

August 25, 2021

Project No. 13258.001

City of Jurupa Valley
8930 Limonite Avenue
Jurupa Valley, CA 92509

Attention: Mr. Ernest Perea

Subject: Pipeline Safety Hazard Assessment Peer Review

References: *PlaceWorks, 2021, Pipeline Safety Hazard Assessment Appaloosa Springs, Jurupa Valley, dated June, 2021.*

CDE (California Department of Education), 2007, Guidance Protocol for School Site Pipeline Risk Analysis, dated February 2007.

PIPA (Pipeline Informed Planning Alliance), 2010, Partnering to Further Enhance Pipeline Safety in Communities Through Risk-Informed Land Use Planning, Final Report of Recommended Practices, dated November 2010.

Leighton and Associates, Inc. (Leighton) conducted a peer review of the above-referenced pipeline safety hazard assessment (PSHA) report. The proposed Appaloosa Springs project consists of a 51.5-acre vacant parcel that is bisected by a 30-inch diameter natural gas transmission pipeline. The PSHA was performed to evaluate the risk the pipeline poses to the proposed future development and its inhabitants. The report is summarized below, followed by Leighton's conclusions and recommendations.

PIPELINE SAFETY HAZARD ASSESSMENT SUMMARY

The PSHA report was prepared by PlaceWorks in general accordance with the California Department of Education (CDE) *Guidance Protocol for School Site Pipeline Risk Analysis* (2007), and the Pipeline and Informed Planning Alliance (PIPA)

Partnering to Further Enhance Pipeline Safety in Communities Through Risk-Informed Land Use Planning, Final Report of Recommended Practices (2010) (CDE, 2007; PIPA, 2010). The PSHA was performed to determine the risk to the future residents of the proposed Appaloosa Springs development (Site) by an existing 30-inch high pressure natural gas transmission pipeline that will cross the Site from southeast to northwest.

An acceptable level of risk to residents living near pipelines or other industrial sites has not been established by the State of California or the Federal government, however the CDE has established an individual risk level of 1×10^{-6} (one in one million) for schools located near pipelines. A risk level of less than 1×10^{-6} is considered less than significant and acceptable for school occupancy. The United Kingdom and the Netherlands, both use a risk-based approach for locating sensitive receptor developments (schools, hospitals, or residences) near industrial facilities or pipelines. Both nations consider 1×10^{-6} to be the risk threshold for sensitive receptor developments. Below this threshold, the risk is assumed to be less than significant.

The pipeline at the Site was installed in 1950 at a depth of 36 inches below ground surface. The pipeline lies within a 16.5-foot easement owned by the Southern California Gas Company (SCG), which in turn, will be located in the center of a 166-foot wide greenbelt that will extend across the Site along the pipeline easement resulting in a minimum property line setback of 83 feet from the centerline of the pipeline and a minimum structural setback of 93 feet from the centerline of the pipeline. Additionally, there will be 6-foot tall concrete block walls along the lots adjoining the green belt.

No incidents have been reported for SCG pipelines in the Jurupa Valley area between 1970 and 2020. A total of 9 incidents were reported for SCG pipelines in Riverside County. The predicted failure probability rate for all SCG transmission pipelines is 2.6×10^{-4} releases per mile per year. Based on the onsite length of the pipeline (980 feet), the failure probability equates to an onsite release occurring once every 21,400 years.

According to SCG, the portion of the proposed development surrounding the pipeline is considered a high consequence area (HCA) based on the projected occupancy of the surrounding homes. PIPA (2010), provides a formula for the calculation of a potential impact radius (PIR) from a fire resulting from a full-diameter natural gas pipeline release. Based on the pipeline operational specifications, the PIR for the pipeline is 500 feet with a radiant heat energy of 5,000 BTU/hour-ft². The PIR is not intended to be used as a structural setback distance, but rather an estimation of the radius of influence of a worst case pipeline rupture and fire.

Very few municipalities in California have implemented setbacks from pipelines. Santa Barbara County requires a minimum setback of 25 feet from pipelines which is much closer than the planned 83-foot setback at the proposed development. No municipalities in the United States have implemented risk-based pipeline setbacks.

The CDE pipeline protocol for determining individual risk associated with natural gas and hazardous materials was used as the basis for the PSHA. The analysis calculates probabilities for different scenarios (jet fire, flash fire, and flammable vapor cloud) and determines an aggregate individual risk which is then compared to the significance threshold of 1×10^{-6} . Because the model is intended to calculate risk to students and school staff, it assumes individuals will be in proximity to the pipeline approximately 6 hours a day and 180 days per year by default. In order to adapt the model to a residential scenario, occupancy was assumed to be 24 hours per day, 350 days per year (assuming a total of 15 days spent away from home per year). The model also assumes that residents would spend two hours per day in their back yard (portions of the lots closest to the pipeline easement). The model also assumes that outdoor individuals would be 83 feet from the centerline of the pipeline, the minimum distance between the pipeline and the nearest residential property line. The minimum planned structural setback of 93 feet from the centerline of the pipeline was used for the structural setback in the model. Wind speed and direction were also incorporated into the model for the purpose of determining the likely direction of travel for a natural gas cloud produced by a rupture. For the purposes of modeling a worst case scenario wind was modeled blowing to the southwest toward the nearest residence

There is a relatively low potential for ignition sources in the case of a catastrophic release of natural gas from the pipeline, as no structures will be present within 93 feet of the pipeline, and no vehicles are likely to be present within 83 feet of the pipeline. The risk assessment assumes a 30% chance of a pipeline leak being ignited and a 40% chance of a pipeline rupture being ignited. The green belt and neighborhood park that the pipeline traverses are being considered as emergency landing areas for aircraft arriving or departing Riverside Municipal Airport. Based on the relatively small size of the aircraft that fly into and out of Riverside Municipal Airport, and the depth of burial of the pipeline (36 inches) it is unlikely that an aircraft landing in the park or greenbelt would damage the pipeline.

The individual risk to a residents standing at the edge of the greenbelt was calculated to be 3.6×10^{-7} (1 in 2,777,778) which is below the allowable risk threshold of 1×10^{-6} (1 in 1,000,000). The risk to structures 93 feet from the centerline of the pipeline was also

calculated. The model showed that the thermal radiation flux on the closest structure drops to below 10,000 BTU/hr-ft² after 120 seconds, well below the 15 minutes required to ignite wood at that level of thermal flux.

LEIGHTON CONCLUSIONS

Leighton generally concurs with PlaceWorks' assumptions and conclusions of the PHSA. Based on the data presented in the report, the individual risk to future residents occupying houses adjacent to the pipeline is less than significant. The assumptions made for the various unknown or variable parameters when modeling were conservative or assumed a worst case scenario. These assumptions included:

- Substitution of the actual SCG failure rate of 2.6×10^{-4} releases per year per mile for the CDE predicted failure probability of 1.2×10^{-4} releases per year per mile in the risk calculation.
- The model assumed that all the gas contained between the upstream and downstream mainline valves would be released in the vicinity of the proposed development.
- Wind direction was assumed to be to the southwest, directly toward the nearest proposed residence. The prevailing wind direction at the Site is toward the east, away from the majority of the proposed residences.
- The maximum allowable operating pressure (50% of the yield strength of the pipeline) was used during the risk calculations instead of the much lower normal operating pressure.
- The occupancy times used for the analysis were conservative. According to the California Environmental Protection Agency Office of Environmental Health Hazard Assessment (OEHHA) and the California Air Resources Board (CARB) the average Californian spends approximately 17.5 hours per day at home and approximately 27 minutes per day in the back yard. The overestimate of exposure time resulted in conservative results.

The calculated risk value of 3.6×10^{-7} for the Site is likely elevated as a result of the conservative assumptions made during the risk analysis. As a result, the actual risk to future residents is likely lower than the stated value of 3.6×10^{-7} .

LEIGHTON RECOMMENDATIONS

Leighton recommends that the discussion of the PIR be clarified or removed from the text of the report. The thermal flux calculated during the risk assessment is approximately double that of the thermal flux calculated using the PIPA guidance document. The reason for this appears to be that that PIPA calculation used the normal pipeline operating pressure to calculate thermal flux from an ignited pipeline rupture while the risk assessment calculation used the maximum allowable operating pressure to calculate the thermal flux of an ignited pipeline rupture. This difference in methodology is not immediately apparent in the text of the report.

While the probability of an aircraft making an emergency landing within the greenbelt area is remote, Leighton recommends an engineering study be performed to quantify the potential maximum load the pipeline may expect to experience from an aircraft from the Riverside Municipal Airport making an emergency landing within the greenbelt.

Leighton generally concurs with Placeworks' recommendations for mitigation measures including the use of fire resistant exterior materials such as stucco, stone, or brick on houses adjacent to the green belt and the construction of concrete block walls, or, at a minimum, non-combustible fencing along the property lines of residences adjacent to the green belt. Leighton recommends that the pipeline damage prevention and mitigation measures described in the report be followed by future developers of the Site.

If you have any questions regarding this summary, please do not hesitate to contact me at 909-527-8785. We appreciate the opportunity to be of service.

Respectfully submitted,

LEIGHTON AND ASSOCIATES, INC.


Zachary Freeman, PG 9460
Project Geologist

