

## SURF Metrics Toolbox – Remedy Selection

Parameter	Objective	Metrics	QN, QL	EN, S, EC	Data Source(s)*	Implementation Guidance and Comments	External Benefits	Challenges
Element: <b>Alternatives Analysis</b>								
Consumables	Select minimum-essential materials.	Environmental impacts**	QN	EN, EC	Conceptual design estimate, experience, and estimation resources	Because consumables are often a significant contributor to impacts, include life-cycle impacts from raw materials, manufacturing, energy, and transportation.	Incrementally reduces generation (EN, EC).	Emission factors may not be available for all consumables.
	Select minimum-essential transportation options.	Air emissions and worker hours	QN	EN, S		Use transport distance to estimate energy and worker hours.	Incrementally reduces generation (EN, EC).	Shipment distances can be difficult to predict.
	Select minimum-essential energy needs.	Energy use	QN	EN		Evaluate the availability of alternate energy sources and more detailed evaluation in design phase.	Enhances demand for alternate energy sources (EN, S, EC).	--
Physical disturbances and disruptions	Minimize traffic, odor, and noise.	Vehicle trips and volatile organic compound emissions	QN, QL	S	Conceptual estimate of deliveries and solid waste disposal volume	Model volatile organic compound emission estimates.	Supports social/community values (S).	Noise and odor are difficult to quantify.
Land stagnation	Maximize future land use and area.	Type of future use and area	QN	S, EC	Remedial objectives	Match with local planning.	Enhances community integrity, quality of life, and local economy (S).	--
	Minimize timing to achieve future use.	Time to achieve future use			Conceptual design, experience	--	Serves as catalyst for cohesive development (EC).	--
Air impacts	Minimize air emissions.	Air emissions	QN	EN, S	Conceptual design scope, experience, and estimation of resources	Determine on-site and off-site transportation electricity and fuel consumption, and compare to more efficient transportation (e.g., rail, larger trucks)	Incrementally reduces emissions (EN).	Determining air emissions from offsite power generation (hydroelectric versus coal versus nuclear)
Water impacts	Select minimum-essential water use and discharge.	Volume, biochemical oxygen demand, suspended solids, and toxicity	QN	EN	Conceptual design estimate and experience	Reuse water on-site as permissible to reduce potable water demand. Identify water efficiencies for design, construction, and operations and maintenance.	Makes water available for other, more productive uses (S). Reduces energy used for municipal water treatment prior to use (EN, EC).	Treatability tests are may be needed to refine impacts.

**Notes:**

\* Data sources in this table support predictive sustainability analyses conducted before remedial implementation. SURF is developing guides for post-implementation assessments ([www.sustainableremediation.org/library/guidance-tools-and-other-resources](http://www.sustainableremediation.org/library/guidance-tools-and-other-resources)) to support evaluation of in-place remedies and scoping of bid documents, technical specifications, and operation and maintenance plans to ensure that necessary data are collected for future evaluation.

\*\* Environmental impacts: air emissions (global warming potential, nitrogen oxides, sulfur oxides, particulate matter, toxics), water demand, and waste generation

QN = quantitative                      S = social  
 QL = qualitative                      EC = economic  
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Solid waste	Maximize recycle and reuse waste.	Total recycle mass	QN	EN	Waste characterization data.	Identify opportunities for on-site soil reuse or off-site material recycle. .	Incrementally reduces waste generation (EN, S).	Additional time may be required to determine amount of recycled materials.
	Minimize off-site disposal.	Air emissions and highway miles	QN	EC, EN	Conceptual design estimates and waste disposal options, including transport.	--	Minimizes impact to the community near the receiving landfills (S).	Impacts due to construction and operation of the disposal facility are difficult to predict.
Job creation	Align with community land use and re-development.	Space available for commercial development or recreation	QN	S, EC	Economic development plan, economic and/or marketing analysis	Alternatively, use area as predictor for benefit.	Supports local economic growth and job creation (S, EC).	Predicting job creation and quality of life from future use acreage can be difficult.
Remediation labor	Determine minimum-essential labor.	Occupational exposure hours	QN	S	Conceptual design estimate	Reduce the potential for unsafe acts and conditions by increased safety focus and tools in the design and construction phases.	--	Additional training, communication, and a potential shift in safety cultures are necessary (e.g., focus on behavior-based safety).

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