WEA2017

Northeast Ohio Regional Sewer District

Hazen

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FOLLOWING UP AFTER TEN YEARS...

AN UPDATED LONG TERM RESIDUALS PLAN

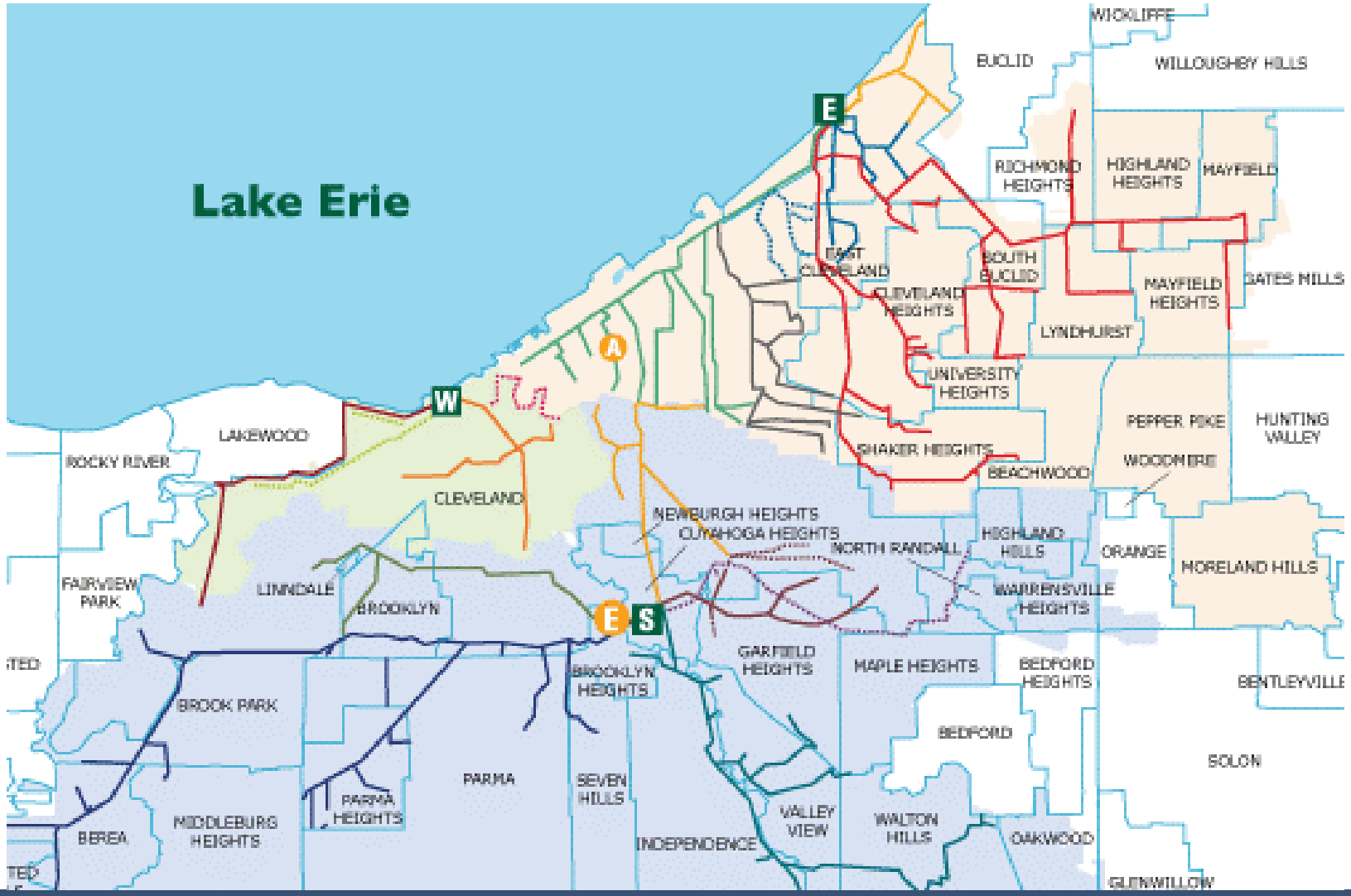
Agenda

- Introduction / Background
  - Project Objective
- Overall Project Approach
- Summary of Alternatives
- Alternative Evaluation Methodology
- The proactive strategy for the future

Introduction / Background

- Northeast Ohio Regional Sewer District (NEORSD) owns and operates three (3) wastewater treatment facilities and major interceptor sewers.
  - **Easterly WWTC**
  - **Southerly WWTC**
  - **Westerly WWTC**
- Serve > 1 Million residents within service area

Introduction / Background



Introduction / Background

- NEORSD completed a Long Term Residual Management Plan (LTRMP) in December 2005 that evaluated solids management options for its three WWTC.
- Recommendations from the 2005 LTRMP included:
  - Continue incineration of solids at Southerly and Westerly, with landfilling as a backup option.
  - Replace Southerly's four existing multiple hearth incinerators (MHI) with three new fluid bed incinerators (FBI).
  - Continue pumping solids from Easterly to Southerly for processing and disposal.
  - Continue to incinerate solids at Westerly's two existing MHI for at least the next 10 years. Re-investigate potential long-term management alternatives for Westerly's solids at that time.

Introduction / Background

Skimmings

Biosolids FM

Skimmings

<u>Westerly</u>
Avg. 30 mgd (ADF)
Incin. biosolids

<u>Easterly</u>
Avg. 95 mgd (ADF)

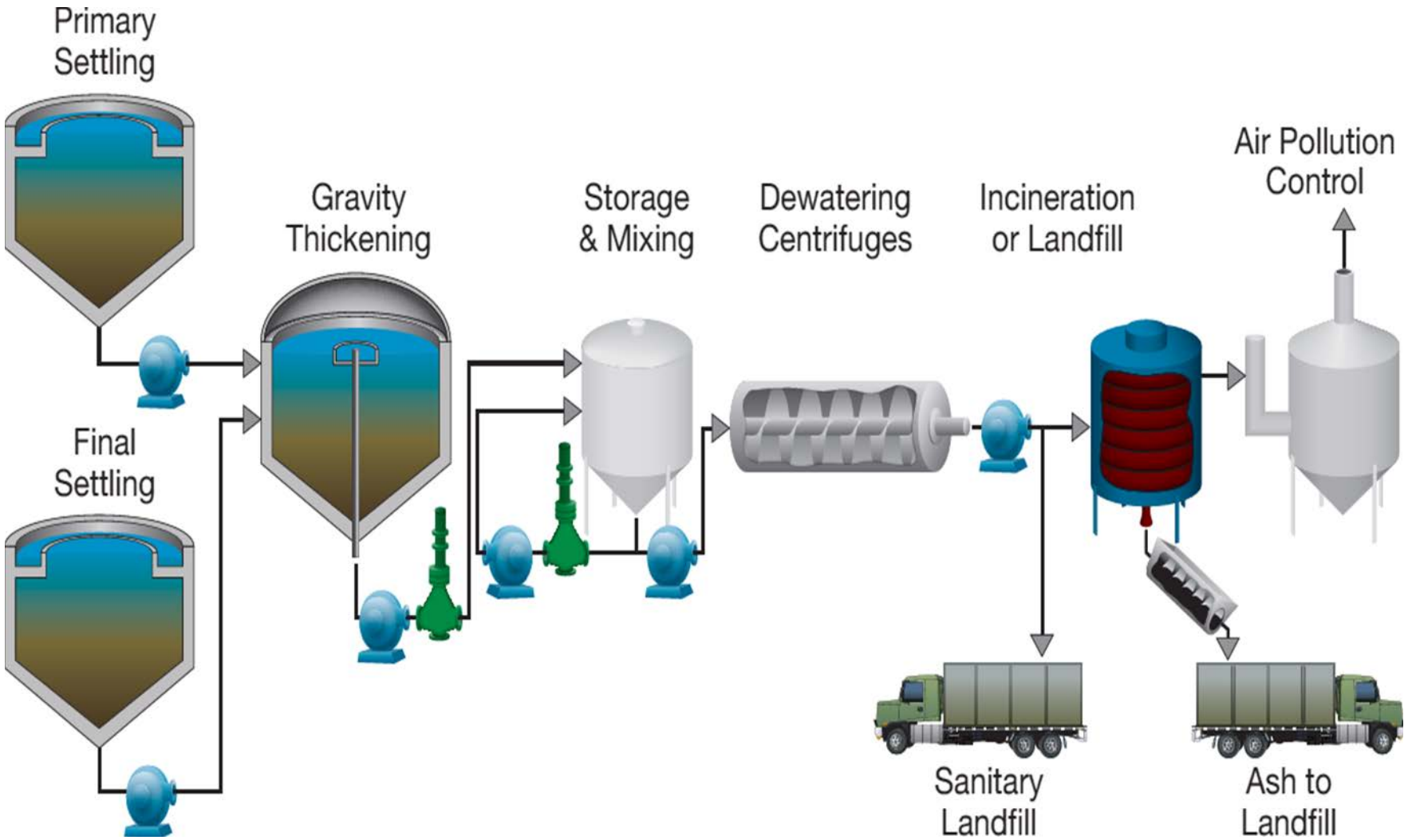
New FBI
Incin. Facility

<u>Southerly</u>
Avg. 125 mgd (ADF)
Incin. biosolids &
skimmings

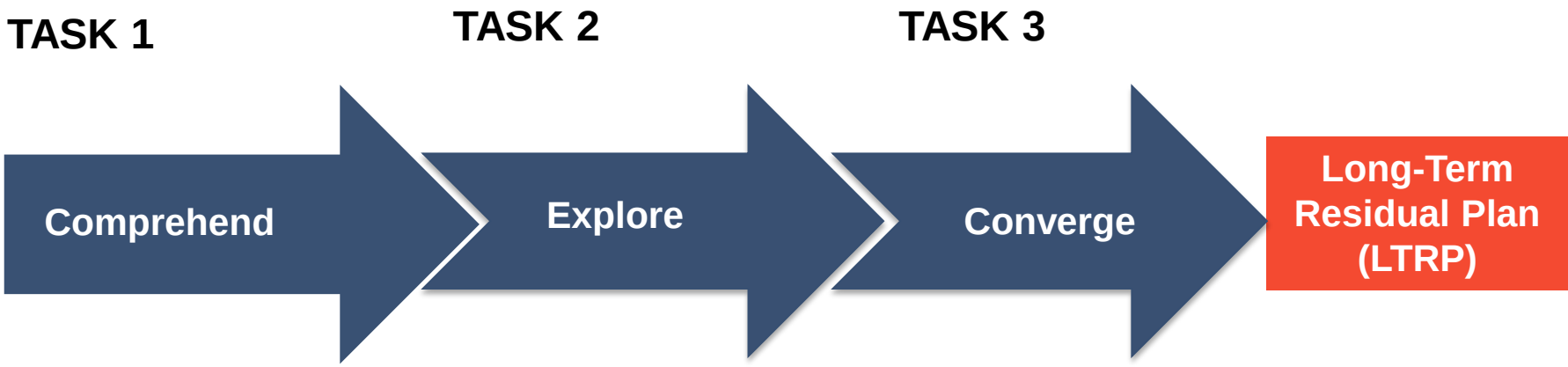
Project Objectives

- Evaluate future solids handling alternatives based on life cycle costs and non-cost criteria.
- Provide recommendations for a long term solids management strategy for Westerly WWTC for the 20 year planning period.

Westerly WWTC Solids Process Diagram



Overall Project Approach

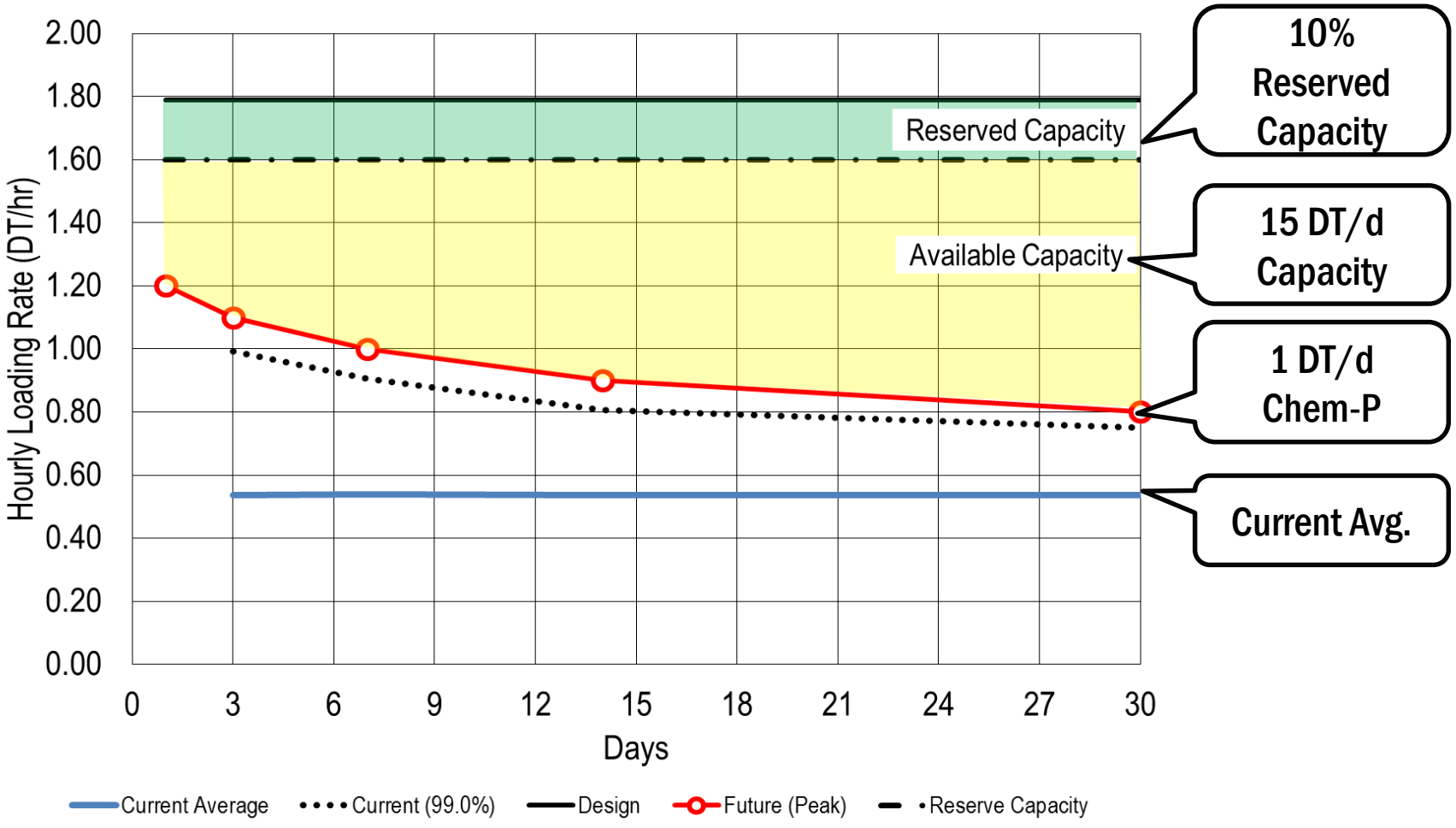


- Historical Data Analysis
- Design Criteria
- Condition Assessment

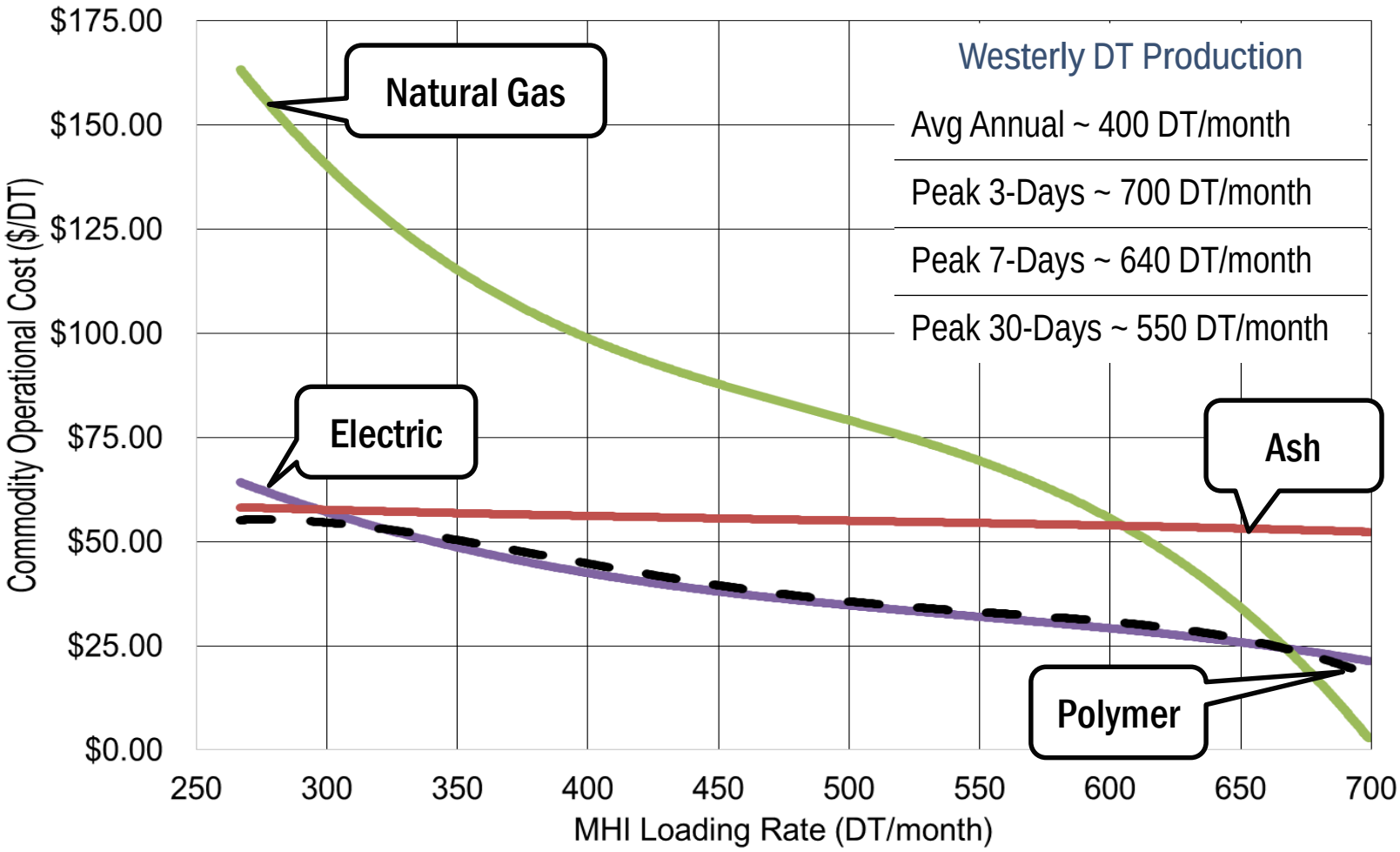
- Alternative Development
- Feasibility Screening

- Sustainable Evaluation Tool (SET)
- Alternative Analysis
- Long Term Residual Plan (LTRP)

MHI Capacity Evaluation and Chemical Solids Projections



O&M Costs


$175.00
$150.00
$125.00
$100.00
$75.00
$50.00
$25.00
$0.00
Commodity Operational Cost ($/DT)
250
300
350
400
450
500
550
600
650
700
MHI Loading Rate (DT/month)
Natural Gas
Electric
Ash
Polymer
Westerly DT Production
Avg Annual ~ 400 DT/month
Peak 3-Days ~ 700 DT/month
Peak 7-Days ~ 640 DT/month
Peak 30-Days ~ 550 DT/month

Existing Equipment Assessment

- Condition assessments performed
  - MHI Nos. 1 and 2
  - Scrubber
  - Ash conveyance
  - Ash/Cake load out station

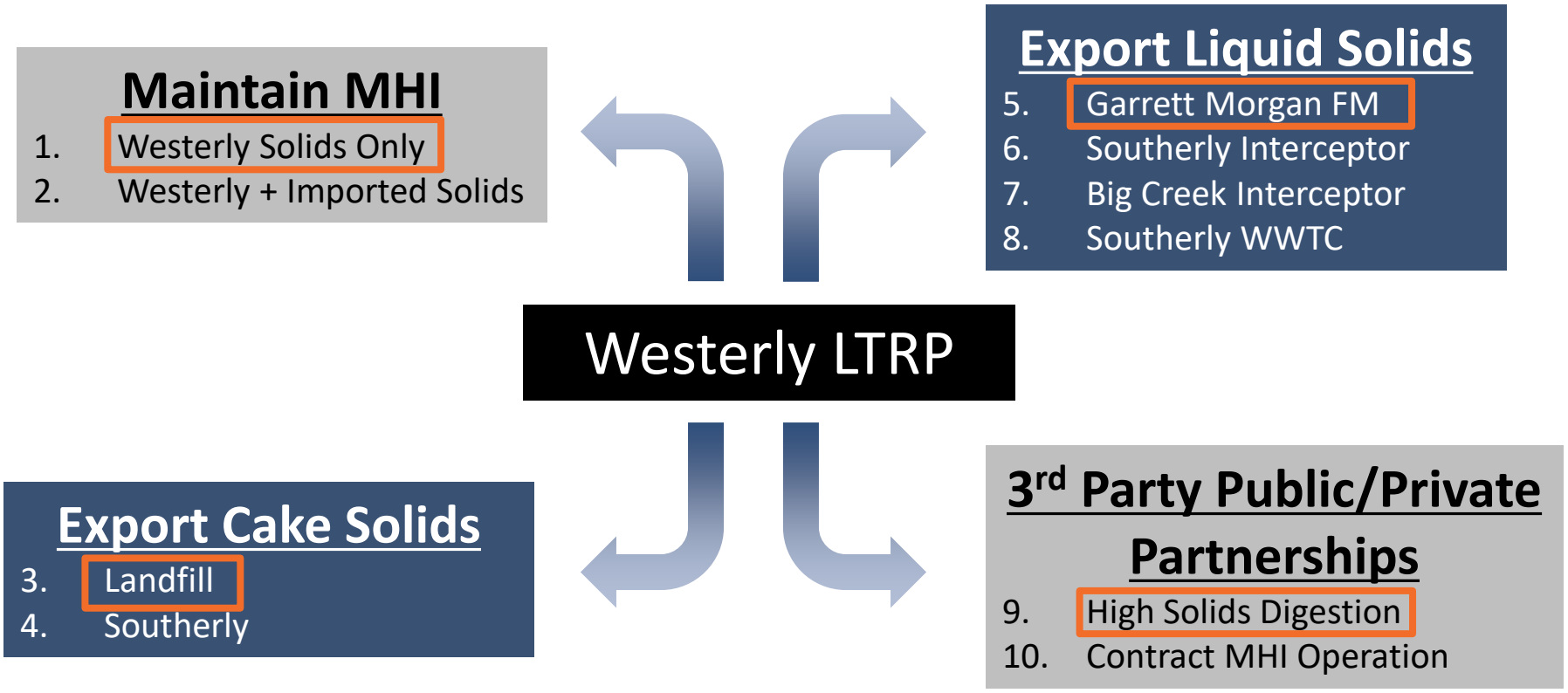
- Recommended Improvements
  - MHI Nos. 1 and 2
    - Top shaft and bearing
    - Rabble Arm
    - Burner Tiles
    - Center Shaft Castable (MH 2 only)
  - Combustion System (NFPA)
  - Scrubber
  - Controls (NFPA)

Existing Equipment Assessment
2015 MACT Testing Results

Criteria	MACT Standard	75% Threshold	MH No. 1 (Aug 12, 2015)	MH No. 2 (July 19, 2015)
Cadmium (mg/dscm)	0.095	0.071	**0.076**	**0.088**
Carbon Monoxide (ppmvd)	3,800	2,850	54.6	128
Dioxins, TEQ (ng/dscm)	0.32	0.24	0.00068	N/A
Hydrogen Chloride (ppmvd)	1.2	0.9	0.351	0.19
Lead (mg/dscm)	0.3	0.23	**0.252**	0.109
Mercury (mg/dscm)	0.28	0.21	0.105	0.073
Oxides of Nitrogen (ppmvd)	220	165	**229**	**218**
Part. Matter (mg/dscm)	80	60	31.3	28.3
Sulfur Dioxide (ppmvd)	26	19.5	<5.04	8.8

= Exceeded MACT Standard

Task 2 – Explore



- Total of 14 Alternatives Evaluated (includes sub-alternatives)

▭ = Most economic alternatives based on LCCA

Maintain Incineration at Westerly
Alternative 1

Description:

- Maintain Incineration
  - MACT compliance reliability
- Inspection to Define Required Improvements

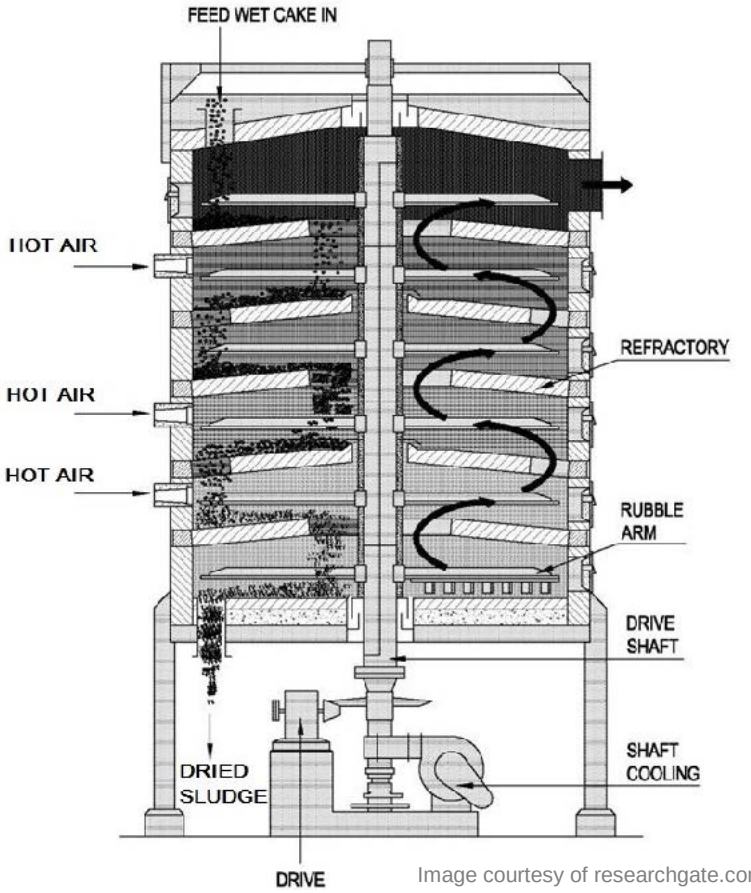
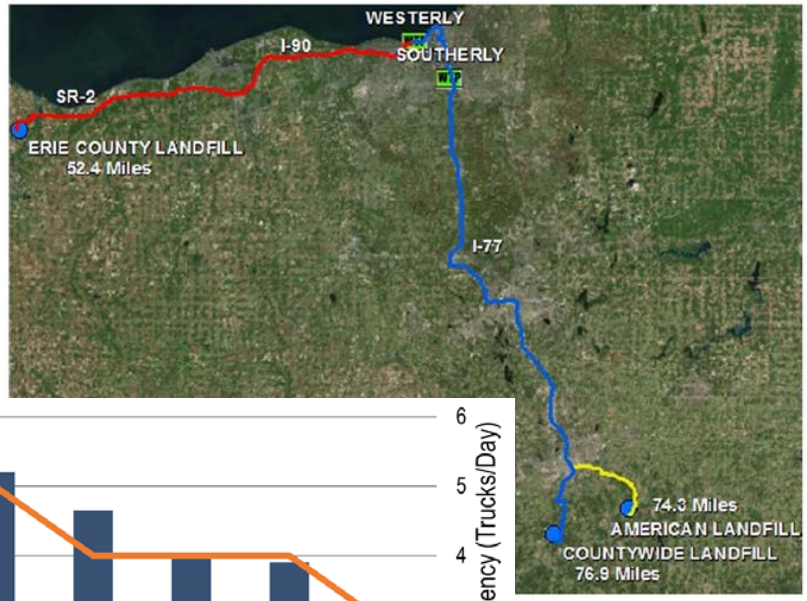


Image courtesy of researchgate.com

Landfill (Export Cake Solids) – Alternative 3

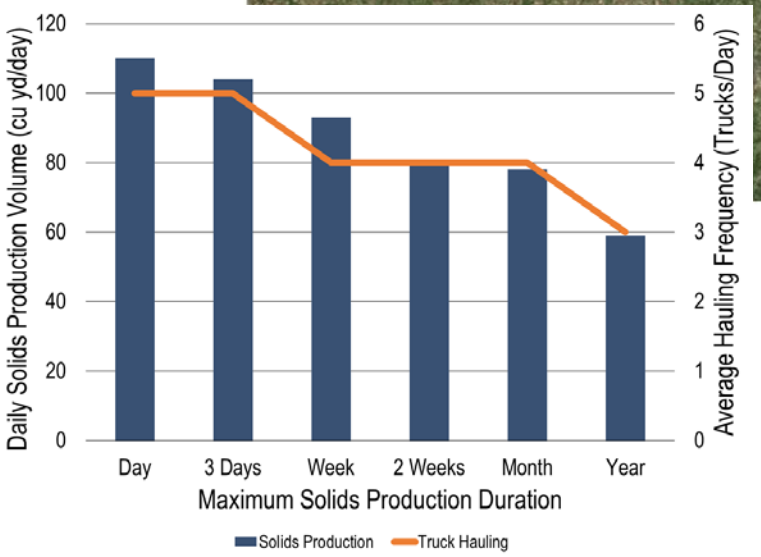
Description

- Decomm. Westerly MHIs
- Maintain Dewatering Equip
- No Cake Storage



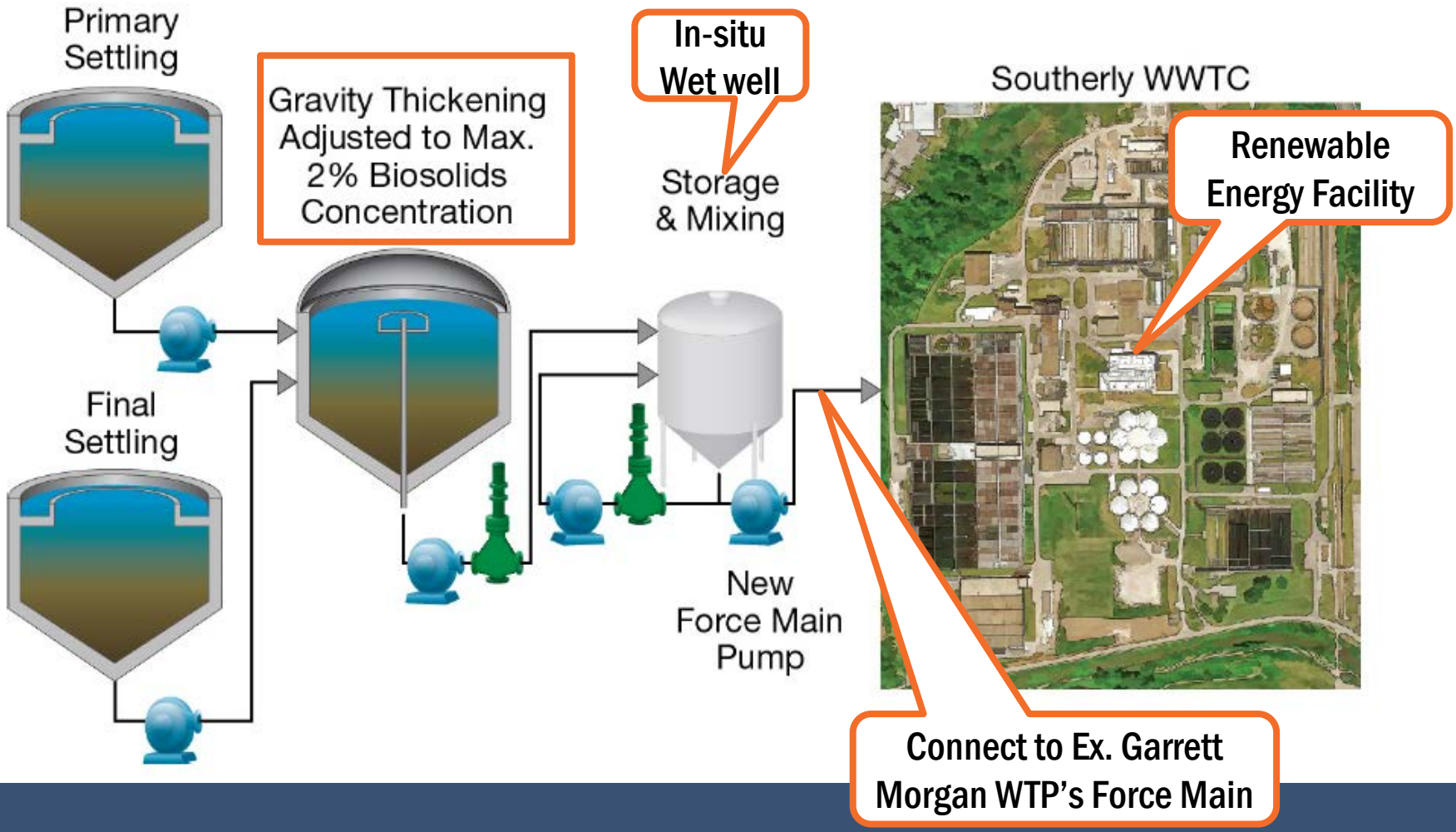
Evaluation Process

- Landfill Investigation
  - ID No. of Landfills and Locations
  - Expected Life-Span
  - Max. Biosolids willing to accept (capacity)
- Hauling & Disposal Costs
  - Distance to Landfill
  - Frequency
  - Tipping Fees



Garrett Morgan Force Main (Export Liquid Solids) – Alternative 5

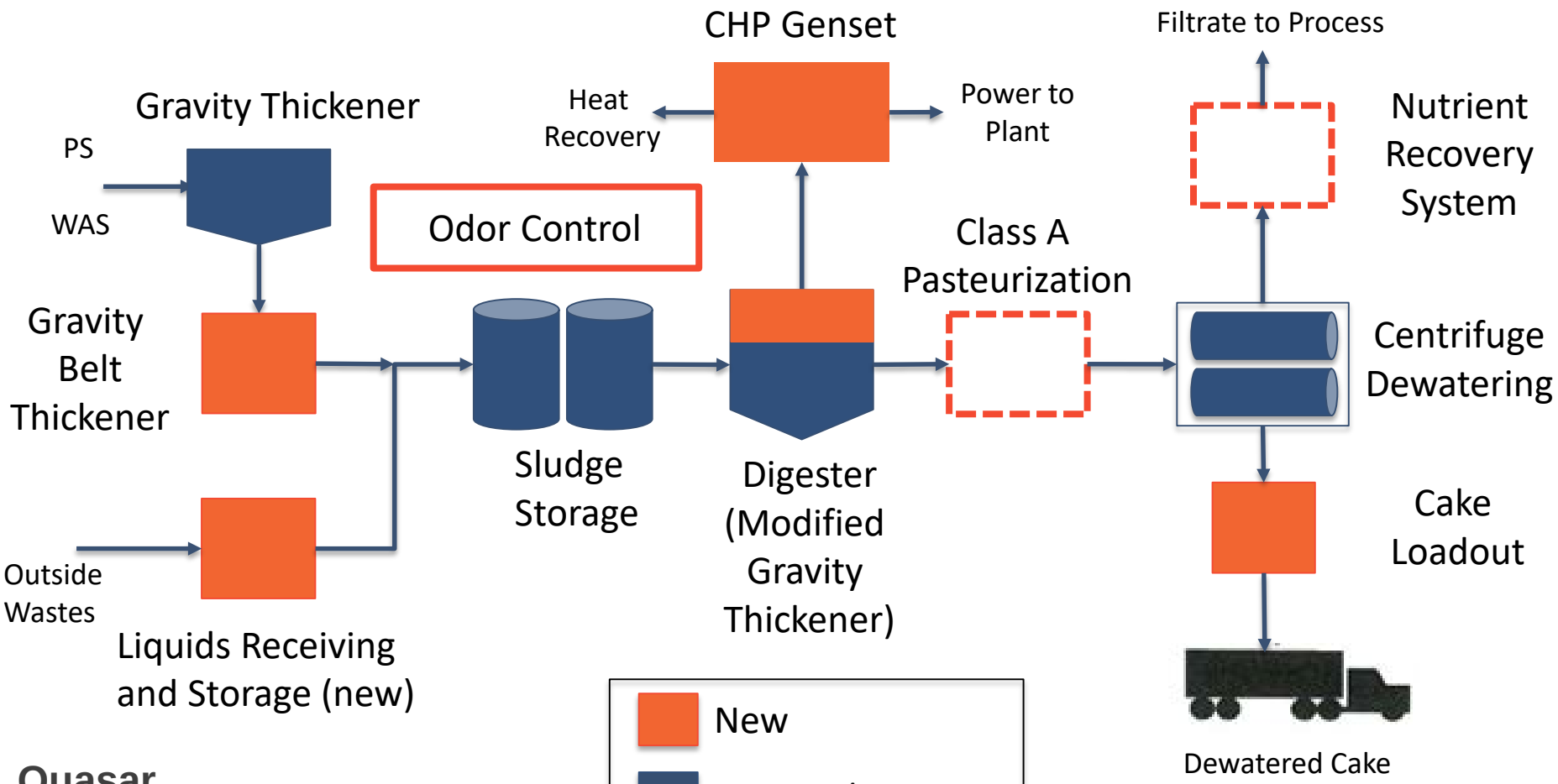
Process Flow Diagram



Third Party
Public-Private Partnerships (PPP)

- Growing gap between infrastructure needs and financial resources to fund those improvements
- Capital invested by private company, but complete privatization does not occur
- Various arrangements of responsibility:
  - Ownership of assets
  - Operating Facility
  - Sourcing of solids

High Solids Digestion (PPP) – Alternative 9



Quasar – Simplified Schematic

PPP – Risks / Benefits

PPP Vendor	Benefits	Risks
Quasar	• Sustainable Solution (EQ + Energy Recovery) • Potential decrease in op cost • Beneficial use of solids • Quasar operating risk for end use	• Increased nutrients (increase with import of wastes) • Imported waste effect on biosolids quality • Potential increase in odors • On-site safety • NEORSD maintains compliance risk
Synagro	• Continues use of incineration • Potential reduction in treatment costs	• Imported waste impact on MHI emissions • Potential increase in odors • On-site safety • NEORSD maintains compliance risk

PPP Overall Risks
- Contracting
- Long-term viability of company
- Owner loses level of control

Task 3 - Converge

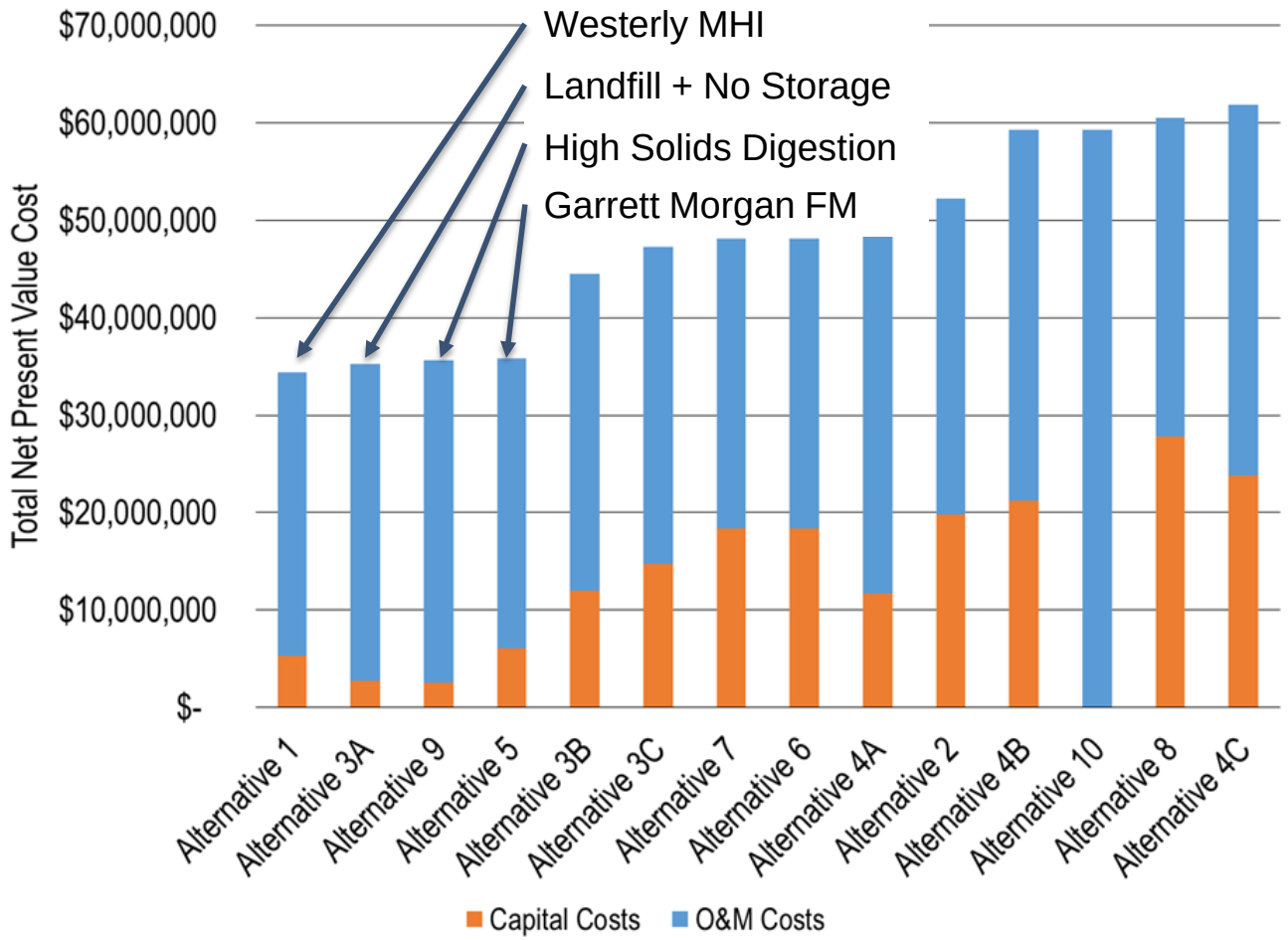
Sustainability Evaluation Tool (SET)

- Non-Cost Factors
  - Long-Term Viability
  - Impact on Land Availability
  - Risk of Regulatory Changes
  - Operations/Maintenance
  - Energy Recovery
  - GHG Emissions
  - Carbon Footprint
  - Health & Safety
  - Control / Use of Assets
  - Utility Leadership
  - Ratepayer Perception
  - What is important to NEORSD?

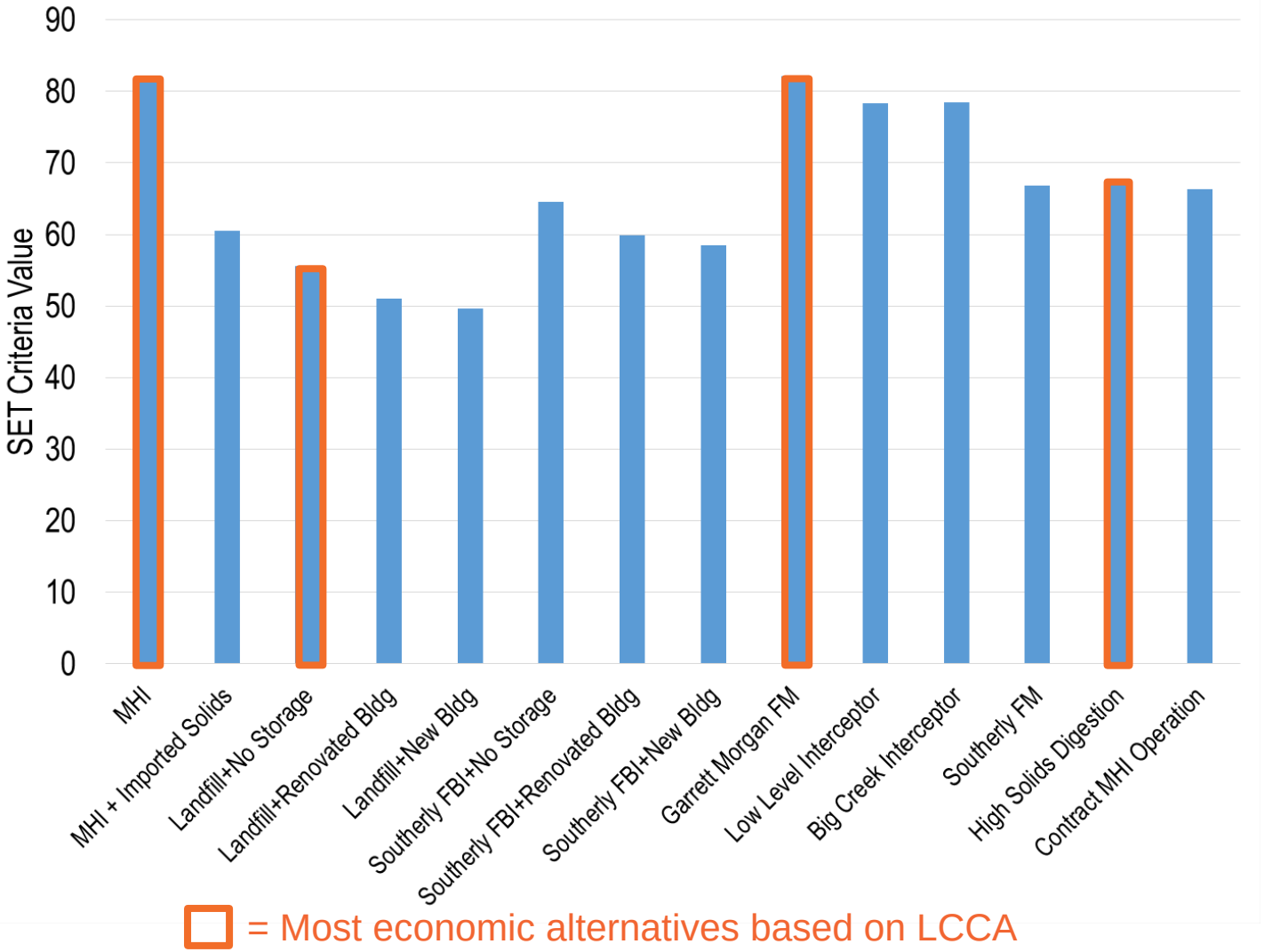
- Cost Factors
  - Capital
  - O&M
  - Commodities
    - Escalation
    - Discount Factors

Westerly LTRP Alternative Analysis

Total Net Present Value Cost Ranking



Non-Cost Factors – SET Results



= Most economic alternatives based on LCCA

Non-Cost Factor Advantages Comparison

Category	Criteria	Westerly MHI	Landfill + No Storage	High Solids Digestion	Garrett Morgan FM
TNPV	Cost	$34.4 M	$35.3 M	$35.7 M	$35.8 M
Environmental	Regulatory				
	Energy				
	GHG				
Implementation	Const. Complexity				
	Existing Assets				
	Agreements				
Operations	Complexity				
	Reliability				
	Traffic				
Social	Odors				
	Health & Safety				
	Construction				

Non-Cost Factor Disadvantages Comparison

Category	Criteria	Westerly MHI	Landfill + No Storage	High Solids Digestion	Garrett Morgan FM
TNPV	Cost	$34.4 M	$35.3 M	$35.7 M	$35.8 M
Environmental	Regulatory				
	Energy				
	GHG				
Implementation	Const. Complexity				
	Existing Assets				
	Agreements				
Operations	Complexity				
	Reliability				
	Traffic				
Social	Odors				
	Health & Safety				
	Construction				

Southerly FBI + No Cake Storage (Export Cake Solids) Alternative 4A

Description:

- Haul cake solids to Southerly WWTC's Renewable Energy Facility (REF)
- Three (3) Fluidized Bed Incinerators
  - Incinerators currently under capacity
- Build cake receiving station at REF
- No cake storage at Westerly

Southerly FBI + No Cake Storage (Export Cake Solids) Alternative 4A

- Did not make the "short list" of Alts. based on LCCA
  - evaluated to verify the economics of operating costs and other factors at Southerly relative to keeping MHI at Westerly.
- Conclusion
  - Use of existing MHIs at Westerly still most cost effective

Southerly WWTC Renewable Energy Facility

UPDATE
2017 MACT Testing Results

Criteria	MACT Standard	75% Threshold	MH No. 1 (Feb 22, 2017)	MH No. 2 (April 6, 2017)
Cadmium (mg/dscm)	0.095	0.071	0.016	0.016
Carbon Monoxide (ppmvd)	3,800	2,850	894.3	780
Dioxins, TEQ (ng/dscm)	0.32	0.24	0.0098	0.0069
Hydrogen Chloride (ppmvd)	1.2	0.9	< 0.12	< 0.14
Lead (mg/dscm)	0.3	0.23	0.060	0.076
Mercury (mg/dscm)	0.28	0.21	0.038	0.083
Oxides of Nitrogen (ppmvd)	220	165	**174.8**	78.9
Part. Matter (mg/dscm)	80	60	7.7	14.0
Sulfur Dioxide (ppmvd)	26	19.5	< 2.39	4.6

= Exceeded MACT Standard

The proactive strategy for the future

- Continue to operate existing MHIs with reasonable capital investment for rehab.
  - Burner efficiency
  - MACT performance
  - Mechanical needs
- Be opportunistic in future years about use of Southerly capacity

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