



Strategic Closure Planning Using Decision Analysis at Nexen's Balzac Gas Plant:

Unlocking Capital in a Time of Fiscal Constraint

October 2017



A New Energy

Nexen Culture Moment



SAFETY FIRST



BE THE BEST



RESULTS MATTER



DO IT RIGHT



BE BOLD



STEP UP



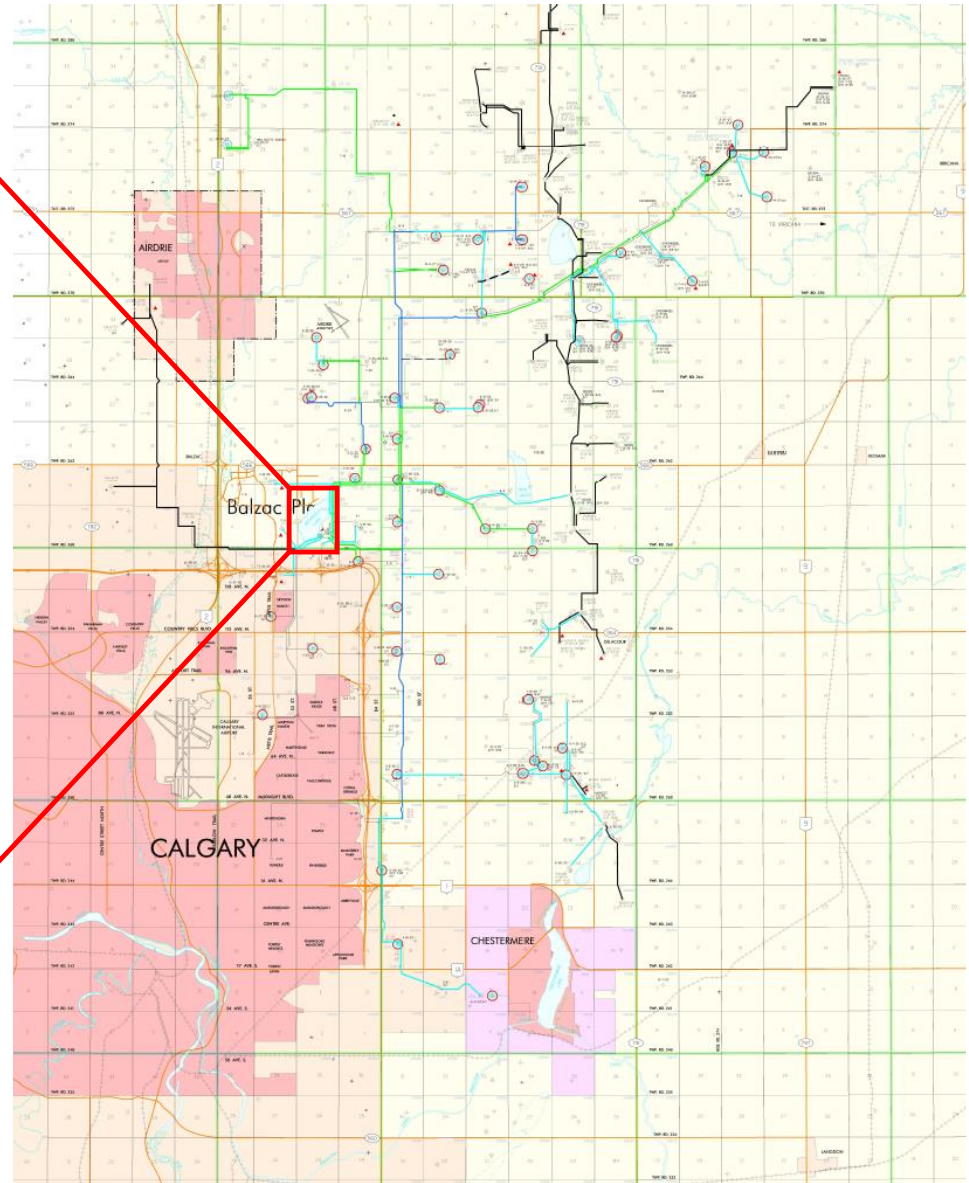
VALUE FEEDBACK



WIN TOGETHER

I collaborate within boundaries and align with the team to achieve superior results, and I share our successes and learnings.

Balzac Gas Plant Location



- First discovery wells were drilled in 1956
- Balzac Gas Plant (BGP) was built in 1961 and expanded in 1967
- Processed over 3 Tcf of gas over its long & successful life
- Addition of Balzac Power Plant in 2001 sharing the same property
- In 2010 the decision was made to close and abandon the Gas Plant
- Shut-down initiated April 2011
- Abatement and Demolition 2012-2014

Background



- Nexen is the working interest owner / operator (47%)
- Remainder of ownership shared with several minority partner companies



- Property is owned by the Balzac Gas Plant Partnership
- Sulfolane was never used at the facility
- Impacts are understood to be predominantly isolated to the property
- Groundwater impacts are thought to be manageable through soil remediation processes and selective exposure control

Left with an environmental liability currently estimated to be approximately 1,000,000 m³ of impacted soil

Balzac Gas Plant c.1961



Balzac Gas Plant c.2011



Surrounding Area



Drivers for Long Term Strategy



We needed a long term strategy to create and maintain forward momentum in an era of fiscal constraint...

1. Regulatory: AER Requirement to Develop a Remedial Action Plan and to fulfill our duty to reclaim
2. Economic: Oil price crash of 2014 drove need maximize capital efficiency
3. Commercial: Partner constraints re. capital and resources Internal
 - Responsible Care
 - CNOOC commitment to managing liability
 - Ongoing Resourcing

Long-term Strategy Objectives

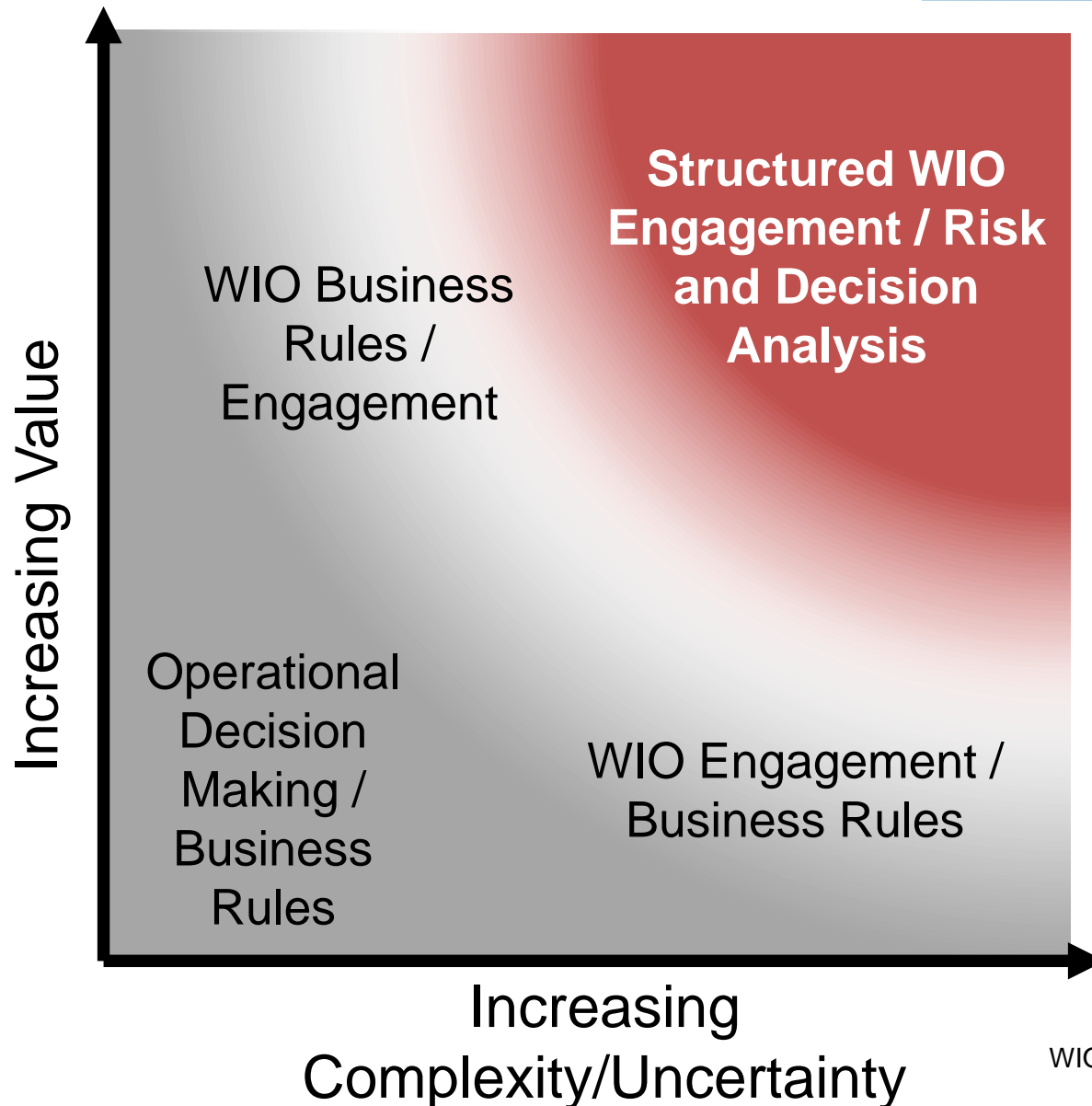


Problem: Find a process that would meet 3 key objectives:

- Create and maintain internal and Partner **alignment**;
- Develop a plan that is **transparent, robust** and **well documented**;
- Use a process that is **repeatable, flexible** and **readily communicated**.

Solution: **Multi-Criteria Decision Analysis (MCDA)**

Partner Engagement Hierarchy



WIO = Working Interest Owner

Strategic MCDA Process



MCDA provides an evaluation of viable liability management strategies and options with associated timelines and budgets:

- **Aligns** with Nexen's DA processes
- **Identifies key decisions** associated with the Balzac Gas Plant (BGP) using a transparent decision making process
- **Facilitates stakeholder alignment** and partner engagement
- **Identifies viable liability management strategies** and options with associated timelines and budgets
- **Provides robust decisions** to both internal and external stakeholders
- **Documents** a process that provides for a high level of stakeholder engagement and facilitates communication
- **Ensures decisions are applicable** and appropriate in the current environment
- **Creates a plan** that is adaptable to changing conditions

MCDA Process Flow



Pre-Framing

- Interviews
- Develop Decision Analysis Context
- Expected Outcomes

Framing

- Context
- Stakeholders
- Objectives
- Decision Hierarchy
- Options
- Criteria / Risks / Opportunities

Strategy Table

Data and Criteria Validation

MCDA

Results Interpretation / Reporting

Stakeholder Alignment / Action Plan

MCDA ACTIVITIES



Date	Activity	Objective
21/22-Oct-15	Nexen interviews	Pre-Framing Interviews
22-Oct-15	Partner interviews	Pre-Framing Interviews
8-Dec-15	Partner interviews	Pre-Framing Interviews
9-Dec-15	Partner interviews	Pre-Framing Interviews
16-Dec-15	Partner interviews	Pre-Framing Interviews
21-Dec-15	Nexen review of interview material	Re-Cap and Results
7-Jan-16	Pre-Framing Nexen Review	Preparation & Technical Presentation Review
12-Jan-16	Framing Workshop	Framing
27-Jan-16	Strategy Table Workshop	Construct the Strategies / Options for Analysis
2-Feb-16	Strategy Table Re-cap and Partner Alignment	Re-cap and Partner Alignment
3-Feb-16	Strategy Table Re-cap and Partner Alignment	Re-cap and Partner Alignment
2-Feb-16	Strategy Table Re-cap and Alignment (Nexen)	Re-cap and Partner Alignment
10-Feb-16	Strategy Table Re-cap and Partner Alignment	Re-cap and Partner Alignment
17-Feb-16	Data and Criteria Validation Workshop	Validate Data Inputs (Costs, volumes etc.) and Performance Measure Criteria (Criteria and weighting)
22-Feb-16	Data and Criteria Partner Alignment (phone update)	Re-cap and Partner Alignment
26-Feb-16	Data and Criteria Partner Alignment	Re-cap and Partner Alignment
15-Mar-16	Commercial and Technical Partner Review	Final Validation of themes, assumptions and criteria
24-Mar-16	MCDA Workshop	Final Scoring and Weighting of Strategies
19-Apr-16	Results Presentation with Nexen	Draft Results Review

Objective Statement



“Create a sustainable process and outcomes that enable Partner alignment and agreement which results in the efficient progression of the BGP closure program towards a defined end goal. Sustainable refers to the balance of economic, environment, social and technical drivers.”

Decision Hierarchy



Givens

Focus

Tactical - Decide Later





















- What is the pace of progression to complete remedial end point?
- What is the optimal spend profile?
- What is the end land use / end goal?
- What are our remedial end points/regulatory closure mechanisms?
- What are viable soil remediation strategies?
- What are viable groundwater remediation strategies?
- How do we address McDonald Lake? (Receptor - not mgmt. area)
- How do we leverage current economic opportunities?
- If we tackle in pieces how would we address each differently?
- How do we prioritize (incl. risk)/sequence the remediation?
- How much residual liability are we willing to accept?
- How do we pursue sale of property? Is it feasible /achievable?

Strategy Table

Nexen Balzac Remediation MCDA Strategy Table

Notes	1	2	3	4	5	6	7	8	9	10	11	12
Category	1	2	3	4	5	6	7	8	9	10	11	12
Focus Decisions → Strategic Themes ↓	What is the pace of progression to complete remedial end point?	What is the optimal spend profile?	What is the end land use / end goal?	What are our remedial end points/regulatory closure mechanisms?	What are viable soil remediation strategies?	What are viable groundwater remediation strategies?	How do we address McDonald Lake? (Receptor - not mgmt. area)	How do we leverage current economic opportunities?	If we tackle in pieces how would we address each differently?	How do we prioritize (incl. risk)/sequence the remediation?	How much residual liability are we willing to accept?	How do we pursue sale of property? Is it feasible /achievable?
Greatest Regulatory Certainty	0-3 Years (Accelerated)	Bi-modal	Industrial	Regulatory Closure (Reclamation Certificate) (T3,T4)	Ex-situ Biological Treatment	Risk Managed	Drain and fill	Do nothing	Phase - by management area	Phase - by developer needs	No future liability (Reclamation Certificate)	Identify and sell to qualified developer prior to undertaking substantive remediation
Maximum Capital Efficiency	2-10 Years (Base Case)	Front end load	Parkland / Industrial/Municipal Reserve	Regulatory Letter of Comfort (AER CI) (T3,T4)	Ex-situ Physical/Chemical Treatment (existing landfill)	Boreshole Injection	Cut off high risk flow area, absealing	Maximize existing landfill capacity nearby	Phase - by developer needs	Phase - highest perceived risk	Residual Liability	Identify and sell to qualified developer after remediation to risk managed end point
Maximize Opportunity for Divestment /Asset Value	10-15 years	Tail end	Light Industrial	Exposure Control (risk management, no regulatory closure) (T2)	Ex-situ Import soil and mix (AER CI)	Reverse osmosis	Cut off entire site (sell within lake)	Purpose built landfill	Phase - highest perceived risk	Phase - highest environmental risk	Risk Cert / Letter of Comfort	Identify and sell to developer after risk cert issued (placement AER CI or whole)
Lowest Feasible Annualized Effort	1-12 Years (Risk Managed)	Even spend	Commercial	BUY Model (Ownership and Liability transfer), Direct prior to remediation (e.g., other producers), brownfield	Ex-situ Centralized collection area (AER CI)	Evaporation technology	Manage risks	Option space in landfill	Phase - highest environmental risk	Inventory Management	Transfer liability	Sell places with risk cert
Most Adaptable / Flexible		Normal Distribution	Municipal Reserve	Remediation Certificate (T3,T4)	Ex-situ Thermal	Cut-off wall/treatment for McDonald Lake	Turn R&D into wellhead with one way flow from McDonald Lake to area	Increased ability to negotiate lower cost contracts	Placement (prioritize and address using the following criteria)	Remediation Technology Timeline	Remediate to achieve / remediation certificate	Sell places without risk cert
Maximize Social Licence			Parkland		In-situ Biological	Completely treat all GW	Interceptor trench	Increased ability to retain qualified and efficient professional / technical services	By PCOCs	Risk Cert / Letter of Comfort Closure	Risk Managed	Sell entire property
Maximize Opportunities for Partner Alignment			Status quo / NRI Natural resource Industrial District		In-situ Physical/Chemical Treatment		Remediate the impacted area (Phase area)	Increased ability to negotiate better landfill rates	By # / volume	By legislation (e.g. treatment area needs)	Do minimum and manage long term	Retain property
			Combination of above		In-situ Mixing similar to drilling waste disposal area (DWTDA)		Remediate the impacted area (Phase area)	Purpose third party interests (M&E, other)	By remediation technology	Upgradient/downgradient	Partial reclamation certificate and subdivide	Source market
					In-situ Thermal			Leverage potential government programs (R&D, infrastructure & etc.)	Timeline			Rely on others
					Other including Risk Management			Remediate and Lease land	Rebelling conceptual drainage plan needs			Do not sell
					Purpose built landfill				Factoring in regulatory feedback			
					On-site containment / landfill (AER CI)				By legislation (e.g. treatment area needs)			
					Third party landfill - closer to site (closer than Rocky Mts. e.g. Irving)				Upgradient/downgradient			
					Containment							
					Subsidence							
					Monitored natural attenuation							
					Leak							
					Off-site treatment							
					On-site treatment							
					Third party landfill - capacity to take only partial volume (Greenfield)							

Strategy Table (example)

Focus Decisions → Strategic Themes ↓	What is the pace of progression to complete remedial end point?	What is the optimal spend profile?	What is the end land use / end goal?
Greatest Regulatory Certainty 	0-5 Years (Accelerated) 	Bi-modal 	Industrial 
Maximum Capital Efficiency 	5-10 Years (Base Case) 	Front end load 	Parkland / Industrial/Municipal Reserve 
Maximize Opportunity for Divestment /Asset Value 	10-25 years 	Tail end	Light Industrial 
Lowest Feasible Annualized Effort 	>25 Years (Risk Managed) 	Even spend 	Commercial 
Most Adaptable / Flexible 		Normal Distribution 	Municipal Reserve
Maximize Social Licence 			Parkland 
Maximize Opportunities for Partner Alignment 			Status Quo / NRI Natural resource Industrial District
			Combination of above

Strategic Themes



No.	Theme Name	Description
1	Greatest Regulatory Certainty	Excavate and dispose of all impacted soils, 3 rd party landfill. Reclamation certificate.
2 A	Maximum Capital Efficiency	Onsite treatment – froth floatation, thermal desorption. Risk manage chlorides. Letter of comfort/remediation certificates.
B		Onsite treatment – froth floatation, aeration. Risk manage chlorides. Letter of comfort/remediation certificates.
C		Onsite treatment – soil mixing, aeration. Risk manage chlorides. Letter of comfort/remediation certificates.
3 A	Maximize Opportunity for Divestment	<i>*Purpose built landfill. Risk manage chlorides. Letter of comfort/remediation certificates.</i>
B		Purpose built landfill. Risk manage chlorides. Fill in South Pond. Letter of comfort/remediation certificates.
4	Lowest Feasible Annualized Effort	Maximize risk management, no regulatory closure.
5	Most Adaptable/Flexible	Slow-paced excavation and disposal of hydrocarbon and sulphur-impacted soil. Risk manage chlorides. Letter of comfort.
6	Maximize Social Licence	Combination of excavation and disposal, in-situ thermal and electrokinetics. Reclamation certificate.

Criteria

Economic Criteria	Workshop Weights (%)
Partner acceptance of cost and schedule	10
Spend profile / timing	3.5
PV capital and operating costs	10
Cost certainty / risk of cost variance	8
Present value of benefits	2
Net savings resulting from R&D	1
Regulatory effort required	3.5
Groundwater and Industrial run-off management during remediation	2
Total	40%

Environmental Criteria	Workshop Weights (%)
Residual environmental liability	10
Impacts/benefits to aquatic ecosystems/habitats (wetlands etc.) after remediation	0.7
Fresh Water Usage (re-use/treatment) during remediation	0
Amount of waste created	0
Soil conservation	2
Land use requirement	0
Probability of further migration of contaminants	2.5
Criteria air pollutants (VOCs)	0.7
Criteria air pollutants (PM10 & PM2.5)	0.7
Greenhouse gas emissions	1
Probability of environmental incidents	2.5
Total	20%

Criteria



Social Criteria	Workshop Weights (%)
Regulatory acceptance probability	10
Probability of onsite health and safety incidents	2
Probability of offsite health and safety incidents	2
Odour	1.2
Public nuisance (traffic)	1.2
Noise	1.2
Media attention	0
Probability of positive public perception of theme	1
Job Creation	0
Ability to develop new industry standards	1.2
Total	20%

Technical Criteria	Workshop Weights (%)
Partner acceptance (technical)	10
Proven and viable remediation technology	3
Technology availability	1.3
Availability of expertise	0
Guideline/ endpoint certainty / risk	3
Timeline certainty / risk	1.3
Flexibility (technical only)	1.3
Seasonality	0
Total	20%

MCDA Results



Economic

Environmental

Social

Technical

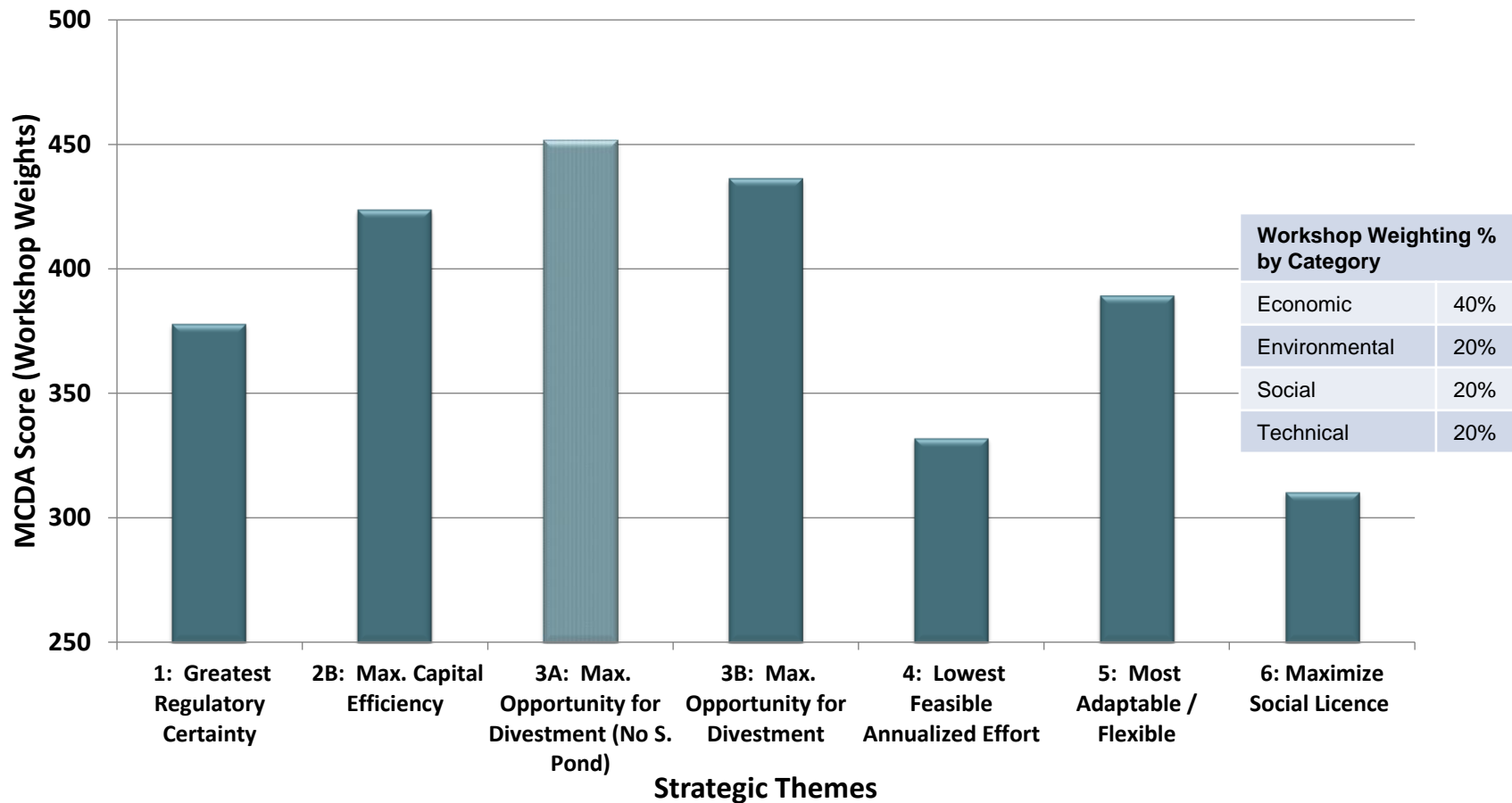
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MCDA Results

Workshop Weightings

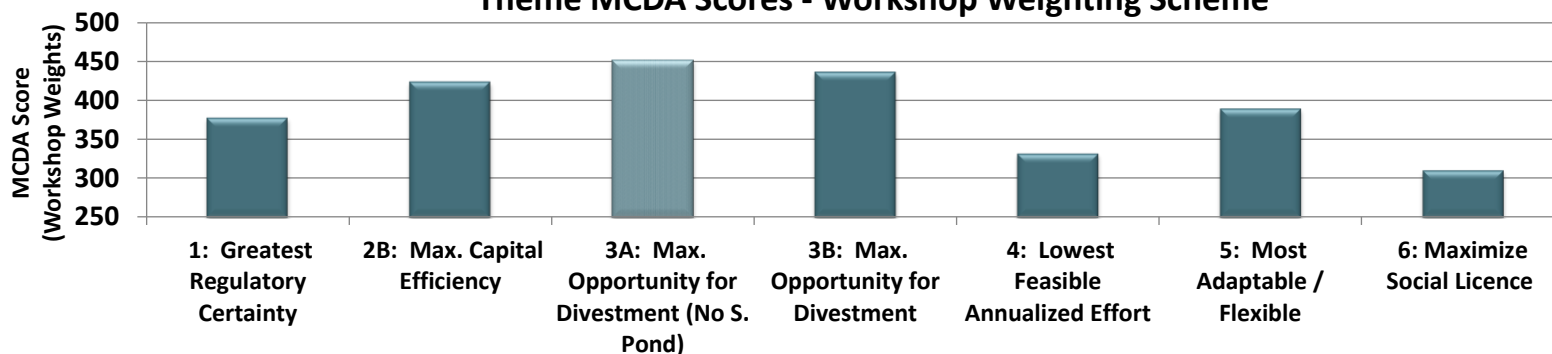


Theme MCDA Scores - Workshop Weighting Scheme



Key Trade Offs

Theme MCDA Scores - Workshop Weighting Scheme



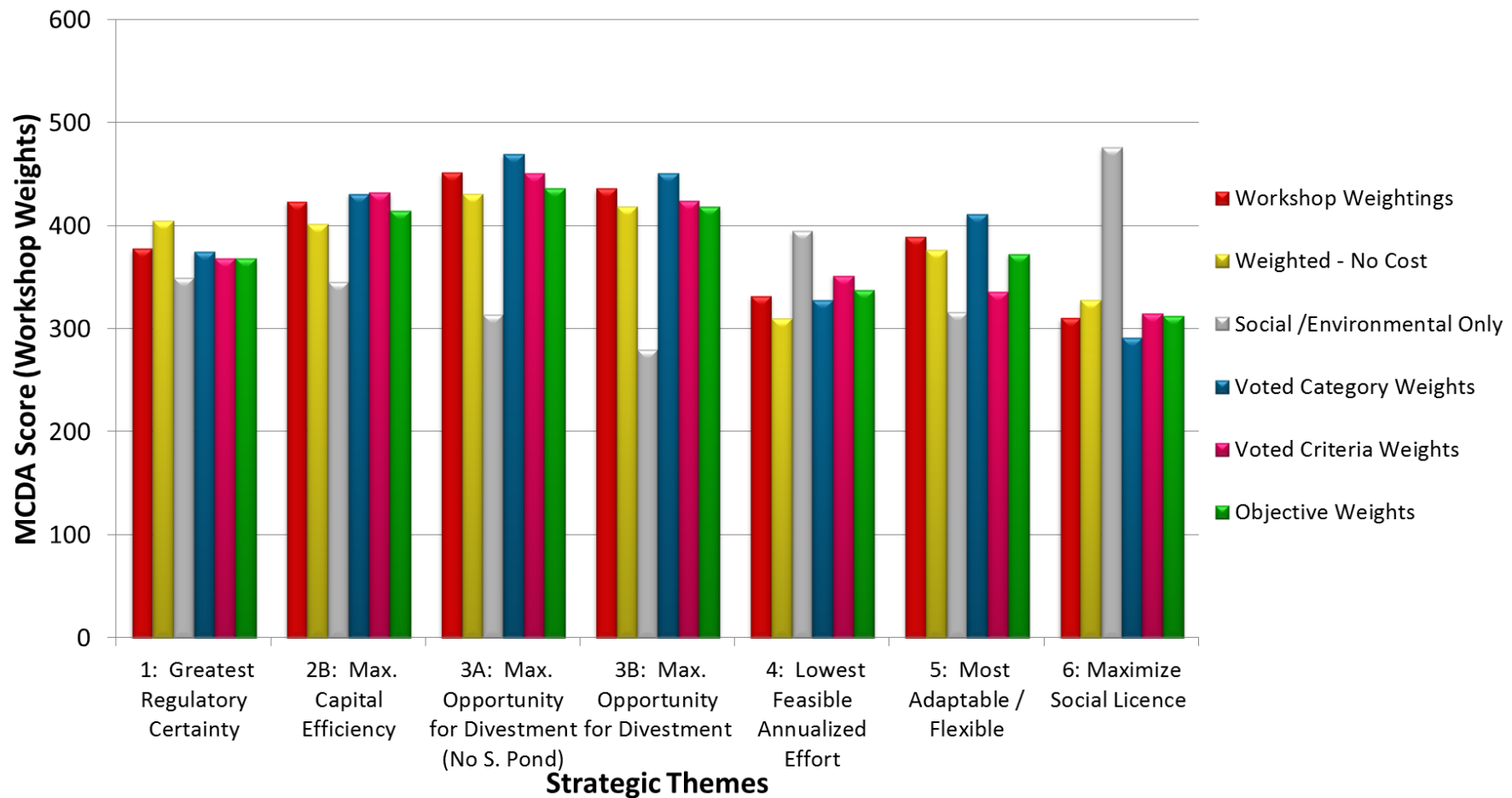
Themes	1	2B	3A	3B	4	5	6
Significant benefits	<ul style="list-style-type: none"> Unit Cost Certainty Regulatory Effort Required Residual liability Regulatory acceptance Proven & viable tech, expertise 	<ul style="list-style-type: none"> Spend profile PV Capex/Opex Partner acceptance (cost) Soil conservation Partner acceptance (technical) 	<ul style="list-style-type: none"> Proven & viable tech, expertise PV Capex/Opex Unit Cost Certainty Partner acceptance (cost) Partner acceptance (Technical) 	<ul style="list-style-type: none"> Unit cost certainty PV benefits Partner acceptance (cost) Proven & viable tech, availability, expertise Partner acceptance (technical) 	<ul style="list-style-type: none"> Spend profile Probability of enviro incidents, offsite H&S incidents Odour Public nuisance Noise 	<ul style="list-style-type: none"> Proven & viable tech, availability, expertise Timeline certainty Partner acceptance (technical) Spend profile PV Capex/Opex 	<ul style="list-style-type: none"> PV benefits Benefits to aquatic ecosystems Further contaminant migration probability Probability of enviro incidents Regulatory acceptance
Significant Risks	<ul style="list-style-type: none"> Spend profile PV Capex/Opex Partner acceptance (cost) Probability of enviro/H&S incidents Partner acceptance (technical) 	<ul style="list-style-type: none"> Unit cost certainty VOCs Odour Further contaminant migration probability Probability of onsite H&S incidents 	<ul style="list-style-type: none"> Regulatory effort required Regulatory acceptance Probability of onsite H&S incidents Soil conservation Probability of positive public acceptance 	<ul style="list-style-type: none"> Regulatory effort required Impacts to aquatic ecosystems Soil conservation Regulatory acceptance Probability of enviro/H&S incidents 	<ul style="list-style-type: none"> PV Benefits Regulatory effort Partner acceptance (cost) Residual liability Regulatory acceptance Partner acceptance (technical) 	<ul style="list-style-type: none"> Unit cost certainty PV benefits Soil conservation Further contaminant migration probability Regulatory acceptance 	<ul style="list-style-type: none"> Spend profile Partner acceptance (cost) Partner acceptance (technical) PV Capex/Opex Unit cost certainty

MCDA Results

All Weighting Schemes



Theme MCDA Scores - All Weighting Schemes

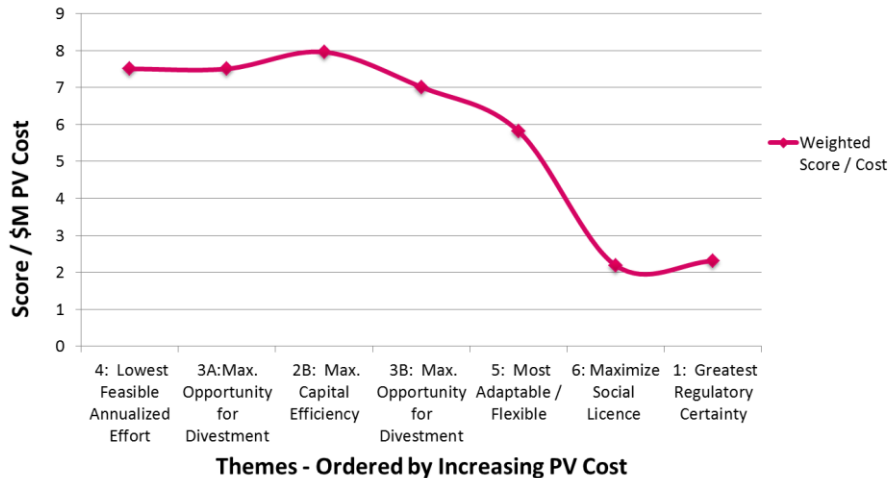


Value Index

MCDA Score vs PV Cost

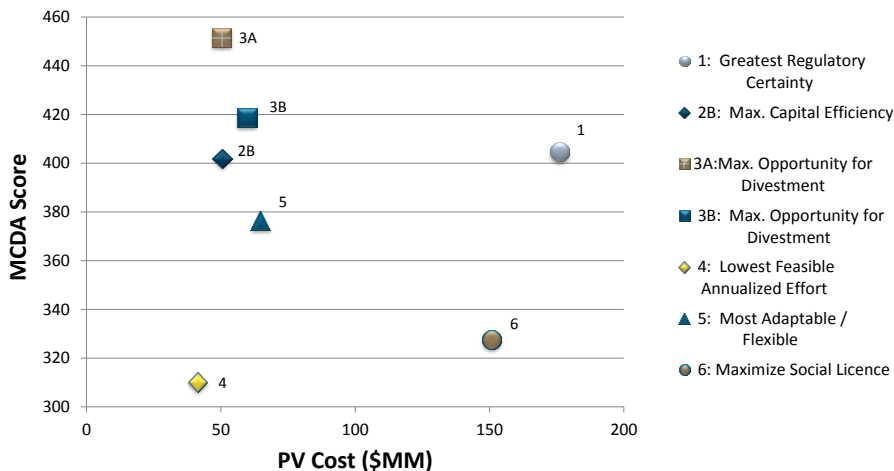


Value Index (MCDA Score vs. PV Cost)



- Charts show value (MCDA score) generated per \$MM of PV cost
- Themes 2B, 3A, 3B and 4 all show high value relative to their cost
- However, Theme 4 is the lowest scoring theme. Themes 2B, 3A or 3B have small incremental cost increases, but will generate large increase in overall value

Weighted (No Cost) MCDA Score vs. PV Cost



Conclusions



- Maximize opportunities for divestment of BGP lands
- 10 year time frame maximum (active remediation)
- Risk manage chloride impacted soils
- Maximize regulatory engagement to align on closure efforts
- End land use will be Industrial

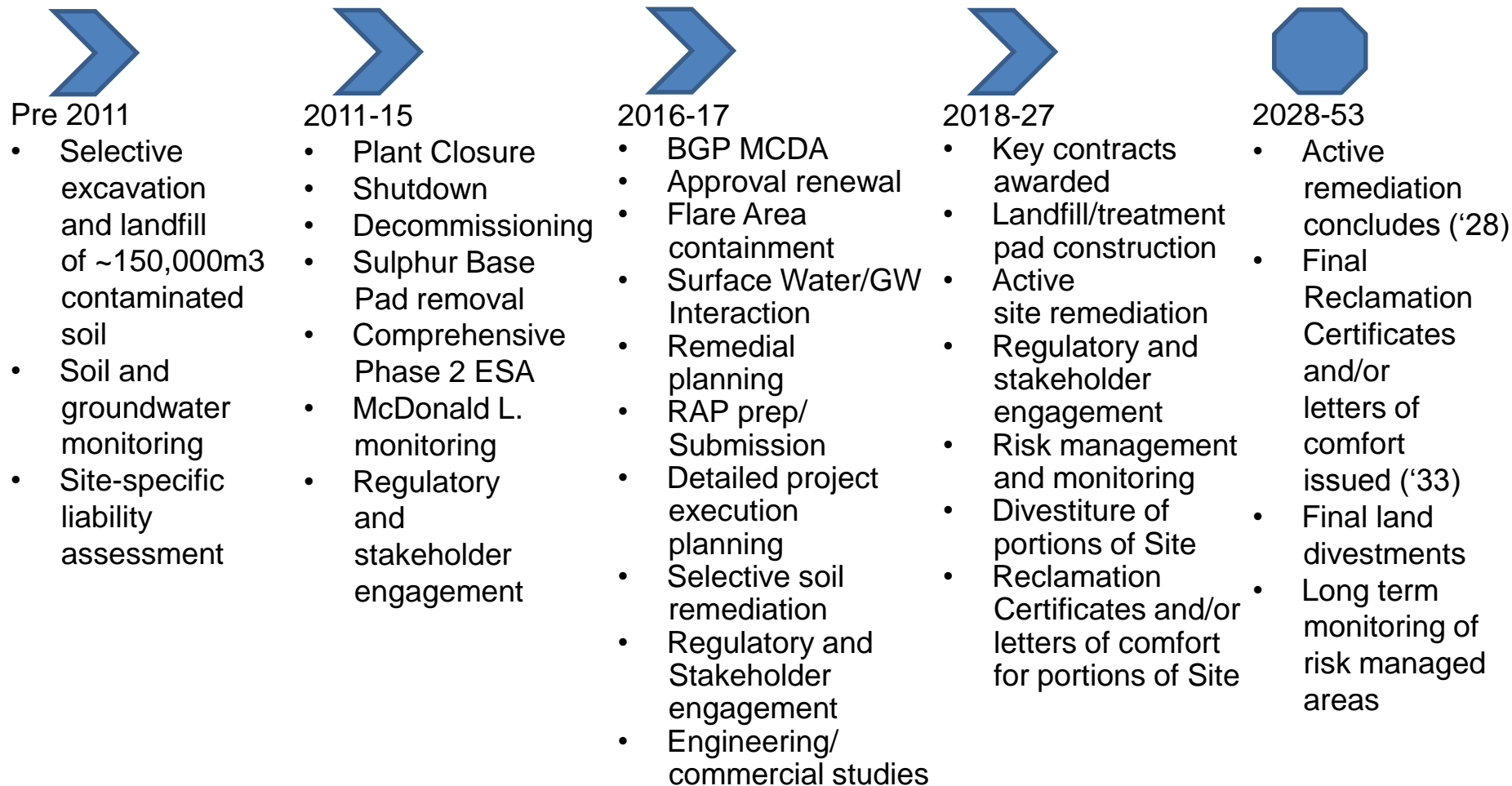
18 Month Road Map

Proposed Activities (MCDA Recommendations)

- Landfill Study
- Froth Floatation Feasibility Study
- Divestiture Investigation
- Remedial Technology Evaluation



Long-Term Road Map



Outcomes



- Partner alignment
- RAP submitted and under review
- Long-term strategy approved by Nexen Executive and Partners
- Informed subsequent long term strategy for BAR Field





QUESTIONS / DISCUSSION



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