D.6 Hazardous Materials, Public Health and Safety

This section evaluates the potential hazards to public and worker health and safety associated with the Proposed Project and alternatives. Section D.6.1 describes the environmental setting and Section D.6.2 describes the regulatory conditions related to hazardous materials and wastes associated with the Proposed Project. Section D.6.3 includes an analysis and discussion of environmental contamination and hazardous materials impacts resulting from the Proposed Project as well as mitigation for these impacts. Section D.6.4 presents impact analysis for the project alternatives. Section D.6.5 presents the mitigation monitoring program for hazardous materials, public health and safety. Section D.6.6 lists the references cited in this section.

D.6.1 Environmental Setting for the Proposed Project

This section identifies known hazardous waste contamination sites in the study area for the Proposed Project. The primary reason to define potentially hazardous sites is to protect worker health and safety and to eliminate or minimize public exposure to hazardous materials during construction of the SNGS Facility and waste handling. Contaminated soil may qualify as hazardous waste, thus requiring handling and disposal according to local, state, and federal regulations. Information on known hazardous material sites was collected from the review of several documents, including the Proponent's Environmental Assessment (PEA) (SNGS, LLC 2007a), the addendum to the PEA (2007b), the environmental site assessment prepared for the project (Kleinfelder 2007), and the study conducted for the closure and reuse of the former Sacramento Army Depot (Ebasco Environmental 1992). The Army has constructed a number of monitoring and remediation- wells in the Depot Park area. This section also discusses the past uses of the project area for gas extraction and the history of the Florin Gas Field.

D.6.1.1 Overview

The Proposed Project study area encompasses a variety of land uses, including industrial, residential, commercial businesses, educational facilities, recreation, agricultural, and open space. Existing and past land use activities are potential indicators of hazardous material storage and use. For example, many industrial sites, historic and current, are known to have soil or groundwater contamination by hazardous substances. Other hazardous materials sources include leaking underground storage tanks (LUSTs), surface runoff from contaminated sites, and migration of contaminated groundwater plumes. A number of potentially contaminated soil and/or groundwater sites have been identified within the vicinity of the wellhead and compressor station and underground project study area. In addition, the former Sacramento Army Depot ~~have~~has ~~contamination~~contaminated groundwater with ~~TEC~~TCE and other pollutants.

Existing Sources of Release of Hazardous or Toxic Materials

City of Sacramento

There are a number of sources for the release of toxic or hazardous materials within the Proposed Project area. The Southern Pacific Railroad is located in the northern portion of the study area near the proposed pipeline alignment. Although specific records are not available for this portion of the railway, railroads in general carry a wide range of hazardous and toxic materials that could result in release of toxic gases and liquids, or result in fire or explosion. These hazardous and toxic materials could include fuels; solvents; oxidizers; caustic materials; and hazardous gases such as chlorine gas, propane, or butane. A derailment of one or more of these rail cars containing these types of substances and a resulting spill or release could affect areas in proximity of the Proposed Project. The effect would depend upon the location, type of material, and extent of the spill.

Trucks travel on the roadways within the project area. These trucks could also carry hazardous and toxic materials including fuels, gases, oxidants, and other hazardous materials. The type and quantities of materials vary.

Two large-diameter pipelines, one maintained by the Sacramento Municipal Utilities District (SMUD) and the other by Pacific Gas and Electric (PG&E), are located along Fruitridge Road. A pipeline leak or rupture due to operator error, physical damage, or pipeline failure would impact areas in the vicinity of the release.

The area also contains a number of businesses that store or use toxic or hazardous materials. These uses range from salvage yards to manufacturing plants to warehouses. There is a potential that these types of facilities could release toxic or hazardous materials.

Characteristics of the Former Florin Gas Field

The Florin Gas Field was discovered by the Union Oil Company through the drilling of the Florin #1 well in 1977 (SNGS, LLC 2007a). A total of eight wells were drilled in the area by Union Oil, Venada National, TXO Production, and Proctor and Gamble. Five of these wells were used as production wells for natural gas only, with no oil produced. No pipelines connected the site to the natural gas distribution grid. Natural gas was either used by local manufacturing plants or the gas was processed into compressed natural gas and transported via truck to other areas. After the wells were depleted, the field was abandoned in 1993 and all wells were plugged and capped, in accordance with Division of Oil, Gas, and Geothermal Resources (DOGGR) regulations (Weatherwax and Weatherwax 2007). Because the gas field has been depressurized and the wells abandoned according to DOGGR standards, there is currently little potential for gas to migrate to the surface or leak through the abandoned wells (see discussion under Impact Haz-2a).

D.6.1.2 Project Components

Wellhead Site

The proposed wellhead site is currently undeveloped. While the site is not listed on any federal, state, or local regulatory database indicating on-site contamination, 20 sites located in the project's vicinity have been identified. One site, the former Sacramento Army Depot, was listed as the potential land use responsible for contaminating the groundwater beneath the Proposed Project site. Currently, the groundwater beneath the Depot site is being treated. Contaminated soils located at the Depot site were excavated and treated and relocated to the southern end of the site. According to the Phase I environmental site assessment (Kleinfelder 2007), past land uses at the wellhead site and parcels in the vicinity were agricultural. This could result in the presence of pesticide and herbicide residues in the area. Historical photographs indicate that a ranch was once located in close proximity to the wellhead site. A portion of a residential septic tank was also identified on site in photographs. The environmental site assessment further revealed that the Purity Oil Sales Company conducted operations south of the wellhead site over 30 years ago. There was no data found concerning past operations of the Purity Oil Sales Company at the site.

Compressor Station

The proposed compressor station would be located within Depot Park, northeast of the wellhead site. According to an environmental site assessment completed for Depot Park, past land uses were found to have contaminated on-site soils and groundwater (Ebasco Environmental 1992). The site is listed on several federal, state, and local regulatory databases including the Environmental Protection Agency's (EPA's) National Priority List (NPL), tThe Resource Conservation and Recovery Act's (RCRA's) Corrective Action System (CORRACTS), the State Priority List (SPL), and the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS). According to the environmental site assessment, all soil contamination has been fully remediated and no further action is required. Groundwater contamination on site and down gradient of the site was being remediated during conduction of the environmental site assessment. The U.S. Army has accepted responsibility for all on-site contamination associated with past activities ~~and any future contamination found~~ within the boundaries of Depot Park. While sites surrounding Depot Park were found on various regulatory databases including the Regional Water Quality Control Board's (RWQCB's) LUST list (2007), the California Solid Waste Information System (SWIS) of solid waste landfills (SWLFs), the environmental site assessment determined that these sites have little potential to impact the compressor station site. Sampling wells and remediation wells are located on and adjacent to this site.

Pipeline Segments 1 and 2

The proposed pipeline parallels but is not within the railroad alignment except where it crosses the track using horizontal directional drilling (HDD). The remainder of the alignment is within City streets or rights-of-way. Portions of the pipeline within Depot Park are near sampling and remediation wells for the Depot Park remediation.

D.6.2 Applicable Regulations, Plans, and Standards

Hazardous materials and wastes are identified and defined by federal and state regulations for the purpose of protecting public health and the environment. Hazardous materials have certain chemical, physical, or infectious properties that cause them to be considered hazardous. Hazardous wastes are defined in the Code of Federal Regulations (CFR) Title 40, Part 20 and also in the California Code of Regulations (CCR), Title 22, Div. 4.5, Chapter 11, Article 1, Section 66261.

D.6.2.1 Federal Regulations

Hazardous Materials

Toxic Substances Control Act of 1976

The Toxic Substances Control Act (TSCA) of 1976 (15 United States Code (USC) 2601 et seq.) was enacted by Congress to give the federal EPA the ability to track the thousands of industrial chemicals being produced or imported to the United States. According to the EPA, industrial chemicals are routinely screened by the EPA and those found to pose a potential health hazard to the environment and/or to human health are reported and tested. Through the TSCA, the EPA has the ability to ban the manufacture and import of those chemicals that pose an immediate risk. The EPA also has the ability to track and control new industry developed chemicals in order to protect the environment and human health from potential risks.

Resource Conservation and Recovery Act of 1976

The Resource Conservation and Recovery Act (RCRA), or Solid Waste Disposal Act (42 USC 6901 et seq.), established a framework for the proper management of hazardous and non-hazardous solid waste. This act, along with the TSCA, enacted a program administered by the EPA for the regulation of the generation, transportation, treatment, storage, and disposal of hazardous waste. The RCRA was amended in 1984 by the Hazardous and Solid Waste Act (HSWA), which affirmed and extended the "cradle to grave" system of regulating hazardous wastes from their creation to disposal. The use of certain techniques for the disposal of some hazardous wastes was specifically prohibited by the HSWA. The RCRA focuses on active and future facilities; it does not address abandoned or historical sites, which are managed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601 et seq.).

Comprehensive Environmental Response, Compensation, and Liability Act

CERCLA (42 USC 9601 et seq.), also commonly known as Superfund, was enacted by Congress on December 11, 1980. This law provided broad federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA established requirements concerning closed and abandoned hazardous waste sites, provided for liability of persons responsible for the release of hazardous waste at these sites, and established a trust fund to provide for cleanup when no responsible party could be identified. The law authorizes two types of responses: short-term removals requiring prompt response and long-term remedial response actions that permanently and significantly reduce serious on-site dangers. CERCLA also enabled the revision of the National Contingency Plan (NCP) (42 USC 9605). The NCP provided guidelines and procedures needed to respond to releases and threatened releases of hazardous substances, pollutants, or contaminants. The NCP also established the NPL, which is a list of contaminated sites warranting further investigation by the EPA. CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA) on October 17, 1986.

Superfund Amendments and Reauthorization Act

CERCLA was amended by SARA in October of 1986. Under SARA Title III, a nationwide emergency planning and response program was established that imposed reporting requirements for businesses that store, handle, or produce significant quantities of hazardous or acutely toxic substances, as defined under federal laws. SARA Title III required each state to implement a comprehensive system to inform federal authorities, local agencies, and the public when a significant quantity of hazardous, acutely toxic substances are stored or handled at a facility. In addition, SARA provided new enforcement and settlement tools, increased the focus on human health problems posed by hazardous waste sites, and stressed the importance of permanent remedies and innovative treatment technologies in cleaning up hazardous waste sites.

EPA Risk Management Program

Ammonia is an example of an acutely hazardous material (AHM) that is regulated by the EPA under the Risk Management Program. Although a federal program, the Risk Management Program is intended to reduce hazards at the local level. The program requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes detailed safety precautions and maintenance plans, and an adequate emergency response program. The information required is intended to help local fire, police, and emergency response personnel (first responders) in the event of an accidental spill or exposure event. The Risk Management Program is contained within the Clean Air Act (42 USC 7401 et seq.).

Occupational Safety and Health Administration Process Safety Management of Highly Hazardous Chemicals

The Process Safety Management of Highly Hazardous Chemicals (HHCs) (29 CFR 110.119) is intended to prevent or minimize the consequences of a catastrophic release of toxic, reactive, flammable, or explosive HHCs by regulating their use, storage, manufacturing, and handling. The standard intends to accomplish its goal by requiring a comprehensive management program integrating technologies, procedures, and management practices. The standard does not apply to gas well drilling and servicing activities.

Department of Transportation Office of Hazardous Materials Safety

Transportation of hazardous materials is regulated by the U.S. Department of Transportation's (DOT's) Office of Hazardous Materials Safety (OHM). OHM formulates, issues, and revises hazardous materials regulations under the federal Hazardous Materials Transportation Law (49 CFR 100–185). These regulations cover hazardous materials definitions and classifications, hazard communications, shipper and carrier operations, training and security requirements, and packaging and container specifications.

The hazardous materials transportation regulations require carriers transporting hazardous materials to receive training in the handling and transportation of hazardous materials. Training requirements include pre-trip safety inspections; use of vehicle controls and equipment, including emergency equipment; procedures for safe operation of the transport vehicle; training on the properties of the hazardous material being transported; and loading and unloading procedures. All drivers must possess a commercial driver's license (49 CFR 383). Vehicles transporting hazardous materials must be properly placarded. In addition, the carrier is responsible for the safe unloading of hazardous materials at the site, and operators must follow specific procedures during unloading to minimize the potential for an accidental release of hazardous materials.

Gas Wells and Pipeline Operations and Safety

Department of Transportation

DOT provides oversight for the country's natural gas pipeline transportation. The DOT responsibilities are promulgated under Title 49, USC Chapter 601. The Pipeline and Hazardous Materials Safety Administration (PHMSA), Office of Pipeline Safety (OPS), administers the national regulatory program to ensure the safe transportation of gas and other hazardous materials by pipeline. Two statutes provide the regulatory framework for the federal pipeline safety program: the Natural Gas Pipeline Safety Act (NGPSA) of 1968 and the Hazardous Liquid Pipeline Safety Act (HLPSA) of 1979 (49 USC 601). These acts are discussed in more detail below.

The federal pipeline regulations are published in Title 49 CFR, Parts 190–199. Section 192.5 specifies pipe class locations and Section 192.101 describes the requirements for steel pipe yield strength, nominal wall thickness, longitudinal joint factor, and other design factors based on pipe class. It should be noted that many of the pipeline regulations discussed in Parts 190–199 are written as performance standards. These regulations set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve the desired result.

In summary, the requirements of federal regulations become more stringent as the human population density increases. Title 49 CFR Part 192 defines area classifications, based on population density in the vicinity of the pipeline and specifies more rigorous safety requirements for more heavily populated areas. In general, pipeline facilities located within more populated areas are required to have a more conservative design. In addition, the DOT requires that operators have certain qualifications to operate gas pipelines. Construction crews are not subject to these qualifications.

Title 49 CFR 192, Subpart O, Pipeline Integrity Management, requires the operators of gas pipeline systems in high consequence areas (HCAs) to significantly increase their minimum required maintenance and inspection efforts. In general, the integrity of pipelines must also be evaluated using an internal inspection device or a direct assessment, as prescribed in regulation. As of December 17, 2004, gas transmission operators of pipelines in HCAs were required to develop and follow a written integrity management program that contained the elements prescribed in 49 CFR 192.911 and address the risks on each covered transmission pipeline segment.

The DOT (68 Federal Register (FR) 69778; 69 FR 18228; 69 FR 29903) defines HCAs as they relate to the different class zones, potential impact circles, or areas containing an identified site as defined in 49 CFR 192.903. The OPS published a series of rules from August 6, 2002, to May 26, 2004 (69 FR 69817; 69 FR 29904), that define HCAs where a gas pipeline accident could do considerable harm to people and their property. This definition satisfies, in part, the congressional mandate in 49 USC 60109 for the OPS to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

Natural Gas Pipeline Safety Act (NGPSA) of 1968

The NGPSA of 1968, as amended through March 2006 (49 USC 601), defines the safety standards for the design, construction, inspection, and initial testing of new natural gas pipeline facilities. These standards include permissible construction materials, location-specific design factors, and safety factors used to prevent (and if necessary) contain a natural gas incident. Additionally, the NGPSA authorizes the DOT to regulate pipeline transportation of natural (flammable, toxic, or corrosive) gas and other gases as well as the transportation and storage of liquefied natural gas (LNG).

Hazardous Liquid Pipeline Safety Act (HLPSA) of 1979

The HLPSA of 1979, as amended, authorizes the DOT to regulate pipeline transportation of hazardous liquids (crude oil, petroleum products, anhydrous ammonia, and carbon dioxide). Both the NGPSA and HLPSA have been recodified as 49 USC Chapter 601.

Pipeline Safety Improvement Act of 2002

The Pipeline Safety Improvement Act of 2002 (49 USC 60129) implemented changes and new requirements in the way that the natural gas industry maintains the safety and integrity of its pipelines. The law applies to natural gas transmission pipeline companies. Central to the law are the requirements it places on each pipeline operator to prepare and implement an “integrity management program,” which, among other things, requires operators to identify HCAs on their systems, conduct risk analyses of these areas, perform baseline integrity assessments of each pipeline segment, and inspect the entire pipeline system according to a prescribed schedule and using prescribed methods. Integrity management programs are submitted to the OPS, Research and Special Projects Administration, DOT. All pipeline segments within HCAs must be inspected and remediation plans (if required) completed by December 17, 2008, while non-HCA segments must be inspected by 2012. All segments must be re-inspected on a 7-year cycle, with certain exceptions. Other provisions of the law included increased penalties for violations of the law and “whistle-blower” protection for pipeline system employees. This law was subsequently enhanced and passed by the 109th Congress in 2006 (referred to as the Pipeline Inspection, Protection, Enforcement and Safety Act of 2006 (HR 5782)).

D.6.2.2 State Regulations

Hazardous Materials

Hazardous Waste Control Law

The California Hazardous Waste Control Law (HWCL) is administered by the California Environmental Protection Agency (CalEPA) to regulate hazardous wastes. While the HWCL is generally more stringent than the RCRA, until the EPA approves the California hazardous waste control program (which is charged with regulating the generation, treatment, storage and disposal of hazardous waste), both the state and federal laws apply in California. The HWCL lists 791 chemicals and approximately 300 common materials that may be hazardous; establishes criteria for identifying, packaging, and labeling hazardous wastes; prescribes management controls; establishes permit requirements for treatment, storage, disposal, and transportation; and identifies some wastes that cannot be disposed of in landfills.

CCR, Title 22, Chapter 11, Article 2, Section 66261 provides the following definition for hazardous waste (22 CCR 11):

> ...a waste that exhibits the characteristics may: (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 or otherwise managed.

According to CCR Title 22, substances having a characteristic of toxicity, ignitability, corrosivity, or reactivity are considered hazardous waste. Hazardous wastes are hazardous substances that no longer have a practical use, such as material that has been abandoned, discarded, spilled, or contaminated or is being stored prior to proper disposal.

Toxic substances may cause short-term or long-lasting health effects, ranging from temporary effects to permanent disability, or death. For example, toxic substances can cause eye or skin irritation, disorientation, headache, nausea, allergic reactions, acute poisoning, chronic illness, or other adverse health effects if human exposure exceeds certain levels (the level depends on the substance involved). Carcinogens (substances known to cause cancer) are a special class of toxic substances. Examples of toxic substances include most heavy metals, pesticides, and benzene (a carcinogenic component of gasoline). Ignitable substances (e.g., gasoline, hexane, and natural gas) are hazardous because of their flammable properties. Corrosive substances (e.g., strong acids and bases such as sulfuric (battery) acid or lye) are chemically active and can damage other materials or cause severe burns upon contact. Reactive substances (e.g., explosives, pressurized canisters, and pure sodium metal, which react violently with water) may cause explosions or generate gases or fumes.

Other types of hazardous materials include radioactive and biohazardous materials. Radioactive materials and wastes contain radioisotopes, which are atoms with unstable nuclei that emit ionizing radiation to increase their stability. Radioactive waste mixed with chemical hazardous waste is referred to as “mixed wastes.” Biohazardous materials and wastes include anything derived from living organisms. They may be contaminated with disease-causing agents, such as bacteria or viruses.

California Accidental Release Prevention Program

Similar to the federal Risk Management Program, the California Accidental Release Prevention Program (CalARP) includes additional state requirements as well as an additional list of regulated substances and thresholds. The regulations of the program are contained in CCR Title 19, Chapter 4.5. The intent of CalARP is to provide first responders with basic information necessary to prevent or mitigate damage to public health, safety, and the environment from the release or threatened release of hazardous materials.

California Department of Transportation and California Highway Patrol

The California Department of Transportation (Caltrans) regulates the transportation of hazardous materials throughout the state. Caltrans requires that drivers transporting hazardous wastes obtain a certificate of driver training that shows the driver has met the minimum requirements concerning the transport of hazardous materials, including proper labeling and marking procedures, loading/ handling processes, incident reporting and emergency procedures, and appropriate driving and parking rules. The California Highway Patrol (CHP) also requires shippers and carriers to complete hazardous materials employee training before transporting hazardous materials.

California Health and Safety Code

In California, the handling and storage of hazardous materials is regulated by Chapter 6.95 of the California Health and Safety Code. Under Sections 25500–25543.3, facilities handling hazardous materials are required to prepare a hazardous materials business plan. The business plan provides information to local emergency response agencies regarding the types and quantities of hazardous materials stored at a facility and provides detailed emergency planning and response procedures in the event of a hazardous materials release. In the event that a facility stores quantities of specific acutely hazardous materials above the thresholds set forth by California code, facilities are also required to prepare a risk management plan and California accidental release plan. The risk management plan and accidental release plan provide information on the potential impact zone of a worst-case release and require plans and programs designed to minimize the probability of a release and mitigate potential impacts.

California Occupational Safety and Health Administration

The California Occupational Safety and Health Administration (Cal/OSHA) is the primary agency responsible for worker safety in the handling and use of chemicals in the work place. Cal/OSHA standards are generally more stringent than federal regulations. The employer is required to monitor worker exposure to listed hazardous substances and notify workers of exposure (8 CCR 337–340). The regulations specify requirements for employee training, availability of safety equipment, accident prevention programs, and hazardous substance exposure warnings.

Gas Wells, Pipelines, and Pipeline Safety

Department of Conservation, Division of Oil, Gas, and Geothermal Resources

The Department of Conservation's DOGGR is responsible for reviewing and regulating the drilling, operation, and maintenance of natural gas wells. Title 14, Division 2, Chapter 4 of CCR provides regulations for the development of natural gas resources throughout the state through standard engineering practice that protects the environment and ensures public safety. Division 3 and several chapters of the Public Resources Code regulate natural gas operations in the state.

California Public Utilities Commission General Order 112-E

State pipeline facilities are under the jurisdiction of the California Public Utilities Commission (CPUC) as a result of their certification by the OPS. The retrieval/storage wells are within the jurisdiction of California's DOGGR. CPUC General Order 112-E provides regulations to ensure adequate services are maintained by gas facilities located within the jurisdiction of the CPUC. The regulations provide the following in relation to public health and safety: minimum requirements for the design, construction, quality of materials, locations, testing, operation and maintenance of facilities used in the gathering, transmission, and distribution of gas and minimum requirements for similar equipment and procedures used in LNG facilities. These requirements are considered adequate for safety for standard conditions encountered within the gas industry.

California Code of Regulations

The construction and operation of natural gas wells are regulated per CCR Title 14, Division 2, Chapter 4, entitled Development, Regulation, and Conservation of Oil and Gas Resources (14 CCR 1712 et seq.). Article 3, entitled Requirements, contains regulations specific to oil and gas field practices, including preparation of an oil spill contingency plan and a blowout prevention and control plan. Section 1724.6, entitled Approval of Underground Injection and Disposal Projects, requires DOGGR approval prior to the beginning of any underground injection project. Section 1724.7, entitled Project Data Requirements, identifies the documents required by DOGGR in order to obtain approval, which includes geologic and engineering studies and an injection plan. Section 1724.9, entitled Gas Storage Projects, requires submittal and approval from DOGGR of the characteristics of the cap rock; calculations of the oil and gas reserves of storage zones prior to injection; a list of proposed surface and subsurface safety devices to ensure safety of the project; and the proposed wastewater disposal method. Similarly, Section 1724.10 contains requirements for underground injection projects, including drilling procedures; a chemical analysis of the injecting product; and data showing that no damage to life, health, property, or natural resources is occurring as a result of the project. CCR Title 14, Division 2, Chapter 4, Subchapter 2, entitled Environmental Protection, sets forth rules and regulations governing DOGGR's environmental protection program (14 CCR 1750 et seq.). Section 1775, entitled~~,~~ Oilfield Wastes and Refuse, regulates the disposal of drilling fluids. Disposals are to be carried out in a manner to avoid impacts to life, health, property, natural resources, and public safety. Chapter 4 also contains provisions for the testing of idle wells that have been out of continuous service for more than 5 years.

D.6.2.3 Local Regulations

Hazardous Materials

Sacramento County Environmental Management Department

The Hazardous Materials Division of the Sacramento County Environmental Management Department is responsible for the implementation of six statewide environmental programs for Sacramento, including underground storage tanks, CalARP, hazardous waste generators and hazardous waste on-site treatment, and the Uniform Fire Code hazardous materials management plan and inventories. This division also regulates the use of hazardous materials through the issuance of permits, monitoring of regulatory compliance, and other enforcement processes. This division also helps oversee local remediation efforts at contaminated sites. The Pproposed Pproject must conform to the rRequirements in CalARP.

Sacramento County Department of General Services, Emergency Operations Division

The Emergency Operations Division has the responsibility for overall planning, coordination, and implementation of emergency and disaster plans for the unincorporated areas of the County of Sacramento. This division is also responsible for the hazardous materials incident response plan. This plan contains current information for all responding agencies (i.e., fire, law enforcement, and development services).

City of Sacramento General Plan

The City of Sacramento has identified several goals and policies concerning hazards and hazardous materials in the city. Those that are relevant to the Proposed Project are discussed below and can be found in the Public Health and Safety Element of the City of Sacramento's General Plan (19882009).

Goal APHS 3.1 **Reduce Exposure to Hazardous Materials and Waste..** Protect and maintain the safety of residents, businesses, and visitors by reducing, and where possible, eliminating exposure to hazardous materials and waste. Provide for the health and safety of the citizens of Sacramento and for the protection of the environment by reducing, and where possible, eliminating, exposure to hazardous materials and waste.

Policy PHS 3.1.11 **Investigate Sites for Contaminiation.** The City shall ensure buildings and sites are investigated for the presence of hazardous materials and/or waste contamination before development for which City discretionary approval is required. The City shall ensure appropriate measures are taken to protect the health and safety of all possible users and adjacent properties. Work with the

~~county, state, federal agencies and responsible parties to identify, contain, and clean up sites that contain hazardous materials.~~

Policy PHS 3.1.2 **Hazardous Material Management Plan.** The City shall require that property owners of known contaminated sites work with Sacramento County, the s~~S~~tate, and/or f~~F~~ederal agencies to develop and implement a plan to investigate and manage sites that contain of have the potential to contain hazardous materials contamination that may present an adverse human health or environmental risk.

Policy PHS 3.1.4 **Transportation Routes.** The City shall restrict transport of hazardous materials within Sacramento to designated routes.

Policy PHS 3.1.6 **Compatibility with Hazardous Materials Facilities.** The City shall ensure that future development of treatment, storage, or disposal facilities is consistent with the County's Hazardous Waste Management Plan, and that land uses near these facilities, or proposed sites for the storage or use of hazardous materials, are compatible with their operation.

County of Sacramento General Plan

The County of Sacramento has identified several goals and policies concerning hazards and hazardous materials in the county. Those that are relevant to the Proposed Project are discussed below and can be found in the Hazardous Materials Element of the General Plan (1993).

Policy HM-1 Work with industry, community groups, and government agencies to develop effective, workable, and equitable hazardous materials regulations and provide information to the general public and interested parties on technical and administrative developments in the field of hazardous materials management.

PHS Goal Protect the residents of Sacramento County from the effects of a hazardous materials incident via the implementation of various health and safety programs.

Policy HM-4 The handling, storage, and transport of hazardous materials shall be conducted in a manner so as to not compromise public health and safety standards.

Policy HM-6 Strongly encourage federal and state agencies to accelerate their efforts to evaluate human health impacts and establish legally enforceable standards for hazardous materials.

Policy HM-7 Encourage the implementation of workplace safety programs and to the best extent possible ensure that residents that live adjacent to industrial and commercial facilities are protected from accidents and the mishandling of hazardous materials.

Policy HM-10 Reduce the occurrences of hazardous materials accidents and the subsequent need for incident response by developing and implementing effective prevention strategies.

Policy HM-13 Develop and implement a comprehensive hazardous materials management program and permit process for all applicable county agencies. The program and permitting process should be devoid of overlap and shall be consistent with the Goals and Policies of this Hazardous Materials Element to the best extent possible under existing laws and regulations.

Policy HM-14 Support local enforcement of hazardous materials regulations.

Wells, Pipelines, and Pipeline Safety

Sacramento Metropolitan Fire District Hazardous Materials Response Team

The Sacramento Metropolitan Fire District Hazardous Materials Response Team (SMFD HMRT) was established in 2003 to provide an organized, integrated, and effective response to hazardous materials incidents. The SMFD HMRT provides coordination and technical services to ensure the safety of the community and protect the environment and property in response to hazardous materials releases. The SMFD HMRT provides recommendations and assistance in the areas of isolation, notification, identification, hazard assessment, protective actions, containment, and mitigation. Additionally, SMFD HMRT provides technical and reference material support for proper handling of hazardous materials and cleanup recommendations upon request to assist in such actions.

D.6.3 Environmental Impacts and Mitigation Measures for the Proposed Project

D.6.3.1 Definition and Use of Significance Criteria

For this section, the following are used as criteria for determining the significance of an impact and are based on standards of significance established in Appendix G of the CEQA Guidelines (14 CCR 15000 et seq.). The project is considered to have a significant impact if it would do one or more of the following:

- 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 create a significant hazard to the public or environment
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan
- Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences and schools are intermixed with wildlands.

D.6.3.2 Applicant Proposed Measures

Table D.6-1 presents the applicant proposed measures (APMs) proposed by SNGS, LLC to reduce or eliminate potential impacts from hazardous materials use and storage associated with the Proposed Project, as well as existing environmental contamination along the alignment.

Table D.6-1
Applicant Proposed Measures for Hazardous Materials, Public Health and Safety

APM No.	Description
5	DOGGR is responsible for wells drilled into an underground gas storage facility. SNGS, LLC would complete engineering and geology studies and an injection plan and submit them to DOGGR for approval. These studies would describe the well drilling and abandonment plans; reservoir characteristics; all geologic units, aquifers, and oil and gas zones; and the monitoring system to ensure that injected gas is confined to the intended zone. SNGS, LLC would be required to post a bond with DOGGR to ensure proper completion or abandonment of any well drilled. Additionally, DOGGR would be responsible for approving a water injection plan that would allow SNGS, LLC to inject water that is extracted from the gas field back into the gas field.
7	The following measures would be incorporated into the construction contract specifications to address hazardous materials generated from construction-related activities: • Diesel fuel and petroleum-based lubricants shall be stored only at designated staging areas. • All hazardous material spills or threatened releases, including petroleum products such as gasoline, diesel, and hydraulic fluid—regardless of the quantity spilled—must be immediately reported if the spill has entered or threatens to enter a water of the State of California or the United States, or has caused injury to a person or threatens injury to public health.

Table D.6-1 (Continued)

APM No.	Description
8	SNGS, LLC would prepare a Hazardous Materials Contingency Plan that would be implemented if a spill occurs or if any hazardous materials are encountered during construction. Provisions outlined in this plan would include phone numbers of city, county, state, and federal agencies and primary, secondary, and final cleanup procedures. In addition, SNGS, LLC would require the project contractor to prepare a Health and Safety Plan (HSP) to minimize environmental impacts in the event that hazardous soils or other materials are encountered during construction of the project. The HSP would include elements that establish worker training, engineering controls, and monitoring. The HSP also would establish security measures to prevent unauthorized entry to cleanup sites and to reduce hazards outside the investigation/cleanup area.
9	SNGS, LLC would prepare an Emergency Response Plan, for use in response to a pipeline-related emergency (e.g., gas leak, earthquake, accidental release of hazardous materials or waste, fire, and/or pipeline or facility damage). Included in this plan would be measures for fire prevention. The plan would be designed in accordance with state and federal regulations, including 49 CFR 192, Health and Safety Code (Chapter 6.95), and Titles 19, 22, and 27 of the CCR.
10	SNGS, LLC would design the pipelines between Fruitridge Road and the compressor station, and between the compressor station and the wellhead site with a design safety factor of 0.4, which exceeds the Class 3 standard applicable to the project under the provisions of 49 CFR 192.5. SNGS, LLC would also place the pipeline under a minimum of 6 feet of earthen cover in all locations, which exceeds the 3-foot minimum standard applicable to the project.

D.6.3.3 Hazardous Materials, Public Health and Safety Impact Analysis

Impact HAZ-1: Potential Hazards Associated with Routine Transport, Use, and Disposal of Hazardous Materials

Hazardous materials would be used and transported during the construction of the Proposed Project and for the operation of the proposed compressor station. These individual impacts are discussed as follows:

Impact HAZ-1a: Potential Hazards Associated with the Routine Use, Transport, and Disposal of Hazardous Materials During Construction of the Proposed Project

Implementation of the Proposed Project would involve the transport, use, storage, and disposal of hazardous materials during the construction phase. This material would include fuels (gasoline, diesel, and propane), lubricants, solvents, hydraulic fluids, and other toxic or flammable materials. There is a potential that this material could spill during its transport. This could result in release of toxic materials into the public streets or potentially wetlands and could potentially contaminate soils or groundwater. This impact is considered significant, but can be reduced to a less-than-significant level (Class II; refer to Section D.1 for classification of impact significance) through implementation of APMs 7, 8, 9, and Mitigation Measure HAZ-1a. The construction activities associated with the Proposed Project would also require the use and storage of hazardous materials on site. These would include fuels, solvents, lubricants, and similar substances. There is a potential that this material could be released, thereby contaminating soil and potentially surface water and groundwater. This impact is considered significant but can be reduced to a less-than-significant level (Class II) through implementation of APMs 7 and 8 and HAZ-1a. These measures would reduce the potential for a spill to occur and will ensure rapid and proper cleanup.

Impact HAZ-1b: Potential Hazards Associated with the Generation and Disposal of Drilling Mud and Cuttings from Well Drilling and Horizontal Directional Drilling (HDD)

Wellhead Site

Implementation of the Proposed Project would require the drilling of wells for the injection and recovery of natural gas be drilled with drilling mud to lubricate the drill bit and to maintain the down-hole pressure while drilling. The drilling mud may be fairly nontoxic or could contain lubricants, solvents, and heavy metals. Regardless, the mud would become contaminated with contaminated water, oils, and chemicals during drilling. Of particular concern would be the potential trichloroethylene (TCE) contamination in the groundwater aquifer. Additionally, the drilling would produce cuttings (earth and rock material from the drill hole) that would be mixed with the drilling mud and brought to the surface. The drill mud and cuttings would become contaminated and will require proper disposal. This is considered a significant impact that can be reduced to a less-than-significant level (Class II) through implementation of Mitigation Measure HAZ-1b.

Compressor Station

No drilling mud or cuttings would be generated by construction of the compressor station.

Pipeline Segments 1 and 2

Construction of pipeline segments one and two would require HDD. This would produce mud and cuttings and could result in similar Class II impacts as discussed for the wellhead site and, similarly, can be reduced to less-than-significant levels through implementation of Mitigation Measure HAZ-1b. This mitigation measure will ensure proper transport and disposal of the material.

Impact HAZ-1c: Use, Transportation, and Storage of Methyl Mercaptan

Compressor Station

Methyl mercaptan is a chemical that occurs naturally in soils and is used for a variety of industrial applications, including as an odorant to natural gas. Natural gas has very little odor and methyl mercaptan is routinely used in low concentrations because of its disagreeable odor, so that any release of natural gas may be detected. Methyl mercaptan would be transported, stored, and used at the compressor station and wellhead site to add more odorant to natural gas, as necessary. Methyl m~~M~~ercaptan is considered an irritant causing respiratory distress if breathed in c~~C~~oncentrated form.

Methyl mercaptan would be transported to the site via trucks carrying individual cylinders of the chemical. It is estimated that one delivery of two to three cylinders per week would be required.

Methyl mercaptan is classified as hazard class 2.3 for toxic gases. The route for delivery would likely be along Fruitridge Road, from State Route 99 (SR-99) to the proposed compressor station. The one-way travel distance from SR-99 is 4.3 miles. An alternate route is along Howe Avenue and Power Inn Road from Highway 50 (US-50) to Fruitridge Road. The one-way travel distance along this route is 3.1 miles.

According to the report *Comparative Risks of Hazardous and Non-Hazardous Materials Truck Shipment Accidents/Incidents* (Battelle 2001), the hazardous materials transport accident/incident risk-per-mile is estimated at 0.507 in a million for all types of hazardous materials, including leak-en-route incidents. The hazardous materials transport accident/incident risk-per-mile specific to hazard class 2.3 (toxic gases) is 0.338 in a million.

The route from SR-99 along Fruitridge Road to the proposed compressor station off of Food Link Street (in Depot Park) is approximately 4.3 miles each way, thus the probability of a hazardous materials incident occurring on this route is 2.18 in a million for each methyl mercaptan delivery. This estimate is conservative in that it accounts for the higher risk-per-mile rate of 0.507 instead of the chemical-specific rate of 0.338. Using the hazardous materials transport accident/incident risk-per-mile specific to hazard class 2.3, the risk of a hazardous materials incident occurring on this route is 1.45 in a million for each methyl mercaptan delivery.

The travel route from SR-99 along Fruitridge Road to the compressor station passes residential, commercial, and industrial developments. Additionally, an elementary school (Earl Warren Elementary School) is located near Fruitridge Road near Lowell Street, within 0.15 miles of the travel route. Additional schools are located within 0.25 mile of the travel route to the compressor station.

Using the same evaluation for the alternate travel route from US-50 along Howe Avenue and Power Inn Road, the risk of a hazardous material incident is 1.57 in a million for general chemicals or 1.05 in a million using the risk-per-mile rate specific to hazard class 2.3 (toxic gases). The route from US-50 to the compressor station passes commercial, industrial, and recreational (Granite Regional Park) properties. There are no schools located within 0.25 mile of this alternate travel route. Another travel route option of a similar length and risk of hazardous materials incident from US-50 and Howe Avenue is via Folsom Boulevard, Jackson Road, and Florin Perkins Road instead of Power Inn Road. This route passes commercial, residential, and industrial properties.

Despite the low probability of an incident, impacts associated with hazardous materials delivery are considered significant due to the close proximity along travel routes to area schools and parks. Implementation of Mitigation Measures HAZ-1c*i* and HAZ-1c*ii* would ensure that public health and safety impacts due to delivery of hazardous materials would be less than significant (Class II) by ensuring that the transporters comply with the regulations and by creating a route that will minimize potential exposure to a large number of people in the event of an accidental release.

The methyl mercaptan will be stored at the compressor station in a structure designed for that purpose. Because the compressor station is located in an industrial area away from the general public and because the methyl mercaptan will be contained within the specially designed compressor station structure, the impact associated with a release of stored material at the site is considered less than significant (Class III).

Wellhead Site

Methyl mercaptan may be used at the wellhead site. Methyl mercaptan would likely be transported to the wellhead site either from SR-99 and Florin Road via Power Inn Road (2.5 miles) or from US-50 and Howe Avenue via Power Inn Road (3.4 miles). The route from US-50 passes by a school and is longer than the route from SR-99; therefore, the route from SR-99 is preferable.

Using the same evaluation for the travel route to the compressor station, the risk of a hazardous material incident along the route from SR-99 to the wellhead site is 1.27 in a million for general chemicals or less than one in a million (0.85 in a million) using the risk-per-mile rate specific to hazard class 2.3 (toxic gases). The route from SR-99 to the wellhead site passes commercial, industrial, residential, and recreational properties. There are schools located within 0.25 mile of this travel route. These schools include Earl Warren Elementary School near Fruitridge Road and Elder Creek Elementary School near Power Inn Road. Both are within approximately 0.15 mile of the route. The risk of a hazardous material incident along the route from US-50 (not the preferred route) to the wellhead site is 1.72 in a million for general chemicals and 1.15 in a million for toxic gases.

Another possibility is that the delivery route will be from the compressor station to the wellhead site. This travel distance is approximately 1.9 miles and passes mostly industrial and some residential properties. The risk of a hazardous material incident along this route is less than one in a million (0.96 in a million for general chemicals and 0.64 in a million for toxic gases). This route is longer on Power Inn Road.

Despite the low probability of an incident, impacts associated with hazardous materials delivery are considered significant due to the close proximity along travel routes to area schools and parks. Implementation of Mitigation Measures HAZ-1c*i,* HAZ-1c*ii,* and HAZ-1c*iii* would ensure that public health and safety impacts due to delivery of hazardous materials would be less than significant (Class II) by ensuring that the transporters comply with the regulations and by creating a route that will minimize potential exposure to a large number of people in the event of an accidental release.

Mitigation Measures for Impacts HAZ-1a, HAZ-1b, and HAZ-1c: Potential Hazards Associated with Routine Transport, Use, and Disposal of Hazardous Materials, Including Exposing People to Significant Risk of Fire or Explosion

HAZ-1a: Hazardous wastes generated during construction and operation of the Proposed Project shall be transported to an approved facility for the specific type of material.

HAZ-1b: SNGS, LLC shall contain drilling mud and cuttings from well drilling and HDD in portable tanks and shall remove and dispose of these at approved facilities for this type of waste.

HAZ-1c*i*: SNGS, LLC shall ensure that transportation of methyl mercaptan shall comply with all DOT, Caltrans, EPA, DTSC, California Highway Patrol, and California State Fire Marshal regulations, including the Vehicle Code Section 32100 (Division 14.3) for transportation of inhalation hazards.

HAZ-1c*ii*: SNGS, LLC shall require that the route used to deliver methyl mercaptan be US-50 (instead of SR-99) and Howe Avenue to either Power Inn Road or to Folsom Boulevard, Jackson Road, and Florin Perkins Road. This will minimize exposure to sensitive receptors. This material shall only be transported during nighttime hours.

HAZ 1c*iii*: ~~SNGS, LLC shall only store and inject methyl mercaptan exclusively at the compressor station. If that is not feasible, t~~The methyl mercaptan shall be stored in a specialized structure and the delivery routes shall be similar to that for the compressor station, except that only a ~~small~~ portion of Power Inn Road shall be used.

Impact HAZ-2: Potential to Expose People to a Significant Risk of Fire or Explosion

This section describes the potential impacts of release of natural gas from the Proposed Project. Natural gas may be released from the proposed pipelines due to structural failure, damage to the pipeline, operator error, or vandalism. There is also a concern that natural gas may migrate from the reservoir through existing wells or cracks in the cap rock and impact residents living above the gas field. The impacts associated with each mechanism are addressed in the following subsections: HAZ-2a for gas migrating to the surface from the reservoir and HAZ-2b for pipeline failure. A general description of the characteristics of natural gas is found below.

Natural gas is composed primarily of methane. It is colorless, odorless, and tasteless. Methane is not toxic, but is classified as a simple asphyxiate, possessing an inhalation hazard. If natural gas is breathed in high concentration, oxygen deficiency can result in serious injury or death. Natural gas for this project will have an odorant, methyl mercaptan, added so that leaks can be detected by odor.

Methane has an ignition temperature of 1,000°F and is flammable at concentrations between 5% and 15% in air. Unconfined mixtures of methane in air are not explosive. However, a flammable concentration within an enclosed space, such as a building, in the presence of an ignition source can explode. Methane is buoyant at atmospheric temperatures and disperses rapidly in the air.

Two types of fires may occur from a gas leak. The first is a torch fire that would be associated with a high-pressure leak that is ignited at the source. The torch fire would be relatively localized but would result in radiant heat injuries near the source (up to 600 feet for a 165-inch pipeline). The physiological effect of fire to humans depends on the rate at which heat is transferred from the fire to the person, and the amount of time the person is exposed to the fire. Skin that is in contact with flames can be seriously injured, even if the duration of the exposure is just a few seconds. The torch fire would be reduced in size and intensity as the gas in the pipeline is depleted.

Humans in the vicinity of a fire but not in contact with the flames would be subject to heat from the fire in the form of thermal radiation. Radiant heat flux decreases with increasing distance from a fire. So those close to the fire would receive thermal radiation at a higher rate than those farther away. The ability of a fire to cause skin burns due to radiant heating depends on the radiant heat flux to which the skin is exposed and the duration of the exposure. As a result, short-term exposure to high-radiant heat flux levels can be injurious. However, if an individual is far enough from the fire, the radiant heat flux would be lower, likely incapable of causing injury, regardless of the duration of the exposure.

An incident heat flux level of 1,600 British thermal units per square foot per hour (Btu/ft^2-hr) is considered hazardous for people located outdoors and unprotected. Generally, humans located beyond this heat flux level would not be at risk to injury from thermal radiation resulting from a fire. The radiant heat flux effects on humans are summarized below:

- 8,000 Btu/ft^2-hr (25.1 kilowatts per square meter (kW/m^2))—50% mortality after 30--second exposure (CDE 2007).
- 12,000 btu/ft2-hr (37.7 kw/ms)—-100% mortality after 30--second exposure (CDE 2007).
- 5,000 btu/ft2-he (15.7 kW/m2)—1% mortality after 30--second exposures (CDE 2007). In many instances, an able--bodied person would increase the separation distance or seek cover during the 30--second period.
- 3,500 Btu/ft^2-hr (11.0 kW/m^2)—Second-degree skin burns after 10 seconds of exposure, 15% probability of fatality (Quest Consultants 2003). This assumes that an individual is unprotected or unable to find shelter soon enough to avoid excessive exposure (Quest Consultants 2003). Other data sources provide a 10% mortality at 5,500 Btu/ft^2-hr and 15% mortality at 5,800 Btu/ft^2-hr (CDE 2007).

- 1,600 Btu/ft^2-hr (5.0 kW/m^2)—Second-degree skin burns after 30 seconds of exposure.
- 440 Btu/ft^2-hr (1.4 kW/m^2)—Prolonged skin exposure causes no detrimental effect (CDE 2007; Quest Consultants 2003).

Generally, injury can be avoided or reduced if a person can leave the area. Clothing also provides some protection from radiant heat.

The second type of fire that may occur from a gas leak is a flash fire. Natural gas does not explode unless it is in a confined space, such as a building, within a specific range of mixtures with air and is ignited. However, if an explosion does occur, the physiological effects of overpressures depend on the peak overpressure or pressure created by an explosion that reaches a person. Exposure to overpressure levels can be fatal. People located outside the flammable cloud when a combustible mixture ignites would be exposed to lower overpressure levels than those inside the flammable cloud. If a person is far enough from the source of overpressure, the explosion overpressure level would be incapable of causing injuries. The generally accepted hazard level for those inside buildings in an explosion overpressure is 1.0 pound per square inch gauge (psig). This level of overpressure can result in injuries to humans inside buildings, primarily from flying debris. The consequences of various levels of overpressure are described in Table D.6-2.

Table D.6-2
Explosion Overpressure Damage Thresholds

Side-On Overpressure (psig)	Damage Description
0.02	Annoying noise
0.03	Occasional breaking of large window panes under strain
0.04	Loud noise; sonic boom glass failure
0.10	Breakage of small windows under strain
0.20	Glass breakage—no injury to building occupants
0.30	Some damage to house ceilings; 10% window glass broken
0.50–1.00	Large and small windows usually shattered; occasional damage to window frames
0.70	Minor damage to house structures; injury, but very unlikely to be serious
1.00	1% probability of a serious injury or fatality for occupants in a reinforced concrete or reinforced masonry building from flying glass and debris; 10% probability of a serious injury or fatality for occupants in a simple frame, unreinforced building
2.30	0% mortality to persons inside buildings or persons outdoors
3.10	10% mortality to persons inside buildings
3.20	<10% mortality to persons outdoors
14.50	1% mortality to those outdoors

Sources: Mannan 2004,; CDE 2007,; Quest Consultants 2003.

DThese data in Table D.-6-2 were used as a basis for the probability analysis.

For outdoor explosions, the endpoints listed in Table D.6-3 -have been used to evaluate potential explosion impacts to the public from the Proposed Project.

Table D.6-3
Explosion Overpressure Levels

Mortality Rate	Outdoor Exposure (psig)	Indoor Exposure (psig)
99% Mortality	72	13
50% Mortality	13	5.7
1% Mortality	2.4	1.0

Source: Appendix B-1.

Impact HAZ-2a: Potential Impact from Gas Leaking From the Gas Reservoir After Repressurization of the Gas Field for Gas Storage

Concerns raised during the public scoping for the project include the potential for gas to migrate to the surface from the repressurized reservoir. This gas could then enter structures or other confined spaces to create concentrated gas in structures that could become a health hazard or explosive. There would also be a concern that gas could concentrate within confined spaces such as manholes or utility bunkers and potentially asphyxiate a person entering the space. Fugitive gas migrating near the surface could accumulate under impervious or semipervious pavement or concrete slabs underlying structures, streets, or parking lots and could migrate laterally within underlying porous materials such as gravel/sand layers beneath slabs, gravel/sand road base, or within the gravel/sand material used to provide bedding for pipelines in trenches.

Three potential pathways for natural gas to migrate from the reservoir to the surface are: (1) from defective cementing of annular seals for new wells or previously abandoned wells that were not properly abandoned; (2) through existing cracks or faults in the cap rock; or (3) through formation of new fractures in the cap rock from the proposed gas injection and repeated cycling of gas pressure associated with gas storage procedures. Each of these pathways is discussed in turn, followed by a conclusion about the whether the risk of gas migration from the repressurized reservoir to the surface would be significant. Finally, a short discussion of the impact of methyl mercaptan on the cap rock is given.

Potential Gas Migration Through Wells

In regard to potential gas leakage via improper well cementing, abandoned wells at Florin have been sealed into the cap rock and plugged per the stringent requirements permitted and enforced by DOGGR. DOGGR will also review the plugged wells as part of its permitting process and require any additional remediation. The grouting of the wells during the plugging and abandonment procedures is done using greater pressure than would be exerted by the repressurized Florin Gas Field during storage in order to form an effective bond between the cementing material and the surrounding native formation; therefore, even with the proposed increased storage pressure, the possibility of failure of the seals of the abandoned wells is remote and less than significant (Class III).

The new wells will be constructed under the supervision of DOGGR, according to DOGGR regulations. Submittal by SNGS, LLC of detailed drilling plans and procedures to DOGGR will be done at the appropriate time. The five or six production wells will be drilled directionally from a single site in the east central area of the Florin Gas Field, with horizontal casing completions in the production/storage reservoir sand.

Conceptually, the drilling will be done as follows: prior to drilling into the cap rock or underlying gas reservoir, an initial drilling pass will be made to install large-diameter conductor casing to approximately 100 feet below the freshwater table. The annulus, or gap between the conductor casing and the borehole through the freshwater aquifer, will be sealed with cement grout. An intermediate diameter borehole will be drilled through the conductor pipe and partially into the cap rock. The annulus between this casing and the cap rock will be sealed with cement grout. A third small-diameter borehole will be directionally drilled and cased to provide access to the Winters Sand gas reservoir rock, with completion of the screened production section approximately horizontal. The combination of one or perhaps two conductor casings and associated cement annular seals will effectively block any migration of gas through the wells into the aquifer or to the surface. Therefore, the impact would be considered less than significant (Class III).

In addition, APM 5 requires SNGS, LLC to complete engineering and geology studies and an injection plan and submit them to DOGGR for approval. These studies would describe the well drilling and abandonment plans; reservoir characteristics; all geologic units, aquifers, and oil and gas zones; and the monitoring system to ensure that injected gas is confined to the intended zone.

Potential Gas Migration Through Existing Cracks or Faults in the Cap Rock

The Florin Gas Field reservoir is contained by a shale cap rock of 150 to 300 feet thick. This cap rock has apparently contained the gas within the original Florin Gas Field without substantial leakage.

Most documented leakage from gas storage reservoirs have occurred in shallow salt formations rather than in formations contained by a shale cap rock (Mannon Associates 2008). However, leakage of stored gas has occurred in California at the El Segundo Oil Fields, Castaic Hills Oil Field, and the Montebello Oil Field (Khilyuk et al. 2000), ~~at~~ fields with different characteristics. The route of escape for stored gas leakage can include cap rock structure, existing or new cap rock fractures, faults, defective cement well seals, and/or substandard abandonment cementing of oil and gas wells.

There have been no documented incidences of leakage of natural gas from the former Princeton Gas Field operations.

An analysis by Ryder Scott Company (2008), based on reservoir computer modeling, has concluded that the pressure within the gas field at the projected storage capacity may exceed pressures of the original gas field by almost 8%. In testimony to the CPUC, Bruce Palmer of the Ryder Scott Company indicated that standard industry practice is that gas reservoir caps can withstand 10% overpressure above the original reservoir without substantial risk of gas leakage (Palmer 2008). Existing data from previous drilling in the Florin Gas Field does not include laboratory data substantiating the strength of the reservoir cap rock. This would raise concern that sufficient cap rock strength to contain gas at anticipated pressure has not been objectively demonstrated. In addition, there may be existing fractures within the reservoir cap that are substantially closed at ambient pressures that could dilate and leak under proposed operation pressure. See Section D.7, Hydrology and Water Quality, for an analysis of impact to groundwater.

Potential Gas Migration to the Surface Through Formation of New Fractures in the Cap Rock from the Proposed Gas Injection and Cycling of Gas Associated with Gas Storage Procedures

There is a remote potential that gas could migrate to the surface from around or through the cap rock, either through existing fractures or faults or other discontinuities in the cap rock. Golder Associates (2008) addressed the potential for migration of gas from the reservoir to the surface through cracks or fissures and identified ~~five~~ potential mechanisms (described as follows) that could result in this occurrence. This analysis was based on information on the cap rock and other geologic structures. It should be noted that laboratory analysis of core samples could not be conducted at this time since it would require the drilling of new wells.

1. **Degradation of cap rock due to cyclic loading associated with the gas storage process.**

   The opinion by Golder Associates (2008) indicates that the proposed gas pressures involved in the cyclic loading and unloading of the reservoir would likely not be high enough to result in degradation of the cap rock. However, this is based on information describing the cap rock and drilling logs and does not reflect laboratory tests, including strength testing of the cap rock core samples.

2. **Failure of the cap rock due to hydraulic fractures.**

   Golder Associates (2008) have concluded that the pressures associated with injection of the gas are not high enough to cause fractures. This is based on the information available on the cap rock but does not include laboratory testing, including an analysis of the strength of the cap rock core samples.

3. **Damage to the cap rock due to historical reservoir production.**

   Golder Associates (2008) did not identify evidence that the cap rock has been damaged based on previous production data and records for the Florin Gas Field wells. The production data records for the field would only allow inference of damage from the pressure and flow characteristics of the wells. Quantities of gas leakage from minor fracture zones in the gas reservoir, which would not be significant in gas field production operations, could produce effects in the overlying groundwater aquifers that could accumulate over time and result in gas leakage to the surface. Thus, such minor reservoir damage may not have been noted or may not be apparent. This portion of the analysis by Golder Associates (2008) was not intended to account for additional potential damage to the cap rock through the recycling of storage gases and the fluctuation in pressure.

4. **Gas mMigration via preexisting faults due to gas injection pressure changes.**

   Based on analysis of drilling logs for the previously drilled wells in the Florin Gas Field and four seismic reflection data lines evaluated by Ryder Scott (2008), no preexisting faults have been identified in the cap rock. However, these wells and seismic data constitute only a small portion of the reservoir area and small preexisting faults or fracture zones may be present between wells and seismic profiles. The gas could migrate through the various formations and aquifers and eventually reach the surface. There is debate among experts whether a fault is located within the field. If one exists, it would not be considered active but could be a pathway for gas migration.s Although no blind thrust faults for the area have been identified, these are not normally detectable and could further resulting in fault rupture.

5. **Gas seepage through the cap rock.**

   Golder Associates (2008) expect that the permeability of the cap rock is sufficiently low that it is not likely that the gas will migrate substantially through the cap rock during the lifetime of the project and would actually occur over geologic time. Based on assumed cap rock properties, Golder Associates (2008) concludes that gas would be expected to migrate only a small fraction of an inch a year and it would take several thousands of years to permeate the cap rock. These would be well beyond the life of the project. This portion of Golder's evaluation only considers the cap rock matrix (shale) physical properties and is not intended to account for possible localized imperfections (faults, fractures, course-grained channels with the cap rock shale) that could provide pathways for gas migration.

6. **Lateral spreading of gas along the edges of the reservoir.**

   Neither the bottom of the reservoir nor the sides of the reservoir has been well defined in detail, especially since drilling and core sampling has not been conducted at the well field perimeter. Therefore, it is not known whether gas would seep in this area under pressures exceeding original reservoir pressure. The shape and limits of the Florin Gas Field structure was inferred by Ryder Scott (2008) from well logs, seismic data, and a reservoir computer model. During calibration of the reservoir computer model to the known gas production history, it was found necessary to reduce the reservoir footprint by eliminating the southern one-third (approximately) of the conceptual reservoir footprint from the volume available for gas storage (Palmer 2008). The nature and geometry of the hydraulically interconnected northern area and the substantially isolated southern area have been approximated, but have not been verified with drilling. Therefore, it is not known whether stored gas could seep from the edges of the reservoir.

Conclusion

There is sufficient information to conclude that the leakage of stored gas into the overlying groundwater aquifer and perhaps to the ground surface is unlikely to occur. There is insufficient information to conclude categorically that stored gas migration to the overlying groundwater aquifer and/or ground surface would not occur. Therefore, it is assumed that there is a low potential that gas could migrate to the overlying groundwater aquifer and/or to the ground surface. Gas migration could result in groundwater impacts, health effects, and potentially flash fires or explosions. Therefore, this impact is considered significant. Despite implementation of APM 5 and Mitigation Measures HAZ-2a*i* and HAZ-2a*ii,* which would reduce this already low potential, the impact would remain significant and unavoidable (Class I). This remains a significant and unavoidable (Class I) impact for the following reasons:

1. A release of natural gas, even with a low probability, has a potential for substantial consequences from fire and explosions due to the project area having high population densities. Although mitigation measure HAZ-2*aii* would reduce the already low probability by conducting further testing of the cap rock to ensure release of gas would not occur, the possibility of a release of gas would still remain.
2. While mitigation measure HAZ-2*aii* would mitigate for any possible release of natural gas by depressurizing the reservoir, there will be a lag in the time to remediate any gas migration from the time gas is detected and the reservoir depressurized.

Potential for Methyl Mercaptan to Weaken the Cap Rock

Concern has been raised during the public scoping process regarding the potential for methyl mercaptan, which is used to odorize the natural gas prior to injection, to affect the integrity of the cap rock. Methyl mercaptan would be used in very low concentrations and there is no evidence that methyl mercaptan is associated with degradation of rock; therefore, no impact is anticipated.

Impact HAZ-2b: Potential for Release of Natural Gas and Resulting Fire and Explosion from Wellhead Site, Compressor Station, and Pipeline Segments 1 and 2

EDM Services prepared a system safety and risk of upset report for the Proposed Project (EDM Services 2008, revised 2009). This assessment is contained in Appendix B-1 of this EIR and is summarized in this section. Due to controversy involving the pipeline hazard upset report prepared by EDM, a peer review of the -EDM's revised report was conducted by Richard Gustafson of Atkins International (Atkins 2010). This risk analysis reflects the results of the EDM study as modified bye the review by Atkins.

The DOT database of natural gas transmission pipeline releases from January 2002 through December 2007 has been analyzed (DOT 2008). These data will be used to develop the baseline frequency of unintentional releases from the proposed facilities in subsequent sections of this document. After deleting all releases noted from "gathering" lines and "offshore" lines, which are not onshore natural gas transmission lines, there were 520614 releases remaining from onshore transmission pipelines. Of these, the two major causes of release were excavation damage and external corrosion. One hundred thirty--one and thirteen (212%) of the releases were caused by excavation damage from a third party and the pipeline operator. Eighty-three Seventy one (14%) of the releases were caused by external corrosion. The remaining 400336 (654%) of the releases were caused by a variety of factors, listed below in descending order of frequency:

- Miscellaneous or unknown, 12%
- Malfunction of control or relief equipment, 87%
- Vehicles not related to excavation, 6%
- Internal corrosion, 5%
- Butt weld failure, 45%
- Rain and flooding, 4%
- Body of pipe failure, 4%
- Incorrect operation, 3%
- Pipe weld seam failure, 3%
- Earth movement, 2%
- Component failure, 2%
- Joint failure, 2%
- Threaded fitting or coupling failure, 2%
- Lightning, 1%

- Fire and explosions, 1%
- Fillet weld failure, 1%
- Temperature, <1%
- Wind, <1%
- Rupture of previously damaged pipe, <1%
- Vandalism, <1%.

Wellhead Site

The wellhead site would be equipped with the 16-inch pipeline entering the site from pipeline segment one and then dispersing to a manifold where the gas is injected or recovered from the wells.

~~D6-4D.6-4(Table D.6-4) Table D.6-4There is a potential that a leak or a rupture of the pipelines or manifold could result in a release of gas.If the 16-inch pipeline ruptured and ignited, it could produce a torch flame with a radiant heat footprint of approximately 600 feet. This could result in injury to persons near the flame, especially if someone could not leave the immediate area If gas were to be released from the pipeline, it would not explode unless the gas was confined in a structure. If this gas were to enter nearby buildings, there would be an approximately 1% possibility of serous injury to occupants in a reinforced concrete or masonry building or a 10% potential of serious injury to occupants of a simple frame building. Although the potential for pipeline rupture and release of gas is low, this impact is considered significant and unavoidable (Class I), because of the consequences of a fire or explosion. Despite~~ira ~~-- implementation of APM 8 and Mitigation Measures HAZ-2b*i* through HAZ-2b*vii*, which will further reduce this already low potential~~EDM conducted an initial analysis of the potential for torch fires from the well-head. Richard Gustafson of Atkins reviewed this analysis. These studies are provided in Appendix B. ~~.,~~Gustafson's individual risk of fatality was 8.3~~x~~ × 10~~(~~$^{-8}$~~)~~ per year, which is just slightly over ~~the~~ de- minimis (see Appendix B-2 to this EIR)-. The risk from the well-head~~s~~ would be to individuals in the north parking lot to the south. The design of the well-head would contain most torch fires below the 10--foot level. Therefore, the impact is considered less than significant (Class II) with implementation of M~~m~~itigation M~~m~~easure~~s~~ HAZ-2b*iii*. ~~the impact would remain significant and unavoidable~~

Compressor Station

The level of confinement within the compressor station is sufficient to provide a 5.5 psig peak overpressure (threshold level pressure of a gas from an explosion) in the vicinity of the compressors and other equipment. This level can result in serious injuries to those outdoors. However, since the site is not accessible to the public, these impacts can be mitigated to less-than-significant levels (Class II) through implementation of Mitigation Measure HAZ-2b*viii*. This mitigation would include an evaluation of the structural components of the c~~C~~ompressor station building and either provision of ventilation to prevent buildup of the gas within the building or to demonstrate the structural integrity of the structureand ability to contain an explostionexplosion.

Pipeline Segments 1 and 2

The distances to various levels of peak side-on overpressures (highest pressure resulting from a blast) for each of the pipeline segments are summarized in Table D.6-3. In Table D.6-3, the first column describes the type of gas release, including the amount of gas in the pipeline segment and the size of the hole. The last three columns of the table provide the blast overpressure at specific distances from the explosion. The results are essentially the same, whether the lines are operational or are shut in (no flow) and pressurized. It should be noted that the overpressure relates to the intensity of the blast. This analysis is divided into three segments: Segment two (low-pressure line), which is from the SMUD line to the compressor station and two segments of segment one (high-pressure line) between the compressor station and wellhead site. The two portions of sSegment one are- divided by an automated block value. Ttables 6.3.2-1 through 6.3.2-7 in Appendix B-1 to the EIR summarize the modeling results for torch fires. Flash fire results are shown in Tables 6.3.3-1 through 6.3.3-7 in Appendix B-1 to the EIR.

Summary of Risks

Table D.6-45 _summarizes the -aggregate risks of the pipelines and wellhead sites.:

Table D.6-45
Individual Risk (IR) versus Aggregate (PLL) Risk

Item	Individual Risk (IR)	Aggregate or PLL Risk
Exposure Location	Single Specific Location	Cumulative, Along the Length of the Entire Project
Probability of Exposure	100% 24 hours per day, 365 days per year	Actual Value, Normally Less Than 100% Based on Realistic Probability of Exposure to Specific Hazard
Significance Threshold	1 : 1,000,000 Some Jurisdictions Only No Established Threshold in U.S. or California	No Known Established Threshold

Source: Appendix B-1.

The aggregate risk results are summarized in Table D.6-56.

Table D.6-56
Aggregate Risk Results, Pipeline Segments

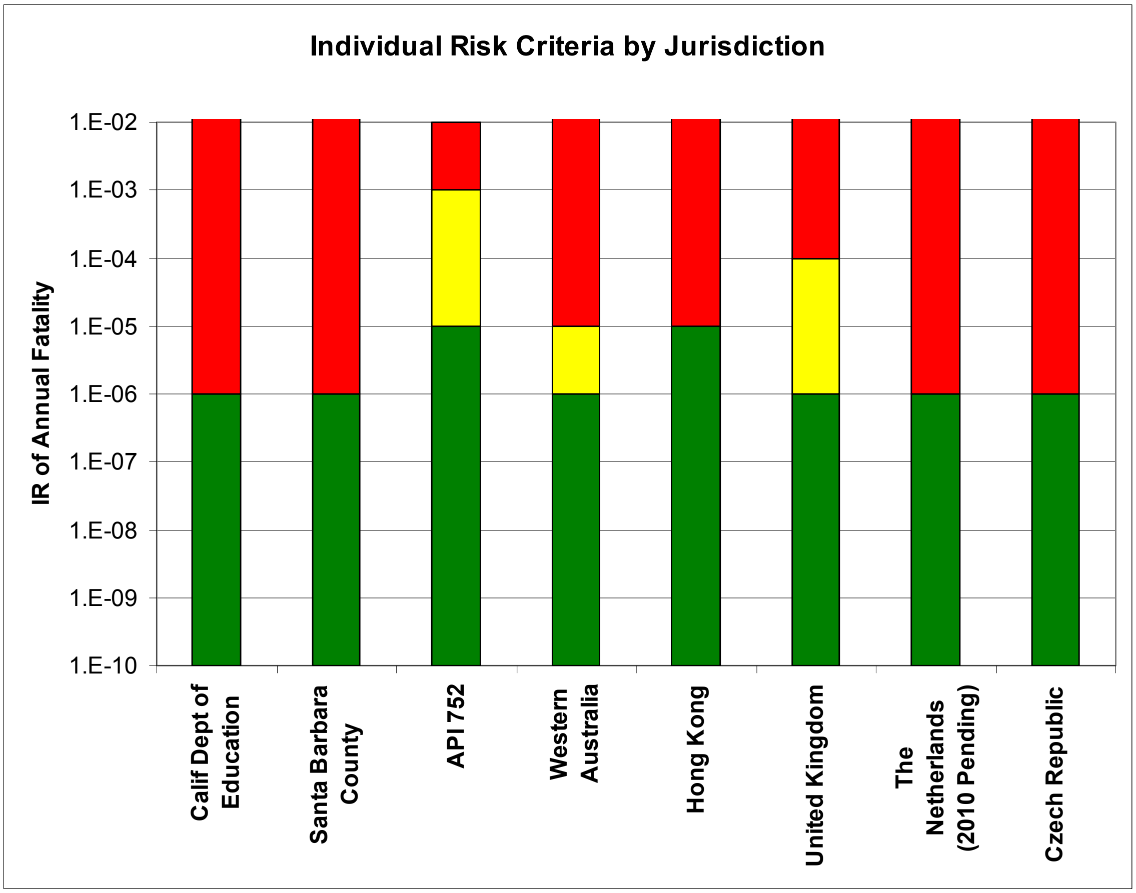
Release Description	Residential Exposure (lineal feet)	Commercial or Public Exposure (lineal feet)	PLL or Aggregate Risk Annual Likelihood of Fatality
Low-Pressure Pipe Segment			
Indoor Explosion Full Bore Rupture	0	156	6.94×10^{-11}
Indoor Explosion 1-inch Release	0	0	0
Torch Fire Full Bore Rupture	0	500	6.82×10^{-8}
Torch Fire 1-inch Release	0	130	9.43×10^{-9}
Flash Fire Full Bore Rupture	0	156	2.50×10^{-9}
Flash Fire 1-inch Release	0	0	0
Total	N/A	N/A	8.01×10^{-8} 1 : 12,500,000
High-Pressure Long Pipe Segment			
Indoor Explosion Full Bore Rupture	0	504	2.24×10^{-10}
Indoor Explosion 1-inch Release	0	0	0
Torch Fire Full Bore Rupture	0	2,854	2.96×10^{-7}
Torch Fire 1-inch Release	0	350	1.51×10^{-8}
Flash Fire Full Bore Rupture	0	504	8.07×10^{-9}
Flash Fire 1-inch Release	0	0	0
Total Pre-Mitigation	N/A	N/A	3.19×10^{-7} 1 : 3,130,000
High-Pressure Short Pipe Segment			
Indoor Explosion Full Bore Rupture	0	458	2.04×10^{-10}
Indoor Explosion 1-inch Release	0	0	0
Torch Fire Full Bore Rupture	1,910	742	4.08×10^{-7}
Torch Fire 1-inch Release	0	480	3.39×10^{-8}
Flash Fire Full Bore Rupture	0	458	7.34×10^{-9}
Flash Fire 1-inch Release	0	0	0
Total Pre-Mitigation	N/A	N/A	4.50×10^{-7} 1 : 2,220,000

Source: Appendix B-1.

Table D.6-7

D.6-8 Individual risk (IR) is most commonly defined as the frequency that an individual may be expected to sustain a given level of harm from the realization of specific hazards, at a specific location, within a specified time interval. Individual risk is typically measured as the probability of a fatality per year. The risk level is typically determined for the maximally exposed individual; in other words, it assumes that a person is present continuously——24 hours per day, 365 days per year.

The California Department of Education defines individual risk as the probability of fatality for an individual exposed to the physical impact of a hazard, at a specific location, within a specified period of time. (CDE 2007). The individual risk threshold most commonly used, where one has been established, is an annual likelihood of fatality of one in one million (1:1,000,000, 1 x 10-6, or 1.0E-06 fatalities per year). However, the United States federal and California state governments have not adopted individual risk thresholds; the acceptable level of risk is left to local decision makers and project proponents. The figure belowIndividual Risk Criteria by Jurisdiction chart -presents the individual risk thresholds for a number of jurisdictions, where such thresholds have been adopted.



Sources: ~~(CDE 2007;, SBCO 2008;, API 1995;, Marszal 2001~~Appendix B-1.

The upper end of the green areas represent the de minimus[1] risk values for each jurisdiction; IR risk levels within the green range are considered broadly acceptable. Risks within this green region are considered so low that no further consideration is warranted. In addition, risks within the green band are generally considered so low that it is unlikely that any risk reduction would be cost effective, since extraordinary measures would normally be required to further reduce the risk. As a result, a benefit-—cost analysis of risk reduction is typically not undertaken.

[1] Latin term for "of minimum importance" or "trifling." Essentially it refers to something or a difference that is so little, small, minuscule, or tiny that the law does not refer to it and will not consider it. In a million dollar deal, a $10 mistake is de minimus.

The lower end of the red areas represent the de manifestus[2] risk values; IR risk levels within the red range are considered unacceptable and the risks are not normally justified on any grounds.

Some jurisdictions have adopted a "grey area-," where the risk levels may be negotiated or otherwise considered. The United Kingdom developed the ALARP (as low as reasonably practicable) approach. This approach is depicted by the yellow areas in Figure 3.1-1. Generally, risks within the yellow area may be tolerable only if risk reduction is impractical or if its cost is grossly disproportionate to the risk improvement gained. The underlying concept is to maximize the expected utility of an investment, but not expose anyone to an excessive increase in risk.

The United States government has opposed setting tolerable risk guidelines. The 1997 final report of the Presidential/Congressional Commission on Risk Assessment and Risk Management (Commission), entitled Framework for Environmental Health Risk Management, included the following finding, "There is much controversy about bright lines, '"cut points,'" or decision criteria used in setting and evaluating compliance with standards, tolerances, cleanup levels, or other regulatory actions. Risk managers sometimes rely on clearly demarcated bright lines, defining boundaries between unacceptable and negligible upper limits on cancer risk, to guide their decisions. Congress has occasionally sought to include specified bright lines in legislation. A strict '"bright line'" approach to decision making is vulnerable to misapplications since it cannot explicitly reflect uncertainty about risks, population within, variation in susceptibility, community preferences and values, or economic considerations——all of which are legitimate components of any credible risk management process." The report states further that the, "~~Furthermore,~~ use of risk estimates with bright lines, such as one-in-a-million, and single point estimates in general, provide a misleading implication of knowledge and certainty. As a result, reliance on command-and-control regulatory programs and use of strict bright lines in risk estimates to distinguish between safe and unsafe are inconsistent with the Commission's Risk Management Framework and with the inclusion of cost, stakeholder values, and other considerations in decision-making." (Commission 1997).

The United States is not alone in its opposition to establishing fixed risk thresholds. The vast majority of nations do not have government established risk tolerance criteria. In these cases, risk tolerance is left to individual owners and other decision makers.

Despite the fact that the United States does not have a bright line individual risk threshold, the country has an exemplary safety record. Many believe that this is due to two factors. First, the free market allows the application of capital where it will produce the most risk reduction benefits. And

[2] ALARP (as low as reasonably practical) principle states that there is a level of risk that is intolerable, sometimes called the de manifestus risk level. Above this level risks cannot be justified.

secondly, the tort system provides a mechanism to determine third party liability costs in the event of an injury or fatality. These factors generally result in sound risk reduction decisions whichthat are normally based on a cost-benefit analysis. (Marszal 2001)

Societal risk is the probability that a specified number of people will be affected by a given event. The accepted number of casualties is relatively high for lower probability events and much lower for more probable events. However, the acceptable values for societal risk vary greatly by different agencies and jurisdictions. Unfortunately, there are no prescribed societal risk guidelines for the United States, nor the State of California. The United Kingdom, considers those events which result in 100 fatalities, with an annual probability of 1.0 x 10-5 (1:100,000) or less. The Committee for the Prevention of Disasters, uses the criteria as shown in Figure 7.1.3-1 of Appendix B-1 to the EIR. below. This data is the same as the criteria used in the Netherlands. These criteria have been used to evaluate societal risk in this document.

Table D.6-3
Vapor Cloud Explosion Modeling Results

Release	Maximum Operating Pressure (psig)	Distance from Unintentional Release (feet)		
		1.00 psig Overpressure	0.70 psig Overpressure	0.10 psig Overpressure
16-inch, 1.5-mile pipeline full-bore release at 45° above horizon	1,000	122146	175209	1,2231,464
16-inch, 1.5-mile pipeline 1-inch-diameter release at 45° above horizon	1,000	32	46	320
16-inch, 0.8-mile pipeline full-bore release at 45° above horizon	1,965	203168	290240	2,0301,683
16-inch, 0.8-mile pipeline 1-inch-diameter release at 45° above horizon	1,965	48	68	479480

Note: N/A indicates that this is not applicable.
Source: EDM Services 2008.

As indicated in Table D.6-4, for a pipeline rupture, one would expect a radiant heat flux of 3,500 Btu/ft^2-hr (second-degree skin burns after 10 seconds of exposure, 15% probability of fatality if exposure is prolonged) at up to 6800 feet from a release from the 16-inch pipeline segments.

For the proposed facilities, the fire impacts that could result in an injury are limited to relatively short distances from the release. Since these distances are small, one would generally expect affected individuals to find shelter or move beyond the impacted distance before they could be fatally injured. In these cases, one would only have to move slightly over 100 feet from the release to avoid potentially serious or fatal injuries. As a result, it is highly probable that affected individuals would avoid serious injuries and fatalities resulting from torch fires, unless they were exposed directly to the flame, which would extend an estimated 60030 feet for a full-bore release.

Table D.6-4
Torch Fire Modeling Results

Release	Maximum Operating Pressure (psig)	Flame Length (feet)	Distance from Unintentional Release (feet)		
			8,000 Btu/ft²-hr	3,500 Btu/ft²-hr	1,600 Btu/ft²-hr
16-inch, 1.5-mile pipeline full-bore release at 45° above horizon	1,000	423433	419427	588600	770785
16-inch, 1.5-mile pipeline 1-inch-diameter release at 45° above horizon	1,000	52433	49419	67595	89783
16-inch, 0.8-mile pipeline full-bore release at 45° above horizon	1,965	595430	576427	823599	1,067784
16-inch, 0.8-mile pipeline 1-inch-diameter release at 45° above horizon	1,965	70429	67420	93594	123783

Note: Radiant heat flux values shown are measured at 6 feet above ground surface.
Source: EDM Services 2008.

As discussed previously, flash fires can occur when a vapor cloud is formed, with some portion of the vapor cloud within the combustible range, and the ignition is delayed. (If the ignition is immediate, a torch fire results.) In a flash fire, the portion of the vapor cloud within the combustible range burns quickly. It is assumed that those within the combustible portion of the vapor cloud would likely be seriously injured or killed. Those outside the combustible portion of the vapor cloud would likely be uninjured. The results of the flash fire modeling are shown in Table D.6-5.

Table D.6-5
Flash Fire Modeling Results

Release	Maximum Operating Pressure (psig)	Distance from Unintentional Release (feet)	
		Upper Flammability Limit (UFL)	Lower Flammability Limit (LFL)
16-inch, 1.5-mile pipeline full-bore release at 45° above horizon	1,000	3947	85102
16-inch, 1.5-mile pipeline 1-inch-diameter release at 45° above horizon	1,000	10	22
16-inch, 0.8-mile pipeline full-bore release at 45° above horizon	1,965	6754	140113
16-inch, 0.8-mile pipeline 1-inch-diameter release at 45° above horizon	1,965	15	32

Source: EDM Services 2008.

The annual individual risk of serious injury or fatality is approximately 3.56.9 × 10^{-6}. This represents a 1:286145,000 likelihood of a serious injury or fatality annually. This value is three and one-halfroughly seven times the generally accepted significance criterion of one in 1 million per year (1:1,000,000) (see Appendix B of this EIR).This criteria has been used in a number of EIRs for the

State Department of Education for their school siting criteria, and by the County of Santa Barbara, the California Public Utilities Commission, and the California State Lands Commission for a number of similar pipeline projects. As a result, the individual risk from the Proposed Project is considered significant. It should be noted that this analysis was done based on the existing level of land development and traffic volumes. Should population density or traffic volumes increase over the life of the project, the resulting likelihood of serious injuries and fatalities would increase accordingly.

It should also be noted that the above individual risk result assumes that the pipeline segments are operational 100% of the time. During periods of non-operation, when the lines are isolated from the SMUD supply line and the storage reservoir, the public risk posed by the pipeline would be reduced by roughly 40% of the pipeline risk when the project was operational (gas flowing in the pipelines). This reduction is a result of the reduced mass flow rate from a pipeline rupture, due to the isolation from the storage reservoir and supply pipeline. The annual frequency of fatality presented above ($3.5x10^{-6}$) would be reduced to about $2.6x10^{-6}$ (1:384,000) if the pipeline were operational only 50% of the time.

The results of the societal risk analysis are summarized below in Table D.6-6. Societal risk involves the risk to the population in general and not to individuals. As indicated, the ratio of site casualties to the societal risk criterion is less than 1.0 for each situation. This is expressed as an estimated number of casualties for an event divided by the number of casualties assumed acceptable for an event. A ratio below one is considered less than significant based on California Department of Education guidance. In other words, the number of anticipated casualties is less than that generally considered acceptable for the given exposure probability. As a result, the societal risk for these potential hazards is not considered significant, using the stated societal risk criterion.

Table D.6-6
Societal Risk Summary for Occupants of Residential and Commercial Buildings

Release	Exposure Probabilit[1]	Probability of Serious Injury or Fatality to Exposed Individuals[1]	Population Exposed (number of people)[2]	Number of Site Casualties (SC)[3]	Societal Risk Criterion (SRC)[4]	SC/SR[5]
16-Inch Pipeline Segments						
Rupture Flash Fire Commercial Outdoors	3.04e-09	1.00	10	10	573600	0.017
Rupture Torch Fire Residential	1.24e-07	0.50	24	12	9050	0.134240
Rupture Torch Fire Commercial	4.836.61e-07	0.50	20	10	4520	0.220500

Release	Exposure Probabilit[1]	Probability of Serious Injury or Fatality to Exposed Individuals[1]	Population Exposed (number of people)[2]	Number of Site Casualties (SC)[3]	Societal Risk Criterion (SRC)[4]	SC/SR[5]
Rupture Explosion Residential	4.57e-07	0.10	16	1.6	4740	0.0340
Rupture Explosion Commercial	1.57e-07	0.10	100	10	90	0.111
Wellhead Site						
Rupture Torch Fire Commercial	8.09e-11	0.50	30	515	3.5161,500	0.0010
Rupture Explosion Residential	6.57e-10	0.10	16	1.6	1,200	0.0013
Rupture Explosion Commercial	2.81e-10	0.10	200	520	1,8851,500	0.003133

Source: EDM Services 2008.
[1] These probabilities are based on statistical history of pipeline failures.
[2] This is an estimate of the number of people affected by an event.
[3] This is an estimate of the number of people killed or injured by an event.
[4] This societal risk criterion is a number upon which the number of risks is calculated.
[5] This is a ratio of the number of site casualties divided by the societal risk criterion.

The societal impacts for risks to the motoring public are summarized in Table D.6-7.

Table D.6-7*
Societal Risk Summary for Vehicle Occupants

Release	Exposure Probability	Probability of Serious Injury or Fatality to Exposed Individuals	Population Exposed	Number of Site Casualties (SC)	Societal Risk Criterion (SRC)	SC/SRC
16-Inch Pipeline Segment—Power Inn Road						
1-Inch Flash Fire	1.85e-07	0.10	2.96	0.3	7470	0.004
1-Inch Torch Fire	1.75e-06	0.10	3.74	0.4	2420	0.0169
Rupture Flash Fire	1.12e-07	0.10	3.62	0.4	94100	0.004
Rupture Torch Fire	1.1824e-06	0.10	9.99	1.0	2930	0.0343
1-Inch Explosion	1.55e-06	0.10	3.74	0.4	2520	0.0153
Rupture Explosion	7.32e-07	0.10	6.39	0.6	3740	0.0176
16-Inch Pipeline Segment—Fruitridge Road						
1-Inch Flash Fire	3.46e-09	0.10	2.00	0.2	538400	0.0001
1-Inch Torch Fire	4.987.47e-08	0.10	2.58	0.3	142120	0.002
Rupture Flash Fire	5.93e-09	0.10	2.50	0.3	411350	0.001
Rupture Torch Fire	2.1978e-07	0.10	6.88	0.7	6870	0.0102
1-Inch Explosion	3.90e-08	0.10	2.58	0.3	160150	0.002

Release	Exposure Probability	Probability of Serious Injury or Fatality to Exposed Individuals	Population Exposed	Number of Site Casualties (SC)	Societal Risk Criterion (SRC)	SC/SRC
Rupture Explosion	5.57e-08	0.10	4.40	0.4	134100	0.003
16-Inch Pipeline Segment—Elder Creek Road						
1-Inch Flash Fire	3.32e-08	0.10	1.51	0.2	174200	0.001
1-Inch Torch Fire	4.50e-07	0.10	1.91	0.2	4740	0.0045
Rupture Flash Fire	3.20e-08	0.10	1.85	0.2	177200	0.001
Rupture Torch Fire	1.14e-06	0.10	5.09	0.5	3030	0.017
1-Inch Explosion	2.60e-07	0.10	1.91	0.2	6250	0.0034
Rupture Explosion	2.75e-07	0.10	3.25	0.3	60	0.005
Wellhead Site—Power Inn Road						
Rupture Torch Fire	0.002.70e-09	0.10	0.008.79	0.00.9	N/A600	0.0002
Rupture Flash Fire	0.001.88e-09	0.10	0.0012.39	0.01.2	N/A800	0.0002

Source: EDM Services 2008.
* See Table D6-6 footnotes for definition of criteria.

There are a few release scenarios that could impact both building occupants and vehicle passengers. For example, an explosion along Power Inn Road could impact commercial buildings, the residential neighborhood, and vehicle occupants.

The data has been combined for torch fires resulting from a rupture of the 16-inch pipeline segment along Power Inn Road. An estimated 2,000 linear foot segment of this line could impact commercial, residential, and vehicular traffic. The annual probability of an incident along this pipeline segment is approximately 3e-07. The resulting societal risk criterion is roughly 50 casualties. The estimated number of casualties from this event is 23 (12 residential occupants, 10 commercial occupants, and 1 vehicle occupant). The resulting ratio of site casualties to societal risk criterion in an explosion resulting from a rupture torch fire at this location is 0.5. Since this value is less than one, these impacts are not generally considered significant.

The societal risk results presented herein are somewhat higher than those presented in the applicant's probabilistic risk assessment (Weatherwax 2008). However, the conclusions are the same; the project poses societal risks below the generally accepted significance level.

An unintentional release from the Proposed Project pipelines could result in serious injuries and/or deaths. These impacts are significant and unavoidable (Class I) even with APM 8 and Mitigation Measures HAZ-2b*i* through HAZ-2b*ix*. The qualitative risk analysis determined that the annual probability of fatalities resulting from the Proposed Project was 1:10993,000. The individual quantitative risk analysis resulted in an annual fatality probability of 1:286140,000. This is less than that from the qualitative risk assessment due to the proposed mitigation and other factors. These levels exceed the generally accepted significance criteria and are considered significant even with mitigation.As discussed abovepreviously, there is not a universal threshold- for significance of individual risk and no threshold for aggregate risk has been developed. The CPUC has not developed a rule or policy as to what levels would constitute a significant impact. Individual risks from the pipeline segments are below one in a million, and therefore, are considered less than significant (Class II),. Gustafson also considered individual risk from the proposed project as less than significant (Appendix B-2 to the EIR). one. ,ed.This analysis is not absolutely precise since it is based on statistical analysis of similar pipelines. However, it provides a reasonable estimate of the public risks posed. Although sSocietal rRisk is based on the number of people exposed during an incident and the densities in the area may vary, it is anticipated that societal risks associated with the a gas pipeline risk would be below potential thresholds and would be considered less than significant. Allthough the level is highly dependent on the population present, this Iimpact would be belowless than significantce in most population scenarios.

Mitigation Measures for Impacts HAZ-2a and HAZ-2b: Potential Hazards Associated with Reasonably Foreseeable Upset and Accident Conditions Involving the Release of Hazardous Materials

HAZ-2a*i* SNGS, LLC shall conduct laboratory tests of cores and may also conduct in situ (in place) bore-hole tests of the cap rock structure, if recommended after review by qualified industry experts prior to storage of natural gas. These tests shall include determination of the cap rock strength properties to facilitate assessment of the cap rock integrity relative to the projected pressures exerted by the stored natural gas. If possible, Tthese tests will also provide data that allows assessment of the effects of the cycling of gas pressure during operation of the gas storage facility. These tests shall determine the properties of the cap rock itself, including permeability and strength of the cap rock within the range of the projected gas storage pressures. These tests shall be monitored and approved by the DOGGR who will review tests relative to the proposed storage pressure prior to allowing the storage of natural gas. Results of the studies shall also be made available to Sacramento County Department of Environmental Management and the Regional Water Quality Control Board.

HAZ-2a*ii* SNGS, LLC shall develop a gas detection plan at key points within the area over the Florin Gas Field. The plan will include the installation of monitoring wells for detection of anomalous pressure changes in the deep groundwater aquifer immediately above the cap rock structure. These wells shall be equipped with instrumentation to monitor and record (with electronic data loggers) aquifer pressure, temperature, and other parameters as needed. The number, location, depth, screened interval, and instrumentation of the deep aquifer monitor wells will be selected jointly by qualified petroleum industry and groundwater experts. The intent of the deep aquifer wells is to allow detection of the anomalous pressure, which is a way to tell if there is leakage of stored gas into zones above the cap rock from the underlying Florin Gas Field. One monitoring station shall be included at the Florin Portable Water Storage Reservoir.

This plan shall also include gas detection instruments, well probes, and sampling of the aquifer for entrained natural gas. This plan shall be reviewed and approved by DOGGR where applicable, the City of Sacramento Fire Department, City of Sacramento Department of Utilities, Regional Water Quality Control Board, and the Sacramento County Environmental Management Department prior to implementation and shall include natural gas detectors at strategic locations. In the event that natural gas is detected and confirmed to be seeping from the reservoir, the gas reservoir shall be reduced to lessen and eliminate the potential for seepage. The deep aquifer monitoring will commence prior to repressurizing the Florin gas reservoir, so that baseline conditions can be established, including ambient levels of natural gas if present.

The four primary elements of this gas monitoring mitigation measure are:

1) Establish a baseline or background level for natural gas at the surface prior to storage operations. This will allow comparison and sound evaluation of future project-related gas monitoring results.

2) Periodically measure for levels of detectable gas at predetermined surface locations. This will allow the storage operator to ascertain whether the levels of gas detected at the surface, if any, have increased noticeably above the previously established background levels. It is expected that small variations may occur, which may not individually rise to any significant level but trends over several sample periods could provide an indication of a change that requires further investigation.

3) Quantify and, if necessary, qualify any changes in an attempt to identify the source. First, based on sampling and testing of gas samples, it should be determined whether the gas quality signature is similar to the native gas production in the area or to pipeline gas. Gas in the storage reservoirs will be almost exclusively pipeline gas with components that should be relatively easy to identify compared to native gas.

4) Based on any specific changes observed, the operator shall respond to the data and corresponding analysis with additional testing, surveillance, or mitigation, as appropriate. If the data indicates that any detected surface gas is from the storage operation, then a plan will be developed to identify the leaking pipeline, well or reservoir, including procedures to further test and correct the situation. If it appears that the source of the gas is related to a

non-storage facility, the operator should attempt to identify the owner or operator of that facility and inform them of the findings of the study. The overall gas monitoring program will be evaluated after 5 years to determine its future usefulness.

The monitoring program will consist of the following features:

- Permanent monitoring/testing sites at the project wellhead site and compressor station site
- Leakage surveys at predetermined locations on a regular basis
- Utilize standard, industry-approved gas measurement equipment
- Field personnel trained on gas sampling methods and instrumentation, identifying stressed vegetation and other indicators of potential leakage.

Two permanent test stations will be located at the wellhead site. Two additional test stations will be installed at the compressor station site. Additional sites for sampling shall be identified in the sampling plan. Baseline measurements, using portable analytical gas instruments, will be made within 48 hours of the installation of the test station. Portable analytical gas instruments will consist of infrared gas analyzers or other combustible gas analyzers. Flame Ionization Detectors (FIDs) may be used as the primary detector for monitoring. All portable analytical gas equipment will be calibrated daily using a laboratory-certified methane calibration gas. All test sites will be identified and all test data will be gathered and recorded. The testing program will be conducted prior to initiation of injection of gas and weekly thereafter. Water quality information shall be made available to the City of Sacramento ~~City~~ Department of Utilities.

HAZ-2b*i* The following mitigation shall be incorporated into the compressor station site:

- The compressor station shall be secured by two levels of security. The perimeter of the 382-acre industrial park is secured with a security fence and gate, with a 24-hour site security staff. The compressor station site itself will be surrounded by an 8-foot-high steel security fence with barbed wire, with gates maintained in a closed and locked default status, actuated with key cards.
- The station's control center, which is located at the compressor station site, shall be manned 24 hours per day.
- Emergency backup power shall be provided by a 75-kilowatt ~~diesel~~ natural gas generator.
- Motion detectors shall be installed on posts along the perimeter security fence. Motion detected within the facility will result in an alarm and trigger the activation of security lighting during periods of darkness.

- A security lighting system shall be provided within the compressor station site. The system will be manually operated, but will have automatic activation in the event of an emergency alarm for fire, smoke, or intrusion.
- All buildings on the site shall be equipped with fire and smoke detectors. In addition, the compressor building will be equipped with heat and flash detectors. All sensors will be integrated into the control system with audible and visual alarms.
- Operators shall -be trained and hold the required certifications for the operation of the compressor station and other facilities.

The additional measures shall also be provided:

- A service gap analysis shall be conducted at the applicant's -expense by a well control specialist to identify and recommend additional fire and explosions protection including but not limited to infrastructure improvements. The analysis shall include an evaluation of equipment and training for first responders to meet the strategies outline in the Emergency Action Plan. The applicant shall establish a funding mechanism to cover one time costs and continued costs relative to training and equipment for departments and for any infrastructure costs.
- The applicant shall be required to retain the services of a company recognized as proficient in emergency response well control for the purpose of controlling and suppressing incidents beyond the technical proficiency of the fire department. The firm selected shall be approved by the fire department. Costs shall be paid by the applicant.
- City costs for emergency -response including response by other departments shall be paid or guaranteed by the Applicant in accordance with the Sacramento hazardous materials Emergency Response Ordinance.

HAZ-2b*ii* The following mitigation shall be incorporated into the wellhead site portion of the project.

- The wellhead site shall be surrounded by a 10-foot-high masonry wall, with a security gate actuated by key card entry.
- The wells shall be provided with fire and gas detectors and will be under continual audio/video surveillance from the continually manned compressor station. They will also be provided with three emergency shutdown (ESD) valves: a subsurface down-hole ESD, an ESD located at the wellhead, and an ESD located at the pipeline interface. In the event that a high- or low-pressure alarm is set off, a fire

alarm at the wellhead is detected, or potentially dangerous level of natural gas is detected, these ESD valves will automatically close in order to limit the supply of natural gas to the fire or leak.

- A third-party peer review shall be conducted by a well control specialist, under the supervision of the Sacramento City Fire Department ~~.~~and DOGGR.
- A backup power system shall be installed to provide electrical power in an emergency or power outage.
- A security lighting system shall be provided. The system will be manually operated but will have automatic activation in the event of an intrusion.
- Motion detectors shall be installed along the top, inside perimeter of the masonry wall. Motion detected within the facility will result in an alarm and trigger the activation of security lighting during periods of darkness.
- Security cameras shall be installed along the inside top of the masonry wall. Visual signals will be relayed to the Control Center 24 hours per day.
- All alarms at the wellhead site shall be monitored 24 hours per day at the Control Center.

HAZ-2b*iii* The CPUC shall conduct, or cause to be conducted in coordination with the DOT, an independent, third-party design review of the applicant's construction drawings, supporting calculations, and specifications and shall monitor and observe construction to ensure compliance with all applicable laws, ordinances, regulations, and standards (LORS). This review shall also include a review of the pipeline control and leak detection system to ensure that the system performance is consistent with the assumptions stated in Appendix B. The applicant shall make payments to the CPUC for these design review, plan check, and construction inspection services. These design review and construction observation services shall not in any way relieve the applicant of its responsibility and liability for the design, construction, operation, maintenance, and emergency response for these facilities.

HAZ-2b*iv* A 6-inch-wide polyethylene marker tape shall be installed approximately 18 inches below the ground surface, above the center of the pipeline. The marking tape shall be brightly colored and shall be marked with an appropriate warning (e.g., Warning—High Pressure Natural Gas Pipeline).

HAZ-2b*v* 100% of the circumferential welds shall be radiographically inspected in accordance with American Petroleum Institute (API) Standard 1104, Welding of Pipelines and Related Facilities. This shall be approved by the DOT.

HAZ-2b*vi* The applicant shall submit to the CPUC an operation and maintenance (O&M) manual, prepared in accordance with 49 CFR 192.605. The O&M manual shall address internal and external maintenance inspections of the completed facility, including but not limited to details of integrity testing methods to be applied, corrosion monitoring and testing of the cathodic protection system, and leak monitoring. In addition, the O&M manual shall also include a preventative mitigation measure analysis for the use of automatic shutdown valves per DOT Part 192.935(c) requirements. The O&M manual shall also incorporate all of the APMs.

HAZ-2b*vii* The applicant shall conduct an in-line inspection of the pipeline if the maximum allowable operating pressure (MAOP) creates a circumferential stress greater than 40% of the specified minimum yield strength (SMYS). The in-line inspection tool shall be capable of identifying pipe anomalies caused by internal and external corrosion and other causes of metal loss. The inspections shall be performed at regular intervals, in accordance with the applicant's integrity management program.

HAZ-2b*viii* The following mitigation measures shall be incorporated into the project by the applicant:

- The minimum depth of cover for each of the pipeline segments shall be 6 feet.
- 100% of the circumferential welds shall be inspected using radiographic techniques in accordance with API 1104.
- A sectionalizing valve shall be provided on the pipeline segment between the wellhead site and the compressor station.
- A control system and associated equipment shall be provided to facilitate ultra-fast closure of important safety valves, including those in the well field and on the pipeline segment between the well field and the compressor station.
- During periods where there is no flowing gas, the block valves at each end of each pipeline segment shall be closed, to "shut-in" the facilities. During non-operational periods, the pipeline segments shall be pressurized but shall be isolated from all natural gas sources.
- All pipeline segments shall be designed to Class 4 (most conservative) area classification per 49 CFR 192.
- Structural analysis of the compressor station building shall be conducted to either demonstrate that the building shall contain an explosion if a gas leak were to occur within the building or that the building will be designed to prevent a buildup of gas in the building.

- Body mass sensitive intrusion alarms shall be installed at the cCompressor sStation and wWellh Head.
- Multiple line--of--sight gas detectors couple to below well-head and process perimeter shutdown valves.
- Pipeline leakd detectors based on metered flow differences between the wellhadwellhead and compressor systems.

HAZ 2b*ix* An integrity management program for HCA portions of the pipeline shall also be prepared in accordance with 49 CFR 192, Subpart O. The integrity management program shall be submitted to DOT and CPUC.

Impact HAZ-3: Potential for the Project to Emit Hazardous Emissions or Handle Acutely Hazardous Waste within 0.25 Mile of an Existing or Proposed School

Wellhead Site, Compressor Station, and Pipeline Segments 1 and 2

Figure D.8-2 in Section D.8 (Land Use, Agriculture, and Recreational Resources) illustrates the relationship of the Proposed Project components and the projected boundaries of the Florin Gas Field to the schools in the project area. No schools are within 0.25 mile of the pipelines, compressor station, and wellhead site. Elder Creek Elementary School is located just beyond the 0.25-mile mark. It is not expected that fire or explosion would reach these areas since the gas would diffuse prior to reaching these areas.

No school sites are located above the projected boundaries of the limits of the Florin Gas Field. The Florin Elementary School and the Samuel Kennedy Elementary School are located approximately 0.12 mile beyond the gas field boundary. Therefore, the impact would be considered less than significant (Class III). It is not expected that gas would migrate to that extent.

Methyl mercaptan would be transported to the compressor station and wellhead sites via truck during nighttime hours. As discussed under impact HAZ-1c, the delivery of methyl mercaptan could pass within 0.15 mile of a school. Implementation of mitigation measures HAZ-1c*i*, HAZ-1c*ii*, and HAZ-1c*iii* would reduce impacts from transporting methyl mercaptan to less then significant (Class II).

Impact HAZ-4: Project is Located on a Site on a List Compiled Pursuant to Government Code Section 65962.5, Indicating it Would Present a Significant Hazard to the Public and the Environment

Wellhead Site, Compressor Station, and Pipeline Segments 1 and 2

The compressor station site and portions of pipeline segments one and two are in portions of Depot Park. The site is listed on several federal, state, and local regulatory databases, including the EPA's

NPL, the RCRA's CORRACTS, the SPL, and the CERCLIS. According to the environmental site assessment, all soil contamination has been fully remediated and no further action is required. Groundwater contamination on site and down-gradient of the site was being remediated during conduction of the environmental site assessment. The U.S. Army has accepted responsibility for all on-site contamination and any future contamination found within the boundaries of Depot Park. No other sites have been identified on the pipeline alignments, compressor station, or wellhead sites that are on the list. Therefore, no significant impact is anticipated (Class III).

Impact HAZ-5: Interference with an Adopted Emergency Response Plan or Emergency Evacuation Route

Wellhead Site, Compressor Station, and Pipeline Segments 1 and 2

As discussed in APM 9, SNGS, LLC will prepare an emergency response plan for the Proposed Project. Currently, no emergency response plan exists for the area. No formal evacuation route is within the Proposed Project area. Therefore, no impact is anticipated.

Impact HAZ-6: Exposure to Wildland Fires

Wellhead Site, Compressor Station, and Pipeline Segments 1 and 2

The risk of fire and explosion associated with the operation of the Proposed Project is discussed above. However, construction of the Proposed Project would be partially within grassland areas that may be prone to fire during portions of the year. This would be due to welding and other activities. This impact is considered significant (Class II) but can be reduced to less-than-significant levels through implementation of Mitigation Measure HAZ-6.

Mitigation Measure for Impact HAZ-6: Exposure to Wildland Fires

HAZ-6 **Preparation of a Fire Protection Plan.** SNGS, LLC shall prepare a fire protection plan that shall be approved by the City of Sacramento Fire Department ~~during the~~prior to construction~~ of the facilities~~. This plan shall include procedures to reduce the potential for creation of fires from welding and the provision of firefighting equipment and trained personnel to put out any fire that may be ignited.

D.6.4 Project Alternatives

D.6.4.1 Gas Field Alternatives

Freeport Gas Field

Environmental Setting

The Freeport Gas Field is located approximately 5 miles southwest of the Florin Gas Field on agricultural land located on the suburban fringe of Elk Grove. The gas field is partially located underneath a wastewater treatment plant. Because the site is also a former natural gas production field, it is likely that the integrity of the cap rock is similar to the Proposed Project. This alternative is located in a less populated area but the gas storage area does underlie a portion of the outskirts of Elk Grove. Pipeline routes may also be near populated areas.

Environmental Impacts and Mitigation Measures

Similar to the Proposed Project, this alternative would involve constructing facilities including injection/withdrawal wells, compressor station, and connecting pipelines. Class I impacts would occur associated with a leak of natural gas from the storage area. This impact would remain significant with implementation of Mitigation Measures HAZ-2a*i* and HAZ-2a*ii*. ~~There is also a potential for Class I impacts associated with pipeline rupture and fire and explosion because there are residences and other structures near possible pipeline alignments. This impact would remain significant and adverse even with implementation of Mitigation Measures HAZ-2b*i* through HAZ-2b*ix*.~~ Other impacts would remain similar to those associated with the Proposed Project.

Comparison to the Proposed Project

Although the alternative would have Class I impacts associated with the potential release of gas from the reservoir or pipeline failure, the consequences of the impact is considered less than that of the Proposed Project since less people would be at risk due to lower population densities.

Snodgrass Slough Gas Field

Environmental Setting

The Snodgrass Slough Gas Field is located approximately 20 miles southwest of the Florin Gas Field on agricultural land adjacent to Reclamation District 551 Borrow Canal, 3 miles east of the Sacramento River and California State Highway 160 (CA-160), and 4 miles north of the nearest population center, Walnut Grove. The alternative would be located in a largely agricultural area. Because the reservoir was a former gas field, it is assumed that the cap rock would be similar to the Proposed Project. This area is less populated than the Proposed Project area.

Environmental Impacts and Mitigation Measures

Similar to the Proposed Project, this alternative would involve constructing facilities including injection/withdrawal wells, compressor station, and connecting pipelines. Impacts associated with the release of gas from the reservoir would be considered Class II with implementation of Mitigation Measures HAZ-2a*i* and HAZ-2a*ii* due to the limited population in the area. ~~Additionally, the impact associated with pipeline rupture would be considered Class II with implementation of Mitigation Measures HAZ-2b*i* through HAZ-2b*ix*.~~ Other impacts would be similar to those associated with the Proposed Project.

Comparison to the Proposed Project

Due to this alternative's location in a less populated area, which reduces the consequences of a gas leak~~ or pipeline rupture~~, the impact is considered less than that associated with the Proposed Project.

Thornton Gas Field

Environmental Setting

The Thornton Gas Field is located approximately 20 miles south of the Florin Gas Field on agricultural land south of the Cosumnes River Preserve, 1.5 miles east of Interstate 5 (I-5) and 1 mile north of the town of Thornton. The alternative would be located in a largely agricultural area. Because the reservoir was a former gas field, it is assumed that the cap rock would be similar to the Proposed Project. The area is less populated than the Proposed Project area.

Environmental Impacts and Mitigation Measures

Similar to the Proposed Project, this alternative would involve constructing facilities including injection/withdrawal wells, compressor station, and connecting pipeline(s). This alternative would construct nearly 7 miles of pipeline travelling through a largely rural natural area in order to reach tie-ins. Impacts associated with the release of gas from the reservoir would be considered Class II with implementation of Mitigation Measures HAZ-2a*i* and HAZ-2a*ii*, due to the limited population in the area. ~~Additionally, the impact associated with pipeline rupture would be considered Class II with implementation of Mitigation Measures HAZ-2b*i* through HAZ-2b*ix*.~~ Other impacts would be similar to those associate with the Proposed Project.

Comparison to the Proposed Project

Due to the alternative's location in a less populated area, thus reducing the consequences of a gas leak~~ or pipeline rupture~~, the impact would be considered less than that associated with the Proposed Project.

D.6.4.2 Project Design Alternatives

Alternative Wellhead Site to Compressor Station Pipeline Route 1

Environmental Setting

This alternative (see Figure C-5) would use the same construction locations for the wellhead site, compressor station, and SMUD Line 700 tie-in. Only the pipeline route would differ from the Proposed Project. From the northwest corner of the wellhead site, this alternative would head due east to the Union Pacific Railroad (UPRR) tracks. This alternative would parallel Junipero Street and cross an active industrial-use yard. It would then parallel the UPRR tracks northwest to Elder Creek Road. This route would be approximately 7,800 feet long. This alternative would be approximately 450 feet longer than the Proposed Project.

Environmental Impacts and Mitigation Measures

Because the alternative pipeline alignment is located in the same general area as the proposed pipeline, a rupture of the pipeline would result in a Class II -impact ~~even~~ with the implementation of Mitigation Measures HAZ-2b*i* through HAZ-2b*ix*~~, a rupture of the pipeline would result in a Class I impact even with the implementation of Mitigation Measures HAZ-2b*i* through HAZ-2b*ix*~~. The alternative pipeline route is slightly longer than the Proposed Project~~,~~ and is ~~slightly increasing the probability of a rupture. The pipeline is~~ oriented away from Power Inn Road and further away from residences. Hazards and p~~P~~ublic ~~Safegy~~safety impacts would be similar to those associated with the Proposed Project.

Comparison to the Proposed Project

The impact of this alternative would be ~~slightly less than~~similar t~~r~~o that of the Proposed Project~~, even though it is slightly longer, since it would be located further from residences~~.

Alternative Wellhead Site to Compressor Station Pipeline Route 2

Environmental Setting

This alternative (see Figure C-5) would use the same construction locations for the wellhead site, compressor station, and SMUD Line 700 tie-in. Only the pipeline route would differ from the Proposed Project. From the northwest corner of the wellhead site, this alignment would run approximately 600 feet north within the utility alignment to Berry Avenue, and then parallel the UPRR tracks northwest to Elder Creek Road. This alignment would be approximately 7,700 feet long. This alternative would be approximately 350 feet longer than the Proposed Project.

Environmental Impacts and Mitigation Measures

~~This alternative would also have Class I impacts because a pipeline failure would impact residential and commercial areas. Mitigation Measures HAZ-2b*i* through HAZ-2b*ix* would not reduce impacts to a less-than-significant level.~~ The pipeline is slightly longer than the Proposed Project and would ~~slightly increase the potential for pipeline failure. The pipeline would~~ not be as close to as many residential units as the Proposed Project. Hazards and p~~P~~ublic ~~Safegy~~safety impacts would be similar to those associated with the Proposed Project.

Comparison to the Proposed Project

This impact would be similar to the Proposed Project. ~~It would be slightly longer than the Proposed Project, increasing the potential for pipeline failure, but would be further from some residences, decreasing the consequences of a gas release.~~

Alternative Wellhead Site to Compressor Station Pipeline Route 3

Environmental Setting

This alternative (see Figure C-5) would use the same construction locations for the wellhead site, compressor station, and SMUD Line 700 tie-in. Only the pipeline route would differ from the Proposed Project. From the northwest corner of the wellhead site, this alignment would run north approximately 1,650 feet within an existing utility alignment and then approximately 650 feet north along Power Inn Road to Elder Creek Road. From that intersection, the pipeline would be installed within Elder Creek Road, for approximately 1,800 feet, to the intersection with the UPRR tracks. This alternative would be approximately 7,100 feet long; approximately 250 feet shorter in length than the Proposed Project pipeline.

Environmental Impacts and Mitigation Measures

~~Because the alternative is located in the same area, the potential release of gas from a pipeline leak or rupture is considered a Class I impact even with implementation of Mitigation Measures HAZ-2b*i* through HAZ-2b*ix*.~~ This alternative is slightly shorter than the Proposed Project~~,~~ and -is ~~slightly reducing the potential for pipeline failure; however, it is~~ located ~~near~~closer to ~~5~~ residential units. Hazards and p~~P~~ublic ~~Safegy~~safety impacts would be similar to those associated with the Proposed Project.

Comparison to the Proposed Project

This alternative would have similar impacts when compared to the Proposed Project.~~, but impacts would be slightly less because the pipeline would be slightly shorter, thus reducing the potential for a pipeline rupture.~~

D.6.4.3 Environmental Impacts of the No Project Alternative

Under the No Project Alternative, none of the facilities associated with the project or alternatives evaluated in this EIR would be developed; therefore, none of the impacts in this section related to hazardous materials, public health and safety, would occur. However, in the event of disruption of the PG&E natural gas pipelines 400/401, SMUD may be required to implement cutbacks on non-essential energy use and may run out of natural gas at some locations.

D.6.5 Mitigation Monitoring, Compliance, and Reporting

Table G-1 describes the mitigation monitoring, compliance, and reporting program for hazardous materials, public health and safety.

D.6.6 References

8 CCR 337–340. California Occupational Safety and Health Regulations.

14 CCR 15000 et seq. CEQA (California Environmental Quality Act) Guidelines.

14 CCR 1712 et seq. Development, Regulation, and Conservation of Oil and Gas Resources.

14 CCR 1750 et seq. Development, Regulation, and Conservation of Oil and Gas Resources. Subchapter 2, Environmental Protection.

15 USC 2601 et seq. Toxic Substances Control Act of 1976.

19 CCR 4.5. California Accidental Release Prevention (CalARP) Program. June 28, 2004.

29 CFR 1910.119. The Process Safety Management of Highly Hazardous Chemicals.

22 CCR 11. Identification and List of Hazardous Waste.

40 CFR 20. Certification of Facilities.

40 CFR 68. Chemical Accident Prevention Provisions.

42 USC 6901 et seq. Solid Waste Disposal Act.

42 USC 7401 et seq. Clean Air Act.

42 USC 9601 et seq. Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).

42 USC 9605. National Contingency Plan (NCP).

49 CFR 100–185. Transportation, Hazardous Materials Regulations.

49 CFR 190–199. Pipeline Safety.

49 CFR 383. Commercial Driver's License Standards; Requirements and Penalties.

49 USC 601. Safety.

49 USC 60129 Pipeline Safety Improvement Act of 2002. December 17, 2002.

68 FR 69778. Final Rule. Pipeline Safety: Pipeline Integrity Management in High Consequence Areas (Gas Transmission Pipelines). December 15, 2003.

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