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Development of a Freight Transportation Network Optimization Strategy – An Overview

June 19, 2015

consulting & technology

Quetica History

- 1997 Founders of PowerTrack™ Business
  - Architected, developed & operated B2B technology & transaction processing platform
    - Freight Audit and Payment Network
    - Transportation and Supply Chain Automation Solutions
    - Third Party Logistics (3PL)
    - Global Trade Bank
    - Transportation and Supply Chain Technology Consulting practices
  - 220 of Fortune 1000 customers, government agencies and 12,000+ service providers
  - Operations in NA, AP, EU and India supporting 42 countries in 23 languages
- 2009 Founders of the Syncada© from Visa, Global Multi-Bank Network
  - Visa bought JV of global payment and financing business
- 2011 Consulting business branded as Quetica™
  - Provide solution-neutral, technology and management consulting to commercial, government and industry service provider clients
- 2014 Re-launched Web-based Fleet Team Fleet Management SaaS Solution

GSA Contract Holder

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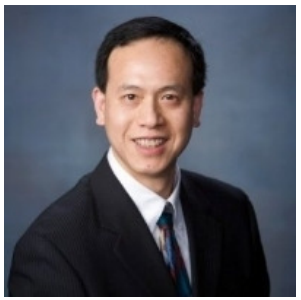
Veteran Owned Small Business VOSB cVE

FLEET TEAM

Quetica Principals



- Rick Langer, Managing Director & President
  - Founder and general manager of PowerTrack network.
  - A visionary leader to translate business strategy into maximum profits.
  - Expert in growing revenue; reducing costs; and enhancing profitability.
- Holly Zimmerman, Executive Director & COO
  - Led PowerTrack new program expansion efforts.
  - Leader in new product and business innovation.
  - Expert in converting complex problems into practical solutions for clients.
- Weiwen Xie, Ph.D., Executive Director & CTO
  - Chief architect and CIO of PowerTrack
  - Leader in innovating and developing new products
  - Expert in planning and delivering technology solutions to improve client's revenue and profitability

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Approach Overview

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Project Background

- ***Vision**: To effectively identify and prioritize investment opportunities for an optimized freight transportation network to lower transportation costs and promote business growth in Minnesota.*
- State DOT can optimize statewide freight transportation network to enable companies to better meet customer demand and reduce transportation costs
  - Existing approach focuses on capacity planning
  - Existing research doesn't produce a practical business value measurement framework due to:
    - Data complexity and data normalization challenges in the research
    - Lack of multimodal freight movement data available to public sector
    - Existing freight performance measures don't focus on optimizing transportation network for businesses
  - Current planning methods don't identify and quantify cost saving opportunities in a multimodal network
- Quetica uses a demand-based supply chain network design and optimization approach to assisting state DOT planning

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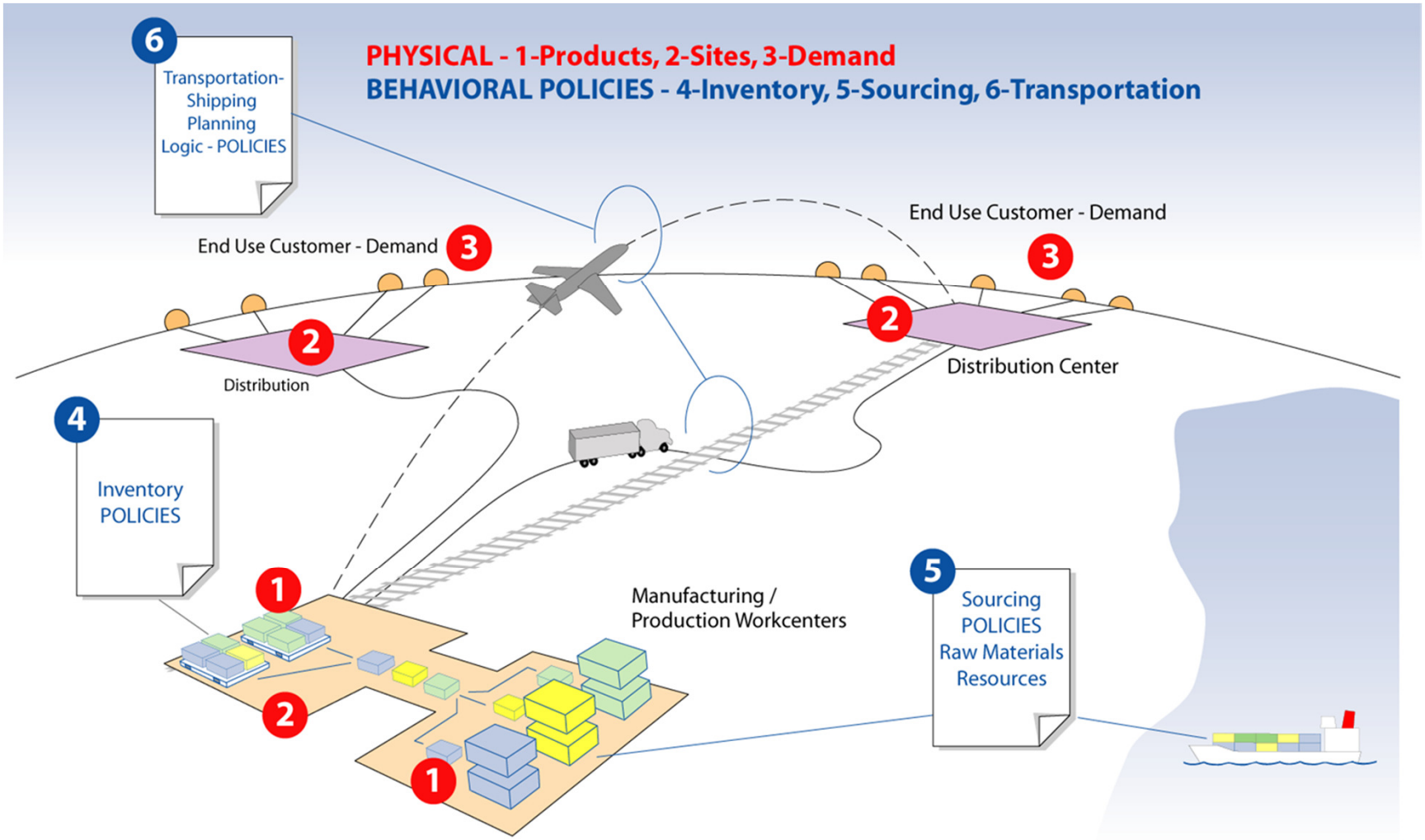
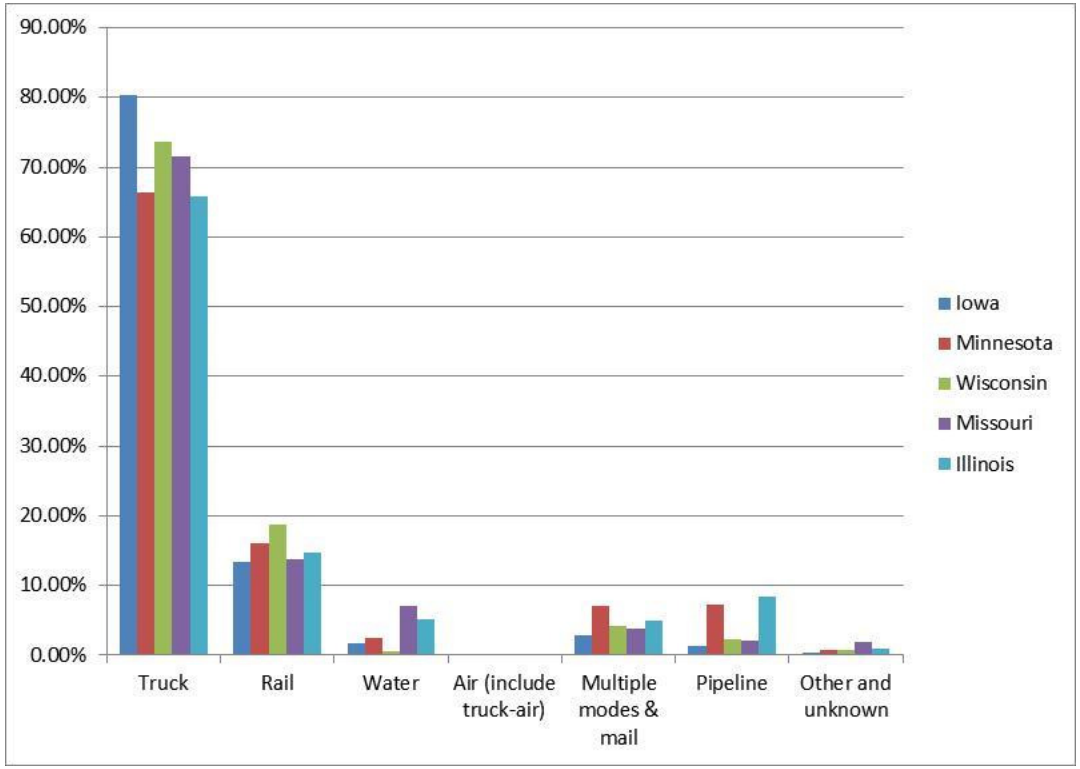
Supply Chain Network and Optimization

- 80% of the landed costs are locked in with the supply chain network



Opportunities in Current Freight Flow

- The chart shows the percentage breakdown of tonnage by mode in 2012 domestic freight in 5 states
- MN has lower % of truck shipments than neighboring states, mainly due to higher % in pipeline shipments
- MN has opportunities to improve rail and water-borne transportation to reduce transportation costs for MN businesses



Data Source: FAF 3.5, Federal Highway Administration

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Optimization Analysis

- Quantitative Analysis
  - Cost, lead time requirement, capacity, etc.
  - Economic viability
- Qualitative Analysis
  - Strategic alignment
  - Increasing network capacity and resiliency
  - Tax incentive / funding availability
  - Job creation and local buy-in
  - Service levels / transportation time
  - Road mile reduction
  - Project implementation risks

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Benefits of Multi-Modal Freight Optimization

- Effectively identify and prioritize investment opportunities to lower transportation costs for Minnesota businesses
  - Leverage current transportation network to deliver optimized results
  - Identify new infrastructure opportunities to optimize freight transportation network
    - e.g. intermodal yards, commodity consolidation points, rail transload facilities/rail spurs, barge terminals, roadways, rail lines
- Assess current and forecasted transportation network constraints
- Identify opportunities to develop a more robust transportation network by enabling alternative modes and routes
- Identify economic development opportunities to recruit companies
- Provide a foundation model to help Minnesota businesses optimize their supply chains

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Project Approach

Analysis of Network Demand and Capacity	• Identification and prioritization of demand areas • Analyze network demand and capacity
Performance Measurement and Constraints Analysis	• Use quantitative and qualitative measurements • Identify and prioritize current and forecasted network performance constraints
Creating and Prioritizing Optimization Strategies	• Develop pragmatic short-term and long-term optimization strategies • Does not intend to identify and evaluate all optimization strategies
Business Case Development	• Conduct financial analysis and develop financial models • Develop actionable recommendations with justifications

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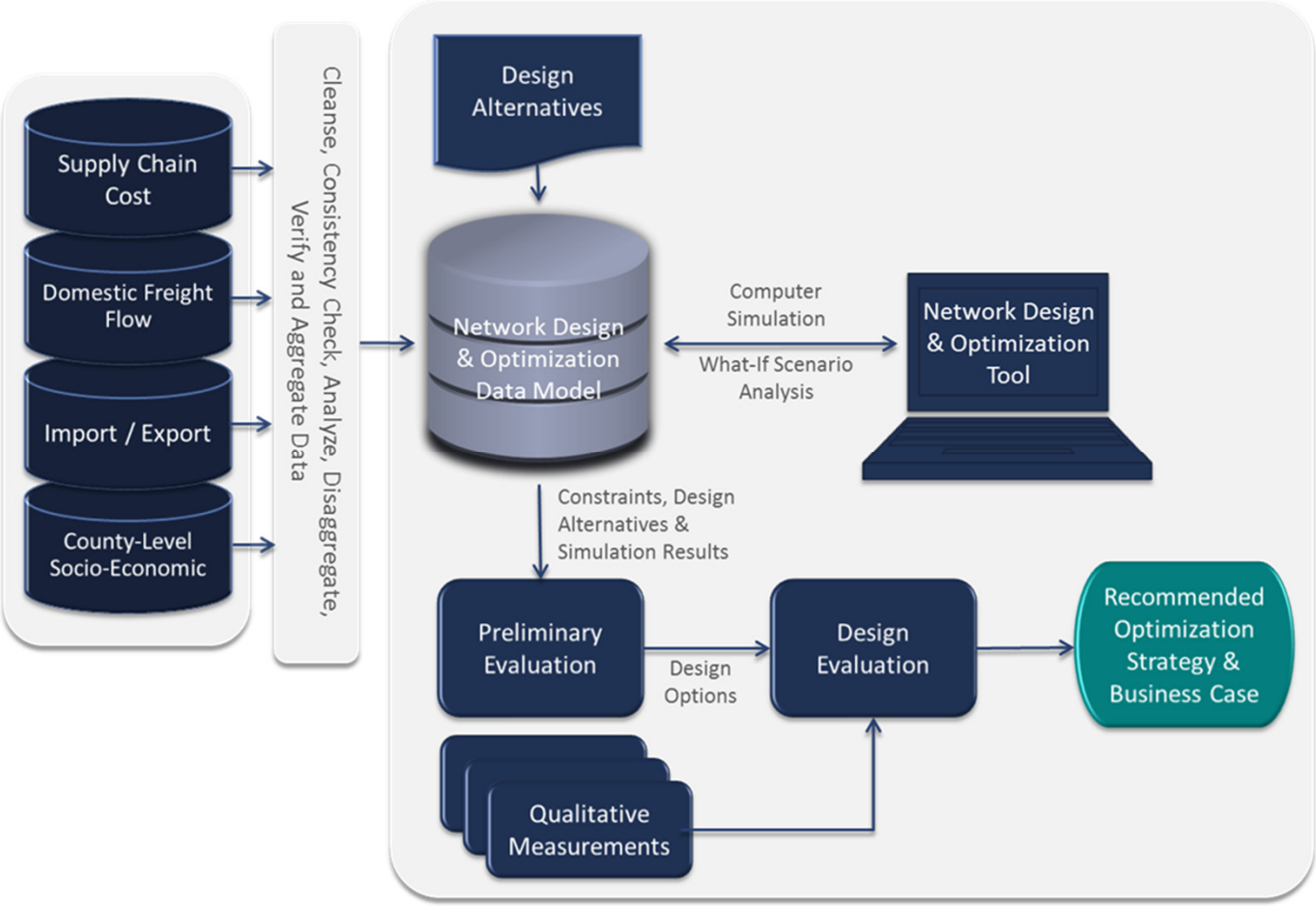
Business Architecture Overview



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Analysis Examples

- Road network and truck transportation
  - Truck cross-docking facilities for freight consolidation
  - Road corridor resiliency
- Rail network and transportation
  - Assessing values of short line rails
  - Intermodal facilities to enable low cost, reliable rail shipments
  - Transloading facilities to provide better rail access
- Waterborne transportation network
  - New terminals for better access to barge transportation
  - Leveraging Great Lakes shipping
- Trade routes for import/export

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Case Study 1 – Cross-Dock Facility

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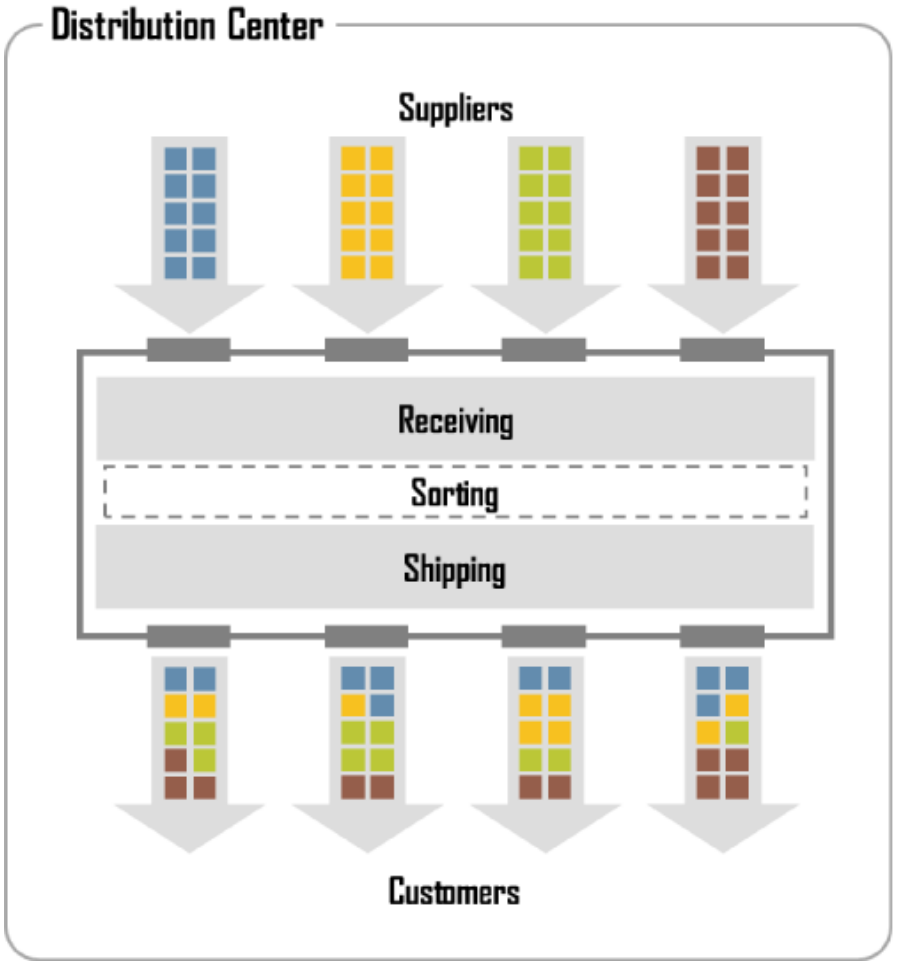
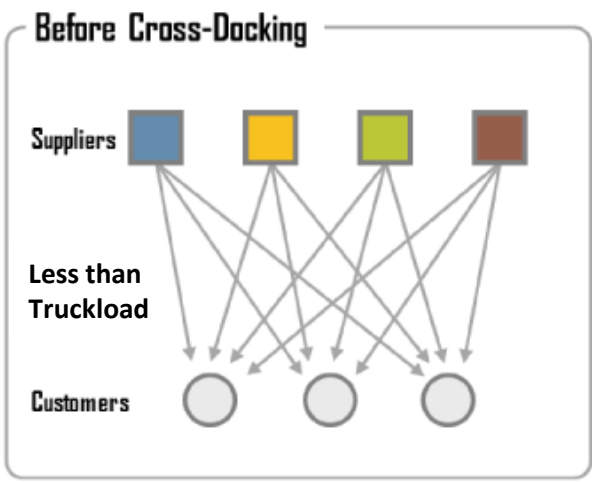
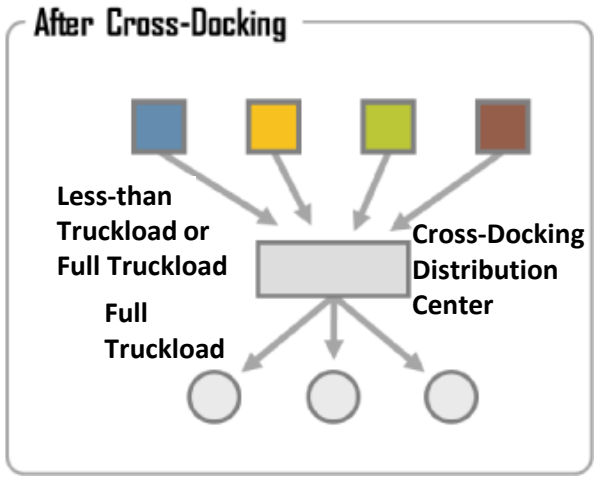
Cross Dock Overview







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Case Study 1 - Cross-Dock Opportunity Analysis

- Evaluated total cost saving opportunities in four regions
- Region 1 has the highest cost saving, but Regions 2 & 3 are more viable options because of existing access to interstate highways
- Selected Region 2 as the primary site candidate with the concept to co-locate cross-dock and intermodal facilities in a logistics park

Location	Total Annual Saving Opportunity
Region 1	$909 Million
Region 2	$883 Million
Region 3	$908 Million
Region 4	$713 Million

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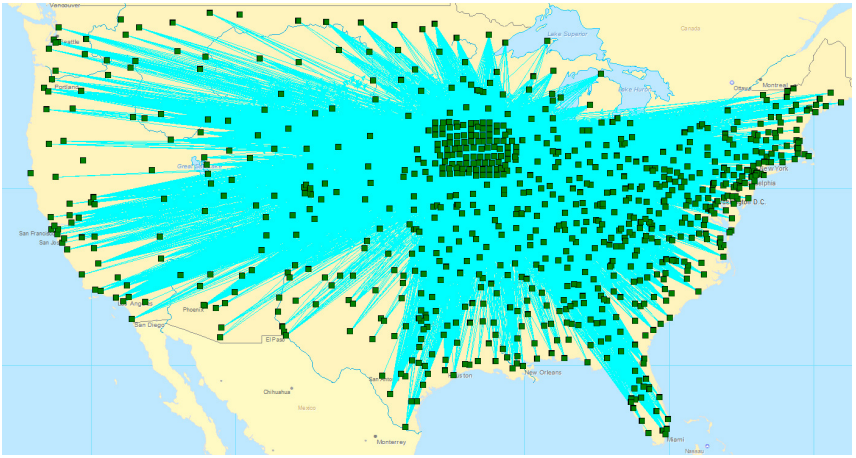
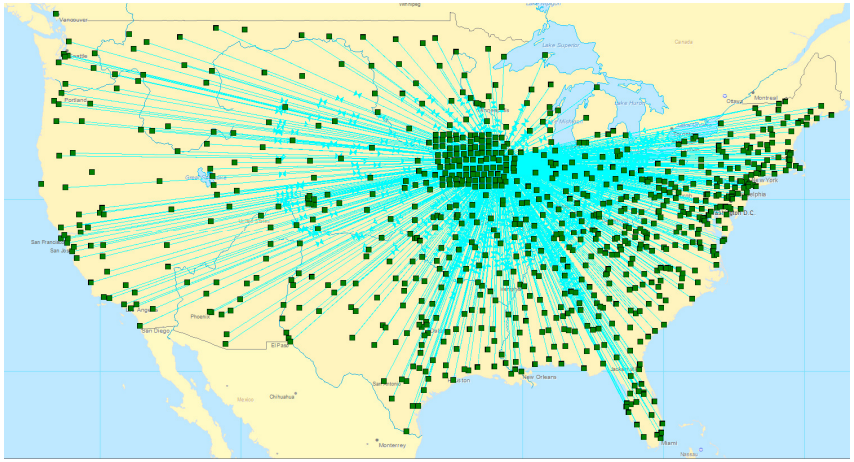
Case Study 1 - Cross-Dock Network Impact

Current State



Future State



- Benefits:
  - Leverage freight consolidation to reduce transportation costs
  - Reduce long distance truck traffic and improve environmental sustainability

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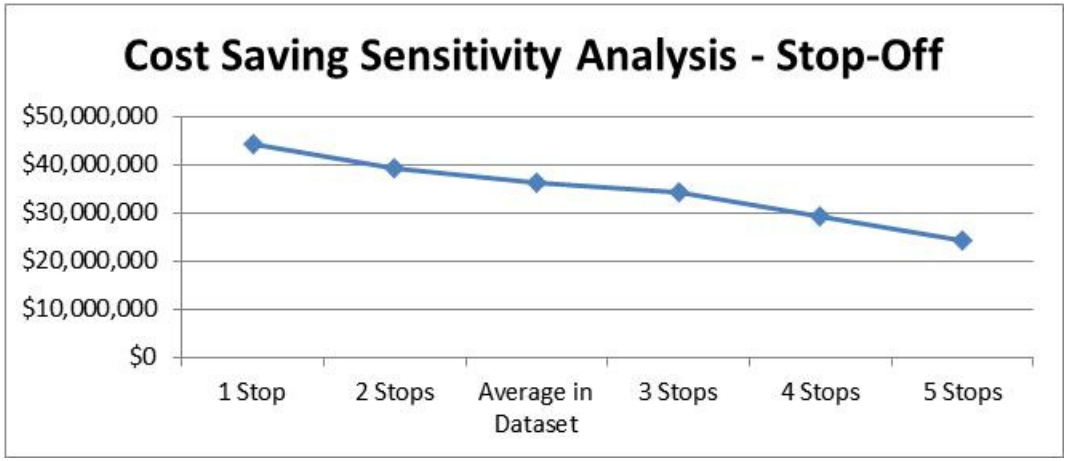
Investment Analysis – A Mid-Sized Cross Dock in Region 2, Iowa

- Assumption
  - Build a 150-door, 600 trailer parking, 120,000 sq. ft. cross dock facility on 15 acres
  - 200 truck pickups daily, 52,000 truck pickups yearly (5 days a week, 52 weeks a year)
  - 5.30% of overall market opportunity
  - Cross-docking fee ($450/truck) covers all operational expenses and profit margin
- Initial Investment: **$21 million**
- Annual Net Saving Opportunities: **$24.4 MM to $44.3 MM**; Average **$36.2 MM**

Item	Cost
Construction Cost	$ 5 million
Doors	$1 million
15 acres of land	$5 million
Sortation and support systems	$10 million



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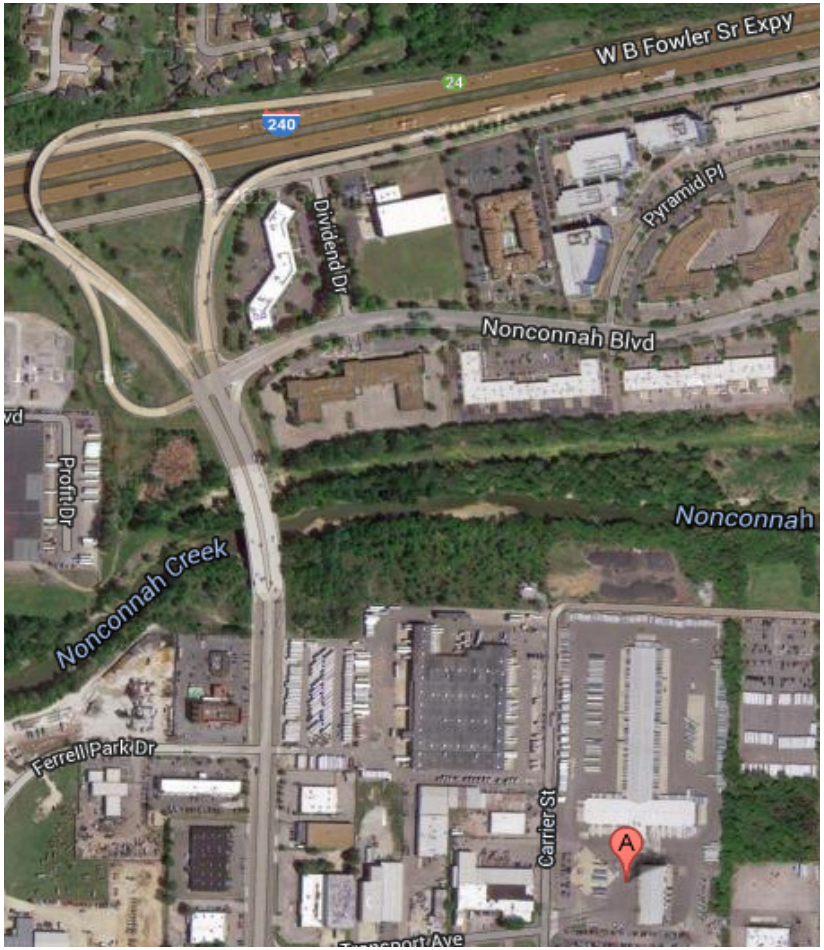
Comparable Cross-Dock - Memphis

- Carrier-owned transportation cross-docking
- Old Dominion, a $535.5 MM trucking company, operates a 150-door cross-docking facility on ~16 acres in Memphis employing 308 people
- Old Dominion plans to replace the 150-door site by building a 229-door cross-docking facility, creating 188 new jobs and spending $31.3 million
- The average salary of the new hires will be $52,111



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Comparable Cross-Dock – Breinigsville, PA

- Provider-owned transportation cross-docking
- NFI is $1B provider of logistics, warehousing, transportation, and distribution services
- Facility Features:
  - Square Footage: 254,000
  - Building Height: 38'-47'
  - Trailer Spots: 550
  - Dock Doors: 150
  - ~40 acres
  - Close proximity to CSX and Norfolk Southern intermodal rail yards
- Other Services provided: Contract Packaging & Decorating , Light Manufacturing / Assembly, Product Labeling, Reverse Logistics, IT Integration
- Breinigsville was a Ag and Mining town, turned into logistics hub (Home Depot, Amazon, Shoprite, etc.)

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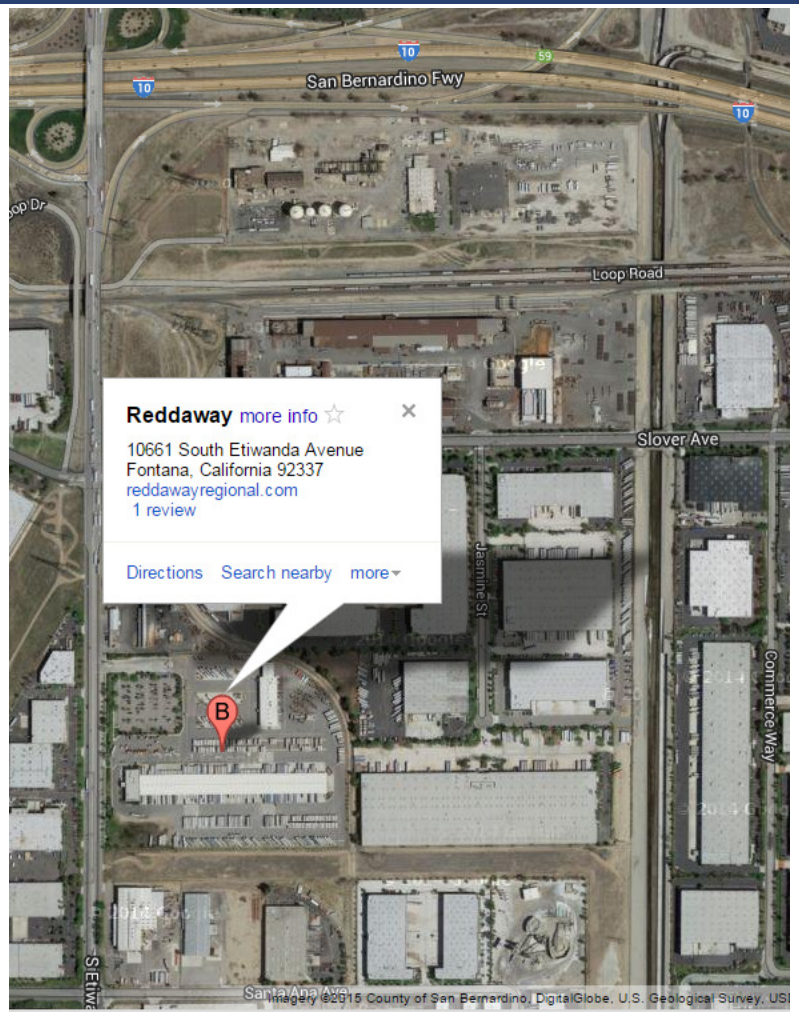
Comparable Cross-Dock – Fontana, CA

- Provider-owned distribution cross-dock provided to L&L Nursery Supply to consolidate shipments from over 60 manufacturers to deliver full truckloads to major retailer
- Reddaway Fontana Service Center is owned by Reddaway, a $335 million subsidiary of YRC Worldwide
- L&L is West Coast's leading manufacturer and distributor of lawn and garden products
- The 160-door facility is located on 17.6 acres



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Case Study 2 - Intermodal Facility

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Opportunity Size – Focusing on High Volume Origin-Destination Pairs

The total market opportunity for high volume Origin-Destination pairs: $289 million net annual savings

Item	Opportunity
Annual Gross Transportation Saving	$412 Million
Empty Container Reposition Cost	($123 Million)
Total Outbound Container Number	247,000
Total Inbound Container Number	42,000
Total Container Shortage	205,000
Annual Net Saving	**$289 Million**
Annual Lift Number	**494,000**

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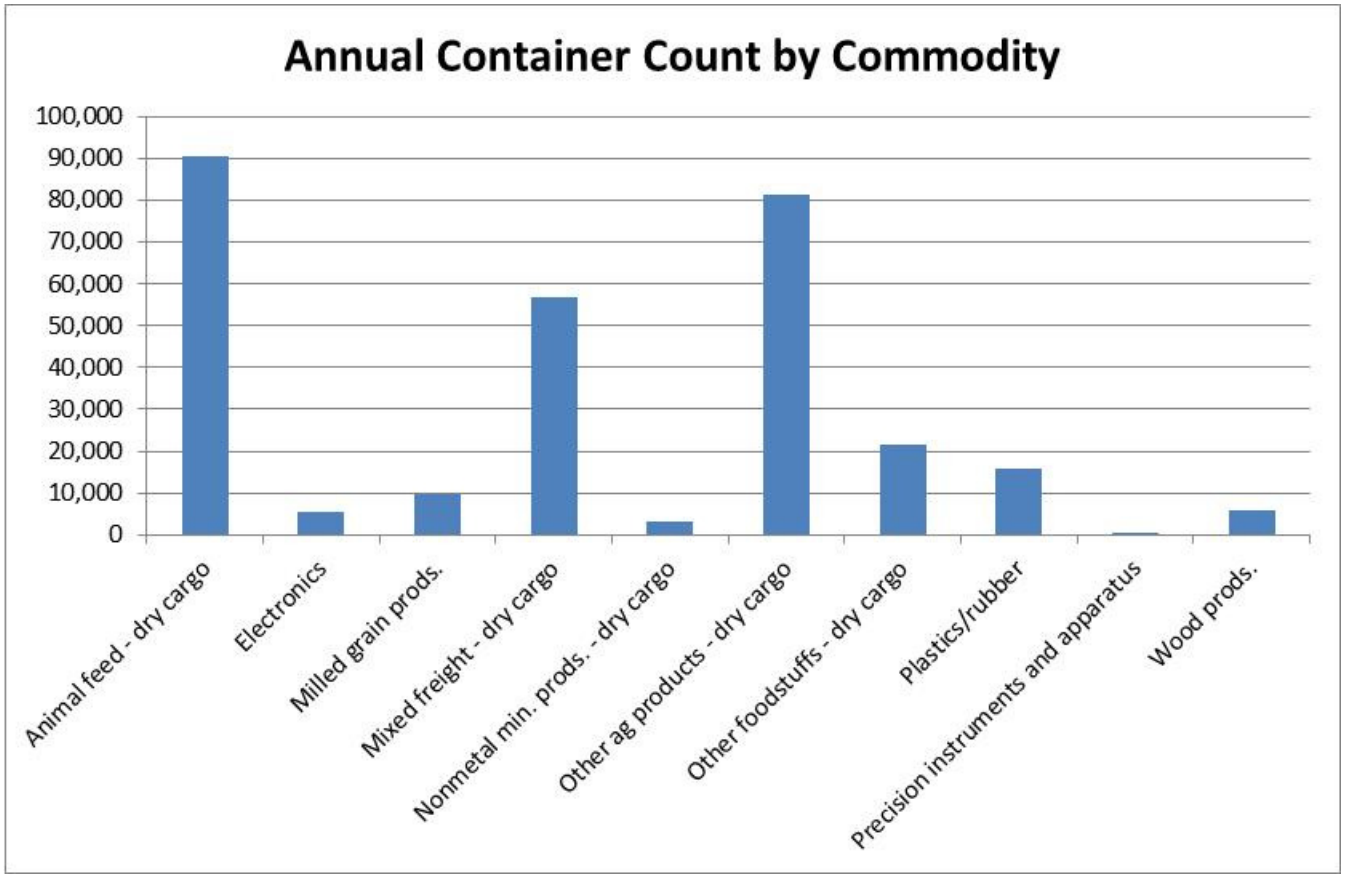
Container Count by Commodity

Top 3 commodities: Animal Feed, Other Ag Products, and Mixed Freight



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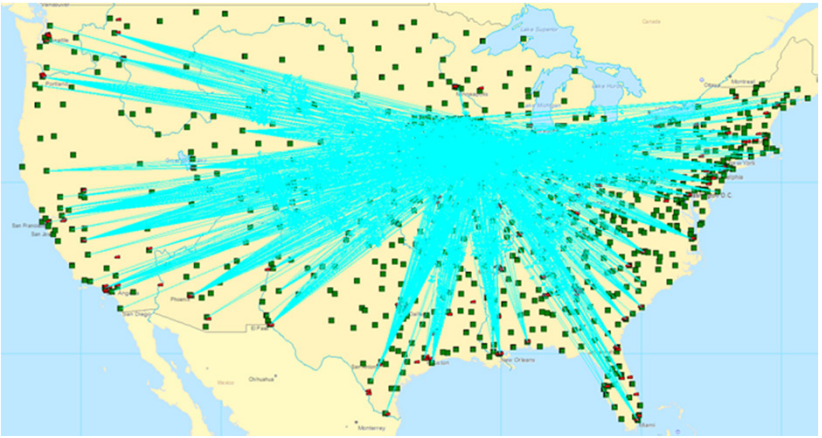
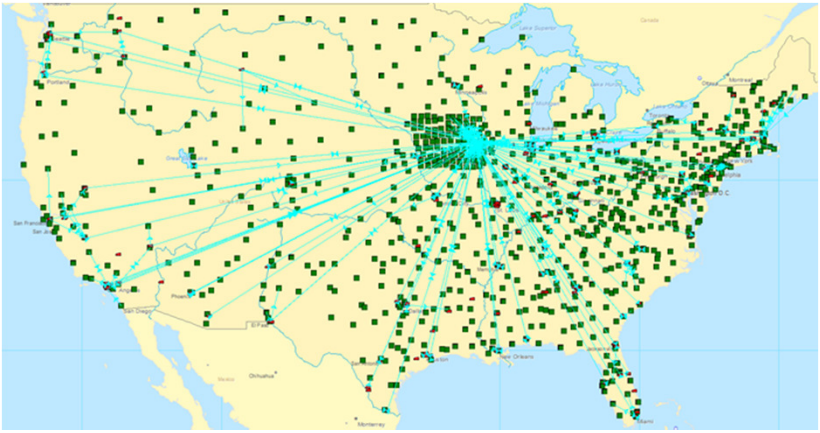
Case Study 2 – IM Facility Network Impact

Current State



Future State



- Optimization Benefits:
  - Leverage rail network to reduce transportation costs
  - Reduce truck traffic and improve environmental sustainability

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Investment Analysis – a Mid-Sized Intermodal Facility in Iowa

Conservative Case vs. Base Case

A Mid-Sized Intermodal Facility in Iowa

	Annual Lift No.	Annual Net Cost Saving	Facility Size	Initial Investment
Conservative Case	32,000	**$23 million**	16 to 20 acres	< $15 million
Base Case	56,000	**$40 million**	30 to 35 acres	$15 million

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Comparable Facility – CSX Louisville, KY

- Investment Example
  - In 2011, CSX invested $15MM to build a 34-acre IMF in Louisville, KY
  - 34-acre intermodal facility – capacity to handle 68,000+ lifts per year

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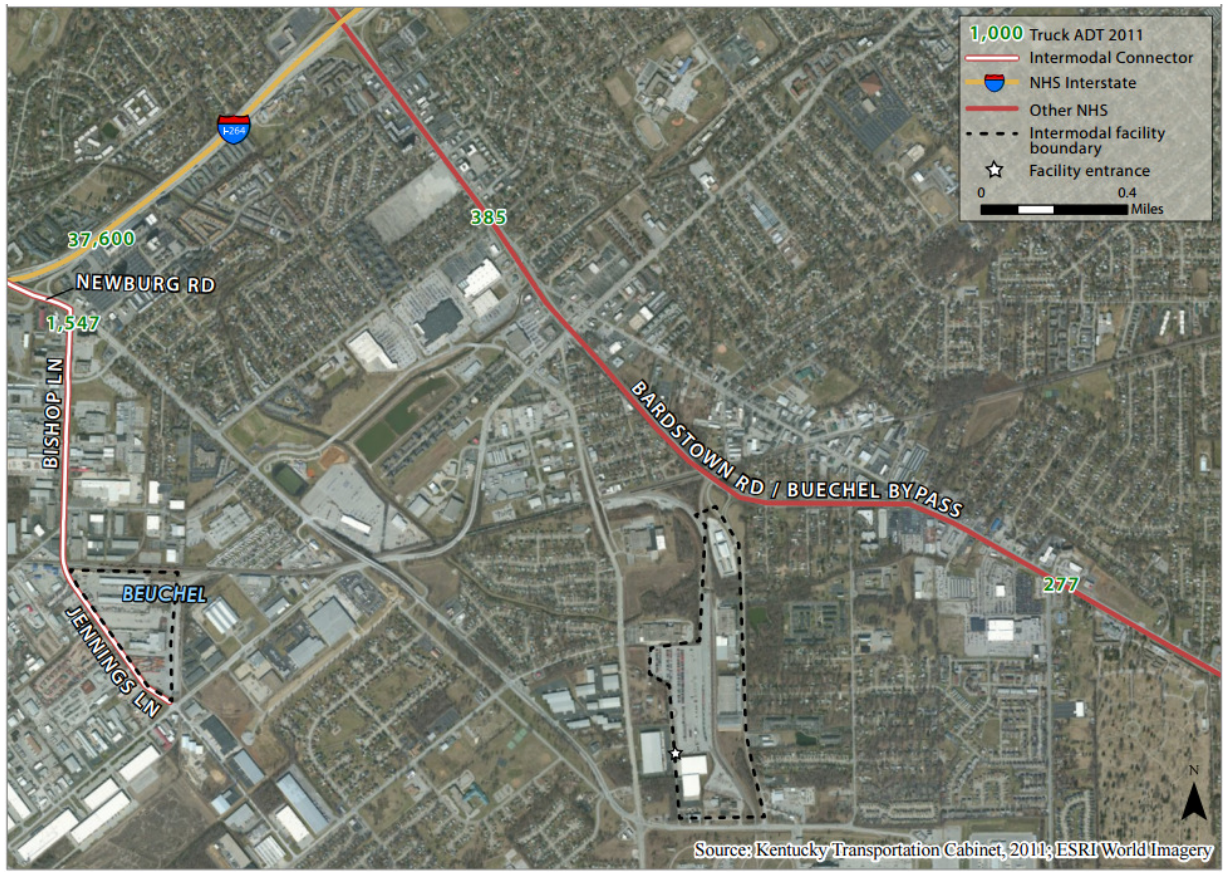
Comparable Facility – NS Louisville, KY

One of the three IM terminals in KY, 9 miles away from CSX terminal

- 30-acre facility
- The capacity of the terminal is ~55,000 lifts per year
- In 2012, the IM terminal handled 40,000 lifts



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Comparable Facility – UP Council Bluffs

- Existing Council Bluffs Intermodal Facility
  - Shared by UP and Iowa Interstate Railroad System
  - COFC facility processing <65,000 lifts per year (62,000 in 2012)

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Case Study 3 - Transloading Facility

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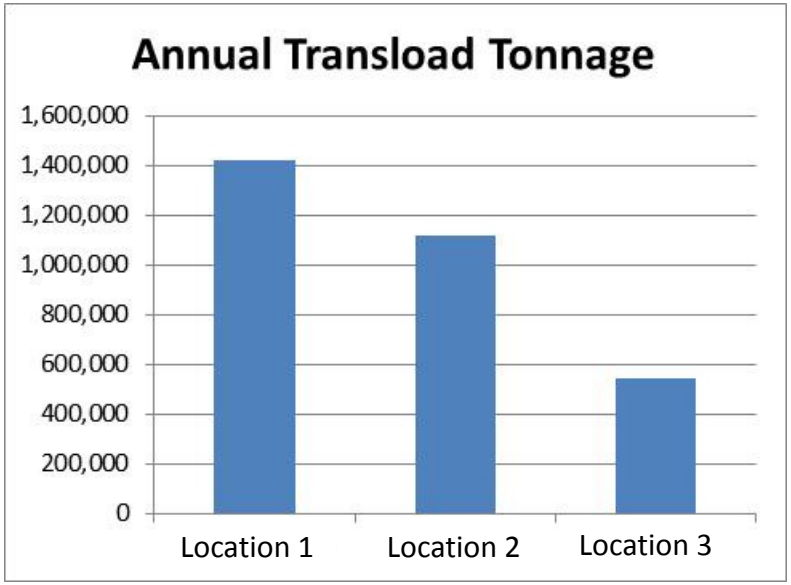
Opportunity Analysis



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Investment Analysis – Transload Facility

- Base case financial

Region	Annual Railcar	% of Tonnage	Annual Saving	Facility Investment	Land Cost	Total Investment
Location 1	1634	11.98%	$5,462,720	$4.2 Million	$1.31 Million	$5.5 Million
Location 2	1634	15.17%	$4,966,715	$4.2 Million	$1.31 Million	$5.5 Million
Location 3	817	15.65%	$2,611,274	$4.2 Million	$1.31 Million	$5.5 Million

- Conservative case financial

Region	Annual Railcar	% of Tonnage	Annual Saving	Facility Investment	Land Cost	Total Investment
Location 1	583	4.27%	$2,788,109	$4.2 Million	$1.31 Million	$5.5 Million
Location 2	427	3.97%	$1,885,382	$4.2 Million	$1.31 Million	$5.5 Million
Location 3	317	6.08%	$1,402,065	$4.2 Million	$1.31 Million	$5.5 Million

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Case Study 4 – Propane

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Iowa Propane Supply Chain

- Severe propane shortage and sharp price increases for residential and commercial users in 2013-2014 due to supply chain issues
- Applying same scientific principles to propane supply chain:
  - To be better informed when demand for propane reaches critical levels and Iowa faces potential shortages
  - To proactively define viable contingencies to better manage extreme fluctuations and disruptions in propane supply in future
- Propane supply chain optimization analysis focuses on:
  - Ability to handle current demand with current infrastructure
  - Ability to handle future increases in demand with current infrastructure
  - Impact of changing and/or new infrastructure constraints
- Identifies thresholds for when changes in demand or constraints limit ability to meet propane demand at reasonable price

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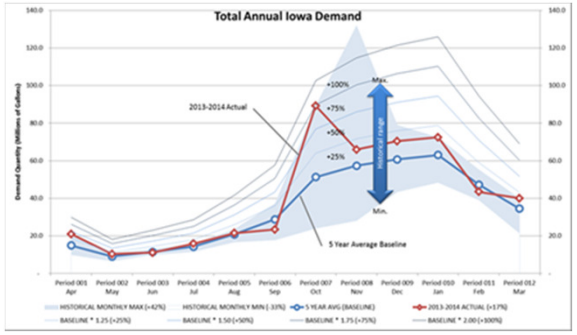
Optimization Approach

- Obstacles are constraints in:
  - Transportation network (e.g. pipeline and terminal capacity, truck availability)
  - Inventory management (e.g. storage in market centers, in bulk in Iowa and at end users)
- Requires understanding of propane supply chain infrastructure including:
  - Demand fluctuations for crop drying and heating
  - Storage requirements (e.g. capacity, reorder points)
  - Sourcing practices (e.g. contracting, contingency supply)
  - Transportation capacity across modes
- Analyzing objectively using network optimization methodology to run simulations and conduct what-if analysis to identify constraints and evaluate alternatives



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Questions

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