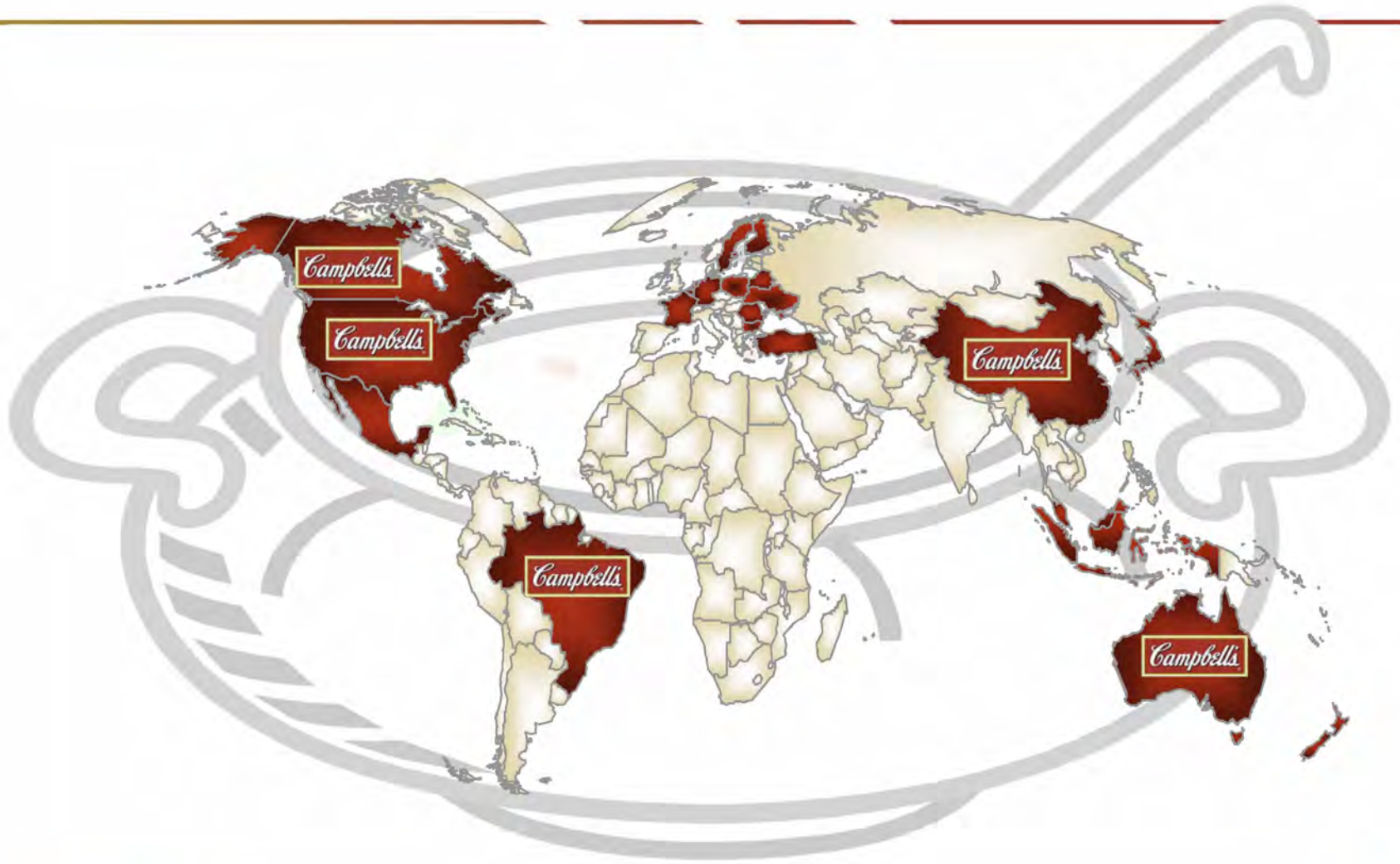
Campbell Soup Foundation DOLLARS FOR DOERS

Campbell's Labels for Education™

Campbell's

FOCUS FORWARD

Campbell International Presence



Campbell's

FOCUS FORWARD

Campbell International Presence

- **Greater Europe**
  - Headquartered in Puurs, Belgium. It includes businesses in Belgium, France, Germany, Sweden, and Finland. Our products are available in more than 20 countries across Europe, the Middle East, and Africa
- **Australia and New Zealand**
  - Our Arnott's brand is Australia's No. 1 biscuit brand, with 60 percent market share.
  - Our biscuits are enjoyed in more than 95 percent of Australian households, and the Arnott's brand is an Australian icon.
  - We also have a strong soup business, leading Australia's total soup category with more than 30 percent of the market, and the total wet soup category by more than 50 percent.
- **Greater China**
  - We have offices in Shanghai, Hong Kong, and Taipei, and sell products throughout Greater China. Campbell's branded soups are the market leader in Hong Kong, as is the Swanson range of broths.
  - In 2007, we launched Swanson broths in China. Our broths are used as the base for popular dishes, such as soup and noodles and rice dishes.

Campbell International Presence *(cont.)*

- **Campbell's de Mexico**
  - It was established in 1959, Campbell's de Mexico is headquartered in Mexico City and operates a manufacturing plant in Villagran.
  - Campbell's Mexican portfolio includes Soups, V8, V8 Splash, and V8 Smoothies beverages, and Prego Italian sauces.
- **Campbell's Caribbean, Central and South America**
  - Serves 45 diverse countries with a range of cultures and eating habits.
  - Our soup and beverages products are sold in Puerto Rico, the Dominican Republic, and Venezuela. The V8 Juice Blends are produced in Guatemala.

Campbell North America

- **US Businesses**
  - Soup: In total in the U.S., Campbell sells almost 2 billion cans of soup every year, accounting for more than 60 percent of the U.S. wet soup market. Each year, nearly 100 million U.S. households, or more than 80 percent of all U.S. households, purchase our soups. On average, American consumers stock six cans of our soups in their pantries at all times.
  - Sauces: Campbell offers two sauce brands: Prego pasta sauces and Pace Mexican sauces, along with Campbell's SpaghettiOs pastas, Campbell's gravies, and Swanson chicken.
  - Beverages: V8 is the quintessential wellness brand, and includes products such as V8 100% vegetable juice, which has healthy sodium levels and a full serving of vegetables in every eight-ounce glass. V8 was introduced more than 75 years ago and remains on-trend for today's health conscious consumers.
- **Canada**
  - Established in 1930 in Toronto, Campbell Company of Canada was our first foreign subsidiary. Today, our Canadian business is a major Canadian food manufacturer and represents one of our largest soup businesses outside the United States.
  - We market a full array of Campbell's products in Canada, including soups, sauces, Pepperidge Farm products, and V8 beverages

N. A. Manufacturing Operations Overview

- 14 Manufacturing Facilities, 18 Co-Manufacturing Facilities
- Employees ~ 5,900
- Cases Manufactured ~ in excess of 250 million
- Products: Soups, Prego, Pace, V8, Frozen
- Package Formats: Cans (Steel, Aluminum), Glass, Plastic, Pouch, Aseptic, Totes, Drums, Trays

US Business primarily sourced by four thermal plants

Napoleon, OH

Maxton, NC

Paris, TX

Sacramento, CA

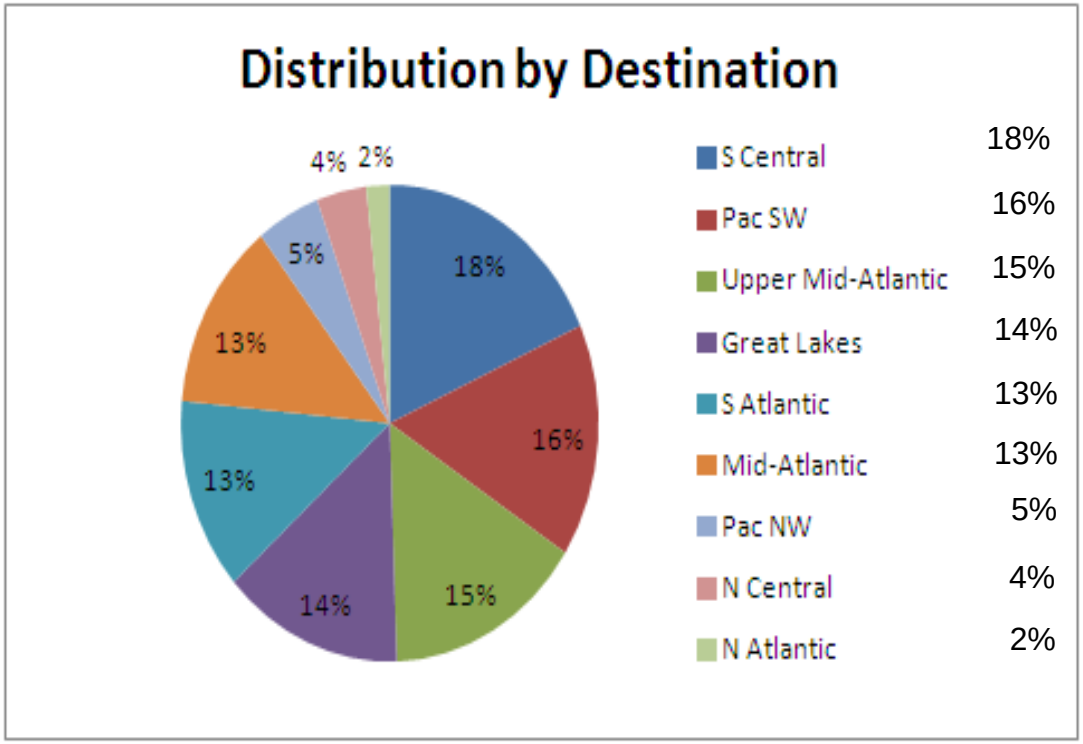
Campbell's Agriculture Operations

- 95% of North American processed tomatoes are grown in California.
- Campbell has a significant presence in California
    1. Vertically integrated agriculture and manufacturing
    2. Campbell Agriculture Research that develops varieties to maximize quality for crops such as tomatoes & peppers
    3. Long standing relationships with growers that started in 1947
    4. Our company ingredient facilities process 75 – 90% of Campbell North America's needs
- These Agriculture Operations also procure the remainder of our tomato ingredients, adhering to strict Campbell quality standards

Campbell's Commitment to Sustainability

- **To give our consumers the greatest soups, we must be responsible stewards of farms and farmland. We've been growing and cultivating vegetables for our soups for over 100 years. In the last 20 years, we've taken an active role in developing sustainable agriculture practices**
- **Just in the Last 20 Years, We've Helped to Develop:**
  - Better water management practices, including drip irrigation & holding ponds to reduce runoff & conserve water
  - Conservation tillage to reduce fuel usage & greenhouse gas emissions
  - Disease-resistant varieties to reduce pesticide usage
  - Environmentally friendly, integrated pest-management programs
  - Cover crop & crop rotation programs to improve soil health, prevent erosion & conserve water

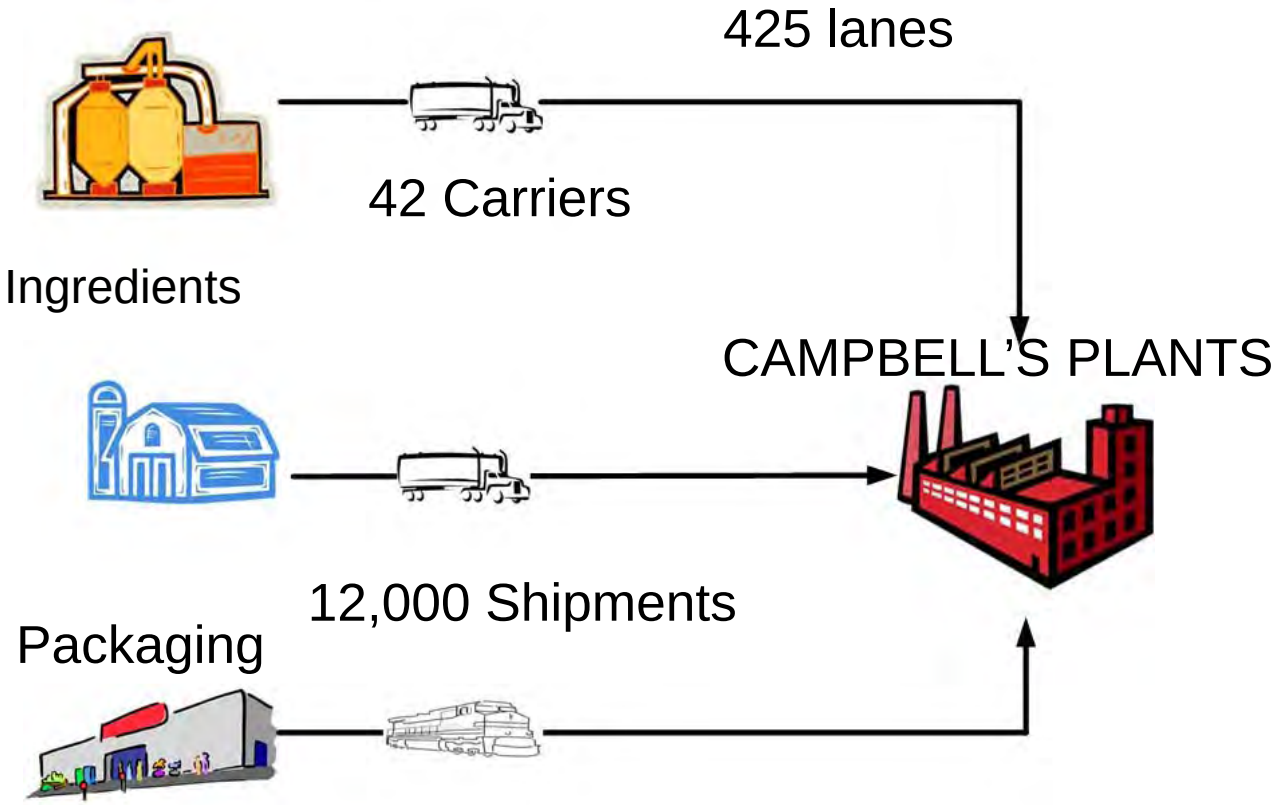
Delivery Distribution is relatively balanced



Upper Mid-Atlantic	CT	DE	NJ	NY	PA				
Pac SW	AZ	CA	HI	NV	UT				
N Central	IA	MN	ND	SD	WV	NE			
N Atlantic	MA	ME	NH	RI	VT				
Mid-Atlantic	KY	WY	MD	NC	TN	VA			
S Central	AR	CO	KS	LA	MO	MS	NM	OK	TX
Great Lakes	IL	IN	MI	OH	WI				
S Atlantic	AL	FL	GA	SC					
Pac NW	ID	MT	OR	WA					

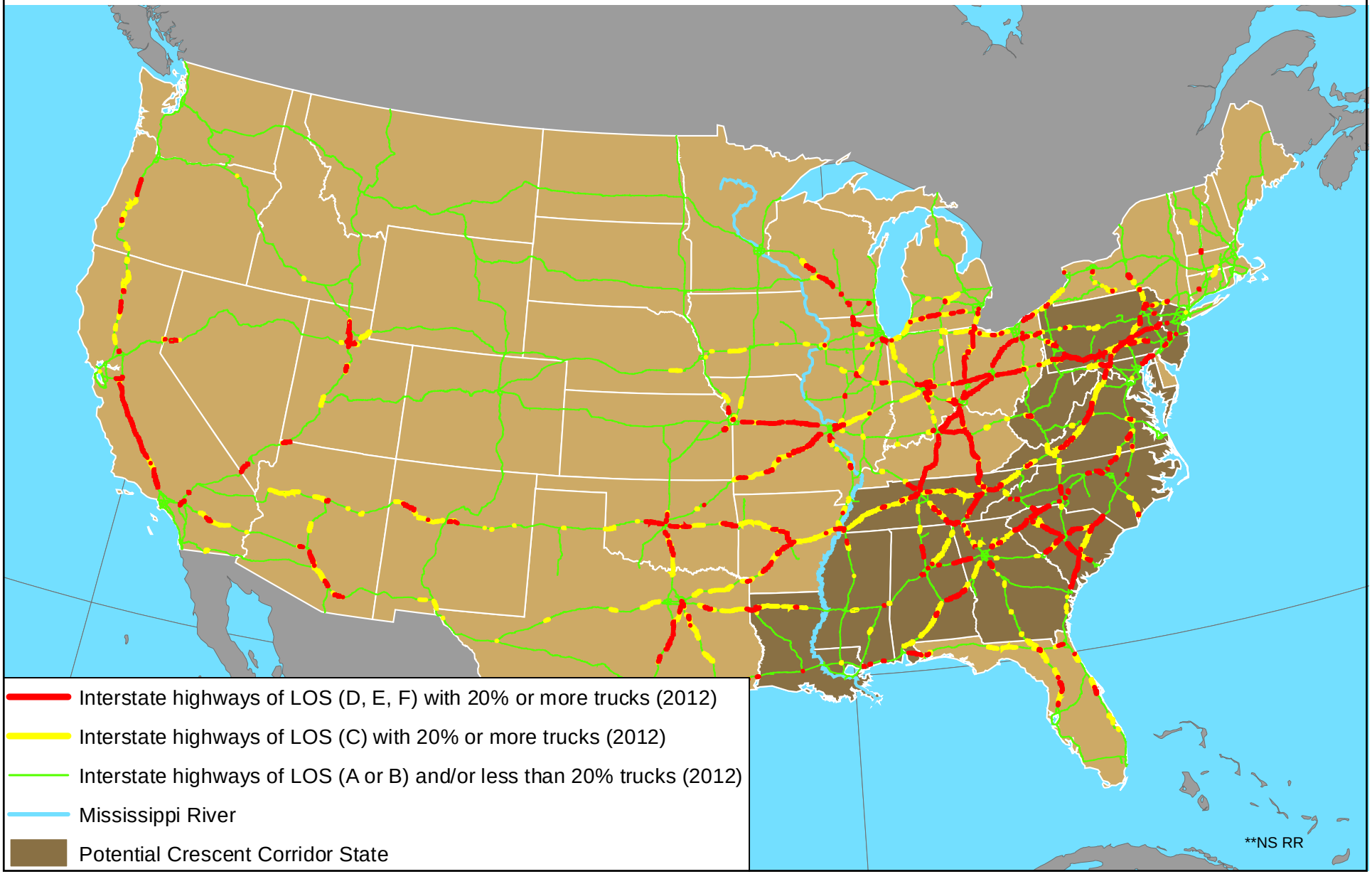
Freight by Mode		
	Campbell's Delivered	Inter-Plant
TL	92.70%	50.20%
IM	3.60%	37.90%
Heavy Payload		11.90%
LTL	3.70%	

Inbound Freight is a relatively recent area of focus for the company



- **78 Vendors**
- **8.5 million miles**

F12 Severe OTR highway congestion will have negative impact on capacity and service



Future State: Key Customer Trends

- **Focused on less inventory – more demand driven**
  - Shorter lead times, real time shipment visibility
- **Expanding into smaller footprint stores**
  - Load consolidation, backhaul, continuous moves
- **Increasing asset utilization**
  - Smaller unloading window
- **Seeking narrower, more strategic vendors partnerships**
  - `Vendors Optimization

Future state: Safety / Sustainability

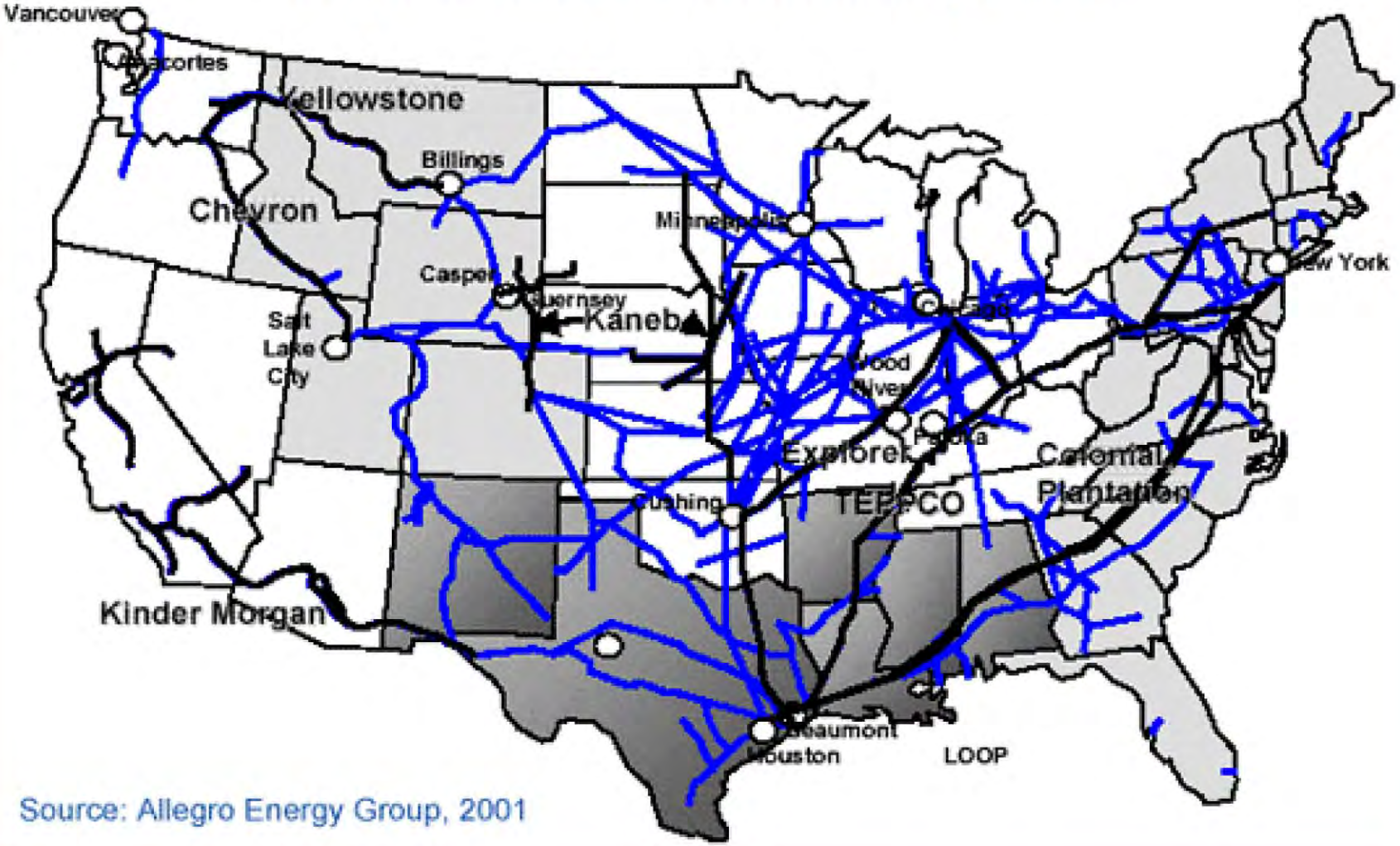
- **Food Safety – more ….**
  - Product / load traceability
- **Operational safety**
  - CSA scores
  - EOBR
- **Sustainability**
  - Maintain Smartway certification
  - Collaborate with partners to reduce empty miles
  - Increase intermodal usage
  - Reduce indirect environmental impact (e.g. Tar Sands)

Colonial Pipeline Company

Moving the Energy that Moves America

Sam Whitehead
Public Affairs Manager
April 2012

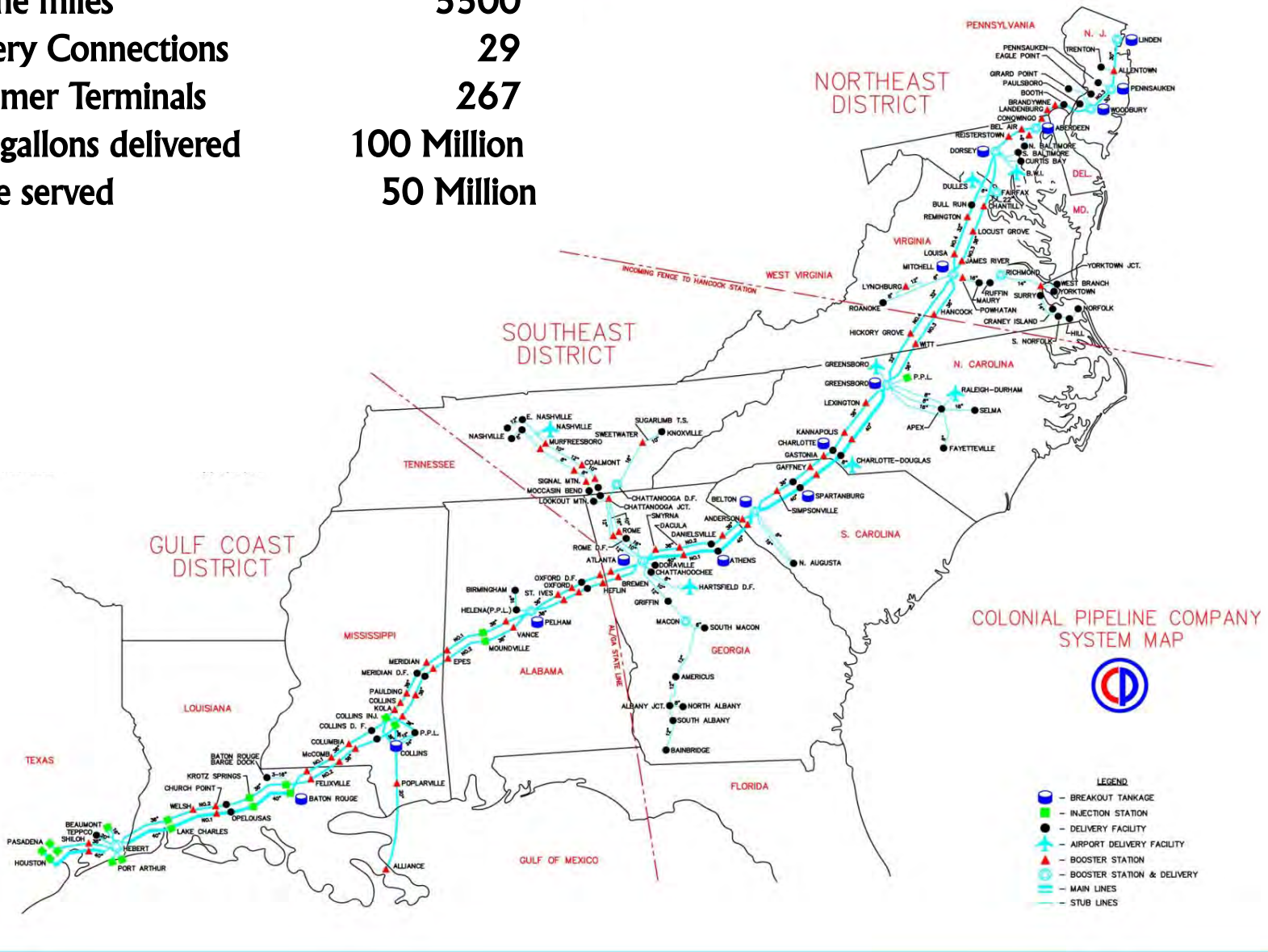
Major Refined Products Pipelines



Source: Allegro Energy Group, 2001

The Colonial System

Pipeline miles	5500
Refinery Connections	29
Customer Terminals	267
Daily gallons delivered	100 Million
People served	50 Million



Colonial Pipeline Overview

- Largest refined-products pipeline in the U.S.
  - Founded 1962; operational since 1963
  - Delivers 16% of overall U.S. refined-product demand
  - Transports gasoline, diesel fuel, jet fuel, home heating oil, U.S. military fuels and similar products
  - Connects Gulf Coast refineries to Southeast, Mid-Atlantic and Northeast regions of U.S.
  - Direct connects to seven major airports; transfer service to three in NYC via Buckeye Pipeline
  - Deliver to five U.S. military installations, from where, up to 10 additional bases (North Carolina to Maine) are served
  - *Making safety our No. 1 priority helps Colonial achieve reliable operations that are efficient, responsible and ultimately add stability and low-delivery costs to a sometimes volatile marketplace*

Our Owners

	Ownership
Koch Industries	28.09%
Keats Pipeline Inv.	23.44%
Caisse	16.55%
Shell Oil Pipeline	16.12%
Industry Funds Mgt	15.80%
	100.00%

KOCH INDUSTRIES INC

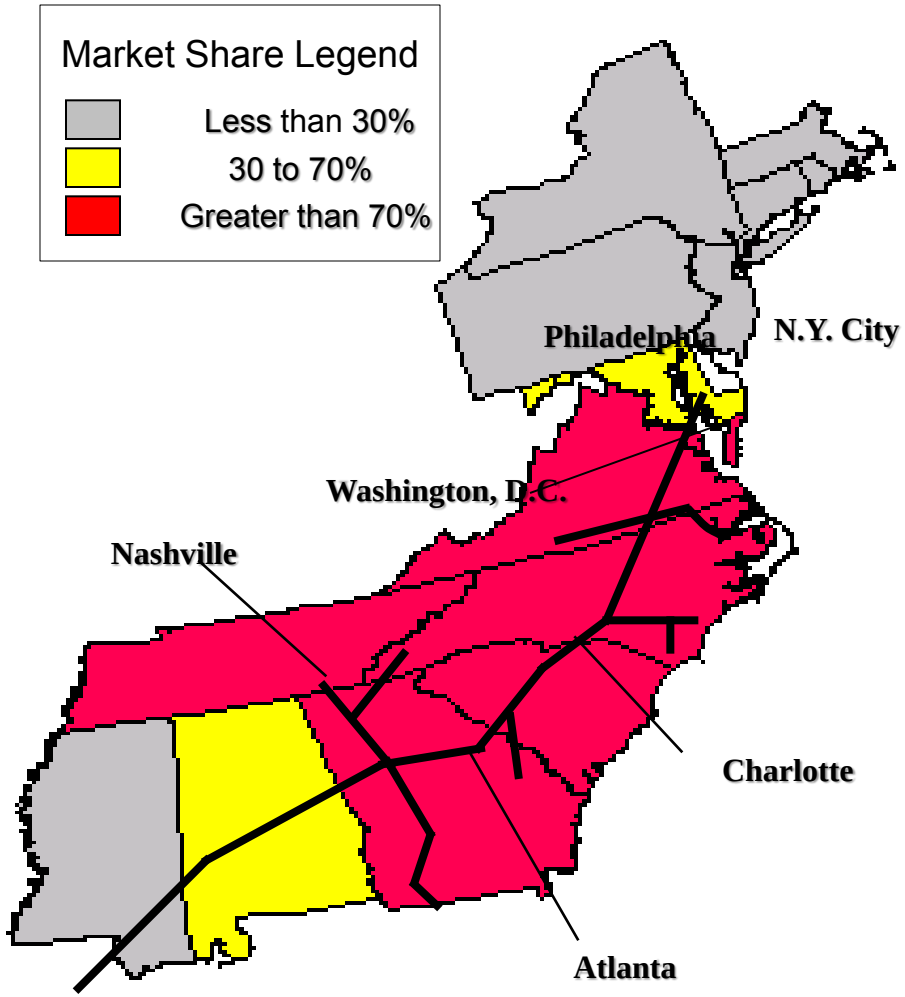
KKR

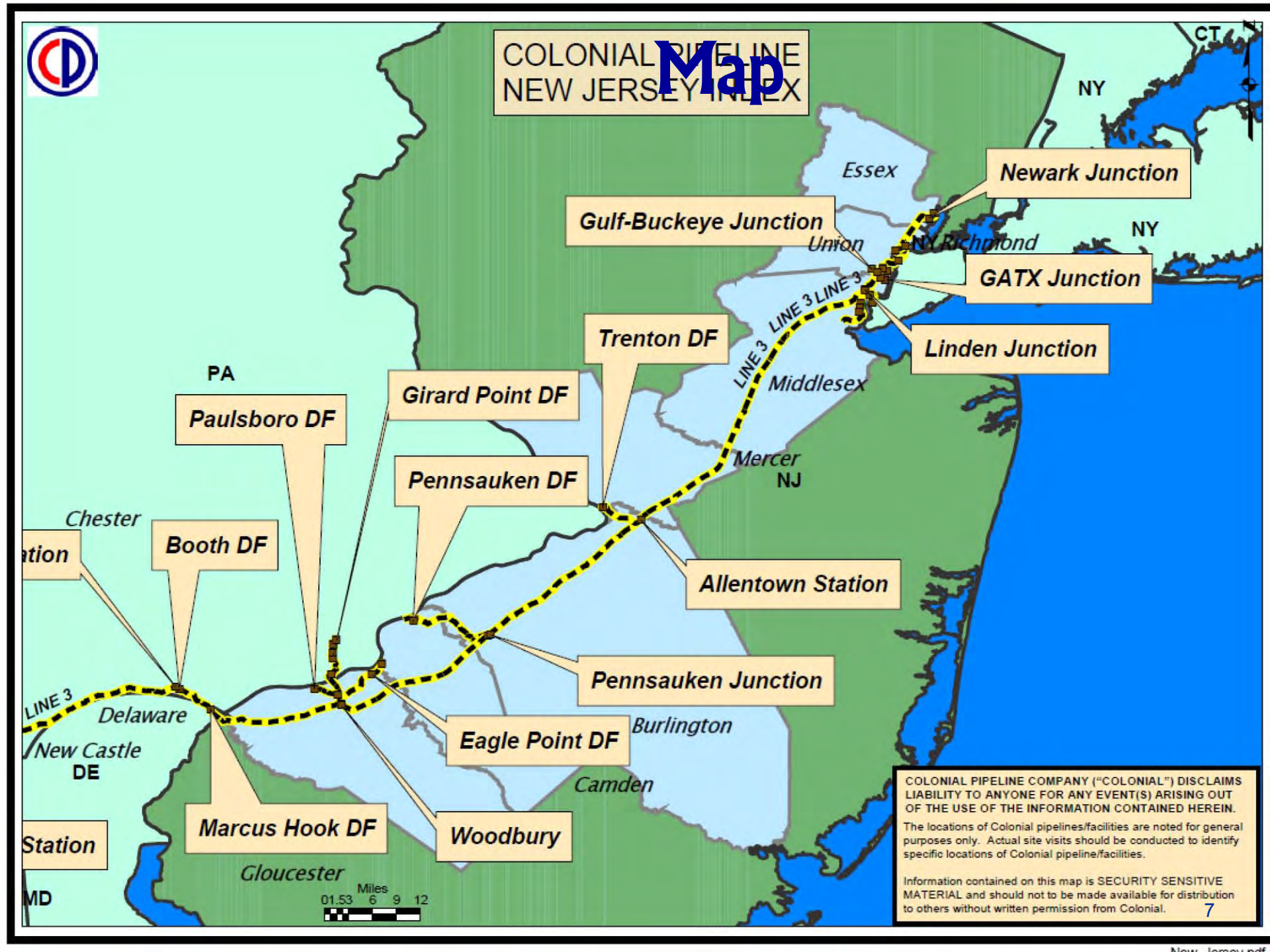
Caisse de dépôt et placement du Québec

Industry Funds Management

States Depend on Colonial for Liquid Fuel Supply

- **Colonial delivers over 70% of the liquid fuel supply to GA, SC, NC, TN, and VA**
- **Northeast has alternate sources from northeast refineries and access to barge transport**
- **South-Atlantic states have limited alternate supply:**
  - **From coastal port terminals**
  - **No east to west supply routes**
  - **No direct supply route from northern refineries to the south**
  - **Limited service by Plantation Pipe Line**




COLONIAL PIPELINE
NEW JERSEY INDEX
Map
CT
NY
NY
NY
Essex
Union
Richmond
Middlesex
Mercer
NJ
PA
Chester
Delaware
New Castle
DE
Burlington
Camden
Gloucester
MD
Newark Junction
Gulf-Buckeye Junction
GATX Junction
Linden Junction
Trenton DF
Girard Point DF
Paulsboro DF
Pennsauken DF
Booth DF
Allentown Station
Pennsauken Junction
Eagle Point DF
Marcus Hook DF
Woodbury
LINE 3
LINE 3
LINE 3
Miles
0 1.5 3 6 9 12
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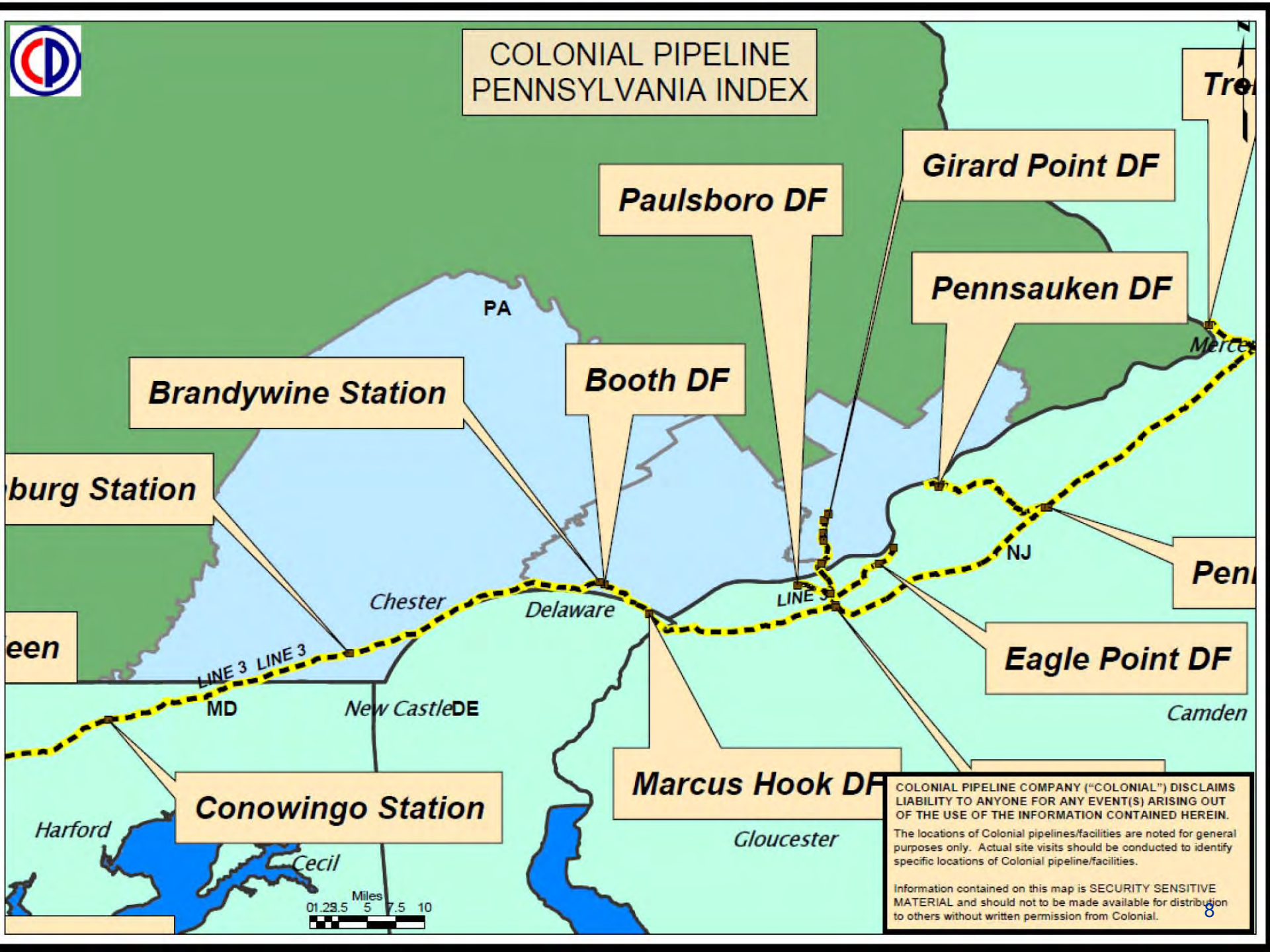
COLONIAL PIPELINE
PENNSYLVANIA INDEX
Girard Point DF
Paulsboro DF
Pennsauken DF
Booth DF
Brandywine Station
Eagle Point DF
Marcus Hook DF
Conowingo Station
PA
NJ
MD
DE
Chester
Delaware
New Castle
Camden
Gloucester
Harford
Cecil
LINE 3
LINE 3
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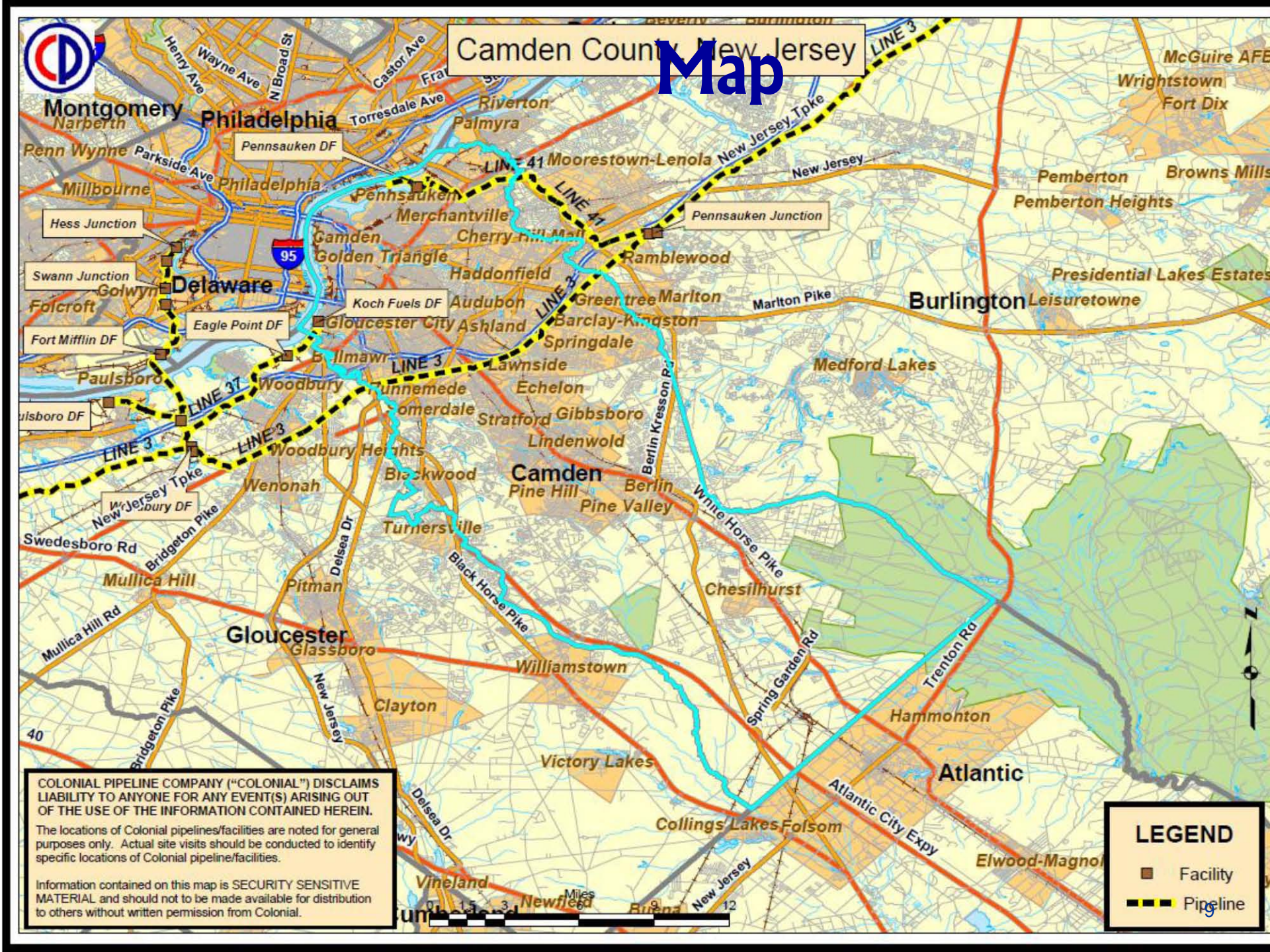
Camden County, New Jersey
Map
Montgomery
Philadelphia
Narberth
Penn Wynne
Millbourne
Parkside Ave
Philadelphia
Henry Ave
Wayne Ave
N Broad St
Castor Ave
Torresdale Ave
Riverton
Palmyra
Pennsauken DF
Hess Junction
Swann Junction
Folcroft
Delaware
Eagle Point DF
Fort Mifflin DF
Koch Fuels DF
Gloucester City
Pennsauken
Merchantville
Camden
Golden Triangle
Cherry Hill Mall
Haddonfield
Audubon
Ashland
Barclay-Kingston
Springdale
Lawnside
Echelon
Stratford
Gibbsboro
Lindenwold
Woodbury Heights
Blackwood
Pine Hill
Pine Valley
Berlin
Berlin Kresson Rd
White Horse Pike
Chesilhurst
Turnersville
Black Horse Pike
Delsea Dr
Bridgeton Pike
Swedesboro Rd
Mullica Hill
Mullica Hill Rd
Pitman
Gloucester
Glassboro
Williamstown
Clayton
New Jersey
Victory Lakes
Vineland
Newfield
Buena
Collings Lakes
Folsom
Atlantic
Hammonton
Spring Garden Rd
Trenton Rd
Atlantic City Expy
Elwood-Magnol
Pennsauken Junction
New Jersey Tpke
New Jersey
LINE 3
LINE 41
LINE 37
Ramblewood
Marlton
Marlton Pike
Burlington
Leisuretowne
Medford Lakes
Presidential Lakes Estates
Pemberton
Pemberton Heights
Browns Mills
McGuire AFB
Wrightstown
Fort Dix
Woodbury
Paulsboro
Wenonah
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Miles
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LEGEND
Facility
Pipeline

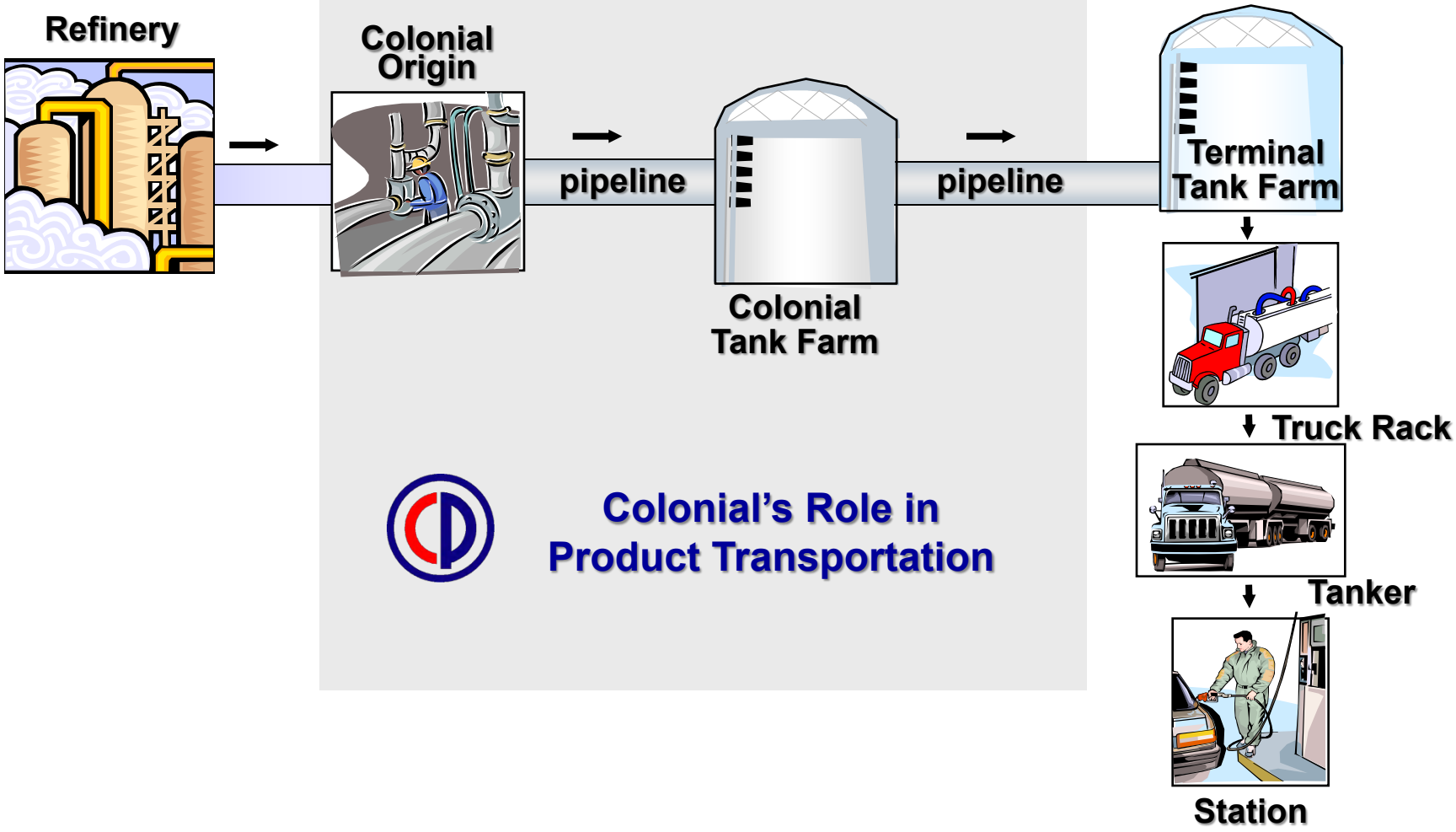
Area Statistics

- 176 miles of pipe in NJ
- 38 miles of pipe in PA

- 2011 Deliveries into Delaware Valley Region locations:
  - Gasoline 10 million barrels
  - Distillates 17 million barrels

    - Distillates include diesel fuel, jet fuel, heating oil, etc.
    - One barrel = 42 gallons

Product Transportation System



Basic Pipeline Operation

- **Product Injected at Origin**
- **Moved by Pumps**
- Transferred through Tank Farms
- Delivered to Terminals
- Direct Connections to:
  - Commercial Airports
  - Defense Installations
  - Truck Racks

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  - **Commercial Airports**
  - **Defense Installations**
  - **Truck Racks**

Product Sequencing

Reformulated Regular Gasoline | Low Sulfur Diesel Fuel | Kerosene/ Jet Fuel | High Sulfur Diesel | Conventional Regular Gasoline | Premium Gasoline | Reformulated Premium Gasoline

- Petroleum products are loaded in the pipe as batches, with no separators
- Principles of hydraulics keep the batches from blending with each other, except at the interfaces
- Interfaces are separated out at their destination and reprocessed

Increasing the number of distinct product types complicates the product distribution systems.

Colonial Supports National Renewable Fuels Initiative

- Due to operational and compatibility concerns (steel, seals and pumps), Colonial does not transport ethanol or ethanol blends (ethanol is added to gasoline after it leaves Colonial's system)
- Early in 2011, we demonstrated our commitment to provide biofuels solutions by incorporating renewable diesel into our fungible distillate stream. (Leading the pipeline industry in this regard).
- We currently allow renewable diesel in our pipeline – neat or blended (Jan 1, 2011) – as it meets ASTM D975 (Diesel Fuel) specifications
- Renewable diesel (at 5% blends) has been available on Colonial since mid-year 2011, sustaining product throughput that may otherwise be blended at terminal/truck stop in the form of biodiesel
- As a fungible system, it's likely that all markets served by Colonial have received renewable diesel blends since mid-2011.

Capacity Expansions 2011-2012

- Expansions are based on customer needs, market forces, ongoing analysis of trends and conditions

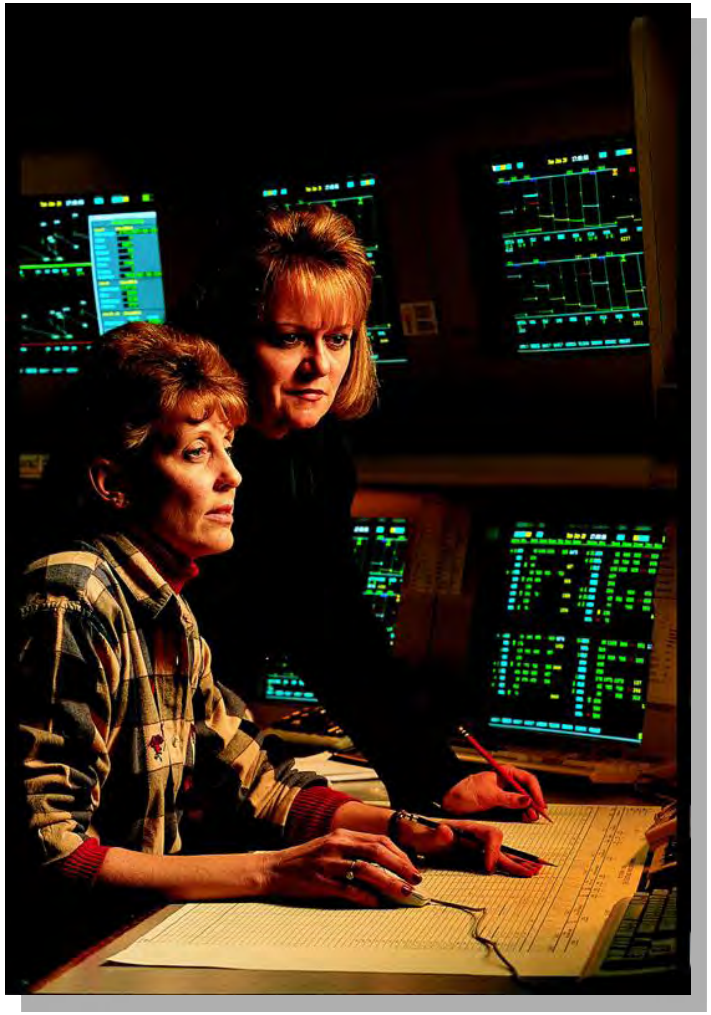
- 2011 Projects Completed
  - 218,000 barrel tank in Linden, N.J.
  - 100,000 barrel-per-day Northeast expansion (Greensboro-Linden)
  - 25,000 stub-line expansion (serving eastern Virginia)

- 2012 Projects Under Way
  - 75,000 BPD distillate mainline (20,000 BPD completed in 2011)
  - 100,000 BPD gasoline mainline (Houston-Greensboro)

- Capacity enhancements give customers and the market greater access to reliable and low-cost pipeline deliveries, but they also add complexity and costs to operating the Colonial system.

Protecting the Pipeline: Leak Detection

- **Control Center – SCADA, Procedures and Training**
  - The Supervisory Control and Data Acquisition (SCADA) system monitors flow rates, pressure and other operating variables
  - The SCADA system is a primary method of leak detection
  - Trained controllers rely on system of normal and abnormal operating procedures
- **Public Observation of Right of Way**
  - Visual observation by employees or the public is most common method of detecting smaller leaks
  - Pipeline markers provide toll-free phone number to Control Center
  - Partnership with local responders
  - Aerial patrols can detect leaks



Protecting the Pipeline: Monitoring

- Pipeline Surveillance
  - Ground patrol
  - Aerial Patrol
  - Video Surveillance
- Buried pipeline locating system
  - One-Call Center

Protecting the Pipeline: Ground Patrol

- Inspectors responsible for providing patrol of 3,500 miles of Right of Way
- Inspectors manage any encroachment on Right of Way
- Equipped with:
  - Global Positioning System (GPS) to locate pipeline
  - Pipeline locators to verify location

Protecting the Pipeline: Aerial Patrol

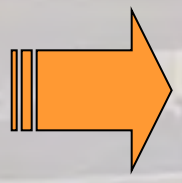
- Single-engine planes fly 300-500 feet over the Right of Way
- Right Of Way patrolled at least once a week, weather permitting
- Threatening activity is documented, with emergency conditions radioed immediately to inspectors on ground

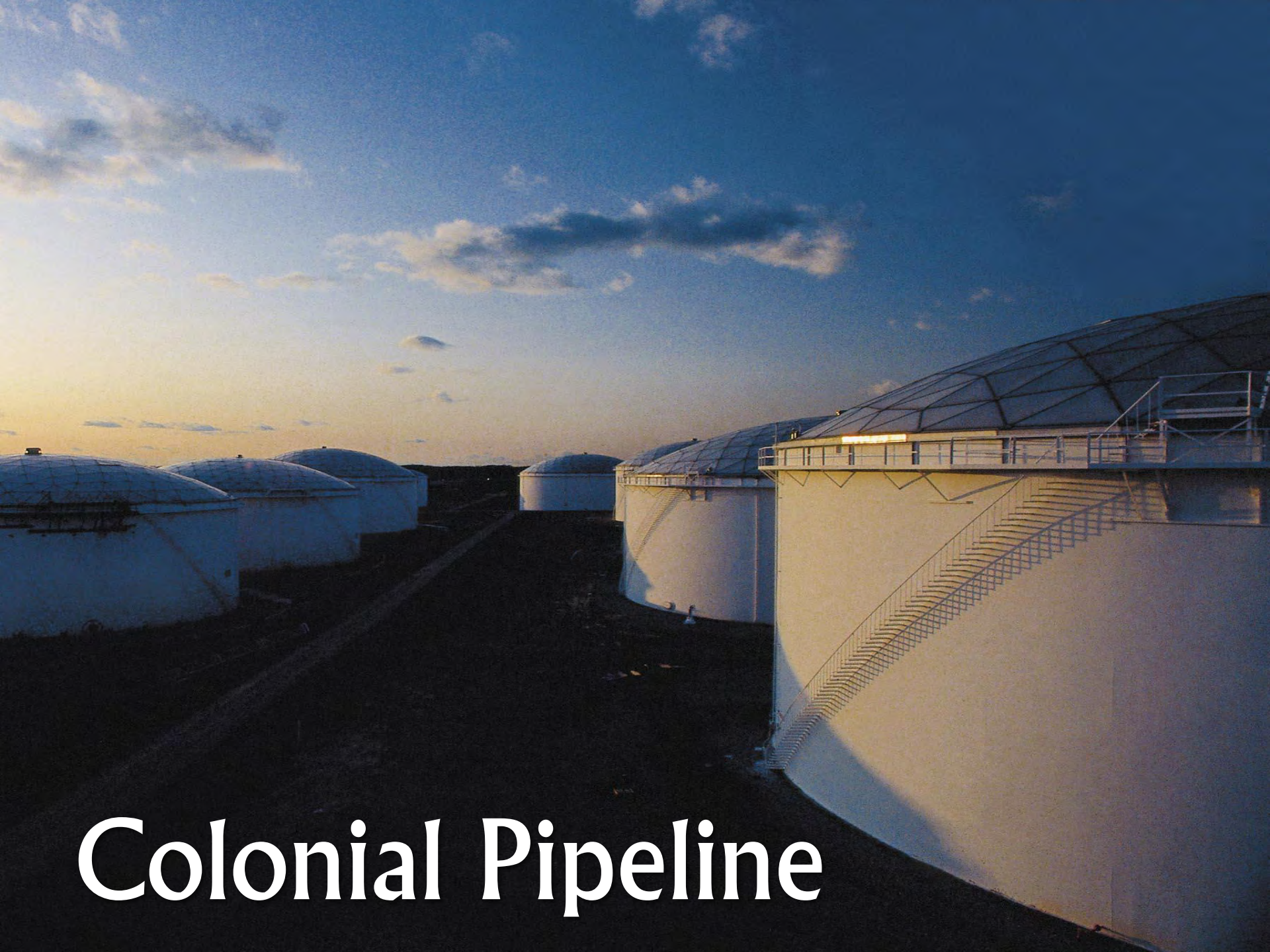
Protecting the Pipeline: One Call Monitoring

- States require excavators to request permission prior to digging
- That information is shared with companies that could be impacted
- Colonial receives an average of 1,000 encroachment requests each day.
- Colonial's One-Call computer system and software automatically maps the location of the dig site
- 40% of the requests resolved by Colonial's One-Call Center
- Remaining 60% are assigned to Right-of-Way Inspectors
  - Of those alerts, about three-quarters (450) are resolved by inspectors' phone calls
  - The remainder (150) require on-site visits

Protecting the Pipeline: Tool Technology

- Internal Line Inspection
  - Tool Technology
    - Data Integration and Analysis




Colonial Pipeline