Northern New Mexico Citizens' Advisory Board Meeting

January 28, 2025
1:00 p.m. to 5:15 p.m.
Hybrid Meeting
Cities of Gold Ballroom
10 Cities of Gold Rd
Santa Fe, NM 87506

The video for the January Board Meeting can be viewed on the NNMCAB YouTube Channel:
NNMCAB Board Meeting January 2025

Minutes

Meeting Attendees

Department of Energy

1. Jessica Kunkle, Manager, Environmental Management Los Alamos
2. Keith Grindstaff, Deputy Designated Federal Officer, Environmental Management Los Alamos
3. Ming Zhu, Environmental Management, Headquarters
4. Cherly Rodriguez, Environmental Management, Los Alamos
5. John Evans, Environmental Management Los Alamos
6. Allison Scott Majure, Environmental Management Los Alamos
7. Lisa Pansoy-Hjelvik, Environmental Management Los Alamos
8. Susan Wacaster, Environmental Management Los Alamos
9. Isaac Gibbons, Environmental Management Los Alamos
10. Rose Brown, Environmental Management Los Alamos
11. Carmen Bentley, Environmental Management Los Alamos
12. Jeff Silvera, Environmental Management Los Alamos

NNMCAB Members

1. Patricio Pacheco, Chair
2. Manuel L'Esperance, Vice-Chair
3. Eleanor Bravo
4. Danielle Duran
5. Christy Green
6. Sterling Grogan
7. Mark Hayden
8. Abbey Hayward
9. Beverly Martin
10. Stephen McLaughlin
11. Arlina Sanford
12. Joseph Villegas

NNMCAB Staff/Support

1. Bridget Maestas, Executive Director
2. Menice Santistevan, Senior Advisor
3. Yolanda Valdez, Executive Assistant

Guests

1. David Ableson, N3B
2. Andres Aguirre, Industrial Economic, Inc
3. Joni Arends, Concerned Citizens for Nuclear Safety
4. Dr. Vedat Batu Ph.D., P.E., Argonne National Laboratories
5. Theresa Bonelli, Environmental Management Los Alamos
6. Kevin Boyko, New Mexico Environmental Department
7. Siona Briley, New Mexico Environment Department
8. Amanda Caudillo, Environmental Management Los Alamos
9. Antonio Chavarria, N3B
10. Dr. Rick Devlin Ph.D., University of Kansas
11. Peter Dillon, TetraTech
12. Alexis Donahue, N3B
13. Zoe Duran, N3B
14. Robert Edwards, N3B
15. Kate Ellers, N3B
16. Erich Evered, N3B
17. Mark Everett, Los Alamos National Laboratory
18. Elena Fernandez, NMSU Program Manager EPA R6 EJ TCTAC
19. Matthew Fesko, N3B
20. Stephanie Gallagher, Environmental Management Los Alamos
21. Ubaldo Gallegos, Environmental Management Los Alamos
22. Kate Girard, Office of Natural Resources Trustee
23. John Gonsky, TetraTech
24. John H. Hall, Public
25. Don Hawkins, TetraTech
26. Kristin Henderson, N3B
27. Amanda Kennedy, Environmental Management Los Alamos
28. Deborah Kerrigan, N3B
29. Susan Kon, TetraTech
30. Scott Kovac, Nuclear Watch New Mexico
31. Whitney LaMarche, TetraTech
32. Patrick Longmire, N3B
33. Ricardo Maestas, New Mexico Environment Department
34. Angela Martinez, Los Alamos National Laboratory
35. Brandi Martinez, Public
36. Caitlin Martinez, New Mexico Environment Department
37. Raymond Martinez, Department of Environmental and Cultural Preservation, San Ildefonso Pueblo
38. Renee Martinez, Environmental Management Los Alamos
39. Christian Maupin, N3B

40. Thomas McCrory, Environmental Management Los Alamos
41. JohnDavid Nance, New Mexico Environment Department
42. Dr. Charles Newell Ph.D., GSI Environmental Inc.
43. Rebecca Ortiz, Environmental Management Los Alamos
44. Michael Peterson, New Mexico Environment Department
45. Aubrey Pierce, Environmental Management Los Alamos
46. Kent Rich, Environmental Management Los Alamos
47. Joe Ritchey, Environmental Management Los Alamos
48. Kylian Robinson, New Mexico Environment Department
49. Vince Rodriguez, N3B
50. Clark Short, Public
51. Brad Smith, N3B
52. Troy Thomson, N3B
53. Dr. Inés Triay Ph.D., Florida International University
54. Matt Tonkin, S.S. Papadopulos & Associates Inc.
55. Mark Turnbough, Environmental Management Los Alamos
56. Kristen Van Horn, Los Alamos National Laboratory
57. Luciana Vigil-Holterman, Los Alamos National Laboratory
58. Sarah Voorhees, Environmental Management Los Alamos
59. David Wilson, Longenecker & Associates
60. Elicia Williams, Environmental Management Los Alamos

Minutes

I. Call to Order

The meeting of the Northern New Mexico Citizens' Advisory Board (NNMCAB) was held on January 28, 2025, in a hybrid format. Mr. Keith Grindstaff, Deputy Designated Federal Officer (DDFO), stated that on behalf of the Department of Energy (DOE) the meeting of the Northern New Mexico Citizens Advisory Board (NNMCAB) was called to order at 1:01 p.m.

Mr. Grindstaff recognized Mr. Patricio Pacheco, the NNMCAB Chair. Mr. Pacheco presided over the meeting.

The meeting of the NNMCAB was posted in the *Federal Register* in accordance with the Federal Advisory Committee Act.

II. Establishment of a Quorum (Roll Call)

Mr. Pacheco conducted a roll call of board members and guests in person and on WebEx. At the call to order, nine NNMCAB members were present or online, and a quorum was established.

III. Welcome and Introductions

Mr. Pacheco welcomed everyone to the January Board Meeting in Pojoaque, NM. Mr. Pacheco requested that individuals sitting at the table and board members online, introduce themselves.

IV. Approval of Agenda

The board reviewed the agenda for the January 28, 2025, meeting. Mr. Pacheco stated that an amendment to the agenda is required. Mr. JohnDavid Nance, New Mexico Environmental Department (NMED) will be presenting after the update from Environmental Management Los Alamos (EM-LA).

Mr. Stephen McLaughlin made a motion to approve the agenda, as amended Mr. Manuel L'Esperance seconded the motion. The agenda was approved, as amended.

V. Old Business

a. Update from Chair/Vice-Chair

Mr. Pacheco, NNMCAB Chair

Mr. Pacheco stated that a list of milestones achieved in calendar year 2024 was sent out to members and he advises that they be reviewed. Goals for FY 25 are now underway.

Mr. Manuel L'Esperance, NNMCAB Vice-Chair

Mr. L'Esperance stated that he had no update.

b. Update from Subcommittee Chairs

c. Public Outreach Subcommittee

Mr. Villegas stated that he had no update.

Risk Evaluation and Management Subcommittee

Ms. Martin stated that the Risk Evaluation and Management Subcommittee met in December 2024. The members of the subcommittee look forward to the results of the Chromium Plume report.

Consent Order Subcommittee

Mr. Hayden stated that the Consent Order Subcommittee has not met. The subcommittee submitted questions to N3B through Ms. Maestas, and they are awaiting a response.

Ms. Abbey Hayward, Vice-Chair of the Consent Order Subcommittee stated that the questions were submitted to EM-LA.

Mr. Pacheco stated that EM-LA did provide a response. The response was provided to the members in an email sent out by Ms. Santistevan on December 30, 2024. Please forward all questions or comments to Ms. Santistevan or Ms. Maestas.

Questions

Mr. McLaughlin asked if an updated timeline for the receipt of the work plans has been provided.

Mr. Pacheco stated that nothing had been presented to the board.

Ms. Duran asked if the communication pause across the administration is currently a hindrance to the work of the NNMCAB.

Ms. Kunkle stated that there are several executive orders and policies that are being directed through the Federal agencies and EM-LA is attempting to adapt as quickly as possible. Public outreach is being coordinated through the DOE Headquarters regarding our Federal Register Notices EM-LA will continue to follow DOE's guidelines to ensure that we go forward with upcoming meetings.

Mr. McLauglin asked if the NNMCAB would be provided copies of the Executive Orders.

Ms. Kunkle stated that the Executive Orders are available on the White House website.

https://www.whitehouse.gov/presidential-actions/

VI. New Business

a. Other Items

Mr. Pacheco stated that he is looking forward to all upcoming milestones and the recommendations that will be provided concerning the plume in Dr. Triay's presentation.

VII. Update and Look Ahead from N3B

Mr. Brad Smith stated that he was pleased to present to the NNMCAB and introduced his team in the audience.

Mr. Smith stated that EM-LA and N3B have been striving to improve their working relationship. N3B has been awarded option period two and this will provide the opportunity to maintain a well-trained and qualified workforce. The scope of 2025 is to continue the work that was underway in 2024. The Corrugated Metal Pipe (CMP) campaign was completed in 2024. The 158 pieces have been placed in standard waste boxes. Seven hundred and ninety-two are awaiting characterization and upon completion, they will be shipped to the Waste Isolation Pilot Plant (WIPP).

The Chromium Interim Measure (IM) is currently in 24/7 operations with few issues arising. N3B is focusing on retention and training of its workforce. The Environmental Remediation (ER) staff provided the Operations staff from Contact Handled Transuranic Waste (CH-TRU) staff with a tour of the areas. The tour allowed the CH-TRU staff to see the cleanup side of the mission.

CMP shipments are anticipated for late 2025. WIPP is currently under a maintenance outage and N3B will continue working closely with them for scheduling. The High Energy Real-time Radiography (HE-RTR) unit became fully operational in December of 2024. Personnel from N3B, WIPP, and the Central Characterization Process (CCP) jointly made the unit operational. The unit is processing waste in anticipation of the resumption of WIPP shipments. Pit 9 documentation is being updated and should be completed in approximately a year and a half. N3B will collaborate with EM-LA and DOE Headquarters to acquire a Fit for Purpose Safety Basis that will allow operators to execute the work.

At the start of the contract, there were 451 legacy waste containers and only 111 remain. The 111 legacy waste containers are anticipated to be completed by the end of calendar year 2025. There are 11 Consent Order milestones for FY 25. Work in the Starmer Aggregate Areas is anticipated to be completed by the end of the FY. Polychlorinated Biphenyl

sampling will begin in the Two-mile Aggregate area. The Risk Assessment for Material Disposal Area (MDA) T will be completed by the end of the year and soil vapor extractions will continue in MDA C and L. Characterization of the Royal Demolition Explosives was the first Consent Order Milestone to be completed. It took place during the first quarter of the FY. N3B continues to work on workforce retention. They have implemented tours of the areas for all staff. Maintenance and work control programs are being upgraded to ensure that work is completed properly and safely. A Safety Conscious Work survey of the workforce was just completed. The results indicate that improvement is needed in answering staff questions and this can be alleviated with regular site visits by management.

a. Questions

Mr. Villegas thanked Mr. Smith for his straightforward presentation and his work to establish a trusting relationship with the community.

Mr. Pacheco thanked Mr. Smith for the work on the cleanup mission and for providing students with the opportunity to work in a field they could be proud of.

VIII. EM-LA Update

Ms. Kunkle stated that she would like to give kudos to N3B, EM-LA, and the extended team for the completion of the CMP project. The project's completion is a proving ground for future retrievals of TRU Waste. N3B was successful in deploying innovative techniques to improve production and operational efficiency.

Ms. Kunkle stated that she would go over the list of priorities she discussed with the NNMCAB in November. Her top priority was to foster robust collaborative relationships and to fortify both the mission and organizational success, by making regular site visits and meeting with the workforce. In November an update was provided on the 2016 Compliance Order on Consent. N3B and EM-LA are now working to initiate the planning required to comply with the new requirements. EM-LA is looking forward to establishing the five-year schedules that are required for a Class A campaign. Significant progress has taken place in completing the Strategic Vision document. EM-LA will begin rolling out the framework to the NNMCAB and the public by the summer.

IX. Update from the New Mexico Environment Department

Consent Order - Mr. Nance stated that NMED and DOE signed the Settlement Agreement on August 30, 2024. The Revised Consent order requires a five-year schedule campaign that includes completion dates to facilitate transparency with the public and NMED. DOE has not officially begun discussions toward that requirement. NMED and DOE are in communication and will set dates to start working through negotiations for Appendix A, B and C. DOE has until July 31, 2025; to submit a proposed revision and the parties have until September 30, 2025, to reach an agreement and finalize the appendices.

Groundwater – SIMR-3 is the next proposed groundwater monitoring well for completion. The goal of the well is to evaluate potential contamination on the Pueblo de San Ildefonso land, south of the injection locations. Conversations are continuing with the Pueblo and DOE to reach an agreement on the installation of the SIMR-3 well. NMED supports the Pueblo's

requirements for the design of the monitoring well and encourages accelerated action by DOE to characterize the areas of uncertainty within the chromium plume.

Chromium Interim Measures - NMED and DOE participated in an Independent Technical Review (ITR) for the Hexavalent Chromium Project. The ITR team has completed their report, and they have provided their recommendations on a path forward for the Chromium IM. NMED encourages transparent communication with DOE regarding the inclusion of the report's recommendations and NMED will continue to necessitate compliance with regulatory direction. The final report is available on the Hazardous Waste Bureau website. On September 30, 2024, DOE acted on the temporary approval to resume partial IM operations by restarting injections into wells CrINs-3, 4 and, 5. The restart includes extraction from wells CrEX-2, 4, and 5. NMED will continue to monitor concentrations under this temporary authorization period.

Corrective Action Document – NMED issued a Statement of Basis for MDA C and held a 60-day public comment period. Hearing requests were received from Triad, EM-LA, N3B, and Nuclear Watch New Mexico. On January 15th an informal conference was held with the requesters to discuss the scheduling of a public hearing. During the discussion, a potential compromise was discussed but no compromise was reached. The public hearing is expected in early fall of 2025.

Aggregate Areas – NMED is issuing a disapproval and comments for the Phase II Investigation Report for Twomile Canyon. An approval will be issued for the investigation report for MDA A. The approval recommends proceeding with a corrective measure's evaluation for MDA A. The approval letters are signed and will be sent out by 01/29/2025.

Permit Related Activities – On March 20, 2024, the Environmental Protection Agency proposed amendments to the regulations for open burn and open detonation of waste explosives. DOE has been re-evaluating the permit application with consideration of the proposed rule. NMED is currently awaiting the revised application.

WIPP Update – A Legacy TRU Waste Disposal Plan was submitted to NMED on November 4, 2024. The plan is currently in a 60-day comment period. WIPP Community Forum Permittees held their third and final forum for 2024 in Las Vegas, NM on October 24th. The proposed FY '25 audit schedule and Small Generator Storage Site Risk Assessment were received on October 8, 2024. NMED is currently reviewing the audit schedule. NMED also received the Repository Sighting Annual Report. The report was due by the end of calendar year 2024 and is under review.

Shipment Update – From January 1, 2024, through December 31, 2024, there have been 470 total shipments to WIPP: 341 from Idaho National Laboratory; 48 from LANL; 64 from Savannah River Site; 12 from Oak Ridge National Laboratory; 4 from Argonne National Laboratory; and 1 from Lawrence Livermore National Laboratory.

a. Questions

Ms. Duran asked when the public hearing for MDA C would take place.

Mr. Nance stated that the public hearing is tentatively scheduled for the fall of 2025.

Mr. Hayden asked for information on the lack of compromise on MDA C.

Mr. Nance stated that DOE has a position that NMED did not consider all the variables. Specifically, the cost analysis in providing NMED Statement of Basis and looking at other

remedial alternatives for implementation. NMED and Nuclear Watch New Mexico's stance was for full excavation of MDA C.

Mr. Hayden asked if an impasse took place, will the next step be mediation.

Mr. Nance stated that a hearing would be the next step.

Mr. Ricardo Maestas stated that there are currently no shipments taking place due to WIPP being on a maintenance outage. The outage is expected to be completed by March.

X. Presentation on "Hexavalent Chromium Project Expert Technical Review"

Ms. Jessica Kunkle, EM-LA, Dr. Inez Triay Ph.D. and Dr. Daniel Stephens Ph.D. presented on "Hexavalent Chromium Project Expert Technical Review" An electronic copy of the presentation may be obtained from the NNMCAB staff. (Yolanda.valdez@em.doe.gov or bridget.maestas@em.doe.gov)

Ms. Kunkle stated that from 1951-1970 Potassium Chromate which is an active ingredient in Hexavalent Chromium was utilized in power reactors as a corrosion inhibitor at LANL. The Chromium Plume was first detected in 2004. It was a mile and a half long and was 1,000 feet beneath Mortandad and Sandia Canyons. The Chromium IM's objective is to prevent the plumes migration beyond the LANL boundary. IM operations commenced in 2018 under the 2015 NMED approved work plan. Hydraulic plume control IM consists of 5 extraction wells, groundwater treatment, 5 injection wells, and over three miles of buried conveyance pipelines. Chromium concentration was increasing in R-25 and NMED believed that injection wells may have forced the contamination deeper. On March 30, 2023, IM operations shut down to comply with NMED direction. NMED and DOE collaborated to engage in an Expert Technical Review. The team would focus on 5 specific topics. Partial operations of the IM resumed on September 30, 2024. The IM had been running on a 24/5 schedule and in mid-November it transitioned to 24/7 operations. Ms. Kunkle turned the meeting over to Dr.Triay.

Dr. Triay introduced herself and the ITR team. Dr. Triay then stated the 5 questions NMED and DOE were charged with. Chromium Plume Control IM Hydraulic Control, Chromium Plume Modeling, NMED Groundwater Quality Bureau acceptable corrective actions and conditions in the September 6, 2023, letter Appendix A proposal, Regulatory matters and well design.

The IM, at a limited and/or altered capacity, should be restarted as soon as possible. The historical configuration and operation of the IM extraction and injection wells likely resulted in incomplete hydraulic containment of the chromium plume. The IM needs to be operated in a revised configuration while further analyses improve the remedy. Greater effort is needed to obtain consensus on the characterization, modeling, and remediation of the chromium contamination. To transition from a limited start-up of the IM to expanded operations, alternative configurations should be considered that may include alternative treated water disposal options.

Dr. Daniel Stephens referred to Figure 2-2. He stated that the southern boundary of the plume has shifted to the north away from the San Ildefonso boundary. The plume is elongated to the east. Well R-70 on the east side of the boundary indicates that the

contamination has extended. The team utilized 4 different methods to determine the containment such as the hydraulic gradient. Dr. Stephens referred to Figure 3-1. The time of the graphs extends from 2009 to 2023. In 2018 there was a declining concentration, and the team interprets this factor, as the IM being successful in lowering concentrations. Different results were found in wells R-61, S-1, R-45 and S-2. The second method utilized water levels. Neptune looked carefully at water levels in three different wells at a time. This method discovers if the water table is going downhill towards the extraction well. Dr. Stephens referred to Figure 3-7. According to the Neptune equipotential, the wells that have contamination are being contained by the full IM system. The third method is the Finite Element Heat and Mass Transfer Code (FEHM). FEHM provides data on the direction of the water table slope toward the extraction wells. The ITR team does not feel that complete capture did not occur at R-45 or R-70 but was captured at R-61 despite rising concentrations over time.

The team was asked to evaluate alternatives to getting the remediation system back online. Dr. Stephens referred to Figure 3-27. NMED proposed that extractions take place from the extraction sites and injected in the southern boundary at I-3, I-4, and possibly I-5, if the completion of SIMR-3 shows no contamination.

The team was also asked, where they believed the treated water could be relocated. Additional water extraction is needed, and the water be remediated. The ITR team suggested that PM-3 be converted into an injection well. Other suggestions included digging a deeper well into the aquifer, adding additional injection wells that would allow the clean water to push the existing plume faster towards the extraction wells, utilizing the vadose zone injection well, spreading basins, and piping extracted water into Sandia Canyon. No recommendation was provided for a specific approach however, the team did recommend a working study group be created that will get all parties together to evaluate and move towards a common goal.

Dr. Triay stated that the NMED, DOE, and contractors provided presentations on topics to the ITR team. The team would then proceed with independent verification of the salient points to arrive at their consensus concerning particular findings. Two main questions were associated with the Chromium Modeling question. The first is potential data gaps in the Conceptual Site Model (CSM) and the second is groundwater flow and transport utilized by EM-LA. The second question pertained to the transition between groundwater flow and the transport simulator. The team suggested that MODFLOW-6 be utilized over FEHM due to its wider user code community.

Dr. Stephens referred to 3-19A and provided an explanation on the slope of the water table and each layer below the plume. The team believes the FEHM process is acceptable but still provided recommendations to improve the model. Suggestions included a conceptual model that better honors the geology, and the team feels that the FEHM model needs to provide an improved description of the slope of the water table. The FEHM model does not include the basalt levels, nor does it include the PM wells. Dr. Stephens referred to Table 3-2. The ITR team suggests that a lesson learned activity be conducted to find the best value approach and build a consensus for a modeling strategy.

Dr. Triay stated that question four pertained to regulatory matters. The ITR team recommended that an Adaptive Site Management (ASM) strategy be implemented. The ITR team also recommends a close working relationship between EM-LA, NMED, San Ildefonso Pueblo and, stakeholders.

Dr. Stephens discussed question five which pertains to Well Design. He referred to Table 3-3. Dr. Stephens stated that all well permits must be obtained from the New Mexico Office of the State Engineer (OSE). Most of the current wells are dual screens that allow for the measurement of two horizons within the same well. The OSE does not approve of this type of well design and is not in their policy. The ITR team supports the use of dual screen wells and encourages the OSE to grant a variance to their policy. The OSE is also concerned about the earth outside the casing. In many cases, bentonite has been utilized to isolate the annular space outside the casing. Bentonite is a sticky material that swells up when liquid is applied. The ITR team feels that bentonite is working however, the OSE believes that concrete should be utilized. The team arrived at a compromise that will utilize coated round bentonite granules. The particles will settle around the casing and then concrete will be placed over.

a. Questions

Mr. Hayden asked if a summary of the recommendation is to turn on some of the injection wells, create a working group to study solutions, and continue with extraction and injection in some combination.

Dr. Triay stated that the IM was restarted in September of 2024. The ITR team believes restarting was a good choice. An ASM strategy was suggested to find a final remedy.

Dr. Stephens stated that modeling and water disposal are important factors that need to be utilized.

Mr. Hayden asked if the summary and slideshow presented were based off the Independent Review of Chromium Interim Measure Remediation System in Mortandad Canyon Los Alamos, New Mexico. Dated December 2024.

Dr. Triay stated that the information does come from the Chromium Interim Measure Remediation System in Mortandad Canyon Los Alamos, New Mexico.

Mr. Villegas asked how the NNMCAB members could assist in this recommendation.

Dr. Triay stated that NMED, OSE, and EM-LA will have joint conversations regarding the recommendations from the report.

Ms. Kunkle stated that the OSE may be permitting dual screened wells on a case-by-case basis. EM-LA has reached out to the OSE to attain its position on the ITR findings and recommendations.

Mr. McLaughlin asked if he was correct in saying that the results from the ITR report have not resolved the dispute between NMED and EM-LA but has created the framework for determining that result.

Dr. Triay stated that the ITR reviewed the proposal from NMED and found the proposal not to be unreasonable. The team recommended the ASM and recommended the restart of the IM.

Mr. McLaughlin asked what further analysis is needed and how it should be attained.

Dr. Stephens stated that work needs to be completed on the data gaps so the systems can be relied upon with greater confidence.

Mr. McLaughlin asked if there has been an assessment of the anticipated cost.

Dr. Stephens stated that the ITR team was not charged with cost analysis.

Mr. McLaughlin asked DOE for a cost analysis.

Ms. Kunkle stated that the cost would be approximately $160 million spread out over several years.

Mr. McLaughlin asked if there was a total of how much had been spent to date on remediation of the plume.

Ms. Kunkle stated that she would acquire that number for the NNMCAB.

Dr. Triay stated that the ITR team did take costs into account. One benefit of the ASM is that it allows all parties to discuss the financial aspect as well.

Mr. McLaughlin asked if an alternative approach had been discussed instead of attempting to interdict the spread of the plume.

Dr. Triay stated that many of the recommendations deal with how to model what is transpiring to engage in natural attenuation.

Mr. McLaughlin referred to 3-27. Mr. McLaughlin asked if the dotted lines are contour gradient or surface contour gradient of the water table.

Dr. Stephens stated that they are subterranean and are approximately 1,000 ft underground.

Ms. Kunkle stated that migration of the plume has been the predominant focus of the ITR team. An alternative that was discussed was to utilize an oxygen inhibitor to convert the Hexavalent Chromium to Trivalent Chromium. After research, it was discovered that the approach would have unintended consequences, and it would not be beneficial.

Mr. Pacheco asked if the concentration of the plume outside R-70 was contained.

Dr. Stephens stated that he misspoke and intended to say that the R-70 is outside of what was being captured.

Mr. Pacheco asked if the injection wells are down gradient to protect the county wells from the plume.

Dr. Stephens stated CrIN-1 and CrIN-2 are for that purpose.

Mr. Pacheco asked if additional water rights are being acquired and if permits and work are being held up by OSE.

Ms. Kunkle stated that water rights will have to be considered in the future, and work is currently not being held up by the OSE.

Mr. McLaughlin asked if SIMR-2 had detected any contamination and if the well drilled to 5,832 ft.

Ms. Kunkle stated that it had not detected anything above background.

Mr. Thomas McCrory, EM-LA stated that 5,200 is the elevation of the water table above sea level. SIMR-2 is dug from 900-1,000 ft below land surface.

Mr. Grogan asked for the disclosure plans for today’s presentation.

Ms. Kunkle stated that today's presentation is the third of four presentations that will take place. NMED and EM-LA worked closely to publish the report, and it can be located on both the NMED and DOE websites.

Mr. McLaughlin asked with what degree of confidence the ITR team has that the plume can be 100 percent interdicted or is there a probability that some portion will escape downstream.

Dr. Stephens stated that it is not possible to get every molecule. He believes that there is potential to capture the contamination and remediate it down to the 50 microgram per liter standard.

XI. Public Comment Period

Mr. Pacheco opened the floor for public comment at 3:54 p.m.

Mr. Scott Kovac, Nuclear Watch New Mexico stated the following:

"Thank you, Chairman Patricio and members, of the NNMCAB. My name is Scott Kovak. I'm with Nuclear Watch New Mexico. With all due respect, it's been 20 years since the chromium plume was originally discovered out in Mortandad Canyon. We just want to make sure that the regional aquifer and protection of the regional aquifer is a priority. Unfortunately, I have a couple of questions, but I'll just put them in the form of a statement. I was wondering if you had found or if there's any way that the technical review board could find if chromium is still flowing into the plume. I also was wondering if there is a priority for the recommendations that the technical review board said they had. I was just wondering if there are one or two that are more important than the others. I'm not in favor of the dual screens and we have had many problems with those in the past. We just need to make sure if there's a better way besides bentonite to use in the dual screens, we need to consider using those. Have we received data from SIMR-3 yet. I thought that one was drilled but I may be mistaken I'm also in favor of using the MODFLO thank you very much."

Ms. Arends, Concerned Citizens for Nuclear Safety (CCNS) stated the following:

"Good afternoon my name is Joanie Arends. I'm a co-founder of Concerned Citizens for Nuclear Safety based in Santa Fe. I've been working on LANL and WIPP issues for a long time. I just want to give a little history lesson. In 1994 LANL asked for a groundwater waiver to not do any monitoring of the groundwater and NMED said no. They said in fact you must do a hydro geological work plan. That began the process of modeling to find out where the wells needed to go. The first well was R-25 over in the southwest corner of LANL at TA-16. The plan was to have it be a single screen well drilled without bentonite clay. It then shifted through the work plan process to a five screen well and that well has recently closed 25 years later.

This is an ongoing problem with respect to the use of bentonite clay in these Wells. The bentonite clay binds up contaminants and the screens were not put in the right places. In fact, for the Sentry and Buckman well fields on the east side of the river, 30,000 lb. of bentonite clay was used to drill that well. Most of it is in the bottom of the well which would provide data about whether contaminants from Area G would reach the Buckman area. That's just one example of the opportunity that's available right now to refocus finding out about the hexavalent chromium plume. We need to do a comparison. I mean

everybody said today that everybody's in a big hurry. In over 25 years we haven't gotten the data that we need to be able to make a realistic and fundamental answers to what's going on with the groundwater. Specifically, about the 3,000 square mile Espanola Basin Sol Source drinking water aquafer. If you've ever gone to the Environmental Protection Agency website, you can see the map of the Espanola Sol Source drinking water aquafer. What that means is that 50 % of the people who live in this area don't have access to any other source of water, so the priority for CCNS is do a comparison of MODFLO and FEHM.

In my history of working on these issues. I met the designer of the FEHM model. I met with him and my hydrologist in Los Alamos, and I asked him for the directions to run the model because I wanted to look at it before I met with him. I read the directions for how to run the model and I went and met with him the next morning. I said Well I have a couple questions before we start. I started asking my questions and he became so frustrated with the process that he left the meeting, and he didn't come back. That's when my name comes up in the report that Inez and her team put together. That's a foundational issue that needs to be addressed first before we start talking about anything else. We need to do a basic comparison between the data that we get from FEHM and MODFLO. It's really a fundamental democracy issue to have the data go into the MODFLO because it's accessible to everybody and FEHM is not available to everybody. If you go to the FEHM website. If you don't have the right passcode you can't get into it. If you don't have permission, you can't get into it and that's a fundamental problem.

In terms of protecting not only the areas under LANL, the Buckman and the Rio Grande but the whole 3,000 square mile Espanola Basin Sol Source aquifer. It starts up in Tres Piedras and it goes almost to Galisteo and between the two mountain ranges. There are more protections now for the Espanola Basin Sol Source aquifer than there have been. In doing research for the sitewide environmental impact statement. There are extra protections that we need to make sure that our public comments are included about protecting the sole source aquifer. My basic plea is that the cab recommends that there be a review of FEHM and MODFLO because we can’t invest in my opinion and in respectfully that this area is special and beautiful and sacred. We can't allow this contamination to continue to spread and we need to understand the model more fully and have consensus about what the model says. The model we're using has got to be accessible to everybody. We can no longer play this game with the Department of Energy and the National Nuclear Security Administration because they're not going to say the truth. In my years of doing this work I can tell you handfuls of examples of when these federal agencies don't tell the truth, and it's come to the point where I must speak up with a stronger voice about the need for protecting the water.

Thank you for letting me go over and I have business cards if the NNMCAB wants to talk. I found this format to be hard because I couldn't see the screen and I couldn't hear very well. It's a very frustrating process that we don't as public members get to speak during or ask questions when the experts are talking. The other problem is that the report is a thousand pages and people can't print out a thousand pages to be able to review it. Especially color copies. There are really some significant environmental justice issues regarding access to the CAB and access to be able to make inform public.”

With no further public comment, Mr. Pacheco closed public comment at 4:08 p.m.

XII. Adjournment

Mr. Grindstaff stated that on February 5, 2025, the Public Outreach Subcommittee will meet at 8:30 a.m., Consent Order Subcommittee at 10:00 a.m. and the Risk Evaluation and Management Subcommittee at 1:00 p.m. On February 12th a Combined Subcommittee meeting will take place via Webex at 1:00 p.m. The presentation for that meeting will be on the budget process. The next NNMCAB meeting is scheduled for March 19th, at the Cities of Gold Hotel. Ms. Maestas is currently looking into dates for a WIPP tour. The Environmental Management Cleanup Forum is scheduled at the SALA Event Center on January 29, 2025.

With no additional business to discuss, Mr. Grindstaff adjourned the meeting at 4:13 p.m.

Certified By:

03/10/2025

Mr. Patricio Pacheco, Chair

***Minutes prepared by Yolanda Valdez, Executive Assistant, NNMCAB**

Attachments

1. **Final NNMCAB Meeting Agenda for 1/28/2025**
2. **Presentation Introduction by Jessica Kunkle, EM-LA, "Hexavalent Chromium Project Expert Technical Review"**
3. **Presentation by Dr. Inez Triay Ph.D., "Independent Review of the Chromium Interim Measures Remediation System in Mortandad Canyon Los Alamos, New Mexico"**
4. **EMLA-24-079-4-1 Letter to NMED, "Independent Technical Review of Los Alamos National Laboratory Chromium Interim Measures and Plume Characterization"**
5. **Hexavalent Chromium Project Expert Technical Review Team**
6. **Executive Summary, Independent Review of the Chromium Interim Measures Remediation System in Mortandad Canyon Los Alamos, New Mexico**
7. **Handout, Hexavalent Chromium Fact Sheet**
8. **Handout, Hexavalent Chromium FAQ**

***All NNMCAB meetings are recorded. The written minutes are intended as a synopsis of the meeting.**

Attachments

Northern New Mexico Citizens' Advisory Board
Tuesday, January 28, 2025
Cities of Gold Ballroom
10-A Cities of Gold Road
Santa Fe, NM 87506
1:00 p.m. to 5:15 p.m. (MT)

(Please see WebEx Call-In Information Below)

AGENDA

Time	Action	Presenter
1:00 p.m.	Call to Order	Keith Grindstaff, Deputy Designated Federal Officer
	Welcome and Introductions Overview and Approval of Agenda	Patricio Pacheco, Chair
1:10 p.m.	Old Business	
	a. Update from Chair and Vice-Chair	Patricio and Manny
	b. Update from Subcommittee Chairs	Mark, Beverly and Joseph
	c. Other Items	
1:30 p.m.	New Business	Patricio
	a. Other Items	
1:35 p.m.	Update from NMED	JohnDavid Nance, Hazardous Waste Bureau Chief
2:05 p.m.	Update and Look Ahead from N3B	Brad Smith President and General Manager
2:35 p.m.	Update from EM Los Alamos Field Office	Jessica Kunkle EM-LA Field Office Manager
3:05 p.m.	**Break**	
3:15 p.m.	"Hexavalent Chromium Technical Review Findings"	Dr. Inés Triay Technical Review Team Lead
4:45 p.m.	**Public Comment Period**	
5:00 p.m.	Update from DDFO	Keith
5:15 p.m.	Adjourn	Keith

Meeting number (access code): 2824 788 7728
Meeting password: rXNmwt3Jh54
https://doe.webex.com/doe/j.php?MTID=m480e508f0fda0c836752e1656cec63cd
Join by phone
+1-415-527-5035 US Toll
+1-929-251-9612 USA Toll 2

Hexavalent Chromium Project Expert Technical Review

Jessica Kunkle, Manager, Department of Energy (DOE) Environmental Management Los Alamos Field Office (EM-LA)

JohnDavid Nance, Hazardous Waste Bureau Chief, New Mexico Environment Department (NMED)

January 28, 2025

Hexavalent Chromium Plume

- From 1956-1972, potassium dichromate, with the active ingredient hexavalent chromium, was commonly used as a corrosion inhibitor in power plants worldwide, including at Los Alamos National Laboratory (LANL)
- Plume discovered in 2004—first detection above New Mexico groundwater standard of 50 micrograms per liter
- ~1,000 feet beneath Mortandad & Sandia Canyons at LANL
- Approximately 1 mile long x ½ mile wide

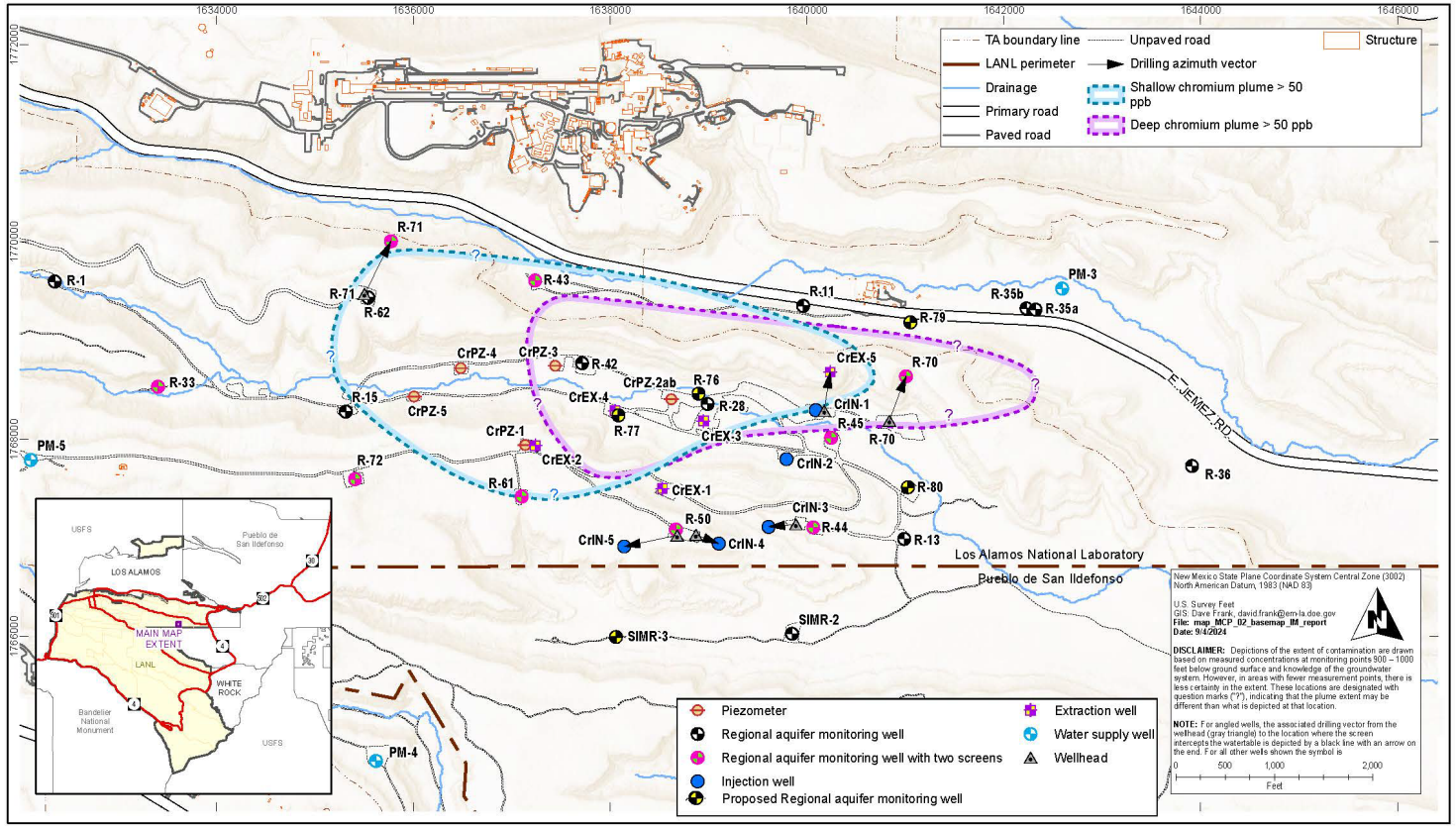
Overlooking top of Mortandad Canyon & operation of Chromium Plume Control Interim Measures

Chromium Plume Control Interim Measures (IM)

- PRIMARY OBJECTIVE: prevent migration of the plume beyond LANL boundary
- Full operation of the IM commenced 2018 (under NMED approved 2015 work plan)
- Hydraulic plume control IM consists of:
  - 5 extraction wells
  - Groundwater treatment system
  - 5 injection wells along downgradient plume edge
  - Over 3 miles of buried conveyance pipelines

IM Operations

- Chromium concentration was increasing in R-45 Screen 2 since installation
- NMED believes use of nearby injection wells may have been forcing contamination deeper into regional aquifer in Eastern area
- March 30, 2023, IM operation was shutdown to comply with NMED direction to cease injection by April 1, 2023
  - Extraction not feasible without injection
- After IM shutdown, chromium concentrations in all but 1 well began rebounding immediately



Collaboration to Engage Expert Technical Review

- Acted on feedback from New Mexico Radioactive & Hazardous Materials Committee
- EM-LA & NMED agreed to evaluate 5 specific topics:

1. Ability of Chromium IM to hydraulically control plume
2. Plume modeling: is the model currently used appropriate
3. NMED's proposed corrective actions & conditions
4. Regulatory: readiness to propose & begin evaluating remedial alternatives
5. Well design

Expert Technical Review

EM-LA & NMED jointly convened a team of experts from the Network of National Laboratories for Environmental Management & Stewardship, industry, academia, & the U.S. EPA, Region 6

Primary recommendation is to restart IM—using a portion of the original system—while other studies & field investigations move forward

EM-LA & NMED will work together to evaluate & prioritize the recommendations from the expert technical review report

EM-LA & NMED will mutually agree on implementation of the recommendations

Status of Chromium Plume Control IM

- EM-LA worked with NMED to resume partial operation of the IM September 30, 2024
- Since mid-November, the IM is running 24/7 at ~70% capacity with 2 extraction wells & 3 injection wells
- EM-LA continues monthly sampling

Independent Review of the Chromium Interim Measures Remediation System in Mortandad Canyon Los Alamos, New Mexico

Vedat Batu, PhD, P.E.
Fred Day-Lewis, PhD
Inci Demirkanli, PhD
J.F. Devlin, PhD
Scott Ellinger, M.S. P.G.
J. Alexandra Hakala, PhD
Brian B. Looney, PhD
Charles J. Newell, PhD, P.E., BCEE
Sorab Panday, PhD
Mark J. Rigali, PhD
Daniel B. Stephens, PhD
Matthew Tonkin, PhD
Ines Triay, PhD
Haruko Wainwright, PhD
David Wilson, MS, P.E.

December 2024

Review Panel Charge Questions:

1. Chromium Plume Control Interim Measure Hydraulic Control
2. Chromium Plume Modeling
3. NMED Ground Water Quality Bureau Acceptable Corrective Actions and Conditions in September 6, 2023 Letter Appendix A Proposal
4. Regulatory Matters
5. Well Design

Summary of Findings and Recommendations

Questions 1. Chromium Plume Control Interim Measure Hydraulic Control and 3. NMED Ground Water Quality Bureau Acceptable Corrective Actions and Conditions in September 6, 2023 Letter Appendix A Proposal (Figures 2-2, 3-1, 3-7, and 3-27)

- The IM, at a limited and/or altered capacity, should be restarted as soon as possible.

- The historical configuration and operation of the IM extraction and injection wells likely resulted in incomplete hydraulic containment of the chromium plume.
- The IM needs to be operated in a revised configuration while further analyses improve the remedy.
- Greater effort is needed to obtain consensus on the characterization, modeling, and remediation of the chromium contamination.
- To transition from a limited start-up of the IM to expanded operations, alternative configurations should be considered that may include alternative treated water disposal options.

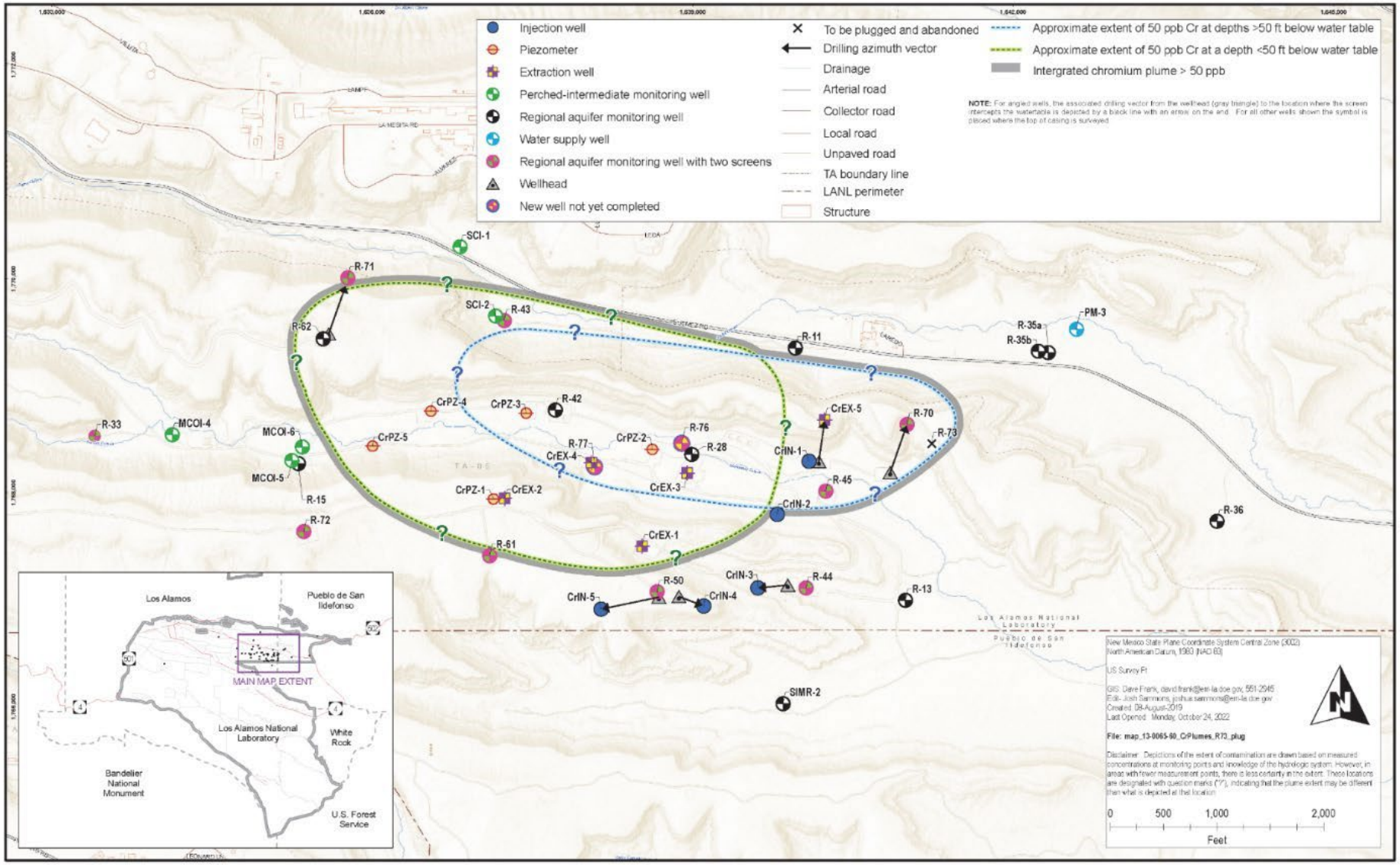


Figure 2-2. Estimated extents of chromium plume showing monitoring wells, extraction wells (CrEX-1 thru CrEX-5) and injection wells (CrIN-1 thru CrIN-5) and extent of chromium in groundwater as estimated by LANL (2019).

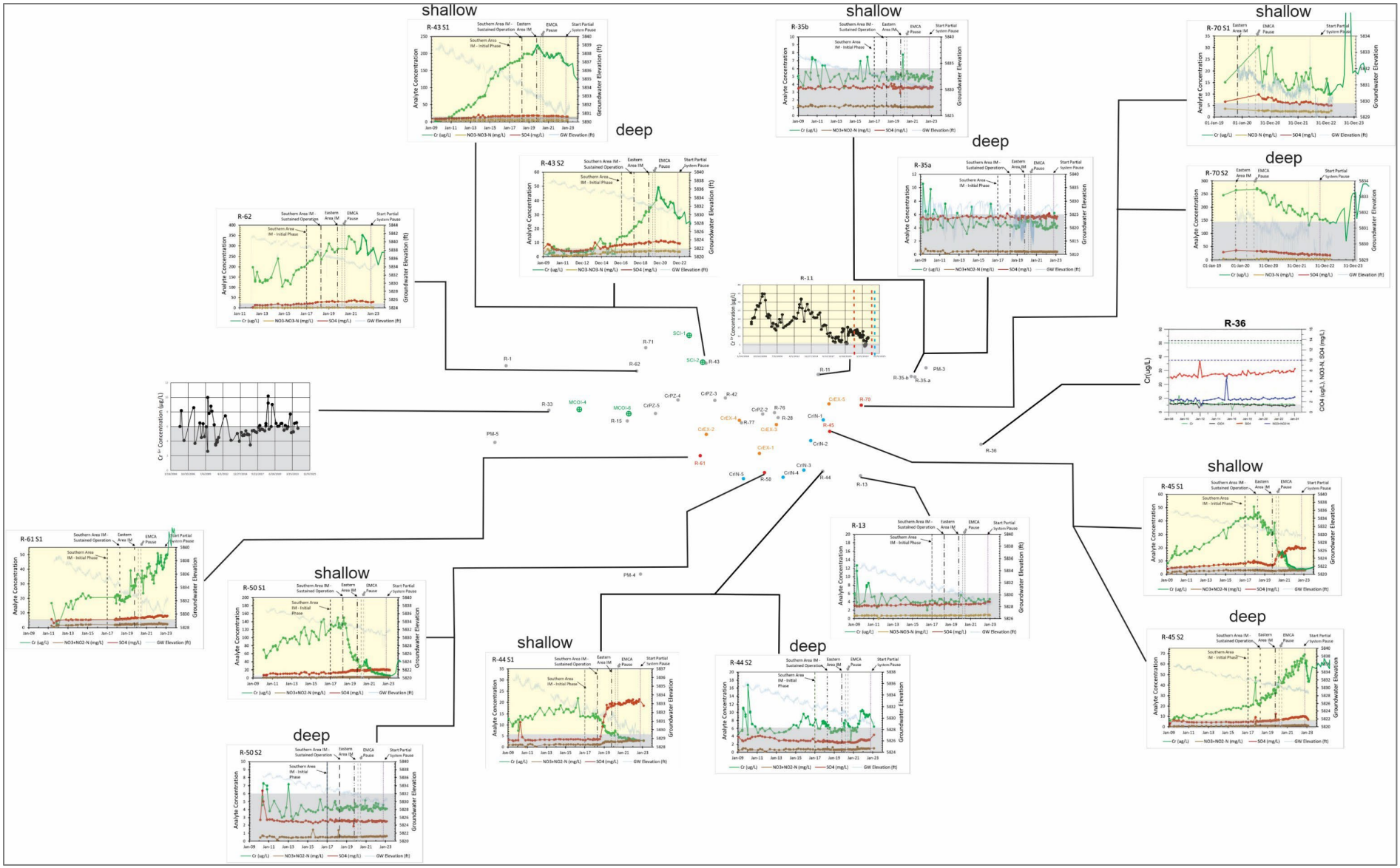


Figure 3-1. Time-series concentrations of chromium (green), nitrate (brown), and sulfate (red) at perimeter monitoring wells in the plume area. The figures were taken from Neptune (2023) with selected locations appended to March 2024 from file Time-Series Quarterly Plots_FYQ1_020724.pptx. Plots highlighted in yellow are those with persistent chromium concentrations above background (~6 µg/L).

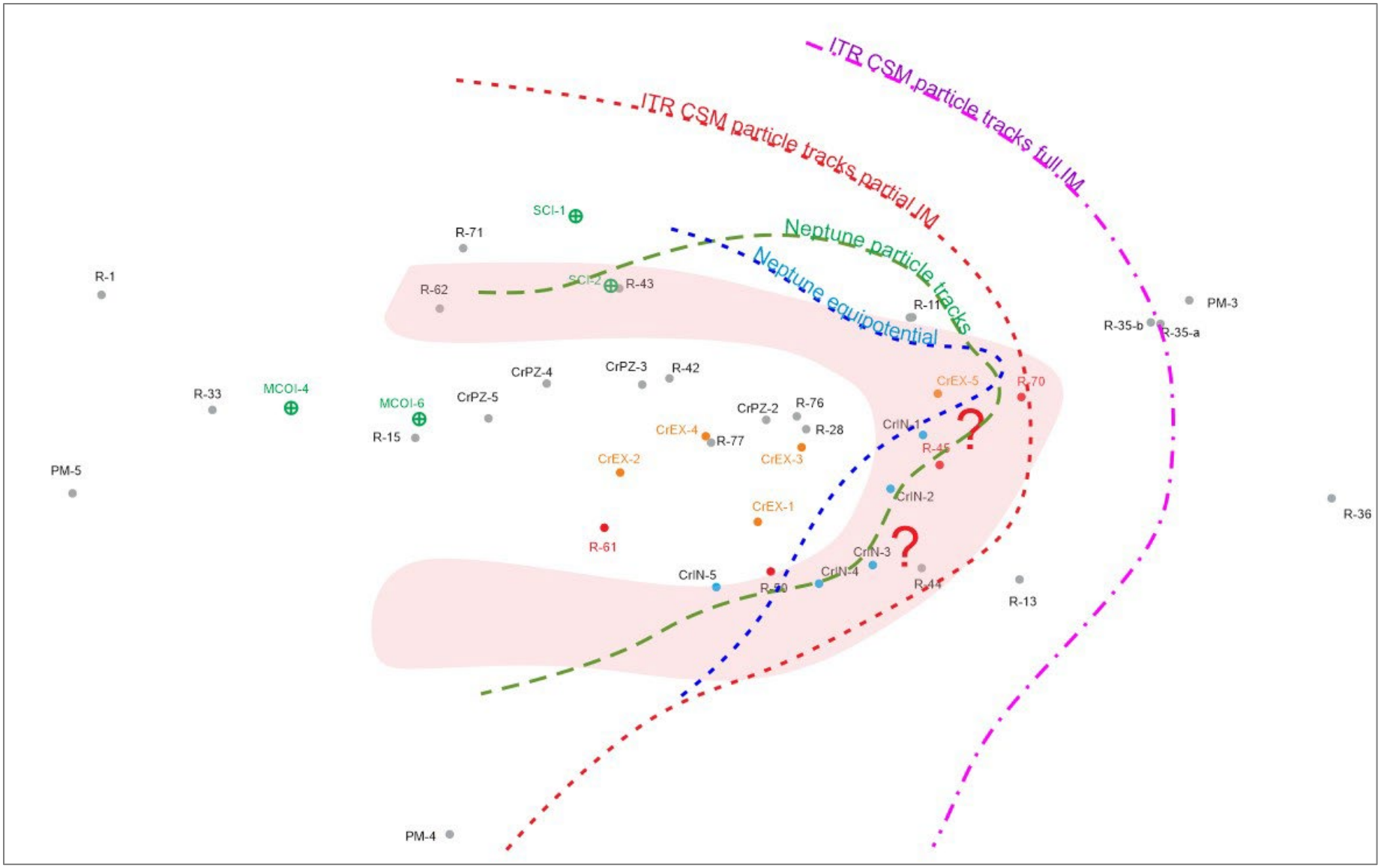


Figure 3-7. Comparison of effective capture zones, in plan view, inferred in Figure 3-4 (red shaded area) and from two-dimensional models simulating full IM operation (purple line) and partial IM operation with two extraction and two injection wells (red line). Also shown are capture zone limits reported by Neptune (2023) from particle tracking calculations (green line shows capture zone for 50% of particles) and equipotential modeling (blue line, based on hand-drawn contours inferred from three-point problems of hydraulic head). The location of the capture zone boundary with respect to R-70 is in question for all but the two-dimensional, full IM model simulation. The capture zone in that case is only roughly estimated, and should not be regarded as highly accurate. Nonetheless, it suggests a meaningful expansion of the capture zone between partial and full IM operation.

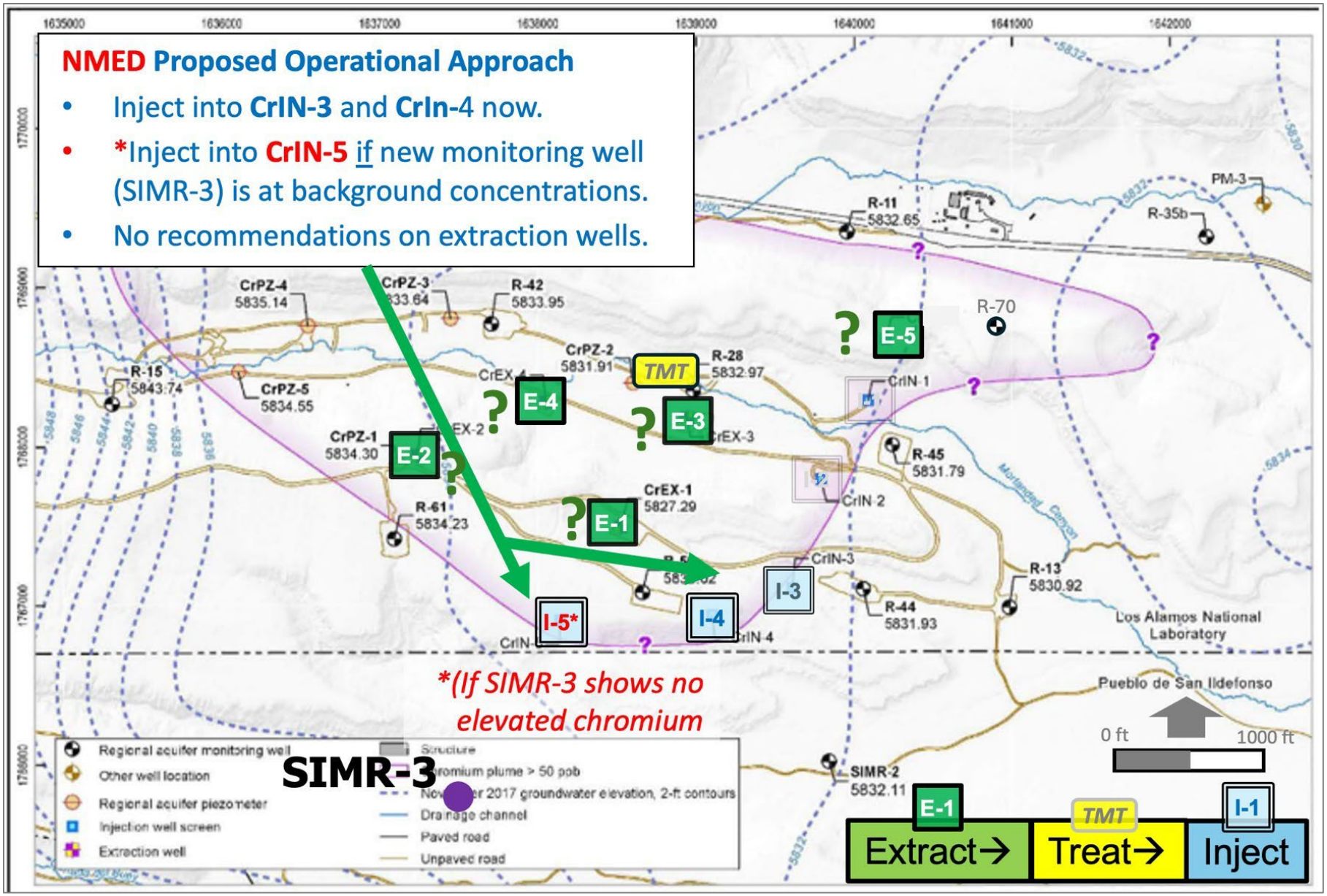


Figure 3-27. NMED's proposed interim measure restart configuration (Letter #3).

Question 2. Chromium Plume Modeling (Figure 3-19A and Table 3-2)

- Certain aspects of the conceptual site model (CSM) should be reevaluated. In particular, the following should be reassessed:
  - Role of stratigraphy and property contrasts between major hydrostratigraphic units (HSUs) on model design, lateral and vertical hydraulic containment, and contaminant fate and transport.
  - Evaluation of the site-wide measured and estimated horizontal hydraulic conductivity (KK_h) and vertical hydraulic conductivity (KK_{vv}) values. This evaluation will require understanding to a depth substantially greater than the depth of the plume, including the depths of the PM-series wells.
  - Causes of relatively small (flat) horizontal hydraulic gradient and significance of the notable downward vertical gradients in the IM area.
  - Role of the nearby water supply wells in vertical gradients and lateral and vertical plume migration and spread.
  - Further investigation of potential vadose zone sources of Cr(VI) contributing to the groundwater plume and their impacts through alternative conceptualization of location of fluxes and their time-dependent contributions.
- Transition to a groundwater flow and transport simulator (e.g., MODFLOW-6) that has a wider user community with well-established application areas.

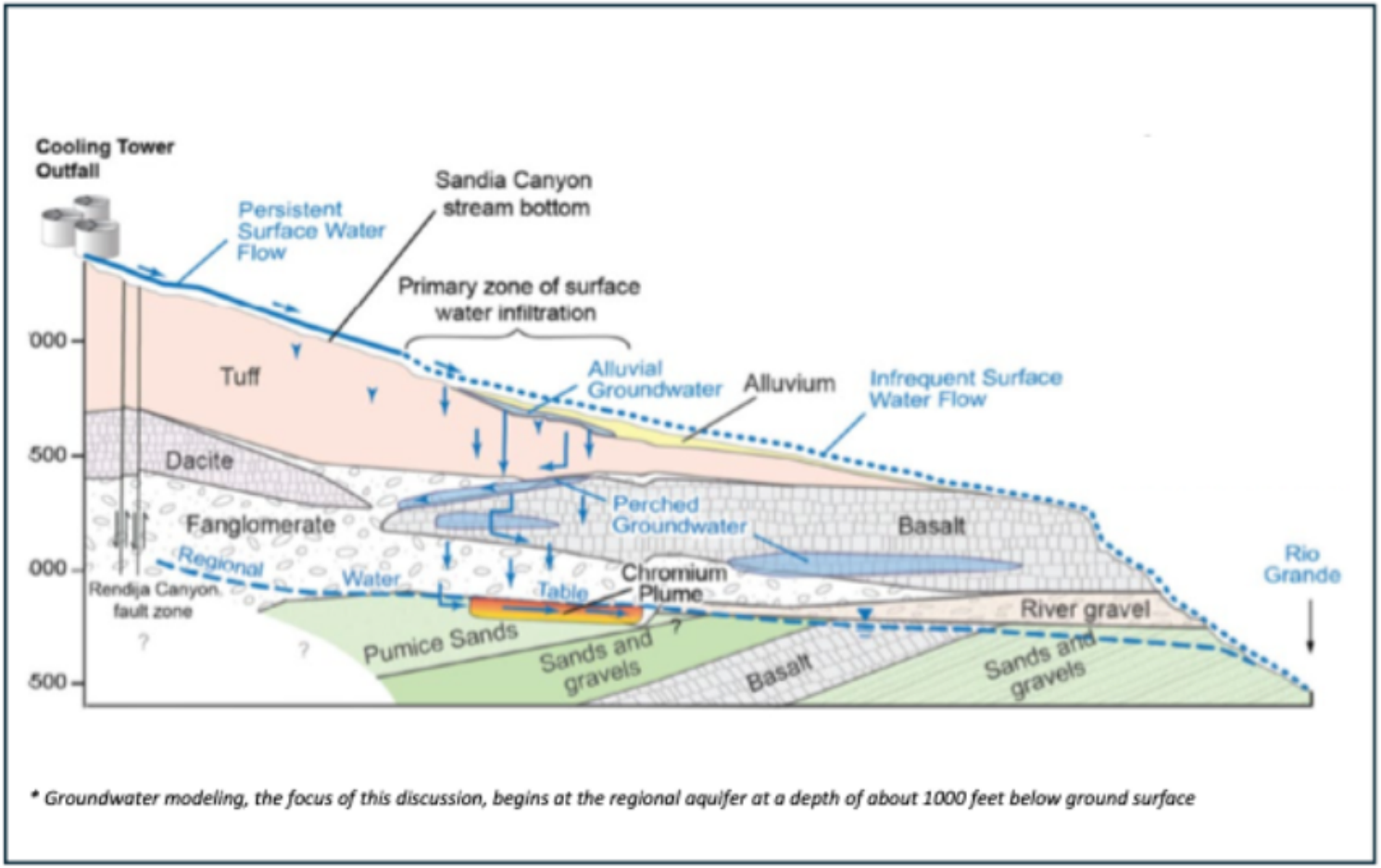


Figure 3-19A. Schematic hydrogeologic conceptual site model (CSM) for site modeling purposes: Full section.

	Code / Code Family	Most recent release (VERSION, YEAR)	Dimensions	Fluid Flow								Material Transport										Heat Transport					Deformation			Discretization		Parallel Computing	Preprocessor	Manual			Operating System(s)		Status				Comments	Ref.
				Surface Flow	Richards eqn (VS)	Water	Air	Water Vapor	NAPL	Density Flow	Compressibility	Viscosity	Advection	Dispersion/Diffusion	Adsorption	Dissolution	Precipitation	Volatilization	Ion Exchange	Chemical Reaction	Decay	Discrete fracture flow/transport	Dual domain/dual-porosity	Advection	Conduction	Eradiation	Heat Exchange	Phase-Transfer	Elastic	Inelastic	Coupled Flow	Spatial	Temporal			Theoretical	Operating	V&V	UNIX	Windows/DOS	Proprietary ($)	Freeware	Open-source	License needed?		
Modflow/MT3D	Modflow USG "Flow"	V1.5, 2019	3D	X	X	X																								unstructured	FI		?	X	X		X	X		X	X			1
	Modflow USG "Transport"	V1.10.0, 2022	3D	X	X	X				X			X	X	X								X	X							unstructured	varying, user-def.	?		X	X		X	X		X	X			2
	Modflow USG with PHREEQ		3D		X																																							3
	Modflow 6	V6.3.0, 2022	3D	X		X				X																					variable	FI		?	X	X		X	X		X	X			4
	Modflow 2000	?, 2000	3D	X		X																						X	X	X	IFDM	FI		X	X	X		X	X		X	X			5
	MT3D-USGS	V1.0.1, 2019	3D			X				X			X	X	X					X	X		X								IFDM	FI			X	X	X	X	X		X	X			6
National Labs	STOMP	?	3D		X	X	X	X	X**	X	X	X	X	X	X	X		X			X			X	X			X				IFDM	FI		X	X	X	X	X				X	Capabilities require customized builds/compilation	7
	Parflow+Crunch	V?, 2015	3D	X	X	X							X	X	?	?	?	?	?	X	?			?	?							?	?	X	?	X			X	X		X	X		Paywalled journal article	8
	Tough 2	V2, 1999	3D		X	X	X	X	X	X	X	X	X	X	X	X		X			X	X		X	X			X				IFDM	FI	X		X			?	X		X	X			9
	Tough 3	V1, 2018	3D		X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X			X				IFDM	FI	X	X	X			?	?		X	X			10
	FEHM	V3.4, 2019	3D		X	X	X	X			X	X	X	X	X	X				X	X		X	X	X	X	X					IFDM	FI			X	X	X	X	X		X	X	?		11
	JOINT LAB CODE (Name?)		3D																																										12
Propr.	Feflow	V7.5, 2022	3D		?	X							X	X	?	?	?	?	?	X	X	?		?	?	?	?	?	?	X	?	?	?			X	X	X				X		13
	Modflow-Surfact*	V4, 2018	3D	?	X	X			X	X			X	X	?	?	?			X		X	X									varying	varying			X	X		?	?	X			X		14
	Eclipse	V?, 2014	3D		X				?	?	?	?	?	?	?	?				X		X	X									?	?	?	?			?	?	X			X		15
	UTCHEM	V9, 2000	3D			X	X	?	X**	?	X	X	X	X	X	X	X		X	X	X		X		X		?					varying	varying				X		?	X	X				Included with Aquaveo's GMS. No stand alone source found	16
Other	MAGNAS	V3, 1993	3D			X			X																										?	?	?	?	?	?	?	?	?	No code source or documentation located	17

Table 3-2. Comparison of Modeling Platforms

Question 4. Regulatory Matters

- Implement an adaptive site management (ASM) strategy.
- Many of the recommendations developed by the IRT would benefit from close collaboration between DOE-EM-LA, NMED, and other stakeholders.

Question 5. Well Design (Table 3-3)

- Chromium investigation and remediation efforts would benefit from more rapid and cost-effective drilling and well installation procedures. To facilitate this, the IRT recommends:

- Using coated bentonite granules below the water table (ending just above the capillary fringe) and then using cement throughout the entire vadose zone. Uncoated bentonite granules would be an appropriate alternative to cement for the vadose zone due to their ability to swell in the presence of perched water.
- It would be enormously beneficial if the New Mexico Office of the State Engineer (OSE) would permit dual-screen monitoring wells to be constructed.

Table 3-3. Key Characteristics of Potential Annular Sealants for LANL Wells

	Cement	Cement with Bentonite	Bentonite Slurry	Uncoated Bentonite Chips	Uncoated Bentonite Granules	Coated Bentonite Granules
performance in groundwater zone	✹	✹	◎	◎	○	✹
performance in vadose zone	○	◎	◎	◎	○	◎
geochemical impacts (nominal)	✹	✹	✹	✹	✹	✹
deployment logistics						
field logistics	✹	✹	○	○	✹	✹
tremie logistics	✹	✹	✹	○	✹	✹
tagging logistics	○	○	○	✹	✹	✹
timing logistics (groundwater zone)	○	○	○	◎	◎	○
Resilience (e.g., self-healing) in perched vadose interval	◎	○	○	○	○	○
potential for adverse collateral impacts						
Geochemical impacts (incursion into screen zone)	◎	◎	○	○	○	○
leaking/cracking risks (groundwater zone)	✹	✹	✹	○	○	✹
leaking/cracking risks (vadose zone)	○	◎	◎	○	○	○

key -->	✹	= good
	○	= acceptable
	◎	= poor

EMLA-24-079-4-1 Date: December 19, 2023

Dr. Inés Triay
Interim Dean
College of Engineering & Computing
Florida International University
10555 West Flagler Street
Engineering Center Suite 2100
Miami Florida 33174

Subject: Independent Technical Review of Los Alamos National Laboratory Chromium Interim Measures and Plume Characterization

Dear Dr. Triay:

We request you organize and conduct an independent technical review of actions taken by the Department of Energy Office of Environmental Management Los Alamos Field Office (EM-LA) to characterize and model the hexavalent chromium plume at the Los Alamos National Laboratory (LANL) and the efficacy of Chromium Plume Control Interim Measures (IM) taken to prevent plume migration offsite. The purpose of this review is to assess IM control of the plume, plume modeling, additional proposed corrective actions cited in the New Mexico Environment Department (NMED) letter of September 6, 2023, project readiness to propose a remedy and monitoring well design within the chromium plume.

This independent technical review should respond to the following questions:

1. Chromium Plume Control Interim Measure Hydraulic Control: Do groundwater data and modeling results demonstrate that operation of the IM, as originally approved and in full operation, hydraulically control the plume. Is there assurance that existing injection locations are outside the current 50 micrograms-per-liter or parts-per-billion plume boundary? To what extent are the increasing chromium concentration trends in R-45 S2 and R-61 the result of an adverse impact of current injection locations? Will the current IM be protective of the environment until a remedial alternative is selected and implemented? If not, what are the recommendations for maintaining hydraulic control?

2. Chromium Plume modeling: Is the software currently used to model the chromium plume [Finite Element Heat and Mass (FEHM)] at LANL appropriate? Are modeling assumptions, inputs, and results reasonable and defensible? Are there technical issues or data gaps that significantly impair the project's or the regulator's ability to use the model results when making operational or regulatory decisions? To what extent can the modeling be relied upon (e.g., predictions) without the data gaps being fully closed? What limitations should be considered when using the model before the known data gaps are filled? What aspects of the existing model are sufficiently mature to predict future

plume behavior, and what recommendation(s) does the team have to improve the model's ability to predict future plume behavior (e.g., aquifer test versus slug test)?

3. NMED Groundwater Quality Bureau Acceptable Corrective Actions and Conditions in September 6, 2023, letter (Enclosure) Appendix A Proposal: Are the proposed Appendix A conditions appropriate as part of the IM or more suited for remedy selection? Has a technical basis been established that demonstrates the existing extraction wells alone would control plume migration if the IM were modified for use of an alternative injection location that did not provide hydraulic control? What are the team's recommendations for considering alternative injection locations?

4. Regulatory: Is the current chromium plume characterization consistent with industry practices and EPA guidance for the maturity and understanding necessary to propose and begin evaluating potential remedial alternatives (i.e., conducting a corrective measures evaluation and Corrective Measures Evaluation Report)? Has the project defined the needed data and uncertainties for designing a remedy (e.g., Corrective Measures Implementation Plan [CMIP])? Which data gaps need to be closed, if any, before completing the comparison of the potential remedial alternatives? Is use of an adaptive management strategy as a component of a final remedy appropriate? If so, how is regulatory oversight preserved during the CMIP phase as design evolves due to emerging information? Under what circumstances is it more favorable to apply an adaptive management strategy to interim measures vice the remedy itself?

5. Well Design: Do the monitoring wells constructed with bentonite in the chromium plume region demonstrate a seal between the screened intervals in the dual-screened monitoring wells that is adequate to ensure the prevention of commingling or inter-aquifer exchanges between the separate hydrogeologic units in the plume area? Are there alternatives to bentonite that can be used to seal chromium monitoring wells at LANL that will not negatively impact or alter groundwater chemistry (e.g., cement in lieu of bentonite)?

Thank you for agreeing to serve as the lead for this independent technical review. Ms. Cheryl Rodriguez will serve as the EM-LA point of contact and Messrs. John Rhoderick and Rick Shean will serve as the NMED point of contact for this review. When the independent team of experts has finished its independent review, please engage with EM-LA and NMED to lead technical discussions of the team's independent findings/conclusions to help us resolve our differing professional opinions. We would appreciate receiving the independent team's report within 60 days of the conclusion of those discussions.

If you have any questions, please contact Cheryl Rodriguez, Director, Office of Cleanup Execution, EM-LA at (505) 414-0450 (cheryl.rodriguez@em.doe.gov) or Rick Shean, Director, Resource Protection Division, NMED at (505) 629-6494 (rick.shean@env.nm.gov).

Sincerely,

Michael A. Mikolanis
Digitally signed by Michael A. Mikolanis
Date: 2023.12.14 14:29:35 -07'00'

Michael A. Mikolanis
Manager
Department of Energy
Environmental Management
Los Alamos Field Office

John Rhoderick
Digitally signed by John Rhoderick
Date: 2023.12.19 09:31:37 -07'00'

John Rhoderick
Director
Water Protection Division
New Mexico Environment Department

Rick Shean
Digitally signed by Rick Shean
Date: 2023.12.15 08:52:32 -07'00'

Rick Shean
Director
Resource Protection Division
New Mexico Environment Department

Enclosure:
1. New Mexico Environment Department Letter, Subject: *Corrective action under DP-1835 associated with the chromium plume*, dated: September 6, 2023

cc:
R. Martinez, San Ildefonso Pueblo, NM
J. Ball, NMED-GWQB
J. Herman, NMED-GWQB
M. Sandoval, NMED-GWQB
A. Romero, NMED-GWQB
N. Dhawan, NMED-HWB
S. Yanicak, NMED-OB
Chandler, Sarah, DOE EM-LA
Evans, John, DOE EM-LA
Gilbertson, S. Elizabeth, DOE EM-LA
Harcek, Brian, DOE EM-LA
McCrory, Thomas, DOE EM-LA
Mikolanis, Michael, DOE EM-LA
Ritchey, Joe, DOE EM-LA
Rodriguez, Cheryl, DOE EM-LA
Wacaster, Sue, DOE EM-LA
Shen, Hai, DOE EM-LA
Vargas, Miquela, DOE EM-LA
Wacaster, Susan, DOE EM-LA
Zhu, Ming, DOE EM
S. Hoffman, DOE NA-LA
J. Payne, LANL
Aguilar, Felicia, N3B

Alexander, William, N3B
Diehl, David, N3B
Erickson, Michael, N3B
Maupin, Christian, N3B
Rodriguez, Vince, N3B
Short, Clark, N3B
Smith, Bardley, N3B
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September 6, 2023

VIA EMAIL

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RE: Corrective action under DP-1835 associated with the chromium plume

Dear Messrs. Mikolanis and Duran:

The New Mexico Environment Department (NMED), including both the Groundwater Quality Bureau (GWQB) and Hazardous Waste Bureau (HWB), has no more pressing mission than to protect the health of all New Mexicans. The gravity of our responsibility is clearly illustrated by our ongoing efforts to protect the drinking water of those surrounding the Los Alamos National Laboratory (LANL). As an agency driven and directed by science, we seek the greatest possible clarity in understanding how our actions and those of regulated entities will impact the people and environment of our State. To that end, we seek a path forward with you that will further our shared goal of protecting public health through collaborative decision-making while maintaining our clear roles as permittee and regulator, respectively.

Since December of 2022, LANL and NMED have discussed the impacts of injection on downgradient wells, ceasing injection at the location and spreading of the chromium plume. Throughout the corrective action process, LANL has expressed that treated ground water can only be disposed of by injecting into existing injection wells, a position with which NMED disagrees.

Recognizing the gravity of the situation, the risks to groundwater safety, and the urgent need to take immediate action, the GWQB is taking the extraordinary step, one that GWQB rarely takes, of identifying an acceptable corrective action path forward (see Appendix A). NMED, including GWQB and HWB, feel this path is supported by the best available science and will allow us to take the action necessary to protect the regional aquifer. We hope LANL will take this opportunity to submit a revised Corrective Action Plan (CAP) to NMED including the actions identified in Appendix A (20.6.2.3107 (A)(10) NMAC). This matter is of utmost urgency and your immediate response will reflect your understanding of the importance of submitting and

implementing a revised CAP as soon as possible.

The Hazardous Waste Bureau (HWB) fully supports the corrective action path provided in this letter and Appendix A.

To continue to expedite corrective action, NMED would like LANL to identify and retain an independent mediator to facilitate such technical discussions as soon as possible. The use of an independent mediator was recently recommended by the Government Accountability Office and endorsed by the New Mexico legislators at the August 21, 2023, Radioactive and Hazardous Waste Interim Legislative Committee (RHW) meeting. We believe working together in conjunction with a third-party mediator will clarify the technical discussions and open both parties to new ideas to protect the environment and public health of this historic community, a goal we both share. We look forward to meeting within the next several weeks to collaboratively discuss the path forward for corrective action alternatives. Please contract with a third-party mediator and provide a copy of the contract prior to our meeting.

Further, it is in the best interest of the U.S. Department of Energy (DOE) to renegotiate a functional and effective consent order governing the clean-up of LANL, including the chromium plume. As Mr. Mikolanis stated in his response to Representative Christine Chandler's line of questioning related to available funding and changes to the interim measure addressing the chromium plume at the August 21, 2023 Radioactive and Hazardous Waste Interim Legislative Committee meeting, "…we have the money to operate the system and we have the money to move into a remedy...that consent order does not envision an 'amping up' of the chromium interim measure to something different. That would be a change to the consent order and that is not within my authority…" The fact that LANL has stated the 2016 consent order is an impediment to more aggressive clean-up is precisely why the U.S. DOE Environmental Management leadership in Washington, DC must renegotiate a new consent order.

Please note that nothing in this letter or Appendix A shall be construed as relieving the Permittees of the obligation to comply with all requirements of DP-1835 and all other applicable state and federal laws, regulations, permits, and orders.

If you have any questions, please contact Justin Ball, GWQB Chief, at (505) 231-3773 or Ricardo Maestas, HWB Chief, at 505-690-6148.

Sincerely,

John Rhoderick Digitally signed by John Rhoderick Date: 2023.09.06 11:46:25 -06'00'

John Rhoderick, Director
Water Protection Division
New Mexico Environment Department

Rick Shean Digitally signed by Rick Shean Date: 2023.09.06 11:43:15 -06'00'

Rick Shean, Director
Resource Protection Division
New Mexico Environment Department

JB: JH

Enc: GWQB Acceptable Corrective Actions

cc: Rep. Joanne J. Ferrary
Sen. Jeff Steinborn
Rep. Eliseo Lee Alcon
Rep. Cathrynn N. Brown
Rep. Christine Chandler
Sen. David M. Gallegos
Rep. Stefani Lord
Sen. Brenda G. McKenna
Sen. Shannon D. Pinto
Sen. Nancy Rodriguez
Sen. Joshua A. Sanchez
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L. King, US EPA R6
J. Payne, LANL
S. Hoffman, NA-LA
C. Rodriguez, EM-LA
C. Maupin, N3B

GWQB Acceptable Corrective Actions

DP-1835

NMED would accept restart of injection for a period of 12 months based on implementation of the following actions by LANL in a revised CAP (20.6.2.3107 (A)(10) NMAC):

1. During a one-year temporary recommencement of injections, LANL will develop, install, and operate an alternative disposal location for injection of treated water.
    a. The alternative disposal location must be designed to be able to dispose of the full amount of water intended to be extracted.
    b. The alternative disposal location must be outside of the plume and not hydrologically affect the plume. Outside of the plume will be defined as 1200 feet from the outer boundary of an area where the plume is well-defined as indicated by data.
    c. The alternative disposal location can be used on an ongoing basis to inject treated water as an alternative to injecting into CRINs 1-5.

2. LANL/DOE recommences injection into CRINs 3 and 4 for a maximum of one-year.
    a. During the one-year temporary recommencement of injection, with the approval and oversite of the Pueblo of San Ildefonso, LANL will install and sample SIMR 3 on San Ildefonso land.
        i. If SIMR 3 sampling shows any evidence of levels of Chromium above background, LANL will cease injections immediately.
        ii. If SIMR 3 sampling does not show any evidence of Chromium contamination, LANL may continue injection into CRINs 3 and 4 and may commence injection into CRIN-5.
    b. No injections may recommence into CRINs 1 and 2 until R-80 is installed, sampled, and evaluated. Additional wells or analysis may be required to make any determination on the effects of CRINs 1 and 2 on nearby wells.
        i. If data shows that R-45 Screen 2 will continue to be impacted by injections into CRINs 1 and 2, those injections will remain paused.
        ii. If hard data shows that R-45 Screen 2 will not be impacted further by injections into CRIN-1 or CRIN-2, LANL may commence injection into one, the other, or both

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Independent Review of the Chromium Interim Measures Remediation System in Mortandad Canyon Los Alamos, New Mexico

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December 2024

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Executive Summary

In 2004, sampling of a monitoring well revealed chromium at concentrations exceeding the 50 parts per billion (ppb) State of New Mexico water quality standard in groundwater beneath a portion of Mortandad Canyon in Los Alamos, New Mexico. The subsequent investigation and cleanup efforts have been regulated since 2016 under a Resource Conservation and Recovery Act (RCRA) Corrective Action Order from the New Mexico Environment Department (NMED) Hazardous Waste Bureau. The U.S. Department of Energy (DOE) Office of Environmental Management Los Alamos Field Office (DOE-EM-LA) is responsible for oversight of the prime contractors implementing the investigation and cleanup, including interim measures (IM) that have been taken to mitigate plume migration until a final remedy is implemented.

The current IM is a groundwater pump-and-treat (P&T) hydraulic control measure together with chromium mass recovery, currently consisting of five extraction wells located in the center of the plume and five injection wells located on the south and east margins of the plume. Contaminated water recovered from the five extraction wells is treated before reinjection. The injection aims to create a hydraulic barrier such that the plume will not cross the Pueblo de San Ildefonso lands boundary to the south. A discharge permit for treated water injection was issued by the NMED Ground Water Quality Bureau (GWQB). The IM system began partial operations in 2017, and ramped up to full capacity in 2018.

In March 2023 during IM operations, unanticipated increases in chromium concentrations in two monitoring wells, as well as the discovery of contamination deeper than expected, caused NMED to issue an order to stop injection until DOE-EM-LA could ensure that chromium was not migrating beyond hydraulic control at concentrations above the 50 ppb standard. From September 2023 to March 2024, an exchange of correspondence took place between NMED and DOE-EM-LA to discuss restarting the IM, without resolution. DOE-EM-LA and NMED then agreed to convene an independent panel of 15 experts (the Independent Review Team [IRT]) to assess the issues in dispute and recommend possible solutions. The parties developed specific questions for the IRT to address and grouped them into five topics: (1) the performance of the IM in achieving hydraulic control of the chromium plume, (2) the modeling of the chromium plume, (3) the corrective actions proposed by NMED, (4) regulatory matters, and (5) well design issues. Each of these topics is summarized in the following paragraphs. The IRT was provided two days of briefings and a site tour in March 2024. This report represents the combined efforts of the IRT in answering the questions posed.

The first topic was chromium plume control by IM operation. The horizontal and vertical extents of chromium have been the subjects of several years of investigation, and although understanding is growing, at this time the plume is not sufficiently characterized to design a final remedy. It is also difficult to fully address the success of hydraulic containment when the plume boundaries are not yet confidently defined in some areas, and when there is some potential as inferred by the IRT that operation of the IM may increase downward migration potential in some areas. Nevertheless, during IM operations, the chromium plume appeared to shift northward (i.e., toward the extraction wells and away from the Pueblo de San Ildefonso lands boundary) and, over much of the plume, chromium concentrations declined during IM operations due—at

least in part—to the successful recovery of substantial chromium mass. Therefore, though the ability of the IM system to capture all the chromium during operations and prevent further migration on the east side is not clear, it *is* clear that chromium concentrations increased significantly in some wells following IM shutdown, including in the easternmost monitoring well where chromium was detected (R-70). The rate of chromium plume expansion with the IM turned off could be on the order of hundreds of feet per year in some places. Therefore, increasing areas and regions of the aquifer appear to be impacted following the cessation of the IM pumping, bringing a sense of urgency to renewing the IM abatement procedures. For this reason, *the single most important recommendation of the IRT is to restart the IM*—using a portion of the original system—while other studies and field investigations move forward.

The second topic was computer modeling of the chromium plume. DOE-EM-LA contractors used a sophisticated computer code referred to as FEHM (Finite Element Heat and Mass) to develop a groundwater model to simulate chromium behavior during and after IM operations. Although the IRT raised concerns regarding the complexity of the analyses that have been undertaken and the use of the FEHM code in preference to more common codes, the IRT has no concerns regarding the technical reliability of the FEHM code itself. Nonetheless, the FEHM code was not originally developed for groundwater simulation and is not widely used by groundwater professionals—including regulators and their consultants—which limits the ability of third parties to review or execute analyses. The IRT therefore recommends that the model be converted to another simulation code—preferably one of the MODFLOW family of codes—which would be equally or better suited to the technical tasks at hand, but also more widely accepted and more transparent to third parties. In addition, the IRT concluded that the chromium plume conceptual site model (CSM) should be revisited and that the numerical model should show improved correspondence with the CSM, including layering and aquifer parameters, with particular emphasis on horizontal and vertical hydraulic conductivities. Data for some aquifer tests were reanalyzed by members of the IRT, and details for these and other analyses are presented in report appendices. Although the IRT expressed concerns with the groundwater model, the IRT believes that the model is, at this time, the best tool for comparative analysis of IM system operational schemes to improve plume capture until an updated, preferably MODFLOW-based, model is implemented.

The third topic is NMED's recommendation for a path forward, as described in Appendix A to their September 6, 2023 letter to DOE-EM-LA. Overall, the IRT finds the NMED proposal reasonable. NMED stated it would accept restarting the IM if certain wells were used for injection while an alternative means of treated water disposal was evaluated. The IRT urges DOE-EM-LA to consider the IRT's concerns related to the computer modeling of the plume going forward. The IRT also urges NMED to be flexible in approving alternate well locations and flow rates that optimize capture without losing containment. The IRT suggests using at least two injection wells and two extraction wells, but also points out that significant modifications and expansion of the existing IM may be needed, especially on the east side of the plume. The IRT fully supports the drilling of the proposed new site characterization 'data gap' monitoring wells while the partial IM is restarted and evaluating options for returning cleaned treated water to the environment to support future groundwater cleanup.

The fourth topic pertains to regulatory matters. In addressing the questions within this topic, the IRT finds that the cleanup process generally follows standard practice. However, data gaps and uncertainties need to be addressed before committing to an alternative or final remedy. These data gaps include (1) improved understanding and representation of the horizontal and vertical extents of chromium contamination and, for any final remedy in particular, (2) improved characterization of the vadose zone sources. The IRT believes that an adaptive management strategy is well suited to guide remediation throughout the project.

The fifth topic is monitoring well design. This issue arose because OSE indicated that it would not approve any permit to drill a monitoring well that was constructed in the same manner as most of the existing IM monitor wells—that is, with dual well screens and bentonite clay seals in the well casing annulus. The IRT finds that the regional aquifer monitoring wells in the IM area function as intended, with no convincing evidence of cross-contamination within the regional aquifer due to drilling or comingling of water between well screens where bentonite has been used in well construction. The IRT recommends that new monitoring wells be constructed so that the casing annulus in the vadose zone is sealed with cement. Coated bentonite granules are recommended to seal the annulus in the regional aquifer. The use of dual-screen monitoring wells, constructed with appropriate supplemental documentation, procedures, and controls, to ensure that any risks of leakage or cross-contamination are mitigated and minimized, would also be beneficial to future plume characterization. The IRT recommends improved communication and coordination between DOE-EM-LA, NMED, and OSE in planning for and constructing additional monitoring wells.

Los Alamos National Laboratory
Hexavalent Chromium Plume Fact Sheet

CAMPAIGN	LOCATION	CONTAMINANT OF CONCERN	PROJECT GOAL
Chromium Interim Measures and Characterization	*Beneath Sandia and Mortandad canyons at Los Alamos National Laboratory (LANL)*	*Hexavalent chromium*	*Conduct IM to prevent migration of plume beyond LANL boundary, obtain data necessary to conduct Corrective Measures Evaluation (CME), and conduct CME*

HISTORY

From 1956 to 1972, workers at a non-nuclear power plant at Los Alamos National Laboratory (LANL) periodically flushed hexavalent chromium-contaminated water from the cooling towers into Sandia Canyon. At the time, potassium dichromate was commonly used as a corrosion inhibitor. The water flowed down Sandia Canyon as surface water, penetrated the underlying rock layers and, over time, seeped into the regional aquifer beneath Sandia and Mortandad canyons. LANL stopped releasing chromium-contaminated water in 1972.

JULY 2023 STATUS

- ✓ Interim measures turned off March 31, 2023, to comply with New Mexico Environment Department (NMED) direction.
- ✓ Evaluating final remediation strategies.

BY THE NUMBERS

50 parts per billion	New Mexico standard for chromium groundwater.
1 mile long x 1/2 mile wide x 100 ft. thick > 50ppb	Approximate size of the hexavalent chromium plume.
900 - 1,000 feet	Depth to the regional aquifer.
37	Number of monitoring, extraction and injection wells installed in and around the plume.
1/4 mile	Approximate distance from the plume edge to the nearest Los Alamos County groundwater well.
0	Amount of chromium contamination in Los Alamos County drinking water wells.
5 miles	Distance (as measured at the surface) of the plume from the Rio Grande.
~500 feet	Approximate distance plume moved away from LANL's boundary with Pueblo de San Ildefonso.

Chromium Plume Draft #11 23.08.29

N3B Los Alamos

Produced by Los Alamos Legacy Cleanup Contractor, N3B Los Alamos, on behalf of DOE's Environmental Management Los Alamos Field Office

CHROMIUM INTERIM MEASURES AT A GLANCE

Interim Measures are used to reduce or prevent migration of site-related contaminants which, have or may result in an unacceptable human or environmental receptor risk while long-term corrective action remedies are evaluated and implemented. In the case of the hexavalent chromium plume, the chromium interim measures combine extraction of contaminated groundwater, above-ground treatment, and injection of treated water to control plume migration, reduce the size of the plume and hold it within the LANL boundary.

WHY IT'S NEEDED

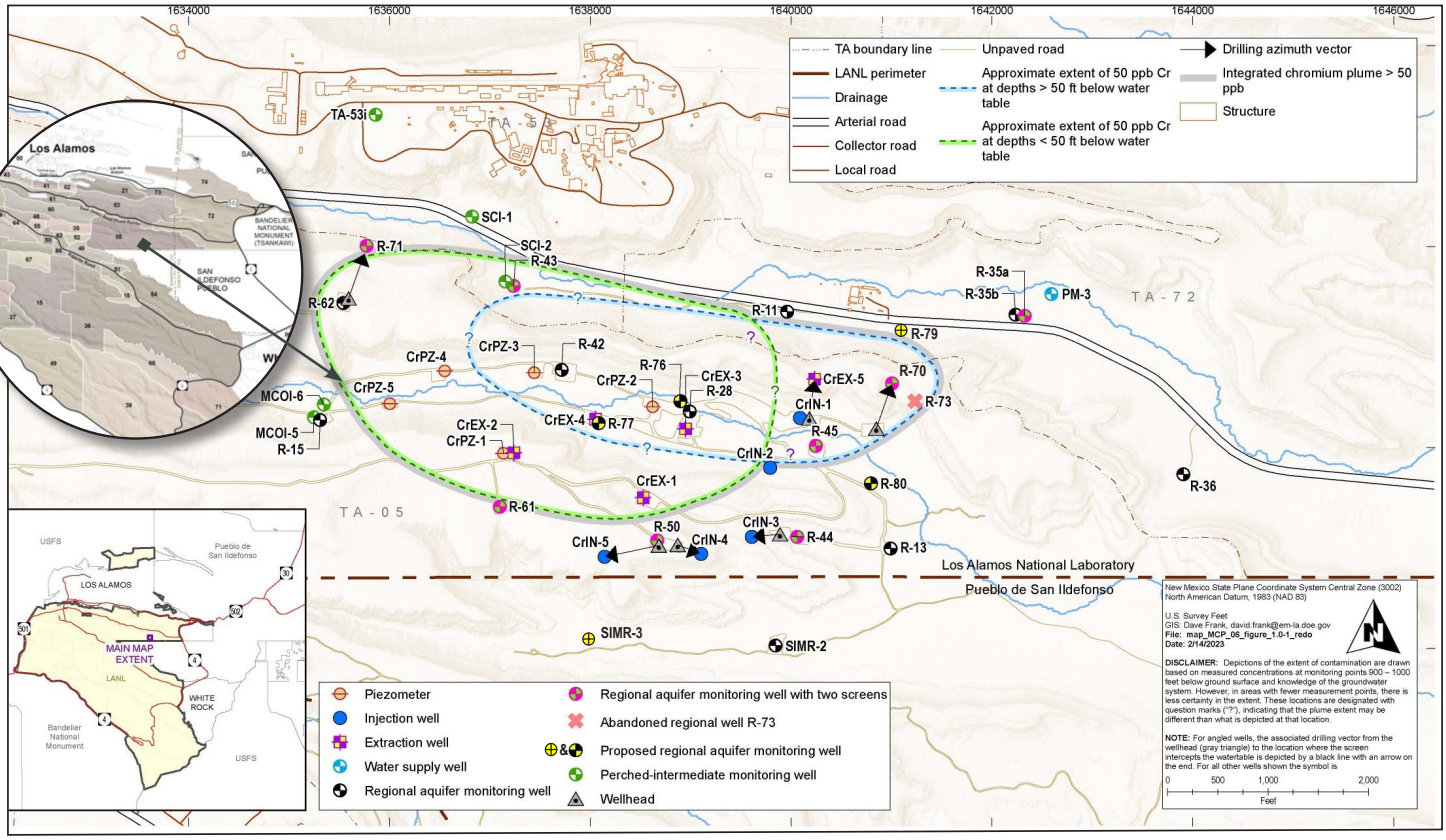
The chromium interim measures approved by NMED are being conducted to mitigate plume growth and reduce the size of the plume.

HOW IT WORKS

Contaminated water is pumped to a central treatment facility via underground piping, treated using ion exchange and then injected along the down-gradient edge of the plume. This recirculation approach has been successful in controlling plume migration.

WHAT'S NEXT

Technical data and analysis shows the chromium interim measures have been successful in controlling plume migration. Long-term corrective action remedies are being evaluated while additional wells are in the planning and permitting process to further define the plume.



FINAL REMEDY

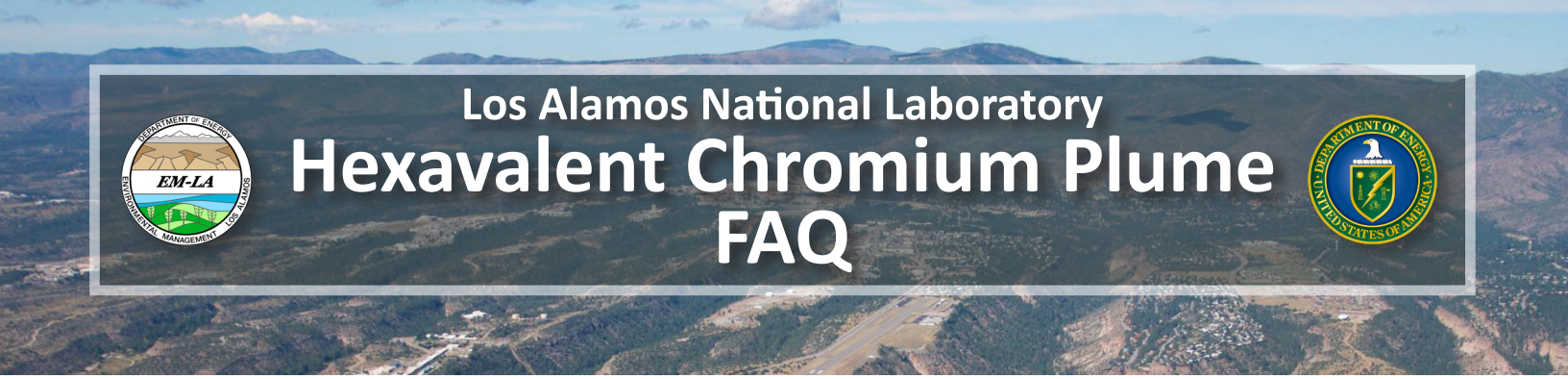
The chromium interim measures have demonstrated success in controlling potential plume migration. The chromium IM methodology is expected to be integrated into the final remediation remedy, which will be determined by NMED and requires public input.

CONTACT DOE Environmental Management Los Alamos Field Office | LegacyCleanupFeedback@em-la.doe.gov

Revised: 8/29/23

Chromium Plume Draft #11 23.08.29

Produced by Los Alamos Legacy Cleanup Contractor, N3B Los Alamos, on behalf of DOE's Environmental Management Los Alamos Field Office



Los Alamos National Laboratory
Hexavalent Chromium Plume FAQ

What is hexavalent chromium?

Chromium is a naturally occurring element found in rocks, soil, volcanic dust, and other sources. It is in several different forms, including trivalent chromium [chromium (III)] and hexavalent chromium [chromium (VI)]. Trivalent chromium is a nutrient found in vegetables, grains, meats, and some dietary supplements. Hexavalent chromium, which is produced through industrial processes, is a known carcinogen. Hexavalent chromium exposure occurs through inhalation, ingestion, or direct contact with the skin.

What is being done to address the hexavalent chromium plume at Los Alamos National Laboratory?

A network of 32 monitoring, extraction and injection wells has been installed in and around the hexavalent chromium plume. These wells and associated infrastructure support efforts to characterize the plume and to prevent the plume's advancement via an Interim Measure (IM). The focus of the IM has been predominately along the Los Alamos National Laboratory (LANL) southern boundary with the Pueblo de San Ildefonso. As of April 2021, the IM is now also operational along the eastern edge of the plume. While the IM is underway, aquifer and plume characterization is being conducted to refine the site conceptual and numerical models that will support development of a final remedy.

What is the status of the plume?

As reported by the Department of Energy (DOE) in various documents, including the semiannual performance monitoring reports, as a result of the IM, the plume along the LANL southern boundary with San Ildefonso, as defined by the New Mexico groundwater standard of 50 parts per billion, has shrunk approximately 500 feet of where it was at the start of the IM in 2018. It is anticipated the IM will have a similar impact along the plume's eastern edge.

Is hexavalent chromium from this plume present in Los Alamos County water-supply wells?

No. Los Alamos County's water-supply wells are located outside the plume. DOE supports the county by supplementing their own monitoring of the water-supply wells. Additionally, two "sentinel" monitoring wells are located between the plume and the nearest downgradient water-supply well. These sentinel wells are sampled monthly and would detect any evidence of plume expansion before it would reach the county's well.

Are there pathways for hexavalent chromium from this plume to contaminate water-supply wells?

The actions of DOE and its cleanup contractor N3B are reducing the footprint of the plume while a permanent remedy is developed. As well, DOE and N3B are working closely with Los Alamos County to ensure that nearby water-supply wells are appropriately monitored so that the county can take action if it were to become necessary. There is no practical way for the chromium contamination to reach the Buckman Well Field, which serves as part of the water supply for the City of Santa Fe and Santa Fe County. The possibility of chromium from the plume reaching the Buckman Well Field is extremely unlikely due in part to the distance of the plume to the well field (five miles) and because of the protective actions being taken to prevent migration and reduce the plume footprint.

FAQ04_Chromium Plume v3 21.06.02

N3B Los Alamos

Produced by Los Alamos Legacy Cleanup Contractor, N3B Los Alamos, on behalf of DOE's Environmental Management Los Alamos Field Office

Is there a possibility hexavalent chromium is being unknowingly drawn into a Los Alamos County water-supply well?

It is extremely unlikely. Additionally, monitoring of sentinel wells located directly upgradient of the nearest county water-supply well would identify chromium that might be migrating towards it. The county's water- supply wells, which are also sampled for chromium on a quarterly basis, show chromium concentrations consistent with naturally occurring levels.

How close is the plume to the boundary with San Ildefonso?

As of May 2021, the southern edge of the plume is currently estimated to be approximately 500 feet from the LANL boundary with the Pueblo de San Ildefonso. At the start of the IM, the plume was approximately at the boundary.

Has the original source of hexavalent chromium contamination been cut off?

Yes. A non-nuclear power plant, the source of the chromium contamination, stopped releasing water with chromium from its cooling towers in 1972. There are no active sources of chromium at LANL.

The hexavalent chromium contamination was discovered in 2004. What has DOE been doing since?

Since the plume was discovered in 2004, wells have been installed to characterize and monitor the plume's behavior. Comprehensive groundwater models have been developed to guide locations of wells and to inform the IM strategy. The wells, treatment system, and several miles of piping necessary for the IM have also been installed. The IM is now fully operational and is underway along the plume's southern edge along the LANL boundary with San Ildefonso and along the plume's eastern edge.

How does the Interim Measure work?

Hexavalent chromium-contaminated groundwater is pumped from the regional aquifer via extraction wells and piped to a centrally located treatment system that utilizes a technology called ion exchange to remove chromium from the groundwater. The treated water is then pumped to injection wells located near the downgradient edge of the plume via a network of pipes. Over time, the injection of the treated water will reduce the hexavalent chromium concentrations at the edge of the plume and reduce the plume's size.

When will the Interim Measure be fully active?

The IM is fully operational.

What will the final strategy be for the treatment of the hexavalent chromium plume?

DOE and N3B are evaluating potential approaches to remediate the plume. The final remedy will be proposed to the New Mexico Environment Department (NMED) by DOE and is subject to NMED's approval process.

When will the final remedy be implemented?

No date has been established for final remediation. However, the goal of the IM is to ensure that the footprint of the chromium plume remains within the LANL boundary while the technical approach for final remedy is evaluated and approved. The timing of the final remedy will be dependent on the approach selected and a process that involves public participation and NMED approval.

CONTACT DOE Environmental Management Los Alamos Field Office **(505) 257-7950 | publicaffairs.emla@em.doe.gov**

N3B Los Alamos

Produced by Los Alamos Legacy Cleanup Contractor, N3B Los Alamos, on behalf of DOE's Environmental Management Los Alamos Field Office