



**DuPont Sodium Cyanide Production & Packaging  
Operations**

**ICMI Cyanide Code Re-Certification Audit**

**SUMMARY AUDIT REPORT**

**Audit Dates: April 27-28 and May 12-15, 2009**

**Submitted to:  
International Cyanide Management Institute  
888 16th Street, NW – Suite 303  
Washington, DC 20006  
USA**

**Management System Solutions, Inc.  
[www.mss-team.com](http://www.mss-team.com)**



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## SUMMARY AUDIT REPORT

### Name of Cyanide

### Production /

### Packaging /

### Transload

### Operations:

### DuPont Sodium Cyanide Operations consisting of:

- (1) Memphis Plant (Memphis, TN)
- (2) LSI Terminal (Memphis, TN)
- (3) DuPont Carlin Terminal (Carlin, NV)

### Names of Facility

### Owners:

- (1) E.I. duPont de Nemours and Company, Inc (Memphis Plant)
- (2) Lemm Services Inc. (LSI Terminal)
- (3) E.I. duPont de Nemours and Company, Inc (Carlin Terminal)

### Names of Facility

### Operators:

- (1) E.I. duPont de Nemours and Company, Inc (Memphis Plant)
- (2) Lemm Corporation (LSI Packaging Terminal)
- (3) Lemm Corporation (Carlin Transload Terminal)

### Names and Addresses of Responsible Managers:

#### (1) DuPont Memphis Plant

John Wasilik, Plant  
Manager  
DuPont Memphis  
Plant  
2571 Fite Road  
Memphis, TN 38127  
USA  
Tel. 901-353-7201  
Fax. 901-353-7397

#### (2) LSI Packaging Terminal

Ed Jodzio, Plant Manager  
  
Lemm Corporation  
5200 Old Millington  
Memphis, TN 38127 USA  
Tel. 901-353-5056  
Fax. 901-353-4855

#### (3) DuPont Carlin Transload Terminal

Marley Robinson, Manager  
  
Lemm Corporation  
3 miles east of Carlin on old  
Highway 40  
Carlin, NV 89822 USA  
Tel. 800-798-6333  
Fax. 775-754-6053

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Lead Auditor

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Date

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### Company Background Information:

E.I. duPont de Nemours and Company, Inc. (DuPont) is a science-based company operating in more than 70 countries. DuPont offers a wide range of products and services for markets including agriculture, nutrition, electronics, communications, safety and protection, home and construction, transportation and apparel. Solid sodium cyanide for use in the gold mining sector is manufactured at the Memphis, Tennessee plant, which is part of the DuPont Chemical Solutions Enterprise business. The plant is located just outside of Memphis in Woodstock, Tennessee. DuPont is the world's largest producer of cyanide.

DuPont was one of the original 14 Cyanide Code signatory companies announced on November 3, 2005. As such, DuPont made the commitment to obtain Cyanide Code certification for its Memphis Solid Cyanide Plant and its packaging operations. DuPont was the first Cyanide Producer to achieve certification in June 2006. This re-certification audit of DuPont and its cyanide packaging operations was conducted according to the ICMI certification auditing process that calls for each signatory organization to undergo a third-party re-certification audit every three years.

### Description of the Operations:

The DuPont sodium cyanide production operation is just one of several operations at this DuPont-owned plant site. DuPont has been producing sodium cyanide at this location since 1953. The solid sodium cyanide briquettes are packaged at the Memphis Plant, at the LSI Terminal directly adjacent to the plant and at the DuPont packaging terminal in Carlin, Nevada, USA. The Memphis Plant ships sodium cyanide in bulk and semi-bulk packages.

The LSI Terminal re-packs the sodium cyanide briquettes from rail hopper cars into semi-bulk (bag-in-box intermediate bulk containers) and small packages (Tuff Pak® bags). The LSI Terminal has been in operation since 1994. The LSI Terminal is owned by Lemm Services, Inc. and is operated by the Lemm Corporation.

The DuPont Carlin Terminal re-packs the cyanide briquettes from rail hopper cars into semi-bulk and bulk packages. The Carlin Terminal also dissolves sodium cyanide in alkaline water to make a nominal 30% sodium cyanide solution. Carlin has been in operation since 1982. The Carlin Terminal is owned by DuPont and is operated by the Lemm Corporation.

Cyanide handling and management practices at the three locations were evaluated against the Cyanide Code requirements, the organizations' procedures and supporting documents. The audit was conducted through discussions and interviews with management, production, and packaging personnel at each of the three operations. Additionally, records were reviewed and observations of current practices were made. The auditor used the July 2005 revision of the ICMI "Cyanide Production Verification Protocol" to confirm that the operations have continued to remain in compliance with Cyanide Code requirements since the initial certification in 2006. All three

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operations were found to be in FULL COMPLIANCE with the Cyanide Code as a result of this audit.

### *Auditor's Finding*

This operation is

in full compliance

with the International Cyanide Management Code.

- \* For cyanide production operations seeking Code certification, the Corrective Action Plan to bring an operation in substantial compliance into full compliance must be enclosed with this Summary Audit Report. The plan must be fully implemented within one year of the date of this audit.

|                    |  |
|--------------------|--|
| Audit Company:     | Management System Solutions, Inc.<br><a href="http://www.mss-team.com">www.mss-team.com</a>    |
| Audit Team Leader: | Nicole Jurczyk<br>E-mail: <a href="mailto:CodeAudits@mss-team.com">CodeAudits@mss-team.com</a> |
| Date(s) of Audit:  | April 27-28 and May 12-15, 2009  |

I attest that I meet the criteria for knowledge, experience and conflict of interest for Code Verification Audit Team Leader, established by the International Cyanide Management Institute and that all members of the audit team meet the applicable criteria established by the International Cyanide Management Institute for Code Verification Auditors.

I attest that this Summary Audit Report accurately describes the findings of the verification audit. I further attest that the verification audit was conducted in a professional manner in accordance with the International Cyanide Management Code Verification Protocol for Cyanide Production Operations and using standard and accepted practices for health, safety and environmental audits.

  
\_\_\_\_\_  
Signature of Lead Auditor

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**1. OPERATIONS:** *Design, construct and operate cyanide production facilities to prevent release of cyanide.*

Production Practice 1.1: *Design and construct cyanide production facilities consistent with sound, accepted engineering practices and quality control/quality assurance procedures.*

**The operation is**  **in full compliance with Production Practice 1.1**

*Summarize the basis for this Finding:*

All three facilities were built using sound, accepted engineering practices and quality control processes. Process hazard analysis methods and procedures were used to design and build all three facilities. DuPont QC & QA records audited during the initial certification audit were found at that time to be complete and readily retrievable. DuPont uses a formal management of change (MOC) process to manage all changes to the facility. MOC records from facility changes since the initial 2006 certification audit were reviewed and were found to be complete. Additionally records reviewed during the re-certification audit showed that qualified American Petroleum Institute (API) inspectors continue to perform inspections and tests of the equipment. Technical specifications for acceptable materials of construction are formally defined and a review of records confirmed that materials conformed to internal requirements.

No substantial facility changes were made at the LSI and Carlin Terminals since the initial certification. One subtle change was made since the certification audit at the LSI Terminal and it was reviewed. A quality assurance record was available to show that the new equipment had been inspected and was approved for use by a professional engineer.

All facilities are built on concrete and they have appropriate containment systems that ensure full containment. Interlock systems and high-level alarms are integral parts of the design and construction of each of the facilities. All facilities use management system procedures and forms to inspect their interlocks, process equipment, piping, and containment systems regularly to ensure functionality and integrity.

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Production Practice 1.2: *Develop and implement plans and procedures to operate cyanide production facilities in a manner that prevents accidental releases.*

The operation is  in full compliance with Production Practice 1.2

*Summarize the basis for this Finding:*

All three operations have detailed procedures, work instructions and checklists that enable them to operate in a safe and environmentally responsible manner. Additionally, robust training programs at the three operations include competency evaluations to ensure that personnel are competent to operate the production and packaging equipment. Operational procedures also detail what steps must be taken in case of an upset condition or emergency.

Appropriate reviews and evaluations are conducted any time changes are made to operations or facilities. The DuPont production operation follows a formal management of change (MOC) process that includes the review and approval of changes from multiple professional experts prior to implementing a change. The same MOC process is applied to any changes made at the DuPont Carlin terminal. Any changes made to the facility or operations at the LSI Terminal are made after review and approval made by a professional engineer. Facility and operational changes since the initial certification were very minor in nature. Records were reviewed and the auditor concluded that appropriate management of change methodologies are being used by all three operations.

Each facility has a formal preventive maintenance program in place to ensure that process equipment is properly maintained and that instruments are calibrated. Safety systems designed to protect worker health and the environment such as interlocks, air monitors, and personal cyanide monitors are included in the preventive maintenance programs. Maintenance and calibration records for critical process and safety equipment and instruments were evaluated against internal requirements. Records were found to be complete and where applicable, internal procedures were consistent with manufacturers' recommendations. Additionally, maintenance personnel were interviewed at each facility and were found to be very knowledgeable and competent.

No cyanide-containing water discharges to the environment occur from any of the facilities. The only facility that is near a water body (Loosahatchie River) is the DuPont cyanide production operation. Any water that potentially can come in contact with or derive from the cyanide production area is treated on-site and discharged as a permitted discharge to the local water authority. Cyanide-containing water from the other facilities is either stored on site and sent to DuPont for processing or stored on-site and treated to enable the cyanide in the water to be reclaimed.

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Procedures exist at all sites for the disposal of cyanide and cyanide-contaminated solids. Procedures include decontamination procedures and hazardous waste handling / management procedures.

Ventilation at the three facilities was sufficient to protect against the build-up of HCN gas. The cyanide is kept under roof and dry at all times. Security was found to be acceptable at each of the locations. Access to areas with cyanide is strictly controlled and state-of-the-art security equipment and systems are being used by all three locations.

DuPont controls the labeling and packing specifications for all products shipped from all three locations. Processes exist within the DuPont Corporation to ensure that packaging and labeling are appropriate for the jurisdictions through which the load will pass. The languages printed on the containers, for example, appear in English, the language of the destination country, and also in 6 standard European languages.

*Production Practice 1.3: Inspect cyanide production facilities to ensure their integrity and prevent accidental releases.*

**The operation is  in full compliance with Production Practice 1.3**

*Summarize the basis for this Finding:*

All three sites have thorough inspection programs to ensure the integrity of process equipment and prevent accidental releases of cyanide. A review of records and results of interviews confirmed that tanks, valves, pipelines, and containments are routinely inspected for their integrity, closure of drains, presence of fluids, and deterioration. Field operators, terminal managers, and operators were interviewed and the inspection sheets from field rounds and trench / drain inspections were presented as evidence. Frequencies of inspections were found to be appropriate for the operations. Inspection records indicate the date of inspection, the name of the inspector, and any observed deficiencies. Additionally, API inspections are performed to check for deterioration of process equipment / piping in contact with cyanide solution.

Operators at all sites showed a high level of awareness regarding the importance of performing thorough inspections. Records from all sites indicated that corrective actions are taken in a timely manner in response to deficiencies noted during preventive maintenance and/or daily inspection rounds.

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**2. WORKER SAFETY:** *Protect workers' health and safety from exposure to cyanide.*

Production Practice 2.1: *Develop and implement procedures to protect plant personnel from exposure to cyanide.*

**The operation is**  **in full compliance with Production Practice 2.1**

*Summarize the basis for this Finding:*

Worker exposure to cyanide is minimized through the use of personal protective equipment (PPE) and through the safe operation of equipment. The minimum PPE requirements are defined in formal procedures at each location. PPE requirements are defined for all types of operations from receipt of material through packaging and shipping. Non-routine and emergency operations at all three sites are performed by trained personnel wearing protective gear that is inspected regularly. Emergency procedures are defined in the site emergency response plans (ERPs).

All three sites have mature detailed procedures that are used for normal and abnormal operating conditions. The buddy system is implemented throughout each facility and PPE requirements are identified for each type of job. Increased PPE requirements are defined for non-routine operations. Personal conduct and safety rules are similar at each site and employees stated that they respect and adhere to the rules. Work permits and/or standard procedures are used by each of the operations for maintenance activities to ensure that work practices and PPE are appropriate and safe.

A formal management of change (MOC) system is used to manage proposed process and operational changes at the DuPont production operation. Action items are entered into a database for action tracking. Any changes that may impact worker safety are reviewed by appropriate personnel to ensure that a thorough safety review is conducted. Additionally, pre-start up safety reviews (PSSRs) are used prior to putting new equipment on-line. Operators and engineers are involved in the MOC process and in the PSSRs. Several samples of action items and MOC reviews were evaluated. All records were complete and were well tracked to closure. Changes to processes or operations at the terminals are reviewed for safety by site managers who consult with DuPont industrial hygiene and medical professionals, as necessary and appropriate.

Operators and Shift Supervisors / Terminal Managers are involved in PPE determinations. Safety Meetings are also used to gain participation. Records and interviews confirmed that employees are involved in evaluating safety procedures.

Fixed point cyanide detectors and personal cyanide detectors are used by the DuPont production operation to monitor cyanide concentrations to ensure that they are below 4.7 ppm. Procedures require that field operators have personal monitors and production and warehouse area visitors

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have at least one person in each group who has a monitor with them. At the Carlin terminal, stationary cyanide detectors and personal cyanide detectors are used to monitor cyanide concentrations to ensure that they are below 4.7 ppm. The LSI terminal uses personnel cyanide detectors to ensure that concentrations are below 4.7 ppm. All hydrogen cyanide equipment is calibrated according to manufactures' recommendations. This was confirmed through a review of procedures, owner's manuals, and calibration records.

DuPont production operations where cyanide exposure may be elevated have been identified, but aside from the offices, anywhere in the plant or warehouse it is assumed to have the potential for elevated concentrations of cyanide. PPE is therefore required for all areas, and additional PPE is required for non-routine activities or for jobs in which there is a splash hazard. Procedures (e.g., for line breaks) were reviewed and this was confirmed. At the terminals, operations where cyanide exposure may be elevated have also been identified. Industrial health studies were reviewed for each site. PPE is required for all warehouse and packaging work areas, and additional PPE is required for wet or dusty tasks.

Practices designed to protect workers at all three locations include the use of the buddy system, regular health assessments, and formally defined change of clothing policies. Eating, drinking, and smoking restrictions existed at all sites. Open flames are prohibited in areas that have flammable materials (such as HCN) and in electrically classified areas. Areas with cyanide have strict access control and posted PPE requirements. Strict adherence to worker safety practices is monitored by management. Employees at each location were interviewed and showed very good awareness and understanding of these practices.

*Production Practice 2.2: Develop and implement plans and procedures for rapid and effective response to cyanide exposure.*

**The operation is  in full compliance with Production Practice 2.2**

*Summarize the basis for this Finding:*

All three locations have detailed emergency plans and procedures available for use during a cyanide exposure incident. Commercially supplied combination shower / low-pressure eye wash stations and non-acidic fire extinguishers are located strategically at each site. Each location also has a program for inspecting the equipment regularly. All three locations have water, oxygen, resuscitators, antidote, and a means of communication readily available. Each site manages its amyl nitrite medicines appropriately to ensure that they do not go out of date. All three locations appropriately maintain their equipment and their medicines to ensure their availability during an emergency. Recent records of equipment inspections were reviewed at all sites. All three locations have an English-speaking workforce. MSDSs were available at each of the site. Operator awareness was confirmed and several MSDSs were sampled at each location. Piping at

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all three locations was appropriately identified and showed the direction of flow. Storage tanks and process tanks were appropriately identified and were marked as having cyanide, process water, or process solution. Since the all the operations are dedicated cyanide operations, this practice was deemed to be acceptable.

Each facility has a decontamination area and a policy. Medical professionals are on-site at the DuPont production operation. The terminals have personnel who have been trained in first aid, CPR, and in responding to cyanide exposure emergencies. In case of a cyanide exposure event requiring the transport of a person to a hospital, the procedures for all sites were to decontaminate the workers, call 911 and wait for ambulance transport. Procedures also define the need to send an amyl nitrite medical kit with the ambulance. Interviews confirmed that the amyl nitrite kit gets sent with the ambulance driver in cases of cyanide exposure. Hospitals near each of the facilities have been contacted and cyanide safety training is provided by DuPont on a recurring basis, as appropriate. Each site conducts mock emergency drills, holds a drill critique, and evaluates the need for further training or adjustment to the emergency procedures. Records were reviewed and the auditor confirmed that all sites are holding drills at least once per year and often several times per year. Evaluations were available and were reviewed. Each site has procedures for investigating emergency incidents after the event.

### **3. MONITORING:** *Ensure that process controls are protective of the environment.*

Production Practice 3.1: *Conduct environmental monitoring to confirm that planned or unplanned releases of cyanide do not result in adverse impacts.*

**The operation is**  **in full compliance with Production Practice 3.1**

*Summarize the basis for this Finding:*

There are no direct or indirect discharges of process water to surface water from any of the facilities. All process water from the DuPont cyanide operation at the Memphis plant is treated to meet applicable standards and is discharged to the municipal sewer system. Process waters and effluent from the LSI and Carlin facilities are put into storage vessels and either recycled or sent off as a product.

Groundwater monitoring is done at the DuPont production operation and the DuPont Carlin terminal. WAD cyanide levels in groundwater were found to be below detection levels at the DuPont production operation and were below action levels at the Carlin terminal. The LSI terminal was built on a lined engineered surface, has no cyanide solution product, and has had no spill events. No groundwater sampling is therefore done at this terminal. Air monitoring data

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for the DuPont production operation reviewed during the audit confirmed that HCN air emissions are well within permitted levels. The air emissions for the terminals are calculated levels based on throughput of the facilities. A review of records for 2006-2009 indicated that both terminals are well under permitted air emissions levels. The frequencies of monitoring and calculations were found to be appropriate for each of the sites.

**4. TRAINING:** *Train workers and emergency response personnel to manage cyanide in a safe and environmentally protective manner.*

Production Practice 4.1: *Train employees to operate the plant in a manner that minimizes the potential for cyanide exposures and releases.*

**The operation is**  **in full compliance with Production Practice 4.1**

*Summarize the basis for this Finding:*

Formal training and refresher training is given to employees at each site. Training includes watching a professionally produced training DVD, a review of Standard Operating Procedures, hands-on training sessions, formal testing, and witnessing. Employees are given refresher training at established frequencies. Training is given by highly qualified personnel at each location who have personal experience with safe cyanide management practices.

Training records were available at all three locations to demonstrate adherence to internal requirements. A sample of training records confirmed that training needs were identified for all employees and tasks and that employees were appropriately trained on operational, safety, and PPE requirements prior to working with cyanide. The correct use of PPE is one of the many topics included in the training programs. Training effectiveness was judged at each site via testing or skill demonstrations.

Production Practice 4.2: *Train employees to respond to cyanide exposures and releases.*

**The operation is**  **in full compliance with Production Practice 4.2**

*Summarize the basis for this Finding:*

Employees at all sites are trained on emergency response procedures, including the response to a cyanide leak or exposure. Refresher training is given at defined frequencies. Records from 2006 through 2009 were sufficiently detailed to demonstrate conformance. Interviews confirmed that employees understand and are aware of the emergency response procedures. Additionally, employees participate in regular emergency drills including "man down" drills which simulate a

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cyanide exposure event. Drill critiques are conducted after each drill to determine if additional training is required. Detailed training records are retained by each site. Records are maintained for at least as long as the employee is working at the site. A sampling of training records from 2006 through 2009 showed that training record retention requirements are being fulfilled. Records pertaining to cyanide safety were sufficiently detailed to be found conformant.

**5. EMERGENCY RESPONSE:** *Protect communities and the environment through the development of emergency response strategies and capabilities.*

Production Practice 5.1: *Prepare detailed emergency response plans for potential cyanide releases.*

**The operation is**  **in full compliance with Production Practice 5.1**

*Summarize the basis for this Finding:*

The Emergency Response Plans from each site were reviewed. They were found to be appropriately detailed. All necessary types of emergencies are addressed by the plans and the steps to be taken for on-site and off-site notifications are clear. The roles and responsibilities of the response personnel are well defined. Specific details are included in the emergency plans to address the necessary steps to be taken in order to mitigate environmental impact and protect worker safety. A detailed review of the Emergency Response Plan from each site confirmed that all Code requirements identified in the Production Protocol are fulfilled.

Production Practice 5.2: *Involve site personnel and stakeholders in the planning process.*

**The operation is**  **in full compliance with Production Practice 5.2**

*Summarize the basis for this Finding:*

Site personnel at each location are involved in the emergency planning process. DuPont manages the interface with local response agencies for itself and LSI. The local fire department and EMTs are invited and are usually involved in drills each year (most recent involvement of external responders was April 2009). DuPont maintains contact with the Memphis Hazmat Team and participated in the Memphis / Shelby County Emergency Response drill in 2008. Extensive efforts have been made to outreach to the community including the working with the LEPC to

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provide shelter-in-place training and supplies to local schools. DuPont also meet with the People of Woodstock (POW) for planning purposes and to update them on changes to the facilities. DuPont has also performed outreach activities for medical facilities and outside responders in the Carlin, NV area as part of its product stewardship program. Additionally, the Carlin terminal involves external responders in emergency response drills to ensure that they are prepared for responding to a potential emergency.

*Production Practice 5.3: Designate appropriate personnel and commit necessary equipment and resources for emergency response.*

**The operation is  in full compliance with Production Practice 5.3**

*Summarize the basis for this Finding:*

Each site clearly designates full responsibility and authority for managing an emergency situation. Alternate coordinators are also identified in the ERPs. The emergency responders are identified at each site. They receive appropriate training, respirator fit tests, and participate in regular meetings and/or drills. Records of training were sampled and were found to be acceptable. The DuPont emergency plan is very detailed regarding the titles, responsibilities, and call-out procedures to be used during an emergency. The ERP lists the emergency equipment that needs to be on-site and the equipment is inspected regularly. The ERPs for the terminals were found to be appropriately detailed for the complexity of the operations. Each ERP has identified the emergency equipment necessary and has a checklist for inspecting the equipment.

The emergency response plans for each site clearly designate roles & responsibilities, call-out procedures, and list current phone numbers. Appropriate emergency response equipment was available at each site. Equipment located at appropriate places on-site was observed during the audit and inspection records were sampled. Each site had at least one drill since the initial certification in 2006 involving outside responders.

*Production Practice 5.4: Develop procedures for internal and external emergency notification and reporting.*

**The operation is  in full compliance with Production Practice 5.4**

*Summarize the basis for this Finding:*

Each site's ERP had a detailed list of internal and external stakeholders that need to be notified depending on the nature of the emergency. Procedures are in place to ensure that timely communications and notifications are made in the event of an emergency.

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Production Practice 5.5: *Incorporate into response plans and remediation measures monitoring elements that account for the additional hazards of using cyanide treatment chemicals.*

The operation is  in full compliance with Production Practice 5.5

*Summarize the basis for this Finding:*

This requirement is not directly applicable to the sites. An outside remediation firm is called in if remediation needs to be done. DuPont procedures do indicate the use of the deluge system in the waste water system trenches (trade waste) if there is a high concentration of cyanide containing water headed for the waste water treatment system. LSI & Carlin would also rely on a professional remediation firm in the event of a spill that could impact soil or groundwater. General knowledge at the DuPont site and the waste water treatment procedures in operating manuals were found to be sufficient to ensure that dangerous chemicals would not be added to the surface water.

Production Practice 5.6: *Periodically evaluate response procedures and capabilities and revise them as needed.*

The operation is  in full compliance with Production Practice 5.6

*Summarize the basis for this Finding:*

Each site reviews the adequacy of its ERP regularly and conducts drills each year. Drill critiques are conducted with those who were involved. Action items for revisions to the plan are identified, as necessary, and tracked to closure. Records were reviewed for drills that were held between 2006 and 2009. All three sites were found to be in compliance with Code requirements regarding emergency drills and the updating of emergency plans.

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