TARGA

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September 8, 2010

Mr. Glenn von Gonten
Acting Bureau Chief
State of New Mexico
Oil Conservation Division
1220 S. St. Francis
Santa Fe, New Mexico 87505

RE: Targa Midstream Services Limited Partnership
19.15.11 NMAC H2S Contingency Plan for Eunice Plant Acid Gas Pipeline

Dear Sir:
Targa Midstream Services L. P. is submitting the attached H2S Contingency Plan for a new pipeline which will transport acid gas from the Targa Eunice Plant to an acid gas injection well which is located at the Targa South Eunice Compressor Station. The Plan is written per 19.15.11.9 NMAC and submitted per 19.15.11.9 D. NMAC. This submittal is both hard copy and electronic.

Please feel free to contact me with any questions or concerns at 432.688.0542 or cwrangham@targaresources.com

Sincerely,

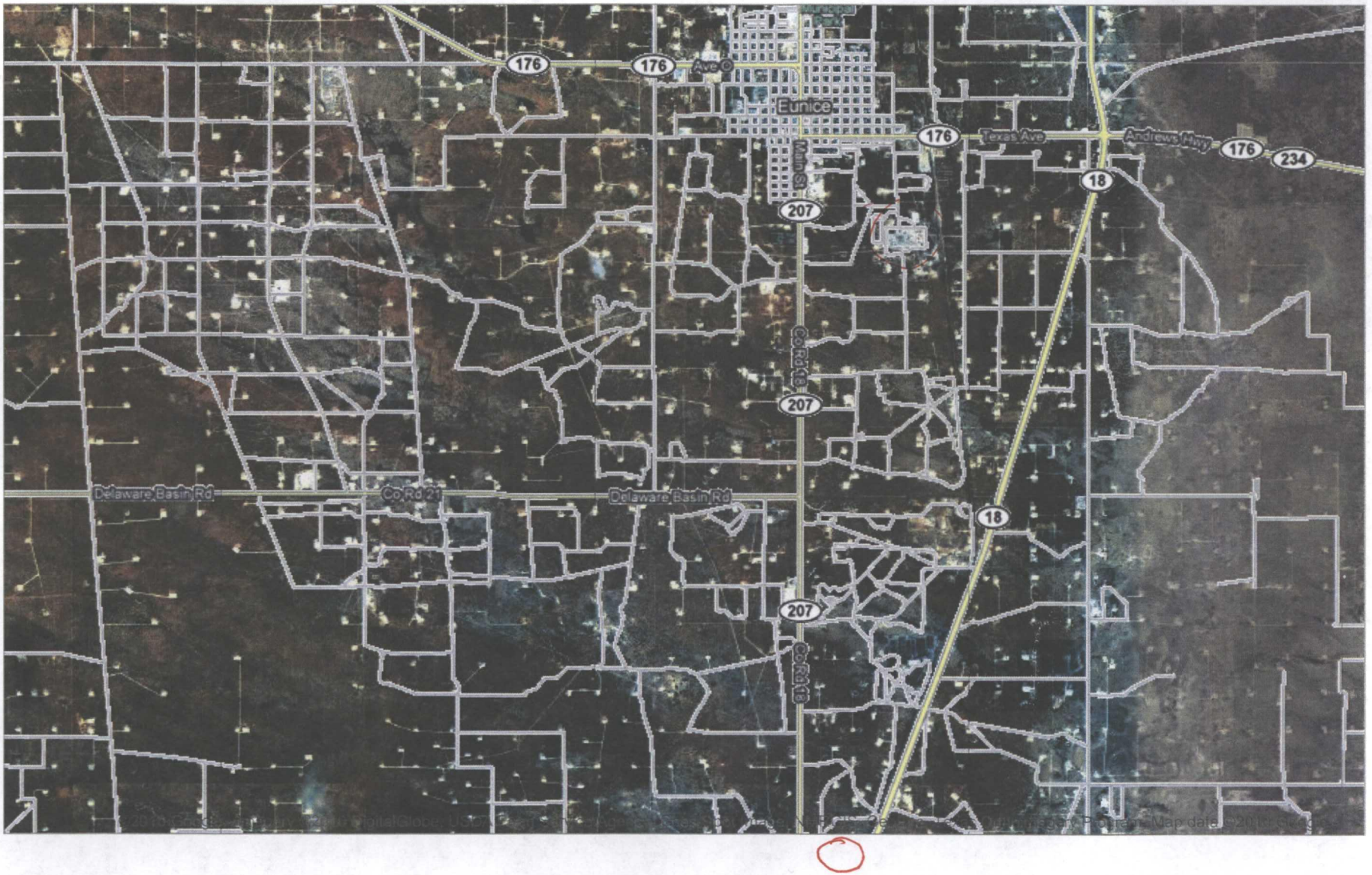
Cal Wrangham
ES&H Manager

Cc Gary Maricle – Targa Eunice Area Manager
Jessica Keiser – Targa Assistant Vice President - ES&H
Rebecca Woodell - Eunice Plant ES&H Specialist

Google maps

To see all the details that are visible on the screen, use the "Print" link next to the map.

Print Send Link



TARGA

HYDROGEN SULFIDE CONTINGENCY PLAN

for

EUNICE AREA ACID GAS PIPELINE

and

COMPRESSION/INJECTION WELL SITE

TITLE 19 NATURAL RESOURCES AND WILDLIFE
CHAPTER 15 OIL AND GAS
PART 11 HYDROGEN SULFIDE GAS

19.15.11

VERSADO GAS PROCESSORS, L. L. C.
operated by
TARGA MIDSTREAM SERVICES,
LIMITED PARTNERSHIP

July 29, 2010

19.15.11.9 NMAC H2S CONTINGENCY PLAN

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NEW MEXICO 19.15.11.9
HYDROGEN SULFIDE (H2S) CONTINGENCY PLAN

1. INTRODUCTION

These written procedures are established to minimize any hazard to the public that might result from an emergency due to an accidental release of hydrogen sulfide. Targa Midstream Services Limited Partnership (Targa) has prepared this Contingency Plan as required by State of New Mexico 19.15.11 NMAC - Hydrogen Sulfide Gas. The Plan was developed in accordance with these regulations and American Petroleum Institute Recommended Practice 55, "Recommended Practices for Oil and Gas Producing Gas Processing Plant Operations Involving Hydrogen Sulfide", Second Edition, February 15, 1995.

1.1. GENERAL STATEMENT

This Contingency Plan has been written to provide information essential for the response to an emergency situation. An emergency situation exists when it is determined that extraordinary procedures, equipment, manpower and/or supplies must be used to protect the public from existing or potential hazards resulting from the escape of hydrogen sulfide gas.

No contingency plan can predict all situations. It is the intent of this document to allow for careful thought concerning any potential emergency and remedial actions to be followed. This plan will be fully implemented in the event of an accidental release of a potentially hazardous quantity of hydrogen sulfide gas.

1.2. KEY CONTACT

For Plan implementation refer to the Emergency Notification List in Appendix B.

For Operations:

Gary Maricle
Area Manager
Eunice Plant and Gathering
Eunice, NM
Office 575-394-2534
Mobile 575-602-6005

For Plan Development:

Cal Wrangham
ESH Manager, Midland, TX
432-688-0542

1.3. PURPOSE AND SCOPE OF CONTINGENCY PLAN

The purpose of this plan is to provide for the logical, efficient and safe emergency response action to be taken by Targa. The protection of the general public and workers in the event of an accidental release of potentially hazardous quantity of Hydrogen Sulfide Gas (H2S) from its operations is of the highest priority.

This plan covers the Acid Gas Pipeline which extends from the Targa Eunice Plant to the Targa South Eunice Compressor Station, the Acid Gas Injection Compressor and associated equipment, and the Acid Gas Injection Well. These facilities are in Lea County. These facilities are owned by Versado Gas Processors, L. L. C. and operated by Targa Midstream Services Limited Partnership.

The majority of this equipment lies in rural areas that are sparsely populated. However, the Eunice Plant, which is the northern most end of the Acid Gas Pipeline, is near the proper city limits of the City of Eunice, New Mexico.

Due to the proximity to the City of Eunice, a reaction-type contingency plan has been developed. A reaction-type contingency plan is a pre-planned written procedure for alerting and protecting the public within an area of exposure. This plan is used when it is impossible or impractical to brief in advance all of the public that might possibly be within an area of exposure at the moment of an accidental release of a potentially hazardous volume of hydrogen sulfide.

formaly Versado

2. GENERAL INFORMATION

2.1. DESCRIPTION OF FACILITIES AND SAFETY SYSTEMS

The pipeline and equipment covered by this plan are used to transport and inject acid gas into the disposal formation. The acid gas injection authority is by order of the Division, Order No. R-12809.

A map of the pipeline included in Appendix C, showing the location of the facilities and potential exposure areas.

Sources of potentially hazardous volumes of H_2S gas include the pipeline and the compressor station. Leaks from these sources could create a hydrogen sulfide (H_2S) exposure area. Whether such exposure areas would be hazardous would depend upon their location and size. The exposure potential has been calculated for the sources using calculations based on an escape rate defined by NMAC 19.15.11. This rate is based on the maximum daily rate of the gaseous mixture handled in this system and is assumed to be the maximum possible for the system. This is generally and intentionally a conservative calculation. The H_2S concentrations were determined using applicable ASTM or GPA standards. The maximum daily rate of the gaseous mixture handled in this system is 5 mmcf/d, consisting of approximately 15% H2S and 85% CO2. The Pasquill-Gifford derived equation as defined by NMAC was used to calculate the 100 PPM and 500 PPM radius of exposure (ROE) for H2S.

GW-5 Middle Plant

The process begins at the Eunice Plant where a combination of H2S and CO2, know as acid gas is the overhead stream from the plant treating system. This stream will be compressed to approximately 50 psi before going into the pipeline. This line is approximately 4.5 miles long and ends at the Targa South Eunice Compressor Station where it is mixed with water and the solution compressed with an acid gas compressor to approximately 1200 psi, then injected to the formation through an injection well.

GW-34 Spur C.S.

The pipeline is constructed of a 16" poly line which is inserted into a 22" poly line which acts as an outer layer of protection for added safety. The poly lines are made of 4710 SDR 17. An air blower will move air through the annulus from the acid gas compressor toward the Eunice Plant where a fixed H2S detector is located to detect any leaks from the inner pipe. This detector system alarms in the Eunice Plant Control Room which is occupied 24 hours a day.

There is an ESD Valve located at the inlet of the Pipeline and another one at the compressor and injection well end which can be remotely operated from the Eunice Plant Control Room in case of emergency. There are also remotely activated valves at the Compressor/Injection Site to move any gas from the pipeline to a Flare for safe removal in an emergency. 19.15.11.12 D. (1)

There is a subsurface safety valve (SSSV) on the injection well located below ground to isolate the down hole well contents in case of an emergency. 19.15.11.12 D. (2)

The acid gas compressor area is equipped with a fixed H2S detector system which alarms in the Eunice Plant Control Room which is occupied 24 hours a day.

The pipeline ROW has warning signs containing the words "poison gas" to warn the public that a potential danger exists. 19.15.11.10

The compressor/injection area is protected from public access with chain link fencing. 19.15.11.12 B.

Wind direction indicators known as wind socks are located at the compressor/injection site so that it is visible from all principal working areas at all times. 19.15.11.12 C.

2.2. AVAILABILITY OF PLANS, PPE SAFETY EQUIPMENT & SUPPLIES

A copy of this contingency plan shall be retained at the Eunice Plant. Additional copies will be kept in field operator's vehicles for referral away from the office. The contingency plan shall be available to all personnel responsible for implementation and will be periodically reviewed and updated. A copy of the Plan will also be made available to the City of Eunice emergency response officials.

Each Field Operator has access to a self-contained breathing apparatus (SCBA), a personal H_2S monitor, a fire extinguisher, and a first aid kit. In addition, when responding to a release, the field operator will have a portable H_2S detector that can be used in the field to determine H_2S levels. Portable H_2S detectors are located at each field office.

In addition to this Plan the Eunice Plant has an emergency plan for responding to an emergency at the facility. This emergency plan contains a list and location of the safety equipment in the plant.

2.3. COORDINATION WITH STATE EMERGENCY PLAN 19.15.11.9 B. (2) (e)

Under certain conditions as provided for in the New Mexico Hazardous Materials Emergency Response Plan (HMER), the New Mexico State Police responding to the emergency may elect to assume the position of Field Incident Commander (FIC) or they may establish a Unified Command of which Targa may be a key member. Under the Unified Command scenario, the Targa FIC shall cooperate with the other involved emergency responders, such as the New Mexico State Police, local fire department, City Police, Sheriff's Office, NMOCD or other appropriate public emergency response agencies to manage the effective and safe response to the emergency situation.

The Area Manager (or his designee) for the Plant, depending on the location of the emergency, will serve as Targa's Field Incident Commander. The Field Incident Commander's responsibility is to ensure control of the emergency incident. Targa's FIC will notify or delegate notifications

of all Targa or contract personnel as well as the civil authorities needed for response to the situation. Targa's FIC will also assign additional Targa personnel to support roles as needed.

2.4. CHARACTERISTICS OF HYDOGEN SULFIDE & SULFUR DIOXIDE

19.15.11.9 B. (2) (b)

2.4.1. Hydrogen Sulfide

Hydrogen sulfide is an extremely toxic and flammable gas that is sometimes present in raw or unprocessed natural gas. The majority of the facilities covered by this Plan contain various amounts of hydrogen sulfide. **INHALATION AT CERTAIN CONCENTRATIONS CAN LEAD TO INJURY OR DEATH.**

Hydrogen sulfide is a colorless gas that has a foul, rotten egg odor. In low concentrations, it is detectable by its characteristic odor. However, smell cannot be relied on to forewarn of dangerous concentrations because exposure to high concentrations (greater than 100 ppm) of the gas rapidly paralyzes the sense of smell.

IT SHOULD BE WELL UNDERSTOOD THAT THE SENSE OF SMELL CAN BE RENDERED INEFFECTIVE BY HYDROGEN SULFIDE, WHICH CAN RESULT IN AN INDIVIDUAL FAILING TO RECOGNIZE THE PRESENCE OF DANGEROUSLY HIGH CONCENTRATIONS.

A more detailed description of physical properties and physiological effects of hydrogen sulfide can be found in Appendix A of this Plan.

2.4.1. Sulfur Dioxide

Sulfur dioxide is a combustion product of hydrogen sulfide. It is also a colorless gas but is non-flammable. It has a pungent odor associated with burning sulfur. **INHALATION AT CERTAIN CONCENTRATIONS CAN LEAD TO INJURY OR DEATH.**

A more detailed description of physical properties and physiological effects of sulfur dioxide can be found in Appendix A of this Plan.

3. EMERGENCY PROCEDURES 19.15.11.9 B. (2) (a)

3.1. ACTIVATION OF THE CONTINGENCY PLAN 19.15.11.9 C and B. (f)

This contingency plan will be activated immediately upon the knowledge that a potentially hazardous volume of hydrogen sulfide (H2S) gas has been released. A potentially hazardous volume occurs when a release creates a concentration of H2S of more than

- 100 ppm in any public area,
- 500 ppm at any public road, or
- when a 100 ppm ROE is greater than 3000 feet from the site of the release.

The Area Manager or designated relief will serve as the Field Incident Commander (FIC) and will activate the Plan. In the absence of the Area Manager or his relief the Targa employee (first responder) at the site shall assume the role of FIC and determine whether or not to activate the Contingency Plan. It is the responsibility of the FIC to ensure control of the emergency response management system and if necessary to coordinate these efforts with any state or local emergency plans.

Note: Appendix B contains Emergency Notification List and phone numbers.

3.2. INITIAL RESPONSE, ROLES & RESPONSIBILITIES

3.2.1. FIRST RESPONDER

The Targa employee (first responder) responding to or receiving notification of an emergency situation shall immediately proceed to the location and attempt to assess the situation, notify the Area Manager or his relief, and take the following actions:

- Provide the Area Manager with as much data possible concerning the location, the extent of emergency and need for additional assistance.
- Warn others in the area of situation, evacuate if necessary.
- Remain at the site, at a safe distance, and available for communication. Wait for assistance to arrive before attempting to enter into any potentially hazardous area.
- Initiate rescue and first aid as the situation dictates.

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It is possible that a person other than a Targa employee could discover a potentially hazardous hydrogen sulfide gas leak. Should a call be received from a member of the general public, employees will be dispatched to the scene immediately by activation of the company notification list. The Targa employee arriving at the seen will take the actions noted above as the first responder.

3.2.2. AREA MANAGER

Upon notification of an emergency the Area Manager or his relief will serve as the Field Incident Commander (FIC). Under certain conditions, the New Mexico State Police

responding to the emergency may elect to assume the position of FIC or they may establish a Unified Command of which the Targa Area Manager may be a key member. The responsibility of the FIC is to ensure control of the emergency incident. The Area Manager serving as the FIC shall have the following role and responsibilities.

- Notify other key Targa personnel and alert them to the situation.
- Proceed to the site to assess the size and scope of the situation.
- Establish preliminary "Hot" and "Safe" zones based on information in Appendix C.
- Determine if the Contingency Plan is to be activated based on his assessment of the situation and the Potential Exposure Area information located in Appendix C.
- Alert other emergency response personnel of the situation.
- Arrange for back up personnel to be dispatched to the scene.
- Establish an on-site mobile command station.
- Initiate any "municipal emergency response" requests as deemed appropriate.
- FIC is responsible for assigning support roles as listed below.

In the absence of the Area Manager or his relief the Targa employee (first responder) at the site shall assume the role of FIC and determine whether or not to activate the Contingency Plan. The Field Incident Commander, or relief, will remain on site until the emergency is over, ensure all repairs have been completed, and ensure the operation has returned to normal before releasing emergency team members.

3.2.3. OTHER ROLES

The FIC will assign the following support positions as needed:

Operations and Planning Section Chief: The Operations and Planning Section Chief (OPSC) plays an integral role in interfacing with the various State and Local emergency responders in coordinating all response activities. This allows the FIC to focus on the incident and its big picture decisions.

Technical Specialist: Technical Specialists, those individuals possessing critical skills, experience, and knowledge in specific areas of Targa's or industry operations may be enlisted to assist in providing operational solutions for controlling releases in their areas of expertise.

Engineers / Field Operators: Engineers / Field Operators will assist in providing operational solutions to controlling the size and scope of an incident. The following tasks should receive the initial priority.

- Identify source location and isolation equipment if available.
- Provide detailed isolation instructions for responding personnel. Keep in mind the responders may or may not be Targa employees and may or may not have a good understanding of gas processing operations.

- Begin the operational aspect of a facility recovery plan, first to address operational needs to return to "normal" operating mode, and second to complete long term considerations for site mitigation.

Safety Officer: The Safety Officer (SO) plays an integral part in assisting the FIC in managing the onsite issues surrounding an incident. The Safety Officer is constantly evaluates the safety and health issues involved with the incident and monitors pieces of the response process to allow the FIC to address "bigger picture" issues. The following is an abbreviated list of responsibilities.

- Confirm that the FIC's preliminary "hot and safe zones" are still applicable and adjust accordingly for such activities as staging areas.
- Address Safety, Health, Environmental, and Regulatory issues including notifications.

Other Employees: All other personnel should stand by and wait for instructions from the FIC. Once accounted for, Targa employees may be called upon to provide logistical support in many different directions. These may include contacting vendors for supplies, contacting local company support groups for assistance to the general public, providing onsite logistical support to the responders "staging area" where others wait to assist in the actual response efforts, escorting vendors to remote locations as a guide, blocking roads, assisting with evacuations, etc.

Media Contact: All media inquiries should be directed to Corporate Communications in Houston. The FIC or his designee will provide Corporate Communications with periodic updates and will take their direction with regard to any onsite communication with the media.

However, it should be understood that <u>no employee or contractor</u> will be asked to provide incident scene support that they are not comfortable in their ability to perform, or have not been specifically trained to do.

3.3. IMMEDIATE ACTION PLAN

The following sequence of events shall be initiated and continued as necessary to end the emergency. Some steps may be taken simultaneously. At the end of the list of actions is a description of each task.

A. Request assistance, if needed.
   1. Alert and account for facility personnel
   2. Move away from the source and get away from the affected area
   3. Don personal protective breathing equipment
   4. Alert other affected personnel
   5. Assist personnel in distress
   6. Proceed to the designated emergency assembly area
   7. Account for on-site personnel

form why that

B. Take immediate measures to control the presence of or potential H_2S discharge and to eliminate possible ignition sources. Emergency shutdown procedures should be initiated as deemed necessary to correct or control the specific situation. When the required action cannot be accomplished in time to prevent exposing operating personnel or the public to hazardous concentrations of H_2S, proceed to the following steps, as appropriate for the site-specific conditions.

C. Alert the public (directly or through appropriate government agencies) that they may be subjected to an atmosphere exceeding 30 ppm of H_2S. Initiate evacuation of those within the exposure area. ?

D. Contact the Area Manager or first available person on the call list. Notify them of the circumstances and whether or not immediate assistance is needed. The Area Manager should notify (or arrange for notification of) other supervisors and other appropriate personnel (including public officials) on the call list, as necessary.

E. Cordon off the exposure area to prevent entry, make recommendations to public officials regarding blocking unauthorized access to the unsafe area, and assist as appropriate. Make recommendations to public officials regarding evacuating the public and assist as appropriate.

F. Notify, as required, state and local officials and the National Response Center to comply with release reporting requirements.
   ~ stepped up on weather conditions

G. Monitor the ambient air in the area of exposure (after following abatement measures) to determine when it is safe for re-entry. Temp. Inversion.

H. Return the situation to normal.

The following discussion expands on the emergency actions in the order in which they were previously listed. An attempt was made to list these actions in logical sequence and priority order. Ideally, some of these actions, after the first, will be performed simultaneously. There may be situations where actions must be performed in a different sequence from those listed. The employee first knowing about the potential hazard (First Responder) will take the first action(s). Subsequent actions will generally be taken by or assisted by those dispatched to help.

A. Request Assistance if Needed

Any employee who finds himself in an emergency situation involving the escape of hydrogen sulfide gas that would pose a hazard to the public shall notify the Area Manager, or his designated alternate, by the fastest means. The employee will advise the Area Manager, or alternate, of the location and nature of the emergency and the assistance needed. He will also state the actions taken and those he will be taking while waiting for assistance. The Area Manager is directly responsible for requesting the assistance needed. He will also proceed with the appropriate notifications. Please refer to Appendix B of this Plan for a list of emergency telephone numbers.

B. Stop the Escape of Hydrogen Sulfide

Where is ESD? procedure

Isolate the leak by closing the upstream and downstream valves. If necessary, initiate emergency shut down (ESD) procedures for the equipment. ?

C. Alert the Public and Evacuate Those Within the Exposure Area

Alert all persons who are within the exposure area. Refer to the map and list of ROEs in Appendix C. In the event a leak causes a potentially hazardous volume public, notification must be made immediately by the employee who discovers (or arrives first at the leak site) and judges the situation serious enough to require immediate evacuation. If it is determined that the notification proceeding shall not be immediate, the Area Manager is the designated employee to initiate evacuations. Whether by the first person at the scene or by the Area Manager, notification to the public shall be made by the fastest possible means.

In the event that complete or partial evacuation becomes necessary, evacuation must be confirmed by personal observations, which should include repeat visits to the area to confirm that persons have not entered the evacuated area. If evacuation is deemed prudent, advise persons and/or assist them to leave the area without delay by the fastest, safest route out of the exposure area. In populated areas such as the City of Eunice, evacuations will be conducted by city officials with the aid of Targa employees.

- First, evacuation should be from the 500 ppm exposure area, giving priority to the downwind position.
- Next, evacuate those within the potential exposure area, giving priority to the downwind position.

- Monitor ambient hydrogen sulfide concentrations in adjacent areas to ensure that any exposed residents are evacuated.
- Always wear a breathing apparatus.

D. Contact the Area Manager

The Targa employee (first responder) responding to or receiving notification of an emergency situation shall immediately proceed to the location and attempt to assess the situation, notify the Area Manager or his relief, and take the following actions:

- Provide the Area Manager with as much data possible concerning the location, the extent of emergency and need for additional assistance.
- Warn others in the area of situation, evacuate if necessary.
- Remain at the site, at a safe distance, and available for communication. Wait for assistance to arrive before attempting to enter into any potentially hazardous area.
- Initiate rescue and first aid as the situation dictates.

E. Cordon off the Exposure Area to Prevent Entry and/or Make Barricade and Evacuation Recommendations

Place barricades outside the area of exposure on all routes to prevent entry into the area. Barricades must be manned by Targa and/or law enforcement personnel to prevent entry. The persons manning the barricades must be equipped with a protective breathing apparatus, hydrogen sulfide measuring devices, and two-way radios or cell phones. Barricades should be placed a safe distance away from the potential exposure area and should be monitored for Hydrogen Sulfide.

Based on all information available and the calculated potential exposure information listed in Appendix C, make recommendations to public officials for the strategic placing barricades, for evacuating the public, and assist as needed. Priority should be given to those areas in the 500 ppm radius of exposure, then the 100 ppm radius of exposure, with consideration given to the wind direction. Proper caution should be used for shifting changes in wind direction.

F. Complete Notifications as Required

Generally, some notifications will have been made under Steps A or D. Any of the following notifications that were not made must be made as soon as possible. Normally the Region ES&H Advisors will complete the agency notifications.

- Complete the chain of notification within the company.
- The local public safety officials not already notified who need to be aware of the situation.
- New Mexico Oil Conservation Division – Notification to the OCD should be made as soon as possible, but must be made no more than 4 hours after a Plan evacuation. A

full report of the incident must be submitted to the Division on Form C-141 no later than 15 days following the release.

- Environmental Protection Agency Regional Office.

G. Monitor for Safe Re-entry

As soon as the complete and permanent stoppage of the release is confirmed, begin monitoring evacuated areas for hydrogen sulfide and combustible gas concentrations. Monitor the ambient air in the area of exposure only after following abatement measures, to determine when it is safe for re-entry.

H. Return of the Situation to Normal

No re-entry will be allowed until ambient conditions have been assessed and verified. Communications for re-entry should be coordinated through the Area Manager assuming the role of Field Incident Commander (FIC). When total absence of hydrogen sulfide and combustible gas is confirmed throughout the evacuated area, notify the sheriff's office so that they may be informed of the situation. Advise all parties previously notified that the emergency has ended.

Initiate the post-emergency actions listed in Section 4.

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4. EMERGENCY PREPAREDNESS

4.1. PRE-EMERGENCY ACTIONS

Targa recognizes that the most critical portion of this plan is Section 3 - Emergency Procedures. To ensure the most effective implementation of these procedures, pre-emergency measures shall be completed to attain a state of preparedness. These actions are as follows:

- Every employee is to be completely familiar with the contents and location of the contingency plan.
- Surveillance and preventative maintenance to minimize the possibility of an accidental release of gas.
- Training and drills will be conducted as further described below.
- All emergency breathing equipment is maintained and ready for use.
- This Plan is made available to appropriate public response officials and shall be reviewed and discussed thoroughly with the City of Eunice emergency response officials.
- Targa will use brochures, public notices, or other means, as deemed appropriate and practical, to alert and educate any persons who reside within the potential areas of exposure.

4.2. TRAINING AND DRILLS 19.15.11.9 B. (2) (d)

The value of training and drills in emergency response procedures cannot be over emphasized. All Targa personnel identified in this plan shall be trained on the emergency response plan and procedures annually. The importance of each role of the emergency responders and the effects that each person has during an emergency will be stressed. In additional, the needs for emergency preparedness and maintaining the plan will be emphasized through the use of drills and other exercises that simulate an emergency in which personnel perform or demonstrate their duties. These exercises will consist of table-top or classroom discussions or can be a realistic drill in which equipment is deployed, communications equipment is tested, etc. Public officials will be informed and asked to participate in these exercises. Specific table-top or classroom drills maybe conducted with the City of Eunice emergency response officials to review evacuation measures for the city.

Review and critiques of the drills or exercises will be conducted after they are completed to identify any potential improvement opportunities for the plan. Documentation of the training, drills, and reviews will be kept on file.

4.3. POST-EMERGENCY ACTIONS

In the event this plan is activated, the following post-emergency actions shall be taken in an effort to reduce the possibility of a recurrence of the type of problem that required its activation and to assure that any future activation will be as effective as possible:

- Clean up, recharge, restock, repair, and replace emergency equipment, as necessary, and return it to its original location.
- Critique all actions and procedures, providing additional training to employees if need is indicated. Modify contingency plan, if necessary.
- Review the cause of the emergency and modify operating maintenance and other surveillance procedures, if needed.
- Ensure all agency notifications have been completed and follow-up with any written notification requirements.
- Ensure all previously notified or evacuated persons have been advised that the emergency situation has ended.

5. RESCUE AND FIRST-AID

General Information

The first and foremost objective in any emergency situation (including a hydrogen sulfide leak) is the welfare of the employees and the general public. Good judgment, consultation with supervisors, and the use of protective breathing equipment are of prime importance in controlling the situation and averting personal and property damage. In cases where persons are unable to move, our first objective is their rescue. If they are in an enclosure where hydrogen sulfide has accumulated and are over an arm's length away, a life belt should be secured to them with the other end held by a responsible person stationed in a clear area. Persons should not remove breathing equipment until tests indicate that the air is safe to breathe.

When a hydrogen sulfide emergency exists, personnel must use the 'BUDDY SYSTEM" to prevent anyone from entering a contaminated area alone. Never enter an enclosed place where hydrogen sulfide may have accumulated without wearing protective breathing equipment. what about the public?

EMERGENCY RESCUE AND FIRST-AID FOR HYDROGEN SULFIDE ASPHYXIATION VICTIM

1. ALWAYS WEAR RESPIRATORY EQUIPMENT WHEN MAKING A RESCUE.

Never enter an area to rescue a person you suspect has been overcome by hydrogen sulfide without taking the time to secure a self-contained respirator. One deep breath of the highly concentrated gas can cause respiratory and cardiac (heart) paralysis.

2. MOVE THE VICTIM TO AN AREA OF FRESH AIR.

3. DETERMINE IF HEART IS BEATING AND IF VICTIM IS BREATHING.

If the victim is breathing, his heart will most likely be beating. If the victim is not breathing, his heart may have stopped.

a. Check for pulse by feeling the carotid artery. This can be done by pressing down on the sides of the trachea (windpipe) adjacent to the jawbone with the thumb on one side and the index finger on the opposite side. If the heart is beating, proceed with mouth-to-mouth resuscitation.

b. If the heart is stopped and the victim is no longer breathing, external heart massage must be given.

4. EXTERNAL HEART MASSAGE PROCEDURE

External heart massage procedure consists of placing the heel of one hand on the center line of the chest approximately two inches above the end of the breastbone. Placement is extremely important, both on the area of chest and use of the heel of hand. The fingers on the bottom hand must never touch the chest. The other hand is placed diagonally across the heel of the first hand. The massage is done by depressing the chest down 1 to 1 1/2" inches by applying the body weight on the hands. It actually takes 80 to 100 pounds of pressure to depress the chest enough to squeeze (pump) the heart. The arms must be kept straight and the body weight utilized for applying pressure. The depressing action must be done in a rapid depress-release motion. It should be repeated a minimum of 60 times per minute. This will be vigorous work. The carotid artery should be checked occasionally to determine if the heart has begun to beat on its own.

5. MOUTH-TO-MOUTH RESUSCITATION

With the victim lying on his back, place one hand under the neck and with the other hand tilt the head back to where the chin extends up as high as possible. This will pull the tongue back from the throat and allow free air passage. Keep one hand under the neck and pinch the nose shut with the other hand, while keeping the head tilted back. Place your mouth over the victim's mouth and blow a forcible breath. Remove your mouth from his and turn your ear toward his mouth to listen for the exhale of air. Continue this procedure approximately 12-13 times a minute until the victim begins to breathe on his own.

6. ARTIFICIAL CIRCULATION (JOINT EXTERNAL HEART MASSAGE AND MOUTH-TO-MOUTH RESUSCITATION USING TWO PERSONS)

Do not waste time, as seconds literally may mean the difference between life and death. As a two-man team, one person should give mouth-to-mouth breathing and the other should apply heart massage. To begin, the lungs should be inflated once and the chest depressed five times. The rhythm should never be broken. The person giving the mouth-to-mouth breathing must get his breath into the victim between the fifth and sixth chest depression. The rhythm is very important and the "breath-in" must not be during a chest depression. It can be done easily, but it takes practice. If circulation is restored, the victim's color will become noticeably better and he should revive within fifteen minutes. The two participants will need to take turns as the external heart massage is strenuous work.

7. ARTIFICIAL CIRCULATION (JOINT EXTERNAL HEART MASSAGE AND MOUTH-TO-MOUTH RESUSCITATION BY ONE PERSON)

If you do not have any help, start the procedure by giving the victim three deep breaths by mouth-to-mouth breathing. Then massage the chest fifteen times, then two deep breaths and continue the 2-15-2-15 sequence. This procedure will be somewhat difficult, but a person in the unconscious state only requires 40% to 50% of the normal circulatory action to stay alive.

8. BRINGING THE VICTIM AROUND

a. A person overcome with hydrogen sulfide may have uncontrolled muscular reaction varying from slight twitching to violent jerking. The rescuer should be prepared for the unexpected.

b. When the victim starts to revive, he may be sick and vomiting. His head should be turned to the side to prevent choking.

c. Oxygen should be used as a supplement when breathing has been restored to normal. However, the emphasis is on quick response of the rescuer in giving mouth-to-mouth breathing/external heart massage. Administering oxygen is absolutely worthless unless the victim is breathing.

d. Treat for shock by keeping the victim quiet, reassuring him he is going to be okay and by preserving body heat.

e. Get professional help immediately. Summon an ambulance and/or doctor. Call the hospital in advance to notify them of the impending arrival and emergency.

9. HOW TO DETERMINE IF THE VICTIM IS RESPONDING TO ARTIFICIAL CIRCULATION.

a. The pupils will constrict to light sources.

b. The victim's color will improve.

APPENDIX A.1 - PHYSICAL PROPERTIES AND PHYSIOLOGICAL EFFECTS OF HYDROGEN SULFIDE

1. Physical Data

Chemical Name: Hydrogen Sulfide
CAS Number: 7783-06-04
Synonyms: Sulfureted hydrogen, hydrosulfuric acid, dihydrogen sulfide.
Chemical Family: Inorganic sulfide.
Chemical Formula: H2S.
Normal Physical State: Colorless gas, slightly heavier than air. Vapor density (specific gravity) at 59°F (15°C) and 1 atmosphere – 1.189.
Auto-ignition Temperature: 500°F (260°C).
Boiling Point: 76.4°F (-60.2°C).
Melting Point: -117.2°F (-82.9°C).
Flammable Limits: 4.3 – 46 percent vapor by volume in air.
Solubility: Soluble in water and oil; solubility deceases as the fluid temperature increases.
Combustibility: Burns with a blue flame to produce sulfur dioxide (SO_2).
Odor and Warning Properties: Hydrogen sulfide has an extremely unpleasant odor, characteristic of rotten eggs, and is easily detected at low concentrations. However, due to rapid onset of olfactory fatigue and paralysis, (inability to smell), ODOR SHALL NOT BE USED AS A WARNING MEASURE.

2. Exposure Limits

The Occupational Safety and Health Administration (OSHA) has established 20 ppm by volume as an acceptable ceiling concentration (ACC) and 50 ppm by volume as an acceptable maximum peak above the ACC for an 8-hour shift for hydrogen sulfide (refer to 29 *Code of Federal Regulations* Part 1910.1000, Subpart Z, Table Z-2). The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a Threshold Limit Value (TLV) of 10 ppm (eight-hour TWA) and a short term exposure limit (STEL) of 15 ppm averaged over fifteen minutes. Exposure at the STEL should not be repeated more than four times per day with at least sixty minutes between successive exposures in this range.

3. Physiological Effects

INHALATION AT CERTAIN CONCENTRATIONS CAN LEAD TO INJURY OR DEATH (refer to Table A-1). Hydrogen sulfide is an extremely toxic, flammable gas that may be encountered in the production and processing of gas well gas, high-sulfur-content crude oil, crude oil fractions, associated gas, and waters. Since hydrogen sulfide is heavier than air, it can collect in low places. It is colorless and has a foul, rotten-egg odor. In low concentrations, it is detectable by its characteristic odor. However, smell cannot be relied on for forewarn of dangerous concentration because exposure to high concentrations (greater than 100 ppm) of the gas rapidly paralyzes the sense of smell due to paralysis of the olfactory nerve. A longer exposure to lower concentrations has a similar desensitizing effect on the sense of smell.

IT SHOULD BE WELL UNDERSTOOD THAT THE SENSE OF SMELL WILL BE RENDERED INEFFECTIVE BY HYDROGEN SULFIDE, WHICH CAN RESULT IN AN INDIVIDUAL FAILING TO RECOGNIZE THE PRESENCE OF DANEROUSLY HIGH CONCENTRATIONS.

Excess exposure to hydrogen sulfide causes death by poisoning the respiratory system *at the cellular level.* There is some indication that the presence of alcohol in the blood aggravates the effects of hydrogen sulfide in acute poisoning cases. Even at low concentrations (10-15 ppm) Hydrogen sulfide is irritating to the eyes and respiratory tract. Closely repeated short-term exposures at low concentrations may lead to irritation of the eyes, nose, and throat. Symptoms from repeated exposures to low concentrations usually disappear after not being exposed for a period of time. Repeated exposures to low concentrations that do not produce effects initially may eventually lead to irritation if the exposures are frequent.

4. Respiratory Protection

The National Institute for Occupational Safety and Health (NIOSH) has examined the criteria for respirator tests and sources of respirator leakage and recommends that positive pressure, either supplied-air or self-contained breathing apparatus, as appropriate, with a full face piece be worn by anyone exposed to atmosphere containing hydrogen sulfide concentrations above OSHA's ACC.

Table A-1
Typical Characteristics of Exposure to Hydrogen Sulfide

Percent by Volume	Parts Per Million by Volume	Grains Per 100 Std. Cubic Feet	Milligrams Per Cubic Meter	Typical Characteristics Regarding Hydrogen Sulfide Exposure
0.000013	0.13	0.008	0.18	Obvious and unpleasant odor generally at 0.13 ppm and quite noticeable at 4.6 ppm. As the concentration increases, the sense of smell fatigues and the gas can no longer be detected by odor.
0.001	10	0.63	14.41	Unpleasant odor. Possible eye irritation. ACGIH recommended Threshold Limit Value (TLV) (eight-hour TWA).
0.0015	15	0.94	21.61	ACGIH STEL averaged over 15 minutes.
0.002	20	1.26	28.83	Burning sensation in eyes and irritation of the respiratory tract after one hour or more exposure. OSHA acceptable ceiling concentration (ACC).
0.005	50	3.15	72.07	Loss of sense of smell after 15 or more minutes exposure. Exposure over one hour may lead to headache, dizziness, and/or staggering. Pulmonary edema reported following extended exposure to greater than 50 ppm. Exposure at 50 ppm or greater can cause serious eye irritation or damage.
0.01	100	6.3	144.14	Coughing, eye irritation, loss of sense of smell after 3 to 15 minutes. Altered respiration, pain in eyes, and drowsiness after 15 to 20 minutes, followed by throat irritation after one hour. Prolonged exposure results in a gradual increase in the severity of these symptoms.
0.05	500	31.49	720.49	Unconsciousness after short exposure, cessation of breathing if not treated quickly. Dizziness, loss of sense of reasoning and balance. Victims need prompt artificial ventilation and/or cardiopulmonary resuscitation (CPR) techniques.
0.10+	1000+	62.98+	1440.98+	Unconsciousness at once. Permanent brain damage or death may result. Rescue promptly and apply artificial ventilation and/or cardiopulmonary resuscitation (CPR).

APPENDIX A.2 - PHYSICAL PROPERTIES AND PHYSIOLOGICAL EFFECTS OF SULFUR DIOXIDE

1. Physical Data

Chemical Name: Sulfur Dioxide.
CAS Number: 7446-09-05.
Synonyms: Sulfurous anhydride, sulfurous oxide.
Chemical Family: Inorganic.
Chemical Formula: SO_2.
Normal Physical State: Colorless gas, appreciably heavier than air. Vapor density (specific gravity) at 32°F (0°C) and 1 atmosphere – 2.26.
Boiling Point: 14°F (-10.0°C).
Flammable Limits: Non-flammable (produced from burning hydrogen sulfide).
Solubility: Readily soluble in water and oil; solubility deceases as the fluid temperature increases.
Odor and Warning Properties: Sulfur dioxide has a pungent odor associated with burning sulfur. It produces a suffocating effect and produces sulfurous acid on membranes of the nose and throat.

2. Exposure Limits

The Occupational Safety and Health Administration (OSHA) has established a permissible exposure limit (PEL) of 5 ppm as an 8-hour TWA for sulfur dioxide (refer to 29 Code of Federal Regulations Part 1910.1000, Subpart Z, Table Z-1). The American Conference of Governmental Industrial Hygienists (ACGIH) recommends 2 ppm as an eight-hour TWA Threshold Limit Value (TLV) and 5 ppm as a STEL averaged over 15 minutes for sulfur dioxide.

3. Physiological Effects

Acute Toxicity

INHALATION AT CERTAIN CONCENTRATIONS CAN LEAD TO INJURY OR DEATH. Exposure to concentrations below 20 ppm can cause eye irritation, throat irritation, respiratory tract irritation, chest constriction, and some nausea. Exposure to concentrations above 20 ppm can result in marked coughing, sneezing, eye irritation, and chest constriction. Exposure to 50 ppm causes irritation to the nose and throat, running nose, coughing, reflex bronchia-constriction with possible increase in bronchial mucous secretion, and increased pulmonary resistance to air flow (breathing congestion) occurs promptly. This atmosphere, (50 ppm or more), will not be tolerated by most persons for more than 15 minutes. Some reported acute reactions of exposure to high concentrations include, but are not limited to, inflammation of the eyes, nausea, vomiting, abdominal pain, and sore throat. These symptoms are sometimes followed by bronchitis, pneumonia, and/or complaints of weakness for a period of weeks.

Chronic Toxicity

It has been reported that prolonged exposures to sulfur dioxide may lead to increased risk of chronic nasopharyngitis, alteration in sense of smell and taste, shortness of breath on exertion, and a higher frequency of respiratory tract infections compared to unexposed persons. It has also been postulated that sulfur dioxide in the work environment "possibly enhances" the suspected carcinogenic (cancer) effect of arsenic or other cancer agents. No definite evidence is available regarding co-carcinogenesis or promotion of cancer by sulfur dioxide exposure. A few persons apparently have or develop a hyper susceptibility to sulfur dioxide. Decrements in pulmonary function tests have been noted after both acute and chronic exposures.

Exposure Risks

It is not yet clear what concentrations of low level exposure or lengths of exposure increase the risks, nor by how much the risks are increased. Sulfur dioxide exposures should be minimized. Smoking by persons exposed to sulfur dioxide should be strongly discouraged.

4. Respiratory Protection

The National Institute for Occupational Safety and Health (NIOSH) has examined the criteria for respirator tests and sources of respirator leakage and recommends that positive pressure, either supplied-air or self-contained personal breathing apparatus, as appropriate, with a full face piece be worn by anyone exposed to atmosphere containing sulfur dioxide concentrations above OSHA's permissible exposure limit (PEL) (refer to 29 Code of Federal Regulations Part 1910.1000, Subpart Z, Table Z-1).

APPENDIX B - EMERGENCY NOTIFICATION LIST

B.1. COMPANY PERSONNEL

Call the following persons in the order listed until one is notified of the emergency:

1. Area Management

Eunice Plant

Gary Maricle Eunice Area Manager
Office 575-394-2534, ext. 226 Eunice, NM
Mobile 575-602-6005

Alternate: Frank Brainard, Eunice Operations Supervisor
Office 575-394-2534, ext. 229
Home none
Mobile 575-631-0420

Alternate: Chuck Tolsma, Eunice Field Supervisor
Office 575-394-2516, ext. 327
Home 575-631-1846
Mobile 575-631-6026

Alternate: Tim Jordan – Saunders Plant Area Manager
Office 575-396-3221 Lovington, NM
Home 575-396-0189 Lovington, NM
Mobile 575-631-7091

Alternate: Todd Young – Area Manager
Office 575-393-2823 ext. 234
Home 432-523-3770 Andrews, TX
Mobile 575-441-1645

2. ES&H Group

Cal Wrangham – ES&H Manager
Office 432-688-0542 Midland, TX
Home 432-697-6580 Midland, TX
Mobile 432-425-7072

Rebecca Woodell – ES&H Compliance Specialist
Office Office 575-394-2534, ext. 239 Eunice, NM
Home 575-394-2280
Mobile 575-631-7085

Cindy Klein – ES&H Compliance Specialist
Office 575-396-3221, ext. 38
Home 575-398-6670
Mobile 575-631-7093

3. Region Manager

Clark White – Permian Basin Region Manager
Office 713-584-1525 Houston, TX

4. Field Operators

Eunice Area
Doyle Mapp 575-631-7064
Roger Holland 575-631-7094
Robert McBee 575-631-7061

Call company support personnel in Houston, TX, as needed:

1. Assistant V-P ES&H	Jessica Keiser	713-584-1084 Cell Phone 713-263-4537
2. Corporate Security	Weldon Green	713-584-1301 Cell Phone 281-802-5351

B.2. LAW ENFORCEMENT AND EMERGENCY SERVICES

STATE POLICE New Mexico 575-392-5588

LEA COUNTY

Eunice – Police	575-394-2112
Eunice – Fire Dept.	575-394-3258
Hobbs - Sheriff	575-396-3611
Hobbs – Police	575-397-9265
Hobbs – Fire Dept.	575-397-9265
Hobbs – Ambulance	575-397-9265
Lovington – Sheriff	575-396-3611
Lovington – Police	575-396-2811
Lovington – Fire Dept	575-396-2359
Lovington - Ambulance	575-396-2811

B.3. STATE AND FEDERAL AGENCIES

NEW MEXICO

1.	Oil Conservation Division, Santa Fe	505-476-3440
2.	Oil Conservation Division – District Office, Hobbs	575-393-6161
3.	Environmental Department – Air Quality Bureau, Santa Fe	505-827-1494

FEDERAL

1.	U. S. EPA – Region VI Office, Dallas, TX	(800) 887-6063

B.4. CONTRACTOR SUPPORT

ELECTRIC SERVICE COMPANIES

Excel Energy - Customer Service	800-895-4999 24 hour
Kay and Company	806-592-3513

WATER SERVICE AND VACUUM TRUCKS

Chaparrel Services – Eunice, NM	575-394-2545 24 hour
Danny's Hot Oil	575-398-3490
Gandy Corporation – Lovington, NM	575-396-4948 24 hour
Key Energy Services – Hobbs , NM	575-397-4994 24 hour

ROUSTABOUT CREWS

Flint Energy Services – Odessa, TX	432-332-0687 24 hour
Gandy Corporation – Lovington, NM	575-396-4948 24 hour
B & H Construction - Eunice, NM	575-934-2588 24 hour

DIRT WORK EQUIPMENT

B & H Construction – Eunice, NM	575-394-2588 24 hour
EDW Construction – Hobbs, NM	575-391-7814 24 hour
EKB Welding – Monument, NM	575-361-7078 24 hour
Ferguson Construction – Lovington	575-396-3689 24 hour
Gandy Corporation – Lovington, NM	575-396-4948 24 hour

WELDERS

EKB Welding – Monument, NM	575-361-7078 24 hour
Flint Energy Services – Odessa, TX	432-332-0687 24 hour
B & H Construction – Eunice, NM	575-394-2588 24 hour

SAFETY EQUIPMENT

Total Safety Equip. – Hobbs, NM	575-392-2973 24 hour

APPENDIX C - POTENTIAL EXPOSURE AREA MAP

19.15.11.9 B. (2) (c)

The information in this appendix has been developed to aid in the determination of potential areas of exposure during a release of hydrogen sulfide.

The system exists in an arid climate. In the event of a hydrogen sulfide emergency, detailed consideration shall be given to ambient conditions and their considerable impact upon the situation. Among the most important factor to regard is wind direction during an emergency so that any evacuation will safely take place. The Radius of Exposure (ROE) has been calculated for potential release for all areas covered by this plan. A radius has been calculated for both 100 ppm and 500 ppm concentrations at the end point away from the release in all directions. The ROE for 100 ppm is 6346 feet and 2900 feet for the 500 ppm ROE. Prevailing winds at the time of the release will result in an exposure area predominately downwind form the release point.

Contents

TITLE 19 NATURAL RESOURCES AND WILDLIFE
CHAPTER 15 OIL AND GAS
PART 11 HYDROGEN SULFIDE GAS

19.15.11.1 ISSUING AGENCY: Energy, Minerals and Natural Resources Department, Oil Conservation Division.
[19.15.11.1 NMAC - N, 12/1/08]

19.15.11.2 SCOPE: 19.15.11 NMAC applies to a person subject to the division's jurisdiction, including a person engaged in drilling,
stimulating, injecting into, completing, working over or producing an oil, gas or carbon dioxide well or a person engaged in gathering, transporting,
storing, processing or refining of oil, gas or carbon dioxide. 19.15.11 NMAC does not exempt or otherwise excuse surface waste management
facilities the division permits pursuant to 19.15.36 NMAC from more stringent conditions on the handling of hydrogen sulfide required of such
facilities by 19.15.36 NMAC or more stringent conditions in permits issued pursuant to 19.15.36 NMAC, nor shall the facilities be exempt or
otherwise excused from the requirements set forth in 19.15.11 NMAC by virtue of permitting under 19.15.36 NMAC.
[19.15.11.2 NMAC - Rp, 19.15.3.118 NMAC, 12/1/08]

19.15.11.3 STATUTORY AUTHORITY: 19.15.11 NMAC is adopted pursuant to the Oil and Gas Act, NMSA 1978, Section 70-2-6,
Section 70-2-11 and Section 70-2-12.
[19.15.11.3 NMAC - N, 12/1/08]

19.15.11.4 DURATION: Permanent.
[19.15.11.4 NMAC - N, 12/1/08]

19.15.11.5 EFFECTIVE DATE: December 1, 2008, unless a later date is cited at the end of a section.
[19.15.11.5 NMAC - N, 12/1/08]

19.15.11.6 OBJECTIVE: To require oil and gas operations be conducted in a manner that protects the public from exposure to hydrogen
sulfide gas.
[19.15.11.6 NMAC - N, 12/1/08]

19.15.11.7 DEFINITIONS:

A. "ANSI" means the American national standards institute.

B. "Area of exposure" means the area within a circle constructed with a point of escape at its center and the radius of exposure as its
radius.

C. "Dispersion technique" is a mathematical representation of the physical and chemical transportation characteristics, dilution
characteristics and transformation characteristics of hydrogen sulfide gas in the atmosphere.

D. "Escape rate" means the maximum volume (Q) that is used to designate the possible rate of escape of a gaseous mixture
containing hydrogen sulfide, as set forth in 19.15.11 NMAC.

(1) For existing gas facilities or operations, the escape rate is calculated using the maximum daily rate of the gaseous mixture
produced or handled or the best estimate thereof. For an existing gas well, the escape rate is calculated using the current daily absolute open flow
rate against atmospheric pressure or the best estimate of that rate.

(2) For new gas operations or facilities, the escape rate is calculated as the maximum anticipated flow rate through the system. For a
new gas well, the escape rate is calculated using the maximum open-flow rate of offset wells in the pool or reservoir, or the pool or reservoir
average of maximum open-flow rates.

(3) For existing oil wells, the escape rate is calculated by multiplying the producing gas/oil ratio by the maximum daily production

rate or the best estimate of the maximum daily production rate.
(4) For new oil wells, the escape rate is calculated by multiplying the producing gas/oil ratio by the maximum daily production rate of
offset wells in the pool or reservoir, or the pool or reservoir average of the producing gas/oil ratio multiplied by the maximum daily production rate.
(5) For facilities or operations not mentioned, the escape rate is calculated using the actual flow of the gaseous mixture through the
system or the best estimate of the actual flow of the gaseous mixture through the system.
E. "GPA" means the gas processors association.
F. "LEPC" means the local emergency planning committee established pursuant to the Emergency Planning and Community
Right-To-Know Act, 42 U.S.C. section 11001.
G. "NACE" means the national association of corrosion engineers.
H. "Potentially hazardous volume" means the volume of hydrogen sulfide gas of such concentration that:
(1) the 100-ppm radius of exposure includes a public area;
(2) the 500-ppm radius of exposure includes a public road; or
(3) the 100-ppm radius of exposure exceeds 3000 feet.
I. "Public area" means a building or structure that is not associated with the well, facility or operation for which the radius of
exposure is being calculated and that is used as a dwelling, office, place of business, church, school, hospital or government building, or a portion
of a park, city, town, village or designated school bus stop or other similar area where members of the public may reasonably be expected to be

present.
J. "Public road" means a federal, state, municipal or county road or highway.
K. "Radius of exposure" means the radius constructed with the point of escape as its starting point and its length calculated using
the following Pasquill-Gifford derived equation, or by such other method as the division may approve:
(1) for determining the 100-ppm radius of exposure: $X = [(1.589)(\text{hydrogen sulfide concentration})(Q)](0.6258)$, where "X" is the
radius of exposure in feet, the "hydrogen sulfide concentration" is the decimal equivalent of the mole or volume fraction of hydrogen sulfide in the
gaseous mixture and "Q" is the escape rate expressed in cubic feet per day (corrected for standard conditions of 14.73 psi absolute and 60 degrees
fahrenheit);
(2) for determining the 500-ppm radius of exposure: $X = [(0.4546)(\text{hydrogen sulfide concentration})(Q)](0.6258)$, where "X" is the
radius of exposure in feet, the "hydrogen sulfide concentration" is the decimal equivalent of the mole or volume fraction of hydrogen sulfide in the
gaseous mixture and "Q" is the escape rate expressed in cubic feet per day (corrected for standard conditions of 14.73 psi absolute and 60 degrees
fahrenheit);
(3) for a well being drilled, completed, recompleted, worked over or serviced in an area where insufficient data exists to calculate a
radius of exposure but where hydrogen sulfide could reasonably be expected to be present in concentrations in excess of 100 ppm in the gaseous
mixture, a 100-ppm radius of exposure equal to 3000 feet is assumed.
[19.15.11.7 NMAC - Rp, 19.15.3.118 NMAC, 12/1/08]

19.15.11.8 REGULATORY THRESHOLD:

A. Determination of hydrogen sulfide concentration.
(1) Each person shall determine the hydrogen sulfide concentration in the gaseous mixture within wells, facilities or operations either
by testing (using a sample from each well, facility or operation); testing a representative sample; or using process knowledge in lieu of testing. If

the person uses a representative sample or process knowledge, the concentration derived from the representative sample or process knowledge shall
be reasonably representative of the hydrogen sulfide concentration within the well, facility or operation.
(2) The person shall conduct the tests used to make the determination referred to in Paragraph (1) of Subsection A of 19.15.11.8
NMAC in accordance with applicable ASTM or GPA standards or by another division-approved method.
(3) If the person conducted a test prior to January 31, 2003 that otherwise meets the requirements of Paragraphs (1) and (2) of
Subsection A of 19.15.11.8 NMAC, new testing is not required.
(4) If a change or alteration may materially increase the hydrogen sulfide concentration in a well, facility or operation, the person
shall make a new determination in accordance with 19.15.11 NMAC.
B. Concentrations determined to be below 100 ppm. If the hydrogen sulfide concentration in a given well, facility or operation is
less than 100 ppm, the person is not required to take further actions pursuant to 19.15.11 NMAC.
C. Concentrations determined to be above 100 ppm.
(1) If the person determines the hydrogen sulfide concentration in a given well, facility or operation is 100 ppm or greater, then the
person shall calculate the radius of exposure and comply with applicable requirements of 19.15.11 NMAC.
(2) If calculation of the radius of exposure reveals that a potentially hazardous volume is present, the person shall provide results of
the hydrogen sulfide concentration determination and the calculation of the radius of exposure to the division. For a well, facility or operation, the
person shall accomplish the determination, calculation and submission 19.15.11.8 NMAC requires before operations begin.
D. Recalculation. The person shall calculate the radius of exposure if the hydrogen sulfide concentration in a well, facility or
operation increases to 100 ppm or greater. The person shall also recalculate the radius of exposure if the actual volume fraction of hydrogen
sulfide increases by a factor of 25 percent in a well, facility or operation that previously had a hydrogen sulfide concentration of 100 ppm or
greater. If calculation or recalculation of the radius of exposure reveals that a potentially hazardous volume is present, the person shall provide the
results to the division within 60 days.
[19.15.11.8 NMAC - Rp, 19.15.3.118 NMAC, 12/1/08]

19.15.11.9 HYDROGEN SULFIDE CONTINGENCY PLAN:

A. When required. If a well, facility or operation involves a potentially hazardous volume of hydrogen sulfide, the person shall
develop a hydrogen sulfide contingency plan that the person will use to alert and protect the public in accordance with the Subsections B through I
of 19.15.11.9 NMAC.
B. Plan contents.
(1) API guidelines. The person shall develop the hydrogen sulfide contingency plan with due consideration of paragraph 7.6 of the
guidelines in the API publication Recommended Practices for Oil and Gas Producing and Gas Processing Plant Operations Involving Hydrogen
Sulfide, RP-55, most recent edition, or with due consideration to another division-approved standard.
(2) Required contents. The hydrogen sulfide contingency plan shall contain information on the following subjects, as appropriate to
the well, facility or operation to which it applies.
(a) Emergency procedures. The hydrogen sulfide contingency plan shall contain information on emergency procedures the
person will follow in the event of a release and shall include, at a minimum, information concerning the responsibilities and duties of personnel
during the emergency, an immediate action plan as described in the API document referenced in Paragraph (1) of Subsection B of 19.15.11.9

NMAC, and telephone numbers of emergency responders, public agencies, local government and other appropriate public authorities. The plan
shall also include the locations of potentially affected public areas and public roads and shall describe proposed evacuation routes, locations of road
blocks and procedures for notifying the public, either through direct telephone notification using telephone number lists or by means of mass

notification and reaction plans. The plan shall include information on the availability and location of necessary safety equipment and supplies.
(b) Characteristics of hydrogen sulfide and sulfur dioxide. The hydrogen sulfide contingency plan shall include a discussion of
the characteristics of hydrogen sulfide and sulfur dioxide.
(c) Maps and drawings. The hydrogen sulfide contingency plan shall include maps and drawings that depict the area of
exposure and public areas and public roads within the area of exposure.
(d) Training and drills. The hydrogen sulfide contingency plan shall provide for training and drills, including training in the
responsibilities and duties of essential personnel and periodic on-site or classroom drills or exercises that simulate a release, and shall describe how
the person will document the training, drills and attendance. The hydrogen sulfide contingency plan shall also provide for training of residents as
appropriate on the proper protective measures to be taken in the event of a release, and shall provide for briefing of public officials on issues such
as evacuation or shelter-in-place plans.
(e) Coordination with state emergency plans. The hydrogen sulfide contingency plan shall describe how the person will
coordinate emergency response actions under the plan with the division and the New Mexico state police consistent with the New Mexico
hazardous materials emergency response plan.
(f) Activation levels. The hydrogen sulfide contingency plan shall include the activation level and a description of events that
could lead to a release of hydrogen sulfide sufficient to create a concentration in excess of the activation level.
C. Plan activation. The person shall activate the hydrogen sulfide contingency plan when a release creates a hydrogen sulfide
concentration greater than the activation level set forth in the hydrogen sulfide contingency plan. At a minimum, the person shall activate the plan
whenever a release may create a hydrogen sulfide concentration of more than 100 ppm in a public area, 500 ppm at a public road or 100 ppm 3000
feet from the site of release.
D. Submission.
(1) Where submitted. The person shall submit the hydrogen sulfide contingency plan to the division.
(2) When submitted. The person shall submit a hydrogen sulfide contingency plan for a new well, facility or operation before
operations commence. The hydrogen sulfide contingency plan for a drilling, completion, workover or well servicing operation shall be on file with
the division before operations commence and may be submitted separately or along with the APD or may be on file from a previous submission. A
person shall submit a hydrogen sulfide contingency plan within 180 days after the person becomes aware or should have become aware that a
public area or public road is established that creates a potentially hazardous volume where none previously existed.
(3) Electronic submission. A filer who operates more than 100 wells or who operates an oil pump station, compressor station,

refinery or gas plant shall submit each hydrogen sulfide contingency plan in electronic format. The file may submit the hydrogen sulfide
contingency plan through electronic mail, through an Internet filing or by delivering electronic media to the division, so long as the electronic
submission is compatible with the division's systems.

E. Failure to submit plan. A person's failure to submit a hydrogen sulfide contingency plan when required may result in denial of
an application for permit to drill, cancellation of an allowable for the subject well or other enforcement action appropriate to the well, facility or
operation.

F. Review, amendment. The person shall review the hydrogen sulfide contingency plan any time a subject addressed in the plan
materially changes and make appropriate amendments. If the division determines that a hydrogen sulfide contingency plan is inadequate to protect
public safety, the division may require the person to add provisions to the plan or amend the plan as necessary to protect public safety.

G. Retention and inspection. The hydrogen sulfide contingency plan shall be reasonably accessible in the event of a release,
maintained on file at all times and available for division inspection.

H. Annual inventory of contingency plans. On an annual basis, each person required to prepare one or more hydrogen sulfide
contingency plans pursuant to 19.15.11 NMAC shall file with the appropriate local emergency planning committee and the state emergency
response commission an inventory of the wells, facilities and operations for which plans are on file with the division and the name, address and
telephone number of a point of contact.

I. Plans required by other jurisdictions. The person may submit a hydrogen sulfide contingency plan the BLM or other
jurisdiction require that meets the requirements of 19.15.11.9 NMAC to the division in satisfaction of 19.15.11.9 NMAC.

[19.15.11.9 NMAC - Rp, 19.15.3.118 NMAC, 12/1/08]

19.15.11.10 SIGNS, MARKERS: For each well, facility or operation involving a hydrogen sulfide concentration of 100 ppm or greater, the
person shall install and maintain signs or markers that conform with the current ANSI standard Z535.1-2002 (Safety Color Code), or some other
division-approved standard. The sign or marker shall be readily readable, and shall contain the words "poison gas" and other information
sufficient to warn the public that a potential danger exists. The person shall prominently post signs or markers at locations, including entrance
points and road crossings, sufficient to alert the public that a potential danger exists.

[19.15.11.10 NMAC - Rp, 19.15.3.118 NMAC, 12/1/08]

19.15.11.11 PROTECTION FROM HYDROGEN SULFIDE DURING DRILLING, COMPLETION, WORKOVER AND WELL SERVICING OPERATIONS:

A. API standards. The person shall conduct drilling, completion, workover and well servicing operations involving a hydrogen
sulfide concentration of 100 ppm or greater with due consideration to the guidelines in the API publications Recommended Practice for Oil and
Gas Well Servicing and Workover Operations Involving Hydrogen Sulfide, RP-68, and Recommended Practices for Drilling and Well Servicing
Operations Involving Hydrogen Sulfide, RP-49, most recent editions, or some other division-approved standard.

B. Detection and monitoring equipment. Drilling, completion, workover and well servicing operations involving a hydrogen sulfide

concentration of 100 ppm or greater shall include hydrogen sulfide detection and monitoring equipment as follows.

(1) Each drilling and completion site shall have an accurate and precise hydrogen sulfide detection and monitoring system that automatically activates visible and audible alarms when the hydrogen sulfide's ambient air concentration reaches a predetermined value the operator sets, not to exceed 20 ppm. The operator shall locate a sensing point at the shale shaker, rig floor and bell nipple for a drilling site and the cellar, rig floor and circulating tanks or shale shaker for a completion site.

(2) For workover and well servicing operations, the person shall locate one operational sensing point as close to the well bore as practical. Additional sensing points may be necessary for large or long-term operations.

(3) The operator shall provide and maintain as operational hydrogen sulfide detection and monitoring equipment during drilling when drilling is within 500 feet of a zone anticipated to contain hydrogen sulfide and continuously thereafter through all subsequent drilling.

C. Wind indicators. Drilling, completion, workover and well servicing operations involving a hydrogen sulfide concentration of 100 ppm or greater shall include wind indicators. The person shall have equipment to indicate wind direction present and visible at all times. The person shall install at least two devices to indicate wind direction at separate elevations that visible from all principal working areas at all times.

When a sustained hydrogen sulfide concentration is detected in excess of 20 ppm at a detection point, the person shall display red flags.

D. Flare system. For drilling and completion operations in an area where it is reasonably expected that a potentially hazardous hydrogen sulfide volume will be encountered, the person shall install a flare system to safely gather and burn hydrogen-sulfide-bearing gas. The person shall locate flare outlets at least 150 feet from the well bore. Flare lines shall be as straight as practical. The person shall equip the flare system with a suitable and safe means of ignition. Where noncombustible gas is to be flared, the system shall provide supplemental fuel to maintain ignition.

E. Well control equipment. When the 100 ppm radius of exposure includes a public area, the following well control equipment is required.

(1) Drilling. The person shall install a remote-controlled well control system that is operational at all times beginning when drilling is within 500 vertical feet of the formation believed to contain hydrogen sulfide and continuously thereafter during drilling. The well control system shall include, at a minimum, a pressure and hydrogen-sulfide-rated well control choke and kill system including manifold and blowout preventer that meets or exceeds the specifications in API publications Choke and Kill Systems, 16C and Blowout Prevention Equipment Systems for Drilling Wells, RP 53 or other division-approved specifications. The person shall use mud-gas separators. The person shall test and maintain these systems pursuant to the specifications referenced, according to the requirements of 19.15.11 NMAC, or as the division otherwise approves.

(2) Completion, workover and well servicing. The person shall install a remote controlled pressure and hydrogen-sulfide-rated well control system that meets or exceeds API specifications or other division-approved specifications that is operational at all times during a well's completion, workover and servicing.

F. Mud program. Drilling, completion, workover and well servicing operations involving a hydrogen sulfide concentration of 100

ppm or greater shall use a hydrogen sulfide mud program capable of handling hydrogen sulfide conditions and well control, including de-gassing.

G. Well testing. Except with prior division approval, a person shall conduct drill-stem testing of a zone that contains hydrogen sulfide in a concentration of 100 ppm or greater only during daylight hours and not permit formation fluids to flow to the surface.

H. If hydrogen sulfide encountered during operations. If hydrogen sulfide was not anticipated at the time the division issued a permit to drill but is encountered during drilling in a concentration of 100 ppm or greater, the operator shall satisfy the requirements of 19.15.11 NMAC before continuing drilling operations. The operator shall notify the division of the event and the mitigating steps that the operator has or is taking as soon as possible, but no later than 24 hours following discovery. The division may grant verbal approval to continue drilling operations pending preparation of a required hydrogen sulfide contingency plan.

[19.15.11.11 NMAC - Rp, 19.15.3.118 NMAC, 12/1/08]

19.15.11.12 PROTECTION FROM HYDROGEN SULFIDE AT OIL PUMP STATIONS, PRODUCING WELLS, TANK BATTERIES AND ASSOCIATED PRODUCTION FACILITIES, PIPELINES, REFINERIES, GAS PLANTS AND COMPRESSOR STATIONS:

A. API standards. A person shall conduct operations at oil pump stations and producing wells, tank batteries and associated production facilities, refineries, gas plants and compressor stations involving a hydrogen sulfide concentration of 100 ppm or greater with due consideration to the guidelines in the API publication Recommended Practices for Oil and Gas Producing and Gas Processing Plant Operations Involving Hydrogen Sulfide, RP-55, latest edition or some other division-approved standard.

B. Security. A person shall protect well sites and other unattended, fixed surface facilities involving a hydrogen sulfide concentration of 100 ppm or greater from public access by fencing with locking gates when the location is within 1/4 mile of a public area. For the purposes of Subsection B of 19.15.11.12 NMAC, a surface pipeline is not considered a fixed surface facility.

C. Wind direction indicators. Oil pump stations, producing wells, tank batteries and associated production facilities, pipelines, refineries, gas plants and compressor stations involving a hydrogen sulfide concentration of 100 ppm or greater shall have equipment to indicate wind direction. The person shall install wind direction equipment that is visible from all principal working areas at all times.

D. Control equipment. When the 100 ppm radius of exposure includes a public area, the following additional measures are required.

(1) The person shall install and maintain in good operating condition safety devices, such as automatic shut-down devices, to prevent hydrogen sulfide's escape. Alternatively, the person shall establish safety procedures to achieve the same purpose.

(2) A well shall possess a secondary means of immediate well control through the use of an appropriate christmas tree or downhole completion equipment. The equipment shall allow downhole accessibility (reentry) under pressure for permanent well control.

E. Tanks or vessels. The person shall chain each stair or ladder leading to the top of a tank or vessel containing 300 ppm or more

of hydrogen sulfide in the gaseous mixture or mark it to restrict entry.

[19.15.11.12 NMAC - Rp, 19.15.3.118 NMAC, 12/1/08]

19.15.11.13 PERSONNEL PROTECTION AND TRAINING: The person shall provide persons responsible for implementing a hydrogen sulfide contingency plan training in hydrogen sulfide hazards, detection, personal protection and contingency procedures.

[19.15.11.13 NMAC - Rp, 19.15.3.118 NMAC, 12/1/08]

19.15.11.14 STANDARDS FOR EQUIPMENT THAT MAY BE EXPOSED TO HYDROGEN SULFIDE: Whenever a well, facility or operation involves a potentially hazardous hydrogen sulfide volume, the person shall select equipment with consideration for both the hydrogen sulfide working environment and anticipated stresses and shall use NACE Standard MR0175 (latest edition) or some other division-approved standard for selection of metallic equipment or, if applicable, use adequate protection by chemical inhibition or other methods that control or limit hydrogen sulfide's corrosive effects.

[19.15.11.14 NMAC - Rp, 19.15.3.118 NMAC, 12/1/08]

19.15.11.15 EXEMPTIONS: A person may petition the director or the director's designee for an exemption to a requirement of 19.15.11 NMAC. A petition shall provide specific information as to the circumstances that warrant approval of the exemption requested and how the person will protect public safety. The director or the director's designee, after considering all relevant factors, may approve an exemption if the circumstances warrant and so long as the person protects public safety.

[19.15.11.15 NMAC - Rp, 19.15.3.118 NMAC, 12/1/08]

19.15.11.16 NOTIFICATION OF THE DIVISION: The person shall notify the division upon a release of hydrogen sulfide requiring activation of the hydrogen sulfide contingency plan as soon as possible, but no more than four hours after plan activation, recognizing that a prompt response should supersede notification. The person shall submit a full report of the incident to the division on form C-141 no later than 15 days following the release.

[19.15.11.16 NMAC - Rp, 19.15.3.118 NMAC, 12/1/08]

HISTORY of 19.15.11 NMAC:

History of Repealed Material: 19.15.3 NMAC, Drilling (filed 10/29/2001) repealed 12/1/08.

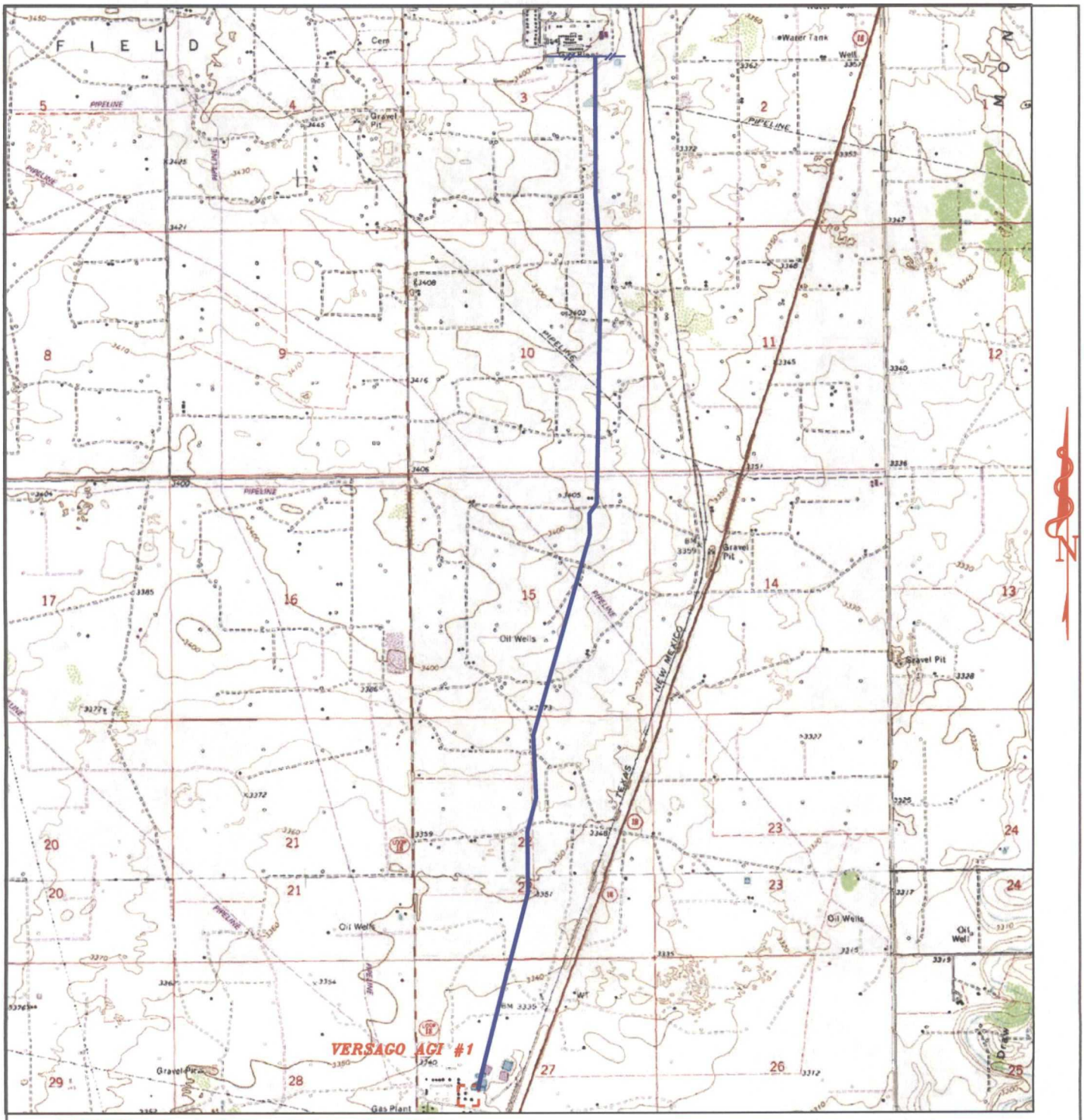
NMAC History:

That applicable portion of 19.15.3 NMAC, Drilling (Section 118) (filed 10/29/2001) was replaced by 19.15.11 NMAC, Hydrogen Sulfide Gas, effective 12/1/08.

OCD Rule 118

Pasquill-Gifford Equation for Calculating Radius of Exposure (ROE) of Hydrogen Sulfide (H2S)

Enter H2S in PPM	150000	*enter Data in green shaded areas*	
Enter Gas flow in mcf/day	5000		
Constant for 500 ppm ROE	0.4546	constant	
Constant for 300 ppm ROE	0.77	constant	
Constant for 100 ppm ROE	1.589	constant	
Mult factor for 500 ppm ROE	340950	formula	
Mult factor for 300 ppm ROE	577500	formula	
Mult factor for 100 ppm ROE	1191750	formula	
Flow Rate of Pure H2S in Gas Stream (Actual Volume Fraction)	750	mcf/day	
H2S Concentration Volume Fraction	0.15	decimal equivalent	
H2S Concentration Volume Fraction in percent %	15.00%	percent	
500 ppm radius of exposure (public road)	**2900**	feet	*ANSWER*
300 ppm radius of exposure	**4033**	feet	*ANSWER*
100 ppm radius of exposure (public area)	**6346**	feet	*ANSWER*



EUNICE ACID GAS LINE

Sections 3,10,15,22&27, Township 22 South, Range 37 East, N.M.P.M., Lea County, New Mexico.

basin surveys
focused on excellence in the oilfield

P.O. Box 1786
1120 N. West County Rd.
Hobbs, New Mexico 88241
(505) 393-7316 - Office
(505) 392-3074 - Fax
basinsurveys.com

W.O. Number:	JMS 19950
Survey Date:	VARIES
Scale:	1" = 3000'
Date:	07-11-2008

TARGA RESOURCES

NEW MEXICO ENERGY, MINERALS and NATURAL RESOURCES DEPARTMENT

BILL RICHARDSON
Governor
Joanna Prukop
Cabinet Secretary

Mark E. Fesmire, P.E.
Director
Oil Conservation Division

October 23, 2006

Mr. Cal Wrangham
Environmental, Safety and Health Advisor
TARGA Resources, Inc.
6 Desta Drive, Suite 3300
Midland, Texas 79705

RE: DISCHARGE PERMIT GW-005
EUNICE-MIDDLE GAS PLANT

Dear Mr. Wrangham:

Pursuant to Water Quality Control Commission (WQCC) Regulations (20.6.2.3104 - 20.6.2.3114 NMAC), the Oil Conservation Division (OCD) hereby approves the discharge permit for the TARGA Resources, Inc., (owner/operator) Eunice-Middle Gas Plant (GW-005) located in the NE/4 of Section 3, Township 22 South, Range 37 East, NMPM, Lea County, New Mexico, under the conditions specified in the enclosed **Attachment To The Discharge Permit**. Enclosed are two copies of the conditions of approval. **Please sign and return one copy to the New Mexico Oil Conservation Division (OCD) Santa Fe Office within 30 working days of receipt of this letter including permit fees.**

Please be advised that approval of this permit does not relieve the owner/operator of responsibility if operations result in pollution of surface water, ground water or the environment. Nor does approval of the permit relieve the owner/operator of its responsibility to comply with any other applicable governmental authority's rules and regulations.

If you have any questions, please contact Carl Chavez of my staff at (505-476-3491) or E-mail: carlj.chavez@state.nm.us. On behalf of the staff of the OCD, I wish to thank you and your staff for your cooperation during this discharge permit review.

Sincerely,

Wayne Price
Environmental Bureau Chief

LWP/cc
Attachments-1
xc: OCD District Office

ATTACHMENT TO THE DISCHARGE PERMIT
TARGA RESOURCES, INC., EUNICE-MIDDLE GAS PLANT (GW-005)
DISCHARGE PERMIT APPROVAL CONDITIONS
OCTOBER 23, 2006

Please remit a check for $4000.00 made payable to Water Quality Management Fund:

Water Quality Management Fund
C/o: Oil Conservation Division
1220 S. Saint Francis Drive
Santa Fe, New Mexico 87505

1. **Payment of Discharge Plan Fees:** All discharge permits are subject to WQCC Regulations. Every billable facility that submits a discharge permit application will be assessed a filing fee of $100.00, plus a renewal flat fee (*see* WQCC Regulation 20.6.2.3114 NMAC). The Oil Conservation Division (OCD) has received the required $100.00 filing fee. However, the owner/operator still owes the required $4,000.00 renewal permit fee for a gas plant.

2. **Permit Expiration and Renewal:** Pursuant to WQCC Regulations (20.6.2.3109.H.4 NMAC), this permit is valid for a period of five years. **The permit will expire on May 16, 2011** and an application for renewal should be submitted no later than 120 days before that expiration date. Pursuant to WQCC Regulation 20.6.2.3106.F NMAC, if a discharger submits a discharge permit renewal application at least 120 days before the discharge permit expires and is in compliance with the approved permit, then the existing discharge permit will not expire until the application for renewal has been approved or disapproved.

3. **Permit Terms and Conditions:** Pursuant to WQCC Regulation 20.6.2.3104 NMAC, when a permit has been issued, the owner/operator must ensure that all discharges shall be consistent with the terms and conditions of the permit. In addition, all facilities shall abide by the applicable rules and regulations administered by the OCD pursuant to the Oil and Gas Act, NMSA 1978, Sections 70-2-1 through 70-2-38.

4. **Owner/Operator Commitments:** The owner/operator shall abide by all commitments submitted in its December 12, 2005, discharge permit renewal letter with $100 Filing Fee, including attachments and subsequent amendments and these conditions for approval. Permit applications that reference previously approved plans on file with the division shall be incorporated in this permit and the owner/operator shall abide by all previous commitments of such plans and these conditions for approval.

5. **Modifications:** WQCC Regulation 20.6.2.3109.G NMAC addresses possible future modifications of a permit. Pursuant WQCC Regulation 20.6.2.3107.C NMAC, the owner/operator (discharger) shall notify the OCD of any facility expansion, production increase or process modification that would result in any significant modification in the discharge of water contaminants. Pursuant to WQCC Regulation 20.6.2.3109.E NMAC, the Division Director may require a permit modification if any water quality standard specified at 20.6.2.3103 NMAC is being or will be exceeded, or if a toxic pollutant as defined in WQCC Regulation

20.6.2.7 NMAC is present in ground water at any place of withdrawal for present or reasonably foreseeable future use, or that the Water Quality Standards for Interstate and Intrastate streams as specified in 20.6.4 NMAC are being or may be violated in surface water in New Mexico.

6. **Waste Disposal and Storage:** The owner/operator shall dispose of all wastes at an OCD-approved facility. Only oil field RCRA-exempt wastes may be disposed of by injection in a Class II well. RCRA non-hazardous, non-exempt oil field wastes may be disposed of at an OCD-approved facility upon proper waste determination pursuant to 40 CFR Part 261. Any waste stream that is not listed in the discharge permit application must be approved by the OCD on a case-by-case basis.

A. **OCD Rule 712 Waste:** Pursuant to OCD Rule 712 (19.15.9.712 NMAC) disposal of certain non-domestic waste without notification to the OCD is allowed at NMED permitted solid waste facilities if the waste stream has been identified in the discharge permit and existing process knowledge of the waste stream does not change.

B. **Waste Storage:** The owner/operator shall store all waste in an impermeable bermed area, except waste generated during emergency response operations for up to 72 hours. All waste storage areas shall be identified in the discharge permit application. Any waste storage area not identified in the permit shall be approved on a case-by-case basis only. The owner/operator shall not store oil field waste on-site for more than 180 days unless approved by the OCD.

7. **Drum Storage:** The owner/operator must store all drums, including empty drums, containing materials other than fresh water on an impermeable pad with curbing. The owner/operator must store empty drums on their sides with the bungs in place and lined up on a horizontal plane. The owner/operator must store chemicals in other containers, such as tote tanks, sacks, or buckets on an impermeable pad with curbing.

8. **Process, Maintenance and Yard Areas:** The owner/operator shall either pave and curb or have some type of spill collection device incorporated into the design at all process, maintenance, and yard areas which show evidence that water contaminants from releases, leaks and spills have reached the ground surface.

9. **Above Ground Tanks:** The owner/operator shall ensure that all aboveground tanks have impermeable secondary containment (e.g., liners and berms), which will contain a volume of at least one-third greater than the total volume of the largest tank or all interconnected tanks. The owner/operator shall retrofit all existing tanks before discharge permit renewal. Tanks that contain fresh water or fluids that are gases at atmospheric temperature and pressure are exempt from this condition.

10. **Labeling:** The owner/operator shall clearly label all tanks, drums, and containers to identify their contents and other emergency notification information. The owner/operator may use a tank code numbering system, which is incorporated into their emergency response plans.

11. **Below-Grade Tanks/Sumps and Pits/Ponds.**

A. All below-grade tanks and sumps must be approved by the OCD prior to installation and must incorporate secondary containment with leak detection into the design. The owner/operator shall retrofit all existing systems without secondary containment and leak

detection before discharge permit renewal. All existing below-grade tanks and sumps without secondary containment and leak detection must be tested annually or as specified herein. Systems that have secondary containment with leak detection shall have a monthly inspection of the leak detection system to determine if the primary containment is leaking. Small sumps or depressions in secondary containment systems used to facilitate fluid removal are exempt from these requirements if fluids are removed within 72 hours.

B. All pits and ponds, including modifications and retrofits, shall be designed by a certified registered professional engineer and approved by the OCD prior to installation. In general, all pits or ponds shall have approved hydrologic and geologic reports, location, foundation, liners, and secondary containment with leak detection, monitoring and closure plans. All pits or ponds shall be designed, constructed and operated so as to contain liquids and solids in a manner that will protect fresh water, public health, safety and the environment for the foreseeable future. The owner/operator shall retrofit all existing systems without secondary containment and leak detection before discharge permit renewal.

C. The owner/operator shall ensure that all exposed pits, including lined pits and open top tanks (8 feet in diameter or larger) shall be fenced, screened, netted, or otherwise rendered non-hazardous to wildlife, including migratory birds.

D. The owner/operator shall maintain the results of tests and inspections at the facility covered by this discharge permit and available for OCD inspection. The owner/operator shall report the discovery of any system which is found to be leaking or has lost integrity to the OCD within 15 days. The owner/operator may propose various methods for testing such as pressure testing to 3 pounds per square inch greater than normal operating pressure and/or visual inspection of cleaned tanks and/or sumps, or other OCD-approved methods. The owner/operator shall notify the OCD at least 72 hours prior to all testing.

12. Underground Process/Wastewater Lines:

A. The owner/operator shall test all underground process/wastewater pipelines at least once every five (5) years to demonstrate their mechanical integrity, except lines containing fresh water or fluids that are gases at atmospheric temperature and pressure. Pressure rated pipe shall be tested by pressuring up to one and one-half times the normal operating pressure, if possible, or for atmospheric drain systems, to 3 pounds per square inch greater than normal operating pressure, and pressure held for a minimum of 30 minutes with no more than a 1% loss/gain in pressure. The owner/operator may use other methods for testing if approved by the OCD.

B. The owner/operator shall maintain underground process and wastewater pipeline schematic diagrams or plans showing all drains, vents, risers, valves, underground piping, pipe type, rating, size, and approximate location. All new underground piping must be approved by the OCD prior to installation. The owner/operator shall report any leaks or loss of integrity to the OCD within 15 days of discovery. The owner/operator shall maintain the results of all tests at the facility covered by this discharge permit and they shall be available for OCD inspection. The owner/operator shall notify the OCD at least 72 hours prior to all testing.

13. Class V Wells: The owner/operator shall close all Class V wells (e.g., septic systems, leach fields, dry wells, etc.) that inject non-hazardous industrial wastes or a mixture of industrial wastes and domestic wastes unless it can be demonstrated that ground water will not be impacted in the reasonably foreseeable future. Leach fields and other wastewater disposal systems at OCD-regulated facilities that inject non-hazardous fluid into or above an underground source of drinking

water are considered Class V injection wells under the EPA UIC program. Class V wells that inject domestic waste only, must be permitted by the New Mexico Environment Department (NMED).

14. **Housekeeping:** The owner/operator shall inspect all systems designed for spill collection/prevention and leak detection at least monthly to ensure proper operation and to prevent over topping or system failure. All spill collection and/or secondary containment devices shall be emptied of fluids within 72 hours of discovery. The owner/operator shall maintain all records at the facility and available for OCD inspection.

15. **Spill Reporting:** The owner/operator shall report all unauthorized discharges, spills, leaks and releases and conduct corrective action pursuant to WQCC Regulation 20.5.12.1203 NMAC and OCD Rule 116 (19.15.3.116 NMAC). The owner/operator shall notify both the OCD District Office and the Santa Fe Office within 24 hours and file a written report within 15 days.

16. **OCD Inspections:** The OCD may place additional requirements on the facility and modify the permit conditions based on OCD inspections.

A. The owner/operator shall correct the following site conditions subsequent to the OCD inspections (see attachment) of January 31, and August 17, 2006:

1. Develop a process for laboratory waste disposal exclusive of septic system (1/31/06);
2. Construct secondary containment(s) structures for all drums lacking containment (1/31/06);
3. Construct a berm around bullet tanks to contain releases, since some of the tanks contain liquids other than propane/butane (1/31/06);
4. Remediate oily stains on the ground near the oil treater at the SE region of the plant (1/31/06));
5. Fix steam condensate leakage water by immediately re-routing steam process water (pH~ 10.96) currently discharging as stormwater runoff across and off-site back into treatment system (8/17/06);
6. Build secondary containment area for drum storage and lay empty drums on side at storage area (8/17/06);
7. Properly dispose of trash and litter waste from storage area (8/17/06); and
8. Properly dispose of contaminated soils, i.e; raw sulfur, stockpiled on premises (8/17/06).

17. **Storm Water:** The owner/operator shall implement and maintain run-on and runoff plans and controls. The owner/operator shall not discharge any water contaminant that exceeds the WQCC standards specified in 20.6.2.3101 NMAC or 20.6.4 NMAC (Water Quality Standards for Interstate and Intrastate Streams) including any oil sheen in any stormwater run-off. The owner/operator shall notify the OCD within 24 hours of discovery of any releases and shall take immediate corrective action(s) to stop the discharge.

18. **Unauthorized Discharges:** The owner/operator shall not allow or cause water pollution, discharge or release of any water contaminant that exceeds the WQCC standards listed in 20.6.2.3101 NMAC or 20.6.4 NMAC (Water Quality Standards for Interstate and Intrastate

Streams) unless specifically listed in the permit application and approved herein. ***An unauthorized discharge is a violation of this permit.***

19. Vadose Zone and Water Pollution: The owner/operator shall address any contamination through the discharge permit process or pursuant to WQCC 20.6.2.4000-.4116 NMAC (Prevention and Abatement of Water Pollution). The OCD may require the owner/operator to modify its permit for investigation, remediation, abatement, and monitoring requirements for any vadose zone or water pollution. Failure to perform any required investigation, remediation, abatement and submit subsequent reports, will be a violation of the permit. This permit shall include remediation of contaminated soils by land treatment or land farming in accordance with the owner/operator Ground Water Discharge Plan (GW-005) Surface Waste Management Plan (SWMP) report dated March 15, 2006 and 19.15.9.711 NMAC.

20. Additional Site Specific Conditions:

A. Remediation Plan: The owner/operator shall comply with the "Remediation Plan" section of the "Laboratory Analysis of Soil Samples" report, Targa Midstream Services, L.P., Eunice Gas Plant, Ground Water Discharge Plant (GW-005) report dated January 20, 2006 and active remediation of the ground water to capture inorganic and organic contamination must be implemented by February 1, 2007. In addition, the owner/operator shall sample the sidewalls and base of excavation (minimum five discreet samples per wall) to compare with closure constituents in Section 20(B)(6) verify soil remediation before filling any excavations. Sample locations shall be selected based on physical evidence, i.e.; olfactory, visual staining, fine-grained sediments, etc.

B. Land treatment: In addition to the SWMP report (report) in Sections 19 and 20B herein, the owner/operator shall implement and comply with the following permit conditions applicable to landfarming soils contaminated with predominantly petroleum hydrocarbons:

(1) Waste acceptance criteria. The owner/operator may place only RCRA Subtitle "C" Hazardous Waste exempt and non-exempt oilfield waste soils and drill cuttings predominantly contaminated by petroleum hydrocarbons in an OCD landfarm. The division may approve placement of tank bottoms in a landfarm if the operator demonstrates that the tank bottoms do not contain economically recoverable petroleum hydrocarbons. All waste placed in any landfarm shall be sufficiently free of liquid content to pass the paint filter test and shall not have a chloride concentration exceeding 500 mg/kg where water table depth below waste is less than or equal to 100 feet or shall not exceed 1000 mg/kg where water table depth below waste is greater than 100 feet.

(2) Background testing. The owner/operator prior to beginning operation of a new landfarm or to opening a new cell at an existing landfarm, the operator shall take, at a minimum, four background soil samples from each landfarm cell, three feet below the original ground surface, to establish background concentrations. The operator shall analyze the background soil samples for the following total petroleum hydrocarbons (TPH), as determined by Environmental Protection Agency (EPA) Method 418.1 or other EPA method approved by the division; benzene, toluene, ethyl benzene and xylenes (BTEX), as determined by EPA SW-846 Method 8021B or 8260B; chlorides, as determined by EPA Method 300.1; and/or other constituents listed in Subsections A and B of 20.6.2.3103 NMAC, using approved United States EPA methods.

(3) **Operation and waste treatment.**

(a) The operator shall berm each cell of the landfarm to prevent run-on and run-off of rainwater.

(b) The operator shall not place contaminated soils received at any landfarm within 100 feet of a boundary of the facility unless approved by the OCD.

(c) The operator shall not place contaminated soils received at any landfarm within 20 feet of any pipeline crossing the landfarm.

(d) The operator shall biopile or spread and disk all contaminated soils in eight inch or less lifts or approximately 1000 cubic yards per acre per eight-inch lift within 72 hours of receipt. The owner/operator shall spread contaminated soils on the surface in eight-inch or less lifts or approximately 1000 cubic yards per acre per eight-inch lift.

(e) The operator shall ensure that soils are disked biweekly and biopiles are turned at least monthly.

(f) The operator shall add moisture, as necessary, to enhance bioremediation and to control blowing dust.

(g) The application of microbes for the purposes of enhancing bioremediation requires prior division approval.

(h) Pooling of liquids in the landfarm is prohibited. Freestanding water shall be removed within 24 hours.

(i) The operator shall maintain records of the facility's treatment activities in a form readily accessible for division inspection.

(j) The division's environmental bureau may approve other treatment procedures if the operator demonstrates that they provide equivalent protection for fresh water, public health, safety and the environment.

(4) **Treatment zone monitoring.** The owner/operator shall conduct treatment zone monitoring to ensure that the TPH concentration of each lift, as determined by EPA SW-846 Method 8015M or EPA Method 418.1 or other EPA method approved by the division, does not exceed 2500 mg/kg and that the chloride concentration, as determined by EPA Method 300.1, does not exceed 500 mg/kg where the water table is less than or equal to 100 feet below waste or 1000 mg/kg where the water table is greater than 100 feet below waste, prior to adding an additional lift. The operator shall collect and analyze a minimum of four representative, independent samples from the vadose zone at least semi-annually using the methods specified above for TPH and chlorides. The maximum thickness of treated soils in any landfarm cell shall not exceed two feet or approximately 3000 cubic yards per acre. When that thickness is reached, the operator shall not place additional oil field waste in the landfarm cell until it has demonstrated by monitoring the treatment zone at least semi-annually that the contaminated soil has been treated to the standards specified in Paragraph (6) below or that the contaminated soils have been properly disposed at an OCD landfill.

(5) **Vadose zone monitoring.**

(a) Sampling. The operator shall monitor the vadose zone beneath the treatment zone in each landfarm cell to ensure that contaminants do not migrate to the underlying native soil or to ground water. The vadose zone samples shall be taken from soils between three and four feet below the cell's original surface.

(b) Semi-annual monitoring program. The operator shall collect and analyze a minimum of four representative, independent samples from the vadose zone at least

semi-annually using the methods specified in Section 20(B)(6) below, for TPH, BTEX and chlorides.

(c) Annual monitoring program. The operator shall collect and analyze a minimum of four representative, independent samples from the vadose zone at least annually, using the methods specified below, for TPH, BTEX, chlorides, and the constituents listed in Section 20(B)(6) below.

(d) Record keeping. The operator shall maintain a copy of the monitoring reports in a form readily accessible for division inspection.

(e) Corrective action for releases. If any vadose zone sampling results show that the concentrations of TPH, BTEX, chlorides, or constituents listed in Section 20(B)(6) below, exceed the background concentrations, then the operator shall notify the division's environmental bureau of the exceedance, and shall submit a corrective action plan, within 15 days. The corrective action plan shall address changes in the operation of the landfarm to prevent further contamination and a plan for isolating or remedying any existing contamination.

(6) **Closure constituents.** After a landfarm cell has been filled to the maximum thickness of two feet or approximately 3000 cubic yards per acre, the operator shall continue treatment until the contaminated soil has been remediated to the higher of the background concentrations or the Practical Quantitation Limit (PQL) of the closure performance parameters specified in Section 20(B)(6). The operator shall demonstrate compliance with the standards below and closure performance parameters by collecting and analyzing a minimum of four representative, independent samples.

(a) Benzene, as determined by EPA SW-846 Method 8021B or 8260B, shall not exceed 0.2 mg/kg.

(b) Total BTEX, as determined by EPA SW-846 Method 8021B or 8260B, shall not exceed 50 mg/kg.

(c) The gasoline range organics (GRO) and diesel range organics (DRO) combined fraction, as determined by EPA SW-846 Method 8015M, shall not exceed 500 mg/kg. The total extractable petroleum hydrocarbon (TPH) fractions, as determined by EPA Method 418.1 or other EPA method approved by the division, shall not exceed 2,500 mg/kg.

(d) Chloride, as determined by EPA Method 300.1, shall not exceed 500 mg/kg where water table depth is less than or equal to 100 feet below waste or 1000 mg/kg where water table depth is greater than 100 feet below waste.

(e) The concentration of the constituents listed below as determined by EPA SW-846 Methods 6010B or 6020, or other methods approved by the division, shall not exceed the site background soil concentration or acceptable PQL, whichever is greater:

Closure Constituents			
(i)	Arsenic (As)	(xix)	1,1,2-trichloroethylene (TCE)
(ii)	Barium (Ba)	(xx)	methylene chloride
(iii)	Cadmium (Cd)	(xxi)	chloroform
(iv)	Chromium (Cr)	(xxii)	1,1-dichloroethane
(v)	Cyanide (CN)	(xxiii)	ethylene dibromide (EDB)
(vi)	Fluoride (F)	(xxiv)	1,1,1-trichloroethane
(vii)	Lead (Pb)	(xxv)	1,1,2-trichloroethane
(viii)	Total Mercury (Hg)	(xxvi)	1,1,2,2-tetrachloroethane
(ix)	Nitrate (NO3 as N)	(xxvii)	vinyl chloride
(x)	Selenium (Se)	(xxviii)	PAHs: total naphthalene plus monomethylnaphthalenes
(xi)	Silver (Ag)	(xxix)	benzo-a-pyrene
(xii)	Uranium (U)	(xxx)	Copper (Cu)
(xiii)	Radioactivity: Combined Radium-226 and Radium-228	(xxxi)	Iron (Fe)
(xiv)	Polychlorinated biphenyls (PCBs)	(xxxii)	Manganese (Mn)
(xv)	Carbon Tetrachloride	(xxxiii)	Phenols
(xvi)	1,2-dichloroethane (EDC)	(xxxiv)	Sulfate (SO4)
(xvii)	1,1-dichloroethylene (1,1-DCE)	(xxxv)	Zinc (Zn)
(xviii)	1,1,2,2-tetrachloroethylene (PCE)		

(7) **Disposition of treated soils.**

(a) If the operator achieves the closure performance standards specified in Paragraph (6) above, then the operator may either leave the treated soil in place, or with prior division approval, dispose or reuse the treated soil in an alternative manner.

(b) If the owner/operator cannot achieve the closure characteristics specified in Paragraph (6) above within five years or at the end of the permit period, or as extended by the division, then the operator shall remove all contaminated soil from the landfarm cell and properly dispose of it at a division-approved landfill, or reuse or recycle it in a manner approved by the division.

21. **Transfer of Discharge Permit:** The owner/operator shall notify the OCD prior to any transfer of ownership, control or possession of a facility with an approved discharge permit. The purchaser shall submit a written commitment to comply with the terms and conditions of the previously approved discharge permit and shall seek OCD approval prior to transfer.

22. **Closure:** The owner/operator shall notify the OCD when operations of the facility are to be discontinued for a period in excess of six months. Prior to closure of the facility, the operator shall submit a closure plan for approval. Closure and waste disposal shall be in accordance with the statutes, rules and regulations in effect at the time of closure.

23. **Certification: TARGA Resources, Inc.**, by the officer whose signature appears below, accepts this permit and agrees to comply with all submitted commitments, including these terms and conditions contained herein. **TARGA Resources, Inc.**, further acknowledges that the OCD may, for good cause shown, as necessary to protect fresh water, public health, safety, and the environment, change the conditions and requirements of this permit administratively.

Conditions accepted by: **TARGA Resources, Inc.**

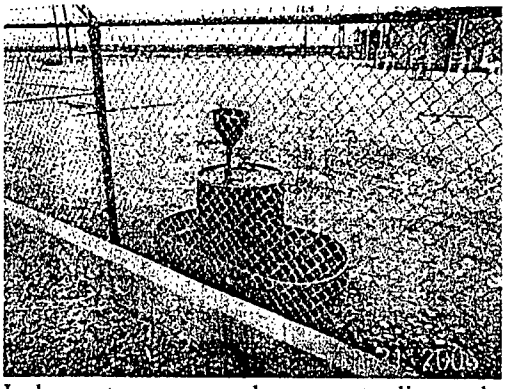
Clark White
Company Representative- print name

Clark White
Company Representative- signature

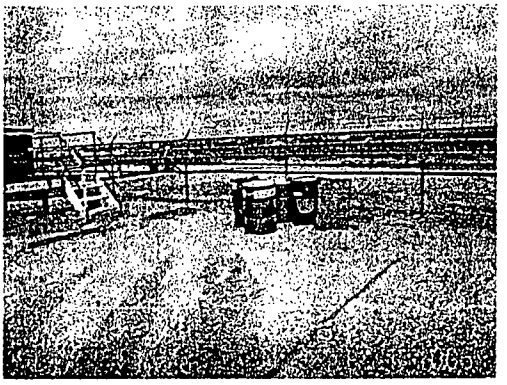
Date 11/8/06

Title V.P. + Region Manager

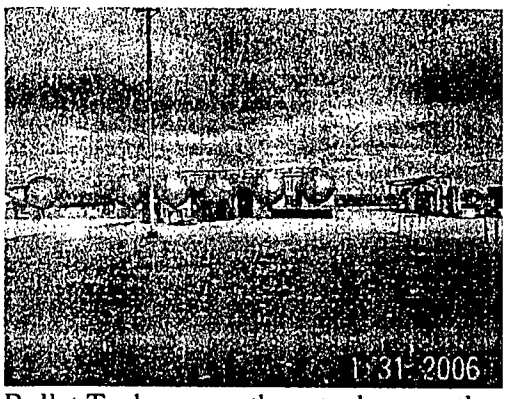
Discharge Plan Inspections: Targa (Old Dynegy) GW-005 Eunice Middle Plant 1/31/06 (OCD Inspectors: Wayne Price, Carl Chavez and Daniel Sanchez) and 8/17/06 (OCD Inspectors: Larry Johnson, Carl Chavez and Cheryl O'Connor).



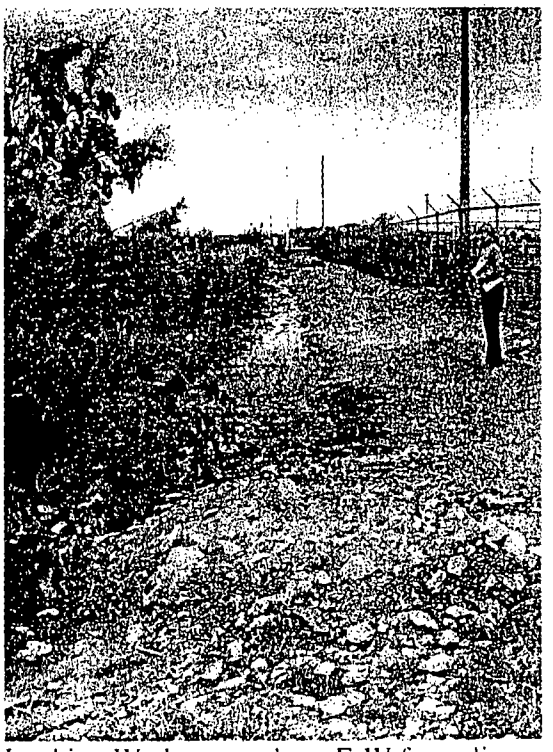
Lab waste concern about waste disposal procedure (1/31/06)



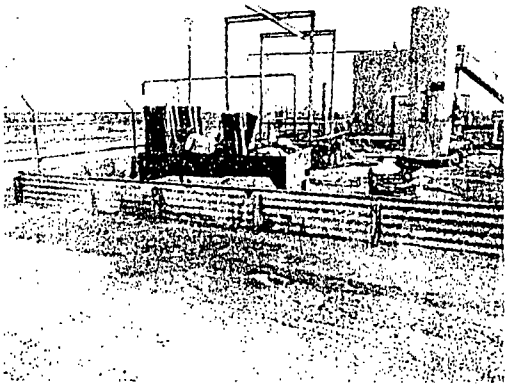
Drums stored without secondary containment (1/31/06)



Bullet Tanks- some these tank currently holds liquids other than propane/butane & no secondary containment was evident (1/31/06)

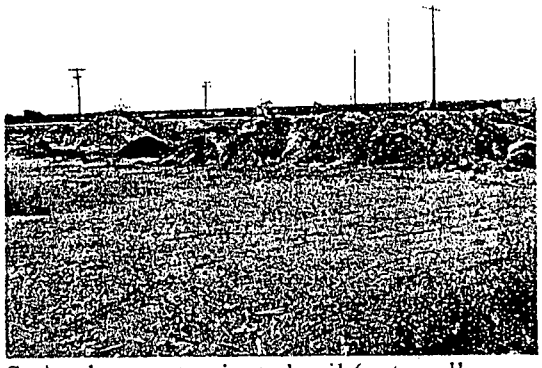


Looking W along southern E-W fence line of plant at steam condensate or process water (pH 10.96) runoff flowing E (toward photographer) and then S near pH grab sample (water) location (Cheryl O'Connor in background) Violations of process area & stormwater requirements of permit (8-17-06)

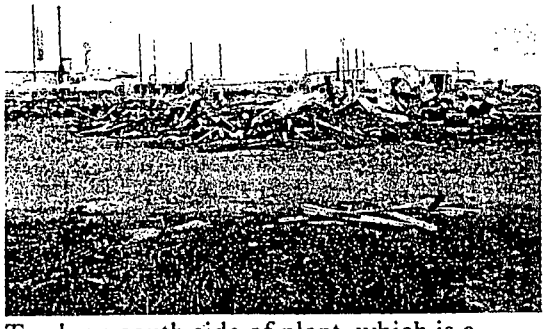


Oil Treater-SE part of plant-oily stains in area (1/31/06)

Drum storage area with "Selectox™ 33" on S side of plant violates drum secondary storage provisions of permit. No impermeable pad with curbing was present and empty drums are not stored on their sides (8-17-06)



Stained or contaminated soil (note yellow colored sulfur pile in background) stockpiles and storage is in violation of the waste disposal provision of the permit (8-17-06)



Trash on south side of plant, which is a violation of waste disposal provision of permit (8-17-06)

LAMSON PIPE COMPANY

High Density Polyethylene PE 3608 & PE 4710 Pressure Pipe

HDPE Pressure Pipe Solutions for:

Industrial

Oil/Gas

AWWA – NSF

Geothermal

Features:

Superior Flow Rates

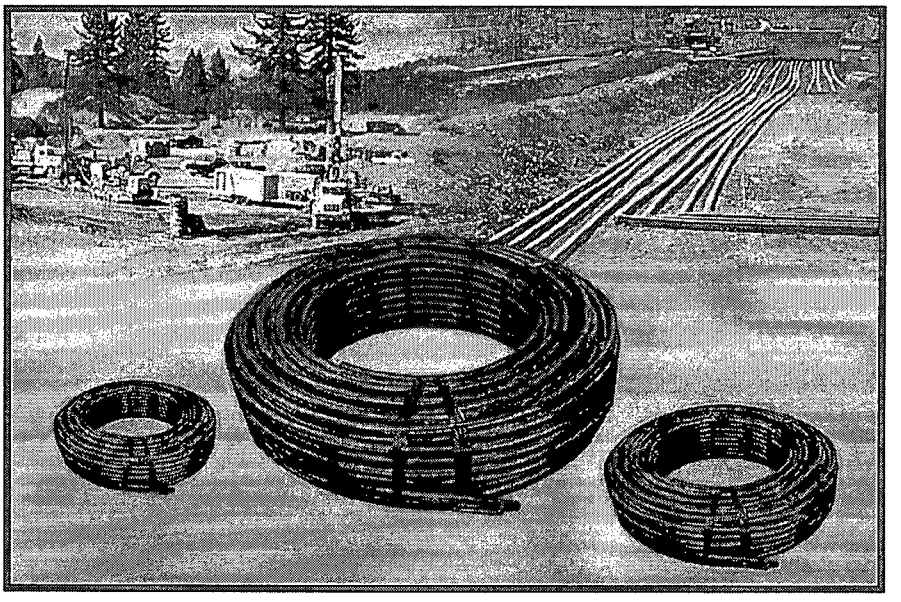
Ease of Handling

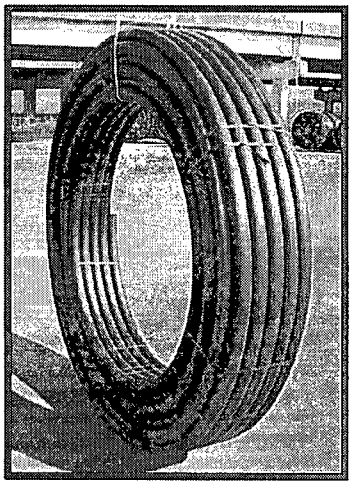
Environmentally Safe

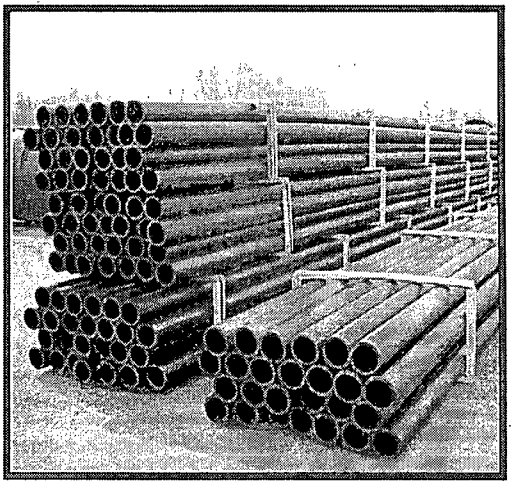
Superior Corrosion Resistance

Durability, Long Term Strength and Integrity

Flexible and Lightweight







HDPE Products for Your Infrastructure Needs

PressureFlex Water/Sewer, and Oil & Gas Gathering HDPE Pipe

PressureFlex Water / Sewer PE 3608 & PE 4710 HDPE Pipe

Our PressureFlex Water HDPE is manufactured to strict quality standards from the highest grade of polyethylene materials available. The PressureFlex Water is NSF listed and suitable for potable water applications. The PressureFlex Sewer is manufactured in either black or grey color material. PressureFlex pipe can be made according to the following standards: AWWA C901, AWWA C906, NSF-61.

PressureFlex Water / Sewer can be manufactured out of PE4710 or PE3608 resin material. Size availability in 1" to 16" IPS sizes and 4" to 14" DIPS sizes.

PressureFlex Oil & Gas Gathering PE 3608 & PE 4710 HDPE Pipe

Lamson Pipe Company PressureFlex HDPE is manufactured to strict quality standards from the highest grade of polyethylene materials available. PressureFlex is suitable for oil and gas gathering piping systems, non-potable industrial & mining, landfill, and gas distribution applications and can be made according to the following standards: ASTM D 3035, F714, D2513, and API I5LE.

PressureFlex Oil & Gas Gathering HDPE Pipe can be manufactured out of PE4710 or PE 3608 resin material. Size availability in 1" to 16" IPS sizes and 4" to 14" DIPS sizes.

PE 4710 HDPE Pipe

Ongoing research aimed at improving polyethylene pressure pipe resin materials, has resulted in materials that are today referred to PE4710. Polyethylene pressure pipes made from PE4710 resin have higher operating pressures, increased flow capacities and increased long-term performance characteristics. This is due to higher densities, better Hydrostatic Design Basis (HDB) and improved Slow Crack Growth than conventional PE3608 resins.

The major advantage of PE4710 is that because it offers higher operating pressures, it enables the use of the next higher DR (thinner wall) pipe. For example, an SDR 11 pipe made from PE3608 has an operating pressure of 160 psi. By converting to an SDR 13.5 which is manufactured from PE4710 material, the same 160 psi operating pressure is obtained. This reduces the pipe's wall thickness, it lowers the weight per foot and increases the ID of the system. As a result, the material handling cost is decreased and the system flow capacity is increased. Despite PE4710 being a more costly for resin manufacturers to produce the overall net result is a savings for the end user.

PE4710 not only offers higher operating pressures, increased flow system flow capacities and increased long-term performance characteristics, it does so while still providing the same pipe flexibility, chemical resistance and ease of installation as conventional PE3608 pipe. Additionally, joining PE4710 with leak-tight heat fusion joints provides for a ZERO allowable leakage rate. All of this combines to make PE4710 pressure pipe a superior alternative to PVC pipe and Ductile Iron Pipe piping systems.

PE 3608 - Typical Physical Properties

*Nominal Values

Property	ASTM Standard	Value
Density (Natural)	D792	0.944 g/cc
Density (Black)	D792	0.955 g/cc
High Load Melt Index	D1238	8.75 g/10 min
Tensile Strength @ Yield (2 in/min)	D638	3,500 psi
Tensile Strength @ Break (2 in/min)	D638	5,000 psi
Elongation @ Break (2 in/min)	D638	>800%
Hydrostatic Design Basis, 73.4° F (23° C)	D2837	1,600 psi
Hydrostatic Design Basis, 140° F (60° C)	D2837	800 psi
Flexural Modulus	D790	140,000 psi
Hardness (Shore D)	D2240	66
Brittleness Temperature	D746	<-150° F
ESCR Condition C (100% Igepal F50)	D1693	>5,000 hrs
Slow Crack Growth PENT at 2.4 Mpa and 80° C	D1473	150 hrs
NSF Standard 61		Approved
Cell Classification	D3350	345464C**

*Nominal values are to be used as guides only, and not as specification limit.

** Cell classification 345464C refers to black pipe only.

PE 4710 - Typical Physical Properties

*Nominal Values

Property	ASTM Standard	Value
Density (Natural)	D792	0.949 g/cm3
Density (Black)	D792	0.959 g/cm3
High Load Melt Index	D1238	8.5 g/10 min
Melt Index	D1238	0.08 g/10 min
Tensile Strength (Yield)	D638	3,600 psi
Tensile Elongation (Break)	D638	740%
Hydrostatic Design Basis, 73.4° F (23° C)	D2837	1,600 psi
Hydrostatic Design Basis, 140° F (60° C)	D2837	1,000 psi
Flexural Modulus	D790B	150,000 psi
Notched Izod Impact Strength (73° F)	D256	9.10 ft-lb/in
Brittleness Temperature	D3350	<-103° F
Slow Crack Growth PENT at 2.4 Mpa and 80° C	D1473	>24 wk
NSF Standard 61		Approved
Cell Classification	D3350	445574C**

*Nominal values are to be used as guides only, and not as specification limit.

** Cell classification 445474C refers to black pipe only.

Iron Pipe Size (IPS) Pipe & Pressure Ratings - PE 3608

Nom. O.D.	Actual O.D.	265 PSI SDR 7		200 PSI SDR 9		160 PSI SDR 11		130 PSI SDR 13.5		110 PSI SDR 15.5		100 PSI SDR 17		90 PSI SDR 19		80 PSI SDR 21		65 PSI SDR 26		50 PSI SDR 32.5	
		Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)
1"	1.315	0.188	0.290	0.146	0.230	0.120	0.200	0.097	0.160	-	-	-	-	-	-	-	-	-	-	-	-
1 1/4"	1.660	0.237	0.450	0.184	0.370	0.151	0.310	0.123	0.250	0.107	0.224	-	-	-	-	-	-	-	-	-	-
1 1/2"	1.900	0.271	0.590	0.211	0.480	0.173	0.400	0.141	0.330	0.123	0.295	0.112	0.270	-	-	-	-	-	-	-	-
2"	2.375	0.339	0.940	0.264	0.760	0.216	0.640	0.176	0.530	0.153	0.458	0.140	0.430	0.125	0.390	0.113	0.350	-	-	-	-
3"	3.500	0.500	2.050	0.389	1.660	0.318	1.390	0.259	1.150	0.226	0.997	0.206	0.932	0.184	0.840	0.167	0.770	0.135	0.630	-	-
4"	4.500	0.643	3.390	0.500	2.740	0.409	2.290	0.333	1.900	0.290	1.645	0.265	1.514	0.237	1.390	0.214	1.260	0.173	1.030	0.138	0.830
5"	5.563	0.795	5.170	0.618	4.180	0.506	3.510	0.412	2.910	0.359	2.517	0.327	2.352	0.293	2.120	0.265	1.930	0.214	1.570	0.171	1.270
6"	6.625	0.946	7.330	0.736	5.930	0.602	4.970	0.491	4.130	0.427	3.566	0.390	3.340	0.349	3.010	0.315	2.730	0.255	2.230	0.204	1.800
8"	8.625	1.232	12.430	0.958	10.050	0.784	8.430	0.639	7.000	0.556	6.046	0.507	5.653	0.454	5.100	0.411	4.640	0.332	3.790	0.265	3.050
10"	10.750	1.536	19.320	1.194	15.610	0.977	13.090	0.796	10.870	0.694	9.405	0.632	8.878	0.566	7.920	0.512	7.210	0.413	5.870	0.331	4.750
12"	12.750	1.821	27.160	1.417	21.970	1.159	18.410	0.944	15.290	0.823	13.230	0.750	12.360	0.671	11.140	0.607	10.130	0.490	8.260	0.392	6.670
14"	14.000	1.918	31.640	1.556	26.490	1.273	22.200	1.037	18.450	-	-	0.824	14.900	-	-	0.667	12.220	0.538	9.970	0.431	8.040
16"	16.000	2.192	41.330	1.778	34.600	1.455	28.990	1.185	24.090	-	-	0.941	19.470	-	-	0.762	15.960	0.615	13.020	0.492	10.510

Ductile Iron Pipe Size (DIPS) Pipe & Pressure Ratings - PE 3608

Nom. O.D.	Actual O.D.	265 PSI SDR 7		200 PSI SDR 9		160 PSI SDR 11		130 PSI SDR 13.5		110 PSI SDR 15.5		100 PSI SDR 17		90 PSI SDR 19		80 PSI SDR 21		65 PSI SDR 26		50 PSI SDR 32.5	
		Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)
4"	4.800	0.686	3.835	0.533	3.093	0.436	2.588	0.356	2.148	0.310	1.890	0.282	1.734	0.253	1.561	0.229	1.420	0.185	1.158	0.148	0.934
6"	6.900	0.986	7.924	0.767	6.391	0.627	5.348	0.511	4.438	0.445	3.909	0.406	3.583	0.363	3.227	0.329	2.935	0.265	2.393	0.212	1.930
8"	9.050	1.293	13.630	1.006	10.995	0.823	9.200	0.670	7.635	0.584	6.719	0.532	6.163	0.476	5.551	0.431	5.049	0.348	4.117	0.278	3.320
10"	11.100	1.586	20.510	1.233	16.540	1.009	13.840	0.822	11.490	0.716	10.107	0.653	9.272	0.584	8.350	0.529	7.595	0.427	6.193	0.342	4.994
12"	13.200	1.886	29.000	1.467	23.390	1.200	19.570	0.978	16.240	0.852	14.290	0.779	13.110	0.695	11.809	0.629	10.740	0.508	8.758	0.406	7.063
14"	15.300	2.186	38.960	1.700	31.420	1.391	26.300	1.133	21.820	0.987	19.200	0.900	17.620	0.805	15.865	0.729	14.430	0.588	11.767	0.471	9.489

NOTE:

- Pressures are based on using water at 73.4°F (23°C) and determined using standard formulas for the industry.
- Service factors should be utilized to compensate for the effect of substances other than water, and for other temperatures.

Iron Pipe Size (IPS) Pipe & Pressure Ratings - PE 4710

Nom. O.D.	Actual O.D.	333 PSI SDR 7		250 PSI SDR 9		200 PSI SDR 11		160 PSI SDR 13.5		125 PSI SDR 17		100 PSI SDR 21		80 PSI SDR 26		63 PSI SDR 32.5	
		Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)
1"	1.315	0.188	0.290	0.146	0.230	0.120	0.200	0.097	0.160	-	-	-	-	-	-	-	-
1 1/4"	1.660	0.237	0.450	0.184	0.370	0.151	0.310	0.123	0.250	-	-	-	-	-	-	-	-
1 1/2"	1.900	0.271	0.590	0.211	0.480	0.173	0.400	0.141	0.330	0.112	0.270	-	-	-	-	-	-
2"	2.375	0.339	0.940	0.264	0.760	0.216	0.640	0.176	0.530	0.140	0.430	0.113	0.350	-	-	-	-
2 1/2"	2.875	-	-	-	-	0.262	0.930	0.213	0.764	-	-	-	-	-	-	-	-
3"	3.500	0.500	2.050	0.389	1.660	0.318	1.390	0.259	1.150	0.206	0.932	0.167	0.770	0.135	0.630	-	-
4"	4.500	0.643	3.390	0.500	2.740	0.409	2.290	0.333	1.900	0.265	1.514	0.214	1.260	0.173	1.030	0.138	0.830
5"	5.563	0.795	5.170	0.618	4.180	0.506	3.510	0.412	2.910	0.327	2.352	0.265	1.930	0.214	1.570	0.171	1.270
6"	6.625	0.946	7.330	0.736	5.930	0.602	4.970	0.491	4.130	0.390	3.340	0.315	2.730	0.255	2.230	0.204	1.800
8"	8.625	1.232	12.430	0.958	10.050	0.784	8.430	0.639	7.000	0.507	5.653	0.411	4.640	0.332	3.790	0.265	3.050
10"	10.750	1.536	19.320	1.194	15.610	0.977	13.090	0.796	10.870	0.632	8.878	0.512	7.210	0.413	5.870	0.331	4.750
12"	12.750	1.821	27.160	1.417	21.970	1.159	18.410	0.944	15.290	0.750	12.360	0.607	10.130	0.490	8.260	0.392	6.670
14"	14.000	1.918	31.640	1.556	26.490	1.273	22.200	1.037	18.450	0.824	14.900	0.667	12.220	0.538	9.970	0.431	8.040
16"	16.000	2.192	41.330	1.778	34.600	1.455	28.990	1.185	24.090	0.941	19.470	0.762	15.960	0.615	13.020	0.492	10.510

Ductile Iron Pipe Size (DIPS) Pipe & Pressure Ratings - PE 4710

Nom. O.D.	Actual O.D.	333 PSI SDR 7		250 PSI SDR 9		200 PSI SDR 11		160 PSI SDR 13.5		125 PSI SDR 17		100 PSI SDR 21		80 PSI SDR 26		63 PSI SDR 32.5	
		Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)	Min. Wall	Wt (lb/ft)
4"	4.800	0.686	3.835	0.533	3.093	0.436	2.588	0.356	2.148	0.282	1.734	0.229	1.420	0.185	1.158	0.148	0.934
6"	6.900	0.986	7.924	0.767	6.391	0.627	5.348	0.511	4.438	0.406	3.583	0.329	2.935	0.265	2.393	0.212	1.930
8"	9.050	1.293	13.630	1.006	10.995	0.823	9.200	0.670	7.635	0.532	6.163	0.431	5.049	0.348	4.117	0.278	3.320
10"	11.100	1.586	20.510	1.233	16.540	1.009	13.840	0.822	11.490	0.653	9.272	0.529	7.595	0.427	6.193	0.342	4.994
12"	13.200	1.886	29.000	1.467	23.390	1.200	19.570	0.978	16.240	0.779	13.110	0.629	10.740	0.508	8.758	0.406	7.063
14"	15.300	2.186	38.960	1.700	31.420	1.391	26.300	1.133	21.820	0.900	17.620	0.729	14.430	0.588	11.767	0.471	9.489

NOTE:

- Pressures are based on using water at 73.4°F (23°C) and determined using standard formulas for the industry.
- Service factors should be utilized to compensate for the effect of substances other than water, and for other temperatures.

AWWA Pipe Referenced Standards

MATERIAL
Material used for the manufacturing of polyethylene pipe shall be PE 3608 High Density Polyethylene (HDPE) meeting the ASTM D 3350 cell classification 345464C

PIPE
Polyethylene pipe shall be manufactured in accordance with AWWA C901 for size 1/2" through 3" and in accordance with AWWA C906 for sizes 4" through 63".

Referenced Standards

- **AWWA C901**
  Polyethylene (PE) Pressure Pipe and Tubing 1/2" through 3" for Water Services
- **AWWA C906**
  Polyethylene (PE) Pressure Pipe 4" through 63" for Water Distribution
- **ASTM D 2683**
  Socket Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe
- **ASTM D 3261**
  Butt Fusion Polyethylene (PE) Fittings for Polyethylene (PE) Plastic Pipe and Tubing
- **ASTM D 3350**
  Standard Specification for Polyethylene Plastic Pipe and Fittings Material
- **PPI TR-3**
  Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials
- **PPI TR-4**
  Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds
- **NSF Standard #61**
  Plastic Piping Components and Related Materials

Superior Hydraulics

Lamson Vylon HDPE Pipe has superior hydraulic characteristics. In order to calculate the friction loss of water, the Hazen-Williams formula is used:

$$H = \frac{1044 \times Q^{1.85}}{C^{1.85} \times D_i^{4.865}}$$

Where

H = Friction loss in feet of water per 100 ft.
Q = Flow rate (gpm)
C = Hazen-Williams Coefficient
D_i = Inside Diameter (in.)

The Hazen-Williams coefficient for Lamson Vylon HDPE pipe is 150 and doesn't change over time. With its superior corrosion resistance it will remain smooth and not corrode or tuberculate.

Construction Advantages

The combination of butt-fused, leak free joints and flexibility allows for more construction options than is possible with rigid pipe. Lamson Vylon HDPE pipe can be bent to a radius 25 times the nominal pipe diameter. This makes Lamson Vylon HDPE pipe ideal for installation methods such as Horizontal Directional Drilling, Pipe Bursting or Sliplining.

Water Hammer Effects

Water Hammer is a sharp pressure differential caused by differences in the velocity of fluids in a pressurized system. These differences can be originated by pump and valve operations, together with other aspects. AWWA has design formulas that calculate pressure surges for different piping materials.

Pressure Surge

The formula for pressure surge is:

$$Ps = \frac{a \times \Delta V}{2.31 \times g}$$

Ps = Pressure surge (psi)
a = wave velocity (fps)
ΔV = change in water velocity (fps)
g = gravitational acceleration ($32.17^{ft}/sec^2$)

where the wave velocity is calculated by:

$$a = \frac{4660}{[1+(k(DR-2)/E)]^{1/2}}$$

k = Water Modulus (psi)
DR = Dimensional Ratio
E = Modulus of Elasticity (psi)

HDPE pipe is viscoelastic in nature, which causes it to absorb a sizable amount of energy from a pressure surge. This energy absorption enables HDPE piping systems not to be oversized, hence, yielding a cost saving.

Lamson Pipe Company HDPE Maximum Pull Force (MPF) lbs*

TENSILE Strength
3200 psi

Size	Nom.OD	SDR 7	SDR 9	SDR 11	SDR 13.5	SDR 15.5	SDR 17
1 1/4"	1.660	1242	1002	838	696	612	
1 1/2"	1.900	1627	1312	1098	911	802	
2"	2.375	2542	2050	1715	1424	1253	
3"	3.500	5520	4452	3726	3092	2721	2496
4"	4.500	9125	7360	6159	5111	4498	4126
5"	5.375	13018	10500	8787	7292	6417	5886
5"	5.563	13945	11248	9412	7811	6873	6305
6"	6.625	19778	15952	13349	11078	9748	8942
8"	8.625	33521	27038	22625	18776	16522	15156

Lamson Pipe Company recommends a load cell be used to monitor the applied force.
* MPF values are based on a temperature of 73° F and are in lbs., not psi.

Geothermal HDPE

Specifications and Data

SCOPE
- Meets overall design requirements for use in closed-loop ground source heat exchangers
- Pipe configured as specified in ASTM D 3035
- Standard specification for Polyethylene (PE) Plastic Pipe (DR-PR) based on controlled outside diameter or ASTM D 2447

PIPE
- Conforms to requirements of ASTM D 3035 or ASTM D 2447
- Loop pipe shall be joined at one end with a factory-installed "U"-Bend with a standard dimension ratio (SDR) of 9
- "U"-Bends will be a single piece, injection molded from PE 3608 HDPE resin with a minimum cell classification of PE345434C
- Working pressure rating of 160 psi water at 73°F for SDR 11 and 200 psi water at 73°F for SDR 9

MATERIAL
- All pipe and heat fused materials are manufactured from virgin high density polyethylene resin exceeding or meeting ASTM D 2513, Sections 4.1 & 4.2
- Hydrostatic Design Basis – 1600 psi at 73°F per ASTM D 2837 and ASTM D 3350
- Listed in PPI-TR4 as PE 3608

MARKING
- Pipe marked with identification, nominal size, trade name, material designation or cell classification, pressure rating at 73°F, ASTM standard, date of manufacture
- Coiled loop pipe shall also have sequential footage marking at two-foot intervals

INSTALLATION
- Installation & backfill shall comply with IGSHPA guidelines, local, state & federal regulations
- When performing heat fusion, IGSHPA's recommended fusion procedures or fusion tool manufacturer's joining procedure for PE 3608 should be utilized

TESTING
- DO NOT TEST WITH AIR OR GAS
- The loop assembly shall be hydrostatically tested with water at a pressure not greater than 150% of the pipe pressure rating

GEOTHERMAL PIPE
- Available in coils 3/4"-4"
- Straight lengths (available up to 16 inch) using PE 3608 resin
- For commercial, institutional, residential or industrial applications

GEOTHERMAL LOOPS
- Custom designed to your job requirements
- Coils are configured with a parallel supply and return pipe heat fused to a patent pending "U"-Bend to make a leak tight joint utilizing PE 3608 resin
- 3/4", 1", & 1-1/4" SDR 11 rated @ 160 psi
- 3/4", 1", & 1-1/4" SDR 9 rated @ 200 psi
- Outside width of "U"-Bend less than 2.50" for 3/4", 3.00" for 1", 3.50" for 1-1/4"

FEATURES AND BENEFITS OF LAMSON VYLON PIPE GEOTHERMAL PRODUCTS
- Fusionable
- Flexible
- Abrasion resistant
- Footage markers on loop piping
- Permanent indent printing
- Made from PE 3608 high density polyethylene resin
- Resistant to most chemical compounds and aggressive soils

High Density Polyethylene IPS Pipe and Pressure Ratings

Iron Pipe Size (IPS)		265 psi SDR 7		200 psi SDR 9		160 psi SDR 11		130 psi SDR 13.5		110 psi SDR 15.5		100 psi SDR 17		90 psi SDR 19		80 psi SDR 21		65 psi SDR 26		50 psi SDR 32.5	
Nom. O.D.	Act. O.D.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.
1"	1.315	0.188	0.291	0.146	0.234	0.119	0.196	0.097	0.163												
1 1/4"	1.66	0.237	0.463	0.184	0.374	0.150	0.313	0.122	0.259	0.107	0.228										
1 1/2"	1.9	0.271	0.607	0.211	0.489	0.172	0.41	0.140	0.34	0.123	0.299	0.112	0.274								
2"	2.375	0.339	0.948	0.264	0.765	0.216	0.640	0.176	0.531	0.153	0.467	0.140	0.429								
3"	3.500	0.500	2.059	0.389	1.661	0.318	1.390	0.259	1.153	0.226	1.015	0.206	0.931	0.184	0.838	0.167	0.763				
4"	4.500	0.643	3.404	0.500	2.746	0.409	2.297	0.333	1.907	0.290	1.678	0.265	1.539	0.237	1.387	0.214	1.261	0.173	1.028	0.138	0.829
5"	5.563	0.795	5.202	0.618	4.196	0.506	3.511	0.412	2.914	0.359	2.564	0.327	2.352	0.293	2.120	0.265	1.927	0.214	1.571	0.171	1.267
6"	6.625	0.946	7.378	0.736	5.951	0.602	4.980	0.491	4.133	0.427	3.636	0.390	3.336	0.349	3.007	0.315	2.733	0.255	2.228	0.204	1.797
8"	8.625	1.232	12.505	0.958	10.086	0.784	8.440	0.639	7.004	0.556	6.164	0.507	5.654	0.454	5.093	0.411	4.631	0.332	3.777	0.265	3.046
10"	10.750	1.536	19.426	1.194	15.668	0.977	13.111	0.796	10.881	0.694	9.575	0.632	8.783	0.566	7.913	0.512	7.195	0.413	5.867	0.331	4.731
12"	12.750	1.821	27.326	1.417	22.041	1.159	18.443	0.944	15.306	0.823	13.469	0.750	12.355	0.671	11.127	0.607	10.121	0.490	8.253	0.392	6.655
14"	14.000	2.000	32.947	1.556	26.575	1.273	22.237	1.037	18.455	0.903	16.239	0.824	14.896	0.737	13.419	0.667	12.203	0.538	9.951	0.431	8.024
16"	16.000	2.286	43.033	1.778	34.710	1.455	29.044	1.187	24.104	1.032	21.210	0.941	19.457	0.842	17.521	0.762	15.938	0.615	12.997	0.492	10.481

High Density Polyethylene DIPS Pipe and Pressure Ratings

Ductile Iron Pipe Size (DIPS)		265 psi SDR 7		200 psi SDR 9		160 psi SDR 11		130 psi SDR 13.5		110 psi SDR 15.5		100 psi SDR 17		90 psi SDR 19		80 psi SDR 21		65 psi SDR 26		50 psi SDR 32.5	
Nom. O.D.	Act. O.D.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.	Min. Wall	Wt. Lb./Ft.
4"	4.800	0.686	3.835	0.533	30.930	0.436	2.588	0.356	2.148	0.310	1.890	0.282	1.734	0.253	1.561	0.229	1.420	0.185	1.158	0.148	0.934
6"	6.900	0.986	7.924	0.767	6.391	0.627	5.348	0.511	4.438	0.445	3.909	0.406	3.583	0.363	3.227	0.329	2.935	0.265	2.393	0.212	1.930
8"	9.050	1.293	13.630	1.006	10.995	0.823	9.200	0.670	7.635	0.584	6.719	0.532	6.163	0.476	5.551	0.431	5.049	0.348	4.117	0.278	3.320
10"	11.100	1.586	20.510	1.233	16.540	1.009	13.840	0.822	11.490	0.716	10.107	0.653	9.272	0.584	8.350	0.529	7.595	0.427	6.193	0.342	4.994
12"	13.200	1.886	29.000	1.467	23.390	1.200	19.570	0.978	16.240	0.852	14.290	0.776	13.110	0.695	11.809	0.629	10.740	0.508	8.758	0.406	7.063
14"	15.300	2.186	38.960	1.700	31.420	1.391	26.300	1.133	21.820	0.987	19.200	0.900	17.620	0.805	15.865	0.729	14.430	0.588	11.767	0.471	9.489

*Iron Pipe Size - Pressures are based on using water at 23°C (73°F) and are determined by using standard formulas for the industry.
NOTE: Service factors should be utilized to compensate for the effect of substances other than water, and for other temperatures.

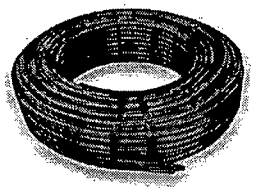
Density	0.955
Corr. Factor	1.045

Geothermal HDPE

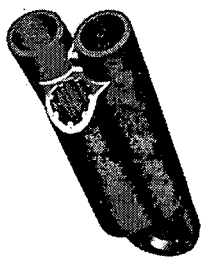
Geothermal Pipe Loops Coiled with "U"-Bend* Attached

Pipe Size	SDR 11 O.D.	Min. Wall	Approx Wt./100 ft	Coil Length (Feet)	Coil Dimensions (Inches) I.D.	O.D.	Width
3/4"	1.050	0.095	12 lbs.	310	30.8	44.0	6.00
				410	32.0	44.0	7.50
				510	30.0	48.5	6.00
1"	1.315	0.120	19 lbs.	310	30.0	44.0	8.00
				410	30.0	48.0	9.25
				510	30.0	48.5	9.50
				610	30.0	48.5	11.00
1 1/4"	1.660	0.151	31 lbs.	710	48.0	76.0	9.00
				810	48.0	71.0	12.00

Made to Order Lengths
SDR 9 Available
*"U"-Bend Rated at SDR 9
*Patent Pending



Pipe Loop Assembly



"U"-Bend

Head Loss per 100 ft of SDR 11 PE Pipe

GPM	3/4 Inch	1 Inch	1-1/4 Inch	1-1/2 Inch	2 Inch
1	0.23	0.08	0.02	0.01	
2	0.83	0.27	0.09	0.04	0.01
3	1.76	0.58	0.18	0.09	0.03
4	2.99	0.99	0.31	0.16	0.05
5	4.52	1.49	0.47	0.24	0.08
6	6.34	2.09	0.66	0.34	0.11
7	8.44	2.78	0.88	0.45	0.15
8	10.80	3.56	1.12	0.58	0.19
9	13.44	4.43	1.39	0.72	0.24
10	16.33	5.39	1.70	0.87	0.29
11	19.48	6.43	2.02	1.04	0.35
12	22.89	7.55	2.38	1.23	0.41
13	26.55	8.76	2.76	1.42	0.48
14	30.45	10.05	3.16	1.63	0.55
15	34.60	11.42	3.59	1.85	0.62
20		19.45	6.12	3.16	1.06
25		29.40	9.25	4.77	1.61
30		41.22	12.97	6.69	2.25
40			22.10	11.40	3.84
50			33.40	17.23	5.81
75				36.51	12.31
100					20.96

*U.S. gallons per minute
"Head loss based on Hazen-Willams Formula, C=150 for water"
ASTM D3035 nominal outside diameter and average wall thickness

Technical Information

Property	ASTM Test Method	Typical Values English Units	SI Units
Density (Natural)	D 4883	—	0.944 g/cc
Density (Black)		—	0.955 g/cc
Melt Index	D 1238	—	12.5 g/10 min
Tensile Strength			
@ Yield (2 in/min)	D 638	3300 psi	22.8 MPa
@ Break (2 in/min)	D 638	4500 psi	31.0 MPa
Elongation			
@ Break (2 in/min)	D 638	>800%	>800%
Flexural Modulus [2]	D 790	120,000 psi	827 MPa
Notched Izod Impact Strength	D 256	6 ft-lbf/in	0.32 kJ/m
Hardness (Shore D)	D 2240	68	68
Vicat Softening Point	D 1525	259° F	126° C
Brittleness Temperature	D 746	<-180° F	<-118° C
Hydrostatic Design Basis			
@ 23° C	D 2837	1600 psi	11.0 MPa
@ 60° C	D 2837	800 psi	5.5 MPa
Minimum Required Strength	ISO 9080	—	8.0 MPa
Environmental Stress Crack Resistance [3]	D 1693	>2000 hrs	>2000 hrs
Environmental Stress Crack Resistance [4]	D 1693	>5000 hrs	>5000 hrs
Pipe Ring ESCR [5]	F 1248	>5000 hrs	>5000 hrs
Notch Tensile (PENT)	F 1473	>100 hrs	>100 hrs
Carbon Black Concentration	D 1603	2.3%	2.3%
Cell Classification	D 3350	345464C	345464C

[1] 190° C/21600 g [2] 2% Secant-Method 1 [3] Condition B, 10% [4] Condition C [5] Two inch, SIDR 19

Butt Fusion

Butt Fusion joining process is an approved method of joining HDPE when joint fused appropriately. The following guidelines are provided in appendix A to provide a properly fused joint:

Butt Fusion Time Cycles For HDPE Smoothwall Conduit

Pipe Inches IPS	Heat Time @ 500 Deg. F (Seconds)	Heat Time @ 425 Deg. F (Seconds)	Heat Time Cool Time (Seconds)	Approx Melt Bead Width (inches)	Approx Finished Bead Width (inches)
1	16 – 20	27 – 32	90	1/16	1/16 – 1/8
1-1/4	20 – 24	35 – 40	90	1/16	1/16 – 1/8
2	28 – 32	52 – 57	90	1/8	1/8
3	32 – 38	59 – 66	180	1/8	1/8
4	38 – 44	68 – 75	210	3/16	3/16
5	44 – 56	77 – 82	225	3/16	3/16
6	56 – 66	80 – 90	240	3/16	3/16

Note: The information given above is an estimate and may vary depending upon prevailing weather and jobsite conditions.
Recommended interface pressure on these sizes is 75 psi.

Butt Fusion Time Cycles For PressureFlex PE 3608 Pipe

Pipe Inches IPS	Heat Time @ 500 Deg. F (Seconds)	Heat Time @ 425 Deg. F (Seconds)	Heat Time Cool Time (Seconds)	Approx Melt Bead Width (inches)	Approx Finished Bead Width (inches)
1/2	9 – 12	18 - 22	80	1/16	1/16
3/4	12 – 16	24 – 26	80	1/16	1/16
1	16 – 20	27 – 32	90	1/16	1/16 – 1/8
1-1/4	20 – 24	35 – 40	90	1/16	1/16 – 1/8
2	28 – 32	52 – 57	90	1/8	1/8
3	32 – 38	59 – 66	180	1/8	1/8
4	38 – 44	68 – 75	210	3/16	3/16
6	56 – 66	80 – 90	240	3/16	3/16
8	72 – 82	105 – 130	300	3/16	1/4
10	88 – 98	140 – 165	360	3/16	5/16
12	104 – 120	175 – 220	420	3/16	5/16

Note: The information given above is an estimate and may vary depending upon prevailing weather and jobsite conditions.
Recommended interface pressure on these sizes is 75 psi.
For sizes larger than 12 inch, use visual fusion procedures. Recommended interface pressure on these sizes is 40 psi.

Butt Fusion

The most widely used method for joining individual lengths of large diameter polyethylene pipe is by heat fusion of the pipe butt ends. This technique, which precludes the need for specially modified pipe ends or couplings, produces a permanent, economical and flow-efficient connection. Field-site butt fusions may be made readily by trained operators using specially developed butt fusion machines that secure and precisely align the pipe ends for the fusion process.

The six steps involved in making a butt fusion joint are:

1. Securely fasten the components to be joined
2. Face the pipe ends
3. Align the pipe profile
4. Melt the pipe interfaces
5. Join the two profiles together
6. Hold under pressure

Secure

Each component that is to be fused must be held in position so that it will not move unless it is moved by the clamping device.

Face

The pipe ends must be faced to establish clean, parallel mating surfaces. Most, if not all, equipment manufacturers have incorporated the rotating planer block design in their facers to accomplish this goal. Facing is continued until a minimal distance exists between the fixed and movable jaws of the machine and the facer is locked firmly and squarely between the jaws. This operation provides for a perfectly square face, perpendicular to the pipe centerline on each pipe end and with no detectable gap.

Align

The pipe profiles must be rounded and aligned with each other to minimize mismatch (high-low) of the pipe walls. This can be accomplished by adjusting the clamping jaws until the outside diameters of the pipe ends match. The jaws must not be loosened or the pipe may slip during fusion. The minimal distance requirement between fixed- and moveable-jaws mentioned above allows the pipe to be rounded as close as possible to the joint area. The closer to the joint area that the pipe can be clamped, the better control the operator has in properly aligning the pipe.

Melt

Heat the ends of the pipe to the pipe manufacturer's recommended temperature, interface pressure, and time duration. By doing so, the heat will penetrate into the pipe ends and a molten "bead" of material will form at the pipe ends. Heating tools which simultaneously heat both pipe ends are used to accomplish this operation. These heating tools are normally furnished with thermometers to measure internal heater temperature so the operator can monitor the temperature before each joint is made. However, they can be used only as a general indicator because there is some heat loss from internal to external surfaces, depending on factors such as ambient temperatures and wind conditions. A pyrometer or other surface temperature measuring device should be used periodically to insure proper temperature of the heating tool. If temperature indicating crayons are used, do not use them on a surface which will come in contact with the pipe or fitting. Additionally, heating tools are usually equipped with suspension and alignment guides which center them on the pipe ends. The heater faces which come into contact with the pipe should be coated by the manufacturer to prevent molten plastic from sticking to the heater faces. Remaining molten plastic can interfere with fusion quality and must be removed according to the tool manufacturer's instructions.

Join

After the pipe ends have been heated for the proper time and to the proper temperature, the heater tool is removed and the molten pipe ends are brought together with sufficient pressure to properly mix the pipe materials and form a homogeneous joint. The pipe manufacturer's instructions may specify either interface pressure or bead size of molten material as a guide for a proper joint. There are machines available for pipe sizes from 5/8-inch through 72-inch diameters that will assist the operator to apply sufficient force to obtain the proper fusion pressure. Machines for 4-inch diameter and smaller sizes are normally lever-operated. Many of these smaller machines can be fitted with torque wrenches to obtain a theoretical value which allows the operator to consistently apply the approximate force required to properly fuse a joint. Larger machines employ hydraulics with various types of control systems such as:

1. Manual with hydraulic hand pump.
2. Semi-automatic with motorized hydraulics including pressure reducing, selector, and directional control valves.
3. Fully automatic with computer- or microprocessor-control of the heat and fusion cycles and pressures.

Hold

The molten joint must be held immobile under pressure until cooled adequately to develop strength. The designs of the machines vary from a lever-arm-assist to manual or automatic locking devices that assist the operator to accomplish this step. The proper cooling times for the joint are material-, pipe-diameter-, and wall-thickness-dependent and are established by the pipe manufacturer. Allowing proper times under pressure for cooling prior to removal from the clamps of the machine is important in achieving joint integrity.

Optional Bead Removal

In some pipe system usage, the bead from the butt fusion process may be undesirable. Inside beads may create minor flow turbulence of liquids or may become an obstacle on which solids in the fluids may become lodged. Furthermore, outside beads may be a hindrance to sliplining operations. Equipment is available to remove the bead if that is desirable.

LAMSON PIPE COMPANY

Geothermal Pipe – 50 Year Limited Warranty

Lamson Pipe Company will warrant its Geothermal pipe, Geothermal "U"-Bend, and Geothermal pipe loop assemblies for a period of 50 years from the date of manufacture. Lamson Pipe Company will replace free of charge and with freight prepaid the new pipe quantity equivalent to the quantity of pipe that failed.

WARRANTY WILL APPLY IF:

- Geothermal pipe and Geothermal loop assemblies are properly installed, utilized, tested and inspected per the International Ground Source Heat Pump Association (IGSHPA) standards
- Geothermal pipe and Geothermal loop assemblies are tested before sealing/grouting the final installation as per IGSHPA standards
- Your supplier is notified immediately
- Lamson Pipe Company receives written notice explaining the defect within 30 days of discovery of defect

WARRANTY WILL NOT APPLY IF:

- The design, installation, inspection or testing of the Geothermal pipe and Geothermal loop assemblies was not in accordance with the recommendations of the IGSHPA, applicable code requirements, if any, and industry accepted guidelines
- Installed product is affected by a natural disaster or by earth movement, whether caused by persons or by natural cause
- Product affected by
  - Improper handling/storage
  - Inadequate freeze protection
  - Improper temperatures
  - Improper pressure levels
- Product is exposed to petroleum products

THIS WARRANTY DOES NOT COVER:

- Components in the closed-loop Geothermal system other than the pipe or loop assemblies
- Pipe and fitting joining process, method, tools, or equipment
- Uses for other than Geothermal installations

This warranty is in lieu of all other warranties, express, implied or statutory, including but not limited to any warranty for merchantability of fitness for a particular purpose and shall constitute the sole remedy to any original purchaser of Lamson Pipe Company's Geothermal pipe.

LAMSON PIPE COMPANY

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LPC-PressurePipe 2/10

GLOBAL POLY SYSTEMS INC.

Global's New High Performance PE4710 Material

Introduction: Global Poly Systems is pleased to introduce its new PE4710 material for pressure pipe applications. PE4710 is a new and improved high density polyethylene resin, with improved properties over the traditional PE3408/PE3608 resins. Global offers PE4710 in all sizes and SDR's for use in all applications.

History: High performance resins have been used in Europe for many years and have recently been introduced into North America. In Europe, it is known as a PE100, which is not equivalent to the PE4710 in North America. The difference being PE100 follows an ISO equation, which determines its minimum required strength (MRS) at 20°C (68°F), In North America we follow ASTM D2837, which determines a hydrostatic design basis (HDB) at 23°C (73°C). Due to the differences in testing only the best PE100's will qualify as a PE4710.

Design: With the increased properties of PE4710, it will allow for higher pressure ratings without compromising the long term properties of the pipe. In accordance with ASTM D3350 and the Plastic Pipe Institute (PPI), PE4710 qualifies for a design factor of 0.63 for water service, which is higher than the design factor of 0.50 for PE3408/3608. Below is the standard equation for determining the pressure rating for polyethylene pipe.

PE4710 pressure design:

$$PR = \frac{(2 \times HDB) \times (DF)}{(SDR - 1)} = \text{Pressure rating}$$

HDB – 1600psi
DF – **0.63** design factor for water service at 23°C (73°F)
SDR – Standard dimension ratio

Design Temperature Factor (T)

C	PE3608 PE3708	PE3710 PE4710
‹23	1.00	1.00
23-27	0.95	0.96
28-32	0.88	0.91
33-38	0.80	0.85
39-44	0.72	0.79
45-49	0.65	0.74
50-55	0.57	0.68
56-60	0.50	0.63

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Advantages over PE3408/3608: Overall PE4710 will have many advantages over the traditional PE3408/3608, increased flow rates, higher pressure rating, improved resistance to slow crack growth, which will increase the long term performance of the pipe. Table 1 will show the differences in pressure rating of PE4710 compared to PE3408/PE3608.

Table 1

Operating pressures	250 (psi)	200 (psi)	160 (psi)	125 (psi)	100 (psi)	80 (psi)	65 (psi)	50 (psi)
PE3408/ PE3608	SDR 7.3	SDR 9	SDR 11	SDR 13.5	SDR 17	SDR 21	SDR 26	SDR 32.5
PE4710	SDR 9	SDR 11	SDR 13.5	SDR 17	SDR 21	SDR 17	SDR 21	SDR 26

Note: Pressure ratings are based on 23°C (73°F) for water service and are established using ASTM D-2837

Example:

PE3408: SDR 9 PR = $\frac{2 \times 1600 \times 0.50}{(9-1)}$ = 200 psi

PE4710: SDR 9 PR = $\frac{2 \times 1600 \times 0.63}{(9-1)}$ = 252 psi

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Global's New High Performance PE4710 Material

Cell Classification (ASTM D3350): When describing polyethylene pipe and the material used to produce it, it is important to refer to the Cell Classification. The Cell Classification gives an accurate description of the properties of the material used. Table 2 shows the difference in Cell Classifications of PE3408/PE3608 vs. PE4710.

Table 2 D-3350 Cell Classification

Designation Code	PE3408	PE3608	PE4710	Test Procedure
Density (natural)	3	3	4	ASTM D1505
Melt Index	4	4	4	ASTM D1238
Flexural Modulus	≥4	≥4	≥5	ASTM D790
Tensile Strength at yield	≥4	≥4	≥5	ASTM D638
SCG Resistance (Pent)	5	6	7	ASTM D1473
Hydrostatic Strength Classification	4	4	4	PPI TR-4
Color and UV Stabilizer	C or E	C or E	C or E	ASTM D3350

GLOBAL POLY SYSTEMS INC.

Global's New High Performance PE4710 Material

Certifications: Due to its higher performance and the recent introduction into the North American market, changes are needed to update standards and educate polyethylene pipe users of the benefits of PE4710. Industry standards like CSA, ASTM, and AWWA are currently being updated and will be ready in the near future. Until those standards become available, Global will offer PE4710 following the same pressure ratings as PE3408/3608.

Conclusion: It is clear that the future of Polyethylene pipe is in high performance PE4710 resins. With the higher design factor of 0.63 for water service at 23°C, PE4710 will bring new opportunities to the piping industry. As well, the higher-pressure ratings, increased slow crack growth and overall better performance will eventually phase out the PE3408/3608 resins. Once the new standards are in place, pricing for projects will decrease due to the higher-pressure ratings in a thinner wall. Contact a Global representative to explore the benefits of using PE4710 resins.

GLOBAL POLY SYSTEMS INC.

Global's New High Performance PE4710 Material

Table 2 PE4710 Material Data Sheet

Nominal Physical Properties	English	SI	Test Method
Density	-----	0.961 g/cm³	ASTM D1505
Flow Rate (HLMI)	------	8.0 g/10min	ASTM D1238
Tensile Strength at Break	3500psi	23 MPa	ASTM D638
Elongation at Break	≥800%	≥800%	ASTM D638
Flexural Modulus	150,000 psi	1,034 MPa	ASTM D790
Pent Slow Crack Growth	>5000 h	>5000 h	ASTM F1473
Hydrostatic design Basis, 23°C (73°F)	1,600 psi	11.0 MPa	ASTM D2837
Hydrostatic Design Basis, 60°C (73°F)	1000 psi	5.5 MPa	ASTM D2837

The data contained herein is a guide to the use of Pipe produced by Global and is believed to be accurate and reliable. However, general data does not adequately cover specific applications, and it's suitability in particular applications should be independently verified. In all cases, the user should assume that additional safety measures may be required in the safe installation or operation of the project. Due to a wide variation in service conditions, quality of installation, etc. no warranty expressed or implied, is given in conjunction with the use of this material, other than that stated in our Terms and Conditions of Sale

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NSF/ANSI STANDARD 14
Plastics Piping System Components and Related Materials

Click here for a list of End Use Code Designations.

Click on Product Standards or footnote in blue to view the referenced document

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Endot Industries, Inc.

60 Green Pond Road
Rockaway, NJ 07866
United States
800-443-6368
973-625-8500
Visit this company's website

Facility : Rockaway, NJ

Potable Water - Pipe and Fittings

Product Type	Material Type	Trade Name	Product Standard
*Pipe** + 1" SIDR 5.3 1/2" - 2" SIDR 7 1/2" - 2" SIDR 9 1/2" - 6" SIDR 11.5 1/2" - 6" SIDR 15 1/2" - 6" SIDR 19	*PE 3408/4710*	*Endot*	*ASTM D2239*

* The trade designation "Endot" may or may not be followed by any of the following designations:
ENDOPOLY, ENDOPURE, ENDOTRACE, EN-DUO-PLEX, GEOFLEX-GEOTHERMAL, PREMIUM, GOLDEN JET,

SUPER GOLDEN JET, BLACK DIAMOND, ORANGEBURG SP, ORANGEBURG SUPER POLY, ENDOT/YARDLEY, ENDOT/ORANGEBURG, DUAL-LIST, or Endot Logo.
+ Material complies with NSF/ANSI 61 health effects requirements.

*Tubing** +	*PE 3408/4710*	*Endot*	*ASTM D2737*
1/2" - 2" SDR 9			

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+ Material complies with NSF/ANSI 61 health effects requirements.

*Pipe** +	*PE 3408/4710*	*Endot*	*ASTM D3035*
1/2" - 12" SDR 7			
1/2" - 12" SDR 9			
1/2" - 12" SDR 9.3			
1/2" - 12" SDR 11			
1/2" - 12" SDR 13.5			
1/2" - 12" SDR 15.5			
1/2" - 12" SDR 17			

* The trade designation "Endot" may or may not be followed by any of the following designations:
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+ Material complies with NSF/ANSI 61 health effects requirements.

Facility : Pryor Creek, OK

Potable Water - Pipe and Fittings

Product Type	**Material Type**	**Trade Name**	**Product Standard**
*Pipe** +	*PE 3408/4710*	*Endot*	*ASTM D2239*
1/2" - 2" SIDR 7			
1/2" - 2" SIDR 9			
1/2" - 6" SIDR 11.5			
1/2" - 6" SIDR 15			
1/2" - 6" SIDR 19			

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+ Material complies with NSF/ANSI 61 health effects requirements.

Tubing * +	*PE 3408/4710*	*Endot*	*ASTM D2737*
1/2" - 2" SDR 7			
1/2" - 2" SDR 9			
1/2" - 2" SDR 9.3			
1/2" - 2" SDR 11			
1/2" - 2" SDR 13.5			
1/2" - 2" SDR 15.5			
1/2" - 2" SDR 17			

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+ Material complies with NSF/ANSI 61 health effects requirements.

Pipe * +	*PE 3408/4710*	*Endot*	*ASTM D3035*
1/2" - 12" SDR 7			
1/2" - 12" SDR 9			
1/2" - 12" SDR 9.3			
1/2" - 12" SDR 11			
1/2" - 12" SDR 13.5			
1/2" - 12" SDR 15.5			
1/2" - 12" SDR 17			

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+ Material complies with NSF/ANSI 61 health effects requirements.

Facility : Greeneville, TN

Gas Applications - Pipe and Fittings

Product Type	Material Type	Trade Name	Product Standard
Pipe §	*PE 2406/2708*	*Endot Yellow Gas Pipe*	*ASTM D2513*
1/2" IPS SDR 9.3			
1/2" IPS SDR 11			
3/4" IPS SDR 11			
1" IPS SDR 9.3			
1" IPS SDR 9.9			
1" IPS SDR 11			
1" IPS SDR 13.5			
1 1/4" IPS SDR 6			
1 1/4" IPS SDR 9.3			
1 1/4" IPS SDR 10			
1 1/4" IPS SDR 11			

1 1/4" IPS SDR 13.5
1 1/4" IPS SDR 17
1 1/2" IPS SDR 11
1 1/2" IPS SDR 13.5
1 1/2" IPS SDR 17
2" IPS SDR 9.3
2" IPS SDR 11
2" IPS SDR 13.5
2" IPS SDR 17
2" IPS SDR 21
2 1/2" IPS SDR 11
2 1/2" IPS SDR 13.5
2 1/2" IPS SDR 17
2 1/2" IPS SDR 21
3" IPS SDR 9.3
3" IPS SDR 11
3" IPS SDR 11.5
3" IPS SDR 13.5
3" IPS SDR 17
3" IPS SDR 21
3 1/2" IPS SDR 11
3 1/2" IPS SDR 13.5
3 1/2" IPS SDR 17
3 1/2" IPS SDR 21
4" IPS SDR 9.3
4" IPS SDR 11
4" IPS SDR 11.5
4" IPS SDR 13.5
4" IPS SDR 17
4" IPS SDR 19
4" IPS SDR 21
5" IPS SDR 11
5" IPS SDR 13.5
5" IPS SDR 17
5" IPS SDR 21
6" IPS SDR 11
6" IPS SDR 11.5
6" IPS SDR 13.5
6" IPS SDR 17
6" IPS SDR 21
8" IPS SDR 11
8" IPS SDR 11.5
8" IPS SDR 13.5
8" IPS SDR 17
8" IPS SDR 21

* Gas pipe and tubing limited to outside underground use only.
§ Product is Certified to the Uniform Plumbing Code™. Installation in accordance with th manufacturer's instructions and the requirements of the latest edition of the Uniform Plumbing Code™.

Potable Water - Pipe and Fittings

Product Type	Material Type	Trade Name	Product Standard
*Pipe** + 3/4" - 2" SIDR 7 1/2" - 6" SIDR 11.5 1/2" - 6" SIDR 15	*PE 3406/4710*	*Endot*	*ASTM D2239*

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+ Material complies with NSF/ANSI 61 health effects requirements.

*Tubing** + 3/4" - 2" SDR 9	*PE 3406/4710*	*Endot*	*ASTM D2737*

* The trade designation "Endot" may or may not be followed by any of the following designations:
ENDOPOLY, ENDOPURE, ENDOTRACE, EN-DUO-PLEX, GEOFLEX-GEOTHERMAL, PREMIUM, GOLDEN JET, SUPER GOLDEN JET, BLACK DIAMOND, ORANGEBURG SP, ORANGEBURG SUPER POLY, ENDOT/YARDLEY, ENDOT/ORANGEBURG, DUAL-LIST, or Endot Logo.
+ Material complies with NSF/ANSI 61 health effects requirements.

*Pipe** + 1" - 2" SIDR 5.3 1/2" - 2" SIDR 7 1/2" - 2" SIDR 9 1/2" - 12" SIDR 11.5 1/2" - 12" SIDR 15 1/2" - 12" SIDR 19	*PE 3408/4710*	*Endot*	*ASTM D2239*

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+ Material complies with NSF/ANSI 61 health effects requirements.

*Tubing** + 3/4" - 2" SDR 9	*PE 3408/4710*	*Endot*	*ASTM D2737*

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+ Material complies with NSF/ANSI 61 health effects requirements.

*Pipe** +	*PE 3408/4710*	*Endot*	*ASTM D3035*

1/2" - 12" SDR 7
1/2" - 12" SDR 9
1/2" - 12" SDR 11
1/2" - 12" SDR 13.5
1/2" - 12" SDR 15.5
1/2" - 12" SDR 17

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