United States Government Accountability Office

Report to Congressional Committees

March 2022

WASTE ISOLATION PILOT PLANT

Construction Challenges Highlight the Need for DOE to Address Root Causes

GAO-22-105057

GAO Highlights

Highlights of GAO-22-105057, a report to congressional committees

March 2022

WASTE ISOLATION PILOT PLANT

Construction Challenges Highlight the Need for DOE to Address Root Causes

Why GAO Did This Study

DOE suspended operations at WIPP after two accidents in 2014 and resumed on a limited scale in 2017. In response to the accidents, DOE has a construction project to improve WIPP's underground ventilation and allow full disposal operations to resume. However, DOE has encountered cost increases and schedule delays with the ventilation project.

The conference report accompanying the National Defense Authorization Act for Fiscal Year 2021 included a provision for GAO to report on the operational status and a construction project at WIPP. This report examines (1) the extent to which DOE identified and addressed root causes for the ventilation system project's cost increases and schedule delays, and (2) DOE's plans to ensure WIPP can meet anticipated disposal needs, and what risks DOE may face.

GAO reviewed documents related to root causes and changes in project cost and schedule estimates, and interviewed DOE and contractor officials.

What GAO Recommends

GAO is making four recommendations, including that DOE require a corrective action plan and a process to determine whether root causes have been sufficiently addressed, as well as update the WIPP risk register. DOE agreed with all four recommendations.

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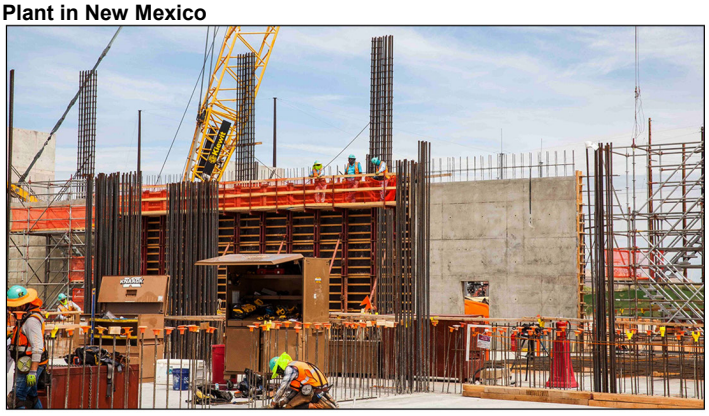
What GAO Found

The Waste Isolation Pilot Plant (WIPP), near Carlsbad, New Mexico, is the nation's only facility for disposal of certain defense-related nuclear waste. The Department of Energy (DOE) identified two root causes for cost increases and schedule delays in its project to install a new ventilation system at WIPP (see figure). The facility is currently operating at a reduced capacity because of ventilation issues in the underground waste disposal areas. The root causes DOE identified were (1) its contractor's inexperience managing construction projects and (2) an inability to incentivize staff to work in Carlsbad. DOE also identified more specific problems with this ventilation project, and has taken corrective actions to address them. While some of these corrective actions may also help to address the root causes, the extent to which these actions will do so is unclear because DOE is not required to develop a corrective action plan for addressing the root causes and does not have a process to determine whether root causes have been sufficiently addressed. Without such a plan and process, DOE cannot ensure that root causes it identifies for cost increases and schedule delays in the WIPP ventilation project or other projects will not persist or recur.

The Department of Energy's (DOE) Ventilation System Project at the Waste Isolation Pilot Plant in New Mexico



Source: Department of Energy. | GAO-22-105057

DOE's construction project to improve the ventilation system is part of its plans to ensure that WIPP can meet DOE's anticipated needs for waste disposal. However, the department faces construction and regulatory risks that might delay its plans. For example, DOE may not be able to finish construction and start operating the ventilation system on time. In addition, DOE may not receive needed approvals from the state regulator and the Environmental Protection Agency if, for example, the department does not provide requested information on time. Department officials told GAO that DOE has not updated recently its WIPP risk register, which helps track risks and plan mitigation measures. Department guidance states that it should periodically evaluate and include emerging risks and mitigation strategies in the risk register because this information is used to update the schedule. Without these updates, DOE may not have an achievable WIPP schedule, which could in turn create shipping delays and cost increases for the sites that are generating the waste.

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Abbreviations

COVID-19	Coronavirus Disease 2019
DOE	Department of Energy
EIR	External Independent Review
EPA	Environmental Protection Agency
NMED	New Mexico Environment Department
SSCVS	Safety Significant Confinement Ventilation System
WIPP	Waste Isolation Pilot Plant

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March 15, 2022

Congressional Committees

The Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico, is the nation's only repository for disposal of certain nuclear waste: defense-origin transuranic waste, which is contaminated by nuclear elements heavier than uranium, such as plutonium.[1] At WIPP, the waste is disposed of in underground "panels," made up of rooms that are mined out of an ancient salt formation approximately 2,150 feet below the earth's surface. The Department of Energy (DOE) is responsible for managing WIPP, which is currently operating at a reduced capacity because of two underground accidents in 2014, one of which resulted in radiological contamination of some underground areas.[2] Ventilation remains restricted because air must be filtered after passing through the contaminated portion of the underground, and WIPP has limited air-filtering capabilities. Because of this restricted ventilation capacity, according to DOE officials, DOE can only perform one of the following key activities at a time: (1) mine maintenance operations, (2) mining, or (3) nuclear waste disposal.

To address the ventilation challenges and enable WIPP to increase capacity to full disposal operations, in May 2018, DOE began construction on a new ventilation system—the Safety Significant Confinement

[1]"Transuranic" is used to describe elements that have atomic numbers greater than that of uranium. Transuranic waste is defined in the Waste Isolation Pilot Plant Land Withdrawal Act as waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for (A) high-level radioactive waste; (B) waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the Environmental Protection Agency, does not need the degree of isolation required by the disposal regulations; or (C) waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with part 61 of title 10, Code of Federal Regulations. Pub L. No. 102-579, § 2(20), 106 Stat. 4777, 4779 (1992).

[2]In February 2014, two accidents occurred in the underground area (a fire on a salt-hauling truck and an unrelated radiological release from a waste container), one of which involved the release of radiological material that contaminated portions of the facility and the ventilation system. As a result, DOE was forced to halt waste disposal operations while it worked to recover from the accidents. In addition, in March 2020, DOE reduced activities at WIPP due to the Coronavirus Disease 2019 (COVID-19) pandemic.

Ventilation System (SSCVS)—to increase air filtration capacity.[3] However, this project has experienced significant cost increases and schedule delays. As a result, DOE is developing revised cost and schedule baselines for this project. Specifically, according to DOE documents, as of October 2021, the SSCVS is currently projected to cost about $486 million, which is nearly 70 percent more than originally planned, and incur a 3-year delay in completion, with a new estimated completion date of January 2026.[4]

In addition, WIPP is running out of permitted space for waste, and DOE has a large amount of transuranic waste at sites around the country—called generator sites—that still requires disposal. The current footprint of WIPP includes eight panels, which DOE estimates filling by August 2025. DOE has developed plans to add two new panels in the short term. However, it is unclear whether the new space will be ready in time to prevent an interruption of disposal operations.

The conference report accompanying the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 included a provision for GAO to report on the operational status and a construction project at WIPP.[5] This report examines (1) the extent to which DOE identified and addressed root causes for the SSCVS cost increases and schedule delays, and (2) DOE's plans to ensure that WIPP can meet

[3]DOE has also started a second capital project—a utility shaft to exhaust unfiltered air. However, this project was put on hold from November 2020 until October 2021, when the state regulator approved the final permit. According to a DOE document, DOE will restart work on this shaft in August 2022 because of the time needed to negotiate with a subcontractor, remobilize the workforce and commission the equipment. DOE is in an early stage of a third project, which would add a hoisting capability to the utility shaft for carrying equipment, providing additional access and egress for underground personnel, and removing salt mined in excavating new panels in the repository.

[4]These numbers are based on preliminary information because DOE has not yet finalized its revised cost and schedule estimates for the project. DOE memorandum from the Director of the Office of Project Management to the DOE Deputy Secretary, *External Independent Review, Validation of the Performance Baseline, and Project Management Risk Committee Review of Baseline Change Proposal 01 for the Waste Isolation Pilot Plant Safety Significant Confinement Ventilation System Project* (Oct. 29, 2021) and DOE, *Supplement to the External Independent Review and Independent Cost Review of Baseline Change Proposal (BCP)-01 for the Waste Isolation Pilot Plant (WIPP) Safety Significant Confinement Ventilation System Project (SSCVS)* (Washington, D.C.: September 2021).

[5]H.R. Rep. No. 116-617, at 1916 (2020). The report included a provision for GAO to monitor WIPP operations and a construction project to add hoisting capability to the Utility Shaft. That construction project is in a very early stage, so conducting our review at this time would be premature.

anticipated disposal needs for transuranic waste disposal once the existing panels are filled and the risks the department may face in implementing its plans.

To determine the steps DOE has taken to identify and address root causes for cost increases and schedule delays at SSCVS, we reviewed a root cause analysis prepared by the department, and DOE documentation discussing corrective actions DOE has taken to address the root causes. We also reviewed documents from other sources, such as documents submitted as part of the regulatory process, independent project reviews, and an external independent review conducted by DOE's Office of Project Management as part of revising the cost and schedule estimates for the SSCVS capital project. We also interviewed DOE and contractor officials from WIPP; officials from DOE headquarters, the Environmental Protection Agency (EPA), and the state regulator; and DOE and contractor officials who conducted the root cause analysis for the SSCVS to discuss causes for the cost increases and schedule delays. In addition, we compared the actions DOE has taken to conduct a root cause analysis and take corrective actions for the SSCVS project with requirements in its project management order—Order 413.3B—and other department guidance, such as the Office of Environmental Management's 2020 Program Management Protocol, to determine the extent to which DOE followed relevant requirements and guidance.[6]

To examine DOE's plans to ensure WIPP can meet anticipated needs for transuranic waste disposal and the associated risks, we reviewed department documents describing plans for future expansion of WIPP. These documents included DOE's April 2021 National Environmental Policy Act analysis to identify its plans for mining two more panels; DOE's documents submitted to the state and EPA regulators and other relevant communication between the department and the regulators; DOE's risk register for WIPP, which includes the risks DOE identified for operating and expanding WIPP; and the department's regulatory strategy from July

[6]Department of Energy, *Program and Project Management for the Acquisition of Capital Assets*, DOE Order 413.3B (Change 6) (Washington, D.C.: Jan. 12, 2021) and *Environmental Management Program Management Protocol* (Washington, D.C.: Oct. 30, 2020).

2018.[7] We also interviewed DOE and contractor officials at WIPP, as well as officials at DOE headquarters, EPA, and the state regulator. In addition, we evaluated whether DOE's risk register for WIPP was updated to include emerging risks and mitigation strategies, as called for in GAO's Schedule Assessment Guide and DOE's Office of Environmental Management's 2020 Program Management Protocol.[8]

We conducted this performance audit from March 2021 to March 2022 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

WIPP's Statutory Capacity and Physical Limitations

WIPP has statutory and physical limitations on the amount of transuranic waste that can be disposed of at the site. The Waste Isolation Pilot Plant Land Withdrawal Act (hereafter referred to as the WIPP Land Withdrawal Act) established a statutory capacity for WIPP of 175,565 cubic meters (m^3) of transuranic waste, meaning that by law, WIPP can only accept up to this amount of transuranic waste from generator sites.[9] The physical limitations on WIPP are established by EPA's certification that WIPP, including its 10 panels, complies with EPA's radioactive waste disposal regulations (hereafter referred to as disposal regulations). As of October 2021, DOE had filled most of the space in seven of the panels. DOE finished the mining of panel 8 as of October 2021 and plans to start using it for waste disposal in August 2022, according to DOE officials. Panel 8

[7]Nuclear Waste Partnership LLC, *Regulatory Strategy, Additional New Panels*, *Rev. 3* (Carlsbad, NM: July 27, 2018). DOE officials explained that DOE does not plan to update this regulatory strategy, since this July 2018 strategy was developed by the WIPP contractor to address a one-time need from DOE to ensure that the regulatory aspects associated with new panels were evaluated.

[8]GAO, *Schedule Assessment Guide: Best Practices for Project Schedules*, GAO-16-89G (Washington, D.C.: December 2015).

[9]Pub. L. No. 102-579, § 7(a)(3), 106 Stat. 4777, 4785 (1992). The act limits WIPP's capacity to 6.2 million cubic feet, which is 175,565 m^3, of transuranic waste. For purposes of consistency, in this report we express all volumes in cubic meters.

is expected to be filled by August 2025.[10] DOE no longer intends to dispose of transuranic waste in the final two panels included in EPA's original certification—panels 9 and 10.[11] However, DOE officials estimate that WIPP will not have reached its statutory capacity after filling these eight original panels, and DOE's current planning assumes WIPP will remain open to accept transuranic waste until at least 2050 with the construction of additional panels.[12]

We previously reported that DOE officials calculated that nine additional panels similar to the existing ones should be sufficient to meet DOE's transuranic waste disposal needs.[13] DOE officials decided that DOE may construct additional panels up to the point at which the volume of transuranic waste that could be disposed of in the panels equaled WIPP's

[10]In 2018, DOE revised the method it uses to count the volume of transuranic waste it disposes of at WIPP against the WIPP Land Withdrawal Act statutory capacity. This revision reduced the combined volume of waste already at and planned for disposal at WIPP by approximately 21 percent (37,515 m^3), increasing the likelihood that WIPP will have sufficient statutory capacity to dispose of the volume of waste DOE estimated in its 2018 Annual Transuranic Waste Inventory Report. The New Mexico Environment Department (NMED) approved a permit modification authorizing this new method of counting in December 2018; non-governmental organizations sued to challenge this decision, and the New Mexico Court of Appeals affirmed the permit modification on November 9, 2021.

[11]Prior to the 2014 accidents, DOE had plans for disposing of transuranic waste in the hallways between the eight panels once the panels themselves were full. The hallways that were considered for waste disposal were divided into two areas that were labeled panels 9 and 10. According to DOE officials, as a result of the accidents, DOE no longer plans to dispose of transuranic waste in these hallways, in part because DOE could not conduct sufficient maintenance while operations were suspended after the accidents.

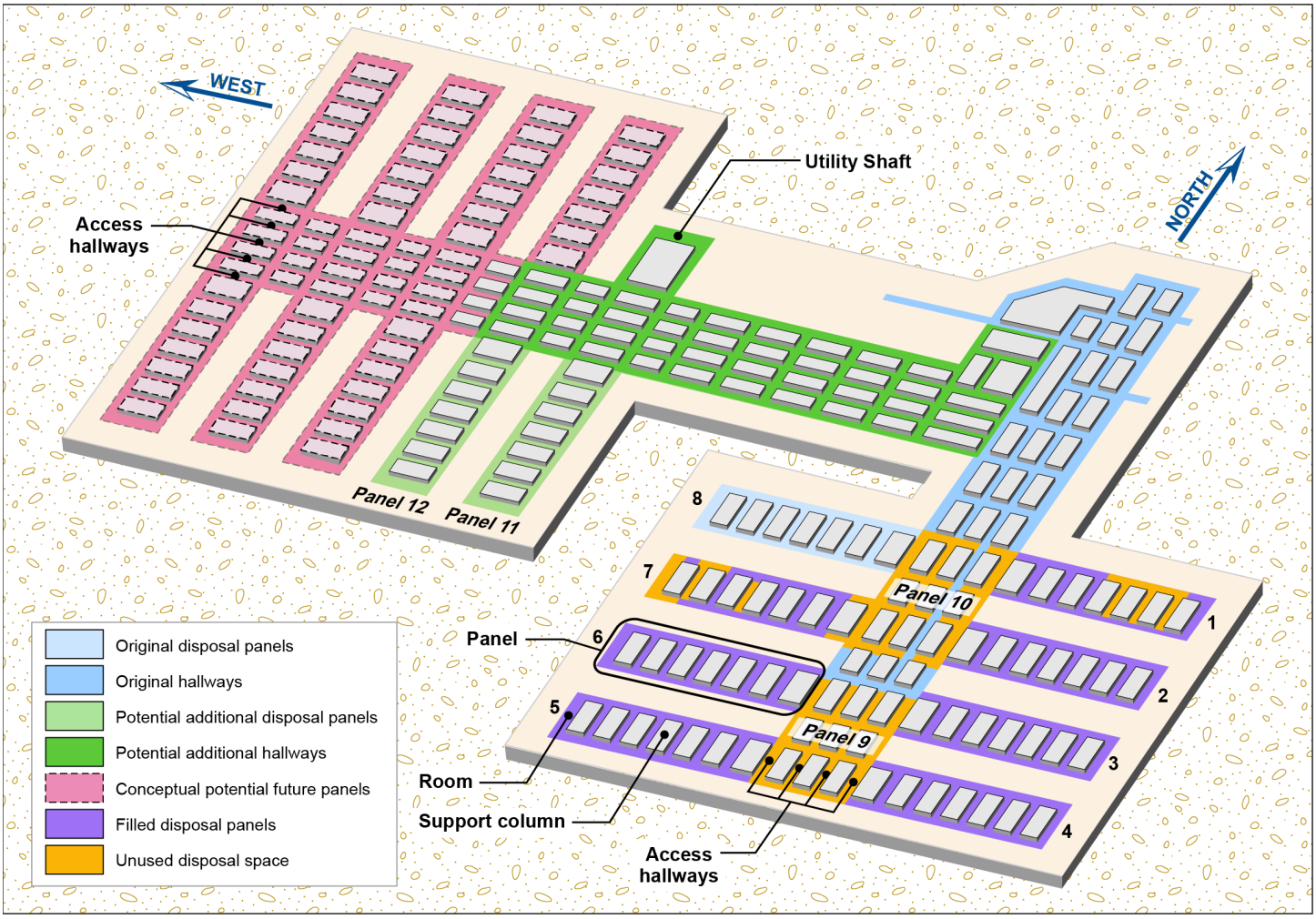
[12]DOE's estimates for filling the available disposal space at WIPP were based on shipping and disposal schedules as of January 2020. According to DOE officials, the rate at which transuranic waste is being shipped to and disposed of at WIPP was reduced in March 2020 in response to the COVID-19 pandemic, and it is unclear what the full impact of the pandemic will be on future shipping and disposal rates.

[13]At the time of our prior report, the most current available data on the volumes of waste DOE expected to be disposed of in WIPP were from DOE's 2018 Annual Transuranic Waste Inventory Report. Despite the revision to the method for counting transuranic waste volumes and DOE's potential plans for additional physical space, DOE may have insufficient statutory capacity and physical space to meet future transuranic waste disposal needs at WIPP if (1) significant volumes of transuranic waste are added to DOE's transuranic waste inventory or (2) the permit modification authorizing the revised volume counting method is successfully challenged in court. GAO, *Nuclear Waste Disposal: Better Planning Needed to Avoid Potential Disruptions at Waste Isolation Pilot Plant*, GAO-21-48 (Washington D.C.: Nov. 19, 2020).

statutory capacity.[14] As of November 2021, DOE had made a decision to add two additional panels—panels 11 and 12—while the other potential panels are in conceptual design. Figure 1 shows the current WIPP layout and a draft conceptual design of additional panels.

[14]According to DOE officials, this analysis took into account the 34 metric tons of diluted plutonium from the National Nuclear Security Administration's Surplus Plutonium Disposition Program, even though that waste had not yet been added to DOE's Transuranic Waste Inventory Report because the agency had not yet completed the documentation necessary to initiate the program.

Figure 1: Current Layout of the Waste Isolation Pilot Plant (WIPP) Facility and a Draft Conceptual Design of Additional Potential Waste Disposal Space



Source: GAO analysis of Department of Energy information. | GAO-22-105057

Note: As of November 2021, the Department of Energy proposed two additional disposal panels—panels 11 and 12. All the other potential additional panels shown in pink are conceptual.

WIPP's Regulatory Oversight Structure

EPA and the New Mexico Environment Department (NMED) both have a role in regulating WIPP. Specifically, EPA regulates the radiological safety

of WIPP.[15] The WIPP Land Withdrawal Act required EPA to certify that WIPP will comply with disposal regulations and to issue criteria for certifying DOE's compliance with the disposal regulations.[16] The act also requires EPA to recertify WIPP's compliance with the disposal regulations every 5 years.[17] DOE submitted the fourth Compliance Recertification Application for WIPP to EPA in March 2019 and additional performance assessment calculations on December 20, 2019. EPA is currently reviewing this application, and EPA officials anticipate issuing a decision in early 2022. In addition to these regular recertifications, DOE must notify and obtain approval from EPA if DOE needs to make changes to activities or conditions at WIPP that differ significantly from the most recent compliance application.[18] According to EPA officials, DOE submits "planned change requests" for changes it considers significant; EPA makes the final determination of whether a change is significant.[19]

In addition, NMED has regulatory authority over WIPP because EPA has authorized New Mexico to administer its own hazardous waste management program under the Resource Conservation and Recovery Act. Pursuant to this authorization, NMED issues the hazardous waste storage and disposal permit for WIPP under the New Mexico Hazardous Waste Act and state regulations. Every 10 years, DOE must submit to NMED a permit renewal application for WIPP. In March 2020, DOE submitted to NMED its application for a 10-year permit renewal to continue operations at WIPP from 2021 to 2030; the application is currently under consideration by NMED.[20] Certain modifications to issued

[15]As required by the WIPP Land Withdrawal Act, EPA issued final regulations regarding the disposal of transuranic waste; these regulations apply to WIPP and also apply to the disposal of spent nuclear fuel and high-level radioactive waste. 40 C.F.R. pt. 191, subpts. B, C.

[16]EPA issued these criteria as regulations in 1996 and certified in 1998 that DOE had demonstrated that WIPP would comply with these regulations.

[17]To support the recertification, DOE prepares a performance assessment, which uses mathematical models and computer calculations to assess cumulative releases of radioactive isotopes under specified scenarios relative to release limits established by EPA.

[18]40 C.F.R. § 194.4(b)(3)(i).

[19]"Planned change requests" is a DOE term and is not in EPA regulation.

[20]Because DOE timely filed this site permit renewal application, the existing permit will remain in effect until a new permit is issued.

permits require DOE submission of a permit modification request for NMED approval.[21]

Therefore, to construct the physical space needed to dispose of transuranic waste beyond the current panels and up to WIPP's statutory capacity, DOE would first need to develop a design for this capacity and obtain approvals from EPA and NMED. Before construction of this additional physical space can begin, EPA would need to certify that the additional physical space complies with EPA's disposal regulations and NMED would need to approve the additional space, either as a modification to WIPP's Hazardous Waste Facility Permit or as part of the 10-year permit renewal.

WIPP's Capital Asset Projects

DOE's Office of Environmental Management, the office responsible for overseeing WIPP operations, has initiated two capital asset projects to improve ventilation at WIPP—the SSCVS and the Utility Shaft.[22] Together, these projects will act as one complete ventilation system to facilitate the return to full disposal operations and the planned increase in physical space at WIPP—specifically, mining additional panels.

SSVCS. The SSCVS project includes the design and construction of high efficiency particulate air filters and fans, as well as supporting infrastructure that will be able to filter all of the exhaust from the mine. Once completed, the SSCVS is expected to increase airflow capacity to 540,000 cubic feet per minute (about a 270 percent increase above current levels), providing sufficient airflow to support additional personnel and equipment underground.[23] In May 2018, DOE began constructing the SSCVS and initially projected to complete it in November 2022 at an

[21]There are three classes of permit modifications (classes 1, 2, and 3) that vary in terms of the process for review and the amount of supporting documentation required. The type of permit modification required depends on the type of change DOE requests. In general, NMED officials told us that the Class 3 modifications require the most significant level of review.

[22]DOE has initiated a third project, called the hoisting capabilities project, to use the Utility Shaft for supplemental capability for transporting mined salt, equipment, and personnel to and from the underground area. This project is in very early stages; DOE plans to select a preferred alternative no earlier than 2022, according to DOE officials.

[23]SSCVS will allow two modes of operations: filtered and unfiltered. When the SSCVS is in operation and the facility is operating in filtered mode, the air exhausted from the underground area will go through a process in which salt dust and humidity are removed, and then the air passes through high efficiency particulate air filters to remove potential radiological contamination.

estimated total project cost of $288 million. However, in November 2020 DOE initiated a baseline change process to update the cost and schedule estimates; it expects to finalize the estimates in early 2022, according to DOE officials. According to DOE documents as of October 2021, DOE expects to complete the new facility in January 2026 at a revised estimated cost of approximately $486 million.[24]

Utility Shaft. The Utility Shaft is designed as an air intake shaft to draw fresh air into the planned additional physical space and will complement the SSCVS. DOE approved the Utility Shaft project in June 2019 and began construction in April 2020 after obtaining a temporary 6-month permit authorization from NMED, while it awaited NMED's approval of a permit modification request for the project.[25] In September 2020, DOE requested a second temporary 6-month authorization.[26] NMED denied DOE's request in November 2020, and the project was subsequently put on hold. In October 2021, NMED approved the modification.[27] DOE initially estimated completing the Utility Shaft project by December 2023 at an estimated total project cost of $197 million. In May 2021, DOE initiated a baseline change process for the Utility Shaft to reflect cost increases and schedule delays on this project and expects to finalize a revised baseline in early 2022.

[24]DOE's memorandum validating the performance baseline for SSCVS (Oct. 29, 2021) and DOE's *External Independent Review* (September 2021).

[25]According to DOE officials, DOE would have preferred to begin construction of the SSCVS and Utility Shaft projects concurrently; however, due to funding constraints, the two projects had to be undertaken sequentially. The SSCVS was initiated first because DOE considered it the highest priority.

[26]In April 2020, shortly after the temporary authorization for the utility shaft was issued, a nongovernmental organization in New Mexico challenged the NMED order granting the authorization in the New Mexico Court of Appeals. The court dismissed the appeal in June 2020, and the state Supreme Court declined to hear the appeal in September 2020 but directed the appeals court to proceed with the case. The temporary authorization expired in October 2020 and, in November 2020, the appeals court issued a mandate in the case.

[27]In the month following NMED's approval of the modification, nongovernmental organizations appealed NMED's decision. *Southwest Rsch. and Info. Ctr. v. New Mexico Env't Dep't.*, No. A-1-CA-40030 (N.M. Ct. App. Nov. 8, 2021); *Concerned Citizens for Nuclear Safety v. New Mexico Env't Dep't.*, No. A-1-CA-40074 (N.M. Ct. App. Nov. 29, 2021). One organization has requested a stay of the permit modification while the appeal is pending. *New Mexico Env't Dep't. v. Southwest Rsch. and Info. Ctr.*, No. A-1-CA-40030 (N.M. Ct. App. Jan. 12, 2022). As of February 2022, the court has not issued a stay.

DOE Review Requirements for Baseline Changes for Capital Asset Projects

DOE is managing both of the WIPP capital asset projects using DOE's Order 413.3B, which provides the requirements for managing DOE capital asset projects from planning through construction.[28] DOE's Office of Project Management is responsible for Order 413.3B within its broader responsibilities for providing leadership and assistance in developing and implementing DOE-wide policies, procedures, programs, and management systems pertaining to project management, and independently monitoring, assessing, and reporting on project performance. Included in the order are particular requirements related to performance baseline changes in the event that the approved total project cost, completion date, or performance and scope parameters cannot be met. For example, the order requires the program office to conduct an independent and objective root cause analysis to determine the underlying causes of the cost overruns, schedule delays, and performance shortcomings, and identify and present corrective actions to the project management executive.[29]

In addition, for projects with a total project cost greater than or equal to $100 million that have a new performance baseline established, DOE's Office of Project Management must conduct an External Independent Review (EIR) to validate the project's proposed performance baseline. In conducting the EIR, DOE's Office of Project Management is to identify major findings, findings, and observations to the project team, and the project team is to develop a corrective action plan to resolve those issues.[30] DOE's EIR standard operating procedures specify that major findings require resolution before DOE's Office of Project Management can recommend validation of the revised performance baseline and that

[28]Department of Energy, *Program and Project Management for the Acquisition of Capital Assets*, DOE Order 413.3B (Change 6) (Washington, D.C.: Jan. 12, 2021).

[29]DOE added these requirements for conducting a root cause analysis and identifying corrective actions in response to a GAO recommendation made in 2015. GAO, *Plutonium Disposition Program: DOE Needs to Analyze the Root Causes of Cost Increases and Develop Better Cost Estimates*, GAO-14-231 (Washington, D.C.: Feb. 13, 2014).

[30]According to DOE guidance, a major finding is a condition that affects project elements such as the mission, the proposed performance baseline scope, or the schedule, or is of such significance that safety, quality, risk management, planning, funding, or the ability to successfully execute the baseline is jeopardized. A finding is a lesser issue that does not impact the project elements, but could diminish safety, quality, risk management, planning, funding, or the ability to successfully execute the proposed performance baseline, unless corrected. Observations are not findings, but are comments on other project aspects that were evaluated.

every effort should be made to resolve findings as quickly as possible.[31] They also state that if findings have not been resolved by the time the EIR team recommends validation of the performance baseline, the EIR team lead and the responsible project team members should periodically assess the status of these actions until closed.[32]

DOE Identified Root Causes of SSCVS Cost Increases and Schedule Delays but Does Not Have Assurance That They Are Fully Addressed

DOE conducted an analysis that identified two root causes and five significant contributing factors for the cost increases and schedule delays in its SSCVS project, but it has not developed a corresponding corrective action plan to address them, and it is not required to do so for such an analysis. The department also identified more specific problems with the project in an EIR, which DOE requires when a project faces major cost and schedule increases; for EIRs, a corrective action plan is developed, and DOE has been implementing that plan. A DOE analysis showed that certain corrective actions in the plan also address the root causes for the cost increases and schedule delays, but DOE does not have a process for assessing the extent to which the actions do so.

DOE Conducted a Root Cause Analysis but Is Not Required to Develop a Corrective Action Plan

In April 2021, DOE's Office of Environmental Management finalized a root cause analysis of the SSCVS project cost increases and schedule delays.[33] As previously mentioned, DOE's Order 413.3B requires that the program office in charge of the project conduct an independent and objective root cause analysis when DOE determines that the performance baseline scope, schedule, or cost thresholds for a capital asset project will be breached. This analysis is intended to inform the decision of whether to terminate or proceed with the project.[34] In its analysis, DOE identified two root causes for the SSCVS project cost increases and

[31]Department of Energy, Office of Project Management, *External Independent Review Standard Operating Procedures Rev. 3.6* (Washington, D.C.: November 2019).

[32]The length of time to complete these planned corrective actions should be limited to about 3 months, according to DOE's guidance.

[33]Department of Energy, *Forensic Root Cause Analysis of the Waste Isolation Pilot Plant (WIPP) Safety Significant Confinement Ventilation System (SSCVS) Capital Asset Project* (April 8, 2021). DOE issued this report documenting the analysis it conducted using a digital whiteboard application. For purposes of this report, we refer to both the report and the information aggregated in the digital whiteboard collectively as the root cause analysis.

[34]For the SSCVS, DOE conducted the root cause analysis after deciding to proceed with a baseline change proposal for the project in November 2020. DOE officials we interviewed told us they took this approach because the baseline change process is lengthy, and they were confident that the root cause analysis would have findings similar to those in previous reviews conducted by DOE, the contractor, and the U.S. Army Corps of Engineers.

schedule delays: (1) the contractor's inexperience managing capital asset projects, and (2) DOE's and the contractor's inability to attract and retain qualified staff.[35] In addition, DOE identified five significant contributing factors—a type of cause that is typically more project-specific—that are described in table 1.[36]

Table 1: Root Causes and Related Significant Contributing Factors Identified in the Department of Energy's (DOE's) Root Cause Analysis for the Construction of the Safety Significant Confinement Ventilation System (SSCVS)

Root cause[a]	Significant contributing factor[b]
Root cause 1: The contractor's inexperience managing capital asset projects and its inability to obtain corporate support resulted in failure to manage the SSCVS project and subcontractors.	Factor 1: The contractor hired an unqualified subcontractor to perform the primary construction responsibilities of this project. Specifically, this subcontractor did not have the required quality assurance qualifications.
	Factor 2: The contractor did not thoroughly review the effects of more than 200 engineering changes on overall risk and cost.
	Factor 3: The contractor did not recognize and correct in a timely manner a number of cost, schedule, and other issues because it did not have dedicated risk managers or experienced cost account managers. This led to inadequate identification of project risks and failure to mitigate them.
Root cause 2: DOE and contractors have not found viable solutions to incentivize personnel to work and stay in the Waste Isolation Pilot Plant area. Staffing turnovers and the inability to attract qualified personnel have had a significant impact on the overall performance of the federal and contractor staff.	Factor 4: Competing priorities and many transitions and turnovers at DOE's Office of Environmental Management contributed to the decisions regarding allocation of resources and SSCVS not receiving a higher priority.
	Factor 5: The ability of federal project directors to adequately perform their jobs was significantly hampered by a number of external factors including insufficient staffing and headquarters support.

Source: GAO analysis of DOE information. | GAO-21-105057

Notes: Information is from the department's *Forensic Root Cause Analysis of the Waste Isolation Pilot Plant (WIPP) Safety Significant Confinement Ventilation System (SSCVS) Capital Asset Project* (Washington, D.C.: Apr. 8, 2021).

[a]Root causes are underlying causes of cost overruns, schedule delays, missed or postponed milestones, and performance shortcomings that, if not corrected, could result in persistent or recurrent problems.

[35]According to the methodology DOE used for its root cause analysis, root causes are defined as the deepest-seated causes for an event or condition. In addition, it indicates that corrective actions for root causes would provide a high degree of confidence that they will prevent repetition of, not only the event or condition being analyzed, but also many other conditions affecting past and future performance.

[36]According to the methodology DOE used for its root cause analysis, significant contributing factors are defined as causal factors that increased the likelihood of the failure or malfunction or made the overall event worse because of their effects and must also be addressed.

[b]Significant contributing factors are causal factors that increased the likelihood of the failure or malfunction or made the overall event worse because of their effects and must also be addressed.

According to the root cause analysis and DOE officials, the majority of the cost increases stemmed from the first root cause—the contractor's lack of experience managing capital projects—and its related significant contributing factors.[37] Specifically, DOE awarded the contract for the SSCVS capital project to the existing maintenance and operations contractor at WIPP, in part based on assurance that the contractor could rely on support from its parent company. However, according to a DOE official, DOE did not get that assurance in writing, and support from the parent company was insufficient to prevent or mitigate the significant downturn in performance, according to DOE's analysis.

The contractor's inexperience had consequences that caused significant schedule delays and cost growth. For example, according to the root cause analysis, the contractor did not properly evaluate subcontractors and awarded a $135 million construction subcontract to an entity that did not have adequate qualifications to perform certain construction responsibilities for the project. In addition, DOE's root cause analysis found that the contractor did not hire staff with capital asset project experience to conduct adequate risk management. For example, the contractor staff did not conduct thorough reviews of the effects of more than 200 engineering changes largely proposed by the subcontractor on the overall risk and cost of the project, which contributed to over $12 million in additional costs, according to the root cause analysis.[38]

DOE also reported a second root cause—that recruiting and retaining technically capable staff in the WIPP area is a long-standing, well-documented issue that the contractor and DOE headquarters have had limited success in resolving. Contractor and DOE staffing problems were also identified in the 2017 EIR and the 2019 and 2020 project peer reviews conducted by DOE's Office of Project Management. For example, the root cause analysis noted that the contractor has had three different

[37]DOE officials said that the department cannot provide exact amounts at this time because of ongoing negotiations and potential litigation with the contractor to recover some of these costs.

[38]In its May 2020 SSCVS constructability and cost review, the U.S. Army Corps of Engineers estimated that the engineering changes resulted in approximately $68 million and many were for convenience because there were no design or constructability issues with the original design related to the panels. U.S. Army Corps of Engineers, *Safety Significant Confinement Ventilation System (SSCVS) Constructability and Cost Review* (Huntington, WV: May 11, 2020).

quality assurance managers on the SSCVS project since 2018. Similarly, DOE has had five different federal project directors on the project, which led to a lack of continuity and inconsistency in risk management plan oversight and compliance. Moreover, according to DOE's root cause analysis, staffing issues had a direct impact on the Carlsbad Field Office and its ability to adequately oversee all of the WIPP procurements and capital projects.

This aspect of DOE's analysis is consistent with our 2020 finding that significant staffing shortages could impede DOE's ability to manage the challenges on the project and remain on schedule.[39] In that report, we recommended that DOE identify and fully analyze what additional flexibilities could be used to address the staffing vacancies at the Carlsbad Field Office. According to DOE, this staffing analysis is underway but not complete, and this recommendation remains open as of November 2021.

DOE's Office of Environmental Management's 2020 Program Management Protocol states that to prevent persistent or recurrent problems, a root cause analysis is supported by a corrective action plan. However, DOE's project management order does not explicitly require such a plan, stating instead that corrective actions shall be identified and presented to management for approval. Office of Project Management officials said that the Office of Environmental Management project team for the SSCVS is responsible for identifying and presenting corrective actions related to a root cause analysis. DOE's Office of Environmental Management officials told us that they have not developed and do not plan to develop a corrective action plan specifically for these root causes identified during the baseline change process for the SSCVS project. Instead, DOE officials said that the department has taken some actions to address them through other efforts, as discussed below.

DOE's Office of Project Management officials told us that their office planned to update its change management control guide later in 2021 to include guidance for conducting a performance baseline deviation root cause analysis and defining corrective actions. However, this guidance does not set forth requirements, and it is not clear that it will recommend corrective action plans. Until DOE requires that program offices develop

[39]GAO-21-48.

corrective action plans to address root causes, DOE has limited assurance that known problems will not recur.

DOE Has Taken Corrective Actions to Address Findings from Another Review but Is Not Required to Assess the Extent to Which the Actions Address Root Causes

In April 2021, the Office of Project Management completed a preliminary EIR, as required by DOE's project management order.[40] In its analysis, the Office of Project Management identified 10 major findings and 19 findings.[41] In response to the EIR, the program office—DOE's Office of Environmental Management—has developed a corrective action plan and has taken corrective actions to address the major findings and findings. Specifically, as of October 2021, the Office of Project Management reported that it had closed nine of the 10 major findings and 11 of the 19 findings because they had been addressed.[42]

As previously discussed, DOE guidance requires that major findings of EIRs be fully addressed by the project team and approved by the Office of Project Management prior to the validation of the baseline change; for other findings of EIRs, corrective actions can be implemented after the baseline change is validated.[43] DOE's Office of Project Management officials told us that for any findings that remain open after the baseline change is validated, project teams report on them and the Office of Project Management tracks implementation of corrective actions at monthly and quarterly project review meetings. Major findings and findings of the SSCVS EIR had been identified in prior project reviews, but the EIR process is the only review that requires implementation of

[40]According to Order 413.3B, the purpose of the EIR includes providing an unbiased assessment of whether a capital asset project can be executed within proposed scope, schedule, and cost commitments, and to validate a new performance baseline.

[41]According to DOE guidance, a major finding is any deficiency, condition, shortcoming, error, or omission that affects project elements such as the mission, the proposed performance baseline scope, or the schedule, or in the professional judgment of the EIR team, is of such significance that safety, quality, risk management, planning, funding, or the ability of the project team to successfully execute the baseline is jeopardized. A finding is a lesser issue that does not impact the project elements, but in the professional judgment of the EIR team could diminish safety, quality, risk management, planning, funding, or the ability of the project team to successfully execute the proposed performance baseline, unless corrected.

[42]According to DOE's final EIR report, the Office of Project Management downgraded the remaining major finding related to the project schedule to a finding as the significant issues associated were mostly resolved.

[43]DOE, *External Independent Review Standard Operating Procedures Rev 3.6* (November 2019).

corrective actions before the project can move forward, according to DOE Office of Project Management officials.

DOE Office of Project Management officials told us that even though a corrective action plan is not specifically required for the root causes DOE identified through the root cause analysis during the baseline change process, the project team's efforts to address the EIR major findings and findings also addressed the root causes that the Office of Environmental Management identified in its root cause analysis. We found EIR major findings and findings that were more clearly connected to certain underlying root causes and significant contributing factors than others. For example, one of the EIR major findings was that the contractor needed to strengthen its administration and oversight of subcontractors, which is related to the first root cause. In addition, the EIR identified specific staffing issues—such as the absence of a full-time contract officer (a federal staff position)—as findings that align with the second root cause. However, since these staffing issues were not identified as major findings in the EIR, the Office of Environmental Management is not required to address them before the baseline change is validated.

In other instances, EIR major findings and findings were more project-specific in nature, and the connection between them and the root causes and significant contributing factors identified in the root cause analysis was less clear. Examples of these included project documentation not reflecting the removal of certain project scope components and ineffective change control documentation and procedures requiring modification of specific contract terms.

We asked DOE to provide a crosswalk showing the relationship between corrective actions for EIR major findings and findings and the root causes identified in the root cause analysis. According to the requested crosswalk, provided to us in August 2021, DOE related certain corrective actions to the root causes. For example, corrective actions that address the first root cause regarding contractor oversight include (1) the federal project director updating the project execution plan—the core document for the management of a project—and (2) the contractor requesting and receiving support from its parent company for resources to support the

project.[44] Similarly, corrective actions that address the second root cause regarding staffing challenges include (1) DOE hiring an experienced and qualified federal project director and (2) increasing headquarters management oversight through monthly project review meetings.

Office of Project Management officials told us that in an October 2021 meeting to review progress on the baseline change proposal, reviewers raised questions about the extent to which the corrective actions the project team had taken to address EIR major findings and findings also addressed the root causes. The officials told us that the SSCVS project team subsequently updated its presentation for the reviewers to clarify the connections between corrective actions and root causes, which the reviewers accepted before recommending approval of the baseline change. However, the updated presentation did not address the extent to which root causes had been sufficiently addressed to prevent recurrence.

The extent to which the project team's corrective actions to address the EIR major findings and findings will fully address the root causes is unclear because DOE does not have a process to ensure that the corrective actions will fully address all of the root causes and significant contributing factors. In particular, DOE Order 413.3B and its guidance do not require an independent office, such as the Office of Project Management, to assess and validate the extent to which DOE's corrective actions—in this case, those taken in response to the EIR—satisfactorily address the root causes. Without conducting such an assessment for the SSCVS project, DOE cannot reasonably ensure that the root causes will not persist or recur, which could result in future cost increases and schedule delays. Similarly, until DOE requires such an assessment in its project management order, the department cannot ensure that the root causes will not persist or recur on other capital projects.

[44]According to DOE's Order 413.3B, he project execution plan is prepared by the Federal Project Director and establishes the policies and procedures to be followed to manage and control project planning, initiation, definition, execution, and closeout. It includes an accurate reflection of how the project is to be accomplished, resource requirements, risk management, and roles and responsibilities, among other things.

DOE Plans to Improve Ventilation and Accelerate Mining but Risks Delays and Has Not Updated Its Risk Register with Mitigation Strategies

To ensure WIPP can meet its anticipated needs for transuranic waste disposal, DOE is planning to improve ventilation underground so that mining of new panels and access hallways can be conducted simultaneously with ongoing required maintenance and waste disposal, but it faces risks of delays. In light of delays with the capital asset projects, in the near term, DOE plans to improve ventilation using a legacy fan—called 700-C fan—that, according to DOE officials, restarted in October 2021.[45] This fan would increase underground airflow by about 65 percent above the current level.[46] According to DOE officials, this fan will allow DOE to simultaneously conduct mining operations and mine maintenance operations, which it has not done together since DOE resumed operations at WIPP in 2017.[47] With the use of this fan and by adding a second work shift, DOE anticipates that by April 2023 it will have the ability to dispose of 17 shipments of waste per week, which DOE considers to be full disposal capacity.[48]

In addition, by January 2026, DOE plans to complete the SSCVS project to increase the airflow to 270 percent above the current level.[49] According to DOE officials, DOE needs the SSCVS because, even with 700-C fan working properly, DOE would not have the level of ventilation needed to ensure it can accept the number of shipments anticipated for disposal in panel 11 while mining panel 12.

In accordance with DOE's Order 413.3B and the Office of Environmental Management's 2020 Program Management Protocol, DOE tracks risks in its risk register—a key document used in developing the schedule for a program. The risk register allows managers to ensure that (1) newly identified risks are accounted for and mitigation is planned and (2) older risks are regularly revisited to define them better and mitigate them. Some of the risks to the WIPP program include:

[45]According to DOE officials, DOE's legacy fans are past their 30-year expected operating life.

[46]Current airflow capacity is approximately 146,000 cubic feet per minute.

[47]Waste disposal operations are specifically prohibited while the 700-C fan is operating, according to DOE officials.

[48]At the moment, DOE averages about seven shipments per week, according to DOE officials.

[49]Once SSCVS starts, DOE will have an airflow capacity about 25 percent over the capacity before the 2014 accidents.

- DOE started the operations of the 700-C fan in October 2021 after it had been largely idle since the accidents in 2014, according to DOE officials. DOE identified the failure of the 700-C fan to restart or perform as expected as a moderate risk in its risk register, but DOE's risk register did not provide any mitigation strategies for failure of the fan. DOE officials told us that they are currently evaluating, as a mitigation strategy, a second legacy fan—called 700-B—to determine whether it could function as a backup to the 700-C fan. If DOE cannot use one of these fans, DOE will likely have to continue at reduced levels of mining operations, slowing its progress.
- DOE identified not being able to finish construction of the SSCVS on time and potential delays during turnover of the SSCVS to operations as high risks in its risk register for causing additional delays for waste disposal. However, DOE did not include any mitigation strategies for the first risk and few mitigation details for the second risk. Department officials told us that, as long as the 700-C fan works as planned, they do not need the SSCVS until December 2026—about one year after its planned construction completion date of January 2026. DOE officials thought this would be enough time to allow the department to account for any delays in construction or any problems in starting the operation of the SSCVS. If DOE cannot complete the SSCVS within this time period, DOE would have to continue at reduced levels of mining operations and to conduct one underground activity at a time, slowing its progress.

DOE also faces risks of delays as it seeks to obtain regulatory approvals for its planned activities from NMED and EPA before it can mine and dispose of waste in panel 11 after August 2025.

NMED 10-Year Permit Renewal. In March 2020, DOE submitted its application for a 10-year permit renewal to NMED to continue operations at WIPP from 2021 to 2030 because the existing permit was scheduled to expire on December 30, 2020. NMED subsequently began its review of the application but, as of January 2022, the review was not complete, according to NMED officials. Because DOE was timely in filing this application, the existing permit will remain in effect until a new permit is issued.

NMED Permit Modifications. In July 2021, DOE submitted a permit modification request to NMED for construction of panels 11 and 12. In December 2021, NMED decided to combine the permit modification request for panels 11 and 12 with the 10-Year Permit Renewal application. According to NMED officials, combining the permit

modification request with the permit renewal application makes it easier for NMED to review these requests. In addition, according to NMED's letter to DOE, NMED concluded that looking at these issues concurrently is unrealistic given the time and resources available to NMED and the public. Furthermore, the letter stated that including the permit modification request for panels 11 and 12 allows the public to comment on and debate the expansion of the facility footprint in its appropriate venue, the 10-year Permit Renewal process, allowing for transparency and efficiency. However, delays may occur because DOE would have to amend its 10-year permit renewal application and a senior NMED official told us its review could take additional time. In addition, this official told us that DOE needs to mine five access hallways to panel 11 to be able to mine panel 11 on time. DOE officials stated that they started mining one access hallway in October 2021, and that DOE does not need to ask NMED for a permit modification for three of the five access hallways because they are not exclusively intended to support waste emplacemet activities.[50] However, as of December 2021, NMED officials told us they have not yet made a decision on whether they want DOE to apply for a permit modification for these three access hallways. According to DOE officials, NMED has requested that DOE provide a written analysis explaining why these three access hallways are not part of the permit modification request.

EPA Certification of Compliance. EPA is required to certify WIPP's continued compliance with EPA's disposal regulations every 5 years and must approve significant changes in activities or conditions pertaining to WIPP. EPA has said that development of new waste panels, such as panels 11 and 12, are likely to be a significant change. EPA requested that future DOE requests for EPA approval of significant changes include all reasonably foreseeable information related to the condition of WIPP at the time of closure, using a footprint of WIPP that addresses potential future waste disposal needs (such a footprint would include panels 11

[50]According to DOE officials, DOE included two of the five access hallways going to panel 11 and the Utility Shaft in its permit modification request for the utility shaft project, which NMED approved in October 2021, but not the other three access hallways.

and 12 and the seven conceptual panels DOE thinks may be needed).[51] However, according to DOE officials, DOE plans to submit a significant change request only for panels 11 and 12 in January 2023 because a decision on subsequent panels (beyond panel 12) has not been made. To help EPA conduct its review, DOE officials stated in a letter to EPA that DOE will include additional information on potential additional new panels in its March 2024 certification application.[52] According to EPA officials, it is unclear whether DOE will be able to compile the necessary additional information in the time available.[53] In addition, EPA officials stated that panels 11 and 12 likely would depart significantly from the most recent compliance application and would likely require a rulemaking, which may

[51]In an April 20, 2021 letter to DOE, EPA told DOE that it expects DOE to submit the following documentation as part of a planned change request for panels 11 and 12: technical information identified and documented in the 2017 certification decision, site characterization, information on future anticipated waste, and the expected repository design. Specifically, EPA asked for the following: 1) updated modeling for actinide solubility and the salt creep closure of open areas; 2) site characterization information specific to the location for new repository panels located to the west of the current waste panels, which would require new data collection and possibly more hydrologic information since the panels would be closer to the site boundaries; 3) analysis of the full range of reasonably expected waste that may be disposed at WIPP; and 4) provide the general design of the new repository, to the best of available knowledge, that would accommodate disposal of the total anticipated waste. DOE will need to model the repository that is expected for the future.

[52]Letter from DOE to EPA. *Response to Environmental Protection Agency's Letter dated April 20, 2021* (Carlsbad, NM: Aug. 12, 2021).

[53]EPA officials explained that DOE is developing a 3-D modeling system that DOE wants to include in its 2024 certification application. They also said that this modeling would not be ready by January 2023 to use for panels 11 and 12 significant change request. However, it is unclear to EPA when the 3-D model would need to be fully functional to be used for the 2024 certification application. Other than the 3-D modeling, it is unclear to EPA what the differences would be for the different submissions.

take longer than the 2-year time frame DOE has planned for EPA's review.[54]

DOE acknowledged regulatory delays as risks in its risk register for WIPP. In particular, DOE's risk register contains a moderate risk related to regulatory approval, stating that regulatory approval delays could impede the completion and turnover of panel 11 for active waste storage. However, DOE included minimal input on mitigation strategies for this risk in its risk register.

According to GAO's Schedule Assessment Guide and DOE's Office of Environmental Management's 2020 Program Management Protocol, emerging risks should be periodically evaluated and included in the risk register, together with mitigation strategies. Doing so is important because the information in the risk register is needed to update the schedule and determine whether the schedule is credible and achievable.[55] However, DOE officials told us that DOE has not updated its WIPP risk register recently. In addition, the risk register provides very little information on the specific risks discussed above, mitigation strategies for these risks, or the cost or schedule impacts if these risks materialize.

DOE officials acknowledged that the risk register for WIPP lacks details but said that DOE is already in the process of mitigating some of these

[54]If the EPA Administrator determines that any changes in activities or conditions pertaining to the disposal system depart significantly from the most recent compliance application, EPA will publish a notice of proposed rulemaking in the *Federal Register* announcing EPA's proposed decision on modifying or revoking WIPP's certification and soliciting comment on the proposed decision. 40 C.F.R. § 194.65(a). After receiving public comments on the proposed decision, the Administrator will publish a final rule in the *Federal Register* announcing a decision on modification or revocation of WIPP's certification. 40 C.F.R. § 194.66(a). The Administrator must also prepare a document summarizing significant comments and issues arising from comments received on the notice of proposed rulemaking as well as the Administrator's response to such significant comments and issues. 40 C.F.R. § 194.66(b). Based on experience and available information on DOE plans, EPA estimated such a rulemaking would take between 2 and 2.5 years.

[55]According to GAO's schedule guide, a credible schedule uses data about risks to predict the level of confidence in meeting a completion date, and necessary schedule contingency and high-priority risks are identified based on conducting a robust schedule risk analysis. If a schedule is not credible, it may not accurately capture project risks, among other things.

risks, as explained above.[56] They explained that DOE plans to update the risk register for WIPP after the performance baselines for the SSCVS and the Utility Shaft are updated, which the department plans to complete in 2022. Without updating the risk register to include specific risks related to construction and regulatory delays and plan for adequate mitigation strategies, DOE may not have an achievable schedule, which may cause shipping delays and cost increases for the generator sites. For example, DOE may need to ask states for permission to keep storing waste at generator sites, potentially violating legal agreements with the states if DOE cannot obtain their consent for extending the storage and incurring higher storage costs or running out of storage space.

We recommended in November 2020 that DOE develop a plan for mitigating the potential impacts of the risks to DOE's transuranic waste cleanup program posed by a potential interruption to waste disposal operations at WIPP.[57] DOE concurred with our recommendation and said DOE is in the process of developing this plan. Without this plan, it is difficult to assess the impact on the generator sites. We continue to monitor DOE's implementation of this recommendation.

Conclusions

WIPP—the only U.S. repository for disposal of transuranic waste—has been operating at diminished capacity because of accidents that increased the need for ventilation. DOE is working to return WIPP to full disposal operations while also getting the regulatory approvals to mine new panels that will be needed after August 2025. However, the construction project on which these efforts depend—SSCVS—has experienced cost increases and schedule delays, and DOE has not developed a corrective action plan to address root causes it identified for these problems. Developing such a plan and ensuring that corrective actions are taken to address root causes are not explicitly required by DOE's project management order. However, assessing the extent to which all corrective actions taken in response to another SSCVS project review—the EIR—have addressed the root causes and determining whether the root causes will not persist or recur is critically important for ensuring that the project does not incur additional cost increases and schedule delays. Moreover, by including requirements in its project management order to (1) develop a corrective action plan, and (2) have an independent office assess and validate that the root causes have been

[56]In addition, DOE officials stated that DOE has additional contingency built into its mining schedules to address various risks.

[57]GAO-21-48.

addressed, DOE will have greater assurance that root causes it identifies will not persist or recur on future capital projects.

Additionally, DOE faces risks related to construction and regulatory delays for completing the first new panel of the additional physical space at WIPP—panel 11—by August 2025, which could affect DOE's transuranic waste cleanup program at multiple waste generator sites across the country. DOE has acknowledged certain construction and regulatory delays as risks in its WIPP risk register, but DOE provides very little information on the specific risks, mitigation strategies, or the cost or schedule impacts if these risks materialize. By updating the risk register to include specific risks related to regulatory and construction delays for the ventilation system and plan for adequate mitigation strategies, DOE may improve the reliability of its schedule and position itself to better mitigate delays and cost increases for the generator sites should risks materialize.

Recommendations for Executive Action

We are making the following four recommendations to DOE:

The Secretary of Energy should ensure that the Director of the Office of Project Management assess the extent to which all corrective actions taken in response to various SSCVS project reviews have addressed the root causes and significant contributing factors identified in the root cause analysis and determine whether there is reasonable assurance that the root causes will not persist. (Recommendation 1)

The Secretary of Energy should ensure that the Director of the Office of Project Management update Order 413.3B to require that program offices develop corrective action plans that will address root causes. (Recommendation 2)

The Secretary of Energy should ensure that the Director of the Office of Project Management update Order 413.3B to require that the Office of Project Management assess and validate the extent to which the program office has taken corrective actions to address root causes identified during the baseline change process. (Recommendation 3)

The Secretary of Energy should ensure that the Assistant Secretary for Environmental Management update the risk register for the Waste Isolation Pilot Plant to include specific regulatory, construction, and other risks, together with adequate mitigation strategies. (Recommendation 4)

Agency Comments and Our Evaluation

We provided a draft of this report to DOE and EPA for review and comment. In its comments, reproduced in appendix I, DOE concurred with our four recommendations. DOE also provided technical comments, which we incorporated as appropriate. EPA did not provide comments on the draft report.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Energy, and other interested parties. In addition, this report is available at no charge on the GAO website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or andersonn@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made significant contributions to this report are listed in appendix II.

Nathan Anderson
Director, Natural Resources and Environment

List of Committees

The Honorable Jack F. Reed
Chairman
The Honorable James M. Inhofe
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Dianne Feinstein
Chair
The Honorable John Kennedy
Ranking Member
Subcommittee on Energy and Water Development
Committee on Appropriations
United States Senate

The Honorable Adam Smith
Chairman
The Honorable Mike Rogers
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable Marcy Kaptur
Chair
The Honorable Michael K. Simpson
Ranking Member
Subcommittee on Energy and Water Development, and Related Agencies
Committee on Appropriations
House of Representatives

Appendix I: Comments from the Department of Energy

The Deputy Secretary of Energy
Washington, DC 20585

February 23, 2022

Mr. Nathan Anderson
Director
Natural Resources and Environment
U.S. Government Accountability Office
Washington, DC 20548

Dear Mr. Anderson:

This letter provides the Department of Energy's (DOE) response to the U.S. Government Accountability Office (GAO), GAO-22-105057SU, Draft Report on the *Waste Isolation Pilot Plant: Construction Challenges Highlight the Need for DOE to Address Root Causes*.

DOE concurs with all the recommendations in the GAO draft report, which are intended to help ensure that corrective actions taken in response to issues identified during the project reviews of the Safety Significant Confinement Ventilation System Project (SSCVS) at the Waste Isolation Pilot Plant (WIPP) have been successfully addressed. Ensuring that the root causes are adequately assessed and addressed is critical in ensuring that SSCVS does not incur additional cost increases and schedule delays. Furthermore, by implementing the recommendations aimed at including additional requirements in DOE's project management order, DOE will have greater assurance that root causes will not persist or recur on future capital projects. Additionally, DOE agrees that updating the risk register to include regulatory and construction delay risks for the ventilation system, and identifying mitigation strategies, may improve the reliability of the SSCVS schedule and improve DOE's ability to mitigate delays and costs increases for the generator sites, should risks be realized. Specific responses to the GAO recommendations are enclosed.

The Department is committed to ensuring root causes of project cost and schedule delays are identified and fully addressed to ensure that DOE projects benefit taxpayers while reducing the risk to human health and the environment.

Thank you for the opportunity to respond to your draft report. If you have any questions, please contact Mr. William I. White, Senior Advisor for Environmental Management, at (202) 586-8214, or Mr. Dae Y. Chung, Associate Principal Deputy Assistant Secretary for Corporate Services, at (202) 586-9636.

Sincerely,

David M. Turk

Enclosures

Enclosure 1

Management Response

GAO Draft Report, GAO-22-105057SU, *Waste Isolation Pilot Plant: Construction Challenges Highlight the Need for DOE to Address Root Causes.*

Recommendation 1: The Secretary of Energy should ensure that the Director of the Office of Project Management assess the extent to which all corrective actions taken in response to various SSCVS project reviews have addressed the root causes and significant contributing factors identified in the root cause analysis and determine whether there is reasonable assurance that the root causes will not persist.

Management Response: Concur.

The Office of Project Management will conduct an independent assessment of the Safety Significant Confinement Ventilation System Project (SSCVS) project which will independently assess the effectiveness of all corrective actions taken in response to previous SSCVS project reviews addressing the root causes and significant contributing factors identified in the SSCVS root cause analysis.

Estimated Completion Date: September 30, 2022

Recommendation 2: The Secretary of Energy should ensure that the Director of the Office of Project Management update Order 413.3B to require that program offices develop corrective action plans that will address root causes.

Management Response: Concur

The Department will develop a project management policy statement requiring the development of a formal corrective action plan for root cause analyses conducted in support of capital asset projects subject to DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*. The policy will be incorporated into the next update of the Order.

Estimated Completion Date: August 31, 2022

Recommendation 3: The Secretary of Energy should ensure that the Director of the Office of Project Management update Order 413.3B to require that the Office of Project Management assess and validate the extent to which the program office has taken corrective actions to address root causes identified during the baseline change process.

Management Response: Concur

The Department will develop a project management policy statement requiring the Office of Project Management to independently assess the effectiveness of all corrective actions taken in response to root cause analyses conducted in support of a baseline change proposal (BCP) on capital asset projects subject to DOE Order 413.3B, *Program and*

Project Management for the Acquisition of Capital Assets. The policy will be incorporated into the next update of the Order.

Estimated Completion Date: August 31, 2022

Recommendation 4: The Secretary of Energy should ensure that the Assistant Secretary of the Office of Environmental Management update the risk register for the Waste Isolation Pilot Plant to include specific regulatory, construction, and other risks, together with adequate mitigation strategies.

Management Response: Concur.

The Office of Environmental Management (EM) is in the process of updating the Waste Isolation Pilot Plant risk register, including the SSCVS project, to include specific regulatory, construction, and other appropriate risks, as well as adequate mitigation strategies for each identified risk. In conjunction with efforts to implement the EM Program Management Protocol life-cycle cost estimate requirements, the Carlsbad Field Office (CBFO) will perform on an annual basis a bottoms-up risk analysis to identify and update risks. Risks identified as contractor risks outside of the contract period of performance will be considered as "federal risks" until transferred to the contractor in future contract periods. CBFO will update procedure documents to reflect the annual risk update and federal to contractor risk transfer process.

Estimated Completion Date: December 31, 2022

Appendix II: GAO Contact and Staff Acknowledgments

GAO Contact

Nathan Anderson, (202) 512-3841 or andersonn@gao.gov

Staff Acknowledgments

In addition to the individual named above, Janice Poling (Assistant Director), Cristian Ion (Analyst in Charge), Eli Lewine, and Jamie Meuwissen made key contributions to this report. Also contributing to this report were Cindy Gilbert, Cynthia Norris, Dan C. Royer, and Jeanette Soares.

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