

3.7: HAZARDS AND HAZARDOUS MATERIALS

Introduction

This section describes the health and safety aspect of the project and the applicable regulations pertaining to hazardous resources in the project area. This section also discusses potential impacts from hazards and hazardous materials associated with the proposed project. Measures to mitigate any potentially significant impacts are described.

Environmental Setting

EXISTING CONDITIONS

Hazardous Materials

Hazardous materials are used in gas storage field operations. These materials must be handled, stored and used in accordance with strict federal and state regulations.

Methanol. Methanol is a chemical commonly used to prevent formation of hydrates in pipelines and other equipment. About 400 gallons of methanol is currently stored at the Remote Facility Site for injection into the storage pipeline. The containment structure provides 110 percent of the tank capacity.

A hydrate is a chemical compound containing water within its structure. Hydrates form in the presence of water and natural gas at high pressures. Under some conditions, they can form blockages inside pipelines and equipment.

Methanol is injected downstream of inlet separation, and is used as needed to prevent freezing across the pressure letdown valves. Hydrate formation has not caused problems during operation of the existing storage facility. Operations staff monitor temperatures, and use methanol when necessary.

Corrosion Inhibitor. Corrosion inhibitors protect the integrity of pipelines, valves, and well components. This material is a bactericide. Corrosion inhibitors are currently not used on the existing storage facility.

Lubricants and Solvents. Lubricants are required for reciprocating compressor engines and other engines located at the Remote Facility Site, as well as construction equipment. These materials include engine oil, grease and petroleum-based solvents.

Hazardous Wastes

Used solvent and solid wastes are stored at the Wild Goose facility for 90 days according to current federal, state, and local regulations. At or before 90 days a licensed hazardous waste hauler picks up the waste to be distributed in a licensed hazardous waste storage facility.

Hazardous Materials Release Response Plan. A Hazardous Materials Release Response Plan (HMRRP), consistent with the requirements of Section 25500 of the California Health and Safety Code, was prepared during initial project development. A copy of the HMRRP is provided in Appendix J. The HMRRP provides a detailed list of hazardous materials used at the Wild Goose Facility and a map locating the storage of hazardous materials and wastes.

Natural Gas Field Conditions

Natural gas is composed of several components that may create a hazardous effect when released into the environment. Three types of gas may be present in the project area: biogenic gas, thermogenic gas (remaining original gas in-place) and storage gas (processed thermogenic gas). Understanding the origin of the different components that make up natural gas aids in determining the source of any gas leaks. A full description of these different types of natural gas is presented in Appendix K.

Thermogenic gas may exist in two different intervals within the project area, in moderate depth zones and as original gas in-place within storage zone related isolated reservoir rock. Thermogenic gas from different reservoirs (moderate depths versus deep) in the project area may not exhibit distinct difference in composition that would allow identifying the reservoir source.

Methane (primary storage gas component) is flammable. At certain concentrations in air, it is also explosive. Fires or explosions at natural gas storage facilities are rare. One recent incident in Kansas is discussed below under Impacts.

Original field pressure for the zones under evaluation for use as storage reservoirs ranged from 1,210 to 1,328 pounds per square inch (psi) measured relative to atmospheric pressure, denoted as psia. Planned normal injection pressures would range from 1,600 to 1,700 psia, about 30 percent higher than original field pressures. Initial injection pressures would range from 1,700 to 1,800 psia, approximately 35 to 40 percent higher than original field pressures. These high pressures are required to displace water from the reservoir

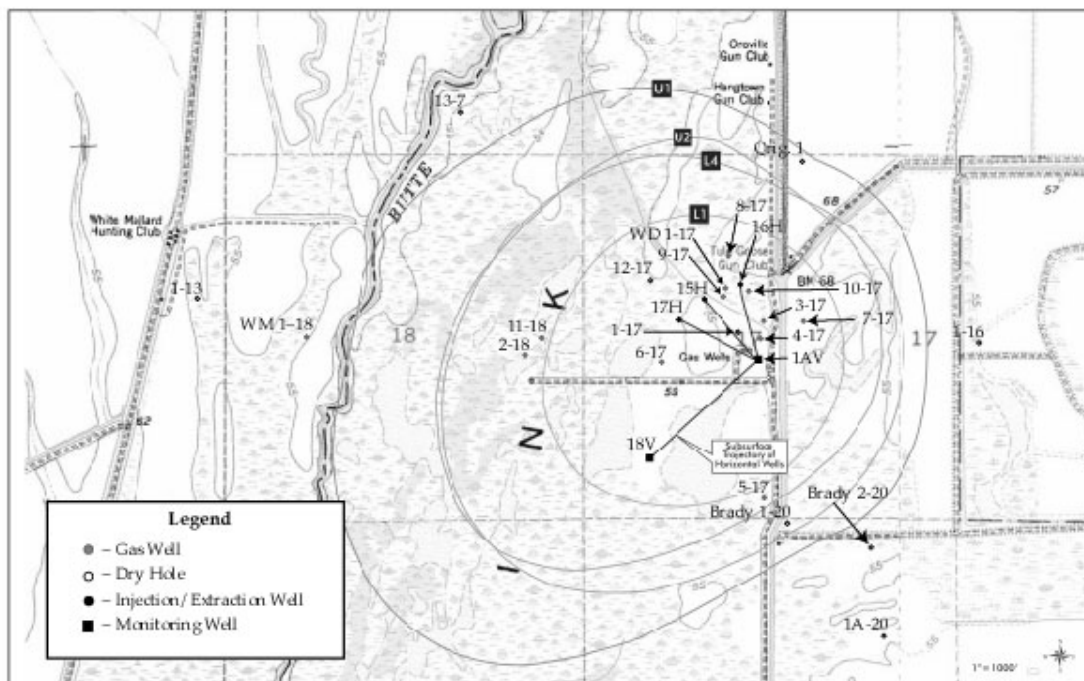
zones. More detailed information, related to proposed operating pressures, is presented in Appendix K.

Abandoned Wells and Dry Holes

Plugged and abandoned wells or dry holes represent potential vertical conduits for gas migration. Even when a well is properly abandoned in accordance with DOGGR regulations, using modern equipment and techniques, the potential for future leaks cannot be precluded. Over time (several years or decades), various well components (steel casing, annular seals, cement plugs) naturally deteriorate. This long-term deterioration increases the potential for future leaks. Very old wells or dry holes represent the highest risk of leaking. In the Sacramento Valley, early exploratory drilling began in the mid-1800s, prior to the existence of strict regulation and oversight.

Original wells in Wild Goose Field were drilled in the early 1950s (see Figure 3.7-1). Most wells in the field (eight) were abandoned in 1993. Some wells were abandoned in the late 1970s. A few wells and dry holes were abandoned earlier, including some in the early 1950s. Wells and dry holes with the greatest risk of developing future leaks are those abandoned in the 1950s. Figure 3.7-1 shows the early abandoned wells and dry holes are located beyond the extent of the gas storage reservoirs and those within the boundary of proposed gas storage reservoirs. Information on abandoned wells and dry holes in the field area is summarized in Appendix K. This appendix also summarizes information on dry holes in the project vicinity, but outside the field area.

Figure 3.7-1: Wild Goose Reservoir and Wells



SOURCE: MHA Inc.

Natural Gas Pipeline Hazards

The Applicant (WGSJ 2001) summarizes the following pipeline accidents:

“Fires and explosions on natural gas pipelines are also very rare. The latest incident in the project study area occurred in 1997 along PG&E’s L172 north of Colusa. The gas pipeline ruptured and produced a tall flame after the gas was ignited by nearby flailing electric lines. PG&E was able to quickly shut off the gas flow and thereby extinguish the flame. Post-incident investigations identified evidence of many nicks from plowing activities, and established that field leveling activities over its 30-plus years of operation had reduced the cover. Following pipeline repairs, the crater created at the rupture site was filled with topsoil and the site returned to its pre-incident condition.

Another natural gas pipeline rupture, which received national press, occurred on August 20, 2000 near Carlsbad New Mexico on the Mojave Pipeline System. The rupture and explosion resulted in 12 fatalities. While the National Transportation Safety Board’s report has not yet been released, early indications are that significant internal corrosion may have contributed to the failure of this 50-year old pipeline.”

Since natural gas is lighter than air, it rises into the atmosphere. Cases where a pressurized pipeline is expelling gas, the material can be directed straight up or nearly horizontally for great distances.

Accidental “dig-in”, pipeline age, and the degree of corrosion are three very important factors in pipeline performance. Current design and safety standards are superior to technologies in use 30 to 50 years ago; this technology includes epoxy protective coatings and cathodic protection, as well as better materials and equipment.

The potential exists for pipeline failure or rupture, with or without fire and explosion. Based on national statistics, man-made actions are the primary cause of natural gas pipeline failures. The major causes of natural gas pipeline failures in the United States (DOT 1994-2000) are listed below in order of highest annual occurrence rate.

- *Outside Forces* – accidents caused by excavation
- *Other* – geologic effects, including earthquakes, landslide and settlement
- *Corrosion* – external and internal pipe corrosion
- *Construction Defects* – e.g., weld problems

A detailed description and analysis of natural gas pipeline failures is presented in Appendix K.

Project Safety And Inspection Programs

In order to operate a natural gas storage field, various safety and inspection programs are required. Project related safety and inspection procedures for the existing WGSJ project are discussed below.

WGSJ Existing Safety Program. Alberta Energy Company (AEC), the parent company of WGSJ, established safety programs to maintain safe and healthy working conditions, in accordance with all federal, state and local requirements. For the Wild Goose Gas Storage Project, pipeline safety procedures are listed below.

- Cathodic Protection Surveys: WGSII tests its system between 6 and 12 times per year, depending on surface conditions and access during the hunting season.
- Leak Surveys: WGSII conducts leak surveys twice each year.
- Leak Patrols: WGSII patrols the line every time a cathodic protection survey is conducted, between 6 and 12 times per year.
- Pipeline Internal Inspection: WGSII presently pigs its pipeline regularly with a poly pig to remove water produced during the withdrawal cycle. Besides adversely affecting pipeline hydraulics, the buildup of such fluids can result in internal corrosion of the pipe. WGSII would conduct an internal integrity inspection of its pipelines every five years using a smart pig.

At AEC's Gas Storage Division, which includes the Wild Goose Project, activities to ensure safety and health are ongoing and integrated into the entire operation. When potential hazards are identified, measures are taken to eliminate hazards, or procedures are followed to minimize the chances of an undesired event occurring.

WGSII is a member of the Utility Service Alert notification program. WGSII established a toll-free number for the public to call regarding the location of its facilities. This number is posted on its pipeline marker signs and would be posted at each of the proposed aboveground facilities.

WGSII coordinates with emergency service providers in the Gridley area. Facility tours have been conducted and the compressor station and pipeline operations, controls and safety equipment and systems are explained and demonstrated where appropriate. The WGSII Emergency Response Plan was also reviewed and explained during the tours. Local emergency service providers have a working understanding of the project facilities and operations systems that would facilitate a focused, coordinated and effective response should an emergency situation arise. WGSII would continue to conduct these orientation and familiarization sessions as requested by the emergency service providers (e.g. for new staff or refreshers for existing staff), or when project facility or operations changes warrant.

Emergency Response Plan. An Emergency Response Plan (WGSII 2000), consistent with the requirements of the Code of Federal Regulations, Title 49 and the California Code of Regulations, Title 8, 19 and 22, was prepared during Phase I of the Wild Goose project. This plan describes what constitutes an emergency and provides procedures to follow in the event of an incident. Emergency response personnel are defined and responsible agencies listed. The location (including directions) and telephone number for emergency service providers (medical, fire, police) are also listed in the plan. A copy of the current Wild Goose emergency response plan is available upon request from the CPUC Energy Division.

Construction Fire Prevention and Safety. A Fire Prevention Plan, in compliance with California fire laws and local fire prevention requirements, would be followed during construction. At a minimum, these measures would include the specific items listed below.

- Procurement of appropriate burning or welding permits from local agencies when required
- Measures for prohibiting smoking except in designated areas

- Measures for fire prevention, including spark arresters on equipment, minimum clearances around facilities, procedures for grinding and welding, and fire suppression equipment to be maintained on the job site
- Training on fire awareness and suppression techniques
- Methods and equipment to control any fire started by construction activities
- Methods for reporting any fires observed in or near the project area

Abandoned Well Inspection Program. In 2000, WGSi implemented a surface gas monitoring program for all abandoned wells in Wild Goose Field. Abandoned wells in the field area are inspected annually during the fall. Visual observations are made, noting gas bubbles or vegetation changes. A sensitive gas detection instrument (Heath Detecto Pak III) is used during the well inspections to check for gas. If gas is detected, a sample is collected for chemical and isotopic analysis to determine the gas origin (WGSi 2001a).

Facility Security. As part of the proposed project, access to above ground project facilities would be controlled to the greatest extent feasible. Access to the Well Pad Site is the easiest to control. From the south, access is through three gates, one of which is usually locked. From the north, access is through three locked gates. Both access routes cross private property and pass by several permanent residences that are always on the watch for trespassers.

At the Remote Facility Site, the perimeter 6-foot high chain link fence has a barbed-wire outrigger to discourage intruders. The single entrance gate is open while staff is present. It is closed and locked when the station is unmanned. Motion sensors in the office building notify the Butte County Sheriff's Department and the on-call operator when activated.

The main line valve lot(s) and the Delevan Interconnect Site would be enclosed by 6-foot high chain link fences and locked gates with barbed wire or razor wire on outriggers.

Regulatory Setting

The current regulatory framework relevant to hazards and human health encompasses process risk related to the use of hazardous materials and management of risks from hazardous materials that have been or could be released to the environment. With respect to chemical hazards, the use, storage, and disposal of hazardous materials and wastes are regulated through a network of sometimes overlapping federal, state, and local laws and regulations. Various government agencies are responsible for implementing these laws and enforcing their requirements.

Federal and state laws require planning to ensure that hazardous materials are properly used, stored, and disposed of, and in the event that such materials are accidentally released, to prevent or to reduce injuries to human health, safety, or the environment. Businesses must store hazardous materials appropriately and train employees to manage them safely. Hazardous waste laws impose "cradle-to-grave" liability, requiring generators of hazardous waste to handle it in a manner that protects human health and the environment to the extent possible. Both federal and state laws have established programs to identify hazardous waste sites, to require site remediation, and to recover the costs of site remediation from polluters. The following discussion briefly summarizes regulations that must be complied with regardless of ownership of the generating station.

FEDERAL SETTING

Clean Water Act (CWA). The CWA sets up the framework through which permits to discharge waste to surface waters are authorized- The National Pollutant Discharge Elimination System (NPDES) permit typically has conditions specific to the permitted operation and may set limits on acidity (pH), chemical concentrations, oil and grease, dissolved and suspended solids, and temperature. The CWA also prohibits the discharge of pollutants to storm water.

Department of Transportation. Physical hazards, storage field maintenance and operations within the storage field are under the federal jurisdiction of the Department of Transportation (DOT). The DOT regulates the transportation of hazardous materials between states. Both federal and state agencies specify driver-training requirements, load labeling procedures, and container specifications. The DOT also indirectly regulates the transportation of natural gas through pipelines according to the Natural Gas Pipeline Safety Act. The Act's requirements, including designing pipelines to maximize safety (e.g., installing corrosion protection), routinely inspecting pipelines, preparing for possible emergencies, and reporting injuries and physical damage caused by accident, have been adopted by the CPUC.

Office of Pipeline Safety. The Office of Pipeline Safety (OPS) is responsible at the Federal level for natural gas pipeline regulations and standards. Chapter 49 Part 192 of the Code of Federal Regulations prescribes federal safety standards for transportation of natural gas by pipeline. One of the key pipeline design factors is the class location. The class location unit is defined by the number of dwelling units or high occupancy buildings or open areas within 220 yards (660 feet) of the pipeline centerline per mile of pipeline. Based on this definition, natural gas pipeline locations are classified as one of the four classes listed below.

- A Class 1 location has 10 or fewer dwelling units per mile.
- A Class 2 location has more than 10 but less than 46 dwelling units per mile.
- A Class 3 location has 46 or more dwelling units per mile, or is located within 100 yards of either a building, such as a school, restaurant or other business, or a small, well-defined outside area, such as a playground, recreation area, or other place of public assembly, that is occupied by 20 or more persons on at least 5 days a week for 10 weeks in any 12-month period.
- A Class 4 location is in any class location unit where buildings with 4 or more stories above ground are prevalent.

A design factor (ratio of maximum allowable operating pressure relative to design pressure), as determined by the class location, is used during pipeline engineering to provide a factor of safety. This safety factor (reciprocal of the design factor) for Classes 1 through 4 is 1.39, 1.67, 2.00, and 2.50, respectively. For example, in a Class 1 location, the pipeline would be designed to withstand a pressure equaling 139 percent of the maximum allowable operating pressure. With a higher design factor, the pipeline is stronger (thicker walls, different steel grade or alloy). Overall, design factors are greatest (Class 3 or 4) when a pipeline is located in high-density residential areas, or proximate to schools, businesses, or other high use public open areas. As land use changes or densities increase, the pipeline operator is required (if necessary) to upgrade the pipeline to meet the appropriate class location or reduce the maximum operating pressure to remain in compliance with federal safety requirements (49 CFR 192).

Area development, for example construction of a school or densely populated development, would change local land use thereby a pipeline segments safety standard from, for example, a location Class 1 to Class 3. The new pipelines are to be designed for a Class 3 location, which means that they must have a safety factor of at least 2.00, in order to remain in compliance with federal regulations. The pipeline would need to be upgraded to a Class 4 (factor of safety 2.5) if it became within 660 feet of an area where “buildings with 4 or more stories above ground are prevalent”. The change to a higher Class must come from an adequate existing design, a change to more frequent surface inspections, and/or a reduction in operating pressure. It must be assumed that WGSJ would comply, as required, with requirements of 49 CFR 192 with regard to operating as a Class 3 location.

STATE/REGIONAL SETTING

Title 22 of the California Code of Regulations defines, categorizes, and lists hazardous materials and wastes. Title 22, defines a hazardous material as:

A substance or combination of substances which, because of its quantity, concentration, or physical, chemical or infectious characteristics, may either (1) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness; or (2) pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported or disposed of or otherwise managed.

Hazardous wastes are categorized in Title 22 as either hazardous wastes as defined in the Resource Conservation and Recovery Act (RCRA) or non-RCRA hazardous wastes. Title 22 lists chemical compounds that are presumed to make a material or waste hazardous to the environment.

California Water Code (CWC)

The CWC includes provisions of the federal CWA and water quality programs specific to California. The CWC requires reporting, investigation, and cleanup of hazardous material releases that could affect waters of the state (including stormwaters).

California Health and Safety Code Section 25534 (CAH&SC)

This section of the CAH&SC requires businesses that handle amounts of Acutely Hazardous Materials (AHMs) in excess of certain quantities to develop a Risk Management Plan (RMP). The RMP encompasses process hazards; potential consequences of releases; and documentation, auditing, and training relative to the AHMs above threshold quantities at the generating station. Regulated AHMs may include aqueous ammonia and sulfuric acid.

Division of Oil, Gas and Geothermal Resources

Physical hazards, storage field maintenance and operations within the natural gas storage fields are under the jurisdiction of the California Department of Conservation, Division of Oil, Gas and Geothermal Resources (DOGGR). DOGGR regulates production of oil and gas, as well as geothermal resources, within the state of California. DOGGR regulations define well design and construction standards, surface production equipment and pipeline requirements, and well abandonment procedures and guidelines.

- Oversees drilling and construction of extraction, observation and injection wells.

- Regulates well abandonment procedures to ensure they are conducted safely and are effective. These regulations require procedures designed to prevent future migration of oil and gas from a producing zone to shallower zones, and to protect groundwater.
- Oversees field operations. When an operator ceases well operation or production, state law requires the well is abandoned within a reasonable period of time.
- Regulations require operators to maintain detailed records of abandonment operations and file copies with DOGGR.
- Approves underground injection and disposal projects, including gas storage projects.
- Regulates environmentally sensitive pipelines within 300 feet of any public recreational area, or a building intended for human occupancy (residences, schools, hospitals, and businesses) that is not necessary to the production operation.
- Administers the Methane Gas Hazards Reduction Program.

DOGGR regulations are defined in the Public Resources Code, Division 3, Chapter 1 and the California Code of Regulations (CCR), Title 14, Chapter 4.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) regulates the operations and maintenance of natural gas storage fields. The CPUC regulates privately owned gas storage facilities to ensure that California customers have safe, reliable utility service, at reasonable rates. For this reason, the CPUC is entrusted with the safety jurisdiction over natural gas facilities by legislative mandate. The Utilities Safety Branch of the CPUC enforces Federal Pipeline Safety Regulations through the natural gas safety program under CPUC General Order No. 112-E. The natural gas safety program specifically audits facilities of investor-owned natural gas utilities for compliance with applicable codes.

As intrastate gas pipelines, the WGSII pipelines are under the jurisdiction of the CPUC. Under the Hinshaw exemption, the CPUC implements federal regulations as they pertain to intrastate gas pipelines. General Order (GO) 112-E of the CPUC governs design, construction, testing operation and maintenance of gas gathering, transmission and distribution piping systems in the State of California. These rules are supplements to these Federal regulations and do not supersede the Federal Pipeline Safety Regulations.

State of California Regulations, Part 51020 through 51018 of the Government Code, provide specific safety requirements that are more stringent than the Federal rules. Areas covered include: (a) exemptions, (b) hazardous pipeline safety technical standards, (c) intrastate pipeline operators, (d) leak detection and cathodic protection, (e) periodic hydrostatic testing, (f) hydrostatic test results, (g) maps, records procedures, inspections, (h) contingency plans, (i) notification of break, explosion or fire, (j) local enforcement, and (k) regulations for enforcement proceedings.

California Department of Education—California Education Code

The Education Code, Parts 17210 through 17223 of the Government Code, provides specific guidelines for evaluating hazards to school sites. This code indicates that all risk assessments conducted by school districts that elect to receive state funds shall include a focus on the risks to children's health posed by a hazardous materials release or threatened release, or the presence of naturally occurring hazardous materials, on the school site. Evaluating potential risks to children associated with natural gas pipelines is included in these regulations.

For site selection purposes the California Department of Education had, in the past, required only that the school district indicate the presence and location of pressurized natural gas pipelines if they are located within 1500 feet of the site boundary. On September 7, 2000 in a "Continuation Sheet for Filing Administrative Regulations with the Secretary of State", subsection (h) indicated that "The [school] site shall not be located near an above-ground fuel or water storage tank or within 1500 feet of the easement of an above-ground or underground pipeline that can pose a safety hazard as determined by a risk analysis study, conducted by a competent professional, which may include certification from a local public utility commission."

Storage Tank Regulations

Hazardous materials are typically stored in underground or aboveground storage tanks. Laws and regulations regarding underground storage tanks used to store hazardous materials (including petroleum products) require that owners and operators register, install, monitor, and remove their tanks according to established standards and procedures. Releases are to be reported. Owners of above-ground storage tanks containing petroleum products are to prepare and implement spill prevention and response strategies, and to contribute to the Environmental Protection Trust Fund that is used to respond to some spills. Proper drainage, dikes and walls are required to prevent accidental discharge from endangering employees, facilities, or the environment.

LOCAL SETTING

Butte County

The Butte County General Plan includes the policies that are relevant to the proposed project and project alternatives to preserve or protect health and safety of the environment located within the project area. Specific policies pertaining to Hazards and Hazardous Materials are listed below.

Safety Element/Fire Hazard

- 1.1:** Make protection from fire hazards a consideration in all planning, regulatory, and capital improvement programs, with special concern for areas of "high" and "extreme" fire hazard.
- 2.1:** Encourage adequate fire protection services in all areas of population growth and high recreation use.
- 3.1:** Use fuel breaks along the edge of developing areas in "high" and "extreme" fire hazard areas.
- 5.1:** Carefully evaluate the effect of development on water supplies.
- 7.1:** Ensure that road access for new development is adequate for fire protection purposes.
- 9.1:** Regulate as necessary those activities and uses with a high fire potential except uses regulated by the Forest Practices Act.
- 10.1:** Regulate use of certain building materials in areas of higher than average fire hazard.

Circulation Element

- 3.1.4:** The County shall encourage the continued development and implementation of comprehensive state and federal programs for the regulation and monitoring of the transportation of hazardous and toxic materials on highways and railways in and through

the County. Appropriate fire and emergency service agencies shall participate in plans for the transportation of hazardous and toxic materials in and throughout the County.

Colusa County

The Colusa County General Plan contains policies relevant to the proposed project and project alternatives to preserve or protect the health and safety of the environment located within the project area. Specific policies pertaining to Hazards and Hazardous Materials are listed below.

SAFE-9: Efforts to reduce or eliminate fire hazards should be supported, provided that they do not adversely affect the county's other natural resources.

SAFE-10: An adequate water source for fire protection purposes shall be ensured prior to development in high or moderate fire hazard zones.

SAFE-11: Fire protection policies in the Community Services Element should be supported to reduce the hazards associated with wildfire.

SAFE-12: Reservoirs for firefighting purposes should be maintained by major industrial developments if located in high or moderate fire zones...

SAFE-23: The County Planning Department and the Office of Emergency Services should maintain hazard maps to aid in the review of development proposals and in the development of emergency response plans. Such maps shall illustrate potential flooding, dam inundation, landslides, subsidence, and wildfire threats.

SAFE-25: Known hazard information should be reported as part of every General Plan amendment, zoning change, or use permit approval.

SAFE-26: Development proposals in potential hazard areas should be referred to appropriate agencies for review and recommendations.

SAFE-29: Emergency shelters and first-aid centers should be designated.....Primary emergency shelters and first-aid centers should be established at the high schools in these communities...If necessary, secondary emergency shelters could be opened at elementary schools or other public facilities in those communities.

Environmental Analysis

AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

The following are areas of potential environmental concern that may be associated with implementation of the proposed project.

- Accidents with the potential to release a hazardous material or waste
- Possible pipeline incidents resulting in a release of natural gas, representing a potential risk of fire or explosion
- Possible leaks from the storage field (old abandoned wells), representing a potential risk of fire or explosion

THRESHOLD OF SIGNIFICANCE

The project may result in a significant hazardous materials/wastes impact if it increases the potential for exposure to hazardous materials/wastes or increases the likelihood of a hazardous materials release to the environment. The project would also have a significant impact if it would substantially increase the safety and health risks to members of the

public. Potential for fire or explosion resulting from a natural gas release represents a safety and health risk.

An impact would be considered significant if any of the following conditions are present.

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school
- Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment
- For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of an airport or use airport, would the project result in a safety hazard for people residing or working in the project area
- Expose people or structures to a significant risk of fire or explosion
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan

IMPACT DISCUSSION

Various project components present potential risks or hazards. Some of these risks and hazards are related to the storage, use, and handling of hazardous materials and waste. Other risks and hazards are associated with high-pressure gas pipelines and storage field equipment use. In addition, a potential hazard is gas leaking from the storage field.

Impact 3.7-1: Potential to create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials

Hazardous Materials and Waste. During both construction of proposed facilities and field operations, several types of hazardous materials would be stored and hazardous wastes would be generated. These materials and wastes have been described previously in the environmental setting of this section. Potential hazards associated with pipelines and storage field equipment (including wells) are also presented below.

It is anticipated that the Future Phase expansion of project operations would generate approximately 4,000 additional gallons of liquid waste annually from maintenance of compressors and the emergency generator. Hazardous waste would be handled in accordance with all applicable manufacturers' specifications for storage and handling. Handling and storage of hazardous materials and wastes would comply with local, state, and federal requirements. Liquid wastes would be held temporarily in storage tanks – either underground or on skids – in the compressor building pending off-site shipment. Containment structures would provide 110 percent of the storage tank capacity.

A minor amount of solid hazardous waste would also be generated at the storage facility. Small quantities of oily rags, glycol filters, and oil filters would also result from both construction and project operations. Solid wastes would be stored at the site in enclosed, secured areas for a maximum of 90 days.

During construction, hazardous materials and wastes would be handled in accordance with the best management practices prescribed in the Storm Water Pollution Prevention Plan (SWPPP) (see Chapter 3.5: Hydrology). This plan is required by the Regional Water Quality Control Board, in compliance with the National Pollution Discharge Elimination System General Permit for Construction Activities under the federal Clean Water Act.

Within 90 days or less, licensed hazardous waste transporters would remove produced hazardous wastes. For the types of hazardous wastes generated by this facility, Ramos Oil Company of Marysville is the licensed hauler presently providing this service for WGS.

Ramos Environmental would recycle most of the hazardous oily type wastes and glycol at their facility in West Sacramento. Any hazardous waste that could not be recycled would be transported to DK Environmental or Pacific Resource Recovery in Los Angeles for disposal.

If a release of hazardous materials occurred within the 90-day storage period, a potential health and safety impact could result. The volumes of materials used or stored at the site are limited. Containment structures enclose storage areas. No sensitive receptors are within one-quarter mile of either the Well Pad Site or Remote Facility. Since all materials are handled, stored and transported in accordance with applicable government regulations and there are no nearby sensitive receptors, the chance of an accidental release reaching the public is considered very unlikely. Therefore, no public health hazards are anticipated from the normal use, handling, storage or transport of hazardous materials or waste. No additional mitigation measures are warranted.

Impact 3.7-2: Potential to create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment

Any accidental release of hazardous materials or wastes has the potential to create hazards for sensitive receptors in the immediate area. Since the nearest residence to the Remote Facility is approximately 4,000 feet away, it is unlikely that they would be affected by an accidental release. No impacts to area residents are anticipated from an accidental release; however, a spill or release of hazardous materials or wastes could enter a local water way or affect groundwater quality. Facilities are designed to contain large releases in order to comply with State and Federal regulations. These required measures minimize the potential for a large release affecting water quality. No adverse impacts from accidental releases are anticipated and no additional mitigation is required.

Storage Field Reservoir and Caprock Conditions

Proposed injection and operating pressures are substantially higher than the original field pressure. They are based on technical information collected by the DOGGR for the Sacramento Valley region, and on specific technical data collected by WGS for the proposed storage field project. Original field pressure for the zones under evaluation ranged from 1,210 to 1,328 pounds per square inch (psi) measured relative to atmospheric pressure, denoted as psia. Initial injection pressures would range from 1,700 to 1,800 psia. Technical data on field pressures are provided in Appendix K.

In order to operate new intervals (L-1, U-2 and U-1) for gas storage, water currently present in these reservoirs must be displaced. This natural formation water encroached into the reservoir when the original gas field was depleted. Water displacement requires

temporary “over-pressuring” of the reservoir. In this process, storage gas is injected into the formation at relatively high pressures calculated to force water out of the field area. Once this typical procedure is completed and storage gas displaces water, field-operating pressure would be maintained at a lower level. The potential for gas to migrate through either natural or man-made pathways increases with higher pressures.

Based on protocols used during the analysis of core samples collected from Well #14(V), some of the pressure results and conclusions may not accurately represent actual field conditions. There is a possibility that the threshold pressures determined for the cap rock intervals analyzed are too high and the margin of safety for field operating pressures is less than expected. If the data is not accurate and the margin of safety is lower than expected, a potential adverse impact would exist.

Core sample analyses provide data measurements for single points in the cap rock. As such, data may not be representative of the larger cap rock area even when all standard protocols are used. If data does not accurately reflect actual subsurface conditions, the cap rock may be stronger or weaker than believed. If the cap rock is weaker, then the margin of safety associated with operating pressures may be lower than acceptable and an adverse impact would exist.

Level of Significance Without Mitigation. Without further testing defined as a mitigation measure, a potentially significant adverse impact may exist.

Mitigation Measure 3.7-1. WGSJ will submit core sample analysis protocols to the CPUC technical team for review and approval prior to conducting tests on new core samples.

Test data on new core samples will be submitted to the CPUC technical team for review. If new data indicates that cap rock strength is different (substantially lower) than indicated by previous tests, operating and injection pressures would be reduced to maintain an appropriate level of safety consistent with DOGGR safety guidelines.

Mitigation Measure 3.7-2. WGSJ will conduct in-situ stress tests of the project relevant cap rock intervals in at least one well when drilled. If in-situ stress test results are not consistent with core sample test results, re-evaluation of operating pressures may be necessary. If in-situ stress tests indicate that cap rock strength is substantially less than currently believed, operating and injection pressures would be reduced to maintain an appropriate level of safety consistent with DOGGR guidelines.

Storage Field and Wells

Storage zone containment issues and naturally occurring (geologic) gas migration pathways are summarized under Geology, Section 3.6, and discussed in the Geologic Appendix I. Based on data collected and analyses conducted, the possibility of gas migration through natural geologic pathways is considered remote. In contrast to natural migration pathways, old abandoned wells and dry holes represent potential vertical conduits for gas movement.

Several factors contribute to possible gas migrations through abandoned and active wells: original drilling, development and completion, operations and redevelopment, and abandonment. Many wells and dry holes were drilled during California’s early exploration and field development period, and dry or non-commercial wells were

abandoned. Common practice by some operators in the late 1800s through early 1900s was to abandon wells and dry holes by filling them with construction debris or other items, such as telephone poles or railroad ties, prior to covering them with soil. Many of these wells and dry holes may not have been plugged, as they would be today. Current requirements developed since the 1950s provide more stringent standards. Old dry holes and non-commercial wells have a high potential to provide migration pathways.

Early in California's oil and gas development history (late 1800s and early 1900s), non-commercial wells or dry holes were abandoned without proper documentation. Some of these abandoned dry holes and wells were not recorded by the original drillers or DOGGR and their existence is not documented on any maps or in DOGGR files. Based on development history in the Wild Goose area, beginning in the 1950s, the potential existence of unknown and undocumented abandoned holes is considered very low. Impacts associated with undocumented dry holes are not anticipated.

Well construction, redevelopment, and abandonment deficiencies can contribute to gas migration problems. If cement bonds between the casing and surrounding natural formation do not form adequate storage seals, pressurized leakage is possible. Leakage through the annular space between casing and formation can occur under a variety of circumstances: lack of proper seals, inadequate seal or poor cement bonds with bore walls, channels within cement, or deterioration of annular seals over time.

Intermediate gas bearing (non-commercial) zones are present overlying Wild Goose Field. The amount of gas and the pressure within these zones is not known. If these intermediate depth gas zones are under high-pressure, they can create problems for cement annular seals.

During the well completion process, a cement slurry is pumped into the annular space between the hole drilled (rock face) and casing to form a seal. Gas from shallow or intermediate high-pressure zones can enter cement within the annular space during this process. Gas bubbles within the slurry would weaken the cement and compromise seals around the zones. In turn, poor seals could allow fluid migration and enhance corrosion of both casing and cement in these areas. If large volumes of gas enter the annular space, vertical channels within the cement seal can also form. Marlow (1989) discusses the mechanisms contributing to compromised integrity of annular cement seals associated with gas zones. If this shallow to intermediate high-pressure gas situation exists at Wild Goose, it would contribute to the potential for future leaks in wells near sensitive receptors.

Structural integrity of well components and seals is not permanent and eventually deteriorates over time. Both casings and seals are subject to corrosion caused by exposure to chemical attack, high and fluctuating pressures, high temperatures, and earthquakes. Steel casing is susceptible to rusting from saline and "sour" (sulfur compounds) water produced along with oil and gas. Hydrogen sulfide can corrode both steel and cement. Differential earth stresses (e.g., local earthquakes) can affect well integrity, even causing casing to collapse. Any deterioration of well integrity can lead to leaks. Leaking gas has a possible hazardous effect on the health and safety of the environment in the project area. Leaking gas can also create a significant fire hazard to the environment as discussed under Impact 3.7-6.

It is anticipated that corrosion inhibitors would not be needed on the expansion facilities. However, if they are needed, corrosion inhibitor applicators can easily be installed. If used, they would be applied, via small-diameter tubing, directly to the components requiring protection at both the Well Pad Site and the Remote Facility Site.

Although the probability of occurrence is considered low, sensitive receptors located in the general vicinity of abandoned wells could be subjected to a potential risk of fire or explosion if gas from leaking wells accumulated inside structures. The Tule Goose Gun Club is located in the vicinity (east) of several abandoned wells, and could be subject to subsurface gas migration if one or more of the area wells develop leaks. In addition, the Hangtown Gun Club is less than one-quarter mile from an old abandoned dry hole (Quigley 1-17). Any future development in the vicinity of abandoned wells would increase the potential for this risk.

Abandoned Wells and Dry Holes

WGSJ collected and evaluated all available data for the abandoned wells and dry holes in the field area. These data included well files, drilling records, plugging and abandonment documentation, and down-hole wireline geophysical logs. WGSJ (2001a) prepared a summary report for these wells and dry holes. This report and these well data were also independently reviewed.

During routine testing, a small amount of gas was detected in one abandoned well (Brady #1-20). This abandoned well is located within the L-4 reservoir zone currently used for gas storage (see Figure 3.7-1). No additional testing was conducted to determine the source or origin, and no remedial actions were implemented to reseal (re-abandon) the well.

In October and December 2001, well WGGU1 #1-17 (gas well drilled 1951, abandoned 1993) was inspected after flooding of the wetland. Gas bubbles were observed, but the source of these bubbles was not determined. It was suspected that bubbles resulted from decomposing organic matter from agricultural (cattle grazing) during the previous summer.

The Brady #1-20 (gas well drilled 1958, abandoned 1970) is within the L-4 zone in current use, as well as the U-1 and U-2 zones. It lies beyond the estimated boundary of the L-1 zone. The Quigley #1-17 (dry hole drilled and abandoned 1952) is within the projected U-1 and U-2 zone boundaries.

Brady #1-20. Documentation for the Brady #1-20 indicates a gas leak was detected. Well records and documentation are incomplete; therefore, it is not known if the source of this leak was determined. If this well is leaking storage gas, the possibility exists for gas reaching the surface. Any accumulation of gas inside a building or structure would represent a fire or explosion hazard and be considered a potential significant adverse impact.

Mitigation Measure 3.7-3. The Brady #1-20 shall be inspected and tested immediately to ascertain its condition. This well shall be located and soil surrounding it excavated to expose the well casing. An attempt should be made to tap (drill a small hole) the plate welded onto the casing, and test for gas. If gas were present, a sample would be extracted and collected for further analysis. Depending on gas origin, if present, appropriate remedial actions (re-abandonment) would be implemented. Routine inspection, monitoring and testing of this well would continue for the duration of the gas storage operation. WGSJ shall prepare a report of investigation and remedial actions taken. This report shall be

submitted to the CPUC and DOGGR prior to initiating gas storage activities in additional storage zones. Annual inspection of this abandoned well would be included as part of the WGSi inspection program. Annual reports would be submitted to CPUC and DOGGR upon inspection completion. With these immediate (inspection, testing and remediation) and on-going (annual inspection) mitigation measures, potential impacts associated with leaks from the Brady #1-20 would be less than significant.

It is not known if near-surface gas conditions, related to leaking wells, are present in the soil overlying Wild Goose Field. If gas from leaking wells is present, a potentially significant impact may exist depending upon gas source, concentrations present, and location relative to sensitive receptors. If storage gas migrates through abandoned wells and accumulates inside buildings or structures, the risk of fire or explosion exists. This represents a potentially significant adverse impact if subsurface gas migration is occurring. If subsurface gases were not present, then no associated impact would be present. The following measure would reduce this impact to less than significant:

Mitigation Measure 3.7-4. Prior to initiating new gas storage operations, WGSi shall conduct a soil-gas survey in the vicinity around each abandoned well within the storage zone boundaries to define current shallow subsurface gas conditions and document that storage gas is not currently leaking. If soil-gas is detected, samples should be collected for laboratory analysis. Samples would be analyzed to determine if any natural gas collected is of biogenic, thermogenic or storage zone origin. All testing and sampling plans would be submitted to CPUC for review and approval by a qualified member of the technical team (Registered Geologist with appropriate background evaluating soil-gas). If wells are found to be leaking, the leaking well would be remediated in consultation with CPUC and DOGGR.

Level of Significance Without Mitigation. As abandoned wells age, some structural integrity is lost. As casing, annular seals or cement plugs deteriorate, storage gas in the reservoir may migrate through these man-made vertical conduits. The greatest potential for leakage is during and immediately following an injection cycle. Vertical migration of storage gas would represent a potentially significant impact if it accumulated inside a building or structure.

Mitigation Measure 3.7-5. At the end of each injection cycle, WGSi shall conduct well inspections, testing and leak surveys for each abandoned well in the field. If gas is detected, samples should be collected and analyzed to determine its source or origin. Necessary remedial actions would be implemented to address the leak. All testing and sampling plans would be submitted to CPUC and DOGGR for review and approval by a qualified member of the technical team (Registered Geologist with appropriate background evaluating soil-gas).

Level of Significance Without Mitigation. Since abandoned wells deteriorate with time, future gas leaks may develop. If future new buildings or structures are present in the immediate vicinity of a leak, gas could possibly collect inside. This would lead to the risk of fire or explosion, representing a potentially significant adverse impact.

Mitigation Measure 3.7-6. In addition to regularly scheduled well tests, WGSi shall test any well if other indicators or leaks are present (gas bubbles, distressed vegetation) in the immediate well vicinity. WGSi would submit all well test and repair records to DOGGR, CPUC and Butte County. Any well leaks detected would be reported immediately to these agencies. With DOGGR oversight, WGSi would implement appropriate remedial actions to repair detected leaks.

With mitigation, this impact would be less than significant.

The exact location of some wells is not known; therefore, these wells cannot be readily inspected or tested. If a leak developed in one of these wells, a potential adverse impact may occur. Following initial abandonment of Wild Goose Field wells, the tops of some well casings were cut off at a level below ground surface and the locations were buried. As a result, the exact locations of a few old field wells are not marked at the surface and routine surveys cannot test these locations.

WGSJ Mitigation Measure 3.7-1. WGSJ would initiate a program to locate each previously abandoned and documented well in the field and place permanent markers at these locations.

Mitigation Measure 3.7-7. WGSJ shall locate each abandoned well within the field and immediate vicinity, and place permanent markers over each one. WGSJ would accurately survey and record these locations, submitting plans and maps to DOGGR, CPUC and Butte County. All markers would be maintained so they are clearly visible at all times during the duration of storage field activities and upon final field decommissioning.

This impact would be less than significant with mitigation implementation.

Impact 3.7-3: Potential to emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.

There are no private or public schools located within one-quarter mile of any of the proposed project construction or operation areas; therefore, no impact would occur.

Impact 3.7-4: Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment.

None of the project construction or operation locations would be located on a site that is included on a list of hazardous materials compiled pursuant to Government Code Section 65962.5. The proposed project therefore would not create an impact to the public or the environment through siting on a listed hazardous material site.

Impact 3.7-5: Potential for the project to result in a safety hazard for people residing or working in the project area based on a proposed location near an airport.

The proposed pipeline would be located adjacent to two private airstrips. The first airstrip is located in Butte County on a parcel of land owned by Kirk T. Jensen (Trustee). The second airstrip is located in Colusa County on a parcel of land owned by GVL Partners.

Construction contractors would implement their own safety programs, including periodic "tailgate" safety refresher sessions. The WGSJ construction project manager and construction inspectors would monitor construction activities to ensure that work is conducted in a safe manner.

Subject to the terms of road encroachment permits, pipeline construction activities at road crossings would employ appropriate signage and traffic control. Steel plates would be installed over the trench if it must be left open overnight in areas where traffic might be expected. Construction traffic crossing public roads along the ROW would be controlled as required by the circumstances or applicable encroachment permits.

According to WGSJ standard operating procedures as part of the proposed project, construction activities in the vicinity of the two private airstrips along the pipeline route would be coordinated with the users/owners of those strips. This would ensure that the construction activities do not represent a hazard to the use of these airstrips.

Impact 3.7-6: Potential to expose people or structures to a significant risk of fire or explosion.

The project is located within an area where existing land use or reasonably expected land use (within approximately one-eighth mile of the Line 400/401 Connection Pipeline, the Storage Loop Pipeline, or other project components) may expose people or structures to a significant risk of fire or explosion. There are currently ten residences or structures within one-eighth mile (660 feet) of the proposed pipeline or other project facilities.

Natural Gas Storage Fields. Natural gas has been detected at the surface overlying other natural gas storage fields, as well as areas overlying oil fields. Surface gases can originate from biogenic, thermogenic, or storage sources, or a combination of these sources. Gas may reach the surface through various natural, man-made, or combination migration pathways. If migrating natural gas reaches the surface and accumulates inside buildings, the risk of fire and explosion exists.

Fires at operational natural gas storage facilities are very rare. Storage providers wish to protect not only workers and the public, but their substantial investment as well. In January 2001, the Yaggy underground natural gas storage facility in Hutchinson Kansas leaked, allowing storage gas to escape and migrate into an aquifer. Storage gas reached the surface through abandoned water wells, sparking fires and explosions that injured several and resulted in one fatality. The Yaggy facility utilizes man-made salt caverns only 600 feet below the surface.

In contrast to Yaggy, Wild Goose Storage Field is over 2,500 feet below the surface. It is within a naturally occurring dome that previously contained natural gas. Both primary and secondary seals (shale intervals) are present overlying the WGSJ storage zones. These geologic features are described in the Geologic Appendix I. With the presence of multiple seals, geologic conditions at Wild Goose Field would not be expected to result in fires or explosions because potential vertical gas movement through natural migration pathways is unlikely.

Possible shallow subsurface gas conditions overlying the Wild Goose Field have not been fully characterized. Three types of subsurface gas may be present within geologic and soil units underlying the Project area: (1) processed natural gas (storage gas), (2) biogenic (or swamp) gas, and (3) thermogenic (field) gas. Biogenic gas is primarily methane with carbon dioxide and sulfide gases resulting from decomposition of organic material from local agricultural uses, natural organic material in marsh areas, or other similar sources.

Analyses of specific cap rock intervals overlying proposed storage zones were conducted. The probability of these rocks allowing vertical gas migration is considered very low (Advanced Geotechnology 2001; Apex 2002). Even if some vertical gas migration from the storage zone occurred, additional moderately to very thick shale (confining layers) units that would trap vertically migrating gas are present in shallower horizons. Therefore, no adverse gas migration impacts are anticipated. Existing, limited data may not reflect actual conditions across the field. If the data are not representative, then a potential hazardous condition might exist.

If storage gas reached the fault zone along the southern field boundary and migrated upward, a potentially significant adverse impact would exist if the leaking gas was in proximity to buildings or residences. Depending on the exact subsurface fault location and orientation, sensitive receptors may be located in the vicinity of this fault zone's projected trend. WGSJ plans on operating the field so that storage gas does not reach the area where this fault or potentially fractured area may possibly intersect reservoir rocks. By preventing storage gas from reaching this fault location, a factor of safety is maintained and potential adverse impact would be prevented.

The reservoir model used to predict gas migration are based on limited data and may not accurately represent actual condition. In addition, the exact fault location has not been determined. As such, it is impossible to guarantee that storage gas could not reach the fault zone. If storage gas reached this fault or fracture zone and migrated upward, sensitive receptors located along the projected fault trend could be exposed to leaking storage gas.

Faults were discussed in the Section 3.6, Geology and Appendix I of this document. If storage gas reaches the faulted (possibly fractured) area on the southern side of the Wild Goose gas storage field, the potential for vertical gas migration increases. Vertical migration of storage gas in the vicinity of sensitive receptors would represent a potentially significant impact if leaking gas reached the surface and accumulated inside area buildings.

Level of Significance Without Mitigation. Without further testing and defined remediation implemented as mitigation, a potentially significant adverse impact could occur.

Mitigation Measure 3.7-8. During periodic well testing and leak surveys, evaluate the area overlying the documented faults along the southern field boundary. This will require installation of at least three permanent soil gas probes. Each probe would be monitored during routine leak surveys. If gas were detected in these probes, samples would be collected and analyzed to determine gas origin. All testing and sampling plans, along with probe design and installation procedures, will be submitted to a qualified member of the CPUC.

If storage gas is found leaking through the fault or fracture zone along the southern side of Wild Goose Field, storage activities would be reduced to restrict the volume of gas stored in the field until further investigations are conducted. New data from exploratory wells could be required in order to redefine storage reservoir boundaries near the fault or fracture zone area. Based on this new data and revised reservoir boundary conditions, allowable storage volumes would be reduced to prevent storage gas from reaching the fault zone and maintain an appropriate level of safety. All studies and remedial actions would be conducted under the supervision of DOGGR and CPUC technical staff (California Registered Geologist) with the appropriate background to evaluate gas migration through fault or fracture zones.

Qualitative Assessment of Risk to Existing Residences from a Natural Gas Release.

Each of the proposed project components would be associated with the transportation or storage of natural gas under high pressures. If natural gas were to leak, there could be a range of results relative to the impacts of people and structures. These results of an unplanned gas release could range from gas harmlessly rising vertically into the atmosphere to gas being directed laterally in the air, or collecting in porous soil, and

igniting. The negative outcomes may well have a very low probability of occurrence. Kleinfelder (2001e, Appendix A) suggests an annual probability of 2.2×10^{-6} to 4.4×10^{-6} , for thermal radiation of gas cloud ignition events, respectively. These events have a low annual probability of occurrence, but the impacts are potentially very serious. The objective of this section is to provide a qualitative assessment of the relative risk to nearby receptors (in this case existing residences) for each project component. To establish relative risk the distances from the various components to individual residences were determined. A relative risk was assigned to distances based on the Office of Pipeline Safety location classes discussed above, which regulates pipeline factors of safety out to a distance of 660-feet. Based on other consequence analyses results, it is felt that beyond about 2000-feet the chance of severe impacts to people and structures is very small.

The data on existing residences was sorted to find the number of residences in the three established risk zones (zero to 660 feet, 661-2000 feet, and >2000) for each component. These are termed most, intermediate, and least risk. Table 3.7-1 shows the number of residences in each zone for each component.

Table 3.7-1: Relative Risk from an Unplanned Natural Gas Release

Project Component	Qualitative Level of Risk for Existing Residences		
	Most (Zero – 660 ft)	Intermediate (660- 2000 ft)	Least (>2000 ft)
Delevan Interconnect	0	0	91
Remote Facility	0	0	91
Well Pad Site	0	2	89
Storage Loop Pipeline	2	1	88
Line 400/401 Connection Pipeline (Preferred Central Alignment)	8	6	77

SOURCE: MHA 2002 and WGSi 2001 based on data in Appendix L.

Line 400/401 Connection and Storage Loop Pipelines.

A properly designed and constructed natural gas pipeline in a stable geologic environment and isolated from human intervention has an extremely low risk of failure that would lead to a loss of gas. Geologic forces, such as earthquakes, liquefaction, and lateral spreading landslides are potentially significant, although low probability, events that could be expected to damage the pipeline. This damage may not initially lead to a loss of gas, but may wrinkle the pipeline setting up weak locations that may be susceptible to a loss of gas in subsequent less severe events. Human intrusion, such as backhoe excavation or deep ripping farming activity, would be the most likely causes of pipeline damage. Depending upon the situation, damage could lead to loss of gas as in the 1997 incident north of Colusa.

The minimum standards for natural gas pipeline design and operation specified by Title 49, Part 192 of the Code of Federal Regulations (Office of the Federal Register, 1990 and 1998), essentially set the minimum design pressure requirements for steel pipe. The

criteria also insure that pipes are designed with sufficient wall thickness or are installed with adequate protection to “withstand anticipated external pressures and loads that would be imposed on the pipe after installation.” A critical element in this design formula is the “design factor.” This factor states that based on class location, the design pressure would be increased by a certain level to provide an additional factor of safety for that pipeline. The State regulations require more stringent procedures for monitoring leaks and insuring the long-term integrity of these pipelines.

Another regulatory issue that may affect the design and operation of this pipeline is the Pipeline Safety Act of 1992 (U.S. Congress 1992). This act calls for the identification of all transmission pipeline facilities in high-density population areas and increases the inspection requirements for them.

The Line 400/401 Connection Pipeline would be designed for a maximum operating pressure (MAOP) of 1,200 pounds per square inch gauge (psig). Sectionalizing block valve(s) would be installed, consistent with the federal safety requirements. Each valve station would consist of aboveground valves, a pipe vent to de-pressurize the pipeline (if needed for emergency situations or for periodic maintenance), and site security lighting.

The proposed Storage Loop Pipeline would consist of a maximum 24-inch-diameter bi-directional natural gas pipeline and a fiber optic cable placed in the same trench. A 90-foot-wide ROW would be utilized along the entire pipeline length. The pipeline loop would be installed approximately 10 feet from the existing pipeline, within the same easement, except along the county road where the pipeline loop would be installed along the southern edge of the private rice fields. Concrete weights or other acceptable measures would be utilized to counteract buoyancy resulting from the high groundwater in the area. The tops of the saddle weights would be about one foot above the pipe. The depth of the pipeline would provide up to 5 feet of cover above the saddle weights in rice fields, and 6 feet of cover elsewhere (WGSJ 2001).

The area that would be most likely to be damaged due to geologic forces is within about one-quarter mile each side of the Sacramento River crossing because of a combination of possible permanent ground displacement events (liquefaction, lateral spread landslides, fault rupture or uplift, river bed incision, surface slumps). Buoyant uplift of the pipeline is possible where shallow groundwater exists, which is along much of the pipeline route, in particular in the Butte Sink area. Non-geologic causes of damage would be most likely in public areas where backhoe excavation could occur and in farming areas where deep ripping associated with soil improvement would take place. Because the pipeline would be modern, well-designed, and equipped with cathodic protection, it is very unlikely that the pipeline would fail from corrosion or poor workmanship.

For the purposes of evaluating the risk of pipeline failure, sensitive receptors would be future residents along the pipeline route within 220 yards of the pipeline easement. Sensitive receptors could be exposed to various risks associated with failure of a nearby natural gas pipeline.

Sensitive Receptors. Sensitive receptors are locations with concentrations of people that could be exposed to risks associated with project components. The receptors include schools, hospitals, residences, and other building structures. Sensitive receptors associated with the proposed project are primarily residences and some hunting lodges. Currently,

no schools, hospitals, churches or other potential high-occupancy buildings are located near any project components.

There several residential parcels along the pipeline corridor. Of these, eight are within less than 660 feet of the proposed pipeline route. Two residences are immediately adjacent to the proposed Line 400/401 Connection Pipeline route. The Tule Goose Gun Club is located about 200 feet west of the Storage Loop Pipeline. These sensitive receptors are listed in Appendix L. A complete list of residential parcels and distances to proposed and alternative pipeline routes is provided in Appendix L.

In the Wild Goose Field area, there are six sensitive receptors: five gun club lodges (four with residences) and one residence. These sensitive receptors are listed below in Table 3.7-2. Of the five gun club lodges, only one (Tule Goose Gun Club) directly overlies the field. None of the sensitive receptors are immediately adjacent to the Remote Facility, Well Pad Site or other surface equipment locations. The nearest residence to the Remote Facility is approximately 4,000 feet east. Receptors near the Well Pad Site from approximately 1,700 to 4,400 feet north (gun clubs) of the well pad, and about 2,400 feet south (residence) of the pad. Distances from sensitive receptors to specific storage reservoir outlines and the Well Pad Site are summarized in Table 3.7-2.

Table 3.7-2: Sensitive Receptors Located Near Storage Field Facilities

Residence (# corresponds to residences in Figures 3.9-1a and 5-1a)	Name	Distance to Well Pad Site in feet	Distance to Wild Goose Field Natural Gas Reservoirs
26	Tule Goose Gun Club	1,700 northeast	Lies within the L1 reservoir boundary
27	Oroville Hunt Club	4,400 north	Approximately 770 ft north of the U1 reservoir boundary
28	Hangtown Gun Club	3,800 north	Approximately 150 feet north of the U1 reservoir boundary
34	White Mallard Hunting Club		Approximately 2,700 west of U1 boundary
81	residence	2,000 south	
no number	Wild Goose Country Club (no residence)		Approximately 3,200 feet south of U1 boundary

SOURCE: MHA from WGS maps 2001

Level of Significance Without Mitigation. The Applicant has indicated that the pipeline “would be designed, manufactured, installed, and operated in accordance with the applicable specifications, standards, and regulations established by the industry and state and federal government”. There are no industry-wide design standards that address unique conditions associated with geologic instability, such as liquefaction, lateral spread landslides, fault rupture or uplift, riverbed incision, surface slumps. Without special design consideration, and possibly additional design measures, there could be a

potentially significant impact to existing and future populations adjacent to the pipeline due to the geologic and earthquake hazards described.

The burial depth for the pipeline in agricultural areas where deep ripping (plowing) may occur should be such that the likelihood of damage from deep ripping would be minimal. The Applicant proposes to have 3 to 5 feet of cover over the pipelines. The Applicant (WGSJ 2001) also suggests that:

“Lowering of a natural gas pipeline may be required where there is insufficient cover to safely protect the pipe from agricultural plowing and ripping. This typically occurs in agricultural areas when fields are leveled to improve irrigation. While WGSJ installed the existing storage pipeline, and is proposing to install the Line 400/401 Connection Pipeline and Storage Loop Pipeline with a minimum of five feet of cover to compensate for agricultural plowing and ripping practices, it may be necessary to lower the line where fields have not yet been leveled or have been re-leveled. This activity involves exposing a sufficient length of pipe, excavating a deeper trench under the supported pipe, and lowering the pipe into position. The pipe may also be re-coated while it is exposed. The activity requires the standard ROW previously described, and the pipe remains in operation during the work.”

The process for making the determination of “where fields have not yet been leveled or have been re-leveled” and the construction process are not clear. It appears that there is a potential for areas not to be identified before an inadvertent deep ripping event damages the pipeline. Therefore, without special design consideration for these deep ripping events before original construction, and possibly additional design measures, there is a potentially significant impact to existing and future populations adjacent to the pipeline due to the possible deep ripping over the pipelines.

To account for the geologic permanent ground displacement potential, certain specific analyses are being requested below. Based on these determinations, the design shall include the following mitigation:

Mitigation measure 3.7-9. The standard “monitored and maintained” seismic design approach would accept significant levels of plastic pipe strain for low probability design events and utilize post-earthquake review and inspection to identify locations where permanent ground displacement-induced (PGD-induced) damage may have occurred. Considering this approach, the Applicant shall prepare (prior to final project approval) a post-earthquake monitoring plan in which an accurate “as-built” base line of the pipeline geometry at/near know seismic hazards will be clearly identified. This plan shall become part of the existing Emergency Plan and will allow rapid response to the most probable damage areas in the event of a severe earthquake.

Mitigation Measure 3.7-10. All of the measures of pipe demand and capacity considered in Appendix A of the Kleinfelder report (2001e) are based on the failure condition (i.e., the loss of pressure integrity limit state). The loss of pressure integrity condition occurs in the post wrinkling condition, i.e., well beyond the peak in the moment curvature diagram. As the wrinkle forms, the moment capacity decreases with increasing curvature. Pipe curvature tends to concentrate in the wrinkle (sometimes referred to as “hinging”) while the pipe on either side of the wrinkle tends to straighten and unload elastically. It is not necessary to account for hinging action in demand-capacity assessments that are limited to consideration of the incipient wrinkling limit state. This is because the concentration of

curvature is still relatively limited. For all pipe deformation demand-capacity assessments, which make use of post-wrinkling demand-capacity measures, the Applicant shall account for the concentration of curvature at the wrinkle, because demand analyses, which do not include this hinging behavior, can significantly underestimate the pipe strain demand. The CPUC shall review and approve the analysis methodology in advance of its application to the final design.

Mitigation Measure 3.7-11. In addition to the seismic demand required to reach the loss of pressure integrity limit state, for all of the PGD analyses the Applicant shall incorporate into their final design different “damage” limit states (e.g., incipient wrinkling) that can occur well before the failure limit state is reached. The CPUC shall review and approve the analysis methodology in advance of its application to the final design.

Mitigation Measure 3.7-12. The PGD demand analyses for PGD parallel to and perpendicular to the pipe alignment discussed in Appendix A of the Kleinfelder report (2001e) are based on simplified hand or spreadsheet calculations methods. The Applicant shall utilize a rigorous analysis and design approach, nonlinear pipe-soil interaction analysis, for evaluating PGD effects for all but the simplest cases. The CPUC shall review and approve the analysis methodology in advance of its application to the final design.

Mitigation Measure 3.7-13. Further analysis by the Applicant of generic perpendicular PGD scenarios shall consider a range of soil block lengths (i.e., span lengths) rather than a single span length. The critical span length shall be considered the soil block length that generates the largest strain for given amplitude of a selected PGD profile.

Mitigation Measure 3.7-14. The Applicant shall provide a more formal limit states seismic design for the final pipeline design to the CPUC prior to final design. The framework of such a procedure shall include: identification of ultimate and serviceability limit states, application of appropriate load (demand) factors and load combinations, application of appropriate resistance (capacity) factors, structural analysis to calculate pipe deformation demand, and a demand-capacity comparison for each limit state of interest.

Impact 3.7-7: Potential to impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan

WGSJ (2000) has in place an Emergency Response Plan for the existing storage field, Remote Facility, Well Pad Site, and pipelines. The plan specifies the responsibilities of the various WGSJ personnel and indicates the notifications that are necessary for the three levels of emergency categories. This plan would cover the proposed project. The proposed project would not interfere with implementation of or physically interfere with an adopted emergency response or evacuation plan. Emergency road access will be coordinated with the local Emergency Service Providers as part of the project conditions. The Transportation Management Plan would be updated to include the procedures for coordination with the fire departments, public works departments, sheriff departments, paramedics, and California Highway Patrol if required. Additional detail on this measure is in Section 3.14, Transportation.

The existing Emergency Response Plan relies on the training of the responsible personnel, and upon the knowledge and cooperation of the local agencies that would be required to respond in case of an emergency. Pages 40 through 43 of 43 of the plan describe that a) new employees would be familiarized with the plan, b) periodic communication would take place with Emergency Services Providers, and c) the public would be part of a continuing education program including periodic contact with property owners. As previously stated, the current Wild Goose Emergency Response Plan is available upon request from the CPUC Energy Division. The generally comprehensive plan lacks

specificity with regard to the re-training of existing employees, and the frequency of contact with Emergency Services Providers and property owners.

Level of Significance Without Mitigation. Without the proper training and indoctrination to ensure effective interaction of all responsible parties in the Plan, there could be a potentially significant impact if an accident were to occur.

Mitigation Measure 3.7-15. The Applicant shall update the existing Emergency Response Plan to reflect the new project components and operations. The updated plan shall also include specific dates and frequencies with regard to the re-training of existing employees, and the contact with Emergency Services Providers and property owners about the Plan. The update shall indicate the nature and extent of the proper training and indoctrination to ensure effective interaction of all responsible parties in the Plan if an accident were to occur.