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Ms. Kristin L. Starbird
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Subject: Feasibility Assessment of Air Quality Performance Standards for the Inglewood Oil Field Project for Culver City

Dear Ms. Starbird:

Yorke Engineering, LLC (Yorke) prepared this technical letter report to present our review and assessment of the feasibility of mitigating air quality impacts pursuant to the Specific Plan to regulate the installation of new oil field wells and the use of well stimulation in the Culver City portion of the Inglewood Oil Field (City IOF).

This feasibility assessment is based on the draft Air Quality and Greenhouse Gas Technical Report (AQ/GHG Tech Report) prepared by Yorke in support of the Environmental Impact Report (EIR) for the Specific Plan, and in response to comments received from BonTerra Psomas and Culver City on the draft AQ/GHG Tech Report.

The draft AQ/GHG Tech Report identified potentially significant air quality and health risk impacts due to emissions from diesel-fueled engines expected to be used on the City IOF as part of the Specific Plan. Two mitigation measures (MM-AQ-1 and MM-AQ-2) were recommended to reduce the air quality impacts; however, even with the implementation of those measures, significant adverse impacts remained. As directed by the City, Mitigation Measure 3 (MM-AQ-3), an emissions-based Performance Standard, was developed as a flexible, results-oriented mitigation measure to address those residual impacts. This report demonstrates the feasibility of implementing the Performance Standard MM-AQ-3, discussed below.

PROJECT BACKGROUND

The proposed Project allows for the construction of two new oil wells per year, with the construction of a third well upon approval. A total of up to 30 wells are allowed to be newly drilled or redrilled through 2032 under the 15-year life of the Specific Plan. If a maximum number of wells are drilled each year, the 30 well maximum could be completed within just 11 years. The Specific Plan mandates that no more than two rigs used for well reworking can be present on the City IOF at any one time, but does not limit the number of rework events per year.

Well drilling is a five-step process: 1) site preparation, 2) grading, 3) mobilization and setup, 4) drilling, and 5) demobilization. Well construction involves several individual activities that have the potential to emit regulated air contaminants. Our emission estimates assume that well drilling uses four diesel-powered engines of approximately 750 brake horsepower (bhp) each: 1) generator powering the drill motor itself, 2) generator to support drilling platform operations, and 3) two mud pumps.

The Specific Plan does not limit the number or method of well stimulation events that can be conducted within the City IOF. However, under the Maximum Buildout Scenario set forth in the Project's Draft EIR, the maximum number of wells assumed to be treated with well stimulation treatments, including hydraulic fracturing, within the City IOF is assumed to be one per year. Well stimulation treatments are defined in accordance with DOGGR's definition in which activity must affect the integrity of the geologic formation (e.g. fracture the geologic formation) to increase the permeability of the formation for the purpose of enhancing oil and gas production. Well stimulation treatments do not include steam flooding, water flooding, or cyclic steaming and do not include routine well cleanout work, routine well maintenance, routine removal of formation damage due to drilling, bottom hole pressure surveys, or routine activities that do not affect the integrity of the well or the formation.

Well stimulation treatments can require substantial power from high-capacity and high-pressure pumps to move water, sand, and chemicals into the geologic formation. As reported by California Department of Conservation's Division of Oil, Gas, and Geothermal Resources (DOGGR)[1], the requirement for each pump unit is approximately 2,500 hydraulic horsepower (HHP), and up to four of these diesel-powered engines each may be required for hydraulic fracturing (i.e., 10,000 HHP total). Auxiliary equipment including pumps and blenders powered by diesel engines or portable electrical generators may be utilized as well.

For the purpose of the emission estimates, it is assumed that there would be no more than one well stimulation event per year. Well stimulation is a short-duration event (e.g., 1-2 days), most similar to construction; thus, for this analysis, these activities are evaluated as construction activities. "Well stimulation" includes either hydraulic fracturing or gravel packing. Gravel packing as a well stimulation technique has been used in the IOF since 2003. Gravel packing is used in conjunction with hydraulic fracturing, but at much lower pressures. The process involves simultaneous fracking and the placement of a gravel pack. The materials for a gravel pack are pumped at much lower pressures than hydraulic fracturing, using less slurry, proppants, and other fracking chemicals. A gravel pack will influence a zone within 100 to 250 feet of the pack, while fracking affects an area up to 5000 feet.[2] Because lower pressures are required for gravel packing than for hydraulic fracturing, lower pump horsepower is required, leading to lower air emissions. For the worst-case scenario under this study, well stimulation is assumed to mean hydraulic fracking, as it will lead to higher emissions than gravel packing. Acid well stimulation generally requires lower-capacity units (between 250 HHP to 850 HHP), but this form of well treatment is not being considered by the proposed Project.

Emissions from portable diesel-fueled equipment and mobile sources can emit hundreds of pounds of nitrogen oxides (NO_x) and dozens of pounds of diesel particulate matter (DPM) daily at each well site. The AQ/GHG Tech Report estimated daily unmitigated NO_x and CO emissions to

[1] The DOGGR Environmental Impact Report (EIR) for Senate Bill 4, Oil and gas: well stimulation, certified on July 1, 2015

[2] Earthworks 2016. Gravel Packing (webpage): https://www.earthworksaction.org/issues/detail/gravel_packing; accessed March 2016.

exceed the SCAQMD's regional mass-daily emissions thresholds[3], and daily NO_x, PM10 and PM2.5 emissions exceeded localized CEQA significance thresholds.

EMISSIONS OF CONCERN

The AQ/GHG Tech Report estimated potentially significant peak daily emissions of 'criteria pollutants' (so-called because of the ambient air quality standards, or criteria, used to determine a regions attainment status of these pollutants) that exceeded localized and/or regional threshold levels, and toxic air contaminant (TAC) emissions that produced annual health risk impacts. Greenhouse gas (GHG) emissions, also estimated in the AQ/GHG Tech Report, were not identified as having a potentially significant impact but are discussed in this assessment in the context of use of using electric utility grid-power as a project alternative to reduce criteria and toxic air pollutant emissions.

The AQ/GHG Tech Report includes two mitigation measures that would reduce potentially significant air quality impacts. These include:

> **MM-AQ-1**. Drill Rig Engines. All drilling, re-drilling, reworking, well stimulation, and maintenance rig diesel engines, except rigs powered by on-road engines, shall comply with the following provisions:
>
> a) Utilize CARB/EPA Tier 4 Certified engines or other methods approved by CARB as meeting or exceeding the Tier 4 standard, and
>
> b) Utilize second generation heavy duty diesel catalysts capable of achieving 90 percent reductions for hydrocarbons and for PM10.
>
> **MM-AQ-2.** Concurrent Operations. The operator shall not conduct well drilling concurrent with well stimulation activities.

Culver City has considered implementation of these mitigation measures as feasible; therefore, this Feasibility Memorandum assumes reductions from these required mitigation measures and evaluates whether the performance standards in proposed MM-AQ-3 (i.e., to reduce or offset Project emissions below SCAQMD threshold levels) are feasible and would further minimize emissions of concern. The specific impacts from criteria and TAC emissions as described in the AQ/GHG Tech Report are summarized below.

Criteria Pollutant Emissions

Unmitigated peak daily criteria pollutants of concern for the City IOF Project include nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compounds (VOCs) due to exceedances of the mass-daily CEQA significance threshold for operations, and NOx and particulate matter with a 10-micron diameter or less (PM_{10}) due to exceedances of the localized significance threshold (LST) applicable to those pollutants. Emissions of sulfur dioxide (SO_x), and fine PM with a 2.5-micron diameter or less ($PM_{2.5}$) were determined to pose a less than significant air quality impact without mitigation.

[3] The Project involves both construction and operational activities that will occur concurrently. In addition, unlike many construction project, the well construction activities may occur each year of the Project. For these reasons, the construction and operational emissions are combined and compared to the (lower) operational mass-daily and LST significance thresholds.

Upon implementation of the proposed mitigation measures MM-AQ-1 and MM-AQ-2, the proposed Project remains significant for NO_x, PM_{10} and $PM_{2.5}$ due to exceedances of the LST. Table 1 shows these mitigated pollutant emissions by activity for well drilling, well stimulation, and the balance of IOF activities that could be occurring on-site at any time. Well drilling and stimulation are exclusive of each other, in accordance with MM-AQ-2; therefore, only emissions from drilling or stimulation (not both) is accrued for a peak day, along with the other construction and operational activities that could be conducted within the constraints of the project description. For example, peak daily CO emissions from well drilling of 494 pounds are combined with CO emissions from other IOF activities of 126 pounds and operations of 1.53 pounds, for total peak emissions of 620 pounds per day. As shown in Table 1, even with incorporation of MM-AQ-1 and MM-AQ-2, the peak daily emissions of CO and NO_x exceed the localized and/or regional threshold levels established by the SCAQMD for evaluating projects pursuant to CEQA.

Table 1: Peak Daily Emissions with MM-AQ-1 and MM-AQ-2 Compared to CEQA Significance Thresholds

Project Activity	CO (lb/day)	NO_x (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)
Well Drilling -- or--	494 -or -	89 -or -	10 -or -	1.91 – or -
Well Stimulation	474	486	16	2.84
+ Other City IOF Activities[1]	+ 126	+ 102	+ 59	+ 8.44
Operational Emissions	1.53	0.14	1.96	0.23
Peak Daily Regional Emissions	*621.53*	*588.14*	*76.96*	*11.51*
Regional Mass-Daily CEQA Thresholds	*550*	*55*	*150*	*55*
Additional Mitigation Required?	**YES**	**YES**	NO	NO
Localized CEQA Thresholds	*1482.5*	*128.7*	*8.54*	*2.66*
Additional Mitigation Required?	NO	**YES**	**YES**	**Yes**

[1] Other City IOF activities, for this evaluation are those that occur only in the City IOF. Other activities include general site preparation, drilling mobilization and setup, grading, demobilization, well completion, well stimulation site preparation and flow-back, and well rework. Note that this also includes the incidental operational emissions from worker activities (passenger vehicles, etc.), and fugitive emissions from piping and connections throughout the City IOF.

Toxic Air Contaminant Emissions

Maximum Individual Cancer Risk (MICR) is the estimated probability of a maximally exposed individual potentially contracting cancer as a result of continuous exposure to TACs over a period of 30 years for residential receptor locations, or 25 years for off-site worker receptor locations. The AQ/GHG Tech Report determined the MICR for the worst-case residential/sensitive receptor is 14.3 in-one-million (14.3E-06). This annual emissions of toxic air pollutants poses a potential cancer risk impact of 14 (cases) per million individuals, compared to the significance threshold is 10 per million. This cancer risk estimate is overwhelmingly due to emissions of diesel particulate matter (DPM), which is emitted from diesel-fueled internal combustion engines. The risk value of 14.3 per million assumes that MM-AQ-1 has been employed to reduce the DPM emissions by reducing PM_{10} emissions; however, the risk remains significant with that mitigation. MM-AQ-2 does not influence cancer risk,

Table 2 presents mitigated DPM emission as the resultant cancer risk compared to SCAQMD significance thresholds for TAC emissions. Non-cancer chronic and acute health impacts are all estimated to be well below the hazard index threshold.

Table 2: Summary of Toxics Emissions and Cancer Risk

Project Activity	Culver City IOF Residential Cancer Risk	Contribution to Total Cancer Risk (%)
Well Drilling	9.86	68.8
Well Stimulation	0.22	1.5
Other IOF Well Activities	1.32	9.2
IOF Operations	2.94	20.5
Total	14.3	100.0

Greenhouse Gas Emissions

GHG emissions were determined less than significant at approximately 5,600 metric tons/year (MT/yr) of carbon dioxide equivalent (CO2e) emissions, compared to the SCAQMD interim significance threshold of 10,000 MT/yr for industrial facilities. No mitigation measures are required or were recommended.

SIGNIFICANT AIR QUALITY IMPACTS

With the implementation of mitigation measures MM-AQ-1 and MM-AQ-2, the proposed Project remains significant for NO_x, CO, PM_{10}, $PM_{2.5}$ and health risk impacts, as shown in Tables 1 and 2 above. The residual significant impacts are summarized as follows:

1) AQ Impact 1: Peak daily NO_x emissions exceed the regional significance threshold of 55 pounds per day and impacts remain significant for well stimulation (fracking). In accordance with the project description, well stimulation activities were assumed to require large pumps providing up to 10,000 HHP for the hydraulic fracturing. Up to four diesel pump rigs at 2,500 HP each were assumed for the emission analysis, based on the maximum build-out scenario.

2) AQ Impact 2: Peak daily NOx emissions remain significant (i.e., exceed the LST significance criterion of 128.7 pounds per day) due to well drilling and/or well stimulation in combination with other IOF activities. Well stimulation is the largest contributor to the exceedance with 481 pounds per day of NOx emissions. As footnoted in Table 1, other IOF activities include general site preparation, drilling mobilization and setup, grading, demobilization, well completion, well stimulation, site preparation and flow-back, and well rework, as well as incidental operational emissions from worker activities and fugitive emissions from piping and connections throughout the City IOF.

   In accordance with the project description, well drilling rigs generally require up to four 750-Hp engines to power the drill and mud pumps. MM-AQ-1 requires the use of Tier 4 engines. With the Tier 4 engines, well drilling alone is predicted to emit 89 pounds per day of NO_x, compared to a CEQA significance threshold of 55 pounds per day, as shown in Table 1. Additional well field activities performed concurrently can cause the Project to exceed 100 pounds per day.

3) AQ Impact 3: Peak daily CO emissions exceed the significance threshold of 550 pounds per day and are significant when well drilling occurs on the same day as other on-site activities (e.g. general site preparation, drilling mobilization and setup, grading, demobilization, well completion, well stimulation, site preparation and flow-back, and well rework, as well as operational emissions from worker activities and fugitive emissions from piping and connections throughout the City IOF), or when well stimulation (fracking) occurs on the same day as other on-site activities. This conclusion assumes that multiple activities are conducted on the same day, as allowed by the Specific Plan, although no single activity exceeds the significance threshold by itself. The largest single contributor is drilling emissions at 493 pounds per day. If drilling emissions were eliminated, peak daily CO emissions would remain significant due to well stimulation emissions at 473 pounds per day. Other sources of CO are relatively minor contributors to the CO impacts.

4) AQ Impact 4: Peak daily PM_{10} emissions remain significant (i.e., exceed the LST significance criterion of 8.54 pounds per day) due to well drilling and/or well stimulation in combination with other IOF activities. Well stimulation is the largest contributor to the exceedance with 15.24 pounds per day of PM_{10} emissions. As footnoted in Table 1, other IOF activities include general site preparation, drilling mobilization and setup, grading, demobilization, well completion, well stimulation, site preparation and flow-back, and well rework, as well as incidental operational emissions from worker activities.

5) AQ Impact 5: Peak daily $PM_{2.5}$ emissions remain significant (i.e., exceed the LST significance criterion of 2.66 pounds per day) due to well drilling and/or well stimulation in combination with other IOF activities. Well stimulation is the largest contributor to the exceedance with 2.72 pounds per day of $PM_{2.5}$ emissions. As footnoted in Table 1, other IOF activities include general site preparation, drilling mobilization and setup, grading, demobilization, well completion, well stimulation, site preparation and flow-back, and well rework, as well as incidental operational emissions from worker activities.

6) AQ Impact 6: Health risk impacts, expressed as cancer risk, are significant based on annual emissions that include well drilling, well stimulation, and fugitive emissions from the operation of the City IOF.

   The primary cause of the cancer risk impact is the accumulation of emissions from activities throughout the course of a year and the course of the project, as would be allowed by the Specific Plan. The AQ/GHG Tech Report assumed the following activities would occur over the course of one year: drilling three new oil wells; three well rework events; one well stimulation (fracking) event. In addition, operational emissions of TAC from fugitive piping components would occur. The combined emissions from these activities results in a cancer risk of approximately 14.3 per million, compared to a CEQA significance threshold of 10 per million, as shown in Table 2. Approximately 80% of the cancer risk is from diesel PM emissions, and the majority of diesel PM emissions is from well drilling.

AIR QUALITY PERFORMANCE STANDARD

To remain below the CEQA significance threshold for all air quality impacts identified above, Culver City is considering an air quality performance standard as proposed mitigation for the

proposed Project. The following Performance Standard is proposed as Mitigation Measure 3 (MM-AQ-3):

> **MM-AQ-3.** Performance Standard. The Oil Field Operator shall demonstrate that the activities included in the Annual Drilling Plan will be conducted in compliance with the following performance standards:
>
> - Mitigated VOCs emissions shall not exceed 55 pounds per highest day;
> - Mitigated CO emissions shall not exceed 550 pounds per highest day;
> - Mitigated NOx emissions shall not exceed 55 pounds per highest day;
> - Mitigated SOx emissions shall not exceed 150 pounds per highest day;
> - Mitigated PM10 emissions shall not exceed 150 pounds per highest day;
> - Mitigated PM2.5 emissions shall not exceed 55 pounds per highest day;
> - PM10 and PM2.5 24-hour average concentrations shall not exceed 2.5 $\mu g/m^3$ at the facility fenceline; and
> - Health risk impacts shall not exceed the following thresholds:
>   - Cancer Risk: 10 per million,
>   - Chronic, non-cancer risk: 1.0 Hazard Index, and
>   - Acute risk: 1.0 Hazard Index.
>
> Compliance with the above standards shall be demonstrated through a quantified analysis using a SCAQMD-approved methodology that includes a description of the anticipated activities, equipment, duration/schedule, locations, and distances to the nearest sensitive receptors. Any changes to the planned activities and/or equipment assumed in the Annual Drilling Plan shall be subject to the same quantified analysis not less than 30 days prior to the start of the activities. All activities within 500 feet of City IOF southern boundary (i.e. City/County boundary) that may overlap planned City IOF activities and potentially effect a peak day analysis must be considered in the Annual Drilling Plan and well-specific drilling plan for comparison to the emissions and impact thresholds established by this mitigation measure.
>
> If emission offsets are proposed to mitigate any excess emissions, the Oil Field Operator shall provide a minimum of 20 percent of those offsets from local sources, specifically within the Inglewood Oil Field as a whole. If offsets totaling 20 percent of the offset requirement are not available, the Oil Field Operator shall document that a good-faith effort was made to obtain local offsets.

OPTIONS FOR MITIGATING TO LESS THAN SIGNIFICANT

CEQA requires that significant impacts must be reduced through all feasible mitigation measures. The MM-AQ-3 Performance Standard may be met through a number of options that reduce, minimize, or eliminate certain air emissions from the proposed Project. The Performance Standard

allows the Oil Field Operator reasonable and substantial flexibility to accomplish the target reductions and demonstrate that the Project impacts are reduced below the significance thresholds.

This section is organized according to impacts, and provides a list of possible alternative control technologies, management strategies and other compliance options that could be used individually or in combination to achieve compliance with the Performance Standard. The technologies listed herein are not mandates, nor is it intended to be a complete list of alternative methods to achieve the Performance Standard. The technologies listed are provided to illustrate that multiple alternatives may be available to address each of the activities with emissions exceeding a significance threshold.

Option 1: Concurrent Activities

The concurrent operation of well drilling, well stimulation, and other City IOF activities could be prohibited to the level necessary to remain below CEQA significance thresholds for CO, NO_x, and PM_{10}. Applying this option will reduce peak daily emissions (i.e., the maximum emission that could occur on any individual day) while maintaining the equipment assumptions for well drilling, well stimulation, and other City IOF activities through implementation of the proposed Project. This would require scheduling well construction so that drilling or well stimulation does not overlap any other well preparation, completion, or stimulation activities.

Option 2: SCAQMD Emission Reduction Credits

Emission offsets or contemporaneous reductions, sometimes called 'netting', to offset the excess emissions have been used by all levels of air agencies and air program to force a beneficial air quality result due to an emission increase. Under the Clean Air Act (CAA), emission offsets must be 1) real; 2) quantifiable; 3) permanent; 4) enforceable; and 5) surplus (i.e., not required by rule or regulation).

There are three types of credits managed and administered by the SCAQMD that could be used by the Oil Field Operator to offset emissions from implementation of the Specific Plan. These include the following:

- Emission Reduction Credits (ERCs), available for NO_x, CO, and PM_{10}, are considered permanent, life-of-project reductions.
- Short Term Emission Reduction Credits (STERCs), available for NO_x, CO, and PM_{10}, are considered valid for discrete years, having a start and expiration year.
- Regional Clean Air Incentives Market (RECLAIM) Trading Credits (RTCs), available only for NO_x, are administered through the SCAQMD cap-and-trade RECLAIM program.

The SCAQMD maintains a registry of ERCs and STERCs, which are available for purchase, typically through a broker. The most recent SCAQMD ERC/STERC registry, updated October 2016, can be viewed at http://www.aqmd.gov/home/permits/emission-reduction-credits. RTCs are typically traded in higher volume and are obtained through use of broker. The SCAQMD list of brokers can be viewed at http://www.aqmd.gov/home/permits/erc-brokers.

Note that when applying RTCs, ERCs, or STERCs, the offsets would have to be provided for each day that excess emissions would occur. For example, well drilling may require 30 days. Well drilling by itself does not exceed the significance threshold. If mobilization were to overlap well drilling by 5 days, then the offsets would be required for each day of that 5-day period.

Option 3: Local Culver City Emission Reduction Program

Emission offsets or contemporaneous reductions, sometimes called 'netting', to offset the excess emissions have been used by all levels of air agencies and air program to force a beneficial air quality result due to an emission increase. Under the Clean Air Act (CAA), emission offsets must be 1) real; 2) quantifiable; 3) permanent; 4) enforceable; and 5) surplus (i.e., not required by rule or regulation). Offsets obtained through or recognized by the SCAQMD typically meet the offset CAA criteria stated above, however because the Oil Field Operator would be seeking to offset temporary emissions, a temporary offset or contemporaneous reduction may be acceptable.

As a Lead Agency pursuant to CEQA, Culver City could independently develop an emissions offset program for this Specific Plan. Any offset program developed by the City should require the Oil Field Operator to demonstrate that any emission reductions not obtained through SCAQMD also meet the criteria identified above. In this case, enforcement could be through the Annual Drilling Plan, individual drilling permit, or city ordinances designed to limit the emissions such that the reduction can be quantified and attributed to the Specific Plan. The Oil Field Operator could provide concurrent emission reductions from other oilfield operations; and/or concurrent emission reductions from other (off-site) local sources. Emission reductions could come from any source of diesel emissions, e.g., on-site service truck(s) could be converted to an alternative fuel such as CNG.

Independent development of an emissions offset program would likely require resources to establish and maintain the program and would be developed in coordination with the SCAQMD as a form of voluntary emission reduction agreement (VERA) for this Specific Plan.

Option 4: Limiting Engine Intensity

Limiting the number and size of engines running at the City IOF on any single day will reduce the engine intensity and may reduce many of the AQ impacts to below significance.

For example, the operator may have flexibility when selecting the size of the engines servicing a load. EPA's[4] Tier 4 off-road emission standards for large engine class (engines greater than 750 bhp), at 2.6 grams per bhp-hour (g/bhp-hr), is a substantially higher emission rate than the 0.3 g/bhp-hr standard for engines between 750 and 600 bhp. To illustrate, if a well stimulation activity required 2000 HP to be supplied by electric generators, there would be substantially less NOx emissions from three 750 Hp engines than there would be from a single 2,000 Hp engine.

Option 5: Alternatives to Diesel

Alternatives to the use of diesel include use of gasoline-powered engines, natural gas or propane-fired engines, and use of electric power provided directly from the utility power grid. Use of an alternative fuel (natural gas, propane, or gasoline) would not significantly lower criteria pollutant emissions because of the Tier 4 Final engine standards already assumed/required under MM-AQ-1. Because NO_x emissions would result from any combustion option, use of an alternative fuel would provide minimal benefit as fuel combustion produces NO_x emissions, regardless of the fuel type. However, use of non-diesel alternative fuels for local engines would eliminate diesel PM, thereby reducing health risk impacts. Use of electric drill rigs would also eliminate all local emissions from this source and relocate the emissions to power plants. The energy used for electric

[4] U.S. Environmental Protection Agency (EPA), 40 CFR Part 89

drill rigs is anticipated to result in generally less emissions at these power plants as compared to the same activity powered by diesel fuel. The use of grid-supplied electric power would reduce local emissions of NOx, PM10 and PM2.5, potentially reducing the impacts to ambient air quality (as was assessed via the Localized Significance Threshold [LST] analysis).

Option 6: Air Dispersion Modeling

The air dispersion modeling analysis in the AQ/GHG Tech Report used dispersion parameters that are representative of the coastal metropolitan area within the South Coast Air Basin, but not specific to the local topography of the City IOF. The Oil Field Operator may conduct an air dispersion modeling analysis that contains specific parameters for actual equipment to be used, specific site location of drilling, etc. A situation-specific air dispersion modeling analysis may demonstrate impacts that would be less than the applicable ambient air quality standards for PM_{10}.

Option 7: Other Feasible Technologies or Methods

There are various other means of reducing air quality impacts that may be available to the Oil Field Operator, such as increasing setbacks, reducing daily activities, or using more advanced technologies. This option is provided to ensure that the Oil Field Operator considers all available options for reducing air quality impacts, with the understanding that these options must be measurable and beyond the expectation of compliance with regulations.

OPTIONS FOR COMPLIANCE WITH MM-AQ-3

CEQA requires that significant impacts must be reduced through all feasible mitigation measures. The MM-AQ-3 Performance Standard allows the Oil Field Operator reasonable and substantial flexibility to demonstrate that the Project impacts are reduced below the significance thresholds.

Several of the listed compliance alternatives involve providing emission offsets or scheduling changes to offset the excess emissions. As mentioned above, the offsets should be real, quantifiable, enforceable, and surplus (i.e., not required by rule or regulation). While offsets obtained through or recognized by the SCAQMD typically meet these criteria, the City should require the Oil Field Operator to demonstrate that any emission reductions not obtained through SCAQMD also meet these criteria. Regulatory offsets are often permanent as well; however, because the Oil Field Operator would be seeking to offset temporary emissions, a temporary offset or contemporaneous reduction may be acceptable.

1) **AQ Impact 1: Peak Daily NO_x Emissions from Well Stimulation (fracking).**

   Operational scenarios that may allow the Oil Field Operator to demonstrate compliance with the Performance Standard include, but are not limited to the following:

   a. Concurrent emission reductions from other IOF local sources (Option 3)

   b. Limit engine intensity from City IOF operations (Option 4)

   c. Electrification of engines used for well stimulation activities (Option 5). The use of a non-diesel alternative fuel (e.g. on-site use of natural gas, gasoline powered engines) would provide minimal benefit for NO_x emissions, as fuel combustion produces NO_x emissions regardless of the fuel type.

   d. Choose not to conduct well stimulation during that calendar year (Option 7)

e. Another feasible approach proposed by the Oil Field Operator (Option 7)

If options a through e cannot be demonstrated to be feasible and/or cannot be demonstrated to satisfy MM-AQ-3 to the satisfaction of the City of Culver City, then the Oil Field Operator may pursue NO_x emissions offsets in the form of RTCs, ERCs, or Short Term ERCs to mitigate excess emissions (Option 2).

2) AQ Impact 2: Peak Daily NOx Emission from Well Construction (drilling)

Operational scenarios that may allow the Oil Field Operator to demonstrate compliance with the Performance Standard include, but are not limited to the following:

a. Schedule City IOF activities so that well drilling does not overlap any other well preparation or completion activities (Option 1)

b. Concurrent emission reductions from other IOF local sources (Option 3)

c. Limit engine intensity from City IOF operations (Option 4)

d. Electrification of engines used for well drilling (Option 5) The use of a non-diesel alternative fuel (e.g. on-site use of natural gas, gasoline powered engines) would provide minimal benefit for NOx emissions, as fuel combustion produces NOx emissions regardless of the fuel type.

e. Another feasible approach proposed by the Oil Field Operator (Option 7)

If options a through e cannot be demonstrated to be feasible and/or cannot be demonstrated to satisfy MM-AQ-3 to the satisfaction of the City of Culver City, then the Oil Field Operator may pursue NOx emissions offsets in the form of RTCs, ERCs, or Short Term ERCs to mitigate excess emissions (Option 2). Note that when applying RTCs, ERCs, or STERCs, the offsets would have to be provided for each day that excess emissions would occur.

3) AQ Impact 3: Peak Daily CO Emissions from Well Activities

Operational scenarios that may allow the Oil Field Operator to demonstrate compliance with the Performance Standard include, but are not limited to the following:

a. Schedule well construction activities so that well drilling does not overlap any other well preparation, completion and stimulation activities (Option 1)

b. Concurrent emission reductions from other IOF local sources (Option 3)

c. Limit engine intensity from City IOF operations (Option 4)

d. Electrification of engines used for well drilling (Option 5). The use of a non-diesel alternative fuel (e.g. on-site use of natural gas, gasoline powered engines) would provide minimal benefit for CO emissions, as fuel combustion produces CO emissions regardless of the fuel type.

e. Another feasible approach proposed by the Oil Field Operator (Option 7)

If options a through e cannot be demonstrated to be feasible and/or cannot be demonstrated to satisfy MM-AQ-3 to the satisfaction of the City of Culver City, then the Oil Field Operator may pursue CO emissions offsets in the form of ERCs or Short Term ERCs to

mitigate excess emissions (Option 2). Note that when applying ERCs or STERCs, the offsets would have to be provided for each day that excess emissions would occur.

4) AQ Impact 4: Peak Daily NOx Emissions Exceed LST

Operational scenarios that may allow the Oil Field Operator to demonstrate compliance with the Performance Standard include, but are not limited to the following:

a. Schedule City IOF activities so that well drilling does not overlap any other well preparation, completion and stimulation activities (Option 1)

b. Limit engine intensity from City IOF operations (Option 4)

c. Electrification of engines used for well drilling (Option 5). The use of a non-diesel alternative fuel (e.g. on-site use of natural gas, gasoline powered engines) would provide minimal benefit for NOx emissions, as fuel combustion produces NOx emissions regardless of the fuel type.

d. Provide an ambient air quality modeling analysis that demonstrates impacts less than the applicable ambient air quality standards (Option 6)

e. Another feasible approach proposed by the Oil Field Operator (Option 7)

5) AQ Impact 5: Peak Daily PM_{10} Emissions Exceed LST

Operational scenarios that may allow the Oil Field Operator to demonstrate compliance with the Performance Standard include, but are not limited to the following:

a. Schedule City IOF activities so that well drilling does not overlap any other well preparation, completion and stimulation activities (Option 1)

b. Limit engine intensity from City IOF operations (Option 4)

c. Electrification of engines used for well drilling (Option 5). The use of a non-diesel alternative fuel (e.g. on-site use of natural gas, gasoline powered engines) would provide minimal benefit for PM_{10} emissions, as fuel combustion produces PM_{10} emissions regardless of the fuel type.

d. Provide an ambient air quality modeling analysis that demonstrates impacts less than the applicable ambient air quality standards (Option 6)

e. Another feasible approach proposed by the Oil Field Operator (Option 7)

6) AQ Impact 6: Peak Daily PM2.5 Emissions Exceed LST

Operational scenarios that may allow the Oil Field Operator to demonstrate compliance with the Performance Standard include, but are not limited to the following:

a. Schedule City IOF activities so that well drilling does not overlap any other well preparation, completion and stimulation activities (Option 1)

b. Limit engine intensity from City IOF operations (Option 4)

c. Electrification of engines used for well drilling (Option 5). The use of a non-diesel alternative fuel (e.g. on-site use of natural gas, gasoline powered engines) would

provide minimal benefit for $PM_{2.5}$ emissions, as fuel combustion produces $PM_{2.5}$ emissions regardless of the fuel type.

d. Provide an ambient air quality modeling analysis that demonstrates impacts less than the applicable ambient air quality standards (Option 6)

e. Another feasible approach proposed by the Oil Field Operator (Option 7)

7) Impact AQ 7: Health Risk impacts exceed the significance threshold for cancer risk

Operational scenarios that may allow the Oil Field Operator to demonstrate compliance with the Performance Standard include, but are not limited to the following:

a. Electrification of engines used for well drilling (Option 5)

b. Use an alternative fuel (e.g. natural gas or propane) for at least 33 percent of the required engine horsepower for drill rig operation (e.g., the generators on the rig could be natural gas-fired, while the mud pumps could use diesel fuel) (Option 5)

c. Drill less than the maximum number of new wells for the project (Option 7)

d. Another feasible approach proposed by the Oil Field Operator (Option 7)

Electrification of well drilling and well stimulation activities will significantly reduce all pollutant emissions from internal combustion, but will have the most pronounced effect on reducing health risk impacts due to emissions of diesel PM. Table 3 below summarizes the change in cancer risk impacts under the option to electrify well drilling and stimulation activities.

Table 3: Summary of Toxics Emissions and Cancer Risk

Project Activity	Culver City IOF Residential Cancer Risk	Electrification Option Culver City IOF Residual Cancer Risk
Well Drilling	9.86	---
Well Stimulation	0.22	---
Other IOF Well Activities	1.32	1.32
IOF Operations	2.94	2.94
Total	14.3	4.26

Note that if DPM reductions are the selected compliance option, the reductions would have to be on-site or immediately local, but would not necessarily need to be contemporaneous because cancer risk is evaluated over a 30-year lifetime. Emission reductions could come from any source of diesel emissions, e.g., on-site service truck(s) could be converted to an alternative fuel such as CNG.

In addition to reducing cancer risk, if electrification is a selected compliance alternative, secondary GHG emissions from power generation would occur. The projected GHG emissions due to electrification are shown in Table 4. These GHG emissions are approximately 30% of the emissions that would have occurred if diesel-fueled engines were used to power the drill rig and mud pumps. The reasons that electrification leads to lower emissions can be attributed to two factors: 1) modern combined cycle power plants

are more efficient in converting fuel to electricity than diesel engines are, and 2) California derives a significant percentage of its power from low-GHG emitting sources such as hydro, solar, and wind.

Table 4: GHG Emissions for the Electrification Option

Project Activity	Number of Events	MW-hr/yr	GHG Emissions (MT/yr)[2]
Well Drilling	3	1610.6	1280.5
Well Stimulation	6[1]	408.0	85.4
Other IOF Well Activities	--	N/A	51.2
IOF Operations	--	N/A	42.7
Annualized Total	--	5508.4	1459.7

[1] Includes one well stimulation, three well reworks, and two well completions.

[2] Assumes a 0.265 MT/MW-hr GHG emissions intensity.[5]

RESULTS AND CONCLUSIONS

Using the AQ Impacts and Options for reducing impacts, the following table may be used as a menu for selecting one or more option for reducing emissions and air quality impacts from proposed well activities at the Culver City IOF in accordance with the Specific Plan.

Table 5: Feasibility of Mitigation Options for Air Quality Impacts

Option for Mitigating to Less Than Significant	AQ Impact 1	AQ Impact 2	AQ Impact 3	AQ Impact 4	AQ Impact 5	AQ Impact 6
Option 1: Concurrent Activities	---	Yes	Yes	Yes	Yes	---
Option 2: SCAQMD Emission Credits	Yes	---	Yes	---	---	---
Option 3: Local Emission Reductions	Yes	---	Yes	---	---	---
Option 4: Limiting Engine Intensity	Yes	Yes	Yes	Yes	Yes	Yes
Option 5: Alternatives to Diesel Fuel	Yes	Yes	Yes	Yes	Yes	Yes
Option 6: Air Dispersion Modeling	---	---	---	Yes	Yes	Yes
Option 7: Other Approaches	Yes	Yes	Yes	Yes	Yes	Yes

Note: "Yes" indicates that the Mitigation Option (in whole or in part when combined with other suitable options) is feasible for reducing the air quality impact to less significant levels.

We understand that the City will not mandate electric rigs, nor will they allow emission reductions credits to be used to offset localized impacts. Given these constraints to the Performance Standard, localized health impacts (i.e., exceedance of the LST due to NO_x, PM_{10} and $PM_{2.5}$ emissions will

[5] 2016 GHG emissions intensity for SCE, as shown in Figure 18. Change in the Emissions Intensity of Electricity of Retail Providers in the Accelerated Policy Case Scenario (2008 – 2020), Greenhouse Gas Modeling of California's Electricity Sector to 2020, October 2009, Prepared under CPUC R.06-04-009.

remain significant. That said, the LST is a surrogate analysis for the ambient air quality standards. The Performance Standard allows the use of ambient air quality modeling to demonstrate that localized impacts will not exceed ambient air quality standards. It may be possible for the operator to optimize set-backs, stack heights and other operating parameters, in combination with air quality modeling to show compliance with the ambient air quality standard.

Please let us know if you have any questions.

Sincerely,

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cc: Russell Kingsley, Yorke Engineering