

# Hydrologic and Geologic Review of the San Luis Obispo County proposed Negative Declaration for Excelaron Conditional Use Permit (DRC 2006-00222)

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This report is prepared for the Huasna Valley Association. The author is a California Registered Professional Geologist and hydrologist retired from a teaching career in the University of California. He has 40 years of experience as a professional geologist in California with over 100 professional publications. He has evaluated hazards associated with numerous petroleum-related projects, including the Santa Barbara Oil Spill and Alaska North Slope and transportation issues (working with the US Geological Survey as a Research Hydrologist) and consulting for federal, state, tribal, and county agencies on hazards and clean-up of oil, gas, and geothermal development projects. As science advisor to the US Senate Public Works Committee he has conducted a review of petroleum-development related hazards for the Office of the President's Science Advisor. He is a specialist in geologic hazard assessment and currently working on the Santa Barbara County Greka – Bradley oil spill. He has represented the American Association of Petroleum Geologist on international speaking tours, although does not consider himself as a petroleum geologist. His PhD is from the University of California Berkeley, Department of Geology and Geophysics with petroleum geology studies at the University of Colorado at the Masters level.

## **Introduction and Conclusion**

This project is much too complex and has far too many unknown impacts to be approved using the Mitigated Negative Declaration CUP process. There are serious unanswered questions remaining regarding potential scope of the project and potential piecemeal approaches, disposal of produced make-up water and other fluids, produced natural gas, reuse of existing abandoned wells, and transport of products on local unstable roadways. These and many other issues need to be

addressed through a full EIR process. The County, the Community, and the State all need to be able to review and critique the many real and potential impacts of this proposed project.

## **Findings**

### ***Unanswered Geologic Questions***

Excelaron's documents, as released by San Luis Obispo County, attempt to make the readers believe that the geology of this site much simpler than is actually the case. They would have us believe that both production and disposal of waste water, perhaps natural gas, and waste fluids will be accomplished either through existing well bores or through newly drilled bore holes into the Monterey Formation. They purport that this deeper geologic bedrock unit is isolated from overlying geologic substrates by impermeable sedimentary deposits, and that there is thus no chances of upward leakage of oil-bearing hot water. This is simply not true.

The Monterey Formation silicious shales are the source rocks for the petroleum. Overlying the Monterey shale units is the Santa Margarita Formation, which is made up of porous sandy rocks (Phillips, 1991; Kornacki, 1996). These extend to the surface and are the unit from which water is derived by local landowners surrounding the immediate Excelaron development site. The basic fact that oil and tar seeps are found on the surface of the land throughout this area demonstrates that the petroleum has seeped upward to the surface (Schumacher, 1999). These surface expressions of an underlying oil-bearing deposit are called macro-seeps and only develop where the fluids themselves can migrate upward through reasonably permeable rocks.

If heavy tar-like fluids can migrate upward out of the Monterey Formation source rocks, then it is very improbable to postulate that hot water pumped into the Monterey shales will not drive the tarry residues both to the production well(s) and toward the surface. While it is true that the shortest distance between the injection site(s) and the recovery site(s) may be entirely underground, ultimately the oily water will seek passage to the surface. It is a matter of time, with potential deleterious effects on shallow water supply aquifers not realized for perhaps a decade or more. The opportunity for contamination of aquifers needs to be addressed through an EIR process. There is no demonstrated aquitard or impermeable unit that caps the oil-bearing source rocks. In fact, oil has been produced locally from the Santa Margarita and the proposed Excelaron

development may try to extract some of that naturally migrating petroleum.

On p. 50 of the County CUP document, in a discussion of Project Production Water, Excelaron states categorically that “The oil formation is approximately 4,500 feet below the ground surface and is not connected to the Huasna Valley groundwater basin (which is about 300 feet below the ground).” [emphasis in the original]. While it is technically true that the State of California’s “Huasna Groundwater Basin” is a shallow alluvial basin created by Huasna Creek in the Huasna Valley, it is also true that the homes and ranches in the Newsom Ridge – Loma Pelona area west of the Huasna Valley extract water from the immediately underlying Santa Margarita sandstones which are not isolated from the “oil formation”.<sup>1</sup>

The comprehensive 1991 paper by Kornacki (op cit) provides the most detailed overview of the Huasna Basin geology. It summarizes much of the Huasna literature and notes that the 5 Homestake Lavoie-Hadley wells pumped 19,800 bbls of oil from the Santa Margarita (op cit, Table 3) and that no oil production has been proven from the depths proposed by Excelaron. It is some of these same wells that are proposed to be reestablished for this project. Past exploration and production has been limited to wells drawing from less than 3000 feet depth. The Kornacki paper establishes that the primary petroleum traps are folds and faults along the western side of the Huansa geologic basin where small anticlinal folds (cf Meridian Anticline) along the west wall of the Huansa syncline trap heavy high-sulfur very viscous oil in the Santa Margarita sand units. The new well or wells proposed by Excelaron will drill deeper than the older wells and anticipate a possible production zone up to 3600 feet thick penetrating completely through the Santa Margarita and on through the entire depth of the Monterey Formation. It was the middle Phoenix unit of the Santa Margarita that produced petroleum at the old Lavoie-Hadley facility. As pointed out by Kornacki, the Phoenix and basal Huasna units of the Santa Margarita Formation act as petroleum reservoirs but the source of the hydrocarbons is the deeper Monterey shale units.

### **Natural Gas**

Natural gas disposal or handling must be addressed. These wells have produced gassy oil and gas as well as water with or without oil according to Kornacki’s summary paper. As reviewing agencies such as the Regional Air Pollution Control District have pointed out, this

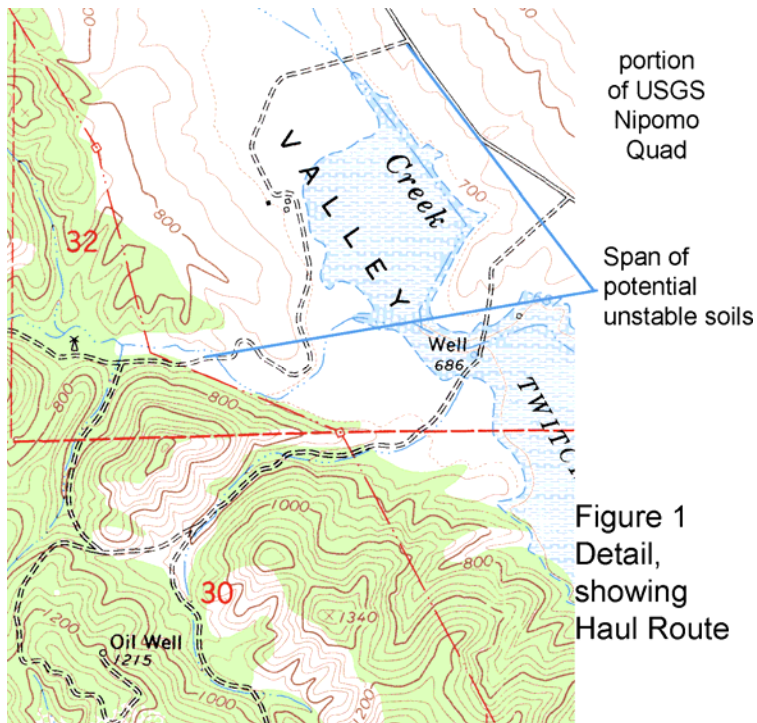
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<sup>1</sup> See California Department of Water Resources Bulletin 118 ([www.groundwater.water.ca.gov/bulletin118/](http://www.groundwater.water.ca.gov/bulletin118/)).<sup>1</sup>

possibility has not been addressed in the proposed Negative Declaration. In fact, gas production is virtually certain and, if it is to be simply pumped back into the Monterey Formation along with the excess water that will be produced, then special handling procedures and special monitoring procedures need to be addressed. Raw natural gas has no odor and in all probability slowly seeps into the atmosphere naturally in the region. New wells or deeper existing wells will potentially vent more gas directly. This is both a local facility hazard and a regional fire hazard. The technology exists to capture gas as oil is produced, but its expected volumes are yet unknown. If plentiful, special contingencies need to be in place to minimize hazards and waste.

### **Liquifaction**

The proposed Mitigated Negative Declaration includes an initial checklist (p. 26) that states that liquefaction potential during a ground shaking event is considered low and that a potentially active Suez fault is ½ mile west of the site is not expected to produce dangerous ground acceleration. The primary structural faults, the West Huansa Fault Zone and the East Huansa Fault define and constrain the Huansa Basin that has trapped heavy oil and tar, but are not known to be active in today's regional tectonic framework. Again, these are technically accurate statements for the well site itself, but do not include consideration of the appurtenant ranch roads and haul route. In fact, the ranch roads along the proposed revised haul route are subject to liquefaction. The Salinas Loam soil unit and the creekside alluvium of Huansa Creek itself, where the proposed haul route is now located, is very poorly drained and slow to percolate seasonal water and is frequently saturated with high local groundwater (USDA, 2008). While seismic hazards may not be limiting, the weight of trucks passing over dirt fill on these ranch road routes is sufficient to mire local pickup trucks. It is reported by local ranchers that similar liquefaction occurs on the Porter Ranch Road. Excelaron proposes to lay fill on these ranch roads to upgrade them for heavy haul trucks. Further, the sizes of trucks may have to be reduced, thus increasing frequencies of trips to carry the petroleum to the Oxnard refinery. These details have not been worked out for the present version of the proposed Excelaron CUP, nor has the cost and sources of fill necessary to upgrade the roads to carry heavy loads and resist liquefaction been identified. An EIR should develop better information on potential liquefaction hazards along the Huansa Valley floor. Figure 1 is a map showing some of the areas where we believe liquefaction must be assessed.



**Possible Groundwater Contamination**

The California Department of Conservation, Division of Oil Gas and Geothermal (DOGGR) have a very comprehensive set of regulations. These are referenced throughout the Excelaron CUP document, and the County defers to their regulatory authority for most of the geologic and water supply issues associated with a potential project such as this. A primary shortcoming of this centralized approach is that the comprehensive regulations lack enforcement. Standards for well development, for reuse of existing abandoned wells, and for drilling safety and clean-up are hard to enforce, particularly in a region that cannot support a full-time state regulator. Unlike point source emissions regulated by the regional Air Pollution Control Districts or the Regional Water Quality Control Boards, what goes on underground cannot be seen and readily monitored. Much of the regulations rely on the accuracy and honesty of the applicants' contractors. DOGGR simply does not have the staff to police their rules and regulations.

Specifically, Excelaron proposes to test the existing well(s) to evaluate if they can be used for waste-water, process-water, and/or hot water injection, and to drill new wells if the existing bore holes prove inadequate. This is a difficult area to evaluate. The Lavoie-Hadley area wells were initially drilled in the 1930's and some were reused in

the 1980's. At neither time were the present standards applicable for completion of exploration or production wells. The Sherer-Dickes (also referred to as Union-Dickes 01 in the CUP) proposed injection well site is equally old. It is highly probable that it will be difficult to set tight "packer" seals at various depths in these old wells to permit pressure testing. Various devices can be lowered into the wells to "see" the state of decay of the well casings but these are not fool-proof. To safely inject waste process water derived from the geologic intervals from which oil may be produced, one must establish that the well can be sealed tightly at some depth below which the injecting is to occur. Because the system is inherently difficult to control and some leakage is to be expected in old corroded pipe strings, testing for continuity or lack thereof tends to be imprecise.

What this means is that you may not know that the injected fluids are leaking upward until they show up at the surface. The project may be abandoned after being operated for several years and it may be another decade before contamination of shallow groundwater is detected. There are monitoring requirements for surface sites and ephemeral watercourses, but there is no one to enforce such monitoring or to check on its thoroughness.

The residents and livestock of the Newsom Ridge – Loma Pelona mountainous area west of the Huansa Valley derive their domestic water supplies from local wells, springs and seeps, primarily in the Santa Margarita sand aquifer. This is an open aquifer system utilizing rainfall that recharges the hillslopes and side streams. Little information is publicly available about private wells in this area. The only published information on water quality and depths to water tables are derived from wells out in the agricultural Huansa Valley bottomlands where wells are very shallow and where water tables rise to the surface during wet seasons of wet years.

We have established that as many as 100 residents may pump water from the Santa Margarita Formation within 1 mile of the proposed operation. This is unlike typical oil field areas in California where few private water wells produce domestic water from the same geologic unit that acts as a petroleum reservoir. Wells are generally 200 to 400 feet in depth and some have high sulfide or hydrogen sulfide smell. Local drillers will try to develop wells that do not have sulfur smells but this is not always possible. Wells in the agricultural bottom lands of the Huansa Valley itself generally produce ample good water, although one owner reported sulfide smell and oily residues. The Monterey Formation does underlie the Huansa Valley and the alluvium derived

from it creates a high radon gas flux that has been studied by the California Geological Survey (Churchill, 2008). Excelaron seems to believe that only the valley bottom wells are of concern for contamination. That is not the case.

There is a strong incentive to claim that the petroleum bearing rocks are separate from and do not influence domestic source aquifers. The DOGGR is the agency charged with insuring that oil exploration and production does not potentially contaminate California's drinking groundwater resources. As such they have established lists of "exempted aquifers" that do not require as stringent a level of protection as do those of potential use by humans. Thus, saline aquifers that are often associated with oil fields are considered exempt from protective regulation as are water bearing geologic units that are not connected to surface aquifers. Thus, it is in Excelaron's best interests to claim that they are only trying to produce oil from the isolated Monterey Formation beneath the Santa Margarita sands. The regulations that define exempted aquifers are quite revealing<sup>2</sup>. This document establishes maps of some of the oil and gas fields in California and shows boundaries of lands where water supply wells within the boundaries must demonstrate isolation from petroleum bearing units while those outside are allowed to assume non-connection. This document establishes that the State will assume responsibility from the federal Environmental Protection Agency in its enforcement of the Safe Drinking Water federal statutes. The State pledges to have personnel available and capabilities to monitor and regulate injection wells such as those that are proposed by Excelaron. There is no mention of the Huasna region in this document. The same arrangement existed in Santa Barbara County's oil fields which are specifically named in the 1981 DOGGR regulations, but the Federal Government has now had to step in to regulate the Greka - Bradley oil operations and enforce liability for oil spill cleanup under the federal Clean Water Act regulations that DOGGR tried to assume and continues to assume in the Huasna instance. How all this might play out in the case of a long-absent Australian investor is unknown.

Driller's logs are proprietary information and are protected under California law. San Luis Obispo County maintains a record of many of the Huasna geologic Basin and Husnsa Valley water wells. These records can be compiled in a generalized regional fashion for an EIR to help address issues of possible future contamination of domestic water

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<sup>2</sup> State of California, Resources Agency, Department of Conservation, Division of Oil and Gas, April, 1981, Application for Primacy in the Regulation of Class II Injection Wells Under Section 1325 of the Safe Drinking Water Act.

supplies associated with the Excelaron operations, both in the proposed site and throughout the region of their current leases. It will be in Excelaron's best interests to develop that information now, rather than waiting until this initial exploratory development is economically successful. Residential wells along Suey Creek can be impacted by presently proposed development and by future expansion of exploration through other areas of Excelaron's lease holdings. A full EIR will postpone anticipated Excelaron –Mankins development until capital markets improve to support the anticipated Excelaron program. Contamination of domestic water supplies at several hundred feet of depth cannot be reversed or mediated. Protection is far better than inadequate bonding or a County trust account.

### ***Surface Water Protection***

The surface water of Huasna Creek and its western ephemeral and intermittent tributaries are also at risk from this development. Those tributary watercourses and the hillslopes adjacent to Huasna Valley recharge the shallow water table of that valley. The water extracted from that Huasna Groundwater Basin is generally of good quality and not subject to drought restrictions. If tributary water courses to Huasna Creek became contaminated due to leakage from pipelines, storage tanks or loading facilities, downstream surface and shallow groundwater resources would be at risk.

Surface water resources are under the jurisdiction of the Central Coast Regional Water Quality Control Board. Their offices are near in San Luis Obispo and they are requiring monitoring and reporting from Excelaron. So long as that monitoring is performed and so long as oil spill clean-up materials are on hand and trained personnel are available to use them, problems should be minimized. The problem at Huasna, like that at the nearby Greka Bradley spill sites, is that the facilities are designed to operate independently of direct oversight. Although we are told that there will be a 24-hour operator on site there is no discussion of the responsibility to monitor drainage from the development site(s). If production occurs with out-of-County transport of heavy oil, it may be the truck drivers who are able to see problems in the creeks that cross the Huasna Valley. Presumably, they are paid by the load and cannot be expected to hike down the hill and inspect for leaks or petroleum residues in the creeks. For all practical purposes, it will be up to local residents to conduct spot inspections and to call the Water Quality Control Board staff if needed. Tanks and pipelines are inspected periodically by DOGGR just as they were at Greka's Santa Barbara County operations. Spills still occur.

Water Quality Control Board staff cannot be expected to be on site very frequently without local oversight.

## **Summary of Findings**

An EIR needs to be developed for the combined exploration and development phase of this first Excelaron development at Huasna. Although the proposed Negative Declaration document contains many pages, there is in fact very little information on actual hydrological and geological hazards and potential mitigations. Some of the information and conclusions based thereupon is factually incorrect. The potential interconnections between the shallower Santa Margarita Formation potential oil extraction and local domestic water supply wells must be accurately represented to the public. The potential for leakage within the production and injection wells needs to be more completely covered. The disposition of wastewater and co-produced natural gas has not been explained in any meaningful fashion. The fact that Excelaron cannot yet establish the potential volumes of these co-produced commodities is not an excuse for cavalier statements about disposing of them in the Monterey Formation. If, as is probable, there are significantly higher volumes of water produced for each barrel of oil that is extracted, it is not clear how that waste-water will be reinjected in a timely fashion. The proposed "injectivity tests" do not assess the volumetric capacity of the sites of injection. The problems associated with transport of the tanker-trucks of oil away from the production site are not adequately addressed for the Huasna Valley floor farm roads where liquefaction of the roadbeds is likely.

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