

**ECONOMIC ANALYSIS OF EPA'S UPDATED SOIL LEAD GUIDANCE FOR SITES
UNDER CERCLA AND RCRA AUTHORITIES**

Submitted by:

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April 2024

EXECUTIVE SUMMARY

The National Mining Association, the Superfund Settlements Project, the RCRA Corrective Action Project, the American Petroleum Institute, and the U.S. Chamber of Commerce asked Policy Navigation Group (PNG) to prepare a partial economic analysis of the U.S. Environmental Protection Agency's (EPA) updated soil lead guidance for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites and Resource Conservation and Recovery Act (RCRA) corrective action (CA) facilities. PNG focused on providing a more accurate social cost estimate than those presented in EPA's economic assessment (EA).

EVALUATION OF EPA'S COST METHODOLOGY

The updated guidance will require soil screening at lead sites under CERCLA and RCRA to a level of 200 parts per million (ppm). Some remedial sites with an additional source of lead will also be subject to a 100-ppm screening level. In its EA, EPA creates a social cost estimate based on incremental costs incurred from additional remediation at existing sites and at additional lead-contaminated sites that will be discovered during, and limited to, an initial 10-year period.

There are two major problems with EPA's analysis that underestimate the social costs. First, EPA does not include all sites that will be affected by this guidance. Second, EPA underestimates the additional remediation cost of each site.

For its cost estimation, EPA's universe of sites that will be potentially affected by the updated guidance is limited to only three categories of CERCLA sites: National Priorities List (NPL) sites; deleted sites; and new (future) sites. Through this approach EPA omits three major groups of CERCLA sites: brownfields, federal cleanup sites, and other non-NPL CERCLA sites that are in EPA's active inventory. There are an estimated 120 to 1,400 additional active inventory sites with lead likely to be in the soil. While EPA argues that brownfields would only be affected by a change to EPA's lead screening levels if states voluntarily change their standard to match OLEM's updated standard, this claim ignores that fact that, whether directly or indirectly, EPA must approve brownfield cleanups and will consider this guidance in that approval process. Given the magnitude of brownfields in the U.S. (approximately 450,000), EPA should develop an estimate of social costs for potentially impacted brownfield sites.

EPA underestimates the cleanup costs per site because EPA does not include the oversight costs EPA charges private parties, the transaction costs private parties have to assign liability and to manage the cleanup, and other construction management costs.

Table ES.1 presents more accurate social cost estimate. EPA's partial analysis of social costs range from an annualized amount (at three percent) of \$190 million to \$580 million per year,

with a midpoint range of \$240 million to \$470 million annually. Our analysis shows that the more accurate number of affected properties is approximately 608,000. The annualized social costs at three percent are between \$6,500 million and \$34,000 million per year (\$6.5 billion per year to \$34 billion per year).

Table ES.1: Estimated Social Costs

Social Costs	Total Costs (\$M)		
	Midpoint	Low	High
Additional Site Cleanup Costs			
Annualized (2% Discount Rate)	25,000	8,000	43,000
Annualized (3 % Discount Rate)	20,000	6,500	34,000
Annualized (7% Discount Rate)	10,000	3,500	17,000

EPA has the data to include the active CERCLA sites, brownfields, and federal facility sites. By using an estimate of “zero” for these sites, EPA is not using the best available information for the sites affected by this guidance. By not accurately accounting for costs, EPA has failed to follow its own economic analysis guidance, its requirements for analysis under statutes, and best economic practices and requirements under the Office of Management and Budget’s Circular A-4.¹ As Circular A-4 states:

At the same time, the fact that benefits and costs often are uncertain, or difficult to monetize or quantify, does not necessarily make them minor, and low-probability but high-impact effects may be important to assess (whether or not those effects can be quantified or monetized). Analytic priority should be given to those additional benefits and costs that are important enough to potentially change the rank ordering of the main alternatives in the analysis.²

¹ U.S. Office of Management and Budget, “Circular A-4: Regulatory Analysis,” November 9, 2023.

² A-4, pg. 28

TABLE OF CONTENTS

I.	Introduction	1
1.	Summary of EPA's Action	1
2.	Scope of Analysis	1
3.	EPA's Methodology	2
4.	Timing Assumptions	3
5.	EPA's Estimated Social Costs	4
II.	Underestimation of Social Costs in EPA's Economic Assessment.....	5
1.	Number of Affected Cleanup Sites	5
	Overview of CERCLA Sites	9
	Additional Quantitative Estimate	10
	Additional New Sites	16
	Other Additional Sites EPA Should Include.....	16
2.	The Cleanup Costs per Site.....	20
	Cost Categories	20
III.	Revised Social Cost Estimates.....	23
IV.	State Distribution of Costs.....	24
V.	Conclusion	26

INDEX OF TABLES

Table 1: EPA's Size Categories for CERCLA Sites	2
Table 2: Cost-related Uncertainties in EPA's EA	3
Table 3: EPA's Estimated Incremental Remediation Costs and Benefits, 60-Year Timeframe...	4
Table 4: Summary of EPA's Targeted Data Collection Variables for CERCLA Sites.....	6
Table 5: EPA's Universe of Sites Potentially Affected by the Updated Guidance	9
Table 6: NPL Sample Data for RLS by State	12
Table 7: Universe of Affected CERCLA Sites.....	15
Table 8: Universe of Residential Properties	15
Table 9: Proportions of Key Demographics in the Total Near-Site Brownfields Population and the Total U.S. Population (%).....	19
Table 10: Estimated Social Costs.....	23
Table 11. States' Estimate Remedial Action Cost Share	25

INDEX OF FIGURES

Figure 1: CERCLA Sites.....	10
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I. INTRODUCTION

1. Summary of EPA's Action

On January 17, 2024, the U.S. Environmental Protection Agency's (EPA) Office of Land and Emergency Management (OLEM) published its Updated Residential Soil Lead Guidance for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites and Resource Conservation and Recovery Act (RCRA) Corrective Action (CA) Facilities.³ The new guidance updates the regional screening level (RSL), which is a screening tool used to help identify and to define areas that may need further evaluation for remediation, cleanup, and removal actions. The revisions specifically lower the RSL for lead in soil at residential properties from 400 parts per million (ppm) to 200 ppm. For remedial actions, if there are other sources of lead exposure (e.g. lead air emissions, lead water service lines, or lead-based paint), EPA recommends screening a site's soil levels at a concentration of 100 ppm.

2. Scope of Analysis

This analysis provides more accurate social cost estimates than those contained in EPA's Economic Assessment (EA). This analysis is not a comprehensive evaluation of social costs or a comprehensive critique of EPA's methodology. A comprehensive analysis was not possible due to EPA's lack of transparency into its estimates. For many key assumptions, EPA relies on internal staff estimates that are not provided in the docket. Therefore, it is impossible to validate EPA's data or approach independently.

The analysis concentrates its efforts on sites and social cost categories that EPA did not include in the economic analysis. For certain estimates, we draw upon EPA's economic analysis for data and for approaches. We do so for expediency and for ease of comparison with EPA's values. However, we urge EPA to release additional information so that its estimates can be independently reproduced.

The scope of this analysis does not include any review of the EA's social benefit estimate. Benefit estimates from the EA given in this report are for comparison purposes only.

³ Environmental Protection Agency, "Updated Residential Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities" (Office of Land and Emergency Management, January 17, 2024).

3. EPA's Methodology

EPA's EA estimates incremental costs to remediate properties with soil lead levels above the levels in the updated guidance due to CERCLA or RCRA remediation sites.⁴ The updated guidance will require soil screening at lead sites under CERCLA and RCRA to a level of 200 ppm, with some sites with an additional source of lead also subject to a 100-ppm screening level. EPA presents a low-cost scenario (screening level of 200 ppm at all sites), high-cost scenario (screening level of 200 ppm at all CERCLA Removal and RCRA CA sites, and 100 ppm at all Remedial CERCLA sites), and a midpoint scenario (midpoint cost estimate between the lower cost and higher cost scenarios).

The guidance will lead to additional remediation costs under each of the three scenarios. These costs will be incurred at three types of sites: existing sites, new sites, and sites previously deleted that now will require additional remediation. Existing sites that are not already using a 200-ppm screening level will require expanded screening and may identify additional areas that require remediation. Costs will also result from the discovery of newly identified, lead-contaminated sites that will be remediated under CERCLA. EPA assumes that costs for these unidentified sites will be about the same as current lead-contaminated, residential CERCLA remedial sites. Finally, EPA includes sites classified as no further remedial action planned (NFRAP), since they will require re-examination and potentially additional cleanup.

EPA then categorizes these three site types into three size categories summarized in Table 1.

Table 1: EPA's Size Categories for CERCLA Sites

Category	Anticipated Cost Threshold (Million)	Description and examples
Large	>\$100	Generally former mines, mineral processing facilities, or large-scale manufacturing facilities. Typically, large sites have extensive residential contamination as well as large-scale industrial contamination. Some sites include contaminated residential properties that number in the thousands, and/or large areas of contaminated land with anticipated uses that include recreation or agriculture.
Medium	\$10 M - \$100 M	Generally mineral processing and large-scale manufacturing sites. In addition to industrial site contamination, they are characterized by large numbers of contaminated residential properties, sometimes numbering in the hundreds.

⁴ Environmental Protection Agency, "2024 Economic Assessment Updated Soil Lead Guidance for Sites and Facilities Being Addressed Under CERCLA and RCRA Authorities," January 2024, ES-4-ES-5.

Category	Anticipated Cost Threshold (Million)	Description and examples
Small	<\$10 M	More heterogeneous with a range of industries and a variable, but smaller number of residential properties contaminated.

EPA further acknowledges a range of uncertainties for both social costs and social benefits assessments in its EA. The following table summarizes the cost-related uncertainties, EPA's characterization of their direction of potential biases, and EPA's estimate of the relative magnitude of effect. This report will highlight how EPA has understated certain uncertainties, methodological biases, and data gaps.

Table 2: Cost-related Uncertainties in EPA's EA⁵

Issue	Direction of Bias
Cost data for PRP-lead sites are incomplete and uncertain	? Unclear
Cost estimates provided by the Region are assumed to be in \$2021 dollars	? Unclear
Future changes in costs in real terms are uncertain.	↓ Underestimate
How EPA will cleanup the site (i.e., removal or remedial).	↑ Overestimate
Current PRP sites may later be designated as Fund-lead.	— None
Cost data for RCRA CA sites are extrapolated from CERCLA sites.	↑ Overestimate
Potential health impacts of remedial activities are unquantified	↓ Underestimate
Except for Region 4, lack of cost data to assess and remediate properties with unknown contamination levels.	? Unclear

4. Timing Assumptions

In its projections of remediation activities and associated costs, as well as the benefits from exposure reductions, the EA uses an analytic time frame of 60 years.⁶ EPA acknowledges that there is significant variation in the duration of cleanup activities which may cause remediation to extend beyond the 60-year analytical time frame. The EA's timing assumption relies on an extraordinarily rapid implementation schedule for this guidance. From Exhibit 2-

⁵ Environmental Protection Agency, ES-5-ES-6.

⁶ Environmental Protection Agency, ES-5-ES-6.

2, EPA expects nearly \$700 million in additional soil remediation in 2024 and more than \$500 million by 2027. It is almost impossible for EPA to spur \$700 million of additional cleanup activity in 2024 since many states and EPA Regions are still evaluating the guidance and its implications. In general, that rate would increase Superfund annual cleanup activity by 1/3 or more in the near-term, depending on the rate of Potentially Responsible Party (PRP) cleanup activity.⁷ EPA does not have the staff to oversee this rate of program expansion. Even in 2082, cleanup is occurring at a pace of \$200 million (in today's dollars) a year. Since most of those cleanups will be Fund-lead, that amount is 1/3 more than (or 1/3 of) the historic level of appropriations for remedial action in CERCLA.⁸ It is implausible that EPA will divert more than 1/3 of its current remedial action spending toward soil lead sites. As the EA notes, the assumed timeline for the social costs and social benefits is "highly uncertain" with "many properties may not be addressed within the assumed 60-year period."⁹

The EA's timing assumption increases the net present value of the social benefits in an unrealistic manner. If cleanups proceed at a pace consistent with recent years, the lagged benefits would also begin later. It is also more likely that cleanup costs would proceed not in a rapid exponential experience and then decay, but at a reasonable steady rate over many decades, the experience of the RCRA and CERCLA programs for the past 25 years. In this analysis we distribute the additional site cleanup costs over a 60-year period to be consistent with the EA, recognizing that this pace of activity is highly unlikely to occur.

5. EPA's Estimated Social Costs

Table 3 summarizes EPA's estimated costs. EPA estimates that between 170,973 - 767,356 incremental properties may be affected, with a midpoint estimate of 469,165. The total undiscounted costs, based on the midpoint, is estimated to be between \$19 billion and \$37 billion.

Table 3: EPA's Estimated Incremental Remediation Costs and Benefits, 60-Year Timeframe

Category	Lower-Cost Scenario	Higher-Cost Scenario	Midpoint
Incremental Properties	170,973	767,356	469,165

⁷ Environmental Protection Agency, "Superfund Enforcement FY 2023 Annual Results," 2023, <https://www.epa.gov/enforcement/superfund-enforcement-fy-2023-annual-results>.

⁸ U.S. Government Accountability Office, "Superfund: Trends in Federal Funding and Cleanup of EPA's Nonfederal National Priorities List Sites," September 2015, <https://www.gao.gov/assets/gao-15-812.pdf>.

⁹ Environmental Protection Agency, "2024 Economic Assessment Updated Soil Lead Guidance for Sites and Facilities Being Addressed Under CERCLA and RCRA Authorities," 2-10.

Category	Lower-Cost Scenario	Higher-Cost Scenario	Midpoint
Incremental Costs (\$Million)			
Total Costs (undiscounted)	\$14,000 - \$27,000	\$24,000 - \$47,000	\$19,000 - \$37,000
Annualized - 3% discount rate	\$190 - \$370	\$290 - \$580	\$240 - \$470
Annualized - 7% discount rate	\$75 - \$170	\$100 - \$240	\$89 - \$120

II. UNDERESTIMATION OF SOCIAL COSTS IN EPA'S ECONOMIC ASSESSMENT

As discussed above, EPA underestimates the number of remediation sites and the remediation costs per site. Each of these issues are discussed in more detail in this section.

1. Number of Affected Cleanup Sites

The universe of sites potentially affected by the updated guidance, according to EPA's EA is the following:

includes all sites (or portions of sites) that have soil lead as a contaminant of concern requiring cleanup to residential levels. This includes sites and portions of sites that have already completed remediation activities but may undergo re-examination and potentially additional remediation to ensure that CULs [cleanup levels] are consistent with the updated guidance.¹⁰

These sites include these categories:

- **CERCLA Sites.** These RSL sites are on the National Priorities List (NPL), are removal-only sites, and are Superfund Alternative Approach (SAA) sites.
- **RCRA CA Sites.** EPA evaluated ongoing lead-driven remediation of RCRA-permitted facilities with off-site, soil lead corrective action requirements.

¹⁰ Environmental Protection Agency, 3-2.

- **NFRAP Sites.** To identify these sites, EPA used sampling data based on the Laboratory Information Management System (LIMS) database for Region 7 and the Contract Laboratory Program (CLP) data for all other regions.
- **Complex Expansion Sites.** These RCRA and CERCLA sites are expected to experience a sizeable expansion of boundaries under the updated guidance.
- **New Future NPL Sites.** As noted earlier in this report, EPA assumes the discovery of new lead sites will continue over the next 10-year period (but not beyond) and follow the rate of discovery of the past 10 years. EPA recognizes that their “estimate is highly uncertain” as the “future may not be reflective of historical data,” but does not provide further explanation for the assumption that new lead in soil site discovery will stop after 10 years.¹¹

To identify the universe of NPL sites, EPA collected data for four site categories: ongoing fund-lead sites; closed fund-lead sites; ongoing PRP-lead sites; and closed PRP-lead sites. EPA’s data collection involved surveying EPA regional Superfund program staff to identify known CERCLA sites with residential soil lead contamination in each EPA region. EPA’s survey focused on 34 variables to characterize sites, though “many of the variables were not directly used to calculate costs” (see Table 4).¹² As EPA mentions in two footnotes, regional staff provided limited data on the number of additional properties that would require remediation under the updated guidance and the associated cost for only some PRP-lead sites.¹³ EPA reviewed additional data from the Superfund Enterprise Management System (SEMS) to add missing datapoints for the following variables (but not for cost estimates): EPA ID, site size, federal facility status, NPL/RO/SAA status, start and completion dates, current CULs and screening levels (SLs), site coordinates, and source of lead.

Table 4: Summary of EPA’s Targeted Data Collection Variables for CERCLA Sites

Site Category	Variables
All Fund-Lead CERCLA Sites	• General information on the site: name, ID, operable unit (OU), OU description, Region, federal facility status, type of action, and NPL/RO/SAA status; • Current remediation status of the site: Record of Decision (ROD) date, start date, and closure date; • Site size based on the following criteria: ○ Large sites, with total soil lead remediation costs anticipated to be \$100 million or higher; ○ Medium sites, with total soil lead remediation costs anticipated to be between \$10 million and \$100 million; and, ○ Small sites, with total soil lead remediation costs anticipated to be less than \$10 million.

¹¹ Environmental Protection Agency, 3-6.

¹² Environmental Protection Agency, 3-5.

¹³ Environmental Protection Agency, 3-10, 4-4.

Site Category	Variables
Ongoing Fund-Lead Sites	• The soil lead screening level currently in use; • The soil lead CUL currently in use; • The number of residential properties remaining to be remediated, and the associated cost under current CULs; • The revised CULs anticipated under the updated guidance; • The number of additional properties that would require remediation under the updated guidance, and the associated cost; • The type of action at the site (i.e. removal or remedial action); • Natural and anthropogenic background levels; • Whether there is available clean fill above 100 ppm; • The primary source of lead contamination; • Whether the site footprint would expand under the updated guidance and whether cost estimates account for this expansion; • The percent of properties containing a residence at a site; • Number of properties outside of the current boundary; and, • Whether the cleanup or revised cleanup will be driven by applicable or relevant and appropriate requirement (ARAR).
Closed Fund-Lead Sites	• The soil lead screening level that was used; • The soil lead CUL that was used; • The completion date for soil lead cleanup; • Whether or not the site would likely reopen for additional cleanup activity due to the updated guidance; • The revised CULs anticipated under the updated guidance; • At sites that might be expected to reopen, the number of additional properties that would likely require remediation under the updated guidance, and the associated costs; • The type of action at the site (i.e., removal or remedial action); • Natural and anthropogenic background levels; • Natural Soil background; • Whether there is available clean fill above 100 ppm; • The primary source of lead contamination; • Whether the site footprint would expand under the updated guidance and whether cost estimates account for this expansion; and, • Whether revised cleanup will be driven by ARAR.
Ongoing PRP-Lead Sites	• The soil lead CUL currently in use; • The revised soil lead CUL anticipated under the updated guidance; • The anticipated time to complete residential remediation under current CULs; • The type of action at the site (i.e., removal or remedial action); • The number of additional properties that would require remediation under the updated guidance, and the associated cost; • Natural and anthropogenic background levels; • The primary source of lead contamination; and, • Whether the cleanup or revised cleanup will be driven by ARAR.
Closed PRP-Lead Sites	• The soil lead CUL that was used; • The completion date for soil lead cleanup;

Site Category	Variables
	• Whether or not the site would likely reopen for additional cleanup activity due to the updated guidance; • The number of additional properties that would require remediation under the updated guidance, and the associated cost; • The revised CUL that they would expect to use; • The type of action at the site (i.e., removal or remedial action); • Natural and anthropogenic background levels; • Natural background soil concentration; • The primary source of lead contamination; • Whether revised cleanup will be driven by ARAR; and, • Whether funding would come from PRP if reopened.

EPA excludes certain sites from its data collection effort that are assumed to not be affected by the updated guidance based on two criteria:

Soil lead remediation is not the primary driver of remediation costs. EPA provides an example of a site where the arsenic cleanup level requires a more costly remediation that addresses both lead and arsenic.

Contamination is related to an industrial site where residential use and exposure is not anticipated.

The following table summarizes EPA's universe of potentially affected NPL sites, according to size category and removal/remedial status. EPA estimates 381 sites may require response action under an updated CUL under a screening level of 100 ppm for remedial action and a screening level of 200 ppm for removal actions. This estimate is comprised of an estimated 268 existing or historical NPL sites and 113 future NPL sites that may need additional remediation under the updated guidance.

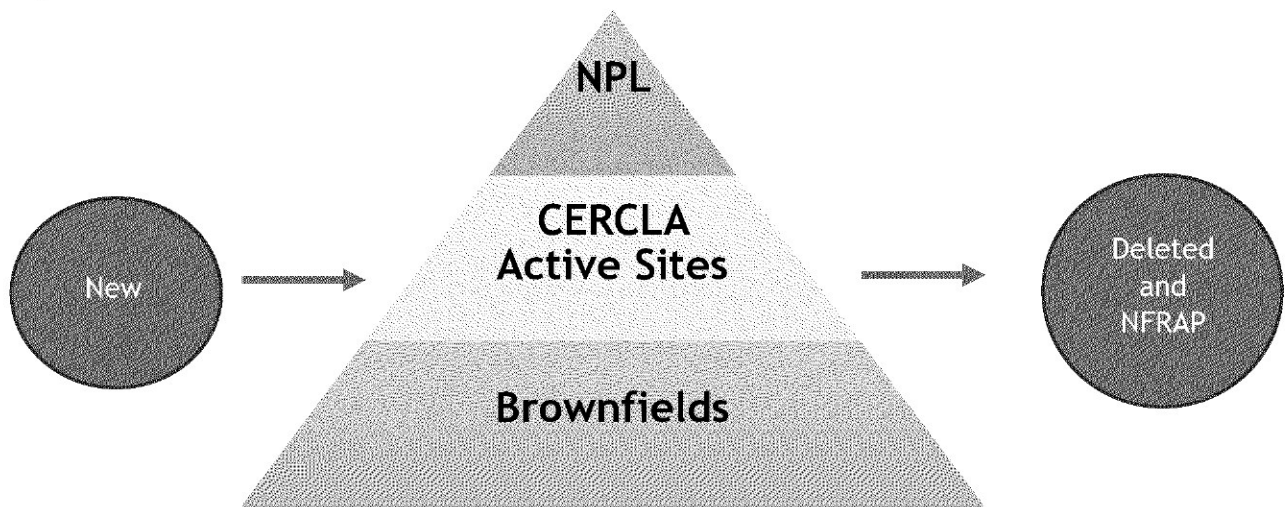
Table 5: EPA's Universe of Sites Potentially Affected by the Updated Guidance

Site Category	CERCLA Sites Identified by EPA							May Require Response Under Updated CUL
		Residential - Small	Residential - Medium	Residential - Large	Residential Size - N/A	Removal	Remedial	Total
Fund-Lead	107	25	22	98	143	109	252	198
Ongoing	15	9	16	5	17	28	45	45
Closed	92	16	6	93	126	81	207	153
PRP-Lead	23	22	7	19	31	40	71	70
Ongoing	7	12	5	1	3	22	25	25
Closed	16	10	2	18	28	18	46	45
Future CERCLA Sites	-	-	-	-	14	106	120	113
Total							443	381

Overview of CERCLA Sites

EPA's approach misses groups of sites subject to CERCLA jurisdiction. Figure 1 illustrates a comprehensive universe of all sites under CERCLA jurisdiction. The triangle in the center of Figure 1 shows the three levels of non-Federal CERCLA sites that are described in more detail in this section. While Federally-owned sites fall broadly within these categories, the categories have different names. The largest group of sites are brownfields, followed by sites on the active inventory, and at the top of the triangle are sites on the National Priorities List. To the left of the triangle are new sites that are discovered over time and are subject to CERCLA. To the right are sites deleted from these categories and NFRAP sites.

Figure 1: CERCLA Sites



EPA’s analysis focuses on three categories from the entire CERCLA universe in Figure 1: new, NPL, and deleted NPL sites. EPA omits the two largest groups: brownfields and other non-NPL CERCLA active inventory sites. By failing to include these site categories, EPA’s analysis dramatically understates the costs associated with the new guidance. In this section, we estimate the entire universe of sites that will more accurately be affected by the new guidance.

Additional Quantitative Estimate

Active Sites and Active Inventory Sites

Active sites include the NPL and active inventory sites, thousands of sites for which EPA believes there is significant release of hazardous substances, but lacks the resources, a viable PRP, or staff to evaluate. EPA plans to consider site assessment, removal, remedial, enforcement, cost recovery, or oversight activities under the Superfund program at active inventory sites.¹⁴ In this section of the report, we provide estimates of NPL and non-NPL active sites as well as estimated number of residential properties that will be affected by the updated guidance.

¹⁴ Environmental Protection Agency, “Superfund Glossary,” n.d.

NPL Sites

EPA's Superfund Enterprise Management System (SEMS) database provides searchable data on NPL sites.¹⁵ The NPL sites used in this analysis is retrieved from the SEMS database, filtering by "Active" under site status, "Currently on the NPL" under NPL or Superfund Alternative Approach (SAA) Status, "LEAD (7439-92-1)" under Contaminant Name or Chemical Abstracts Service (CAS) number, and "Soil" under Contaminant Media. We further add additional sites that have lead contaminants in other solid media (e.g. sludge, debris, buildings/structures, and residuals). We include these sites since debris, sludge, and building material often mixes with soil and migrates to nearby soils. These sites will at least be evaluated to determine if additional remediation is required. This screening results in 642 sites across 48 states (Mississippi and North Dakota do not appear to have lead sites) and the District of Columbia (DC).

We take a nationally-representative sample of these 642 NPL sites by examining 25 percent of the sites in each state (e.g., New Jersey has the highest count of 72 sites and therefore has the highest count in our sample at 18). For states that have one site (25 percent of which would round to zero), we include those sites in the sample to ensure all states with lead sites are included. Our sample ultimately includes 171 sites (approximately 27 percent of the 642 NPL sites). We then screen each site in the sample for residential status to determine, for each state, a percentage of sites that are residential lead sites (RLS). We apply these percentages to the total lead solid media NPL sites that are likely RLS (see Table 6).

To assess whether a site is residential, we use EPA's definition for residential sites:

any areas where children have unrestricted access to lead contaminated soil which include, but are not limited to, properties containing single- and multi-family dwellings, apartment complexes, vacant lots in residential areas, schools, day-care centers, community centers, playgrounds, parks and other recreational areas and green ways.¹⁶

We visit each location's Superfund Site page on EPA's website, which provides background information, the site's address, cleanup activities, and other site documents and data.¹⁷ For some sites, EPA mentions nearby residential areas or residential contamination. When this description was not available, we searched for a satellite view of the location on Google Maps to determine whether properties that fit or meet EPA's definition are within an approximately one-mile radius.¹⁸

¹⁵ Environmental Protection Agency, "Superfund Enterprise Management System," n.d., <https://cumulis.epa.gov/supercpad/CurSites/srchsites.cfm>.

¹⁶ Environmental Protection Agency, "Updated Residential Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities."

¹⁷ Environmental Protection Agency, "Superfund," n.d., <https://www.epa.gov/superfund>.

¹⁸ Google Maps, "Map of the U.S.," accessed March 6, 2024, <https://maps.google.com/>.

Table 6: NPL Sample Data for RLS by State

State	Total NPL Sites with Lead in Solid Media	Number of Sampled Sites	Sampled Sites - RLS	Sampled Sites - Non-RLS	Rate of RLS Based on Sample (%)	Est. RLS from All NPL Sites with Lead in Solid Media
NJ	72	18	12	6	67%	48
FL	35	9	7	2	78%	27
PA	42	11	7	4	64%	27
CA	35	9	6	3	67%	23
NY	35	9	7	2	78%	27
IL	29	7	5	2	71%	21
MA	25	6	5	1	83%	21
MI	24	6	5	1	83%	20
WA	26	7	5	2	71%	19
TX	21	5	5	0	100%	21
OH	18	5	4	1	80%	14
NC	16	4	2	2	50%	8
VA	17	4	3	1	75%	13
IN	17	4	4	0	100%	17
MO	15	5	5	0	100%	15
CO	14	5	4	1	80%	11
MD	14	4	1	3	25%	4
WI	17	3	3	0	100%	17
MT	11	3	3	0	100%	11
SC	10	3	3	0	100%	10
TN	9	2	2	0	100%	9
GA	9	2	2	0	100%	9
KS	9	2	2	0	100%	9
AL	7	2	2	0	100%	7
AZ	7	2	0	2	0%	0
DE	8	2	2	0	100%	8
IA	7	2	2	0	100%	7
NH	9	2	2	0	100%	9
ME	7	2	2	0	100%	7
RI	7	2	2	0	100%	7
UT	7	2	2	0	100%	7
CT	6	2	0	2	0%	0
OK	7	2	2	0	100%	7

State	Total NPL Sites with Lead in Solid Media	Number of Sampled Sites	Sampled Sites - RLS	Sampled Sites - Non-RLS	Rate of RLS Based on Sample (%)	Est. RLS from All NPL Sites with Lead in Solid Media
VT	5	1	0	1	0%	0
WV	6	2	2	0	100%	6
AK	4	1	1	0	100%	4
ID	4	1	1	0	100%	4
KY	6	2	1	1	50%	3
NE	4	1	1	0	100%	4
LA	3	1	0	1	0%	0
MN	3	1	1	0	100%	3
OR	5	1	0	1	0%	0
HI	2	1	1	0	100%	2
NM	3	1	1	0	100%	3
AR	1	1	0	1	0%	0
DC	1	1	1	0	100%	1
NV	1	1	1	0	100%	1
SD	1	1	1	0	100%	1
WY	1	1	0	1	0%	0
Total	642	171	130	41	76%	492

NPL Deleted Sites

EPA acknowledges that sites removed from the NPL may be reopened as a result of the updated guidance. We download data on sites deleted from the final NPL and filtered for lead soil sites.¹⁹ Of the 171 sites, we assume 130 will be RLS based on the percentage rate of sites we determine to be RLS from the sampled NPL data (see Table 6).

CERCLA Active Inventory Sites

¹⁹ Environmental Protection Agency, "All Current Deleted NPL Sites (FOIA 5)," February 29, 2024, <https://www.epa.gov/superfund/superfund-data-and-reports>.

For non-NPL active inventory sites, we download two sets of Superfund data reports. The first contains NPL and non-NPL sites with potential smelting-related operations.²⁰ This dataset includes contaminant of concern information and can be filtered for lead sites. Based on this first dataset, we count a minimum of 139 non-NPL active sites that EPA should include in its analysis. This count underestimates lead sites by excluding active inventory sites that did not have smelting-related operations.

The second dataset is the full active site inventory.²¹ After excluding sites that have been deferred to RCRA, have been determined to require no site assessment, or are being handled as part of another site, we count 7,281 total active sites. Unfortunately, this dataset does not include contaminant information. Thus, we rely again on the percentage rate of sites we determine to be RLS from the sampled NPL data and assume approximately 2,673 active sites will be affected by the updated guidance.

CERCLA NPL and Non-NPL Active Sites

²⁰ Environmental Protection Agency, “Sites with Potential Smelting-Related Operations (FOIA 1),” February 29, 2024, <https://www.epa.gov/superfund/superfund-data-and-reports>.

²¹ Environmental Protection Agency, “Active Site Inventory (List 8R Active),” February 29, 2024, 8, <https://www.epa.gov/superfund/superfund-data-and-reports>.

Table 7 summarizes the universe of affected sites from our assessments of NPL, deleted NPL, and non-NPL active inventory. Total sites across these categories range from 761 to 3,295. Based on a midpoint for the CERCLA active inventory sites estimated range, the total sites are estimated at 2,028.

Table 7: Universe of Affected CERCLA Sites

Site Category	Range			
	Estimate	Lower Estimate	Higher Estimate	Mid-Point
NPL Sites	492			
NPL Deleted Sites	130			
Non-NPL Active Sites		139	2,673	1,406
Sum		761	3,295	2,028

NPL and Active Site Affected Properties

Not all surrounding residential properties will require cleanup. For cleanup cost calculations, we assume an average of 300 properties per site based on EPA's assumptions in the EA.²² The total number of properties is computed by adding the properties estimated to be around the NPL sites, the NPL deleted sites, and then either the lower, higher, or midpoint estimate of the non-NPL active inventory sites.

Table 8: Universe of Residential Properties

Site Category		Range			
		Estimate	Lower Estimate	Higher Estimate	Mid-Point
NPL Sites	Cleanup Costs Analysis	147,600			
NPL Deleted Sites	Cleanup Costs Analysis	39,000			
Non-NPL Active Sites	Cleanup Costs Analysis		41,700	801,900	421,800
Total	Cleanup Costs Analysis				608,400

²² Environmental Protection Agency, "2024 Economic Assessment Updated Soil Lead Guidance for Sites and Facilities Being Addressed Under CERCLA and RCRA Authorities," 4-8.

Additional New Sites

EPA assumed 12 new sites per year on average for the first ten years and then zero new sites annually afterwards. EPA claims that there is too much uncertainty to estimate beyond 10 years. EPA incorrectly claims, and inconsistently considers, uncertainty. By choosing a value for new sites of zero in years 11 and beyond, EPA simply picks another point estimate. Both 12 and zero are both discrete numbers - point estimates of the uncertain number of future sites. Uncertainty should be considered in the analysis not by using a point estimate, but by using a range or a distribution of potential future values. By using a point estimate of zero, EPA's value is less probable to be the real number than its point estimate for the first ten years since the latter is based on EPA recent experience.

We use EPA's point estimate for the first ten years for the entire period of the analysis. We note that EPA has ample data to characterize the uncertainty in the annual number of new sites. EPA has over 40 years of data for the CERCLA program and could generate the distribution of new CERCLA sites added to the active inventory each year.

Other Additional Sites EPA Should Include

EPA further excluded two categories of sites that EPA should (and can) quantitatively assess the incremental social costs of this guidance. Due to limited data sources, we are unable to provide quantitative estimates of how many brownfield sites and federal sites - e.g. military housing and Base Realignment and Closure (BRAC) sites - will be impacted. The following qualitative discussion underlines the probable magnitude of these impacts to highlight how EPA's exclusions lead to a significant underestimate of the guidance's social costs.

Brownfields

A brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.²³ In its EA, EPA assumes that federal standards involving lead remediation do not directly affect brownfields and that costs from a new lead CUL will only occur at brownfields sites if states decide to change their standards. Thus EPA claims the incremental

²³ Environmental Protection Agency, "General Brownfields Guidelines on All Appropriate Inquiries," April 2023.

cost is not directly attributable to this action.²⁴ EPA argues that brownfields would only be affected by a change to EPA's lead screening levels if states voluntarily change their standard to match OLEM's updated standard.

EPA appears to confuse its practical implementation of CERCLA from its legal authority. Except for limited exemptions, all sites with releases of hazardous substances are subject to CERCLA. As EPA states:

Other properties may be "brownfields" – properties where expansion, redevelopment, or reuse may be complicated by the presence (or potential presence) of contamination. The level of contamination may vary and generally, brownfields sites are lower risk than Superfund sites. Often, the federal government is not involved in cleanups at brownfield sites. Rather, state and tribal response programs play a significant role in cleaning up and helping to revitalize these sites.²⁵

By using state resources, EPA can better administer the vast number of sites subject to federal authority under CERCLA. EPA explains the practical advantages and the clear retention of its authority under CERCLA:

Beginning in the 1990s, the EPA increased its partnership with states to address the cleanup of brownfields and to strengthen and build state program capacity. As part of that effort, the EPA entered into MOAs [memoranda of agreement] with individual states to encourage the assessment and cleanup of brownfields under state oversight. MOAs can be valuable mechanisms to support and strengthen efforts to achieve protective cleanups under state oversight. The purpose of the MOAs is to foster more effective and efficient working relationships between an EPA Region and an individual state regarding the use of its state response program. MOAs are non-binding documents that promote coordination and clarify the general roles and responsibilities and provide the EPA's recognition of the state's capabilities. MOAs typically include a general statement of the EPA's enforcement intentions regarding certain sites cleaned up under the oversight of a state response program. An MOA, or the absence of an MOA, does not alter EPA's or a state's legal authority.²⁶

In other words, while states as a practical matter oversee many brownfield cleanups, EPA ultimately has the authority to enforce CERCLA requirements (and applicable cleanup guidance) at sites with state oversight. EPA's role as the ultimate regulatory authority is apparent when organizations seek "comfort letters" from EPA concerning brownfield properties. EPA's recent policies and sample letters show the range of possible EPA

²⁴ Environmental Protection Agency, "2024 Economic Assessment Updated Soil Lead Guidance for Sites and Facilities Being Addressed Under CERCLA and RCRA Authorities," 3-12.

²⁵ Environmental Protection Agency, "The Revitalization Handbook: Addressing Liability Concerns at Contaminated Properties," August 2022, 6, https://www.epa.gov/system/files/documents/2022-08/revitalization-handbook-final-2022_2.pdf.

²⁶ Environmental Protection Agency, 18.

responses.²⁷ All these letters start from the basis that these sites are subject to federal oversight; states cannot grant parties “comfort” from CERCLA.

Therefore, whether states adopt EPA’s guidance or not, EPA ultimately decides whether brownfield sites are sufficiently remediated. Consider the scenario where a party is considering purchasing a site to convert to residential use that has a soil lead level of 300 ppm and that the state determines does not need additional remediation. If the prospective buyer seeks a comfort level from EPA, will EPA allow this site to escape cleanup action while EPA is requiring other sites to clean up to 100 ppm? By assuming no additional costs to CERCLA brownfield sites, EPA essentially would tolerate different cleanup levels across CERCLA sites. Since EPA’s guidance does not explicitly allow this outcome, EPA should include the additional cleanup costs for all non-NPL sites subject to CERCLA jurisdiction.

EPA’s argument also understates the influence its guidance documents have on state policies. State agencies often look to federal authoritative documents to inform public health and environmental policy decisions. To assert that the guidance will not directly affect brownfields because states are not required to change their standards also ignores the potential magnitude of affected populations. While quantifying a precise number of affected brownfields may face several uncertainties, EPA can posit some assumptions and explore different scenarios that highlight different possible levels of social costs.

The U.S. has an estimated 400,000-500,000 brownfields.²⁸ Approximately 35.1 million people live within a half mile of a brownfield site, 70.4 million people live within one mile, and 160.5 million people live within three miles of a brownfield site.²⁹ The table below provides demographic data of populations living near brownfield sites. Put succinctly, there are many brownfields some of which will have lead in soil in residential areas. It is very likely that the guidance will cause additional remediation at some, if not a majority, of applicable brownfield sites.

²⁷ Environmental Protection Agency, “Transmittal of the 2019 Policy on the Issuance of Superfund Comfort/Status Letters,” August 21, 2019, https://www.epa.gov/sites/default/files/2019-08/documents/comfort-status-ltr-2019-mem_0.pdf.

²⁸ Environmental Protection Agency, “Brownfields,” February 12, 2024, <https://www.epa.gov/brownfields/about>.

²⁹ Environmental Protection Agency, “Population Surrounding 34,305 Brownfields Sites” (Office of Land and Emergency Management, July 2023).

Table 9: Proportions of Key Demographics in the Total Near-Site Brownfields Population and the Total U.S. Population (%)

	Population Within ½ Mile of All Sites	Population Within 1 Mile of All Sites	Population Within 3 Miles of All Sites	U.S. Population
Minority	53.5	52.4	48.1	41.1
Below Poverty Level	19.8	18.1	14.8	12.7
Linguistically Isolated	6.7	6.5	6.0	4.8
Less Than a High School Education	15.5	14.7	12.7	11.2

Federal Facilities

Although the EA excludes the costs at federal facilities subject to CERCLA or RCRA, the additional cleanup costs at these sites should be included. In the EA, EPA states: “The costs associated with the cleaning up federal facility sites are paid for by the federal government. It is possible that there would be transfer costs not accounted for in this EA.”³⁰ One interpretation of this language is that the expansion of federal cleanups is not a social cost but a transfer. If that is the correct interpretation of this language, the analysis is incorrect. Cleaning up a site requires real resources - labor, equipment, clean fill, and many other goods and services. Diverting these resources to soil cleanup is a social cost. For benefit-cost analysis who pays for these costs - private parties or the federal government - is irrelevant. Moreover, any claim that federal facility costs are transfers is inconsistent with the analysis of Fund expenditures on additional cleanup. The Fund is a federal resource funded by dedicated and general tax revenue. Funding a cleanup from the Superfund is also a financial transfer; EPA properly estimates the social costs of Fund-lead cleanups.

At a minimum, the best estimate the social costs of additional remediation at federal facilities is not zero, the effective value the EA uses. For example, the Department of Defense (DoD) has nearly 35,000 cleanup sites in its active inventory.³¹ It seems plausible that some number of these sites have soil lead cleanups, are located in residential areas, and are affected by this guidance.

³⁰ Environmental Protection Agency, “2024 Economic Assessment Updated Soil Lead Guidance for Sites and Facilities Being Addressed Under CERCLA and RCRA Authorities,” 3-8.

³¹ Office of the Under Secretary of Defense for Acquisition and Sustainment, “Defense Environmental Programs Annual Report to Congress for Fiscal Year 2022,” October 2023.

2. The Cleanup Costs per Site

Cost Categories

EPA's Approach

EPA's approach to estimate the costs associated with the updated guidance at CERCLA sites lacks transparency and fails to follow best practices. EPA relies on cost and site characterization data for an undisclosed portion of CERCLA sites that are remediated through federal Superfund resources (i.e. fund-lead sites).³² Based on this sample, EPA calculates average site costs and extrapolates these costs to the rest of the universe. EPA does not disclose the criteria or approach used to select the portion of sites by which cost averages were estimated, the cost categories that were included, or its assumption that cost averages are applicable to all sites. EPA selected these sites from a larger sample of 132 sites, excluding 30 sites from the average because they "either lacked known cost data or were viewed as outliers."³³ EPA does not provide any data to justify excluding these sites from its computed averages.

EPA calculates an average per-site incremental cost of \$4 million for small and medium fund-lead CERCLA sites based on cost data retrieved for a subset of 102 sites. In the EA, EPA further applies a fixed percentage to its remediation cost estimate to account for site preparation, site investigation, permit approvals, and other project costs. This approach underestimates these costs for small sites. For many of these costs, there is a fixed cost portion that is independent of the project size. For example, an inspector must spend the same time to travel to a small site as a large site. Although developing a project management, construction management, and health and safety plan may be less complex for a small site, there are core elements that must be considered in each plan. Therefore, for smaller sites, these management costs do rise proportionately only after a minimum of fixed costs. This relationship can also be modeled as a larger proportionate amount to the total remediation costs for small sites than for medium and larger sites.

From EPA's EA Exhibit 4-2, the average incremental cleanup costs per property for small sites are between \$0.03 million and \$0.05 million. From project cost estimates at other sites, we compute that project management and construction management costs would be more equivalent to 30 percent of a \$0.03 million remediation effort. Instead of EPA's value of 15 percent, we use 30 percent for small sites.

³² Environmental Protection Agency, "2024 Economic Assessment Updated Soil Lead Guidance for Sites and Facilities Being Addressed Under CERCLA and RCRA Authorities," sec. 4.2.

³³ Environmental Protection Agency, 4-6.

Omitted Oversight Costs

EPA charges private parties for its oversight costs when a private party carries out cleanup activities. EPA's charges include the costs of other federal agencies like the Department of Justice (DOJ), the Department of Health and Human Services (HHS), and some state oversight costs. These costs are substantial; the DOJ routinely submits repayment requests to EPA of more than \$18 million per year.³⁴ These expenditures are social costs since they are resources like labor that are committed to oversight of these new/expanded cleanups and are not available to other activities. Some project cost estimates in public documents use 10 percent of the remedy cost as EPA's oversight costs.³⁵ We increase PRP cleanup costs by adding 10 percent to remedy costs for EPA (and other agency) oversight costs.

Omitted PRP Transaction Costs

When PRPs manage a cleanup, there are costs to identify other PRPs, negotiate responsibilities and payments, respond to EPA and other government agencies, and manage the remedial activity. Identifying PRPs, litigation, and project oversight are transaction costs and flow from CERCLA's liability scheme, EPA's regulations, and EPA's enforcement policies. For active NPL sites, the incremental costs due to this guidance may be small relative to the on-going, overall cleanup projects. However, many sites do not have active PRP management. For example, for deleted sites, PRP committees may have disbanded or be operating with only minimal resources. Active inventory sites often do not have identified responsible parties.

The RAND Corporation in 1993 published a study of cleanup cost estimates and transaction costs for 18 CERCLA sites.³⁶ RAND obtained spending data from private companies as they carried out litigation, filed insurance claims, and negotiated with other responsible parties. This study remains the largest and most complete study of the costs of CERCLA's liability system and program administration. The study found that transaction costs added an amount equal to 19 percent of the remedial action, with a lower bound of 15 percent and an upper bound of 24 percent. We apply a factor of 1.19 to the cleanup cost estimates for PRP-lead cleanups to account for transaction costs.

³⁴ U.S. Department of Justice, "Environment and Natural Sources Division FY 2022 Accomplishment Report," April 2023, <https://www.justice.gov/d9/2023-06/fy22-accomplishments-report.pdf>.

³⁵ See for example: URS Corporation, "Final Feasibility Study, Casmalia Resources Superfund Site - Appendix E - Cost Spreadsheets" (Casmalia, CA, n.d.), https://www.waterboards.ca.gov/rwqcb3/water_issues/programs/stormwater/docs/lid/Casmalia_Superfund_Site/Final%20Feasibility%20Study/Appendices/Appendix%20E/Appendix%20E%20Complete.pdf.

³⁶ Lloyd Dixon, Deborah Drezner, and James Hammitt, "Private-Sector Cleanup Expenditures and Transaction Costs at 18 Superfund Sites" (RAND Corporation, 1993).

Omitted Project Management Costs

Numerous costs are associated with managing cleanup projects. EPA should cost out these activities and ensure the Agency does not underestimate costs. Project managers need to map site utilities prior to construction. Initial site setups also include temporary soil erosion control installations and dust prevention technologies (e.g. dust control and dust monitoring equipment). EPA should also account for hazardous waste disposal costs for a sizable fraction of soils.³⁷ Hazardous waste management costs include waste characterization sampling (e.g. lead testing, ignitability, corrosivity, and reactivity), loading at staging areas, and off-site transportation and disposal.

EPA's methodology assumes preconstruction cost categories can be uniformly assumed to be 15 percent of construction costs for all sites. EPA's approach underestimates site costs for small sites. There are fixed costs that may be 15 percent for some sites, but account for larger cost percentages for smaller sites. Setting up site utilities, designing projects, mobilizing and demobilizing equipment at the site, sediment control and dust prevention equipment, permitting processes, and public outreach all present substantial fixed costs that can often account for 30 percent of total project costs (twice EPA's assumption).

Timing

Baseline

We begin by determining the annual rate by which EPA has moved sites off the active inventory. We compare the current active sites inventory with a version collecting in 2021. We find that 112 sites from the 2021 inventory are no longer on the current active site inventory and divide this by three years to reach an average annual rate of 37 sites that are removed from the active inventory. We estimate the average probability that in any given year a site is remediated is the annual rate (37) divided by total active sites (7,281), which gives us 0.51 percent. Thus, we estimate that the annual number of lead sites that are removed from the active inventory each year will be approximately 14.

Post-Guidance

³⁷ Environmental Protection Agency, "Questions About the Disposal of Lead Contaminated Items," Wastes - Hazardous Waste - Treatment, Storage & Disposal (TSD), n.d.

It can be assumed that, following the guidance, EPA will place higher priority on RLS. Thus, we assume that the estimated removal of 14 sites per year doubles during the first 10 years and returns to the baseline pace thereafter.

III. REVISED SOCIAL COST ESTIMATES

Table 10 presents a more accurate estimate of social costs. EPA’s partial analysis of social costs estimates range from an annualized amount (at three percent) of \$190 million to \$580 million per year, with a midpoint range of \$240 million to \$470 million annually. From Exhibit 4.4, EPA presents a midpoint estimate of 469,165 affected properties that will experience incremental costs under the updated guidance.³⁸ Our analysis shows that the more accurate number of affected properties is approximately 608,400. The annualized social costs at three percent are between \$6,500 million and \$34,000 million per year (\$6.5 billion per year to \$34 billion per year).

Table 10: Estimated Social Costs

Social Costs	Total Costs (\$M)		
	Midpoint	Lower	Higher
Additional Site Cleanup Costs			
Annualized (2% Discount Rate)	25,000	8,000	43,000
Annualized (3% Discount Rate)	20,000	6,500	34,000
Annualized (7% Discount Rate)	10,000	3,500	17,000

Limitations

There are some limitations to our estimates. Due to limited data sources, we rely on certain assumptions that may lead to either under- and overestimations in each category of the estimated universe of affected sites and properties. We determine the number of potentially-affected NPL sites and properties through a nationally-representative sample that includes

³⁸ Environmental Protection Agency, “2024 Economic Assessment Updated Soil Lead Guidance for Sites and Facilities Being Addressed Under CERCLA and RCRA Authorities,” 4-23.

approximately 27 percent of lead-contaminated NPL sites. A comprehensive assessment of all NPL sites may yield different results. We also assume the number of sites deleted from the NPL that will likely be reopened and affected under the updated guidance reflects the rate of NPL sites that we estimate will meet EPA's definition of a RLS. We further rely on this estimated RLS rate to determine the upper-bound estimate of likely active inventory sites that will be affected. It is unclear whether our assumption for either deleted NPL sites or active inventory sites lead to under- or overestimations. Furthermore, we are unable to include brownfield sites and federal sites (e.g. BRAC and military sites). This omission, in particular, leads to a significant underestimation of total social costs.

Our approach to estimate the complete cleanup costs associated with the updated guidance also has some limitations. For omitted PRP transaction costs, we rely on the best available study by RAND. Past costs may not reflect current conditions and, thus, it is unclear whether RAND's 1993 publication remain accurate. Unfortunately, there are no other more recent studies of equal scale to RAND's 1993 publication that measure current PRP transaction costs. In addition, it is likely that the cleanup costs we use understate near- and long-term future costs due to the supply constraints.

The updated guidance will have labor force and supply chain impacts. Remediation requires specialized labor. Under EPA's updated guidance, thousands of sites nationwide will require remediation. A sudden increase in demand for equipment and labor will place a strain on supply chains and the labor force. A wide range of municipalities and diverse sectors that rely on this supply chain will ultimately bear the additional costs associated with increased scarcity in the labor force and in capital equipment.

IV. STATE DISTRIBUTION OF COSTS

CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) require states to share the costs of Fund-financed remedial actions for sites listed on the NPL.³⁹ For facilities publicly operated at the time of the disposal of hazardous substances, states are required to pay 50 percent, or greater as determined by EPA, of the cost of Fund-financed response actions.⁴⁰ For other facilities, except federal, states are required to pay 10 percent of remedial action costs. States can pay their cost share in cash, in-kind services, or by applying credit granted by EPA.

Based on our sample of 171 NPL sites, we assessed that 12 (i.e. seven percent) are publicly-owned waste management sites. Thus, apply the 50 percent cost share to seven percent of total estimated Fund-lead costs at NPL sites and active inventory sites. We apply a 10 percent

³⁹ Environmental Protection Agency, "State Cost Share Payment Options," December 2018.

⁴⁰ 40 CFR § 300.510 (1994).

cost share at the remaining estimated costs. Table 11 presents each state's estimated remedial action cost share. New Jersey has the greatest cost share over the 60 year period, \$230 million. Florida, California, Pennsylvania, and New York also have significant cost share obligations.

Table 11. States' Estimate Remedial Action Cost Share

State	Estimated Remedial Cost Share over 60 years Midpoint (\$mil)
NJ	230
FL	130
PA	130
CA	110
NY	130
IL	100
MA	100
MI	100
WA	100
TX	100
OH	70
NC	40
VA	70
IN	80
MO	70
CO	50
MD	20
WI	80
MT	50
SC	50
TN	40
GA	40
KS	40
AL	30
DE	40
IA	30
NH	40
ME	30
RI	30
UT	30
OK	30

*** POLICY
*** NAVIGATION
*** GROUP

State	Estimated Remedial Cost Share over 60 years Midpoint (\$mil)
WV	30
AK	20
ID	20
KY	10
NE	20
MN	10
HI	10
NM	10
DC	-
NV	-
SD	-

V. CONCLUSION

In its estimation of social costs of remediation activities associated with updated soil screening levels, EPA presents a low cost scenario (screening level of 200 ppm at all sites), high cost scenario (screening level of 200 ppm at all CERCLA Removal and RCRA CA sites, and 100 ppm at all Remedial CERCLA sites), and a midpoint scenario (midpoint cost estimate between the lower cost and higher cost scenarios). We assess EPA's analysis and assumptions and identify two major flaws that lead to substantial underestimation. First, EPA does not include all sites that will be affected under the updated guidance. Second, EPA's per-site remediation costs are underestimated.

EPA limits the universe of potentially affected sites to three types of CERCLA sites: NPL sites; deleted sites; and new sites over a 10-year period. EPA's omission of brownfields, active CERCLA sites, and federal facility sites from the universe amounts to a failure to follow best economic practices. We present an alternative universe of affected sites that shows EPA's underestimates affected properties by a minimum 30 percent. Compared to EPA's partial analysis that estimates a total of 469,165 properties potentially affected under the guidance, we estimate 608,000 properties and highlight that this still understates impacts because our analysis did not have enough data to include the expected vast number of brownfields that should be included in EPA's assessment.

EPA underestimates remediation costs for sites by excluding the oversight costs charged to private parties, the transaction costs private parties have to assign liability and to manage the cleanup, and other construction management costs. EPA relies on cost averages and site characterization data for a sample of CERCLA sites collected from regional staff. EPA does not disclose the approach used for selecting the portion of sites by which cost averages were extrapolated to the rest of the universe, including smaller sites whose pre-construction costs are likely significantly larger than EPA's averages and assumptions imply. Specifically, based

on project cost estimates at other sites, we determine that project management and construction management costs would be more equivalent to 30 percent of remediation efforts, twice that of EPA's assumed value of 15 percent.

Under the CERCLA statute, states are required to share the costs of Fund-lead remediation activity for sites on the NPL. States' share of these costs range from 50 percent (or greater) for facilities publicly operated at the time of the hazardous substance's disposal to 10 percent for other facilities. We assess the expected cost share by states over the 60 year period and estimate \$730 million in cost share obligations for the top five states alone: New Jersey, Florida, California, Pennsylvania, and New York. For the top ten states, the cost share obligations amount to \$1.2 billion.

By not accurately accounting for costs, EPA has failed to follow its own economic analysis guidance, its requirements for analysis under statutes, and best economic practices and requirements under the Office of Management and Budget's Circular A-4.⁴¹ EPA has over 40 years of data for the CERCLA program and could generate a full universe of potentially affected sites that should include active CERCLA sites, brownfields, and federal facility sites. EPA can and should also develop accurate and complete cost estimates that include oversight costs, PRP project management costs, and transaction costs.

⁴¹ Environmental Protection Agency, "Guidelines for Preparing Economic Analyses," December 17, 2010; U.S. Office of Management and Budget, "Circular A-4: Regulatory Analysis."

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