



Paper to be presented at Meeting of the
 Pacific Section Convention American Association Petroleum Geologists
 and
 Western Regional Meeting of the Society of Petroleum Engineers
 Westin Hotel, Long Beach
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 Session: "Environmental Liabilities Associated with Oil Industry Operations".

Methane dangers in Los Angeles linked to waste disposal in old oilfields

Studies of past oilfield hazards in Los Angeles show that the most severe hazards above old oilfields are associated with disposal of production wastes and attempts to give new life to old fields by repressurizing the ground, according to studies by two experts who have analyzed the history of hazards present in the Fairfax and Baldwin Hills areas. "Both the failure of the Baldwin Hills Reservoir in 1963 and the Fairfax Gas explosions of 1985 occurred following initiation of waste disposal or secondary recovery operations by pressure injection of oilfield wastewater back into the fields," said Douglas Hamilton, a geologist who has been studying these events for the past decade. To an increasing degree much of the fluid that is produced by oilwells in old fields is gassy salt water that has no use and must be disposed of. The discovery in the late 1950s that the waste could be pumped back down into the ground, and that the underground balloon of pressure would actually force more oil into oil wells was a boon to the oil industry. "But the history of past disasters backed by mathematical modelling studies now show that use of excessive pressure will cause gas and water to burp back up from thousands of feet below the ground," according to Richard Meehan, who teaches courses on environmental hazards at Stanford University. The rush to develop land areas over oilfields and the controversial siting of the Belmont Learning Center at the edge of Los Angeles' oldest field and development proposals in the Playa Vista wetland area have raised new concerns about methane hazards. Repressurization and waste disposal have not been attempted at the field beneath the Belmont Learning Center, though these operations are being conducted at another newer oilfield located beneath the downtown part of the city. Natural processes of repressurization and earthquakes could also result in methane releases, but the hazard is much greater when waste disposal is active. The important thing is to maintain injection pressures at safe levels and also understand the various pathways that gas and fluid might take to reach the ground surface, according to the experts.

Abstract of the paper to be presented follows.

Explosion and other gas ventings at the Fairfax District, Los Angeles

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Methane gas ventings in the, Fairfax District of Los Angeles resulted in the explosion of a Ross Dress for Less department store in 1985, and the evacuation of several buildings in 1989. The Fairfax District overlies part of the old Salt Lake oil field and is about one-half mile from the LaBrea Tar Pits. The oil field, once developed by more than 400 wells, was largely abandoned prior to being redeveloped by slant drilling starting in 1962. Since then production of oil, salt water and gas has been continuous with the water being reinjected into the field since 1980. The disposal reinjection was into a block adjacent to the Third Street fault which projects to the surface near the surface venting sites. Injection was at surface pressures of up to 770 psi giving rise to a gradient of about 0.7 psi/ft within the subsurface near the point of injection. We conclude that this resulted in episodic fracturing of the Third Street fault.

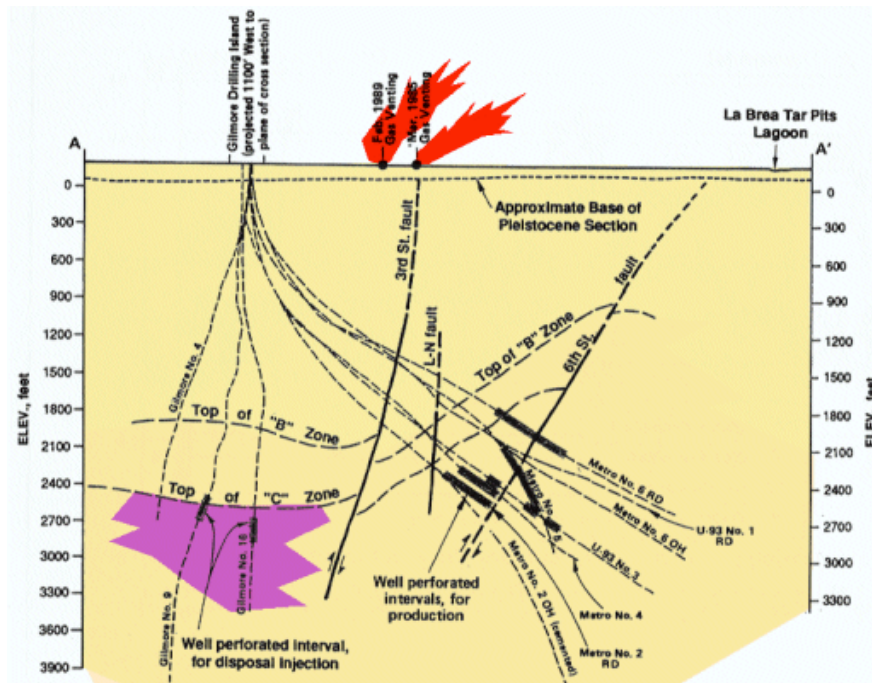
The fault acting as a valve structure, was temporarily jacked open by the local fluid overpressure and while open served as a conduit for escape of pressurized methane to the near surface. With depressurization the fault conduit would collapse and the venting cease. Similar effects of fault activation by fluid pressure excursions have been demonstrated in connection with the 1963 failure of Baldwin Hills dam in the Inglewood field, with seismicity triggering elsewhere, and also in geological paleoeffects preserved in vein structures.

Clearly the phenomenon of methane venting in the urban environment can be hazardous, especially if no provision has been made to control it at the surface. But we propose that an adequate response to this hazard should include developing an integrated understanding of both surface and subsurface conditions, starting, where oil field activity is involved, with the geology and operations within the producing zone.

Other old oilfields such as the Los Angeles field have not been subject to artificial repressurization and do not present the same explosive and ground rupture hazards which accompanied reinjection of wastes at the Salt Lake and Inglewood fields. Potentially hazardous migration of gas to the surface at these locations would be controlled by diffusive or natural repressurization processes operating in conjunction with primary or secondary permeability characteristics of the upper few thousand feet of rock or via abandoned wells.

Some illustrations follow:

Fairfax area gas ventings, 1985

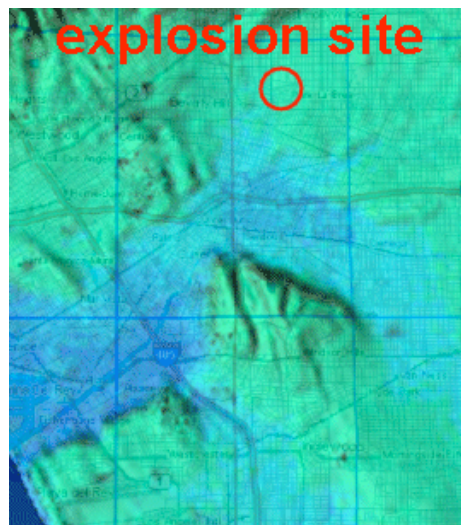


Nighttime gas release, near Ross store.



More than seven hours after original explosion, flames continue to seep up from cracks in pavement.
**BLAST: 23 Injured; Burnoff of Gas
Could Take Months, Fire Dept. Says**

Relation of explosion site to Los Angeles landforms



Fluid injection and the Baldwin Hills reservoir

