



# California Geologic Energy Management (CalGEM) Final Orphan Well Screening and Prioritization Methodology

## EXECUTIVE SUMMARY

The California Department of Conservation's (Department) Geologic Energy Management Division's (CalGEM's) developed a methodology to screen, rank, and prioritize California's more than 5,300 orphan, deserted, and potentially deserted wells to be permanently plugged and sealed.

The methodology was developed in preparation for California's expanded state abandonment operations which will be supported by significant new federal funding offering an unprecedented investment in tackling the climate change, public health and environmental risks posed by orphan and deserted wells. The 2022-2023 California State Budget also included \$100 million allocated over the next two 2 fiscal years for this purpose.

In September 2022, CalGEM released to the public and solicited feedback on a draft methodology for prioritizing likely orphan and deserted wells for state abandonment. The draft method CalGEM released consisted of two phases:

- Phase 1 of the screening process is an initial technical screening that aims to provide a first-order prioritization of the thousands of likely orphan wells statewide. It aims to prioritize wells based on risk factors for which data is available that indicate the well may pose a greater risk to people or the environment—either due to their location near communities, vulnerable communities, and environmental assets, including vulnerable communities and sensitive environments, or due to the physical nature of the well itself. It is not intended to be the sole determining factor of which wells will be addressed through state abandonment, but rather to provide a systematic way to narrow the population of wells under consideration based on additional evaluation.
- Phase two of the prioritization method allows additional considerations, such as local priorities, practical considerations, and factors such as geographic equity and ensuring benefits to disadvantaged communities

to be taken into account when CalGEM identifies proposed projects for state abandonment. Extensive local engagement will be done to ensure that local priorities and real community impacts are incorporated into the final prioritization decisions.

In September 2022, CalGEM released a draft initial screen methodology in which three potential scenarios for screening of individual wells were proposed for public consideration. Based on public feedback received, CalGEM constructed its final screening methodology by building on and making important modifications to Scenario 2, which focused on minimizing risk to communities and sensitive environments rather than a focus solely on disadvantaged communities (scenario 1) or well integrity and safety (scenario 3). For a summary of the three proposed scenarios, please see Appendix A of this document and reference the September 2022 *Draft Orphan Well Screening Methodology*: [https://www.conservation.ca.gov/calgem/Documents/DRAFT%20Well%20Screening%20%20Prioritization%20Methodology%20Multiple%20Scenario%20Revision\\_20220915%20final.pdf](https://www.conservation.ca.gov/calgem/Documents/DRAFT%20Well%20Screening%20%20Prioritization%20Methodology%20Multiple%20Scenario%20Revision_20220915%20final.pdf)

Importantly, CalGEM made several modifications to Scenario 2 based on public feedback received. The final initial screening method:

- Prioritizes wells located within 3,200 feet of a residence, school, and health care facility;
- Prioritizes wells for which there is any historical information indicating the well has leaked, or is in a lease for which a leak was previously detected during an environmental inspection;
- Modifies the point values assigned to wellhead location to be an average of the range provided across the three scenarios;
- Prioritizes wells that are accessible and likely accessible, and significantly deprioritizes wells that through field inspection have been confirmed to not be accessible; and
- Increases the value of points assigned to wells with failed casing integrity tests, as this is a direct indication the well lacks mechanical integrity.

For the Phase 2 secondary screening, CalGEM will also take into consideration if wells are located in densely populated areas.

With these modifications, CalGEM's final method for prioritization includes:

- Phase 1, using the initial screening methodology, includes conducting an initial technical screening of all wells informed by the regulatory criteria found in California Code of Regulations, title 14, section 1772.4, data from CalEnviroScreen 4.0, which identifies communities heavily burdened by pollution and socioeconomic disadvantage, as well as criteria identified as a priority based on public feedback. These criteria include:
  - status as a critical well, urban well, or with an environmentally sensitive wellhead;
  - whether the well is located in an area of known geologic hazard;
  - whether the well has pressure in the casing or the tubular;
  - whether the well is open to the atmosphere;
  - whether the well has surface obstacles or other impediments to access;
  - whether the well has known downhole issues;
  - whether the fluid level is above the base of fresh water or USDW<sup>1</sup>;
  - the age of the well;
  - whether production facilities are present;
  - if a well is located in a Disadvantaged Community (DAC) and the well's census tract relative pollution burden and population percentile.

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<sup>1</sup> Base of fresh water is defined as 3,000 mg/L of less Total Dissolved Solids. A USDW is defined in the Code of Federal Regulations (40 CFR 144.3) as: “an aquifer or its portion: (a)(1) Which supplies any public water system; or (2) Which contains a sufficient quantity of ground water to supply a public water system; and (i) Currently supplies drinking water for human consumption; or (ii) Contains fewer than 10,000 mg/l total dissolved solids; and (b) Which is not an exempted aquifer. “

- whether the well is likely located within 3200 feet of a residence, school, or health care facility; and
- whether there is any historical information indicating the well has leaked.
- Phase 2 is a secondary evaluation that incorporates local government and public feedback on the provisional ranking that results from Phase 1, with consideration of other important values and factors, such as:
  - Local priorities. Engagement with local governments and the public on local needs and priorities, as well as land use plans will be conducted and taken into consideration.
  - Benefits to disadvantaged communities. Ensuring monies available for state abandonments benefit those communities most vulnerable to and impacted from pollution in California will be considered when identify proposed state abandonment projects.
  - Geographic equity. With thousands of likely orphan and deserted wells statewide, CalGEM will need to take into consideration geographic location and balance when identifying proposed state abandonment projects to ensure many communities across California benefit from the program.
  - Efficient use of funds. CalGEM will also consider practical factors such as wellsite location, access, and efficiency and cost of abandonments to maximize the impact of available funds.
  - Unique wellsite characteristics. CalGEM will also consider unique wellsite characteristics, such as if the well is located in a relatively population dense area, reservoir characteristics (e.g. if reservoir is known to contain sour gas), and if there is a history of noncompliance issues at the site.

Once finalized, the results of the screening methodology will be presented at a series of local government and community engagements through early 2023 for review and comment on local priorities. The screening results will also be posted on the Department's website and public comment will be welcomed while the

prioritization discussion remains open. Input from this public process will inform the development of a draft Expenditure Plan, which will outline a framework for expending state and federal funds across multiple years and which will designate which wells and fields have been prioritized and proposed for early action. This draft Expenditure Plan is expected to be released for public comment second quarter 2023.

## **BACKGROUND**

California's oil industry is more than 150 years old, with production operations peaking in 1985 and in decline since. This decline has led to more wells being taken out of production. California has also seen an increase in orphan and deserted wells. Orphan and deserted wells can pose a threat to public health, safety, and the environment. They can leak oil, emit air emissions, including methane—a potent greenhouse gas, and pose physical hazards.

The statewide inventory of wells that CalGEM generated and is using to prioritize wells for state abandonment using this method include:

- Orphan wells. Orphan wells are those wells for which there is no responsible, solvent operator to maintain, repair, or plug and abandon them. Orphan wells can pose a threat to public health, safety, and the environment, including the climate, by leaking oil, emitting greenhouse gases, and posing physical hazards. Because there is no responsible operator CalGEM can compel or seek funds from, orphan wells are left to the state to remediate and permanently seal or plug and abandon.
- Deserted wells. Deserted wells are wells that have not been maintained in compliance with CalGEM's regulations and are determined to be deserted as demonstrated through a final plugging and abandonment order. Deserted wells have not yet been definitively determined to be orphan because a determination of financial resources held by legally responsible current or prior operators has not yet been completed. If the operator does not plug and abandon the wells in accordance with the order, CalGEM has the authority to plug and abandon deserted wells—and has limited authority to recover costs from a solvent responsible operator that is identified. If there are no solvent responsible operators, CalGEM will generally refer to the wells as orphan.

- In addition to orphan and deserted wells, some of the wells included for prioritization may have been previously abandoned, but have been included in case they may need to be reabandoned. CalGEM may order the reabandonment of any previously abandoned well if CalGEM has reason to question the integrity of the previous abandonment or the well is not accessible or visible.

CalGEM has been issuing contracts to plug and abandon orphan and deserted wells for many years, but with limited funding to date. Since fiscal year 2016/2017, CalGEM has expended more than \$9.3 million to plug and abandon more than 70 wells. CalGEM's current inventory of likely orphan wells includes more than 5,300 wells across the state and CalGEM projects the cost to plug and abandon them could be nearly \$1 billion. As such, new federal funding offers an unprecedented investment in tackling the climate, public health, and environmental risks posed by orphan and deserted wells, as well as the \$100 million over two years allocated in the 2022-23 State Budget.

The proposed methodology described herein will enable CalGEM to more systematically and efficiently manage that investment to address the wells that may pose the greatest risk to public health, safety, and the environment.

## **PHASE 1 – INITIAL SCREENING OF INDIVIDUAL WELLS**

The initial technical screening, also known as Phase 1, is intended to evaluate the potential risk a well may pose to public health, safety, and the environment. The technical data included in the evaluation cover four key categories: a surface study, a downhole study, evaluation of other potential hazards, and evaluation of impacts on disadvantaged communities. Each category identifies the specific attributes and variables associated with a well that speak to its location, condition, and other important risk factors that may affect public health and the environment.

In order to compare the wells across the criteria, CalGEM created a composite relative risk score by assigning a risk score ranging from zero to ten points for each factor identified in California Code of Regulations, title 14, section 1772.4, including whether or not the well is critical due to the proximity of waterways and other critical habitat, and other factors identified by technical experts or identified in public feedback as having the potential to increase the potential

risk the well might pose to public health or the environment . The points are then aggregated to establish an overall score for each well that correlates to the potential risk the well may pose. The higher the score, the greater the potential risk the well poses, and the higher the priority for abandonment.

After a score has been calculated the wells are categorized into five tiers 1-5, with the tiers representing the five segments under the normal distribution, with tier 1 representing the highest risk wells. As part of the methodology development process, CalGEM staff developed 3 scenarios comprised of different weights across the criteria. These scenarios were used to facilitate meaningful public engagement on which values to emphasize when prioritizing wells for abandonment. The scoring varies in each scenario to emphasize the risk based on each of the following:

- Scenario 1 focused on impacts on disadvantaged communities with data taken primarily from CalEnviroScreen using the definition for disadvantaged used by that system, which is focused on pollution burdens;
- Scenario 2 with a focus on proximity to communities and sensitive environments; and
- Scenario 3 focused on well condition.

More detail regarding the rationale behind the points associated with the criteria in each of the scenarios is provided in September 2022 *Draft Orphan Well Prioritization Methodology* document. To develop its finalized screening method, CalGEM staff made improving modifications to scenario 2, based on public feedback. The final method heavily prioritizes wells located near California communities, including its most vulnerable communities, and those wells that have indications of well integrity issues, such as history of leaks, in order to prioritize wells that if properly plugged and abandoned, can bring about the most benefits to public health and California communities.

### **Selected Screening Methodology**

Based on an evaluation of public feedback, CalGEM has decided to move forward with a modified Scenario 2 for the initial screening process. Feedback received has been in favor of emphasizing abandoning wells near or within

critical or sensitive environments, near where people are located, and disadvantaged communities. CalGEM made several modifications to Scenario 2 based on public feedback received. The final initial screening method:

- Prioritizes wells located within 3,200 feet of a residence, school, and health care facility;
- Prioritizes wells for which there is any historical information indicating the well has leaked, or is in a lease for which a leak was previously detected during an environmental inspection;
- Modifies the point values assigned to wellhead location to be an average of the range provided across the three scenarios;
- Prioritizes wells that are accessible and likely accessible, and significantly deprioritizes wells that through field inspection have been confirmed to not be accessible; and
- Increases the value of points assigned to wells with failed casing integrity tests, as this is a direct indication the well lacks mechanical integrity.

Table 1.1 highlights the selected screening criteria CalGEM has decided to move forward with for prioritizing orphan well plugging and abandonments.

**Table 1.1 Points Association for Screening Methodology**

<b>Criteria</b>	<b>Risk Parameters</b>	<b>Risk Points</b>
<b>Wellhead Location</b>	None	0
	Critical	3
	Environmental Sensitive	3
	Urban	3
	Multiple, 2 of 3 Designations	6
	Multiple, 3 of 3 Designations	9



<b>Criteria</b>	<b>Risk Parameters</b>	<b>Risk Points</b>
<b>Geologic Hazards</b>	None	0
	Within a Fault Zone	1
	Within a Landslide Area	1
	Within a Seismic Hazard Zone	1
	Within 2 Hazard Areas	2
	Within 3 Hazard Areas	3
<b>Wellhead Pressure</b>	No Info	0
	No Pressure	0
	Well pressure <200 psi	1
	Well pressure >200 psi	2
	Open to Atmosphere	3
<b>Wellsite Accessibility<sup>2</sup></b>	Accessible	3
	Possible Access Restrictions to Site	2
	No Discernible Road Access	1
	Wellhead Not Visible	0
	Inaccessible (determined through field verification)	-88
<b>Within 3,200' of a residence, school, or health care facility</b>	Located within 3200 feet of a residence, school, or health care facility	Yes/No
	No	0

<sup>2</sup> Wellsite accessibility is determined using GIS maps and field inspections. The categories “Accessible,” “Possible Access Restrictions to Site,” “No Discernible Road Access,” and “Wellhead Not Visible” were determined using GIS maps. For those wells for which field staff were deployed to locate the well, and the well was determined to be inaccessible, they are categorized as “Inaccessible.”

<b>Criteria</b>	<b>Risk Parameters</b>	<b>Risk Points</b>
	Yes	10
<b>Historical Well Leaks</b>	Leak Never Detected	0
	Leak Detected and Repaired or Actively Being Repaired	10
<b>Production Facilities</b>	No	0
	Yes	1
<b>Jurisdiction</b>	None	0
	BLM	1
	Tribal	1
	State Lands	1
<b>Damage</b>	Damage at depth?	Yes/No
	No	0
	Yes – Damage not above either BFW or USDW	1
	Yes – Above BFW and/or USDW	10
	Yes – BFW and USDW presence unknown	10
	Yes -- Just USDW presence unknown	5
<b>Fish/Junk in Hole</b>	Damage at depth?	Yes/No
	No	0
	Yes	1
<b>BFW Present</b>	No	0
	Yes	5
	Unknown	5
<b>Fluid Level Test Result</b>	Not above either BFW or USDW	0

<b>Criteria</b>	<b>Risk Parameters</b>	<b>Risk Points</b>
	Above BFW	1
	Above USDW	1
	BFW presence unknown	1
	USDW presence unknown	1
	Unknown fluid level	2
	Above both BFW and USDW	2
<b>Cleanout Tag</b>	Overdue Cleanout	0.5
	Failed Cleanout	1
<b>Casing Integrity Test</b>	Pass	0
	Overdue	2.5
	Fail	5
<b>Years Idle</b>	Idle Years > 15	1
<b>Age of Well</b>	Age < 25	0
	25 < Age < 50	1
	Age > 50	2
<b>Total Population Percentile</b>	Percentile value/40	(0-2.5)
<b>Pollution Burden Percentile (CalEnviroScreen 4.0)</b>	Percentile value/20	(0-5)
<b>Population Characteristic Percentile (CalEnviroScreen 4.0)</b>	Percentile value/20	(0-5)

Criteria	Risk Parameters	Risk Points
<b>SB 535 Disadvantaged Community (CalEnviroScreen 4.0)</b>	No	0
	Yes	5

### Well Information

As part of the screening process, CalGEM reviewed data for each well. During its review, CalGEM gathered information that, while not scored, is important to identifying the well and future plugging and abandonment work.

- **API Number:** The 10-digit API number of the well. At the time an oil or gas well is drilled, it is assigned a unique 10-digit API number to identify and track the well.
- **Field:** The name of the oil and gas field in which the well is located. The field is an area boundary, characterized by similar geological properties.
- **Well Designation:** The well name. In addition to the 10-digit API number, oil and gas wells are also typically assigned a name. When discussing a well, it is often easier to refer to the name, rather than the API.
- **Operator Code:** A unique numerical code CalGEM assigns to identify the operator of an oil or gas well.
- **Operator Name:** The name of the last known operator of the well, according to CalGEM's records.
- **District:** The CalGEM District in which the well is located.
- **Latitude & Longitude:** Location of the well, including if the well location coordinates have been validated by CalGEM staff during field inspections, as six-digit decimal degrees, non-projected, Latitude and Longitude, in the Geographic Coordinate System (GCS) NAD83.

- **Well Management Map:** A link to CalGEM's internal Geographic Information System (GIS) map with multiple layers to show where the well is located on Earth and the surrounding area. CalGEM uses the information to help complete the surface study.
- **Plug Back Depth:** The depth of any plug back that meets regulation standard; it is considered the effective bottom depth of the well.
- **Partial Abandonment Depth:** The depth of any plug used to partially abandon the well or the effective depth of the well.
- **Total Depth:** The bottom or lowest point in the subsurface to which the well was drilled.
- **Wellbore Path:** The subsurface path of the well providing measured depth and both inclination and azimuth measurements.

### Surface Study

CalGEM has conducted a review of the surface location and conditions for each well at the surface to assess potential risks associated with the well, including actual and potential access issues. This process is known as a surface study. CalGEM utilized GIS maps to conduct an initial review of the well's location and the accessibility of the well. In addition, a subset of wells have already been confirmed to be inaccessible based on field inspections (Inaccessible). This existing information is used to prioritize wells, but in addition, prior to finalizing plugging and abandonment projects, the well's location and accessibility will be verified through field inspections.

The data collected during the surface study provides information on the surface conditions that will affect the efficiency and cost of the plug and abandonment effort.

Key criteria for the surface study include:

- **Wellhead Location:** Evaluation of whether the well is a critical well, or is located in an urban area, or an environmentally sensitive area, as defined in regulation. A higher risk score is assigned to a well that falls into these categories because the well has a greater potential impact to health,

public safety, and the environment in the event of a failure either at the surface or subsurface. Generally, these designations are defined by the wellhead's distance to a building, airport runway, public street, highway, railway, waterways, public recreational facility, officially recognized wildlife preserve, public recreational area, environmentally sensitive habit, or a well located in the coastal zone. (Cal. Code of Regulations, tit. 14, §§ 1720, subd. (a); 1760, subds. (f), (y).)

More specifically, a critical well means a well within 100 feet of public street, railway, body of water, public recreational facility, or wildlife preserve; or within 300 feet of building and airport. A well is within an environmentally sensitive area if the wellhead is located within the coastal zone, 200 feet away from wildlife preserve, environmentally sensitive habitat, or waterbody, or 300 feet from any public recreational area or buildings. And a well is within an urban area if the well is within 300 feet of an area with at least twenty-five business establishments, residences, or combination thereof.

The total points assigned in the final method for this criterion was modified to be in the middle of the range created across the three scenarios provided for consideration. This lowered its value from that presented in scenario two because, with the addition of the new, and high-value criteria prioritizing wells located within 3,200 feet of homes, educational resources, and health care facilities, the total weight placed on a well's location needed to be balanced with weight placed on the condition of the well.

- **Geologic Hazards:** Evaluation of whether the well is located in an area of known geologic hazard, such as subsidence, landslides, faults or if there is a history of seismicity. A higher risk score will be assigned to a well which is located in an area with one of these known hazards, and as such, may have its surface equipment damaged or become buried and inaccessible at the surface. The geologic hazards are identified from the CalGEM Hazard Management map, which relies upon data from the California Geological Survey hazard maps.

- **Wellhead Pressure:** Evaluation of whether the well has pressure in the casing or tubing at the surface or is open to the atmosphere. A higher risk score is assigned to a well with high pressure in the tubing or casing or that is open to the surface because the well has a greater risk of spill from an uncontrolled release, or risk that fluid will flow out of the wellbore, due to the risk of well failure over time.
- **Presence of Production Facilities:** This criterion refers to any equipment attendant to oil and gas operations that are present at the well site. The presence of this equipment, like pipelines or tanks connected to the well, increases the potential risk of soil contamination and has the potential to cause harm by virtue of the equipment not being secured.
- **Jurisdiction:** Evaluation of whether the well is located on BLM, Tribal, or State land. Where the well is located is important for coordinating plugging and abandonment work when a group of wells cross jurisdictional boundaries. Such coordination allows for savings associated with rig mobilization costs and access.
- **Wellsite Accessibility:** Evaluation of whether the well has surface obstacles or other impediments preventing access to the wellhead, including but not limited to buildings or structures, surface-use activities, irrigation systems, roads, terrain, or restricted access. For purposes of the initial screening, wellhead accessibility is based on review of aerial photos on the CalGEM GIS map and through wellsite inspections. In response to public feedback, CalGEM has updated its final screening method to prioritize wells that are accessible. As part of this update, wells that have been formally determined to be inaccessible based on field inspections were assigned negative points to ensure they are deprioritized over wells for which state abandonments can be carried out. If any potential hazards arise from an inaccessible well, CalGEM will inspect and address those wells directly, as needed, using its authorities to respond to and address hazardous situations.
- **Located within 3,200 feet of a residence, school, or health care facility:** Evaluation of whether or not a well is located within 3200 feet of a sensitive site, such as residences, schools, and health care centers. The

draft screening method released in September 2021 aimed to prioritize wells located in proximity to communities, and in proximity to vulnerable communities. At the time, CalGEM did not have finalized data on likely orphan wells located within 3,200 feet of a residence, school, and health care center. In order to prioritize wells located near people and vulnerable populations, the September draft scenarios prioritized wells located in a Senate Bill 535 Disadvantaged Community, and for wells considered “critical wells,” which are wells located within 300 feet of buildings intended for human occupancy, other infrastructure, and environmentally sensitive areas (critical wells, as defined in California Code of Regulations, title 14, section 1720 subd. (a)).

Since its September release, CalGEM has worked diligently to finalize data on orphan wells within 3,200 feet of a residence, school, and health care facility. As such, and in response to public feedback, CalGEM has updated its method to add an additional criterion for if a well is located within 3,200 feet of these sites, or not. Orphan, deserted, and likely orphan wells located within 3,200 ft of these sites are assigned more points, to elevate these wells in the prioritization.

This is an expansion of the original 100-300 foot priority area that was based on the regulatory definition of a critical well. All critical, urban, and environmentally sensitive wells will also still be assigned points.

- **Historical Well Leaks:** Evaluation of whether a well has any historical information indicating the well has leaked. In some instances, the presence of a leak in any single equipment may be associated to an entire lease; if that is the case, the well will be treated as if it had a history of leaking. In response to public feedback, CalGEM has added this criterion to the screening method and assigned it a high level of points to ensure that wells or wells within leases for which there is a history of leaks, and thus may be at increased risk of leaking again, are prioritized for state abandonment.

### **Downhole Study**

CalGEM reviewed the information available about the subsurface (“downhole”) conditions for each well to assess potential risks associated with the integrity of



the well and identify any known downhole issues that would make it difficult to plug and abandon the well, such as known holes in casing, collapsed casing, stuck rods, unset packer, or fish or junk in the hole. This process is known as a downhole study.

Key elements of the downhole study include:

- **Well Damage:** Evaluation of whether the well has known downhole issues that would make it difficult to plug and abandon, such as damaged casing or downhole equipment, known unintended hole in casing, or collapsed casing. Such damage may influence flow in the well and compromise the mechanical integrity of the well. If damage to the well is present, additional points are assigned if it is above the BFW and/or USDW, in order to better capture the potential for contamination.
- **Junk or Fish:** Evaluation of whether the well has known junk, such as a stuck rod or packer, or fish. The presence of junk or fish influences flow in the well, may compromise the mechanical integrity of the well, or restrict access to the well.

### Other Potential Hazards

CalGEM then evaluates other critical factors that increase the risk associated with the well, such as the results of any testing performed on the well and the age of the well.

Key elements examined as part of the other potential hazards analysis include:

- **Fluid Level Test Result:** Evaluation of whether the most recent fluid level test results show that the fluid level depth inside the well is above the base of freshwater (BFW) or an underground source of drinking water (USDW). A higher risk score is assigned to those wells where the fluid level depth inside the well is above the BFW or USDW because of the increased risk of contamination if the well is leaking. Where such information is unknown, the default is to score the well as if the most hazardous condition exists, i.e. that the fluid is above both the BFW and the USDW for 2 points. This conservative approach was taken because a lack of data does not guarantee a non-hazardous condition, and the lack of data itself is a risk factor.

- **Cleanout Tag Result:** Evaluation of the results of any cleanout tag performed on the well. The cleanout tag results indicate the ability to reach the current CalGEM-approved depth of the well, which is an important indicator of whether the well can be abandoned to current regulatory standards, or if there are any obstructions inside the well that would prevent the bottom of the well from being properly abandoned.
- **Casing Integrity Test Result:** Evaluation of the results of any casing pressure test that has been conducted. A successful casing pressure test indicates the well is not leaking. A failed casing pressure test indicates the well casing is leaking or cannot withstand the expected operating pressure of the well. In response to public feedback, the value of the criteria was increased as it is evidence the well has integrity issues and, under certain conditions, could be leaking above or below surface.
- **Age of well:** Inclusion of age of well based upon the date the well was drilled. Older wells are assigned a higher risk score because age can be an indicator of the potential for the well to have integrity issues. Wells with integrity issues are at greater risk of leaking due to deterioration of the casing and cementing over time.
- **Number of Years Idle:** Inclusion of the number of years a well has not be actively producing, which is also an important metric for well condition. A well is considered idle after 24 consecutive months of inactivity. CalGEM requires operators to conduct idle well testing on a set frequency for all idle wells to ensure they do not have integrity issues. In addition, CalGEM requires operators to perform more rigorous analysis for all idle wells that have been idle for longer than fifteen years, because such wells may have integrity issues and may not be viable. However, orphan wells do not have a viable operator to conduct this testing and analysis. For these wells, the longer a well is idle, the greater the risk that the well may have integrity issues that may lead to the well leaking. By regulation, wells that have been idle for longer than fifteen years are required to undergo more rigorous analysis because such wells may have integrity issues and may not be viable.

## Impacts on Disadvantaged Communities

To prioritize wells for abandonment in those communities that are disproportionately burdened by pollution, CalGEM has and will apply information from CalEnviroScreen and Senate Bill 535 (2012) Disadvantaged Communities data to identify those communities that are potentially being most affected by industry.<sup>3</sup>

CalEnviroScreen 4.0 is the most recent version of a science-based screening methodology and mapping tool created and maintained by the CalEPA Office of Environmental Health Hazard Assessment (OEHHA) that identifies California communities that are disproportionately burdened by multiple sources of pollution. CalEnviroScreen uses environmental, health, and socioeconomic information to produce scores for every census tract in the state and identify disadvantaged communities based on geographic, socioeconomic, public health, and environmental hazard criteria. CalEPA uses the tool, in part, to designate as disadvantaged certain communities, pursuant to Senate Bill 535.

CalGEM reviews the census tract a well is located in to identify those wells located in communities systematically burdened by pollution and populations most vulnerable to the effects of pollution. This includes:

- **Total Population Percentile:** This percentile reflects the total population of a particular census tract relative to others. The higher the percentile, the more populated the tract is and the more residents that could be impacted by an orphan well, so a higher risk score is assigned. Because a census tract is often very large, population density is revisited during secondary screening as well.

In addition, key elements from the CalEnviroScreen tool include:

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<sup>3</sup> More detail on percentile methodology and list of indicators is in:  
<https://oehha.ca.gov/media/downloads/calenviroscreen/report/calenviroscreen40reportf2021.pdf>  
Final Designation of Disadvantaged Communities:  
[https://calepa.ca.gov/wp-content/uploads/sites/6/2022/05/Updated-Disadvantaged-Communities-Designation-DAC-May-2022-Eng.a.hp\\_-1.pdf](https://calepa.ca.gov/wp-content/uploads/sites/6/2022/05/Updated-Disadvantaged-Communities-Designation-DAC-May-2022-Eng.a.hp_-1.pdf)

- **CalEnviroScreen 4.0 Pollution Burden Percentile:** This percentile is assigned to each census tract and results in a higher risk score if the well is located in a census tract more exposed to and affected by pollutants. For this metric, thirteen pollutants and environmental effect indicators are collected and assessed for each census tract, scored and ranked in percentile.<sup>4</sup> The higher the percentile value the more the census tract is exposed to and affected by pollutants and the higher the risk score.
- **CalEnviroScreen 4.0 Population Characteristic Percentile.** The Population Characteristic Percentile is assigned to each census tract results in a higher risk score if the well is located in a census tract where the population is more vulnerable to pollutants. The Population Characteristic Percentile evaluates sensitive populations that are at increased vulnerability to pollutants using eight physiological conditions and socioeconomic factors.<sup>5</sup> Each census tract was or will be scored and ranked in percentile. The higher the percentile, the more vulnerable the population within that area to pollutants and the higher the risk score.
- **Senate Bill 535 Disadvantaged Community data:** This data is referenced to determine if the well is located in a disadvantaged community, as identified by CalEPA, pursuant to Senate Bill 535. For the current designation, released by CalEPA in May 2022, census tracts receiving the highest 25 percent of overall scores in CalEnviroScreen 4.0, or the highest 5 percent of CalEnviroScreen 4.0 cumulative pollution burden scores, are considered disadvantaged communities. Other communities identified as disadvantaged in CalEPA's current designation include census tracts identified in the previous (2017) designation as disadvantaged and lands under the control of federally recognized tribes.

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<sup>4</sup> More detail on percentile methodology and list of indicators is in: <https://oehha.ca.gov/media/downloads/calenviroscreen/report/calenviroscreen40reportf2021.pdf>

<sup>5</sup> More detail on percentile methodology and list of indicators is in: <https://oehha.ca.gov/media/downloads/calenviroscreen/report/calenviroscreen40reportf2021.pdf>

## PHASE 2 – SECONDARY SCREENING PROCESS

Following the initial screening process described above that provides an initial ranking and prioritization of the well inventory for plugging and abandonment, CalGEM will conduct a secondary screening that incorporates local government and public feedback on the outcome of the screening of the well inventory. The focus will be on obtaining local government and community input to incorporate local needs, insight into local land use development priorities, and local knowledge on sites of concern.

### Local Concerns

To begin the facilitation of local input on the results of the screening methodology, CalGEM will post the results on its website and invite comments and feedback. Local governments and the public may provide any feedback they wish on the screened wells and the prioritization ranking. In addition, CalGEM will meet with local governments with high numbers of orphan wells in order to identify local priorities, with a focus on cities and areas within the five major producing counties within the state.

CalGEM will be particularly interested in learning about the following:

- **Complaints or hazards:** The technical screening is expected to capture much of the data related to risk to public health and the environment; however, additional information about wells and sites of particular concern due to complaints local government has received about the wells or hazards they pose will be considered to increase a well's priority level.
- **Impacts on Communities:** Any data or information regarding a well's impact on local communities will be considered to affect a well's priority level.
- **Future Development Plans:** CalGEM will also consider existing plans to redevelop areas for housing, particularly affordable housing, parks and recreation, and other community development priorities.

All comments received will be recorded and considered as CalGEM develops its draft Expenditure Plan, outlining its framework for expending state

abandonment funds, including proposed first phase projects for public consideration.

### **Efficient Use of Resources**

Plugging and abandonment work requires the use of a “rig.” At any one time, there are a limited number of rigs available for this work. Bringing a rig to a wellsite (“mobilizing”), is a significant portion of the cost of plugging and abandonment work.

- **Well Proximity:** In order to make most efficient use of available rigs, minimize rig mobilization costs, and maximize the number of wells that can be plugged and abandoned with available funds, CalGEM will consider prioritizing a group of wells in a lease or field.

Through field inspections, CalGEM will confirm that the well can be located and accessed to carry out the plugging and abandonment work.

- **Accessibility:** CalGEM will work to confirm that the well can in fact be located and accessed to carry out the plug and abandonment. If a well is not locatable, CalGEM may consider utilizing additional methods, such as excavation, to try to locate the well. If the well is inaccessible, CalGEM will assess the reason for the well inaccessibility, whether any monitoring is needed of the well, and a plan for abandoning the well should it become accessible. For example, if a well is temporarily inaccessible due to it being in an agricultural field and a crop being grown, CalGEM will develop a plan to monitor the well, if necessary, and then abandon the well once the crop has been harvested. On the other hand, if the well is inaccessible because it is located under a building, CalGEM will note the location of the well in its records and develop a plan for any monitoring that is needed and abandonment of the well, should it ever become either a hazard or accessible.

## **CONCLUSION**

With an unprecedented infusion of state and federal funds to address California’s orphan well problem, CalGEM is taking a statewide and systematic approach to identifying priority projects across the state that maximize these

dollars and reduce the most risk these wells pose to California communities and environment. CalGEM welcomes comments and feedback that can be considered as it develops a draft Expenditure Plan to be released Q2 2023. This plan will provide a framework for expenditures, and will propose a first phase set of potential state abandonment projects based on the method and considerations discussed in this document.

## **APPENDIX A. ORIGINAL PROPOSALS FOR SCREENING METHODOLOGY**

In September 2022, CalGEM release a *Draft Orphan Well Prioritization Methodology* for public consideration. As part of this document, CalGEM provided three scenario approaches for the initial, data-driven screening method for public consideration. These scenarios, and public feedback received on them, informed development of the final screening method. As such, an overview of each scenario is provided below for reference. These can also be found in the *Draft Orphan Well Prioritization Methodology* document: [https://www.conservation.ca.gov/calgem/Documents/DRAFT%20Well%20Screening%20%20Prioritization%20Methodology%20Multiple%20Scenario%20Revision\\_20220915%20final.pdf](https://www.conservation.ca.gov/calgem/Documents/DRAFT%20Well%20Screening%20%20Prioritization%20Methodology%20Multiple%20Scenario%20Revision_20220915%20final.pdf)

### **Scenario 1: Impact on Disadvantaged Communities**

Scenario 1 aims to prioritize wells that are located within disadvantaged communities, as identified by the CalEPA Disadvantaged Communities designation, and may present risks to those communities if left unplugged. In this scenario, information from CalEnviroScreen and Senate Bill 535 (2012) Disadvantaged Communities data are the only criteria that are weighted up to five points, except for the presence of freshwater.

### **Scenario 2: Proximity to communities and sensitive environments**

Scenario 2 places greater emphasis on criteria that indicate the well is located near people or critical or sensitive environments that may be at risk due to orphan wells remaining unaddressed, and also emphasizes if that well is located in a disadvantaged community. It uses the same scoring as Scenario 1 but allows up to five points to each the following well location factors: whether the well is critical, in an urban area, or is environmentally sensitive. After evaluating preliminary results from Scenario 1 it was found that some census tracts are so large that wells in rural areas, away from large populations of people, are ranked highest. To further emphasize the importance a well's location has on its potential impact to health, public safety, and the environment, each of the location factor scores were increased. A well is given five points for each designation that it falls into. A well that falls into two designations is given a score of two points, and three points if falls in all three designations.



### Scenario 3: Well condition

When thinking about the risk an orphan well poses to California communities, that is largely driven by two factors: what is nearby and susceptible to that risk, and the physical state of the orphan well itself. Scenarios 1 and 2 emphasize the first factor, while Scenario 3 aims to emphasize criteria that may indicate the well is in a poor state and has a high likelihood of contaminating groundwater or leaking. It uses the same scoring as Scenario 1 but allows up to five points for subsurface conditions and other critical factors that indicate higher risks associated with the integrity of the well. These criteria include: well damage, junk or “fish” stuck in the well, casing integrity test results, wellhead pressure, number of years idle, and the age of the well. The quality and detail of the well records varies across the dataset and many older wells have very limited downhole data. While most wells have data pertaining to the well’s age and long-term idle well status, less than 5 percent of wells have data available for the other relevant criteria. Despite the data limitations, wells that are known to have conditions that may compromise the mechanical integrity of the well or obstruct access to the depths required for a proper abandonment, can be prioritized.

Table A-1 below shows the points associated with the criteria across each scenario.

**Table A-1 Points Association**

Criteria	Risk Parameters	Risk Points	Risk Points	Risk Points
		Scenario 1	Scenario 2	Scenario 3
<b>Wellhead Location</b>	None	0	0	0
	Critical	1	5	1
	Environmental Sensitive	1	5	1
	Urban	1	5	1
	Multiple, 2 of 3 Designations	2	10	2
	Multiple, 3 of 3 Designations	3	15	3

<b>Geologic Hazards</b>	None	0	0	0
	Within a Fault Zone	1	1	1
	Within a Landslide Area	1	1	1
	Landslide Area	1	1	1
	Within a Seismic Hazard Zone	1	1	1
	Within 2 Hazard Areas	2	2	2
	Within 3 Hazard Areas	3	3	3
	No Info	0	0	0
	No Pressure	0	0	0
<b>Wellhead Pressure</b>	<200 psi	1	1	2.5
	>200 psi	2	2	5
	Open to Atmosphere	3	3	5
<b>Wellsite Accessibility</b>	Accessible	0	0	0
	Possible Access Restrictions to Site	1	1	1
	No Discernible Road Access	2	2	2
	Wellhead Not Visible	3	3	3
<b>Production Facilities Present</b>	No	0	0	0
	Yes	1	1	1
<b>Jurisdiction</b>	None	0	0	0
	BLM	1	1	1
	Tribal	1	1	1

	State Lands	1	1	1
<b>Damage Depth</b>	Enter depth	1	1	5
<b>Fish/Junk Depth</b>	Enter depth	1	1	5
<b>BFW Present</b>	No	0	0	0
	Yes	5	5	5
<b>Fluid Level Test Result</b>	Not above either BFW or USDW	0	0	0
	Missing BFW/USDW value	0.5	0.5	0.5
	Above BFW	1	1	1
	Above USDW	1	1	1
	Unknown	1	1	1
	Above both BFW and USDW	2	2	2
<b>Cleanout Tag Result</b>	Overdue Cleanout	0.5	0.5	2.5
	Failed Cleanout	1	1	5
<b>Casing Integrity Test Result</b>	Pass	0	0	0
	Overdue	0.5	0.5	0.5
	Fail	1	1	1
<b>Years Idle</b>	Idle Years > 15	1	1	1
<b>Age of Well</b>	Age < 25	0	0	0
	25 < Age > 50	1	1	1
	Age > 50	2	2	2
<b>Total Population Percentile</b>	Percentile value	Percentile/40	Percentile/40	Percentile/40
		(0-2.5)	(0-2.5)	(0-2.5)
<b>CalEnviroScreen 4.0 Pollution</b>	Percentile value	Percentile/20	Percentile/20	Percentile/20

<b>Burden Percentile</b>		(0-5)	(0-5)	(0-5)
<b>CalEnviroScreen 4.0 Population Characteristic Percentile</b>	Percentile value	Percentile/20	Percentile/20	Percentile/20
		(0-5)	(0-5)	(0-5)
<b>CalEnviroScreen 3.0 SB 535 Disadvantaged Community</b>	No	0	0	0
	Yes	5	5	5