Stakeholder value-linked assessment of remedial options: Portland Harbor Superfund Site Sustainability Project (PHSP)

Sabine E Apitz
SEA Environmental Decisions Ltd
drsea@cvrl.org

Co-Authors:
Amanda McNally, AECOM
Anne Fitzpatrick; AECOM (now Geosyntec Consultants)
Deborah A Edwards, ExxonMobil
David Harrison and Conor Coughlin, NERA Economic Consulting

10th International SedNet Conference; "Sediments on the move" 14-17 June 2017
Palazzo San Giorgio, Genoa, Italy

Portland Harbor Superfund Site

- Willamette River; 11 River Miles in Portland, Oregon, US
- USEPA evaluated a range of remediation options
- Proposed Remedial Alternatives
  - Dredge up to 9 million cubic yards of sediment
  - Construction time of 17 years or more
  - Cost up to $4 billion
- Decision process contentious
- **All active treatment results in environmental, economic & social impacts on the river and community**
- ***Objective was to develop a comprehensive and transparent framework to evaluate and communicate trade-offs***

What is Sustainable Remediation?

"the practice of demonstrating, in terms of **environmental**, **economic** and **social** indicators, that the benefit of undertaking remediation is greater than its impact, and that the optimum remediation solution is selected through the use of a ***balanced decision-making process***." (*SuRF– UK)*

EPA Region 10 embraced a trade-off perspective in selecting a preferred remedy

- "We've weighted all the different trade-offs: Certainty, cost, time, impact to community, how much of the contamination is addressed through more aggressive actions or not"…
- "…We think we've found the right balance, *but we want to hear from people*."
  - Cami Grandinetti, EPA Region 10 (June 8, 2016) http://www.oregonlive.com/environment/index.ssf/2016/06/post_48.html

Remedial Alternative	Description	Threshold Criteria		Balancing Criteria				
		Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume through Treatment	Short-Te…		Present Value Cost (Dollars)
	Contaminated Sediment Alternati…							
A	No Action/No Further Action	–	–					NA
B	Dredge/Cap 95 acres; ENR 100 acres MNR 1,966 acres; In-situ 7 acres Ex-situ 234,455 cy; Disposal 66…							$
D	Dredge/C…					◕	◕	$
E				◑	◑	◕	◑	$$
F	L… Ex-… …; Disposal 5,222,800 cy	+	+	◕	◕	◔	◔	$$$
G	Dredge/Cap 756 acres; ENR 19 acres MNR 1,391 acres; Ex-situ 234,455 cy; Disposal 8,432,900 cy	+	+	●	●	○	○	$$$$
I	Dredge/Cap 231 acres; ENR 60 acres MNR 1,876 acres; Ex-situ 234,455 cy; Disposal 1,987,600 cy	+	+	◑	◑	◕	◑	$$

How do we balance trade-offs without numbers?
How do we integrate community values?

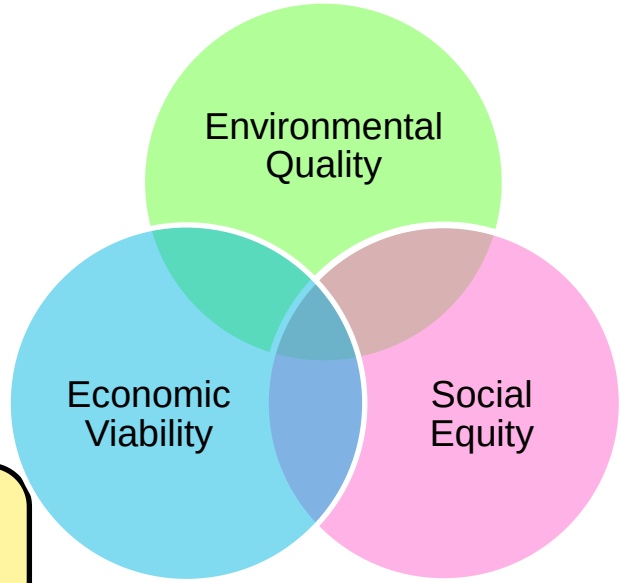
Building a Framework for *Balanced* Decision-Making: Portland Harbor

5 Remedial Alternatives were evaluated for their sustainability by integrating EPA FS data into innovative tools:

1. **Environmental** Impacts were evaluated using CERCLA-linked Net Environmental Benefit Analysis (NEBA), SiteWise™ and GIS tools

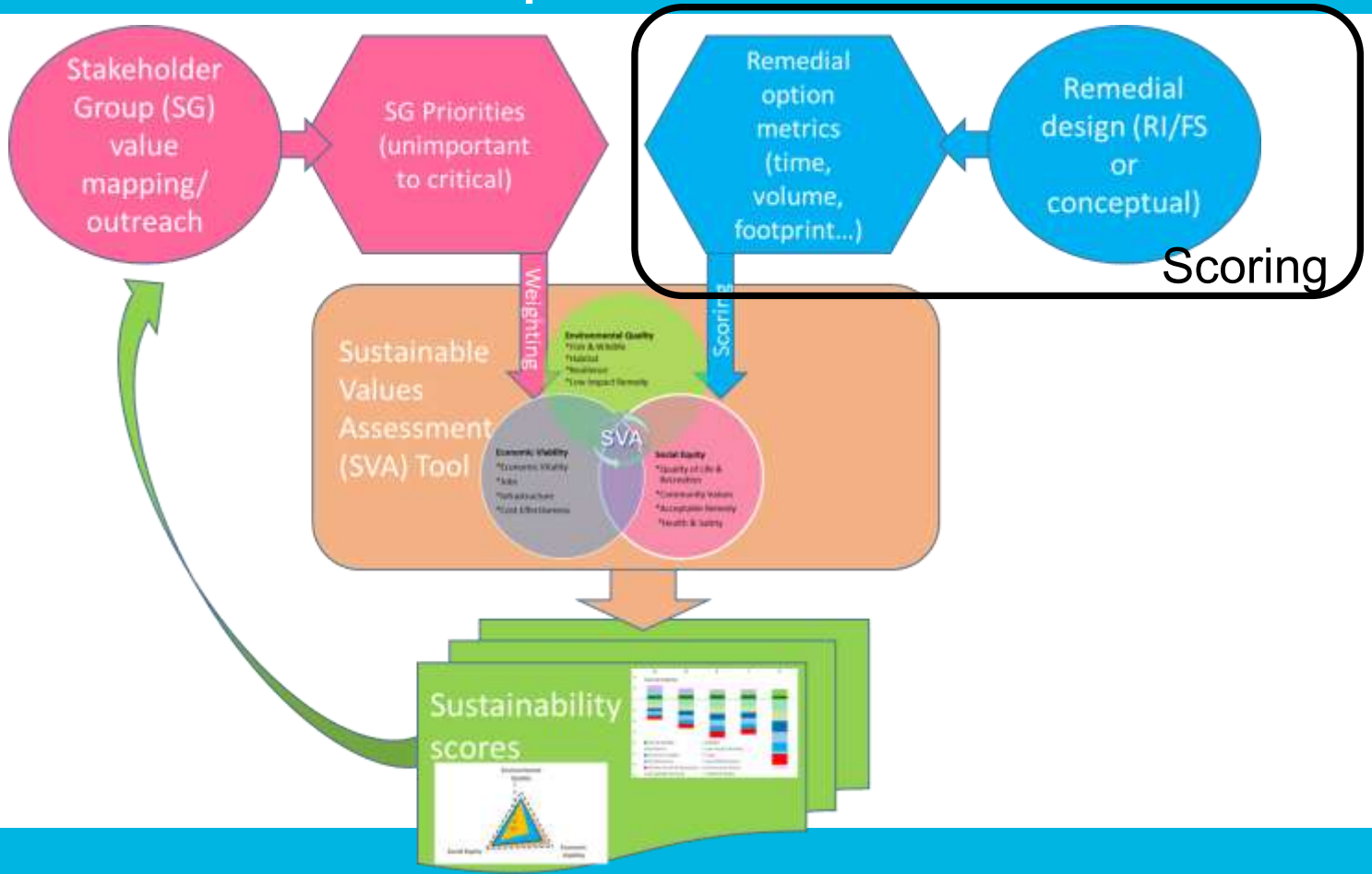
2. **Economic** Impacts were evaluated using dynamic, regional economic impact analysis with state-of-the-art REMI Model, stakeholder outreach and cost-effectiveness considerations

3. **Social** sustainability was evaluated using the Sustainable Values Assessment (SVA) Tool to integrate environmental, economic, and social metrics into stakeholder values-based sustainability assessment



Three Pillars of Sustainability

Sustainable Values Assessment (SVA) Tool links sustainability metrics to Stakeholder Group Values



What do Stakeholders Value When Considering Remedial Options?

- Values identified for each pillar
- "Translate" technical assessments into key stakeholder issues
- These terms are used to aggregate metrics and assess remedial options in terms of stakeholder values
- This provides a basis for the balancing of disparate risks and benefits

Stakeholder values in terms of **environmental quality**, **economic viability** and **social equity**

How can we quantify impacts to these values?

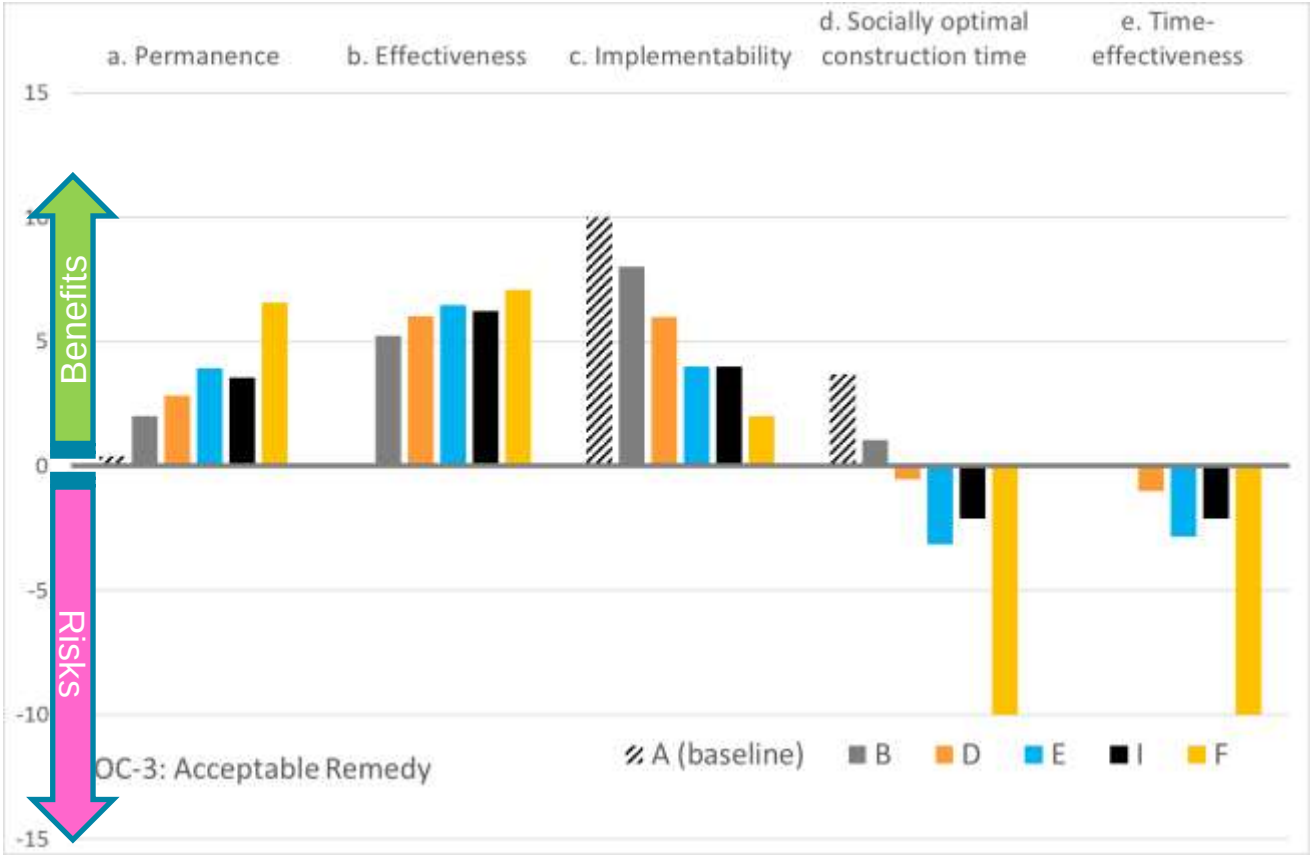
Environmental Quality		
Value	Label	Metric
Fish & Wildlife	ENV-1a	1a. Residual risk, T0
	ENV-1b	1b. Downstream risk
	ENV-1c	1c. Reliance on controls
	ENV-1d	1d. Construction risk
	ENV-1e	1e. Residual Risk, T45
Habitat	ENV-2a	2a. Nearshore habitat
	ENV-2b	2b. Benth
	ENV-2c	
Resil-		
Low Impact Remedy		consumption
		4d. Hazardous landfill use
	ENV-4e	4e. Non-hazardous landfill use
	ENV-4f	4f. Volume of sediment
	ENV-4g	4g. Contaminant mobilization

Economic Viability		
Value	Label	Metric
Economic Vitality	ECON-1a	a. Economic (long-term)
	ECON-1b	b. Economic (short-term)
	ECON-1c	c.Tourism
	ECON-1d	d. Re
bs		
		d.River infrastructure
	ECON-3e	e. Navigational channel
Cost Effectiveness	ECON-4a	a. Capital cost
	ECON-4b	b. Long-term cost
	ECON-4c	c. Cost-effectiveness (T0)
	ECON-4d	d. Cost effectiveness (T45)
	ECON-4e	e. Net environmental benefit

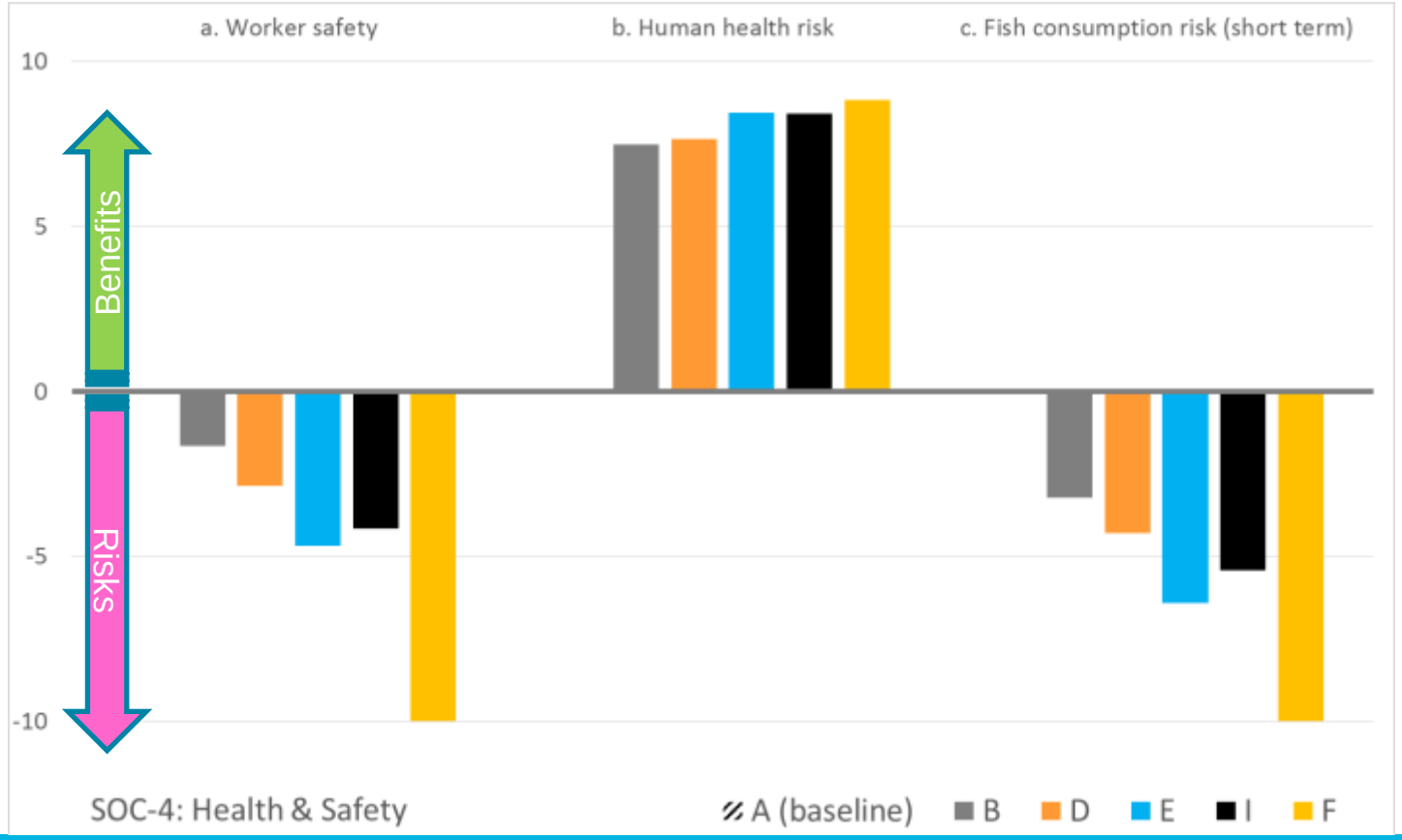
Social Equity		
Value	Label	
of on	SOC-1	
		volvement
		e-use
Co	SOC-2c	c. Communication of uncertainty
	SOC-2d	d. Archaeological sites
Acceptable Remedy	SOC-3a	a. Permanence
	SOC-3b	b. Effectiveness
	SOC-3c	c. Implementability
	SOC-3d	d. Socially optimal construction time
	SOC-3e	e. Time-effectiveness
Health & Safety	SOC-4a	a. Worker safety
	SOC-4b	b. Human health risk
	SOC-4c	c. Fish consumption risk (short term)

- Metrics scored in Sustainable Values Assessment (SVA) tool – (-10 to +10 for undesirable to desirable impacts)
- **Scored based upon data in EPA FS**

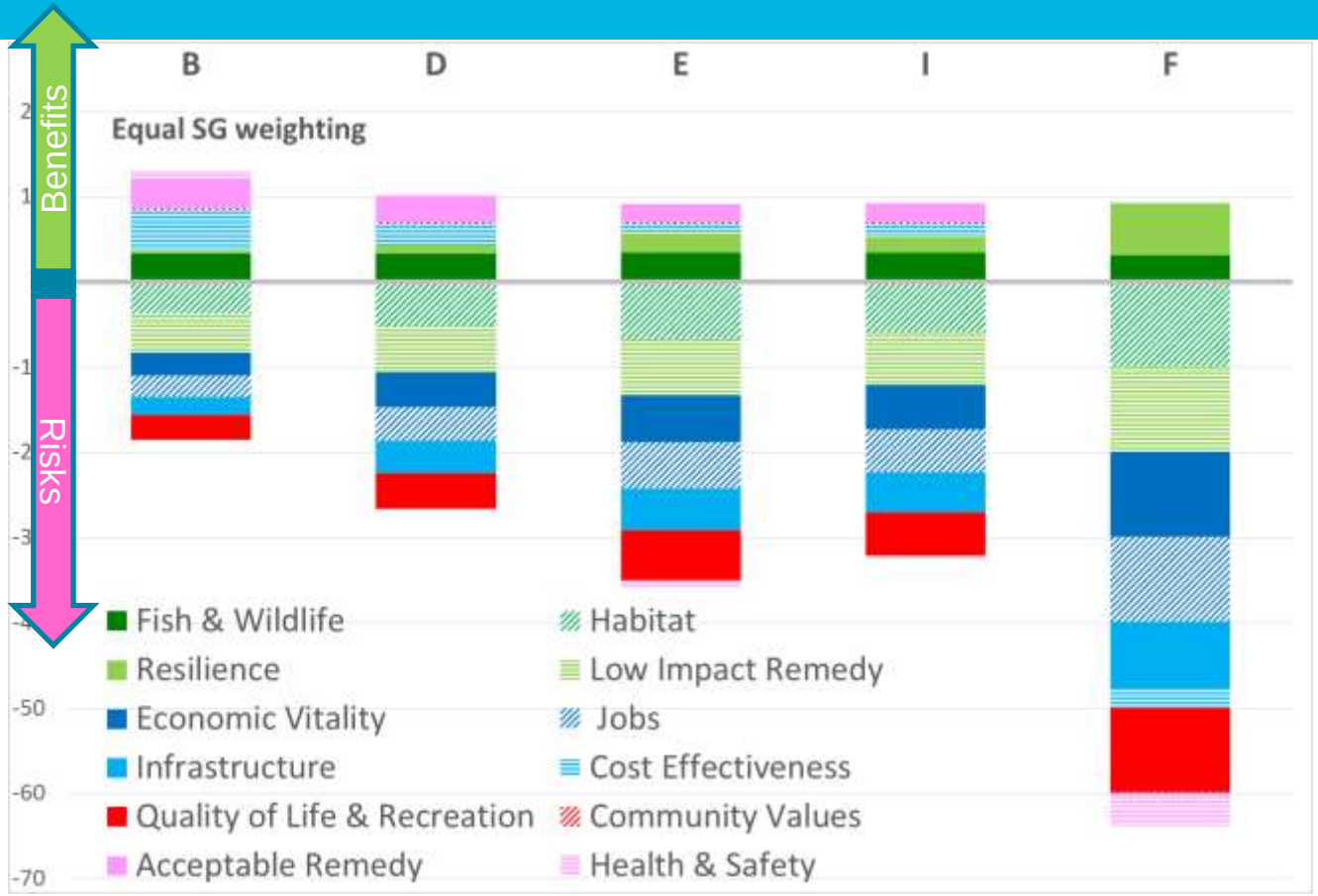
Example option metric scores: Acceptable Remedy (SOC-3)



Example option metric scores: Human Health & Safety (SOC-4)



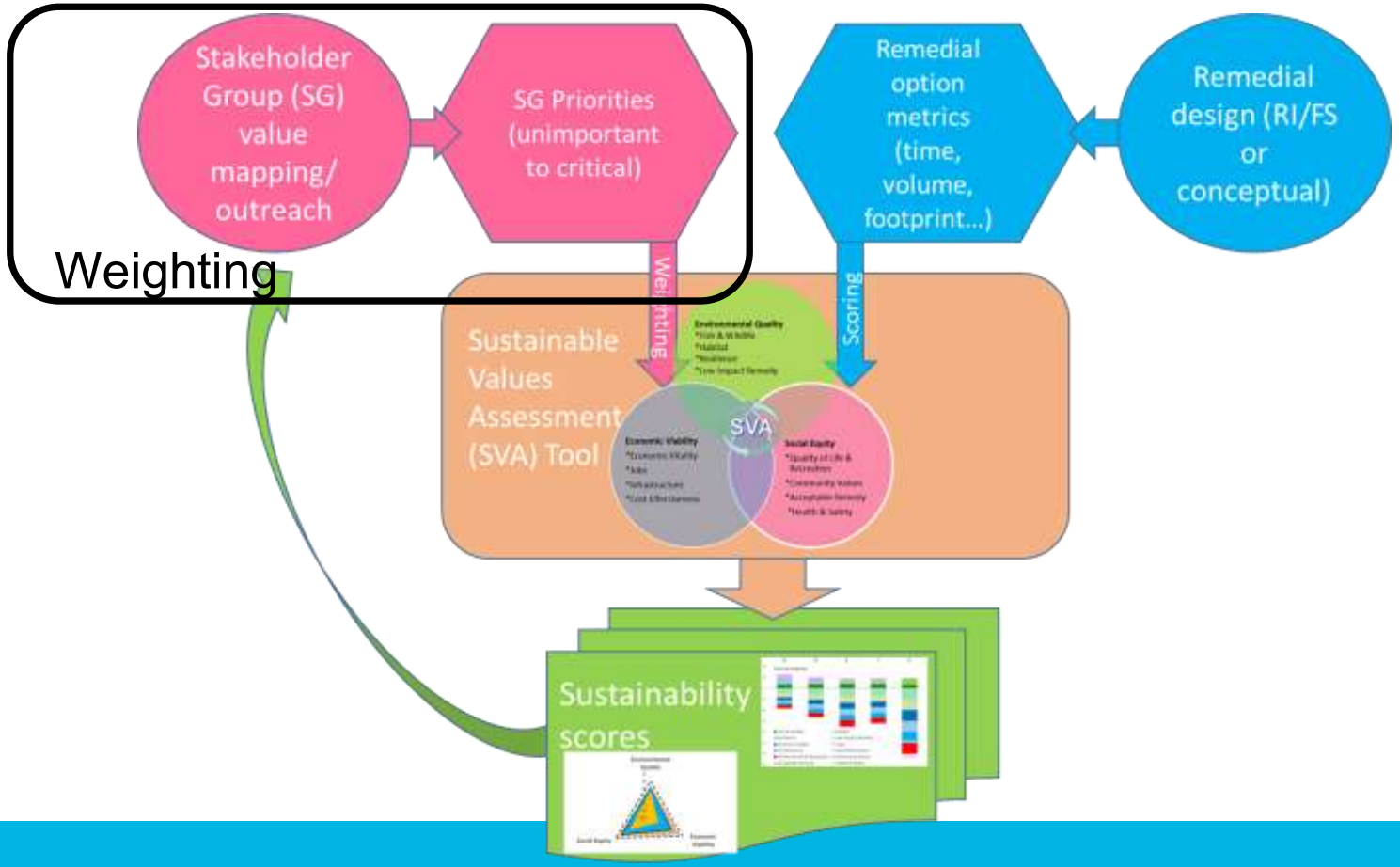
Aggregated Value Scores for Remedial Alternatives



Stakeholder Group Priorities: Finding Balance

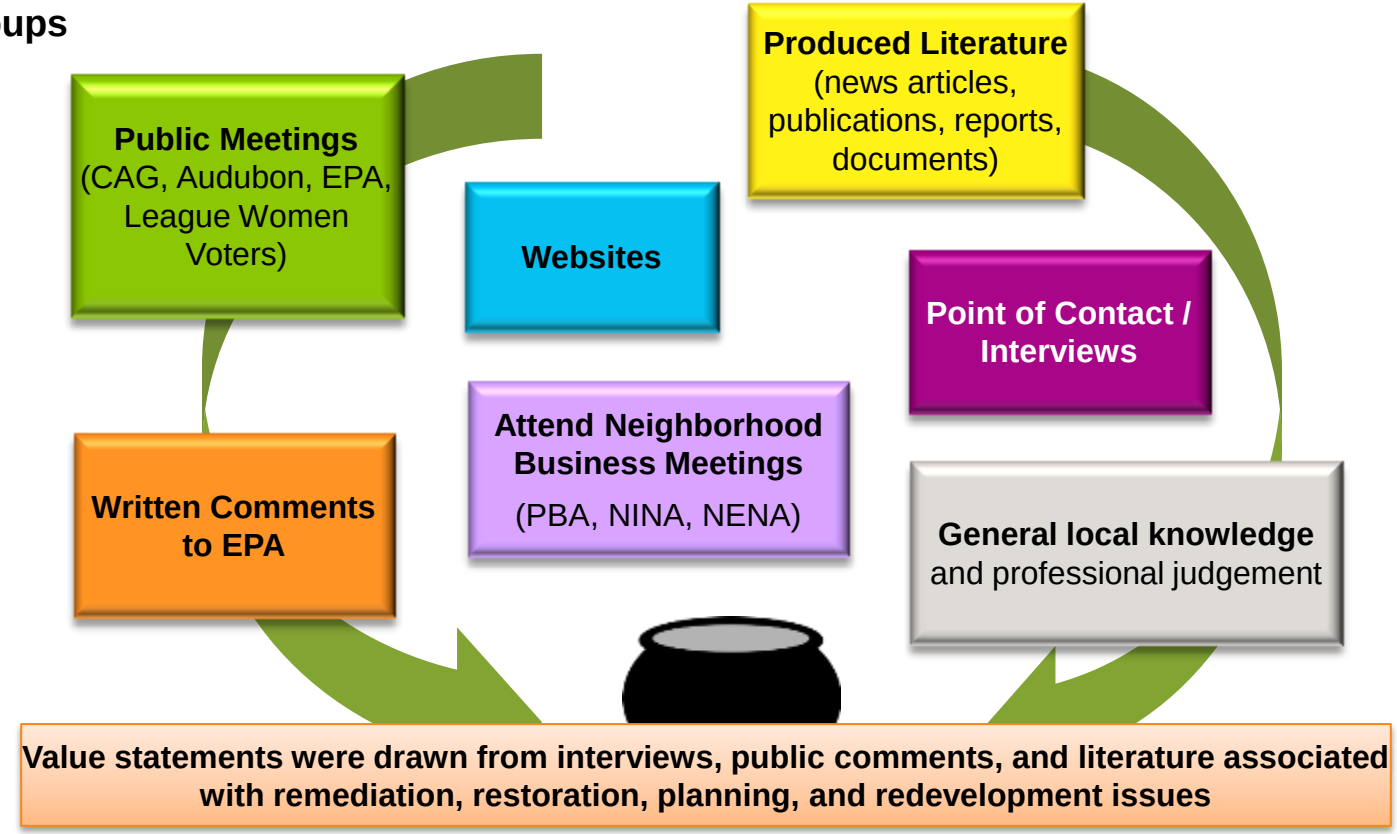
- There are a diversity of voices in Portland
- Values and metrics can be weighted based upon the priorities and values of different stakeholder groups (SGs)
- Initial assessment carried out with equal weighting to capture diversity
- We identified an illustrative set of “Representative SGs” to weight based on differing priorities
  - Community meetings and comments, City survey, Business Groups, Tribal Groups
  - Values and metrics were weighted based upon SG inferred values (0-5 for unimportant to critical)
- The intent was ***not*** to represent ***all*** stakeholders, or to speak for the specific groups, but to ***illustrate*** how relative values are affected when differing priorities are considered

Value and metric scores can be weighted based on stakeholder priorities, adjusting scores based upon community preferences

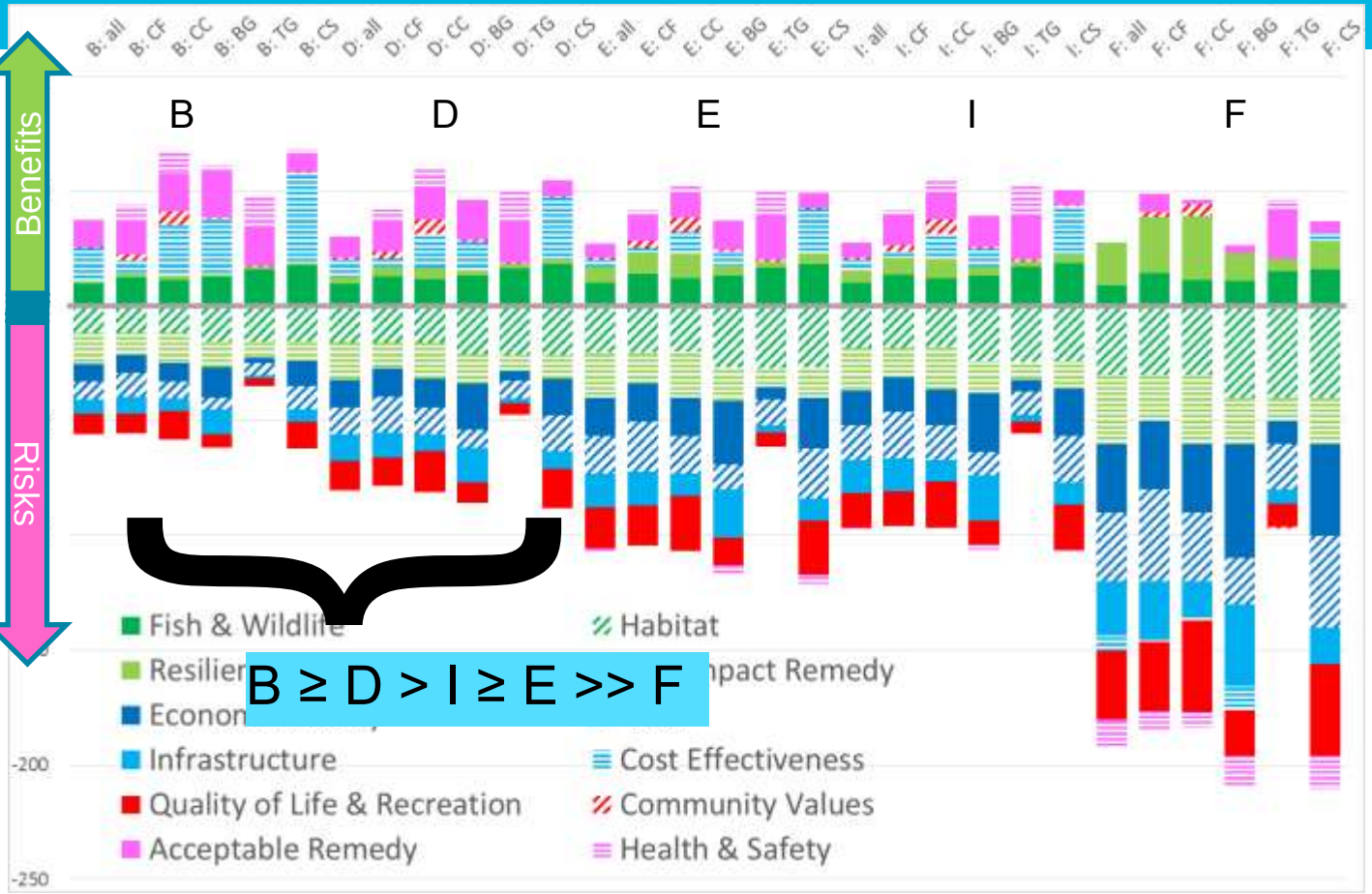


What do Stakeholders prioritize?

Over 280 stakeholder groups (SGs) were identified, including NGOs, community, government, and business groups

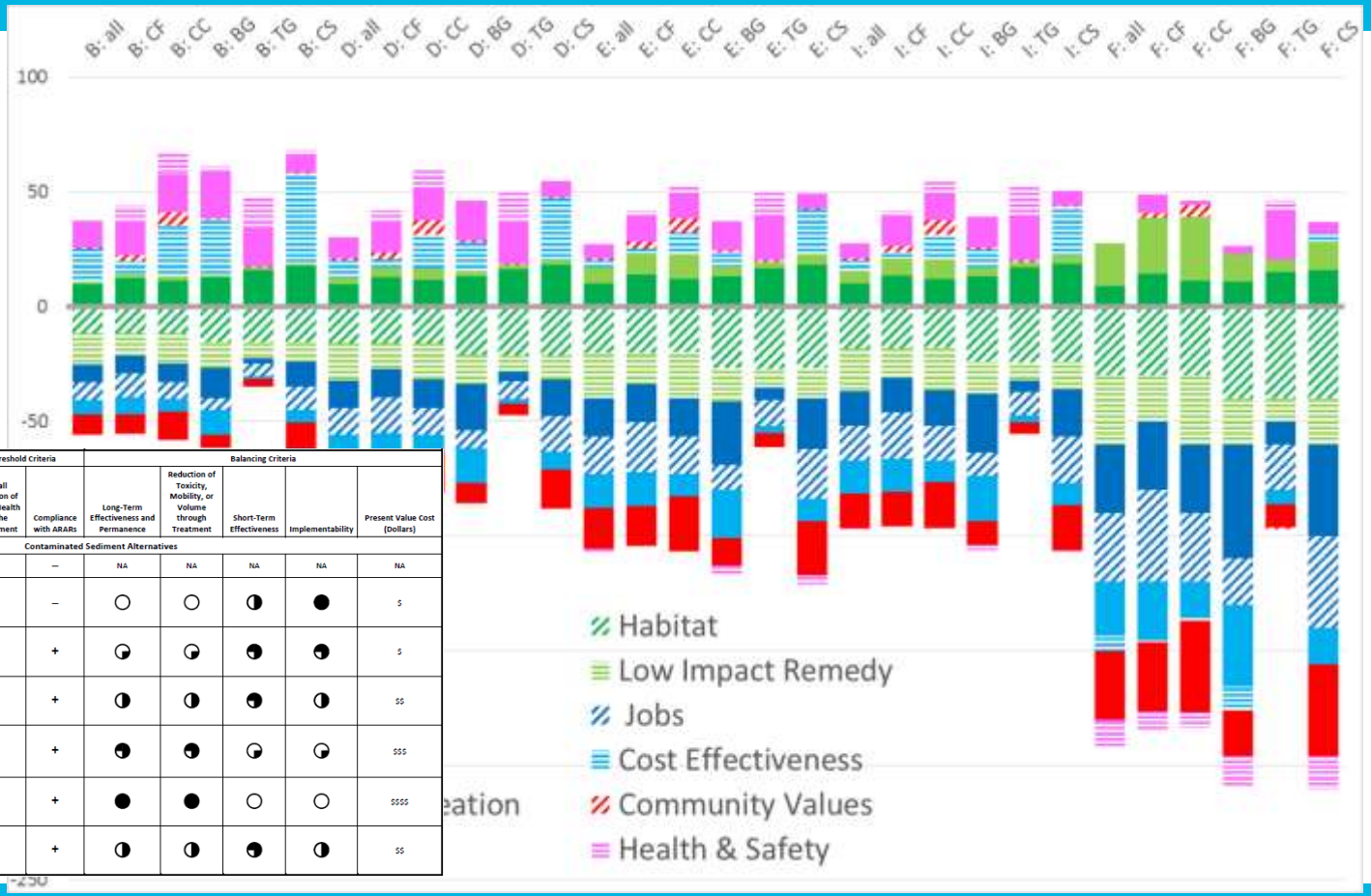


It all stacks up: clear, clear benefits; increasing costs (regardless of SG)



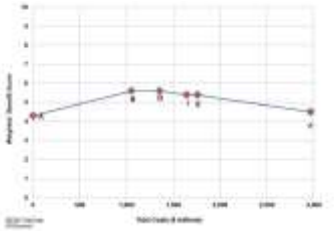
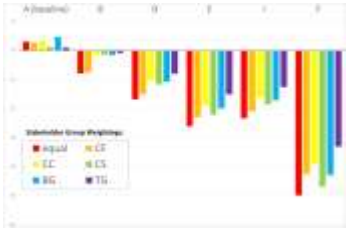
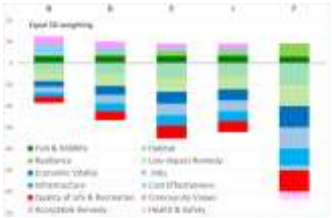
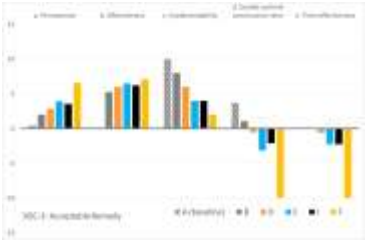
This approach provides a much clearer basis for discussion, but is based largely on the same data sources as the EPA table

Remedial Alternative	Description	Threshold Criteria		Balancing Criteria				
		Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume through Treatment	Short-Term Effectiveness	Implementability	Present Value Cost (Dollars)
Contaminated Sediment Alternatives								
A	No Action/No Further Action	–	–	NA	NA	NA	NA	NA
B	Dredge/Cap 95 acres; ENR 100 acres MNR 1,966 acres; In-situ 7 acres Ex-situ 234,455 cy; Disposal 668,455 cy	–	–	○	○	◑	●	$
D	Dredge/Cap 177 acres; ENR 87 acres MNR 1,900 acres; In-situ 3 acres Ex-situ 234,455 cy; Disposal 1,339,192 cy	–	+	◔	◔	◕	◕	$
E	Dredge/Cap 269 acres; ENR 60 acres MNR 1,838 acres; Ex-situ 234,455 cy; Disposal 2,300,086 cy	+	+	◑	◑	◕	◑	$$
F	Dredge/Cap 505 acres; ENR 28 acres MNR 1,634 acres; Ex-situ 234,455 cy; Disposal 5,222,800 cy	+	+	◕	◕	◔	◔	$$$
G	Dredge/Cap 756 acres; ENR 19 acres MNR 1,391 acres; Ex-situ 234,455 cy; Disposal 8,432,900 cy	+	+	●	●	○	○	$$$$
I	Dredge/Cap 231 acres; ENR 60 acres MNR 1,876 acres; Ex-situ 234,455 cy; Disposal 1,987,600 cy	+	+	◑	◑	◕	◑	$$

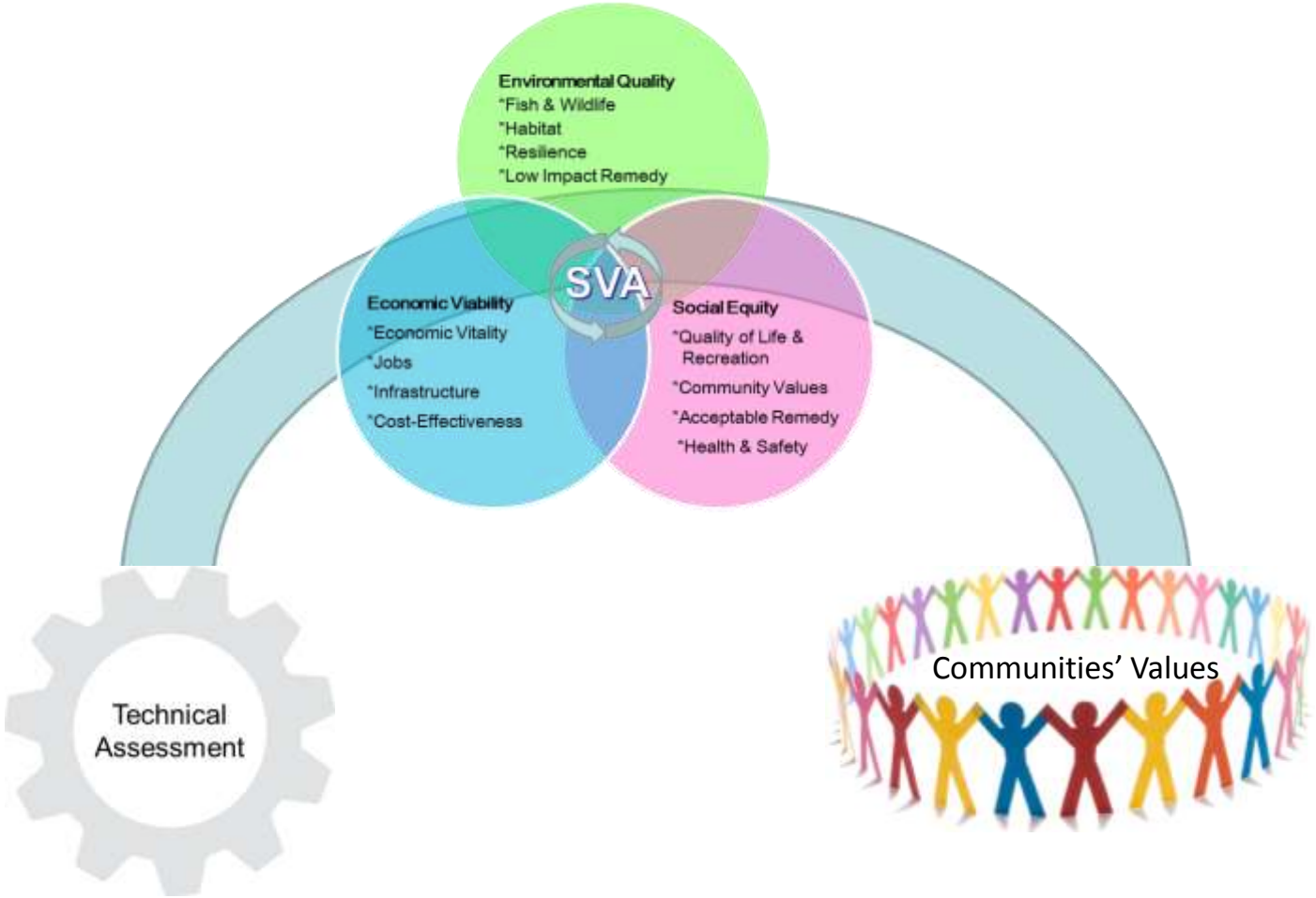


Social Sustainability, summary

- Value scoring is sensitive to diverse stakeholder group (SG) priorities, but rankings are robust
  - Provides a community-based social cost-benefit assessment
- Values-linked analysis identified trade-offs and points of contention, providing a systematic, transparent tool for community (and EPA) engagement
- The tool can be used at other sites and can easily integrate new SG inputs based upon surveys, workshops or other inputs
- Approach can be used to collaboratively build in sustainability, finding the community's "sweet spot"

Sustainable Values Assessment provides a bridge…



Thank You

Contributing authors:

Sabine E. Apitz, PhD, SEA Environmental Decisions Ltd (drsea@cvrl.org)

Conor Coughlin, NERA Economic Consulting (conor.coughlin@nera.com)

Deborah A Edwards, PhD, ExxonMobil (deborah.a.edwards@exxonmobil.com)

Anne Fitzpatrick, LHG, AECOM (now at Geosyntec; AFitzpatrick@Geosyntec.com)

David Harrison, PhD, NERA Economic Consulting (david.harrison@nera.com)

Amanda McNally, PE, AECOM (amanda.mcnally@aecom.com)