

DRAFT Lithium Valley Health Impact Assessment



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Acronyms and Abbreviations

Abbreviation	Definition
AHA	American Heart Association
ALA	American Lung Association
BHE	Berkshire Hathaway Energy
Cal/OSHA	California Division of Occupational Safety and Health
CalEnviroScreen	California Communities Environmental Health Screening Tool
CalEPA	California Environmental Protection Agency
CARB	California Air Resources Board
CCD	Census County Division
CDC	Centers for Disease Control and Prevention
CDPH	California Department of Public Health
CHIS	California Health Interview Survey
COPD	Constructive obstructive pulmonary disease
DLE	Direct lithium extraction
Draft PEIR	Draft Programmatic Environmental Impact Report
DTSC	California Department of Toxic Substances Control
e.g.	<i>Exempli gratia</i> (for example)
Etc.	Etcetera
FEV ₁	Forced expiratory volume in one second
FVC	Forced vital capacity
GED	General educational development
HIA	Health Impact Assessment
ICAPCD	Imperial County Air Pollution Control District
i.e.	<i>Id est</i> (in other words)
IID	Imperial Irrigation District
IVHD	Imperial Valley Health District
KGRA	Known geothermal resource area
M	Magnitude
MCL	Maximum containment level
n.d.	Not dated
NO	Nitric oxide
OSHA	Occupational Safety and Health Administration
pH	Potential of hydrogen (measure of acidity or alkalinity)
PM	Particulate matter
PM ₁	Particulate matter with an aerodynamic diameter of 1 micrometer or less
PM ₁₀	Particulate matter with an aerodynamic diameter of 10 micrometers or less
PM _{2.5}	Particulate matter with an aerodynamic diameter of 2.5 micrometers or less
PRC	Professional Research Consultants
SDSU	San Diego State University
Specific Plan	December 2025 Draft Lithium Valley Specific Plan

Abbreviation	Definition
U.S.	United States
U.S. EPA	United States Environmental Protection Agency
UCLA	University of California, Los Angeles
µg/ft ²	Micrograms per square foot
µg/g	Micrograms per gram
µg/m ³	Micrograms per cubic meter

Key Findings and Recommendations

Introduction and Purpose

The County of Imperial commissioned a Health Impact Assessment (**HIA**) to examine the potential health impacts of lithium extraction from geothermal brine and related development in northern Imperial County. Conducted by the San Diego State University (**SDSU**) Research Foundation from July 2023 through September 2026, the HIA provides community-informed, data-driven information to support decision-making, policy development, and health-focused planning. The assessment sought to improve understanding of potential health impacts, identify opportunities to promote and protect community health, and recommend strategies to minimize potential risks while maximizing potential benefits.

The *Draft Lithium Valley Specific Plan* (**Specific Plan**) (County of Imperial, 2025c) and accompanying *Draft Programmatic Environmental Impact Report* (**Draft PEIR**) (Dudek, 2025b) establish a framework for geothermal energy and lithium development that balances economic growth, environmental protection, community well-being, and long-term regional sustainability. The Specific Plan guides future development, while the Draft PEIR evaluates potential environmental impacts and identifies measures to avoid, minimize, or mitigate adverse effects. This HIA complements these planning documents by determining potential health impacts, examining the pathways through which they may occur, identifying populations that may be disproportionately affected, and highlighting opportunities to enhance positive health outcomes while reducing potential risks.

Background

The Salton Sea Known Geothermal Resource Area (**KGRA**) is a United States Geological Survey–designated area on the southeastern side of the Salton Sea lake identified as having viable geothermal resources (California Energy Commission, 2026b; Paz et al., 2022). Beneath this area lies a naturally occurring geothermal reservoir approximately 1–3 kilometers below ground, containing high-temperature, highly saline brine¹ enriched with dissolved lithium and other minerals (Dobson, Araya, Brounce, et al., 2023; Neupane & Wendt, 2017). **This geothermal system is *not* hydrologically connected to the Salton Sea itself, and geothermal energy production does not use water from or discharge water into the Salton Sea lake** (Kaspereit et al., 2016; Paz et al., 2022).

The U.S. Department of Energy estimates that geothermal brine within the Salton Sea KGRA contains up to 18 million metric tons of lithium, making the region a potentially significant domestic source of lithium (Dobson, Araya, & Brounce, 2023). Unlike conventional lithium mining or evaporation-pond methods, direct lithium extraction (**DLE**) recovers lithium from geothermal brine after it has been used to generate electricity and before the brine is reinjected into the geothermal reservoir (Razmjou, 2024).

¹ **Brine** is highly saline water containing elevated concentrations of dissolved salts. **Geothermal brine** refers to high-temperature, high-salinity fluid within deep hydrothermal reservoirs that contains dissolved salts, metals, and other minerals derived from prolonged water–rock interaction under elevated temperature and pressure conditions (Neupane & Wendt, 2017).

Proposed Development

The Specific Plan guides the long-term development of approximately 51,622 acres near the Salton Sea over the next 40 years. Planned activities include expanding geothermal energy production, implementing DLE technologies, and gradually converting land to industrial uses consistent with the Specific Plan's vision (County of Imperial, 2025c). As of early 2026, Controlled Thermal Resources and EnergySource Minerals both have fully permitted DLE projects that have not yet begun construction (Controlled Thermal Resources, n.d.; EnergySource Minerals, 2025b; Reuters, 2026). Berkshire Hathaway Energy Renewables is operating a DLE pilot project that is approximately one-tenth the scale of commercial operations (BHE Renewables, 2026). Additionally, the Controlled Thermal Resources permit includes the construction of a new geothermal power facility (Controlled Thermal Resources, n.d.).

Assessment of Potential Health Impacts: Overview

Because DLE has not yet been widely implemented on a commercial scale, little published evidence exists regarding its potential health impacts. This HIA therefore draws on evidence from analogous processes, established exposure pathways, and known environmental health relationships, while also considering potential health benefits associated with economic development in the Salton Sea region.

Key limitations include the lack of information related to the health impacts of DLE, the use of estimates of potential health effects rather than known health effects, and an inability to quantify the health benefits or adverse impacts attributable to the proposed development. Additionally, isolating the health effects of this program from other sources of environmental pollution may not be possible.

Sensitive Populations and Locations

The California Air Resources Board (**CARB**) identifies several populations as more sensitive to air pollution and related health impacts, including infants and children, older adults, individuals who engage in vigorous outdoor activities/work, pregnant individuals, and those with pre-existing respiratory or cardiovascular conditions (e.g., asthma, chronic obstructive pulmonary disease, or heart disease) (CARB, 2025, 2026aa, 2026h, 2026s, 2026v, 2026p). Additional groups of concern include workers with potential occupational exposures (Fang et al., 2010; MacMurdo et al., 2025) and economically vulnerable communities, who may experience disproportionate risks due to financial, environmental, or social stressors (Huang & London, 2012; Jbaily et al., 2022; U.S. EPA, 2019).

Sensitive receptor locations, defined as places where individuals who are more vulnerable to air pollution live or spend substantial time, include residential areas, schools and schoolyards, parks and playgrounds, childcare facilities, nursing homes, hospitals, and other community-serving facilities (CARB, 2026y).

The California Environmental Protection Agency (**CalEPA**), further conducts a cumulative risk assessment, the California Communities Environmental Health Screening Tool (**CalEnviroScreen**), that incorporates both pollution burden and population characteristics, including sensitive populations and socioeconomic factors (CalEPA, 2026e). Based on

CalEnviroScreen 4.0, much of Imperial County is identified as an economically vulnerable community, classified as either low-income, disadvantaged, or both, highlighting the potential for disproportionate health impacts (CARB, n.d.-a).

Potential Health Impacts Summary

Potential Health Benefits

The development proposed under the Specific Plan is projected to generate lithium-related revenues, a portion of which is anticipated to be allocated to community benefits and Salton Sea restoration. These investments, along with project-driven economic growth, could support infrastructure improvements, expanded public services, and increased employment and household incomes. These factors are closely linked to health outcomes (CDC, 2024a; Hacker et al., 2022; Taylor et al., 2016; World Health Organization, 2026b) and could contribute to improved community health. Additional benefits may include improvements in air quality through measures such as road paving, or improvements in both air and water quality from reductions in agricultural emissions due to land-use changes within the Specific Plan area (Dudek, 2025b).

Potential Adverse Health Effects

Potential health effects considered in this assessment include the onset and exacerbation of respiratory diseases, neurodevelopmental impacts, cancer risk, premature mortality, cardiovascular disease exacerbation, heat-related illness, injury, and adverse psychological effects.

Net Health Effects

While certain aspects of the development proposed under the Specific Plan have the potential to improve public health, project implementation is also expected to generate additional pollutant emissions that could adversely affect air quality and increase potential exposures to hazardous materials (Dobson, Araya, Brounce, et al., 2023; Dudek, 2025b). As a result, the overall net health effect remains uncertain.

Equity Considerations

Equity considerations are critical for understanding how impacts are distributed and for ensuring that potential health benefits reach all segments of the population. Population growth may strain access to health care if services and infrastructure do not expand in a proportionate and equitable manner. Economic benefits may also be unevenly distributed, with some residents, including retirees and those not directly connected to new employment opportunities, experiencing limited gains. In addition, individuals facing potential job displacement in the agricultural sector may experience income loss and related adverse health effects if comparable employment opportunities are not available. Residents located closest to industrial development may also face a higher likelihood of adverse impacts due to increased exposure to stressors such as air pollution, traffic, noise, and other changes associated with growth and development.

Assessment of Potential Health Impacts: Detail

Air- and Dust-Related

Background

In 2023, the Salton Sea Air Basin was designated as nonattainment for California's ambient air quality standards for ozone and particulate matter 10 microns or less in diameter, consistent with other air basins in Southern California (CARB, 2026r). As of 2026, the southern part of Imperial County was designated as nonattainment for the federal standard related to particulate matter 10 microns or less in diameter (U.S. EPA, 2026a). Countywide, however, Imperial County attained the federal air quality standard for particulate matter 10 microns or less (U.S. EPA, 2026a). Hydrogen sulfide, which produces a characteristic rotten egg odor, remains unclassified due to limited data (CARB, n.d.-c), and monitoring networks may be insufficient to characterize concentrations in the area (Centeno et al., 2025). The largest source of hydrogen sulfide emissions in the region is the Salton Sea (Dobson, Araya, Brounce, et al., 2023).

Air quality in Imperial County is influenced by a combination of geographic-, climatic-, and human-driven factors (ICAPCD, 2009, 2017), as well as both local emissions and pollutants transported from outside the region. Prevailing wind patterns carry pollutants and their precursor compounds from areas west of the County through the San Geronio Pass and Coachella Valley (Griffiths et al., 2009), contributing to ambient concentrations of ozone and fine particulate matter (Durkee et al., 2013). In Imperial County, windblown desert dust is the primary contributor to particulate matter in the air, with additional emissions from unpaved roads, agricultural operations, and construction activities (ICAPCD, 2018b; IID, 2026f). Local air quality is also influenced by vehicular traffic, diesel equipment, agricultural activities (including field burning), and industrial operations such as geothermal power generation, food processing, plaster manufacturing, and other light industrial uses (Imperial County, 2016). Emissions of nitrogen oxides from agricultural soils may also contribute to regional air quality conditions (Lieb et al., 2024).

Potential Health Impacts

Development proposed under the Specific Plan is expected to generate additional air pollutant emissions; however, the magnitude of these increases and the associated health impacts remain uncertain. This uncertainty reflects the difficulty of linking emission levels to specific health outcomes, as well as the challenges in quantifying the effects of planned mitigation measures (Dudek, 2025b) and potential health benefits. Because the proposed activities may exceed established air quality thresholds, they may contribute to adverse health outcomes, including respiratory symptoms, lung irritation and tissue damage, exacerbation of existing lung disease, increased hospitalizations, and premature mortality (Dudek, 2025b).

Desert-source dust is not expected to change as a result of the development proposed under the Specific Plan, nor is playa dust due to applicable mitigation measures. Similarly, odors related to the proposed development are not expected to pose health concerns due to required mitigation and abatement activities (County of Imperial, 2025c; Dudek, 2025b).

Water-Related

Background

Municipal Water

Municipal water refers to potable (safe for human consumption) water supplied to homes, businesses, and other community users. In Imperial County, most local municipalities and water districts obtain Colorado River water from the Imperial Irrigation District (IID). They then treat the water to meet drinking water standards before delivering it to customers (IID, 2026i). However, some smaller water providers operate independently and rely on groundwater as their primary water source (IID, 2026b, 2026i).

Surface Water

Surface water in the region includes the Salton Sea, local rivers, and irrigation canals. The Salton Sea is a terminal lake sustained primarily by agricultural runoff, with additional inputs from rivers and wastewater discharges, contributing to increased salinity, elevated nutrient levels, algal blooms, and low oxygen conditions (Dudek, 2025b; Frie et al., 2017; Ma et al., 2020; Rick Engineering Company, 2024). The New River and Alamo River, which flow into the Salton Sea, also experience poor water quality (Rick Engineering Company, 2024). In addition, the IID operates irrigation canals that convey Colorado River water for agricultural use. Water from the irrigation canals is not considered potable (Imperial County Public Health Department, 2025a).

Groundwater

“Groundwater is water located beneath the Earth’s surface...forming underground reservoirs called aquifers” (California State Water Resources Control Board, 2026a). The Imperial Valley Groundwater Basin is made up of two major aquifers that are separate from the much deeper geothermal reservoirs (Busse et al., 2024; California’s Groundwater Bulletin 118, 2024; Tompson et al., 2008). Water quality across much of the Imperial Valley Groundwater Basin is generally unsuitable for potable water use without treatment due to elevated total dissolved solids, as well as localized concentrations of fluoride and boron (Busse et al., 2024; California’s Groundwater Bulletin 118, 2024; IID, 2026i; Loeltz et al., 1975). Nevertheless, in select areas, groundwater supplies some community drinking water systems for potable use; water is treated as needed (State Water Resources Control Board, 2025b; U.S. EPA, 2026b).

Potential Health Impacts

Municipal Water

Development proposed under the Specific Plan will obtain water from the IID, and is expected to maximize water recycling (Dudek, 2025b). The IID prioritizes municipal and domestic water uses, providing these users with the highest level of supply assurance (IID, 2026b). New industrial development will receive water from IID that is not allocated for municipal or domestic use (IID, 2026b). Accordingly, water demands associated with development under the Specific Plan are not expected to substantially affect the availability of municipal drinking water supplies.

Surface Water and Groundwater

Development proposed under the Specific Plan would not utilize water from the Salton Sea and is not currently anticipated to rely on groundwater for operations (Dudek, 2025b; Lawrence Berkeley National Laboratory, n.d.). The development will likely necessitate updates to the IID

distribution systems, wastewater treatment facilities, and stormwater and drainage systems (Rick Engineering Company, 2024). Any new wastewater treatment plants will meet National Pollutant Discharge Elimination System standards, with treated water to be discharged into the Alamo River, feeding the Salton Sea (Dudek, 2025b). Similarly, developments would need to follow the wastewater management guidelines and drainage standards set by Imperial County (County of Imperial, 2025c).

Construction or operational activities, as well as unexpected leaks, spills, or accidents, could directly affect surface water and groundwater quality (e.g., spills into water bodies) or affect it via stormwater runoff. However, because construction and operations must comply with numerous federal, state, and local laws, regulations, and ordinances, the project's environmental impacts are considered less than significant² (Dudek, 2025b).

Hazardous Materials and Waste Management

Background

The California Department of Toxic Substances Control (**DTSC**) defines hazardous waste as any material that poses a potential risk to human health or the environment due to its chemical or physical properties (DTSC, 2026). Hazardous waste may occur in liquid, solid, or gaseous forms and is commonly generated through industrial processes, the disposal of used materials, or the discarding of unused commercial products such as solvents (e.g., cleaning supplies) and pesticides (DTSC, 2026).

Current operations at geothermal plants, which will continue with the addition of DLE:

- Hazardous waste, either solid or liquid, generated by geothermal energy production, is transported to an appropriate landfill facility (Dobson, Araya, Brounce, et al., 2023).
- “Permitting, inspection, compliance, and corrective action programs ensure that people who manage hazardous waste follow state and federal requirements and other laws that affect hazardous waste specific to handling, storage, transportation, disposal, treatment, reduction, cleanup, and emergency planning” (Dudek, 2025b).
- Non-hazardous waste is transported to appropriate disposal facilities, depending on the material classification (Dudek, 2025b; Stringfellow & Camarillo, 2025a).

Potential Health Impacts

The implementation of the mitigation measures identified in the Draft PEIR, together with compliance with applicable existing rules and regulations, would reduce the impacts of hazards

² Under the California Environmental Quality Act, thresholds of significance are standards or criteria used to evaluate whether a project's environmental effects could be significant. Please see the draft PEIR for a list of significance thresholds for each environmental impact examined (Dudek, 2025b). In this case, a significant impact would occur if the proposed project violated any water quality standard or waste discharge requirements or otherwise substantially degraded surface or ground water quality (this is the first of the five thresholds evaluated) (Dudek, 2025b).

and hazardous materials on the public and the environment to less than significant³ (Dudek, 2025b). Additionally, excavation and removal of existing contaminated soils during construction “could also result in an overall reduction of contaminated sites” (Dudek, 2025b).

While regulations, operational standards, and mitigation measures are in place to protect community health and minimize potential harm, ongoing monitoring and effective enforcement will remain important. As DLE technologies continue to evolve, ongoing evaluation of operational practices, waste streams, and environmental impacts can help ensure that project activities remain aligned with community health protection goals.

Seismic Effects

Background

The Salton Sea KGRA lies within an active seismic zone near several major faults in Imperial County, including the San Andreas, San Jacinto, and Elsinore faults, as well as the Brawley Seismic Zone (Rockwell et al., 2014). In the Final Baseline Report (Rick Engineering Company, 2024), authors note that, “Currently, portions of the County are affected by minor earthquakes with magnitudes of 4.5 or less every few months. The County may experience an earthquake with a magnitude of 5.5 or greater every five years and dozens of micro-seismic events, with magnitudes of 2.0 or less, on a daily basis” (California Department of Conservation, 2024; McCrink, Timothy et al., 2011; Minnick, 2022).

Existing geothermal power plants in the Salton Sea KGRA generate electricity by producing naturally circulating geothermal brine that are used for electricity generation, before reinjecting the fluids into the geothermal reservoir to maintain reservoir pressure (U.S. Department of Energy, n.d.-c). Although brine production and reinjection can induce seismic activity, studies of hydrothermal geothermal systems, including those similar to the Salton Sea KGRA, indicate that most induced events are microearthquakes that are too small to be felt at the surface (Buijze et al., 2019; Gaucher et al., 2015; Li et al., 2022; Majer et al., 2007; Zang et al., 2014). Additionally, most induced seismic activity occurs within or immediately adjacent to active production and/or injection zones (Brodsky & Lajoie, 2013; Cardiff et al., 2018; Koirala et al., 2024; Tung et al., 2024). Some researchers have proposed that long-term geothermal production can modify subsurface stress conditions, which may either promote or inhibit fault slip depending on reservoir conditions (Cardiff et al., 2018; Im et al., 2021; Im & Avouac, 2021; Tung et al., 2024; Zang et al., 2014).

The geothermal and lithium development proposed under the Specific Plan includes two mitigation measures focused on monitoring and managing potential geologic impacts: one addressing induced seismicity and the other addressing ground subsidence (Dudek, 2025b). Before drilling new geothermal wells, operators must develop and obtain approval of a seismic monitoring plan that includes microseismic monitoring, procedures for responding to increased seismic activity (including suspension or termination of operations, if warranted), evaluation of

³ Under the California Environmental Quality Act, thresholds of significance are standards or criteria used to evaluate whether a project’s environmental effects could be significant. Please see the draft PEIR for a list of significance thresholds for each environmental impact examined (Dudek, 2025b). In this case, a significant impact would occur if the proposed project created a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials (this is the first of the seven thresholds evaluated) (Dudek, 2025b).

whether seismic events are associated with geothermal activities, and reporting requirements for regulatory review. Operators are also required to monitor injection pressures and production rates. In addition, prior to initiating operations, operators must establish a ground subsidence monitoring program that includes annual land surveys to detect surface subsidence and implement operational adjustments as needed (Dudek, 2025b).

Potential Health Impacts

DLE at the Salton Sea KGRA is not expected to substantially change seismicity, as lithium recovery occurs after geothermal brine is produced during normal geothermal operations (Lawrence Berkeley National Laboratory, n.d.). Project descriptions indicate that DLE would operate within the existing closed-loop production and reinjection system and is not anticipated to require additional drilling or reinjection beyond that associated with geothermal power generation (Lawrence Berkeley National Laboratory, n.d.).

However, if additional geothermal wells are drilled or production and reinjection rates change substantially, seismic activity could increase, although the extent to which geothermal operations influence seismicity in the Salton Sea region remains uncertain. Most seismic events associated with geothermal activity are expected to be of small magnitude; however, earthquakes up to or in the range of magnitude 4.0 to 5.5 could be induced (Dudek, 2025b) or occur independently of project activities. Earthquakes of this magnitude could damage structures not built to current seismic standards and result in injuries from falling or unsecured objects (Dudek, 2025b). Structural damage could also affect industrial facilities, including chemical storage tanks, pipelines, and brine-handling equipment, potentially causing releases that could affect air, soil, or water quality and result in secondary environmental or health impacts (Dudek, 2025b).

Despite the potential risk, the likelihood of fault rupture associated with the development proposed under the Specific Plan is considered less than significant⁴ (Dudek, 2025b). All new construction and modifications to existing facilities would be required to comply with current building code requirements, including applicable seismic design standards, thereby reducing the potential for structural damage (Dudek, 2025b). Infrastructure, including underground pipelines, must be resilient to ground deformation in accordance with current building codes. The analysis also notes that geothermal development involves managing reservoir pressure and monitoring operations that could influence seismicity (Dudek, 2025b). With the implementation of the proposed mitigation measures, seismic impacts are expected to be less than significant³ (Dudek, 2025b).

⁴ Under the California Environmental Quality Act, thresholds of significance are standards or criteria used to evaluate whether a project's environmental effects could be significant. Please see the draft PEIR for a list of significance thresholds for each environmental impact examined (Dudek, 2025b). In this case, a significant impact would occur if the proposed project would directly or indirectly expose people or property to substantial geologic or seismic hazards as well as other geologic hazards identified under the applicable significance thresholds (Dudek, 2025b).

Stress, Psychological Well-Being, and Employment

Background

Health and well-being encompass physical, mental, and social dimensions (Bai et al., 2012). According to Bai et al. (2012), physical health includes disease, injury, and disability. Mental health includes illness, trauma, cognitive functioning, and emotional well-being. Social well-being relates to relationships, community belonging, social isolation, family changes, and empowerment. Stress can be defined as the process by which individuals respond to “expectations and pressure from the environment” that may be perceived as “threatening or overwhelming” (Lazarus and Folkman, 1986, as cited in (Slimmen et al., 2022)):

“Stress can be brief, situational, and a positive force motivating performance, but if experienced over an extended period of time it can become chronic stress, which negatively impacts health and well-being” (American Psychological Association, 2026).

Data on stress and psychological well-being are limited; however, available indicators suggest elevated levels of social and economic stress in Imperial County. Adverse childhood experiences, which have been linked to long-term negative health outcomes, (CDC, 2026c) are more prevalent in Imperial County than in California overall. Based on pooled 2023–2024 data, 71.7% of adults in Imperial County reported at least one adverse childhood experience and 38.3% reported three or more, compared with 67.4% and 33.4%, respectively, statewide) (UCLA Center for Policy Research, 2026).

Additional indicators point to ongoing stressors, including high unemployment (18.6% in 2025) (Employment Development Department, 2026), as well as residents reporting financial stress related to housing costs (47.2%), food insecurity (44.8%), and fair or poor mental health (28.8%) (PRC, 2022). Additionally, an estimated 19.5% of Imperial County residents were at or below the federal poverty level, compared to 12.0% for California (*Census Reporter*, n.d.).

Potential Health Impacts

Community development may influence social determinants of health and support overall community well-being (Public Health Institute, 2026). However, it may also introduce stressors, particularly when changes affect housing affordability, employment stability, social networks, or neighborhood cohesion through redevelopment, population shifts, or a perceived loss of community identity (CDC, 2024c; Luke et al., 2026). In addition, the construction and operation of industrial facilities may affect nearby residents by altering environmental conditions, including noise, air pollution, dust, and odors, which can contribute to both physical and psychological stress (M. Lima & Marques, 2017).

The overall effect on stress and psychological well-being among Imperial County residents remains uncertain, but potential impacts are likely to be greater for those living closest to development areas or along transportation corridors.

Details

Changes in Community. In the Specific Plan area, implementation would result in more densely developed areas, including increased population, taller structures, and the loss of some “expansive horizontal views” (Dudek, 2025b). These changes, including alterations to the landscape, may alter the region's visual character and influence individuals’ or communities’ sense of place and belonging. Potential impacts to tribal cultural resources could affect culturally significant landscapes and land uses associated with features such as Obsidian Butte, Rock Hill, Red Island, Mullet Island, mud pots, trails, and archaeological sites containing prehistoric materials (Dudek, 2025b). In addition, population growth and development are expected to increase traffic and noise levels, which would not be fully eliminated (Dudek, 2025b).

Social Equity. The Imperial County Good Neighbor Community Benefit Agreement Program, Specific Plan goals and policies, and lithium excise tax revenues are intended to support nearby communities and maximize the benefits of the development. Improvements in neighborhood amenities, such as parks, transportation, and access to grocery stores, may attract new investment and residents, potentially increasing housing costs and contributing to the displacement of existing residents if not carefully managed (Aboelata et al., 2017). Similarly, a rapid influx of workers from outside the region could place additional pressure on the housing market, further increasing the risk of displacement (Brasier et al., 2011).

Mitigations. The Draft PEIR (Dudek, 2025b), identifies mitigation measures intended to reduce potential impacts associated with development. These include noise and visual controls, compensation for farmland conversion, the use of Cultural Resource Specialists and cultural sensitivity training, regional planning to address housing and population growth, and transportation strategies such as trip reduction programs, improved pedestrian and bicycle connectivity, and transit enhancements. Additional measures are also included to protect cultural resources.

Employment. The proportion of future lithium and geothermal jobs that will be filled by local residents remains uncertain. Workforce shortages exist in engineering, technical, and business fields (Alhajjar et al., 2025) although local post-secondary institutions are developing industry-focused certificate and degree programs, some with the aid of industry partners.

Occupational Concerns: Heat Stress, Injury, Etc.

Background

The Occupational Safety and Health Administration identifies a range of workplace hazards associated with geothermal energy operations, including electrical hazards, falls, exposure to airborne silica, trenching and excavation risks, and welding and cutting activities (OSHA, n.d.-e). Additional concerns include exposure to hydrogen sulfide and other hazardous gases in confined spaces, the need for appropriate personal protective equipment, and potential contact with hot geothermal brine, which can cause burns (OSHA, n.d.-e). More broadly, power generation activities may involve additional risks such as electrocution, fires and explosions, heat stress, and physical injuries (OSHA, n.d.-b). Associated health outcomes can include sprains, strains, fractures, burns, silicosis, and, in severe cases, death.

Hazardous materials and chemicals may also be used or generated during geothermal operations and DLE processes, as well as during construction activities (Lawrence Berkeley National Laboratory, n.d.; OSHA, n.d.-i, n.d.-j, n.d.-a; Saleem et al., 2025).

In addition, construction workers may be exposed to risks related to heavy equipment operation, falling or being struck by objects, vehicle and mobile equipment movement, noise and vibration, and ergonomic stressors associated with repetitive motion or lifting/carrying heavy materials (OSHA, n.d.-a, n.d.-b, n.d.-d, n.d.-h).

Between April 2021 and April 2026, five accidents and one complaint prompted OSHA inspections at the 11 geothermal plants within the Salton Sea KGRA (OSHA, n.d.-c). In total, OSHA issued nine citations for violations at some of these geothermal facilities, all of which were later marked as abated (i.e., successfully corrected) (OSHA, n.d.-c). The citations involved failures to adequately establish, implement, and maintain an effective injury and illness prevention program; protect workers from indoor and outdoor heat illness through prevention measures and training; immediately report any serious injury, illness, or death; and maintain pipelines containing hot, poisonous, corrosive, or flammable substances in a manner that prevents dangerous vibrations (California Department of Industrial Relations, 2026). Four of the citations specifically mentioned heat hazards (OSHA, n.d.-c).

Potential Health Impacts

The development proposed under the Specific Plan is expected to increase the number of workers exposed to occupational hazards. Although injury rates per worker are not expected to change if safety practices are maintained, a larger workforce could lead to more occupational injuries and illnesses, including heat-related illnesses, physical injuries, noise exposure, and exposure to hazardous materials.

Compared with conventional geothermal operations, DLE facilities may introduce additional occupational hazards, including chemical handling, pressurized processing systems, corrosive materials, additional lithium product dust, increased maintenance activities, and startup or process-upset conditions. The specific occupational hazards may vary depending on the type of DLE technology employed.

All construction and operational activities would be required to comply with applicable federal and state worker safety standards (Dudek, 2025b). In addition, applicable dust-suppression and hazardous-materials mitigations would be implemented to reduce occupational risks.

Healthcare Services Availability

Background

Health care infrastructure influences both access to health care services and the quality of care provided, making it an important social determinant of health. Factors that can influence health outcomes related to health care infrastructure include the availability of health promotion and prevention services; access to clinical care, including adequate provider supply; provider linguistic and cultural competency; and the overall quality of care delivered (Artiga & Hinton, 2018; University of Wisconsin Population Health Institute, 2026a).

As of 2023, Imperial County had a lower-than-average supply of physicians treating community-acquired pneumonia, diabetes, and urinary tract infections, while hospitalization rates for these potentially preventable conditions remained higher than statewide levels (California Department of Health Care Access and Information, 2026). Access to care is further constrained in rural northern communities, where the availability of services is limited (County of Imperial, 2025c).

Survey data further explain the barriers to health care. In 2022, 53.0% of adults reported difficulty or delays in accessing health services, most commonly due to challenges obtaining appointments, inconvenient hours, difficulty finding providers, and cost (PRC, 2022). Cost-related barriers also affected medication adherence: 16.0% of adults reported skipping or delaying prescriptions, and 10.1% of parents reported that their child was unable to obtain needed care at least once in the past year (PRC, 2022).

Potential Health Impacts

The potential effects of the development proposed under the Specific Plan on health care access remain uncertain. As population increases with buildout, demand for health services is expected to grow, and existing gaps could be exacerbated if not adequately addressed. The County of Imperial has identified strategies to address these challenges, including potential investments in mobile and telehealth services and updates to planning documents to align service delivery with projected population growth (County of Imperial, 2025c). The County of Imperial also intends to ensure that emergency medical services are in place prior to accommodating employees in workforce housing (County of Imperial, 2025c).

Funding generated by the Lithium Extraction Tax Law could provide one source to expand health services. Information about the funding plan is available online (County of Imperial, 2025a). The County of Imperial has identified the California Health Facilities Financial Authority as another potential funding source for healthcare services (County of Imperial, 2025c).

Recommendations

While the Specific Plan provides a program-level framework for future lithium and related industrial development, the precise magnitude, location, duration, and timing of potential environmental and health effects are not yet fully known. The fully proposed development, as allowed within the framework, could provide direct or indirect public health benefits (depending on the type and amount of development), although the overall net effects on health care access, community health, and air and water quality remain uncertain given the available information. Because DLE technologies are not yet widely practiced at a commercial scale, there is limited evidence regarding their potential health impacts.

Although the proposed development may pose health risks, there are numerous existing rules, laws, regulations, ordinances, policies, and proposed mitigation measures intended to protect public health and safety (Dudek, 2025b). Collectively, these requirements are intended to reduce potential health risks by establishing operational standards, requiring pollution controls and environmental monitoring, protecting water and air quality, and providing mechanisms for oversight, compliance, and corrective action. However, it is possible that regulatory frameworks are insufficient, inconsistently implemented, or limited in their monitoring and enforcement.

Additionally, in Imperial County, there are existing air quality challenges, including nonattainment designations for ozone and PM₁₀, as well as concerns about hydrogen sulfide emissions primarily from the Salton Sea and other sources. The maximum development proposed under the Specific Plan would produce emissions of these and other air pollutants, potentially affecting air quality and, in turn, potentially impacting the public's health (Dudek, 2025b). The potential for or magnitude of these potential environmental effects is not yet known, particularly because mitigation measures could not be incorporated into the health impact modeling (Dudek, 2025b). Additionally, much of Imperial County is economically vulnerable, and community members experience higher-than-average rates of certain health conditions as well as limited access to healthcare for some residents, especially in rural areas.

In response to these uncertainties and existing environmental and health concerns, the following recommendations were developed based on the available evidence. They are intended to support ongoing monitoring and adaptive management and to promote safeguards that protect public health and well-being. Implementation will require prioritization and operationalization through collaboration among the County of Imperial, industry partners, and community stakeholders. In doing so, it will be important to consider practical constraints, identify potential funding sources, and align actions with community priorities and available resources.

While these recommendations are broad, the implementation plans translate them into specific, measurable, achievable, relevant, and time-bound (i.e., SMART) actions, including defined monitoring and reporting mechanisms (see Appendix C).

Recommendation 1: Evaluate and Strengthen Environmental Monitoring and Oversight Systems

The ability to identify, prevent, and respond to potential health impacts associated with development under the Specific Plan framework depends on the effectiveness of environmental monitoring and regulatory oversight systems. These systems should be periodically evaluated and strengthened to ensure they remain capable of detecting environmental changes, identifying non-compliance, and supporting timely corrective actions.

Two priorities should guide these efforts:

- Ensuring that monitoring systems can detect emissions, releases, contamination, or other environmental conditions that could affect public health.
- Ensuring that industry operators, developers, and other entities comply with applicable regulations, permit conditions, and mitigation measures throughout all phases of development and operation.

Key questions include:

1. Are existing monitoring systems sufficient to detect emissions, releases, or contamination and non-compliance in air, water, and soil?
2. Are existing oversight and compliance mechanisms adequate to verify that operators consistently comply with applicable regulations, permit requirements, and mitigation measures?

Assess the Adequacy of Environmental Monitoring Systems and Strengthen Systems as Applicable

Evaluate whether existing environmental monitoring and regulatory oversight systems are sufficient to identify, track, and respond to environmental conditions that may adversely affect public health during the buildout and operation proposed under the Specific Plan. This evaluation should assess whether monitoring systems provide adequate spatial and temporal coverage, measure relevant environmental indicators, generate reliable and timely data, and detect localized and cumulative impacts. Particular attention should be given to whether monitoring locations adequately represent potentially affected communities, whether data are collected frequently enough to detect changing conditions, and whether monitoring networks can detect both anticipated and unanticipated impacts associated with development activities. It should also assess the roles and expectations of parties responsible for the environmental impacts.

Any gaps in monitoring locations, monitoring frequency, measured parameters, data quality, or reporting processes should be identified and addressed through a strategic implementation plan. In developing this plan, the County of Imperial may need to prioritize actions based on potential public health significance, consider technical and financial constraints, identify funding opportunities, align efforts with community priorities, and leverage partnerships with regional, state, federal, academic, and other external resources.

Assess the Adequacy of Compliance Monitoring and Strengthen Oversight as Needed

Compliance with applicable environmental regulations, permit conditions, and mitigation measures is evaluated through multiple oversight and monitoring mechanisms, including permit review and renewal processes, operator self-monitoring and reporting, regulatory inspections, compliance audits, environmental monitoring programs, sampling and laboratory analysis, spill and incident reporting requirements, and third-party verification activities.

Assess Adequacy

Evaluate whether existing compliance monitoring and oversight systems are sufficient to identify non-compliance, verify adherence to permit conditions and mitigation measures, and support timely corrective actions when concerns are identified. This assessment should consider the frequency and scope of inspections, adequacy of monitoring and reporting requirements, data quality and verification procedures, transparency of reporting, and the ability of oversight systems to identify both routine and unexpected compliance issues.

Plan to Address Gaps

Any gaps identified in compliance monitoring or oversight should be addressed through a strategic implementation plan. In developing this plan, the County of Imperial may need to prioritize actions based on potential public health significance, consider technical and financial constraints, identify funding opportunities, align efforts with community priorities, and leverage partnerships with regional, state, federal, academic, and other external resources.

Where feasible, the county should strengthen existing oversight systems by incorporating independent verification measures to improve accountability, transparency, and public confidence. Independent monitoring and data validation can help identify issues that may not be detected through routine compliance activities alone. Potential approaches include third-party

environmental monitoring, independent review of environmental data and waste characterization, periodic compliance audits, and public reporting of monitoring results.

Implement Enhanced Environmental Monitoring and Protection Measures as Warranted

Identify and document existing health and environmental monitoring programs, monitoring results, and protective measures to establish baseline conditions. As development under the Specific Plan framework progresses, periodically review environmental and health monitoring data, particularly following major development milestones, environmental incidents, permit exceedances, or other indicators of potential health concern. In conjunction with current scientific literature and evolving operating standards, use these reviews to determine whether enhanced monitoring, additional operational measures, or other protective actions are warranted and feasible to further protect public health. Develop and implement procedures to address noncompliance in ways that strengthen impact mitigation and support improved public health outcomes.

Potential measures may include enhanced ambient and fence-line air monitoring, expanded groundwater and surface water monitoring, predefined health-based action levels that trigger additional monitoring, mitigation measures, or operational changes when environmental conditions indicate a potential health concern, enhanced dust suppression practices, real-time leak detection systems, improved containment measures, and the use of low- or zero-emission equipment. For example, elevated PM_{2.5} concentrations could trigger additional dust control measures, reductions in dust-generating activities, or temporary restrictions on diesel-powered equipment until conditions improve.

If needed, monitoring and response programs developed should support adaptive management, facilitate the early identification and mitigation of potential concerns, account for cumulative impacts, and prioritize protecting communities that already experience disproportionate environmental burdens.

Evaluate and Strengthen Worker Health and Safety Protections as Needed

If determined to be warranted and feasible, engage industry partners to implement enhanced worker health and safety protections beyond minimum regulatory requirements. Potential measures may include respiratory protection programs, heat-illness prevention strategies, air-quality alert systems, exposure monitoring, and wearable technologies that detect heat stress and gas exposures. Worker health and safety programs should be periodically reviewed and updated as operations evolve and new risks are identified.

Evaluate and Strengthen Emergency Preparedness and Response as Applicable

Review and update emergency preparedness and response systems as needed to address potential incidents associated with the development proposed under the Specific Plan. Plans should include community notification protocols, coordination with local emergency responders, healthcare providers, and public health agencies, and clear procedures for incident response, risk communication, and public notification.

Recommendation 2: Establish Accessible and Transparent Information Sharing

Establish Centralized System

Establish a centralized and accessible system for ongoing information sharing and community engagement. While a digital platform may serve as a core component, information should also be disseminated through multiple channels to ensure equitable access, including in-person outreach, printed materials, community-based organizations, schools, local events, and other trusted community venues. Information should be presented in plain language; interpreted objectively; and made available in English, Spanish, and other languages as needed, and in formats accessible to diverse audiences.

In developing this system, the County of Imperial may need to prioritize included information based on potential public health significance, consider technical and financial constraints, engage industry partners and community stakeholders, identify funding opportunities, align implementation with community priorities, and leverage partnerships with regional, state, federal, academic, and other external organizations. A clear timeline of dissemination activities should be made available as dissemination plans are established and updated.

Project Impact Information

Develop clear, publicly accessible information about the project, including potential environmental and health benefits and risks, mitigation measures, monitoring plans, and opportunities for community involvement.

Environmental Information

Include environmental monitoring data collected by both industry operators and regulatory agencies in the information-sharing system. Information should be presented in a clear and accessible format that enables community members to understand monitoring results, trends over time, and, where appropriate, potential health implications. To support transparency, accountability, and informed decision-making, information should be balanced, regularly updated, and made available as soon as practicable following data collection, analysis, or incident reporting.

The County of Imperial may need to establish clear requirements for the collection and sharing of operational data between industry partners, the County of Imperial, and the public. While some information may be proprietary, key data related to emissions, environmental conditions, incidents, and response actions should be shared in a standardized, accessible format. Data shared needs to be usable, transparent, timely, and include summaries that support understanding by non-technical audiences. Even when information itself cannot be shared with the public, it is recommended that a list of all collected information be shared to ensure transparency about the full context of reporting.

Public Notification

Assess whether establishing a public notification system for environmental incidents aligns with County of Imperial priorities and would provide meaningful benefits to affected communities. If

determined to be warranted and feasible, develop and implement a public notification system for incidents such as spills, leaks, fires, releases, permit exceedances, or off-site migration of contaminants that could affect public health. Notifications should be issued as promptly as practicable and provide timely, accurate, and actionable information to affected communities.

Notification procedures should clearly define the types of incidents that warrant public notification, the methods and timelines for communication, the information to be provided, and any recommended actions community members should take to protect their health and safety. Provide transparent means for community members to sign up for public notifications.

Health Information

Determine which health indicators are most appropriate, useful, and feasible to incorporate into the community-shared information system and ongoing monitoring to ensure the community's health is maintained or improved. Prioritize indicators that support the early identification of potential health concerns, recognizing that some health effects associated with environmental exposures may not become apparent for years. Accordingly, monitoring efforts should focus on identifying and reducing harmful exposures before adverse health outcomes occur. In addition, provide clear, accessible, and evidence-based public health information to help community members understand environmental risks and take practical steps to reduce their exposure to pollution.

Recommendation 3: Create Enforceable Structures to Maximize Community Benefits

Where feasible, establish enforceable (if possible) requirements, performance standards, and accountability mechanisms to ensure that communities meaningfully benefit from development and that potential adverse impacts are avoided, minimized, or mitigated. The County of Imperial may need to identify and prioritize strategies that maximize community benefits from proposed development while considering technical, legal, and financial constraints. This process may include engagement with industry partners, community stakeholders, and public agencies; identification of potential funding sources; alignment with community priorities; and coordination with regional, state, federal, academic, and other external partners to support implementation.

In collaboration with community partners, industry or other partners, key actions may include:

- **Community-level mitigation and investment:** Explore options to fund community-based mitigation measures and other emissions-reduction initiatives, such as indoor air filtration or funds to facilitate changes to non-gas appliances that directly benefit surrounding communities.
- **Indoor air quality protections:** Provide methods to enhance indoor air quality for residents near development sites (e.g., high-quality, high-efficiency air filtration systems, weatherization, alternatives to gas appliances or fireplaces, etc.) in schools, community centers, and homes.
- **Increased setbacks and land use protections:** Increase setback distances beyond minimum regulatory requirements between industrial operations and homes or places where community members spend time, as appropriate. While the proposed geothermal/DLE plants are not located near existing homes, other planned

developments may be closer to existing or new residences. If setbacks or other land-use restrictions reduce the amount of developable land, consider strategies to minimize impacts on property owners and affordability, while identifying community-beneficial uses for setback areas, such as parks, trails, habitat restoration, or other public amenities.

- **Health needs assessment and expanded healthcare services:** Identify unmet health care needs, barriers, and health priorities in communities closest to the Specific Plan area. Use this information to provide targeted health services and support programs.
- **Support for respiratory health programs:** Enhance accessibility to specialty care for respiratory conditions, including asthma, along with community-based education.
- **Minimize displacement pressures:** Provide programs or assistance to help nearby residents manage rising housing costs or property taxes.
- **Local hiring goals and workforce development programs:** Establish policies to ensure that employment and economic benefits are accessible to local residents, including local hiring goals, workforce training programs, and support for career transitions.
- **Workforce transition support for agricultural workers:** Provide targeted support for agricultural workers who may be affected by land use changes such as a reduction in agricultural activity. Support could include paid job training, compensated educational opportunities, or clear pathways to acceptable employment.
- **Enhanced community support to promote equity:** Create ongoing opportunities for community members to share concerns, identify needs, and participate in planning. In addition, consider measures to ensure that the benefits of new development are shared broadly, particularly among populations that experience barriers to accessing services and opportunities.
- **Cumulative pollution control:** Investigate ways that existing businesses/industries that contribute to cumulative environmental pollution impacts can become more involved in reducing their emissions, improving regional environmental concerns, or contributing to community-level health investment programs.

Recommendation 4: Provide Ongoing Engagement with the Community

Engagement Plan

Maintain consistent, meaningful engagement with community members throughout the planning, development, and operation of projects implemented under the Specific Plan framework. Engagement efforts should emphasize education, outreach, transparency, and two-way communication, while supporting the early identification of emerging concerns related to community well-being, stress, environmental conditions, and potential health impacts. Information shared with the public should be evidence-based, accessible, and include practical guidance with resources on potential environmental exposures and actions that can help reduce risk.

In developing an engagement plan, the County of Imperial will need to determine the size and scope of the plan, prioritize actions based on potential public health significance, consider technical and financial constraints, include existing efforts and community partners, identify funding opportunities, align efforts with community priorities, and leverage partnerships with regional, state, federal, academic, and other external resources.

- **Methods:** Direct, two-way engagement, such as answering questions, soliciting community input, and establishing clear mechanisms to address concerns, can help build and maintain trust with the community. Various authors describe best practices related to meaningful community engagement for development and industry (M. L. Lima et al., 2012; Majer et al., 2007).
- **Industry Partners:** Where feasible, encourage industry partners to designate community liaisons or engagement programs that share information, respond to questions and concerns, and facilitate ongoing dialogue. Consider building on industry-partner education and engagement efforts already underway, as well as lessons learned from them.
- **Hearing and Reporting to Community:** Include clear, accessible, and culturally appropriate processes for community members to raise concerns and receive timely responses. Potential approaches include dedicated hotlines, email addresses, online reporting portals, community liaisons, regular public meetings, and community advisory groups. Procedures may include timelines for acknowledging, investigating, and responding to concerns, as well as mechanisms for tracking issues and communicating actions taken to address them.

Educational Content

Develop educational materials that address community concerns and information needs. Use findings from the Community Intercept Survey, along with other community engagement and feedback efforts, to create accessible, relevant educational content for residents throughout Imperial County, with particular attention to communities in the northern region.

Stakeholder Identification and Engagement

Identify and engage additional community stakeholders to ensure broad and inclusive representation. Assess whether establishing a standing community advisory group or ad hoc committee would improve ongoing communication, facilitate community input, and strengthen collaboration throughout implementation of the Specific Plan.

Recommendation 5: Strengthen Industry-Community Relationships

Explore opportunities for the County of Imperial to encourage, facilitate, and promote the "good neighbor" program (County of Imperial, 2024) among industry partners to enhance transparency, responsiveness, and community well-being. The current program requires companies to, at a minimum, support local and priority hiring, address workplace safety and quality standards, support education and skill building, participate in community engagement, advance local infrastructure, and support the local economy (County of Imperial, 2024). Potential additional practices may include a voluntary participation level for companies to begin

building their engagement, proactive environmental monitoring, public reporting of monitoring results, timely responses to community concerns, and other measures that build trust and strengthen relationships between industry operators and nearby communities.

Additional practices could include community benefit programs that directly support residents in affected areas, such as those described in Recommendation 3 (e.g., providing air filtration systems to nearby households), funding community improvement projects, supporting local health and education initiatives, or establishing dedicated community liaison positions and outreach programs to facilitate ongoing communication, education, and engagement.

In considering these opportunities, the County of Imperial will need to determine its appropriate role, identify and prioritize strategies that are most likely to benefit the community, assess technical and financial feasibility, build upon existing programs and partnerships, identify potential funding sources, align efforts with community priorities, and leverage collaborations with regional, state, federal, academic, and other external organizations. The goal should be to foster long-term, mutually beneficial relationships between industry partners and the communities affected by development under the Specific Plan framework.

Recommendation 6: Enhance Health Monitoring

Determine Monitoring Gaps

Determine whether additional health monitoring is warranted by identifying gaps in existing public health surveillance systems and assessing whether additional primary data collection could provide useful information not currently available. Potential approaches may include periodic surveys, focus groups, key informant interviews, community meetings, or other community-engaged methods. The goal should be to identify information that could support the early detection of emerging health concerns, improve understanding of community well-being, and inform future public health actions. Potential areas of focus may include respiratory health, mental health, stress, well-being, quality of life, perceived health impacts, and community concerns related to development and operations within the Specific Plan area.

The County of Imperial will need to assess its capacity to implement and sustain additional health monitoring activities and identify approaches that are both feasible and likely to provide meaningful public health benefits. This process may include evaluating staffing, technical capabilities, and available resources; prioritizing activities based on their potential public health value; building upon existing programs and partnerships; identifying funding opportunities; aligning efforts with community priorities; and leveraging collaborations with regional, state, federal, academic, and other external organizations.

Potential Scope

In addition to environmental health concerns, consider collecting information on broader community stressors and priorities, such as housing, transportation, employment, healthcare access, and other social determinants of health. Understanding the factors that most influence community well-being may help inform future interventions, resource allocation, policy development, and grant-funded programs and services. These collection efforts should build on the community feedback from the Community Health Assessment from 2024, where community

members participated in coordinated efforts to voice concerns over local systems that impact health (Imperial County Community Health Improvement Partnership, 2024).

Community Considerations

Data collection efforts may be developed in partnership with affected communities, including Tribal communities and other populations that may experience disproportionate environmental, economic, or health impacts. Data collection activities should be culturally appropriate, responsive to community priorities, and designed to address locally identified concerns.

Recommendation 7: Health Impact Assessment Planning

Because this is the first HIA conducted for the development proposed under the Specific Plan in Imperial County, establishing a long-term partnership to guide future health assessment and monitoring efforts should be considered. This partnership could provide continuity as development under the Specific Plan progresses by helping to review new information, evaluate the implementation and effectiveness of HIA recommendations, identify emerging health issues, and inform future planning and decision-making.

The partnership should include representatives from local and Tribal communities, public health agencies, environmental and regulatory agencies, industry, academic institutions, healthcare organizations, and other relevant stakeholders. Using a participatory approach would help ensure that community priorities and local knowledge continue to inform assessment, monitoring, research, and mitigation efforts over time.

In addition to guiding future HIA activities, the partnership could facilitate long-term public health and environmental health research related to geothermal energy and lithium development. Potential activities may include identifying research priorities, coordinating data collection and monitoring efforts, seeking external funding, supporting independent research, and translating findings into policies and practices that protect and promote community health.

This recommendation recognizes that understanding the health effects of large-scale direct lithium extraction and associated development will require ongoing evaluation as technologies, operations, scientific evidence, and community conditions evolve.

1. Introduction and Purpose

1.1 Introduction

In 2023, the County of Imperial, a political subdivision of the State of California, issued a request for proposals to conduct a Health Impact Assessment (**HIA**) examining the potential health impacts of lithium extraction from geothermal brine and related development in northern Imperial County. The County of Imperial subsequently awarded the HIA contract to the San Diego State University (**SDSU**) Research Foundation, which conducted assessment and reporting activities from July 2023 through September 2026.

1.2 HIA Purpose

The purpose of this HIA was to provide community-informed, data-driven information to support decision-making, policy development, and health-focused planning related to proposed lithium extraction and associated development in Imperial County. The assessment sought to improve understanding of potential health impacts, identify opportunities to promote and protect community health, and recommend strategies to minimize potential risks while maximizing potential benefits. Specific tasks included:

- a. Providing an in-depth, comprehensive analysis of the potential health impacts of lithium extraction of all projects being evaluated under the Imperial County Lithium Valley Specific Plan and Programmatic Environmental Impact Report (see Section 7);
- b. Addressing social determinants of health (see Sections 6 and 7);
- c. Exploring, collecting, and analyzing baseline health data and conditions (see Sections 6 and 7); and
- d. Identifying findings that will be used to inform decisions, influence policy development, support decision-making, as well as offer practical and evidence-based recommendations for ways to minimize risks and support opportunities to maintain and/or improve health in all Lithium-focused plans and programmatic Environmental Impact Reports (see Sections 7 and 8).

1.3 HIA Process

An HIA is a process that uses data, research, and community input to evaluate how a proposed project, plan, policy, or decision could affect the health and well-being of a population, and to identify opportunities to enhance positive health outcomes and reduce potential harms.

While the steps in an HIA can vary, they generally include the following six steps (Bhatia, 2011; CDC, 2025a):

1. **Screening:** Determine whether an HIA is needed, feasible, and likely to be useful.
2. **Scoping:** Identify which health effects to consider, available evidence/baseline data, affected populations, HIA parameters, and roles of stakeholders.

3. **Assessment:** Collect qualitative and quantitative information to create a profile of existing health conditions, and identify, evaluate, and prioritize the potential health impacts of the decision and likely health effects.
4. **Recommendation:** Develop feasible, evidence-based recommendations and/or alternatives to decisions/strategies for promoting positive health impacts and/or mitigating adverse ones and plan for implementing them.
5. **Reporting:** Write and disseminate findings (final report) to decision makers, affected communities, and other stakeholders.
6. **Monitoring and Evaluation:** Evaluate the processes involved in the HIA, the impact of the HIA on the decision-making process, and the impacts of the decision on health.

1.4 Key Definitions Related to the Term “Salton Sea”

It is important to distinguish between the terms related to the Salton Sea region that are used frequently throughout this report. The term “Salton Sea” may refer to the lake itself, but it also appears in the names of nearby geothermal resource areas and specific geothermal production fields. For clarity, the following definitions are used in this HIA:

Salton Sea:

The Salton Sea is a shallow inland lake located in Imperial and Riverside counties (IID, 2026d).

Salton Sea Known Geothermal Resource Area (KGRA):

The Salton Sea KGRA is a public land area classified by the United States (U.S.) Geological Survey as having viable geothermal resources, located on the southeastern side of the Salton Sea (California Energy Commission, 2026b; Paz et al., 2022).

Salton Sea Geothermal Field:

The Salton Sea Geothermal Field refers to specific areas within the Salton Sea KGRA where geothermal energy is being produced (Dobson, Araya, Brounce, et al., 2023; Letcher & Axelsson, 2022).

Salton Sea Geothermal Reservoir:

The Salton Sea geothermal reservoir is a naturally occurring hydrothermal system located approximately 1–3 kilometers beneath the surface, consisting of high-temperature, highly saline geothermal brine⁵ that contains dissolved lithium and other mineral resources (Dobson, Araya, Brounce, et al., 2023). Relationship Between the Salton Sea and the Salton Sea Geothermal Reservoir

The water in the Salton Sea (lake) is not connected to the underground geothermal reservoir, and geothermal energy production in the region does not use water from, or discharge water into, the Salton Sea (Kaspereit et al., 2016; Paz et al., 2022). Similarly, lithium (and other critical minerals) found in geothermal brine are not correlated with the Salton Sea.

⁵ **Brine** is highly saline water containing elevated concentrations of dissolved salts. **Geothermal brine** refers to high-temperature, high-salinity fluid within deep hydrothermal reservoirs that contains dissolved salts, metals, and other minerals derived from prolonged water–rock interaction under elevated temperature and pressure conditions (Neupane & Wendt, 2017).

1.5 Report Organization

The remainder of this HIA report begins with background information (Section 2) and an overview of direct lithium extraction (**DLE**) (Section 3). The report then follows the six core components of the HIA process, with Step 3 split into two sections:

- **Section 4:** Step 1 – Screening
- **Section 5:** Step 2 – Scoping
- **Section 6:** Step 3 – Community Profile and Baseline Conditions
- **Section 7:** Step 3 – Assessment
- **Section 8:** Step 4 – Recommendations
- **Section 9:** Step 5 – Communication and Monitoring
- **Section 10:** Step 6 – HIA Monitoring and Evaluation

The report concludes with the methodology (Section 11) and supporting appendices.

2. Background

2.1 Geothermal Power Plants in the Salton Sea KGRA

2.1.1 Geothermal Facilities

Imperial County contains nine designated KGRAs (California Energy Commission, 2026a) (see Figure 1). Within these resource areas, 17 geothermal power plants are currently in operation (June 2026) (U.S. Energy Information Administration, n.d.-a). Eleven of these facilities are located within the Salton Sea KGRA (Richter, 2020; U.S. Energy Information Administration, n.d.-a). Ten of the Salton Sea facilities are owned and operated by Berkshire Hathaway Energy Renewables, and one facility is owned by Macquarie Infrastructure Partners V and operated by EnergySource Minerals (Richter, 2020; U.S. Energy Information Administration, n.d.-a).

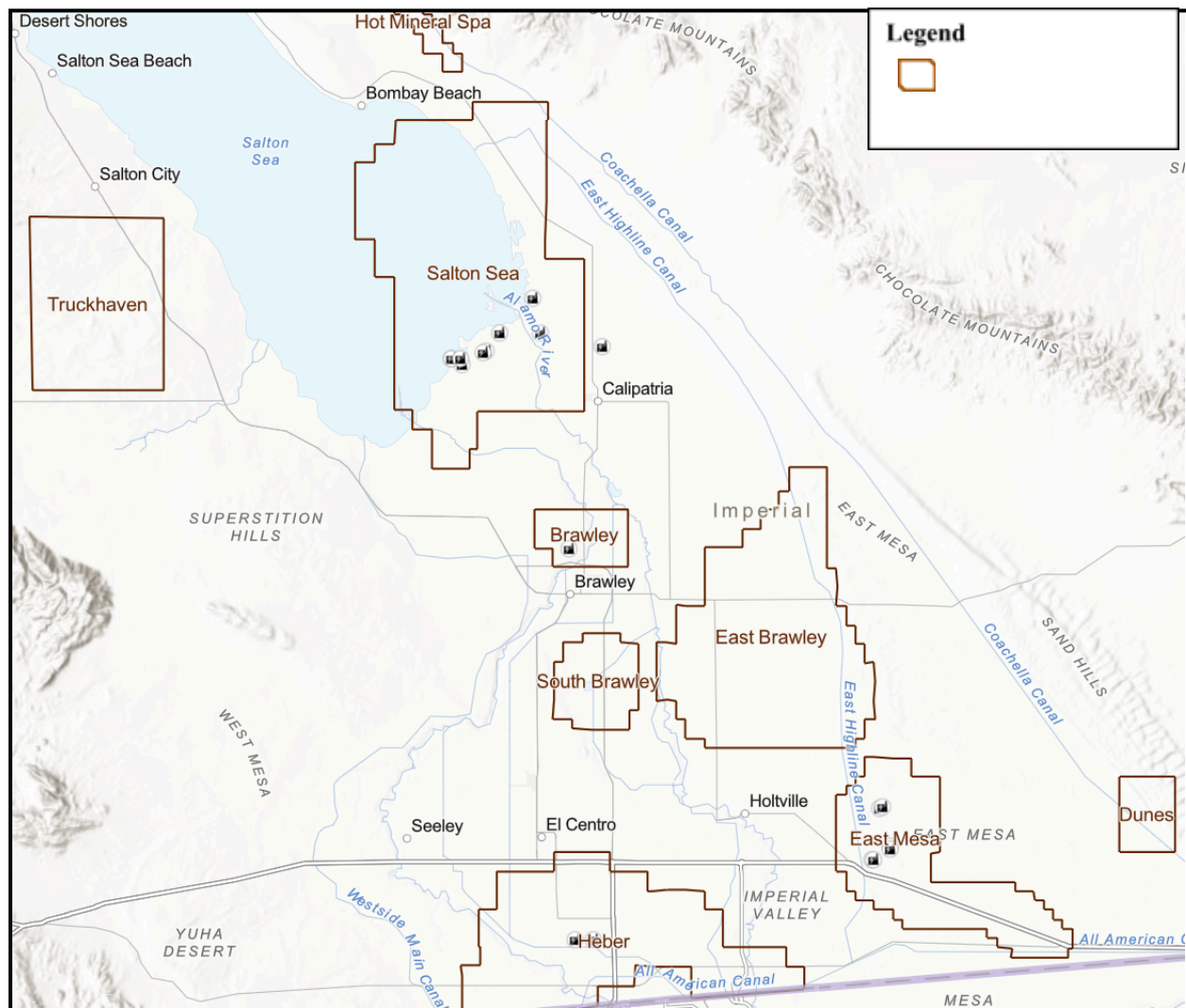


Figure 1. KGRAs in Imperial County and Lithium Valley Planning Area

2.1.2 Geothermal Energy Production Process in the Salton Sea KGRA

The Salton Sea KGRA, in the northern part of Imperial County, is the second-largest geothermal field in the United States (U.S. Army Corps of Engineers, 2023). Geothermal energy production in this region has been established for more than four decades and represents a stable, renewable source of electricity (County of Imperial, 2025b). These facilities are flash steam plants, where geothermal wells drilled to depths of approximately 1–3 kilometers bring high-pressure geothermal brine to the surface. At the surface, the pressure drop “flashes” or turns the brine into steam that drives electrical turbines to produce power (Rick Engineering Company, 2024). The brine is then clarified and reinjected into the underground reservoir to maintain reservoir pressure, ensure the sustainability of the geothermal system, and minimize environmental impact (Krishnan & Gopan, 2024; Nikfar et al., 2025).

Within the Salton Sea KGRA, the 11 geothermal power plants operate approximately 28 geothermal production wells that produce over 265 billion pounds of brine each year (Dudek, 2025b). At these plants, about 20% of the brine is flashed to steam, and the remaining brine is reinjected after solids are removed (Dudek, 2025b).

2.2 Lithium Valley Planning

2.2.1 Lithium Valley

Lithium Valley refers to a 51,622-acre planning area located in northern Imperial County along the southeastern shoreline of the Salton Sea, within unincorporated areas of the county (Imperial County Executive Office, 2025). The area encompasses a portion of the Salton Sea KGRA and has been identified by policymakers and industry leaders as a focal region for integrating existing geothermal energy operations with proposed geothermal expansion and critical mineral extraction activities, including lithium recovery (Dobson, Araya, & Brounce, 2023; Paz et al., 2022).

In 2021, the California Energy Commission, in partnership with the County of Imperial, convened the Blue-Ribbon Commission on Lithium Extraction, referred to as the Lithium Valley Commission, to evaluate the feasibility of developing the Salton Sea Geothermal Resource Area into a competitive domestic source of lithium while simultaneously fostering local economic investment (Paz et al., 2022). The Commission comprised 14 experts and stakeholders representing community organizations, geothermal and mineral extraction companies, tribal governments, state agencies, and environmental organizations. Commissioners met regularly between February 2021 and January 2023 to assess technical, environmental, economic, and community considerations related to lithium development in the region (Dobson, Araya, & Brounce, 2023).

2.2.2 Lithium Valley Specific Plan Overview

Description

In December 2025, the County of Imperial released an updated Draft Lithium Valley Specific Plan (**Specific Plan**) to establish a coordinated policy and land-use framework for the sustainable development of a vertically integrated supply chain, including geothermal, critical minerals, and advanced manufacturing within Lithium Valley (County of Imperial, 2025c). The Specific Plan outlines goals, policies, and implementation measures intended to guide future geothermal energy production, critical mineral recovery, manufacturing, and logistics activities throughout the plan area. Land Use Designation and Planned Development

“A major goal is to encourage renewable energy industry investment that provides quality local jobs, while minimizing adverse effects on the environment and public health”

*- Lithium Valley Website
(<https://lithiumvalley.imperialcounty.org/planning/>)*

The Specific Plan guides the 40-year transformation of approximately 51,622 acres of predominantly undeveloped land adjacent to the Salton Sea (County of Imperial, 2025c). Planned activities include the initial expansion of DLE, the development of new geothermal power generation facilities, and the gradual transition of land to industrial uses consistent with the Specific Plan's objectives. This HIA examines the potential health effects associated with the full range of development activities and land-use changes envisioned under the Specific Plan framework. For a more detailed review of the framework, please see the draft Specific Plan.

Planning for Health and Well-Being

The draft Specific Plan incorporates requirements intended to promote public health and community well-being (County of Imperial, 2025c):

Land Use and Design

Public health is supported through land use and design measures, including development setbacks, which establish the minimum distance between a building and the property line, limits on building and structure heights, dust suppression requirements, particularly for development within 100 feet of the Salton Sea shoreline, and streetscape improvements such as vegetation and tree planting (County of Imperial, 2025c). Additional features, including pedestrian, bicycle, and public transit infrastructure, as well as adequate lighting, can further promote safety, mobility, and overall community well-being.

Employment

The three companies currently proposing DLE in conjunction with existing or planned geothermal facilities collectively project approximately 700 permanent operations jobs and 1,000 construction jobs for lithium extraction (Alhajjar et al., 2025). The estimates from these three companies do not include employment related to all potential development and land uses specified in the Specific Plan or additional employment generated by ancillary businesses, supply chains, or other secondary industries that could develop to support the growing lithium and geothermal sector. According to Alhajjar et al. (2025, p. vi), large projects such as these “typically lift employment and earnings in adjacent fields (e.g., construction, retail, professional services, logistics, and housing).”

To support workforce readiness, the Specific Plan framework includes strategies to expand adult education, workforce training partnerships, vocational and technical instruction, and related support services (County of Imperial, 2025c). It also seeks to strengthen career pathways that connect high schools, community colleges, and workforce development programs, helping prepare local residents for employment opportunities associated with emerging regional industries

Fire, Police, and Health Services

To support anticipated increases in population and economic activity, the Specific Plan framework includes the development of a new joint fire and police substation and the expansion of healthcare services (County of Imperial, 2025c). The Imperial Valley Healthcare District will collaborate with existing healthcare providers to enhance medical services in the area, while telehealth services and mobile clinics may be utilized to help improve access to care. In addition, the framework recommends establishing specialized asthma treatment centers and expanding air quality surveillance by installing additional monitoring stations.

Water Supply

Changes in water supply can impact public health if they lead to water contamination or shortages. The draft Specific Plan clarifies that water for non-agricultural development obtained from the Imperial Irrigation District (IID) must be obtained through a formal application process. If IID determines that it cannot service the proposed demand, the applicant may be denied service (County of Imperial, 2025c). To make these determinations in support of public health, the water district follows an Equitable Distribution Plan under California State law (IID, 2026a). Additionally, converting land within the plan area from agricultural use to new development is projected to reduce water use (Dudek, 2025).

Transportation

Transportation infrastructure and traffic management can influence public health by affecting air quality, noise levels, stress, and the risk of traffic-related injuries. The draft Specific Plan includes recommendations for roadways and intersection improvements based on a traffic analysis conducted by Dudek as part of the Lithium Valley Local Mobility Analysis (County of Imperial, 2025c; Dudek, 2025a). Strategies identified in the Specific Plan include stakeholder engagement, the designation of truck routes, roadway upgrades and new construction, bridge construction, and the establishment and enforcement of designated routes for both hazardous and non-hazardous waste transport, among other measures. Relationship Between the Lithium Valley Specific Plan, Draft Programmatic Environmental Impact Report, and HIA

2.2.3 Relationship Between the Lithium Valley Specific Plan, Draft Programmatic Environmental Impact Report, and HIA

Collectively, the Specific Plan and the accompanying *Draft Programmatic Environmental Impact Report (Draft PEIR)* (Dudek, 2025b) articulate a comprehensive approach to integrated resource development that balances economic growth with environmental protection, community health, and long-term regional sustainability. The Specific Plan provides the vision and guidance for future geothermal energy and lithium development, while the Draft PEIR evaluates the potential environmental impacts of that development, identifies the regulatory framework governing responsible implementation, and recommends mitigation measures to reduce adverse environmental and community impacts.

The HIA complements these planning documents by providing a focused review of community health and identifying opportunities to enhance health benefits while minimizing potential risks. While the HIA draws on the baseline conditions and environmental impact analyses presented in the Specific Plan and Draft PEIR, it expands upon those findings by further examining how projected environmental changes may influence human health, identifying populations that may be disproportionately affected, incorporating community perspectives, and developing additional recommendations to help protect and promote public health throughout implementation of the development proposed under the Specific Plan.

2.3 Lithium Extraction Taxation and Distribution of Tax Revenue

In 2022, the State of California enacted the *Lithium Extraction Tax Law*, establishing an excise tax on lithium extraction to generate revenue for the counties in which lithium is produced (California Energy Commission, n.d.; SB-125 Public Resources: Geothermal Resources: Lithium, 2022). Under the statute, 80% of tax revenues are allocated to counties in proportion to the amount of lithium taxes, interest, penalties, and other amounts collected for lithium extraction within each county. Within Imperial County, at least 30% of these funds must be directed to benefit communities most affected by lithium extraction, considering both direct and indirect impacts.⁶ The remaining 20% of revenues are dedicated to Salton Sea restoration efforts (restoration projects and grants for community engagement, public amenity, capital improvement, or community-benefit projects at or around the Salton Sea and those communities impacted by the Salton Sea's restoration and development).

In a recently completed study by Alhajjar et al. (2025), the authors recommend allocating lithium excise tax revenues toward investments that improve the quality of life for local residents, including expanding access to affordable housing, broadband connectivity, transportation, critical infrastructure (e.g., roads and bridges), and other essential public services (Alhajjar et al., 2025). The current Lithium Excise Tax Funding Plan is available online (County of Imperial, 2025a).

2.4 Social Determinants of Health

2.4.1 General Information

According to the World Health Organization (World Health Organization, 2026a):

“Social determinants of health – broadly defined as the conditions in which people are born, grow, live, work and age, and people’s access to power, money and resources – have a powerful influence on health inequities. These are the unfair and avoidable differences in health status seen within and between countries.

At all levels of income, health and illness follow a social gradient: the lower the socioeconomic position, the worse the health. People who have limited access to

⁶ Direct affected: Bombay Beach, City of Brawley, City of Calipatria, Niland, City of Westmorland. Indirectly affected: Bard, City of Calexico, Desert Shores, City of El Centro, Heber, City of Holtville, City of Imperial, Ocotillo, Palo Verde, Salton City, Salton Sea Beach, Seeley, Winterhaven, Vista Del Mar.

quality housing, education, social protection and job opportunities have a higher risk of illness and death. Research shows that these social determinants can outweigh genetic influences or healthcare access in terms of influencing health.”

Social determinants of health include factors like socioeconomic status, education, neighborhood and physical environment, food, employment, and social support networks, as well as access to health care (Artiga & Hinton, 2018). They also include discrimination, racism, and historical trauma (Public Health Agency of Canada, 2001).

The U.S. Department of Health and Human Services notes that social determinants of health “have a major impact on people’s health, wellbeing, and quality of life,” and groups them into five categories (U.S. Department of Health and Human Services, n.d.) (Figure 2). A substantial body of evidence consistently demonstrates that non-medical factors, including the social determinants of health, often have a greater influence on health outcomes than clinical care alone (CDC, 2024a; Hacker et al., 2022; Taylor et al., 2016; World Health Organization, 2026b).



Source: Healthy People 2030 <https://health.gov/healthypeople/objectives-and-data/social-determinants-health>

Figure 2. Social Determinants of Health

2.4.2. Resource Development/Extraction and Social Determinants of Health

Resource development encompasses the planning, exploration, extraction, processing, and production of natural resources, together with the infrastructure and facilities needed to support these activities. **Resource extraction** refers specifically to the removal of natural resources from the environment for commercial or industrial use. In addition to their direct environmental effects, these projects can influence social determinants of health by shaping employment, income, education and workforce development, housing, transportation, and community infrastructure. These impacts may be positive or negative, and potential benefits may not be distributed equally across all populations (Aalhus et al., 2018). Potential impacts are discussed below by social determinant of health category.

Economic Stability

Improvements in economic stability are generally associated with better health outcomes (CDC, 2024a). Resource development projects may increase employment opportunities and household income, but the resulting benefits are not always distributed equally, and wage disparities may persist (Aalhus et al., 2018). Some populations, particularly those with the education, skills, and transportation needed to access new jobs and training opportunities, may experience greater economic benefits, while others may realize fewer economic benefits or be displaced from existing employment as industries and land uses change. Similarly, development may increase housing availability, but rapid job growth can also attract new residents, increasing demand for housing and potentially contributing to rising housing costs, higher property taxes, and the displacement of existing residents (Aboelata et al., 2017). In the longer term, local economic stability may also be affected if the underlying resource is depleted.

Social and Community Context

The transition from a predominantly rural environment to a more urbanized setting may be viewed positively by some community members and negatively by others (Aalhus et al., 2018). Such changes may influence people's sense of stress levels and overall well-being. Residents may be affected by changes to the viewshed (Dudek, 2025b) or by potential impacts to indigenous culturally significant places, resources, and traditions if these are not adequately protected and respected. At the same time, investments supported by resource development tax revenues have the potential to strengthen family and community connections by funding local services, infrastructure, and community programs.

Healthcare Access and Quality

Healthcare systems may eventually expand and improve community health over the long term, but rapid population growth can initially strain healthcare capacity and reduce access to services (Aalhus et al., 2018).

Neighborhood and Built Environment

Neighborhood conditions may change as development occurs, potentially improving or diminishing residents' sense of well-being and contributing to changes in stress levels (Aalhus et al., 2018; M. Lima & Marques, 2017). Increased development can expand access to community

resources, recreational amenities, and infrastructure, including parks, walking trails, and projects that improve neighborhood safety or enhance water and air quality. At the same time, operational noise from increased truck traffic, employee commuting, and industrial activities may affect the local environment (Dudek, 2025b), and resource development in general can increase pollution levels that may adversely affect health (Brisbois et al., 2019; Matheis, 2019).

Education Access

In Imperial County, access to education and workforce training related to the emerging lithium industry is expanding. Three postsecondary institutions in Imperial County and one in Riverside County are developing or expanding specialized energy-related degree, certificate, and training programs (Alhajjar et al., 2025). In addition, two career technical education centers are offering and developing more workforce training opportunities to prepare local residents for employment in these industries (Alhajjar et al., 2025). These efforts indicate that educational and workforce development opportunities related to lithium extraction are increasing.

However, the extent to which local residents will access these opportunities and whether they will lead to broader improvements in educational attainment remain uncertain. One study found that resource extraction booms can increase enrollment in postsecondary technical education while reducing completion of four-year professional degrees (Balza et al., 2022). More broadly, Molla et al. (2026) caution that achieving lasting benefits from resource development requires strong institutions that promote the equitable distribution of benefits and continued investment in economic diversification in order to reduce long-term dependence on finite natural resources (Molla et al., 2026).

3. Description of DLE and Current DLE Projects

3.1 DLE from Geothermal Brine

Geothermal brine⁷ contains dissolved minerals and metals, including lithium, potassium, manganese, and zinc, which are considered critical materials for battery manufacturing, metal alloys, and other advanced technologies (Subasinghe et al., 2025). A 2023 study funded by the U.S. Department of Energy estimated that geothermal brine within the Salton Sea KGRA contains up to 18 million metric tons of lithium, identifying the region as having the potential to be a substantial domestic supplier of lithium (Dobson, Araya, & Brounce, 2023).

Traditional lithium production methods include hard rock mining and evaporation ponds, which represented 60% and 30% of global lithium production in 2022 (Razmjou, 2024). Recent technological advancements have enabled the application of DLE processes to recover lithium from geothermal brine prior to its reinjection underground into the geothermal reservoir (Razmjou, 2024). Compared with traditional lithium production methods, DLE is generally considered to have a substantially smaller environmental footprint, including reduced land disturbance, lower water consumption, and decreased surface impacts (Razmjou, 2024). After being used for geothermal energy production, the brines need to be treated to remove ions that compete with the DLE process (MacDonald et al., 2026; Razmjou, 2024). The environmental impacts of these processing steps are specific to the brine and DLE process and have not been well defined (Schill et al., 2025). Accordingly, public health implications may also vary with brine composition and the DLE technology used.

There is no physical or hydrologic connection between the Salton Sea and the geothermal reservoir, which is located deep underground (Dobson, Araya, & Brounce, 2023). This separation enables lithium recovery as a “byproduct of existing geothermal operations, using a closed-loop” process where brine is reinjected back into the geothermal reservoir following extraction (Imperial County Executive Office, 2025).

3.2 Currently Planned DLE Projects at the Salton Sea KGRA

Currently, three companies are advancing DLE technologies to extract lithium from geothermal brine within Lithium Valley (California Energy Commission, n.d.; County of Imperial, 2025c):

- Berkshire Hathaway Energy Renewables (**BHE Renewables**),
- Controlled Thermal Resources, and
- EnergySource Minerals.

BHE Renewables and EnergySource Minerals plan to integrate lithium extraction facilities with their existing geothermal power plants, while Controlled Thermal Resources proposes developing a new geothermal power plant with on-site lithium extraction capabilities (BHE Renewables, 2025; Controlled Thermal Resources, n.d.; EnergySource Minerals, 2025b). In

⁷ As stated previously: **Brine** is highly saline water containing elevated concentrations of dissolved salts. **Geothermal brine** refers to high-temperature, high-salinity fluid within deep hydrothermal reservoirs that contains dissolved salts, metals, and other minerals derived from prolonged water–rock interaction under elevated temperature and pressure conditions (Neupane & Wendt, 2017).

addition, EnergySource Minerals plans to recover other critical minerals, including zinc and manganese. Hy Power Industries purchased land in the region in 2018 and proposed developing a mineral extraction and refining site, as well as solar and geothermal energy projects (Geothermal Resources Council, 2018; Rick Engineering Company, 2024). The status of Hy Power Industries' activities for this project is unknown.

As of early 2026, commercial-scale DLE operations had not yet commenced at any of these companies, although each had undertaken planning and project development activities, as described below:

- As of June 2026, the **BHE Renewables** website indicates that the company is collaborating with Oxy to demonstrate DLE capabilities in Imperial County; however, no timeline for these activities is provided (BHE Renewables, 2025).
 - The initial pilot test of DLE technologies (2020-2023), which was located at the Unit-5 facility, was terminated due to failure of the DLE material under real-world conditions (Fleming, 2024). Lessons learned included that some alloys were not compatible with the geothermal brine, on-site testing with actual brine may produce different results than lab testing, and brine pretreatment (effective removal of other minerals such as iron and silicon) is critical for the DLE process (Fleming, 2024). Emissions were measured and calculated for operation but not reported.
 - In 2024, BHE Renewables partnered with Occidental Petroleum to use their TerraLithium DLE technology (Moses, 2024). They have been operating this technology at demonstration scale (BHE Renewables, 2026). As of June 2026, they have successfully demonstrated that they produced lithium chloride at one geothermal facility in Lithium Valley and will use the results to inform scale-up assessments (TerraLithium LLC, 2026).
- In 2023, **Controlled Thermal Resources** constructed a Demonstration and Optimization Facility to evaluate brine conditioning and DLE processes using two previously drilled geothermal wells at a pre-commercial scale (Controlled Thermal Resources, n.d.). They plan to produce lithium using technology from Aquatech from their proposed Hell's Kitchen geothermal plant (Reuters, 2026). The Controlled Thermal Resources permit includes the construction of a geothermal power facility with power production expected by 2028 and lithium production by 2029 (Reuters, 2026).
 - The demonstration project noted that the system “successfully produced stable, high-quality brine” for DLE using an adsorption process (Controlled Thermal Resources, n.d.).
- **EnergySource Minerals** plans to integrate DLE into the existing Featherstone geothermal facility. Their DLE process used commercially available technologies from water treatment, metal processing, and chemical industries (Benson et al., 2022). As of June 2026, their website states that they are commercially ready, with initial lithium delivery expected in 2028 (EnergySource Minerals, 2025b). They note that the construction of the DLE production facility will take approximately 3 years.

- The pilot DLE project was completed at the Feathersone Geothermal Plant in 2020 (Chesney, 2021). This work resulted in engineering designs and capital cost estimates for DLE facilities (Benson et al., 2022). They established that their impurities removal stage prepared brine to adequate standards for subsequent DLE with proprietary technology. In their DLE circuit, 85 – 95% of lithium was recovered (Benson et al., 2022).
- They noted that they expect their emissions to increase during construction in a 2024 annual report, in which they are committed to hiring locally and prioritizing local vendors (EnergySource Minerals, 2025a).

3.3 DLE Technologies for Geothermal Brine

DLE technologies selectively remove lithium from geothermal brine without relying on traditional evaporation processes or mining (Dobson, Araya, & Brounce, 2023; Dobson, Araya, Brounce, et al., 2023; Razmjou, 2024). Brine that is removed from the geothermal well is reinjected back into the reservoir, allowing water and processing fluids to be reused rather than discharged to the environment (Farahbakhsh et al., 2024). This reinjection of brine is often referred to as a closed-loop system, although the term can have different meanings.⁸ DLE processes selectively separate lithium from brine sources (Warren, 2021). The extracted lithium is then concentrated, refined, and converted into lithium salts (Razmjou, 2024). Adsorption-based DLE technology is currently in use commercially on continental brines (underground saline water reservoirs) (Razmjou, 2024). Others nearing commercial deployment include ion exchange, solvent extraction, membrane separation, and electrochemical methods (Farahbakhsh et al., 2024).

In practice, most projects rely on multiple integrated technologies tailored to site-specific brine chemistry (Farahbakhsh et al., 2024). DLE processes typically include pre- and post-treatment steps (Farahbakhsh et al., 2024). Pre-treatment may involve methods such as acidification, filtration, membrane separation, or ion exchange to prepare the brine for DLE (MacDonald et al., 2026), while post-treatment includes concentration, purification (e.g., solvent extraction, ion exchange, or membrane separation), and final conversion of lithium into desired lithium products (Farahbakhsh et al., 2024). Vera et al. (2023) offer a simplified diagram of the process (Figure 3).

⁸ While the term closed-loop is often used to describe the return on brine to the same geothermal field, different definitions exist. A true “closed loop” geothermal design (Advanced Geothermal Design) includes circulating fluid through underground sealed pipes to absorb heat without extracting brine (U.S. Department of Energy, n.d.-b). Additionally, some authors define a closed DLE loop specifically as the surface DLE processing loop (taking brine, extracting lithium, returning brine) (Lithium Harvest, n.d.; Liu et al., 2021).

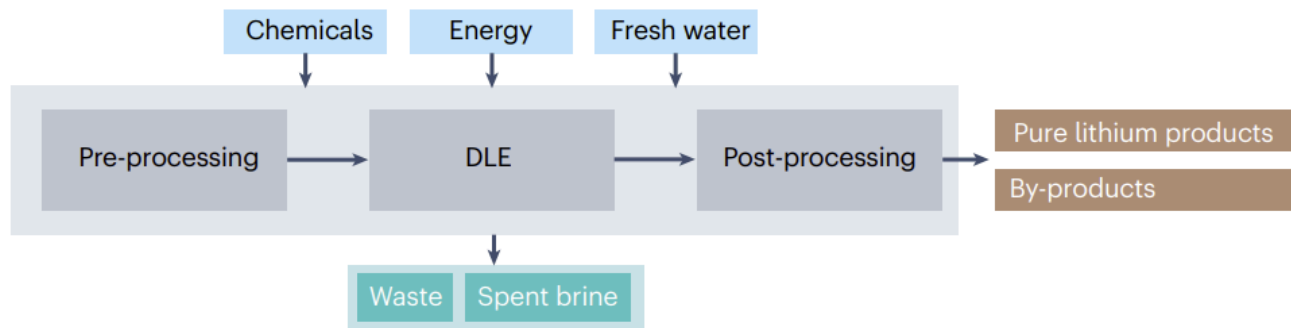


Figure 3. General Scheme of DLE Overall Processing Strategy
et al., 2023)

Source: (Vera

DLE technologies vary in their environmental impacts, and authors emphasize the importance of evaluating the full life cycle of each process (Vera et al., 2023). While many technologies are designed to operate in closed-loop systems with reduced water use, most require chemical inputs, generate secondary waste streams, or have energy demands that may introduce additional environmental considerations (Dobson, Araya, & Brounce, 2023; Nicolaci et al., 2023; Razmjou, 2024; Vera et al., 2023; Zhang et al., 2025). An overview of key technologies and environmental considerations is provided in Table 1.

Some of the DLE methods described are not feasible or are technically challenging to use with the Salton Sea KGRA geothermal brines (Kim et al., 2025), as the brines are highly saline and must be maintained at elevated temperatures during the geothermal process (Dobson, Araya, Brounce, et al., 2023). If the brine is not kept sufficiently hot, these salts and other compounds can precipitate and form scale (solid deposits) on well casings and related equipment during reinjection into the geothermal reservoir (Dobson, Araya, Brounce, et al., 2023). In general, each geothermal brine is unique and requires a tailored approach to lithium extraction (Razmjou, 2024). Within the Salton Sea KGRA, geothermal brine chemistry also varies widely across the geothermal field, and each site must optimize pretreatment and DLE processes for facility-specific conditions (personal communication with BHE Renewables, February 4, 2026).

Although there are various DLE technologies (see Table 1), the three companies currently proposing DLE in Imperial County plan to use adsorption methods with pretreatment processes specific to the brine chemistry at each geothermal site (Department of Energy & EnergySource Minerals, LLC, 2025; Farahbakhsh et al., 2024; Fleming, 2024; Nicolaci et al., 2023). Adsorption is the most commercially advanced technology (Alghamdi et al., 2025), and it is most suitable for the high temperature requirements of geothermal brine processing (Boroumand & Razmjou, 2024).

Table 1. Information About Direct Lithium Extraction Technologies; Not Limited to Those Applicable in the Salton Sea KGRA¹

Technology	Definition	Commercial Use Status	Environmental Concerns	Environmental Benefits
Sorption: Adsorption²	Adsorption: Lithium is physically/chemically attached to the surface of solid particles. Lithium is then recovered through a chemical desorption or regeneration step (typically with acid or water) (Farahbakhsh et al., 2024; Ighalo et al., 2022; Razmjou, 2024).	Adsorption is used at a commercialized scale globally (Farahbakhsh et al., 2024; Nicolaci et al., 2023; Razmjou, 2024; Sun et al., 2021).	Use water or mild solutions for rinsing; requires chemical regeneration (acids/bases); potential sorbent degradation and replacement waste; handling of spent regeneration fluids (Nicolaci et al., 2023; Wu et al., 2025; Y. Zhou et al., 2025). Requires pretreatment of brine (Dobson, Araya, Brounce, et al., 2023).	“Lower chemical consumption compared to ion exchange” (Wu et al., 2025).
Sorption: Ion Exchange	Ion Exchange: Lithium ions are exchanged with other ions on a resin or solid matrix. Lithium is then recovered through a chemical desorption or regeneration step (typically with acid or water) (Farahbakhsh et al., 2024; Razmjou, 2024).	Used thus far at pilot-scale or in supporting roles for DLE, with limited deployment as a primary method at the commercial scale (Farahbakhsh et al., 2024; Stringfellow & Dobson, 2021).	High chemical demand for regeneration (acid/base); organic resin degradation and disposal concerns (Nicolaci et al., 2023; Wu et al., 2025).	“Lower energy and water consumption” compared to adsorption, membrane, electrochemistry, and solvent extraction (Wu et al., 2025).
Solvent Extraction	Lithium is extracted from brine into an organic phase using chemical extractants, then separated in a stripping step, typically with acidic solutions (Farahbakhsh et al., 2024; Razmjou, 2024).	Not mature enough to compete with sorption, but has been used on an industrial scale (Farahbakhsh et al., 2024).	Use of organic solvents (flammability, toxicity risks); solvent loss/emissions if not fully contained; requires pretreatment of brine and may require post-treatment of brine before reinjection or disposal (Nicolaci et al., 2023; Wu et al., 2025; Zhang et al., 2025).	“Low solid waste production” (Wu et al., 2025); Effective solvent recycling systems can reduce waste (Kanagasundaram et al., 2024).
Membrane Separation	Lithium is separated using semi-permeable membranes that separate ions based on size, charge, or chemical properties. Includes processes such as nanofiltration, reverse osmosis, and ion-selective membranes (Farahbakhsh et al., 2024).	Emerging; currently used in the pre-treatment stage for some brines (Farahbakhsh et al., 2024).	Membrane fouling/scaling (especially for some brines, such as at the Salton Sea KGRA); chemical cleaning requirements; concentrated reject streams; energy demand for pressure-driven systems (Wu et al., 2025; Zhang et al., 2025).	“No chemical regeneration needed” (Wu et al., 2025).
Electro-chemical Separation	Lithium ions are transported across membranes or incorporated into electrode materials under an applied electric field. The systems can be classified as battery-based, battery-based with membrane, or electro-membrane-based (Farahbakhsh et al., 2024).	Available commercially in some industries for extracting metals, but has not been done commercially for lithium (Farahbakhsh et al., 2024; Kong et al., 2025).	Electricity-intensive (impact depends on the energy source); potential electrode degradation and material waste; may need fewer chemical inputs than sorption (Wu et al., 2025; L. Xu et al., 2025; Zhang et al., 2025).	“Low chemical consumption,” and “Low water consumption and waste generation” (Wu et al., 2025; Y. Zhou et al., 2025)

¹ Some sections modified from (Farahbakhsh et al., 2024).

² Adsorption processes are the technology currently being used in the Salton Sea KGRA.

4. HIA Step 1: Screening for HIA Need

Screening is the initial step of an HIA and is used to determine whether an HIA is warranted based on potential health relevance, feasibility, and utility for informing decision-making, consistent with established HIA best-practice frameworks. The need for this HIA was identified by the Blue-Ribbon Commission on Lithium Extraction in 2022, which recommended additional evaluation of potential community-level impacts associated with lithium extraction activities (Paz et al., 2022). In response to this recommendation, the County of Imperial issued a Request for Proposals (1009-23, Cycle 2) for the *Salton Sea Renewable Resource Health Impact Assessment*.

As part of the proposal process, the proposed scope of work underwent a comprehensive review by County of Imperial officials. Through this review, the County of Imperial determined that conducting an HIA was both appropriate and feasible. The review further concluded that the proposed framework, which utilizes the six-step HIA process, aligned with the objective of evaluating potential public health impacts associated with regional geothermal development that incorporates DLE technologies.

5. HIA Step 2: Scope of the Health Effects Considered

To identify health-related issues appropriate for inclusion in the HIA, the project team conducted a formal scoping process informed by both evidence and community input. This process involved reviewing findings from the literature review alongside existing documents that reflected the perspectives of residents and key stakeholders. As part of this scoping exercise, the team reviewed the following documents:

- **Environmental reports and information**
 - The Draft PEIR (Dudek, 2025b).
 - Environmental impact reports and documents from BHE Renewables (BHE Renewables, 2025, 2026; Fleming, 2024; Miller, 2025), Controlled Thermal Resources (Chambers Group, Inc., 2023a, 2023b; Controlled Thermal Resources, n.d.), and EnergySource Materials (Chambers Group, Inc., 2021; Department of Energy & EnergySource Minerals, LLC, 2025; EnergySource Minerals, 2025a, 2025b).
- **Lithium Valley reports**
 - *Lithium Valley Specific Plan: Land Use Alternatives Memorandum 2023* (Rick Engineering Company, 2023).
 - *Lithium Valley Specific Plan Final Baseline Report February 2024* (Rick Engineering Company, 2024).
 - *Imperial County Good Neighbor Community Benefit Agreement Program* (Imperial County, 2024).
 - *Lithium Valley Specific Plan December 2025 Draft* (County of Imperial, 2025c).
 - *Empowering Imperial County: A Comprehensive Workforce and Economic Development Strategy for Harnessing the Lithium Opportunity* (Alhajjar et al., 2025).
- **Literature**
 - Published information related to DLE, DLE at the Salton Sea KGRA, pollutants, and health effects of pollutants (see References section).
- **Public and stakeholder feedback**
 - Public comments from the *February 2025 Lithium Valley Specific Plan Draft* (February 2025 Lithium Valley Specific Plan Public Review Comments, 2025).
 - Scoping comments from the community related to the Draft PEIR (Scoping Comments, 2024).
 - Feedback collected by the Blue-Ribbon Commission on Lithium Extraction in California (Paz et al., 2022).
 - Comments gathered from community members who completed surveys implemented during the HIA process.

The team also corresponded with the consulting firms that prepared the Specific Plan, the DRAFT PEIR, and the *Lithium Valley Specific Plan Final Baseline Report*, as well as the staff from the Imperial County Public Health Department.

5.1 Parameters

This HIA evaluates the potential health impacts associated with all of the potential development proposed in the Specific Plan framework, including construction activities, expansion of geothermal energy facilities, implementation of DLE processes, and development related to anticipated population growth. The assessment examines relevant exposure pathways, associated health outcomes, and cumulative impacts across both construction and operational phases. Key health pathways evaluated include air quality, noise, water resources, seismic activity, psychosocial stress related to socioeconomic conditions, occupational (worker) exposures, and access to health care services.

The Draft PEIR (Dudek, 2025b) also evaluates the full buildout of the development allowable within the Specific Plan framework, including construction and operational activities across the approximately 51,622-acre plan area adjacent to the Salton Sea over a 30-year planning horizon. The PEIR assesses cumulative impacts associated with the proposed Specific Plan by considering development throughout the plan buildout, together with growth projections from applicable regional and local planning documents. Although development activities would occur within the Specific Plan area, air quality impacts are evaluated within the broader context of the Salton Sea Air Basin, which encompasses all of Imperial County.

This HIA reviewed estimates of cumulative environmental effects associated with the development allowable under the Specific Plan (Dudek, 2025b) while examining how these effects may interact with existing environmental stressors, including Salton Sea dust emissions and the underlying socioeconomic and health characteristics of affected populations.

The HIA's geographic scope includes Imperial County as a whole. Where data permit, findings are presented separately for northern Imperial County communities in closer proximity to the Specific Plan area, recognizing the potential for differential exposure, heightened vulnerability, and localized health impacts associated with the proposed development.

5.2 Available Evidence/Baseline Data

Community-level demographic and health data were compiled for Imperial County as a whole and for northern Imperial County communities closest to the proposed geothermal and DLE activities. Data were drawn from multiple sources, including the United States Census Bureau (*Census Reporter*, n.d.), the California Health Interview Survey (UCLA Center for Policy Research, 2026), the 2024 Imperial County Community Health Assessment (Imperial County Community Health Improvement Partnership, 2024; PRC, 2022), and various other resources from the California Department of Public Health.

Additional evidence informing this HIA included consultation with environmental and public health experts, synthesis of findings from the scientific literature, and review of companion planning and environmental documents, including the project-specific environmental impact reports, the *Lithium Valley Specific Plan Final Baseline Report* (Rick Engineering Company, 2024), and the Draft PEIR (Dudek, 2025b).

Because many DLE technologies are still in the demonstration or early commercialization stages (Razmjou, 2024), baseline information on the potential health impacts associated with DLE is limited. While some adsorption-based DLE methods have been deployed commercially,

particularly in China and Argentina (Jaswani, 2025; Razmjou, 2024), the HIA team found no published research examining health effects related to DLE operations.

5.3 Health Effects to Consider

Concerns identified through community input and stakeholder engagement, as well as those documented in the literature, are summarized in Table 2. While all major health-related concerns from the project are included, their relevance, supporting evidence, and potential health implications are examined in greater detail in the Assessment section, where they inform the recommendations.

Table 2. Areas of Health Concern Identified through Literature and Community Feedback

Area of Health Concern	Sources		
	Comm unity Interce pt Survey	Feedb ack ¹	Literat ure
Air- and Soil/Dust-Related Health Effects			
Dust from construction/operation /industrial traffic	*	*	*
Dust from exposed lakebed (playa)	*	*	*
Air pollution related to construction and operation	*	*	*
Air pollution from increased population and associated development	*	*	*
Potential contamination of toxic chemicals from spills/accidents	*	*	*
Water-Related Health Effects			
Potential drinking water contamination	*	*	*
Potential contamination of Salton Sea water	*	*	*
Reduction of available fresh water/source of water for DLE	*	*	*
Seismic Activity Health Effects			
Change in seismic activity	*	*	*
Noise-Related Health Effects			
Noise from construction, traffic, and increased industry		*	*
Stress/Mental Well-Being			
Potentially negative economic impacts	*	*	
Psychosocial stress associated with development	*	*	*
Driving in increased traffic conditions	*	*	*
Injury			
Occupational (exposure at plan work sites)	*	*	
Safety concerns at work sites (noise, etc.)	*	*	
Transportation related (to and from work site; for work)		*	*

¹ Public comments from the February 2025 Lithium Valley Specific Plan Draft; scoping comments from the community related to the Draft PEIR; and feedback collected by the Blue-Ribbon Commission on Lithium Extraction in California (February 2025 Lithium Valley Specific Plan Public Review Comments, 2025; Paz et al., 2022; Scoping Comments, 2024).

Table 2. Areas of Health Concern Identified through Literature and Community Feedback, Continued

Area of Health Concern	Source		
	Community Intercept Survey	Feedback ¹	Literature
Health Services Availability			
Reduction in emergency care/services availability		*	
Reduction in health care availability		*	*
Specific Health Concerns			
Cancer and asthma	*	*	*

¹ Public comments from the February 2025 Lithium Valley Specific Plan Draft; scoping comments from the community related to the Draft PEIR; and feedback collected by the Blue-Ribbon Commission on Lithium Extraction in California (February 2025 Lithium Valley Specific Plan Public Review Comments, 2025; Paz et al., 2022; Scoping Comments, 2024).

5.4 Sensitive Populations

5.4.1 Air Quality

The entire population of Imperial County may be affected by commercial, industrial, residential, and other development included in the Specific Plan land-use framework, but based on findings from the Draft PEIR and supporting baseline data, several populations in and near the Specific Plan area are considered more susceptible to potential health impacts associated with air quality (Dudek, 2025b; Rick Engineering Company, 2024).

The California Air Resources Board (**CARB**) lists sensitive populations as including infants and children, older adults, adults who participate in vigorous activities outdoors, pregnant individuals, and people with pre-existing respiratory or cardiovascular conditions, such as asthma, chronic obstructive pulmonary disease, or heart disease (CARB, 2025, 2026aa, 2026h, 2026s, 2026v, 2026p).

Sensitive receptor locations, defined as locations where air-pollution-sensitive individuals live or spend substantial time, include residential neighborhoods, schools and schoolyards, parks and playgrounds, daycare centers, nursing homes, hospitals, and other community facilities (CARB, 2026y). The Draft PEIR identifies the nearest sensitive receptors as existing single-family residential areas located adjacent to the Specific Plan boundary in Niland and Calipatria, including three schools and a state correctional facility (Dudek, 2025b). In addition, the Specific Plan area includes locations designated for potential temporary and permanent residential development inside the Specific Plan boundary (County of Imperial, 2025c). These newly developed residential areas would also be considered sensitive receptor locations.

5.4.2 Sensitive Populations, Stressors, and Exposure Media

Table 3 summarizes the relationships between sensitive populations and key exposure pathways identified during HIA scoping. The assessment considers physical (e.g., noise and heat), chemical (e.g., air and soil pollutants), and other stressors (e.g., psychological stress,

socioeconomic conditions, and underlying health status) (Lewis et al., 2011; U.S. EPA, 2025l), and how they relate to health. Exposure to these stressors may occur through inhalation, ingestion, and dermal contact (U.S. EPA, 2025g), with exposure media including air, soil, water, and the food chain (U.S. EPA, 2025k).

Table 3. Sensitive Populations, Potential Stressor Type / Exposure Media, and Health Outcomes of Concern

Sensitive Population Group	Stressor Type (Exposure Media)	Health Concerns	Explanation/Information
Infants, children, and teens (CARB, 2025, 2026aa, 2026v, 2026s, 2026h, 2026aa, 2026p) (Castagna et al., 2022) (U.S. EPA, 2019)	Chemical (air, water, soil/dust); other stressors ¹	Asthma development and exacerbation, reduced lung function, respiratory infections, increased emergency care, premature mortality, lung cancer, neurodevelopmental effects (motor, cognition, language)	Children experience higher exposure per body weight and have developing respiratory systems, increasing vulnerability to air pollutants. Children also spent more time outdoors, increasing exposure to ambient air pollution. Schools and playgrounds are recognized as sensitive receptor locations.
Pregnant individuals and unborn babies (CARB, 2026h; Castagna et al., 2022)	Chemical (air, water, soil/dust); other stressors ¹	Risk of adverse developmental and neurodevelopmental effects (baby).	Maternal exposure to air pollution has been associated with adverse birth outcomes in multiple population studies.
Older adults (CARB, 2026h, 2026aa; U.S. EPA, 2019)	Chemical (air, water, soil/dust); other stressors ¹	Respiratory disease exacerbation, increased emergency care, hospitalization, mortality, and lung cancer	Older adults are susceptible to the health concerns listed as well as cardiopulmonary effects from exposure to fine particulate matter.
Individuals with chronic respiratory disease (CARB, 2026s, 2026h, 2026aa, 2026p)	Chemical (air, water, soil/dust); other stressors ¹	Increased medication use, respiratory disease exacerbation, increased emergency care, hospitalization, premature mortality, and lung cancer	Evidence demonstrates that exposure to several types of air pollution exacerbates pre-existing respiratory conditions.
Individuals with cardiovascular disease (CARB, 2026h, 2026aa, 2026p)	Chemical (air and soil/dust); physical (noise, heat); other stressors ¹	Cardiovascular disease exacerbation, increased emergency care, hospitalization, and premature mortality	Common air pollutants are associated with increased cardiovascular morbidity and mortality.
Sensitive receptor locations (schools, daycare, nursing homes, hospitals, residences) (CARB, 2026y)	Chemical (air, water, soil/dust); physical (noise); other stressors ¹	Disproportionate health burden from all effects previously listed	Sensitive receptors are defined as locations where susceptible populations live or spend substantial time; proximity increases exposure potential.

¹ Other stressors include psychological stress, socioeconomic conditions, and underlying health status.

Table 3. Sensitive Populations, Potential Stressor Type / Exposure Media, and Health Outcomes of Concern, Continued

Sensitive Population Group	Stressor Type ¹ (Exposure Media)	Health Concerns	Explanation/Information
Occupational (Specific Plan related and other) (Fang et al., 2010; MacMurdo et al., 2025)	Chemical (air, water, soil/dust); physical (noise, heat); other stressors ¹	Respiratory irritation, heat stress, injury, emergency care, hospitalization, premature mortality, and lung cancer	Workers may experience higher-intensity and longer-duration exposures than the general population, warranting consideration of occupational exposure pathways. Construction and transportation workers are exposed to greater levels of ambient (outdoor) air pollution.
Communities with lower incomes (Huang & London, 2012; Jbaily et al., 2022; U.S. EPA, 2019)	Chemical (air, water, soil/dust); physical (noise, heat); other stressors ¹	Disproportionate health burden from all effects previously listed	Cumulative environmental exposures, combined with social vulnerability, can amplify health risks and constrain adaptive capacity, as lower-income populations are more likely to live near pollution sources, work outdoors, and reside in older housing.

¹ Other stressors include psychological stress, socioeconomic conditions, and underlying health status.

5.5 Role of Stakeholders and Stakeholder Engagement

Throughout this project, the SDSU team coordinated with relevant stakeholders to support the preparation of an HIA that was consistent with and complementary to ongoing planning and environmental review efforts. Stakeholder input was incorporated in a structured manner to inform the scope of analysis, provide context regarding existing conditions and potential health effects, and support the development and review of findings.

Stakeholders engaged in the HIA included technical consultants preparing related Lithium Valley planning and environmental review documents, the Imperial County Public Health Department, and community members.

To maintain consistency with parallel planning activities, the SDSU team coordinated with the entities responsible for the Specific Plan (County of Imperial, 2025c), the *Lithium Valley Specific Plan Final Baseline Report* (Rick Engineering Company, 2024), and the Draft PEIR (Dudek, 2025b). Coordination efforts included five formal interagency meetings held on February 12, April 15, June 17, September 9, 2024, and February 6, 2025, as well as ongoing information exchange to promote consistency across technical documents. Ongoing oversight from the Imperial County Public Health Department informed and supported the HIA at all stages.

In addition, the SDSU team reviewed public comments and community input submitted in response to relevant plans and technical reports. Community perspectives were further incorporated through a community survey conducted in 2025, which provided planning-level information on residents' understanding of the proposed development, knowledge of DLE, perceived health and non-health concerns, and opinions on potential benefits associated with the proposed activities.

6. HIA Step 3: Community Profile and Baseline Information

For this HIA step, staff reviewed relevant literature, County of Imperial documents, publicly available datasets, and other reports. Data are presented to one decimal place where available.

6.1 Community Profile

6.1.1 Geographic Area

The area of focus for this HIA included all of Imperial County, with particular attention to communities in the northern part of the county closest to the planned development.

Imperial County and the Specific Plan

Imperial County is located in the southeastern corner of California within a broad, flat desert valley bounded by mountain ranges to the east and west and the U.S.–Mexico border to the south (Imperial County, 2016). The region is characterized by an arid desert climate, with high temperatures, low humidity, and minimal annual precipitation (Dudek, 2025b).

The Specific Plan area is situated in the northern portion of the County along the southeastern shoreline of the Salton Sea (County of Imperial, 2025c) (Figure 4). Existing land uses within the area are mostly agricultural (61.6%), and 25.5% is occupied by surface water (i.e., the Salton Sea) (Rick Engineering Company, 2024). Additionally, there is some recreation/open space (3.8%), vacant areas (3.1%), utilities, communication and transportation (3.0%), residential (mobile homes, 0.6%; rural, 0.3%; single-family, 0.3%), industrial (0.6%), facilities, commercial and services (0.1%), and 1.1% has no designated use (Rick Engineering Company, 2024).

Communities Closest to Specific Plan Areas

The communities closest to existing geothermal facilities in the Salton Sea KGRA and next to the Specific Plan boundary include Niland and Calipatria (Dobson, Araya, & Brounce, 2023; Rick Engineering Company, 2024). Other frontline communities, defined as those most likely to experience direct and indirect effects associated with development in the Specific Plan area, include Westmorland, Bombay Beach, Brawley, Salton City, Salton Sea Beach, and Desert Shores (see Table 4) (Dobson, Araya, & Brounce, 2023).

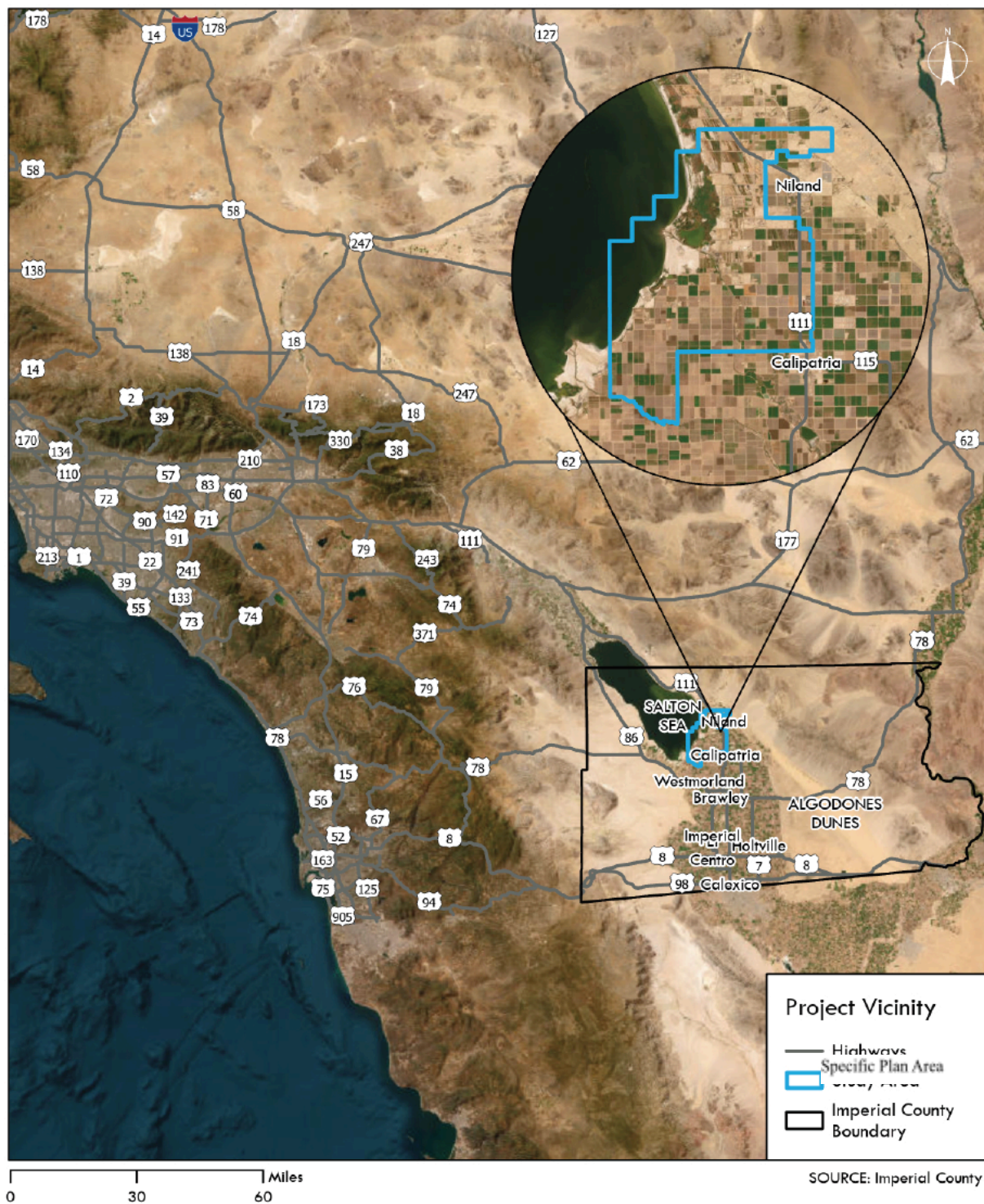


Figure 4. Lithium Valley Specific Plan Area Map and Vicinity with Cities

Table 4. *Frontline Communities Near the Salton Sea KGRA, and Distance to Nearest Geothermal Facility and Salton Sea KGRA¹ (Dobson, Araya, & Brounce, 2023)*

Name	County	Distance to Nearest Geothermal Facility (straight-line)	Distance to Salton Sea-KGRA
Niland	Imperial	4.04 miles	0.63 miles
Calipatria	Imperial	4.76 miles	0.78 miles
Westmorland	Imperial	7.91 miles	2.65 miles
Brawley	Imperial	13.45 miles	8.84 miles
Bombay Beach	Imperial	13.48 miles	1.89 miles
Salton City	Imperial	20.70 miles	12.71 miles
North Shore	Riverside	29.40 miles	17.71 miles
Torres Martinez Reservation	Imperial/Riverside	27.85 miles	19.63 miles

¹ The Specific Plan includes a large portion of the Salton Sea KGRA. Source: (Rick Engineering Company, 2024).

6.1.2 Salton Sea

The Salton Sea encompasses approximately 298 square miles and is California’s largest lake (California Department of Fish and Wildlife, 2026; Pacific Institute, 2026). The modern Salton Sea basin was formed in 1905 when floodwaters from the Colorado River breached an irrigation canal (California Department of Fish and Wildlife, 2026). Since that time, the Salton Sea has been sustained primarily by agricultural runoff, with additional inflows from local rivers (California Department of Fish and Wildlife, 2026). The Salton Sea is a terminal water body with no natural outlet; as a result, declining inflows, combined with continued agricultural runoff, are the primary source of pollutants (Imperial County, 2016; E. G. Xu et al., 2016) that have contributed to increasing salinity and nutrient concentrations in the lake (M. J. Cohen et al., 1999). The Salton Sea also “receives wastewater discharges from numerous municipal wastewater systems in the Imperial and Coachella valleys through the New River, Alamo River, or Coachella Valley Stormwater Channel” (Rick Engineering Company, 2024). These conditions have resulted in degraded water quality and associated adverse effects on fish and wildlife resources (California Department of Fish and Wildlife, 2026).

6.1.3 Air Quality Information, Air Pollution Sources, and Air Quality Monitoring

Air Quality Information and Pollution Sources

General Information

According to the U.S. National Institute of Environmental Health Sciences, air pollution is a complex mixture of pollutants from both human-made and natural sources, including vehicle emissions, fuel combustion, industrial and power generation activities, chemical production, wildfires, volcanic activity, and decomposing organic matter (National Institute of Environmental Health Sciences, n.d.). “Air pollution is any substance in the air that is harmful to people or the environment,” and includes smog-forming emissions, air toxics, particulate matter (**PM**), and climate-changing gases (CARB, 2026b).

PM consists of microscopic solid and liquid particles, including sulfates, nitrates, carbon compounds, and mineral dusts (National Institute of Environmental Health Sciences, n.d.). Smaller particles pose greater health risks because they can penetrate deeper into the lungs, including PM₁₀ and PM_{2.5}, which are particles less than 10 and 2.5 microns in diameter, respectively (U.S. EPA, 2025d). Exposed or disturbed soil can become airborne, contributing to particulate matter emissions and affecting local air quality (CARB, 2026p).

Criteria Air Pollutants

Pollutants with established ambient (outdoor) air quality standards to protect public health are known as *criteria air pollutants* (U.S. EPA, 2025a). These standards are based on scientific evidence and are used to determine attainment status and to evaluate potential emissions from proposed projects or plans (U.S. EPA, 2025a). California ambient air quality standards regulate carbon monoxide, hydrogen sulfide, lead, nitrogen dioxide, ozone, PM₁₀, PM_{2.5}, sulfate, sulfur dioxide, vinyl chloride, and visibility-reducing particles (CARB, 2026e).

California's air quality standards predate national ambient air quality standards, though the attainment of national standards holds precedent due to federal penalties for non-attainment (CARB, 2026e). Differing from national standards, California mandates incremental improvement towards attainment and does not set a specific date for attainment (CARB, 2026e).

Major sources of criteria air pollutants include the following:

- Carbon monoxide (gas): Carbon monoxide “results from the incomplete combustion of carbon-containing fuels such as natural gas, gasoline, or wood” and is emitted by “motor vehicles, power plants, wildfires, and incinerators” (CARB, 2026h).
- Hydrogen sulfide (gas): “The most common sources of [hydrogen sulfide] emissions are oil and natural gas extraction and processing, and natural emissions from geothermal fields. It is also formed during bacterial decomposition of human and animal wastes, and it is present in emissions from sewage treatment facilities and landfills.” (CARB, 2026o).
- Lead (metal; PM): Lead is a metal that can be present in the air as small particles. Due to the previous use of leaded gasoline in the U.S., lead is still present in soils and can become airborne (CARB, 2026q). Current sources of emissions are “ore and metals processing, aircraft that operate on leaded aviation fuel, waste incinerators, utilities, and lead-acid battery manufacturing (CARB, 2026q).
- Nitrogen dioxide (gas): Nitrogen dioxide can be emitted from combustion sources, but it is mostly formed by “reactions between nitric oxide (NO) and other air pollutants” (CARB, 2026s). Major sources include trucks, buses, and cars, although “diesel-powered non-road equipment, industrial processes such as oil and gas production, industrial boilers and other movable engines, and coal-fired power plants” are sources as well, according to the American Lung Association (ALA) (ALA, 2023). Indoor sources include appliances that use natural gas.
- Ozone (gas): Ground-level ozone is not emitted but “formed by chemical reactions between oxides of nitrogen and volatile organic compounds” (CARB, 2020). Sources include vehicles, factories and other industrial sources, fossil fuels, combustion, consumer products, evaporation of paints, and others.

- PM (particulates): Airborne PM is a “complex mixture of solids and aerosols” and “particles vary widely in size, shape and chemical composition, and may contain inorganic ions, metallic compounds, elemental carbon, organic compounds, and compounds from the earth’s crust” (CARB, 2026p). Major sources of ambient PM_{2.5} include combustion of gasoline, oil, diesel, or wood. In addition to these sources, “PM₁₀ also includes dust from construction sites, landfills and agriculture, wildfires and brush/waste burning, industrial sources, wind-blown dust from open lands, pollen and fragments of bacteria” (CARB, 2026p).
- Sulfate (chemicals; component of PM_{2.5}): Sulfates are chemicals that contain sulfur “in combination with metal or hydrogen ions,” and sources include combustion of gasoline or diesel fuels that contain sulfur (CARB, 2026z).
- Sulfur dioxide (gas): Sulfur oxides “are emitted when sulfur-containing fuel is burned.” Examples include motor vehicles, locomotives, ships, and off-road diesel equipment that operate on fuels with high sulfur levels; some industrial processes; volcanic activity; and geothermal fields (CARB, 2026aa).
- Vinyl chloride (gas): “Most vinyl chloride is used in the process of making polyvinyl chloride (PVC) plastic and vinyl products, thus may be emitted from industrial processes...exposure if primarily and occupational concern” (CARB, 2026ac).
- Visibility-reducing particles (PM): Particulate matter can decrease visibility. Sources include windblown dust and soot, as well as haze “formed in the air from the chemical transformation of gaseous pollutants” (CARB, 2026ad).

Toxic Air Contaminants

Toxic air contaminants can cause serious long-term effects, including cancer, reproductive and developmental effects, and neurological effects, even at low concentrations (CARB, 2026k). CARB has identified over 200 substances or groups of substances as air toxins, including benzene, asbestos, cadmium, nickel, lead, and diesel particulate emissions (CARB, 2026k). The federal government refers to pollutants known or suspected of causing serious health issues that are not included as criteria air pollutants as *hazardous air pollutants* (U.S. EPA, 2025h).

Most sources of hazardous air pollutants are human-made, from sources such as automobiles, factories, refineries, power plants, building materials, and cleaning solvents, although some are natural, from sources such as volcanic eruptions and forest fires (U.S. EPA, 2025h). In the region, pesticides, off-road vehicle activity, and various types of fires, including agricultural burning, incineration, and landfill fires, contribute to hazardous emissions (M. Cohen & Halama, 2025).

Some substances are regulated as both California criteria air pollutants and California toxic air contaminants. For example, lead is a criteria pollutant and is also classified as a toxic air contaminant (CARB, 2026g). In addition, specific constituents within the criteria pollutant categories, such as heavy metals (e.g., arsenic, cadmium, nickel) suspended in PM, are themselves designated toxic air contaminants (CARB, 2026w). Diesel PM contributes to PM_{2.5} and is likewise identified as a toxic air contaminant in California, containing both small carbon particles and more than 40 cancer-causing substances (CARB, 2026ab). Diesel PM has been recognized as a significant contributor to health risk (CARB, 2026ab).

Salton Sea Emissions

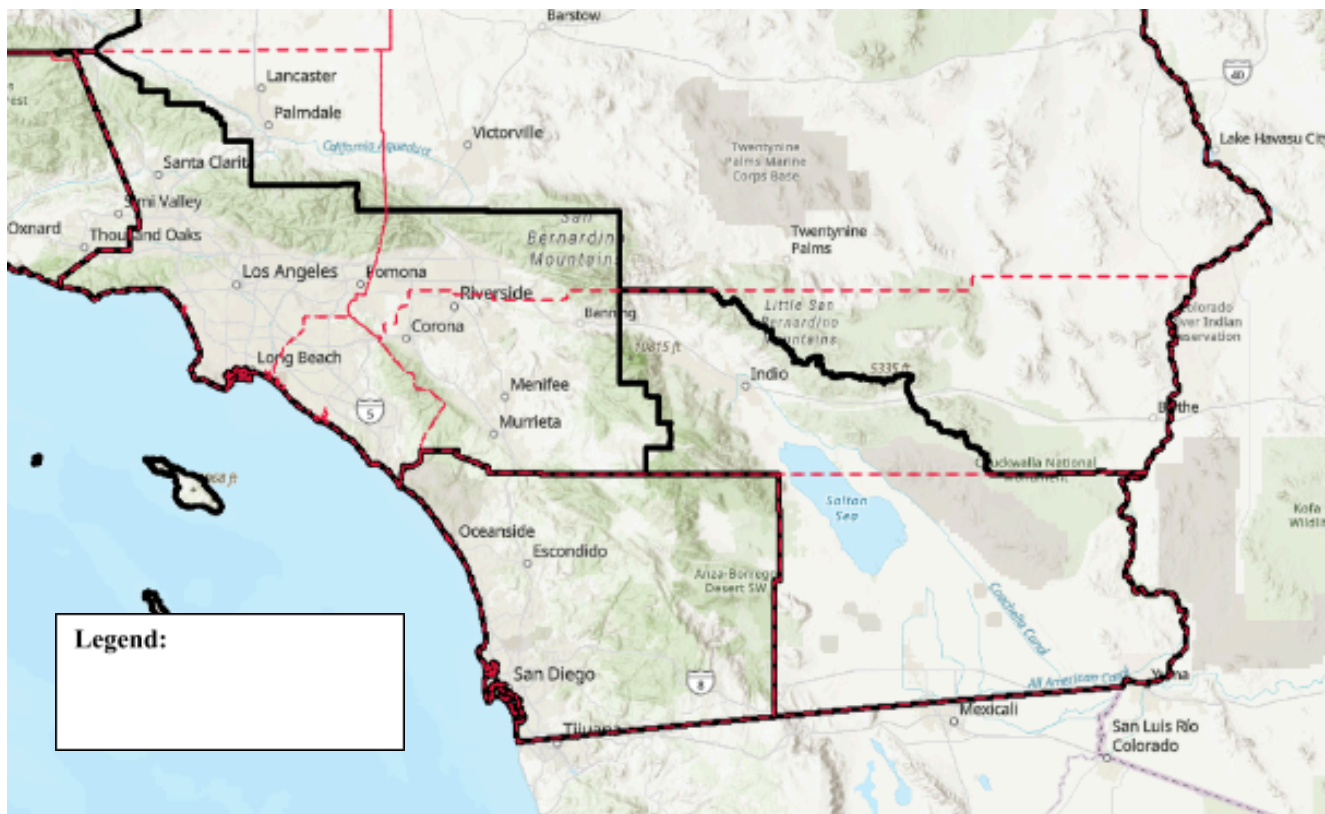
PM. The Salton Sea is currently declining in surface area at an estimated rate of approximately 3.75 square miles per year, primarily due to reductions in agricultural runoff and limited precipitation (Pacific Institute, 2026). As the Sea recedes, exposed playa (dry lakebed) sediments become susceptible to wind erosion (Abman et al., 2025). Under dry and windy conditions, these sediments can become airborne and contribute to PM₁₀ emissions, raising air quality concerns for nearby communities (Abman et al., 2025; Dudek, 2025b; Imperial County, 2016). PM₁₀ can be inhaled and deposited in the lungs and has been associated with a range of adverse respiratory health outcomes, including impaired lung function development in children (CARB, 2026y).

Hydrogen Sulfide. The Salton Sea water has low oxygen levels and high nutrient levels, which support the production of hydrogen sulfide from anaerobic digestion of organic material by sulfide-reducing bacteria (Centeno et al., 2025; F. B. Hill, 1972). The largest source of hydrogen sulfide emissions in the region is the Salton Sea (Dobson, Araya, Brounce, et al., 2023). Hydrogen sulfide emissions contribute to a “rotten egg” smell (Agency for Toxic Substances and Disease Registry, 2014). Exposure to elevated concentrations through inhalation can cause respiratory tract irritation, nausea, headache, unconsciousness, and death (Agency for Toxic Substances and Disease Registry, 2014). Under the same exposure conditions, children may receive higher doses because they have a greater lung surface-to-body weight ratio and have shorter stature (hydrogen sulfide concentrations are higher nearer the ground) (Agency for Toxic Substances and Disease Registry, 2014).

Air Quality Monitoring

Salton Sea Air Basin

An air basin is an area where air masses and pollution patterns are commonly shared. The Salton Sea Air Basin is one of the state-designated air basins used for air quality planning and management in California (CARB, 2026a). Almost all of Imperial County lies within the Salton Sea Air Basin that extends from the Coachella Valley and Palm Springs area southward through the Imperial Valley toward the U.S.–Mexico border (Kerlin, 2024; Lieb et al., 2024) (see Figure 5).



Source: Caltrans GIS Data: (California Department of Transportation, n.d.)

Figure 5. Overlay of Southern California Air Basins with County Boundaries

Imperial County Air Quality Monitoring

Local air quality in Imperial County is managed under the jurisdiction of the Imperial County Air Pollution Control District (ICAPCD) and CARB, which regulate stationary sources and implement air quality programs in the region (ICAPCD, 2018c). Together, ICAPCD, CARB, and IID operate ambient air monitoring networks in Imperial County, which are further supplemented by community-based monitoring through the Identifying Violations Affective Neighborhoods (IVAN) Air Monitoring program.

ICAPCD, CARB, and IID Monitoring Networks: The ICAPCD operates four local ambient air monitoring network stations in El Centro, Brawley, Niland, and Westmorland to characterize particulate matter and other air pollutants relevant to public health (CARB, 2026x; IID, 2026e). Additionally, the IID and CARB operate ambient air monitor stations in Imperial County: Calexico, Bombay Beach, Sonny Bono, Naval Test Base, Johnsons Landing, and Salton City (CARB, 2026x). Altogether, including six sites in Riverside, 16 ambient air quality monitoring stations gather air quality data in the Salton Sea Air Basin (CARB, 2026x). The type of information gathered by the stations in Imperial County is listed in Table 5.

The Salton Sea Air Quality Monitoring Program, developed by IID, uses air quality monitoring stations, meteorological towers, and cameras to monitor windblown dust in the Salton Sea region and Imperial Valley. This system was established in collaboration with CARB and the U.S. Environmental Protection Agency (IID, 2026g). Data for PM₁₀ are available from 2022 – 2025 for six sites, measured with tapered element oscillating microbalance instruments

(Formation Environmental, 2025). A Partisol instrument⁹ was also installed at two sites to filter air samples to determine the chemical composition of particles after laboratory analysis (Formation Environmental, 2025; IID, 2026h). The data for daily PM₁₀ values reported by CARB through the Air Quality and Meteorological Information System at a Calexico-Ethel Street site is from this IID monitoring network (CARB, 2019), not a separate monitoring station.

Table 5. ICAPCD, CARB and IID_Ambient Air Quality Monitoring Stations and Data Monitored, Imperial County

Station Name	Agency	Criteria Air Pollutants Monitored ¹							
		PM _{2.5}	PM ₁₀	Ozone	Nitrogen Dioxide	Carbon Monoxide	Sulfur Dioxide	Lead	Hydrogen Sulfide
Bombay Beach	IID	No	Yes	No	No	No	No	No	No
Brawley-Main Street #2	ICAPCD	Yes	Yes	No	No	No	No	No	No
Calexico-Ethel Street	CARB	Yes	Yes	Yes	Yes	- ²	Yes	No	No
El Centro-9 th Street	ICAPCD	Yes	Yes	Yes	Yes	- ²	No	No	No
IVAN Air Monitoring (40 monitors)	Comité Cívico del Valle	Yes	Yes	No	No	No	No	No	No
Johnsons Landing	CARB	- ³	- ³	- ³	- ³	- ³	- ³	- ³	- ³
Naval Test Base	IID	No	Yes	No	No	No	No	No	No
Niland-English Road	ICAPCD	No	Yes	Yes	No	No	No	No	No
Salton City	IID	No	Yes	No	No	No	No	No	No
Sonny Bono	IID	No	Yes	No	No	No	No	No	No
Westmorland	ICAPCD	No	Yes	Yes	No	No	No	No	No

Source: CARB <https://www.arb.ca.gov/aqmis2/aqdselect.php?tab=daily>. No data were reported for the following via this website: benzene, black carbon, carbon dioxide, methane, non-methane hydrocarbons, total hydrocarbons, PM₁₀-sulfate, PM₁₀-potassium, PM₁₀-lead, PM₁₀-nitrate, PM₁₀-Chloride.

¹ Vinyl chloride and sulfates are not listed as they are typically collected via samples with laboratory analysis. Vinyl chloride is more often monitored via site-specific studies. Ambient hydrogen sulfide is not collected by Imperial County stations, but the Mecca station in Riverside County collects the information.

² Data available for prior years (2023 or earlier).

³ Information not available on the Air Quality and Meteorological Information System website.

IVAN Air Monitoring Program. In addition to the ICAPCD, CARB, and IID air quality monitoring network, the IVAN Air Monitoring program measures PM₁₀ and PM_{2.5} from a network of 40 low-cost Dylos 1700 air monitors throughout Imperial County to provide additional neighborhood-level data (Comité Cívico del Valle, 2026b). The monitors cost around \$425 (Dylos Corporation, 2026). To evaluate their performance relative to more sophisticated regulatory-grade equipment, the Calexico sensor is located next to a CARB Beta Attenuation Monitor. . The results of the two monitors have a correlation coefficient of approximately 0.9, corresponding to a coefficient of determination of 0.8¹⁰ (Comité Cívico del Valle, 2026a).

⁹ A specialized, regulatory-grade ambient air sampler.

¹⁰ 80% of the variance in the IVAN monitor could be explained by variance in the CARB monitor and vice versa.

Toxic Air Contaminant Monitoring: While ambient air monitoring networks routinely measure criteria air pollutants to assess attainment of California Ambient Air Quality Standards (CARB, 2026c), the monitoring of toxic air contaminants is more limited (U.S. EPA, 2026j). Due to the large number of toxic air contaminants and the technical complexity of measuring them, assessments are conducted using various sampling and analysis methods, including emissions inventories, dispersion modeling, and laboratory analysis of field-collected air samples (U.S. EPA, 2026j).

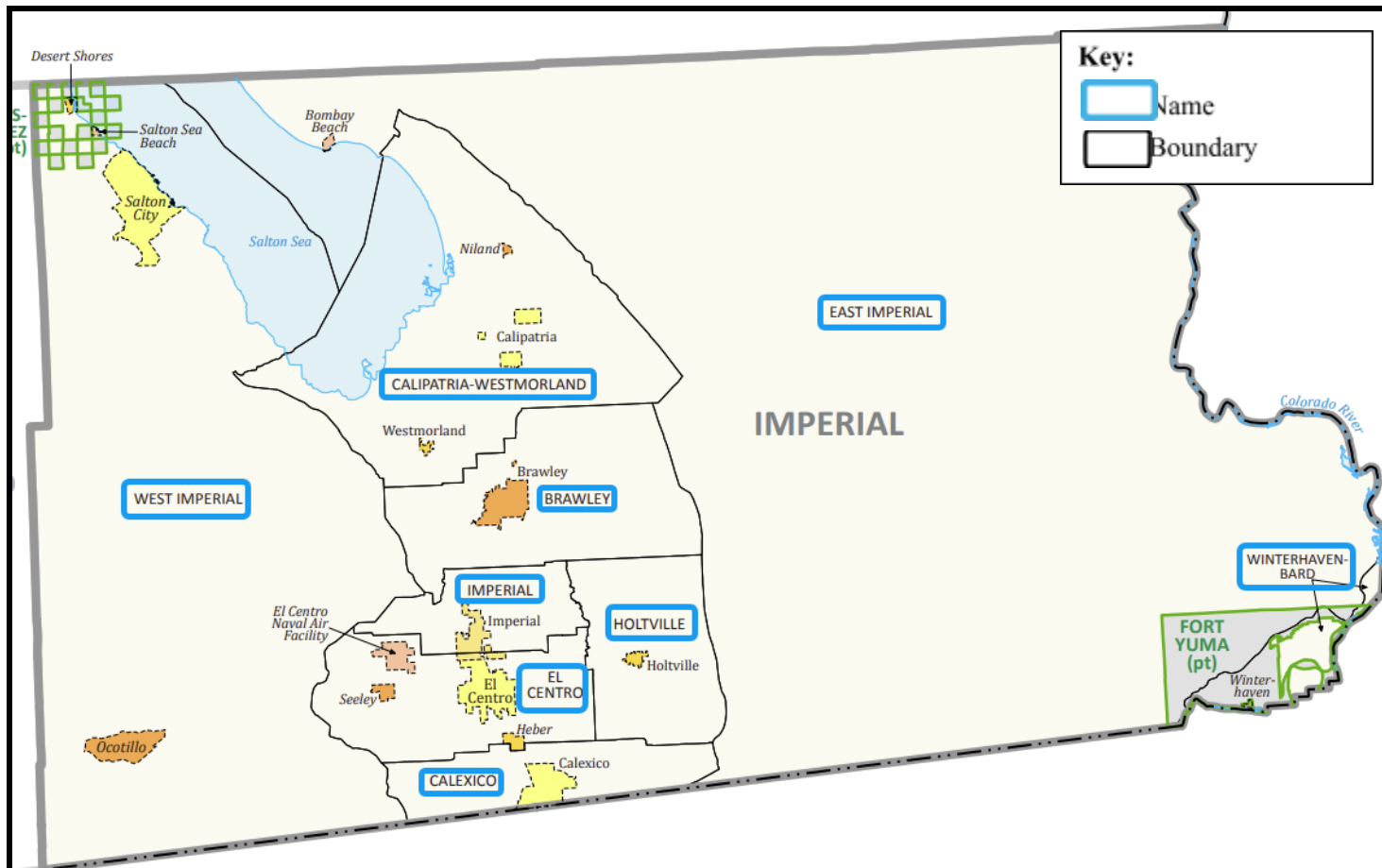
6.1.4 Demographic Characteristics

According to the 2024 American Community Survey five-year estimates from the U.S. Census Bureau, Imperial County had an estimated population of 180,202 residents (*Census Reporter*, n.d.). Children and adolescents under age 18 comprised 28.3% of the population, 58.0% were between 19 and 64 years of age, and 13.7% were aged 65 years or older. By comparison, 22.0% of California's population was under age 18.

Imperial County's population identified predominantly as Hispanic or Latino (86.0%), with 31.6% of the residents being foreign-born (*Census Reporter*, n.d.). Among individuals aged five years and older, 74.0% reported speaking Spanish at home. In contrast, 40.2% of California residents identified as Hispanic or Latino, 27.0% were foreign-born, and 28.3% reported speaking Spanish at home (*Census Reporter*, n.d.). Additional demographic information is presented in Table 6.

The demographic information presented in Table 6 is provided for California, Imperial County as a whole, and each of the nine Census County Divisions (**CCDs**) that collectively comprise Imperial County. These non-overlapping CCDs are described below and illustrated in Figure 6:

1. **Calexico CCD:** Centered around the border city of Calexico.
2. **Calipatria-Westmorland CCD:** Calipatria, Niland, Westmorland, and surrounding areas.
3. **Brawley CCD:** The city of Brawley and surrounding areas.
4. **Winterhaven-Bard CCD:** Southeastern corner of the county, including the Fort Yuma Indian Reservation.
5. **Holtville CCD:** The city of Holtville and the surrounding area.
6. **El Centro CCD:** El Centro and surrounding area.
7. **West Imperial CCD:** The western areas of the county to the county border that are not included in other CCDs.
8. **East Imperial CCD:** The eastern portion of the county that is not included in other CCDs.
9. **Imperial CCD:** Centered around the city of Imperial and the surrounding area.



Source: Modified from Geographic Areas Referencing Map Series – California:
https://www2.census.gov/geo/maps/DC2020/GARM20/GARM2020_ST06_CA.pdf

Figure 6. The Nine Census County Divisions (CCDs) in Imperial County

Table 6. Demographic Characteristics of California Residents and Imperial County Residents per Census County Division (CCD)¹: American Community Survey 2024 Five-Year Estimates, U.S. Census Bureau

Characteristic	California	Imperial County	Area and Census County Divisions								
			North/Central Area		East Area	West/South Area		South Area			
			Brawley CCD	Calipatria-Westmorland CCD	East Imperial ² CCD	Winterhaven-Bard CCD	West Imperial ² CCD	Calexico CCD	El Centro CCD	Holtville CCD	Imperial CCD
Total Population	39,287,376	180,202	28,099	10,576	835	1,701	10,607	38,664	63,804	7,784	18,132
Age Group (percent of population)											
Under 18 years	22.0%	28.3%	30.1%	27.2%	21.1%	5.3%	29.2%	28.6%	36.0%	18.2%	29.3%
Age 19 to 64 years	62.4%	58.0%	58.6%	56.3%	67.5%	51.7%	58.0%	51.9%	53.0%	66.1%	58.3%
Age 65 years and older	15.7%	13.7%	11.3%	16.5%	11.3%	43.0%	12.8%	19.5%	10.9%	15.7%	12.4%
Sex (percent of population)											
Male	49.9%	51.4%	51.5%	62.2%	54.0%	46.8%	64.8%	47.6%	50.3%	47.5%	51.1%
Female	50.1%	48.6%	48.5%	37.8%	46.0%	53.2%	35.2%	52.4%	49.7%	52.5%	48.9%
Educational Attainment (percent of population age 25 and older)											
Population age 25 and older	27,073,960	111,419	16,247	24,504	7,469	791	38,780	4,780	10,025	7,793	1,030
No schooling completed	3.6%	4.8%	6.5%	1.7%	1.8%	0.4%	3.2%	6.8%	4.3%	7.5%	2.2%
Nursery school through 12th grade, no diploma	11.6%	23.7%	20.6%	36.3%	10.2%	14.0%	36.1%	28.7%	20.3%	17.4%	15.5%
High school diploma or GED (General Education Development)	20.5%	25.7%	25.9%	27.2%	30.7%	36.7%	37.6%	20.1%	27.0%	26.8%	21.1%
Some college	19.3%	21.6%	22.3%	23.7%	21.6%	28.7%	13.8%	18.3%	22.6%	23.6%	26.9%
Associate's degree	7.9%	8.2%	8.8%	4.6%	15.2%	8.1%	4.9%	7.1%	8.8%	6.2%	13.6%
Bachelor's degree	22.7%	11.6%	12.3%	4.7%	12.9%	10.9%	2.4%	14.3%	11.6%	13.4%	14.7%
Master's degree or higher	14.4%	4.5%	3.6%	1.8%	7.6%	1.3%	2.0%	4.7%	5.4%	5.2%	5.9%
Veteran Status (percent of population age 18 and older)											
Population age 18 and older	30,494,912	128,818	19,586	28,138	8,341	782	44,937	5,557	11,599	8,675	1,203
Veteran	4.3%	3.4%	1.6%	3.3%	2.0%	7.7%	3.0%	1.7%	4.9%	2.2%	6.0%
Nonveteran	95.7%	96.6%	98.4%	96.7%	98.0%	92.3%	97.0%	98.3%	95.1%	97.8%	94.0%

Source: <https://censusreporter.org/search/> (tables B01003, B03002, B05001, B09001, B15003, B16007, B18101, B18135, B19013, B25001, and B21001).

¹ CCD stands for Census County Division. Imperial County is divided into nine census divisions, which together make up the entire Imperial County population.

² East Imperial and West Imperial CCDs are areas in the east and west of Imperial County, respectively, that do not include the other CCD areas. The Imperial CCD surrounds the city of Imperial.

Table 6. Demographic Characteristics of California Residents and Imperial County Residents per Census County Division (CCD)¹: American Community Survey 2024 Five-Year Estimates, U.S. Census Bureau, Continued

Response Options	California	Imperial County	Area and Census County Divisions								
			North/Central Area		East Area	West/South Area		South Area			
			Brawley CCD	Calipatria-Westmorland CCD	East Imperial ² CCD	Winterhaven-Bard CCD	West Imperial ² CCD	Calexico CCD	El Centro CCD	Holtville CCD	Imperial CCD
Total Population	39,287,376	180,202	28,099	10,576	835	1,701	10,607	38,664	63,804	7,784	18,132
Race and Hispanic Origin (percent of population)											
Non-Hispanic	59.8%	14.0%	15.1%	18.8%	93.4%	81.5%	25.9%	2.7%	14.2%	21.2%	13.2%
White alone	33.8%	9.1%	11.9%	8.7%	64.1%	26.8%	19.4%	1.2%	8.8%	17.9%	8.9%
Black or African American alone	5.2%	2.0%	0.2%	7.0%	23.2%	0.0%	5.2%	0.1%	2.7%	0.7%	0.9%
American Indian/Alaska Native alone	0.3%	0.6%	0.4%	0.4%	0.0%	50.3%	0.4%	0.0%	0.1%	0.3%	0.1%
Asian alone	15.3%	1.3%	1.8%	1.7%	0.0%	0.1%	0.3%	1.0%	0.8%	0.6%	3.2%
Native Hawaiian/Other Pacific Islander alone	0.3%	0.1%	0.0%	0.2%	0.0%	0.0%	0.1%	0.0%	0.2%	0.0%	0.0%
Some other race alone	0.6%	0.1%	0.0%	0.1%	1.7%	0.1%	0.1%	0.0%	0.2%	0.1%	0.0%
Two or more races	4.4%	0.9%	0.8%	0.5%	4.4%	4.2%	0.4%	0.3%	1.5%	1.7%	0.0%
Hispanic or Latine (a, o, x)	40.2%	86.0%	84.9%	81.2%	6.6%	18.5%	74.1%	97.3%	85.8%	78.8%	86.8%
White alone	5.9%	10.7%	10.2%	10.0%	2.9%	0.4%	2.3%	11.2%	11.2%	11.3%	15.2%
Black or African American alone	0.2%	0.3%	0.5%	0.2%	0.0%	0.0%	0.4%	0.0%	0.4%	0.0%	0.0%
American Indian/Alaska Native alone	1.0%	0.9%	1.9%	1.0%	1.4%	2.6%	0.7%	0.6%	0.5%	0.5%	1.3%
Asian alone	0.2%	0.3%	0.2%	0.9%	0.5%	0.0%	0.0%	0.2%	0.2%	0.0%	0.5%
Native Hawaiian and Other Pacific Islander alone	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Some other race alone	17.9%	41.4%	36.5%	34.1%	1.8%	2.7%	41.2%	51.3%	44.0%	43.6%	27.4%
Two or more races	14.8%	32.4%	35.5%	34.9%	0.0%	12.8%	29.5%	34.0%	29.4%	23.3%	42.6%
Nativity (percent of population)											
Foreign born (excluding American parents overseas)	27.0%	31.6%	27.4%	26.5%	2.4%	0.9%	23.3%	47.0%	30.1%	31.7%	22.7%

Source: <https://censusreporter.org/search/> (tables B01003, B03002, B05001, B09001, B15003, B16007, B18101, B18135, B19013, B25001, and B21001).

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Total Population	39,287,376	180,202	28,099	10,576	835	1,701	10,607	38,664	63,804	7,784	18,132
Language Spoken at Home (percent of population age five or older)											
Population age five or older	37,121,456	167,458	25,467	35,800	10,142	813	59,270	7,224	17,007	10,199	1,536
English only	55.6%	24.7%	32.5%	29.9%	93.1%	90.2%	33.9%	7.5%	23.8%	31.6%	31.9%
Spanish	28.3%	74.0%	66.5%	68.0%	3.3%	3.4%	65.5%	91.9%	74.9%	67.4%	65.4%
Another language	16.1%	1.3%	0.9%	2.0%	3.6%	6.4%	0.5%	0.6%	1.3%	1.0%	2.7%
Income in the Past 12 Months (percent of population³)											
At or below federal poverty level	12.0%	19.5%	21.3%	29.5%	32.6%	41.8%	14.7%	19.7%	19.2%	16.7%	13.7%
Median household income (2024 inflation-adjusted)	\$99,122	\$57,681	\$59,478	\$44,136	\$25,978	\$39,205	\$39,191	\$49,821	\$60,122	\$72,024	\$90,346
Housing (percent of households)											
Number of households	13,548,091	49,644	8,127	10,104	2,351	440	18,286	2,138	4,903	2,682	613
Owner occupied	55.9%	56.8%	51.7%	57.4%	55.5%	63.5%	86.4%	50.2%	54.0%	53.5%	73.9%
Renter occupied	44.1%	43.2%	48.3%	42.6%	44.5%	36.5%	13.6%	49.8%	46.0%	46.5%	26.1%
Median gross rent	\$2,036	\$1,056	\$987	\$874	\$1,144	\$674	\$1,318	\$1,094	\$1,086	\$883	\$1,187
Median monthly housing costs	\$2,114	\$1,128	\$1,102	\$848	\$599	\$394	\$715	\$1,179	\$1,179	\$1,000	\$1,587
Number of housing units	14,644,735	58,044	8,942	2,860	934	1,084	3,350	12,082	21,085	2,436	5,271
Disability (percent of population)	38,818,412	173,281	27,967	38,611	7,723	826	62,960	7,784	18,105	7,604	1,701
Age 17 and younger	0.9%	2.3%	2.7%	4.0%	0.0%	1.0%	2.6%	1.2%	2.2%	2.1%	3.3%
Age 18 to 64	5.5%	5.9%	7.2%	6.4%	6.8%	8.8%	7.0%	3.9%	6.1%	5.8%	6.2%
Age 65 and older	5.2%	6.7%	6.0%	7.7%	23.1%	7.1%	7.6%	7.9%	6.0%	6.8%	6.0%
Disability (all age groups) ⁴	11.6%	14.8%	15.9%	18.1%	29.9%	16.9%	17.2%	13.1%	14.3%	14.6%	15.5%

Source: <https://censusreporter.org/search/> (tables B01003, B03002, B05001, B09001, B15003, B16007, B18101, B18135, B19013, B25001, and B21001).

¹ CCD stands for Census County Division. Imperial County is divided into nine census divisions, which together make up the entire Imperial County population.

² East Imperial and West Imperial CCDs are areas in the east and west of Imperial County, respectively, that do not include the other CCD areas. The Imperial CCD surrounds the city of Imperial.

³ Poverty calculation does not include persons living in institutions, military group quarters, college dormitories, or foster/unrelated individuals under age 15; household income includes all people who occupy a housing unit (single person, a family, or unrelated individuals living together) and does not include those living in institutions.

⁴ In some cases the disability age groups do not sum to 100% due to rounding.

6.1.5 Health Care Services Infrastructure and Health Insurance

Health care infrastructure influences both access to health care services and the quality of care provided, making it an important social determinant of health. Factors that can influence health outcomes related to health care infrastructure include the availability of health promotion and prevention services; access to clinical care, including adequate provider supply; provider linguistic and cultural competency; and the overall quality of care delivered (Artiga & Hinton, 2018; University of Wisconsin Population Health Institute, 2026a). In addition, the availability and type of health insurance coverage are critical in determining whether individuals can obtain needed health services.

Assessment of health care infrastructure commonly relies on indicators such as the number of physicians or other providers per population, rates of preventable hospitalizations, levels of health insurance coverage, and the availability of specialty services (Artiga & Hinton, 2018; University of Wisconsin Population Health Institute, 2026a). Selected indicators are described below, based on data availability.

Health Care Services

This section examines the services offered, while the next discusses physician availability.

Emergency Medical Services

Imperial County emergency medical services include ambulance companies, hospitals, fire departments, police departments, and other providers (Imperial County Public Health Department, 2025b). There are two hospitals in Imperial County: Pioneers Memorial Hospital in Brawley and El Centro Regional Medical Center in El Centro. Both offer a “broad range of services, including emergency care, specialized treatments, surgeries, and outpatient services” (County of Imperial, 2025c).

Primary Care Services

Pioneers Memorial Hospital provides outpatient clinics/services in Brawley and Calexico, while the El Centro Regional Medical Center provides outpatient clinics/services in El Centro and Calexico. The Federally Qualified Health Center, Innercare, operates multiple health, dental, and pharmacy sites across Imperial County with locations in El Centro, Brawley, Calexico, Winterhaven, Niland, and Salton City (Innercare, 2026).

Gaps in Service and Plans to Address Gaps

“Despite the presence of these healthcare providers, significant gaps remain under existing conditions, particularly in the northern region, extending from El Centro through Brawley, Calipatria, and Niland. Rural areas like Calipatria and Niland experience insufficient access to critical healthcare services” (County of Imperial, 2025c).

The Imperial Valley Health District is expected to oversee hospital operations and collaborate with existing healthcare providers to enhance medical services, reduce redundancies, and address gaps in care (County of Imperial, 2025c). Potential ideas to enhance health care include expanding telehealth services and establishing mobile clinics for temporary healthcare access (County of Imperial, 2025c).

Medical Provider Availability

Primary care physicians in California are unevenly distributed, with higher concentrations in urban counties and substantially lower physician-to-population ratios in rural and inland counties, including Imperial County (California Health Care Foundation, 2025). In 2023, Imperial County had 82 physicians per 100,000 residents, including 56 non-primary-care physicians and 26 primary-care physicians. In comparison, the statewide rate was 202 physicians per 100,000 residents (141 non-primary care and 61 primary care) (California Health Care Foundation, 2025). In absolute numbers, Imperial County had 147 physicians in 2023, including 100 non-primary-care physicians and 47 primary-care physicians.

Provider availability can also be expressed as the number of residents per clinician. In 2022, Imperial County had one primary care physician for every 4,360 residents, compared with one per 1,200 residents statewide and one per 1,310 residents nationally (University of Wisconsin Population Health Institute, 2026b). In 2025, Imperial County had approximately 1 non-physician primary care provider (i.e., nurse practitioner or physician assistant) per 960 residents, compared with 1 per 1,000 residents in California and 1 per 680 nationally (University of Wisconsin Population Health Institute, 2026c).

Preventable Hospitalizations

Preventable hospitalizations for some health conditions can be used to gauge access to quality outpatient or primary care (Agency for Healthcare Research and Quality, 2026b).

Adults

Overall, in 2024, among adults, Imperial County had a preventable hospitalization rate of 882 per 100,000 population based on a composite score of 10 ambulatory care-sensitive conditions, compared to 903 for California (Agency for Healthcare Research and Quality, 2026b). The risk-adjusted rate¹¹ for the composite score in Imperial County was 687 per 100,000 compared to 964 for California (Agency for Healthcare Research and Quality, 2026b).

The conditions included in the composite preventable score were short- and long-term diabetes complications, COPD or asthma in adults aged 40 and over, hypertension, heart failure, community-acquired pneumonia, urinary tract infection, uncontrolled diabetes, asthma in those aged 18-39 years, and lower-extremity amputation among patients with diabetes (Agency for Healthcare Research and Quality, 2026b).

Using 2023 data, the California Department of Health Care Access and Information reported that Imperial County has a lower supply of physicians treating community-acquired pneumonia, diabetes, and urinary tract infections than the statewide average. These conditions are often preventable or manageable through timely outpatient care, yet hospitalization rates for each were higher than the statewide average in Imperial County. This combination of indicators warrants continued attention to healthcare access in the County. (California Department of Health Care Access and Information, 2026).

For the other conditions examined (adult asthma/chronic obstructive pulmonary disease, heart failure, and hypertension), physician supply was also lower than statewide levels; however, hospitalization rates were comparatively low, making it difficult to determine whether provider

¹¹ The risk-adjusted rate represents what the rate would be if the county or state had the same age, sex, and poverty distribution as the reference population, allowing for fair comparisons between areas.

availability is affecting health outcomes for these conditions. (California Department of Health Care Access and Information, 2026). Physician supply and hospitalization rates are broad measures that can provide insight into healthcare access and system capacity; however, they do not account for residents who receive care outside the county or for the contributions of other healthcare providers, such as nurse practitioners and physician assistants.

Youth

Overall, in 2024, Imperial County had a higher preventable hospitalization rate among youth aged 6–17 years than the statewide average when measured using a composite indicator of four ambulatory care–sensitive conditions (Agency for Healthcare Research and Quality, 2026a). The unadjusted rate in Imperial County was 87 hospitalizations per 100,000 population, compared with 73 per 100,000 in California (Agency for Healthcare Research and Quality, 2026a). After risk adjustment,¹² however, the composite rate for Imperial County was 58 per 100,000, lower than the statewide rate of 75 per 100,000.

The composite measure includes four conditions: asthma (ages 2–17), diabetes short-term complications (ages 6–17), gastroenteritis (ages 3 months–17 years), and urinary tract infections (ages 6–17) (Agency for Healthcare Research and Quality, 2026a). For asthma specifically, the risk-adjusted hospitalization rate for Imperial County youth was 26 per 100,000, compared with 58 per 100,000 statewide. Among the four conditions, urinary tract infections were the only measure with a higher rate in Imperial County than in California overall, with a risk-adjusted rate of 24 per 100,000 compared with 11 per 100,000 statewide.

Health Insurance

According to the 2024 American Community Survey 5-year estimates, the majority of Imperial County residents reported having health insurance coverage across all age groups (*Census Reporter*, n.d.) (Table 7). Coverage was reported for 98.3% of individuals aged 18 years and younger, 90.2% of those aged 19 to 64 years, and 99.1% of those aged 65 years and older (*Census Reporter*, n.d.).

Among children and adolescents (≤ 18 years), the largest proportions were insured through public programs (60.7%), including Medicaid, Medicare, TRICARE, military coverage, or Veterans Affairs benefits (*Census Reporter*, n.d.). For adults aged 19 to 64 years, coverage was more evenly distributed between employer-sponsored or direct-purchase plans (46.4%) and public insurance (40.3%). Adults aged 65 years and older were predominantly covered by public insurance, most commonly Medicare, either alone or in combination with employer-sponsored or direct-purchase coverage (85.7%).

¹² The risk-adjusted rate represents what the rate would be if the county or state had the same age, sex, and poverty distribution as the reference population, allowing for fair comparisons between areas.

Table 7. Health Insurance Reported by California Residents and Imperial County Residents per Census County Division (CCD)¹: American Community Survey 2024 Five-Year Estimates, U.S. Census Bureau

Age Group and Health Insurance Type	California	Imperial County	Area and Census County Division								
			North/Central Area		East Area	West/South Area		South Area			
			Brawley CCD	Calipatria-Westmorland CCD	East Imperial ² CCD	Winterhaven-Bard CCD	West Imperial ² CCD	Calexico CCD	El Centro CCD	Holtville CCD	Imperial CCD
Health Insurance by Age (percent per age group)											
Age 18 years and younger	9,165,578	54,019	9,154	2,377	44	554	1,989	11,252	19,570	2,354	6,725
Employer-based or direct-purchase ³	52.4%	30.3%	33.5%	11.5%	0.0%	5.4%	23.0%	22.8%	32.8%	35.8%	40.4%
Medicare/Medicaid/TRICARE/Military/Veterans Affairs	39.1%	60.7%	61.7%	85.3%	31.8%	86.5%	69.4%	70.1%	56.5%	54.7%	45.0%
Two or more other types	5.3%	7.3%	3.7%	2.1%	68.2%	0.4%	6.3%	5.1%	8.3%	9.6%	13.9%
No coverage	3.2%	1.7%	1.0%	1.1%	0.0%	7.8%	1.4%	2.0%	2.4%	0.0%	0.7%
Age 19 to 64 years	23,594,476	94,778	15,669	4,161	423	936	4,000	20,967	35,287	3,914	9,421
Employer-based or direct-purchase ³	66.0%	46.4%	47.1%	31.2%	55.6%	37.2%	33.0%	41.7%	48.6%	52.3%	58.1%
Medicare/Medicaid/TRICARE/Military/Veterans Affairs	21.5%	40.3%	41.7%	52.8%	15.6%	41.9%	51.1%	44.3%	37.5%	36.2%	31.9%
Two or more other types	3.1%	3.5%	1.8%	1.0%	0.0%	1.1%	3.6%	2.6%	4.9%	3.2%	4.3%
No coverage	9.3%	9.8%	9.4%	14.9%	28.8%	19.9%	12.3%	11.3%	9.0%	8.3%	5.6%
Age 65 or more years	6,058,359	24,484	3,144	1,185	359	211	1,615	6,392	8,103	1,516	1,959
Employer-based or direct-purchase	5.0%	4.5%	5.7%	3.5%	6.1%	10.0%	0.9%	5.1%	4.6%	2.2%	4.0%
Employer-based or direct-purchase and Medicare	29.5%	14.9%	21.7%	12.6%	7.2%	21.3%	9.5%	6.8%	16.5%	11.9%	33.2%
Medicare/Medicaid/TRICARE/Military/Veterans Affairs	51.1%	70.7%	63.9%	69.4%	71.6%	49.8%	86.6%	80.1%	67.4%	76.7%	50.3%
Two or more other types	13.3%	8.9%	8.1%	12.0%	15.0%	18.0%	2.2%	7.0%	10.4%	9.2%	12.3%
No coverage	1.1%	0.9%	0.6%	2.6%	0.0%	0.9%	0.7%	1.0%	1.1%	0.0%	0.2%

Source: <https://censusreporter.org/search/> (table B18135).

¹ CCD stands for Census County Division. Imperial County is divided into nine census divisions, which together make up the entire population of Imperial County.

² East Imperial and West Imperial CCDs are areas in the east and west of Imperial County, respectively, that do not include the other CCD areas. The Imperial CCD surrounds the city of Imperial.

³ Includes a very small percentage (less than 0.05%) with both employer-based or direct-purchase health insurance who also report having Medicare.

6.1 Existing Health Conditions (Baseline)

Baseline information on health conditions that may be influenced by the industrial, commercial, residential, and other development envisioned under the Specific Plan land-use framework is presented in this section to provide context for the assessment of potential health impacts.

6.2.1 Respiratory Diseases

The two most prevalent noncommunicable chronic respiratory diseases are asthma and chronic obstructive pulmonary disease (**COPD**) (World Health Organization, 2026a). Other common chronic respiratory conditions include occupational lung diseases and pulmonary hypertension (World Health Organization, 2026a). Although these diseases are not curable, their progression and severity can often be managed (World Health Organization, 2026a).

Respiratory Disease: Asthma

Asthma is influenced by a combination of genetic susceptibility, environmental exposures, and social conditions (ALA, n.d.-b). Common risk factors for developing asthma include having a parent with asthma, experiencing severe respiratory infections in early childhood, living with allergic conditions, and occupational exposure to chemical or industrial irritants (ALA, n.d.-b). Smoking further increases asthma risk, and individuals living in areas with higher outdoor ozone levels, often urban or industrialized regions, face a greater likelihood of asthma development (ALA, n.d.-a). In Imperial County, agricultural burns have been linked to asthma exacerbations as well as bronchitis symptoms among children without asthma (Kamai et al., 2023).

Social and economic conditions also play a critical role in shaping asthma prevalence, diagnosis, and health outcomes. Asthma rates and severity vary by race/ethnicity, income, and gender, reflecting broader social determinants of health (ALA, n.d.-a; Grant et al., 2022). Individuals with lower incomes, limited access to health insurance, substandard housing conditions (e.g., pests, mold, poor ventilation), chronic psychosocial stress, or exposure to structural racism are more likely to experience more severe symptoms, increased reliance on emergency or urgent care services, and higher rates of hospitalization (ALA, n.d.-a; Grant et al., 2022). In addition to contributing to poorer asthma control, lower income is associated with higher overall asthma prevalence and greater likelihood of residing in neighborhoods with overlapping environmental and housing-related risk factors, including mold, pests, and elevated pollution exposures (Grant et al., 2022).

Asthma Prevalence

The California Health Interview Survey (**CHIS**) is an annual, population-based survey that produces statewide and county-level estimates across a broad range of health indicators (UCLA Center for Policy Research, 2026). Based on pooled 2023–2024 CHIS data, Imperial County residents had a higher estimated prevalence of ever being diagnosed with asthma than California as a whole (Table 8). Substantial differences in current asthma prevalence (“still have asthma”) were observed only among youth. For children and adolescents, Imperial County had a higher estimated current prevalence than the statewide average; however, this estimate was statistically unstable and should be interpreted with caution. In general, it is important to note that CHIS findings are based on self-reported survey data rather than clinical records, and

several estimates are accompanied by wide confidence intervals, indicating statistical uncertainty.

Differences between the proportion of individuals ever diagnosed with asthma and those currently reporting asthma may reflect symptom remission, prior misdiagnosis, or historical reliance on less objective diagnostic criteria (Aaron et al., 2017; Kavanagh et al., 2019). Discrepancies may also arise from inherent limitations of self-reported data, including recall bias and potential misunderstanding of survey questions.

Asthma Emergency Department Visits and Hospitalization

According to data from the California Department of Public Health (CDPH), Imperial County's 2023 asthma-related emergency department visit rate for children ages 0–17 exceeded the statewide rate (Table 8) (CDPH, n.d.). Pooled 2023–2024 CHIS data further indicate that a slightly greater proportion of individuals with current asthma in Imperial County (57.3%) reported experiencing an asthma episode or attack in the past 12 months compared with those statewide (51.9%) (UCLA Center for Policy Research, 2026). In contrast, asthma-related hospitalization rates in Imperial County were lower than statewide rates in 2023 (CDPH, n.d.).

Table 8. Asthma Prevalence, and Emergency Department Visit, Hospitalization and Mortality Rates in Imperial County and California, 2023-2024

Ages	Location	Ever Diagnosed: CHIS¹ (95% Confidence Interval)	Current Prevalence: CHIS¹	Emergency Department Visit Rate²	Hospitalization Rate²	Mortality Rate³
All Ages	Imperial County	22.6% (13.6%-31.6%)	10.5%	36.9	3.1	-- ⁴
	California	15.6% (15.2%-16.1%)	9.0%	36.3	3.9	8.8
Age 0-17 Years	Imperial County	24.5% (11.4% - 37.7%)	17.0% ⁵	68.5	7.9	-- ⁴
	California	12.0% (11.2%-12.9%)	7.9%	59.4	8.6	1.2
Age 18 and Older	Imperial County	21.9% (11.2%-32.5%)	8.1% ⁵	25.9	1.4	-- ⁴
	California	16.6% (16.1%-17.2%)	9.3%	28.3	2.2	11.5

¹ Source: California Health Interview Survey from <https://healthpolicy.ucla.edu/our-work/askchis>; confidence interval - 95% certain that the percent lies within the range specified. Pooled estimates from 2023-2024 data. Current prevalence includes those reporting that they still have asthma out of the population responding (yes or no) to the ever diagnosed with asthma question.

² Age-adjusted rate per 10,000 individuals; data from 2023; source <https://data.chhs.ca.gov/organization/california-department-of-public-health?q=Asthma>.

³ Age-adjusted rate per 10,000 individuals; data from 2020-2022; source <https://data.chhs.ca.gov/organization/california-department-of-public-health?q=Asthma>.

⁴ Not available; data suppressed (under 12 events).

⁵ Estimate is unstable; interpret with caution.

Asthma Prevalence, Emergency Care, and Hospitalization Over Time: Youth

Although the asthma-related emergency department visit rate among children aged 0–17 years was higher in Imperial County than in California in 2023, the gap was smaller in 2019/2020 than in the years before or after that period (Table 9) (CDPH, n.d.). A reduction in asthma diagnoses

and emergency department visit rates coincided with the onset of the Coronavirus Disease 2019 (COVID-19) pandemic and may have been driven by reduced exposure to respiratory viruses and other environmental triggers, as well as disruptions in healthcare access (Henry et al., 2026; Saliccioli et al., 2021). However, asthma-related emergency department visits are also shaped by a range of factors, including access to a primary care provider, the availability of tools that help physicians and patients improve care, evolving medical knowledge and treatment protocols over time (L. H. Johnson et al., 2016) and broader structural factors such as the availability of specialists, receipt of care outside the County, and language barriers.

Table 9. Asthma Prevalence, Emergency Department Visit Rate, and Hospitalization Rate among Youth Aged 0-17 in Imperial County and California Between 2016 and 2024

Location	Year	Ever Diagnosed: CHIS ^{1,2} (95% Confidence Interval)	Ever Diagnosed: CDPH ^{2,3} (95% Confidence Interval)	Current Prevalence ³ (95% Confidence Interval)	Emergency Department Visit Rate ⁴	Hospitalization Rate ⁴
Imperial County	2015	23.2% ⁵ (6.4%–40.0%)	22.0% ⁵ (7.8%–36.2%)	19.1% ⁵ (5.6%–32.5%)	-- ⁶	-- ⁶
	2016				133.0	17.0
	2017	-- ⁶	-- ⁶	-- ⁶	126.8	14.7
	2018				108.5	12.3
	2019	11.2% ⁵ (2.7%–19.7%)	10.4% (2.5%–18.4%)	7.5% ⁵ (0.3%–14.7%)	111.7	15.7
	2020				32.5	3.2
	2021	18.9% (9.2%–28.6%)	17.8% (7.9%–27.7%)	10.1% ⁵ (2.6%–17.5%)	34.9	4.3
	2022				52.7	7.6
	2023	24.5% (11.4% - 37.7%)	-- ⁶	17.0% ¹ -- ⁶	68.5	7.9
	2024				-- ⁶	-- ⁶
California	2015	15.2% (12.8%–17.6%)	14.5% (12.2%–16.8%)	10.1% (8.3%–11.9%)	-- ⁶	-- ⁶
	2016				75.3	9.4
	2017	14.3% (12.1%–16.5%)	13.7% (11.7%–15.8%)	8.0% (6.4%–9.6%)	74.5	9.2
	2018				64.7	8.4
	2019	12.4% (11.3%–13.4%)	11.9% (10.9%–12.9%)	7.4% (6.6%–8.2%)	63.4	8.3
	2020				25.2	3.1
	2021	11.5% (10.6%–12.3%)	9.9% (9.0%–10.8%)	6.8% (6.1%–7.4%)	33.5	5.3
	2022				56.7	9.0
	2023	12.0% (11.2%–12.9%)	-- ⁶	7.9% ¹ -- ⁶	59.4	8.6
	2024				-- ⁶	-- ⁶

Note: 95% confidence interval signifies 95% certainty that the estimated percentage lies within the range indicated.

¹ Source: California Health Interview Survey pooled data (2015-2016, 2017-2018, 2019-2020, 2021-2022, 2023-2024) from <https://healthpolicy.ucla.edu/our-work/askchis>. Current prevalence includes those reporting that they still have asthma out of the population responding (yes or no) to the ever diagnosed with asthma question.

² The reasons for the slight differences between the CHIS and CDPH estimates are unclear, as both are derived from CHIS data; however, they may reflect differences in analytic methods, such as the population weights applied.

³ Source: <https://data.chhs.ca.gov/organization/california-department-of-public-health?q=Asthma> from California Health Interview Survey. Current prevalence 2016-2023 includes those who report still having asthma, or who have had an episode in the past 12 months. Data also available from: <https://data.trackingcalifornia.org/>.

⁴ Age-adjusted visit rate per 10,000 individuals; data from 2023; source: <https://data.chhs.ca.gov/organization/california-department-of-public-health?q=Asthma>.

⁵ Estimate is unstable; interpret with caution.

⁶ Data not available; estimates not considered valid; 2015 or earlier data diagnostic coding transition so comparison not recommended to later data.

Improved asthma-related knowledge among health care providers and patients, supported by initiatives such as California Breathing's Asthma Management Academy (initiated in 2017), the *Respira Sano* program (2015–2017), and the Asthma Community Linkages Project (2017–2019), likely contributed to improved asthma control and reductions in asthma-related hospitalizations in Imperial County (CDPH, 2026; Elder et al., 2021; Staten et al., 2025).

Asthma Prevalence in Imperial County Youth: Additional Data Sources

Several recent studies of children in Imperial County provide corroborating evidence regarding the proportion of youth who have ever been diagnosed with asthma. However, the findings are based on specific study samples and may not be generalizable to all children residing in Imperial County.

- In a 2017–2018 study of parents of 357 children aged 5–10 years attending four elementary schools within 20 miles of the Salton Sea, 22.4% of children were reported to have received a physician diagnosis of asthma at baseline. Asthma was more common among children with a maternal history of asthma and among those exposed to tobacco smoke (Farzan et al., 2019). The authors also observed high rates of wheezing, allergies, and dry cough among children without an asthma diagnosis, suggesting the possibility of underdiagnosed respiratory impairment.
- The same research group subsequently initiated a larger cohort study in 2017 involving 731 children from five elementary schools in Imperial County (Farzan et al., 2024). At baseline (2017–2019), parents reported that 23.8% of children had been diagnosed with asthma, although some values were imputed. Consistent with earlier findings, approximately one-quarter of children without an asthma diagnosis reported bronchitis-related symptoms.
- Of the 1,747 adults responding to the Professional Research Consultants (PRC) Community Health Survey in 2022, 14.9% indicated that they had asthma (PRC, 2022). Among children under the age of 18 in surveyed households, parents reported that 16.4% had asthma (Imperial County Community Health Improvement Partnership, 2024). It is unclear whether these percentages represent respondents who had ever been told they had asthma or those who currently have asthma, as the two measures produce different results. For example, in 2021–2022, CHIS data for youth showed that 17.8% had ever been diagnosed with asthma, compared with 10.1% who currently had asthma (UCLA Center for Policy Research, 2026). Similar to CHIS, researchers used sampling strategies and applied weighting methods to help ensure the sample was representative of Imperial County residents (PRC, 2022).

Respiratory Disease: Chronic Obstructive Pulmonary Disease

Common risk factors for COPD are exposure to tobacco smoke, ambient and indoor air pollution, occupational chemicals and dust, and allergens, as well as recurrent lower respiratory infections during childhood (ALA, 2026).

COPD Prevalence

In Imperial County, the age-adjusted prevalence of COPD among adults aged 18 years and older was 5.4% in 2023 (95% confidence interval [CI]: 4.5%–6.3%) (CDC, 2026a). Prevalence

was slightly higher in the two preceding years, at 6.0% (95% CI: 5.3%–6.6%) in 2022 and 5.9% (95% CI: 4.9%–6.9%) in 2021.

In 2023, the age-adjusted prevalence of COPD among U.S. adults aged 18 years and older was 3.8%, according to the CDC analysis of data from the National Health Interview Survey (Weeks & Elgaddal, 2025). COPD prevalence increased substantially with age, ranging from 0.4% among adults aged 18–24 years to 10.5% among those aged 75 years and older (Weeks & Elgaddal, 2025). An analysis of the same dataset by the American Lung Association indicates that state-level adult COPD prevalences ranged from 3.7% to 12.6%, with California estimated at 4.2% (ALA, n.d.-b); it is unclear whether these state-level estimates were age-adjusted. The 2022 PRC survey indicated that 5.5% of adults in Imperial County reported having COPD, although it is unknown whether this estimate is age-adjusted (PRC, 2022).

The American Lung Association further reported that approximately 14% of COPD cases in the United States in 2023 were attributable to occupational exposures to vapors, gases, dusts, and fumes (ALA, n.d.-a). They also noted that COPD prevalence was higher in rural communities (8%) than in urban communities (approximately 5%), based on rounded figures in the report.

COPD Emergency Department Visits, Hospitalization, and Death Rates

Age-adjusted rates of emergency department visits, hospitalizations, and mortality related to COPD in Imperial County are all lower than the corresponding statewide rates (Table 10).

Table 10. Age-Adjusted Emergency Department Visit, Hospitalization, and Death Rates for COPD in Imperial County and California, 2021-2023

Measure	Location	Year		
		2022 (95% Confidence Interval)	2023 (95% Confidence Interval)	2024 (95% Confidence Interval)
Age-adjusted rate of emergency department visits for COPD (per 10,000 population age 25 and older) ¹	Imperial County	13.6 (11.6%-15.9%)	15.0 (12.8%-17.4%)	--
	California	22.6 (22.5%-22.8%)	26.8 (26.6%-27.0%)	--
Age-adjusted hospitalization rate for COPD (per 10,000 population aged 25 and over) ¹	Imperial County	2.6 (1.8%-3.6%)	3.2 (2.3%-4.3%)	--
	California	6.1 (6.0%-6.2%)	6.6 (6.2%-6.7%)	--
Age-adjusted death rate for COPD (per 100,000) ²	Imperial County	18.6 (12.9%-26.2%)	16.6 (11.4%-23.6%)	17.5 (12.4%-24.5%)
	California	25.6 (25.1%-26.0%)	25.0 (24.5%-25.4%)	23.0 (22.5%-23.4%)

¹ Source: Tracking California Data Explorer (Tracking California, 2026) <https://data.trackingcalifornia.org/>.

² Source: California Communicable Disease Burden (CDPH, 2026) <https://skylab.cdph.ca.gov/communityBurden/>.

Chronic Lower Respiratory Disease Death Rates

Chronic lower respiratory diseases encompass COPD, asthma, bronchiectasis, and certain occupational lung diseases, with COPD representing the most prevalent condition within this category (National Institute of Health, n.d.).

During the 2019–2023 period, the age-adjusted mortality rate attributable to chronic lower respiratory diseases was 27.4 per 100,000 population in California (95% CI: 27.2–27.7) and

20.6 per 100,000 in Imperial County (95% CI: 17.7–23.8) (National Institute of Health, n.d.). Over this five-year period, mortality rates in both Imperial County and California declined.

6.2.2 Cardiovascular Disease

Cardiovascular disease is an umbrella term that refers to all diseases affecting the heart and blood vessels, including heart disease, heart attack, stroke, heart failure, arrhythmia (abnormal heart rhythm), and heart valve problems (AHA, 2026).

Cardiovascular Disease Prevalence

The Behavioral Risk Factor Surveillance System is a nationwide survey administered by the CDC that collects information about diseases and risk behaviors (CDC, 2025b). The survey asks about cardiovascular diseases, angina, coronary heart disease, heart attack, and stroke. According to survey data, among adults in California between 2015-2019, an estimated 5.9% had been told by a physician that they had any of the cardiovascular diseases mentioned, with the rate in Imperial County being lower (approximately 4%, as viewed from Figure 2 in the source document) (CDPH, 2021).

The CHIS did not ask about cardiovascular diseases; instead, it asked individuals more narrowly about heart disease. In 2024, the CHIS estimated that 6.6% [95% CI 3.0-10.1] of the adults in Imperial County had heart disease based on survey responses (UCLA Center for Policy Research, 2026). The statewide level was similar, at 7.0 percent [95% CI 6.6-7.4]. The 2022 PRC survey estimated that 6.0% of Imperial County adults had heart disease (heart attack, angina, coronary disease) (PRC, 2022).

Cardiovascular Emergency Department and Death Rates

In 2022 and 2023, age-adjusted emergency department visit rates and hospitalization rates for cardiovascular-related conditions were higher among Imperial County residents than among California residents overall (Table 11). However, mortality rates from cardiovascular disease were lower in Imperial County than statewide (CDPH, 2026).

In California in 2024, cardiovascular disease was the leading cause of death, with an age-adjusted death rate of 191.0 per 100,000 population (CDPH, 2026) (Table 11). In Imperial County, the age-adjusted death rate for cardiovascular disease was 162.5 per 100,000, making it the second leading cause of death after the category of other chronic diseases (198.0 per 100,000) (CDPH, 2026). This category includes conditions such as Alzheimer's disease and other dementias, diabetes, kidney disease, COPD, and other chronic illnesses.

Table 11. Age-Adjusted Emergency Department Visit for Heart Disease, and Death Rates for Cardiovascular Disease in Imperial County and California, 2022-2024

Measure	Location	Year		
		2022 (95% Confidence Interval)	2023 (95% Confidence Interval)	2024 (95% Confidence Interval)
Age-adjusted rate of emergency department visits for heart attack (per 10,000 population age 35 and older) ¹	Imperial County	35.8 (32.0 – 40.1)	35.6 (31.8 – 39.9)	--
	California	22.5 (22.3 – 22.7)	22.4 (22.2 – 22.6)	--
Age-adjusted hospitalization rate for heart attack (per 10,000 population aged 35 and over) ¹	Imperial County	26.1 (22.8 – 29.7)	23.9 (20.8 – 27.4)	--
	California	21.1 (20.9 – 21.3)	20.9 (20.7 – 21.1)	--
Cardiovascular disease death rate (per 100,000) ²	Imperial County	185.4 (166.4 – 206.1)	181.9 (163.5 – 202.0)	162.5 (162.5 – 145.5)
	California	211.6 (210.2 – 212.9)	201.6 (200.3 – 203.0)	191.0 (189.8 – 192.3)

¹ Source: Tracking California Data Explorer (Tracking California, 2026) <https://data.trackingcalifornia.org/>.

² Source: California Communicable Disease Burden (CDPH, 2026) <https://skylab.cdph.ca.gov/communityBurden/>.

6.2.3 Child/Infant Developmental

Pregnancy Related

Air pollution, particularly exposure to PM_{2.5} during pregnancy, has been linked to a wide range of adverse outcomes in offspring, including low birthweight, respiratory disease, impaired neurodevelopment, and increased risk of cardiometabolic disorders (N. M. Johnson et al., 2021). Additionally, carbon monoxide exposure during pregnancy has been linked to adverse developmental effects in offspring (CARB, 2026h).

Between 2021 and 2024, an average of 7.4% of births in California were classified as low birthweight, compared with 6.9% in Imperial County (March of Dimes, 2024). Low birthweight is defined as a birthweight of less than 2,500 grams (5.5 pounds). The two primary causes of low birthweight are intrauterine growth restriction and preterm birth, defined as delivery before 37 weeks of gestation (March of Dimes, 2024).

Low birthweight and preterm birth have been associated with increased risk of long-term health problems, including obesity, high cholesterol, high blood pressure, and diabetes, although health outcomes may differ depending on whether low birthweight results from prematurity or from restricted fetal growth (Amadou et al., 2025; Grillo et al., 2022). Other research shows the possibility of cancer in children being linked to prenatal exposure to chemicals (National Institute of Environmental Health Sciences, 2026).

Receipt of prenatal care is associated with improved neonatal outcomes, including lower neonatal mortality and reduced risks of low birth weight and preterm birth (Albarqi, 2025). In Imperial County between 2016 and 2024, among the 2,047 births with available prenatal care information, 98.8% received prenatal care. However, 8.0% began prenatal care in the seventh month of pregnancy or later while 1.2% received no prenatal care (CDC, 2026d).

Childhood Developmental Concerns

“Developmental disabilities are a group of lifelong conditions due to an impairment in physical, learning, language, or behavior areas.” - (Zablotsky et al., 2019)

The causes of childhood developmental disabilities are not always clearly understood, but they are generally attributed to a combination of factors, including genetic influences, parental health, prenatal behaviors, complications during birth, maternal infections during pregnancy, and exposure to environmental toxins such as lead (CDC, 2026b). However, the consequences of childhood exposure to pollutants in air, soil, and water can include neurodevelopmental disorders such as attention-deficit/hyperactivity disorder, problems with fine motor coordination, reduced cognitive function, and potential links to autism (National Institute of Environmental Health Sciences, 2026). Differences in concerns about child development in Imperial County and California are shown in Table 12.

Table 12. Concerns and Referrals Regarding Child Development in California and Imperial County, 2023-2024 Pooled Data from CHIS

CHIS Child Development Survey Question	Imperial County (95% Confidence Interval)	California (95% Confidence Interval)
Doctor/other professional noted concerns to monitor child	16.7% ¹ (3.7% - 29.7%)	13.6% (12.4% - 14.8%)
Child difficulty emotion/concentration/behavior	24.3% (15.2% - 33.5%)	24.6% (22.8% - 26.5%)
Doctor/other professional referred child to specialist regarding development	19.8% (9.1% - 30.4%)	19.7% (18.4% - 21.1%)
Doctor/other professional referred to specialist for speech, language or hearing tests	31.1% (18.0% - 44.2%)	23.5% (22.0% - 25.0%)
Condition that limits or prevents activities that are usual for child's age	8.7% ¹ (1.5% - 15.9%)	7.6% (6.7% - 8.4%)

¹ Source: California Health Interview Survey from <https://healthpolicy.ucla.edu/our-work/askchis>; 2023-2024 pooled estimates; 95% confidence interval signifies 95% certainty that the percentage lies within the range indicated (UCLA Center for Policy Research, 2026).

The percentage of public-school students receiving special education services can serve as a general indicator of child health; however, it is influenced by multiple factors, including demographic factors, socioeconomic characteristics, school policies and practices, service availability, and parents' or guardians' willingness to seek evaluation and support (DuPaul et al., 2019; Gee, 2020; Gordon, 2018; National Center for Learning Disabilities, 2020; U.S. Government Accountability Office, 2019). In 2020, the percentage of students enrolled in special education in Imperial County was generally similar to the statewide average in California (Population Reference Bureau, 2026) (Table 13).

Table 13. Special Education Services by Primary Disability Type in California and Imperial County, 2020

Primary Disability Among Public School Students Receiving Special Education Services	Imperial County	California
Learning Disability	40.6%	37.2%
Autism	16.2%	15.6%
Speech or Language Impairment	15.6%	20.8%
Other Health Impairment	14.9%	13.7%
Intellectual Disability	9.4%	5.3%
Multiple Disability	1.2%	1.0%
Hard of Hearing / Deaf	0.9%	1.7%
Emotional Disturbance	0.7%	3.2%
Orthopedic Impairment	0.4%	1.1%

Source: (Population Reference Bureau, 2026).

Not included in table: Traumatic Brain Injury (0.1%) and Visual Impairment (0.1%) in Imperial County.

The California Department of Developmental Services provides services to individuals with intellectual and developmental disabilities through a network of 21 regional centers across the state, with children representing the majority of those served (California Department of Developmental Services, 2025). Among individuals diagnosed with autism spectrum disorder who qualified for regional center services in January 2024, Imperial County had the highest rate in California, at 1.21% of the county population, compared with a statewide average of 0.46%. These figures do not include individuals with autism spectrum disorder who do not meet eligibility criteria for regional center services.

Adverse Childhood Experiences

Adverse childhood experiences are potentially traumatic events that occur during childhood and can have lasting negative effects on health and well-being across the life course (CDC, 2026c). Examples include experiencing violence, abuse, or neglect; witnessing domestic violence; growing up in a household affected by substance use or mental health problems; or facing housing instability. Adverse childhood experiences have also been associated with disruptions in early brain development and increased risk of adverse physical and mental health outcomes later in life (CDC, 2026c; Hughes et al., 2017).

In the CHIS survey, adults are asked to report the number of adverse childhood experiences they experienced during childhood (UCLA Center for Policy Research, 2026). Using pooled 2023–2024 data, an estimated 71.7% of adults in Imperial County reported at least one, compared with 67.4% statewide. Statewide, 34.0% of adults reported experiencing one to two adverse childhood experiences, 33.4% reported three or more, and 32.6% reported none. In Imperial County, the distribution was similar but slightly higher: 33.4% reported one to two, 38.3% reported three or more, and 28.3% reported none.

6.2.4 All-Cause Cancer and Mortality

California Department of Public Health data indicate that, between 2021 and 2023, Imperial County experienced an annual average of 1,433 deaths from all causes, and an age-adjusted mortality rate of 672 deaths per 100,000 population (CDPH, 2025a). By comparison, the age-adjusted mortality rate in California was 634 deaths per 100,000 people.

6.2 Existing Socio-Economic Conditions

Using a range of social determinants of health indicators, the University of Wisconsin County Health Rankings program evaluates U.S. counties across two composite domains: Population Health and Wellbeing, and Community Conditions (University of Wisconsin Population Health Institute, 2026b).

6.3.1 Population Health and Well-being

According to the Population Health and Wellbeing composite measure, Imperial County performs approximately at the national average but below the California state average (University of Wisconsin Population Health Institute, 2026b). Specifically, in Imperial County:

- **Years of Potential Life Lost:** An estimated 7,500 years of potential life were lost per 100,000 population due to deaths occurring before age 75 (2021–2023), compared with 6,600 per 100,000 statewide.
- **Poor Physical Health Days:** In 2022, adults in Imperial County reported an average of 5.7 physically unhealthy days in the past 30 days (age-adjusted), compared with 3.9 days in California.
- **Poor Mental Health Days:** In 2022, adults reported an average of 5.9 mentally unhealthy days in the past 30 days (age-adjusted), compared with 4.7 days statewide.
- **Self-Rated Fair or Poor Health:** In 2022, 29% of adults in Imperial County rated their health as fair or poor, compared with 18% of adults in California.
- **Low Birth Weight:** Between 2017 and 2023, 6% of infants born in Imperial County had low birth weight, slightly lower than the statewide rate of 7%.

Data sources utilized by the University of Wisconsin included: the National Center of Health Statistics, the Census Population Estimates program, and the Behavioral Risk Factor Surveillance System.

6.3.2 Community Conditions (Social Determinants of Health)

According to the Community Conditions composite measure, Imperial County performs worse than both the national and California averages (University of Wisconsin Population Health Institute, 2026b). The information used to calculate the composite score is presented in the following table.

Table 14. Community Conditions Information, California and Imperial County

Community Condition	Imperial County	California	Data Notes
Health Care Infrastructure			
Flu Vaccination Rate (Medicare)	35%	44%	Medicare enrollees, 2022
Access to Exercise Opportunities	82%	94%	Live close to a park or recreation facility, 2020-2024
Food Environment Index	6.1	8.7	Index factors from 0 (worst) to 10 (best), 2019-2022
Primary Care Physicians	4,360:1	1,200:1	Ratio of population to primary care physicians, 2022
Mental Health Providers	480:1	210:1	Ratio of population to mental health providers, 2025
Dentists	2,980:1	1,050:1	Ratio of population to dentists, 2023
Preventable Hospital Stays (Medicare)	2,399	2,257	Per 100,000 people enrolled in Medicare, 2022
Mammography Screening (Medicare)	27%	36%	Percentage of female Medicare enrollees age 65-74, 2022
Uninsured (under age 65)	9%	8%	Under age 65 (error margin 7-10% for Imperial County), 2022
Physical Environment			
Severe Housing Problems	25%	26%	Overcrowding, high cost, lack of kitchen, lack of plumbing (23-28% error margin for Imperial County), 2017-2021
Driving Alone to Work	79%	67%	Percent of workforce (error margin 76-81% for Imperial County), 2019-2023
Long Commute – Driving Alone	24%	41%	More than 30 minutes, percent of those who commute in a car alone (error margin 21-26% Imperial County), 2019-2023
Air Pollution: Particulate Matter	11.9	12.6	Annual average micrograms per cubic meter of fine particulate matter (PM _{2.5}), 2020
Drinking Water Violations	Yes	-	At least one health-based drinking water violation, 2023
Broadband Access	88%	93%	Percent of households (error margin 86-90% Imperial County), 2019-2023
Social and Economic Factors			
Some College	56%	68%	Percent of adults age 25-44 (error margin 53-60% Imperial County), 2019-2023
High School Completion	72%	85%	Percent of adults aged 25 or older, high school degree or equivalent (error margin 70-74%), 2019-2023
Unemployment	17.3%	4.8%	Percent of people age 16 and older seeking work but unemployed, 2023
Income Inequality	5.5	5.1	Ratio of household income at the 80 th percentile to 20 th percentile (error margin 5.0-6.0 Imperial County), 2019-2023
Children in Poverty	22%	15%	Percent of people under age 18 in poverty (error margin 16-29% Imperial County), 2019-2023

Source: (University of Wisconsin Population Health Institute, 2026b). Data sources utilized included the National Center for Health Statistics, the Census Population Estimates program, and the Behavioral Risk Factor Surveillance System.

Table 14. Community Conditions Information, California and Imperial County, Continued

Community Condition	Imperial County	California	Data Notes
Injury Deaths	58	67	Deaths due to homicide, suicide, motor vehicle crashes, and poisonings per 100,000 (error margin 53-63 Imperial County), 2019-2023
Social Associations	4.7	6.2	Membership associations per 10,000 population, 2022
Child Care Cost Burden	33%	30%	Percent of income spent on childcare costs: costs for households with two children as a percentage of median household income, 2023-2024

Source: (University of Wisconsin Population Health Institute, 2026b). Data sources utilized included the National Center for Health Statistics, the Census Population Estimates program, and the Behavioral Risk Factor Surveillance System.

6.3.3 Economic Situation

Income and Employment

According to the American Community Survey 2024 Five-Year Estimates, the U.S. Census Bureau categorizes 19.5% of Imperial County residents at or below the federal poverty level, compared to 12.0% for California (*Census Reporter*, n.d.). In 2025, 18.6% of the labor force was unemployed (Employment Development Department, 2026). The most common occupation type in Imperial County in 2024 included education services, health care, and social assistance (Table 15) (U.S. Census Bureau, 2025). Note that estimates from the Census Bureau only include those who reside in the United States.

Table 15. Percent of Civilian Working Population Age 16 Years and Older Employed by Industry Type, Imperial County, 2024 Census Bureau American Community Survey 5-Year Estimates

Industry Type	Percent Estimate	Margin of Error
Education services, health care and social assistance	25.3%	±1.5%
Retail trade	11.2%	±1.2%
Public administration	10.0%	±1.1%
Agriculture, forestry, fishing and hunting, mining	9.8%	±1.2%
Arts, entertainment and recreation; accommodation and food services	9.1%	±1.0%
Transportation and warehousing; utilities	7.6%	±1.2%
Professional, scientific, and management; administrative and waste management services	6.8%	±1.0%
Construction	4.9%	±0.8%
Manufacturing	4.6%	±0.8%
Other services, except public administration	4.5%	±0.8%
Finance and insurance; real estate rental and leasing	3.1%	±0.6%
Wholesale trade	2.6%	±0.5%
Information	0.6%	±0.2%

Source: American Community Survey 2024 5-Year Estimates table DPO3 from <https://data.census.gov/>.

Food and Benefits

Based on the 2024 American Community Survey five-year estimates, households in Imperial County were more likely than households statewide to report receiving public income supports associated with lower incomes, including Supplemental Nutrition Assistance Program benefits, Supplemental Security Income, and cash public assistance (Table 16) (U.S. Census Bureau, 2025).

Table 16. Income Sources per Household, Imperial County and California, 2024 Census Bureau American Community Survey 5-Year Estimates

Household Income Sources	Imperial County		California	
	Percent Estimate	Margin of Error	Percent Estimate	Margin of Error
Earnings	76.8%	±1.5%	80.6%	±0.1%
Social Security	34.7%	±1.4%	28.4%	±0.1%
Supplemental Nutrition Assistance Program benefits in the past 12 months	28.7%	±2.2%	12.4%	±0.1%
Retirement income	16.0%	±1.3%	21.7%	±0.1%
Supplemental Security Income	9.7%	±1.1%	5.9%	±0.1%
Cash public assistance	7.2%	±1.2%	4.0%	±0.1%

Source: American Community Survey 2024 5-Year Estimates table DPO3 from <https://data.census.gov/>.

Transportation

While 93.9% of households in Imperial County report access to a vehicle, 6.1% do not (U.S. Census Bureau, 2025), and access varies considerably across cities and communities (Imperial County Community Health Improvement Partnership, 2024). Public transportation is provided by Imperial Valley Transit, which operates 12 fixed bus routes with a fleet of more than 20 vehicles and approximately 55,000 passenger trips per month (Imperial Valley Transit, 2026). Deviation services are available with advance scheduling for individuals with disabilities or limited mobility in Seeley, Ocotillo, and communities along the east side of the Salton Sea, and once-weekly remote-zone routes serve more isolated areas of the county (Imperial Valley Transit, 2026).

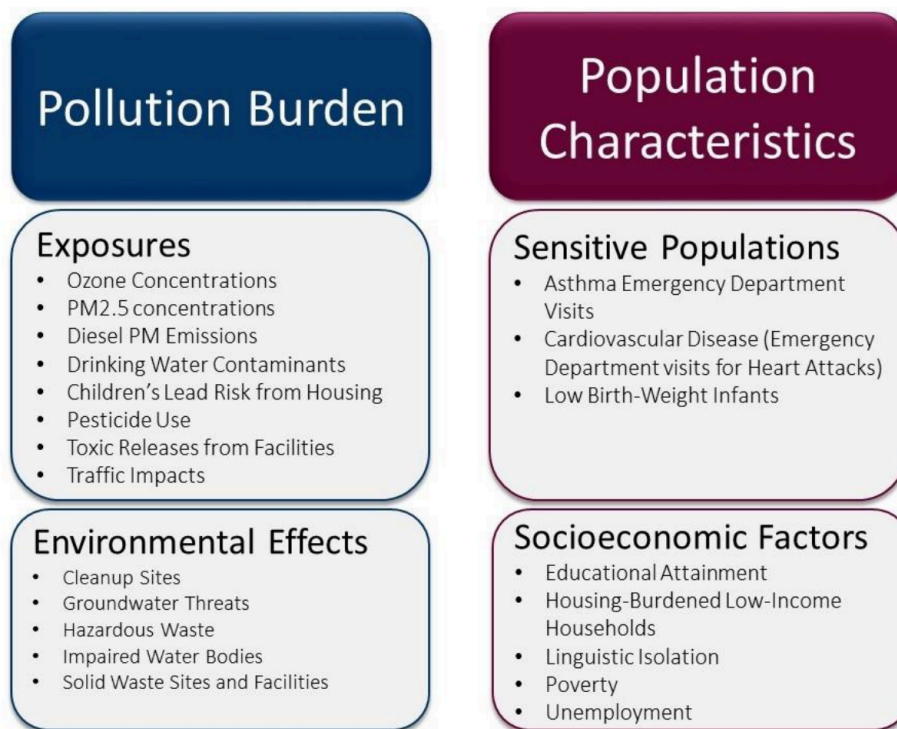
6.3.4 Socio-Economic Conditions and Pollution Burden

Assessing Cumulative Impacts of Pollution

According to CalEPA, pollution burden and community vulnerability are influenced by multiple factors that can interact in complex ways (CalEPA, 2026e). Traditional regulatory risk assessments typically evaluate the health effects of a single pollutant, source, or exposure pathway at a time, which may not capture the full range of risks communities experience. In practice, individuals are exposed to multiple contaminants from different sources and face social and health-related challenges that can increase their susceptibility to harm. These combined environmental and socioeconomic pressures are known as cumulative impacts. Additional

approaches, such as cumulative impact assessments, are often needed to better understand overall risk.

CalEPA uses the California Communities Environmental Health Screening Tool (CalEnviroScreen) to assess the cumulative impacts of pollution on California communities (CalEPA, 2026e). CalEnviroScreen 4.0, released in 2021, utilizes 21 indicators to characterize exposure, environmental effects, sensitive populations, and socioeconomic factors (August et al., 2021) (see Figure 7).



Source: (August et al., 2021), page 21

Figure 7. Pollution Burden and Population Characteristic Indicators Utilized in CalEnviroScreen 4.0

Cumulative Impacts of Pollution in Imperial County

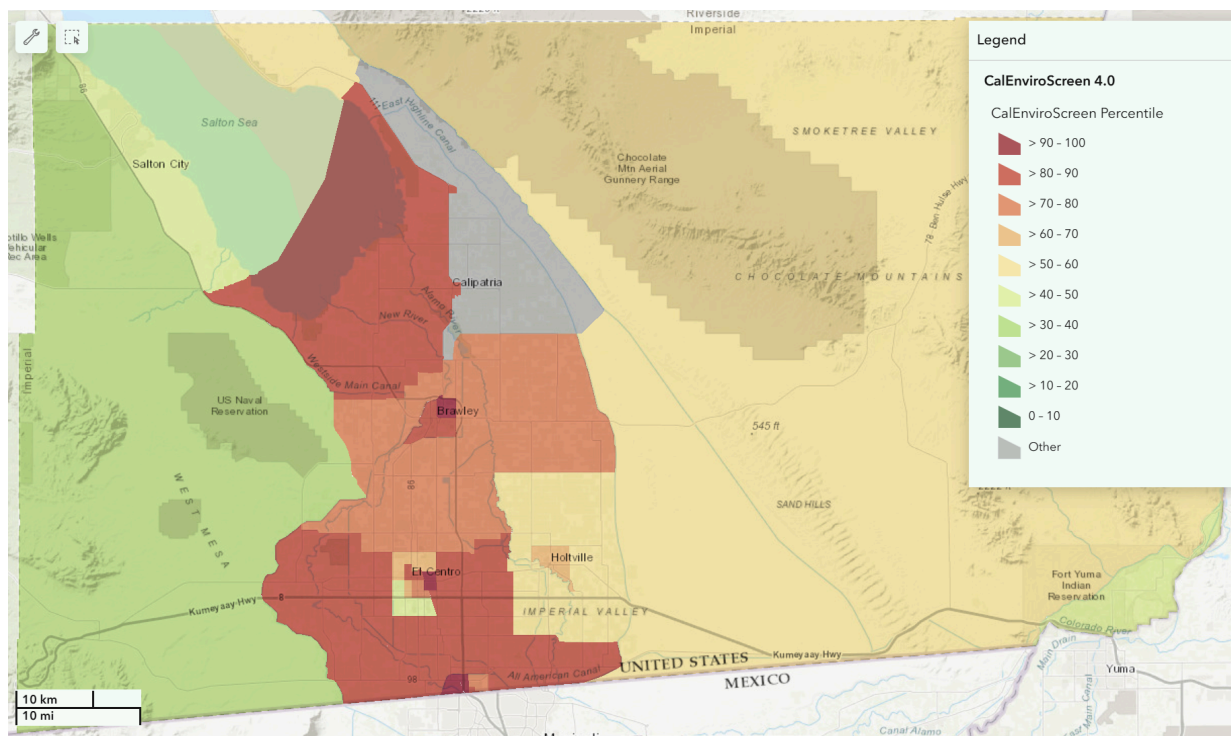
California Climate Investments

For purposes of distributing funds to reduce harmful emissions and protect public health, California identifies much of Imperial County as low-income, disadvantaged, or both (CARB, n.d.-a). Low-income communities are defined as census tracts with median household incomes at or below 80% of the statewide median, or as those designated as low-income by the California Department of Housing and Community Development. Disadvantaged communities are identified using the CalEnviroScreen tool to evaluate cumulative environmental burdens and socioeconomic vulnerability.

CalEnviroScreen 4.0

CalEnviroScreen 4.0 evaluates community conditions using data collected between 2009 and 2021, with most indicators based on data from 2015 or later, and assigns each census tract a percentile ranking from 0 to 100 relative to other tracts statewide (August et al., 2021). A score in the 90th percentile indicates that the tract has a higher combined pollution burden and population vulnerability than 90% of California's census tracts. Overall, census tracts in Imperial County ranked in the 73.2nd percentile, with averages of 56.6 for pollution burden and 77.8 for population characteristics, indicating elevated vulnerability related to population characteristics (health and socioeconomic factors) compared with much of the state (CalEPA, n.d.).

There is substantial variation within Imperial County. Census tracts located along the central corridor, from the southern Salton Sea to the U.S.–Mexico border, have higher pollution burden and vulnerability scores than other parts of the county (CalEPA, n.d.) (see Figure 8). Many of these tracts are designated as disadvantaged communities under CalEnviroScreen, with an overall average score in the 83.9th percentile, including 67.7 for pollution burden and 86.6 for population characteristics.



Source: CalEnviroScreen 4.0 Dashboard (CalEPA, n.d.)

Figure 8. Imperial County CalEnviroScreen 4.0 Data Dashboard

The census tract nearest to the southeastern part of the Salton Sea¹³ and the area proposed for development under the Specific Plan (population 4,108; includes Niland and Calipatria) has an overall score in the 81.7th percentile, including a pollution burden percentile of 63.1 and a population characteristics percentile of 86.3 (CalEPA, n.d.). Indicator-level rankings for this tract include high percentiles for impaired water bodies (100.0), hazardous waste (93.3), pesticides

¹³ Census tract: 6025010102 – includes Calipatria, Niland and unincorporated areas.

(90.5), unemployment (99.0), poverty (94.9), linguistic isolation (88.8), and asthma (87.6), reflecting elevated environmental and socioeconomic vulnerability relative to most census tracts in California. The census tract adjacent to the southeastern part of the Salton Sea, which includes the community of Westmorland, had similar but slightly higher (worse) ratings: 88.8th percentile overall and 97.5th percentile for population characteristics.

CalEnviroScreen 5.0

Although CalEnviroScreen 5.0 results remain preliminary, comparison with CalEnviroScreen 4.0 indicates that several census tracts now fall within higher percentile ranges, reflecting increased relative burden under the updated dataset (CalEPA, 2026c). CalEnviroScreen 5.0 added two new indicators to the model (diabetes and small air toxic sites), which may have also shifted the relative burden levels. Despite these shifts, the overall pattern remains similar for the census tract nearest to the southern portion of the Salton Sea and the Specific Plan development area.¹⁴ This tract (population 5,175) ranks in the 83.9th percentile overall, including the 62.9th percentile for pollution burden and the 91.2nd percentile for population characteristics, indicating elevated cumulative environmental and socioeconomic vulnerability compared with most other California census tracts.

Community Emissions Reduction Programs

Imperial County includes two Assembly Bill 617 community areas with high pollution burdens (based on CalEnviroScreen 4.0 results) that are participating in the Community Emissions Reduction Program: (1) Westmorland, Brawley, and Calipatria-North End Phase 1 Community and (2) Calexico, El Centro, and Herber (CARB, n.d.-b). This bill mandates community-level air monitoring, emission-reduction plans, retrofitting pollution-control technologies at industrial facilities, enhanced emission-reporting requirements, and increased penalties for polluters.

6.3 Most Impacted Populations

As described previously, sensitive populations include the following:

- Infants, children, and adolescents
- Pregnant individuals and fetuses
- Older adults
- Individuals with chronic cardiovascular or respiratory disease
- Persons with occupational exposures or who work outdoors
- Economically vulnerable populations

Sensitive receptor locations include places where individuals with increased vulnerability are likely to live, learn, receive care, or spend extended periods of time, such as schools, daycare centers, nursing homes, hospitals, and residences (i.e., homes). In addition, individuals with elevated social or economic vulnerability, particularly those living closest to the Specific Plan area or near transportation routes associated with development proposed under the Specific Plan, may experience disproportionate exposure to potential environmental stressors and therefore may be at greater risk of adverse health effects.

¹⁴ Census tract: 6025010102 – includes Calipatria, Niland and unincorporated areas.

7. HIA Step 3: Assessment Results

During the HIA assessment phase, the project team researched each topic drawing from published and unpublished studies, online data systems and reports, expert consultants, the Draft PEIR (Dudek, 2025b), and the *Lithium Valley Specific Plan Final Baseline Report* (Rick Engineering Company, 2024) to determine the potential health impacts of all of the future development proposed in the Specific Plan framework.

Feedback from community member intercept surveys provided additional information on community knowledge and their expected positive and negative impacts of DLE. Findings are summarized in this section and reported to one decimal place, where available.

7.1 Potential Health Impacts of the Proposed Development

The Specific Plan framework would allow for an approximate maximum buildout of 51,774,849 square feet (1,190 acres) of development across the 51,622-acre planning area (Dudek, 2025b). Planned land uses include industrial and manufacturing development, logistics and transportation infrastructure, renewable energy production, conservation and restoration areas, and Community Opportunity Areas that incorporate residential housing and associated community resources. **The following information pertains to this buildout scenario, including supplemental details related to the expansion of geothermal activities and DLE.**

7.1.1 Air- and Dust-Related Health Effects

Background (Air and Dust)

General Air Quality

Air quality in Imperial County is influenced by a combination of geographic-, climatic-, and human-driven factors (ICAPCD, 2009, 2017), as well as both local emissions and pollutants transported from outside the region. Prevailing wind patterns carry pollutants and their precursor compounds from areas west of the County through the San Geronio Pass and Coachella Valley (Griffiths et al., 2009), contributing to ambient concentrations of ozone and fine particulate matter (PM_{2.5}) (Durkee et al., 2013). While primary pollutants generally reach their highest concentrations near their emission sources, secondary pollutants such as ozone and much of PM_{2.5} form in the atmosphere through chemical reactions and may not reach peak concentrations until they have traveled many miles downwind of their precursor emission sources (Durkee et al., 2013).

Local air quality is influenced by vehicular traffic, diesel equipment, agricultural activities (including field burning), and industrial operations such as geothermal power generation, food processing, plaster manufacturing, and other light industrial uses (Imperial County, 2016). Emissions of nitrogen oxides from agricultural soils may also contribute to regional air quality conditions (Lieb et al., 2024). In Imperial County, windblown desert dust is the primary contributor to particulate matter in the air, with additional emissions from unpaved roads, agricultural operations, and construction activities (ICAPCD, 2018b; IID, 2026f).

Recent research further suggests that nitrogen oxide emissions from agricultural soils in Imperial County, an important precursor to ozone and particulate matter, may be a significant contributor to poor air quality and warrant further investigation (Lieb et al., 2024). Horwath et al. completed an assessment of the available data for nitrogenous emissions from the soil for CARB in 2025 (Horwath et al., 2025). They reported high uncertainty among estimates, modeling efforts, and measurements, and recommend the need for continuous or more frequent nitrogen oxides flux measurements of the cropland to improve understanding of agricultural contributions to regional air pollution (Horwath et al., 2025).

Cross-Border. The County's emissions are also impacted by cross-border transportation and commercial traffic along the U.S.-Mexico border, as well as broader regional influences from urban and industrial activity in the neighboring Mexicali metropolitan area (ICAPCD, 2009, 2017). In 2024, Eastern Research Group, Inc. began working with CARB to characterize these emissions and provide CARB with tools to make decisions regarding pollution reduction (Eastern Research Group, Inc., 2024).

Salton Sea. Ongoing reductions in the Salton Sea's surface elevation have raised concerns about increased PM emissions from newly exposed sediments that contain accumulated agricultural runoff constituents (Imperial County, 2016). The Salton Sea Management Program was developed to minimize environmental and human health impacts resulting from reduced water levels at the Salton Sea. The first 10 years of the program (2019-2029) focus on constructing wildlife habitats and reducing dust (ICAPCD, 2018b). The Salton Sea Management Program provides annual progress update reports. As of 2025, 1,300 acres along the sea (five miles of shoreline) now have native vegetation to suppress dust (California Natural Resources Agency, 2025). Additionally, the Salton Sea is currently the largest source of hydrogen sulfide emissions in the region (Dobson, Araya, Brounce, et al., 2023).

Baseline Information (Air and Dust)

For baseline health conditions related to air quality (including soil that becomes airborne), please see Section 6.

Criteria Air Pollutants: Attainment

Under the California Ambient Air Quality Standards, criteria air pollutants are categorized as attainment (meeting the standard), nonattainment (not meeting the standard), or unclassified (insufficient data) (Bay Area Air Quality Management District, 2026). Baseline air quality conditions in Imperial County are summarized in this section by attainment status.

Attainment. In 2023, the Salton Sea Air Basin, which encompasses most of Imperial County, was designated as in attainment of state quality standards for nitrogen dioxide, carbon monoxide, sulfur dioxide, PM_{2.5}, lead, and sulfates (CARB, 2026r).

Non-Attainment. In 2023, the Salton Sea Air Basin was designated as nonattainment for state ozone and PM₁₀ standards, consistent with other air basins across Southern California (CARB, 2026r; U.S. EPA, 2026a).

In 2024, data from five air quality monitoring stations in Imperial County indicated (CARB, n.d.-c):

- Maximum 24-hour PM₁₀ concentrations exceeded state standards on 165 days at the Calexico station, 86 days at the Brawley station, 83 days at the Niland station, 76 days at the El Centro station, and 72 days at the Westmorland station.
- Maximum 8-hour ozone concentrations exceeded state standards on 32 days at the Calexico station, 12 days at the El Centro station, 6 days at the Niland station, and 2 days at the Westmorland station.

Unclassified. In Imperial County, routine hydrogen sulfide monitoring data are limited and were listed as unclassified in 2023; the closest long-term regulatory monitor is the Mecca station in neighboring Riverside County.

- In 2024, hydrogen sulfide concentrations at the Mecca station exceeded the California ambient air quality standard on 11 days (CARB, n.d.-c).

Recent research indicates that existing monitoring networks may underestimate the frequency of hydrogen sulfide exceedances in the Salton Sea region (Centeno et al., 2025), and are insufficient to monitor the entire lake emissions or emissions during various wind directions (Márquez et al., 2025). The largest source of hydrogen sulfide emissions in the region is the Salton Sea (Dobson, Araya, Brounce, et al., 2023). In 2008, researchers estimated that approximately 3,400 metric tons of hydrogen sulfide were emitted from the Salton Sea annually (Reese et al., 2008).

Air Quality Improvements. Although some criteria air pollutants remain in nonattainment, air quality in the Salton Sea Air Basin has improved over time, primarily due to regulatory controls on vehicle emissions, as well as controls on industrial sources and other emission-reduction strategies implemented by the ICAPCD (ICAPCD, 2017, 2018b, 2018c).

Criteria Air Pollutants: Additional Information

Sources of criteria air pollutants in Imperial County and the chemical composition of PM are summarized below.

Sources of Particulate Matter. In Imperial County, windblown desert dust is the predominant contributor to ambient PM, with additional emissions generated from unpaved roads, agricultural operations, and construction activities (ICAPCD, 2018b; IID, 2026f).

The California Emissions Inventory Data Analysis and Reporting System, maintained by CARB, is a centralized compilation of emissions data for criteria pollutants and toxic air contaminants (CARB, 2026i). These data inform planning and modeling in the California Emissions Projection Analysis Model using a 2017 baseline year. This database provides estimates of emissions (CARB, 2026d), often based on calculations, and should not be taken as a full inventory or measurements. As seen in Table 17, the majority of estimated PM₁₀ and PM_{2.5} emissions are attributed to fugitive windblown dust and unpaved road dust.

Table 17. 2017 Average Annual PM₁₀ and PM_{2.5} Emissions Estimates for Imperial County, California Emission Projection Analysis Model 2019 version 1.04

PM Emission Sources	Category	PM ₁₀	PM _{2.5}
Fugitive windblown dust	Areawide	74.6%	74.5%
Unpaved road dust	Areawide	18.2%	13.5%
Farming operations	Areawide	2.9%	3.1%
Industrial processes	Stationary	1.5%	1.8%
Construction and demolition	Areawide	1.1%	0.8%
Paved road dust	Areawide	0.9%	1.0%
Mobile sources (on-road motor vehicles and other mobile sources)	Mobile	0.6%	3.5%
Other: Fuel combustion, cooking, managed burning, and disposal	Stationary and Areawide	0.3%	1.9%

Source: (CARB, 2026m) <https://ww2.arb.ca.gov/applications/emissions-county>

Chemical Composition of Particulate Matter. In 2018, there were three PM_{2.5} monitoring stations in Imperial County, located one each in Brawley, El Centro, and Calexico (ICAPCD, 2018a). The Calexico air monitoring site was the only site capable of collecting samples for chemical speciation¹⁵ in Imperial County (ICAPCD, 2018a). The 2015-2016 average PM_{2.5} composition was organic matter (37%), geological (21%), ammonium sulfate (14%), ammonium nitrate (14%), elements (8%), and elemental carbon (6%). Likely sources of organic matter and elemental carbon include burning, cooking, and motor vehicle exhaust (ICAPCD, 2018a). Specific compounds within the PM_{2.5} composition, such as certain organic chemicals, select metals, and diesel particulate matter, are considered toxic air contaminants by CARB.

Sources of Other Criteria Air Pollutants (Plus Ammonia and Organic Gases). The California Emissions Projection Analysis Model estimates future emissions based on multiple criteria. The projections use baseline data from the California Emissions Inventory Data Analysis and Reporting System (CARB, 2026h), on-road emissions from CARB's Emission Factor model (CARB, 2026u), and off-road mobile emissions estimates from CARB's OFFROAD (off-road) model (CARB, 2026t) as well as demographic and economic forecasts, and emissions regulations, to generate emissions scenarios (CARB, 2026j).

Estimates for select criteria pollutants and one toxic air contaminant in Imperial County are presented in Table 18. Bolded values indicate the two largest-contributing source categories for each pollutant.

¹⁵ "The process of disaggregating inventory pollutants into individual chemical species or species groups." (U.S. EPA, 2026g)

Table 18. 2017 Average Annual Emissions Estimates for Select Criteria Air and Other Pollutants, Imperial County, California Emission Projection Analysis Model 2019 version 1.04

Emission Sources	Category	Pollutant Type					
		Total Organic Gases ¹	Reactive Organic Gases ²	Carbon Monoxide (Criteria)	Nitrogen Oxides (Criteria)	Sulfur Oxides (Criteria)	Ammonia (PM _{2.5} Precursor)
Biogenic sources ³	Natural	52.4%	70.3%	0.0%	4.9%	0.0%	36.9%
Farming operations	Areawide	33.9%	5.3%	0.0%	0.0%	0.0%	27.0%
Mobile sources (on-road vehicles and other mobile sources)	Mobile	6.9%	12.9%	89.1%	85.3%	89.7%	0.7%
Solvent evaporation (consumer products; architectural coating; pesticides/fertilizers; asphalt/roofing)	Areawide	4.3%	7.8%	0.0%	0.0%	0.0%	30.2%
Fuel combustion; waste disposal; cleaning and surface coatings; petroleum production; and marketing	Stationary	1.8%	2.9%	1.1%	8.1%	3.4%	2.9%
Residential fuel combustion; fires; managed burning and disposal; cooking; other miscellaneous	Areawide	0.5%	0.8%	9.6%	1.3%	6.9%	0.8%
Industrial processes	Stationary	0.0%	0.0%	0.2%	0.3%	0.0%	0.1%
Geogenic sources ⁴	Natural	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%
Wildfires	Natural	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
Total⁵		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: (CARB, 2026m) <https://ww2.arb.ca.gov/applications/emissions-county>

¹ Total organic gases as reported by CARB represent the total mass of gaseous organic compounds, including both reactive organic gases and non-reactive species such as methane.

² Reactive organic gases represent the subset of volatile organic compounds that participate in photochemical reactions leading to ozone formation.

³ Biogenic emissions are estimated and primarily include emissions generated from vegetation and soils.

⁴ Geogenic emissions are estimated and include emissions generated from non-biological natural processes, such as windblown dust and geothermal activity.

⁵ Due to rounding, may not sum to 100.0% exactly.

Ambient Monitoring(HIA Gathered Data) Data

Findings from one-week ambient air monitoring of PM and total volatile organic compounds conducted in 2024 by SDSU at 50 residences in northern Imperial County (Brawley, n=17; Calipatria, n=14; Niland, n=7; Westmorland, n=7; Salton City, n=5) were consistent with the patterns previously described for PM in Imperial County (see Methodology for more information).

Based on 24-hour averages, PM_{2.5} concentrations exceeded California standards at two homes (4.0%), and PM₁₀ concentrations exceeded standards at two homes (4.0%) (standard is 50 µg/m³). At the 1-hour resolution, exceedances were more frequent, with PM_{2.5} levels exceeding state standards at 10 homes (10.0%) and PM₁₀ levels exceeding standards at 15 homes (30.0%). The average total volatile organic compound concentration measured outside the 50 homes was 107.3 parts per billion, with a maximum of 362.2 parts per billion. However, because total volatile organic compounds represent a mixture of compounds and are not regulated, no applicable standards exist for comparison.

No association was observed between PM or total volatile organic compound concentrations and distance to the nearest geothermal facility. However, because sampling occurred at different locations over different weeks, observed differences may also reflect variations in weather or wind conditions.

Playa Dust

Soils from the exposed Salton Sea lakebed (playa) have been found to contain elevated levels of salts, pesticides, selenium, and trace metals, which may increase the potential toxicity of airborne particulate matter and associated health risks (Dudek, 2025b; Frie et al., 2017). However, Frie et al. (2017) reported that average concentrations of six trace elements in playa-derived PM₁₀ did not exceed CalEPA reference exposure levels,¹⁶ and that mass concentrations of major elements were within the ranges observed in other rural areas of the American Southwest.

One study examined the extent to which the Salton Sea's recession between 1998 and 2014 was associated with increases in PM_{2.5} dust and corresponding rises in respiratory mortality (Jones & Fleck, 2020). Although these findings are correlational, they do not establish causation. The authors accounted for other potential sources of PM_{2.5} in their analysis to better isolate the contribution of dust emissions linked to the Sea's decline. While the exposed Salton Sea playa accounts for approximately one percent of total regional dust emissions (IID, 2026f), differences in composition of the PM are also important (M. Cohen & Halama, 2025). These authors suggest complementary public health strategies, such as improving dust-storm warnings, installing indoor air filtration systems, and weatherizing homes to reduce potential exposure.

As the Salton Sea continues to recede, ongoing monitoring of both the quantity and chemical composition of playa-derived dust will be critical for assessing potential environmental and public health exposures. Air quality in the region may also be influenced by biological emissions, including hydrogen sulfide (Centeno et al., 2025) and harmful algal blooms (Miao et al., 2025).

Toxic Air Contaminants (Air and Dust)

Emission estimates for gases, PM, and reported stationary-source data are categorized as from stationary, area-wide, mobile, or natural sources (CARB, 2026f). Stationary sources include point and aggregated facility emissions reported by operators or air districts, whereas area-wide sources are diffuse and not tied to a single location (e.g., unpaved roads) (CARB, 2026f). Facilities emitting toxic air contaminants are required to report emissions to local air districts to support evaluation and, where necessary, risk-reduction measures (Dobson, Araya, Brounce, et al., 2023). Methodologies are established for reporting; methods may be calculations following specific estimation procedures and often do not require measurement or monitoring.

Monitoring. California's right-to-know law, known as the Air Toxic "Hot Spots" Information and Assessment Act of 1987 (AB 2588) requires local air districts to report the "location, type, and quantity of toxic compounds that are emitted" from specific businesses/industries (ICAPCD, 2025). Facilities are prioritized based on the amount of their emissions, the toxicity of their emissions, and "the distance of the emission point to the nearest" receptor (places where people live, work, or spend time) (ICAPCD, 2025).

¹⁶ Reference Exposure Levels are "airborne concentrations of a chemical that are not anticipated to result in adverse noncancer health effects for specified exposure durations in the general population, including sensitive subpopulations" (California Office of Environmental Health and Hazard Assessment, 2025).

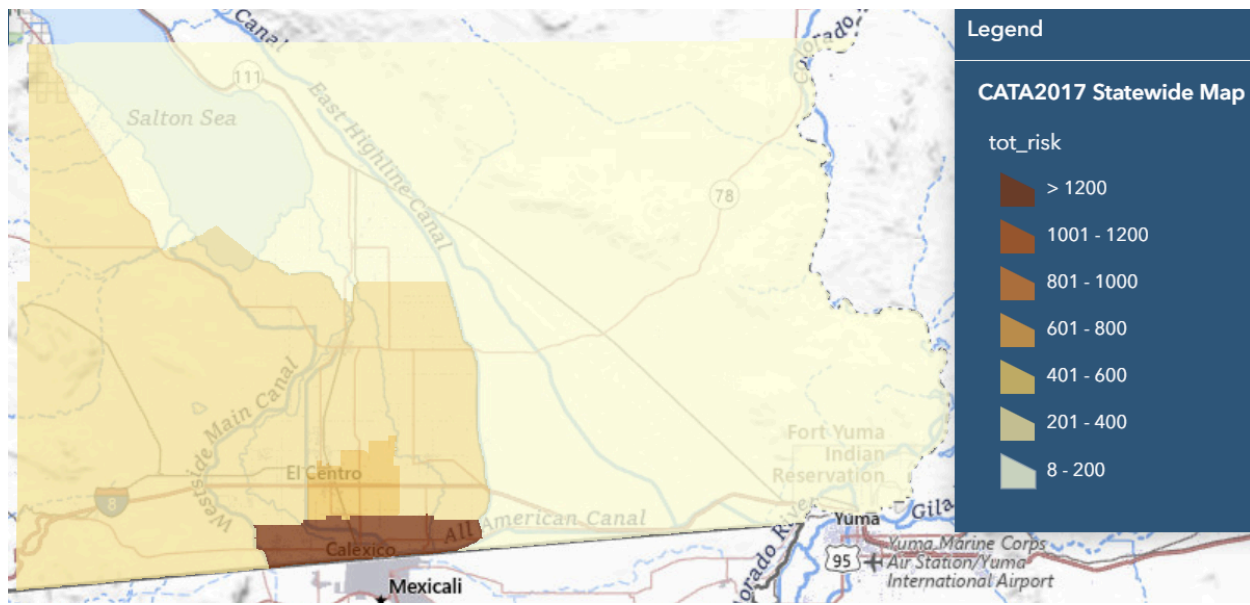
In 2024, the ICAPCD oversaw 833 active facilities within its jurisdiction, including 207 facilities classified as not requiring emissions reporting (ICAPCD, 2025). Among those required to report toxic emissions, none met the threshold for high priority, which would trigger additional reporting, fees, and a health risk assessment. However, 192 met the criteria for intermediate priority (ICAPCD, 2025). The 10 highest-priority facilities were associated with combustion processes, incineration, or construction-related materials (e.g., concrete and asphalt production).

California Toxins Inventory. Stationary-source emissions data, along with estimates of emissions from other sources of gases and PM, are incorporated into the California Toxins Inventory to characterize toxic air contaminants from area, mobile, and natural sources statewide (CARB, 2026f). Draft 2010 California Toxins Inventory data for Imperial County indicate that the predominant toxic air contaminants were aluminum (99.97% from area-wide sources), methanol (99.69% from natural sources), and ammonia (100.00% from stationary point sources) (CARB, 2026f).

Windblown playa dust and hydrogen sulfide emissions from the Salton Sea are likely represented in the California Toxins Inventory to the extent that they fall within defined natural and area-wide source categories (CARB, 2026f). However, the California Toxins Inventory may not fully capture episodic or emerging sources, such as emissions associated with harmful algal blooms, as it relies on established source classifications and available emissions (CARB, 2026f). Additionally, for sources without detailed chemical speciation, emissions are estimated using generalized emission factors, which may increase uncertainty in the resulting estimates (CARB, 2026f).

California Air Toxics Assessment. CARB conducts an ongoing, comprehensive evaluation of air toxics in California every 3 years (CARB, 2025). The assessment uses CARB emissions data, meteorological data, and air quality models to examine 12 air toxics (diesel PM, five heavy metals, and six volatile organic compounds) and assess potential cumulative cancer risk. Cancer risk is reported as the likelihood of developing cancer due to continuous exposure to toxic air contaminants over 70 years, with an inhaled exposure duration of 30 years. As this is an air quality modeling assessment, there are uncertainties in the estimates (CARB, 2025).

This assessment estimates that, in Imperial County, the total population-weighted cancer risk from the measured air toxics was 671.2 per million (CARB, 2023). Cancer risk was related to diesel PM (89.1%), volatile organic compounds (9.3%), and heavy metals (1.6%). Within the diesel PM category, the risk was related to emission sources including Mexico off-road mobile sources (45.9%), Mexico on-road mobile sources (27.9%), major on-road mobile (12.8%), agricultural activities (3.8%), Mexico area sources (3.2%), aggregated area sources (2.2%), minor on-road mobile (2.0%), locomotives (1.2%), and other (1.2%). The risk differed quite a bit by census tract, with the Calexico census tract being the highest (1200.4 cancer risk per million), followed by El Centro tracts (in the 500's) and the northern census tracts closest to the Specific Plan development area of 165.8 or less per million (Figure 9). For the entire state of California, the population-weighted total cancer risk was 598.2 per million, with diesel PM as the largest risk category (82.3%) (CARB, 2023).



Source: <https://californiaarb.maps.arcgis.com/apps/dashboards/95098bd874ec445484365120912ba6a5>

Figure 9. Total Population-Weighted Estimated Cancer Risk in 2017 (per million), Imperial County (California Air Toxics Assessment)

Greenhouse Gases

Greenhouse gases are gases that trap heat in the atmosphere, including carbon dioxide, methane, nitrous oxide, and fluorinated gases (U.S. EPA, 2025n). In the U.S., greenhouse gases are emitted by the following economic sectors, including electricity end-use indirect emissions: commercial and residential (31%), industry (30%), transportation (29%), and agriculture (10%) (U.S. EPA, 2026f).

In 2022, wastewater treatment accounted for 3.0% of methane emissions and 5.6% of nitrous oxide emissions in the United States, with emissions increasing since 1990 (U.S. EPA, 2024a). The cities of Niland and Calipatria operate water treatment facilities that include aeration ponds (California Regional Water Quality Control Board, 2025; Rural Community Assistance Corporation, 2017), which have higher nitrous emissions but less methane emissions on a per-volume basis than other treatment methods (El Abbadi et al., 2025).

Geothermal Power Generation

Geothermal Emissions. The geothermal power plants in the Salton Sea KGRA are flash-steam facilities that generate electricity by utilizing high-temperature geothermal brine that rapidly vaporizes when brought to the surface (Dobson, Araya, & Brounce, 2023). The resulting steam is used to drive turbines before it is condensed back into liquid form and reinjected into the geothermal reservoir to maintain pressure and support continued resource use. When the steam is condensed in a cooling tower, non-condensable gases present, including carbon dioxide and hydrogen sulfide, are emitted (Dobson, Araya, & Brounce, 2023). Local regulations require abatement measures to manage hydrogen sulfide emissions; methods usually convert 90 – 95% of the hydrogen sulfide into sulfate, which can then be dissolved in the brine and reinjected. Consequently, the vapor from the geothermal power plants at the Salton Sea KGRA is over 99% water, with 0.2% carbon dioxide and trace amounts of hydrogen sulfide and ammonia (Dobson, Araya, & Brounce, 2023). Reinjection of produced fluids allows the system

to minimize routine air emissions, and scrubbers help remove hydrogen sulfide (Union of Concerned Scientists, 2013; U.S. Energy Information Administration, n.d.-b).

Geothermal Emissions Compared to Air Basin. Emissions from geothermal production are relatively low compared to other regional sources (Dobson, Araya, Brounce, et al., 2023). Specifically, PM emissions are far lower than those from agriculture, road dust, and fires, while hydrogen sulfide emissions are much lower than natural emissions from the Salton Sea (Dobson, Araya, Brounce, et al., 2023). Ammonia emissions are minimal relative to area-wide sources, and benzene emissions are small overall, though limited regional comparisons are available (Dobson, Araya, Brounce, et al., 2023).

- Carbon Dioxide and Nitric Oxide. Current estimates of the geothermal electricity production in the Salton Sea KGRA include very low emissions of carbon dioxide when compared to other power generation methods, and negligible emissions of nitric oxide (Dobson, Araya, Brounce, et al., 2023).
- PM₁₀. Pollution sources can be categorized as areawide (diffused emissions from farming,¹⁷ construction, road dust, fugitive wind-blown dust, fires, cooking, biogenic (living or biological sources), geogenic (weathering or leaching), stationary (fuel combustion, industrial processes, waste disposal, cleaning and surface coatings, petroleum production), and mobile (motor vehicles, aircraft, trains, recreational boats, farm equipment) (CARB, 2026l). The upper bound estimate of PM₁₀ formation for the total current geothermal capacity in the Salton Sea geothermal field, assuming that all emitted hydrogen sulfide and ammonia are fully converted to PM within the air basin, is less than 1,600 metric tons per (Dobson, Araya, Brounce, et al., 2023). In comparison, areawide PM¹⁸ emissions in the region are approximately 90,000 metric tons per year, stationary sources (including geothermal plants) emit approximately 1,400 metric tons per year, and (Dobson, Araya, Brounce, et al., 2023). Geothermal plants thus account for less than 2% of the PM₁₀ emissions in the Salton Sea geothermal field area (Dobson, Araya, Brounce, et al., 2023).
- Hydrogen Sulfide and Ammonia. Hydrogen sulfide is a naturally occurring gas with a characteristic rotten-egg odor. The noxious odor can cause respiratory effects at higher concentrations (Rick Engineering Company, 2024). Estimated emissions from geothermal power plants in the Salton Sea geothermal field indicate that releases of hydrogen sulfide and ammonia are substantially lower than emissions from area-wide sources (Dobson, Araya, Brounce, et al., 2023). Only 72% of geothermal facilities report hydrogen sulfide emissions; thus, average emissions rates for regional geothermal were used to project that facilities emit approximately 250 metric tons per year of hydrogen sulfide, compared to nearly 3,500 metric tons per year attributed to the Salton Sea (Dobson, Araya, Brounce, et al., 2023). Ammonia emissions are estimated at less than 15 metric tons per year, compared to approximately 10,000 metric tons per year from area-wide sources (Dobson, Araya, Brounce, et al., 2023).

¹⁷ Nutrient runoff from fertilizer and manure, sediment erosion, pesticides/herbicides, livestock waste, ammonia from manure, agricultural burning, etc. that enters water and air over a wide area (U.S. EPA, 2025e).

¹⁸ Includes farming, construction road dust and fugitive wind-blown dust.

Comparison to Other Sources of Power Generation. Geothermal power plants in the Salton Sea geothermal field generate substantially lower carbon dioxide emissions (grams per kilowatt hour) than fossil fuel-based plants (natural gas, oil, and coal) (Dobson, Araya, Brounce, et al., 2023). Authors also found that: (1) emissions of hydrogen sulfide (reported as sulfur dioxide equivalents) were also lower than those associated with coal and oil plants; (2) benzene emissions were higher than those from natural gas-fired plants but lower than those from biomass facilities; (3) emissions of particulate matter (PM₁₀ and PM_{2.5}) were lower than those from biomass plants and generally comparable to natural gas plants; and (4) ammonia emissions were not well characterized, as emissions were not available.

Indoor Dust Information (HIA Gathered Data)

Indoor surface dust samples collected by vacuum in 2024 from 50 homes in northern Imperial County (17 in Brawley, 14 in Calipatria, 7 in Niland, 7 in Westmorland, and 5 in Salton City) found detectable levels of lead, arsenic, and cadmium in 94.0%, 92.0%, and 34.0% of the homes, respectively. The study found no association with distance to the nearest geothermal facility. As a result, the indoor dust likely reflects a combination of broader regional environmental conditions and household-specific factors.

Across the 50 homes studied, median dust concentrations were 16.21 micrograms per gram (µg/g) for lead, 3.92 µg/g for arsenic, and 0.84 µg/g for cadmium. For comparison, a 2018–2019 study of 346 U.S. homes reported a higher median vacuum dust lead concentration of 34 µg/g (Sowers et al., 2024). No comparable studies on arsenic or cadmium were identified that employed the same sampling approach and analytical methods.

Although the mean lead dust loading in the current sample (0.79 micrograms per square foot, µg/ft²) is below the U.S. EPA residential floor action level of 5 µg/ft², the detection of any lead exceeds the 2026 Dust-Level Reportable Level (hazard standards) (U.S. EPA, 2025m). Accordingly, the U.S. EPA recommends best practices such as “*using a vacuum with a high-efficiency particulate air (HEPA) filter on furniture and other items in the area, and regularly cleaning hard surfaces with a damp cloth or sponge and a general all-purpose cleaner.*” They also provide pamphlets available online for reducing lead exposure in homes (U.S. EPA, 2026h).

Major sources of these contaminants through any pathway include the following:

- Lead. Common sources of lead exposure include lead-based paint, the primary indoor source (CARB, 2026q), along with contaminated soil, children’s toys, jewelry, workplace and hobby-related hazards, traditional remedies and cosmetics, lead-glazed ceramics, pottery, and crystal, imported candy, old imported mini blinds, and less commonly, drinking water (CARB, 2026q; Washington State Department of Health, n.d.).
- Arsenic. In the U.S., food is the primary source of arsenic exposure, while air, soil, and drinking water are generally less significant contributors (Agency for Toxic Substances and Disease Registry, 2023; CDC, 2024d). Approximately 80% of dietary arsenic exposure comes from meat, fish, and poultry, although seaweed, rice, fruits, and shellfish may also contain arsenic. Although arsenic can be naturally occurring in groundwater (Shankar et al., 2014), contamination of groundwater can result from agricultural runoff, wood preservatives, or the improper disposal of arsenic-containing chemicals (Agency for Toxic Substances and Disease Registry, 2023).

- **Cadmium.** Cigarette smoke and other tobacco products are the most common sources of cadmium exposure (CalEPA, 2026b). Additional sources include air emissions from metal coating and smelting, inexpensive metal jewelry, pigments used in some dishes, and smaller amounts present in food and water (CalEPA, 2026b). Occupational exposure may occur in industries such as landfills, recycling, manufacturing, and smelting, while common household exposures are primarily linked to secondhand tobacco smoke and cadmium-contaminated food (National Institute for Health, 2024).

A recent study found that levels of lead, cadmium, and arsenic in household dust were all strongly correlated with nicotine residues, highlighting tobacco smoke as an important source of indoor contamination (Lopez-Galvez et al., 2026).

Current Knowledge of Potential Impacts of the Development Proposed Under the Specific Plan Framework (Air and Dust)

Because DLE has not yet been implemented on a commercial scale, its potential air-quality and dust-related health impacts remain uncertain. In contrast, the health effects associated with other development proposed under the Specific Plan, including construction, industrial development, and operation of new geothermal facilities, have been more extensively studied. Estimates based on these established findings, along with potential or anticipated effects related to DLE, are presented below.

Criteria Air Pollutants

Dudek (2025) utilized the 2022 California Emissions Estimator Model to estimate emissions of criteria air pollutants associated with the maximum buildout of all development proposed under the Specific Plan over an approximately 30-year planning horizon. The analysis evaluated the maximum emissions generated during both construction and long-term operation of the proposed land uses under conservative assumptions (maximum emissions), *without* accounting for planned mitigation measures (Dudek, 2025b). Default existing emission regulations are embedded within the modeling framework (BREEZE Software, Trinity Consultants, 2021).

Construction and operational activity associated with the development proposed by the Specific Plan would generate emissions that could exceed applicable significance thresholds for criteria pollutants (Dudek, 2025b). Given the region's existing air quality conditions, thresholds for volatile organic compounds, nitrogen oxides, carbon monoxide, PM₁₀, and PM_{2.5} could be exceeded before mitigation measures are implemented, potentially negatively impacting health (Dudek, 2025b). It is important to note that the modeling did not incorporate the required mitigation strategies to reduce emissions from the proposed development (Dudek, 2025b), nor did it account for potential beneficial health impacts associated with the activities.

Toxic Air Contaminants

Dudek conducted a health risk assessment for toxic air contaminants associated with the Specific Plan (Dudek, 2025b). Consistent with criteria-pollutant modeling over a 30-year horizon, this assessment used conservative worst-case assumptions and did not account for the effects of required mitigation measures. Under these conditions, individuals residing near or in the Specific Plan area, as well as workers on-site, *could* experience exposure to toxic air contaminants with the potential to adversely affect health (Dudek, 2025b). Of note, lead emissions are not expected to be affected by project activities (Dudek, 2025b).

Playa and Desert Dust

Because most land uses designated under the Specific Plan are not located on exposed playa surfaces, and areas that do overlap with playa would be subject to required dust-control measures (County of Imperial, 2025c), direct project-related activities are not expected to substantially increase health risks associated with playa dust exposure. Additional factors that may reduce potential emissions include the paving of roads, the designation of certain lands for restoration within the Specific Plan area (County of Imperial, 2025c), and the requirement that 20 percent of revenues generated through the lithium extraction excise tax be dedicated to Salton Sea restoration efforts (California Energy Commission, n.d.; SB-125 Public Resources: Geothermal Resources: Lithium, 2022). Collectively, these factors are expected to limit the potential for increased exposure to playa dust; however, the magnitude of future impacts cannot be determined with certainty.

Indirect effects could occur if future reductions in Colorado River deliveries lead the IID to decrease water allocations to agriculture while maintaining allocations for the development proposed under the Specific Plan. Because agricultural runoff is the primary source of inflow to the Salton Sea (Pacific Institute, 2026), such a shift could accelerate shoreline retreat and increase the extent of exposed playa. For context, in 2022, IID water allocations were approximately 2.2 million acre-feet per year for agriculture, compared with about 0.072 million acre-feet for renewable energy uses and 0.003 million acre-feet for lithium production (Busse et al., 2023). At the same time, reductions in agricultural activity could also decrease emissions of pesticides, fertilizers, and particulate matter associated with farming operations. Overall, the net magnitude of future health impacts is expected to be small but remains uncertain due to interactions among multiple water-management, land-use, and restoration factors.

Source apportionment information related to air pollution indicates that playa emissions account for approximately one percent of PM₁₀ emissions in the Salton Sea area upwind of the playa, while desert sources are the dominant contributor to PM₁₀ within the airshed (IID, 2026f). The development proposed under the Specific Plan is not expected to affect dust from desert sources.

Dust in Specific Plan Area

The development proposed under the Specific Plan may generate dust, which can contribute to PM₁₀ and PM_{2.5} concentrations, particularly during construction and ground-disturbing activities (Dudek, 2025b). Required dust-control measures, implemented in accordance with applicable regulations and policies, include paving of roads, regular application of water during soil disturbance, watering of unpaved roads, limits on vehicle speeds on unpaved surfaces, and sweeping of paved roads, among other practices (Dudek, 2025b). Because PM₁₀ is a criteria air pollutant, potential impacts related to dust generation were included in the criteria air pollution modeling presented earlier.

Odors

Odor impacts during construction would be minor and short-term, primarily associated with architectural coatings, asphalt application, and equipment exhaust. These emissions are expected to disperse rapidly, resulting in less-than-significant impacts (Dudek, 2025b). During operation, certain proposed land uses, particularly wastewater treatment and anaerobic digesting facilities (County of Imperial, 2025c), could generate odors that could affect nearby areas. However, implementation of required odor control and abatement measures under the Specific Plan (County of Imperial, 2025c) would reduce operational odor impacts to less than

significant¹⁹ with required mitigation measures, including odor treatment systems, regular monitoring and reporting, and buffer zones (Dudek, 2025b).

New geothermal plants developed under the Specific Plan would increase hydrogen sulfide emissions in the area, potentially causing odors. Hydrogen sulfide emissions were included in the operational odor impacts assessed and determined to have a less-than-significant impact with required mitigation (Dudek, 2025b). Mitigation will be important as the hydrogen sulfide concentrations measured at the air monitoring station in Riverside report average yearly concentrations higher than applicable standards (CARB, n.d.-c), and current monitoring may underestimate the problem (Centeno et al., 2025).

Geothermal Specific

The Specific Plan includes the potential development of new geothermal wells and power plants. Aside from operational emissions, which would increase with new plants, accidental venting, equipment malfunctions, or leaks may result in the release of hydrogen sulfide, ammonia, benzene, or other gases into the atmosphere. Because current estimates of geothermal operations in the Salton Sea geothermal field indicate relatively low emissions, it is expected that planned expansion of geothermal operations will have a small impact on pollutants, provided appropriate mitigation measures are in place, but there is high uncertainty in hydrogen sulfide estimates (Dobson, Araya, Brounce, et al., 2023). Ongoing monitoring is important to maintain accurate emission inventories, ensure accurate accident response, and support effective mitigation strategies (Hasheminassab et al., 2025).

DLE Specific (with Geothermal Expansion)

Introducing DLE into the geothermal processing maintains the closed-loop²⁰ system in which the brine is returned to the reservoir after the heat and lithium are removed. After the brine is used for geothermal energy production, the lithium recovery stage introduces additional processing steps and chemical inputs that may present environmental and public health considerations (Stringfellow & Dobson, 2021). Common DLE technologies, including adsorption, which will be used in the region, use chemical reagents such as organic solvents, hydrochloric acid, sodium hydroxide, and sodium carbonate to separate lithium from sorbent materials and produce a concentrated lithium product (Krishnan & Gopan, 2024; Razmjou, 2024). Evaporative losses of solvents and fugitive emissions from processing tanks can affect local air quality if not properly controlled (Dobson, Araya, Brounce, et al., 2023). Additional emissions may also occur during the drying, transfer, and packaging of lithium products, as well as from increased truck traffic associated with transporting the final product (Dobson, Araya, Brounce, et al., 2023). DLE is expected to use energy from the geothermal system, but if energy purchases are needed and the energy is produced locally, indirect pollution can result (Dobson, Araya, Brounce, et al., 2023). The type of DLE to be used in the region is an adsorption process, but the specifics of the technology are still being developed for site-specific parameters. As such, there may be

¹⁹Under the California Environmental Quality Act, thresholds of significance are standards or criteria used to evaluate whether a project's environmental effects could be significant. Please see the draft PEIR for a list of significance thresholds for each environmental impact examined (Dudek, 2025b). In this case, a significant impact would occur if the proposed project would result in odors adversely affecting a substantial number of people (Dudek, 2025b).

²⁰ While the term closed-loop is often used to describe the return on brine to the same geothermal field, different definitions exist. Some authors define a closed DLE loop specifically as the surface DLE processing loop (taking brine, extracting lithium, returning brine) (Lithium Harvest, n.d.; Liu et al., 2021).

variability in the specific environmental impacts. Health impacts related to DLE have not yet been studied.

The maximum buildout of adsorption-based²¹ DLE along with geothermal expansion in the Salton Sea geothermal field is estimated to increase carbon dioxide, PM_{10/2.5}, benzene, hydrogen sulfide, and ammonia emissions, despite emission-reduction measures, although estimates “contain substantial uncertainty,” as DLE processes were under development (Dobson, Araya, Brounce, et al., 2023). In this estimation study, emissions under a maximum buildout scenario were estimated to increase to approximately 8,000 metric tons per year of PM₁₀, compared with roughly 100,000 metric tons per year from area-wide sources. PM_{2.5} emissions were estimated at about 3,500 metric tons per year, compared with approximately 13,000 metric tons per year area-wide. Benzene emissions were estimated at about 250 metric tons per year. Hydrogen sulfide emissions could reach approximately 7,000 metric tons per year, compared with nearly 3,500 metric tons per year attributed to the Salton Sea, and ammonia emissions were estimated at under 8,000 metric tons per year, compared with roughly 10,000 metric tons per year from area-wide sources. In each category, the projected emissions for the buildout originally planned for the next 3-4 years were about one-third of the maximum (Dobson, Araya, Brounce, et al., 2023). The Draft PEIR also evaluated a buildout of 17 facilities producing up to 2,550 megawatt capacity (Dudek, 2025b), which is similar to the maximum production capacity scenario described in the article.

At the Salton Sea geothermal field, silica is currently removed from the geothermal brine during geothermal power processing, producing a solid byproduct commonly referred to as filter cake, which is transported to off-site disposal facilities (Dobson, Araya, Brounce, et al., 2023). Implementation of DLE would require removing additional silica and other dissolved metals from the brine, which would increase the volume of solid byproducts and recovered materials requiring transport for disposal or further processing (Dobson, Araya, Brounce, et al., 2023). Transport of the additional waste and recovered materials would increase truck traffic in the region and could contribute to higher air pollutant emissions. If diesel-powered trucks are used, this would increase particulate matter emissions, including PM₁₀ and PM_{2.5} (Dobson, Araya, Brounce, et al., 2023). Under full-scale production scenarios, estimates suggest that the total quantity of filter cake and related solid residues generated each year could increase to as much as 14 times current levels, or over 700,000 tons of solids requiring disposal annually (Dobson, Araya, Brounce, et al., 2023). Current planning assumptions indicate that nonhazardous filter cake would be transported to the Salton City Landfill, while hazardous waste would be hauled to permitted disposal facilities in Arizona (Dobson, Araya, Brounce, et al., 2023).

One estimate suggests that, if lithium were fully extracted from currently processed brine at the Salton Sea geothermal field, additional solid waste generation could reach 889,000 tons per year, equivalent to roughly 85 additional truckloads per day (carrying 28 tons each) (Lawrence Berkeley National Laboratory, n.d.). For context, average daily traffic on Highway 111 in 2023 ranged from about 2,800 to 3,750 vehicles near Niland Avenue and about 5,400 to 5,700 vehicles near the junction with State Route 115 (California Department of Transportation, 2023). Trucks (two or more axles and more than four tires) constitute 18% of the vehicles near Niland Avenue and 16%–21% of vehicles on Highway 111 at the Route 115 junction (California Department of Transportation, 2023).

²¹ The study considers adsorption using Lithium/Aluminum Double Layered Hydroxide materials, which were the methods being evaluated at pilot projects in the region.

Future facility designs may further reduce atmospheric releases with the capture and reuse of carbon dioxide in the lithium extraction process (Lawrence Berkeley National Laboratory, n.d.) or newer technologies to further reduce hydrogen sulfide emissions (Karapekmez & Dincer, 2018).

Valley Fever

Valley fever (coccidioidomycosis) is a respiratory infection caused by the *Coccidioides* fungus, which is found in soil and dust in parts of California and the broader southwestern United States (CDPH, 2025b). Infection occurs when fungal spores become airborne and are inhaled. However, the incidence of valley fever in Imperial County is low (CDPH, 2025c). In 2024, 20 cases were reported in Imperial County, compared with 12,444 cases statewide (CDPH, 2025d). However, available evidence indicates that Valley Fever is likely substantially underreported, with studies estimating that the true incidence may be 10 to 18 times greater than the number of reported cases (Williams et al., 2025).

Analysis of Potential Health Effects from the Development Associated with the Specific Plan Framework (Air and Dust)

As discussed, the buildout proposed by the Specific Plan may reduce air quality and increase dust emissions, potentially resulting in adverse health effects. Potential health effects related to air quality and ambient dust include the onset and exacerbation of respiratory diseases, neurodevelopmental impacts, increased cancer risk, premature mortality, and exacerbation of cardiovascular disease.

However, the magnitude of these effects cannot be precisely quantified, as there is no direct, meaningful way to link mass-emission estimates to exposure levels and potential health outcomes (Dudek, 2025b). Additionally, the emissions estimates are based on maximum potential build-out conditions (over a 30-year period) and do not account for required mitigation measures (Dudek, 2025b), the potential benefits of project implementation, or changes in background air quality.

Criteria Air Pollutants. Because activities may exceed established air quality thresholds, they may contribute to adverse health outcomes, including respiratory symptoms, lung irritation and tissue damage, exacerbation of existing lung disease, increased hospitalizations, and premature mortality (Dudek, 2025b). Quantifying these potential impacts is difficult, and any attempt to do so may be highly inaccurate. Nonetheless, modeling undertaken by Dudek (2025) of a full buildout without any mitigation measures, resulted in increases in health-related effects such as asthma-related emergency room visits (0.003 incidences per year), lung cancer incidence (0.2 incidences per year), all cardiovascular-related hospital admissions (not including myocardial infarctions) (0.96 incidences per year), all respiratory-related hospital admissions (0.5 incidences per year), mortality (2.3 – 5.1 incidences per year), and nonfatal acute myocardial infarction (1.6 incidences per year for all age groups). Again, these estimates may not be accurate and do not include any mitigating activities.

Toxic Air Contaminants. Without mitigations, toxic air contaminant modeling could affect cancer risk for populations living in and around the Specific Plan area and for workers within the area under maximum potential scenarios (Dudek, 2025b). Similar to modeling for criteria air pollutants, the required mitigation measures were not accounted for in the modeling scenario (Dudek, 2025b).

Dust and Playa Dust. The development proposed by the Specific Plan is not expected to have a major impact on health related to dust or playa dust, although quantification of the potential impacts is not possible.

Odors. Similarly, odors are not expected to pose major health concerns due to required mitigation and abatement activities (County of Imperial, 2025c; Dudek, 2025b).

Valley Fever. Valley Fever was not determined to be a health risk as it relates to the development activities associated with the Specific Plan framework due to the current incidence rates (CDPH, 2025c; Dudek, 2025b).

Background Air Quality. Ongoing air quality control and mitigation efforts in Imperial County, including continued implementation of the Salton Sea Air Quality Mitigation Program, may improve background air quality. In addition, a potential reduction in agricultural activity within the Specific Plan area could lead to lower emissions from agricultural operations. Conversely, any deterioration in background air quality over time could adversely affect public health.

Wastewater Emissions. Wastewater would initially be managed through septic systems during the early phases of development (Dudek, 2025b), with a later transition to centralized wastewater treatment infrastructure. Potential options may include upgrades to existing wastewater treatment facilities in Niland and/or Calipatria, or the construction of new wastewater treatment systems within the Specific Plan area (Dudek, 2025b). Septic systems may emit higher levels of carbon dioxide and methane than some centralized wastewater treatment systems, although all wastewater treatment approaches are associated with greenhouse gas emissions (Diak et al., 2013; Manga & Muoghalu, 2024) that should be considered in planning and environmental review.

Potential Health Benefits. The development proposed under the Specific Plan is projected to generate lithium-related revenues, a portion of which is designated for community and environmental benefits, including 30% for communities affected by lithium extraction and 20% for Salton Sea restoration efforts (California Energy Commission, n.d.; SB-125 Public Resources: Geothermal Resources: Lithium, 2022). Potential benefits include infrastructure improvements (e.g., road paving to reduce dust), community development investments, increased access to resources, higher household incomes, and expanded employment opportunities (County of Imperial, 2025c), which may in turn improve access to health care. As noted, social determinants of health play a substantial role in shaping health outcomes (CDC, 2024a; Hacker et al., 2022; Taylor et al., 2016; World Health Organization, 2026b). Additionally, air quality could improve with additional Salton Sea restoration efforts. Collectively, these factors can contribute to improved community health.

Summary. In summary, the buildout of the Specific Plan is expected to generate additional air pollutant emissions; however, the magnitude of this increase and the associated health impacts remain uncertain. This uncertainty reflects the difficulty in linking mass emissions to specific health outcomes (Dudek, 2025b), as well as the influence of planned mitigation measures and potential health benefits on overall conditions. Ongoing air quality monitoring and implementation of effective mitigation measures to protect public health, including those that address the social determinants of health, will be critical and are discussed further in the recommendations section.

Methods to Reduce Health Impacts (Air/Dust)

Mitigation in Specific Plan/Draft PEIR

As listed in the Draft PEIR (Dudek, 2025b), mitigations related to air quality include:

- 1. Additional Construction Equipment Emission Reductions**
 - Use electric or hybrid-powered equipment
 - Replace diesel with other fuels that are commercially available
- 2. Notification Of Construction Activities**
 - Public notification, signage, and employment of a construction relations officer
- 3. Limit Truck and Equipment Idling During Construction**
 - Shut off heavy-duty trucks when not in use or limit idling to no more than 3 minutes (as opposed to the state 5-minute regulation)
- 4. Use Low-Volatile Organic Compound Paint During Construction**
 - For all interior and exterior paint for residential and non-residential uses
- 5. Use Low-Volatile Organic Compound Cleaning Supplies and Paint Education Program**
 - Green cleaning product and paint education program
- 6. Landscape Maintenance Equipment Emission Reduction**
 - Outdoor electrical outlets to facilitate the use of electrical lawn and garden equipment
 - Encourage the use of yard equipment exchange/rebate programs
- 7. Idling Time Restriction During All Ongoing Business Operations**
 - During all ongoing business operations and as part of lease agreements
- 8. Anti-Idling Implementation Measures**
 - Signage
 - Efficient load management
 - Anti-idling training
- 9. Operational Back-Up Generator Emission Reductions**
 - Backup generators meet Tier 4 emission standards; if not available, demonstrate this to the County and use the next cleanest available
- 10. Valley Fever Exposure Minimization**
 - Additional dust suppression measures when Valley Fever rates are highest (June-November)
 - County-designed worker training program
- 11. Odor Control and Abatement Program for Anaerobic Digester Facilities and Wastewater Treatment Plants**
 - Implement odor treatment systems
 - Regular monitoring and reporting
 - Include adequate buffer zones maintained around facilities

As listed in the Draft PEIR (Dudek, 2025b), additional mitigations related to greenhouse gas emissions include:

1. Energy Conservation

- Install Energy Star-rated heating, cooling, lighting, and appliances
- Use high-efficiency lightbulbs outdoors
- Install double-pane windows
- Install cool pavement
- Provide information about energy-efficient systems and incentive programs to future residents

2. Use Alternative Refrigerants with Lower Global Warming Potential

3. Include Electric Vehicle Charging Infrastructure in Plans

4. Sustainable Concrete Building Materials (on Industrial Land)

5. Trip Reduction Program for Applicants Planning 50 or More Employees

6. Site Design Connecting Pedestrian and Bike Facilities to Existing or Proposed Facilities Within a Quarter Mile

7. Transit-Oriented Features

- Developer/applicant contributes to the construction or implementation of transit features

In addition, there are a number of policies outlined in the Specific Plan related to land use, design standards, circulation and transportation, infrastructure, and community health aimed at reducing the environmental effects of future development (County of Imperial, 2025c).

Additional Suggestions

Decisions regarding the implementation of enhanced protections should be prioritized based on their anticipated health benefits, following the establishment of effective oversight and compliance with applicable regulations, permit conditions, and planned mitigation measures, which may provide sufficient protection if fully implemented and enforced. Additional enhanced measures that could be considered include:

1. Enhanced Dust Suppression (U.S. EPA, 2021)

- Real-time wind-triggered dust control action triggers (e.g., automated watering, work stoppage for wind thresholds).
- Incorporate vegetative barriers or windbreaks to reduce dust transport.

2. Advanced Equipment and Mobile Controls

- Scale up to zero-emission construction equipment (not only electric/hybrid).
- Mandate on-site electrification infrastructure to reduce potential generator use.
- Require fleet electrification targets for project-related transportation over time.
- Require a phased transition to zero-emission operations, including electrification of all feasible equipment.
- Prohibit use of Tier 2/3²² engines (including those operated by contracted organizations)

^{22 20} Emission stringency levels for off-road diesel-fueled engines: “starting with Tier 0 being the dirtiest uncontrolled engine through the cleanest Tier 4 Final” (CARB, 2026n).

- Require tire materials that reduce dust generation for all equipment.
- Require all contracted organizations to utilize zero/low-emission equipment and vehicles; provide incentives to facilitate local contractors' purchase and use of zero/low-emission equipment.

3. Logistics Optimization

- Implement construction traffic management plans.
- Consolidate material delivered and off-peak scheduling.
- Prioritizing low-emission freight options.

4. Worker Protection

- Provide respiratory protection during high-dust activities.
- Implement an on-site air quality flag system to guide work practices on poor air quality days.

5. Fund or Support Direct Community Interventions

- Implement off-site mitigation or offset programs (e.g., funding zero-emission buses, truck replacement programs).
- Provide high-efficiency filtration systems in the ventilation of nearby community buildings.
- Increase setback distances beyond minimum requirements for sensitive receptors.
- Require all new facilities to monitor emissions and report to the county.
- Require new facilities to provide plans for offsetting emissions.

Additional monitoring and compliance enhancement could include:

1. Enhanced Ambient and Fenceline Monitoring

- Deploy dense monitoring networks (including low-cost sensors and additional regulatory monitors) in nearby communities.
- Implement calibration practices to ensure the reliability of low-cost sensors.
- Include speciation sampling (e.g., metals, silica, organics) in addition to PM mass.
- Provide publicly accessible, real-time data dashboards.

2. Community-Based Monitoring and Engagement

- Fund community air monitoring programs (e.g., partnerships with local organizations) with education on how to interpret and use air quality measurements.
- Establish a community advisory group for ongoing oversight.
- Provide multilingual alerts for high pollution events.

3. Health-Based Trigger Thresholds

- Establish action thresholds below regulatory standards that trigger mitigation (e.g., increased watering, operational adjustments).
- Link monitoring data to adaptive management plans.

Airborne measurement campaigns have also been recommended as a useful tool for identifying emission sources and improving regional estimates. Recently, researchers conducted airborne surveys over Imperial County, which detected substantial spatial and seasonal variability in ammonia concentrations, attributed to multiple sources, including concentrated animal feeding operations, geothermal power plants, natural fumaroles, and intensive agricultural activities (Hasheminassab et al., 2025).

Example. CARB implemented a comprehensive strategy to reduce goods movement emissions through a combination of mandatory and voluntary measures, including electrification of port operations, use of cleaner fuels, and incentives for upgrading truck fleets (Meng et al., 2021). These policies led to reductions in nitrogen dioxide and PM_{2.5} concentrations near ports and major transportation corridors, and associated decreases in emergency department visits.

Suggestions Related to DLE (with Geothermal Expansion)

The following mitigation measures for geothermal and DLE operations may already be incorporated into operational standards; if not, they could be considered for implementation:

1. Hydrogen Sulfide and Non-Condensable Gas Controls

- Require redundant abatement systems (backup units) to prevent exceedances during maintenance or failure.
- Establish lower operational thresholds than regulatory limits to trigger corrective action (early-warning system).
- Continuous fence-line hydrogen sulfide and other emissions monitoring with public reporting.
- When feasible, consider converting waste (hydrogen sulfide) to value-added chemicals (hydrogen) (Chan et al., 2023).

2. Closed-Loop System Integrity and Leak Prevention

- Require secondary containment systems for all brine and chemical handling infrastructure.
- Implement continuous pressure monitoring to detect leaks in pipelines and reinjection systems.
- Conduct routine infrared or optical gas imaging surveys for fugitive emissions.

3. Chemical Handling and DLE Process Controls

- Require enclosed systems for reagent storage, transfer, and processing (e.g., acids, solvents).
- Install vapor recovery systems for any volatile chemical processes.
- Develop a chemical substitution plan prioritizing lower-toxicity reagents where feasible.

4. Dust and Waste Management (Filter Cake, Solids)

- Require enclosed or covered transport of filter cake and other solid byproducts.
- Stabilize or treat waste materials to prevent wind entrainment of fine particulates.
- Limit on-site storage duration and require prompt disposal or beneficial reuse.

In addition to standard industry practices and regulatory requirements (such as abatement systems for non-condensable gases, vapor recovery units/carbon filtration for chemical storage and processing, and secondary containment for hazardous materials) the following measures could further reduce the potential for air pollutant emissions from geothermal and DLE operations:

- Although continuous emissions monitoring systems are commonly used within facilities, the implementation of facility-wide monitoring networks, including real-time sensors positioned along the facility *perimeter* and integrated with automated alarms and response protocols, could enhance the detection and rapid mitigation of accidental releases of hazardous gases (U.S. EPA, 2026d).

- Although advanced leak detection and containment systems are more commonly applied in the oil and gas sector, the use of chemical additives in DLE operations may support consideration of enhanced engineering controls, including double-walled pipelines with interstitial monitoring, high-sensitivity pressure sensors, and automated shutoff valves, to minimize fugitive emissions from brine transport systems (U.S. EPA, 2022a).

7.1.2 Water-Related Health Effects and Concerns

Background (Water)

Municipal

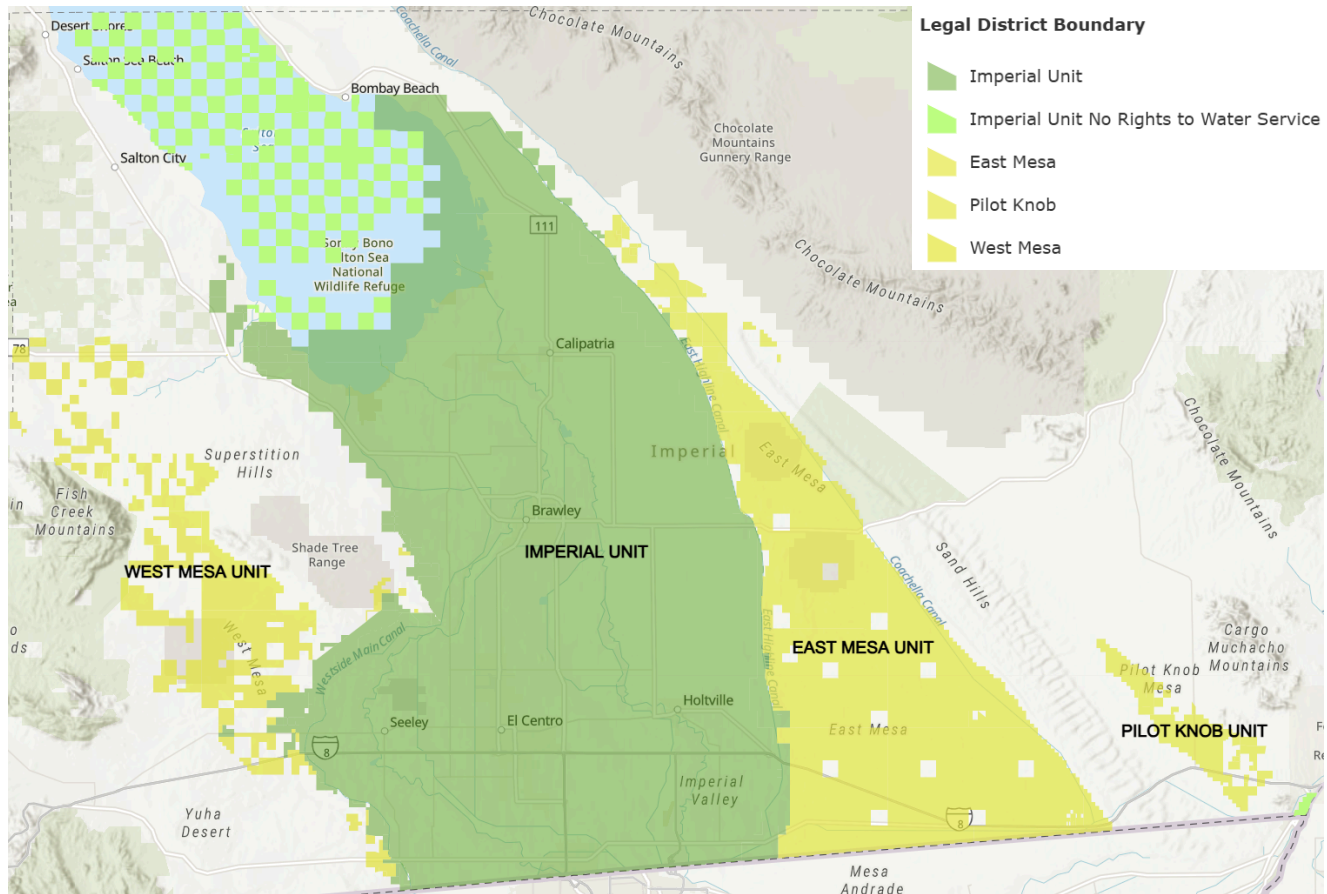
Municipal water refers to potable (i.e., drinkable) water supplied to homes, businesses, and other community users. In Imperial County, drinking water is provided through a network of seven municipalities and two community water systems that treat and distribute water (IID, 2026i). The water provided to these systems is from the IID, which sources its water solely from the Colorado River (IID, 2026i). Some smaller providers use groundwater and operate independently under state and local permitting requirements (IID, 2026b, 2026i). Figure 10 shows the IID service areas.

Surface Water

Salton Sea. As discussed previously, the Salton Sea is shrinking and is highly contaminated by agricultural runoff, contributing to algae blooms, low oxygen levels, and elevated nutrient levels (Dudek, 2025b; Frie et al., 2017; Ma et al., 2020).

Rivers. The New River and Alamo River both discharge into the Salton Sea. The Alamo River carries sediment with pesticides into the Salton Sea (Rick Engineering Company, 2024). The New River, which begins in Mexico, has bacteria concentrations throughout the river that exceed water quality objectives (Rick Engineering Company, 2024). In 2020, the New River Sampling Program was established to monitor water quality and provide publicly accessible data, a function it continues to fulfill (Imperial County Public Health Department, 2026). The State Water Resources Control Board and the Colorado River Basin Regional Water Board have developed and continue to develop control plans to address water quality in these rivers (California Water Boards, 2026).

Irrigation Canals. The IID maintains a system of irrigation canals in Imperial County to transport water from the Colorado River for agricultural use in the Imperial Valley (IID, 2026a). Water is delivered to farmers through a network of lateral canals, supporting irrigation across approximately 500,000 acres of farmland within the IID service area. The IID conducts annual monitoring of its primary supply canals for a range of constituents. This is supplemented by sampling at 21 additional locations throughout the distribution system (IID, 2026h).



Source: <https://mygis.iid.com/portal/apps/webappviewer/index.html?id=a33cfb3714f4eb8a1c85320613a2d1b>

Figure 10. Imperial Irrigation District Public Water Map

Groundwater

“Groundwater is water located beneath the Earth’s surface, filling the pores and cracks in soil, sand and rock, forming underground reservoirs called aquifers. A groundwater basin is generally an aquifer, or stacked aquifers, with naturally defined boundaries” (California State Water Resources Control Board, 2026a). The Imperial Valley Groundwater Basin is bounded by the Sand Hills and the rocks of the Fish Creek and Coyote Mountains, and extends from the Salton Sea into Mexico (California Department of Public Works, 1954; California’s Groundwater Bulletin 118, 2024). Groundwater within the basin is primarily recharged by irrigation return flows (California’s Groundwater Bulletin 118, 2024), although deep percolation of precipitation and surface runoff, and seepage from unlined canals also recharge the basin (California Department of Public Works, 1954; California’s Groundwater Bulletin 118, 2024).

The Imperial Valley Groundwater Basin includes two major aquifers (California’s Groundwater Bulletin 118, 2024). Much deeper²³ geothermal reservoirs are part of a separate, hydraulically distinct system due to low-permeability geological layers that limit fluid exchange (Busse et al., 2024; Thompson et al., 2008). Water quality across much of the Imperial Valley Groundwater Basin is generally poor and often unsuitable for municipal water without treatment, as well as some industrial uses due to elevated total dissolved solids, as well as localized concentrations

²³ The systems are separated by more the 2,100 meters.

of fluoride and boron (Busse et al., 2024; California's Groundwater Bulletin 118, 2024; IID, 2026i; Loeltz et al., 1975).

Nevertheless, in select areas, groundwater is used to support community drinking water systems that meet applicable water standards (State Water Resources Control Board, 2025b; U.S. EPA, 2026b). In total, ten such systems in Imperial County, serving approximately 1,500 residents, rely on groundwater with differing levels of treatment needed to ensure safety: six systems provide water meeting quality standards with no treatment (serving 603 residents), two provide T1²⁴-level treatment (62 residents), one provides T2-level treatment (394 residents), and one provides T3-level treatment (410 residents) (State Water Resources Control Board, 2025b; U.S. EPA, 2026b).

Terminology

At the federal level, the Safe Drinking Water Act was passed by Congress in 1974 to regulate public water supplies; it was amended in 1986 and 1996 to include protections for source waters (U.S. EPA, 2025o). This act gives the U.S. EPA the authority to set regulatory standards for contaminants in water systems. The Safe Drinking Water Act does not apply to private wells if they serve fewer than 25 people (U.S. EPA, 2025o). Table 19 summarizes key drinking water terms, common abbreviations, divisions, and regulating bodies.

Table 19. Drinking Water Contaminant Terminology

Term	Abb. ¹	Definition	Regulating Body
Maximum Contaminant Level Goal (U.S. EPA, 2025j)	MCLG	The concentration of a contaminant that causes no known adverse health effects	U.S. EPA
Maximum Contaminant Level – Federal (U.S. EPA, 2025j)	MCL	Level of contaminant that is allowable; set as close to the MCLG as possible while considering testing costs	U.S. EPA sets and enforces; states can set stricter limits
Lifetime Health Advisory (U.S. EPA, 2026i)	HA	Guide for the health risks of long-term exposure to non-regulated contaminants	U.S. EPA
Secondary Maximum Contaminant Level (U.S. EPA, 2025b)	SMCL	Non-mandatory and non-enforceable limits on contaminants that affect water aesthetics and are not considered harmful to human health	U.S. EPA
Contaminant Candidate List (U.S. EPA, 2026c)	CCL	Contaminants that are likely to be present in public water supplies but are not currently regulated	U.S. EPA releases every five years
Health-based screening level (Smith & Nowell, 2014)	HBSL	Non-enforceable standards set to inform potentially harmful levels of contaminants that do not have MCLs	USGS National Water-Quality Assessment Project

¹ Common abbreviations.

²⁴ Treatment levels (T1–T4) are informal classifications used in California drinking water datasets to indicate increasing complexity of treatment processes, from basic disinfection (T1) to advanced multi-stage treatment (T4), based on source water quality and regulatory compliance (California State Water Resources Control Board, 2025). Those needing no treatment are typically high-quality groundwater that already meets standards, although it is recommended to continue testing the water at least annually (CDC, 2024b).

Table 19. Drinking Water Contaminant Terminology, Continued

Term	Abb. ¹	Definition	Regulating Body
Public Health Goal by (California Office of Environmental Health and Hazard Assessment, 2026)	PHG	Concentration of a contaminant that poses no significant health risk if consumed in drinking water over a lifetime; these are set based on the current state of knowledge for contaminants with or pending MCLs	California Office of Environmental Health and Hazard Assessment
Maximum Contaminant Level – State (California Water Boards, 2024)	CA-M CL	Level of contamination that is allowable; set as close to the public health goal as possible while feasible	State Water Resources Control Board; adopted as regulations
California Notification Level (California Water Boards, 2025a)	CA-N L	“Health-based advisory levels established for chemicals in drinking water that lack maximum contaminant levels”	Division of Drinking Water
Detection Limit for Purposes of Reporting (California Water Boards, 2025b)	DLR	Minimum level at which an analytical finding of contaminant must be reported; set ≤ MCL	California Water Boards

¹ Common abbreviations.

Baseline (Water)

Municipal

There are 79 water systems in Imperial County: 30 community water systems, 24 non-transient non-community systems (at various locations, e.g., individual companies, schools, etc.), and 25 transient non-community systems (e.g., gas stations, marina, individual businesses, etc.) (U.S. EPA, 2026b). These water systems are summarized in Table 20, along with the populations they serve and primary water sources.

Table 20. Drinking Water Systems, Source and Population, Imperial County (2026 Quarter 1)

Type	Primary Source ¹	Population Served
Community Water System	Ground water	1,469
	Surface water	170,269
Non-Transient Non-Community System	Ground water	570
	Surface water	11,915
Transient Non-Community System	Ground water	1,714
	Surface water	363

Source: (U.S. EPA, 2026b). Accessed 4-9-25 from:

https://sdwis.epa.gov/ords/sfdw_pub/r/sfdw/sdwis_fed_reports_public/103

¹ Surface water in Imperial County is sourced from the Colorado River, whereas groundwater comes from the Imperial Valley Groundwater Basin.

Water Quality. Findings from the 2025 Drinking Water Needs Assessment for Imperial County indicate that among the 35 evaluated systems (including all 30 community water systems and five school-based non-transient, non-community systems), water quality risks were present to varying degrees (State Water Resources Control Board, 2026). Specifically, 14.3% of systems

were classified as high risk, 37.1% as medium risk, 14.3% as low risk, and 34.3% as having no identified water-quality risk.

The water quality risk score was derived from six indicators: (1) the percentage of water sources exceeding a California maximum containment level (**MCL**), (2) increasing presence of water quality trends toward MCLs, (3) prior inclusion of failing on California's Human Right to Water list, (4) treatment technique violations in the past three years, (5) history of *E. coli*²⁵ presence in the past three years, and (6) detection of constituents of emerging concern over a five-year period (State Water Resources Control Board, 2026).

Use of Irrigation Canal Water. Individuals in rural areas of Imperial County without access to treated water are allowed to use untreated irrigation canal water for non-potable uses (e.g., washing/bathing), but must obtain drinking water from other sources, such as bottled or bulk water delivery services (IID, 2026c). The IID offers a Water Delivery Assistance Program to assist with the monthly costs of drinking water delivery to low-income households (IID, 2026c).

Surface Water

Salton Sea. The conditions and concerns related to the Salton Sea are discussed in sections 6.1.2. and 7.1.1.

Irrigation Canals. The health department notes that water from irrigation canals may contain elevated levels of bacteria and is not considered safe for drinking (Imperial County Public Health Department, 2025a). A review of 2025 water sample tests from the All-American, East Highline, Central Main, and Westside Main canals found non-detectable concentrations or levels below MCLs or reporting limits for cyanide, nitrate, nitrite, perchlorate, most metals, volatile organic compounds, semi-volatile organic compounds, synthetic organic compounds, tetrachlorodibenzo-p-dioxin, and radiochemicals, while bacterial testing was not conducted (IID, 2026h). However, exceedances were found in other instances, indicating that the irrigation canals do not meet drinking water quality standards:

- The East Highline Canal and Central Main Canal both exceeded MCLs for aluminum, iron, and turbidity, although later East Highline samples were within limits for aluminum and iron (IID, 2026h).
- The Westside Main Canal exceeded MCLs for aluminum, antimony, iron, and turbidity and continued to exceed MCLs in subsequent tests (IID, 2026h).
- Among the 21 enhanced system monitoring canal sites tested, only one exceeded any standard: antimony at Osage Gate 23A near Magnolia Union School District, which was not detected in subsequent samples (IID, 2026h).

Wastewater Discharge. Currently, treated wastewater from the Niland wastewater treatment plant is discharged from IID's "R drain" which eventually feeds the Salton Sea (California Regional Water Quality Control Board, Colorado River Basin Region, 2025). Treated wastewater from the Calipatria wastewater treatment plant is discharged into the "G drain", which is a tributary of the Alamo River that also flows into the Salton Sea (California Regional Water

²⁵ *Escherichia coli* (*E. coli*) is a diverse group of bacteria that normally inhabits the intestines of humans and animals. Most strains are harmless and play a role in normal digestion, whereas some strains produce toxins that can cause illness.

Quality Control Board, Colorado River Basin Region, 2014). The Calipatria facility has experienced ongoing issues with exceeding the required quality limits for the water it discharges (i.e., *E. coli*, total suspended solids, and biochemical oxygen demand) (City of Calipatria, 2018).

Groundwater

In 2000, the California State Water Resources Control Board initiated the Groundwater Ambient Monitoring and Assessment Program to provide comprehensive statewide monitoring of groundwater quality (California State Water Resources Control Board, 2026b). The program evaluates groundwater aquifers by sampling existing wells throughout California, including public drinking water wells, domestic wells, monitoring wells, and other accessible groundwater sources.

In a 2023 publication, researchers analyzed Groundwater Ambient Monitoring and Assessment Program data from wells in Imperial County, focusing on areas near the Salton Sea KGRA (Dobson, Araya, & Brounce, 2023). They found that lithium concentrations exceeded the national health-based screening level of 10 micrograms per liter in most well samples within a 15-mile radius of the southern shoreline of the Salton Sea, and that arsenic concentrations exceeded federal and state drinking water MCLs in some wells. The authors also reported elevated total dissolved solids concentrations in the area, indicating that substantial treatment would be needed before the water could be used for irrigation or municipal purposes. Nitrate as nitrogen, which is a measurement of the nitrogen portion of nitrate molecules, was detected in only a few wells at moderate concentrations. Hexavalent chromium, perchlorate, and uranium were not detected in the study area.

The 2025 Drinking Water Needs Assessment by the State Water Resources Control Board evaluated domestic wells and small state water systems to identify locations that may be accessing groundwater that does not meet safe drinking water standards and to prioritize areas for additional outreach and sampling (State Water Resources Control Board, 2025a). They categorized one-square-mile sections of California into high-, medium-, low-, or unknown-risk categories based on publicly available water-quality data from similar water sources and available sampling results. For sections lacking direct data, risk classifications were estimated using information from surrounding areas. Domestic wells were defined as systems with fewer than five service connections, while small state water systems were defined as those with five to fourteen connections. Depth filters were also applied to minimize bias associated with deeper municipal wells. Of the 76 domestic wells in Imperial County, 25 were located within high-risk sections, while 1, 24, and 26 wells were located in medium-, low-, and unknown-risk sections, respectively. Only one small state water system in Imperial County met the criteria, and it was located within an unknown-risk section.

Related to Geothermal Plants: Groundwater quality characterization is limited by the absence of dedicated monitoring wells within the Specific Plan area (Rick Engineering Company, 2024). As a result, Rick Engineering Company (2024) reviewed data collected over the previous 10 years from water-supply and geothermal production wells, although these sources may not fully reflect site-specific groundwater conditions. These wells were *not* contaminated with common industrial chemicals, although the water was very saline and contained elevated levels of several metals that exceeded drinking water standards (Rick Engineering Company, 2024).

Current Knowledge of Potential Health Impacts of the Development Associated with the

Specific Plan Framework (Water)

Municipal

Development proposed under the Specific Plan will obtain water from IID and is expected to maximize water recycling (Dudek, 2025b). IID gives priority to municipal and domestic water uses (IID, 2026b). Industrial operations cannot access water allocated to municipal and domestic uses, although the IID could adjust future allocations within their framework. Because IID prioritizes domestic and municipal water uses, the planned industrial development is not expected to substantially affect municipal drinking water availability.

IID Supply

As discussed, cuts to the IID supply from the Colorado River may affect the development proposed under the Specific Plan, the Salton Sea water level, and potential health concerns related to Salton Sea shrinkage. In January 2026, the Bureau of Reclamation released a Draft Environmental Impact Statement for Post-2026 Colorado River Operations to introduce federal regulation on Colorado River water supply management (U.S. Bureau of Reclamation, 2026). The potential operating scenarios in the statement are being opposed by IID, who responded through formal comments as of March 5, 2026 (IID, 2026j). The response indicates that some proposed scenarios do not comply with established laws around water allocation and use (IID, 2026j, 2026k). IID further established that the statement does not consider crucial aspects of local environmental impact that have been under scrutiny in DLE buildout plans, nor does it consider how enforced reductions in flow from the Colorado River to IID would affect water delivery to the Salton Sea (IID, 2026j).

Surface Water (Salton Sea, Rivers, and Irrigation Canals) and Groundwater

Water use/discharge. The development proposed under the Specific Plan would not utilize water from the Salton Sea and is not currently anticipated to rely on groundwater for operations (Dudek, 2025b; Lawrence Berkeley National Laboratory, n.d.). Instead, water demands would be met through supplies provided by the IID (Dudek, 2025b). The development will likely necessitate updates to the IID distribution systems, wastewater treatment facilities, and stormwater and drainage systems (Rick Engineering Company, 2024). Any new wastewater treatment plants will meet National Pollutant Discharge Elimination System standards, with treated water to be discharged into the Alamo River, feeding the Salton Sea (Dudek, 2025b). Similarly, developments would need to follow the wastewater management guidelines and drainage standards set by Imperial County (County of Imperial, 2025c).

Industrial operational wastewater should be discharged into brine ponds, the underground geothermal reservoir, or wastewater systems as appropriate (Dudek, 2025b) and should not be pumped directly into local surface water sources, although the exact plans are unclear.

Stormwater Runoff. Operational activities, as well as unexpected leaks, spills, or accidents, could affect surface water quality directly (e.g., spills into water) or via stormwater runoff. Stormwater runoff could include “dust, trash, debris, pesticides and herbicides, fertilizers, nutrients (e.g., bacteria from pet waste), and possibly residual petroleum products (e.g., motor oil, gasoline, diesel fuel) and metals from vehicle use” as well as pollutants from industrial land runoff such as “spills, leaks or debris from loading docks, raw materials, process liquids, great, oil wastes, heavy metals, or other pollutants from materials storage areas, and industrial equipment wash or process water” (Dudek, 2025b).

Impact Summary

Because construction and operations must comply with numerous federal, state, and local laws, regulations, and ordinances, the project's environmental impacts to surface and groundwater are considered less than significant²⁶ and cumulatively negligible (Dudek, 2025b).

DLE Specific (with Geothermal Expansion)

Water quantity. DLE processes require a reliable freshwater source. Since this may become increasingly limited, current industry plans to recycle, reuse, and reduce water will benefit from further investment and improved long-term sustainability.

Water quality. Aside from the potential contamination pathways described above, the DLE and geothermal expansions proposed under the Specific Plan are not anticipated to directly affect the quality of local water sources. Despite the proximity of proposed DLE operations to the Salton Sea, the geothermal brine is far below the Salton Sea, and the two are not hydrologically connected (Dobson, Araya, Brounce, et al., 2023).

Contamination from Accidents/Spills. Local water sources may become contaminated through accidents, spills, or failures of containment systems. These potential impacts are discussed further in Section 7. Although such incidents may not always directly affect human health, accidents do occur. For example, recent dredging and ditching associated with geothermal operations damaged wetlands connected to the Salton Sea, requiring the geothermal operator to conduct wetland restoration (U.S. EPA, 2024b).

Analysis of Potential Health Effects of the Development Associated with the Specific Plan Framework (Water-Related)

With compliance with applicable laws, ordinances, and regulatory requirements, the development proposed under the Specific Plan is not expected to result in significant impacts to water quality (Dudek, 2025b). Accordingly, these activities are not anticipated to affect groundwater or surface water quality, nor the availability or quality of drinking water (Dudek, 2025b). However, accidental contamination of surface waters could adversely affect human health. In the event of accidental runoff, spills, or other releases that degrade water quality in the Salton Sea, nearby rivers, or irrigation canals, exposure through direct contact, incidental ingestion, or consumption of locally sourced fish could result in adverse health effects. Therefore, any such incidents should be promptly communicated to the public, particularly given that individuals may use canal water for bathing or washing, come into contact with water from the Salton Sea or regional waterways, or consume fish from these sources. The Office of Environmental Health Hazard Assessment in California provides fish consumption advisories for most water bodies in Imperial County (OEHHA, 2026).

Although existing regulations are intended to minimize water quality impacts and protect public health, intentional or inadvertent noncompliance could result in adverse health outcomes.

²⁶ Under the California Environmental Quality Act, thresholds of significance are standards or criteria used to evaluate whether a project's environmental effects could be significant. Please see the draft PEIR for a list of significance thresholds for each environmental impact examined (Dudek, 2025b). In this case, a significant impact would occur if the proposed project violated any water quality standard or waste discharge requirements or otherwise substantially degraded surface or ground water quality (this is the first of the five thresholds evaluated) (Dudek, 2025b).

Methods to Reduce Health Impacts (Water-Related)

Methods Utilized to Protect Surface and Groundwater

By complying with existing laws, ordinances, and other regulations, the development proposed under the Specific Plan is not expected to result in significant water quality impacts, and no mitigation is required (Dudek, 2025b). Regulatory and other requirements that help to ensure water quality related to the development govern drainage control, non-stormwater discharge, erosion/sediment control, stormwater flow management, stormwater treatment, implementation of flood control measures, and the storage, use, and disposal of hazardous materials (Dudek, 2025b). Hydrological Impact Avoidance, Minimization, and Mitigation Plans must be approved by the County of Imperial (Dudek, 2025b). In addition, applicable National Pollutant Discharge Elimination System permit requirements mandate water quality monitoring and require corrective actions in response to exceedances of established action levels for both stormwater and non-stormwater discharges (Dudek, 2025b).

Implementation of these requirements includes the following measures, among others: (1) Stormwater Pollution Prevention Plans that address hazardous material handling, storage, spill response, and best practices for controlling sediment and pollutants; (2) stormwater management systems with flow controls and water treatment (to remove pollutants) prior to off-site discharge; (3) implementation of best management practices; (4) industrial permit requirements with strict water quality monitoring and discharge limits; (5) compliant septic systems for non-process wash water and sanitary waste; (6) development of wastewater treatment facilities; and (7) additional regulations governing industrial facilities (Dudek, 2025b).

Agricultural irrigation runoff is a current source of pollutants and high-salinity inputs to the Salton Sea. Conversion of agricultural land to industrial uses within the Specific Plan area, with stricter runoff controls, could reduce pollutant loading, but may also decrease total inflows to the Sea (Dudek, 2025b).

Additional Suggestions

Rigorous monitoring and enforcement of compliance with applicable laws, regulations, and ordinances is essential to maintaining water quality. Additionally, periodic soil sampling around geothermal plants can indicate if there has been an accumulation of minerals or toxic elements from accidental spills of geothermal water (Ramos et al., 2021).

Suggestions for DLE (with Geothermal Expansion)

Decisions regarding the implementation of enhanced protections should be prioritized based on their anticipated health benefits, following the establishment of effective oversight and compliance with applicable regulations, permit conditions, and planned mitigation measures, which may provide sufficient protection if fully implemented and enforced. Additional enhanced measures that could be considered include:

1. **Enhanced Containment and Spill Prevention** (SGI Composites, 2025; U.S. Government Publishing Office, 2026a, 2026b)
 - Automatic shutoff valves tied to real-time monitoring.
 - Tertiary containment systems across all infrastructure.
 - Real-time automated isolation systems across the entire network.
 - Routine integrity testing of pipelines/storage.

2. Advanced Water Monitoring and Transparency

- Water quality monitoring upstream and downstream of facilities (surface water and shallow groundwater).
- Public-facing dashboards of results.
- Establish early warning thresholds below regulatory limits to trigger preventive action.

3. Conservative Chemical Management

- Prioritize less hazardous reagents (beyond regulatory requirements) (U.S. EPA, 2025c).
- Proactive chemical substitution plans as safer alternatives become available.
- Vapor recovery systems where applicable (U.S. EPA, 2026e).

4. Brine and Wastewater Management Enhancements

- Redundant reinjection wells to prevent surface discharge.
- Implement strict regulations on wastewater discharge from new and existing facilities.

5. Stormwater and Runoff Controls

- Design systems for higher-than-expected precipitation (beyond regulatory).
- Post-storm inspections and sampling.
- Diversion channels and containment systems to isolate industrial areas from stormwater flows.

6. Groundwater Protection Measures

- Monitoring wells between operations and sensitive receptors (e.g., drinking water wells, canals).
- Nested monitoring wells to detect vertical migration between shallow and deeper zones.
- Groundwater trigger thresholds and contingency plans (e.g., pumping barriers, hydraulic control).
- Periodic assessment of well-integrity.

7. Irrigation System (i.e., IID canals and drains) Safeguards

- Dedicated canal-adjacent monitoring points for early detection of contamination.

8. Emergency Preparedness and Public Communication

- Establish real-time public notification systems for water-related incidents.
- Provide clear public guidance on avoiding exposure.

9. Cumulative Impact Management

- Regional shared water quality monitoring network across operators.
- Active management of cumulative pollutant loading.

10. Adaptive Management and Independent Oversight

- Third-party audits of water management systems and monitoring data.
- Adaptive management framework with predefined triggers for operational changes.
- Community advisory group to review water quality data and incident reports.
- Continuous updating of mitigation measures based on emerging DLE technologies and evidence.

7.1.3 Hazardous Materials and Waste Management

Background (Hazardous Materials/Waste Management)

The California Department of Toxic Substances Control (**DTSC**) defines hazardous waste as any material that poses a potential risk to human health or the environment due to its chemical or physical properties (DTSC, 2026). Hazardous wastes may occur in liquid, solid, or gaseous forms and are commonly generated through industrial processes, the disposal of used materials, or the discarding of unused commercial products such as solvents (e.g., cleaning supplies) and pesticides (DTSC, 2026).

Under DTSC criteria, a waste is classified as hazardous if it exhibits one or more of the following characteristics: ignitability, corrosivity, reactivity, or toxicity. Ignitable wastes are capable of causing fires; corrosive wastes include strong acids or bases that can degrade materials and cause tissue damage; reactive wastes are unstable and may explode or release toxic gases; and toxic wastes are harmful or potentially fatal when ingested, inhaled, or absorbed through the skin (DTSC, 2026).

Enforcement of Hazardous Materials Requirements

As described in the draft Specific Plan (County of Imperial, 2025c), the California DTSC enforces state requirements governing the handling, storage, and disposal of hazardous materials. DTSC also oversees facilities that generate, transport, or manage hazardous waste. CalEPA created the Unified Program to consolidate, coordinate, and provide consistency across six regulatory programs to protect public health (CalEPA, 2026a). As part of the Unified Program, CalEPA is required to certify local agencies to implement the programs. In Imperial County, the DTSC is authorized as the Imperial County Certified Unified Program Agency to enforce the laws. The Specific Plan identifies the need to hire qualified firms experienced in complying with local, state, and federal waste management regulations. These services would be supported through the creation or expansion of a Special District, with a dedicated budget allocation to ensure adequate oversight and compliance.

Waste Management

Hazardous. Hazardous waste, either solid or liquid, generated by geothermal energy production, is transported to an appropriate Class I²⁷ landfill facility. “Permitting, inspection, compliance, and corrective action programs ensure that people who manage hazardous waste follow state and federal requirements and other laws that affect hazardous waste specific to handling, storage, transportation, disposal, treatment, reduction, cleanup, and emergency planning” (Dudek, 2025b).

Non-Hazardous. Solid waste generated by geothermal energy production is transported to appropriate Class II or Class III facilities,²³ depending on the material classification. Domestic wastewater, as well as non-process wash water, will be disposed of in compliant septic systems until wastewater treatment facilities are developed (Dudek, 2025b).

²⁷ A Class I Landfill is for hazardous solid or liquid waste (regulated by DTSC); a Class II Landfill is for solid or liquid waste that threatens water quality, termed ‘designated waste’, and includes some industrial waste solids (local monitoring and enforcement); and a Class III Landfill is nonhazardous solid waste (local monitoring and regulation) (CalEPA, 2026d; Marshack, n.d.).

Baseline (Hazardous Materials/Waste Management)

Hazardous Materials: Existing Environmental Considerations

A review of hazardous materials conditions in the Specific Plan area identified a limited number of sites with documented negative environmental impacts (Rick Engineering Company, 2024). These include two underground storage tank release sites that resulted in soil contamination with diesel and gasoline (cases closed²⁸ in 1992 and 1996), and one geothermal facility where residues containing elevated levels of lead and arsenic affected groundwater in 1988 (case closed²⁴ in 2022) (Rick Engineering Company, 2024). A landfill adjacent to the Specific Plan area has been updated to comply with current regulatory requirements and conducts routine monitoring of methane and groundwater; no measurable methane or groundwater exceedances were reported in 2021 (California Regional Water Quality Control Board, 2021; Rick Engineering Company, 2024).

Three pipelines in or near the Specific Plan area transport hazardous materials, including a liquid pipeline along Highway 111, an inactive pipeline, and an active natural gas pipeline, which may have resulted in localized areas of petroleum-impacted soil (Rick Engineering Company, 2024). In addition, only one site in Imperial County, located approximately five miles south of the Specific Plan area, has been designated for long-term cleanup due to hazardous waste contamination that poses potential risks to human health or the environment (Rick Engineering Company, 2024).

Within the Specific Plan area, five geothermal energy sites have soils with elevated metal concentrations associated with past waste management activities (Dudek, 2025b). These facilities, which began operating before 2000, are subject to land-use restrictions that prohibit sensitive uses (e.g., residential development, schools, hospitals, and daycare facilities) and require ongoing management of contaminated soils to prevent exposure and protect human health and the environment (Dudek, 2025b). Petroleum and chemical storage at these facilities may also have contributed to localized soil impacts (Rick Engineering Company, 2024).

Additionally, 18 land disposal sites and two oil and gas sites within the Specific Plan area are listed in hazardous materials release databases (Rick Engineering Company, 2024). Of these, 17 are associated with geothermal operations, primarily involving brine pond disposal, and two are related to geothermal exploration (Rick Engineering Company, 2024). Recent monitoring at some of these sites has identified elevated total dissolved solids and detectable metals in groundwater samples collected near active brine ponds (Dudek, 2025b). Some proposals for new geothermal facilities include plans for brine-pond monitoring wells (Black Rock Geothermal LLC & Jacobs, 2024). Many of these sites are subject to ongoing groundwater monitoring and are required to implement hazardous waste management measures to protect water quality (Dudek, 2025b). No new hazardous release sites were identified during a second review in November 2024 (Dudek, 2025b).

In addition, past agricultural land uses in the Specific Plan area may have contributed to soil contamination, and existing structures may contain asbestos-containing materials (Rick Engineering Company, 2024).

²⁸ Regulatory agency determined that the required cleanup, remediation, or cessation of activity has been completed.

Hazardous Waste: Geothermal

Geothermal power plants in the Salton Sea KGRA produce solid wastes from various sources, including silica removal, brine pond²⁹ solids, and other solids generated during operation and maintenance (Dobson, Araya, Brounce, et al., 2023).

Filter Cake. Geothermal power plants remove solids from geothermal brine during processing, generating a solid byproduct referred to as filter cake (Dobson, Araya, Brounce, et al., 2023). Most filter-cake solid waste produced by these operations is non-hazardous, consisting primarily of iron silicate, and is disposed of in Class II and Class III landfills (Busse et al., 2023). However, some of the filter-cake waste contains hazardous constituents and must be managed accordingly (Busse et al., 2023).

Brine Ponds. Geothermal brine in the Salton Sea geothermal reservoir is highly saline and may contain elevated concentrations of naturally occurring metals, including arsenic, lead, zinc, and barium (Stringfellow & Camarillo, 2025b). Although most geothermal brine is reinjected into the reservoir, a portion may be temporarily stored in Class II³⁰ brine ponds during maintenance or other operational activities (Dobson, Araya, Brounce, et al., 2023).

In addition to brine, ancillary waste streams such as cooling tower blowdown, drilling wastes, hydroblasting and cleaning wastewater, biofilter effluent, sump effluent, effluent from emission abatement systems, and process filtrate may also be discharged into the brine ponds (California Regional Water Quality Control Board, 2023; Dobson, Araya, Brounce, et al., 2023). Although the closed-loop design is intended to minimize releases, accidental pipeline failures, well integrity problems, or storage tank ruptures could result in spills that contaminate soil or surface areas with salts and trace metals (Stringfellow & Camarillo, 2025b).

Brine Pond Solid Waste. Solids are generated from sedimentation in these ponds (Gallup, 2009). They are predominantly classified as hazardous waste and are disposed of in Class I or Class II landfills³¹ (California Regional Water Quality Control Board, 2023; Dobson, Araya, Brounce, et al., 2023). Depending on their composition, these and other waste streams may also be treated or transported off-site for appropriate disposal, as discussed previously.

Recent Solid Waste Disposal. Between 2014 and 2022, geothermal power plants in the Salton Sea geothermal field generated approximately 80,000 metric tons of solid waste annually (Dobson, Araya, Brounce, et al., 2023). Slightly more than half was disposed of as non-hazardous waste in regional landfills, while the remainder was classified as hazardous under California regulations or under both state and federal criteria. Waste was transported to permitted disposal facilities in California (non-hazardous) or out of state (e.g., Arizona) (hazardous) (Dobson, Araya, Brounce, et al., 2023). Some of the 'solid' waste, such as liquid geothermal scale sludge, was generated intermittently and sent to a specialized chemical waste

²⁹ Storage ponds used for brine that is not reinjected into the geothermal reservoir. Solids may be removed by evaporation or other methods (e.g., settling or manual removal). Brine may also be recycled back into the plant.

³⁰ Artificial pond for non-hazardous 'designated' waste that isolates waste from surface and groundwater (i.e., with a liner system) (California State Water Resources Control Board, n.d.).

³¹ Class I Landfill is for hazardous solid or liquid waste (regulated by DTSC), Class II Landfill is for solid or liquid waste that threatens water quality, termed 'designated waste', and includes some industrial waste solids (local monitoring and enforcement), and Class III Landfill is nonhazardous solid waste (local monitoring and regulation) (CalEPA, 2026d; Marshack, n.d.).

management facility capable of handling solid, semi-solid, and liquid waste (Dobson, Araya, Brounce, et al., 2023).

Recent Solid Waste Management. An analysis of 2019–2021 data indicates that solid waste generated by geothermal plants in the Salton Sea KGRA was managed as follows: 54% was classified as non-hazardous, 30% as hazardous under California regulations only, 15% as hazardous under both California and federal criteria, and less than 1% was sent for oil and solvent recycling (Stringfellow & Camarillo, 2025b).

Hazardous Materials Used: Geothermal

Chemicals. In addition to geothermal brine, other hazardous materials used and stored during geothermal power production include various chemicals and petroleum products (Rick Engineering Company, 2024). Geothermal facilities in the Salton Sea field use these chemicals in cooling water systems, brine processing, and steam condensation to control scaling, reduce biological growth, limit corrosion, regulate pH, and minimize emissions (Dobson, Araya, Brounce, et al., 2023). The use of new chemicals is subject to review and approval by the California Regional Water Quality Control Board and must comply with applicable Waste Discharge Requirements (Dobson, Araya, Brounce, et al., 2023).

A review of chemicals used at geothermal power plants in the Salton Sea geothermal field, supplemented by literature findings, found no evidence that persistent organic pollutants or acutely toxic chemicals were used for process control (Dobson, Araya, Brounce, et al., 2023). Most of the chemicals were commonly used in industrial processes or water treatment facilities, and many were reinjected into the reservoir with spent brine (Dobson, Araya, Brounce, et al., 2023). The authors indicated that the chemicals used appeared to be “consistent with their reported purposes.”

Current Knowledge of Potential Health Impacts of the Development Associated with the Specific Plan Framework (Hazardous Materials/Waste Management)

Hazardous materials and wastes may adversely affect human health if they contaminate air, water, or soil. The following section first describes expected changes in hazardous materials and waste associated with the buildout proposed under the Specific Plan, followed by a discussion of potential health impacts.

Hazardous Materials and Waste: Geothermal Expansion with DLE

DLE requires freshwater for filter backwashing, lithium recovery, and general plant maintenance, as well as chemicals to control pH, scale, and naturally occurring radioactive materials (Stringfellow & Camarillo, 2025b). While liquid wastes may have limited impacts if reinjected, DLE processes are expected to generate additional solid waste (Stringfellow & Camarillo, 2025b).

Liquid Waste. As discussed previously, most brine is reinjected; however, some ancillary liquid waste streams are managed in brine ponds or treated on-site, with residual solids or sludges disposed of off-site as hazardous waste where appropriate. Strengthened regulations now provide more protective controls than those in place when past discharges from geothermal plants occurred (Dudek, 2025b). Additionally, new brine ponds would be designed and constructed to comply with Class II surface impoundment requirements (Dudek, 2025b), which

requires double-lining, systems for leachate collection and removal, and defined separation from the groundwater table (California Code of Regulations, n.d.-a, n.d.-b).

Solid Waste. Waste generation (hazardous and non-hazardous) is expected to increase as geothermal power production expands under the Specific Plan. Additionally, adding DLE is expected to increase solid waste from additional brine processing and purification of lithium products (Dobson, Araya, & Brounce, 2023). Under geothermal and DLE development scenarios, the annual generation of filter cake and related solid residues could increase substantially. Considering full operation of DLE for all of BHE Renewables current geothermal brine flow and the proposed regional production by CTR, solid waste could potentially reach 14 times current levels, or over 700,000 tons per year (Dobson, Araya, Brounce, et al., 2023). The high-end estimate could be an additional 889,000 tons per year, equivalent to roughly 85 additional truckloads per day (carrying 28 tons each) (Lawrence Berkeley National Laboratory, n.d.). Dobson et al. (2023) recommend exploring uses for these solids that do not require landfilling.

Most solids generated during DLE pretreatment are expected to be non-hazardous, including iron-silica and calcium/magnesium solids, although some iron-silica materials may contain trace levels of toxic elements such as lead and arsenic (Stringfellow & Camarillo, 2025b). However, certain solids are expected to be hazardous, particularly metal-rich wastes (e.g., zinc- and manganese-containing materials), as well as smaller quantities of additional wastes, such as spent adsorbent (Stringfellow & Camarillo, 2025b).

Solid Waste Disposal. Current planning assumptions indicate that non-hazardous filter cake would be transported to the Salton City Landfill, while hazardous waste would be hauled to permitted disposal facilities in Arizona (Dobson, Araya, Brounce, et al., 2023). However, at least one operator anticipates marketing solid byproducts, thereby minimizing or eliminating solid waste requiring disposal (Dobson, Araya, Brounce, et al., 2023). DTSC plans to conduct further research to evaluate how the characteristics of the two primary hazardous solid waste streams, filter cake and brine pond solids, may change with the introduction of DLE (DTSC, 2025a). DTSC will also collaborate with stakeholders to gather additional information on hazardous waste generation and to identify best practices for waste characterization and management (DTSC, 2025b).

Chemicals. The transportation, use, and storage of bulk chemical reagents required for DLE processing (i.e., hydrochloric acid, sodium hydroxide, organic solvents, sodium carbonate) (Nikkhah et al., 2024) also represent a potential source of localized exposure if releases occur. Although the geothermal brine itself remains within a closed reinjection loop, the chemicals used during stripping, regeneration, and product recovery (Nikkhah et al., 2024; Stringfellow & Dobson, 2021) must be transported, stored, and managed in accordance with appropriate industrial safety and hazardous-materials controls.

Hazardous Materials and Waste: Other

In addition to geothermal and DLE expansion and operation, the buildout of the Specific Plan includes wastewater treatment facilities, manufacturing, logistics, solar installations, residential development, and supporting infrastructure (Dudek, 2025b).

A primary health concern associated with this development is construction and grading in areas with existing soil contamination (Rick Engineering Company, 2024). Appropriate mitigation

measures can help protect workers and the public by ensuring contaminated soils are properly identified, handled, and managed during construction activities (Rick Engineering Company, 2024). Construction is also required to incorporate stormwater pollution prevention measures and best management practices to minimize pollutant discharges, properly store materials and equipment to prevent leaks from entering storm drains or waterways, and use filtration or containment controls as needed. Post-construction measures may include street sweeping to reduce PM resuspension and maintenance of storm drain inlets to reduce pollutant runoff (Dudek, 2025b).

Industrial uses associated with the Specific Plan are expected to involve the use, storage, handling, transportation, and disposal of hazardous materials during both construction and operation, including petroleum products for equipment fueling and chemicals used in material processing (Dudek, 2025b). Accidents or operational incidents could also result in hazardous material releases (Dudek, 2025b). Numerous federal, state, and local regulations require proper inventory management, handling, storage, and spill prevention controls wherever hazardous materials are present, and facilities storing hazardous materials above regulatory thresholds must prepare business plans and report to local oversight agencies (Dudek, 2025b).

Potential Health Impacts

Soils in the Specific Plan area contain hazardous materials from past and current agricultural, geothermal, and petroleum-related uses, creating potential exposure risks during excavation, construction, and future occupancy, including vapor intrusion (Dudek, 2025b). Groundwater may be impacted as well. Existing buildings may also contain hazardous materials such as asbestos, lead-based paint, and mercury that could be released if not properly managed (Dudek, 2025b). In addition, spills or accidents during construction, operation, or the transportation of hazardous materials or waste could contaminate air, soil, or water, posing health risks.

Analysis of Potential Health Effects of the Development Associated with the Specific Plan Framework (Hazardous Materials/Waste Management)

The implementation of the mitigation measures identified in the Draft PEIR, together with compliance with applicable existing rules and regulations, would reduce the impacts of hazards and hazardous materials on the public and the environment to less than significant³² (Dudek, 2025b). Additionally, excavation and removal of existing contaminated soils during construction “could also result in an overall reduction of contaminated sites” (Dudek, 2025b).

While regulations, operational standards, and mitigation measures are in place to protect community health and minimize potential harm, ongoing monitoring and effective enforcement help ensure compliance with these standards.

³² Under the California Environmental Quality Act, thresholds of significance are standards or criteria used to evaluate whether a project’s environmental effects could be significant. Please see the draft PEIR for a list of significance thresholds for each environmental impact examined (Dudek, 2025b). In this case, a significant impact would occur if the proposed project created a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials (this is the first of the seven thresholds evaluated) (Dudek, 2025b).

Considerations

As previously described, construction and industrial land uses involve hazardous materials that could affect human health through releases to soil, water, or air. Existing soil contamination within the Specific Plan area, along with the potential presence of hazardous building materials in existing structures, requires remediation and special handling (Rick Engineering Company, 2024) which is proposed in the Draft PEIR. In addition, improper handling, storage, or disposal of hazardous wastes, or failure of landfill liners or containment systems could allow contaminants to leach into surrounding soil, surface water, or groundwater (BRG Consulting, Inc., 2021).

Similarly, pipeline failures, wellhead breaches, or tank ruptures involving geothermal brine or other hazardous materials could contaminate soil, surface water, or groundwater. Geothermal fluids often contain elevated concentrations of salts, metals, and other dissolved constituents that may pose environmental risks if accidentally released (Stringfellow & Camarillo, 2025b). In windy areas, the handling, drying, or storage of hazardous waste solids from brine ponds, industrial operations, or contaminated soils could also generate fugitive dust and disperse contaminants if exposed materials are not properly contained or stabilized (U.S. EPA, 2022b).

The main health effects of exposure to hazardous waste or hazardous materials can include respiratory irritation, skin and eye burns, neurological symptoms (such as headaches, dizziness, or nerve damage), gastrointestinal illness, organ damage, reproductive and developmental effects, and increased cancer risk, depending on the type, concentration, and duration of exposure (CDC, 2011). High-level acute exposures may also result in severe poisoning or death (CDC, 2011).

Although air pollutants and contaminated soil particles may disperse throughout the air basin, those located closest to planned activities would be most likely to experience impacts from windblown soil and water contamination. Existing background pollution levels within various areas of Imperial County can also increase the significance of these exposures. Three schools are located about 0.5 miles from the Specific Plan boundary, and one is approximately 1.5 miles from the boundary (Dudek, 2025b).

Methods to Reduce Health Impacts (Hazardous Materials/Waste Management)

Mitigation in Specific Plan/Draft PEIR

To mitigate any negative health or environmental effects from hazards or hazardous materials, the program intends to utilize the following mitigation measures (Dudek, 2025b):

1. Preliminary Hazardous Materials Evaluation

- Prior to grading or building permits, a hazardous material evaluation to identify past or current soil contamination

2. Soil And Soil Vapor Characterization and Management

- Prepare development plans to avoid soil contaminants
- If past or current operations resulted in contamination of soils or soil vapor, collect and analyze soils
- If soil cannot be avoided, prepare a soil management plan that identifies screening, handling, and disposal of soil and vapor mitigation design as needed

3. Pre-Demolition Hazardous Materials Survey and Abatement

- Demolition plans must incorporate survey and abatement procedures for the identification and removal of materials containing hazardous substances

4. Groundwater Quality Analysis

- Prior to completing dewatering wells during construction, complete a groundwater quality study with an approved sampling/analysis plan
 - If analysis indicates, groundwater management criteria will be developed by a qualified environmental consultant to avoid the discharge of contaminated water

Additional Suggestions

Evaluate opportunities to recover and market valuable byproducts, such as zinc and manganese, and reduce landfill disposal of solid waste (Stringfellow & Camarillo, 2025b).

Suggestions Related to DLE (with Geothermal Expansion)

Decisions regarding the implementation of enhanced protections should be prioritized based on their anticipated health benefits, following the establishment of effective oversight and compliance with applicable regulations, permit conditions, and planned mitigation measures, which may provide sufficient protection if fully implemented and enforced. Additional enhanced measures that could be considered include:

1. Real-Time Leak Detection, Automatic Response (U.S. EPA, 2025f), and Isolation

- Require continuous pressure/flow monitoring and alarms on brine and chemical lines for efficient leak detection
- Implement segment-by-segment isolation
- Investigate automatic shutoff controls
- Minimizing flanged connections (to reduce leak points)

2. Sentinel and Nested Groundwater Monitoring Wells Between Facilities and Receptors as Appropriate (California Department of Water Resources, 2026)

- Install dedicated shallow and deeper monitoring wells between DLE facilities and nearby canals, drains, or any water-supply receptors.
- Include predefined action levels to trigger investigation and corrective action before an exceedance occurs.

3. Expanded Water-Quality Monitoring for DLE/Geothermal-Specific Analytes

- Monitor additional analytes such as lithium, boron, arsenic, manganese, zinc, and process reagents.
- Monitor salinity migration near facilities, brine ponds, and waste handling areas.

4. Independent Third-Party Waste Characterization and Public Reporting

- Routine third-party sampling of filter cake, brine pond solids, and other DLE residues.
- Conduct baseline and follow-up stack testing (before and after DLE initiation) to evaluate emissions and implement additional controls, operational changes, or expanded monitoring if indicated.
- Public reporting about wastes and characterizing them as hazardous or nonhazardous.

5. **Closed Chemical Transfer Systems Plus a Safer-Chemicals Review**
 - Sealed transfer systems for acids, bases, solvents, and treatment chemicals.
 - Secondary containment (U.S. EPA, 2026k) at transfer points.
 - Formal alternatives analysis (U.S. EPA, 2025c) explaining why lower-toxicity reagents cannot be used before higher-hazard chemicals are approved.
6. **Enhanced Design Standards (Brine Ponds and Discharge)**
 - Minimize routine use of brine ponds and use them only during maintenance or upset conditions.
 - Design with double liners, leak-detection systems, storm hardening, and post-storm sampling.
 - Zero off-site discharge (brine ponds, stormwater managed on-site)
7. **Regional Cumulative Monitoring and Incident Tracking Across Operators**
 - Shared operator-funded network for groundwater, canal-adjacent, and waste-stream monitoring.
 - Regional spill/incident database.
8. **Public Notification and Health-Protective Response Protocols**
 - Real-time community notification for spills, pond leaks, fires, or confirmed off-site migration.
 - Plain-language instructions on avoiding contact with canal water, dust, or affected areas.
 - Ensure all notifications are available in English and in Spanish.
9. **Independent Audits and Adaptive Management Triggers**
 - Annual third-party audits of hazardous materials handling, waste determinations, incident logs, and monitoring results.
 - Operational changes if triggers are reached.
10. **Community Oversight**
 - Establish a standing community advisory group with access to monitoring results, incident reports, and audit findings.

7.1.4 Seismic Effects

Definitions of terms used in this section:³³

Fault: A fracture or zone of fractures between two blocks of rock. Faults allow blocks to move relative to one another. This movement may occur rapidly, as an earthquake, or slowly, as creep.

Slip: The relative displacement of formerly adjacent points on opposite sides of a fault, measured on the fault surface.

Seismicity: The geographic and historical distribution of earthquakes.

Induced Seismicity: Earthquakes caused by human activity (Cochran et al., 2024).

Background (Seismic)

³³ Sources: United States Geological Survey websites:
<https://www.usgs.gov/faqs/what-a-fault-and-what-are-different-types> and
<https://www.usgs.gov/glossary/earthquake-hazards-program>.

Salton Sea Geothermal Field

The Salton Sea Geothermal Field refers to specific areas within the Salton Sea KGRA where geothermal energy is being produced (Dobson, Araya, Brounce, et al., 2023; Letcher & Axelsson, 2022). The Salton Sea geothermal reservoir is a naturally occurring hydrothermal system consisting of high-temperature, highly saline geothermal brine that contains dissolved lithium and other mineral resources (Dobson, Araya, Brounce, et al., 2023; Rocha et al., 2024). The Salton Sea geothermal reservoir is located deep underground in the Salton Trough,³⁴ a tectonically active³⁵ area near the San Andreas Fault (Kaspereit et al., 2016). The geothermal field exists within the broader Brawley Seismic Zone and intersects with the Brawley Fault (Dobson, Araya, Brounce, et al., 2023). Similar to other parts of California, the Salton Sea geothermal field has a high level of background seismic activity (Dobson, Araya, Brounce, et al., 2023).

The geothermal field is characterized by high permeability, extremely saline geothermal fluids, and reservoir temperatures commonly ranging from approximately 250 to 380 degrees Celsius, with productive zones occurring at depths of about 1–3 kilometers (Dobson, Araya, Brounce, et al., 2023; Hulen et al., 2002). Existing geothermal power plants in the Salton Sea KGRA generate electricity using naturally circulating geothermal fluids that are brought to the surface, utilized for energy generation, and reinjected into the reservoir to maintain reservoir pressure (U.S. Department of Energy, n.d.-c).

Unlike naturally occurring systems such as those in the Salton Sea geothermal field, enhanced geothermal system technology involves injecting fluids underground to create or reopen fractures in low-permeability rock, allowing water to circulate through hot formations (U.S. Department of Energy, n.d.-a). Seismic risk considerations differ for enhanced geothermal systems, particularly for periods of fluid injection during creation or expansion of subsurface fractures (Gaucher et al., 2015; Majer et al., 2007).

Earthquake Magnitude Scale and Earthquake Frequency

The magnitude of an earthquake is a logarithmic measure of the size or total energy released at its source (Pacific Northwest Seismic Network, n.d.). Each whole-number increase in earthquake magnitude corresponds roughly to a tenfold increase in the amplitude of seismic waves recorded on a seismogram (EarthScope Consortium, 2025; U.S. Geological Survey, n.d.). Magnitude is distinct from intensity. Intensity describes the strength of ground shaking at a particular location and can vary depending on distance from the source and local geologic conditions (U.S. Geological Survey, n.d.).

A general guide to the typical effects associated with different magnitude ranges is available in Table 21 (Michigan Technological University, 2026). Consistent with known magnitude–frequency relationships for earthquakes, small events occur far more frequently than large events, and many low-magnitude earthquakes are not felt at the surface (EarthScope Consortium, 2025; U.S. Geological Survey, n.d.).

³⁴ The Salton Trough is “a tectonically active sedimentary pull-apart basin that occurs at the southern tip of the San Andreas fault system” (Kaspereit et al., 2016).

³⁵ “Tectonically active” means that the Earth’s tectonic plates (large sections of rock that make up the Earth’s outer layer) are moving in the area, which can contribute to earthquakes and other geologic activity (National Geographic, n.d.).

Table 21. Earthquake Magnitude Scale, Typical Effects, and Estimated Number Globally

Magnitude	Earthquake Effects	Global Estimated Number Each Year
2.5 or less	Usually not felt	Millions
2.5 to 5.4	Often felt, causes minor damage	500,000
5.5 to 6.0	Slight damage to buildings	350
6.1 to 6.9	May cause significant damage in populated areas	100
7.0 to 7.9	Major earthquake; serious damage	10-15
8.0 or greater	Massive damage - can destroy communities	Once every year or two

Sources: Modified from Michigan Technological University's *Earthquake Magnitude Scale*
<https://www.mtu.edu/geo/community/seismology/learn/earthquake-measure/magnitude/>.

Induced Seismicity and Geothermal Energy Generation

Mechanisms. Geothermal operations typically involve the circulation of large volumes of brine through production and reinjection wells (Cochran et al., 2024). Geothermal energy production can influence seismicity because the extraction and reinjection of fluids change reservoir volume and may modify subsurface pore pressure, temperature, and stress conditions (Cochran et al., 2024; Holmgren et al., 2026; Im & Avouac, 2021; Moein et al., 2023). Increases in pore pressure during fluid injection can create new fractures or reduce frictional resistance on existing faults, potentially triggering seismic slip (Ge & Saar, 2022; Holmgren et al., 2026; Majer et al., 2007). Changes in fluid volume associated with production and reinjection may also compact or stress the reservoir rock, altering fault stability and contributing to seismic events (Koirala et al., 2024; Majer et al., 2007; Moein et al., 2023).

Reinjection of cooler fluids may cause thermal contraction of fracture surfaces. Geochemical reactions between injected fluids and reservoir rock may further modify fracture strength and permeability, particularly when non-native fluids are present (Ge & Saar, 2022; Holmgren et al., 2026; Majer et al., 2007). These thermal, hydraulic, and chemical processes can change local stress conditions within the reservoir and have been hypothesized to contribute to induced seismicity. In addition, when reinjection volumes are lower than production volumes, gradual declines in reservoir pressure and temperature may occur (Cochran et al., 2024), further influencing fault stability (Segall, 1989; Zang et al., 2014).

Earthquake Rate Changes. Within conventional hydrothermal geothermal systems, as opposed to enhanced geothermal systems, most induced seismic events are microearthquakes³⁶ that are not felt at the surface (Buijze et al., 2019; Gaucher et al., 2015; Li et al., 2022; Majer et al., 2007; Zang et al., 2014). However, geothermal operations have occasionally been associated with larger, felt earthquakes, most often in enhanced geothermal systems (Buijze et al., 2019; Gaucher et al., 2015). Induced seismicity can depend on reservoir conditions, local geology, and operational practices such as fluid injection and production rates (Buijze et al., 2019; Gaucher et al., 2015; Li et al., 2022; Majer et al., 2007; Zang et al., 2014). Most induced seismic activity occurs within or immediately adjacent to active production and/or injection zones (Brodsky & Lajoie, 2013; Cardiff et al., 2018; Koirala et al., 2024; Tung et al., 2024). Additionally, fluid injection may initially be associated with increased low-magnitude seismicity; however, studies indicate that seismic activity can level off over time as the system approaches a new equilibrium

³⁶ Magnitude less than 2.0 or 3.0.

(Majer et al., 2007). It should also be noted that not all earthquakes occurring near geothermal fields are induced, as geothermal resources commonly exist in tectonically active regions where natural seismicity is already frequent (Majer et al., 2007).

Damaging earthquakes require several conditions, including the presence of a sufficiently large fault, stresses capable of overcoming the forces holding the fault in place, and rupture occurring at depths where enough elastic strain energy can accumulate (Majer et al., 2007). Larger earthquakes typically originate at depths greater than about 5 kilometers, whereas shallow crustal fractures, such as those often associated with geothermal reservoirs, generally have lower seismogenic potential and tend to produce smaller events with weaker ground shaking (Majer et al., 2007).

Some researchers have proposed that long-term geothermal production can modify subsurface stress conditions, which may either promote or inhibit fault slip depending on reservoir conditions (Cardiff et al., 2018; Im et al., 2021; Im & Avouac, 2021; Tung et al., 2024; Zang et al., 2014). In some cases, geothermal production may release part of the elastic strain energy already present in the crust, potentially contributing to small earthquakes while reducing the stress available to drive larger events or aftershock sequences (Im et al., 2021; Im & Avouac, 2021). Other studies suggest that geothermal production may alter stress conditions on nearby faults, which can influence the spatial and temporal distribution of seismicity, without determining whether these changes increase or decrease the likelihood of future earthquakes (Tung et al., 2024). Additionally, some studies report that seismicity increases when geothermal operations decline, specifically when production ceases or when pore-fluid pressure decreases (Cardiff et al., 2018; Koirala et al., 2024; Tung et al., 2024). Cardiff et al. (2018) suggested that the “subsurface has adapted to the long-term operations (deep extraction) at the site.”

Forecasting: Forecasting the timing and location of future earthquakes that cause ground shaking remains a significant challenge. Long-term earthquake hazard models typically do not incorporate induced (human-caused) seismicity because it can change rapidly over short time periods (Cochran et al., 2024). However, newer physics-based approaches can estimate earthquake rates that vary more quickly than can be represented in standard one-year hazard maps by incorporating current geothermal brine injection rates into the analysis and including more information in estimates (Cochran et al., 2024; Gaucher et al., 2015).

Seismicity Likelihood from Energy Development (All Types). As stated by the National Academy of Sciences in 2013 (The National Academies et al., 2013):

“Although the vast majority of earthquakes that occur in the world each year have natural causes, some of these earthquakes and a number of lesser-magnitude seismic events are related to human activities...” (p. 5)

“Although only a very small fraction of injection and extraction activities at hundreds of thousands of energy development sites in the United States have induced seismicity at levels that are noticeable to the public, seismic events caused by or likely related to energy development³⁷ have been measured and felt in Alabama, Arkansas, California,

³⁷ Energy development types include geothermal, enhanced geothermal systems, secondary and tertiary oil and gas recovery, hydraulic fracture for shale gas production, hydrocarbon withdrawal, wastewater disposal wells, and carbon capture and storage.

Colorado, Illinois, Louisiana, Mississippi, Nebraska, Nevada, New Mexico, Ohio, Oklahoma, and Texas.” (p. 1)

In the United States, observations from liquid-dominated geothermal systems, including the Salton Sea geothermal field, indicate that induced seismicity at levels that are felt is generally limited in both frequency and magnitude (Majer et al., 2007; The National Academies et al., 2013). Among 23 geothermal projects in the U.S. through 2013, an estimated 10–40 felt seismic events per year were attributed to, or considered likely related to, geothermal energy development, and only one event exceeding magnitude 4.0 (4.1) was identified as possibly associated with geothermal operations (The National Academies et al., 2013).

Determining Causes of Seismicity

Determining whether seismicity is induced by human activities or results from natural tectonic processes can be difficult, particularly in regions with high background seismicity (Brodsky & Lajoie, 2013; Centeno et al., 2025; Li et al., 2022; Llenos & Michael, 2016; Martínez-Garzón et al., 2018; The National Academies et al., 2013; Trugman et al., 2016). The Salton Sea geothermal region is considered a seismically active area characterized by high structural and tectonic complexity, which further complicates attribution of earthquake causes (Li et al., 2022; Martínez-Garzón et al., 2018).

Uncertainty in determining the cause of the seismicity may arise from limited ability to measure subsurface conditions at depth, delays between industrial operations and seismic response, the presence of pre-existing faults and fracture zones, interactions among earthquakes, earthquake clustering, and the possibility that human activities may trigger events that were already close to occurring due to natural tectonic stresses, and site-specific characteristics, among other factors (Brodsky & Lajoie, 2013; Cochran et al., 2024; De Santis et al., 2026; Li et al., 2022; Llenos & Michael, 2016; Moein et al., 2023). As a result, distinguishing induced from natural seismicity typically requires detailed analysis of local geologic conditions, seismic records, and operational data, and attribution may remain uncertain in some cases (Brodsky & Lajoie, 2013; Cochran et al., 2024; De Santis et al., 2026; Li et al., 2022; Llenos & Michael, 2016; Moein et al., 2023).

The Earthquake Hazards Program of the U.S. Geological Survey conducts research on the causes of induced seismicity in the U.S. and evaluates associated seismic hazards (Cochran et al., 2024). This program monitors seismic activity, analyzes links between industrial operations and earthquake occurrence, and develops forecasting approaches that can inform monitoring requirements and mitigation strategies for industry-related seismicity.

Induced Seismicity and Geothermal Energy Generation at the Salton Sea Geothermal Field

Geothermal operations began in 1982 at the Salton Sea geothermal field, and activities increased later in the decade. Several studies found that seismicity increased in the initial years after increased production (Brodsky & Lajoie, 2013; Lawrence Berkeley National Laboratory, n.d.; Llenos & Michael, 2016; Trugman et al., 2016). Researchers noted that the increase leveled off in the early 2000s, with only weak correlations to injection volume and a stronger influence from regional tectonic activity (Dobson, Araya, Brounce, et al., 2023; Lawrence Berkeley National Laboratory, n.d.). Other researchers noted relatively stable rates after 1990 (Trugman et al., 2016), with fluctuations consistent with natural earthquake swarms common in tectonically active regions (Llenos et al., 2009).

Additional studies have evaluated whether changes in net production rate, defined as the difference between geothermal fluid extraction and reinjection,³⁸ are associated with temporal patterns of seismicity in the Salton Sea geothermal field, with mixed findings. Two studies reported no consistent relationship between seismicity and geothermal operations after the initial years of operation, with observed fluctuations attributed to natural earthquake swarms that commonly occur in this tectonically active region (Martínez-Garzón et al., 2018; Trugman et al., 2016) (data examined from 2008-2015 and 1981-2013, respectively). Other analyses identified correlations between seismicity and operational factors such as net production or injection rates, suggesting that changes in reservoir pressure may influence earthquake occurrence (Brodsky & Lajoie, 2013; Llenos & Michael, 2016) (data examined from 1982-2012 and 1975-2012, respectively). Li et al. (2023) found possible correlations between net production rate and earthquakes of magnitude greater than 1.5, whereas smaller events showed no clear relationship (from 2008 to 2013). Using a probabilistic modeling approach, other authors concluded that geothermal energy production was associated with increases in seismic activity between 1972 and 2022, most notably to the east of the Brawley fault, where injection exceeds production (White & Nakata, 2025).

Baseline (Seismic Activity)

Salton Sea KGRA Faults and Seismic Activity History

The Salton Sea KGRA lies within an active seismic zone near several major faults in Imperial County, including the San Andreas, San Jacinto, and Elsinore faults, as well as the Brawley Seismic Zone (Rockwell et al., 2014) (Figure 11). In the Final Baseline Report (Rick Engineering Company, 2024), authors note that, “Currently, portions of the County are affected by minor earthquakes with magnitudes of 4.5 or less every few months. The County may experience an earthquake with a magnitude of 5.5 or greater every five years and dozens of micro-seismic events, with magnitudes of 2.0 or less, on a daily basis,” based on information from cited sources (California Department of Conservation, 2024; McCrink, Timothy et al., 2011; Minnick, 2022). The County of Imperial reported that “Over the last 100 years, the Imperial Valley area experienced 11 earthquakes of magnitude 6.0 or greater with the strongest earthquake being a magnitude of 7.2 in 2010” (Minnick, 2022).

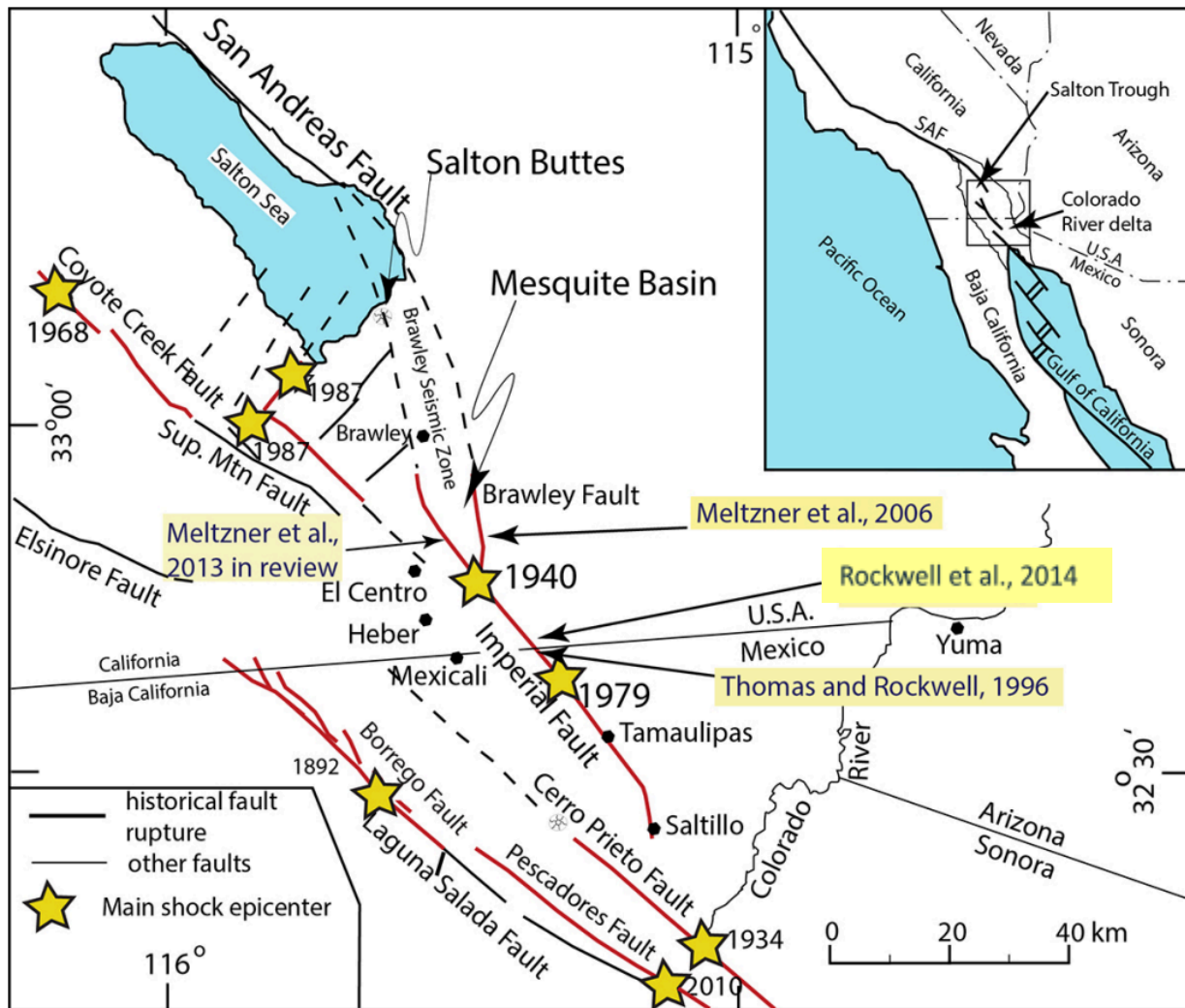
The earthquakes of magnitude (M) 6.2 or greater in Imperial County and northern Mexico between 1915 and 2010 are listed below, with some mapped in Figure 11 (California Department of Conservation, 2024):³⁹

- 1915 – Northern Mexico, near El Centro (M 6.6)
- 1934 – Northern Mexico, near El Centro (M 6.5 and M 7.0, two earthquakes one day apart)
- 1940 – Imperial Valley (M 7.0)
- 1942 – Westmorland area (M 6.6)
- 1956 – Northern Mexico, near El Centro (M 6.5)
- 1968 – Borrego Mountain (M 6.6)
- 1979 – Imperial Valley (M 6.5)
- 1987 – Superstition Hills (M 6.2 and M 6.6, two earthquakes on the same day)

³⁸ On average, 82% of the produced (extracted) brine is reinjected, with the rest being lost to evaporation (Eneva, 2023).

³⁹ Source uses the terminology ‘magnitude.’ The magnitude type is not specified, but it is assumed to be *moment magnitude* (a logarithmic scale measuring the total energy released by an earthquake).

- 2010 – Calexico (M 7.2)



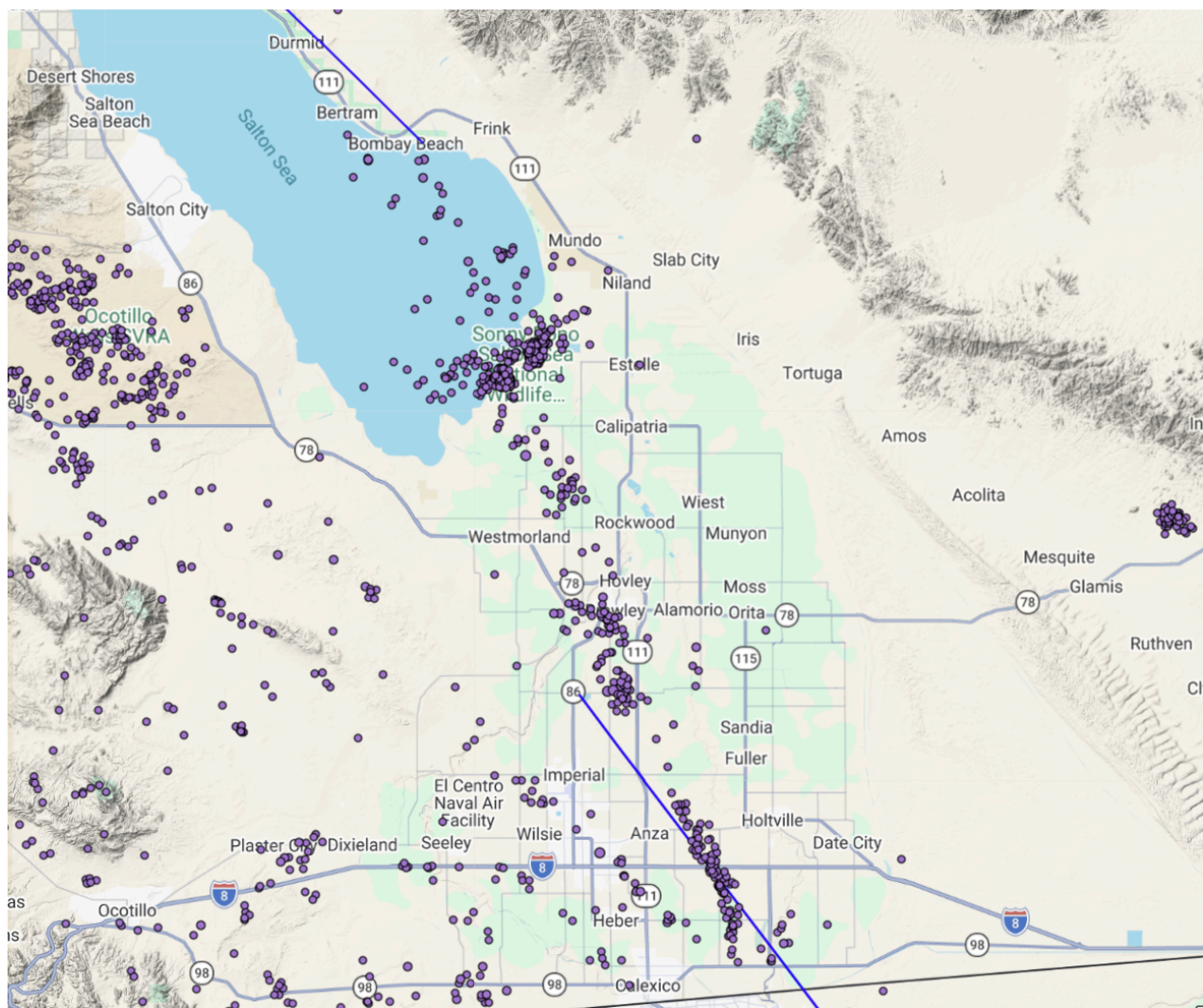
Source: (Rockwell et al., 2014)

Referenced in map: (Meltzner et al., 2006, 2015; Rockwell et al., 2014; Thomas & Rockwell, 1996)

Figure 11. Simplified Fault Map and Seismicity of the Southern Part of the Salton Trough: Surface Ruptures for 1892 (M 7.3), 1934 (M 6.5 & 7.0), 1940 (M 7.0), 1968 (M 6.6), 1979 (M 6.5), 1987 (M 6.2 & 6.6), and 2010 (M 7.2) Earthquakes⁴⁰

Figure 12 presents earthquakes recorded in and around Imperial County during 2025. Approximately 1,200 events occurred within the mapped region, with all but two having magnitudes of 3.5 or less. The largest events included a magnitude 4.3 earthquake near the southeast shore of the Salton Sea and a magnitude 3.8 earthquake located approximately 7 kilometers south of Brawley (EarthScope Consortium, n.d.). A total of 1,109 earthquakes had magnitudes of 3.0 or lower (EarthScope Consortium, n.d.), consistent with the Gutenberg–Richter magnitude–frequency relationship, which indicates that small earthquakes occur far more frequently than larger events (Langenbruch et al., 2024).

⁴⁰ M = magnitude as designated by the California Department of Conservation (2024).



Source: EarthScope Consortium sourcing earthquake data from the U.S. Geological Survey every 15 minutes <https://ds.iris.edu/ieb/index.html> (accessed 3/20/26)

Figure 12. Map of Earthquakes Recorded in the Vicinity of Imperial County between 1/1/25 and 12/31/25

Salton Sea KGRA Ground Deformation

Ground deformation (i.e., changes in the Earth's surface) can result from natural processes such as volcanic activity and tectonic faulting, as well as human activities, including geothermal resource extraction (NERC Centre for the Observation and Modeling of Earthquakes, Volcanoes & Tectonics, 2019). Geothermal operations may induce localized deformation by altering reservoir pressure (Lobos Lillo et al., 2023), although such changes are generally small (on the order of millimeters per year). However, even minor changes can disrupt precisely engineered drainage and water delivery systems in agricultural regions such as the Imperial Valley (Eneva, 2023).

Using Interferometric Synthetic Aperture Radar, researchers have documented ground deformation in the Salton Sea area (Eneva, 2023). For example, following the start of operations

at a new geothermal facility in 2012, ground subsidence (i.e., sinking) of up to 18 millimeters per year was observed in areas where no prior sinking had been detected (Eneva, 2023). In addition, the CalEnergy geothermal plants have experienced ongoing subsidence of up to 30 millimeters per year since the early 1980s (Eneva, 2023).

Analysis of Potential Health Effects of the Development Associated with the Specific Plan Framework (Seismic)

DLE at the Salton Sea KGRA is not expected to substantially change seismicity, as lithium recovery occurs after geothermal brine is produced during normal geothermal operations (Lawrence Berkeley National Laboratory, n.d.). Project descriptions indicate that DLE would operate within the existing closed-loop production and reinjection system and is not anticipated to require additional drilling or reinjection beyond that associated with geothermal power generation (Lawrence Berkeley National Laboratory, n.d.).

However, if additional geothermal wells are drilled or production and reinjection rates change substantially, seismic activity could increase, although the extent to which geothermal operations influence seismicity in the Salton Sea region remains uncertain. Most seismic events associated with geothermal activity are expected to be of small magnitude; however, earthquakes up to or in the range of M 4.0 to 5.5 could be induced (Dudek, 2025b). They could also occur independently of project activities. Earthquakes of this magnitude could damage structures not built to current seismic standards and result in injuries from falling or unsecured objects (Dudek, 2025b). Structural damage could also affect industrial facilities, including chemical storage tanks, pipelines, and brine-handling equipment, potentially causing releases that could affect air, soil, or water quality and result in secondary environmental or health impacts (Dudek, 2025b).

The Draft PEIR identifies the following conclusions regarding seismic hazards (Dudek, 2025b):

- The likelihood of fault rupture associated with the development proposed under the Specific Plan is considered less than significant.⁴¹
- All new construction and modifications to existing facilities would be required to comply with current building code requirements, including applicable seismic design standards, thereby reducing the potential for structural damage (Dudek, 2025b).
- Infrastructure, including underground pipelines, must be resilient to ground deformation. The analysis also notes that geothermal development involves managing reservoir pressure and monitoring operations that could influence seismicity (Dudek, 2025b).
- With the implementation of the proposed mitigation measures, seismic impacts are expected to be less than significant (Dudek, 2025b).

Methods to Reduce Health Impacts (Seismic)

⁴¹ Under the California Environmental Quality Act, thresholds of significance are standards or criteria used to evaluate whether a project's environmental effects could be significant. Please see the draft PEIR for a list of significance thresholds for each environmental impact examined (Dudek, 2025b). In this case, a significant impact would occur if the proposed project would directly or indirectly expose people or property to substantial geologic or seismic hazards as well as other geologic hazards identified under the applicable significance thresholds (Dudek, 2025b).

Mitigation in Specific Plan/Draft PEIR

Construction and operation must comply with a host of federal, state, and local regulations as delineated in the draft PEIR (Dudek, 2025b). Some activities mentioned include: preparing site-specific geotechnical investigations, meeting California technical standards for earthquake design, ensuring worker safety related to construction, having supervision of the State Oil and Gas Supervisor, following requirements for unstable earth conditions, following requirements for well injection and obtaining approval, submitting information to appropriate regulatory agencies, limiting Particulate Matter emissions, integrating public health needs into land use planning, and preparing for and responding to natural and human-caused disasters, among others (Dudek, 2025b).

Specific mitigations noted in the draft PEIR include (Dudek, 2025b):

1. Induced seismicity avoidance monitoring and mitigation plan

- Organizations must prepare an Induced Seismicity Avoidance, Monitoring and Mitigation Plan and receive approval prior to constructing or operating new wells.
- Plans must include developing seismic monitoring, adjusting operations depending on conditions, evaluating whether geothermal activity is correlated with seismic events above certain thresholds, and establishing a notification protocol for seismic events.

2. Subsidence monitoring and mitigation plan

- Organizations must prepare a Subsidence Monitoring and Mitigation Plan prior to approval of any geothermal activities (or industrial activities involving the extraction/injection of fluids subsurface).
- The ground-survey study must be completed every 12 months, and any adjustments that the California Geologic Energy Management Division determines necessary and appropriate must be completed to alleviate any damage must be implemented.

Additional Suggestions

Decisions regarding the implementation of enhanced protections should be prioritized based on their anticipated health benefits, following the establishment of effective oversight and compliance with applicable regulations, permit conditions, and planned mitigation measures, which may provide sufficient protection if fully implemented and enforced.

The mitigation measures recommended in the scientific literature to reduce the potential for seismic impacts are consistent with the monitoring and management practices described previously. For example, Zhou et al. (2024) propose an *Induced Seismicity Risk Management Framework* that integrates lessons learned from prior geothermal, oil and gas, and underground injection projects. The framework includes the following components (W. Zhou et al., 2024):

1. Seismic risk pre-screening

- Evaluate the potential level of seismic concern at a proposed site and identify key data gaps.

2. Data acquisition and research

- Collect geological, geophysical, and operational data needed to support “meaningful pre-screening” or a full risk assessment.

3. Comprehensive seismic risk assessment

- Conduct site-specific analyses to evaluate the likelihood and consequences of induced seismicity, including the development of seismic hazard and risk models.

4. Seismic risk mitigation

- *Technical measures*: Establish seismic monitoring networks, implement traffic-light⁴² protocols, and define operational responses for elevated seismicity (e.g., modification or reduction of injection/production activities).
- *Financial measures*: Evaluate potential liabilities, develop compensation and insurance mechanisms, and plan for infrastructure protection and “worst-case scenarios.”

5. Communication and outreach

- Engage stakeholders⁴³ early, consider local “social context” and risk perception, and develop clear communication approaches involving operators, regulators, and the community (W. Zhou et al., 2024).

Similarly, De Santis et al. (2026) identify the following core elements of effective seismic hazard assessment and mitigation:

- (i) an adequate geological characterization of the target reservoir;
- (ii) dedicated seismic monitoring and advanced seismic data analyses;
- (iii) the continuous monitoring of hydraulic operational data and their correlation to recorded seismic data; and
- (iv) an efficient mitigation strategy for real-time modification of hydraulic operations, based on the seismicity recorded.

Additional recommendations in the literature emphasize the importance of applying current best practices, using established risk-assessment methods, and maintaining transparency with affected communities. These recommendations include:

1. **Use up-to-date modeling approaches** for seismic hazard and risk assessment, as described in recent studies (Cacace et al., 2021; De Santis et al., 2026; R. G. Hill et al., 2024; Karimpouli et al., 2025; Moein et al., 2023; White & Nakata, 2025).
2. **Consult existing good-practice guidance** documents for induced seismicity risk management (Ineris & BRGM, 2023; Majer et al., 2012; W. Zhou et al., 2024).
3. **Strengthen communication with local communities** and stakeholders (Grigoli et al., 2017; Majer et al., 2007, 2012), including (Majer et al., 2007):
 - Ensuring that the local population directly benefits from the project.
 - Maintaining communication among operators, regulators, and residents.
 - Establishing and publicly sharing monitoring and reporting plans, as well as monitoring results.
 - Conducting ongoing outreach and education efforts.

⁴² Term for a calibrated control system for real-time monitoring and management of seismicity (red = pumping stops immediately, amber = proceed with caution, possible reduction in flow rates, and green = pumping proceeds as planned) (Majer et al., 2007).

⁴³ In their model, stakeholders include regulators, operators, independent experts, vendors, affected communities, and the general public.

- Improving working relationships between geothermal operators and local residents. In one documented example, a good-neighbor policy included “a pro-active approach to seismic monitoring, reporting, investigating and, if necessary, compensating for any damage.”
4. **Evaluate reinjection rates** across all operators and monitor surface deformation to help identify and mitigate potential environmental impacts (Eneva, 2023).

7.1.5 Stress, Psychological Well-Being, and Employment

Because physical health and access to healthcare are addressed earlier in this report, this section focuses on the psychological and social aspects of stress and well-being, as well as employment.

Background (Stress and Psychological Well-Being)

Stress

Stress is a related but distinct concept with varying definitions (Epel et al., 2018). One widely cited description defines stress as the process by which individuals respond to “expectations and pressure from the environment” that may be perceived as “threatening or overwhelming” (Lazarus and Folkman, 1986) as cited in (Slimmen et al., 2022).

“Stress can be brief, situational, and a positive force motivating performance, but if experienced over an extended period of time it can become chronic stress, which negatively impacts health and well-being” (American Psychological Association, 2026).

The term stress is often used to describe both external life events or circumstances and the responses they produce, including cognitive, emotional, and biological reactions (Epel et al., 2018).

Well-Being

Health and well-being encompass physical, mental, and social dimensions (Bai et al., 2012). According to these authors, physical health includes disease, injury, and disability; mental health includes illness, trauma, cognitive functioning, and emotional well-being; and social well-being relates to relationships, community belonging, social isolation, family changes, and empowerment (Bai et al., 2012).

Baseline Information (Stress, Psychological Well-Being, and Employment)

As part of the 2024 Imperial County Community Health Assessment process, PRC conducted a Community Health Survey in 2022 with 1,747 Imperial County respondents: 748 through a random sample contacted by cell phone or landline, 836 through an online survey link, and 163 through paper surveys distributed and collected by the health department (PRC, 2022). The analysis included methods designed to ensure the sample was representative of Imperial County residents (PRC, 2022).

Information from this survey on selected factors related to stress and psychological well-being, including financial conditions, mental health, and substance use, is summarized in the following table.

Table 22. Responses Indicating/Affecting Stress or Reduced Mental Well-Being, PRC 2022 Community Health Survey Compared to California and United States Sources Cited in the PRC Report

Question	Population (as cited in PRC report)		
	PRC CHS ^{1,2}	California ¹	United States ¹
Financial Related			
Worry/stress over rent/mortgage in the past year	47.2%	-	32.2%
Unhealthy/unsafe housing conditions	21.9%	-	12.2%
Food insecure	44.8%	-	34.1%
Unable to pay cash for a \$400 emergency expense	37.6%		24.6%
Mental Health Related			
Fair/poor mental health	28.8%	-	13.4%
Diagnosed depression	24.3%	14.1%	20.6%
Symptoms of chronic depression (2+ years)	46.1%	-	30.3%
Typical Day Is "Extremely/Very" Stressful	17.3%	-	16.1%
Taking prescription/receiving mental health treatment	14.6%	-	16.8%
Substance-Use Related			
Excessive drinker	23.8%	18.0%	27.2%
Illicit drug use in the past month	3.3%	-	2.0%
Personally impacted by substance use	34.1%	-	35.8%

¹ Source: (PRC, 2022).

² CHS is the Community Health Survey.

As noted previously (Section 6.3.3), the American Community Survey (2024 Five-Year Estimates) categorizes 19.5% of Imperial County residents at or below the federal poverty level, compared to 12.0% for California (*Census Reporter*, n.d.). Additionally, in 2025, 18.6% of the labor force was unemployed (Employment Development Department, 2026).

Current Knowledge and Analysis of Potential Health Impacts of the Development Associated with the Specific Plan Framework (Stress, Psychological Well-Being and Employment)

Stress and psychological well-being in and near the Specific Plan area may be affected by the following changes and conditions.

Environmental Quality

Stress associated with the construction and operation of industrial facilities can affect nearby residents by altering environmental quality, including noise, air pollution, dust, and odors (M. Lima & Marques, 2017). These changes can contribute to both physical and mental health stress (M. Lima & Marques, 2017).

Air Pollution, Dust and Odors. How people perceive changes in their environment can influence their well-being, with individuals living near industrial areas reporting higher levels of concern (M. Lima & Marques, 2017). In one study, residents of industrial areas reported greater

environmental annoyance related to noise, air quality, and overall perceived environmental quality, as well as lower levels of well-being and optimism, compared with residents of non-industrial areas (Marques & Lima, 2011). Another study found that “residential proximity to industrial activity” was associated with poorer mental health, and that living in areas affected by environmental contamination had negative impacts on mental health and psychological well-being (Downey & Van Willigen, 2005).

Noise. Development conducted under the Specific Plan framework could create temporary noise impacts for nearby sensitive receptors, including residences in Calipatria and Niland, as well as nearby schools, parks, religious institutions, and rural homes (Dudek, 2025b). While most construction noise would be far away from these sensitive sites, some activities may occur as close as 50 feet from residences, resulting in temporary increases in construction and traffic noise (Dudek, 2025b). Proposed mitigation includes temporary sound barriers, setbacks, traffic management, and compliance with County noise standards, but some unavoidable short-term construction noise impacts would remain (Dudek, 2025b).

Operational noise from increased truck traffic, employee commuting, and industrial activities is also expected to affect the local environment (Dudek, 2025b). Although the Specific Plan requires setbacks, noise attenuation walls, designated truck routes, and speed reduction measures, these actions are not expected to fully eliminate exceedances of applicable noise thresholds (Dudek, 2025b). As a result, operational traffic noise impacts are expected to remain. Of note, the proposed rail connection to the Union Pacific Railroad Calexico Subdivision is not near any noise-sensitive sites (Dudek, 2025b).

Environmental and Community Changes

The construction and operation of industrial facilities can affect community identity, alter the use of public spaces, and reduce access to green or restorative areas, thereby diminishing the quality of life (M. Lima & Marques, 2017). In the Specific Plan area, implementation would result in more densely developed areas, including increased population, taller structures, and the loss of some “expansive horizontal views” (Dudek, 2025b). Implementation will also result in population growth and related impacts. These changes, including alterations to the landscape, may affect the region's visual character and influence individuals' and communities' sense of place and belonging.

Population and Growth. Development conducted under the Specific Plan framework is projected to increase population, housing demand, and employment, generating new jobs and substantial long-term growth (County of Imperial, 2025c). Although the plan emphasizes local hiring, workers from outside the Specific Plan area may need to relocate to meet labor demand (Dudek, 2025b). The Specific Plan allows for 556 permanent workforce housing units and 1,720 temporary workforce units (Dudek, 2025b). Growth could place pressure on housing, infrastructure, and local services in surrounding areas (Dudek, 2025b).

Public Services. Public services, including fire protection, law enforcement, schools, libraries, and community facilities, would be supported through planned facilities and development impact fees (Dudek, 2025b). School impact fees would also help fund any necessary school construction or expansion (Dudek, 2025b).

Recreational Amenities. The Specific Plan includes guidance for recreational amenities such as walking and biking trails, parks, river corridor access, and on-site recreation facilities for larger

employment campuses (County of Imperial, 2025c). These improvements are intended to expand and create new recreational opportunities.

Transportation and Traffic. Transportation impacts would be addressed by complying with County plans, policies, and standards for emergency access, road safety, and construction traffic management (Dudek, 2025b). While the Specific Plan includes a variety of measures to reduce traffic impacts, such as roadway and bridge improvements, enhanced bicycle, pedestrian, and transit facilities, and shuttle services (County of Imperial, 2025c), the number of vehicle miles traveled resulting from the project is projected to increase (Dudek, 2025b). Under operational traffic modeling (excluding construction impacts) without shuttle services, and assuming a workforce of 21,000 employees during the first 10 years, estimated vehicle miles traveled would exceed one million (Dudek, 2025b).

Concerns and Changes in Perception. Previous experiences can influence perceptions of risk and levels of concern. For example, individuals may have concerns about the responsible development of industry based on past experiences with other industries (Brasier et al., 2011). In one example, these authors measured the quality of life during an industrial installation (M. Lima & Marques, 2017). Residents closest to the installation reported higher risk perception and annoyance than those farther away, although this diminished over time, with perceptions becoming more positive. The authors note that local identity and perceived justice can impact the perceived threat. In another study, authors found that when individuals live near industrial areas and also perceive that they live in an industrial area, they have improved psychological symptoms, perhaps due to a reality-orientation (Marques & Lima, 2011).

Tribal Cultural Resources. Potential impacts to tribal cultural resources include potential changes to culturally significant landscapes; land uses affecting Obsidian Butte, Rock Hill, Red Island, Mullet Island, mud pots, trails, and archaeological sites containing prehistoric cultural materials (Dudek, 2025b). Physical changes to the natural setting, including effects on plants, animals, viewsheds, industrial noise, and lighting, also affect these resources (Dudek, 2025b).

Employment and Economic Impact

“Implementation of the LVSP [Lithium Valley Specific Plan] would result in the long-term commitment of natural resources and land including the elimination of agricultural land and conversion to specific land uses” (Dudek, 2025b).

As discussed previously, development proposed under the Specific Plan framework is expected to increase employment opportunities, workforce training, and access to resources. The *Imperial County Good Neighbor Community Benefit Agreement Program* (Imperial County, 2024), Specific Plan policies, and lithium excise taxes are intended to help ensure that nearby communities and their residents share in these benefits.

Employment. The proportion of jobs ultimately filled by local residents remains uncertain. Alhajjar et al. (2025) report that most extraction, production, and maintenance positions require at least a high school diploma. However, the local workforce has a limited supply of more skilled labor, particularly among residents with degrees in chemical, electrical, and mechanical engineering, as well as in business fields needed to support the emerging industry (Alhajjar et al., 2025). Consistent with these needs, local post-secondary institutions are developing training programs focused on the skills required for the lithium and geothermal industries.

EnergySource Minerals, in partnership with Imperial Valley College and other industry collaborators, launched the Lithium Industry Force Training program in 2023 to provide a one-year certification pathway for careers in the lithium industry (Shah & Office of Energy Dominance Financing, 2025). This program offers training certificates in plant operations, chemical laboratory technology, and instrumentation technology (Imperial Valley College, 2026). Continued and sustained funding will be important to expand these efforts and meet projected workforce demand (Alhajjar et al., 2025).

Housing/Economic. Improvements in parks, transportation, access to grocery stores, and other neighborhood amenities can attract new investment and new residents from outside the community, potentially increasing housing costs and contributing to the unintended displacement of existing residents if not carefully managed (Aboelata et al., 2017). Similarly, a rapid increase in workers can have the same effect (Brasier et al., 2011).

Summary

Community development generally involves investing in an area's social, economic, political, and environmental conditions to improve the quality of life (CDC, 2024c; Public Health Institute, 2026). These efforts can address social determinants of health and promote community well-being (Public Health Institute, 2026). However, community-level change may also create stress for residents, particularly when it affects housing, employment, social connections, or neighborhood stability, for example, through rising housing costs, redevelopment, population shifts, or a perceived loss of neighborhood identity (CDC, 2024c; Luke et al., 2026).

Methods to Reduce Health Impacts (Stress, Psychological Well-Being, and Employment)

Mitigations from Draft PEIR (other than those discussed previously)

A summary of the mitigations described in the Draft PEIR (Dudek, 2025b) is listed below. See the Draft PEIR for a full explanation.

1. Noise and Visual

- Solar/agrivoltaics systems conduct a solar glare analysis and reduce glare as indicated
- Stationary noise sources located as far as feasible from sensitive receptors, or adequately muffled
- For construction activities close to residences, equip with mufflers
- Noise attenuation walls for sensitive receptors when sound exceeds the sound level standards
- Prohibit construction traffic from traveling along roadways adjacent to residences

2. Agriculture

- Payment of Agricultural and Other Benefit Fees for farmland

3. Biological Resources

- Several mitigations directed towards biological resource protection

4. Cultural Resources

- Cultural Resources Specialist to review Cultural Resources Impact Analysis Report
- Historic Era Build Environmental Resources
 - Technical work conducted prior to the start of construction
 - Ensure potential impact is assessed as part of the planning process
 - Earth-disturbing work halted if cultural resources are identified and contact an archaeologist
- Archaeological Resources
 - Qualified archaeologists to confirm the level of analysis needed
 - If human remains are discovered, no further disturbance until proper handling is determined
- All future project contractors include a standard clause in all contracts that requires cultural resources sensitivity training for workers

5. Housing and Population

- Coordination and Inclusion in Regional Planning – complete a Regional Transportation Plan and Regional Housing Needs Assessment as applicable

6. Transportation

- Trip Reduction Program: 50 employees or more must prepare a Trip Reduction Program (commute trip reduction program, marketing, carpool/vanpool, incentives, transit passes, employee shuttles, telecommuting, alternative work schedule.
- Site Design: Each development is to connect pedestrian and bike facilities to existing and proposed facilities
- Transit Oriented Features: consult with developer/applicant to contribute towards construction/implementation of transit features (connect to a hub, enhance services, bus shelters).

7. Tribal Cultural Resources (in addition to those noted under Cultural Resources)

- Review for Inadvertent Impacts to Tribal Cultural Resources – newly identified tribal cultural resources report to the County of Imperial to review/manage
- Tribal Sensitivity Management Area – monitoring program
- Other plans (not mitigation) include the construction of the Tribal Heritage Trail.

General Suggestions

Procedural justice is defined as transparency in decision-making, opportunities to hear and include local voices in the project, and treating residents with respect (Krütli et al., 2012). Lima & Marques (2017) determined that procedural justice “is particularly important in the initial phases of a change project, as it promotes the perceived control over the process, a fundamental variable in quality of life” (M. Lima, 2006; M. Lima & Marques, 2017).

The authors also suggested that “participation of the residents in the planning phases of a large facility in the neighborhood is a way of both increasing the quality of the final project (as it includes local knowledge and interests) and facilitating the adaptation to the new facility. In terms of the psychosocial processes involved, perceived control, perceived justice, and local identity are key variables, as they are linked to well-being and the quality of life of residents” (M. Lima & Marques, 2017).

In another publication, the authors described the implementation of an inclusive, interactive public participation process for planning two development projects (M. L. Lima et al., 2012). The

process resulted in increased community knowledge, improved communication strategies by the developer, and a shift in the developers' perceptions of and engagement with the community.

Suggestions for Preventing Displacement

Improvements in parks, transportation, access to grocery stores, and other neighborhood amenities can attract new investment and residents from outside the community (Aboelata et al., 2017). To help ensure these changes improve the health and well-being of current residents, recommended strategies summarized from Aboelata et al. (2017) include:

1. **Influencing Policy and Legislation:** Adopt equitable policies and legislation to ensure fair resource allocation and incorporate health equity into land-use decisions.
2. **Changing Organizational Practices:** Revise organizational practices to focus on reducing displacement risk and strengthening community resilience.
3. **Fostering Coalitions and Networks:** Build coalitions and networks that can leverage resources, engage decision-makers, and address multiple risk and protective factors.
4. **Educating "Providers":** Equip trusted community leaders, including professionals, civic leaders, and faith leaders, to advocate for healthy development without displacement.
5. **Promoting Community Education:** Promote community education and engagement by sharing information, resources, and skills that build awareness, collective action, social connections, and self-determination.
6. **Strengthening Individual Knowledge and Skills:** Strengthen individual knowledge and skills to support participation in decision-making processes and ensure policies, practices, and advocacy reflect community needs. This may include financial literacy, workforce development, and employment support.

Additional recommendations from another source include preserving existing affordable rental housing, protecting long-term residents who wish to remain in their communities, expanding affordable housing options, incentivizing developers to build affordable units, and supporting residents in achieving homeownership (Physical Activity Policy Research and Evaluation Network, 2022).

Suggestions for Promoting Health through Local Employment

While plans are in place to encourage and prepare local residents for employment in the new industries, requiring that employers set and meet local hiring goals can help ensure that existing residents of Imperial County share in the economic benefits, which can improve health outcomes. Additionally, monitoring and providing support to people who lose employment or livelihoods due to shifting land-use patterns can help mitigate any income losses.

7.1.6 Occupational Concerns: Heat Stress, Injury, etc.

Background (Occupational: Heat Stress, Injury, etc.)

Geothermal

The U.S. Department of Labor's Occupational Safety and Health Administration (**OSHA**) identifies several workplace hazards associated with the geothermal energy industry, including (OSHA, n.d.-e):

- **Electrical hazards** – Installation, operation, and maintenance of large electrical pumps, as well as power generation, transmission, and distribution systems, can expose workers to shock, arc flash, and other electrical risks.
- **Fall hazards** – Work performed near trenches, excavations, pits, or elevated above-ground system components may create fall risks.
- **Silica exposure** – Silica sand, commonly found in soil, sand, and granite, can become airborne during work activities. Inhalation of crystalline silica dust may cause silicosis, a permanent lung disease.
- **Trenching and excavation hazards** – Activities such as drilling wells, installing underground piping, and conducting maintenance may expose workers to cave-ins, struck-by hazards, and other excavation-related dangers.
- **Welding and cutting hazards** – Work involving metal pipes and system components may expose workers to burns, hot metal, fumes, and ultraviolet radiation from arc welding.

OSHA also lists personal protective equipment in the hazards section, noting that employers must assess workplace hazards and provide appropriate personal protective equipment, such as safety glasses, hard hats, gloves, respirators, and other protective gear (OSHA, n.d.-e).

Additional concerns identified on the website include exposure to hydrogen sulfide, hazardous gases in confined spaces (in this case, a common spray lubricant), and accidental contact with hot brine, which may cause burns (OSHA, n.d.-e).

Geothermal Electrical Power Generation

When geothermal plants generate electricity, additional hazards associated with the power generation, transmission, and distribution industry may also be present (OSHA, n.d.-b). Key hazards include:

- **Electrocution** – fatal or serious injuries resulting from electrical incidents.
- **Falls** – injuries related to working at heights or around elevated equipment.
- **Confined spaces** – risks arising when air quality is not properly tested, evaluated, or monitored.
- **Fires and explosions** – incidents involving steam, hot water, or other hazardous energy sources.
- **Sprains, strains, and fractures** – musculoskeletal and impact injuries related to physical work activities.

- **Environmental stress (heat)** – heat-related illness or injury from high-temperature working conditions.

Hazardous Materials/Chemicals

Hazardous substances, chemicals, and vapors may be used and/or generated during geothermal operations, DLE, and construction activities, depending on the specific processes and technologies employed (see Section 7.1.3). Examples include:

- **Geothermal operations:** Naturally occurring gases and vapors such as hydrogen sulfide, ammonia, trace carbon dioxide, and hot brines containing dissolved minerals and metals may be present (Lawrence Berkeley National Laboratory, n.d.).
- **DLE processes:** Depending on the technology used, lithium extraction may involve reagents such as acids, bases, solvents, sorbents, or other treatment chemicals (Saleem et al., 2025).
- **Construction activities:** Common hazardous substances may include fuels and equipment exhaust emissions, paints and coatings, asbestos, solvents, welding fumes, and respirable crystalline silica dust generated during cutting, grinding, or drilling concrete, stone, brick, and similar materials (OSHA, n.d.-i, n.d.-j, n.d.-a).

Construction

In addition to the geothermal and hazardous materials hazards described above, construction workers may also be exposed to risks associated with heavy equipment operations, falling or struck-by objects, vehicle and mobile equipment movement, noise and vibration, and ergonomic injuries resulting from repetitive motion or lifting and carrying heavy materials (OSHA, n.d.-a, n.d.-b, n.d.-d, n.d.-h).

Baseline (Occupational: Heat Stress, Injury, etc.)

Employers are required to report on-the-job or work-related fatalities or serious injuries/illnesses to the California Division of Occupational Safety and Health (also known as **Cal/OSHA**) as well as accidents involving large quantities of toxic or flammable materials (California Department of Industrial Relations, 2025).

Between April 2021 and April 2026, five accidents and one complaint prompted OSHA inspections at the 11 geothermal plants within the Salton Sea KGRA (OSHA, n.d.-c) (Table 23).

In total, OSHA issued nine citations for violations related to the 11 geothermal plants in the Salton Sea KGRA, all of which were later marked as abated (i.e., successfully corrected) (OSHA, n.d.-c). The citations involved failures to adequately establish, implement, and maintain an effective injury and illness prevention program; protect workers from indoor and outdoor heat illness through prevention measures and training; immediately report any serious injury, illness, or death; and maintain pipelines containing hot, poisonous, corrosive, or flammable substances in a manner that prevents dangerous vibrations (California Department of Industrial Relations, 2026). Four of the citations specifically mentioned heat hazards (OSHA, n.d.-c).

Table 23. OSHA Inspections in Zip Code 92233 between 4/23/21 and 4/23/26

Type of Inspection and Related Activity	Non-Geothermal Businesses		Geothermal Plants/ Businesses	
	Number Conducted	Number Violations	Number Conducted	Number Violations
Planned or Program-Related (and no related accident)	14	36	0	0
Accident or Related Activity is Accident	11	24	5	8
Complaint	1	6	1	1

Source: OSHA Establishment Search Results (OSHA, n.d.-c): <https://www.osha.gov/ords/imis/establishment.html>.

General Heat Impact: Between April 1 and November 8, 2025, hospitals in Imperial County reported 168 heat-related illnesses and five probable heat-related deaths (Imperial County Public Health Department, n.d.). Approximately 40 cases of heat exhaustion or other heat-related illnesses were work-related (all businesses/employers).

Current Knowledge and Analysis of Health Impacts Related to the Development Associated with the Specific Plan Framework (Occupational: Heat Stress, Injury, etc.)

The development proposed under the Specific Plan would involve new construction, population growth, expanded geothermal operations, new energy industries, and DLE, which would increase the number of employees in Imperial County who could be exposed to occupational hazards. Although the overall injury rate per worker is not expected to change if safety practices are maintained, a larger workforce could lead to more occupational injuries and illnesses. The types and causes of occupational injuries may remain similar to those already associated with construction and geothermal operations, including heat stress, physical injuries, noise exposure, and contact with hazardous materials.

Compared with conventional geothermal operations, DLE facilities may introduce additional occupational hazards, including chemical handling, pressurized processing systems, corrosive materials, additional lithium product dust (beyond current levels in geothermal operations), increased maintenance activities, and startup or process upset conditions. The specific occupational hazards may vary depending on the type of DLE technology employed.

Methods to Reduce Health Impacts (Occupational: Heat Stress, Injury, etc.)

As part of a worksite analysis, employers must identify and understand potential hazards related to air contaminants, as well as chemical, biological, physical, and ergonomic risks (OSHA, n.d.-g). Employee exposures can be minimized through the following control measures (OSHA, n.d.-g):

- **Engineering controls** – Implementing controls such as isolating workers from hazards, eliminating toxic chemicals, substituting less hazardous materials, enclosing work processes, and installing ventilation systems.
- **Work practice controls** – Modifying how tasks are performed to reduce exposure, including implementing safe procedures, regularly inspecting and maintaining

equipment, providing supervision, maintaining good housekeeping, and restricting eating to designated areas.

- **Administrative controls** – Scheduling production activities or tasks to reduce the duration or intensity of employee exposures.
- **Personal protective equipment** – Providing appropriate protective equipment when other control measures are not feasible or when additional protection is needed.

Mitigation in Specific Plan/Draft PEIR

Mitigations mentioned in the Draft PEIR that affect occupational health are those related to working with hazardous materials (see Section 7.1.3) and dust suppression (see Section 7.1.1).

The Draft PEIR notes that all construction and operational activities would be required to comply with applicable OSHA and Cal/OSHA worker safety standards (Dudek, 2025b). These agencies also regulate excavation, trenching, and evacuation activities, which are among the most hazardous aspects of construction (Dudek, 2025b).

For hazardous materials, OSHA and Cal/OSHA require worker training, exposure limits, safe handling procedures (Rick Engineering Company, 2024), and emergency response planning to reduce occupational risk and the potential for accidental releases (OSHA, n.d.-f; Rick Engineering Company, 2024). Cal/OSHA also requires injury and illness prevention programs, chemical hygiene plans for certain materials, and specific protections such as lead exposure standards (Rick Engineering Company, 2024).

Additionally, the Specific Plan requires industrial projects to prepare a Safety and Health Program (County of Imperial, 2025c):

“Industrial projects shall submit a Safety and Health Program as part of the development application demonstrating their compliance with applicable Cal/OSHA and Federal OSHA regulations, and shall address safety protocols including but not limited to:

- a. Workplace hazards and risk mitigation strategies*
- b. Emergency response protocols and reporting mechanisms*
- c. A schedule for regular internal audits and compliance reviews*
- d. Ongoing worker training to understand how the program works and how to carry out the responsibilities assigned to them under the program.”*

Additional Suggestions

In addition to compliance with applicable OSHA and Cal/OSHA requirements, project operators could implement additional industry best practices as appropriate. Enhancing oversight and compliance with applicable regulations, permit conditions, and planned mitigation measures may be beneficial.

7.1.7 Health Care Services Availability

Background (Health Services Availability)

For additional information on the availability of health services, see Section 6.

Baseline (Health Services Availability)

According to the U.S. Agency for Healthcare Research and Quality (Agency for Healthcare Research and Quality, 2021):

“Attaining good access to care means having:

- *Health insurance that facilitates entry into the healthcare system.*
- *Timely access to needed care.*
- *A usual source of care with whom the patient can develop a relationship.*
- *The ability to receive care when there is a perceived need for care.”*

While some aspects of access to care, including provider availability and health insurance coverage, were discussed previously, this section provides additional information on the receipt of health care and the barriers to care in Imperial County.

In the 2022 PRC Community Health Survey, when asked about difficulties accessing healthcare services in the past year, 53.0% of adults reported some type of difficulty or delay in obtaining services (PRC, 2022).

Barriers included (PRC, 2022):

- 30.4% - getting a doctor’s appointment
- 27.9% - inconvenient office hours
- 24.4% - finding a doctor
- 20.0% - cost of the visit
- 17.6% - prescription cost
- 14.1% - lack of transportation
- 3.4% - language/culture

Additionally, 16.0% of surveyed adults reported skipping doses or stretching prescriptions in the past year to reduce costs (PRC, 2022). When asked about care for a randomly selected child in the household, 10.1% of parents reported that at least once in the past year, when their child needed care, they were unable to get it.

Key informants who identified access to health care as a major community concern highlighted several challenges (PRC, 2022):

- **Limited provider and service availability:** Shortages in specialty care, primary care, rehabilitation services, nursing home facilities, and geriatric medicine. Some out-of-town physicians are available only a few days per week and can be difficult to contact. Limited access to medical procedures and technology, such as colonoscopies and endoscopies, was also noted.

- **Barriers to timely and convenient care:** Long waits for appointments, extended in-office wait times, and limited clinic locations, hours, and services. Distance to care was identified as an additional barrier for rural residents.
- **Behavioral health access challenges:** Insufficient behavioral health services and long wait times for available care.
- **Health care system issues:** An overburdened system with poor communication, limited coordination of resources, and inadequate patient education.
- **Complex care coordination needs:** Individuals with serious conditions, such as cancer, face challenges related to insurance navigation, understanding coverage, coordinating care with Mexico, higher out-of-pocket costs, and increased caregiver support needs.
- **Personal and social barriers:** Social isolation, mistrust of service providers, incomplete documentation, and fear of being considered a “public charge.”

Current Knowledge and Analysis of Health Impacts Related to the Development Associated with the Specific Plan Framework (Health Services Availability)

Currently, behavioral health services and medical providers are located within five miles of the Specific Plan development area (Rick Engineering Company, 2024). However, as the population increases due to the development proposed under the Specific Plan, demand for additional healthcare services is expected to grow. Additionally, existing service gaps could be exacerbated if they are not adequately addressed.

Methods to Improve Health Services Availability

Specific Plan Methods

According to planning documents, the County of Imperial County intends to ensure that essential public services, including fire protection, law enforcement, and emergency medical services, are in place before employees are accommodated in workforce housing (County of Imperial, 2025c). In addition, to address gaps in medical services in the northern region, the Imperial Valley Healthcare District plans to potentially expand access through mobile and telehealth services and to update planning documents to reflect changing population estimates, thereby guiding service delivery growth (County of Imperial, 2025c).

Funding generated by the Lithium Extraction Tax Law could provide one source to expand health services. Information about the funding plan is available online (County of Imperial, 2025a). The County of Imperial has also identified the California Health Facilities Financial Authority as another potential source of funding for health care services (County of Imperial, 2025c).

Additional Suggestions

Additional recommendations include:

- Identifying the unmet medical needs of residents in the northernmost communities closest to the Specific Plan area through community engagement, as well as assessing barriers to care in order to develop appropriate support services.
- Ensuring that specialty health services related to respiratory illness and asthma are adequately addressed through both clinical care and health education/support services.

7.2 Potential Health Effects Summary

7.2.1 Potential Health Benefits

The development proposed under the Specific Plan is projected to generate lithium-related revenues, a portion of which is designated for community and environmental benefits, including 30 percent for communities most affected by lithium extraction and 20 percent for Salton Sea restoration efforts (California Energy Commission, n.d.; SB-125 Public Resources: Geothermal Resources: Lithium, 2022). Potential benefits could include infrastructure improvements (such as paving roads to reduce dust), community development investments, expanded access to services and resources, higher household incomes, and increased employment opportunities, which may in turn improve access to health care. As noted, social determinants of health play a substantial role in shaping health outcomes (CDC, 2024a; Hacker et al., 2022; Taylor et al., 2016; World Health Organization, 2026b). Collectively, these factors could contribute to improved community health outcomes.

Development proposed with the Specific Plan framework that could improve public health include:

1. **Increased Services and Infrastructure** – Expanded public services, transportation, broadband access, and community programs could improve access to health care and other essential services.
2. **Air/Water Quality and Salton Sea Benefits** – Enhanced Salton Sea restoration efforts funded through project-related revenues, along with dust reduction measures such as paving unpaved roads, could improve local air quality. Converting agricultural lands to other uses would also reduce agricultural emissions and pesticide runoff into the Salton Sea.
3. **Health Care Access** – Expanded mobile health care and telehealth services could improve access to care in rural areas (Butzner & Cuffee, 2021). Population growth could also support the addition of health care providers or facilities, depending on available investment and health workforce capacity.
4. **Economic Opportunities** – Economic growth could improve access to jobs and increase household incomes. Higher incomes are generally associated with improved access to health insurance, transportation, healthy food, stable housing, and health care services.

7.2.2 Potential Net Health Effects

Potential Beneficial Health Effects Summary

The development proposed under the Specific Plan is projected to generate lithium-related revenues, a portion of which is anticipated to be allocated to community benefits and Salton Sea restoration. These investments, along with project-driven economic growth, could support infrastructure improvements, expanded public services, and increased employment and household incomes. These factors are closely linked to health outcomes (CDC, 2024a; Hacker et al., 2022; Taylor et al., 2016; World Health Organization, 2026b) and could contribute to improved community health. Additional benefits may include improvements in air and water quality through measures such as road paving and potential reductions in agricultural emissions from land-use changes (Dudek, 2025b).

Potential Adverse Health Effects Summary

Potential health effects considered in this assessment include the onset and exacerbation of respiratory diseases, neurodevelopmental impacts, cancer risk, premature mortality, cardiovascular disease exacerbation, heat-related illness, injury, and adverse psychological effects.

Potential Net Health Effects

While aspects of the development proposed under the Specific Plan have the potential to improve public health, project implementation is also expected to generate additional pollutant emissions that could adversely affect air quality and increase potential exposures to hazardous materials (Dobson, Araya, Brounce, et al., 2023; Dudek, 2025b). As a result, the overall net health effect remains uncertain.

Equity Considerations

Equity considerations are critical for understanding how impacts are distributed and for ensuring that potential health benefits reach all segments of the population. Population growth may strain access to health care if services and infrastructure do not expand in a proportionate and equitable manner. Economic benefits may also be unevenly distributed, with some residents, including retirees and those not directly connected to new employment opportunities, experiencing limited gains. In addition, individuals facing potential job displacement in the agricultural sector may experience income loss and related adverse health effects if comparable employment opportunities are not available. Residents located closest to industrial development may also face a higher likelihood of adverse impacts due to increased exposure to stressors such as air pollution, traffic, noise, and other changes associated with growth and development.

7.2.3 Likelihood of Health Effects

Table 24 presents an estimate of the relative potential for adverse health outcomes associated with the health concerns identified in the scoping step. Although the overall net health effects remain uncertain, the team used information from Section 7, together with anticipated mitigation measures and applicable standards of practice, to characterize potential adverse health effects as ***unknown (more likely)***, ***unknown***, ***unknown (less likely)***, or ***not likely***. These classifications are

qualitative screening judgments rather than precise predictions and are subject to revision as additional information becomes available, including future monitoring data and project-specific analyses. The rationale for these classifications is described in the discussion following the table.

Table 24. Likelihood of Negative Health Effects on Health from Development Proposed Under the Specific Plan

Area of Health Concern	Likelihood of Negative Effect on Health			
	Unknown but More Likely	Unknown	Unknown but Less Likely	Not Likely
Air- and Soil/Dust-Related Health Effects				
Dust from construction/operation / industrial traffic	X			
Dust from exposed lakebed (playa)			X	
Air pollution related to construction and operation	X			
Air pollution from the increased population and associated development	X			
Potential contamination of toxic chemicals from spills/accidents			X	
Water-Related Health Effects				
Potential drinking water contamination				X
Potential contamination of the Salton Sea water				X
Reduction of available fresh water/source of water for DLE				X
Seismic Activity Health Effects				
Change in seismic activity	Minor seismicity			Major seismicity
Noise-Related Health Effects				
Noise from construction, traffic, and increased industry	X			
Stress/Mental Well-Being				
Potentially negative economic impacts	In areas close to Specific Plan area			
Psychosocial stress associated with rapid development (housing pressure, community disruption, etc.)				
Driving in increased traffic conditions				
Injury				
Occupational (exposure at plan work sites)	X			
Safety concerns at work sites (noise, etc.)	X			
Transportation related (to and from work site; for work)	X			
Health Services Availability				
Reduction in emergency care/services availability			X	
Reduction in health care availability			X	
Specific Health Concerns				
Cancer and asthma (and respiratory, other)		X		

Unknown (more likely). Although the development proposed under the Specific Plan could contribute to air quality improvements through Salton Sea restoration funding, and increased

incomes could support better health outcomes, project implementation would also generate air pollutant emissions in a region that does not meet all applicable air quality standards. Accordingly, the net effects on air quality and associated health outcomes are characterized as *unknown (more likely)*. Although construction dust can often be reduced through standard mitigation measures, dust generation is an inherent component of construction activity and therefore remains within this category. Minor induced seismicity may also occur with expanded geothermal production, and potential stress or negative mental effects may be greater for residents located near Specific Plan boundaries, industrial activity areas, or trucking routes. Similarly, although occupational hazards are extensively regulated by OSHA, Cal/OSHA, and other agencies, the routine nature of workplace exposures and injury risks in construction and industrial settings supports classification of these effects as *unknown (more likely)*.

Unknown. Health outcomes classified as *unknown* include cancer, asthma, respiratory disease, and other illnesses potentially associated with changes in air quality. While these conditions can be influenced by pollutant exposure, the extent to which project-related emissions would measurably affect disease incidence is uncertain. As discussed previously, increases in emissions cannot be directly or reliably translated into specific increases in adverse health outcomes without detailed exposure and epidemiological modeling.

Unknown (less likely). Effects classified as *unknown (less likely)* include hazardous-materials releases or spills resulting from accidents, and reductions in the availability of health care services. Based on available OSHA data, significant spills are relatively infrequent, and stringent requirements govern the storage, reporting, and emergency response for hazardous materials. Although such incidents could pose localized risks, broader community impacts are considered less likely. Existing soil contamination in portions of the Specific Plan area indicates that continued monitoring and appropriate site management would remain important. In addition, the development proposed under the Specific Plan is not expected to increase the extent of exposed playa, and with the implementation of applicable mitigation measures, generation of playa dust is not anticipated.

Not Likely. Effects classified as *not likely* include impacts related to drinking water quality and substantial seismic hazards. The development proposed under the Specific Plan would rely on water supplies provided by IID and are not expected to withdraw water from, or discharge water to, the Salton Sea. Existing water rights and allocation priorities indicate that project activities are unlikely to reduce drinking water availability. In addition, stormwater runoff from project sites would be subject to monitoring and treatment requirements to prevent contaminant discharges. Although some uncertainty remains, available information suggests that geothermal development to date has not caused measurable degradation of groundwater quality, and prior studies indicate limited hydraulic connection between shallow groundwater resources and deeper geothermal reservoirs. Lastly, while most induced seismicity associated with geothermal operations is minor, larger, damaging events are less common (Langenbruch et al., 2024). Available research suggests that fluid injection practices may influence the occurrence and frequency of induced earthquakes, although the maximum potential magnitude is more strongly controlled by pre-existing faults and regional tectonic stresses (Langenbruch et al., 2024).

7.2.4 Populations of Concern

As discussed in Section 5, certain populations and locations are of particular concern regarding changes in environmental quality and the social determinants of health. Sensitive populations

include infants, children, and adolescents; pregnant individuals and fetuses; older adults; individuals with chronic respiratory disease; individuals with cardiovascular disease; and workers with occupational exposures. Sensitive receptor locations include areas where children, older adults, or medically vulnerable individuals are concentrated, while economically vulnerable communities are present throughout Imperial County. Monitoring for and preventing adverse health effects within these populations and locations should be a high priority.

7.3 Community Knowledge, Concerns and Perceived Benefits

Between November 2025 and February 2026, trained research assistants administered the Community Intercept Survey to a convenience sample of 299 individuals. Community members were recruited at various community events and public locations, including supermarkets, parks, and community centers across Calipatria, Niland, Westmorland, Brawley, Calexico, and El Centro. Participants completed the survey independently online (n=88), or via in-person outreach (n=211) on paper or by interview. All participants received a \$10 Walmart gift card as compensation for their time.

Of the 299 respondents, 167 lived or worked in northern communities, as determined by their residential ZIP code (Table 25). The sample included a broad age distribution; most respondents (84.7%) identified as Hispanic/Latino (a/e/x), and approximately half were female (Table 26). Additionally, 15.4% (46 individuals) completed the survey in Spanish.

Table 25. City of Residence: Community Intercept Survey, Imperial County and Northern Communities of Imperial County (n=299 respondents)

City of Residence (According to Zip Code)	Imperial County (n=299)		Northern Communities ¹ (n=167)	
	Number	Percent of Responders	Number	Percent of Responders
Brawley	104	34.8%	104	62.3%
Calexico	59	19.7%	--	--
El Centro	47	15.7%	--	--
Westmorland	21	7.0%	21	12.6%
Calipatria	20	6.7%	20	12.0%
Imperial	18	6.0%	--	--
Niland	15	5.0%	15	9.0%
Thermal/Salton City	5	1.7%	5	3.0%
Holtville	4	1.3%	--	--
Herber	3	1.0%	--	--
Ocotillo Wells/Borrego Springs	1	0.3%	1	0.6%
Outside Imperial County: Works in Calipatria	1	0.3%	1	0.6%
Outside Imperial County: Works in Imperial County	1	0.3%	--	--

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Table 26. Demographic Characteristics of Respondents: Community Intercept Survey, Imperial County and Northern Communities of Imperial County (n=299 respondents)

Question	Response Option	Imperial County (n=299)		Northern Communities ¹ (n=167)	
		Number	Percent of Responders	Number	Percent of Responders
Age	18-29 years	64	21.6%	36	21.6%
	30-39 years	36	12.2%	14	8.4%
	40-49 years	44	14.9%	25	15.0%
	50-59 years	64	21.6%	32	19.2%
	60-69 years	51	17.2%	33	19.8%
	70 or more years	37	12.5%	27	16.2%
	Prefer Not to Answer / No Response	3	--	0	--
Race/ Ethnicity	Hispanic or Latino/a (e/x)				
	Hispanic or Latino/a (e/x) only	232	78.9%	112	67.9%
	White	10	3.4%	8	4.8%
	American Indian or Alaska Native or Indígena	4	1.4%	3	1.8%
	Black or African American	1	0.3%	1	0.6%
	Asian	1	0.3%	1	0.6%
	Native Hawaiian or Pacific Islander	1	0.3%	1	0.6%
	Not Hispanic or Latino/a (e/x)				
	White only	34	11.6%	29	17.6%
	Black or African American	4	1.4%	4	2.4%
	American Indian or Alaska Native or Indígena	3	1.0%	2	1.2%
	American Indian or Alaska Native or Indígena and White	1	0.3%	1	0.6%
	Black or African American and White	1	0.3%	1	0.6%
	Native Hawaiian or Pacific Islander	1	0.3%	1	0.6%
	Native Hawaiian or Pacific Islander and White	1	0.3%	1	0.6%
	Not Specified	5	--	2	--
Gender	Woman	149	50.7%	75	45.2%
	Man	144	49.0%	91	54.8%
	Nonbinary or Gender Fluid	1	0.3%	--	--
	Do Not Wish to Say / Not Recorded	5	--	1	--
Distance from Salton Sea	0-10 miles	83	27.8%	80	47.9%
	11-20 miles	42	14.0%	27	16.2%
	21-30 miles	43	14.4%	21	12.6%
	31 or more miles	92	30.8%	22	13.2%
	Unsure	39	13.0%	17	10.2%

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

7.3.1 Community Knowledge about DLE

Respondents demonstrated familiarity with several key topics related to the Salton Sea region, including the location of the Salton Sea, the term “geothermal,” lithium, and the presence of geothermal power plants near the Sea (Table 27). Awareness of these key topics was generally higher among individuals residing in northern communities. Fewer respondents reported familiarity with more technical concepts, such as geothermal brine, lithium extraction from brine, and DLE. Sixty-two percent (62.3%) of respondents in the northern communities were aware of the DLE plans in Imperial County.

Table 27. Responses to Knowledge-Based Questions: Imperial County and Northern Communities of Imperial County, Community Intercept Survey (n=299 respondents)

Question	Response	Imperial County (n=299)		Northern Communities ¹ (n=167)	
		Number	Percent of Responders	Number	Percent of Responders
1. Do you know where the Salton Sea is?	Yes	276	92.3%	160	95.8%
	No	17	5.7%	7	4.2%
	Unsure	6	2.0%	0	0.0%
2. Do you know what geothermal means?	Yes	226	75.6%	128	76.6%
	No	45	15.1%	22	13.2%
	Unsure	28	9.4%	17	10.2%
3. Do you know what geothermal brine is?	Yes	142	47.5%	89	53.3%
	No	127	42.5%	62	37.1%
	Unsure	30	10.0%	16	9.6%
4. Did you know that geothermal power plants near the Salton Sea currently generate electricity?	Yes	210	70.2%	128	76.6%
	No	62	20.7%	26	15.6%
	Unsure	27	9.0%	13	7.8%
5. Do you know what lithium is?	Yes	228	76.3%	137	82.0%
	No	49	16.4%	23	13.8%
	Unsure	22	7.4%	7	4.2%
6. Did you know that lithium can be extracted (removed) from geothermal brine?	Yes	161	53.8%	109	65.3%
	No	117	39.1%	53	31.7%
	Unsure	21	7.0%	5	3.0%
7. There is a large deposit of lithium in the geothermal brine, over a mile underground, near the Salton Sea.	Yes	156	52.2%	105	62.9%
	No	67	22.4%	36	21.6%
	Unsure	76	25.4%	26	15.6%
<i>There is more than one way to get lithium out of the ground. Direct lithium extraction is a new method.</i>					
8. Are you familiar with the method used to extract (get/remove) lithium from geothermal brine, known as direct lithium extraction?	Yes	85	28.4%	67	40.1%
	No	189	63.2%	88	52.7%
	Unsure	25	8.4%	12	7.2%
<i>There are plans to perform direct lithium extraction with existing and future geothermal power plants and processing plants near the Salton Sea.</i>					

9. Before today, were you aware of these plans?	Yes	157	52.5%	104	62.3%
	No	131	43.8%	60	35.9%
	Unsure	11	3.7%	3	1.8%

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

After respondents were asked about their familiarity with DLE (Question 8 in the table above), they were invited to describe what they knew about the process. Most individuals who indicated that they were not familiar with DLE did not provide a response. In total, 69 respondents described their understanding of DLE, including 7 who had previously indicated they were unfamiliar with the technology, 5 who were unsure of their level of familiarity, and 57 who reported being familiar with it. The responses reflected a wide range of knowledge, including detailed technical explanations, general awareness, misconceptions, and inaccuracies (Table 28).

Table 28. Response to the Question: "In your own words, what do you know about it (DLE)?" Community Intercept Survey (n=69 respondents who provided descriptions of DLE)

Familiar DLE ¹	In your own words, what do you know about direct lithium extraction? (Verbatim Responses)	North ²
No	"Collect lithium for batteries"	No
No	"It is valuable mineral for usage in iPhones and electric car lithium batteries."	Yes
No	"Lithium is for cell phones"	No
No	"Se extrae de la tierra" [It is extracted from the earth]	No
No	"Sé que es algo beneficioso para coleccionar energía..." [I know it is beneficial for harvesting energy...]	No
No	"Sé que es algo que se está implementando en California y que próximamente habrá carros que trabajen 100 con litio" [I know it's something being implemented in California, and that soon there will be cars running entirely on lithium]	No
No	"Use ion or solvent extraction to pull lithium directly from the brines."	No
Unsure	"De ahí hacen baterías" [They make batteries from it]	No
Unsure	"Direct lithium extraction is a method that pulls lithium from brines using selective materials, making production faster, more efficient, and with less environmental impact than traditional evaporation ponds."	No
Unsure	"Que extrae litio de salmueras usando resinas o adsorbentes" [They extract lithium from brines using resins or adsorbents.]	Yes
Unsure	"They make a well and take out the electricity."	No
Unsure	"They take away the lithium from the Salton Sea dirt bed."	No
Yes	"Direct Lithium Extraction (DLE) is an innovative, more sustainable technology that pulls lithium directly from underground brines (salty water) using sorbents, membranes, or ion exchange to capture lithium ions, avoiding massive evaporation ponds and reducing water/land use."	Yes
Yes	"DLE as I understand it is the process used to separate Lithium from brine taken out from the geothermal wells."	Yes
Yes	"Drilling"	Yes
Yes	"Extract it from the ground and separate the lithium to make batteries"	Yes
Yes	"He escuchado que se va hacer una pla[n]ta para extraer el litio y hacer baterías" [I have heard that a plant is going to be built to extract lithium and manufacture batteries]	Yes
Yes	"I agree with geothermal brine extraction. There will be benefits and risks. They will be drying the Salton Sea when they extract the lithium."	Yes
Yes	"I heard about it on Facebook. They take lithium and convert it into energy."	No

Yes	"I just know you have to extract it and refine it"	Yes
Yes	"I used to work in something similar. We would drill holes in the earth where they'd place rigs. It was hard work. I also worked security within geothermal plants, but these were close to the ocean. It showed me what it was like being in a plant."	Yes

¹ Response to the question: Are you familiar with the method used to extract (get/remove) lithium from geothermal brine, known as direct lithium extraction?

² North (northern area) defined by zip code of residence: Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Table 28. Response to the Question: “In your own words, what do you know about it (DLE)?
Community Intercept Survey (n=69 respondents who provided descriptions of DLE),
Continued

Familiar DLE ¹	In your own words, what do you know about direct lithium extraction? (Verbatim Responses)	North ²
Yes	“I would say it's like digging or excavating stuff”	Yes
Yes	“It can be extracted from the brine.”	Yes
Yes	“It comes out with the brine then is extracted from the brine. The brine then goes back into the ground. The lithium then goes different phases to get the end result.”	Yes
Yes	“It has to do with batteries”	Yes
Yes	“It has to do with drilling and bringing up gunk”	Yes
Yes	“It involves drilling into the earth”	Yes
Yes	“It is a chemical in the earth”	No
Yes	“It is a closed loop system that extracts lithium from the geothermal brine that is about 1 mile below ground near the Salton Sea.”	No
Yes	“It is a process of taking the geothermal brine already brought to the top for the geothermal flash that produces energy then processed through chemical extraction procedures that separate the lithium and potentially other minerals from the geothermal brine before the brine is re-injected into the ground. It is an extension of the geothermal process into mineral extraction processes with lithium as the prime mineral at this time to be extracted in a closed loop system not exposed to the open air.”	Yes
Yes	“It is digging into a very hot area that can produce energy.”	Yes
Yes	“It is supposed to be a safe process. I took some workshops on it. It is drilling down and separating lithium from the waste. It's a recycling thing. They put what they don't need back into the ground.”	No
Yes	“It will make batteries and generate electricity.”	Yes
Yes	“It's about bringing up gunk from the ground, taking out the lithium, and then pumping the gunk back into the ground”	Yes
Yes	“It's drilling”	Yes
Yes	“It's drilling”	Yes
Yes	“It's drilling. They're running the valley for a dollar with lithium”	Yes
Yes	“It's like fracking, dangerous and combustible”	Yes
Yes	“It's like mining. Even when the wind blows, we can find geothermal energy in its dust, dirt, sand. It doesn't really need to be extracted. We don't need it. There are other ways to get it.”	Yes
Yes	“It's pulling lithium out to use as energy”	Yes
Yes	“It's the mining of lithium rather than pulling it from the brine”	Yes
Yes	“Lithium is pulled from the brine which is in deep underground wells. It is stripped & processed.”	Yes
Yes	“Lo sacan para hacer las baterías” [They extract it to make batteries]	Yes
Yes	“Que aísla el litio de las salmueras subterráneas usando procesos químicos o físicos”	Yes
Yes	“Roughly I have a basic understanding of how it's removed and filter[ed] to extract the minerals then pumped back onto the earth”	Yes
Yes	“Safe reinjection of the brine post extraction . Non water soluble filtration and chemical separation”	No
Yes	“Sé que las excavaciones serán más profundas y podrían afectar al valle.” [I know the excavations will be deeper and could affect the valley.]	No

¹ Response to the question: Are you familiar with the method used to extract (get/remove) lithium from geothermal brine, known as direct lithium extraction?

² North (northern area) defined by zip code of residence: Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Table 28. Response to the Question: "In your own words, what do you know about it (DLE)? (Community Intercept Survey (n=69 respondents who provided descriptions of DLE), Continued

Familiar DLE ¹	In your own words, what do you know about direct lithium extraction? (Verbatim Responses)	North ²
Yes	"Sustainable technology that extracts lithium ions from brine."	No
Yes	"Taking it out of the brine to use for batteries"	Yes
Yes	"The extraction happens through evaporation and earth digging"	Yes
Yes	"The lithium gets brought up from the earth"	Yes
Yes	"The lithium is a metal that comes from the earth"	No
Yes	"The lithium is being taken out of the ground from a deep hole"	Yes
Yes	"The lithium is taken from brine in the ground, and it's really deep in the earth"	No
Yes	"The method is taking stuff out of the ground and the lithium is used for electronics"	No
Yes	"The way they process it they will dig down and extract the brine for the lithium and while doing that they will disrupt the earth and all the dust and pollution will come to my front door"	Yes
Yes	"There's different processes they do, with lot's of minerals and chemicals coming out. People can get cancer from working there."	Yes
Yes	"They are digging a hole and sucking out the lithium"	Yes
Yes	"They are pumping lithium out of the ground"	Yes
Yes	"They dig and steam comes out and produces power. It's with drilling, which is scary because you don't know what you'll find. There's a refinement process for it too."	Yes
Yes	"They dig it."	Yes
Yes	"They drill it."	Yes
Yes	"They extract the lithium from the ground. The brine which comes from volcano veins that run underneath is where they get the lithium from"	No
Yes	"They perforate the ground with machines to extract it"	No
Yes	"They take the lithium out and clean it."	Yes
Yes	"They would extract the liquid and then take the particles from it. Then they would put back what they don't need back into the ground."	Yes
Yes	"To me it's taking something out of the ground"	Yes
Yes	"Turbines in the ground take this element out for batteries. They bring up the water in the earth to do so."	No
Yes	"Water gets filtered and the motion causes electricity. I can assume this can take out lithium that way too."	Yes

¹ Response to the question: Are you familiar with the method used to extract (get/remove) lithium from geothermal brine, known as direct lithium extraction?

² North (northern area) defined by zip code of residence: Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

7.3.2 Community Beliefs about DLE Impacts

On the Community Intercept Survey, respondents were asked about their beliefs regarding DLE, including its potential impacts on their own health and the community's health, as well as any other concerns they might have (Table 29). While over half believed DLE would affect their health, about a quarter were unsure.

Table 29. *Opinions about Health Impacts and Concerns Related to DLE: Imperial County and Northern Communities of Imperial County, Community Intercept Survey (n=299 respondents)*

Question	Response	Imperial County (n=299)		Northern Communities ¹ (n=167)	
		Number	Percent of Responders	Number	Percent of Responders
1. Do you believe that future lithium extraction from geothermal brine in Imperial County will impact your health?	Yes	165	55.4%	100	59.9%
	No	49	16.4%	27	16.2%
	Unsure	84	28.2%	40	24.0%
	No Response	1	--	--	--
2. Do you believe that the future lithium extraction from geothermal brine will impact the community's health?	Yes	176	59.1%	104	62.3%
	No	42	14.1%	23	13.8%
	Unsure	80	26.8%	40	24.0%
	No Response	1	--	--	--
3. Do you have any other concerns about direct lithium extraction from geothermal brine in Imperial County?	Yes	85	28.5%	44	26.3%
	No	186	62.4%	113	67.7%
	Unsure	27	9.1%	10	6.0%
	No Response	1	--	--	--

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

7.3.3 Community Concerns about DLE

Concerns about DLE were identified from qualitative responses collected through the Community Intercept Survey. Because many respondents repeated similar information across multiple questions, referred to earlier responses (e.g., same as previous question”), and expressed the same concerns regardless of the question asked, findings are presented collectively rather than by individual survey question.

Responses related to concerns about DLE were drawn from the following questions:

- Do you believe that future lithium extraction from geothermal brine in Imperial County will impact your health? Please tell us your thoughts:
- Do you believe that the future lithium extraction from geothermal brine will impact the community's health? Please tell us your thoughts:
- Do you have any other concerns about *direct lithium extraction* from geothermal brine in Imperial County) Please tell us your thoughts:
- What are your thoughts about these plans?
- Do you think direct lithium extraction geothermal brine can benefit Imperial County residents? Please tell us your thoughts.

Several key themes related to DLE concerns emerged from the responses and are listed below, with additional discussion provided afterward.

1. **Environmental concerns:** pollution, waste management, potential water or soil contamination, earthquakes, and the possibility of worsening existing environmental conditions.
 - **Resource use:** increased water consumption and energy demand.
 - **Agriculture:** potential adverse effects on farms and crop production.
 - **Salton Sea Impacts:** pollution levels are already high at the Salton Sea and could be further contaminated.
2. **Health concerns:** worsening of existing health conditions, respiratory problems, allergies, cancer, risks to children, occupational risks and general disease concerns.
3. **Traffic concerns:** increased truck traffic and additional strain on roads already heavily used by large trucks and semi-trailers.
4. **Lack of Community Benefits:** skepticism regarding whether government agencies can be trusted and whether development would provide meaningful benefits to the local community.
5. **Other concerns:** population growth or density, project costs, and general opposition to development.

1. Environmental Concerns

When asked to provide details about potential health effects and related concerns, respondents identified pollution and environmental quality as major issues. Concerns included potential impacts on air quality, increased energy demand (particularly if met through fossil fuel-based sources), water contamination (including the possibility of brine entering canals), disposal of contaminated waste materials, and soil or groundwater contamination. Respondents expressed concern that Imperial County already faces substantial environmental challenges, including poor air quality, and that additional industrial development could further worsen existing conditions. A broader perception also emerged that lithium and lithium-related operations may be inherently "toxic" or "hazardous."

Another common theme involved concerns related to land use and natural resources. Respondents questioned whether expansion of DLE facilities could place additional demands on already limited water resources, potentially resulting in water use restrictions or increased costs for residents. Community members also noted the proximity of project areas to the San Andreas Fault and expressed concern that geothermal and DLE activities could increase earthquake risk. In addition, participants raised concerns about potential impacts on agricultural resources, including farmland, crops, and livestock.

Finally, the Salton Sea emerged as a recurring topic in discussions about DLE. Community members questioned whether DLE development would support restoration efforts and expressed concern that DLE activities could worsen existing environmental challenges associated with the Salton Sea. Specific concerns included the potential for increased pollution within the Sea and the possibility that this could contribute to environmental and air quality impacts in nearby communities.

2. Health Concerns

Community members expressed broad concerns about the potential health impacts of expanded DLE activities. Common themes included concerns about respiratory conditions such as asthma, potential cancer risks, and possible effects on children and future generations. Respondents noted that asthma rates are already high in the region and questioned whether additional industrial development could further worsen respiratory health. Many also emphasized that air quality in Imperial County is already poor and expressed concern that DLE expansion could exacerbate air pollution and related health problems. One subtheme was that health impacts, if they occur, would be greatest for residents living closest to project facilities. Respondents also raised concerns about potential exposure to hazardous substances contained in geothermal brine and discussed occupational health and safety risks for workers, describing lithium extraction activities and associated materials as potentially dangerous.

3. Traffic Conditions

Residents of the northern communities expressed concern about transportation-related impacts, including increased traffic congestion, additional truck traffic, and greater strain on road infrastructure that is already heavily used by commercial trucks and semi-trailers.

4. Lack of Community Benefit

Lack of Trust and Concerns about Community Benefits

A recurring theme was skepticism that DLE development would result in meaningful benefits for local communities. Respondents expressed distrust of government oversight and questioned whether county officials and private companies would prioritize community health and well-being over economic interests. References were made to previous industries or development efforts in which promised benefits were perceived as not having materialized, contributing to skepticism about future commitments.

Trust in government and transparency also emerged as important concerns. Respondents questioned whether accurate and complete information about potential environmental and health impacts would be communicated to the public and whether sufficient oversight would be in place to ensure accountability. In addition, respondents expressed doubt that DLE expansion would generate substantial employment opportunities for local residents or that new jobs created would primarily benefit surrounding communities. Overall, respondents emphasized the need for greater communication, transparency, and public engagement regarding potential environmental and health impacts, as well as clear assurances that appropriate protections and oversight measures would be implemented to safeguard community well-being.

Desire for More Information

Another theme was a desire for additional information about DLE and its potential impacts. Community members expressed interest in learning more about existing research and called on the County to provide clear, accessible information regarding potential health, environmental, and community effects. Respondents also expressed conditional support for DLE development, noting that their support would depend on the implementation of effective safety protocols, transparent communication with the public, and assurances that the project would not cause adverse health or environmental impacts.

5. Other Concerns

Miscellaneous concerns about the project included potential costs and adverse economic impacts, such as higher taxes, increased household expenses, potential overcrowding, and general opposition to the project.

Quotes related to these themes are included in Appendix B.

7.3.4 Community-Perceived Benefits of DLE

On the Community Intercept Survey, 62.4% of respondents in Imperial County and 67.1% in the northern communities of Imperial County indicated that lithium extraction could benefit Imperial County residents. Some individuals said it would not benefit residents, while others were unsure (Table 30).

Table 30. Opinions about Benefits from DLE: Imperial County and Northern Communities of Imperial County, Community Intercept Survey (n=299 respondents)

Question	Response	Imperial County (n=299)		Northern Communities ¹ (n=167)	
		Number	Percent of Responders	Number	Percent of Responders
Do you think direct lithium extraction from geothermal brine can benefit Imperial County residents?	Yes	186	62.4%	112	67.1%
	No	39	13.1%	23	13.8%
	Unsure	73	24.5%	32	19.2%
	No Response	1		--	--

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Potential perceived benefits of DLE were identified from qualitative responses provided in follow-up questions throughout the Community Intercept Survey. Benefits mentioned in response to any open-ended question were included in this analysis. Because many respondents repeated similar information across multiple questions, referred to previous responses (e.g., “same as previous question” or “nothing else to say”), and expressed the same themes regardless of the question asked, the findings are presented collectively.

Responses related to the benefits of DLE were drawn from the following questions:

- Do you think direct lithium extraction geothermal brine can benefit Imperial County residents? Please tell us your thoughts.
- Do you believe that future lithium extraction from geothermal brine in Imperial County will impact your health? Please tell us your thoughts:
- Do you believe that the future lithium extraction from geothermal brine will impact the community's health? Please tell us your thoughts:
- Do you have any other concerns about *direct lithium extraction* from geothermal brine in Imperial County) Please tell us your thoughts:
- What are your thoughts about these plans?

Several key themes related to the perceived benefits of DLE emerged from the responses and are summarized below.

1. **Employment and economic benefits:** job creation, economic growth in the area, or both.
2. **Environmental benefits:** generation of clean energy and improvements in the local environment.
3. **Balancing benefits and harms:** weigh potential benefits against potential harms and ensure that community members benefit.

1. Employment and Economic Benefits

Respondents identified job creation, economic growth, or both as potential benefits of DLE development in Imperial County. They expressed the view that new employment opportunities are urgently needed due to persistently high unemployment rates and the loss of major employers, including the recent closure of a local sugar processing facility. Community members hoped that DLE development could provide higher-paying and more stable jobs than those currently available in some sectors, particularly agriculture, while also creating career opportunities for local youth and reducing the need for younger residents to leave the region in search of employment.

Respondents also identified a range of potential economic benefits beyond job creation. These included increased property values, additional tax revenues, and greater investment in public infrastructure and community programs. Other anticipated benefits included growth in local businesses, expanded housing development, increased investment in technology and innovation, lower electricity costs, lower housing costs, and broader economic opportunities throughout the County.

Another recurring theme was the importance of workforce development. Community members emphasized the need for education, job training, and workforce preparation programs to ensure that local residents are qualified for and able to benefit from employment opportunities created by DLE development.

2. Environmental and Salton Sea Benefits

Respondents mentioned that DLE development could yield environmental benefits, including clean energy generation, a cleaner local environment, reduced water contamination, and support for the restoration or cleanup of the Salton Sea.

3. Balancing Benefits and Harms

Another recurring theme was the need to balance the potential economic benefits of DLE development with possible environmental and health risks, while ensuring that any benefits are distributed broadly throughout the community. Respondents emphasized that local residents should directly benefit through local hiring, job creation, workforce development opportunities, and revenue reinvestment, and that potential environmental impacts should be effectively prevented, addressed, and mitigated.

Concerns about the distribution of benefits focused on whether the economic gains from DLE development would remain within the region and be shared broadly across the community. Respondents worried that profits and other economic benefits would primarily accrue to outside interests or be limited to individuals directly employed by the industry, with few benefits reaching the broader population. Another concern was the potential impact on the agricultural sector, including the possibility that ranchers and agricultural employers could lose workers to higher-paid positions in the lithium industry. Related subthemes included concerns that agricultural workers may face barriers to transitioning into new industries because of long work hours, limited access to training, or other constraints. Respondents suggested that paid education, workforce training, and career development programs could help ensure that residents are able to access and benefit from new employment opportunities created by DLE development.

Select quotes related to these themes are included in Appendix B.

7.3.5 Community Suggestions for Information Dissemination

Both Imperial County and Northern Communities respondents largely agreed on how they want to be reached. Social media was the most frequently cited way people want to be reached (see Table 31), followed by community/direct outreach and television, flyers, and town hall meetings.

Table 31. Suggestions for Educating the Community about Future Geothermal and Lithium Extraction Plans (n=299 respondents)

Response Options	Imperial County (n=299)		Northern Communities ¹ (n=167)	
	Number	Percent of Responders	Number	Percent of Responders
Question: What do you think are the best ways to educate and get feedback from people in your community about the future geothermal and lithium extraction plans?				
Social media	146	48.8%	70	41.9%
Other	109	36.5%	79	47.3%
Flyers	89	29.8%	49	29.3%
Town hall meetings	87	29.1%	53	31.7%
Website	67	22.4%	28	16.8%
Email	42	14.0%	21	12.6%

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Respondents also provided additional comments regarding each communication method listed in Table 31 (excluding websites and email). These findings are summarized below, with complete responses available in Appendix B.

Social media: Facebook was the most frequently cited platform, followed by Instagram and TikTok. YouTube and X/Twitter had minimal support.

Beyond digital: Respondents strongly favored in-person, community-based approaches. Door-to-door outreach, tabling at events, and word of mouth ranked highest in the "other" category, followed closely by television and newspaper. Radio, mail, workshops, and phone calls also had notable support. The need for language-accessible information was noted.

Flyers: Community members reported that the best places to distribute flyers include local businesses (grocery stores, salons, barbers), post offices, schools, and busy public areas. Door-to-door delivery was also mentioned.

Town halls: Respondents indicated a preference for holding town halls at city or county facilities and emphasized the importance of hosting meetings throughout Imperial County rather than in a single location. El Centro was the most frequently mentioned specific location. Schools and facilities serving older adults were also identified as potential meeting venues.

8. HIA Step 4: Recommendations

While the Specific Plan provides a program-level framework for future lithium and related industrial development, the precise magnitude, location, duration, and timing of potential environmental and health effects are not yet fully known. The fully proposed development, as allowed within the framework, could provide direct or indirect public health benefits (depending on the type and amount of development), although the overall net effects on health care access, community health, and air and water quality remain uncertain given the available information. Because DLE technologies are not yet widely practiced at a commercial scale, there is limited evidence regarding their potential health impacts.

Although the proposed development may pose health risks, there are numerous existing rules, laws, regulations, ordinances, policies, and proposed mitigation measures intended to protect public health and safety (Dudek, 2025b). Collectively, these requirements are intended to reduce potential health risks by establishing operational standards, requiring pollution controls and environmental monitoring, protecting water and air quality, and providing mechanisms for oversight, compliance, and corrective action. However, it is possible that regulatory frameworks are insufficient, inconsistently implemented, or limited in their monitoring and enforcement.

Additionally, in Imperial County, there are existing air quality challenges, including nonattainment designations for ozone and PM₁₀, as well as concerns about hydrogen sulfide emissions primarily from the Salton Sea and other sources. The maximum development proposed under the Specific Plan would produce emissions of these and other air pollutants, potentially affecting air quality and, in turn, potentially impacting the public's health (Dudek, 2025b). The potential for or magnitude of these potential environmental effects is not yet known, particularly because mitigation measures could not be incorporated into the health impact modeling (Dudek, 2025b). Additionally, much of Imperial County is economically vulnerable, and community members experience higher-than-average rates of certain health conditions as well as limited access to healthcare for some residents, especially in rural areas.

In response to these uncertainties and existing environmental and health concerns, the following recommendations were developed based on the available evidence. They are intended to support ongoing monitoring and adaptive management and to promote safeguards that protect public health and well-being. Implementation will require prioritization and operationalization through collaboration among the County of Imperial, industry partners, and community stakeholders. In doing so, it will be important to consider practical constraints, identify potential funding sources, and align actions with community priorities and available resources.

While these recommendations are broad, the implementation plans translate them into specific, measurable, achievable, relevant, and time-bound (i.e., SMART) actions, including defined monitoring and reporting mechanisms (see Appendix C).

8.1 Recommendation 1: Evaluate and Strengthen Environmental Monitoring and Oversight Systems

The ability to identify, prevent, and respond to potential health impacts associated with development under the Specific Plan framework depends on the effectiveness of environmental monitoring and regulatory oversight systems. These systems should be periodically evaluated and strengthened to ensure they remain capable of detecting environmental changes, identifying non-compliance, and supporting timely corrective actions.

Two priorities should guide these efforts:

- Ensuring that monitoring systems can detect emissions, releases, contamination, or other environmental conditions that could affect public health.
- Ensuring that industry operators, developers, and other entities comply with applicable regulations, permit conditions, and mitigation measures throughout all phases of development and operation.

Key questions include:

3. Are existing monitoring systems sufficient to detect emissions, releases, or contamination and non-compliance in air, water, and soil?
4. Are existing oversight and compliance mechanisms adequate to verify that operators consistently comply with applicable regulations, permit requirements, and mitigation measures?

8.1.1 Assess the Adequacy of Environmental Monitoring Systems and Strengthen Systems as Applicable

Evaluate whether existing environmental monitoring and regulatory oversight systems are sufficient to identify, track, and respond to environmental conditions that may adversely affect public health during the buildout and operation proposed under the Specific Plan. This evaluation should assess whether monitoring systems provide adequate spatial and temporal coverage, measure relevant environmental indicators, generate reliable and timely data, and detect localized and cumulative impacts. Particular attention should be given to whether monitoring locations adequately represent potentially affected communities, whether data are collected frequently enough to detect changing conditions, and whether monitoring networks can detect both anticipated and unanticipated impacts associated with development activities. It should also assess the roles and expectations of parties responsible for the environmental impacts.

Any gaps in monitoring locations, monitoring frequency, measured parameters, data quality, or reporting processes should be identified and addressed through a strategic implementation plan. In developing this plan, the County of Imperial may need to prioritize actions based on potential public health significance, consider technical and financial constraints, identify funding opportunities, align efforts with community priorities, and leverage partnerships with regional, state, federal, academic, and other external resources.

8.1.2 Assess the Adequacy of Compliance Monitoring and Strengthen Oversight as Needed

Compliance with applicable environmental regulations, permit conditions, and mitigation measures is evaluated through multiple oversight and monitoring mechanisms, including permit review and renewal processes, operator self-monitoring and reporting, regulatory inspections, compliance audits, environmental monitoring programs, sampling and laboratory analysis, spill and incident reporting requirements, and third-party verification activities.

Assess Adequacy

Evaluate whether existing compliance monitoring and oversight systems are sufficient to identify non-compliance, verify adherence to permit conditions and mitigation measures, and support timely corrective actions when concerns are identified. This assessment should consider the frequency and scope of inspections, adequacy of monitoring and reporting requirements, data quality and verification procedures, transparency of reporting, and the ability of oversight systems to identify both routine and unexpected compliance issues.

Plan to Address Gaps

Any gaps identified in compliance monitoring or oversight should be addressed through a strategic implementation plan. In developing this plan, the County of Imperial may need to prioritize actions based on potential public health significance, consider technical and financial constraints, identify funding opportunities, align efforts with community priorities, and leverage partnerships with regional, state, federal, academic, and other external resources.

Where feasible, the county should strengthen existing oversight systems by incorporating independent verification measures to improve accountability, transparency, and public confidence. Independent monitoring and data validation can help identify issues that may not be detected through routine compliance activities alone. Potential approaches include third-party environmental monitoring, independent review of environmental data and waste characterization, periodic compliance audits, and public reporting of monitoring results.

8.1.3 Implement Enhanced Environmental Monitoring and Protection Measures as Warranted

Identify and document existing health and environmental monitoring programs, monitoring results, and protective measures to establish baseline conditions. As development under the Specific Plan framework progresses, periodically review environmental and health monitoring data, particularly following major development milestones, environmental incidents, permit exceedances, or other indicators of potential health concern. In conjunction with current scientific literature and evolving operating standards, use these reviews to determine whether enhanced monitoring, additional operational measures, or other protective actions are warranted and feasible to further protect public health. Develop and implement procedures to address noncompliance in ways that strengthen impact mitigation and support improved public health outcomes.

Potential measures may include enhanced ambient and fence-line air monitoring, expanded groundwater and surface water monitoring, predefined health-based action levels that trigger additional monitoring, mitigation measures, or operational changes when environmental conditions indicate a potential health concern, enhanced dust suppression practices, real-time leak detection systems, improved containment measures, and the use of low- or zero-emission equipment. For example, elevated PM_{2.5} concentrations could trigger additional dust control measures, reductions in dust-generating activities, or temporary restrictions on diesel-powered equipment until conditions improve.

If needed, monitoring and response programs developed should support adaptive management, facilitate the early identification and mitigation of potential concerns, account for cumulative impacts, and prioritize protecting communities that already experience disproportionate environmental burdens.

8.1.4 Evaluate and Strengthen Worker Health and Safety Protections as Needed

If determined to be warranted and feasible, engage industry partners to implement enhanced worker health and safety protections beyond minimum regulatory requirements. Potential measures may include respiratory protection programs, heat-illness prevention strategies, air-quality alert systems, exposure monitoring, and wearable technologies that detect heat stress and gas exposures. Worker health and safety programs should be periodically reviewed and updated as operations evolve and new risks are identified.

8.1.5 Evaluate and Strengthen Emergency Preparedness and Response as Applicable

Review and update emergency preparedness and response systems as needed to address potential incidents associated with the development proposed under the Specific Plan. Plans should include community notification protocols, coordination with local emergency responders, healthcare providers, and public health agencies, and clear procedures for incident response, risk communication, and public notification.

8.2 Recommendation 2: Establish Accessible and Transparent Information Sharing

8.2.1 Establish Centralized System

Establish a centralized and accessible system for ongoing information sharing and community engagement. While a digital platform may serve as a core component, information should also be disseminated through multiple channels to ensure equitable access, including in-person outreach, printed materials, community-based organizations, schools, local events, and other trusted community venues. Information should be presented in plain language; interpreted objectively; and made available in English, Spanish, and other languages as needed, and in formats accessible to diverse audiences.

In developing this system, the County of Imperial may need to prioritize included information based on potential public health significance, consider technical and financial constraints, engage industry partners and community stakeholders, identify funding opportunities, align implementation with community priorities, and leverage partnerships with regional, state, federal, academic, and other external organizations. A clear timeline of dissemination activities should be made available as dissemination plans are established and updated.

8.2.2 Project Impact Information

Develop clear, publicly accessible information about the project, including potential environmental and health benefits and risks, mitigation measures, monitoring plans, and opportunities for community involvement.

8.2.3 Environmental Information

Include environmental monitoring data collected by both industry operators and regulatory agencies in the information-sharing system. Information should be presented in a clear and accessible format that enables community members to understand monitoring results, trends over time, and, where appropriate, potential health implications. To support transparency, accountability, and informed decision-making, information should be balanced, regularly updated, and made available as soon as practicable following data collection, analysis, or incident reporting.

The County of Imperial may need to establish clear requirements for the collection and sharing of operational data between industry partners, the County of Imperial, and the public. While some information may be proprietary, key data related to emissions, environmental conditions, incidents, and response actions should be shared in a standardized, accessible format. Data shared needs to be usable, transparent, timely, and include summaries that support understanding by non-technical audiences. Even when information itself cannot be shared with the public, it is recommended that a list of all collected information be shared to ensure transparency about the full context of reporting.

Public Notification

Assess whether establishing a public notification system for environmental incidents aligns with County of Imperial priorities and would provide meaningful benefits to affected communities. If determined to be warranted and feasible, develop and implement a public notification system for incidents such as spills, leaks, fires, releases, permit exceedances, or off-site migration of contaminants that could affect public health. Notifications should be issued as promptly as practicable and provide timely, accurate, and actionable information to affected communities.

Notification procedures should clearly define the types of incidents that warrant public notification, the methods and timelines for communication, the information to be provided, and any recommended actions community members should take to protect their health and safety. Provide transparent means for community members to sign up for public notifications.

Health Information

Determine which health indicators are most appropriate, useful, and feasible to incorporate into the community-shared information system and ongoing monitoring to ensure the community's health is maintained or improved. Prioritize indicators that support the early identification of potential health concerns, recognizing that some health effects associated with environmental exposures may not become apparent for years. Accordingly, monitoring efforts should focus on identifying and reducing harmful exposures before adverse health outcomes occur. In addition, provide clear, accessible, and evidence-based public health information to help community members understand environmental risks and take practical steps to reduce their exposure to pollution.

8.3 Recommendation 3: Create Enforceable Structures to Maximize Community Benefits

Where feasible, establish enforceable (if possible) requirements, performance standards, and accountability mechanisms to ensure that communities meaningfully benefit from development and that potential adverse impacts are avoided, minimized, or mitigated. The County of Imperial may need to identify and prioritize strategies that maximize community benefits from proposed development while considering technical, legal, and financial constraints. This process may include engagement with industry partners, community stakeholders, and public agencies; identification of potential funding sources; alignment with community priorities; and coordination with regional, state, federal, academic, and other external partners to support implementation.

In collaboration with community partners, industry or other partners, key actions may include:

- **Community-level mitigation and investment:** Explore options to fund community-based mitigation measures and other emissions-reduction initiatives, such as indoor air filtration or funds to facilitate changes to non-gas appliances that directly benefit surrounding communities.
- **Indoor air quality protections:** Provide methods to enhance indoor air quality for residents near development sites (e.g., high-quality, high-efficiency air filtration systems, weatherization, alternatives to gas appliances or fireplaces, etc.) in schools, community centers, and homes.
- **Increased setbacks and land use protections:** Increase setback distances beyond minimum regulatory requirements between industrial operations and homes or places where community members spend time, as appropriate. While the proposed geothermal/DLE plants are not located near existing homes, other planned developments may be closer to existing or new residences. If setbacks or other land-use restrictions reduce the amount of developable land, consider strategies to minimize impacts on property owners and affordability, while identifying community-beneficial uses for setback areas, such as parks, trails, habitat restoration, or other public amenities.
- **Health needs assessment and expanded healthcare services:** Identify unmet health care needs, barriers, and health priorities in communities closest to the Specific Plan area. Use this information to provide targeted health services and support programs.

- **Support for respiratory health programs:** Enhance accessibility to specialty care for respiratory conditions, including asthma, along with community-based education.
- **Minimize displacement pressures:** Provide programs or assistance to help nearby residents manage rising housing costs or property taxes.
- **Local hiring goals and workforce development programs:** Establish policies to ensure that employment and economic benefits are accessible to local residents, including local hiring goals, workforce training programs, and support for career transitions.
- **Workforce transition support for agricultural workers:** Provide targeted support for agricultural workers who may be affected by land use changes such as a reduction in agricultural activity. Support could include paid job training, compensated educational opportunities, or clear pathways to acceptable employment.
- **Enhanced community support to promote equity:** Create ongoing opportunities for community members to share concerns, identify needs, and participate in planning. In addition, consider measures to ensure that the benefits of new development are shared broadly, particularly among populations that experience barriers to accessing services and opportunities.
- **Cumulative pollution control:** Investigate ways that existing businesses/industries that contribute to cumulative environmental pollution impacts can become more involved in reducing their emissions, improving regional environmental concerns, or contributing to community-level health investment programs.

8.4 Recommendation 4: Provide Ongoing Engagement with the Community

8.4.1 Engagement Plan

Maintain consistent, meaningful engagement with community members throughout the planning, development, and operation of projects implemented under the Specific Plan framework. Engagement efforts should emphasize education, outreach, transparency, and two-way communication, while supporting the early identification of emerging concerns related to community well-being, stress, environmental conditions, and potential health impacts. Information shared with the public should be evidence-based, accessible, and include practical guidance with resources on potential environmental exposures and actions that can help reduce risk.

In developing an engagement plan, the County of Imperial will need to determine the size and scope of the plan, prioritize actions based on potential public health significance, consider technical and financial constraints, include existing efforts and community partners, identify funding opportunities, align efforts with community priorities, and leverage partnerships with regional, state, federal, academic, and other external resources.

- **Methods:** Direct, two-way engagement, such as answering questions, soliciting community input, and establishing clear mechanisms to address concerns, can help

build and maintain trust with the community. Various authors describe best practices related to meaningful community engagement for development and industry (M. L. Lima et al., 2012; Majer et al., 2007).

- **Industry Partners:** Where feasible, encourage industry partners to designate community liaisons or engagement programs that share information, respond to questions and concerns, and facilitate ongoing dialogue. Consider building on industry-partner education and engagement efforts already underway, as well as lessons learned from them.
- **Hearing and Reporting to Community:** Include clear, accessible, and culturally appropriate processes for community members to raise concerns and receive timely responses. Potential approaches include dedicated hotlines, email addresses, online reporting portals, community liaisons, regular public meetings, and community advisory groups. Procedures may include timelines for acknowledging, investigating, and responding to concerns, as well as mechanisms for tracking issues and communicating actions taken to address them.

8.4.2 Educational Content

Develop educational materials that address community concerns and information needs. Use findings from the Community Intercept Survey, along with other community engagement and feedback efforts, to create accessible, relevant educational content for residents throughout Imperial County, with particular attention to communities in the northern region.

8.4.3 Stakeholder Identification and Engagement

Identify and engage additional community stakeholders to ensure broad and inclusive representation. Assess whether establishing a standing community advisory group or ad hoc committee would improve ongoing communication, facilitate community input, and strengthen collaboration throughout implementation of the Specific Plan.

8.5 Recommendation 5: Strengthen Industry-Community Relationships

Explore opportunities for the County of Imperial to encourage, facilitate, and promote the "good neighbor" program (County of Imperial, 2024) among industry partners to enhance transparency, responsiveness, and community well-being. The current program requires companies to, at a minimum, support local and priority hiring, address workplace safety and quality standards, support education and skill building, participate in community engagement, advance local infrastructure, and support the local economy (County of Imperial, 2024). Potential additional practices may include a voluntary participation level for companies to begin building their engagement, proactive environmental monitoring, public reporting of monitoring results, timely responses to community concerns, and other measures that build trust and strengthen relationships between industry operators and nearby communities.

Additional practices could include community benefit programs that directly support residents in affected areas, such as those described in Recommendation 3 (e.g., providing air filtration

systems to nearby households), funding community improvement projects, supporting local health and education initiatives, or establishing dedicated community liaison positions and outreach programs to facilitate ongoing communication, education, and engagement.

In considering these opportunities, the County of Imperial will need to determine its appropriate role, identify and prioritize strategies that are most likely to benefit the community, assess technical and financial feasibility, build upon existing programs and partnerships, identify potential funding sources, align efforts with community priorities, and leverage collaborations with regional, state, federal, academic, and other external organizations. The goal should be to foster long-term, mutually beneficial relationships between industry partners and the communities affected by development under the Specific Plan framework.

8.6 Recommendation 6: Enhance Health Monitoring

8.6.1 Determine Monitoring Gaps

Determine whether additional health monitoring is warranted by identifying gaps in existing public health surveillance systems and assessing whether additional primary data collection could provide useful information not currently available. Potential approaches may include periodic surveys, focus groups, key informant interviews, community meetings, or other community-engaged methods. The goal should be to identify information that could support the early detection of emerging health concerns, improve understanding of community well-being, and inform future public health actions. Potential areas of focus may include respiratory health, mental health, stress, well-being, quality of life, perceived health impacts, and community concerns related to development and operations within the Specific Plan area.

The County of Imperial will need to assess its capacity to implement and sustain additional health monitoring activities and identify approaches that are both feasible and likely to provide meaningful public health benefits. This process may include evaluating staffing, technical capabilities, and available resources; prioritizing activities based on their potential public health value; building upon existing programs and partnerships; identifying funding opportunities; aligning efforts with community priorities; and leveraging collaborations with regional, state, federal, academic, and other external organizations.

8.6.2 Potential Scope

In addition to environmental health concerns, consider collecting information on broader community stressors and priorities, such as housing, transportation, employment, healthcare access, and other social determinants of health. Understanding the factors that most influence community well-being may help inform future interventions, resource allocation, policy development, and grant-funded programs and services. These collection efforts should build on the community feedback from the Community Health Assessment from 2024, where community members participated in coordinated efforts to voice concerns over local systems that impact health (Imperial County Community Health Improvement Partnership, 2024).

8.6.3 Community Considerations

Data collection efforts may be developed in partnership with affected communities, including Tribal communities and other populations that may experience disproportionate environmental, economic, or health impacts. Data collection activities should be culturally appropriate, responsive to community priorities, and designed to address locally identified concerns.

8.7 Recommendation 7: Health Impact Assessment Planning

Because this is the first HIA conducted for the development proposed under the Specific Plan in Imperial County, establishing a long-term partnership to guide future health assessment and monitoring efforts should be considered. This partnership could provide continuity as development under the Specific Plan progresses by helping to review new information, evaluate the implementation and effectiveness of HIA recommendations, identify emerging health issues, and inform future planning and decision-making.

The partnership should include representatives from local and Tribal communities, public health agencies, environmental and regulatory agencies, industry, academic institutions, healthcare organizations, and other relevant stakeholders. Using a participatory approach would help ensure that community priorities and local knowledge continue to inform assessment, monitoring, research, and mitigation efforts over time.

In addition to guiding future HIA activities, the partnership could facilitate long-term public health and environmental health research related to geothermal energy and lithium development. Potential activities may include identifying research priorities, coordinating data collection and monitoring efforts, seeking external funding, supporting independent research, and translating findings into policies and practices that protect and promote community health.

This recommendation recognizes that understanding the health effects of large-scale direct lithium extraction and associated development will require ongoing evaluation as technologies, operations, scientific evidence, and community conditions evolve.

9. HIA Step 5: Communication and Dissemination Plan for HIA Findings

9.1 Purpose

The purpose of the dissemination plan is to ensure that findings from this HIA are communicated to community members in Imperial County in a manner that is accessible, culturally appropriate, and responsive to community-identified needs and concerns. Dissemination efforts are intended to (1) increase understanding of DLE and related activities, (2) address community concerns regarding potential health and environmental impacts, and (3) support informed community engagement in ongoing and future decision-making processes. Dissemination activities were undertaken by SDSU.

9.2 Basis for Dissemination Strategy

The dissemination strategy is informed by findings from the Community Intercept Survey, which indicate that while most respondents are familiar with the Salton Sea, geothermal energy, and lithium in general, there are notable gaps in understanding of DLE and related technical processes. Survey results also demonstrate that a majority of respondents believe lithium extraction may impact individual and community health, while a substantial proportion report uncertainty and a desire for additional information.

Community concerns identified through the assessment include potential impacts on air quality, water resources, the Salton Sea, agriculture, traffic, and community health, as well as broader concerns related to trust, transparency, and equitable distribution of benefits. At the same time, many respondents identified potential economic and employment benefits associated with DLE development, particularly if opportunities are accessible to local residents.

These findings underscore the need for a dissemination approach that not only provides clear and accurate information, but also acknowledges uncertainty, validates community concerns, and supports ongoing dialogue within a complex and evolving public context.

9.3 Dissemination Approach

The dissemination approach is guided by three overarching principles:

- **Clarity and Accessibility:** Information will be presented in plain language using culturally and linguistically appropriate formats. All materials will be available in both English and Spanish at a minimum and will incorporate visual elements to support understanding of complex topics such as DLE processes.
- **Community-Centered Engagement:** Dissemination will prioritize engagement through trusted, community-based settings and partners. Rather than relying solely on standalone outreach efforts, activities will be integrated into existing community events and networks to maximize reach, participation, and trust.

- **Transparency and Responsiveness:** Dissemination will clearly distinguish between established knowledge and areas of uncertainty, and will reflect community-identified concerns. Opportunities for community feedback will be incorporated to support ongoing, bidirectional communication, and continuous refinement of messaging.

9.4 Dissemination Methods

9.4.1 Community-Embedded Outreach

Primary dissemination will occur through integration into existing community-based events and outreach activities, including health fairs, community events, school-based gatherings, and clinic-based engagements. This approach is intended to leverage established community relationships, reduce barriers to participation, and increase trust in the information provided.

Planned outreach will primarily utilize a tabling model within these settings, allowing for informal, one-on-one engagement that supports accessibility and creates a low-pressure environment for discussion.

Established partnerships with local organizations, including community-based organizations, health clinics, schools, and faith-based institutions, will be utilized to facilitate outreach. These partners will serve as key collaborators in both dissemination and engagement activities.

9.4.2 Use of Trusted Messengers

Existing partnerships will play a central role in dissemination efforts, particularly in facilitating individual discussions and providing information in culturally relevant contexts. Collaboration with trusted community organizations will support credibility and reach.

Co-branding of materials will remain flexible pending County guidance. Dissemination materials will include a placeholder for potential County or partner logos once direction is finalized.

9.4.3 Interactive Engagement

Dissemination activities will incorporate interactive, structured, and accessible opportunities for community input and dialogue. A QR-based feedback survey will serve as the primary mechanism for capturing community questions, identifying areas of confusion, and understanding ongoing information needs.

The survey tool will be used during outreach activities to support real-time feedback collection and will function as a formative evaluation mechanism to inform iterative refinement of dissemination materials and messaging. Feedback will be collected via an online tool.

Strategies will also be in place for the SDSU outreach team to manage diverse viewpoints constructively, including redirecting detailed or critical feedback to structured input mechanisms to ensure all perspectives are documented while maintaining a productive engagement environment.

9.5 Dissemination Materials and Audiences

Audiences for dissemination will include community members, County of Imperial leadership, and other local/city officials. A suite of materials will be developed to support dissemination; each aligned with key findings from the HIA and tailored to community information needs:

- **Community Findings Summary (Infographic):** A two-sided visual summary of key findings, including community-identified concerns and recommendations.
- **DLE Overview:** A plain-language, visually supported explanation of the DLE process and how it differs from other extraction methods.
- **Executive-Level Overview Presentation (Board of Supervisors):** A concise slide presentation will be developed to communicate key findings of the HIA to County leadership, including the Board of Supervisors and other decision-makers.
- **Community-Facing Presentation Slide Deck:** A separate bilingual, plain-language slide presentation for use in community settings and partner-led outreach.
- **Frequently Asked Questions (FAQ):** A community-informed FAQ addressing common questions and concerns related to health impacts
- **Outreach Materials:** Event posters, tabling displays, and handouts designed for use in community-based settings.
- **QR-Based Feedback Survey Tool:** A mobile-accessible survey designed to capture community questions, concerns and informational needs during dissemination activities
- **Media Release:** a concise, public-facing announcement to inform community members, stakeholders, and regional media outlets about the completion of the HIA and the availability of dissemination materials.

9.6 Implementation

Dissemination will be conducted in coordination with concurrent outreach efforts related to Lithium Valley to ensure responsiveness to emerging narratives and consistency in public-facing communication. Dissemination activities will be conducted in collaboration with community partners and implemented in phased stages:

Phase 1: County Review and Finalization

Dissemination materials will be drafted but not finalized until the County review process is completed, to ensure alignment with approved findings and recommendations.

Phase 2: Community Review and Input Period

Following report finalization, a defined community review period of approximately one month will provide an opportunity to share materials in draft or near-final form and gather community feedback. This phase will be conducted by trained SDSU student team members using a tabling approach embedded with existing community events. Input collected during this period will inform final refinements to dissemination materials and messaging.

Phase 3: Community Dissemination and Outreach

Finalized materials will be deployed through partner-led outreach efforts and community-based dissemination activities. This phase will emphasize collaboration with community partners to expand reach and reinforce credibility through trusted networks.

9.7 Summary

The dissemination strategy for this HIA is designed to ensure that findings are communicated in a manner that is transparent, accessible, and responsive to community needs. By leveraging existing community networks, utilizing trusted messengers, embedding outreach in familiar settings, and incorporating opportunities for feedback, this approach supports informed community participation while maintaining sensitivity to the broader social and political context.

10. HIA Step 6: HIA Monitoring and Evaluation

The purpose of the HIA was to provide community-informed, data-driven insights to support planning efforts for lithium extraction in Imperial County. This HIA is intended to inform decisions by policymakers and community leaders in order to maximize potential health benefits for Imperial County residents while minimizing adverse impacts on health and well-being. The process used to conduct this HIA, along with the potential monitoring measures and anticipated impacts, is described below.

10.1 Evaluation of the HIA Process

The HIA process included various steps and stakeholders. The funding and request for the HIA stemmed from recommendations by the 2021 Blue-Ribbon Commission on Lithium Extraction. Subsequent leadership decisions and actions ensured that the HIA was included in the Lithium Valley planning and development processes. Funding for the SDSU Research Foundation to conduct the HIA began in 2023, with activities spanning through June 2026.

10.1.1 Timeline

The initial one-year performance period was extended several times to allow completion of the contracted work. The timeline is summarized below:

Table 32. HIA Timeline of Major Activity Completion

Timeline	Major Activities	Notes
July 2023 – June 2024	Determination of scope	Scope of work/study areas
	Preparation of measurement tools and collection protocols	Attainment of air monitors and dust sampling materials; creation of collection protocols
	Data collection	Air monitoring data (n=50) and dust samples (n=50)
July 2024 – June 2025	Finalize data collection	Activities pertaining to the air monitoring data and dust sample data
	Analyze data	
	Initial report preparation and review	
July 2025 – June 2026	Initial report revisions	Pertaining to the data previously described
	Preparation of measurement tools and collection methods	Creation of the Community Intercept Survey and planning data collection
	Data collection	Community Intercept Survey (n=299) and data from multiple secondary online datasets/articles
	Data analysis	Of the Community Intercept Survey data, as well as data from multiple secondary online datasets
	HIA preparation	Preparation of a technical HIA formatted report structure
July – August 2026	HIA dissemination/communication	Preparation of infographic, PowerPoint, Executive Summary, and factsheet disseminated to community members, officials, and other stakeholders
September 2026	HIA report finalization after incorporating feedback	May be incorporated into the report or a frequently asked question document.

Delays

Early delays were encountered in obtaining materials needed for data collection and in hiring and training staff from the subcontractor responsible for data collection. Additionally, after the initial report was prepared, it was determined that the template was not well suited to an HIA. Through close collaboration between SDSU and the County of Imperial, a more standard HIA methodology was adopted, incorporating additional community input gathered through the Community Intercept Survey.

Data Collection and Lessons Learned

Primary Data Collection

After the initial primary data collection efforts were completed and analyzed (including lung-function testing, household surveys, ambient and indoor air quality monitoring, and indoor dust sampling), the HIA team determined that these data alone were insufficient to characterize population-level health conditions and environmental exposures for HIA purposes. The assessment therefore shifted to a broader review of population-level secondary data to describe baseline health conditions in Imperial County and the environmental factors that may influence health.

The primary data collected were incorporated into the HIA where appropriate as supplemental baseline information. However, several limitations reduced their usefulness for population-level analyses, including sample size, sampling methods (not random), and the lack of available comparison data. Key lessons learned included the need for larger, randomly selected sample; alternative approaches to lung-function analysis; comparison data from similar populations; longer air-monitoring periods; and simultaneous monitoring across sampled households with comparisons to existing regulatory monitoring stations. These improvements could help determine whether respiratory health differs from comparable populations, assess spatial variation in air quality, evaluate the adequacy of existing monitoring networks, and improve the generalizability of findings.

Future Data Collection and Planning Processes

Whether these baseline measures should be repeated will depend on feasibility, cost, and the availability of other representative data sources, including information from existing monitoring networks such as IVAN. Future HIAs would benefit from an early planning process that identifies key research questions, evaluates available secondary data, and determines what targeted primary data collection is needed. Findings from this HIA can also help inform which data sources and collection methods are most valuable for future assessments.

10.1.2 Community and Stakeholder Collaboration

As previously described, the SDSU team coordinated with key stakeholders throughout preparation of the HIA, including technical experts who prepared the Draft PEIR, the Imperial County Public Health Department, and community members. SDSU consulted with these technical experts and the Imperial County Public Health Department to obtain feedback and technical input throughout the process. Community perspectives were incorporated through review of public comments and findings from the Community Intercept Survey, which collected

information on residents' understanding of the proposed development, perceived concerns, and views regarding potential benefits.

10.2 Impacts of the HIA

Although the ultimate impacts of the HIA are not yet known, the SDSU team recommends additional monitoring measures to evaluate whether the document influenced decisions and actions beyond the mitigation measures identified in the Draft PEIR, particularly those intended to further protect community health. Recommended actions include:

1. **Tracking enhanced measures** – Documenting any actions adopted by the County of Imperial or DLE developers that exceed existing regulations or mitigation measures required under the PEIR.
2. **Community feedback** – Periodically gathering input from community members regarding the Specific Plan development process and any perceived effects on their health and well-being.
3. **Policy changes** – Tracking any policies, programs, or decisions that were informed by the HIA or relied on information presented in the HIA.
4. **Environmental and health indicators** – Where feasible, the effects of policy or project changes should be monitored through environmental indicators (such as air quality and water quality) and related health metrics. However, because the primary goal is to prevent adverse health effects before they occur through proactive monitoring of environmental conditions, measurable changes in health indicators may not be evident in the short term.

11. Methodology and Data Collected

11.1 Assessment Methodology

The HIA employed a mixed-methods, multi-pronged approach to evaluate the potential health impacts associated with DLE and expanded geothermal activities, as well as the planned development of the Specific Plan area. The methodology included (1) community engagement through intercept surveys, (2) environmental data collection, (3) secondary data analysis and literature review, and (4) expert consultation. Collectively, these methods informed the scoping, assessment, and recommendation phases of the HIA.

The data collection procedures and analytical methods used in this assessment are summarized below. Appendix A provides copies of data collection instruments.

11.1.1 Community Intercept Surveys

Community perspectives were collected through intercept surveys administered by trained research assistants to a convenience sample of residents recruited at community events and public locations. The surveys assessed respondents' knowledge and perceptions of DLE, awareness of local geothermal activities and proposed development, perceived and anticipated health impacts, community concerns, perceived benefits, and preferred methods for receiving information. The intercept survey was available in English and Spanish.

Between November 2025 and February 2026, trained research assistants administered the Community Intercept Survey to a convenience sample of 299 individuals. Community members were recruited at various community events and public locations, including supermarkets, parks, and community centers across Calipatria, Niland, Westmorland, Brawley, Calexico, and El Centro. To improve geographic balance within the convenience sample and ensure that perspectives from northern communities were adequately represented, limited targeted email outreach was conducted to individuals who had previously attended Southern Border Coalition events and reside in northern cities.

Participants completed the survey independently online, via interviewer-administered surveys, or via paper questionnaires at the recruitment location. All participants received a \$10 Walmart gift card as compensation for their time. Surveys completed through interviewer-administered (English or Spanish) or paper formats were subsequently entered into the Qualtrics system by trained research staff.

11.1.2 Environmental Data Collection

Environmental data collection included ambient air quality monitoring and indoor dust samples from residences in northern Imperial County. These data were used to provide context for community concerns and to supplement existing environmental information.

Environmental measurements were collected from a convenience sample of 50 households across five communities between May and October 2024: Brawley (n=17), Calipatria (n=14), Westmorland (n=7), Salton City (n=5), and Niland (n=7). The number of households sampled in

each community was allocated proportionally to each community's relative population size. Salton City was located farthest from existing geothermal operations (20.7 miles to the nearest facility), followed by Brawley (13.5 miles), Westmorland (7.9 miles), Calipatria (4.8 miles), and Niland (4.0 miles) (Dobson, Araya, Brounce, et al., 2023). Participants were recruited through door-to-door outreach conducted in partnership with the community-based organization *Líderes Campesinas*.

Household Environmental Samples: Air and Dust

Air Samples

Ambient (outdoor) air samples were collected from each selected residence over a one-week period using PurpleAir Flex⁴⁴ monitors. These devices transmitted real-time data via internet connectivity and measured concentrations of particulate matter (**PM**) with diameters less than 1, 2.5, and 10 microns (PM₁, PM_{2.5}, and PM₁₀), as well as total volatile organic compounds. The monitor reports a unitless volatile organic compound index from the onboard Bosch metal-oxide gas sensor, reflecting relative changes in total volatile organic compound levels (a measure of all volatile organic compounds that may be present) with an approximate resolution⁴⁵ of 0.08%.

Air monitors were mounted on an exterior wall near the main entry door. All monitoring equipment was tested and calibrated concurrently in a controlled environmental chamber prior to deployment to ensure measurement accuracy and consistency. . Assessing PM₁₀ directly outside a home is advantageous for health studies because it captures hyper-local pollutant concentrations in the immediate proximity of human activity.

Detection Thresholds. According to the manufacturer, the PurpleAir Flex sensors operate over an effective PM_{2.5} range of 0-500 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), with a maximum measurable range exceeding 1,000 $\mu\text{g}/\text{m}^3$. Reported consistency errors are $\pm 10\%$ at concentrations of 100-500 $\mu\text{g}/\text{m}^3$ and $\pm 10 \mu\text{g}/\text{m}^3$ at lower concentrations.

Collection Period. The air monitors required continuous household power and could generate noise or light. Because of this, a one-week monitoring period was selected to minimize participant burden and reduce the likelihood that devices would be unplugged, moved, or otherwise disturbed, which is a common challenge in home-based monitoring studies. The monitoring period was also coordinated with dust sample collection and questionnaire administration.

Dust Samples

Concurrent with the air sample collection, indoor surface dust samples were collected from the same 50 households in the most frequently occupied area of each home (typically the living room) using a DUSTREAM® Collector attached to a pre-cleaned vacuum cleaner. Samples were collected to assess the presence and concentration of metals, specifically arsenic, cadmium, and lead. Consistent with standardized and validated dust sampling protocols (Casley et al., 2018; Jarma et al., 2024; Lee et al., 2018; Šarac et al., 2025), sampling was conducted over a surface area of one square meter and continued until the collection filter was full or at least one gram of dust was obtained. All dust samples were sealed, labeled, and stored at -20 degrees Celsius prior to laboratory analysis.

⁴⁴ <https://www2.purpleair.com/products/purpleair-flex>

⁴⁵ The smallest incremental change in the gas sensor signal that the instrument can detect and report.

11.1.3 Secondary Data Analysis and Literature Review

A structured literature review was conducted to identify and synthesize existing evidence relevant to DLE, geothermal development, and associated environmental and public health impacts. Peer-reviewed articles, government and agency reports, environmental impact reports, and technical documents were systematically identified through targeted database searches (e.g., PubMed, Google Scholar) and review of grey literature from regulatory and research institutions (e.g., California Air Resources Board, U.S. Environmental Protection Agency, academic centers). Search terms included combinations of keywords related to lithium extraction, geothermal energy, Salton Sea, air quality, water resources, toxic air contaminants, criteria air pollutants, and various health conditions.

Sources were screened for relevance based on geographic applicability (with emphasis on the Salton Sea region and similar geothermal contexts), recency, and methodological rigor. Priority was given to studies providing empirical data, modeling results, or comprehensive reviews of environmental pathways and health outcomes. Key information was abstracted and synthesized by topic area (e.g., air quality, water, seismicity, health impacts), with attention to consistency of findings, identified uncertainties, and data gaps.

Secondary data analysis included using online datasets with data manipulation features, reproducing aggregated data tables, and performing basic data manipulations (e.g., addition, calculating percentages) as needed to further synthesize results.

11.1.4 Expert Consultation

In addition to SDSU staff, a researcher from Pennsylvania State University, with expertise in the environmental impacts of DLE and Specific Plan–related activities, provided technical guidance and supported the characterization of potential environmental effects.

11.1.5 Data Analysis

Residential Distance to Geothermal Activities in the Salton Sea KGRA

Among the 50 households from which environmental samples were collected, residential proximity to existing geothermal facilities was used as a proxy for potential exposure to future emissions from geothermal energy and DLE activities. Distance was calculated as the straight-line distance, in kilometers, from each household to the nearest geothermal facility located within the Specific Plan area, including Salton Sea Power General/CalEnergy Unit 1, CalEnergy Unit 5, Elmore Geothermal, Vulcan Power Plant, Leathers Geothermal Facility, and Hudson Ranch Power. To maintain sufficient sample sizes for analysis, households were grouped into three distance categories: ≤16 kilometers, 17–25 kilometers, and >25 kilometers. No sampled households were located within 10 kilometers of a geothermal facility.

Residential proximity was used as an indirect indicator of potential exposure and did not account for site-specific factors such as emission characteristics, meteorological conditions (e.g., wind speed and direction), operational variability, or the amount of time household members spend outdoors near their homes. Accordingly, findings should be interpreted as reflecting relative exposure potential rather than precise estimates of individual-level ambient exposure.

Data Analyses Methods

Descriptive statistics were used to summarize data from the Community Intercept Survey and environmental sampling. Differences and associations were evaluated using chi-square tests for categorical variables and analysis of variance to compare mean values of continuous outcomes across the three residential distance categories. Quantitative analyses were conducted using IBM SPSS Statistics (Version 31) and R (Version 4.3.0).

Open-ended responses from the Community Intercept Survey were analyzed using thematic coding conducted independently by two analysts to improve reliability and consistency.

11.1.6 Literature Review

To inform the HIA, researchers reviewed a broad range of published and unpublished sources. These included peer-reviewed scientific literature; governmental reports and public agency publications; relevant web-based resources; environmental impact reports and technical materials prepared by developers planning to operate/expand geothermal and add DLE operations in Lithium Valley; and regional planning documents such as the *Lithium Valley Specific Plan Draft* (County of Imperial, 2025c), the *Lithium Valley Specific Plan Baseline Report* (Rick Engineering Company, 2024), and the *Lithium Valley Workforce and Economic Study* (Alhajjar et al., 2025). Industry-produced materials were reviewed as supplementary sources to provide additional context on proposed technologies and operations.

The purpose of this review was to understand DLE technologies, summarize the existing evidence on potential health impacts associated with DLE and related development under the Specific Plan, and identify potential health implications associated with construction and operational activities.

11.1.7 Community-Level Demographic and Health Data

Community-level demographic and health data were compiled for Imperial County overall and for northern Imperial County communities closest to the proposed geothermal and DLE activities. Data were drawn from multiple sources, including the United States Census Bureau,⁴⁶ the California Health Interview Survey,⁴⁷ and the 2024 Imperial County Community Health Assessment.⁴⁸

11.2 Limitations

This assessment acknowledges several important limitations related to the availability of evidence, attribution of potential health effects, and exposure characterization.

⁴⁶ <https://www.census.gov/>

⁴⁷ <https://healthpolicy.ucla.edu/our-work/california-health-interview-survey-chis>

⁴⁸

<https://www.icphd.org/assets/CHACHIP/Reports/CHA/Imperial-County-2024-Community-Health-Assessment.pdf>

11.2.1 Lack of Available Evidence

At the time of this assessment, commercial-scale DLE has not been implemented anywhere in the world, and several DLE technologies remain in developmental or pilot phases. Consequently, no empirical epidemiologic or toxicological studies directly evaluating the health impacts of DLE are currently available. In the absence of project-specific health data, this HIA evaluates *potential* health effects based on information from analogous industrial processes, established exposure pathways, and well-documented environmental health relationships. Given these limitations, the assessment emphasizes the need for continued environmental and public health monitoring to detect any unanticipated impacts as they develop.

11.2.2 Potential Health Effects and Attribution

Evaluation of potential health effects must be considered within the context of existing environmental conditions and cumulative sources of exposure. The U.S. Environmental Protection Agency (**U.S. EPA**) defines cumulative impacts as the combined effects of multiple chemical and non-chemical stressors acting together on human health and the environment (U.S. EPA, 2025i). Impacts and considerations include the following:

- In many cases, it is not possible to isolate the effects of a single project, particularly when project-related emissions contribute incrementally to pollutant levels that exceed standards only in combination with other sources, as air quality effects are often cumulative in nature (*Sierra Club, Revive the San Joaquin, and League of Women Voters of Fresno v. County of Fresno and Friant Ranch, L.P.*, 2015; *Sierra Club, Revive the San Joaquin, and League of Women Voters of Fresno v. County of Fresno and Friant Ranch, L.P.*, 2015).
- Exposure to pollutants is shaped by existing environmental conditions, including air quality, soil and water characteristics, geographic and meteorological factors, land uses, and other ongoing sources of pollution, all of which influence community health risks (U.S. EPA, 2025i). Consequently, observed health outcomes or changes in health outcomes may reflect the combined influence of multiple overlapping environmental stressors, and changes in health status cannot always be attributed to a single project or development alone (Solomon et al., 2016; U.S. EPA, 2025i).
- Broader changes in mitigation practices, pollution control measures, socioeconomic conditions, and other social determinants of health may also influence potential health effects (Solomon et al., 2016).

All of these structural and contextual factors, which may occur independently of project activities, must be considered when interpreting health outcomes and assessing overall community risk.

11.2.3. Sampling Limitations

Selection Bias

Selection bias refers to systematic error in participant recruitment that may result in a sample that is not representative of the broader population and may influence study findings. In this HIA, selection bias may have occurred due to the use of convenience sampling and voluntary

participation. As a result, findings from the Community Intercept Survey and household environmental sampling are likely not representative of the entire population and should be interpreted as reflecting only the experiences and conditions of participating individuals and households. This approach is consistent with planning-level assessments, where the primary objective is to identify community concerns, knowledge levels, and priority issues to inform decision-making rather than to support population-level inference. To help reduce recruitment-related bias, data collection was conducted by trained interviewers who were representative of the communities engaged.

Additionally, the environmental sampling was conducted within the northern areas of Imperial County near the anticipated DLE activities. As a result, findings may not be applicable to other areas of the county.

Sample Size

Household air and dust sampling was conducted in a relatively small sample of 50 households. The small sample size reduced statistical power to detect significant associations and limited the generalizability of the findings beyond participating households.

Social Desirability Bias

The Community Intercept Survey asked participants to report their level of knowledge about and concerns with DLE. This self-reported information may be subject to social desirability bias. To help minimize this effect, surveys were administered anonymously, staff used standardized best-practice interviewing techniques, and participants were given the option to complete the survey online anonymously.

11.2.4. Additional Environmental Samples Limitations

Attribution of Changes

The primary purpose of the environmental air quality and dust monitoring was to characterize baseline conditions prior to substantial implementation of planned development activities. These baseline data are intended to support future comparative analyses and trend evaluations. However, interpretation of any observed trends should consider the influence of concurrent land-use activities, background emission sources, and ongoing environmental changes in the region that may affect air quality and dust levels independently of geothermal- or DLE-related development.

Short Collection Periods

The use of a one-week sampling window limits the representativeness of baseline dust and air quality samples with respect to seasonal variability. With air quality in particular, the sampling period did not capture late summer and fall conditions, when PM₁₀ levels are higher due to strong winds and dust mobilization (Lieb & Faloona, 2025). Additionally, a single week of air quality data collection is insufficient to estimate long-term chronic exposure because it does not account for prolonged seasonal, meteorological, and weekly variations. As a result, baseline measurements should be interpreted as representative of conditions during the sampling period rather than as comprehensive estimates of annual or peak exposure levels. If these data are

used as baseline measures for future comparisons, subsequent sampling should be conducted within the same seasonal window to ensure comparability.

Limits in Precision

The consumer-grade air monitors used in the 50 households included in this HIA can support spatial and temporal comparisons of pollutant levels but do not provide highly precise measurements of absolute pollutant concentrations. Studies have shown that these types of monitors are suitable for applications such as identifying emissions hotspots, although they exhibit greater measurement variability than traditional regulatory monitoring stations (Lagerspetz et al., 2019). Guidance has also been published on the importance of critically evaluating and interpreting data generated by these instruments to support appropriate use and interpretation (Concas et al., 2021).

Because the air monitors at the 50 households were installed near building entryways, local airflow patterns may have been influenced by human activity and nearby structures that partially shielded the devices from ambient wind. As a result, the monitors may have underestimated concentrations of coarse particulate matter, particularly windblown dust particles in the PM_{2.5-10} size range.

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Appendix A: Community Intercept Survey

Community Intercept Survey (English Version)

Development

The Community Intercept Survey was created by research and County of Imperial health department staff. Survey questions were pilot tested with the community, and professionally translated into Spanish, after which they were reviewed by members of the community to ensure clarity, accuracy, and cultural appropriateness

Survey

Staff: Date ___ / ___ / ___ Collection Location & Address: _____

The County of Imperial has contracted with San Diego State University to do a Health Impact Assessment related to lithium extraction from geothermal brine in the north-end communities of Imperial County. You do not need to know anything about lithium extraction to take the survey. **If you live in Imperial County we would like to ask you some questions. This will only take 2-5 minutes of your time, and we will provide you with a \$10 gift card for your participation.**

Do you live in Imperial County? ☐Yes ☐No

Do you live in the north end of Imperial County? ☐Yes ☐No (*Brawley and north of Brawley*)

What is the zip code where you live? _____

Please say or mark “unsure” if you are unsure or do not know. ALL of the information you tell us is important!

1. Do you know where the Salton Sea is? ☐Yes ☐No ☐Unsure
2. Approximately how far away do you live from the Salton Sea?
 - ☐0-10 miles (*north end of Imperial County*)
 - ☐11-20 miles (*central areas of Imperial County*)
 - ☐21-30 miles (*south-central Imperial County*)
 - ☐31 or more miles (*south end of Imperial County*)
 - ☐Unsure
3. Do you know what geothermal means? ☐Yes ☐No ☐Unsure
4. Do you know what geothermal brine is? ☐Yes ☐No ☐Unsure
5. Did you know that geothermal power plants near the Salton Sea currently generate electricity? ☐Yes ☐No ☐Unsure

6. Do you know what lithium is? ☐Yes ☐No ☐Unsure
7. Did you know that lithium can be extracted (removed) from geothermal brine?
☐Yes ☐No ☐Unsure
8. There is a large deposit of lithium in the geothermal brine, over a mile underground, near the Salton Sea. ☐Yes/True ☐No/False ☐Unsure

There is more than one way to get lithium out of the ground. *Direct lithium extraction* is a new method.

9. Are you familiar with the method used to extract (get/remove) lithium from geothermal brine, known as *direct lithium extraction*? ☐Yes ☐No ☐Unsure

In your own words, what do you know about it?

There are plans to perform *direct lithium extraction* with existing and future geothermal power plants and processing plants near the Salton Sea.

10. Before today, were you aware of these plans? ☐Yes ☐No ☐Unsure
What are your thoughts about these plans?
11. Do you believe that future lithium extraction from geothermal brine in Imperial County will impact your health? ☐Yes ☐No ☐Unsure
Please tell us your thoughts:
12. Do you believe that the future lithium extraction from geothermal brine will impact the community's health? ☐Yes ☐No ☐Unsure
Please tell us your thoughts:
13. Do you have any other concerns about *direct lithium extraction* from geothermal brine in Imperial County? ☐Yes ☐No ☐Unsure
Please tell us your thoughts:
14. Do you think *direct lithium extraction* from geothermal brine can benefit Imperial County residents?
☐Yes ☐No ☐Unsure
Please tell us your thoughts:

You are almost done, please answer the following questions:

15. What do you think are the best ways to educate and get feedback from people in your community about the future geothermal and lithium extraction plans?
- ☐Website
- ☐Social media, which? _____
- ☐Email

☐ Flyers, posted/handed out where? _____

☐ Town hall meetings, where? _____

☐ Other, specify: _____

These last three questions help us know if we reached a wide variety of people:

What is your age:

- ☐ 18-29 years
- ☐ 30-39 years
- ☐ 40-49 years
- ☐ 50-59 years
- ☐ 60-69 years
- ☐ 70 or more years

How would you describe your race/ethnicity?
(check **all** that apply)

- ☐ American Indian or Alaska Native or Indígena
- ☐ Asian
- ☐ Black or African American
- ☐ Hispanic or Latino/a (e/x)
- ☐ Middle Eastern or North African
- ☐ Native Hawaiian or Pacific Islander
- ☐ White

Which best describes your gender:

- ☐ Woman
- ☐ Transgender woman
- ☐ Transfemme
- ☐ Nonbinary or gender fluid
- ☐ Transmasculine
- ☐ Transgender man
- ☐ Man
- ☐ Genderqueer
- ☐ Two-spirit
- ☐ Self-describe/Other, specify: _____

Appendix B: Community Intercept Survey Additional Results

Suggestions for Community Education Methods

When asked about the most effective ways to educate community members about DLE, specific responses provided for each mode are listed by all of Imperial County and Northern Communities. A total of 299 surveys were collected from Imperial County, with 167 from Northern Communities, as defined by zip code of residence, for Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Social Media Suggestions (n=number responding similarly):

Imperial County

- Facebook (n=49)
- Instagram (n=37)
- TikTok (n=14)
- All (n=6)
- YouTube (n=6)
- X/Twitter (n=3)
- Television (n=2)
- One each (n=1): Google, Snapchat, WhatsApp

Northern Communities

- Facebook (n=16)
- Instagram (n=10)
- TikTok (n=6)
- All (n=4)
- YouTube (n=4)
- One each (n=1): Snapchat, WhatsApp

Other Suggestions (n=number responding similarly):

Imperial County

- Community/Direct Outreach (n=39) (in person, door-to-door, tabling/events, word of mouth)
- Television (n=35)
- Educational workshops/classes (n=7)
- Informational Survey (n=7)
- Newspaper (n=8)
- Mail (n=8)
- Radio (n=7)
- Phone Calls (n=5)
- Language Accessible Information (n=3)
- Spread awareness at workplaces (n=3)
- Awareness from leaders in the industry (n=3)
- One each (n=1): billboards, research presentations, rallies

Northern Communities

- Community/Direct Outreach (n=29) (in person, door-to-door, tabling/events, word of mouth)
- Television (n=27)
- Newspaper (n=7)
- Informational Survey (n=6)
- Mail (n=6)
- Radio (n=6)
- Workshop (n=6)
- Phone Calls (n=5)
- Language Accessible Information (n=3)
- Awareness from leaders in the industry (n=2)
- One each (n=1): billboards, rallies

Flyers – Posted/Handed Out Where? (n=number responding similarly):

Imperial County

- Local Businesses (n=7) (stores, grocery stores, bar, grill, barber, beauty salons)
- Local events/gathering (n=4)
- Door to door (n=3)
- Post Office (n=3)
- Educational Institutions (n=3)
- In busy public areas/establishments (n=3)
- City Hall (n=2)
- Libraries (n=2)
- Distribute it as mail or flyers (n=2)
- Mall (n=2)
- Brawley (n=2)
- Calexico (n=2)
- One each (n=1): Calipatria, Niland, Health center, all of Imperial County, and making it language accessible

Northern Communities

- Local Businesses (n=4) (stores, grocery stores, bar, grill, barber, beauty salons)
- Local events/gathering (n=2)
- Brawley (n=2)
- Post Office (n=2)
- Educational Institutions (n=3)
- Door to door (n=2)
- One each (n=1): Calipatria, Niland, city hall, in busy public areas/ establishments, educational institutions, all of Imperial County, in busy public areas/establishments, and making it language accessible

Town Hall Meeting Location Suggestions (n=number responding similarly):

Imperial County

- County/City Hall (n=7)
- In all cities and communities in Imperial County (n=7)
- El Centro (n=5)
- Schools (n=3)
- North End (n=3)
- South End (n=2)
- Private Parking Lots (n=2)
- Public areas (n=2)
- Senior Citizen Places (n=2)
- One each (n=1): clubhouses, conferences, Brawley, non-bureaucratic setting, open forums, post information in a positive way

Northern Communities

- County/City Hall (n=4)
- In all cities and communities in Imperial County (n=3)
- El Centro (n=3)
- Schools (n=2)
- North End (n=2)
- South End (n=2)
- Public areas (n=2)
- Senior Citizen Places (n=2)
- One each (n=1): Clubhouses, Brawley, open forums, post information in a positive way

Qualitative Responses

Concerns About DLE

This section includes concerns noted in qualitative responses to the following questions:

- What are your thoughts about these plans?
- Do you believe that future lithium extraction from geothermal brine in Imperial County will impact your health? Please tell us your thoughts.
- Do you believe that the future lithium extraction from geothermal brine will impact the community's health? Please tell us your thoughts.
- Do you have any other concerns about direct lithium extraction from geothermal brine in Imperial County? Please tell us your thoughts. Do you think direct lithium extraction geothermal brine can benefit Imperial County residents? Please tell us your thoughts.

Table 33. Concerns about DLE, Community Intercept Survey

Concern	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
Environmental		
Pollution (General)	• “It can definitely pollute the air.” • “Just make it go away. Don't do it here, we already have pollution.” • “I don't think something that will continue to ruin the air with toxins is a good thing.”	• “It is a process that needs to be taken care [o]f. As a resident of Imperial Valley, I am concerned about the air quality and if this process is affecting it.” • “Sé que habrán residuos en el ambiente, el agua, se utilizará mucha agua, y no sé cómo se resolverán esos problemas de salud.” [There will be many residuals in the environment, the air, and a lot of water will be used. I don't know how those health problems will be resolved] • “When there was an explosion at these types of plants before, it took months for the smoke to clear in the area.” • “At the end of the day lithium extraction raises concerns with community health due to pollution of the air and water.” • “I'm unsure of the method, but I worry about consequences to water, nature, plants, animals, and people.” • “Que es malo para el medio ambiente” [That it's bad for the environment] • “I am concerned about the environment, businesses, and hospitals and electricity.”

Table 33. Concerns about DLE, Community Intercept Survey, Continued

Concern	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
Water Usage	• “Water usage air quality truck traffic congestion.” • “It consumes too much water, and that’s something already scarce around here.” • “Will there be water rationing? Most of our bills go to water, it’s expensive on top of the light and gas.”	• “I work with firefighters, and I heard about the water being diverted for this.” • “I think it will cause too much water to be used up.”
Energy Usage	• “The energy consumption and the effects on the landscapes.”	• “Van a usar much[o] má[s] agua y luz.” [They will be using much more water and electricity] • “It will take a lot of fossil fuels and energy.”
Waste Management	• “Lithium is great but hard to dispose of.” • “Lithium creates lots of waste.” • “I would be concerned with the [geothermal plants] dumping brine into the drain canals next to them.” • “All the waste from the process gets in your lungs and can kill you. This is not an environmentally safe process, we are dumping waste in the desert as well.”	• “Dónde se irá la tierra [escavada] que está contaminada?” [Where will all that contaminated dirt that is excavated go?]

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Table 33. Concerns about DLE, Community Intercept Survey, Continued

Concern	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
Environmental Continued		
Water/Soil Contamination	• “Nos afecta ya la contaminación del Salton Sea.” [We are already affected by the contamination of the Salton Sea.]	• “This kind of practices always have issues with health, I think, in this case, through water contamination I think.” • “I saw a documentary about what it does to the environment. This stuff kills the soil.”
Will Exacerbate Existing Problems	• “Ya hay mucha contaminación en el aire.” [There is already a lot of contamination in the air] • “The air quality is already terrible, it gets hard to breathe.” • “Why? Why make it worse than it is. We should leave the Salton Sea [a]lone. It used to be a tourist spot, but not anymore.” • “Yes, the area is already heavily polluted.” • “A lot of people have already been lost to floods and fires here. The few that are left will have to deal with the health effects of this decision.” • “Whatever they pull out and process, you'll always have waste, fumes, smell, that will impact respiratory systems of people and it's already bad enough here. It may affect the air quality index.” • “If lithium gets into the water or air, then it will impact us. They have burn days on school days and in the valley, there is already a lot of asthma. They already have a lot of chemicals in the air. If you shine the light at night into the air, you can see it.”	• “The area is already very polluted.” • “I’m a runner and stopped running due to how bad the air quality was and now they want to make it worst no thank you.”
Agriculture/Farm Impacts	• “The circle of life, the environment, can mess with animals and farm fields.” • “I’m a beekeeper. This will destroy the valley and take all the water away. Farmers won’t be able to produce crops and people won’t be able to afford it either. The bees I have will die.” • “Yes, it could impact the fields here.”	• “Afectarían a las plantas porque el agua está contaminada.” [It would affect the plants because the water is contaminated] • “No generará muchos empleos y está acabando ya con el trabajo de la agricultura y no se siembra porque el agua la están guardando y no están sembrando y los files secos ya están, ya está la contaminación.” [It doesn't generate more jobs, in fact it reduces agricultural jobs and it reduces how many crops we grow because they divert and store water away from us, so we aren't planting anything and the fields are dry, everything is affected by contamination too.] • “All the chemicals and stuff, they have spills and it is bad for the crops. It's bad for the people around it too. I think a lot of people around there will get sick.”

- “This is an agricultural area, and I am concerned that the byproduct of the plants will affect crops.”

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Table 33. Concerns about DLE, Community Intercept Survey, Continued

Concern	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
Environmental: Fault Lines		
Too Near Fault Lines	• “I feel that doing it close to a fault line is dangerous.” • “Don’t mess with the fault lines. Don’t take that chance.”	• “I know they were planning to extract the lithium, but I have not seen it done. I don’t agree with it. They are taking from the earth and we don’t know the impact. We are near the San Andreas fault too, so it is dangerous.” • “Las excavaciones profundas, hará estragos en lugares como la falla de san andres.” [The excavations will be deep, it will also wreak havoc on places like the San Andreas fault line.]
Will Cause Earth-quakes	• “There’s way too many plants already. I think it can cause earthquakes with all the tunneling.” • “To me, the stuff from the ground can cause earthquakes, and we don’t really know the effects of lithium on health.” • “Concerns I have are with geothermal plants. Over the years, these plants have cause the ground to sink. I feel there is a relationship to earthquakes. They are putting water in there, creating steam. Brine would come up into containment ponds, and orange salt crystals would grow around the plants and ponds. Lots of gunk would regularly be clogging the pipelines there.”	• “It might cause earthquakes.” • “Provocar temblores y gases.” [It will cause earthquakes and release gases.]
Environmental: Salton Sea		
Pollution	• “They shouldn’t do it. I worked at the wildlife refuge next to the Salton Sea, it’s already heavily polluted.” • “We are going to be living and breathing it. The Salton Sea is polluted and anything that comes out of it is not good.” • “Factor in the pollution that is in the Salton Sea. That will definitely affect people in a negative way.” • “There will be worse asthma from pollution already caused from the Salton Sea and it’s pollutants.” • “I want to know if the water that comes from the plants will end up in the Salton Sea.”	• “The Salton Sea area isn’t the best, it’s polluted. So, messing with that will affect the air quality.” • “I think that the impact of health is minimal though. We have are already failing our environment. I think we need to be practice on how to better the Salton Sea. Cattle is the highest pollutant in our land. I think the impact of health is a combination of everything and not just the extraction.” • “We saw all the fish die in the Salton Sea, so of course it will hurt the community.” • “The Salton Sea has a lot of pollution and things being done to it can cause the community to be harmed.”

Ground Contami-nation	• “It’s not good. The Salton Sea was plugged up and all the stuff is stuck there. If they start drilling it could affect that and cause more stuff to leak out and contaminate the ground.”	• --
Drying out the Salton Sea	• “Indirectly yes, but if the Salton Sea dries out it will affect more people.”	• --

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Table 33. Concerns about DLE, Community Intercept Survey, Continued

Concern	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
Health		
Respiratory Problems and Allergies	• “There is going to be more pollution, allergies, or respiratory problems. It will make the air worse. It will affect people with asthma. It's going to bring all these particles into the air. You can smell it in the air and it stinks; it's awful. We don't know what they'll be releasing into the air.” • “Allergies will get worse and it will affect the air quality.” • “People who have breathing issues and will be affected because of the bad air.” • “A lot of kids in the area have asthma, this could worsen the air quality.” • “Yes, it can impact health, for children especially. There's lots of asthma problems in dry areas. There's so much dust in the air in Westmorland.”	• “A lo que eh escuchado hay gases tóxicos que podrían afectarnos a todos. Pienso en mis hijos que tienen problemas de asma severos como es que los afectaría.” [From what I heard there are toxic gases that could affect all of us. I'm thinking about my kids who have severe asthma issues and how that could affect them] • “El vapor del litio en la salud de los pulmones. Más nublado.” [The lithium vapor could affect lung health. It will also be cloudier.] • “In every aspect, majority of the people in the valley live with asthma and it will make it worse than it already is.” • “De los pulmones, gente con asma. Yo trabajo en el campo.” [It will affect our lungs, and people with asthma. I work in the fields.]
Cancer	• “I think it can be bad and cause cancer.” • “I heard this can cause cancer.” • “It might release a lot of cancerous stuff. The rivers release a lot of bad stuff here too.”	• “Everything has chemicals, we can get exposed to cancerous things.” • “This can cause people to get cancer from the pollution.”
Depends on Distance	• “I think it will impact the [health of] people that live closer to it. Maybe within a 10-mile radius.” • “[The health impact] depends on the people and how close they are to it.” • “If you live close to the Salton Sea, yes [it will impact your health].” • “If they live close to it [it will impact health]. I think more research for it needs to be done to see what happens. We don't know the long term effects.”	• “We are very close to these plants, so yes it can impact us.” • “I think it will be minimal impact compared to someone that lives in the area. I think more impact will arise from the transportation of goods if they pass through Calexico” • “Definitely, especially in the north end. The construction phase will lift a lot of dust. Also with substances that escape from extracting the lithium and refining it.”
General	• “Yes, it's very hot when you extract it. There's lots of waste, nasty minerals in the water we bring out of the plant...It would kills us if we were to take off our masks when working.” • “It will probably give me diseases or something.” • “They have to suit up at our plant when doing the extraction process, so yes [it will impact my health].” • “It can be deadly being in the plant. There will for sure be health problems.” • “El litio puede causar daño. [The lithium can cause harm].”	• “The air they're going to bring will be full of diseases and who knows what else.” • “I heard about it, I used to be a trucker and I would drive by the area. It's very contaminated already, it's a hub for disease.”

	• “Most counties where brine extraction is implemented in tend to have long lasting health problems...”	
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¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Table 33. Concerns about DLE, Community Intercept Survey, Continued

Concern	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
Health, Continued		
Toxins	• “I think it's a bad idea due to the toxicity.” • “It's not food, it's not something that's safe. It is toxic so yes it will have an impact.” • “I think it may be toxic.”	• “The process is toxic.”
Dangers of Lithium, Byproduct, and Process	• “The byproduct can be dangerous.” • “I have worked with that before, and that material is really dangerous.” • “It could be dangerous because of the lithium, since it is in batteries.” • “It is a dangerous procedure.” • “Yes, there is an open pit of stuff and people I know who work there say there aren't any protections.”	• “I think it can be dangerous.” • “Lithium is an element that is highly reactive and so if anything goes wrong it could affect a lot of people.”
Concern for Children	• “My future grandkids and children will be around for the effects.” • “The younger kids will be affected by it.” • “The younger generation will have more health risks.”	• “Future descendants will be affected.” • “Not only will I be affected, but future generations can get hurt.” • “Any effects will of this process will be lingering for years to come.” • “I am worried about the youth - they are more exposed to everything. Every year, they are discovering new things in the air.”
Traffic		
Congestion /Trucking	• “My concern is the roads that will be used. There are rumors that they will be building new roads to be doing the lithium. There are already affected roads with big trucks and semis.” • “I don't know exactly where it will be because I don't drive there. I'm not sure how it will impact the commute.”	• --
Lack of Trust and Benefit to Community		
Govern-ment Should Not be in Charge	• “Not sure if there's enough control. Lithium can be dangerous to the environment, and so I'm not sure we want the government to be in control of that.” • “They disregard the people for government profit.” • “I am too close to the Salton Sea. The government will just do stuff like that.”	• --
Have been promised	• “People give a lot of promises to this place. Geothermal told us the same thing. It promised us	• --

Benefits in the Past that Did Not Materialize	riches and to increase our land values, but we remain a very poor community.” • “I don't think we will see the benefits. The money we get will not go back to the valley and probably go to San Diego or bigger companies. They said the same thing for the data center they built, but I have not seen the benefits from it and it has been years.”	
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¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Table 33. Concerns about DLE, Community Intercept Survey, Continued

Concern	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
Lack of Trust and Benefit to Community, Continued		
Lack of Focus on Community Benefit	• “If it were for our benefit, but they just take advantage. They are depleting the planet's resources.” • “Hopefully, they stop it. They shouldn't do it because they will only get rich. They should do what's good for the community.” • “I don't think the companies will be hiring our people.” • “There's promises of growth, but I feel we've been forgotten. We don't even have a city council, there is no representation for us.” • “I know that they consider profits more, but they should still consider the people.”	• “I think that the Lithium will be extracted as long as there are money to the people in charge of the county. I just hoped it is not as prejudicial for the general public as people think it is.” • “They exploit the area for batteries without care about our health, so I would say there is a negative impact.” • “I believe that a lot of the time company's do not have citizens' best interest in mind and are rather just looking to make a profit out of it without benefits those who are being affected by their project.” • “It's an exploitative process.” • “The wealth from the extraction in the valley will leave us and won't benefit us. It will go to companies instead.” • “Maybe exploitation - the money could be sent somewhere else and the jobs could be brought from somewhere else.” • “Solo el condado beneficia porque es una riqueza, pero no los residentes.” [Only the county would benefit because it's a source of wealth, but not the residents.] • “Unless electric cars are accessible to all and we make a significant switch to cleaner energy, people won't benefit from this. Only big corporate will benefit.”
Lack of Communication about Impacts	• “Not sure what to say. California is hiding a lot especially after the PG&E incident in the 70's from chemicals in the water.” • “There's a high incidence of respiratory issues in the valley. I don't know if they'll ever tell us the effects of these plants.” • “They need to have informational meetings. When the government wants to do something, they do it anyway.” • “Why isn't the local government more transparent.” • “I have fear that they'll go through with plans even if they know it's harmful.” • “How will it be monitored and reported as it is scaled to the amount they are reaching for to extract tremendous amounts to be profitable and how will the community be informed of the results in real time, not years later when impacts have damaged the environment and residents if it is damaging.”	• “Que no han contestado las preguntas acerca del impacto del medio ambiente y no nos han explicado en qué consistirá la extracción.” [They haven't answered our questions about the impact on the environment and they haven't explained to us what the extraction will entail.] • “La comunidad no estamos informados y cada residente tiene diferentes problemas de salud, así que nos afectará de diferente manera a cada persona.” [The community is not informed and each resident has different health problems, so it will affect each individual differently] • “La comunidad necesita información.” [The community needs information.] • “I am concerned that development will only benefit individuals that are aware of the plans. There needs to be done a better job on sharing information about the future development but most important that it is accurate.”

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Table 33. Concerns about DLE, Community Intercept Survey, Continued

Concern	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
	Other	
Population Density	• “There's a lot of things to consider. We don't even know if there will be a town to protect. Our population is dwindling. I understand change, but there's not a lot of us left. I think we should stick with gas and not electric cars. They burn un bad in accidents and it's very unsafe.” • “I am wondering how much it will build up overcrowding and over population with people.” • “I don't even know if enough people will be around here to benefit from this.”	• --
Cost and Negative Economic Impacts	• “Who is going to pay for it? Is that coming from our taxes?” • “My concerns are that the lithium will drive up cost where we live then after words leave cost high without supply further jobs.” • “I want to know if it will affect any of us financially, and if any costs will be driven up specifically.”	• “What would be the cost that the people of the valley would have to pay, in terms of money or health problems.”
General Opposition	• “I am not in favor of it because I don't think it would help us.” • “They should stop geothermal all together. Digging for things that don't need to be dug up like geothermal. Imperial Valley has other ways to generate electricity. We don't need more lithium also.” • “Que deberían de tratar de pararlo.”[They should try to stop it]. • “It's no good. People come first. There's other better technologies that are better than using lithium.” • “Just like the database center, I have seen videos online about it. It was about a town that got ruined by the power plants, so it could happen here.”	• “I don't think we need the plants and so I don't see the need for them to be built.” • “No deberían hacerlo.” [They shouldn't do it] • “I don't want them to do it here.” • “Si me inquieto.” [I am concerned] • “Dangerous people.”

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Perceived Benefits of DLE

This section includes qualitative responses from the following questions that mentioned perceived benefits of DLE:

- What are your thoughts about these plans?
- Do you think direct lithium extraction geothermal brine can benefit Imperial County residents? Please tell us your thoughts.
- Do you believe that future lithium extraction from geothermal brine in Imperial County will impact your health? Please tell us your thoughts.
- Do you believe that the future lithium extraction from geothermal brine will impact the community's health? Please tell us your thoughts.
- Do you have any other concerns about direct lithium extraction from geothermal brine in Imperial County? Please tell us your thoughts.

Table 34. Perceived Benefits of DLE, Community Impact Survey

Benefit	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
Economic		
Jobs	• "I think it is good. It would make more jobs." • "It can generate jobs and aid for the community." • "Pues está muy bien porque va a ver más trabajo de allí. De esto sacan para los carros eléctricos." [I think it's very good because there will be more jobs from there. They get stuff for the electric cars from this.] • "Hopefully it will create jobs to make up for the loss of the Spreckels sugar plant. It would be a great impact and stimulate the economy." • "It would bring in more money and jobs."	• "I think it is good for jobs." • "Que si es bueno para la ciudad y para generar empleo está perfecto." [That it's good for the city and it's perfect for creating jobs.] • "Tal vez existan más oportunidades de empleos [sic], y entrada económica para el condado." [Maybe there will be more employment opportunities, and income for the county] • "The jobs and technology that come from the extraction might be beneficial." • "Maybe more job opportunities. It's just mining going on."
Local Economy	• "I believe lithium extraction can be beneficial to the Imperial Valley economy." • "Very promising economic opportunity for Imperial County." • "It could help local business." • "I am sure there will be new business and benefit economically." • "This will create a new economic source for the County. Additionally this will create jobs which will also create tax benefits to the cities."	• "Son importantes para una comunidad que necesita dinero para vivir no solo de la agricultura." [It is important for a community that needs money to live and not just depend on agriculture.] • "Que es una gran oportunidad para la economía y fuentes de empleo también." [That it's a great opportunity for the economy and for other sources of employment as well.] • "Si se hace correctamente, ayudaría en la economía de los residente[s] ya que aumentaría los empleos." [If done correctly, it could help the economy of residents as it would increase jobs.]
Property Values	• "More people will move in for work and the property values will increase. So it's good for us but that can still affect the community." • "It can increase property value. More money should be coming into the county."	• --

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Table 34. *Perceived Benefits of DLE, Community Impact Survey, Continued*

Benefit	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
Economic (Continued)		
Infra-structure	• “It will increase the tax revenue that the county can invest into public infrastructure.” • “I read an article on it 2 years ago that it would bring benefits. It would build more houses at a cheaper price, more parks/shops.”	• --
Support of Local Interests	• “Yes, I believe that money from taxes given to the County & our communities will benefit Imperial County with its needs. They Lithium Extraction has not even started in mass but already those companies are investing it helping communities through support of local projects or events.”	• --
Energy		
Batteries	• “I believe that the process quickly produces battery-grade lithium, offering faster production, lower environmental impact, and unlocking new resources like geothermal brines, addressing the rising demand for electric vehicle batteries.” • “It’s the future, it is about keeping up with battery power.”	• “Jobs and tech development for batteries and electronics.” • “It would create jobs and there will be more batteries.”
Electricity	• “It’s good for the community and electricity.”	• “Para generar energía será bueno. No sé qué tanto afecte al medio ambiente” [To generate energy it must be good. I don’t know how much it could affect the environment] • “It will provide a stable source of energy with lithium.”
Clean Energy	• “It has a lot of pros and cons but for obtaining lithium that will lead us to cleaner energy.” • “I think plants are a good way generate power compared to other ways we can generate power.” • “I think it can impact the community positively if there’s cleaner energy.” • “People will have more things that are powered by clean energy.”	• “There can be cleaner energy.”
Lower Energy Costs	• “As far as electricity, it can lower the cost in the area.”	• “I think they are good for this area because we will get electricity so we will have a lower cost of electricity.”
Environmental		
Reduce Pollution	• “They can remove the pollution from the Salton Sea. Hopefully without any risk.”	• “Is good for us so we can breathe cleaner air.”

Cleaner Water	--	"Yes so water is not contaminated."
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¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Table 34. Perceived Benefits of DLE, Community Impact Survey, Continued

Benefit	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
Environmental (continued)		
Reduce Impact of Salton Sea	--	"It's good because there's been years of people not doing anything about the Salton Sea. They should clean it up." "It will bring up useful resources for the people. They should be the ones to benefit from this. Hopefully they clean up the Salton Sea and bring back the tourism in that area."
Reduce Water Usage	--	"I don't know the real environmental impact about this, but in theory, appears to use less water, so that is good for all."
General	--	"I think these plans are promising because they could make lithium production faster and more efficient, with less impact on water and land, as long as they're implemented responsibly."
General		
Beneficial	"Me parecen perfectos y que aportarán algo positivo a la Sociedad. [I think it's perfect and it will bring something positive to society]." "Que puede favorecer a la Sociedad. [It can favor our society.]" "Creo que puede favorecer de manera positiva." [I think it could favor us in a positive way.] "Que puede [favorecer]." [It could benefit] "It would be a good resource."	"Lithium is useful." "I believe it's a good idea of using the resources we have." "I am cool with it. They are making use of the resources."
Multiple Benefits	"Infrastructure, educational opportunities, job opportunities and attract new businesses."	"Creo que ayudará al condado de imperial en muchos aspectos." [I think it will help Imperial County in many ways]
Health		
Improved Health	"It would affect health in a positive way if we have battery powered vehicles to reduce pollution."	--

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Conditional Support and Mixed Perceptions of DLE

This section includes mixed perceptions of and conditional support for DLE if noted in qualitative responses to the following questions:

- What are your thoughts about these plans?
- Do you believe that future lithium extraction from geothermal brine in Imperial County will impact your health? Please tell us your thoughts.
- Do you believe that the future lithium extraction from geothermal brine will impact the community's health? Please tell us your thoughts.
- Do you have any other concerns about direct lithium extraction from geothermal brine in Imperial County? Please tell us your thoughts. Do you think direct lithium extraction geothermal brine can benefit Imperial County residents? Please tell us your thoughts.

Table 35. Conditional Support for DLE, Community Impact Survey

Condition	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
Issue Warnings about Potential Issues	• “It depends on where you are going with it. I think they should put in an awareness and warning for the health issues.” • “They should send out information and emergency protocols on what would happen in case of danger.”	• --
Locals Benefit	• “That area is a mess. It is dead land and you can't even fish there. I have no problem with it if they make use of the land and bring in money.” • “I hope they are doing it safe and cleaner. I hope people in charge have our interest in mind.” • “They should give stocks of whatever lithium resources they sell for people in the region.”	• Me parece buena idea, siempre y cuando sea para el bien público y no para el beneficio de UNOS CUANTOS. Y que además, NO tenga un impacto negativo en el ecosistema” [I think it's a good idea as long as it's good for the public and not just benefitting a FEW FOLKS. On top of that I would NOT want it to have a negative impact on the ecosystem]

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Table 35. Conditional Support for DLE, Community Impact Survey, Continued

Condition	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
Have Clearer or More Communi-cation	“County is not clear of this to the community.”	“More information should've been sent out to residents in the Imperial valley.” “This information sounds like we would benefit as a community to be aware and educated before this project begins.” “Qué compañías lo harán y cuál será el impacto en mi comunidad.” [What companies will be doing this, and what will be the impact in my community?] “Porque me gustaría tener más información acerca de en qué nos afectaría con más precisión.” [I would like to have more information to know more precisely how it would affect us.] “Necesitamos más información. No es algo que se escuche la comunidad no estando del todo enterados de lo que nos afectará.” [We need more information. It's not something we hear in the community. We're not altogether informed about the things that will affect us.] “They need to go door to door and sit down with them. There could be misinformation if not. There needs to be more info, especially on how it would impact the schools and the most affected areas (Slab City, Calipatria, and Long Island). There would be too many politics in the way too.”
Safety Protocols in Place/ Standards Followed	“I am in agreement [for] plans as long as process is done correctly if up to date standards.” “We have to make sure the company's respect the environment and process to extract the lithium. I think committee should be put in place to make sure everything is being done by the set standards.” “It will definitely impact the community's health, a lot of people are not aware of that. As a community member it seems like a good opportunity for jobs, but the thing is that they don't consider us or our health. It is a big risk so I'm not for it until they do all the safeguards. Until they have a community based outline of what they will do for the residents that are closer to the lithium and not just the county.” “Put in preventive resources to protect the community.”	“Direct lithium extraction could be good because it might bring clean energy and jobs. I don't have a problem with it if it really helps the community. But since the technology is still pretty new, I do worry about possible risks, like pollution or how it might affect the environment. So I think it could be good, but only if it's done safely and the community is protected.” “I don't believe future lithium extraction from geothermal brine in Imperial County will negatively impact my health, especially if it is properly regulated and monitored. I see it as a potential benefit for the community through cleaner energy, local jobs, and economic growth, as long as safety and environmental protections are strictly followed.” “Que se haga en las condiciones de protección para todos.” [That it be done with protective conditions for all] “As long as they do it safely. Get prepared.”

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Table 35. Conditional Support for DLE, Community Impact Survey, Continued

Category	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
No Health Impacts	• --	• “There's pros and cons on both sides. Before anything is put in, there needs to be research done about health. I have no problem with it being done if it won't make people sick.” • “Mientras no dañen nuestra salud está bien.” [As long as it's not harming our health that's good]
No Environmental impacts	• “Mientras sea para una buena causa y mientras no afecte la naturaleza está bien.” [As long as it's for a good cause and doesn't affect nature, then it's alright.]	• --
Need to Know More	• “I need to investigate more. I'm worried of how it can affect people. The extraction has pros and cons.” • “I knew they were taking stuff out, but I didn't know what for. I would like to know more about lithium.” • “The Salton sea is dead and nasty, we live near it, so I would like to know how it impacts us.” • “They need to analyze the consequences of this.”	• “There is much debate about the pros and cons of lithium extraction. I would need more information about this topic.”
Balance Between Jobs and Health/ Environmental Impacts	• “It will generate more jobs. Health and environment impact will be unknown for another 10-20 years. I'm neither too convinced nor too appalled.” • “I'm mixed in terms of my thoughts. On one hand it's good for the economy, but lithium is toxic. It may upset the ground too and cause earthquakes.” • “Economically it seems good, but physically and health-wise it's not that good.” • “Yes because it gives more job opportunities but also has the took away from the agricultural value.”	• “Eh escuchado que sería generador de empleos pero que a su vez generaría contaminación ambiental.” [I heard it would generate jobs but at the same time it would generate contamination in the environment] • “I think the proposed benefits of cleaner energy won't outweigh the negative health impacts to the community.”

Table 35. Conditional Support for DLE, Community Impact Survey, Continued

Category	Sample Quotes	
	Northern ¹ Communities	Non-Northern Communities
Number of Jobs for Locals	• “The benefits are jobs, stability for the lithium economy but you have to ask yourself how many jobs will be created. For example, if this creates 1,500 construction jobs, but only a few are full-time, that’s a problem. The other cons are the health outcomes from the disposal of the byproducts.” • “Probably job-wise, but the companies might bring their own people. A company nearby closed recently and left a lot of people without jobs. People who were in agriculture.” • “Other than jobs/labor, which they bring in external people anyways. We don’t need it anyways. We have plenty of electricity.”	• “I think we outsource everything already. We don’t have a work ready workforce. We need to have one, especially since we have a low employment rate. If we don’t have a ready workforce, they will bring in people from out of city/state to do the jobs. We need to put more workshops/training in the valley so people can attend them and learn to be more ready and be trained for these jobs. They trainings need to also be at times people could actually go. If someone works on a farm from 6am to 6pm, they are not going to have time to attend a workshop during the day. They would never have the chance to transition to different jobs. There needs to be more holistic approaches.” • “I think it will benefit residents that have the educational knowledge to obtain the jobs coming from direct lithium extraction. It will not benefit everyone because not everyone has the privilege to educate themselves and move to a new industry. Paid education and training will be okay if we want to help all residents succeed.”
General	• “There’s good and bad.” • “Of course there are always pros and cons, good and bad. Just like taking medication. It will do good for what ails you but can also have side effects. Usually the good outweighs the bad.” • “Lithium is used for many things. It could also be dangerous.” • “Por una parte no es buena, pero por otras es buena obra para el valle. Va a ver mucho trabajo.” [On one hand it’s not good, but on the other it’s a good project for the valley. There will be a lot of work] • “There’s pros and cons, we need to see the impact towards the community, and if there’s any effect they need to remedy it.”	• “On the fence about actual benefits to the community.” • “I think there is still a lot of uncertainty with the plans. We read reports depicting different outcomes relating to jobs, water use, air quality.”

¹ Defined by zip code of residence. Responses indicated Brawley, Calipatria, Niland, Westmorland, Thermal/Salton City, and Ocotillo Wells.

Appendix C: Implementation Plans for Recommendations

Initial implementation planning steps for each recommendation include:

1. Establish Lead Agency and Oversight Structure

Identify the lead agency or coordinating entity responsible for overseeing implementation, interagency coordination, monitoring, reporting, and accountability.

2. Review Existing Baseline Conditions and Current Practices

Review available baseline environmental, public health, occupational health, and infrastructure information, as well as existing and proposed industry operational practices, mitigation measures, and regulatory requirements.

3. Collect Additional Baseline Information Where Needed

Conduct additional environmental, occupational, or community health assessments where existing information is limited or insufficient to support decision-making, monitoring, or future comparisons.

4. Identify and Prioritize Enhanced Standards and Practices

Identify, evaluate, and prioritize construction and operational standards or practices that may reduce environmental and health impacts. Prioritization may consider factors such as feasibility, cost, technical capacity, expected health benefits, effectiveness, cumulative pollution risks, and community concerns. Establishing improved oversight of compliance with applicable regulations, permit conditions, and planned mitigation measures, when needed, may be more beneficial to health than enhanced standards or practices.

5. Assign Roles, Responsibilities, and Implementation Teams

Designate the individuals, agencies, departments, contractors, or working groups responsible for implementing, managing, and overseeing specific actions and activities.

6. Identify Required Stakeholders and Approval Mechanisms

Determine the stakeholders, agencies, community groups, Tribal representatives, industry representatives, and decision-makers needed to support implementation, including any required plans, ordinances, agreements, permits, policies, or land use approvals.

7. Determine Funding, Staffing, and Resource Needs

Identify the financial resources, staffing, technical expertise, equipment, monitoring systems, and administrative support needed for successful implementation and long-term operation.

8. Develop an Implementation Roadmap and Action Plan

Establish the steps, timelines, milestones, coordination processes, reporting procedures, and performance measures necessary to support successful implementation, monitoring, and completion of each action.

Recommendation 1: Evaluate and Strengthen Environmental Monitoring and Oversight Systems

Table 36. Potential Implementation Plan Overview for Recommendation 1: Evaluate and Strengthen Environmental Monitoring and Oversight Systems

Action Area	Implementation Activities	Potential Supporting Entities ¹	Timeline for Action ²	Potential Indicators of Progress
Initial Steps	Initial implementation planning steps	County of Imperial	Immediate	• Meetings and documentation
Independent Oversight and Transparency	Establish independent third-party monitoring, or strengthen existing oversight systems, to verify compliance with applicable regulations, permit conditions, and planned mitigation measures.	County of Imperial; independent consultants/laboratories; industry partners; other project developers/operators	Less than one year	• Oversight program established/expanded • Frequency of inspections, audits, and compliance reviews • Number of compliance issues identified • Timeliness and completeness of corrective actions
	Establish independent third-party review and verification of selected environmental monitoring data, waste characterization analyses, and compliance reporting.	County of Imperial; independent consultants/laboratories; industry partners; other project developers/operators	3-4 years	• Third-party audits completed • Validation reports published • Number of independent reviews conducted • Monitor filter cake and emissions from stacks for changes at least yearly
	Develop transparent public reporting systems that provide accessible, real-time, or near-real-time environmental monitoring data and incident notifications.	County of Imperial; industry partners; other project developers/operators; ICAPCD; ICPHD	1-4 years	• Public data portal established • Frequency of data updates • Availability of multilingual communications
	Establish notification procedures for spills, leaks, fires, equipment failures, or potential off-site contaminant migration, including communication with nearby residents, Tribal communities, schools, and local agencies.	Industry partners; other project developers/operators; emergency response agencies; County of Imperial; ICAPCD; ICPHD	1-2 years	• Incident notification protocols adopted • Number and timeliness of notifications • Community awareness and participation

¹ Other project developers/operators = any within the Specific Plan area; ICAPCD = Imperial County Air Pollution Control District; ICDPH = Imperial County Public Health Department; IID = Imperial Irrigation District.

² Timeline for initial implementation; all activities are ongoing throughout the end of the project.

Table 36. Potential Implementation Plan Overview for Recommendation 1: Evaluate and Strengthen Environmental Monitoring and Oversight Systems, Continued

Action Area	Implementation Activities	Potential Supporting Entities ¹	Timeline for Action ²	Potential Indicators of Progress
Enhanced Environmental Standards	Develop and adopt operational standards that exceed minimum regulatory requirements (i.e., enhanced) for the development and operation proposed under the Specific Plan.	Industry partners; other project developers/operators; County of Imperial; ICAPCD; RWQCB	1-2 years	• Number of enhanced operational standards adopted • Use of zero-emission and low-emission equipment • Installation of advanced containment and leak detection systems • Compliance records and corrective actions
	Incorporate enhanced standards into development agreements, permit conditions, operational plans, and contractor requirements.	County of Imperial; industry partners; other project developers/operators	1-2 years	• Permit conditions adopted • Inclusion of enhanced measures in project plans and contracts
	Expand water, groundwater, and stormwater monitoring beyond minimum requirements, including additional monitoring locations and increased sampling frequency in nearby communities and environmentally sensitive areas.	RWQCB; Imperial Irrigation District (IID); industry partners; other project developers/operators; County of Imperial	3-4 years	• Number and type of monitoring locations established • Frequency of monitoring and reporting • Detection and response times for exceedances
Enhanced Monitoring and Adaptive Management	Establish additional comprehensive environmental monitoring systems (including ambient and fence-line air, surface and groundwater, etc.)	ICAPCD; RWQCB; IID; industry partners; other project developers/operators	1-2 years	• Monitoring systems installed and operational • Public availability of monitoring data • Number of monitored pollutants and environmental indicators

¹ Other project developers/operators = any within the Specific Plan area; ICAPCD = Imperial County Air Pollution Control District; ICDPH = Imperial County Public Health Department; IID = Imperial Irrigation District; RWQCB = Regional Water Quality Board.

² Timeline for initial implementation; all activities are ongoing throughout the end of the project.

Table 36. Potential Implementation Plan Overview for Recommendation 1: Evaluate and Strengthen Environmental Monitoring and Oversight Systems, Continued

Action Area	Implementation Activities	Potential Supporting Entities ¹	Timeline for Action ²	Potential Indicators of Progress
Enhanced Monitoring and Adaptive Management	Develop health-based action thresholds and response protocols that trigger operational modifications, mitigation measures, or temporary shutdowns when monitoring results exceed established levels.	County of Imperial; ICPHD; ICAPCD; industry partners; other project developers/operators; California Division of Occupational Safety and Health	3-4 years	• Action thresholds established • Number of operational responses triggered • Time between exceedance detection and response
	Use adaptive management approaches that periodically review monitoring results, community concerns, technological advances, and emerging scientific evidence to improve mitigation and operational practices over time.	County of Imperial; industry partners; other project developers/operators; ICPHD; ICAPCD	1-2 years	• Frequency of adaptive management reviews • Revisions to mitigation or operational practices • Documentation of corrective actions
	Incorporate cumulative impact considerations into monitoring and mitigation efforts, particularly in communities already experiencing elevated environmental burdens.	County of Imperial; ICAPCD; ICPHD	1-2 years	• Inclusion of cumulative impact analyses in reports • Monitoring coverage in vulnerable communities • Trends in environmental indicators over time
Worker Health and Safety	Implement enhanced worker protection measures that exceed minimum occupational health and safety requirements.	County of Imperial; industry partners; other project developers/operators; CalOSHA; contractors	Less than one year	• Availability of protective equipment • Wearable or other enhanced technology utilized • Worker training completion rates
Emergency Preparedness and Response	Review and update emergency preparedness systems as needed; identify clear procedures for public communication.	County of Imperial; industry partners; other project developers/operators	1-2 years	• Emergency preparedness system documentation and review dates • Modifications made to the system • Procedures for public communication

¹ Other project developers/operators = any within the Specific Plan area; ICAPCD = Imperial County Air Pollution Control District; ICDPH = Imperial County Public Health Department; IID = Imperial Irrigation District; RWQCB = Regional Water Quality Board; CalOSHA = California Division of Occupational Safety and Health.

² Timeline for initial implementation; all activities are ongoing throughout the end of the project.

Recommendation 2: Establish Accessible and Transparent Information Sharing

Table 37. Potential Implementation Plan Overview for Recommendation 2: Establish Accessible and Transparent Information Sharing

Action Area	Implementation Activities	Potential Supporting Entities ¹	Timeline for Action ²	Potential Indicators of Progress
Initial Steps	Initial implementation planning steps	County of Imperial	Immediate	• Meetings and documentation
Project Impact Information Sharing	Develop a centralized and publicly accessible information-sharing system that provides clear information regarding project activities, anticipated environmental and health benefits and risks, mitigation measures, monitoring plans, and opportunities for community participation.	County of Imperial; industry partners; other project developers/operators; ICPHD; community-based organizations; Tribal governments; schools and libraries	1-2 years	• Information-sharing platform established • Number of outreach materials developed • Frequency of updates provided • Public participation rates at meetings, events, or online
	Disseminate information through multiple communication methods, including websites, printed materials, community meetings, schools, local organizations, social media, radio, and trusted community venues to improve equitable access.	County of Imperial; community-based organizations; local media outlets; schools; faith-based organizations	Less than one year	• Number of communication channels utilized • Number of outreach events conducted • Distribution of printed materials • Community awareness or engagement levels
	Ensure materials are written in plain language, objectively presented, translated into multiple languages (including Spanish), and accessible to individuals with varying literacy, technological access, or disabilities.	County of Imperial; ICPHD; CARB; translation and accessibility specialists	Less than one year	• Availability of multilingual materials • Accessibility accommodations provided • Community satisfaction with clarity and accessibility of information
	Periodically evaluate community information needs, concerns, and preferred communication methods to improve outreach effectiveness and trust.	ICPHD; community-based organizations; Tribal governments; academic institutions	Yearly	• Feedback received and methods (surveys, listening sessions, etc.) • Changes made in response to community input

				Increased community satisfaction and engagement
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¹ Other project developers/operators = any within the Specific Plan area; ICAPCD = Imperial County Air Pollution Control District; ICDPH = Imperial County Public Health Department; IID = Imperial Irrigation District; RWQCB = Regional Water Quality Board; CalOSHA = California Division of Occupational Safety and Health; CARB = California Air Resources Board.

² Timeline for initial implementation; all activities are ongoing throughout the end of the project.

Table 37. Potential Implementation Plan Overview for Recommendation 2: Establish Accessible and Transparent Information Sharing, Continued

Action Area	Implementation Activities	Potential Supporting Entities ¹	Timeline for Action ²	Potential Indicators of Progress
Environmental Monitoring Information Sharing	Incorporate environmental monitoring information from industry and regulatory agencies into the centralized information-sharing system, including air quality, water quality, noise, and other relevant environmental indicators.	ICAPCD; RWQCB; IID; industry partners; other project developers/ operators; County of Imperial	1-2 years	- Environmental monitoring data publicly available and understandable - Number of monitoring indicators reported - Frequency of data updates
	Develop summaries and explanatory materials that interpret environmental monitoring results and describe potential health implications in language understandable to non-technical audiences.	County of Imperial; environmental consultants; academic institutions	Less than one year	- Number of explanatory summaries developed - Public understanding and trust of indicators - Community use of monitoring information
	Provide timely notification of environmental incidents, monitoring exceedances, spills, leaks, fires, or other events that may affect nearby communities.	industry partners; other project developers/ operators; County of Imperial; emergency response agencies	Less than one year	- Incident notification procedures established - Timeliness of public notifications - Number of incidents publicly reported
Industry Partner Data Sharing	Establish standardized requirements for the collection, management, and sharing of operational and environmental data between industry partners, the County of Imperial, regulatory agencies, and the public.	County of Imperial; industry partners; other project developers/operators; regulatory agencies	3-4 years	- Data-sharing protocols established - Number of participating industry partners - Standardized reporting formats adopted

	Develop procedures to distinguish proprietary information from data appropriate for public disclosure while ensuring transparency regarding emissions, environmental conditions, incidents, and response actions.	County of Imperial; legal counsel; industry partners; other project developers/operators	3-4 years	• Public reporting procedures adopted • Availability of non-confidential operational data • Timeliness of data availability
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¹ Other project developers/operators = any within the Specific Plan area; ICAPCD = Imperial County Air Pollution Control District; ICDPH = Imperial County Public Health Department; IID = Imperial Irrigation District; RWQCB = Regional Water Quality Board.

² Timeline for initial implementation; all activities are ongoing throughout the end of the project.

Table 37. Potential Implementation Plan Overview for Recommendation 2: Establish Accessible and Transparent Information Sharing, Continued

Action Area	Implementation Activities	Potential Supporting Entities ¹	Timeline for Action ²	Potential Indicators of Progress
Industry Partner Data Sharing, Continued	Require that publicly shared information be timely, transparent, standardized, and accompanied by summaries or visualizations that support understanding by non-technical audiences.	County of Imperial; industry partners; other project developers/operators; public information specialists	3-4 years	• Frequency and timeliness of reporting • Availability of summaries and visualizations • Public engagement with shared data
Health Information Gathering and Sharing	Develop systems to monitor, collect, and track local health indicators potentially associated with environmental conditions, with an emphasis on identifying emerging concerns and supporting prevention efforts.	ICPHD; ICPCD; healthcare providers; academic institutions; County of Imperial	3-4 years	• Health tracking systems established • Number of health indicators monitored • Frequency of data collection and reporting
	Where feasible, integrate environmental monitoring information with health indicator data to support evaluation of trends and potential areas of concern while recognizing limitations in establishing causation and a delay in health changes.	ICPHD; ICPCD; academic institutions, and environmental agencies	3-4 years	• Integrated environmental-health datasets developed • Trend analyses completed • Reports evaluating environmental and health indicators
	Develop and disseminate educational materials that provide guidance on reducing personal exposure to pollutants and responding to	ICPHD; ICPCD; schools; community-based organizations; healthcare providers; volunteer organizations	1-2 years	• Educational materials distributed • Community participation in educational activities

	environmental conditions such as dust events, odors, smoke, or poor air quality.			• Increased awareness of exposure-reduction practices
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² Timeline for initial implementation; all activities are ongoing throughout the end of the project.

Recommendation 3: Create Enforceable Structures to Maximize Community Benefits

Table 38. Potential Implementation Plan Overview for Recommendation 3: Create Enforceable Structures to Maximize Community Benefits

Action Area	Implementation Activities	Potential Supporting Entities ¹	Timeline for Action ²	Potential Indicators of Progress
Initial Steps	Initial implementation planning steps	County of Imperial	Immediate	• Meetings and documentation
Off-site Mitigation and Community Investment Programs	Establish enforceable community benefit and mitigation programs that fund emissions-reduction and community health improvement measures, such as zero-emission buses, truck replacement programs, indoor air filtration systems, and electrification or non-gas appliance transition programs.	County of Imperial; industry partners; other project developers/operators; ICAPCD; IID; community-based organizations; schools	1–2 years	• Funding mechanisms established • Number of off-site mitigation projects implemented • Number of off-site locations/homes directly benefited • Estimated reductions in emissions or pollutant exposure
Indoor Air Quality Protections for Sensitive Locations	Provide and maintain high-efficiency air filtration and ventilation improvements at schools, childcare facilities, community centers, senior centers, healthcare facilities, and other sensitive receptor locations near project activities.	School districts; County of Imperial; industry partners; other project developers/operators; public health agencies	1–2 years for assessment and planning; 3–5 years for installation	• Number of facilities upgraded • Number of filtration systems installed • Indoor air quality improvements documented
Increased Setbacks and Land Use Protections	Establish increased setbacks, buffer zones, and land use compatibility standards beyond minimum regulatory requirements between industrial operations and sensitive receptors such as homes, schools, and healthcare facilities.	County of Imperial; planning agencies; industry partners; other project developers/operators	3–5 years	• Updated land use policies or standards adopted/practiced • Acres or distances protected through setbacks • Reduction in proximity of sensitive receptors to industrial activities
Health Needs Assessment and Expanded Health Services	Conduct community health needs assessments focused on communities nearest to the Specific Plan area to identify unmet healthcare needs, barriers to care, and priority health concerns. Use findings to expand targeted healthcare services and support programs.	ICPHD; healthcare providers; academic institutions; community-based organizations	1–2 years for assessment; 3–5 years for service expansion	• Health needs assessments completed • Number of expanded healthcare services or programs

				• Increased utilization of healthcare services
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¹ Other project developers/operators = any within the Specific Plan area; ICAPCD = Imperial County Air Pollution Control District; ICDPH = Imperial County Public Health Department; IID = Imperial Irrigation District; RWQCB = Regional Water Quality Board.

² Timeline for initial implementation; all activities are ongoing throughout the end of the project.

Table 38. Potential Implementation Plan Overview for Recommendation 3: Create Enforceable Structures to Maximize Community Benefits, Continued

Action Area	Implementation Activities	Potential Supporting Entities ¹	Timeline for Action ²	Potential Indicators of Progress
Support for Respiratory Health Programs	Improve access to respiratory specialty care, asthma management programs, pulmonary screening, and community-based education related to air quality and respiratory health.	Healthcare providers; public health agencies; schools; community clinics	3–5 years	• Number of respiratory health programs implemented • Increased specialty care access • Participation in education programs • Respiratory health outcomes tracked over time
Minimize Displacement Pressures	Develop programs to reduce housing displacement risks for nearby residents, including property tax assistance, affordable housing initiatives, rental assistance, housing stabilization programs, or other community support mechanisms.	County of Imperial; housing agencies; community development organizations	3–5 years	• Housing assistance programs established • Number of households receiving support • Housing affordability indicators • Reduced displacement concerns reported by residents
Local Hiring Goals and Workforce Development Programs	Establish local hiring goals, workforce training partnerships, apprenticeships, and career development programs to improve local access to employment opportunities associated with the Specific Plan.	Workforce development agencies; educational institutions; industry partners; other project developers/operators; labor organizations	1–2 years	• Local hiring policies adopted with a specific percentage of local hires • Local hiring monitoring information available and shared with the community • Number of local residents trained or hired • Workforce training program participation rates
Workforce Transition Support for Agricultural Workers	Provide targeted workforce transition support for agricultural workers affected by changes associated with the proposed development, including paid job training, educational support, apprenticeships, and pathways to comparable employment opportunities.	Workforce development agencies; educational institutions; labor organizations; community-based organizations	3–5 years	• Number of agricultural workers participating in transition programs • Job placement rates • Completion rates for training or education programs

¹ Other project developers/operators = any within the Specific Plan area; ICAPCD = Imperial County Air Pollution Control District; ICDPH = Imperial County Public Health Department; IID = Imperial Irrigation District; RWQCB = Regional Water Quality Board.

² Timeline for initial implementation; all activities are ongoing throughout the end of the project.

Table 38. Potential Implementation Plan Overview for Recommendation 3: Create Enforceable Structures to Maximize Community Benefits, Continued

Action Area	Implementation Activities	Potential Supporting Entities	Timeline for Action ¹	Potential Indicators of Progress
Support for Vulnerable Populations Not Directly Benefiting from Employment	Develop programs that improve physical and financial access to healthcare, transportation, food assistance, social services, and other essential resources for populations not directly benefiting from employment opportunities.	Public health agencies; social service organizations; community-based organizations; transportation agencies	3–5 years	• Number of support programs implemented • Utilization of services by vulnerable populations • Reduced barriers to healthcare or essential services
Enhanced Remediation, Restoration, and Pollution Control Activities for Other Industries	Require enhanced remediation, restoration, and pollution control measures for other industries that contribute to cumulative environmental burdens, including, where feasible, improved emissions controls, cleanup activities, and environmental restoration projects.	Regulatory agencies; County of Imperial; industry operators; environmental organizations	3–5 years	• Number of remediation or restoration projects completed • Enhanced pollution control measures implemented • Improvements in environmental monitoring indicators
Performance Tracking and Accountability	Establish enforceable accountability mechanisms tied to permits, funding agreements, development agreements, or project approvals. Require measurable performance indicators, regular reporting, and audits.	County of Imperial; regulatory agencies; industry partners; other project developers/operators; independent oversight entities	1–2 years	• Accountability framework adopted • Frequency of reporting and audits • Public availability of performance reports • Compliance with established performance metrics

¹ Other project developers/operators = any within the Specific Plan area; ICAPCD = Imperial County Air Pollution Control District; ICDPH = Imperial County Public Health Department; IID = Imperial Irrigation District; RWQCB = Regional Water Quality Board.

² Timeline for initial implementation; all activities are ongoing throughout the end of the project.

Recommendation 4: Provide Ongoing Engagement with Affected Communities

Table 39. Potential Implementation Plan Overview for Recommendation 4: Provide Ongoing Engagement with Affected Communities

Action Area	Implementation Activities	Potential Supporting Entities ¹	Timeline for Action ²	Potential Indicators of Progress
Initial Steps	Initial implementation planning steps	County of Imperial	Immediate	Meetings and documentation
Ongoing Community Engagement and Communication	Establish and maintain ongoing community engagement programs with an emphasis on education, outreach, transparency, and responsiveness to community concerns.	Industrial partners; project developers/ operators; ICPHD; community-based organizations	1–2 years	- Community engagement program established - Frequency of outreach activities and meetings - Participation levels at community events
	Ensure engagement activities are inclusive, culturally appropriate, multilingual, and accessible to Tribal communities, communities disproportionately affected, rural residents, and individuals with limited technological access or literacy.	Tribal governments; community-based organizations; ICPHD; County of Imperial	1–2 years	- Availability of multilingual and culturally appropriate materials - Participation from disproportionately affected communities - Accessibility accommodations provided
	Provide educational materials and outreach about environmental quality, potential exposures, and actions community members can take to reduce personal or household exposure to pollutants.	ICPHD; ICAPCD; schools; healthcare providers; community-based organizations	1–2 years	- Educational materials distributed - Number of outreach campaigns or workshops conducted - Increased awareness of exposure-reduction practices
Two-Way Community Communication and Responsiveness	Develop clear mechanisms for two-way communication, including opportunities for residents to ask questions, provide input, report concerns, and receive timely responses regarding environmental conditions, health concerns, project activities, and mitigation efforts.	County of Imperial; industry partners; project developers/ operators; ICPHD	1–2 years	- Community response procedures established - Number of community inquiries or concerns addressed - Response times to community questions or complaints

¹ Other project developers/operators = any within the Specific Plan area; ICAPCD = Imperial County Air Pollution Control District; ICDPH = Imperial County Public Health Department; IID = Imperial Irrigation District; RWQCB = Regional Water Quality Board.

² Timeline for initial implementation; all activities are ongoing throughout the end of the project.

Table 39. Potential Implementation Plan Overview for Recommendation 4: Provide Ongoing Engagement with Affected Communities, Continued

Action Area	Implementation Activities	Potential Supporting Entities ¹	Timeline for Action ²	Potential Indicators of Progress
Two-Way Community Communication and Responsiveness, Continued	Incorporate community feedback into planning, mitigation, monitoring, and implementation decisions where feasible, and communicate how public input influenced outcomes or actions.	County of Imperial; industry partners; project developers/operators; regulatory agencies	3–5 years	• Number of opportunities for public input • Documentation of community-informed decisions • Community perceptions of transparency and inclusion
Community Liaison Programs	Designate community liaisons from both industry and public health agencies to support communication, facilitate information sharing, coordinate outreach activities, and improve responsiveness to community concerns.	Project developers/operators; ICPHD; County of Imperial	1–2 years	• Community liaison positions established • Number of community interactions facilitated • Increased community awareness of liaison roles
Monitoring Community Concerns and Well-Being	Periodically gather information regarding community stress, well-being, environmental concerns, perceived exposures, and satisfaction with engagement efforts through surveys, listening sessions, interviews, or other outreach activities.	Academic institutions; ICPHD; community-based organizations	Yearly	• Community surveys or listening sessions conducted • Trends in reported concerns or stress levels • Adjustments made in response to community feedback

¹ Other project developers/operators = any within the Specific Plan area; ICAPCD = Imperial County Air Pollution Control District; ICDPH = Imperial County Public Health Department; IID = Imperial Irrigation District; RWQCB = Regional Water Quality Board.

² Timeline for initial implementation; all activities are ongoing throughout the end of the project.

Recommendation 5: Strengthen Industry-Community Relationships

Table 40. Potential Implementation Plan Overview for Recommendation 5: Strengthen Industry-Community Relationships

Implementation Steps	Description	Potential Supporting Entities ¹	Timeline for Action ²	Potential Indicators of Progress
Action Area: Strengthen Industry-Community Relationships				
Initial Steps	Initial implementation planning steps	County of Imperial	Immediate	• Meetings and documentation
Establish Good-Neighbor Practices and Communication Procedures	Develop formal “good-neighbor” policies that outline expectations for proactive monitoring, public reporting, and timely response to community concerns.	County of Imperial; industry partners; project developers/operators; ICPHD	1–2 years	• Good-neighbor practices adopted • Community communication procedures established • Good practice activities and responses provided
Community Support and Exposure Reduction Programs	Implement community support programs where feasible, such as distribution of air filtration systems, exposure-reduction education, or assistance programs for nearby residents and sensitive populations.	ICPHD; schools; community-based organizations; industry partners; project developers/operators	3–5 years	• Number of households or facilities receiving support • Participation in education or support programs
Establish Dedicated Community Liaison Offices	Designate community liaison personnel or offices to facilitate outreach, education, answer questions, coordinate engagement activities, and support ongoing communication between industry, agencies, and community members.	Industry partners; project developers/operators; County of Imperial	1–2 years	• Community liaison positions established • Number of community interactions or outreach activities conducted • Community satisfaction with responsiveness and communication

¹ Other project developers/operators = any within the Specific Plan area; ICDPH = Imperial County Public Health Department.

² Timeline for initial implementation; all activities are ongoing throughout the end of the project.

Recommendation 6: Enhance Health Monitoring

Table 41. Potential Implementation Plan Overview for Recommendation 6: Enhance Health Monitoring

Implementation Step	Description	Potential Supporting Entities ¹	Timeline for Action ²	Potential Indicators of Progress
Action Area: Enhance the assessment of potential health impacts through targeted data collection				
Initial Steps	Initial implementation planning steps	County of Imperial	Immediate	• Meetings and documentation
Conduct Periodic Community Health Data Collection	Implement periodic surveys, interviews, screenings, or other data collection activities focused on respiratory health, stress, and well-being to supplement health data metrics. Include perceived impacts of the development proposed under the Specific Plan and ensure participation from Tribal communities and affected populations.	ICPHD; healthcare providers; academic institutions; community-based organizations	Every 2 years	• Implementation strategies documented • Number of surveys or assessments completed • Participation rates among focus populations • Health and well-being indicators tracked over time
Analyze and Share Findings with Communities and Decision-Makers	Summarize and communicate assessment findings in accessible formats to community members, Tribal governments, public agencies, and project stakeholders to support transparency and informed decision-making.	ICPHD; County of Imperial leadership; community-based organizations	Every 2 years	• Public reports or presentations completed • Community awareness of findings • Use of findings in planning or mitigation discussions
Use Findings to Inform Adaptive Mitigation and Community Support Efforts	Utilize collected information, as well as feedback gathered during other engagement activities, to identify emerging concerns, improve mitigation measures, guide outreach priorities, and support targeted health or community assistance programs where needed.	County of Imperial; ICPHD; industry partners; project developers/operators	1-2 years	• Adjustments made in response to findings • New mitigation or support programs implemented • Community concerns addressed through follow-up actions

Note: Source for potential measures of psychological well-being (Crosswell & Lockwood, 2020).

¹ Other project developers/operators = any within the Specific Plan area; ICDPH = Imperial County Public Health Department.

² Timeline for initial implementation; all activities are ongoing throughout the end of the project.

Recommendation 7: Health Impact Assessment Planning

Table 42. Potential Implementation Plan Overview for Recommendation 7: Health Impact Assessment Planning

Implementation Step	Description	Potential Supporting Entities ¹	Timeline for Action ²	Potential Indicators of Progress
Action Area: Enhance the assessment of potential health impacts through targeted data collection				
Initial Steps	Initial implementation planning steps	County of Imperial	Immediate	• Meetings and documentation
Establish Partnerships	Determine the scope and duties of the partnership and County of Imperial staff involved; determine meeting frequency and content; locate and invite stakeholders, including community members; and determine whether remuneration is possible for community members' involvement.	ICPHD; healthcare providers; academic institutions; community-based organizations; community members; industry partners; project developers/operators	First year	• Partnership guidelines • Partnership meeting and attendance
Advise on Implementation of HIA Recommendation	Discuss and document stakeholders' input on HIA recommendations.	Same as above	As occurs	• Meeting summary notes
Review Information Gathered and Provide Insight	Review HIA information gathered at intervals to be determined to guide interpretation, identify gaps, and determine how to best share with the public.	Same as above	Quarterly or yearly	•
Locate Funding Sources	If gaps in research are identified, or if funding is needed for monitoring activities, guide efforts to seek additional funding.	Same as above	As needed	•
Hire External Partners as Needed	Determine scope of any external partners; hire external partners needed to collect or compile information.	Same as above	As needed	•
Guide Data Collection Efforts and Interpretation of Results	Review and provide feedback on data collection efforts and the interpretation of results.	Same as above	As needed	•

¹ Other project developers/operators = any within the Specific Plan area; ICDPH = Imperial County Public Health Department.

² Timeline for initial implementation; all activities are ongoing throughout the end of the project.