



TOWN OF DEWEY-HUMBOLDT
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**SENT VIA FEDEX OVERNIGHT COURIER
AND ELECTRONIC MAIL (dhont.jeff@epa.gov)**

May 13, 2023

Mr. Jeffrey A. Dhont
Remedial Project Manager
Superfund Division
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street (Mail Code: SFD-8-1)
San Francisco, California 94105

Re: Town of Dewey-Humboldt's Comments on the U.S. Environmental Protection Agency's Proposed Remedial Action Plan, dated March 1, 2023, for the Iron King Mine-Humboldt Smelter Superfund Site, Dewey-Humboldt, Arizona

Dear Mr. Dhont:

Through its duly elected Mayor and Town Council, the Town of Dewey-Humboldt (the "**Town**") hereby submits written comment to the U.S. Environmental Protection Agency ("**EPA**") regarding its Proposed Remedial Action Plan, dated March 1, 2023 (the "**PRAP**"), for the Iron King Mine-Humboldt Smelter Superfund Site (the "**IKM-HS Superfund Site**") in Dewey-Humboldt, Arizona (the "**Town's Comments**").

Specifically, the Town's Comments consist of (1) this letter; (2) the enclosed document titled "Specific Comments on EPA's Remedy Selection Process", dated May 13, 2023; and (3) the enclosed documents titled "Technical Memoranda on the Adequacy of the FS and PRAP, and by Reference the RI, Regarding Soils and Groundwater," prepared by the Town's environmental advisor, Dr. Stephen Speyer, R.G. While the focus of the Town's Comments is on the PRAP, to the extent the PRAP refers to or relies on EPA's Feasibility Study Report, dated September 1, 2022 (the "**FS**"), EPA's Remedial Investigation Report, dated September 1, 2016 (the "**RI**"), or other reports and materials in the administrative record for the IKM-HS Superfund Site, the Town's Comments also address such other reports and materials.

A. Introduction

At the outset, the Town wishes to thank EPA for the years of work undertaken at federal expense to characterize the nature, extent, and risk of contamination, to remove residential soils posing unacceptable risk to property owners and occupants, to develop, screen, and evaluate alternative remedial options, and to select and propose a preferred remedial action at the IKM-

HS Superfund Site. While it is no secret that the Town has been frustrated with the amount of time it has taken for the agency to get to this point in the Superfund process (i.e., remedy selection), the Town does appreciate that EPA is finally at the point of remedy selection and is prepared to spend tens of millions of dollars in designing and implementing a remedy. None of the Town's ensuing comments should be read to diminish the Town's appreciation for EPA's efforts to date, or EPA's contemplated efforts in the future. The Town's overriding concern is that its residents, businesses, and visitors are protected and its environment and natural resources are preserved for generations to come, and the Town appreciates EPA's commitment to achieve that outcome.

While the Town does not wish to diminish the comments of any other parties, particularly concerned Town residents, who have made, or will yet make, comments to EPA, the Town understands the importance of its voice among all commenters. The National Oil and Hazardous Substances Pollution Contingency Plan (the "*NCP*") requires that "in planning or undertaking Fund-financed action, [EPA] shall, to the extent practicable, ... [b]e sensitive to local community concerns."¹ Consistent with that general mandate, the NCP provides that "community acceptance" is one of nine criteria that EPA "shall ... consider" in evaluating remedial alternatives² and is a modifying criterion that "shall be considered in remedy selection."³ By "community acceptance," the NCP means an assessment that (a) determines "which components of the [remedial] alternatives interested persons in the community support, have reservations about, or oppose" and (b) "may not be completed until comments on the proposed plan are received."⁴

As the local community's institutional representative, the Town has prepared and hereby submits its comments to EPA with the foregoing NCP provisions in mind, and therefore respectfully requests that EPA accord the Town's Comment the due attention and weight required by the NCP in the agency's consideration of its final remedy for the IKM-HS Superfund Site.

B. The Town Supports Adoption of Remedial Alternative 3B

The NCP provides that "[t]he national goal of the remedy selection process is to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste."⁵ The Town accepts that at the IKM-HS Superfund Site waste treatment and minimization are impracticable. The volume of IKM-HS waste is high, the waste is not liquid, and the waste constituents of concern are not highly mobile, all of which are factors that allow EPA to pursue on-site non-treatment remedial alternatives at the IKM-HS

¹ 40 C.F.R. § 300.400(c)(4) (underscoring added).

² 40 C.F.R. § 300.430(e)(9)(iii)(I) (underscoring added).

³ 40 C.F.R. § 300.430(f)(1)(i)(C) (underscoring added).

⁴ 40 C.F.R. § 300.430(e)(9)(iii)(I).

⁵ 40 C.F.R. § 300.430(a)(1)(i).

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Superfund Site.⁶ Nevertheless, the Town absolutely supports the goal of, is totally committed to, and entirely expects selection of a remedy at the IKM-HS Superfund Site that is “protective of human health and the environment” and that “maintains protection over time.” The Town will necessarily live with EPA’s remedy long after it is implemented, and therefore is completely dedicated to ensuring the adoption and implementation of a remedy that protects the health of the Town’s residents and environment.

The remedy selection process established by the NCP requires EPA to develop a “range of alternatives” for addressing site contamination,⁷ which is “fully integrated with the site characterization activities of the remedial investigation.”⁸ This alternatives range should include, at one end, “an alternative that removes or destroys ... contaminants to the maximum extent feasible, eliminating or minimizing, to the degree possible, the need for long-term management.”⁹ The other end of the range should consist of:

“[o]ne or more alternatives that involve little or no treatment, but provide protection of human health and the environment primarily by preventing or controlling exposure to hazardous substances ... through engineering controls, for example, containment, and, as necessary, institutional controls to protect human health and the environment and to assure continued effectiveness of the response action.”¹⁰

Developing and evaluating a range of remedial alternatives is the primary purpose of a “feasibility study”¹¹, and in that regard the Town is generally comfortable with the remedial alternatives developed, screened and evaluated in the FS for the IKM-HS Superfund Site.

Following the development and evaluation of remedial alternatives, the next step in the remedy selection process established by the NCP is identification of “a preferred alternative” that is presented “to the public in a proposed plan, for review and comment.”¹² In the present case, EPA complied with this NCP requirement by publishing the PRAP, in which EPA identifies the FS’s Remedial Alternative 3B as the agency’s preferred remedial alternative at the IKM-HS Superfund Site. Remedial Alternative 3B consists of consolidation and containment of mine and smelter wastes in two waste repositories, one on the east side and the other on the west side of Highway 69, with the east side repository receiving all waste on the east side of Highway 69 and the west side repository receiving all waste on the west side of Highway 69. Under Alternative 3B, no waste moves across Highway 69.

⁶ See 40 C.F.R. §§ 300.430(a)(iii)(A), 300.430(e)(3)(i).

⁷ 40 C.F.R. § 300.430(e)(3)(i).

⁸ 40 C.F.R. §§ 300.430(d), 300.430(e)(1).

⁹ 40 C.F.R. § 300.430(e)(3)(i).

¹⁰ 40 C.F.R. § 300.430(e)(3)(ii) (underscoring added).

¹¹ See 40 C.F.R. § 300.430(e)(1).

¹² 40 C.F.R. §§ 300.430(f)(1)(ii), 300.430(f)(2), 300.430(f)(3).

After due consideration of EPA's remedial alternatives in the FS, the Town concurs that Remedial Alternative 3B is preferred and supports its selection as EPA's final remedy at the IKM-HS Superfund Site.

C. The Town Urges Immediate and More Substantive Attention to the Development and Implementation of Institutional Controls

1. Non-Treatment/Non-Removal Remedies Must Consist of Mutually Supplementary ECs and ICs

As indicated above, the NCP requires that a "range of [remedial] alternatives" be developed in a feasibility study and that such a range include one or more non-treatment/non-removal alternatives that prevent or control "exposure to hazardous substances ... through engineering controls ... and, as necessary, institutional controls."¹³ The pairing of "engineering controls" ("*ECs*") and "institutional controls" ("*ICs*") in crafting non-treatment/non-removal remedial alternatives for feasibility study evaluation is neither incidental nor insignificant.

The pairing of ECs and ICs is a fundamental NCP "expectation" in the development, selection, and implementation of any remedial alternative that leaves waste and waste residuals at a Superfund site, namely that EPA "shall consider":

"us[ing] a combination of methods, as appropriate, to achieve protection of human health and the environment. In appropriate site situations, treatment of the principal threats posed by a site, with priority placed on treating waste that is liquid, highly toxic or highly mobile, will be combined with engineering controls (such as containment) and institutional controls, as appropriate, for treatment residuals and untreated waste."¹⁴

In other words, any remedy that leaves waste and waste residuals at a Superfund site is presumed to have necessarily two components – ECs and ICs. The reason is that ICs accomplish something that ECs do not, indeed cannot.

"[I]nstitutional controls," according to the NCP, "supplement engineering controls."¹⁵ Supplementation suggests adding something to complete a thing, supplying a deficiency to make a whole of something, or reinforcing or extending the whole of something, and that is precisely what ICs do for ECs. ECs are engineered and constructed physical measures, barriers, and systems that are designed to contain, prevent, reduce or limit exposure to waste or waste residuals. By contrast, ICs are non-engineered legal and administrative controls, restrictions, and guidelines that are designed to govern or manage human behavior towards property containing

¹³ 40 C.F.R. § 300.430(e)(3)(ii) (underscoring added).

¹⁴ 40 C.F.R. § 300.430(a)(1)(iii)(C) (underscoring added).

¹⁵ 40 C.F.R. § 300.430(a)(1)(iii)(D) (underscoring added).

waste and waste residuals, and the engineered systems controlling physical access to such waste and waste residuals. As such, ICs protect the long-term integrity of ECs and further limit the potential for human and environmental exposure to waste and waste residuals.

In short, a Superfund remedy that consists of ECs only, or ECs with inadequately conceived or developed ICs, is an incomplete, deficient remedy. Likewise, a Superfund remedy that consists of ICs only, or ICs with inadequately conceived or developed ECs, is an incomplete, deficient remedy. For this reason, the NCP generally proscribes Superfund remedies consisting only of ICs. “The use of institutional controls shall not substitute for active response measures (e.g., treatment and/or containment of source material, restoration of ground waters to their beneficial uses) as the sole remedy unless such active measures are determined not to be practicable, based on the balancing of trade-offs among alternatives that is conducted during the selection of remedy.”¹⁶ Although not expressly stated in the NCP, the logical implication of the foregoing statement is that ECs likewise should not be used without appropriately developed ICs.

Yet, when a Superfund remedy development process begins with the expectation that ECs will be the principal tools used to address waste threats, ICs can be, and often are, marginalized, which jeopardizes the crafting of a complete, fully protective Superfund remedy. EPA guidance cautions Superfund site managers to avoid this outcome.

“[Institutional controls, or] ICs are vital elements of response alternatives because they simultaneously influence and supplement the physical component of the remedy to be implemented. On the one hand, the right mix of ICs can help ensure the protectiveness of the remedy; on the other, limitations in ICs may lead to reevaluation and adjustment of the remedy components, including the proposed ICs. At some sites, remedy contingencies may protect against uncertainties in the ability of the ICs to provide the required long-term protectiveness. These points illustrate how important it is for site managers to evaluate ICs as thoroughly as the other remedy components in the Feasibility Study (FS) ..., when looking for the best ICs for addressing site-specific circumstances. Adding ICs on as an afterthought without carefully thinking about their objectives, how the ICs fit into the overall remedy, and whether the ICs can be realistically implemented in a reliable and enforceable manner, could jeopardize the effectiveness of the entire remedy.”¹⁷

2. *EPA’s Contemplated ICs are Inadequately Developed*

In the Town’s view, EPA’s contemplated ICs for the IKM-HS Superfund Site are inadequately developed because EPA’s focus in the FS and PRAP is primarily on the ECs. As a

¹⁶ 40 C.F.R. § 300.430(a)(1)(iii)(D).

¹⁷ EPA Office of Solid Waste and Emergency Response, “*Institutional Controls: A Site Manager’s Guide to Identifying, Evaluating and Selecting Institutional Controls At Superfund and RCRA Corrective Action Cleanups*,” OSWER 9355.0-74FS-P, EPA 540-F-00-005 (September 2000), at 2 (underscoring added).

result, the effectiveness of EPA's proposed remedy for the IKM-HS Superfund Site is jeopardized. That EPA's primary focus in its remedy development and evaluation process on ECs (i.e., capped waste repositories) and the ICs are only an "afterthought" is plainly evident throughout EPA's FS and PRAP.

In the FS's executive summary, the essential elements of each evaluated remedial alternative are presented, and in doing so the focus is entirely on the various ECs associated with the alternative. The idea of ICs is simply tagged on at the end, without any meaningful amplification or development. The summary of Alternative 3B, EPA's preferred remedial alternative, is an example:

"Under Alternative 3B, as with Alternative 3A, most mine waste exceeding cleanup standards selected in the ROD would be excavated and disposed of in two waste repositories on either side of Highway 69. With this alternative, all waste west of Highway 69 would be excavated and disposed in a repository at the Main Tailings Pile; while all waste east of Highway 69, including waste from the Chaparral Gulch, would be excavated and disposed of in a repository at the smelter tailings swale. The Main Tailings Pile would hold 4.3 million CY of waste, and the smelter tailings swale would hold 1.0 million CY of waste. The other actions under Alternative 3B would be essentially the same as Alternative 3A. As with Alternatives 2 and 3A, for purposes of the FS it is assumed that the dam in Chaparral Gulch would be removed. The main body of the FS report text evaluates in detail such features as repository volume and areal footprint; repository cover construction, slope stability, grading and compaction, and soil borrow needs; structure demolition (including the dam); hauling routes and durations; long-term maintenance requirements; and institutional controls."¹⁸

Elsewhere, the FS's executive summary provides only modest explanation of the ICs contemplated for the evaluated remedial alternatives: "Alternatives 2, 3A and 3B include the following institutional controls: certain land use controls for waste covers, slag, post-remedial excavation, and preventing residential use of certain areas; zoning restrictions and/or deed restrictions applicable to capped and covered areas, which also applies to Alternative 4."¹⁹

Not surprisingly, the main report of the FS mirrors the FS's executive summary. In the main report of the FS, nearly all the substantive attention is placed on the ECs contemplated for the management of mine and smelter wastes and their constituents at the IKM-HS Superfund Site. While the need for ICs is acknowledged, it is done almost obligatorily. Their potential content description is shallow, even tentative. In Section 3.3.1, the FS states that ICs "potentially applicable" to the ECs under evaluation include "restrictions on land use and access" that "may

¹⁸ ES.4.4, *Alternative 3B: On-Site Consolidation and Containment at Two Repositories with Waste Remaining East and West of Highway 69*, at ES-12 (underscoring added).

¹⁹ ES.4.0, *Development of Alternatives*, at ES-10.

take the form of zoning ordinances or restrictions and covenants to deeds for individual properties.”²⁰ In subsequent sections discussing each evaluated remedial alternative, EPA gives primary attention to the engineered aspects of the alternative and provides only a superficial description of the ICs that might accompany the alternative. An example is, again, EPA’s discussion of Remedial Alternative 3B. In Section 4.5.8, the FS simply states that “land use would be restricted, and excavation prohibited to prevent cap and cover damage” at the mine waste and smelter waste repositories; “zoning restrictions (or deed restrictions, or both) would be implemented to prevent future residential, commercial, or industrial development of other capped and covered areas”; “land use restrictions,” “excavation” restrictions, and “a soil management plan” would be needed in certain areas outside the waste repositories; “potable groundwater use should be prohibited” at the mine waste repository; and “building” prohibitions would be needed in the slag area.²¹ EPA’s PRAP treats the ICs potentially applicable to Remedial Alternative 3B exactly the same way.²²

3. *More Substantive Attention to the Development and Implementation of ICs is Needed Prior to Remedy Design*

While EPA may contend that such superficial treatment of ICs is acceptable at the FS and PRAP stage of the Superfund remedy development and selection process, the Town would beg to differ for two important, related reasons.

a. *IC Development and Evaluation Deserve the Same Rigor and Focus as EC Development and Evaluation*

First, the ICs component of a Superfund remedy is no less important than the ECs component of the remedy. If ICs are “vital”, “essential”, and “critical” components of remedial alternatives as EPA has repeatedly emphasized in its guidance documents on the subject²³, then the ICs component should be developed, screened and evaluated at the FS and PRAP stage with the same rigor and focus as the ECs component. Indeed, this is exactly what EPA guidance provides.

In a guidance document to Superfund site managers, EPA states:

²⁰ 3.3.1, *Institutional Controls*, at 56.

²¹ 4.5.8, *Institutional Controls*, at 103.

²² See PRAP, at 38.

²³ See Office of Solid Waste and Emergency Response, *Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites*, OSWER 9355.0-89 EPA-540-R-09-001 December 2012, at 34 (“vital”); Office of Solid Waste and Emergency Response, *Institutional Controls: A Citizen’s Guide to Understanding Institutional Controls at Superfund, Brownfields, Federal Facilities, Underground Storage Tank, and Resource Conservation and Recovery Act Cleanups*, OSWER 9255.0-98, EPA-540-R-04-004, February 2005, at 5 (“essential”); and Office of Solid Waste and Emergency Response, *Institutional Controls: A Site Manager’s Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups*, OSWER 9355.0-74FS-P, EPA 540-F-00-005 September 2000, at 1 (“critical”).

“If any remedial options being evaluated in the FS ... leave waste in place that would not result in unrestricted use and unlimited exposure, ICs should be considered to ensure that unacceptable exposure from residual contamination does not occur ... ICs should be evaluated in the same level of detail as other remedy components. ICs are considered response actions under CERCLA ... ICs must meet all statutory requirements, and are subject to the nine evaluation criteria outlined in the NCP (40 CFR 300.430 (e)(9)(i)) for CERCLA cleanups.”²⁴

In a subsequent guidance document to Superfund site managers, the same point is made with further elaboration.

“At sites where any media will not be cleaned up to a level that supports UU/UE [i.e., [unlimited use/unrestricted exposure], the site manager and site attorney should discuss any IC instruments (in addition to active response measures where needed) that may be appropriate, taking into account financial concerns, legal implementation issues, jurisdictional questions, the impact of layering multiple ICs, and reliability and enforcement concerns ... The challenges of planning, implementing, maintaining and enforcing ICs ... [require] site managers and attorneys [to] fully evaluate ICs during the development of cleanup alternatives (e.g., during the FS stage of CERCLA ... and plan for the implementation, maintenance, and enforcement challenges early in the cleanup process.”²⁵

Finally, in a guidance document to the public on the role and importance of ICs, EPA emphasizes: “EPA, States, Tribes, local governments and cleanup parties should evaluate ICs as thoroughly and rigorously as all remedy components. This analysis will help to identify potential strengths and weaknesses and to develop the appropriate balance of ICs and ultimately increase the long-term viability of the remedy.”²⁶

²⁴ Office of Solid Waste and Emergency Response, *Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups*, OSWER 9355.0-74FS-P, EPA 540-F-00-005 September 2000, at 5 (underscoring added).

²⁵ Office of Solid Waste and Emergency Response, *Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites*, OSWER 9355.0-89 EPA-540-R-09-001 December 2012, at 3-4 (underscoring added).

²⁶ Office of Solid Waste and Emergency Response, *Institutional Controls: A Citizen's Guide to Understanding Institutional Controls at Superfund, Brownfields, Federal Facilities, Underground Storage Tank, and Resource Conservation and Recovery Act Cleanups*, OSWER 9255.0-98, EPA-540-R-04-004, February 2005, at 5 (underscoring added).

Clearly, EPA guidance documents provide that the ICs component of a remedy should be treated no less equally in terms of development, screening, and evaluation than the ECs component of the remedy. Yet, in the present case EPA's FS and PRAP fail to do so. While the FS and PRAP identify and treat ICs as a component of the remedy, they are conceived and described in a most elementary manner. As a result, the ICs contemplated for the IKM-HS Superfund Site cannot reasonably be considered to have been "thoroughly and rigorously" evaluated.

b. The Town is Likely to be the Primary Adopter and Enforcer of Meaningful ICs, and Needs Guidance and Time to Develop Them

The second reason that the Town begs to differ with any suggestion that EPA's generalized identification and evaluation of ICs is sufficient at this stage of the remedy selection process is that the ICs EPA is proposing at the IKM-HS Superfund Site - "vital," "essential," and "critical" as they are supposed to be - are largely outside EPA's authority to adopt, implement and enforce. Indeed, the "land use restrictions," "excavation" restrictions, "soil management plan", "potable groundwater use" prohibition, and "building" prohibition identified in the FS and PRAP as the general ICs necessary for the IKM-HS Superfund Site are entirely outside of EPA's authority to adopt, implement and enforce. Rather, all such restrictions, management plans and prohibitions would appear to be entirely within the State of Arizona's and the Town's authority to adopt, implement and enforce. The FS acknowledges that fact. "The local government, private and state landowners, Arizona State Land Department (ASLD), EPA, or BLM would likely enforce the ICs developed as part of an alternative for the Site. Therefore, these entities must be involved in developing and eventually implementing any ICs."²⁷

To the Town's knowledge, however, EPA consultation with the State of Arizona and Town on identification, development, implementation, and enforcement of the specific ICs needed for the IKM-HS Superfund Site has not occurred to date. If there have been consultations between EPA and the State of Arizona on these matters, the Town is not aware of such consultations and believes it should not only have been made aware of them, but should have been invited to be an active participant in them. The reason is that, as between the State of Arizona and the Town, the Town undoubtedly has the larger role in developing, implementing, and enforcing the ICs contemplated for the IKM-HS Superfund Site. And with the larger role in such matters, the Town believes its active participation in any ICs discussion is vital to developing meaningful and enforceable ICs to supplement the ECs contemplated in the FS and PRAP for the IKM-HS Superfund Site.

²⁷ 3.3.1, *Institutional Controls*, at 56 (underscoring added).

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Significantly, EPA guidance makes it abundantly clear that both the state and relevant local governments should be actively consulted in the IC identification and development process. Regarding the state's role, EPA guidance provides as follows:

“If it appears that the state will be relied upon to establish the ICs, the site manager should immediately talk to state agency personnel to gauge their willingness to establish, maintain and enforce the control, if necessary. This discussion is encouraged regardless of the type of IC(s) that will be implemented. The site manager should work with his or her state counterpart to identify and contact the appropriate state agency and personnel for each proposed IC.”²⁸

Again, whether such consultations occurred in the present case is unknown to the Town.

Regarding the local municipality's role in the ICs identification and selection process, EPA guidance provides as follows:

“CERCLA ... and the NCP do not specify a role for local governments in implementing the selected remedy. However, a local government is often the only entity that has the legal authority to implement, monitor and enforce certain types of ICs (e.g., zoning changes). While EPA and the states take the lead on CERCLA ... response activities, local governments have an important role to play in at least three areas: (1) determining future land use; (2) helping engage the public and assisting in public involvement activities; and (3) implementation and long-term monitoring and enforcement of ICs. Therefore, it is critical that the site manager and his or her state counterpart involve the appropriate local government agency in discussions on the types of controls that are being considered. The capability and willingness of the local government to implement and ensure the short- or long-term effectiveness of the proposed ICs should be considered during the RI/FS.... In certain cases, cooperative agreements may be considered to assist local governments in the implementation, monitoring and enforcement of required ICs.”²⁹

Notwithstanding the Town's “important role” in the “implementation and long-term-monitoring and enforcement” of ICs, however, to date the Town has had no discussion with EPA on the “types of [institutional] controls” EPA has contemplated for the IKM-HS Superfund Site or on the “capability and willingness” of the Town to “implement and ensure” the effectiveness of such controls. All that the Town has received so far from EPA on the subject of ICs is a statement in

²⁸ Office of Solid Waste and Emergency Response, *Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups*, OSWER 9355.0-74FS-P, EPA 540-F-00-005 September 2000, at 6 (underscoring added).

²⁹ *Id.* at 7.

the PRAP that “the town government will receive instructions and a map of all parcels with warning barrier for use in permitting processes.”³⁰

In the absence of any Town discussions with EPA or the State of Arizona on the ICs needed at the IKM-HS Superfund Site, the Town wishes to make it clear that the Town is willing, and believes itself capable, to implement robust and meaningful ICs and ensure their effectiveness at the IKM-HS Superfund Site. Further, the Town strongly believes that discussions among EPA, the State of Arizona and the Town should commence immediately following the closure of the public comment period on May 13, 2023. If, as among EPA, the State of Arizona and the Town, the Town will have the predominant role in adopting and enforcing the ICs conceptualized in the FS and PRAP, the Town contemplates that such controls will need to be adopted and enforced largely in the form of one or more Town ordinances. The development and adoption of such ordinances, however, will take time to discuss, coordinate, and agree on among EPA, the State of Arizona, and the Town, and thereafter to present to the Town’s elected officials and residents for review and comment before formal adoption by the Town’s elected officials. Discussion of such matters cannot be deferred until remedy design or construction (or some other unspecified time in the future when EPA delivers to the Town “instructions and a map”), with an expectation that the Town can readily prepare, develop, and adopt one or more IC ordinances. For one or more IC ordinances to be ready for implementation by the time of remedy design and/or construction, EPA, the State of Arizona and the Town need to consult now on the scope, content and terms of the ICs ordinances needed from the Town.

c. The Town has Pressing Needs Currently for one or more IC Ordinances

There are other reasons for immediate commencement of the foregoing recommended discussion among EPA, the State of Arizona and the Town. Standards and protocols for the excavation, movement, replacement, transportation, and disposal of residential, commercial, industrial, recreational, and municipal (e.g., roadways) properties, as well as the construction, building, and development on such properties, have been needed since EPA commenced its soil characterization and removal actions years ago, and are needed all the more urgently today.

On a regular basis, the Town and its residents, property owners, and businesses face soil management, excavation, and construction issues implicating Superfund wastes and waste residuals. For the sake of protecting human health and the environment now in connection with all the many ongoing activities in and on Town soils, EPA, the State of Arizona and the Town need to counsel together now to identify, develop, and implement an enforceable ICs program for soils.

³⁰ PRAP, at 38.

The Town notes that such programs have been discussed, agreed upon, and adopted by federal, state and local governments at other Superfund sites with historic metal mines and smelters in Butte and East Helena, Montana; Bunker Hill, Idaho; Murray, Utah; and Leadville, Colorado. An ICs program for soils similar to those at these other mine and smelter Superfund sites is needed sooner rather than later in the Town of Dewey-Humboldt, Arizona.

d. Remedy Construction will Require Landowner Commitment to both ECs and ICs

Further reason for immediate commencement of discussions among EPA, the State of Arizona and the Town on the ICs program for the Town arises from Town concern regarding the current ownership of the land that is targeted for the waste repository sites and the commitment of such ownership to both the ECs and ICs components of EPA's remedy. In other words, EPA, the State of Arizona and the Town need to discuss whether ownership of lands targeted for remediation needs to be transferred to parties committed to protecting the remedy. The Superfund statute and the NCP require that if EPA determines real property must be acquired to conduct a remedial action, EPA may acquire the real property but only if the state assures EPA that the state will accept transfer of the property upon completion of the remedial action.³¹ EPA guidance goes a step further, suggesting that property transfers needed to protect a remedy need to be discussed with both the state and local municipality.

“[I]f a property interest is conveyed by the land owner to EPA to perform a remedial action (e.g., to ensure the reliability of the ICs restricting the use of the land), CERCLA requires the state to accept transfer of the title from EPA following completion of the CERCLA remedial action. If the state does not agree to accept title to the property, the site manager must find another party to assume ownership (e.g., a local government, community group or trust) or another type of IC (e.g., local government control) must be selected.”³²

Irrespective of whether property transfers are needed or will be undertaken, however, the NCP requires that for Superfund-financed remedial actions, the state must assure that any ICs implemented as part of a remedial action are in place, reliable, and will remain in place at a site after the initiation of operation and maintenance.³³ As a subdivision of the State of Arizona and the likely and predominant implementer of ICs at the IKM-HS Superfund Site, the Town believes it has a most important role to play, and therefore should be affirmatively included, in the provision of any such IC assurances to EPA. Again, this suggests that EPA, the State of Arizona

³¹ See 42 U.S.C. § 9604(j)(2); 40 C.F.R. § 300.510(f).

³² Office of Solid Waste and Emergency Response, *Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups*, OSWER 9355.0-74FS-P, EPA 540-F-00-005 September 2000, at 6 (underscoring added).

³³ See 40 CFR 300.510(c)(1); see also 40 C.F.R. § 300.435(f)(1).

and the Town should commence immediately discussing the nature, scope, and content of the ICs the Town will need to adopt to protect the integrity of the ECs proposed at the IKM-HS Superfund Site.

4. *The Town Recommends Preparation and Adoption of an ICIAP*

a. *An ICIAP Would Facilitate Discussion Among Governmental Agencies on Development and Implementation of ICs*

All the foregoing IC comments leads the Town to suggest that EPA consider the preparation and adoption of an Institutional Controls Implementation and Assurance Plan (“*ICIAP*”) for the IKM-HS Superfund Site. An ICIAP would assist EPA, the State of Arizona and the Town to establish and document the actions necessary to develop, implement, enforce, and protect the IC components of the remedy at the IKM-HS Superfund Site and to identify the parties responsible for such actions. An ICIAP for the IKM-HS Superfund Site would therefore serve as a single-source of concise site-specific ICs, and be a useful tool for planning and assuring implementation, maintenance, and enforcement of the controls.³⁴

Generally, EPA guidance recommends that an ICIAP be “developed prior to, or at the same time as, the design of the engineered response (e.g., Remedial Design phase of CERCLA ...) and finalized with design completion,”³⁵ which is about where EPA is in the Superfund process at the IKM-HS Superfund Site. EPA explains that “[t]his approach should allow time for the site managers and site attorneys to complete detailed discussions with parties that are responsible for implementing, maintaining, and enforcing ICs and any other relevant stakeholders.” *Id.* This statement underscores the Town’s prior point about allowing EPA, the State of Arizona and the Town time needed to have the “institutional controls” conceptualized in the FS and PRAP ready for implementation by the time of remedy design and/or construction.

b. *An ICIAP Also Would Facilitate Discussion Among Governmental Agencies on IC Funding Sources*

Finally, development of an ICIAP for the IKM-HS Superfund Site will invite and advance discussion on the availability of funding resources for implementation and enforcement of the “institutional controls” contemplated at the Site. Funding of any “institutional controls” program to be developed, implemented, maintained and enforced by the Town is a critical issue

³⁴ See Office of Solid Waste and Emergency Response, *Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites*, OSWER 9355.0-89 EPA-540-R-09-001 December 2012, at 10.

³⁵ Office of Solid Waste and Emergency Response, *A Guide to Preparing Institutional Control Implementation and Assurance Plans at Contaminated Sites*, OSWER 9200.0-77, EPA-540-R-09-002, December 2012, at 3.

for the Town to address, and should commence right away. As EPA has stated in relevant institutional controls guidance documents:

“Consistent with the ‘polluter pays’ policy, EPA generally strives to ensure that parties responsible for contamination pay for the cleanup, including IC-related costs. The site manager and site attorney may provide state, tribal, and local governmental officials with information concerning possible approaches and strategies to ensure that adequate funding will be available by responsible parties for IC costs. In some instances, it may be possible for state, tribal, or local authorities to use CERCLA’s § 107 liability provisions to secure responsible party financing for ICs.”³⁶

To date, the Town has very little information regarding potentially responsible parties (“*PRPs*”) at the IKM-HS Superfund Site, EPA’s pursuit of such parties for cost recovery, or such parties’ ability to pay. Understanding where EPA is on these matters may assist the Town in understanding its options for securing “responsible party financing” for the Town’s ICs program.

In the absence of PRP funding for ICs, the Town understands that there are a variety of programs and tools to possibly help fund ICs. Such programs and tools include EPA’s Brownfields program that provides grants to states and local governments to carry out site assessment and cleanup activities. Section 104(k)(4)(C) of the Superfund statute and EPA guidance documents provide that a local government that is a Brownfields grant recipient can use up to ten percent of the grant to monitor and enforce ICs that are designed to prevent exposure to contamination from a Brownfields site. States also can use grant funds to establish or enhance their response program for addressing Brownfields sites, including operation and maintenance or long-term monitoring activities. In addition, funding provided to state and tribal response programs under § 128(a) of the Superfund statute can be used to monitor and maintain ICs controls, including the development of IC databases.

Another funding tool available to the Town may be an EPA cooperative agreement. According to EPA guidance on the subject,

“[EPA’s] site manager and site attorney may consider using CERCLA § 104(d) cooperative agreements, as appropriate, to support the initial implementation of ICs (but not O&M) by state and local governments at CERCLA Fund-lead sites. CERCLA authorizes EPA to enter into cooperative agreements with state and local governments to help conduct response actions at remedial action sites and non-time-critical removal sites. A Superfund cooperative agreement is the assistance vehicle that transfers EPA funds for a response to state, tribal, or local governments and documents both EPA and recipient responsibilities for a site. EPA generally will enter into cooperative agreements with the state-lead agency (usually the state’s pollution control agency) as designated by the

³⁶ *Id.* at 11.

state's governor and, less commonly, with local governments. To involve other essential state agencies, the state-lead agency typically enters into an intergovernmental agreement with these other agencies. States also may enter into intergovernmental agreements with local governments as an alternative to a direct cooperative agreement between EPA and the local government."³⁷

Brownfields programs, cooperate agreements and similar funding tools for ICs controls need to be actively and affirmatively explored for potential use, and could be appropriately discussed by EPA, the State of Arizona and Town in connection with the preparation of an ICIAP for the IKM-HS Superfund Site.

5. *Town Reuse/Revitalization Options for the Remediated Mine and Smelter Properties Need to be Factored into IC Development and Implementation*

The Town understands that current and reasonably anticipated future land uses are an essential part of the Superfund remedy selection process. To that end, use and reuse assessments were conducted at the IKM-HS Superfund Site in 2010 and 2020, and the 2020 use and reuse assessment was factored into EPA's FS and PRAP for the IKM-HS Superfund Site.³⁸ Based on the general references in the FS and PRAP regarding the 2020 reuse assessment, the Town understands that EPA is satisfied that its preferred remedy at the IKM-HS Superfund Site is compatible with current and reasonably anticipated future uses of land to be affected by the remedy.

However, the Town wishes to advise EPA that the Town is re-assessing current and future land uses and revitalization options at the mine and smelter sites and surrounding properties. While the Town does not anticipate that its re-assessment of land uses in these areas will be incompatible with the EC component of EPA's remedy, the Town does anticipate that its re-assessment of land uses will affect the development of the IC component of the remedy. For that reason, in addition to all of the other reasons cited above, the Town believes discussions among EPA, the State of Arizona, and the Town are needed well before remedy design and construction regarding ICs and the Town's anticipated development and adoption of one or more IC ordinances.

E. Summary and Conclusion

The Town appreciates the opportunity granted it to provide written comment on EPA's proposed remedy for the IKM-HS Superfund Site. The Town is satisfied that EPA's proposed consolidation-and-cap approach to management of mine and smelter wastes (i.e., Remedial Alternative 3B) is the appropriate remedy among the several viable alternatives considered.

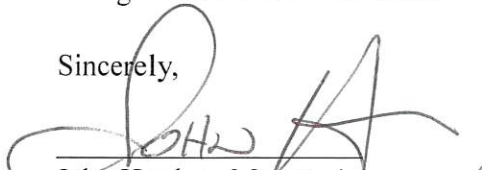
³⁷ *Id.* (underscoring added).

³⁸ FS, at 15; PRAP, at 24-25.

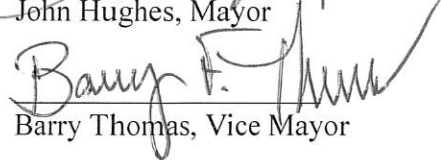
Letter to Mr. Jeffrey A. Dhont
Remedial Project Manager, EPA Region 9
May 13, 2023
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However, the Town strongly believes that the IC component of EPA's proposed remedy is inadequately developed, and that more substantive attention to development and implementation of the IC component is needed now, well before final remedy design. With the Town likely to be the primary adopter and enforcer of ICs at the IKM-HS Superfund Site, the Town needs guidance and time to develop and adopt ICs that properly supplement the ECs of EPA's remedy and properly address the Town's pressing need for an environmentally protective and legally enforceable soil management program. In coming days, the Town's representatives will seek opportunity to meet with EPA on these matters, and requests that EPA be willing to schedule and hold meaningful discussion with them.

Sincerely,



John Hughes, Mayor



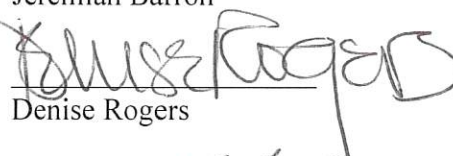
Barry Thomas, Vice Mayor



Amy Lance



Jeremiah Barron



Denise Rogers



Matthew Fenn

Enclosures

cc: Laura Malone, ADEQ Division Director, Waste Programs
Tina LePage, ADEQ Manager, Remedial Projects
Karin Harker, ADEQ Unit Manager, Federal Projects Program
Katelyn Kane-DeVries, ADEQ Project Manager, IKM-HS Superfund Site

SPECIFIC COMMENTS ON EPA'S REMEDY SELECTION PROCESS

THE IRON KING MINE-HUMBOLDT SMELTER SUPERFUND SITE DEWEY-HUMBOLDT, ARIZONA

May 13, 2023

Prepared by:

Stephen E. Speyer, Ph.D., R.G., Speyer Environmental LLC
James J. Hamula, Camelback Law Group

For and in behalf of:

The Town of Dewey-Humboldt

The following are specific comments (these "**Comments**") on the U.S. Environmental Protection Agency's ("**EPA**") remedy selection process for the Iron King Mine-Humboldt Smelter Superfund Site in Dewey-Humboldt, Arizona (the "**IKM-HS Superfund Site**"). These Comments have been prepared for and in behalf of the Town of Dewey-Humboldt (the "**Town**") by Stephen E. Speyer, Ph.D., R.G., Speyer Environmental LLC, and James J. Hamula, Camelback Law Group, both of whom are retained environmental advisors to the Town. These Comments are submitted to EPA in response to its request for public comment on the agency's Proposed Remedial Action Plan (March 1, 2023) for the IKM-HS Superfund Site.

These Comments are coordinated with two (2) Technical Memoranda prepared by Dr. Speyer as directed by the Town. General references are provided to Technical Memorandum 01 ("**TM 01**"), which was submitted to EPA and the Arizona Department of Environmental Quality ("**ADEQ**") on February 28, 2023, and Technical Memorandum 02 ("**TM 02**"). Both documents are attached hereto and, along with these Comments, are intended for inclusion in EPA's Administrative Record for the IKM-HS Superfund Site pursuant to 40 C.F.R. §§ 300.430(f)(3) and 300.815(b). As a point of reference, each Comment herein includes as relevant and appropriate, pertinent and authoritative reference to corresponding requirements and provisions under the National Oil and Hazardous Substances Pollution Contingency Plan ("**NCP**"), as detailed in 40 C.F.R. Part 300.

AVAILABILITY OF FUNDING TO CONSTRUCT & IMPLEMENT THE FINAL REMEDY

- (1) **Bipartisan Infrastructure Law Funding.** EPA Region 9 has advised the Town that it intends to seek funding for the construction and implementation of the final remedy at the IKM-HS Superfund Site from federal appropriations made available to EPA under the Infrastructure Investment and Jobs Act, Pub. L. 117-58, 135 Stat. 429 (the "**Bipartisan Infrastructure Law**" or "**BIL**"). Specifically, the BIL appropriated \$3.5 billion to EPA's Superfund Remedial Program to eliminate the backlog of unfunded Superfund remediation projects and expedite remediation of ongoing Superfund projects. The Town understands that EPA Region 9 cannot apply for BIL money for the IKM-HS Superfund

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Site until EPA’s final remedy for the site is “construction-ready,” meaning that EPA’s final remedy at the site has been selected, designed, and federally procured. As a result, the Town understands that EPA Region 9 has accelerated the remedy selection process at the IKM-HS Superfund Site so that the site remedy is “construction-ready” and BIL money can be applied for by about the end of 2024.

The Town has three (3) concerns with EPA Region 9’s plan to pursue BIL money for the final remedy at the IKM-HS Superfund Site.

- a. The Town understands that, by the conclusion of fiscal year 2023, \$2.0 billion of the BIL’s original \$3.5 billion Superfund-related appropriation will have been spent at or committed to other Superfund sites. The Town therefore is concerned that by the time EPA Region 9 has a “construction-ready” remedy at the IKM-HS Superfund Site, all or nearly all BIL Superfund-related monies will have been spent at or committed to other Superfund sites. Please advise the Town whether potential unavailability of BIL Superfund-related monies for the final remedy at the IKM-HS Superfund Site may result in EPA Region 9, and the Town, having a “construction-ready” remedy that cannot be constructed.
- b. In the absence of BIL Superfund-related monies, the Town is concerned about what funding options will exist for the final remedy at the IKM-HS Superfund Site. The Town notes that the Bipartisan Infrastructure Law also reinstated and modified Superfund chemical excise taxes from July 1, 2022 through December 31, 2031 and that as of September 30, 2022, more than \$413 million had been collected for EPA to use in fiscal year 2023 for Superfund work. Please advise whether EPA Region 9 anticipates such Superfund excise taxes being available to fund the final remedy at the IKM-HS Superfund Site, or what other funding options exist or might exist to ensure that the Superfund process in the Town can continue to closure.
- c. Finally, the Town is concerned that EPA Region 9’s acceleration of the remedy selection process at the IKM-HS Superfund Site may result in an inadequately and deficiently designed final remedy, all in the interest of securing BIL monies that may not be available by the time EPA Region 9 has a “construction-ready” remedy at the site. A test of EPA Region 9’s commitment to develop a fully protective final remedy will be in EPA Region 9’s readiness and willingness to meet and work with the Town prior to final remedy decision and design to develop and implement a robust “institutional controls” program by the Town, as requested in the Town’s May 13, 2023 comment letter to EPA.

REMEDICATION STANDARDS

The Town has several concerns relating to EPA's remediation standards at the IKM-HS Superfund Site. The Town believes that Arizona State Soil Remediation Levels, which are pre-

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determined remediation standards, uniformly apply as an “applicable or relevant and appropriate requirement” (“*ARAR*”) (*see generally* 40 C.F.R. § 300.400(g)) unless site conditions require consideration of alternative remediation standards, as provided for in the Arizona Administrative Code (A.A.C.).

(2) Background Threshold Values for Soils

- a. The Town agrees that the determination of an appropriate Background Threshold Value (“*BTV*”) that adequately addresses A.A.C. R18-7-204 as an ARAR is an appropriate approach regarding Arsenic contamination at the IKM-HS Superfund Site. The Town understands that there are three (3) keynote requirements under the State regulation that bear attention. First, an adequate historical assessment of the property in terms of the background conditions considered to represent a suitable baseline must be established. The Town believes that this has been adequately addressed by EPA. Second, the baseline study must adequately identify “site-specific” and compile an appropriate, corresponding dataset. Third, the background standard must be calculated using an appropriate statistical analysis, such as the 95% Upper Confidence Limit (“*UCL*”).

The Town requests that EPA provide a summary of how these individual requirements for the adopted ARAR were addressed by EPA in assigning a remediation standard based on a calculated BTV for Arsenic.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.400(g)]

- b. The Town does not believe that EPA has satisfied the “site-specific” criterion in a way that is protective of the most sensitive potential receptors located in the IKM-HS Superfund Site, namely residential communities. The IKM-HS Superfund Site is located in a geologically complex area that includes fluvial sediments as well as rugged, ore body massifs. EPA identified 31 separate Areas of Concern (“*AOCs*”) that related only to the source areas within the Site. “Site-specific” as applied in this case, to assign a health-risk based threshold value, must be properly clarified so that the term is not too broadly applied and sufficiently addresses the intent of A.A.C. R18-7-204.B.2. The Town believes that EPA has not adequately addressed the site-specific criterion required in the State regulation.

The Humboldt residential community is located on relatively flat ground west and, to a lesser degree, east of the Aqua Fria River. These two (2) residential areas may warrant differing remedial standards for Arsenic, but the main body of the community, including the Town of Humboldt proper, is clearly situated on a flat of Balon Soil that is characterized, based on EPA’s background arsenic dataset, at a BTV that is substantially less than the 92 mg/Kg proposed. The Town believes that Dr. Speyer has demonstrated that residential properties on Balon Soil, but separated

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by the Aqua Fria River, also show statistically different background attributes that should be reflected in assigning remediation standards.

The Town requests that EPA provide a defensible survey of BTVs in accordance with ARARs that correspond to Residential Areas of Concern (“*RAOCs*”) based on predominant soil types in affected residential areas of the IKM-HS Superfund Site.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.400(g); § 300.430(a)(1)(ii)(C); § 300.430(b)(5); § 300.430(e)(1); § 300.430(e)(2)(i)(A)]

- c. The Town believes that the BTV for Arsenic requires revision based on site-specific criteria as dictated and required by the state ARARs (as referenced). The numerical difference between the BTV remedial standard provided in the FS report and reiterated in the PRAP (92 mg/Kg) and the BTV that is indicated by the concentration of Arsenic in Balon Soils only (< 45 mg/Kg) is an order of magnitude less and, as such, represents a significant and unacceptable increase in the additive lifetime cancer risk associated with soils that are intended to be left on residential properties following completion of the remedy.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.400(g); § 300.430(a)(1)(ii)(C); § 300.430(b)(5); § 300.430(d)(1); § 300.430(e)(1); § 300.430(e)(2)(i)(A); § 300.430(e)(2)(i)(A); § 300.430(e)(2)(i)(D)]

(3) Sensitive Receptors

- a. The Town believes that devout sensitivity to residential receptors should be an EPA priority in assessing Arsenic (and other metals) contamination of surface and near-surface soils. The Town understands that specific metals that have been detected during EPA's Remedial Investigation Report (2016) (“*RI*”) (e.g., Beryllium) in certain affected media (e.g., fugitive dust in air) occur at concentrations that exceed the EPA Alert Level (air for residential receptors) and are present in soils at concentrations that are elevated.

EPA has, historically, been notified that Beryllium (Be)-sensitive receptors, including children, live within the boundaries of the IKM-HS Superfund Site. These potential receptors qualify as a “sensitive population” that pertains to the characterization of the site and affirmatively supports the analysis of potential remedial action alternatives. EPA is required to address this “sensitive population” in the development of its remedial alternatives and assigning removal and remedial standards.

The Town requests that EPA advise how it intends to accommodate the foregoing requirement.

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[EPA Responsibilities Pursuant to 40 C.F.R. § 300.415(b)(2)(viii); § 300.430(d)(2)(vii)]

- c. A recent scientific article, based on research conducted by University of Arizona scientists, indicates that soil and groundwater conditions in residential areas of the IKM-HS Superfund Site have substantially contributed to the concentration of systemic Arsenic in child residents (i.e., toenail and urinary Arsenic). This paper was published at about the same time that the RI was released by EPA. There is no discrete acknowledgement of this study or the implications of its findings by EPA or its contractors. Moreover, there is no comprehensive effort to assess the distribution of conditions throughout the residential area of the IKM-HS Superfund Site that might correspond to the circumstances documented by this scholarship. [Loh et al., 2016. Multimedia Exposures to Arsenic and Lead for Children near an Inactive Mine Tailings and Smelter Site. Environmental Research v. 146:331-339]

The current PRAP provides adequate treatment of remedial alternatives but gives very little attention to the most sensitive subset of the residential population, namely children. Considerations of (i) airborne dust from unpaved roads, (ii) historical building foundations and building pads constructed with waste rock and tailings, (iii) distribution of carcinogenic (e.g., Arsenic) and acutely toxic (e.g., Lead) metal pollutants in subsurface soils within the tilling depth of household gardens and the root depth of vegetable garden produce need to be made in the remedy design phase, particularly in connection with institutional controls.

The Town requests that EPA provide a focus report that details specific provisions that are included in the final remedy that addresses protective measures that were consulted in establishing the remedial standards for each metal pollutant that has been documented to exceed the respective pre-determined regulatory standard, or proxy allowable under applicable ARARs (e.g., BTV for Arsenic and site-specific risk assessment for Lead). The Town expects that the adequate completion of remedial and removal activities conducted on residential properties is appropriately confirmed by soil sample analysis.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.415(b)(2)(viii); § 300.430(d)(2)(vii)]

(3) Consistency Among Removal Actions

- a. Previous Removal Actions conducted by EPA in residential areas were based on remedial standards that vary between 48 mg/Kg, 38 mg/Kg, 144 mg/Kg, 112 mg/Kg, and 92 mg/Kg. This disparity has created a host of challenges for the Town and creates inconsistency between interim removal actions and the final remedial action.

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CH2M-Hill's (2016) calculated BTV (112, mg/Kg) and Tetra Tech's (2022) BTV (92 mg/Kg) are based on too broad a dataset that combines Arsenic concentration data from multiple terranes and entirely unrelated areas. Subsets of these data are applicable to specific, correlated areas of the Superfund Site but, together, slur site-specific criteria and are not representative of areas defined as Residential. Consequently, these generalized standards do not adequately address the risk of exposure among the most sensitive and widespread of receptors, the residential community. EPA should therefore identify areas other than contaminant source areas as AOCs that will be addressed in the Record of Decision ("**ROD**"). We think that these additional AOCs may be referred to as RAOCs so that the integrity of the FS and PRAP are not affected.

The Town recommends that AOCs, including RAOCs, be identified within the boundaries of the IKM-HS Superfund Site. These should be segregated according to soil type and, accordingly, appropriate, and pertinent remediation and removal standards should be assigned.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.415(g)]

- b. The Town has been made aware of confirmation sample results that were collected by Weston Solutions following the 2017 removal action that was conducted on 31 residential properties in the Superfund Site. Soil samples collected at the base of excavations reported concentrations of Arsenic at depths of up to two (2) feet below ground surface that exceeded 750 mg/Kg. These recent excavations pursuant to a removal action identified a target concentration of 144 mg/Kg for Arsenic.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.415(b)(2)(i); § 300.415(b)(2)(iv); § 300.415(b)(2)(viii); § 300.430(a)(1)(ii)(C); § 300.430(a)(1)(ii)(B); § 300.430(d)(2)(i)]

- c. The Town strongly believes that EPA should provide a consistent alignment of interim removal actions that were conducted on selected residential properties, and present a standardized remediation of residential properties to the most appropriate, defensible remediation standard possible and that the selected standard should exhibit transparent equity and consistency with (i) previous work completed by EPA, (ii) current work that is related to the final remedy, and (iii) future anticipated work to be conducted pursuant to institutional controls.

The Town believes that Dr. Speyer's analysis of the background Arsenic data indicates that remedial standards applied by EPA in removal actions conducted in 2010 and 2011/2012 are more appropriate and address more directly the difference between background conditions and contaminated conditions in those areas.

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The Town requests that residential properties be remediated to standards that more closely correspond to these earlier removal actions and believe that sufficient data exist to support this request.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.415(g); § 300.430(a)(1)(ii)(B)]

- d. The Town observes that different residential properties have been historically remediated to differing cleanup criteria. Some of these properties are adjacent to each other and some are adjacent to properties that have elevated concentrations of Arsenic that have not been remediated. A patchwork of parcels that are either cleaned or not cleaned according to different criteria, handicaps future Town planning and adversely affects the Town's ability to administer equal standards regarding health risk and support a uniform perception of property value.

The Town therefore requests that EPA include provisions in the ROD that ensure that residential property tracts, such as are located in, associated with, and surrounding the Town of Humboldt proper (cf. RAOC), are cleaned to a confirmed, comparable remedial standard.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.415(g); § 300.430(a)(1)(ii)(B)]

(4) Data Analytics

- a. The Town questions EPA's calculation of a legitimate BTV based on the BTV values presented in the RI and FS and the definition of the 95% UCL, which is required by regulation, to be used to determine an appropriate BTV. BTV calculations applied to address A.A.C. R18-7-204.B.3, which requires that the BTV be calculated using the 95% Upper Confidence Limit (UCL), appear to defer to the 95% Upper Confidence Interval, which identifies the distribution of data that are less than two (2) standard deviations above the mean value.

This is different from the 95% UCL which, in accordance with EPA's Risk Assessment Guidance for Superfund (RAGS), determines a statistical value that includes the mean value of the dataset with 95 percent confidence. It is reasonable to state that the more representative data included in the dataset, the more closely the 95% UCL will conform to the true mean value for the data population.

The Town therefore requests that EPA confirm that the BTV calculated responds to the 95% UCL requirement and is consistent with EPA's RAGS technical guidance.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.400(g)(1); § 300.400(g)(2)(ii); § 300.400(g)(2)(viii)]

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- b. The BTV calculations applied by CH2M-Hill and Tetra Tech incorporate data that should be eliminated from the dataset as outliers. This is according to EPA guidance documents regarding data analytics required to calculate an applicable 95% UCL. [Tetra Tech (2022) FS Appendix C-6 (Technical Memorandum; Table 2 (August 12, 2022); See Section 4.4 of EPA (2006) Data Quality Assessment: Statistical Methods for Practitioners (EPA QA/G-9S)]

The Town requests that EPA explain, specifically, why four (4) outlier values were not eliminated in addition to the so-called “extreme” outliers, from the BTV calculation. The Town recommends that EPA eliminate these additional four (4) values as conflicted under the terms of EPA guidance documents and as responsive to standard data quality objectives.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(b)(5)]

- c. EPA recognizes ten (10) different soil types, including subtypes, in the dataset used to calculate a BTV for Arsenic. Not all these soil types are applicable to a site-specific assessment of Arsenic conditions in residential areas of the IKM-HS Superfund Site. In fact, one (1) soil type only applies with confidence to residential areas of the Superfund Site, Balon Soil.

Certain soil types recognized by EPA, for which data are incorporated into the EPA BTV calculations, do not occur within the boundaries of the IKM-HS Superfund Site, as defined by EPA. Further, certain outlier values remaining in the complete RI and FS dataset, for example, correspond to the Lonti Soil type. These values are not relevant to the IKM-HS Superfund Site and, therefore, should be removed altogether by EPA from the analysis of BTVs.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(b)(5); § 300.430(e)(1)]

- d. EPA presented several data graphics that were based on groundwater quality data collected at groundwater wells within the IKM-HS Superfund Site. These graphs compared concentrations of selected parameters, including Arsenic, to assess the correlation between mine waste degradation and the release and dispersion of metal contaminants.

These analytics failed to characterize the quality of groundwater and the graphic relationships among data were obscured by inadequate data management. EPA represented that acid-rock drainage (“*ARD*”) played a potentially important role in the dispersion of Arsenic into groundwater resources beneath the Iron King Property Main Tailings Pile (“*MTP*”). Authoritative research conducted by University of Arizona scientists demonstrated that geochemical processes responsible for *ARD* occur in the uppermost reaches of the *MTP* (upper 0.5 m) releasing an additional load of Arsenic as fugitive dust. These reactions, however, have very little direct impact on

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groundwater conditions due to the climatic setting, the geochemistry of the tailings, and the rate and products of redox reactions in the tailings piles that concentrate Arsenic at the redox boundary. [Root et al., 2015. Toxic metal(loid) Speciation during Weathering of Iron Sulfide Mine Tailings under Semi-Arid Climate. Applied Geochemistry v. 62:131-149.]

The Town requests that EPA re-evaluate the combined dataset by separating subsets of the data according to (i) aquifer setting (i.e., shallow verses deep), (ii) AOC location (e.g., MTP, Chaparral Gulch, residential neighborhood properties), and (iii) documented geochemical regime as per the distribution and nature of potential source media (e.g., tailings, waste rock, fugitive dust).

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(a)(1)(ii)(C); § 300.430(b)(5); § 300.430(d)(1); § 300.430(d)(2); § 300.430(e)(1)]

(5) Site-Specific Risk Assessment

- a. The Town agrees that a remediation standard for Lead (Pb) is best established based on site-specific risk assessment criteria as per A.A.C. R18-7-206, which is a state ARAR. However, EPA has relied on an antiquated risk assessment model that has been substantially revised. Reliance on an outdated version of a risk model does not satisfy the regulatory requirements of A.A.C. R18-7-204.B.2 and R18-7-204.B.3.

According to the EPA's overview of changes, the May 2021 version includes significant revisions to the calculation of dose-response regarding soil and dust exposure at the Bunker Hill Superfund Site, a prominent Superfund site with well-known issues concerning Lead-impacted media. In addition, these revised Bunker Hill data are based, in part, on indoor dust exposure criteria which can be measured and monitored using a rafter-dust study as recommended herein. The Town believes that specific attention to household exposure is especially important considering the potential risk of exposure to highly sensitive receptors, including children.

The Town requests that EPA revise its calculations of potential risk to incorporate the calculated results from the revised version of the EPA IEUBK model (May 2021; IEUBK win ver. 2.0) and discard any conflicting results that might have been calculated using the aged version of the model.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.400(g); § 300.415(b)(2)(i); § 300.430(d)(2)(viii)]

- b. State regulations (A.A.C. R18-7-206) regarding using a site-specific risk assessment to determine applicable remediation standards are ARARs that are to be incorporated into EPA's FS. This ARAR stipulates specific provisions regarding multiple, co-occurring contaminants and requires that the risk models applied calculate a

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comprehensive risk factor. This provision is consistent with the requirements of the NCP. EPA has not addressed these requirements or has not presented its findings in a way that is readily accessible.

The superposition of multiple contaminants (Arsenic and Lead) and the exposure to multiple pathways (e.g., ingestion, adsorption, and inhalation) should help in evaluating the threat of risk to the Town community and the surrounding ecological setting. The Town therefore requests that EPA provide a definitive, site-specific analysis of the health risk associated with co-occurring Arsenic and Lead, involving factors that address the multiple exposure pathways, in the RAOC.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(e)(2)(i)(A)(2); § 300.430(e)(2)(i)(D)]

SITE CHARACTERIZATION

(1) Fugitive Dust Contamination

- a. The Town understands that historic mine and smelter operations are known to emit significant quantities of fugitive dust over long periods of time. The release of dust from active mine operations, windblown dust from piles of tailings and mine waste, and the emissions from smelter operations are known to present a contaminant load that accumulates as an apron around these source areas. This apron has blanketed the Town of Humboldt proper and surrounding residential properties. EPA’s assessment of “ambient air” quality from 2008 to 2009 provided very little in the way of useful or applicable data to assess this condition.

Fugitive dust deposition has a documented effect on metals concentrations in surface soils within this apron area. This impact has been incompletely characterized in terms of “soil characterization” and has not been adequately accounted for in EPA’s calculations of Background Threshold Values for Arsenic in soils within the IKM-HS Superfund Site. These issues are detailed elsewhere in these Comments.

In addition, there is clear indication at other mine and industrial sites that fugitive dust is associated with pollutant impact to surface soils, surface water, and groundwater due to secondary transport agents. This correlation has not been considered, much less investigated at the IKM-HS Superfund Site. The Town requests that EPA conduct a suitable expansion of its investigation of soil, surface water, and groundwater exposure point concentrations that incorporates these receptor exposure pathways in the final conceptual site model.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.415(c)(1); § 300.415(e)(2); § 300.430(a)(1)(ii)(B); § 300.430(a)(1)(ii)(C); § 300.430(d)(2)]

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- b. The Town understands that research was conducted at the Iron King Mine MTP that concluded that mine rock oxidation in the upper zone of tailings generates a considerable volume of Arsenic residue that is prone to aerial dispersion.

The Town does not understand why EPA did not sustain meteorological monitoring of wind currents and fugitive dust sampling at air-monitoring stations in the Superfund Site for more than one (1) year. The Town requests EPA's explanation on this matter.

Further, the Town does not understand why EPA did not conduct any meaningful investigation of the distribution of fugitive dust across accessible areas of the IKM-HS Superfund Site and in buildings located in the wind-shadow of the Iron King Mine and Humboldt Smelter properties. The Town requests EPA's explanation on this matter.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(b)(5); § 300.430(d); § 300.430(e)(1)]

- c. It is not now feasible to compile a proper historical dataset of monitoring data, including weather conditions (including precipitation records), wind dispersion patterns, and concentrations of Priority Pollutant Metals in air-borne fugitive dust for the IKM-HS Superfund Site prior to initiating the selected remedy. Therefore, the Town requests that the history of fugitive dust deposition across occupied areas of the Site be investigated by conducting a rafter-dust survey of suitable, statistically defensible buildings, including residential houses, within the dust apron surrounding the recognized source areas (Iron King Mine and Humboldt Smelter properties).

These data will provide the Town with valuable information appropriate to develop informative maps that plot the distribution and concentration of heavy metals as a function of location with respect to known source areas, which may be calibrated according to the duration of individual exposure so that receptor and potential receptor health data may be tested for correlation to exposure point concentration data over individual-specific periods of time.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(b)(5); § 300.430(d); § 300.430(e)(1)]

- c. The Town believes that EPA has not adequately quantified the extent of fugitive dust impact to areas of the IKM-HS Superfund Site, including residential areas. Rafter-dust data for all Priority Pollutant Metals from varied buildings across the Site and in borderland areas are necessary to place the existing, incomplete analysis of aerial dispersion (2008 to 2009 monitoring), as reported in the 2016 RI, into meaningful context. These analytics should also be relied on to provide an independent

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assessment of fugitive dust impact to surface soils across the IKM-HS Superfund Site since the time that mine operations began.

This recommended analysis should be used to assist in distinguishing between natural and anthropogenic transport mechanisms in distributing Arsenic and Lead (Pb) from the source areas to locations within the IKM-HS Superfund Site that surrounds the source areas.

The Town considers the residential and commercial parcels north-northeast of the mine and smelter source properties to be a specific site area that requires specific attention as a RAOC. As such, this RAOC has characterization requirements that are specific to the area. In accordance with removal actions already conducted by EPA at the IKM-HS Superfund Site, within the RAOCs remedial actions that are proposed as time-critical or non-time-critical removal actions or as part of the comprehensive final remedial design, must attend to criteria that differ from criteria assigned to the 31 AOCs defined by EPA in the FS.

The Town requests that EPA incorporate a comprehensive characterization of fugitive dust dispersion throughout the residential and commercial community of properties that are located adjacent to the source areas (i.e., AOCs defined in the FS). The Town believes that the distribution of residual dust from primary (i.e., Iron King Mine and Humboldt Smelter) and secondary (e.g., redistributed tailings and waste rock) source areas has had a significant impact on the concentration of metals in surface and, by vadose transmission, subsurface soils.

Understanding that the shallow aquifer setting is located at approximately 30 feet below ground surface in alluvial sediments, the Town requests that EPA conduct an assessment of Arsenic and Lead to demonstrate that the concentrations of these metals, remaining at depth, are protective of groundwater quality in conformance with A.A.C. R18-11-405 and responsive to the requirements of A.A.C. R18-7-203.B.1, which is an ARAR.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(b)(5); § 300.430(d); § 300.430(e)(1); § 300.430(e)(4); § 300.430(f)(1)(i)]

- d. The Town is aware of Dr. Speyer's assessment regarding rafter-dust sampling and understands that there is a possible correlation between dust deposition and metals contamination of surface soil, subsurface soil, and groundwater. The Town requests that EPA conduct an appropriate rafter-dust sampling of the populated areas of the Superfund Site in order to assess the significance of this impact so that the distribution of contamination may be more completely understood and appropriate removal actions and ICs might be implemented. The Town requests that any such sampling plans or sampling activities be communicated to and coordinated with the Town's Advisory Board.

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[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(b)(5); § 300.430(d); § 300.430(e)(1); § 300.430(e)(2); § 300.430(e)(9)(iii)(C)]

(2) Soil Contamination

- a. EPA indicated in the PRAP and again in its March 29, 2023 public hearing that additional soil sampling and follow-up soil removal actions are being considered. The Town understands EPA’s tight timeframe for securing Bipartisan Infrastructure Law funding for the final site remedy but is also sensitive to the NCP requirements for a complete site characterization and a final remedy that is fully protective of human health and the environment, especially regarding surface and subsurface soil conditions for a residential community with rustic home properties with scant vegetation.

The Town therefore requests that any actions planned and implemented by EPA to complete its characterization of the IKM-HS Superfund Site include provision for appropriate review and comment by the Town.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(c)(4); § 300.430(d); § 300.430(e)(1); § 300.430(d)(2); § 300.515(a)(1)]

- b. The AOCs recognized in the FS report do not account for the extended history of redistribution of waste rock and tailings from the Iron King Mine and Humboldt Smelter properties to serve as road base and to provide foundation for structures, or from stormwater run-off within the boundaries of the IKM-HS Superfund Site. In many cases, these materials are left to surface degradation and represent an on-going source of contaminants that may be transported as fugitive dust and with surface water run-off following storm events. These waste materials and hazardous substances require due attention in EPA’s final remedy decision and final remedy design. It is the Town’s understanding that these secondary sources of contamination have not been investigated by EPA and, therefore, represent a significant “uncertainty” regarding long-term protection from residual effects of contamination. The Town believes that it is unreasonable to expect that institutional controls will be sufficient to contain or control the exposure pathways associated with these occurrences (e.g., inhalation during a dust storm, surface water run-off leading to the Aqua Fria River), unless EPA sets aside Superfund money for the Town to use in addressing such matters in administering its expected institutional control ordinances.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(d)(2)(v), (vi); 300.430(e)(9)(iii)(C)]

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- c. Adjacency of properties with differing cleanup standards results in contaminant drift due to surface water runoff from higher to lower elevation, and aerial dispersion of surface dust due to prevailing winds.

The Town therefore requests that EPA provide provisions in the ROD that the Town may rely on to address this problem now and in the future under the Town's contemplated institutional controls program.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(e)(9)(iii)(C)(2)]

- d. The Town would like to assure community landowners with property within the IKM-HS Superfund Site that the condition of their land is warranted clean in accordance with the ROD.

The Town requests that EPA advise what assurances can be provided to affected residential and commercial landowners that their properties are established as "clean and compliant" with the final remedy, once the remedy is confirmed completed.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(e)(9)(iii)]

(3) Groundwater Contamination

- a. EPA recognizes that groundwater conditions are not adequately understood at the IKM-HS Superfund Site. The Town understands EPA's tight timeframe for securing Bipartisan Infrastructure Law funding for the final site remedy but is also sensitive to the NCP requirements for a complete site characterization and a final remedy that is fully protective of human health and the environment, especially in regard to groundwater conditions for a community that relies heavily on groundwater resources as a source of drinking water.

The Town therefore requests that any actions planned and implemented by EPA to complete its characterization of the IKM-HS Superfund Site include provisions for appropriate review and comment by the Town.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(c)(4); § 300.430(d); § 300.430(e)(1); § 300.430(e)(2); § 300.430(e)(4); § 300.515(a)(1)]

- b. EPA stated in the FS report that groundwater wells tested during the course of RI and FS investigations included wells that were completed in shallow groundwater and deep groundwater settings. However, the EPA states that Arizona Department of Water Resources (ADWR) file records were not reviewed because the information provided is inconsistent, incomplete, and not useful.

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The RI and FS reports represent the majority of 64 privately-owned wells that were included in the investigation of groundwater conditions with identifiers that are not correlated to ADWR 55-Series well registration numbers. The Town requests that all wells involved in EPA's analysis of groundwater be (i) properly registered with the ADWR, (ii) represented according to the ADWR 55-Series registration number, and (iii) be tabulated with available file data so that additional clarity regarding total depth, well construction, well water use, and age, as available, may be easily accessible.

This information, as available, is critical to establishing a comprehensive Geographic Information System (GIS) database of environmental information as this information relates to Town management needs, particularly in connection with one or more institutional control ordinances being considered for Town adoption.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(b)(5); § 300.430(d)(2)(i); § 300.430(d)(2)(ii); § 300.430(d)(2)(v); § 300.430(d)(2)(vi); § 300.430(e)(2)(i)(E); § 300.430(e)(4)]

- c. EPA has provided groundwater quality data for numerous wells within and outside the boundary of the IKM-HS Superfund Site. The Town believes that EPA should group available groundwater data in a way that addresses the two (2) populations of data, deep and shallow aquifer settings, so that these aquifer settings can be adequately and independently characterized. Once these datasets have been appropriately analyzed and shallow (cf. alluvium) and deep (cf. bedrock) aquifer settings are appropriately characterized with respect to groundwater quality parameters, including metals, it should be possible to construct efficient models that evaluate the relationship between shallow deep aquifer settings.

The Town believes that EPA has not provided an established, applicable sense of background groundwater quality for the IKM-HS Superfund Site. EPA's assessment of "background" conditions suffers from (i) mixed data from shallow and deep aquifer settings, (ii) lack of necessary geographic resolution as relates to separate watershed areas for shallow aquifer settings, and (iii) inadequate or miss-applied analytics. The Town believes that EPA should more thoroughly and convincingly demonstrate why Arizona Aquifer Water Quality Standards (AWQS) for mine waste-related contaminants are not applicable.

In addition, EPA's selection of "background" groundwater wells is not well-established, lacks clear, adequate rationale, and does not account for differences that can be related to watershed separation of shallow groundwater sources. Further, the location of certain of the "background" groundwater wells is not clearly identified, which makes the entire assessment vulnerable.

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Because of the dire consequences of misrepresenting “background” groundwater conditions in residential areas of the IKM-HS Superfund Site, and the long-term exposure risk to potential residential receptors, the Town requests that EPA’s characterization of groundwater conditions at the IKM-HS Superfund Site be revisited with (i) rigorous attention, (ii) additional groundwater monitoring well installations, (iii) site-specific data management, (iv) focused analytics, and (v) appropriate modeling. Failure to do so renders EPA’s proposed remedy for the IKM-HS Superfund Site seriously inadequate for meeting the NCP’s mandate (40 C.F.R. § 300.430(a)(1)(i)) that EPA’s Superfund response actions be protective of human health and the environment in both the short-term and long-term.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.400(g)(1); § 300.400(g)(2)(ii); § 300.400(g)(2)(iii); § 300.400(g)(2)(ii); § 300.415(b)(2)(i); § 300.415(b)(2)(ii); § 40 C.F.R. § 300.430(a)(1)(i); § 300.430(a)(1)(ii)(C); § 300.430(a)(1)(d)(iii)(F); § 300.430(b)(5); § 300.430(d)(1); § 300.430(d)(2); § 300.430(e)(1); § 300.430(e)(4)]

- d. EPA has installed a total of 26 groundwater monitoring wells. Most of these monitoring wells are located along the trace of Chaparral Gulch. The Town believes that the groundwater monitoring wells adequately characterize the groundwater quality of subsurface flow in the Chaparral Gulch. However, EPA’s determination of this groundwater setting as “perched” and thus separated from other shallow groundwater settings is not well-established. Interconnection among shallow groundwater bodies is an extremely important factor in assessing the risk of exposure to residential receptors that use shallow groundwater as a drinking water source.

EPA has stated that additional groundwater investigations may be necessary and recognizes that additional groundwater monitoring wells may be installed. The Town agrees that additional groundwater monitoring wells need to be installed and monitored. The EPA plan, however, is late in development and, because of the timeframe imposed by other aspects of the remedy, it is not practicable to expect that groundwater may be adequately characterized in a meaningful way before the final currently contemplated site remedy is designed and constructed.

The Town requests EPA to provide an on-going monitoring program that is focused on groundwater monitoring wells that are strategically located to provide critical data without direct reliance on landowner wells or service wells located in the IKM-HS Superfund Site. The monitoring program should provide groundwater elevation and quality data that provide an active and affirmative understanding of the status of groundwater quality and provide a basis on which changes may be diagnosed and, as necessary, addressed.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.415(b)(5)(ii); § 300.430(a)(1)(ii); § 300.430(a)(1)(iii)(C); § 300.430(a)(1)(iii)(F); § 300.430(b)(5); § 300.430(d)(1); § 300.430(d)(2); § 300.430(e)(4); § 300.515(a)(1)(i)]

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- e. The Town believes that no less than an additional 15 groundwater monitoring wells and as many as 25 such wells are necessary to adequately resolve the inadequacies of EPA's current groundwater characterization study. In addition, the Town is concerned that, based on Superfund site work elsewhere, groundwater contamination in residential areas of the IKM-HS Superfund Site may be due to the downward dispersion of metals, including Arsenic and Lead, from surface fugitive dust deposits through vadose soils to the shallow, alluvial groundwater.

Therefore, the Town requests that staged soil samples, collected from boreholes drilled during the process of installing the 15 to 25 additional groundwater monitoring wells, should be collected and analyzed according to Priority Pollutant Metals (EPA Method 6010/6020), which includes Arsenic, Lead, and Beryllium. These soil samples can be applied to develop informative diffusion models to assess the impact of fugitive dust on shallow groundwater quality and, thus, provide a more comprehensive and meaningful characterization of groundwater conditions across the entire IKM-HS Superfund Site, including the most sensitive potential receptors, namely children.

The Town expects that a strategic selection of these additional groundwater monitoring wells will be installed in residential areas of the IKM-HS Superfund Site to adequately evaluate contaminant fate, transport, and exposure within this expanded conceptual site model. Further, the Town anticipates that these additional groundwater monitoring wells will figure importantly in the on-going monitoring program detailed in the foregoing comment.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.415(b)(5)(ii); § 300.430(a)(1)(ii); § 300.430(a)(1)(iii)(C); § 300.430(a)(1)(iii)(F); § 300.430(b)(5); § 300.430(d)(1); § 300.430(d)(2); § 300.430(e)(4); § 300.515(a)(1)(i)]

AREAS OF CONCERN & OPERABLE UNITS

As indicated above, the Town understands that EPA intends to further characterize soils and groundwater in the IKM-HS Superfund Site and has reserved judgment on whether additional remedial action should be taken with respect to soils and groundwater based on the results of its additional characterization work. Further, the Town believes that groundwater has been inadequately characterized and therefore merits more thorough sampling. Yet, EPA intends to implement a consolidation-and-cap remedy with respect to mine and smelter wastes at the former Iron King Mine and Humboldt Smelter sites.

Superfund Sites, in accordance with NCP requirements, may be divisible into a number of distinct areas, depending on the complexity of the contaminant issues at the site. Such distinct areas, called operable units ("*OU*s"), may address geographic areas of a site, specific site problems, or areas where a specific action is required. OUs are established "when phased analysis and response is necessary or appropriate given the size of complexity of the sits, or to

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expedite the completion of the total site cleanup” (40 C.F.R. § 300.430(a)(1)(ii)(A)). Thus, OUs are useful management tools for conducting, managing, and completing response actions at a site.

The Town has several concerns regarding the recognition of AOCs and determination and assignment of OUs at the IKM-HS Superfund Site.

- a. To date, EPA has defined 31 AOCs and recognizes nine (9) separate remediation standards, as presented in the FS and summarized in the PRAP, and as indicated above intends to conduct further characterization work and potential remedial or removal action(s). The Town and its residents find EPA’s management of its response actions at the IKM-HS Superfund Site confusing, particularly when EPA is proposing a “final remedy” on the one hand and suggesting additional work for soils and groundwater on the other hand.

The Town therefore requests that the 31 AOCs be categorized in the context of an expanded definition of AOCs that includes provisions for (i) residential properties (cf. RAOC), (ii) environmental media of vital concern regarding receptor exposure, and (iii) established primary and secondary source areas (e.g., majority of AOCs defined in the FS report).

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(a)(1)(ii)(A); § 300.430(a)(1)(ii)(C); § 300.430(d)(1)]

- b. To date, EPA has established only one (1) OU at the IKM-HS Superfund Site. The Town believes that additional OUs should be identified and defined so that all involved parties have a reasonable framework within which remedial work planning, progress, and completion may be tracked and communicated and therefore requests such an adjustment in EPA’s management of the IKM-HS Superfund Site.

Based on the findings presented by EPA in its RI and FS reports, and the PRAP, with appropriate reference to reviews that were conducted, the Town recommends that at least four (4) Operable Units be established at the IKM-HS Superfund Site, as follows:

- OU 1 | Iron King Mine and Humboldt Smelter (Repository 1 and 2)
- OU 2 | Groundwater
- OU 3 | Soils, including Residential Properties
- OU 4 | Surface Water & Sediments

OU 1 would consist largely of AOCs recognized in EPA’s FS report. OU 2 (Groundwater) is the topic of Dr. Speyer’s Technical Memorandum 02. OU 3 is the focus topic addressed in Dr. Speyer’s Technical Memorandum 01 (cf. RAOC), and OU 4 addresses concerns that are specific to Chaparral Gulch, Galena Gulch, and

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Aqua Fria River. The Town understands that a certain overlap exists among these represented OUs but feels that this overlap is a matter of inter-connectiveness and serves a purpose beneficial to the Town’s interests.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.430(a)(1)(ii)(A)]

SUPERFUND SITE BOUNDARIES

The Town has two (2) concerns regarding the definition of geographic boundaries of the IKM-HS Superfund Site based on information and data that have emerged with the release of the FS and PRAP.

- a. The RI and FS state and have demonstrated, based on analytics of the data that EPA has compiled, that soil and groundwater conditions in the IKM-HS Superfund Site areas that are located east of the Aqua Fria River are distinct from and do not correlate to background conditions that characterize soil and groundwater that occur west of the Aqua Fria River. Mixing data from these areas is not consistent with the recognition of “site-specific” criteria and does not honor the intent of applicable ARARs, including Article 2 of A.A.C. R18-7. These areas should be recognized as distinct and treated separately in terms of remedial standards that are identified in the ROD and implemented in the final remedial design.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.415(b); § 300.430(a)(ii); § 300.430(d)]

- b. The concentrations of Arsenic and Lead in soils on properties that are located east of the Aqua Fria River indicate that the east and northeast boundary of the IKM-HS Superfund Site might not include all properties impacted by recognized source areas in the IKM-HS Superfund Site. This means that the overall boundary of the IKM-HS Superfund Site has not been adequately resolved and, therefore, may need to be expanded.

Existing data may be supplemented with a statistically defensible analysis of building rafter-dust data from buildings across the IKM-HS Superfund Site and in bordering areas. The Town believes that this expansion is necessary to address critical NCP requirements and make an affirmative and lasting statement regarding the boundary of the IKM-HS Superfund Site.

[EPA Responsibilities Pursuant to 40 C.F.R. § 300.322; § 300.400; § 300.405; § 300.410]

TECHNICAL MEMORANDUM

TO: JEFF DHONT | USEPA RPM | IKMHS SUPERFUND SITE

FROM: STEPHEN SPEYER, PH.D., R.G. | SPEYER ENVIRONMENTAL LLC

SUBJECT: TECHNICAL REVIEW & FINDINGS | USEPA FEASIBILITY STUDY
PREPARED BY TETRA TECH (2022) | IKMHS SUPERFUND SITE

DATE: FEBRUARY 28, 2023

CC: LAURA MALONE | ADEQ WASTE PROGRAMS DIVISION DIRECTOR
KAY BIGELOW | DEWEY-HUMBOLDT TOWN ATTORNEY

This memorandum is provided on behalf of the Dewey-Humboldt Town Council (the “Town”), as requested by Kay Bigelow, Town Attorney. Speyer Environmental LLC (Speyer)¹ was retained by the Town to complete a technical review of materials provided by the United States Environmental Protection Agency (USEPA) pursuant to developments at the Iron King Mine–Humboldt Smelter (IKMHS) Superfund Site. Primary documents reviewed pursuant to this evaluation include the Remedial Investigation (RI), completed by CH2M-Hill² (2016), and the Feasibility Study (FS), completed by Tetra Tech (2022). These documents, including all ancillary Figures, Tables, and Appendices were available, including the MS-ACCESS Database that was compiled by Tetra Tech pursuant to their responsibilities regarding the FS.

It is understood that these documents comprise the core information on which USEPA will base the Record of Decision (ROD) and following which a Final Engineering Design for remedial operations will be developed, put to bid, and implemented. Speyer provided findings during a Study Session convened by the Town on February 14, 2023. It is understood that USEPA attended this meeting by virtual connection.

This memorandum provides a detailed description of what Speyer has determined to be “adequate” and “inadequate” based on an understanding of industry standards and responsibilities under CERCLA, including State Appropriate and Relevant Applicable Requirements (ARARs). Where appropriate, these requirements are cited for reference. It is anticipated that additional comments may be appropriate as the review is not yet completed and these will be communicated prior to the beginning of the Public Response Period which is

¹ Stephen Speyer, Ph.D., R.G., Principal Scientist for Speyer, conducted the review and assessment. His bio and curriculum vitae are available upon request.

² We understand that CH2M-Hill has since been purchased by Jacobs Engineering.

TECHNICAL REVIEW MEMORANDUM

REMEDIAL INVESTIGATION (RI) & FEASIBILITY STUDY (FS) \ IKMHS SUPERFUND SITE

SPEYER ENVIRONMENTAL PROJECT 2022.012.01

FEBRUARY 28, 2023

understood to begin on or about March 15, 2023. This communication is not intended to substitute for a formal response which will be provided during the Public Response period following appropriate authorization by the Town.

PREAMBLE

It is important to communicate at the onset of this and any subsequent memoranda that it is not the intention of any comment or determination of inadequacy to pause or delay the process that USEPA is leading. It is our intent to identify critical flaws and inadequacies that might result in real or potential additional health risk.

Wherever possible and as appropriate, Speyer provides pointed recommendations that are intended to serve the common good and assist USEPA in addressing inadequacies before the formal Public Response Period begins. This memorandum addresses areas of the RI and FS that have been purposefully prioritized based on potentially greater overall impact to the Town and Community and have the greatest effect on planning remedial efforts. For example, this Technical Memorandum is focused on Superfund Site soils, determinations of soil contamination, assignment of Areas of Concern (AOCs), determinations of PRGs related to soils, and recognizes the comprehensive impact of changes in soil volume (including the mass of mine waste) on the efficacy of remedial options.

It is anticipated that an additional memorandum may be provided that focusses on those topics left unaddressed in this document, including, as appropriate, groundwater and surface water concerns.

- (1) Speyer has placed an emphasis on USEPA's current, focused schedule for completion and has leveraged this information to encourage a "no-interruption" perspective in providing advice to the Town Council and in dealings with the Community.
- (2) Specific recommendations attached to each Section, as follows, are intended to be addressed and developed concurrently with the roadmap requirements that USEPA is addressing.
- (3) Speyer has recommended that the Town retain a consultant to provide timely review of new and revised plans for sampling and expanded remediation, as determined to be appropriate by USEPA.
- (4) Speyer attempted to provide, with some success, an explanation of the role and responsibilities of the USEPA under CERCLA. The USEPA decision to address remediation and pursue compensation under established liability. This is an enormously beneficial decision that the Town community needed to better understand.
- (5) It is understood that a newly appointed Citizen Participation Coordinator has been assigned to the IKMHS Superfund Site. This is a positive decision and provides adequate attention to the concerns of the Town.

TECHNICAL REVIEW MEMORANDUM

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- (6) Appropriate and reasonable attention to these and forthcoming review comments provided by the Town’s consultant will help sustain a neutral if not encourage a positive community outlook regarding the unfolding of USEPA’s plans.

EXECUTIVE SUMMARY

Speyer reviewed the Tetra Tech Feasibility Study (FS) and CH2M-Hill’s Remedial Investigation (RI) on which the FS is based. Certain critical inadequacies are identified, and several requests are communicated. Speyer also identifies critical adequacies that are communicated by the referenced documents. Specific recommendations are offered in response to determinations of inadequacy.

Determinations of Adequacy

- There exists a substantial dataset for concentrations of COCs in soils. Certain data-gaps may be exposed that require further attention as has been acknowledged by USEPA. In general, the gross distribution of contaminants in surface soils has been adequately determined.
- Datasets for COCs in surface waters and associated sediments are based on an adequate distribution of sample locations.
- The dataset for determining background concentrations for Arsenic in soils is adequate and can be appropriately segregated into subsets to assess differing soil types and location with respect to the Agua Fria River which are germane to addressing an applicable definition of “site-specific.”
- Tetra Tech’s assessment and treatment of the five (5) Remedial Options, including two (2) options for constructing two (2) waste repositories, is adequate and appears to address applicable National Contingency Plan (NCP) requirements.
- The USEPA decided to delay assessment of liabilities and pursuit of compensation from Responsible Parties (RP) so that federal funding for the removal (remediation) might be accelerated. This is an important hallmark decision by USEPA and should not be understated.
- Similarly, USEPA has forecasted an ambitious schedule to complete the requisite steps leading to implementing a Final Engineered Design, including preparation of the Record of Decision (ROD), completing the Final Design with assistance from Arizona Department of Environmental Quality (ADEQ), and actuating the federal Procurement

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process in a timeframe that allows the Town of Dewey-Humboldt to benefit from available federal funds under the Biden 2021 Infrastructure Bill.

- USEPA has supported the Town's consultant in the process of compiling and reviewing reports and data pertaining to the IKMHS Superfund Site and USEPA's work.

Determinations of Inadequacy

- Tetra Tech relied on CH2M-Hill's assessment of ambient air exposure which was based on one year (2008 to 2009) of air samples and wind current data. The data set is significantly compromised by sampling irregularities, there are limited inferences that can be confidently made about exposure over a year of monitoring, and the number and distribution of sample locations are inadequate to determine defensible Exposure Point Concentrations.
- Preliminary Remediation Goals (PRGs) for Arsenic (As) are based on a calculated Background Threshold Value (BTV) that is not founded on valid data, valid statistics, does not adequately address site-specific criteria, does not adequately address State ARARs, and is not adequately protective of potential residential receptors.
- PRGs for Lead (Pb) are based on calculated, site-specific remediation standards using a USEPA risk assessment model (Integrated Exposure Uptake Biokinetic Model) that is outdated. Tetra Tech used, according to reference, a 2009 version of the IEUBK Model (ver. 1.1) which was updated, with significant changes to the reference database and algorithms, to ver. 2.0 in 2021. Tetra Tech's application of the IEUBK Model does not adequately address State ARARs regarding "site-specific," effects of concurrent exposure to co-occurring Chemicals of Concern (COCs), including Arsenic. In addition, Tetra Tech's implementation of the IEUBK risk assessment model does not appear to incorporate adequate attention to receptor sensitivity and uncertainty of exposure.
- There appears to be a disconnect between Tetra Tech's assessment of Exposure Point Concentrations (EPCs) for each identified COC, in each Area of Concern (AOC), and the development of PRGs that, in concept, should correspond. These terms should be clearly identified in the text of the documents with specific reference to exposure criteria, receptor status, and statutory and screening level standards.

Requested Actions

- Speyer requests that USEPA conduct appropriate evaluations of inadequacies that are identified to determine the veracity of these determinations.
- Background Threshold Values for Arsenic require attention and should be recalculated based on recommendations that provided in the text of the Technical Memorandum. It is

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understood that this value is critically important to all soil and mine waste remedial actions to be conducted at the IKMHS Superfund Site.

- Site-specific Remediation Standards calculated using the 2009 version of USEPA's Integrated Exposure Uptake Biokinetic Model should be recalculated using the 2021 version of the model and incorporate provisions for all State ARARs as discussed in the text of this memorandum.
- Speyer offers recommendations that are intended to sustain current administrative momentum and provide a means to address necessary revisions that may be completed concurrently with the ambitious USEPA schedule and not interfere with task deadlines.

DISCUSSION OF FINDINGS

Speyer's diagnosis and assessment of critical inadequacies are provided in topical organization with specific, applicable Recommendations for consideration by USEPA. This Discussion does not include treatment of Groundwater or Stormwater/Sediment. These topics will be addressed, as determined to be necessary, in a subsequent Technical Memorandum that is scheduled to be released prior to the beginning of the mid-March Public Response Period.

A) GENERAL SAMPLE PLANNING & DATABASE

- (1) USEPA's protracted attention to conditions at the IKMHS Superfund Site has sustained a negative perception among residents, the Town Council, and community at large. There is a general belief that USEPA is ignoring certain chemicals and down-playing the significance of others. Table 1 was reduced from information provided in the RI and adopted in the FS. Six (6) metals, air sample data for which were graphically presented in the RI, exceeded corresponding Screening Levels at, at least one (1) sampling location in the Superfund Site but were not listed as COIs.
- (2) The iterative sampling efforts that span a period of 2006 through 2012 are based on significantly different (sometimes unavailable) Sampling & Analysis Plans (SAPs) and Quality Assurance Project Programs (QAPPs). As a result, the series of reports has (ii) obscured USEPA's determination of adequate Exposure Point Concentrations (EPCs) for the COC, (ii) introduced inconsistent target cleanup concentrations for critical COCs (i.e., Arsenic and Lead) in apparently identical target areas, and (iii) created a confusion among and between successive sampling and remedial efforts by different USEPA contractors (especially in residential areas of the Site). These different cleanup and target levels are summarized in Table 2.
- (3) SAPs are not available for all the sampling efforts reported in the RI (Appendices D and J) and FS (Appendix C). Section 37.1.3 of the SAP that is provided in Appendix G of the

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FS indicates that the SAP addresses “representativeness” by “careful selection of sample locations.” This selection process is the definition of “bias” and is the antithesis of a sampling plan that is designed to address “representativeness.”

ENV MEDIUM	AIR	SOIL	SURFACE WATER	SEDIMENT	GROUNDWATER
ANALYTE					
ARSENIC	X	X	X	X	X
COPPER			X	X	
IRON			X		
LEAD	(X)	X	X	X	X
CADMIUM	(X)				
CHROMIUM	(X)				
ALUMINUM	(X)				
BERYLLIUM	(X)				
NICKEL	(X)				
MERCURY				X	
ZINC			X	X	
NTRATE					X
SULFATE					X
TDS					X
*Additional COIs may be present and unaccounted for.					
X	IDENTIFIED COI [CH2M-HILL (2016) RI]				
(X)	COI IDENTIFIED BASED ON DATA COMPILED IN APPENDIX N OF THE 2016 RI				

- (4) There is an extensive EPA RAGS literature that emphasizes the importance of applying a dataset in Superfund investigations that is derived from either overtly random selection or systematic sampling of an area of interest.³ The Tetra Tech SAP presents an inadequate definition that should not be applied to soils, ambient air sampling, or determination of

³ Random sampling (including systematic sampling) is a statistics and sampling axiom. Without a demonstrated effort to avoid bias it is reasonably assumed that the sample selection was purposeful and is, therefore, biased. Simply stated, samples that are collected at purposefully selected locations cannot be used in applied statistics. This is true for all data applications regardless of the science, with imposed linear functions (e.g., river sediments) being the only possible qualified exception. In the case of channel sediments, systematic sampling, conducted at prescribed intervals along the tract area of interest must still be systematic. This requirement is specifically addressed in numerous documents, including EEI (1997), Gilbert (1987), USEPA (1989, 1992, 2002a, 2002b, 2002d), to name a very few.

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waste rock characteristics (e.g., Main Tailings Pile or several areas within the Former Humboldt Smelter Property). This is a fundamental Data Quality Objective (DQO) that should be addressed in all subsequent sampling efforts, including confirmation sampling following completion of remediation.

- (5) Our review of sample location maps indicate that sampling plans varied, sometimes greatly, among the several iterations of sampling that were conducted in the residential areas of the Superfund Site. Some parcels were grided and samples were collected at all nodes. In other parcels, sometimes in the same report, sample locations were purposefully selected and clustered in areas of presumed contamination. These datasets cannot be combined with any reasonable expectations of achieving a coherent analytical base. Deterministic sampling (i.e., selecting sample locations based on pre-design or professional insight) precludes any meaningful data reduction and application of statistical calculations to characterize appropriate EPCs or calculate adequate PRGs.
- (6) “Representativeness,” as a sampling objective, is quashed because of the mixed sampling strategies and failure to prescribe sampling procedures in an approved and authorized SAP.

Recommendations

- (7) Speyer has stated to the Town those certain datasets, including soils, are, in general, sufficient for the determinations necessary to achieve an adequate clean-up. This presumes adequate data-gap analysis that is focused on assessing adequacy of data under prescribed Data Quality Objectives (DQOs).⁴

B) ASSESSMENT OF AMBIENT AIR CONDITIONS

- (1) The complete body of data relied on for assessing exposure related to fugitive dust consists of approximately 49 sampling events at 10 different sampling locations (including 2 Background Sample Locations) and on-going wind current data from one (1) “weather station” situated at the Iron King Mine property over a one (1) year period (2008 to 2009).

⁴ The gross number of soil samples collected (9,478, as reported in the FS), primarily in residential areas of the Superfund Site, provides a buffer to the effects of sampling bias on statistical calculations. A discrete data-gap analysis as part of assessing DQOs is recommended. The number and manner of sampling ambient air, in contrast, is not adequate.

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- (2) Except for one (1) sampling location (at the Iron King Mine) there is no consistency among the data sources because the stations were sporadically changed over the course of the one (1) year period.⁵
- (3) The data are fundamentally flawed despite the presentation of minimum and maximum values for metals in fugitive dust at each of the four (4) areas. The four (4) areas are incompletely diagnosed, not consistently represented in the dataset, and donot provide adequate, affirmative characterization of the areas with respect to ambient air conditions. The Iron King Mine station, where a complete set of data for the entire year was compiled, is a possible exception and provide a discrete, though limited estimate of seasonal variations.
- (4) These ambient air data and this study do not adequately assess the long-term exposure risk because it is based on an incomplete evaluation of wind-dispersed fugitive dust from known primary and secondary source areas within the Superfund Site.
- (5) Data tabulated in the RI show clear indication that fugitive dust is activated at the Iron King Mine and the Humboldt Smelter locations. What it does not show is the dispersal or destination of this dust. Additional down-gradient sample locations, situated between the known source with an anticipated elevated concentration of metals, including As and Pb, and the Town and residential areas of the Site would have assisted in refining the Conceptual Site Model (CSM).
- (6) Standard air sampling stations should have been set at additional, strategic locations across the Site, with a specific emphasis on Town and Community locations. Each of these stations should have been sampled on a consistent, periodic basis over the course of the entire eight (8) years that USEPA has been engaged with this Site leading up to the 2016 release of the RI. Likewise wind current data should have been compiled from historic sources, such as are available from sources that maintain data at a station located in Prescott Valley. These data, in concert may have provided sufficient foundation to make statements regarding the EPC of fugitive metals in residential areas of the Superfund Site.
- (7) Notwithstanding the incomplete monitoring of ambient air conditions, the long-term effects of wind and air currents across the Site may be evaluated by collecting building

⁵ There were four (4) sample areas that are represented by varying numbers of sample results collected at three (3) sample locations in the Town of Humboldt, three (3) locations on the Iron King Mine property, two (2) sample locations on the Humboldt Smelter property, and two (2) Background Sample locations situated upwind from the Humboldt Smelter.

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rafter dust samples which, providing sufficient volume, can be analyzed according to EPA Method 6010/6020 for metals concentrations (EPA Method 7471B for Mercury). Alternatively, it is widely acceptable to analyze residual dust using a portable, properly calibrated XRF analyzer which requires less material volume, but may suffer a DQO failure because a discrete Quality Assurance (QA) assessment is lacking.⁶

Recommendations

- (8) Speyer recommends that an adequate random sampling (defined here as rendering an appropriate set of data that is representative of the “true” population) be conducted to quantitatively assess the distribution of fugitive dust residues in the rafters of buildings that are located in proximity to known source of contamination. This sampling effort should be preceded by a suitable Sampling & Analysis Plan (SAP) which should be made available for the Town consultant to review.
- (9) The results of implementing the “Rafter Dust” SAP should be used in concert with the 2008 to 2009 data to evaluate critical differences and, as appropriate and applicable, with soils data for areas where building rafter data are available. These data can also be affirmatively applied to evaluate exposure pathways that are not otherwise addressed by CH2M-Hill or Tetra Tech.

C) ASSESSMENT OF SOIL CONDITIONS

- (1) It is understood that the overall cost of remediation is directly related to the assignment of PRGs for soil COCs.⁷ It is also understood that the two (2) COCs that drive the remediation and final closure of the Site (with a future of monitoring) are Arsenic (As) and Lead (Pb).
- (2) The distribution of COCs in soils across the Site is related to proximity to the two (2) source areas and are, in part, related to operations on one or the other.

⁶ Dust samples may be collected and analyzed by any one of several means. It is possible that the volume of rafter dust that is available to collect and analyze is not sufficient to collect a standard 2 ounce jar or allow full duplicate sampling for fixed-base lab analysis by EPA Methods 6010 or 6020. Suitable rafter dust sample results may be obtained by collecting “wipe samples” in accordance with ASTM Standard E1728-16, Standard Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination. Speyer recommends “rafter dust” to calibrate metals data for undisturbed dust according to building age.

⁷ Speyer understands that the RI and FS have variably referred to target chemicals in differing ways, including Chemicals of Interest (COIs) and Chemicals of Potential Concern (COPC). This parsing of words is confusing and misleading. Throughout this document the target contaminants are referred to as Chemicals of Concern (COC) which is consistent with the vocabulary of ADEQ and USEPA.

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- a. Volatile Organic Compounds (VOCs), Semi-Volatile Compounds [SVOCs; including Polycyclic Aromatic Hydrocarbons (PAHs)], residual Pesticides (e.g., Dioxin), Polychlorinated Biphenyls (PCBs), and Cyanide are present in specific, isolated operational areas of the Mine or Smelter properties.
 - b. Removal of Arsenic (As) and Lead (Pb) will, likewise, mitigate exposure to these isolated pockets of other contaminants.
 - c. There is a diversity of metals that co-occur with As and Pb that should be tracked with these two more critical analytes. It is expected that removal of As and Pb will also address locations where these other metals exceed Screening Levels. It appears that this is the general perspective of the FS.
- (3) Arsenic (As) is recognized as the most widespread, prolific, and risk-sensitive of the COCs at this Superfund Site. This challenge is compounded by a very low EPA Screening Level, a presence in each of the primary environmental media, and a known background presence in natural settings.
- a. Arsenic is a carcinogen with a SL that is less than 1 mg/Kg in soil (0.68 mg/Kg).
 - b. Arizona promulgated a 10 mg/Kg threshold for Residential (rSRL) and Non-Residential (nrSRL) Soil Remediation Levels (SRLs). This allowance is based on general State-wide background conditions and, justifiably, ignores the federal health-based guidelines.
 - c. Mining communities are recognized as locations where elevated metals concentrations are expected and warrant appropriate calibration with respect to remedial expectations.
 - d. As discussed above (Section A), USEPA contractors, over the period of 2006 to 2013, sampled soils in residential areas of the Superfund Site and conducted removal actions with very different target values for Arsenic and Lead (see Table 2). Target concentrations calculated by CH2M-Hill (2016) and Tetra Tech (2022), likewise, do not match previous remedial actions. These inconsistencies present additional challenges to completing a comprehensive remediation that includes all AOCs as well as residential and Town properties.

D) BACKGROUND CONCENTRATION OF ARSENIC

- (1) CH2M-Hill (2016; Appendix E) and Tetra Tech (2022; Appendix C-6) present determinations of a Background Threshold Value (BTV) for Arsenic based on data from samples collected outside the boundaries of the Superfund Site. Tetra Tech uses the CH2M-Hill dataset and applies a different statistical protocol, including data clusters, Voronoi tessellation, and a staged calculation of the 95% Upper Confidence Limit (UCL) that rejects ProUCL based on an algorithm inability to apply clustered data. CH2M -Hill calculated a BTV for Arsenic of 112 mg/Kg. Tetra Tech calculated a BTV that is 92 mg/Kg based on the same dataset consisting of 269 data.

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- (2) Speyer’s treatment of a BTV for Arsenic is confined to Tetra Tech’s approach and results.
- (3) Arizona Administrative Code (AAC) R18-7-203 states that remediation of contamination must address one of three (3) methods for determining acceptable cleanup target values.
- a. AAC R18-7-204 includes provisions for determining a target concentration standard for remediation based on background concentrations of the chemical. This is a State ARAR with specific criteria that must be satisfied for acceptable implementation.
 - i. Site-specific historical information concerning land use.
 - ii. Site-specific sampling of soils not affected by a release, but with characteristics similar to those affected by the release.
 - iii. Statistical analysis of background concentrations using the 95% upper confidence limit.
 - b. Tetra Tech’s determination of a BTV for Arsenic appears to address these requirements but does not adequately incorporate site-specific criteria pursuant to R18-7-204(B)2.
 - c. Therefore, the BTV calculation is inadequate because the single 95% UCL value does not uniformly apply to all areas of the Superfund Site, including sensitive parcels located in the Town proper and surrounding neighborhoods.

**TABLE 2 - COMPARISON OF CLEANUP CRITERIA
ARSENIC & LEAD IN RESIDENTIAL SOILS AT THE IKMHS SUPERFUND SITE**

COI	REMEDIATION TARGET*		EPA SUPERFUND / CERCLA / IKMHS CLEANUP CRITERIA					
	SL	rSRL	EA	EA	E & E	LM SERA	CH2M-HILL	Tetra Tech***
	EPA (2022)	ADEQ (2009)	2010	2011	2012	2013	2016	2022
ARSENIC	0.68	10	48	38	38	150	112	92
LEAD	400	400	44	23	23	300	400 (140)**	Varies****

NOTE: All threshold concentrations are reported in milligrams per Kilogram (mg/Kg) [ppm].

* Federal Screening level (SL) | Arizona Soil Remediation Level for Residential Properties (rSRL).

** Provisional Screening Level for Lead (Pb) [According to CH2M, not promulgated (under review) by EPA].

*** Preliminary Remediation Goals vary according to Remedial Group identified by Feasibility Study; Residential = 92 mg/Kg.

**** Tetra Tech (FS) applied an Integrated Exposure Uptake Biokinetic Model (EPA, 2009) to calculate Lead (Pb) PRGs.

BACKGROUND THRESHOLD VALUE (BTV) APPLIED IN RESIDENTIAL SETTINGS

EA – EA Engineering, Science & Technology, Inc. (2008 to 2010) [168 Residential Parcels]

E & E – Ecology & Environment, Inc. [30 Residential Parcel; in part based on EA findings]

LM SERAS – Lockheed Martin Scientific, Engineering, Response & Analytical Services [10 Residential Parcels; Action Levels set by USEPA Region 9]

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- (4) A dataset comprising 269 data for the “local” background concentration of Arsenic was compiled over the course of USEPA investigations at the Superfund Site. Samples were collected during three (3) events and consisted of one (1) collected by ADEQ in 2002-2004, nine (9) were collected by EA Engineering, Science & Technology, Inc. (EA) in 2010, and 259 data collected by CH2M in 2012-2013.⁸
- a. These soil samples were collected under differing SAP criteria (whether these were recorded or not) and are potentially incompatible with the objective of the analysis.⁹
 - b. Soil sample locations were recorded and categorized according to the distribution of native soils and location with respect to the Agua Fria River (East or West). These are reasonable and worthwhile characteristics and serve the intent of R18-7-204(B)2. Specific comparisons of data subsets are presented in Attachment 1 to this memorandum.
 - c. Tetra Tech disregarded these categories and combined the data to calculate a single BTV for all applications across the entire Superfund Site (see Attachment 1.1).
- (5) In addition, Tetra Tech introduced an unacceptable bias into the calculation of an applicable BTV by transforming the raw concentration data into weighted values that are based on a Voronoi Tessellation protocol. This bias was introduced by weighting of the significance of concentration values in the calculation according to tessellated polygon area. The greater that area translates into the greater the significance of the datum representing that area.¹⁰

⁸ CH2M-Hill collected and analyzed 259 background soil samples for Arsenic using fixed-base laboratory and in-field XRF spectrometer. According to the FS, approximately 40 percent of the data were reported by XRF analysis (105 results) and the remainder (154) by certified results from the fixed-base lab. CH2M does provide an assessment of compatibility of data from these two methods that is adequate. There is preference for a stated percentage of total samples (e.g., 10%) for which one (1) sample is split and analyzed at the lab and by XRF spectrometer. This reduces the statistical arguments and relies on a valid, 10 percent selection (which should be randomly selected prior to soil sampling) to confirm data compatibility by standard Student’s t-test and/or F-test of variance.

⁹ It would have been sufficient and, perhaps, more statistically valid to include only those data for the 259 soil samples that were collected by CH2M-Hill.

¹⁰ It is understood that Tetra Tech might have attempted to provide a means to standardize the raw data so that an argument of representativeness might be made. However, the ad hoc weighting of data values imposes an unacceptable bias that arbitrarily exaggerates or minimizes datum significance based on sample density. Consequently, sparsely distributed data have greater significance than closely spaced sample data. The decision to apply raw data is defensible based on the broad range of sample locations that are organized according to soil type and location with respect to the Agua Fria River.

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- (6) This bias was further exacerbated by biases that were introduced into the calculation by including background data that do not apply to the IKMHS Superfund Site and incorporating data for which an unknown, possible bias is indicated.¹¹
- (7) Tetra Tech cited a standard USEPA guidance document to calculate outliers (USEPA, 2002) in the Background Arsenic dataset but failed to apply the results of the calculation in refining the dataset for calculating a 95% UCL. Although the USEPA guidance calculation identified eight (8) outliers, only four (4) “extreme outliers” were removed by Tetra Tech from the dataset prior to completing their calculations.¹²
- (8) Tetra Tech stated that a 95% UCL was calculated. The result of this calculation, 92 mg/Kg, was applied as the single BTV across all areas of the Superfund Site as a conservative target concentration applicable to residential exposure situations. This value is the basis for Preliminary Remediation Goals (PRGs) presented in the FS for all AOCs, including residential, and commercial properties within the boundaries of the Superfund Site (see Table 3).
 - a. This determination does not address the requirement to demonstrate site-specific applicability.¹³
 - b. For reasons not explored by Tetra Tech, all eight (8) outliers, including the four (4) removed as “extreme outliers” and the four (4) that were retained despite the guidance calculation, occur at sample locations that are east of the Agua Fria River (see Attachments 1.2 & 1.4).¹⁴
 - c. The n=265 dataset shows a strong positive skewness (see Attachment 1.1) that is similar to the data distribution exhibited by most subsets of the complete dataset

¹¹ See Section D, Item 9 of this Technical Memorandum.

¹² Tetra Tech removed four (4) obvious outliers (“extreme”) from the BTV dataset and ignored four (4) additional data that were identified by the EPA guidance calculation (USEPA, 2002). These additional four (4) values have significant impact on the data population statistics and can be identified on data frequency graphs, as presented, (see Attachment 1.1 to this memorandum). USEPA should provide adequate justification for including these four (4) outliers or remove altogether them from the operational dataset.

¹³ The dataset applied by Tetra Tech combines Arsenic data for all soil types represented across the Superfund Site. This slurs site-specific nuances that are critical to assigning an adequate and applicable BTV.

¹⁴ In fact, data that are separated according to soil type and location with respect to the Agua Fria River, exhibit obviously different summary statistics and distribution attributes. This may relate to different watershed attributes, unrecognized impact due to residual impact from the Superfund Site due to historic storm patterns, or localized impacts due to prospecting and small mine operations.

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(see Attachments 1.2 and 1.3). Tetra Tech’s BTV assignment (92 mg/Kg) exceeds two (2) standard deviation units (SDUs) above the mean and is not acceptable.¹⁵

- d. The calculation of a 95% UCL, as prescribed in Risk Assessment Guidance for Superfund (RAGS) documents since 1989, determines a value which represents a qualified mean value for the data population with a calculated 95 percent probability of not being exceeded by the calculated mean value (or 95% UCL proxy) of subsequent sample populations from the same original “true” population.¹⁶
 - e. The USEPA ProUCL program includes provisions for calculating background BTVs. The software package User’s Guide (current version is ProUCL v. 5.2.00) describes the algorithms used to calculate “BTVs”. These algorithms calculate an upper confidence interval (UCI), which is a measure of the upper confidence interval (UCI) for the data population (either 95% or 99%). This is a different statistic than the “upper confidence limit,” and refers, according to USEPA RAGS definition, to the 95% UCL. AAC R18-7-204 requires, specifically, calculation of the “upper confidence limit.”¹⁷
 - f. Whereas the 95% Upper Confidence Interval refers to the ordered position of a single datum with respect to the full body of data represented by a mean value, the 95% Upper Confidence Limit refers to the prediction of a data mean of a sample population of data based on a confidence bracket on the mean value of a representative population sample. The 95% UCL approaches the true mean value of the data population as the sample size (n) is increased.
- (9) The distribution of soil types should direct the calculation of site-specific BTVs. It is entirely reasonable if not expected that the BTV will vary across the Site according to soil type and applicable site-specific criteria.
- a. The relative percentage of the Superfund Site that is represented by each of the local soil types is presented by Tetra Tech (2022) as Table 1 of Appendix C-6.¹⁸

¹⁵ According to a review of the histogram of the n=265 dataset (with a bin width of 16 mg/Kg), the value “92 mg/Kg” exceeds the 95% Confidence Interval wherein 95 percent of all data in the population occur beneath the stated value. “Confidence Interval” does not mean the same things as “Confidence Limit.”

¹⁶ In other words, the 95% UCL is a statistic that applies to the mean value of the sample population. There is a 95% confidence that the calculated value is representative of the mean value and will not be exceeded if additional data are collected from the same area, in the same way, and statistically reduced using the same methodology.

¹⁷ The regulatory distinction between UCL and UCI may require additional discussion to resolve. However, it is clear from the Summary Statistics and corresponding Histograms presented in Attachment 1 for Balon Soil, that the assignment of a 92 mg/Kg BTV to certain areas of the Superfund Site is not defensible as either a UCL or a UCI under the provisions of AAC R18-7-204 regarding the “site-specific” criterion.

¹⁸ CH2M (2016) correctly identified the Balon Soil as the predominant soil type in the are of the Superfund Site.

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- b. Tetra Tech's Table 1 (Appendix C-6) is incorrect, is contradicted by Figures 3 & 4 (FS Appendix C-6), and, therefore, does not adequately represent the background concentration of Arsenic in the various soils that are present in the vicinity of the Superfund Site (see Table 3).
 - i. Balon Soil characterizes the majority of the Superfund Site that is occupied by residential and Town properties (Attachment 1.2).
 - ii. Moano Soil is located across the western-southwestern quarter of the Superfund Site, with a border margin with the Galena Gulch, south of the Iron King Mine property (cf. AOC 12). Attachment 1.3 provides a summary of the concentration of Arsenic in background soil samples, which serves as an adequate basis for a BTV that is specific to areas where Moano Soil is located.
 - iii. Lonti Soil does not occur within the boundaries of the Superfund Site [Figures 3 & 4; Appendix C-6 (Tetra Tech, 2022)] and has no corollary that would validate including Arsenic concentration data from this subset population (n=69) of the complete 269 dataset, in the Superfund Site data population.
 - iv. Furthermore, a disproportionate number of outliers ("extreme" and additional based on USEPA 2002c guidance) occur in the Lonti Soil, which was sampled only at locations east of the Agua Fria River (see Attachment 1.4). This simple comparison (i.e., 50% of all outliers in the complete sample population of 265 data occur in a 25 percent subset consisting of 69 data) indicates that Lonti Soil data, overall, exerted an adverse influence on the BTV calculation.¹⁹
 - v. These 69 data should be removed from the BTV dataset as not applicable. Details provided in an Attachment 1.4 to this Technical Memorandum demonstrate the effect of Lonti Soil data on the overall data pattern.
- c. The distribution of "extreme outliers" (as defined by Tetra Tech) and additional (ADD) outliers that are identified by applying the USEPA Guidance calculation indicates important, additional biases that are embedded in the BTV dataset.
 - i. All (100 percent) of the outliers ("extreme" and additional) occur in soils that were collected from sample locations east of the Agua Fria River. This data pattern indicates that there is likely an inherent bias involving soils collected east of the River that does not, in general, affect soils that are present west of the River, regardless of the soil type.

¹⁹ It is reasonable to state, based on Table 3 information and data statistics presented in the Attachment to this memorandum, that data from Lonti Soil have artificially increased the sitewide Arsenic BTV that was calculated by Tetra Tech.

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- ii. Residential properties that are located east of the River and are located within the boundaries of the Superfund Site may require additional attention to resolve the issues raised in this analysis.

TABLE 3 - SUMMARY OF SOIL TYPES INCLUDED IN THE CALCULATION OF A BTV FOR ARSENIC

FS (%) TABLE 1	SOIL TYPES	AGUA FRIA RIVER		TOTAL	COMMENTS
		WEST	EAST		
28.4	BALON*	52	24	76	(1) Overwhelming proportion of Residential properties are located in Balon Soil areas. (2) 1 EXTREME OUTLIER 2 ADD Outliers All EAST Subset
17.8	LONTI**	0	69	69	2 EXTREME OUTLIERS + 2 ADD OUTLIERS 50% of 8 total outliers recognized by USEPA Guidance Caclulation All EAST
15.4	LYNX				ALLUVIUM
	Ly	5	13	18	
	Sa	0	5	5	
32.9	MOANO				
	MkF	17	59	76	1 EXTREME OUTLIER EAST Sample Subset
	MgD	20	0	20	
	MoD	1	0	1	
94.5		95	170	265	TOTAL n=269 / 4 extreme outliers removed n=265

*Contrary to FS Table 1 Summary, Balon Soil occupies more than 28% of the area within the Superfund Site (FS Fig. 4).

**Contrary to FS Table 1 Summary, Lonti Soil does not occur within the Superfund Site.

- d. Attachment 1 to this memorandum compiles background soil data as discussed and presents Summary Statistics and Histogram plots with corresponding Summary Statistics for each Soil Type, and for Balon Soil, on each side of the Agua Fria River channel (see Attachment 1.2).²⁰
- (10) These documented biases, introduced by an inadequate compilation of soils within the Superfund Site and inclusion of soil samples from areas east of the Agua Fria River that show evidence of an unknown bias, are further exacerbated by Tetra Tech’s Voronoi Tessellation transformation of the data to generate a weighted dataset.

²⁰ Pending an acceptable justification for not removing four (4) outliers as determined by the EPA Guidance Calculation, these data have been retained in this assessment. If there is not an acceptable justification, these data should be removed and the revised dataset consisting of 261 data should be used going forward.

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- (11) A weighted dataset is not necessary to address representativeness and area-specific BTVs may be confidently calculated on the basis of available data for each of the soil types documented within the boundaries of the Superfund Site.

Recommendations

- (12) A robust dataset for metals in soils at the Superfund Site has been compiled since before 2012 and is available to support the development of a comprehensive co-occurrence matrix which provides adequate assessment of metals concentrations with respect to the distribution and concentration of As and Pb in most areas of the Superfund Site. This matrix can be used to confirm that accessory metals (i.e., not As or Pb) are adequately removed at the time that As and Pb concentrations are remediated.
- (13) An Arsenic BTV should be calculated that incorporates only those data that pertain to a defined Area of Interest (AOI).
- Remove all consideration of Lonti Soil data as not applicable.
 - Remove all data from areas East of the Agua Fria River as not applicable due to suspected bias.
 - In our opinion it is not necessary to supplement the existing background dataset with additional sample data. The existing datasets, based on individual soil types, is adequate to accomplish the necessary calculations to determine applicable BTVs for each identified and prospective AOC.
 - Apply the data in accordance with the ProUCL (ver. 5.2) regarding calculation of a 95% UCL as required by State ARAR.
 - Complete these calculations for each identified AOI according to AOCs that are recognized by Tetra Tech's FS with provisions for increasing the total number of AOCs, as warranted based on revised EPC values.
- (14) Revise Arsenic (As) PRGs in accordance with AAC statute and as per comments presented herein. Incorporate these values into all calculations of PRGs for all AOCs identified by Tetra Tech.
- (15) Expand the number of AOCs to include areas that are subject to remediation based on revised PRGs for Arsenic.

E) SITE-SPECIFIC REMEDIATION STANDARD FOR LEAD

- (1) Lead (Pb), like Arsenic (As) is often associated with historic mining operations and towns. Unlike Arsenic, Lead (Pb) is not a recognized carcinogen and its remediation level

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is based on Screening Levels that correlate to a Hazard Index (i.e., HI=1).²¹ This is represented in the federal Alert Level for Lead (Pb) in soil, which is 400 mg/Kg (USEPA, November 2022), and as adopted by Arizona as the Soil Remediation Level for residential properties (rSRL).²²

- (2) Tetra Tech utilized an USEPA risk assessment model to calculate applicable Lead (Pb) cleanup levels for the Superfund Site [i.e., Integrated Exposure Uptake Biokinetic Model (IEUBK ver. 1.1)].
 - a. Tetra Tech did not provide justification for this decision or state why the 400 mg/Kg and 800 mg/Kg thresholds (i.e., Arizona SRL for Residential and Non-Residential properties, respectively) is not applicable.
 - b. We believe that this is a reasonable expectation given that this threshold was used by CH2M-Hill (2016) and serves as the State ARAR.
 - c. Furthermore, the distribution of Lead (Pb) across the Site and in residential properties, based on available data and as prescribed in PRGs calculated for the 30 AOCs, spans this concentration value with a range from 197 mg/Kg to 460 mg/Kg.

- (3) AAC R18-7-206, which directs the use of a risk-assessment determination of remediation standards and serves as an ARAR, identifies specific requirements that must be addressed by the risk assessment.
 - a. Certain requirements are imposed on the determination of a “site-specific remediation standard,” including:
 - i. The methodology may be deterministic but must include provisions for maximum exposure for all possible future land use. [AAC R18-7-206(B)1]
 - ii. The methodology may be probabilistic but must accommodate protective measures that address the 95th percentile upper bound estimate of the distribution. [AAC R18-7-206(B)2]
 - iii. The methodology may be another approach, but must be scientifically acceptable (i.e., published in a peer-reviewed journal) and be a considered “sound” methodology by scientific community consensus. [AAC R18-7-206(B)3]
 - b. In addition, AAC R18-7-206(D) stipulates those resulting criteria for acceptance includes:

²¹ It is understood that EPA’s Soil Screening Levels (SSLs) for Superfund Sites are intended to guide human health-based risk assessments. However, Arizona has adopted a Hazard Index of 1 with regard to non-carcinogenic contaminants in assigning site-specific remediation standards by risk assessment [AAC R18-7-206(D)].

²² AAC R18-7 Appendix A (2009).

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- i. The remediation standard cannot exceed a Hazard Index HI=1 for noncarcinogenic chemicals or 10⁻⁶ to 10⁻⁴ cumulative excess lifetime cancer risk.
 - ii. Include provisions for multiple contaminant exposure risks.
 - iii. Include provisions for multiple pathways of exposure.
 - iv. Include provisions that accommodate uncertainties of exposure.
 - v. Include provisions that address the sensitivity of the exposed community.
- (4) Tetra Tech failed to adequately address the complete scope of requirements outlined in AAC R18-7-206. Therefore, the determination of a PRG for Lead (Pb) is not adequate.
- a. The model implemented by Tetra Tech is an aged version of the EPA Model IEUBK ver. 2.0, which was released in May 2021.²³ The statute requires, by inference, that the most recent version of a given model must be implemented or rejected with justification.
 - b. The IEUBK Model incorporates multiple exposure pathways in the process of calculating a target concentration, which satisfies AAC R18-7-206(D).²⁴
 - c. The Tetra Tech application of the IEUBK Model does not appear to incorporate data for concurrent exposure to other contaminants (e.g., Arsenic).
 - d. The target values calculated by the IEUBK Model for risk related to occupational and recreational exposure does not appear to address the ARAR which rejects an exceedance of a HI of 1.²⁵
 - e. Certain of the residential properties appear to have a remediation standard that is sensitive to the ARAR and, in fact, includes provisions that render a human health-based remediation standard that is less than the federal Alert Level and State rSRL. These values should be refined by applying the Lead (Pb) data to the most current version of the Model and incorporate provisions for concurrent receptor exposure to other contaminants (e.g., Arsenic).

²³ The revised and updated model (IEUBK ver. 2.0) incorporates a more robust database of exposure responses, an updated algorithm, and important changes to input variables affecting the calculation of effects related to multiple exposure pathways.

²⁴ The Model includes provisions for accounting exposure to fugitive dust as an additional potential receptor pathway. Tetra Tech relied on ambient air data that were compiled during the 2008 to 2009 period. These data, as discussed in earlier sections of this document, do not adequately characterize exposure to fugitive dust. Speyer recommends that a systematic sampling of rafter dust be completed to assess exposure to fugitive dust over the period of community development. Dust contains residual concentrations of metals that express the integrated effects of wind direction and current, distance from the source, and duration of exposure (calibrated on the basis of building age).

²⁵ The November 2022 Alert Levels published by USEPA identifies that Lead (Pb) has a HI=1 at 400 mg/Kg for residential receptors.

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Recommendations

- (5) Revise Lead (Pb) PRGs in accordance with AAC statute and as per comments presented. Incorporate these values into all calculations of PRGs for Lead (Pb) in all AOCs identified by Tetra Tech.
- (6) Alternatively, apply Arizona State SRLs [rSRL (400 mg/Kg) or nrSRL (900 mg/Kg, as appropriate)] with specific attention to especially sensitive potential receptors in residential settings (i.e., children).
- (7) Expand the number of AOCs, as warranted, to include areas that are subject to Lead (Pb) remediation based on revised PRGs.

F) DETERMINATION OF AREAS OF CONCERN

- (1) Areas of Concern (AOCs) should be evaluated with respect to revised target concentrations (i.e., remedial standards) for COCs, especially Arsenic and Lead. AOCs should be clearly defined with reference to Exposure Point Concentrations (EPCs) for each COC, as applicable.²⁶
- (2) Speyer expects that the framework described and mapped by Tetra Tech, consisting of 31 assigned AOCs and nine (9) Remedial Groups, will remain largely intact.
- (3) Failure to provide adequate foundation for elimination of Area of Concern (AOC) 12 from development of PRGs. Review criteria used to remove AOC 12 from remediation in light of information reported herein and revised target concentrations for Arsenic and Lead.
- (4) It seems likely that additional AOCs may be identified, including residential and Town areas, which have been targeted by USEPA for additional sampling and, possible, remediation (see Section J, below).
- (5) AOCs that include residential properties should reviewed to assess if site-specific criteria have been adequately addressed (e.g., BTV calculated on the basis of Balon Soil data). It appears that residential properties located east of Agua Fria River, for example, may have a separate, site-specific BTV for Arsenic than residential areas located west of the River.

²⁶ It is understood that EPCs relate specifically to manner of exposure and class of receptor, including Residential, Occupational, and Recreational, and that each of these receptor categories impose differing risk elements that are factored into the equation.

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The greater the inherent risk due to exposure, the more finely tuned the determination of “site-specific” should be.²⁷

- (6) Failure to specifically mention the status of residential and town properties is a Public Relations inadequacy. An assignment of AOCs should acknowledge the sensitivities of the Community and include provisions for those areas of the Superfund Site most obvious to the pedestrian reader. A decision that residential and town areas are not subject to remediation and, accordingly, PRGs have not been assigned, should be plainly explained, and justified.
- (7) There appears to be an incomplete or incorrect correlation between current Town Zoning, intended Land Use, and AOC assignments.²⁸

Recommendations

- (8) The number of AOCs should be expanded and appropriately defined to communicate changes in the remedial plans concerning residential, commercial, and Town properties.
- (9) We recommend that the following tables and/or maps that incorporate available and developing information may provide useful summaries for purposes of communicating with the public, providing an overview of remedial plans, and summarize remedial target values on an area-by-area basis.
 - a. Identification of all COCs according to prescribed Superfund Site Areas of Concern (AOCs), including Tetra Tech’s 31 AOCs, additional Residential and Commercial properties, and other areas of the Superfund Site that are revealed based on revised EPCs and PRGs.
 - b. COCs should be clearly identified in table format according to acceptable criteria, such as exceedance of applicable PRGs as per confirmed State promulgated standards, BTV (i.e., As), or remedial standards calculated based on a bona fide risk assessment (i.e., Pb).
 - c. It is responsible and a reasonable expectation that USEPA provide adequate justification for the decision to not adopt State promulgated standards as suitable cleanup target values for specific COCs.

²⁷ This is consistent with the requirements of AAC R18-7-206.

²⁸ Understanding that town zoning can be a moving target, USEPA should contact the Town for a current zoning map that can be used as a base with a timestamp. Provisions for future, anticipated land use should be included and appropriately identified.

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G) ASSIGNMENT OF PRELIMINARY REMEDIATION GOALS (PRGs)

- (1) PRGs for the IKMHS Superfund Site have been summarized according to nine (9) Remedial Groups (Table 4) that comprise 30 of the 31 AOCs identified by CH2M-Hill (2016) and applied by Tetra Tech (2022).
- (2) The PRGs represented by Tetra Tech for Arsenic (As) and Lead (Pb) are inadequate due to reliance on flawed or outdated risk assessment determinations (Pb), inadequate or incomplete attention to State ARARs, and flawed statistics in assigning applicable BTVs (As).

TABLE 4 - SUMMARY OF PRELIMINARY REMEDIATION GOALS ACCORDING TO AREA OF CONCERN & ASSIGNED RISK CATEGORY

COC	ARIZONA		FS PRELIMINARY REMEDIATION GOALS (PRGs) FOR 9 REMEDIAL GROUPS (DECEMBER 2022)								
	rSRL	BACKGROUND	MTP	INDUSTRY / MTP	OPEN LAND / MTP	U CHAPARRAL	M/L CHAPARRAL	S SMELTER	SLAG	AGUA FRIA RIVER	E / AGUA FRIA R.
ARSENIC	10	92	884	92 - 884	92 - 1414	92	274	274	274	92	92
LEAD	400	35	460	197 - 460	197 - 559	197	460 - 559	460	559	128	460

NOTE: All Preliminary Remediation Goal (PRG) concentrations are reported in milligrams per Kilogram (mg/Kg) [ppm].

RES / OCC	<p>ARSENIC (As) & LEAD (Pb) Preliminary Remediation Goals (PRGs) are founded on modelled concentrations. The RI/FS models are incomplete, incorrect, or based on aged versions that are not current with available toxicological information.</p> <p>Arsenic & Lead are the most significant COCs at the Superfund and appropriate remediation requires appropriate application of calculated Background Threshold Value(s). Human Health Risk Assessments must be based on current toxicological information.</p>
OCC / REC	
OCC / ECO	
OCC / REC / ECO	
RES / OCC / REC / ECO	
REC / ECO	

- (3) PRGs for each AOC should include provisions for Town residents who live, work, and recreate within the Superfund Site on an annualized basis.
- (4) PRGs should include explicit provisions for possible receptor exposure to multiple COCs, due to multiple pathways, involving different EPCs.

Recommendations

- (5) Speyer requests that Figures, including maps, that depend on assigned PRGs be revised pursuant to significant changes so that the critical information regarding EPCs and PRGs is easily accessed and communicated.
- (6) Speyer assumes that Tetra Tech will develop a confirmation sampling plan for determining adequacy of remediation at all targeted AOCs at the Superfund Site. This sampling plan should be comprehensive and site-specific, as warranted by predetermined EPCs, and available for review by the Town’s consultant prior to implementation.

H) ADDITIONAL WORK NOT DETAILED IN THE RI OR FS REPORTS

- (1) USEPA has stated that additional sampling and, as indicated, remediation is intended to be completed in residential areas of the Superfund Site.

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- a. This a positive decision that has been communicated to the Town in terms that commend USEPA's approach to the sensitivities of the Town and Community.
 - b. Proper implementation of this supplemental plan requires that Tetra Tech's EPCs and PRGs, as provided in the FS report and analyzed in this document, are reconsidered, and revised.
- (2) This additional work should be based on a focused sampling plan (i.e., SAP) that is designed to address the findings of a data-gap analysis of existing soils data, and a comprehensive remediation plan that is based on revised BTVs and risk assessment determinations (i.e., Pb). Both plans and the data-gap analysis should be reviewed by the Town's consultant to ensure on-going community involvement and a sustained sense of positive public relations.
- (3) Speyer understands that USEPA intends to engage ADEQ to assist with certain tasks required for completion of roadmap to completion, including the Final Engineered Design for the Remedial Plan.
- a. This is a motivating idea, which is easy to communicate to the Town and expresses a sincere federal agency desire to meet the deadlines so that adequate funding can be confidently secured.

Recommendations

- (4) To the degree practicable and as authorized by USEPA, soils data, including additional data that may be available due to supplemental work at Town and residential properties, should be incorporated with fugitive dust data derived from a systematic building rafter survey, as described in Section B above.
- (5) Speyer recommends that USEPA complete a comprehensive review of existing data to identify significant data-gaps in soil data in residential and commercial areas of the Superfund Site. The data-gaps represent target areas for additional soil sampling, as necessary. As stated previously, there is considerable data from USEPA work completed in 2010, 2011, and 2012 that should be compiled and serve as the raw dataset from which informed decisions concerning additional sampling in residential areas of the Superfund Site may be made.
- (6) The following steps are recommended:
- a. Compile all available soils data for the Superfund Site. These data should already be on-line with the MS-ACCESS database.
 - b. Conduct a map-based data-gap analysis to identify areas that are not represented by appropriate density of data. Data-gaps should also include assessment of

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“representativeness” for each recognized area that would be assessed for possible remediation.²⁹

- c. Review AOCs with specific reference to BTVs that are founded on soil-specific characteristics (e.g., Balon Soil for the Town and associated residential areas; see Attachment 1.2).
 - d. Refine the mapped data with reference to revised PRGs that are based on criteria discussed above.
 - e. Develop a comprehensive removal plan for residential and Town properties with a timeframe schedule that integrates with Tetra Tech’s waste management programs as detailed in the FS, according to the final Remedial Option that is selected. These coordinated plans should include provisions for the allocation of replacement soil from an appropriate borrow source.
- (2) Sampling Plans intended to address data-gaps should be reviewed by the Town’s consultant to sustain a cooperative interaction between the agency and the community.
- (3) Removal Plans should, likewise, be reviewed and discussed with the Town’s consultant before contractors are mobilized.
- (4) All additional work and development of plans should be accomplished concurrently with other, scheduled work so that the overall roadmap to completion is not interrupted or paused.

CLOSING REMARKS

Speyer reviewed the CH2M-Hill (2016) RI and Tetra Tech (2022) FS reports on behalf of the Town of Dewey-Humboldt, Yavapai County, Arizona under agreement with the Town Council, as executed by the Town Attorney.

Determinations of inadequacy and recommendations that are provided are strictly intended to address appropriate, protective measures that apply to occupied areas of the IKMHS Superfund Site. All potential revisions to the FS may be accomplished without interfering with or interrupting the current schedule of administrative tasks. The additional inquiry, revised calculations, and changes to Site maps may be completed during the Public Response Period. Additional sampling activities and corresponding SAPs and QAPPs, including sampling/removal actions that USEPA has stated it intends to implement, may be completed following the 60-day Response Period and pertinent data may be available and incorporated into the Record of Decision (ROD) that is scheduled for completion by the end of the 2023 calendar year.

²⁹ “Representativeness” in this sense refers to appropriately implemented sampling plan that excludes overt or passive bias.

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Speyer reviewed Tetra Tech's selection criteria as applied to each of the five (5) remedial options included in the FS. Speyer finds that the selection criteria are, in general, consistent with the expectations under the National Contingency Plan (NCP)³⁰ and the engineered design, in principle, should not be affected by revisions such as requested in this document. It is understood that volume of waste to be moved and volume of borrow soil to restore remediated properties will increase and this, in turn, will affect certain timelines.

REFERENCES CITED

CH2M-Hill, 2016. Remedial Investigation Report, Iron King Mine-Humboldt Smelter Superfund Site, Dewey-Humboldt, Yavapai County, Arizona. U.S. Environmental Protection Agency Region 9 (September 2016).

Ecology & Environment, Inc. (EEI), 1997. Standard Operating Procedure: Soil Sampling. 35 p. [USEPA ARCHIVE DOCUMENT]

Gilbert, R.O., 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold Company, Inc. (New York), 320 p.

Tetra Tech, 2022. Feasibility Study, Iron King Mine / Humboldt Smelter Superfund Site. Public Comment Version, U.S. Environmental Protection Agency Region 9 (San Francisco, California).

USEPA, 1989. Risk Assessment Guidance for Superfund, Volume 1. Human Health Evaluation Manual (Part A). EPA/540/1-89/002, 291 p

USEPA, 1992. Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies. EPA/600/SR-92/128. 4 p.

USEPA, 2002a. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, 32 p.

USEPA, 2002b. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. 106 p.

USEPA. 2002c. Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites. EPA 540/R-01-003.

USEPA, 2002d. Guidance on Choosing a Sampling Design for Environmental Data Collection. EPA QA/G-5S (EPA/240/R-02/005), 178 p.

³⁰ Certain ARARs regarding remediation standards pursuant to AAC R18-7-203, as discussed, require attention.

Attachment 1.1: Total BTV Dataset

Attachment 1.2: Balon Soil Dataset

Attachment 1.3: Moano Soil Dataset

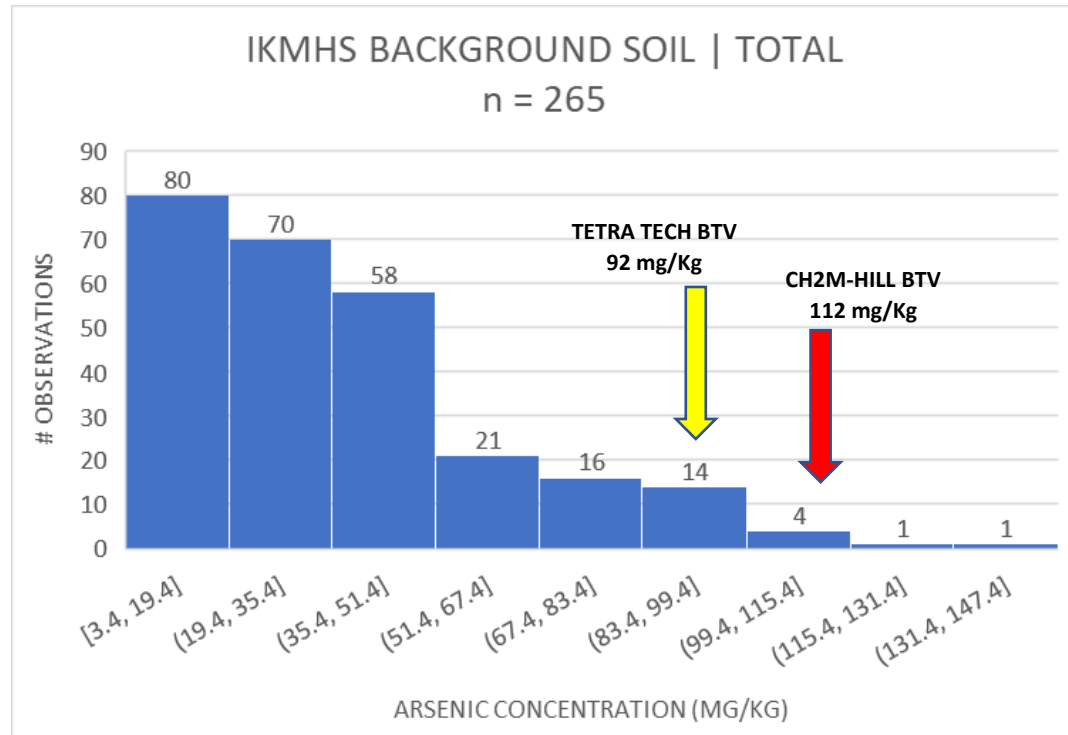
Attachment 1.4: Lonti Soil Dataset

ATTACHMENT 1

ATTACHMENT 1.1

BACKGROUND ARSENIC (AS) DATA FOR IKMHS SUPERFUND SITE BTV | TOTAL

IKMHS BACKGROUND AS IN SOILS TOTAL	
Mean	36.92
Standard Error	1.54
Median	30.80
Mode	8.60
Standard Deviation	25.03
Sample Variance	626.74
Kurtosis	1.16
Skewness	1.18
Range	135.60
Minimum	3.40
Maximum	139.00
Sum	9784.33
Count	265.00
Confidence Level (95.0%)	3.03
Square Root of n [bin size]	16.28



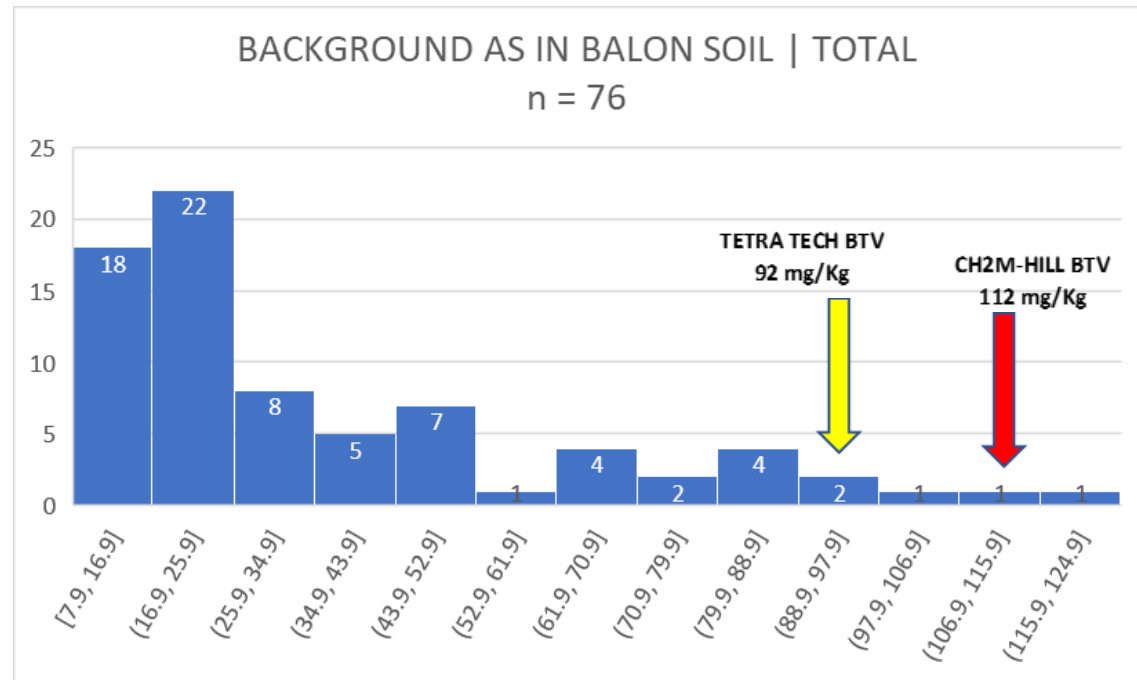
CH2M-Hill (2016; Appendix E) and Tetra Tech (2022; Appendix C-6) applied the same dataset consisting of 269 data from soil sample locations outside the perimeter of the IKMHS Superfund Site to calculate a Background Threshold Value (BTV) for Arsenic (As). CH2M-Hill calculated a BTV of 112 mg/Kg Arsenic. Tetra Tech calculated a BTV for Arsenic equal to 92 mg/Kg.

Two (2) values to the far right of the Histogram are outliers identified by calculations provided by USEPA Guidance Documents (USEPA, 2002c). Likewise, two (2) values of the four (4) identified in Bin 7 should be removed based on standard industry practice.

ATTACHMENT 1.2.1

BACKGROUND ARSENIC (AS) DATA FOR IKMHS SUPERFUND SITE BTV | BALON SOIL

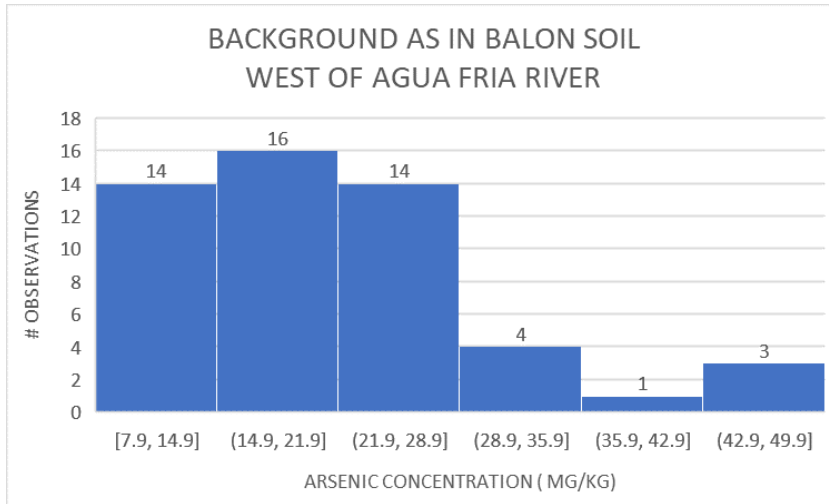
BACKGROUND AS IN SOILS BALON	
Mean	36.86
Standard Error	3.12
Median	24.63
Mode	#N/A
Standard Deviation	27.22
Sample Variance	741.09
Kurtosis	0.94
Skewness	1.33
Range	114.10
Minimum	7.90
Maximum	122.00
Sum	2801.33
Count	76.00
Confidence Level(95.0%)	6.22
Square Root of n (bin size)	8.72



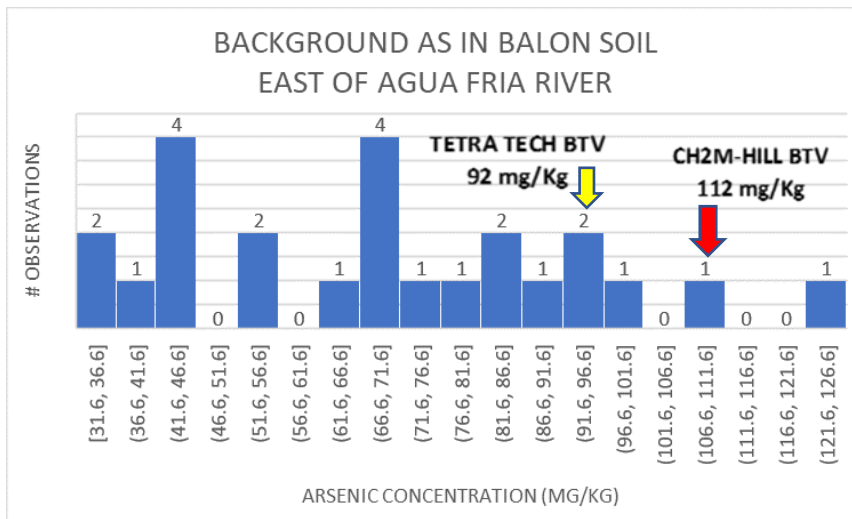
Balon Soil occupies a dominant area of the Superfund Site and is located in areas considered to be the most sensitive with regard to location of potential receptors, including Town properties and residential neighborhoods located northeast and east of the Iron King Mine proper and north and northwest from the Humboldt Smelter property. Balon Soil represents an important site-specific source of information regarding background arsenic concentrations. Two (2) of the outliers that were not removed from the operative dataset are present on this graph and significantly affect the dataset mean and standard deviation values.

ATTACHMENT 1.2.2

BACKGROUND ARSENIC (AS) DATA FOR IKMHS SUPERFUND SITE BTV | BALON



BACKGROUND AS IN BALON SOILS WEST	
Mean	21.84
Standard Error	1.29
Median	20.05
Mode	#N/A
Standard Deviation	9.33
Sample Variance	87.02
Kurtosis	1.38
Skewness	1.18
Range	40.21
Minimum	7.90
Maximum	48.11
Sum	1135.71
Count	52.00
Confidence Level (95.0%)	2.60
Square Root of n (bin size)	7.21



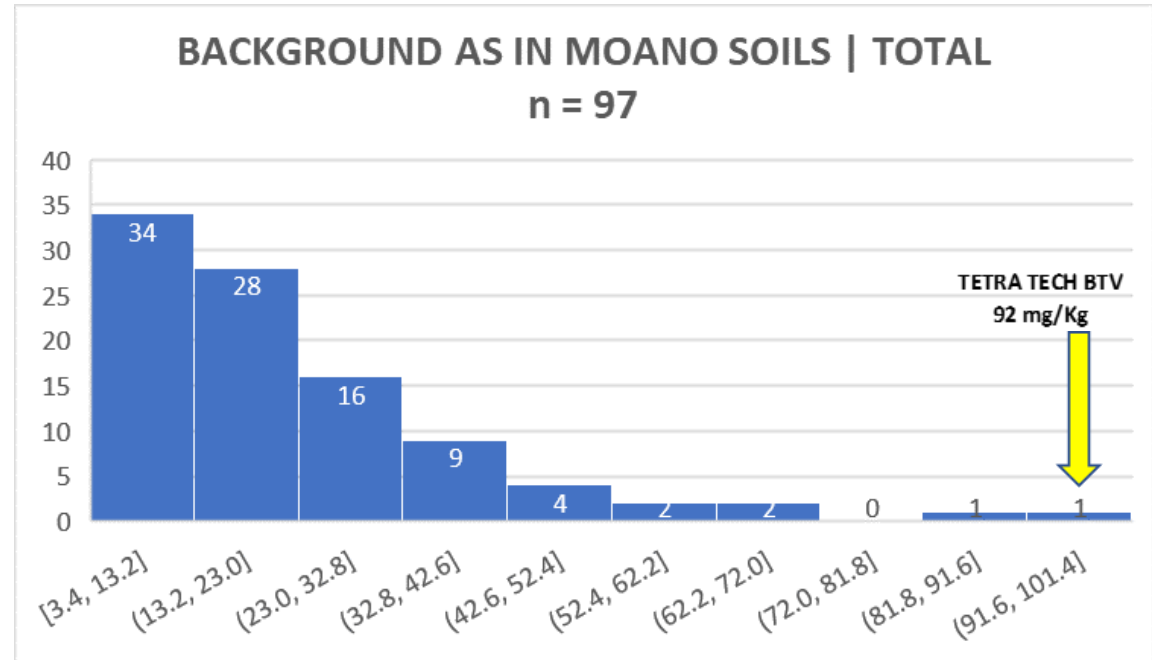
BACKGROUND AS IN BALON SOILS EAST	
Mean	69.40
Standard Error	5.04
Median	69.18
Mode	#N/A
Standard Deviation	24.67
Sample Variance	608.66
Kurtosis	-0.68
Skewness	0.32
Range	90.44
Minimum	31.56
Maximum	122.00
Sum	1665.62
Count	24.00
Confidence Level(95.0%)	10.42
Square Root of n (bin size)	4.90

Balon Soil Arsenic data from samples collected East of the Agua Fria River significantly differ from sample data for samples collected West of the River. Data distribution attributes, maximum values, and standard deviation are significantly different. All data that exceed 59 mg/Kg in Balon Soil from all locations around the IKMHS Superfund Site are present in this data subset, comprising over 60% of the Balon-East dataset count. The CH2M-Hill and Tetra Tech BTVs are not even represented in the Balon-West dataset wherein the highest Arsenic concentration value is about 50% of the 92 mg/Kg BTV assigned by Tetra Tech.

ATTACHMENT 1.3

BACKGROUND ARSENIC (AS) DATA FOR IKMHS SUPERFUND SITE BTV | MOANO SOIL

MOANO TOTAL	
Mean	23.15867
Standard Error	1.687845
Median	17.7
Mode	8.6
Standard Deviation	16.62334
Sample Variance	276.3355
Kurtosis	4.54902
Skewness	1.93405
Range	89.30973
Minimum	3.4
Maximum	92.70973
Sum	2246.391
Count	97
Confidence Level(95.0%)	3.350345
Square Root of n (bin size)	9.8

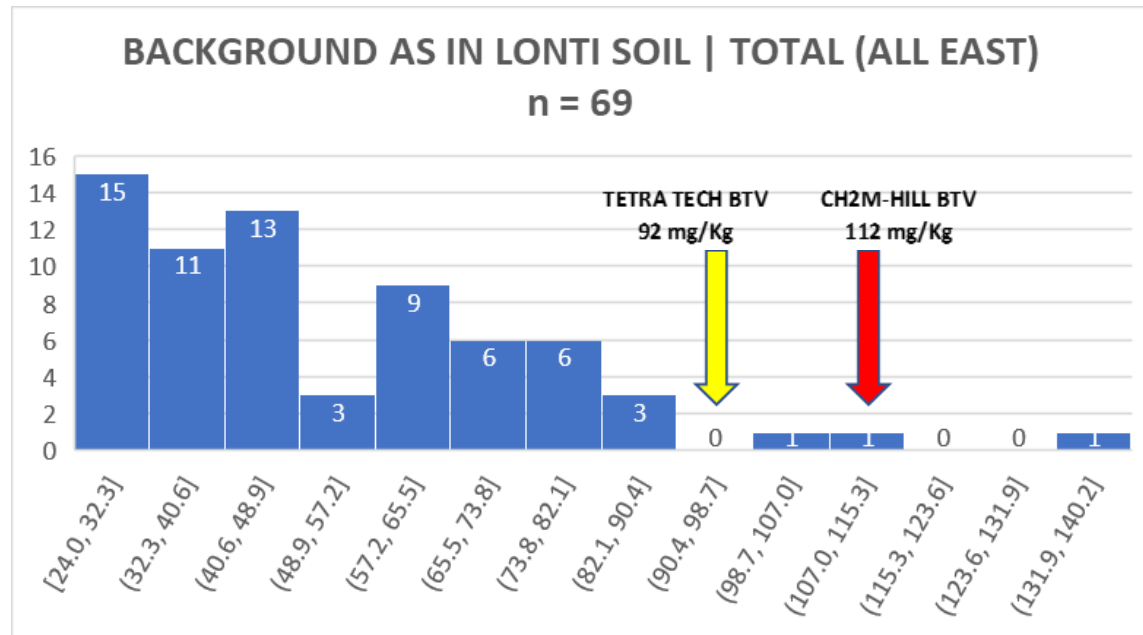


Moano Soils include three types of which two (2) are located within the boundary of the IKMHS Superfund Site (see Figures 3 & 4, Tetra Tech Appendix C-6 (2022)). Moano Soils compose the bulk of Area of Concern 12, located south-southwest of the Iron King Mine proper, south of Galena Gulch. In addition, Moano Soils are present along the east margin of Agua Fria River east, southeast, and south of the Humboldt Smelter property.

ATTACHMENT 1.4

BACKGROUND ARSENIC (AS) DATA | LONTI SOIL (TOTAL)

BACKGROUND AS IN SOILS LONTI	
Mean	51.8802471
Standard Error	2.79583152
Median	42.8
Mode	69.4
Standard Deviation	23.2239208
Sample Variance	539.350499
Kurtosis	1.82553844
Skewness	1.18412631
Range	114.97418
Minimum	24.0258196
Maximum	139
Sum	3579.73705
Count	69
Confidence Level(95.0%)	5.57899494
Square Root of n (bin size)	8.31



According to Figures 3 and 4, as presented in Appendix C-6 of the Tetra Tech Feasibility Study (FS), Lonti Soil does not occur within the boundaries of the Iron King Mine/Humboldt Smelter Superfund Site. Lonti Soil only occurs on the East side of the Agua Fria River and north-northeast of the Superfund Site boundary. These data, though not applicable to the Superfund Site, indicate that the assignment of a BTV that represents the average background concentration of Arsenic in Site soils is significantly less than the BTVs calculated by Tetra tech.

TECHNICAL MEMORANDUM

TO: JEFF DHONT | USEPA RPM | IKMHS SUPERFUND SITE

FROM: STEPHEN SPEYER, PH.D., R.G. | SPEYER ENVIRONMENTAL LLC

SUBJECT: TECHNICAL REVIEW & FINDINGS | USEPA FEASIBILITY STUDY
PREPARED BY TETRA TECH (2022) | IKMHS SUPERFUND SITE

DATE: FEBRUARY 28, 2023

CC: LAURA MALONE | ADEQ WASTE PROGRAMS DIVISION DIRECTOR
KAY BIGELOW | DEWEY-HUMBOLDT TOWN ATTORNEY

This memorandum is provided on behalf of the Dewey-Humboldt Town Council (the “Town”), as requested by Kay Bigelow, Town Attorney. Speyer Environmental LLC (Speyer)¹ was retained by the Town to complete a technical review of materials provided by the United States Environmental Protection Agency (USEPA) pursuant to developments at the Iron King Mine–Humboldt Smelter (IKMHS) Superfund Site. Primary documents reviewed pursuant to this evaluation include the Remedial Investigation (RI), completed by CH2M-Hill² (2016), and the Feasibility Study (FS), completed by Tetra Tech (2022). These documents, including all ancillary Figures, Tables, and Appendices were available, including the MS-ACCESS Database that was compiled by Tetra Tech pursuant to their responsibilities regarding the FS.

It is understood that these documents comprise the core information on which USEPA will base the Record of Decision (ROD) and following which a Final Engineering Design for remedial operations will be developed, put to bid, and implemented. Speyer provided findings during a Study Session convened by the Town on February 14, 2023. It is understood that USEPA attended this meeting by virtual connection.

This memorandum provides a detailed description of what Speyer has determined to be “adequate” and “inadequate” based on an understanding of industry standards and responsibilities under CERCLA, including State Appropriate and Relevant Applicable Requirements (ARARs). Where appropriate, these requirements are cited for reference. It is anticipated that additional comments may be appropriate as the review is not yet completed and these will be communicated prior to the beginning of the Public Response Period which is

¹ Stephen Speyer, Ph.D., R.G., Principal Scientist for Speyer, conducted the review and assessment. His bio and curriculum vitae are available upon request.

² We understand that CH2M-Hill has since been purchased by Jacobs Engineering.

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understood to begin on or about March 15, 2023. This communication is not intended to substitute for a formal response which will be provided during the Public Response period following appropriate authorization by the Town.

PREAMBLE

It is important to communicate at the onset of this and any subsequent memoranda that it is not the intention of any comment or determination of inadequacy to pause or delay the process that USEPA is leading. It is our intent to identify critical flaws and inadequacies that might result in real or potential additional health risk.

Wherever possible and as appropriate, Speyer provides pointed recommendations that are intended to serve the common good and assist USEPA in addressing inadequacies before the formal Public Response Period begins. This memorandum addresses areas of the RI and FS that have been purposefully prioritized based on potentially greater overall impact to the Town and Community and have the greatest effect on planning remedial efforts. For example, this Technical Memorandum is focused on Superfund Site soils, determinations of soil contamination, assignment of Areas of Concern (AOCs), determinations of PRGs related to soils, and recognizes the comprehensive impact of changes in soil volume (including the mass of mine waste) on the efficacy of remedial options.

It is anticipated that an additional memorandum may be provided that focusses on those topics left unaddressed in this document, including, as appropriate, groundwater and surface water concerns.

- (1) Speyer has placed an emphasis on USEPA's current, focused schedule for completion and has leveraged this information to encourage a "no-interruption" perspective in providing advice to the Town Council and in dealings with the Community.
- (2) Specific recommendations attached to each Section, as follows, are intended to be addressed and developed concurrently with the roadmap requirements that USEPA is addressing.
- (3) Speyer has recommended that the Town retain a consultant to provide timely review of new and revised plans for sampling and expanded remediation, as determined to be appropriate by USEPA.
- (4) Speyer attempted to provide, with some success, an explanation of the role and responsibilities of the USEPA under CERCLA. The USEPA decision to address remediation and pursue compensation under established liability. This is an enormously beneficial decision that the Town community needed to better understand.
- (5) It is understood that a newly appointed Citizen Participation Coordinator has been assigned to the IKMHS Superfund Site. This is a positive decision and provides adequate attention to the concerns of the Town.

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- (6) Appropriate and reasonable attention to these and forthcoming review comments provided by the Town's consultant will help sustain a neutral if not encourage a positive community outlook regarding the unfolding of USEPA's plans.

EXECUTIVE SUMMARY

Speyer reviewed the Tetra Tech Feasibility Study (FS) and CH2M-Hill's Remedial Investigation (RI) on which the FS is based. Certain critical inadequacies are identified, and several requests are communicated. Speyer also identifies critical adequacies that are communicated by the referenced documents. Specific recommendations are offered in response to determinations of inadequacy.

Determinations of Adequacy

- There exists a substantial dataset for concentrations of COCs in soils. Certain data-gaps may be exposed that require further attention as has been acknowledged by USEPA. In general, the gross distribution of contaminants in surface soils has been adequately determined.
- Datasets for COCs in surface waters and associated sediments are based on an adequate distribution of sample locations.
- The dataset for determining background concentrations for Arsenic in soils is adequate and can be appropriately segregated into subsets to assess differing soil types and location with respect to the Agua Fria River which are germane to addressing an applicable definition of "site-specific."
- Tetra Tech's assessment and treatment of the five (5) Remedial Options, including two (2) options for constructing two (2) waste repositories, is adequate and appears to address applicable National Contingency Plan (NCP) requirements.
- The USEPA decided to delay assessment of liabilities and pursuit of compensation from Responsible Parties (RP) so that federal funding for the removal (remediation) might be accelerated. This is an important hallmark decision by USEPA and should not be understated.
- Similarly, USEPA has forecasted an ambitious schedule to complete the requisite steps leading to implementing a Final Engineered Design, including preparation of the Record of Decision (ROD), completing the Final Design with assistance from Arizona Department of Environmental Quality (ADEQ), and actuating the federal Procurement

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process in a timeframe that allows the Town of Dewey-Humboldt to benefit from available federal funds under the Biden 2021 Infrastructure Bill.

- USEPA has supported the Town's consultant in the process of compiling and reviewing reports and data pertaining to the IKMHS Superfund Site and USEPA's work.

Determinations of Inadequacy

- Tetra Tech relied on CH2M-Hill's assessment of ambient air exposure which was based on one year (2008 to 2009) of air samples and wind current data. The data set is significantly compromised by sampling irregularities, there are limited inferences that can be confidently made about exposure over a year of monitoring, and the number and distribution of sample locations are inadequate to determine defensible Exposure Point Concentrations.
- Preliminary Remediation Goals (PRGs) for Arsenic (As) are based on a calculated Background Threshold Value (BTV) that is not founded on valid data, valid statistics, does not adequately address site-specific criteria, does not adequately address State ARARs, and is not adequately protective of potential residential receptors.
- PRGs for Lead (Pb) are based on calculated, site-specific remediation standards using a USEPA risk assessment model (Integrated Exposure Uptake Biokinetic Model) that is outdated. Tetra Tech used, according to reference, a 2009 version of the IEUBK Model (ver. 1.1) which was updated, with significant changes to the reference database and algorithms, to ver. 2.0 in 2021. Tetra Tech's application of the IEUBK Model does not adequately address State ARARs regarding "site-specific," effects of concurrent exposure to co-occurring Chemicals of Concern (COCs), including Arsenic. In addition, Tetra Tech's implementation of the IEUBK risk assessment model does not appear to incorporate adequate attention to receptor sensitivity and uncertainty of exposure.
- There appears to be a disconnect between Tetra Tech's assessment of Exposure Point Concentrations (EPCs) for each identified COC, in each Area of Concern (AOC), and the development of PRGs that, in concept, should correspond. These terms should be clearly identified in the text of the documents with specific reference to exposure criteria, receptor status, and statutory and screening level standards.

Requested Actions

- Speyer requests that USEPA conduct appropriate evaluations of inadequacies that are identified to determine the veracity of these determinations.
- Background Threshold Values for Arsenic require attention and should be recalculated based on recommendations that provided in the text of the Technical Memorandum. It is

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understood that this value is critically important to all soil and mine waste remedial actions to be conducted at the IKMHS Superfund Site.

- Site-specific Remediation Standards calculated using the 2009 version of USEPA's Integrated Exposure Uptake Biokinetic Model should be recalculated using the 2021 version of the model and incorporate provisions for all State ARARs as discussed in the text of this memorandum.
- Speyer offers recommendations that are intended to sustain current administrative momentum and provide a means to address necessary revisions that may be completed concurrently with the ambitious USEPA schedule and not interfere with task deadlines.

DISCUSSION OF FINDINGS

Speyer's diagnosis and assessment of critical inadequacies are provided in topical organization with specific, applicable Recommendations for consideration by USEPA. This Discussion does not include treatment of Groundwater or Stormwater/Sediment. These topics will be addressed, as determined to be necessary, in a subsequent Technical Memorandum that is scheduled to be released prior to the beginning of the mid-March Public Response Period.

A) GENERAL SAMPLE PLANNING & DATABASE

- (1) USEPA's protracted attention to conditions at the IKMHS Superfund Site has sustained a negative perception among residents, the Town Council, and community at large. There is a general belief that USEPA is ignoring certain chemicals and down-playing the significance of others. Table 1 was reduced from information provided in the RI and adopted in the FS. Six (6) metals, air sample data for which were graphically presented in the RI, exceeded corresponding Screening Levels at, at least one (1) sampling location in the Superfund Site but were not listed as COIs.
- (2) The iterative sampling efforts that span a period of 2006 through 2012 are based on significantly different (sometimes unavailable) Sampling & Analysis Plans (SAPs) and Quality Assurance Project Programs (QAPPs). As a result, the series of reports has (ii) obscured USEPA's determination of adequate Exposure Point Concentrations (EPCs) for the COC, (ii) introduced inconsistent target cleanup concentrations for critical COCs (i.e., Arsenic and Lead) in apparently identical target areas, and (iii) created a confusion among and between successive sampling and remedial efforts by different USEPA contractors (especially in residential areas of the Site). These different cleanup and target levels are summarized in Table 2.
- (3) SAPs are not available for all the sampling efforts reported in the RI (Appendices D and J) and FS (Appendix C). Section 37.1.3 of the SAP that is provided in Appendix G of the

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FS indicates that the SAP addresses “representativeness” by “careful selection of sample locations.” This selection process is the definition of “bias” and is the antithesis of a sampling plan that is designed to address “representativeness.”

ENV MEDIUM	AIR	SOIL	SURFACE WATER	SEDIMENT	GROUNDWATER
ANALYTE					
ARSENIC	X	X	X	X	X
COPPER			X	X	
IRON			X		
LEAD	(X)	X	X	X	X
CADMIUM	(X)				
CHROMIUM	(X)				
ALUMINUM	(X)				
BERYLLIUM	(X)				
NICKEL	(X)				
MERCURY				X	
ZINC			X	X	
NTRATE					X
SULFATE					X
TDS					X
*Additional COIs may be present and unaccounted for.					
X	IDENTIFIED COI [CH2M-HILL (2016) RI]				
(X)	COI IDENTIFIED BASED ON DATA COMPILED IN APPENDIX N OF THE 2016 RI				

- (4) There is an extensive EPA RAGS literature that emphasizes the importance of applying a dataset in Superfund investigations that is derived from either overtly random selection or systematic sampling of an area of interest.³ The Tetra Tech SAP presents an inadequate definition that should not be applied to soils, ambient air sampling, or determination of

³ Random sampling (including systematic sampling) is a statistics and sampling axiom. Without a demonstrated effort to avoid bias it is reasonably assumed that the sample selection was purposeful and is, therefore, biased. Simply stated, samples that are collected at purposefully selected locations cannot be used in applied statistics. This is true for all data applications regardless of the science, with imposed linear functions (e.g., river sediments) being the only possible qualified exception. In the case of channel sediments, systematic sampling, conducted at prescribed intervals along the tract area of interest must still be systematic. This requirement is specifically addressed in numerous documents, including EEI (1997), Gilbert (1987), USEPA (1989, 1992, 2002a, 2002b, 2002d), to name a very few.

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waste rock characteristics (e.g., Main Tailings Pile or several areas within the Former Humboldt Smelter Property). This is a fundamental Data Quality Objective (DQO) that should be addressed in all subsequent sampling efforts, including confirmation sampling following completion of remediation.

- (5) Our review of sample location maps indicate that sampling plans varied, sometimes greatly, among the several iterations of sampling that were conducted in the residential areas of the Superfund Site. Some parcels were grided and samples were collected at all nodes. In other parcels, sometimes in the same report, sample locations were purposefully selected and clustered in areas of presumed contamination. These datasets cannot be combined with any reasonable expectations of achieving a coherent analytical base. Deterministic sampling (i.e., selecting sample locations based on pre-design or professional insight) precludes any meaningful data reduction and application of statistical calculations to characterize appropriate EPCs or calculate adequate PRGs.
- (6) “Representativeness,” as a sampling objective, is quashed because of the mixed sampling strategies and failure to prescribe sampling procedures in an approved and authorized SAP.

Recommendations

- (7) Speyer has stated to the Town those certain datasets, including soils, are, in general, sufficient for the determinations necessary to achieve an adequate clean-up. This presumes adequate data-gap analysis that is focused on assessing adequacy of data under prescribed Data Quality Objectives (DQOs).⁴

B) ASSESSMENT OF AMBIENT AIR CONDITIONS

- (1) The complete body of data relied on for assessing exposure related to fugitive dust consists of approximately 49 sampling events at 10 different sampling locations (including 2 Background Sample Locations) and on-going wind current data from one (1) “weather station” situated at the Iron King Mine property over a one (1) year period (2008 to 2009).

⁴ The gross number of soil samples collected (9,478, as reported in the FS), primarily in residential areas of the Superfund Site, provides a buffer to the effects of sampling bias on statistical calculations. A discrete data-gap analysis as part of assessing DQOs is recommended. The number and manner of sampling ambient air, in contrast, is not adequate.

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- (2) Except for one (1) sampling location (at the Iron King Mine) there is no consistency among the data sources because the stations were sporadically changed over the course of the one (1) year period.⁵
- (3) The data are fundamentally flawed despite the presentation of minimum and maximum values for metals in fugitive dust at each of the four (4) areas. The four (4) areas are incompletely diagnosed, not consistently represented in the dataset, and do not provide adequate, affirmative characterization of the areas with respect to ambient air conditions. The Iron King Mine station, where a complete set of data for the entire year was compiled, is a possible exception and provides a discrete, though limited estimate of seasonal variations.
- (4) These ambient air data and this study do not adequately assess the long-term exposure risk because it is based on an incomplete evaluation of wind-dispersed fugitive dust from known primary and secondary source areas within the Superfund Site.
- (5) Data tabulated in the RI show clear indication that fugitive dust is activated at the Iron King Mine and the Humboldt Smelter locations. What it does not show is the dispersal or destination of this dust. Additional down-gradient sample locations, situated between the known source with an anticipated elevated concentration of metals, including As and Pb, and the Town and residential areas of the Site would have assisted in refining the Conceptual Site Model (CSM).
- (6) Standard air sampling stations should have been set at additional, strategic locations across the Site, with a specific emphasis on Town and Community locations. Each of these stations should have been sampled on a consistent, periodic basis over the course of the entire eight (8) years that USEPA has been engaged with this Site leading up to the 2016 release of the RI. Likewise wind current data should have been compiled from historic sources, such as are available from sources that maintain data at a station located in Prescott Valley. These data, in concert may have provided sufficient foundation to make statements regarding the EPC of fugitive metals in residential areas of the Superfund Site.
- (7) Notwithstanding the incomplete monitoring of ambient air conditions, the long-term effects of wind and air currents across the Site may be evaluated by collecting building

⁵ There were four (4) sample areas that are represented by varying numbers of sample results collected at three (3) sample locations in the Town of Humboldt, three (3) locations on the Iron King Mine property, two (2) sample locations on the Humboldt Smelter property, and two (2) Background Sample locations situated upwind from the Humboldt Smelter.

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rafter dust samples which, providing sufficient volume, can be analyzed according to EPA Method 6010/6020 for metals concentrations (EPA Method 7471B for Mercury). Alternatively, it is widely acceptable to analyze residual dust using a portable, properly calibrated XRF analyzer which requires less material volume, but may suffer a DQO failure because a discrete Quality Assurance (QA) assessment is lacking.⁶

Recommendations

- (8) Speyer recommends that an adequate random sampling (defined here as rendering an appropriate set of data that is representative of the “true” population) be conducted to quantitatively assess the distribution of fugitive dust residues in the rafters of buildings that are located in proximity to known source of contamination. This sampling effort should be preceded by a suitable Sampling & Analysis Plan (SAP) which should be made available for the Town consultant to review.
- (9) The results of implementing the “Rafter Dust” SAP should be used in concert with the 2008 to 2009 data to evaluate critical differences and, as appropriate and applicable, with soils data for areas where building rafter data are available. These data can also be affirmatively applied to evaluate exposure pathways that are not otherwise addressed by CH2M-Hill or Tetra Tech.

C) ASSESSMENT OF SOIL CONDITIONS

- (1) It is understood that the overall cost of remediation is directly related to the assignment of PRGs for soil COCs.⁷ It is also understood that the two (2) COCs that drive the remediation and final closure of the Site (with a future of monitoring) are Arsenic (As) and Lead (Pb).
- (2) The distribution of COCs in soils across the Site is related to proximity to the two (2) source areas and are, in part, related to operations on one or the other.

⁶ Dust samples may be collected and analyzed by any one of several means. It is possible that the volume of rafter dust that is available to collect and analyze is not sufficient to collect a standard 2 ounce jar or allow full duplicate sampling for fixed-base lab analysis by EPA Methods 6010 or 6020. Suitable rafter dust sample results may be obtained by collecting “wipe samples” in accordance with ASTM Standard E1728-16, Standard Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination. Speyer recommends “rafter dust” to calibrate metals data for undisturbed dust according to building age.

⁷ Speyer understands that the RI and FS have variably referred to target chemicals in differing ways, including Chemicals of Interest (COIs) and Chemicals of Potential Concern (COPC). This parsing of words is confusing and misleading. Throughout this document the target contaminants are referred to as Chemicals of Concern (COC) which is consistent with the vocabulary of ADEQ and USEPA.

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- a. Volatile Organic Compounds (VOCs), Semi-Volatile Compounds [SVOCs; including Polycyclic Aromatic Hydrocarbons (PAHs)], residual Pesticides (e.g., Dioxin), Polychlorinated Biphenyls (PCBs), and Cyanide are present in specific, isolated operational areas of the Mine or Smelter properties.
 - b. Removal of Arsenic (As) and Lead (Pb) will, likewise, mitigate exposure to these isolated pockets of other contaminants.
 - c. There is a diversity of metals that co-occur with As and Pb that should be tracked with these two more critical analytes. It is expected that removal of As and Pb will also address locations where these other metals exceed Screening Levels. It appears that this is the general perspective of the FS.
- (3) Arsenic (As) is recognized as the most widespread, prolific, and risk-sensitive of the COCs at this Superfund Site. This challenge is compounded by a very low EPA Screening Level, a presence in each of the primary environmental media, and a known background presence in natural settings.
- a. Arsenic is a carcinogen with a SL that is less than 1 mg/Kg in soil (0.68 mg/Kg).
 - b. Arizona promulgated a 10 mg/Kg threshold for Residential (rSRL) and Non-Residential (nrSRL) Soil Remediation Levels (SRLs). This allowance is based on general State-wide background conditions and, justifiably, ignores the federal health-based guidelines.
 - c. Mining communities are recognized as locations where elevated metals concentrations are expected and warrant appropriate calibration with respect to remedial expectations.
 - d. As discussed above (Section A), USEPA contractors, over the period of 2006 to 2013, sampled soils in residential areas of the Superfund Site and conducted removal actions with very different target values for Arsenic and Lead (see Table 2). Target concentrations calculated by CH2M-Hill (2016) and Tetra Tech (2022), likewise, do not match previous remedial actions. These inconsistencies present additional challenges to completing a comprehensive remediation that includes all AOCs as well as residential and Town properties.

D) BACKGROUND CONCENTRATION OF ARSENIC

- (1) CH2M-Hill (2016; Appendix E) and Tetra Tech (2022; Appendix C-6) present determinations of a Background Threshold Value (BTV) for Arsenic based on data from samples collected outside the boundaries of the Superfund Site. Tetra Tech uses the CH2M-Hill dataset and applies a different statistical protocol, including data clusters, Voronoi tessellation, and a staged calculation of the 95% Upper Confidence Limit (UCL) that rejects ProUCL based on an algorithm inability to apply clustered data. CH2M -Hill calculated a BTV for Arsenic of 112 mg/Kg. Tetra Tech calculated a BTV that is 92 mg/Kg based on the same dataset consisting of 269 data.

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- (2) Speyer’s treatment of a BTV for Arsenic is confined to Tetra Tech’s approach and results.
- (3) Arizona Administrative Code (AAC) R18-7-203 states that remediation of contamination must address one of three (3) methods for determining acceptable cleanup target values.
- a. AAC R18-7-204 includes provisions for determining a target concentration standard for remediation based on background concentrations of the chemical. This is a State ARAR with specific criteria that must be satisfied for acceptable implementation.
 - i. Site-specific historical information concerning land use.
 - ii. Site-specific sampling of soils not affected by a release, but with characteristics similar to those affected by the release.
 - iii. Statistical analysis of background concentrations using the 95% upper confidence limit.
 - b. Tetra Tech’s determination of a BTV for Arsenic appears to address these requirements but does not adequately incorporate site-specific criteria pursuant to R18-7-204(B)2.
 - c. Therefore, the BTV calculation is inadequate because the single 95% UCL value does not uniformly apply to all areas of the Superfund Site, including sensitive parcels located in the Town proper and surrounding neighborhoods.

**TABLE 2 - COMPARISON OF CLEANUP CRITERIA
ARSENIC & LEAD IN RESIDENTIAL SOILS AT THE IKMHS SUPERFUND SITE**

COI	REMEDIATION TARGET*		EPA SUPERFUND / CERCLA / IKMHS CLEANUP CRITERIA					
	SL	rSRL	EA	EA	E & E	LM SERA	CH2M-HILL	Tetra Tech***
	EPA (2022)	ADEQ (2009)	2010	2011	2012	2013	2016	2022
ARSENIC	0.68	10	48	38	38	150	112	92
LEAD	400	400	44	23	23	300	400 (140)**	Varies****

NOTE: All threshold concentrations are reported in milligrams per Kilogram (mg/Kg) [ppm].

* Federal Screening level (SL) | Arizona Soil Remediation Level for Residential Properties (rSRL).

** Provisional Screening Level for Lead (Pb) [According to CH2M, not promulgated (under review) by EPA].

*** Preliminary Remediation Goals vary according to Remedial Group identified by Feasibility Study; Residential = 92 mg/Kg.

**** Tetra Tech (FS) applied an Integrated Exposure Uptake Biokinetic Model (EPA, 2009) to calculate Lead (Pb) PRGs.

BACKGROUND THRESHOLD VALUE (BTV) APPLIED IN RESIDENTIAL SETTINGS

EA – EA Engineering, Science & Technology, Inc. (2008 to 2010) [168 Residential Parcels]

E & E – Ecology & Environment, Inc. [30 Residential Parcel; in part based on EA findings]

LM SERAS – Lockheed Martin Scientific, Engineering, Response & Analytical Services [10 Residential Parcels; Action Levels set by USEPA Region 9]

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- (4) A dataset comprising 269 data for the “local” background concentration of Arsenic was compiled over the course of USEPA investigations at the Superfund Site. Samples were collected during three (3) events and consisted of one (1) collected by ADEQ in 2002-2004, nine (9) were collected by EA Engineering, Science & Technology, Inc. (EA) in 2010, and 259 data collected by CH2M in 2012-2013.⁸
- a. These soil samples were collected under differing SAP criteria (whether these were recorded or not) and are potentially incompatible with the objective of the analysis.⁹
 - b. Soil sample locations were recorded and categorized according to the distribution of native soils and location with respect to the Agua Fria River (East or West). These are reasonable and worthwhile characteristics and serve the intent of R18-7-204(B)2. Specific comparisons of data subsets are presented in Attachment 1 to this memorandum.
 - c. Tetra Tech disregarded these categories and combined the data to calculate a single BTV for all applications across the entire Superfund Site (see Attachment 1.1).
- (5) In addition, Tetra Tech introduced an unacceptable bias into the calculation of an applicable BTV by transforming the raw concentration data into weighted values that are based on a Voronoi Tessellation protocol. This bias was introduced by weighting of the significance of concentration values in the calculation according to tessellated polygon area. The greater that area translates into the greater the significance of the datum representing that area.¹⁰

⁸ CH2M-Hill collected and analyzed 259 background soil samples for Arsenic using fixed-base laboratory and in-field XRF spectrometer. According to the FS, approximately 40 percent of the data were reported by XRF analysis (105 results) and the remainder (154) by certified results from the fixed-base lab. CH2M does provide an assessment of compatibility of data from these two methods that is adequate. There is preference for a stated percentage of total samples (e.g., 10%) for which one (1) sample is split and analyzed at the lab and by XRF spectrometer. This reduces the statistical arguments and relies on a valid, 10 percent selection (which should be randomly selected prior to soil sampling) to confirm data compatibility by standard Student’s t-test and/or F-test of variance.

⁹ It would have been sufficient and, perhaps, more statistically valid to include only those data for the 259 soil samples that were collected by CH2M-Hill.

¹⁰ It is understood that Tetra Tech might have attempted to provide a means to standardize the raw data so that an argument of representativeness might be made. However, the ad hoc weighting of data values imposes an unacceptable bias that arbitrarily exaggerates or minimizes datum significance based on sample density. Consequently, sparsely distributed data have greater significance than closely spaced sample data. The decision to apply raw data is defensible based on the broad range of sample locations that are organized according to soil type and location with respect to the Agua Fria River.

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- (6) This bias was further exacerbated by biases that were introduced into the calculation by including background data that do not apply to the IKMHS Superfund Site and incorporating data for which an unknown, possible bias is indicated.¹¹
- (7) Tetra Tech cited a standard USEPA guidance document to calculate outliers (USEPA, 2002) in the Background Arsenic dataset but failed to apply the results of the calculation in refining the dataset for calculating a 95% UCL. Although the USEPA guidance calculation identified eight (8) outliers, only four (4) “extreme outliers” were removed by Tetra Tech from the dataset prior to completing their calculations.¹²
- (8) Tetra Tech stated that a 95% UCL was calculated. The result of this calculation, 92 mg/Kg, was applied as the single BTV across all areas of the Superfund Site as a conservative target concentration applicable to residential exposure situations. This value is the basis for Preliminary Remediation Goals (PRGs) presented in the FS for all AOCs, including residential, and commercial properties within the boundaries of the Superfund Site (see Table 3).
 - a. This determination does not address the requirement to demonstrate site-specific applicability.¹³
 - b. For reasons not explored by Tetra Tech, all eight (8) outliers, including the four (4) removed as “extreme outliers” and the four (4) that were retained despite the guidance calculation, occur at sample locations that are east of the Agua Fria River (see Attachments 1.2 & 1.4).¹⁴
 - c. The n=265 dataset shows a strong positive skewness (see Attachment 1.1) that is similar to the data distribution exhibited by most subsets of the complete dataset

¹¹ See Section D, Item 9 of this Technical Memorandum.

¹² Tetra Tech removed four (4) obvious outliers (“extreme”) from the BTV dataset and ignored four (4) additional data that were identified by the EPA guidance calculation (USEPA, 2002). These additional four (4) values have significant impact on the data population statistics and can be identified on data frequency graphs, as presented, (see Attachment 1.1 to this memorandum). USEPA should provide adequate justification for including these four (4) outliers or remove altogether them from the operational dataset.

¹³ The dataset applied by Tetra Tech combines Arsenic data for all soil types represented across the Superfund Site. This slurs site-specific nuances that are critical to assigning an adequate and applicable BTV.

¹⁴ In fact, data that are separated according to soil type and location with respect to the Agua Fria River, exhibit obviously different summary statistics and distribution attributes. This may relate to different watershed attributes, unrecognized impact due to residual impact from the Superfund Site due to historic storm patterns, or localized impacts due to prospecting and small mine operations.

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(see Attachments 1.2 and 1.3). Tetra Tech’s BTV assignment (92 mg/Kg) exceeds two (2) standard deviation units (SDUs) above the mean and is not acceptable.¹⁵

- d. The calculation of a 95% UCL, as prescribed in Risk Assessment Guidance for Superfund (RAGS) documents since 1989, determines a value which represents a qualified mean value for the data population with a calculated 95 percent probability of not being exceeded by the calculated mean value (or 95% UCL proxy) of subsequent sample populations from the same original “true” population.¹⁶
 - e. The USEPA ProUCL program includes provisions for calculating background BTVs. The software package User’s Guide (current version is ProUCL v. 5.2.00) describes the algorithms used to calculate “BTVs”. These algorithms calculate an upper confidence interval (UCI), which is a measure of the upper confidence interval (UCI) for the data population (either 95% or 99%). This is a different statistic than the “upper confidence limit,” and refers, according to USEPA RAGS definition, to the 95% UCL. AAC R18-7-204 requires, specifically, calculation of the “upper confidence limit.”¹⁷
 - f. Whereas the 95% Upper Confidence Interval refers to the ordered position of a single datum with respect to the full body of data represented by a mean value, the 95% Upper Confidence Limit refers to the prediction of a data mean of a sample population of data based on a confidence bracket on the mean value of a representative population sample. The 95% UCL approaches the true mean value of the data population as the sample size (n) is increased.
- (9) The distribution of soil types should direct the calculation of site-specific BTVs. It is entirely reasonable if not expected that the BTV will vary across the Site according to soil type and applicable site-specific criteria.
- a. The relative percentage of the Superfund Site that is represented by each of the local soil types is presented by Tetra Tech (2022) as Table 1 of Appendix C-6.¹⁸

¹⁵ According to a review of the histogram of the n=265 dataset (with a bin width of 16 mg/Kg), the value “92 mg/Kg” exceeds the 95% Confidence Interval wherein 95 percent of all data in the population occur beneath the stated value. “Confidence Interval” does not mean the same things as “Confidence Limit.”

¹⁶ In other words, the 95% UCL is a statistic that applies to the mean value of the sample population. There is a 95% confidence that the calculated value is representative of the mean value and will not be exceeded if additional data are collected from the same area, in the same way, and statistically reduced using the same methodology.

¹⁷ The regulatory distinction between UCL and UCI may require additional discussion to resolve. However, it is clear from the Summary Statistics and corresponding Histograms presented in Attachment 1 for Balon Soil, that the assignment of a 92 mg/Kg BTV to certain areas of the Superfund Site is not defensible as either a UCL or a UCI under the provisions of AAC R18-7-204 regarding the “site-specific” criterion.

¹⁸ CH2M (2016) correctly identified the Balon Soil as the predominant soil type in the are of the Superfund Site.

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- b. Tetra Tech’s Table 1 (Appendix C-6) is incorrect, is contradicted by Figures 3 & 4 (FS Appendix C-6), and, therefore, does not adequately represent the background concentration of Arsenic in the various soils that are present in the vicinity of the Superfund Site (see Table 3).
 - i. Balon Soil characterizes the majority of the Superfund Site that is occupied by residential and Town properties (Attachment 1.2).
 - ii. Moano Soil is located across the western-southwestern quarter of the Superfund Site, with a border margin with the Galena Gulch, south of the Iron King Mine property (cf. AOC 12). Attachment 1.3 provides a summary of the concentration of Arsenic in background soil samples, which serves as an adequate basis for a BTV that is specific to areas where Moano Soil is located.
 - iii. Lonti Soil does not occur within the boundaries of the Superfund Site [Figures 3 & 4; Appendix C-6 (Tetra Tech, 2022)] and has no corollary that would validate including Arsenic concentration data from this subset population (n=69) of the complete 269 dataset, in the Superfund Site data population.
 - iv. Furthermore, a disproportionate number of outliers (“extreme” and additional based on USEPA 2002c guidance) occur in the Lonti Soil, which was sampled only at locations east of the Agua Fria River (see Attachment 1.4). This simple comparison (i.e., 50% of all outliers in the complete sample population of 265 data occur in a 25 percent subset consisting of 69 data) indicates that Lonti Soil data, overall, exerted an adverse influence on the BTV calculation.¹⁹
 - v. These 69 data should be removed from the BTV dataset as not applicable. Details provided in an Attachment 1.4 to this Technical Memorandum demonstrate the effect of Lonti Soil data on the overall data pattern.
- c. The distribution of “extreme outliers” (as defined by Tetra Tech) and additional (ADD) outliers that are identified by applying the USEPA Guidance calculation indicates important, additional biases that are embedded in the BTV dataset.
 - i. All (100 percent) of the outliers (“extreme” and additional) occur in soils that were collected from sample locations east of the Agua Fria River. This data pattern indicates that there is likely an inherent bias involving soils collected east of the River that does not, in general, affect soils that are present west of the River, regardless of the soil type.

¹⁹ It is reasonable to state, based on Table 3 information and data statistics presented in the Attachment to this memorandum, that data from Lonti Soil have artificially increased the sitewide Arsenic BTV that was calculated by Tetra Tech.

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- ii. Residential properties that are located east of the River and are located within the boundaries of the Superfund Site may require additional attention to resolve the issues raised in this analysis.

TABLE 3 - SUMMARY OF SOIL TYPES INCLUDED IN THE CALCULATION OF A BTV FOR ARSENIC

FS (%) TABLE 1	SOIL TYPES	AGUA FRIA RIVER		TOTAL	COMMENTS
		WEST	EAST		
28.4	BALON*	52	24	76	(1) Overwhelming proportion of Residential properties are located in Balon Soil areas. (2) 1 EXTREME OUTLIER 2 ADD Outliers All EAST Subset
17.8	LONTI**	0	69	69	2 EXTREME OUTLIERS + 2 ADD OUTLIERS 50% of 8 total outliers recognized by USEPA Guidance Caclulation All EAST
15.4	LYNX				ALLUVIUM
	Ly	5	13	18	
	Sa	0	5	5	
32.9	MOANO				
	MkF	17	59	76	1 EXTREME OUTLIER EAST Sample Subset
	MgD	20	0	20	
	MoD	1	0	1	
94.5		95	170	265	TOTAL n=269 / 4 extreme outliers removed n=265

*Contrary to FS Table 1 Summary, Balon Soil occupies more than 28% of the area within the Superfund Site (FS Fig. 4).

**Contrary to FS Table 1 Summary, Lonti Soil does not occur within the Superfund Site.

- d. Attachment 1 to this memorandum compiles background soil data as discussed and presents Summary Statistics and Histogram plots with corresponding Summary Statistics for each Soil Type, and for Balon Soil, on each side of the Agua Fria River channel (see Attachment 1.2).²⁰
- (10) These documented biases, introduced by an inadequate compilation of soils within the Superfund Site and inclusion of soil samples from areas east of the Agua Fria River that show evidence of an unknown bias, are further exacerbated by Tetra Tech’s Voronoi Tessellation transformation of the data to generate a weighted dataset.

²⁰ Pending an acceptable justification for not removing four (4) outliers as determined by the EPA Guidance Calculation, these data have been retained in this assessment. If there is not an acceptable justification, these data should be removed and the revised dataset consisting of 261 data should be used going forward.

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- (11) A weighted dataset is not necessary to address representativeness and area-specific BTVs may be confidently calculated on the basis of available data for each of the soil types documented within the boundaries of the Superfund Site.

Recommendations

- (12) A robust dataset for metals in soils at the Superfund Site has been compiled since before 2012 and is available to support the development of a comprehensive co-occurrence matrix which provides adequate assessment of metals concentrations with respect to the distribution and concentration of As and Pb in most areas of the Superfund Site. This matrix can be used to confirm that accessory metals (i.e., not As or Pb) are adequately removed at the time that As and Pb concentrations are remediated.
- (13) An Arsenic BTV should be calculated that incorporates only those data that pertain to a defined Area of Interest (AOI).
- Remove all consideration of Lonti Soil data as not applicable.
 - Remove all data from areas East of the Agua Fria River as not applicable due to suspected bias.
 - In our opinion it is not necessary to supplement the existing background dataset with additional sample data. The existing datasets, based on individual soil types, is adequate to accomplish the necessary calculations to determine applicable BTVs for each identified and prospective AOC.
 - Apply the data in accordance with the ProUCL (ver. 5.2) regarding calculation of a 95% UCL as required by State ARAR.
 - Complete these calculations for each identified AOI according to AOCs that are recognized by Tetra Tech's FS with provisions for increasing the total number of AOCs, as warranted based on revised EPC values.
- (14) Revise Arsenic (As) PRGs in accordance with AAC statute and as per comments presented herein. Incorporate these values into all calculations of PRGs for all AOCs identified by Tetra Tech.
- (15) Expand the number of AOCs to include areas that are subject to remediation based on revised PRGs for Arsenic.

E) SITE-SPECIFIC REMEDIATION STANDARD FOR LEAD

- (1) Lead (Pb), like Arsenic (As) is often associated with historic mining operations and towns. Unlike Arsenic, Lead (Pb) is not a recognized carcinogen and its remediation level

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is based on Screening Levels that correlate to a Hazard Index (i.e., HI=1).²¹ This is represented in the federal Alert Level for Lead (Pb) in soil, which is 400 mg/Kg (USEPA, November 2022), and as adopted by Arizona as the Soil Remediation Level for residential properties (rSRL).²²

- (2) Tetra Tech utilized an USEPA risk assessment model to calculate applicable Lead (Pb) cleanup levels for the Superfund Site [i.e., Integrated Exposure Uptake Biokinetic Model (IEUBK ver. 1.1)].
 - a. Tetra Tech did not provide justification for this decision or state why the 400 mg/Kg and 800 mg/Kg thresholds (i.e., Arizona SRL for Residential and Non-Residential properties, respectively) is not applicable.
 - b. We believe that this is a reasonable expectation given that this threshold was used by CH2M-Hill (2016) and serves as the State ARAR.
 - c. Furthermore, the distribution of Lead (Pb) across the Site and in residential properties, based on available data and as prescribed in PRGs calculated for the 30 AOCs, spans this concentration value with a range from 197 mg/Kg to 460 mg/Kg.

- (3) AAC R18-7-206, which directs the use of a risk-assessment determination of remediation standards and serves as an ARAR, identifies specific requirements that must be addressed by the risk assessment.
 - a. Certain requirements are imposed on the determination of a “site-specific remediation standard,” including:
 - i. The methodology may be deterministic but must include provisions for maximum exposure for all possible future land use. [AAC R18-7-206(B)1]
 - ii. The methodology may be probabilistic but must accommodate protective measures that address the 95th percentile upper bound estimate of the distribution. [AAC R18-7-206(B)2]
 - iii. The methodology may be another approach, but must be scientifically acceptable (i.e., published in a peer-reviewed journal) and be a considered “sound” methodology by scientific community consensus. [AAC R18-7-206(B)3]
 - b. In addition, AAC R18-7-206(D) stipulates those resulting criteria for acceptance includes:

²¹ It is understood that EPA’s Soil Screening Levels (SSLs) for Superfund Sites are intended to guide human health-based risk assessments. However, Arizona has adopted a Hazard Index of 1 with regard to non-carcinogenic contaminants in assigning site-specific remediation standards by risk assessment [AAC R18-7-206(D)].

²² AAC R18-7 Appendix A (2009).

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- i. The remediation standard cannot exceed a Hazard Index HI=1 for noncarcinogenic chemicals or 10^{-6} to 10^{-4} cumulative excess lifetime cancer risk.
 - ii. Include provisions for multiple contaminant exposure risks.
 - iii. Include provisions for multiple pathways of exposure.
 - iv. Include provisions that accommodate uncertainties of exposure.
 - v. Include provisions that address the sensitivity of the exposed community.
- (4) Tetra Tech failed to adequately address the complete scope of requirements outlined in AAC R18-7-206. Therefore, the determination of a PRG for Lead (Pb) is not adequate.
- a. The model implemented by Tetra Tech is an aged version of the EPA Model IEUBK ver. 2.0, which was released in May 2021.²³ The statute requires, by inference, that the most recent version of a given model must be implemented or rejected with justification.
 - b. The IEUBK Model incorporates multiple exposure pathways in the process of calculating a target concentration, which satisfies AAC R18-7-206(D).²⁴
 - c. The Tetra Tech application of the IEUBK Model does not appear to incorporate data for concurrent exposure to other contaminants (e.g., Arsenic).
 - d. The target values calculated by the IEUBK Model for risk related to occupational and recreational exposure does not appear to address the ARAR which rejects an exceedance of a HI of 1.²⁵
 - e. Certain of the residential properties appear to have a remediation standard that is sensitive to the ARAR and, in fact, includes provisions that render a human health-based remediation standard that is less than the federal Alert Level and State rSRL. These values should be refined by applying the Lead (Pb) data to the most current version of the Model and incorporate provisions for concurrent receptor exposure to other contaminants (e.g., Arsenic).

²³ The revised and updated model (IEUBK ver. 2.0) incorporates a more robust database of exposure responses, an updated algorithm, and important changes to input variables affecting the calculation of effects related to multiple exposure pathways.

²⁴ The Model includes provisions for accounting exposure to fugitive dust as an additional potential receptor pathway. Tetra Tech relied on ambient air data that were compiled during the 2008 to 2009 period. These data, as discussed in earlier sections of this document, do not adequately characterize exposure to fugitive dust. Speyer recommends that a systematic sampling of rafter dust be completed to assess exposure to fugitive dust over the period of community development. Dust contains residual concentrations of metals that express the integrated effects of wind direction and current, distance from the source, and duration of exposure (calibrated on the basis of building age).

²⁵ The November 2022 Alert Levels published by USEPA identifies that Lead (Pb) has a HI=1 at 400 mg/Kg for residential receptors.

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Recommendations

- (5) Revise Lead (Pb) PRGs in accordance with AAC statute and as per comments presented. Incorporate these values into all calculations of PRGs for Lead (Pb) in all AOCs identified by Tetra Tech.
- (6) Alternatively, apply Arizona State SRLs [rSRL (400 mg/Kg) or nrSRL (900 mg/Kg, as appropriate)] with specific attention to especially sensitive potential receptors in residential settings (i.e., children).
- (7) Expand the number of AOCs, as warranted, to include areas that are subject to Lead (Pb) remediation based on revised PRGs.

F) DETERMINATION OF AREAS OF CONCERN

- (1) Areas of Concern (AOCs) should be evaluated with respect to revised target concentrations (i.e., remedial standards) for COCs, especially Arsenic and Lead. AOCs should be clearly defined with reference to Exposure Point Concentrations (EPCs) for each COC, as applicable.²⁶
- (2) Speyer expects that the framework described and mapped by Tetra Tech, consisting of 31 assigned AOCs and nine (9) Remedial Groups, will remain largely intact.
- (3) Failure to provide adequate foundation for elimination of Area of Concern (AOC) 12 from development of PRGs. Review criteria used to remove AOC 12 from remediation in light of information reported herein and revised target concentrations for Arsenic and Lead.
- (4) It seems likely that additional AOCs may be identified, including residential and Town areas, which have been targeted by USEPA for additional sampling and, possible, remediation (see Section J, below).
- (5) AOCs that include residential properties should reviewed to assess if site-specific criteria have been adequately addressed (e.g., BTV calculated on the basis of Balon Soil data). It appears that residential properties located east of Agua Fria River, for example, may have a separate, site-specific BTV for Arsenic than residential areas located west of the River.

²⁶ It is understood that EPCs relate specifically to manner of exposure and class of receptor, including Residential, Occupational, and Recreational, and that each of these receptor categories impose differing risk elements that are factored into the equation.

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The greater the inherent risk due to exposure, the more finely tuned the determination of “site-specific” should be.²⁷

- (6) Failure to specifically mention the status of residential and town properties is a Public Relations inadequacy. An assignment of AOCs should acknowledge the sensitivities of the Community and include provisions for those areas of the Superfund Site most obvious to the pedestrian reader. A decision that residential and town areas are not subject to remediation and, accordingly, PRGs have not been assigned, should be plainly explained, and justified.
- (7) There appears to be an incomplete or incorrect correlation between current Town Zoning, intended Land Use, and AOC assignments.²⁸

Recommendations

- (8) The number of AOCs should be expanded and appropriately defined to communicate changes in the remedial plans concerning residential, commercial, and Town properties.
- (9) We recommend that the following tables and/or maps that incorporate available and developing information may provide useful summaries for purposes of communicating with the public, providing an overview of remedial plans, and summarize remedial target values on an area-by-area basis.
 - a. Identification of all COCs according to prescribed Superfund Site Areas of Concern (AOCs), including Tetra Tech’s 31 AOCs, additional Residential and Commercial properties, and other areas of the Superfund Site that are revealed based on revised EPCs and PRGs.
 - b. COCs should be clearly identified in table format according to acceptable criteria, such as exceedance of applicable PRGs as per confirmed State promulgated standards, BTV (i.e., As), or remedial standards calculated based on a bona fide risk assessment (i.e., Pb).
 - c. It is responsible and a reasonable expectation that USEPA provide adequate justification for the decision to not adopt State promulgated standards as suitable cleanup target values for specific COCs.

²⁷ This is consistent with the requirements of AAC R18-7-206.

²⁸ Understanding that town zoning can be a moving target, USEPA should contact the Town for a current zoning map that can be used as a base with a timestamp. Provisions for future, anticipated land use should be included and appropriately identified.

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G) ASSIGNMENT OF PRELIMINARY REMEDIATION GOALS (PRGs)

- (1) PRGs for the IKMHS Superfund Site have been summarized according to nine (9) Remedial Groups (Table 4) that comprise 30 of the 31 AOCs identified by CH2M-Hill (2016) and applied by Tetra Tech (2022).
- (2) The PRGs represented by Tetra Tech for Arsenic (As) and Lead (Pb) are inadequate due to reliance on flawed or outdated risk assessment determinations (Pb), inadequate or incomplete attention to State ARARs, and flawed statistics in assigning applicable BTVs (As).

TABLE 4 - SUMMARY OF PRELIMINARY REMEDIATION GOALS ACCORDING TO AREA OF CONCERN & ASSIGNED RISK CATEGORY

COC	ARIZONA		FS PRELIMINARY REMEDIATION GOALS (PRGs) FOR 9 REMEDIAL GROUPS (DECEMBER 2022)								
	rSRL	BACKGROUND	MTP	INDUSTRY / MTP	OPEN LAND / MTP	U CHAPARRAL	M/L CHAPARRAL	S SMELTER	SLAG	AGUA FRIA RIVER	E / AGUA FRIA R.
ARSENIC	10	92	884	92 - 884	92 - 1414	92	274	274	274	92	92
LEAD	400	35	460	197 - 460	197 - 559	197	460 - 559	460	559	128	460

NOTE: All Preliminary Remediation Goal (PRG) concentrations are reported in milligrams per Kilogram (mg/Kg) [ppm].

RES / OCC	<p>ARSENIC (As) & LEAD (Pb) Preliminary Remediation Goals (PRGs) are founded on modelled concentrations. The RI/FS models are incomplete, incorrect, or based on aged versions that are not current with available toxicological information.</p> <p>Arsenic & Lead are the most significant COCs at the Superfund and appropriate remediation requires appropriate application of calculated Background Threshold Value(s). Human Health Risk Assessments must be based on current toxicological information.</p>
OCC / REC	
OCC / ECO	
OCC / REC / ECO	
RES / OCC / REC / ECO	
REC / ECO	

- (3) PRGs for each AOC should include provisions for Town residents who live, work, and recreate within the Superfund Site on an annualized basis.
- (4) PRGs should include explicit provisions for possible receptor exposure to multiple COCs, due to multiple pathways, involving different EPCs.

Recommendations

- (5) Speyer requests that Figures, including maps, that depend on assigned PRGs be revised pursuant to significant changes so that the critical information regarding EPCs and PRGs is easily accessed and communicated.
- (6) Speyer assumes that Tetra Tech will develop a confirmation sampling plan for determining adequacy of remediation at all targeted AOCs at the Superfund Site. This sampling plan should be comprehensive and site-specific, as warranted by predetermined EPCs, and available for review by the Town's consultant prior to implementation.

H) ADDITIONAL WORK NOT DETAILED IN THE RI OR FS REPORTS

- (1) USEPA has stated that additional sampling and, as indicated, remediation is intended to be completed in residential areas of the Superfund Site.

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- a. This a positive decision that has been communicated to the Town in terms that commend USEPA's approach to the sensitivities of the Town and Community.
 - b. Proper implementation of this supplemental plan requires that Tetra Tech's EPCs and PRGs, as provided in the FS report and analyzed in this document, are reconsidered, and revised.
- (2) This additional work should be based on a focused sampling plan (i.e., SAP) that is designed to address the findings of a data-gap analysis of existing soils data, and a comprehensive remediation plan that is based on revised BTVs and risk assessment determinations (i.e., Pb). Both plans and the data-gap analysis should be reviewed by the Town's consultant to ensure on-going community involvement and a sustained sense of positive public relations.
- (3) Speyer understands that USEPA intends to engage ADEQ to assist with certain tasks required for completion of roadmap to completion, including the Final Engineered Design for the Remedial Plan.
- a. This is a motivating idea, which is easy to communicate to the Town and expresses a sincere federal agency desire to meet the deadlines so that adequate funding can be confidently secured.

Recommendations

- (4) To the degree practicable and as authorized by USEPA, soils data, including additional data that may be available due to supplemental work at Town and residential properties, should be incorporated with fugitive dust data derived from a systematic building rafter survey, as described in Section B above.
- (5) Speyer recommends that USEPA complete a comprehensive review of existing data to identify significant data-gaps in soil data in residential and commercial areas of the Superfund Site. The data-gaps represent target areas for additional soil sampling, as necessary. As stated previously, there is considerable data from USEPA work completed in 2010, 2011, and 2012 that should be compiled and serve as the raw dataset from which informed decisions concerning additional sampling in residential areas of the Superfund Site may be made.
- (6) The following steps are recommended:
- a. Compile all available soils data for the Superfund Site. These data should already be on-line with the MS-ACCESS database.
 - b. Conduct a map-based data-gap analysis to identify areas that are not represented by appropriate density of data. Data-gaps should also include assessment of

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“representativeness” for each recognized area that would be assessed for possible remediation.²⁹

- c. Review AOCs with specific reference to BTVs that are founded on soil-specific characteristics (e.g., Balon Soil for the Town and associated residential areas; see Attachment 1.2).
 - d. Refine the mapped data with reference to revised PRGs that are based on criteria discussed above.
 - e. Develop a comprehensive removal plan for residential and Town properties with a timeframe schedule that integrates with Tetra Tech’s waste management programs as detailed in the FS, according to the final Remedial Option that is selected. These coordinated plans should include provisions for the allocation of replacement soil from an appropriate borrow source.
- (2) Sampling Plans intended to address data-gaps should be reviewed by the Town’s consultant to sustain a cooperative interaction between the agency and the community.
- (3) Removal Plans should, likewise, be reviewed and discussed with the Town’s consultant before contractors are mobilized.
- (4) All additional work and development of plans should be accomplished concurrently with other, scheduled work so that the overall roadmap to completion is not interrupted or paused.

CLOSING REMARKS

Speyer reviewed the CH2M-Hill (2016) RI and Tetra Tech (2022) FS reports on behalf of the Town of Dewey-Humboldt, Yavapai County, Arizona under agreement with the Town Council, as executed by the Town Attorney.

Determinations of inadequacy and recommendations that are provided are strictly intended to address appropriate, protective measures that apply to occupied areas of the IKMHS Superfund Site. All potential revisions to the FS may be accomplished without interfering with or interrupting the current schedule of administrative tasks. The additional inquiry, revised calculations, and changes to Site maps may be completed during the Public Response Period. Additional sampling activities and corresponding SAPs and QAPPs, including sampling/removal actions that USEPA has stated it intends to implement, may be completed following the 60-day Response Period and pertinent data may be available and incorporated into the Record of Decision (ROD) that is scheduled for completion by the end of the 2023 calendar year.

²⁹ “Representativeness” in this sense refers to appropriately implemented sampling plan that excludes overt or passive bias.

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Speyer reviewed Tetra Tech's selection criteria as applied to each of the five (5) remedial options included in the FS. Speyer finds that the selection criteria are, in general, consistent with the expectations under the National Contingency Plan (NCP)³⁰ and the engineered design, in principle, should not be affected by revisions such as requested in this document. It is understood that volume of waste to be moved and volume of borrow soil to restore remediated properties will increase and this, in turn, will affect certain timelines.

REFERENCES CITED

CH2M-Hill, 2016. Remedial Investigation Report, Iron King Mine-Humboldt Smelter Superfund Site, Dewey-Humboldt, Yavapai County, Arizona. U.S. Environmental Protection Agency Region 9 (September 2016).

Ecology & Environment, Inc. (EEI), 1997. Standard Operating Procedure: Soil Sampling. 35 p. [USEPA ARCHIVE DOCUMENT]

Gilbert, R.O., 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold Company, Inc. (New York), 320 p.

Tetra Tech, 2022. Feasibility Study, Iron King Mine / Humboldt Smelter Superfund Site. Public Comment Version, U.S. Environmental Protection Agency Region 9 (San Francisco, California).

USEPA, 1989. Risk Assessment Guidance for Superfund, Volume 1. Human Health Evaluation Manual (Part A). EPA/540/1-89/002, 291 p

USEPA, 1992. Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies. EPA/600/SR-92/128. 4 p.

USEPA, 2002a. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, 32 p.

USEPA, 2002b. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. 106 p.

USEPA. 2002c. Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites. EPA 540/R-01-003.

USEPA, 2002d. Guidance on Choosing a Sampling Design for Environmental Data Collection. EPA QA/G-5S (EPA/240/R-02/005), 178 p.

³⁰ Certain ARARs regarding remediation standards pursuant to AAC R18-7-203, as discussed, require attention.

Attachment 1.1: Total BTV Dataset

Attachment 1.2: Balon Soil Dataset

Attachment 1.3: Moano Soil Dataset

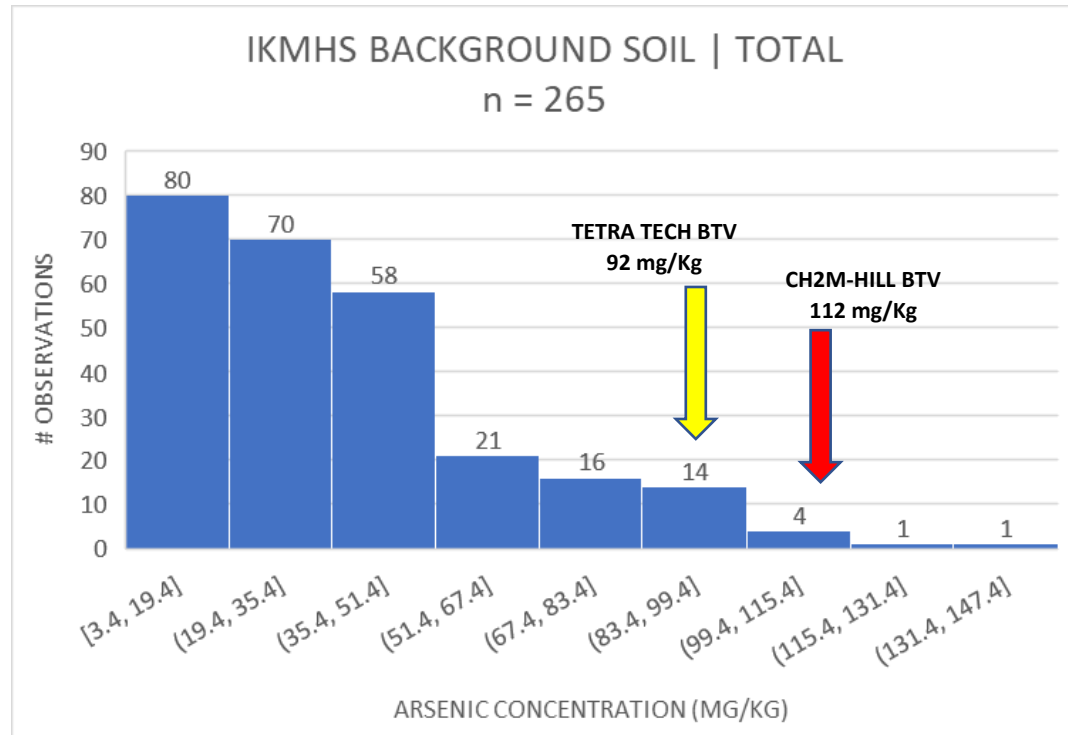
Attachment 1.4: Lonti Soil Dataset

ATTACHMENT 1

ATTACHMENT 1.1

BACKGROUND ARSENIC (AS) DATA FOR IKMHS SUPERFUND SITE BTV | TOTAL

IKMHS BACKGROUND AS IN SOILS TOTAL	
Mean	36.92
Standard Error	1.54
Median	30.80
Mode	8.60
Standard Deviation	25.03
Sample Variance	626.74
Kurtosis	1.16
Skewness	1.18
Range	135.60
Minimum	3.40
Maximum	139.00
Sum	9784.33
Count	265.00
Confidence Level (95.0%)	3.03
Square Root of n [bin size]	16.28



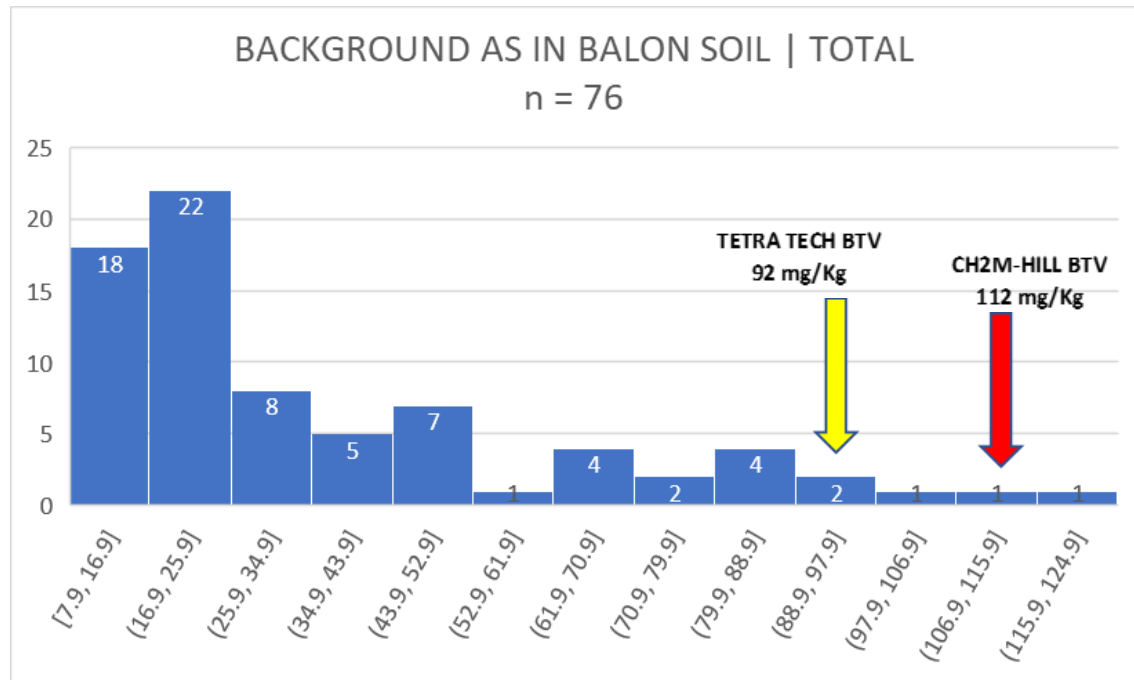
CH2M-Hill (2016; Appendix E) and Tetra Tech (2022; Appendix C-6) applied the same dataset consisting of 269 data from soil sample locations outside the perimeter of the IKMHS Superfund Site to calculate a Background Threshold Value (BTV) for Arsenic (As). CH2M-Hill calculated a BTV of 112 mg/Kg Arsenic. Tetra Tech calculated a BTV for Arsenic equal to 92 mg/Kg.

Two (2) values to the far right of the Histogram are outliers identified by calculations provided by USEPA Guidance Documents (USEPA, 2002c). Likewise, two (2) values of the four (4) identified in Bin 7 should be removed based on standard industry practice.

ATTACHMENT 1.2.1

BACKGROUND ARSENIC (AS) DATA FOR IKMHS SUPERFUND SITE BTV | BALON SOIL

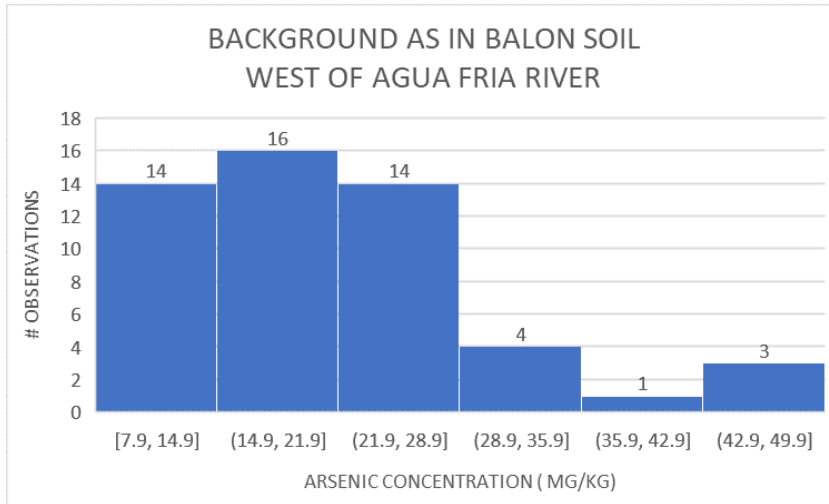
BACKGROUND AS IN SOILS BALON	
Mean	36.86
Standard Error	3.12
Median	24.63
Mode	#N/A
Standard Deviation	27.22
Sample Variance	741.09
Kurtosis	0.94
Skewness	1.33
Range	114.10
Minimum	7.90
Maximum	122.00
Sum	2801.33
Count	76.00
Confidence Level(95.0%)	6.22
Square Root of n (bin size)	8.72



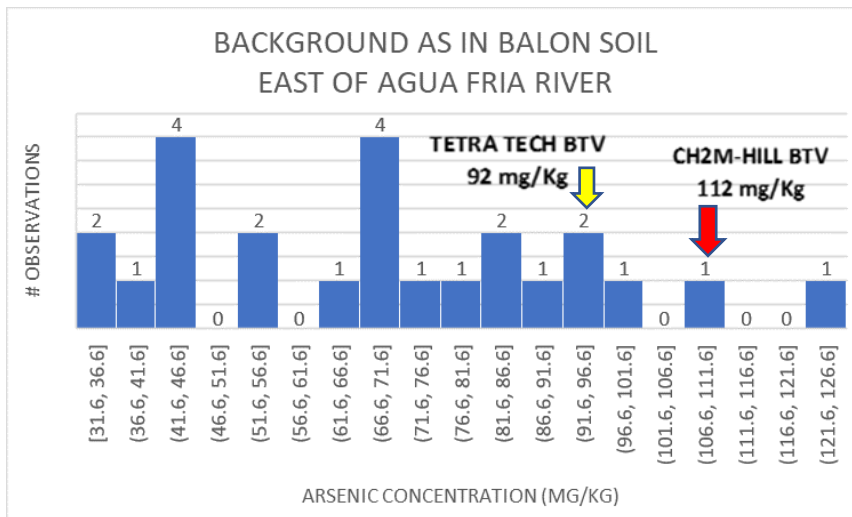
Balon Soil occupies a dominant area of the Superfund Site and is located in areas considered to be the most sensitive with regard to location of potential receptors, including Town properties and residential neighborhoods located northeast and east of the Iron King Mine proper and north and northwest from the Humboldt Smelter property. Balon Soil represents an important site-specific source of information regarding background arsenic concentrations. Two (2) of the outliers that were not removed from the operative dataset are present on this graph and significantly affect the dataset mean and standard deviation values.

ATTACHMENT 1.2.2

BACKGROUND ARSENIC (AS) DATA FOR IKMHS SUPERFUND SITE BTV | BALON



BACKGROUND AS IN BALON SOILS WEST	
Mean	21.84
Standard Error	1.29
Median	20.05
Mode	#N/A
Standard Deviation	9.33
Sample Variance	87.02
Kurtosis	1.38
Skewness	1.18
Range	40.21
Minimum	7.90
Maximum	48.11
Sum	1135.71
Count	52.00
Confidence Level (95.0%)	2.60
Square Root of n (bin size)	7.21



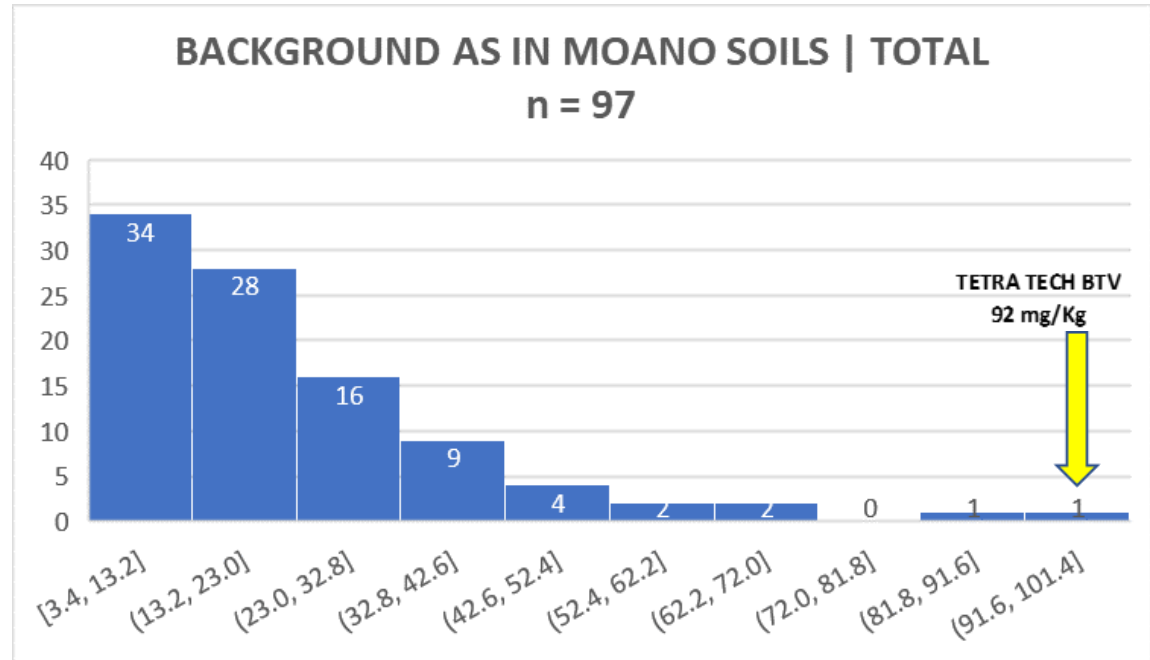
BACKGROUND AS IN BALON SOILS EAST	
Mean	69.40
Standard Error	5.04
Median	69.18
Mode	#N/A
Standard Deviation	24.67
Sample Variance	608.66
Kurtosis	-0.68
Skewness	0.32
Range	90.44
Minimum	31.56
Maximum	122.00
Sum	1665.62
Count	24.00
Confidence Level(95.0%)	10.42
Square Root of n (bin size)	4.90

Balon Soil Arsenic data from samples collected East of the Agua Fria River significantly differ from sample data for samples collected West of the River. Data distribution attributes, maximum values, and standard deviation are significantly different. All data that exceed 59 mg/Kg in Balon Soil from all locations around the IKMHS Superfund Site are present in this data subset, comprising over 60% of the Balon-East dataset count. The CH2M-Hill and Tetra Tech BTVs are not even represented in the Balon-West dataset wherein the highest Arsenic concentration value is about 50% of the 92 mg/Kg BTV assigned by Tetra Tech.

ATTACHMENT 1.3

BACKGROUND ARSENIC (AS) DATA FOR IKMHS SUPERFUND SITE BTV | MOANO SOIL

MOANO TOTAL	
Mean	23.15867
Standard Error	1.687845
Median	17.7
Mode	8.6
Standard Deviation	16.62334
Sample Variance	276.3355
Kurtosis	4.54902
Skewness	1.93405
Range	89.30973
Minimum	3.4
Maximum	92.70973
Sum	2246.391
Count	97
Confidence Level(95.0%)	3.350345
Square Root of n (bin size)	9.8

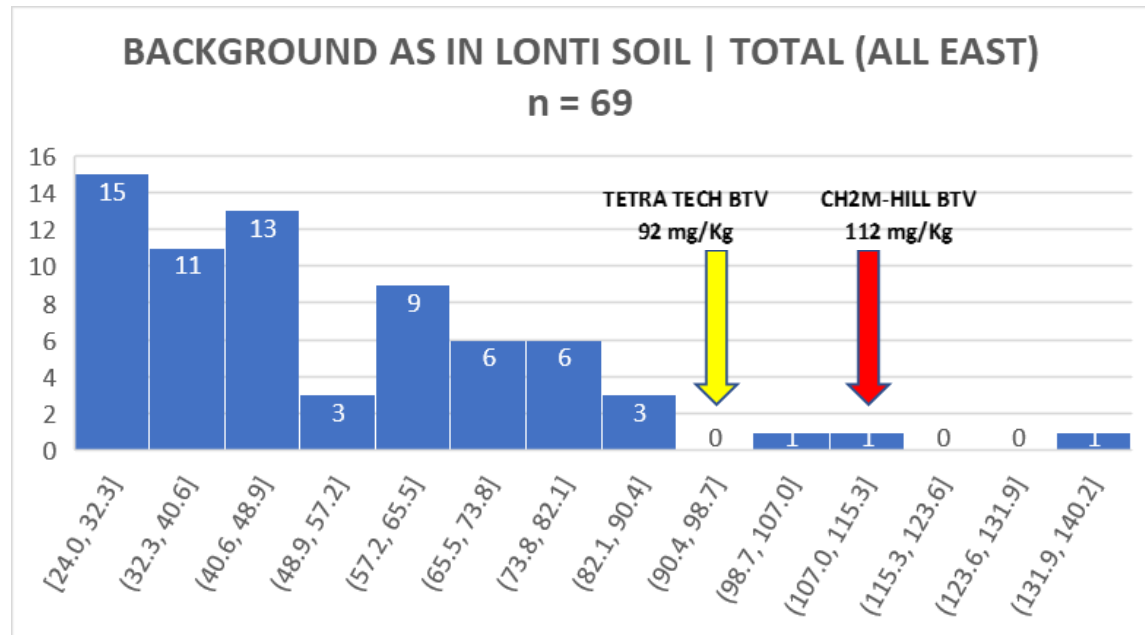


Moano Soils include three types of which two (2) are located within the boundary of the IKMHS Superfund Site (see Figures 3 & 4, Tetra Tech Appendix C-6 (2022)). Moano Soils compose the bulk of Area of Concern 12, located south-southwest of the Iron King Mine proper, south of Galena Gulch. In addition, Moano Soils are present along the east margin of Agua Fria River east, southeast, and south of the Humboldt Smelter property.

ATTACHMENT 1.4

BACKGROUND ARSENIC (AS) DATA | LONTI SOIL (TOTAL)

BACKGROUND AS IN SOILS LONTI	
Mean	51.8802471
Standard Error	2.79583152
Median	42.8
Mode	69.4
Standard Deviation	23.2239208
Sample Variance	539.350499
Kurtosis	1.82553844
Skewness	1.18412631
Range	114.97418
Minimum	24.0258196
Maximum	139
Sum	3579.73705
Count	69
Confidence Level(95.0%)	5.57899494
Square Root of n (bin size)	8.31



According to Figures 3 and 4, as presented in Appendix C-6 of the Tetra Tech Feasibility Study (FS), Lonti Soil does not occur within the boundaries of the Iron King Mine/Humboldt Smelter Superfund Site. Lonti Soil only occurs on the East side of the Agua Fria River and north-northeast of the Superfund Site boundary. These data, though not applicable to the Superfund Site, indicate that the assignment of a BTV that represents the average background concentration of Arsenic in Site soils is significantly less than the BTVs calculated by Tetra tech.