FINAL REPORT

Type B
Accident Investigation Board Report
Of the November 1, 1999
Construction Injury
At the
Monticello Mill Tailings Remedial Action
Site
Monticello, Utah

Albuquerque Operations Office

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December 1999
Albuquerque Operations Office
U.S. Department of Energy

DISCLAIMER

This report is an independent product of the Type B accident investigation board appointed by R. E. Glass, Manager, Albuquerque Operations Office.

The board was appointed to perform a Type B Investigation of this accident and to prepare an investigation report in accordance with DOE Order 225.1A, *Accident Investigations.*

The discussions of facts, as determined by the board, and the views expressed in the report do not assume and are not intended to establish the existence of any duty at law on the part of the U.S. Government, its employees or agents, contractors, their employees or agents, or subcontractors at any tier, or any other party.

This report neither determines nor implies liability.

APPOINTING OFFICIAL'S ACCEPTANCE STATEMENT

On November 5, 1999, I established a Type B Accident Investigation Board to investigate the Accident at the Monticello Mill Tailings Remedial Action Site that resulted in the Injury of a worker. The Board's responsibilities have been completed with respect to this investigation. The analysis, identification of direct, contributing, and root causes, and judgments of need reached during the investigation were performed in accordance with DOE Order 225.1A, *Accident Investigations*. I accept the findings of the Board and authorize the release of this report for general distribution.

Signed,

R. E. Glass, Manager
Albuquerque Operations Office

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ACRONYMS

AL	Albuquerque Operations Office
BLM	Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CID	Construction Interface Document
CFR	Code of Federal Regulations
DOE	Department of Energy
EM	Office of Environmental Management
EPA	Environmental Protection Agency
ER	Environmental Restoration
DOE-GJO	DOE-Grand Junction Office
HSP	Health and Safety Plan
MPP	Monticello Peripheral Properties
OHM	Ohio Hazardous Materials
OSHA	Occupational Safety and Health Act
OU	Operable Unit
PPE	Personnel Protective Equipment
QC	Quality Control

EXECUTIVE SUMMARY

Introduction

On November 1, 1999, a serious accident at the Department of Energy Monticello Mill Tailings Remedial Action Site in Monticello, Utah was investigated in which a truck driver was struck by a bar when attempting to pry open stuck gates of a belly dump truck while unloading rock. Additionally, on September 14, 1999, two scrapers were involved in a head-on collision at a limited visibility area. Two workers were hospitalized. One driver was hospitalized over five days. The contractor, with participation from the Department of Energy (DOE) Grand Junction Office (GJO), conducted an accident investigation of the scraper collision and a report was finalized on October 21, 1999.

On November 5, 1999, R. E. Glass, Manager, DOE Albuquerque Operations Office (AL), appointed a Type B Accident Investigation Board to investigate the accident in accordance with DOE Order 225.1A, *Accident Investigations*, since the injury resulted in a hospital stay over five days. The scope of the Board's investigation was to identify relevant facts; analyze facts to determine the direct, contributing, and root causes of the accident; develop conclusions; and determine the judgments of need that when implemented, would reduce the probability of a similar recurrence. Additionally, the Board was to review the recent scraper incident and report to determine common causes, if any, between the two incidents.

In conducting its investigation, the Accident Investigation Board (the Board) used various analytical techniques that included: 1) barrier analysis, 2) change analysis and (3) event and causal factor analysis. The Board inspected and photographed the trailer involved in the incident and area where the accident occurred, reviewed the events surrounding the accident, and conducted interviews, and reviewed documents to determine the facts that contributed to the accident.

After the November 1, 1999 accident, construction management implemented the following interim corrective actions: increase in safety awareness through the daily safety meetings, increasing postings and notifications, establishing a check-in area for visitors and vendors, and notifying all listed

vendors and subcontractors concerning entry requirements.

The project is scheduled to be completed in December 1999. After being briefed by the Board, the AL Manager directed the Assistant Manager responsible for Environmental Management and the Grand Junction Office Manager, by memorandum dated November 23, 1999, to take immediate action on the areas that the Board identified as needing attention. These areas included:

- Safety requirements clearly identified and communicated
- Unsafe acts evaluated
- Clear roles and responsibilities
- Job hazard analysis
- Clear delineation of the construction area

These immediate actions were developed to ensure safe completion of the Monticello Project while waiting for the issuance of the Type B Accident Investigation Report. Also, the Manger's memorandum required that DOE-GJO work with AL to ensure that the Integrated Safety Management principles are implemented at Grand Junction this year.

Accident Description

On November 1, 1999 at 11:18 am, a truck driver was struck by a metal bar while attempting to pry open stuck gates on a belly dump. The driver's injury resulted in a fractured skull. He underwent surgery and is expected to make a full recovery. The driver was hired by a local truck owner to haul rock for riprap material to be used in completion of the repository cell at Monticello. This truck owner was hired by a material supply vendor, Crowley Construction because the vendor did not have enough equipment to complete the activities on two contracts that had been awarded.

Causal Factors

The Board identified root causes for the accident, the elimination of which could have prevented the serious injury:

- Site workers and subcontractors were not following site procedures and contract requirements.
- The responsibilities of project and construction management for safety and health on construction sites were not clearly defined.

In addition, contributing causes that may have increased the likelihood of the accident, without individually causing the accident, were identified as follows:

- Construction contract management did not ensure subcontractors were meeting contractual requirements.
- Occurrence investigations were not thorough enough to develop effective actions to prevent similar occurrences.
- Various construction tasks were not fully analyzed for hazards.
- Vendors were not subject to the same safety and health requirements as construction contractors.
- Truck driver was impaired; however, the Board could not determine to what degree this contributed to the accident.

Conclusions and Judgments of Need

Table ES-1 presents the Board's Conclusions and Judgments of Need. The Board's Conclusions are those considered significant, based upon facts and pertinent analytical results. From the Conclusions the Board developed Judgments of Need to guide managers in developing follow-up actions. Follow-up actions should include safety and management controls and practices necessary to resolve the conditions identified in the Conclusions for each Judgments of Need.

Table ES-1: Conclusions and Judgments of Need

Conclusions	Judgment of Need
The construction workers, subcontractors, and vendors were not following the requirements established in the Health and Safety Plan or in the contract documents. For example, Driver 1 appeared to be unfit for duty that was a violation to 49 CFR 382.201, *Alcohol concentration* and OHM's requirement 5.2.17, *Alcohol Prohibited Conduct*. Crowley failed to inform OHM of the hiring of the truck drivers.	MACTEC needs to review current requirements and procedures to ensure applicability and consistency. Based on this review, MACTEC needs to disseminate these requirements and procedures to the workers, subcontractors, and vendors. DOE-GJO needs to ensure that their contractors adhere to contractual requirements relating to safety and health.
Roles and responsibilities for safety and health on construction sites for project management and construction management were not clearly defined.	DOE-GJO needs to clarify roles and responsibilities for safety and health involving project management and ensure these responsibilities are understood and accomplished.

	MACTEC needs to clarify roles and responsibilities for safety and health involving construction management and ensure these responsibilities are understood and accomplished.
Crowley did not inform OHM of the use of independent truck owners.	MACTEC needs to ensure the contractor's requirements are met by subcontractor and lower subtier subcontractors, including vendors.
Occurrence and accident investigations tend to identify personal error as root cause for the incident. Potential management and program system errors are not identified	MACTEC needs to conduct occurrence and accident investigations to determine root causes that focus on program and management systems and develop and implement corrective actions to address the identified causes. DOE-GJO needs to ensure that their contractors are conducting accident and occurrence investigations to identify management and program system errors and ensure that their contractors are implementing effective corrective actions to address the causes.

1.0 INTRODUCTION

1.1 Background

On November 1, 1999, at approximately 11:18 a.m., a truck driver for a material supplier was seriously injured as he was unloading rock from a belly dump truck at the Monticello Mill Tailings Remedial Action Site in Monticello, Utah.

On November 5, 1999, R. E. Glass, Manager, Department of Energy (DOE), Albuquerque Operations Office (AL), appointed a Type B Accident Investigation Board to investigate the accident in accordance with DOE Order 225.1A, *Accident Investigations*, since the injury resulted in a hospital stay over five days. The appointment memorandum is attached in Appendix A.

1.2 Facility Description

The Monticello Mill Tailings Remedial Action Site comprises several tracts of land, including the old Monticello millsite and 34 Monticello Peripheral Properties (MPPs) surrounding the millsite The millsite is a 110-acre tract located along Montezuma creek on the south side of the city of Monticello, San Juan County, Utah. Uranium and vanadium mill tailings and other by-product materials produced during mill operations contaminated the Monticello Mill Tailings Remedial Action Site, the MPPs and the Monticello Vicinity Properties.

The Environmental Protection Agency placed the millsite and vicinity properties on the National Priorities List under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) because of significant risk to human health and the environment associated with the contamination of the tailings. Remedial activities on the millsite began in 1995. Figure 1-1 is a photo of the Monticello Mill Tailings Remedial Action Site.

Contractor activities are managed by the DOE-GJO, which reports to the DOE Albuquerque Operation's Office of Environmental Operations and Services. The cognizant DOE secretarial office is the Office of Environmental Management. The DOE-GJO's construction manager is MACTEC-ERS (MACTEC) and the prime contractor for the Monticello Mill Tailings Remedial Action project is Ohio Hazardous Materials (OHM). OHM conducts most of the work; however, OHM does contract out to other subcontractors and suppliers. Crowley Construction is a supplier to OHM as well as a subcontractor to MACTEC.

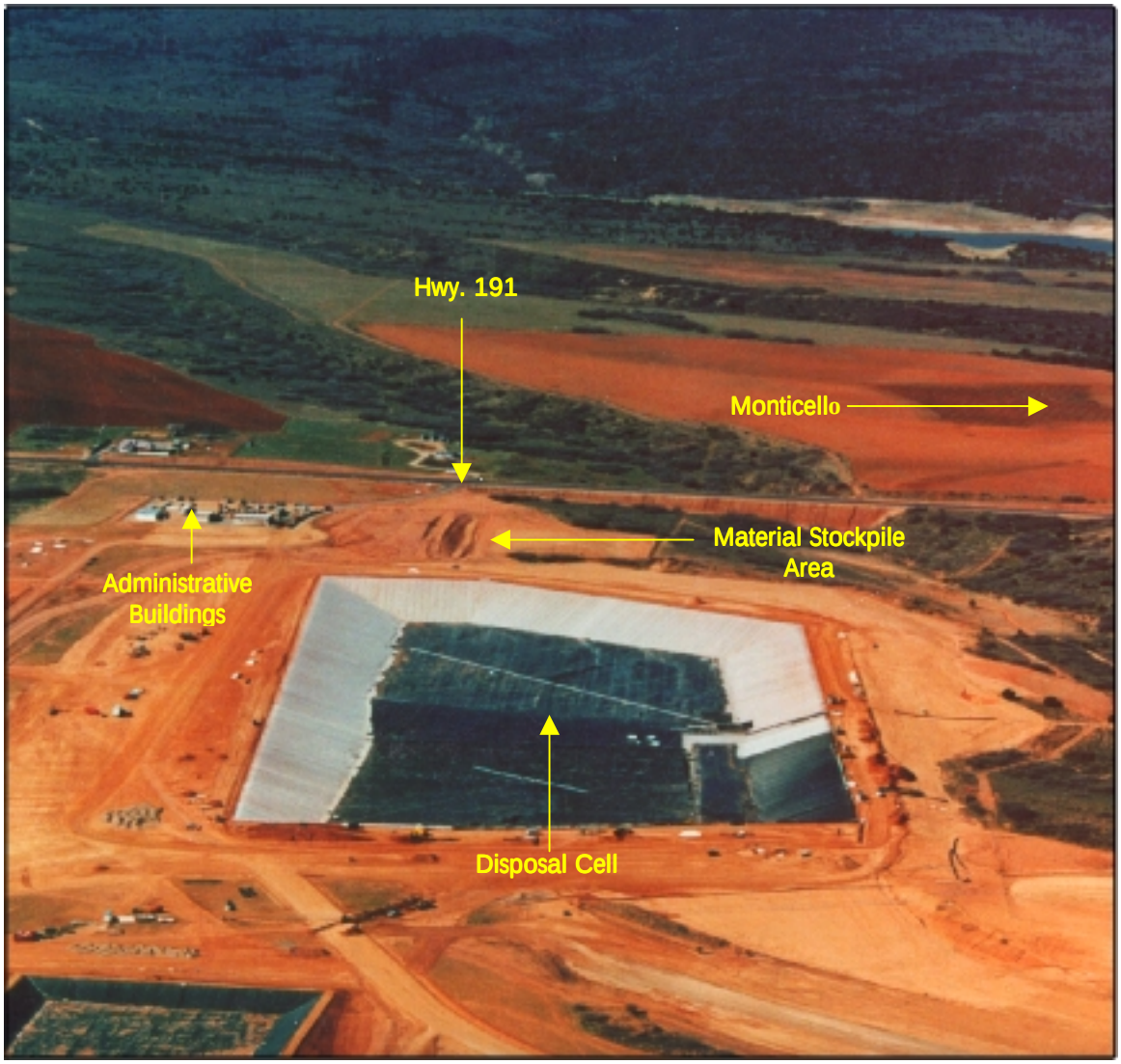


Figure 1-1 Monticello Mill Tailings Remedial Action Site

1.3 Scope, Purpose, and Methodology

The Board began its investigation on November 8, 1999, completed the investigation on November 16, 1999, and submitted its report to the Manager of AL on December 10, 1999.

The Scope of the Board's investigation was to identify relevant facts; analyze facts to determine the direct, contributing, and root causes of the accident; develop conclusions; and determine the judgments of need that when implemented, would reduce the probability of a similar recurrence. Additionally, the Board was to review a recent scraper incident and report to determine common causes, if any, between the two incidents.

The purposes of the investigation were to determine the cause of the accident, identify any safety management deficiencies, and generate lessons learned, which can be applied to similar situations to avoid potential accidents.

The Board conducted the investigation using the following methodologies:

- Interviews and document reviews
- Visual inspections of equipment
- Factual analyses using event and causal factors charting plus barrier and change analysis techniques to identify the causes of the accident and develop judgments of need for corrective actions to prevent recurrence

2.0 FACTS AND ANALYSIS

2.1 Accident Description and Chronology

2.1.1 Background and Accident Description

Onsite activity on the Monticello Mill Tailings Remedial Action Project started in November 1995. The project has various milestones for completion with a final completion date of June 30, 2000. On June 17, 1999, the project experienced a significant safety and health record of 1.5 million man-hours without a lost workday. The project is approximately 90% complete. The contractor is behind schedule, but contracts were put in place to avoid another winter shutdown, which would result in carrying the work over into another construction season. These remaining tasks include completing the dirt cover on the repository and out-slopes, re-contouring of a private property adjacent to the millsite, and hauling and placing the rock (riprap material). Final seeding and restoration will conclude by June 30, 2000, if these tasks are completed.

On May 4, 1999 OHM awarded a purchase order to Crowley to haul rock and sand. On October 19, 1999, Crowley was also awarded a contract to complete a MPP re-contouring project. As a condition of the re-contouring subcontract, Phase IV project, assurances were required of Crowley not to adversely impact any other tasks on the site. Since Crowley did not have enough trucks to complete both contract tasks, he hired trucks and drivers from four local truck owners to continue rock hauling.

2.1.2 Accident Reconstruction and Analysis

The accident occurred at approximately 11:18 am during rock delivery to the stockpile area at the Monticello Mill Tailings Remedial Action Site. The driver of a belly dump truck, Driver 1, delivered two loads of rock to the site earlier in the morning. Typically, the gates of a belly dump truck are operated from the inside of the truck cab, but on both trips Driver 1 had to stop, get out of his truck and manually pry open the belly dump gates using an iron bar approximately 1.25 inches x 4.5 feet. In order to pry open the gates, Driver 1 squatted between the rear tires and behind the belly dump gates, then placed the bar between the partially-opened metal gates and pried open the gates using his own strength. (See Figure 2-1)

Figure 2-1 Reenactment of Accident

On the second trip, Driver 1 and an OHM operator of a front-end loader working in the same area discussed the option of using the front-end loader to assist in the opening of the gates. However, neither had access to a chain to pull the gates apart, and Driver 1 proceeded to open the gates by using the iron bar. The OHM front-end loader operator continued with his work. Although there is a Health and Safety Plan requirement to stop work when equipment malfunctions, neither individual exercised this responsibility.

On both the first two loads, Driver 1 had been successful in opening the gates using the iron bar. Another belly dump truck driver, Driver 2 (hauling for a second truck owner), witnessed Driver 1 prying the gates and did not stop work.

On the third load, Driver 1 once again attempted to open the belly dump gates by using the iron bar. It was during this load that the gates opened and the weight of the rocks forced the iron bar upward, striking the truck driver on the right side of the head above the eye.

Driver 1 was found within minutes of the accident by a Quality Control (QC) Inspector who was also in the area, and by Driver 2 who was unloading his truck on the other side of the stockpile area from where Driver 1 was located. Both of these men found the injured driver unconscious lying adjacent to the truck. Figure 2-2 shows a similar truck at the approximate location of the accident.

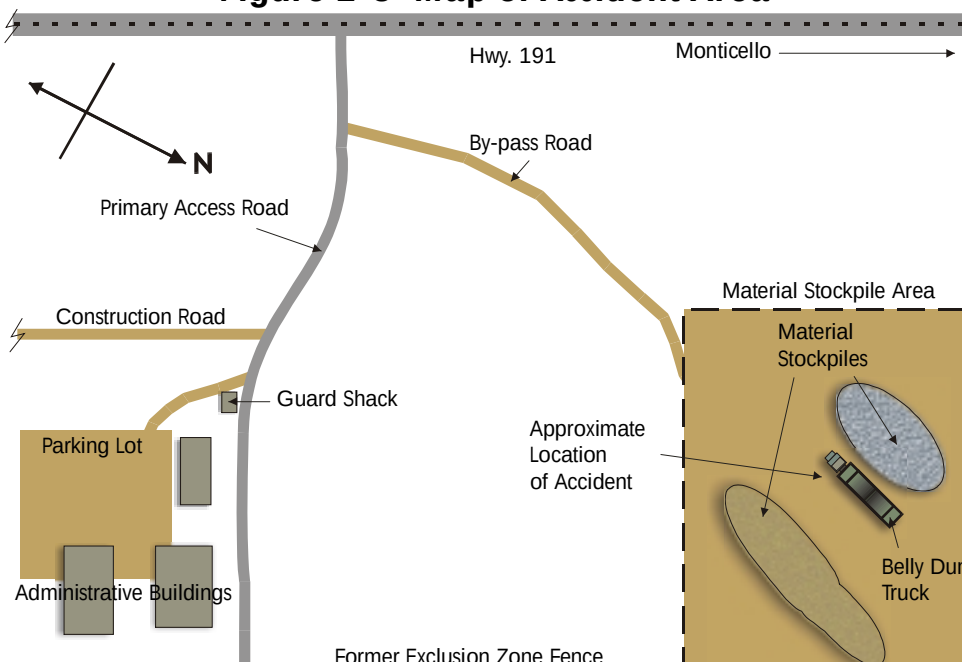
Figure 2-2 Belly Dump Truck at Accident Scene

2.1.3 Chronology of Events

Following is the chronology of significant events and Figure 2-3 *Map of Accident Area*:

- On May 4, 1999, Crowley received purchase order from OHM to produce and deliver sand and rock.
- On October 19, 1999, Crowley received contract from MACTEC to re-contour a MPP adjacent to the millsite.
- On October 25, 1999, Crowley hired trucks and drivers from four truck owners, since Crowley did not have enough equipment to perform both jobs.
- On October 25, 1999, a truck owner hired Driver 1 and provided a belly dump truck. The belly dump trailer had been idle for one year.

Figure 2-3 Map of Accident Area



- On November 1, 1999, Driver 1 delivered three truckloads of rock. Belly dump truck gates stick on each load.
- On November 1, 1999, Driver 1 opened gates successfully on first two loads using an iron bar.
- On November 1, 1999, on third load, at approximately 11:18 a. m., Driver 1 attempted to pry gates open using the metal bar and was struck by the iron bar as the gates opened.
- On November 1, 1999, at 11:23 a.m., a guard called 911.
- On November 1, 1999, at 11.28 a.m., an ambulance arrived at the accident scene.

2.1.4 Emergency Response and Investigative Readiness

At 11:20 a.m., the OHM QC Inspector used his radio to call the OHM Site Safety Officer for assistance. After several tries without any response, the OHM QC Inspector asked Driver 2 to stay with Driver 1 while he went for help. The OHM QC Inspector drove to the office compound to get assistance from the OHM Site Safety Officer. The OHM QC Inspector was able to locate the alternate OHM Site Safety Officer and they both drove toward the accident scene. As they passed the guard shed, the alternate OHM Site Safety Officer asked the guard to call 911 for ambulance assistance.

Upon arriving at the accident scene, the OHM QC Inspector

and alternate OHM Site Safety Officer witnessed that the injured driver had regained consciousness and had stood up with assistance from Driver 2. Driver 2 was physically supporting Driver 1 who was leaning against the truck. Driver 1 was convinced to lay back down until the ambulance arrived. The ambulance arrived approximately five minutes after the guard made the call. The Emergency Medical Technicians treated Driver 1 at the scene and then transported him to San Juan Hospital in Monticello, Utah. Upon examination by the local physician, the physician determined at approximately 3:30 p.m., that Driver 1 should be air lifted to St. Mary's Hospital in Grand Junction, Colorado.

The OHM Site Safety Officer requested that the truck owner get an alcohol and drug screen on Driver 1 since there was some indications from the initial personnel on scene that Driver 1 appeared unfit for duty (several witnesses stated that Driver 1 smelled of alcohol). The accident scene was not secured since the injury was first determined to be minor. Also, during interviews, it was stated that the scene was not secured or photographed since the equipment involved in the incident was not damaged. During the transporting of the injured driver to Monticello and on to Grand Junction, the truck owner moved the belly dump truck off site, therefore, removing physical evidence from the accident scene.

After discovering that the injury to Driver 1 was more severe, DOE-GJO and the prime contractor, MACTEC initiated an accident investigation and arrived at the construction site on November 3, 1999. Witness statements were recorded by DOE-GJO on November 3, 1999. The investigation was interrupted on November 4, 1999 while a formal AL Type B Board was being established.

The Board was established on November 5, 1999 and arrived at the construction site on November 9, 1999. The Board conducted its on-site investigations of the accident on November 9 and 10, 1999 and concluded investigations at DOE-GJO on November 12, 1999.

2.1.5 Medical Analysis

The admission diagnoses included: an open head injury, right frontal-orbital skull fracture, and a right frontal lobe contusion. The laboratory results also showed a residual blood alcohol concentration of 34 milligrams per deciliter or 0.03% at the time of admission. Surgery was conducted on November 5, 1999 with no complications. Driver 1 was

released from the hospital on November 8, 1999 and is expected to return to work.

Several personnel on the scene of the accident informed the Board that Driver 1 appeared to be unfit for duty per their visual contact with Driver 1. 49 CFR 382.201, *Alcohol concentration*, states, "no driver shall report for duty while having an alcohol concentration of 0.04 or greater." Also, OHM Procedure HS101, 5.2.17, *Alcohol Prohibited Conduct*, reiterates this requirement for subcontractors. The Board concluded that the effects of alcohol might have been a factor in this accident, but the degree to which it contributed could not be determine.

2.1.6 Interim Corrective Actions

While awaiting the results of this investigation, MACTEC implemented the following list of corrective actions since the accident on November 1, 1999:

- Increased worker awareness of hazardous operations around them, questioning any unsafe operation, reporting it to supervision and checking for proper personal protective equipment being worn. Presented at the daily tailgate meeting.
- Immediate stopping of all subcontractor and vendor delivery trucks at the guard shack to assure that the proper briefings have been completed, and proper personal protective equipment is available.
- The posting of restricted access signs on roadways that are accessible prior to the guard shack, and additionally at the millsite entrance.
- OHM notified, to all listed vendors and subcontractors, that first time entry requires stopping at the guard shack at the support area.

In addition, MACTEC is implementing the following corrective actions:

- Establish definite physical perimeter boundaries for the site with proper postings.
- Post a map outlining boundaries for each individual controlled area, listing the required proper personal protective equipment for that area.
- Post a notification board at the highway access indicating that all visitors, first-time vendors and subcontractors must stop at the guard shack.
- Establish a route with physical boundaries that directs all

incoming traffic to the guard shack area for checking in.

- Continue worker awareness to safety of not only their individual tasks, but to those around them, and if an unsafe act is observed, it should be reported to supervision.
- Emphasis to all operators that if a piece of equipment is not working properly, stop and report it to supervision.

As a result of the short construction period remaining on the project, the AL Manager directed the Assistant Manager responsible for Environmental Management and the Grand Junction Office Manager, by memorandum dated November 23, 1999, to take immediate action on the areas that the Board identified as needing attention. These areas include:

- Safety requirements, including identifying and ensuring contractual requirements flow down to vendors and subcontractors
- Safety systems should evaluate unsafe acts as well as unsafe conditions and results should be trended to determine possible management and programmatic failures
- Clear defined roles and responsibilities (both contractor and federal staff)
- Current or new construction activities should be analyzed, hazards identified, and appropriate controls established for safety and health (i.e., reevaluate the Reconstruction Task in the Health and Safety Plan)
- Clear identification and communication of the construction area to include traffic patterns and site traffic rules

The Manger's memorandum required that the Grand Junction Office work with AL to ensure that the Integrated Safety Management principles are implemented this year.

2.2 Hazards, Controls, and Management Systems

2.2.1 Management Systems

The following facts address management issues that relate to the accident:

Responsibility

DOE-GJO is a DOE office funded under the Environmental Management (EM) Program. EM's Office of

Site Closure is specifically responsible for the funding and scheduling of environmental restoration (ER).

Through the delegation of the Operations Office responsibility, ER activities in the DOE-GJO are delegated from EM to the Manager of AL. Within AL, overall management of the DOE-GJO is the responsibility of the Office of Environmental Operation and Services. The direct day-to-day management responsibility for ER Projects assigned to the DOE-GJO, for environment, safety and health oversight, resides within the DOE-GJO federal team.

Within DOE-GJO there are two teams; one focusing on project management and the other on environment, safety and health. The health and safety oversight flows down to the Technical Assistance and Remediation Contractor, MACTEC. MACTEC is responsible to ensure that remediation projects are conducted safely and in an environmentally compliant manner.

Safety Program Requirements

Under contract number DE-AC13-96GJ87335, MACTEC is contractually obligated to adhere to the construction management requirements of DOE Order 5480.9A, *Construction Safety Management* and DOE Order 5480.4, *Environmental Protection Safety and Health Protection Standards* (both replaced by DOE Order 440.1A *Worker Protection Management for DOE Federal and Contractor Employees* which references 29 CFR 1910, *Occupational Safety and Health Standards* and 29 CFR 1926, *Safety and Health Regulations for Construction).* Since this was an environmental restoration site, a Health and Safety Plan (HSP) was required, by 29 CFR 1910.120. Initially there were two health and safety plans, one for MACTEC and another for its subcontractor, OHM. To ensure consistency with MACTEC and OHM, a combined HSP, *Monticello Projects Health and Safety Plan, MAC-MRAP 1.3.4* was issued on September 22, 1998, after review and concurrence by the DOE-GJO Project Coordinator. In addition to the HSP, each organization has corporate health and safety policies and procedures. Workers are provided information about the HSP and other safety topics in an initial site briefing and daily tailgate meetings. Although the HSP treats vendors as visitors, OHM's *Health and Safety Policies and Procedures Manual* states that vendors are treated as subcontractors. The major difference between vendor and subcontractor site requirements is that the equipment and

vehicles for subcontractors were to be initially inspected prior to coming on site.

In the HSP, specific procedures and hazard control requirements are specified in Appendix B, *Task-Specific Requirements for Monticello Projects*. However, most of these procedures relate to industrial hygiene and radiation protection hazards. In the Reconstruction Task section of the HSP, which closely relates to the hauling and stockpiling of rock activities, there is no listing of hazard control requirements such as traffic procedures, signs, traffic plans, etc. In the HSP, Appendix D refers to site traffic rules. *Heavy Equipment and Vehicle Traffic Control Plan* refers to site traffic rules. Also, in the HSP it states, "equipment that is defective or not operating must be reported immediately to the supervisor."

OHM and its lower tier subcontractors are contractually obligated to comply with all Occupational, Safety and Health Administration (OSHA), DOE, and other Federal, State and local agency regulations by the Monticello Remedial Action Project Construction Specifications, Terms and Conditions, GJPO-PROC-111 and the HSP. OHM is also responsible for all lower tier subcontractors' compliance with these health and safety requirements. OHM is responsible to identify procedures to ensure lower tier subcontractors are compliant with OSHA Standards. *Health and Safety Requirements*, E0292601 states, "Subcontractor shall perform initial safety inspections of heavy equipment prior to commencement of work," and "Subcontractor shall provide appropriate safety barricades, signs in accordance with 29 CFR 1926 Subpart G and 29 CFR 1910.144."

Crowley was contractually obligated to MACTEC for the Phase IV re-contouring project, and to OHM for Purchase Order 111871 and OHM Terms and Conditions for sand and rock production and delivery. The purchase order identified Crowley as a vendor thus avoiding liability in the event of loose rocks falling from the trucks and damaging other vehicles on the highway.

There were verbal contracts between Crowley and four local truck owners to haul rock and sand to the Monticello site. Crowley gave no information to the truck owners concerning site safety and health requirements. One of the truck owners hired a temporary driver, Driver 1, to haul the rock, but no safety and health information or directions to the site were given to Driver 1.

Safety Oversight

DOE-GJO Project Management determined that there was duplication of safety oversight by MACTEC and OHM. Roles and responsibilities were clarified such that OHM safety personnel would be responsible for industrial safety, and provide the day-to-day safety inspections; whereas, MACTEC would provide safety oversight on the project, but maintain the day to day industrial hygiene and radiation protection responsibility support. To ensure that professional safety oversight was available, a directive was issued, on June 15, 1998, as part of Construction Interface Document (CID), Number 175, MRAP OU1. In this document it states, "OHM shall provide on-site corporate health and safety support and mentoring at a minimum quarterly or more often as agreed with the contractor. OHM shall also provide one additional on-site Health and Safety Technician." In the first year, after implementation of CID 175, corporate heath and safety was present; however after International Technologies acquired OHM, corporate health and safety support has had a minimal physical presence on the site. The industrial safety oversight is comprised of OHM conducting daily inspections and MACTEC and OHM conducting weekly joint inspections.

At the Monticello site, DOE-GJO has a Site Project Manager and a Construction Inspector who is a federal employee from the Bureau of Reclamation. The coordination of these construction activities is challenging and has kept the DOE-GJO Site Project Manager's workload at a high level. A DOE-GJO Safety & Health Manager stationed at Grand Junction visits the site every three to four weeks. Both the Site Project Manager and the Project Coordinator, located at DOE-GJO, stated that the responsibility for health and safety was assigned to the contractor. Although, the Construction Inspector would oversee the safety and health of workers on the site, the majority of his responsibilities were for overseeing the construction progress. The DOE-GJO Safety and Health Manager oversees safety and heath and any deficiencies are brought to MACTEC and OHM's attention. The DOE Project Coordinator has reduced his participation on the Monticello Project due to other assignments. The responsibilities for safety and health oversight are not clearly delineated for the Construction Inspector and Safety and Health Manager by the either the Project Manager or the Project Coordinator. Based on the

above interviews, roles and responsibilities for safety and health are not clearly delineated and understood by the federal and contractor staff.

Construction Activities

Prior to the current activity, the main construction task was to excavate and haul mill tailings into the constructed repository cell. At that time, strict access control and specific radiological procedures were in place for the safety and heath of the workers, public and environment. Radiological postings and fences were erected to define the exclusionary boundaries.

The construction schedule for completion of the repository is behind schedule. To avoid another winter shutdown, additional funds were provided by DOE-GJO to obtain additional scrapers and earth-moving equipment. With this additional equipment, the cap of the repository cell could be completed by December 1999. At the same time, MACTEC and DOE-GJO decided that Phase IV MPP Re-contouring Project would be contracted to ensure completion while the Montezuma Creek was low and to meet the commitments made to the landowner.

To ensure that there was sufficient equipment to complete both activities, the contract for Phase IV was issued with the stipulation that the contractor awarded the project could not impact the activity on the repository. Crowley (successful awardee of Phase IV) indicated that he would obtain other equipment to avoid any impacts to the repository activities. There was no follow-up by MACTEC to verify how Crowley was obtaining the equipment. Although OHM was aware of Crowley's new contract, OHM assumed that Crowley would make the rock hauls without subcontracting.

During this final activity in completing the cell, a knoll was being removed with scrapers and other earth-moving equipment. This activity was adjacent to the fence line that was used to secure the site and also to demarcate the construction and exclusion areas. Both MACTEC and OHM observed traffic congestion problems with the scrapers and material supply equipment delivering sand and rock to the stockpiles nearby. A by-pass was constructed to keep the haul equipment away from the earth-moving equipment. No further measures were taken to establish a fence, erect signs or restrict travel on the new by-pass. MACTEC Safety

Coordinator noted that the fences and signs were not in place, but these controls were not erected since there were differences in the definition of a construction area. Some individuals felt that the construction area extended to Highway 191, which was bounded by barbwire fencing. The contractors did not perform an integrated job hazard analysis to identify and mitigate hazards for the above construction activities.

Previous Incidents and Accidents

On March 23, 1999, there was a structural deformation of a 1,000-gallon diesel fuel tank because of actions performed by a fuel delivery vendor. MACTEC conducted an investigation and determined that the root cause of the accident was a lack of compliance with existing procedures. Although records show the vendor was trained, the vendor stated that he was not trained. One of the corrective actions was to re-train the fuel vendor on the established refueling plan and the HSP.

Between June 1, 1999 and September 8, 1999, the site experienced four incidents involving scrapers; however, these incidents did not result in personnel injury or equipment damage. The following lists the incidents and root causes:

- On 6/1/99, three scrapers bumped while loading radon barrier material. The root cause was determined to be operator error.
- On 6/7/99, the road sank which caused the scraper to high center. The root cause was lack of management's awareness of the road condition.
- On 6/29/99, the throttle mechanism of the scraper stuck in the open position. The direct cause was mechanical malfunction.
- On 9/8/99, a scraper rolled off the edge of an earthen berm. The root cause was personnel error.

On September 14, 1999, two scrapers were involved in a head-on collision at a limited visibility area. Two workers were hospitalized. One driver was hospitalized over five days. The contractor, with participation by DOE-GJO, conducted an accident investigation and a report was finalized on October 21, 1999. The accident investigation team concluded that the root cause was personnel error because the worker was aware of the limited visibility and potential danger but did not stay on the outside lane. No contributing causes were identified. Judgments of Need were

identified as part of a continuous safety improvement effort. This report was issued on 11/22/99 and no corrective actions were taken at that time prior to the current accident. These Judgments of Need are as follows:

- Performance of field supervisors should be evaluated to ensure work activities are adequately monitored.
- The equipment maintenance system should be evaluated to ensure that the highest priority is given to repair of deficiencies that effect safe operation of equipment.
- The training and qualification practices for equipment operators should be reviewed for adequacy.
- Shift changes should be continually evaluated for safety impact
- Management should assign responsibility for tracking corrective actions and perform oversight to ensure effectiveness of the system.

2.2.2 Work Planning and Controls

The Board's analysis of work planning and controls focused on the site activities and whether the contractor's and subcontractor's implementation resulted in effective project planning and anticipated hazard control. The framework for analysis consisted of the five core safety management functions described in DOE Policy 450.4:

- Define the scope of work
- Identify and analyze the hazards associated with the work
- Develop and implement hazard controls
- Perform work within controls
- Provide feedback on adequacy of controls and continuous improvement in defining and planning work

These five core safety management functions provide the necessary structure for any work activity that could affect the public, the workers or the environment. The rigor in addressing these functions depends on the type of work activity and the hazards involved. An analysis of several activities leading to the iron bar accident in relation to applicable core functions is presented in the following subsections:

Define the Scope of Work

Several activities that were significant and contributed to the accident over a period of time are listed below:

- Elimination of the Exclusion Area
- By-pass Road Construction
- Phase IV Contract Execution
- CID 175 Implementation

These activities were not effectively communicated and integrated into the overall project and were not disseminated to various subcontractors and vendors.

Identify and Analyze the Hazards Associated with the Work

The following hazards were not adequately identified and analyzed by the contractor and subcontractor safety personnel:

- Elimination of Exclusion Construction Area - As the radioactive material control zone was removed, the construction hazards and associated controls were not thoroughly identified. There was much confusion on what constituted the construction area boundaries and therefore, PPE requirements were not consistently enforced.
- By-pass Road Construction - Decisions were made to construct a by-pass road to alleviate a traffic safety concern; however, postings, traffic patterns and rules, and communications to other subcontractors were lacking. Without these hazard controls, Driver 1 was not aware of the construction site boundaries and its rules and requirements.
- Phase IV Contract Execution- Additional re-contouring work on an adjacent MPP was deemed necessary and a new short duration contract was awarded to Crowley for rock hauling. This new work required belly dump trucks in addition to Crowley's rock hauling trucks. As a result Crowley acquired more belly dump trucks and drivers from local truck owners. These new truck owners and drivers were not used to the rigor of safety and health required on the Monticello Project.
- CID 175 Implementation – The change instituted a different approach to implementing industrial safety. The day to day responsibility for industrial safety and health implementation was transferred from MACTEC to OHM. This caused some confusion on roles and responsibilities and weakened verification and oversight of safety.

Develop and Implement Hazard Controls

The September 1998 HSP was used to develop the controls for the Monticello Mill Tailings Remedial Action Project. This project was divided into numerous tasks that are defined in the HSP. Task hazards were identified along with the location of the task, PPE prescribed, additional training, monitoring, permits, associated procedures, and task specific hazard control requirements. These task hazards focused mainly on radiation and industrial hygiene. Since the development of the HSP there has been no updates except for the page change for a traffic plan.

For the Reconstruction Task, REC.1, which includes material hauling, the task specific hazard control requirements included: dust suppression; spotters (if necessary); eye contact (operator/worker); back-up alarms; and ground personnel out of operating area. In addition to these task requirements, the HSP also included Recommended Hazard Controls and Protective Equipment and Traffic Control Plans. This information included rules and instructions for using equipment and vehicles on the site. These administrative controls were provided to the worker during the initial briefing and during daily tailgate safety meetings.

Perform Work within Controls

Monitoring of performance consisted of site inspections and accident/injury statistics. OHM conducted daily inspections and on a weekly basis, both MACTEC and OHM performed site inspections. Based on reviews of the inspection documents, these inspections concentrated on unsafe conditions, such as, housekeeping, condition of roads, etc. Unsafe acts or failure to follow procedures were not documented. Based on interviews, if procedures were not being followed, the worker was alerted of the fact. Without the documentation of the unsafe acts, trending of performance could not be conducted.

Provide Feedback on Adequacy of Controls and Continuous Improvement in Defining and Planning Work

MACTEC and its subcontractor had experienced various incidents in the past year that were investigated and corrective actions taken. However, the incidents were not evaluated to with respect to management systems or program

failures. Several incidents in the past had similarities to this recent incident. For example, the two scrapers that collided resulted in a corrective action to establish two-way traffic control by the use of cones. The rock hauling by-pass did not get any management focus on two-way traffic control. Another example was the incident involving a fuel vendor and the structural deformation of a fuel tank. The corrective action was taken to re-train the fuel vendor but other vendors were not evaluated to determine if they needed re-training.

2.2.3 Equipment Safety

According to the truck owner, the belly dump trailer was idle for the past year prior to being used for this hauling activity. OHM relied on the fact that Crowley was familiar with the site procedures, since the company had worked on the site and other peripheral properties. However, OHM was not informed that other subcontractors to Crowley were hired.

2.3 Barrier Analysis

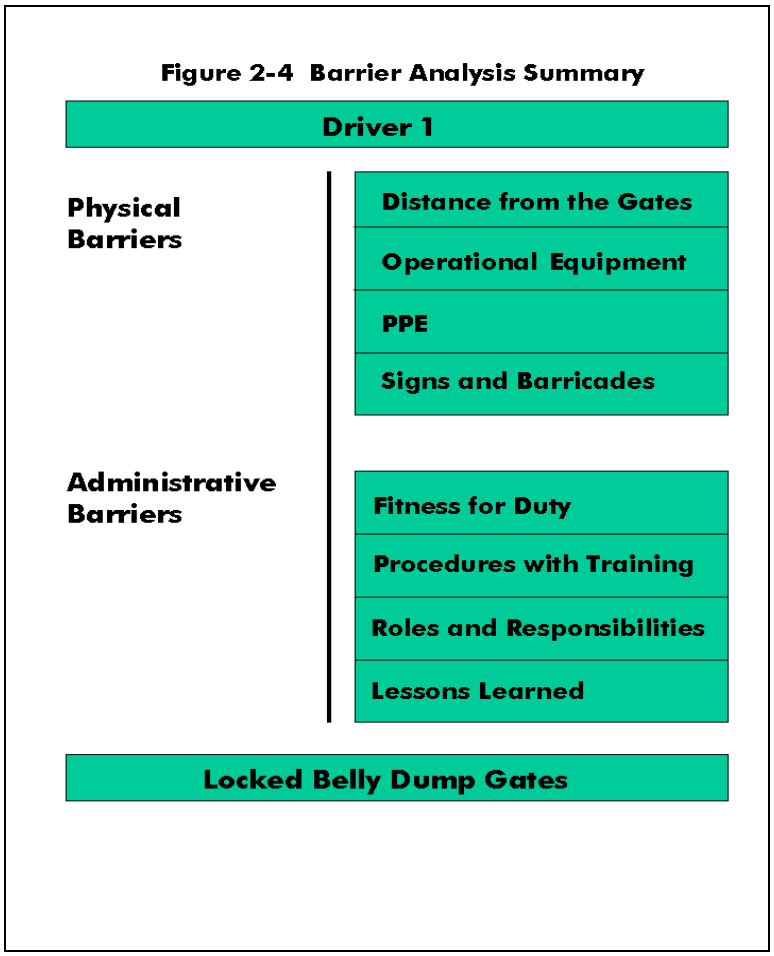
A barrier analysis was conducted to identify conditions that if in place, would have isolated the driver from the hazards associated with the stuck gates of the belly dump truck. The analysis addresses both the management and physical barriers that should have been used or were not in place prior to the accident. The barriers are summarized in Fig. 2-4 *Barrier Analysis Summary*.

Physical Distance from Gates

From interviews with Driver 1 and the front end loader operator, there was a conversation about using the front end loader and a chain to free the stuck gates so that Driver 1 would not have to pry open the gates with the bar. However, since there was no chain available, Driver 1 made the decision to use the iron bar. Although the use of heavy equipment to open the belly dump gates would have kept the driver from using the bar to open the gates, the proper procedure would have been to stop work and make equipment repairs.

Operational Equipment

The belly dump truck used by Driver 1 was idle for about a year. This inactivity may have contributed to the failure of the pneumatic system to open the gates fully. Crowley did not own this vehicle. Crowley was also awarded another contract for earth- moving at the site, and so Crowley's in-use belly dump trucks were pulled from the material supply



purchase order work to the earth-moving contract work. Local truck owners were hired to compensate for the increased work demand. The truck involved in the accident was not inspected or checked for operational readiness. A check for operational readiness may have prevented the truck malfunction.

PPE

To work in a construction area or when alighting from a vehicle in a construction area, workers were required to wear designated PPE including hard hats, safety glasses, reflective vests, and safety shoes at a minimum. Crowley did not communicate the requirement for PPE to the truck owner or to Driver 1. A hard hat, in this case, may have prevented or reduced the seriousness of the injury.

Signs and Barricades

Signs were not posted at the construction site boundary (site entrance from Highway 191) alerting workers and visitors of

PPE requirements or check-in requirements. Signs were in place alerting workers of PPE requirements before entering the former exclusion zone. When the by-pass was constructed, a sign or posting was not in place for the rock haulers to alert them of PPE requirements. Also, fencing which was used to secure the construction site or exclusion zone was removed, so earth-moving activities could be performed along the fence line. Without this fence or additional postings, workers could not define the construction site boundaries.

Fitness for Duty

According to the medical records, there were indications that Driver 1 may not have been fit for duty. Driver 1 was not directly employed by Crowley, but was hired by a local truck owner to deliver rock. Therefore, Driver 1 was not subject to company fitness for duty requirements. Assuring that Driver 1 was fit for duty would have lessened the possibility of performing unsafe acts because of poor judgement.

Procedures with Training

Neither Crowley nor the truck owner provided instructions to Driver 1 concerning PPE requirements, stop work procedures, reporting of defective equipment, traffic patterns or traffic rules. Training on these procedures, requirements and safety rules may have prevented the accident or injury.

Roles and Responsibilities

Roles and responsibilities for safety from the workers to the safety and project managers were not clearly understood or communicated.

- Workers: If roles and responsibilities were properly communicated and followed, work would have been stopped when workers noticed that the belly dump truck gates were malfunctioning. Driver 1 would not have resumed hauling until the equipment was safely and properly repaired. On-site trained workers were required to notify appropriate officials in the event of equipment failure so repairs could be performed in accordance with the HSP. This responsibility was not followed since it was not communicated by the truck owner to Driver 1.
- Vendor: Vendors were, for the most part, not informed of site safety roles and responsibilities. Not knowing

their roles and responsibilities or the roles and responsibilities of the on-site workers, significantly contributed to the failure of Driver 1 to properly handle the malfunctioning belly dump truck. If roles and responsibilities were properly understood, Driver 1 would have stopped work and the truck would have been repaired properly.

- Safety Personnel, Contractor Managers, and DOE Project Managers: Each of these individuals claimed to be the overall responsible person for safety on the Monticello Project. However, without full integration of site activities (constructing the by-pass, removing the fence, and the Phase IV task), there was no overall evaluation of the project with regards to health and safety. Also, previous accidents and incidents were not assessed for trends and lessons learned to ensure that subcontractors met their respective contract requirements. The project over the last year experienced several incidents. The most recent accident may have been prevented if previous accidents were thoroughly investigated an appropriate corrective actions implemented. For example, the accident with the diesel tank deformation revealed a training issue with a vendor. The corrective action was taken to re-train the fuel vendor but other vendors were not evaluated to determine if they needed re-training.

Lessons Learned

There were numerous site incidents and accidents that were investigated. The majority of the root causes were identified as personal error or not following procedures. In one case, the corrective action was to retrain vendors on a specific procedure, yet it was not identified that other vendors may need training on the procedures established at the site. Lack of thorough root cause analysis and subsequent lessons learned implementation resulted in the failure of this barrier. If lessons learned were properly implemented all vendors (including Crowley) would have received proper site safety training.

2.4 Change Analysis

A change analysis was also conducted to analyze any changes or differences to determine causal factors in this accident. These changes and the effect of these changes are presented in summary form in Table 2-1 *Change Analysis*.

Table 2-1 Change Analysis			
Change or Difference		Analysis	
Planned or Normal Condition	Condition at time of Accident	Difference or Change	Evaluation
Chain and Operating Equipment are used to open the belly dump truck gates.	Iron bar is used to open the gate	When using the bar, the driver was exposed to the hazards of the gates opening and causing the bar to strike him.	Although the driver and the operator of the front-end loader identified the need for the chain, neither of these workers stopped the work to get the right equipment.
Driver 1 is fit for duty.	Driver 1 is possibly impaired.	Driver 1 used the bar to open the gates, since his judgement may have been impaired.	Driver 1 is a temporary worker for the Truck Owner. The Truck Owner did not use formal hiring policies and procedures to ensure the drivers are fit for duty. Although OHM has a requirement for Alcohol Prohibited Conduct, this requirement was not passed to the truck owner, since Crowley did not inform OHM of the hiring of other truck owners.
Vendors meet the same requirement as subcontractors.	Vendors do not meet site requirements.	Subcontractors must comply with more stringent requirements than vendors, and must have training.	Vendor status was established to eliminate liability claims should rocks fall from trucks and damage other vehicles. Although the HSP treats vendors as visitor, the Health and Safety Policies and Procedures Manual of OHM states that vendors are treated as subcontractors.

Table 2-1 Change Analysis			
Change or Difference		Analysis	
Planned or Normal Condition	Condition at time of Accident	Difference or Change	Evaluation
Workers are trained and informed about health and safety requirements	Workers are not retaining information provided during the tailgate meetings.	Safety procedures, instructions and policies are not followed	Stop work, working with defective equipment, and wearing PPE was not communicated to the driver since OHM was not informed of the new drivers. But in other incidents, the root causes were identified as personal errors, although workers received the training. The safety requirements at the site consist of the HSP and corporate requirements, and unless brought to the attention of the worker, these requirements are only disseminated in tailgate meetings and site briefings.
Good operating equipment	Pneumatic system on the dump gates was apparently faulty.	The gates did not open and Driver 1 used a bar.	Safety inspections were not performed on vendor equipment.
Adequate and quality equipment available	Limited quality and amount of equipment	Additional equipment contracted from local truck owners	Although MACTEC identified this change when awarding the contract for Phase IV, there was no verification as to what equipment was going to be used.
Qualified Material Supply Contractor available to perform work	Material Supply Contractor subcontracts his work to local Truck Owners.	Truck Owners were not aware of the procedures to be followed at the project site.	Contractor did not inform OHM of the new truck subcontractors; therefore OHM did not provide appropriate training.

Table 2-1 Change Analysis			
Change or Difference		Analysis	
Planned or Normal Condition	Condition at time of Accident	Difference or Change	Evaluation
Secure construction site	Undefined construction area boundaries	PPE is required in construction areas.	Since the fence securing the area was removed, the construction site was no longer defined so the use of PPE was also not defined. Also, some workers believed that the material storage area was not a construction area.
A defined 29 CFR 1910.120 waste remediation site	Final stages of construction	During the remediation activity, radiation and health protection was emphasized. This emphasis on health issues also influenced overall safety.	The exclusion area boundaries were removed because there were no longer health hazards. Additional posting or barricades to alert the worker of safety hazards did not augment the loss of this physical control.
Fenced access to construction area	By-pass constructed around site	There are no longer signs posted on the fence to alert workers to wear PPE.	The by-pass was constructed to reduce the cross traffic between the scrapers and the supply trucks; however, there was no further analysis to determine the consequences of the change.

2.5 Causal Factors

The direct cause of the accident was that an iron bar used for prying the belly dump gates struck the head of Driver 1. The belly dump gates released causing the iron bar to be ejected toward the driver.

The root cause of the accident is the fundamental cause that, if eliminated or modified, would prevent reoccurrence of this and similar accidents. There were also contributing causes that individually did not cause the accident, but increase the likelihood of the accident and are important enough to be recognized as needing corrective action. The causal factors are identified on Table 2-2, *Root Causes*, with a discussion for each cause. Appendix B, *Events and Causal Factors Analysis Summary* includes the summary of the events and causal factors chart.

Table 2-2 Root Causes

Root Causes	Discussion
Site workers and subcontractors are not following site procedures and contract requirements.	Procedures and requirements are found in the Health and Safety Plan along with corporate safety manuals. Unless the contractor and subcontractor review these documents, the workers and subcontractors may only receive the important information during one-time safety briefing or at informal tailgate meetings. Crowley's new Truck Owners and drivers did not receive any briefings prior to entering the site. In addition DOE-GJO has a responsibility to ensure that contractual requirements are met for safety and health.
Roles and responsibilities for safety and health oversight by project and construction management were not clearly defined.	The ES&H oversight by DOE-GJO and MACTEC was limited. The Project Manager and Coordinator were focused on production tasks and relied on MACTEC for oversight. One of the items required under CID 175 was to delegate industrial safety implementation to OHM. Oversight consisted of inspections without evaluations of program and management systems. Consequently, some site workers and vendors were not aware of roles and responsibilities on site, for example, the front end loader operator did not perform according to assigned responsibilities and

	Driver 1 was not aware of PPE requirements or site check-in requirements. In addition, it was apparent through the interviewing process that what position (or which individual) was responsible for overall site safety was not clearly understood by most site personnel.
Contributing Causes	Discussion
Accident and Occurrence investigations were not thorough to develop effective corrective actions to prevent similar occurrences.	Investigations conducted by the contractor and its subcontractors have in most cases identified the cause of the incident as personal error. Occurrence investigations did not identify programmatic failures, management failures, or contributing causes that if corrected could prevent similar occurrences. In one case, the corrective action was to retrain vendors on a specific procedure, yet it was not identified that other vendors may need training on the procedures established at the site.
Various construction tasks were not fully analyzed for hazards.	The following tasks: elimination of the exclusion zone, By-pass road construction, Phase IV contract execution, and CID 175 implementation were not fully analyzed for the possible hazards associated with these changing site activities.
Vendors were not subject to the same safety and health requirements as the construction subcontractors.	Although OHM procedures do not differentiate between suppliers and subcontractors, OHM established a distinction in order to reduce liability issues.
Construction management did not ensure subcontractors were meeting contractual requirements.	Both OHM and its subcontractors did not meet their respective contractual requirements. OHM was requested to provide safety barricades and signs, which were not present, when the exclusion fence was removed. OHM was also required to perform industrial safety inspections of subtier contractor equipment. Crowley failed to report to OHM that he had hired additional the truck owners.
Truck driver was possibly impaired.	Based on interviews, several personnel indicated Driver 1 appeared to be unfit for duty. The Board concluded that the effects of alcohol might have been a factor in this accident, but the degree to which it contributed could not be determined.

3.0 CONCLUSIONS AND JUDGMENTS OF NEED

Conclusions	Judgment of Need
The construction workers, subcontractors, and vendors were not following the requirements established in the Health and Safety Plan or in the contract documents. For example, Driver 1 appeared to be unfit for duty that was a violation to 49 CFR 382.201, *Alcohol concentration* and OHM's requirement 5.2.17, Alcohol Prohibited Conduct. Crowley failed to inform OHM of the hiring of the truck drivers.	MACTEC needs to review current requirements and procedures to ensure applicability and consistency. Based on this review, MACTEC needs to disseminate these requirements and procedures to the workers, subcontractors, and vendors. DOE-GJO needs to ensure that their contractors adhere to contractual requirements relating to safety and health.
Roles and responsibilities for safety and health on construction sites for project management and construction management were not clearly defined.	DOE-GJO needs to clarify roles and responsibilities for safety and health involving project management and ensure these responsibilities are understood and accomplished. MACTEC needs to clarify roles and responsibilities for safety and health involving construction management and ensure these responsibilities are understood and accomplished.
Crowley did not inform OHM of the use of independent truck owners.	MACTEC needs to ensure the contractor's requirements are met by subcontractor and lower subtier subcontractors, including vendors.
Occurrence and accident investigations tend to identify personal error as root cause for the incident. Potential management and program system errors are not identified	MACTEC needs to conduct occurrence and accident investigations to determine root causes that focus on program and management systems and develop and implement corrective actions to address the identified causes. DOE-GJO needs to ensure that their contractors are conducting accident and occurrence investigations to identify management and program system errors and ensure that their contractors are implementing effective corrective actions to address the causes.

4.0 BOARD SIGNATURES

George J. Rael
Accident Investigation Board Chairperson
U.S. Department of Energy
Albuquerque Operations Office

Date 12/10/99

Ralph Fevig
Accident Investigator
U.S. Department of Energy
Albuquerque Operations Office

Date 12/10/99

John Cormier
Board Member
U.S. Department of Energy, Kirtland Area Office
Albuquerque Operations Office

Date 12/10/99

Patricia Armijo
Board Member
U.S. Department of Energy
Albuquerque Operations Office

Date 12/10/99

5.0 BOARD MEMBERS, ADVISORS, AND STAFF

Board Members

George J. Rael
Accident Investigation Board Chairperson
Albuquerque Operations Office

Ralph Fevig
Albuquerque Operations Office

John Cormier
Albuquerque Operations Office

Patricia Armijo
Albuquerque Operations Office

Site Assistance

Vernon Cromwell
Safety Officer
Grand Junction Office
Albuquerque Operations Office

APPENDIX A
TYPE B INVESTIGATION BOARD MEMORANDUM

United States Government **Department of Energy**
Albuquerque Operations Office

memorandum

DATE: 11/5/99

REPLY TO ATTN OF: ISRD

SUBJECT: Establishment of a Type B Investigation Board

TO: John Arthur, Assistant Manager, OEOS, AL
Donna Bergman, Project Office Manager, GJPO, AL

I hereby establish a Type B investigation Board to investigate the construction accident involving a construction sub-contractor employee at the Monticello site that occurred on November 1, 1999. The employee will be hospitalized for greater than five days.

The following individuals are appointed to the Investigation Board in the listed capacity:

Board Chairperson: George Rael, ERD
Accident Investigator: Ralph Fevig, ISRD
Team Member: John Cormier, KAO

Administrator, advisors, consultants and other personnel as determined by the chairperson will assist the Board. The scope of the Board's investigation will include, but not be limited to identifying relevant facts; analyzing the facts to determine the direct, contributing, and root causes of the accident; developing conclusions; and determining the judgments of need that when implemented, reduce the probability of similar recurrence. This investigation will also review the recent scraper incident and report to determine common causes between the two incidents. Since the project is nearing completion, the Board will communicate any evolving issues involving safety and health with the project office while conducting this investigation. The investigation will be conducted in accordance with DOE Order 225.1A.

The Board will provide my office with periodic reports on the status of the investigation, but will not include any conclusions until an analysis of all the causal factors have been completed. Four copies of the draft report should be provided to me by December 6, 1999 for review prior to its preparation in final form. Any delay to this date should be justified and forwarded to this office. Discussions of the investigation and copies of the draft report will be controlled until I authorize release of the final report.

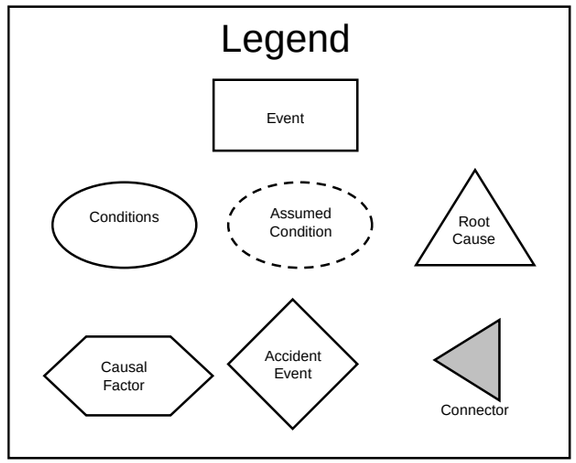
By copy of this memorandum, I am advising the supervisors of each of the Board Members that their assignments are full-time until the investigation and report are completed. The advisors to the Board shall assist the Board in the investigation on a priority basis and provide input to this chairman, as requested. Board members advisors are requested to attend an opening briefing with Grand Junction Project Office to be held at Grand Junction Project Office on November 8, 1999 at 8:00 am.

R. E. Glass
Manager

cc:
D. Stadler, EH-2, HQ
C. Huntoon, EM-1, HQ
R. Hardwick, EH-22, HQ
C. Lagdon, EH-22, HQ
J. Fiore, EM-30, HQ
L. Kirkman, OSS, AL
C. Longenbaugh, ISRD, AL
G. Laskar, KAO
M. Williams, NTPO
J. Owendoff, EM-40, FORS/HQ

APPENDIX B
EVENTS AND CAUSAL FACTORS ANALYSIS SUMMARY

Events and Causal Factors Summary



Role and responsibilities are not clearly defined

Procedures and contractual requirements are not effectively communicated to workers and subcontractors

A

Vendors do not meet HSP requirements

Accident Investigations not thorough

No analysis of change

Violation of contract requirements

No analysis of change

Resulting corrective action implementation was done only for specific vendor

Use of vendors to avoid liability issues

Assumption that since Hwy 191 is boundary, no need to post

No verification of statement of "no impact"

Focus on production and schedule

Truck Owners/ drivers do not receive any safety information

Vendor not informed of new route

No analysis of change

Recommended that all vendors receive training on HSP

Required drivers to perform safety checks and follow routing and traffic directions

Investigations did not determine root cause

Construction safety receives less priority

Materials Supply Contractor pulls trucks off of current work to meet new requirements

OHM/IT not aware of new trucking companies; for subcontractors-yes, vendors-no

Traffic pattern not identified for new area/material unloading

No verification of implementation; oversight is lacking

Root cause is that procedures were not followed

References 99 page terms and conditions

False sense of safety security from previous successes

Other causal factors not properly identified

No more exclusion zone or focus on rad

Materials Supply Contractor does not have enough trucks to meet new requirements

Hired on to meet commitments of new contract for phase IV work

No traffic control on by-pass

Not a dedicated construction site

Reservations about roles and responsibilities

Vendor accident report 4/30/99

Hired with a purchase order

Personal or operator error frequently cited as cause

Root cause of investigation is found to be operator error

Subsequent construction site not identified

OHM/IT is aware of new contract

Verbal agreement with drivers; Pay is by number of loads

Approved verbally by OHM/IT

Doesn't include material stockpile area

CID 175 issued 06/15/98

Tank Deformation Incident 03/22/99

Materials Supply Contractor hired to deliver rock 05/4/99

Numerous accidents occurred (ORPS)

Accident with two scrappers 9/17/99

Informal Operation by OHM

Exclusion (boundary) fences are removed 9/30/99

Focus on production and schedule

Monticello project identified behind schedule

Work schedule changed mid-October

Current work can't be impacted by this new work

Materials Supply Contractor awarded new contract 10/19/99

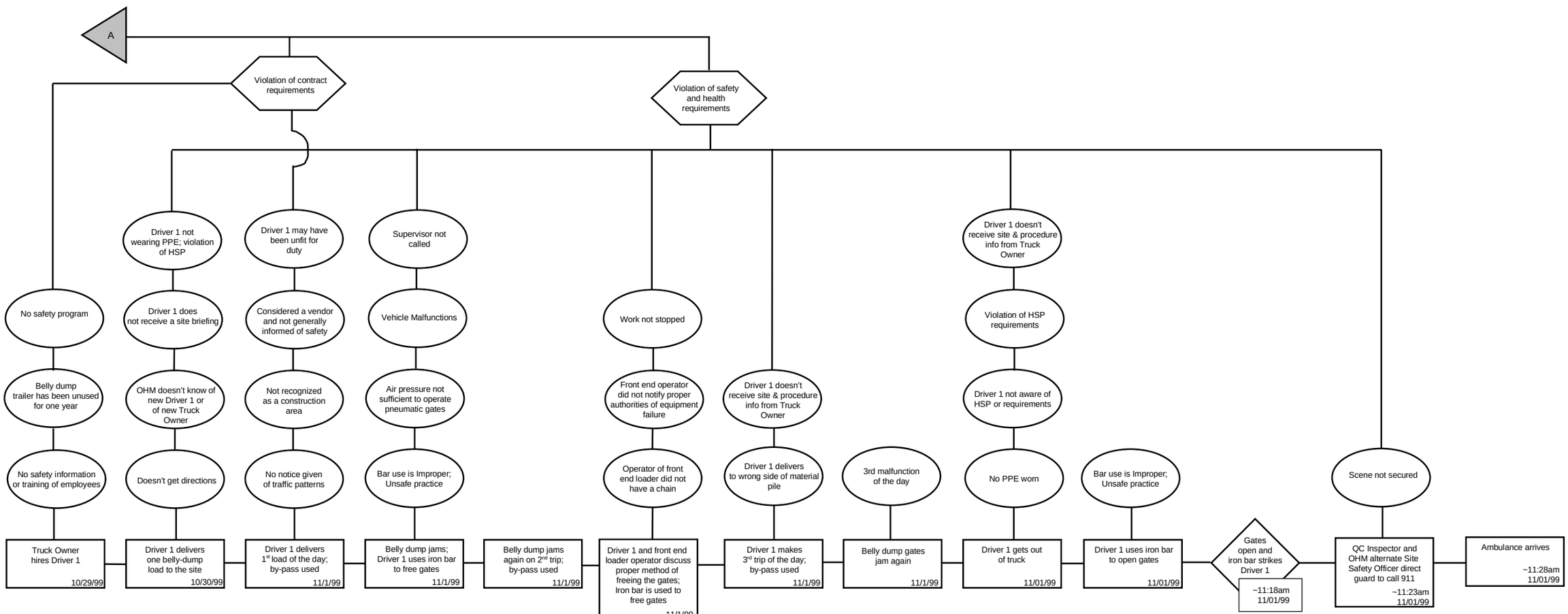
Focus on completion by winter

Increase in amount of heavy equipment 10/21/99

Materials Supply Contractor hires trucks & drivers from 4 local Truck Owners 10/25/99

By-pass to material stockpile area became operational 10/25/99

OHM/IT generates final traffic problem routes 10/27/99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Violation of contract requirements
Violation of safety and health requirements
No safety program
Belly dump trailer has been unused for one year
No safety information or training of employees
Truck Owner hires Driver 1
10/29/99
Driver 1 not wearing PPE; violation of HSP
Driver 1 does not receive a site briefing
OHM doesn't know of new Driver 1 or of new Truck Owner
Doesn't get directions
Driver 1 delivers one belly-dump load to the site
10/30/99
Driver 1 may have been unfit for duty
Considered a vendor and not generally informed of safety
Not recognized as a construction area
No notice given of traffic patterns
Driver 1 delivers 1st load of the day; by-pass used
11/1/99
Supervisor not called
Vehicle Malfunctions
Air pressure not sufficient to operate pneumatic gates
Bar use is Improper; Unsafe practice
Belly dump jams; Driver 1 uses iron bar to free gates
11/1/99
Belly dump jams again on 2nd trip; by-pass used
11/1/99
Work not stopped
Front end operator did not notify proper authorities of equipment failure
Operator of front end loader did not have a chain
Driver 1 and front end loader operator discuss proper method of freeing the gates; Iron bar is used to free gates
11/1/99
Driver 1 doesn't receive site & procedure info from Truck Owner
Driver 1 delivers to wrong side of material pile
Driver 1 makes 3rd trip of the day; by-pass used
11/1/99
3rd malfunction of the day
Belly dump gates jam again
11/1/99
Driver 1 doesn't receive site & procedure info from Truck Owner
Violation of HSP requirements
Driver 1 not aware of HSP or requirements
No PPE worn
Driver 1 gets out of truck
11/01/99
Bar use is Improper; Unsafe practice
Driver 1 uses iron bar to open gates
11/01/99
Gates open and iron bar strikes Driver 1
~11:18am 11/01/99
Scene not secured
QC Inspector and OHM alternate Site Safety Officer direct guard to call 911
~11:23am 11/01/99
Ambulance arrives
~11:28am 11/01/99