7. Stakeholder Perspectives

Stakeholders are individuals and/or members of environmental organizations, community advocacy groups, or other citizens' groups that deal with environmental issues. Stakeholder perspectives incorporate cultural, historical, and other community-based values, as well as technological concerns. Contamination at complex sites damages resources that belong to both current and future generations, and stakeholders are usually concerned that it be remediated to the extent practicable.

The obligation to future generations is particularly strong among tribal stakeholders. Tribal stakeholders include Native American tribes, Alaska Natives, and Native Hawaiians. These stakeholders share many of the same concerns as other public stakeholders, but they also may have government-to-government relationships with federal, state, and local governments.

Engaging stakeholders early in the site decision-making process can benefit the management of a complex site. When they share in the decision-making process, public and tribal stakeholders are more likely to feel invested and involved in the site characterization and may be more likely to support the proposed cleanup. Some case studies also indicate that effective stakeholder engagement can help reduce the cost of remediation and long-term management.

7.1 General Stakeholder Expectations

Stakeholders—as individuals, members of environmental or community advocacy groups, and participants in official advisory bodies—are the ultimate beneficiaries of environmental remediation activities. Furthermore, tribal stakeholders have additional concerns as custodians of ancestral lands and shared resources. Complex sites often contain hazardous substances that pose a risk to health, a threat to property, and a danger to resources. While it may be impractical to remove or destroy all hazardous substances at complex sites, stakeholders generally expect the following:

- Responsible parties, regulators, and others who engage in the investigation and remediation of hazardous waste have an obligation to reduce the toxicity, mobility, and volume of waste to the extent practicable.
- As with initial remediation decisions, assessing when to transition to long-term management and a passive remedy should be based upon characterization using the latest applicable technologies.
- Innovative remedial technologies should be considered in all phases of the remediation process.
- All exposure pathways to hazardous substances that have been released into the environment should be eliminated.
- Decision-makers should include active components in every remedy, unless it can be shown that a passive remedy such as MNA or an engineered remedy such as permeable reactive barriers can achieve an equivalent reduction in contaminant concentrations in a similar time frame when compared to a more aggressive remedy.
- Remedies that operate for long time frames require a robust system of long-term management, and the cost and other challenges of long-term activity should be evaluated when considering initial remedies.
- Those who make remediation decisions should view public stakeholders and tribal representatives as partners in site remediation, from the initial identification of a contaminated site until the site is deemed fit for unlimited use and unrestricted exposure. In some circumstances, sites must be managed in perpetuity, and the role of public and tribal stakeholders should be incorporated into decisions about the site.
- Complex sites should be evaluated to determine whether the remedial design and objectives were based upon an adequate characterization and a valid conceptual site model. Finding and controlling sources reduces remediation time frames, as well as cost of remediation.
- Cost alone should not be the determining factor in classifying whether a site is complex or is subject to an alternative decision-making path.
- The remediation of complex sites should use sustainable, energy- and resource-efficient remedial technologies. Avoiding restoration of resources or delaying remedial goals due to cost or energy consumption is not acceptable, however, because restoring resources is a higher value component of sustainability. See the GSR-2 guidance (ITRC 2011a) for additional information on green and sustainable concepts.
- Long-term management strategies at complex sites must also remove institutional controls as remediation reduces risks, as well as return land and resources to community use. Short of complete cleanup, the remedial goal is to restrict exposure hazards only to the source areas where continued site management operations

occur.

7.2 Stakeholder Concerns

Contamination at complex sites not only threatens public health, but also creates stigma, undermines property values, restrains commerce, and endangers cultural practices. At these sites, stakeholders' overarching concern is preventing or mitigating damage to human health, resources, and culture. Specifically, stakeholder concerns can include the following:

- Adequacy of site characterization
- Removal of exposure pathways
- Adequacy of remedy
- Long-term management
- Cost

7.2.1 Adequacy of Site Characterization

Responsible parties and regulators may not have authority to reopen investigations at a site where remediation seems to have stalled or at a site that has already been closed, despite stakeholders' comments that their lives and property were affected by residual contamination. Additional characterization may be justified, however, because of emerging technology and new knowledge of contaminant transport in complex geological and hydrogeological environments. In some cases, stakeholder advocacy for renewed site investigation has resulted in better characterization, leading to modifications to the remedy.

For example, at the MEW Superfund Study Area in Mountain View, California, high-resolution instruments such as the membrane interface probe detected unexpected hotspots of TCE in groundwater two orders of magnitude above the results from conventional groundwater sampling. The detection of hotspots led to subsequent sampling events, pilot studies and the selection and implementation of a final remedy.

Sampling that better resolves geospatial heterogeneity makes it easier to focus new remedial strategies on the groundwater or soil where remediation is needed most or where innovative technologies can be used most effectively. Even where monitored natural attenuation is under consideration (common for complex sites), better characterization makes it possible to evaluate its suitability.

7.2.2 Removal of Exposure Pathways

Stakeholders generally insist on eliminating exposure pathways as the highest priority, before resources such as groundwater or soil are remediated. While parties may argue over acceptable exposure levels or remedies, they agree that without a pathway, there is no risk. For example, during remediation, the public and particularly remediation workers must be protected from hazardous substances. Homes and businesses should thus be provided with alternate water supplies, not just for drinking and cooking, but for showering and other activities likely to create exposures. The alternate water supply eliminates water from the site as an exposure pathway. Where vapor intrusion is likely, mitigation systems can also remove exposure pathways.

Regulators and responsible parties generally agree with stakeholders on this approach. For example, at the MEW plume, USEPA found that the groundwater remedy was not protective because in many buildings, the vapor intrusion pathway was complete. With community support, USEPA developed a separate ROD to prevent vapor intrusion exposures.

Stakeholders are also concerned, however, that the elimination of exposure pathways might be used as an excuse to slow or halt groundwater remediation. Often regulators agree. For example, at MEW, again with public support, USEPA required a reevaluation of groundwater remedies, and the responsible parties are replacing some of their long-operating P&T facilities with in situ technologies to accelerate treatment in many portions of the 1.5-mile plume. At the Lawrence Livermore National Laboratory (LLNL) Superfund Site, four treatability studies are underway that, if applied, will reduce the time needed to reach drinking water standards.

7.2.3 Adequacy of Remedy

Stakeholders are sometimes concerned that complex site attributes such as plume size or hydrogeologic features will constrain the choices for possible site remedies. When changes in the remedial process occur, stakeholders might suspect that, rather than solve complex problems, responsible parties and regulators are instead compromising environmental protections.

Required five-year reviews at superfund sites include the participation of the community to determine if the remedy initially

selected remains protective of human health and the environment. If a remedy has failed or requires revision, public participation in remedy changes may be required. Many state environmental programs also have remedy review requirements that require community and stakeholder participation. Stakeholder participation in five-year reviews is documented in several case studies in this guidance (see NAS Jacksonville, Rocky Flats, Joliet Army Ammunition Plant, Tri-State Mining District and Industrial Site-Australia).

Five-Year Reviews and similar processes may lead to the use of innovative technologies when existing remedies are deemed unprotective, but stakeholders often want the parties to consider using new technologies where existing remedies are simply inefficient—that is, approaching asymptotic behavior in which risk reduction per dollar or unit of time is low—or because a better remedy may be available. Stakeholders are sometimes concerned that complex site attributes such as plume size or hydrogeologic features will constrain the choices for possible site remedies. When changes in the remedial process occur, stakeholders might suspect that, rather than solve complex problems, responsible parties and regulators are instead compromising environmental protections.

7.2.3.1 Remedy Selection

Stakeholders at complex sites may question tools or conclusions that indicate required cleanup cannot be achieved before the remedial responses are put in place. For example, conducting a remediation potential assessment in advance of any remedial action may cause concerns. Stakeholders may consider metrics such as "reasonable" time frames to be subjective or arbitrary, and be concerned that the use of such processes prior to adequate characterization and feasibility studies will fast-track sites directly to long-term management before the threats to human health and the environment are understood. This fast-track approach might result in unacceptable exposures or an over-reliance on institutional controls to prevent exposures, causing the long-term loss of property, resources, and community economic development.

Informed stakeholders acknowledge challenges such as the difficulty of drilling (for example, when developing a remedial design or selecting an advanced characterization technique), but may not consider such challenges enough reason to introduce new steps to the remedy selection process. Stakeholders are more likely to welcome new approaches, such as adaptive site management, where remedies are in place and their effectiveness appears to be diminishing. At most complex groundwater sites in the United States some form of remediation has already been implemented.

7.2.3.2 Passive Remedies

Stakeholders are often concerned about a passive (natural attenuation) remedy because it appears to be a "do-nothing" option and occurs over long time frames (NRC 2001). Passive remedies may win public support if site managers address stakeholder concerns by explaining the mechanisms of attenuation and using advanced monitoring technologies to confirm that exposure is not occurring. Passive remedies are frequently considered at complex sites where aggressive technologies may not yield better or faster results compared with passive remedies.

Despite initial skepticism, stakeholders may support the natural attenuation of metals and radionuclides (ITRC 2010a), particularly when incorporated into more complex treatment trains. Many stakeholders also recognize that natural degradation, in which organisms destroy contamination in the subsurface, is often superior to extraction, adsorption onto carbon filters, and combustion elsewhere. They may be concerned, however, that biodegradation will impair water quality because of bacterial metabolism that changes the geochemistry of the aquifer.

If contamination remains decades after releases first occurred at a complex site, however, stakeholders are likely to question the choice of natural attenuation as a primary remedial strategy. USEPA (1999b) notes that source control measures will be evaluated for all sites under consideration for any proposed remedy, progress will be monitored to determine if degradation is happening as predicted, and more active contingency measures will be implemented if natural attenuation does not meet performance goals.

7.2.3.3 Transition Assessments

USEPA and its state counterparts have policies that determine when transition to a different remedy is required. USEPA's latest document on the subject, *Groundwater Completion Strategy* (USEPA 2014b), states the following:

Modification of the remedy may involve the following activities as further described…

- Evaluate the groundwater's remediation potential.
- Evaluate if the current site objectives can be achieved with other technologies.
- Select an alternate remedial approach, and if necessary, modify the site objectives.
- Conduct technical impracticability (TI) evaluation.

If groundwater remediation or containment is still viable with a different technology or if the site objectives need to be changed, then the selected remedy may need modification.

Since USEPA policies do not include the term "transition assessment," stakeholders are likely to be more receptive to the concept if they hear how it fits into CERCLA or other regulatory frameworks. The National Research Council's section, "Has an asymptote been reached?" (NRC 2013) is a good start. Stakeholders generally agree that it is not worthwhile to spend time, money, and other resources doing little to reduce contamination and risk. They may be unwilling to support turning off even an ineffective remedy, however, if they believe that no effort will be made to replace it.

Stakeholders are generally unwilling to accept transition decisions that they believe are primarily designed to shift costs, in the broadest sense, from those responsible for cleanup to the community. This approach could take the form of institutional controls that restrict land use or long-term monitoring and maintenance that places burdens and risks on the community and its future generations. Where long-term management is slated to become the responsibility of state regulatory agencies, stakeholders may be concerned that the state lacks the will or resources to continue site management until completion.

At large complex sites, stakeholders are likely to question generalized findings that remediation is too difficult for the entire site based upon localized findings. Stakeholders may suggest that separate assessments be applied to different parts of sites, particularly where activity is focused on areas where exposure is most likely, reuse is under consideration, or contamination is greatest.

As noted in USEPA's *Groundwater Completion Strategy* and by the NRC (2013), decisions to waive or modify certain site objectives (termed "alternative cleanup levels") are allowed only after careful evaluation of risk and remediation potential. Where regulators propose to waive or modify site objectives, stakeholders generally support a robust public participation process. For example, at the Lower Duwamish Waterway Superfund Site near Seattle, the public, with the help of a Technical Assistance Grant, questioned a technical impracticability (TI) Waiver proposed by the responsible party. In response, USEPA instead required that the responsible parties continue cleanup for an interim period. USEPA promised the responsible party that it could later apply for a TI waiver if it were shown that cleanup standards could not be met after attempting remediation.

Modifying Cleanup Levels: Duwamish Waterway Superfund Site

If long-term monitoring data and trends indicate that some ARARs-based cleanup levels selected in the ROD after public comment on this Proposed Plan are not met, a waiver of these ARARs could be considered by USEPA in a future decision document (ROD Amendment or ESD). For example, if monitoring shows such levels have reached Sediment Quality Standards (SQS) but have not reached the surface water Preliminary remediation goals (PRGs) or human health and natural background-based sediment PRGs, and USEPA were to conclude that no further action would practicably improve these levels, the ARARs that are not met would be eligible for a TI waiver. Because USEPA cannot know whether and to what extent ARARs for these various levels for different COCs will be achieved, consideration of the potential for such a waiver prior to the collection of monitoring data sufficient to inform any TI waiver decision(s) is neither warranted nor justifiable. (USEPA 2013c)

7.2.4 Long-Term Management

Remedies that depend on long-term remediation require a robust system of long-term management. Costs and other challenges of long-term activity should be evaluated both when considering initial remedies and when conducting a transition assessment. Because complex sites will not achieve the unlimited use and unrestricted exposure end state for decades, long-term management is necessary for both active and passive remediation technologies to manage risk and maintain protectiveness.

Long-term remedies usually require institutional controls (ITRC 2016b). Affected stakeholders generally want the costs and

uncertainties of proposed controls to be evaluated at the time of remedy selection or transition assessment, and they want to take part in that assessment. By definition, ICs limit the use of land, groundwater, or other resources, so stakeholders may be concerned that the cost of controls to the community outweigh the responsible parties' or government's cost of additional remediation. Furthermore, for tribal lands, restrictions may threaten the cultural traditions of the tribe or village. Stakeholders may question the practice of discounting costs over thirty years, because even after thirty years, someone is still responsible for managing sites that have not reached unlimited use and unrestricted exposure.

Stakeholders, including local governments, should be considered equal partners in the development of institutional controls because they are responsible for most future land-use decisions. Furthermore, community members and their local institutions may be the most important monitors of the efficacy of institutional controls, because they are likely to remain near the site long after regulators and responsible parties have ended site activities.

"Orphaned" sites are sites that no longer have a responsible party to pay for a remedy. Minimal financial resources are often used as a rationale for limiting characterization and only performing risk abatement (plume management, monitoring, institutional controls) while leaving large quantities of contamination behind with land use restrictions. Groundwater and surface water adjacent to these facilities may never return to an environmentally safe or usable level and indoor air may also need to be addressed. The public usually insists on stable funding sources to ensure that both institutional controls and engineering controls effectively protect the public in the long run. Where reuse is planned, stakeholders may ask that the parties redeveloping the property take such responsibility. Cities may require that state environmental review laws, such as the California Environmental Quality Act, be used to enforce such requirements (CPEO 2016b).

In some cases, responsible parties have claimed bankruptcy in the face of remediation or even characterization obligations. Regulators often must address these sites with limited budgets that do not allow proper characterization or a full understanding of site complexities. Some hazards, such as releases from undocumented underground tanks, unmeasured soil gas contamination, and unknown groundwater plumes are often only recognized long after bankruptcy settlements. Stakeholders may therefore ask that the court impose robust financial assurances during bankruptcy proceedings to reduce the public's financial exposure and to better protect human health and the environment.

7.2.5 Cost

Stakeholders recognize that satisfactory remediation cannot always be achieved in a reasonable time frame and generally do not support spending unreasonable amounts of time and money to achieve minimal contaminant (and thus risk) reduction. On the other hand, protective site objectives provide incentives for the development and use of innovative remediation technologies as well as the adoption of pollution prevention practices that protect resources.

Stakeholders care about effectiveness, efficiency, and long-term protection, and they want to be sure that cost-saving measures do not simply shift costs onto the public or onto future generations. When responsible parties and regulators work in good faith with community stakeholders to reduce risks and protect resources, while adapting site management using the latest and best remedial strategies and technologies, stakeholders are likely to accept new approaches regardless of the effect on costs.