Comments on
California Regional Water Quality Control Board Los Angeles Region
Revised Tentative Waste Discharge Requirements
Eastern Canyons Expansion - Puente Hills Landfill - October 12, 1993

Prepared by
G. Fred Lee, Ph.D., D.E.E. and Anne Jones-Lee, Ph.D.
G. Fred Lee & Associates
El Macero, CA

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On October 28, 1993 we obtained a copy of the California Regional Water Quality Control Board Los Angeles Region's [Regional Board] "Revised Tentative Waste Discharge Requirements [WDR's], Eastern Canyons Expansion - Puente Hills Landfill" dated October 12, 1993. We offer the following comments.

Overview

In the period November 1992 through July 1993 we conducted in-depth reviews of the existing Puente Hills Landfill operations and the potential public health and environmental quality impacts of the proposed Puente Hills Landfill expansion as described in various Los Angeles County Sanitation Districts' [District] documents covering that proposed expansion. A listing of reports and testimony that present the results of those reviews is presented in Table 1. We have also reviewed the tentative WDR's for the proposed landfill expansion. Based on those reviews and our many years of experience in issues of public health and environmental impacts of landfills, we find there to be highly significant technical deficiencies in the proposed plans and WDR's for the proposed Puente Hills Landfill expansion. Many of the key findings from our review of the Sanitation Districts' documents pertinent to the existing Puente Hills Landfill and the proposed Landfill expansion are summarized below.

- The geological and geographical setting of the Puente Hills Landfill is highly unsuitable for a landfill of any type, and certainly for the second largest landfill in the US.

- The existing Puente Hills Landfill is having a significant adverse impact on the aesthetic quality of the vicinity and is adverse to the public health of the residents of Hacienda Heights, owing to the inability of the Districts to control gaseous emissions from the landfill.

- The existing Puente Hills Landfill is polluting groundwater in the region of the landfill that are hydraulically connected to high-value groundwaters of the San Gabriel Valley.

- The Los Angeles Regional Board's approach of trying to use groundwater barriers (slurry walls) as a means of preventing the transport of leachate-polluted groundwaters that develop under the existing landfill and that will develop beneath the proposed landfill expansion, from reaching the San Gabriel Valley domestic water supplies, is highly technically flawed. Slurry walls of the type that have been constructed in that area will not prevent leachate-contaminated groundwaters from passing around and through them and that they will not prevent the pollution of the San Gabriel Valley groundwater resources by leachate derived from the current Puente Hills Landfill or from the proposed landfill

expansion.

- A review of the existing groundwater quality monitoring approach and data for the Puente Hills Landfill shows that the groundwater monitoring program that has been conducted at the Puente Hills Landfill by the Los Angeles County Sanitation Districts, with support of the Los Angeles Regional Water Quality Control Board staff, falls far short of meeting the requirements set forth in Chapter 15, Article 5 for the detection of incipient groundwater pollution by landfill leachate before widespread pollution occurs. The fractured rock geology of the Puente Hills Landfill site makes it impossible to reliably monitor groundwater to detect pollution by landfill leachate before widespread pollution occurs.

- The Los Angeles County Sanitation Districts' self-developed and self-certified Environmental Impact Report [EIR] on the proposed Puente Hills Landfill expansion provided substantial amounts of unreliable information regarding the environmental impacts of the existing Puente Hills Landfill and expected for the proposed expansion of that landfill. The review of the Districts' EIR by the Los Angeles County Superior Court generated the conclusion that the EIR is deficient in several areas, including in the description of the groundwater quality issues pertinent to the proposed landfill expansion.

- The Los Angeles County Sanitation Districts' proposed expansion of the Puente Hills Landfill would not comply with the performance standards set forth in Chapter 15 or the performance standards set forth in the State Water Resources Control Board's new landfilling Policy adopted on June 17, 1993 that require the protection of groundwater resources from use-impairment for as long as the wastes represent a threat.

  The liner systems that the Districts propose to use are well-recognized to only postpone groundwater pollution by leachate developed within the proposed expanded landfill; they will not prevent it.

  Contrary to statements made by the Districts in support of the proposed expansion, the proposed landfill expansion will generate leachate that will pollute groundwaters, impairing their use for domestic and other purposes. The inability to reliably monitor this groundwater pollution by the approaches proposed to be used by the Districts, and the inability of the groundwater barriers (slurry walls) to prevent off-site migration of landfill-leachate-polluted groundwaters to the San Gabriel Valley groundwater resources should be grounds for rejection of the proposed landfill expansion.

Backup information on these conclusions is presented in our various reports and testimony, including the appendices that were provided with those reports and testimony.

It is our understanding that all materials previously submitted in connection with the Districts' review of the EIR that took place in November and December 1992, the Los Angeles County Planning Commission's review of the conditional use permit for the landfill expansion that took place in the spring 1993, and the Los Angeles County Board of Supervisors' review of the Planning Commission's conditional use permit for the expansion of the Puente Hills Landfill that took place in June and July 1993, are part of the administrative record for the Regional Board's review of the Waste Discharge Requirements for the Puente Hills Landfill expansion. Copies of our papers and reports and their appendices are in the public record and are available from us upon request.

Reviewer's Technical Expertise and Experience
Pertinent to Review of the Tentative WDR's for
the Puente Hills Landfill Expansion

The senior author of these comments (G. Fred Lee) has been involved in landfill and groundwater quality protection issues for over 25 years. The authors have worked together as a team on these issues since the mid-1970's. This work has included conducting extensive research on a variety of topics pertinent to evaluating the appropriateness of the Regional Board staff's October 12, 1993 proposed landfill expansion WDR's, such as on liner material and containment system characteristics. In addition to extensive work on these issues in the US and in other countries, we have in-depth experience and knowledge of the groundwater resources and their vulnerability in the San Gabriel Valley. While teaching at the New Jersey Institute of Technology in 1989, we were asked to assist the Main San Gabriel Basin Watermaster in the evaluation of the potential for the then-proposed expansion of the Azusa Land Reclamation (ALR) company's landfill (Azusa Landfill).

In the early 1980's, while teaching in the University of Texas system, the senior author of these comments had been asked by the State Water Resources Control Board staff to review and comment on what became Subchapter 15, now Chapter 15, regulations governing landfilling of solid wastes in California that were adopted in 1984. He was also asked to present a seminar to the State and Regional Boards' staff on the monitoring of groundwaters near landfills, as part of his activities associated with the development of Subchapter 15.

Since returning to California in 1989, we have been highly involved on behalf of water utilities and others in reviewing the implementation of the requirements of Chapter 15 as set forth in the performance standards specified in Chapter 15, to protect groundwater resources from use-impairment by landfill leachate for as long as the landfill's solid wastes represent a threat to groundwater quality. We have found, as has the State Water Resources Control Board staff, that regional board staff and boards at several locations in the State had been misinterpreting the requirements of Chapter 15 by allowing the construction at geologically unsuitable sites (such as the Puente Hills site) municipal solid waste landfills that rely on a liner system (such as that which the Districts have been using in part of the existing landfill) that, at best, only postpones groundwater pollution. This problem with interpretation of Chapter 15 requirements is also exemplified by the Los Angeles Regional Water Quality Control Board's 1989 approval of the expansion of the Azusa Landfill. In a review of that expansion in the summer and fall of 1989, the State Water Resources Control Board staff concluded that the Regional Board staff and Board were misinterpreting Chapter 15 requirements by allowing the expansion of that landfill through the issuance of WDR's for that expansion which, because of deficiencies in liner design, would only postpone the occurrence of groundwater pollution from the expanded Azusa Landfill.

There is considerable parallel between the Azusa Landfill situation and the Puente Hills Landfill situation. Both landfills are significant threats to the groundwater resources of the San Gabriel Valley. For neither the Azusa Landfill nor the proposed expansion of the Puente Hills Landfill did the Regional Board implement the performance standards set forth in Chapter 15 (and now the new landfilling Policy) that would prohibit the construction of a landfill at a site that would not protect the groundwater resources of the area from use-impairment by landfill leachate for as long as the wastes represent a threat.

Another unfortunate similarity between the Azusa Landfill situation and the Puente Hills Landfill situation is the Regional Board staff's addressing of evidence of groundwater pollution from the landfill. The Regional Board staff did not recognize the early evidence of groundwater pollution from the Azusa Landfill and apparently still does not acknowledge it today. The groundwater monitoring data that have been submitted to the Regional Board on a quarterly basis by the Azusa Landfill owner-operator since the mid-1980's, have shown groundwater pollution by the existing Azusa Landfill. That notwithstanding, the Regional Board staff stated in 1989 that no pollution was occurring. A similar situation is now occurring with the Puente Hills Landfill. There is no doubt that the existing Puente Hills Landfill is polluting groundwaters. Even though the existing groundwater monitoring program that has been approved by the Regional Board staff is grossly deficient compared to that needed to properly monitor the highly complex hydrogeology of the Puente Hills site, there is strong evidence that the existing Puente Hills Landfill has been and continues to pollute groundwaters at that site. This situation for the Azusa Landfill represents a failure of the Regional Board to implement the requirements of Article 5 of Chapter 15 covering the monitoring of groundwaters in the vicinity of a landfill.

During the winter and spring of 1992 we were highly involved in support of the Los Angeles Regional Water Quality Control Board staff's proposal to ban landfills in sand and gravel pits in the Los Angeles Basin. We submitted extensive written testimony and presented verbal testimony in support of the staff's position, on why landfill liner systems of the type even more extensive than proposed for the Puente Hills landfill, will not prevent leachate migration through them for as long as the municipal solid waste in the landfill will be a threat to groundwater quality. At that time, the Regional Board staff noted that all landfill liner systems will fail, including those being used for double-composite lined landfills. The staff indicated that such landfill liner systems would not be satisfactory for the containment of leachate within the landfill for as long as the wastes represent a threat, which was acknowledged at that time to be forever.

We are surprised by the inconsistency of the Regional Board staff shown in its support of the expansion of the Puente Hills Landfill. The liner system for that expansion will not prevent groundwater pollution and it is located in a much more difficult hydrogeologic setting for monitoring of landfills than the typical landfill located in a sand and gravel pit. While the staff may now try to assert that the groundwater barrier system being used by the Sanitation Districts at the Puente Hills Landfill is a fail-safe system for prevention of the migration of leachate-polluted groundwaters from beneath the Puente Hills Landfill to the adjacent San Gabriel Basin, review of the literature pertinent to slurry wall groundwater barriers of the type being used at the existing Puente Hills landfill clearly shows that such systems are not reliable for prevention of migration of leachate-contaminated groundwater from the landfill to the San Gabriel Valley groundwater system.

The inability to reliably monitor groundwaters under a fractured bedrock system, such as that located at Puente Hills, has been described by Haitjema (1991) as an "environmental nightmare" and usually not more than a "blind gamble." He stated, in his review of monitoring of landfills,

"An extreme example of equation (1) (aquifer heterogeneity) is flow through fractured rock. The design of monitoring well systems in such an environment is a nightmare and usually not more than a blind gamble.

Monitoring wells in the regional aquifer are unreliable detectors of local leaks in a landfill."

Haitjema suggested that landfills should be prohibited from being sited in fractured rock systems of the type that exist at Puente Hills, but should, instead, be located in alluvial homogeneous isotropic aquifer areas where the flow paths of leachate-contaminated groundwater can be much more reliably defined than in a fractured rock system.

Our work on landfills and groundwater quality protection issues is recognized throughout the US and internationally as being on the forefront of new developments in the solid waste management field. Under sponsorship of the American Society of Civil Engineers, the American Water Resources Association, the National Ground Water Association, and the University of California Extension Programs for UC Davis, Berkeley, Los Angeles, Santa Barbara and Riverside, we have presented one- and two-day short-courses devoted to discussions of the issues of landfills and groundwater quality protection. Among other things, we point out the highly significant deficiencies in current landfilling approaches, including approaches such as set forth in the tentative WDR's for the proposed Puente Hills Landfill expansion. About a month ago, ASCE sponsored our presentation of a two-day short-course in Chicago devoted to this topic. ASCE will also be sponsoring our presentation of that short-course in mid-November 1993 in Seattle, WA, and in December 1993 in St. Louis, MO.

Over the past 25 years Dr. Lee has participated in American Chemical Society invited lecture tours to local ACS sections in various regions of the country. Over the past half-dozen years, he has been requested by sections to discuss issues of landfills and groundwater quality protection. He recently returned from such a lecture tour through New Jersey, Connecticut, and New York where he was invited to speak on current problems with landfilling of municipal solid waste in providing groundwater quality protection.

Three weeks ago, Dr. Lee presented two papers on landfills and groundwater pollution issues at an international conference on landfills in Sardinia, Italy. That conference, attended by approximately 1,000 professionals from 30 countries (Sardinia '93, 1993), and included presentations that provided a good overview of approaches being used to manage municipal solid wastes in other countries. Those approaches are significantly different approaches from the "dry tomb" landfilling approach commonly being used in the US today. Many of the professionals in this field in Europe have recognized, for a number of years, the significant deficiencies in the landfill liners that are being used today in providing protection of groundwater resources from pollution from landfill leachate for as long as the wastes represent a threat. It was clear from that European conference that several countries in Europe would not allow the continued operation of the Puente Hills Landfill as proposed by the Districts. Several US states have minimum prescriptive standards for liner design that are far-more protective than those in California.

During the past year we have been instrumental in working with the CA/NV American Water Works Association Section Source Water Quality Committee and the Association of California Water Agencies Groundwater Committee in developing groundwater quality subcommittees. The senior author of these comments is chair of both of these subcommittees. These subcommittees are in the process of developing a guidance manual for water utilities and others on how they should proceed to protect their groundwater resources from pollution by chemicals and pathogens from any source of

contaminants, including municipal landfills. One of the major areas of concern is the pollution of the groundwater resources of the state by landfill leachate.

Table 2 presents a listing of the professional papers and reports that we have developed that serve as back-up to this statement as well as the various items of testimony and support that were developed by us and submitted to the Sanitation Districts in November and December 1992, and the Los Angeles County Planning Commission and the Los Angeles County Board of Supervisors in the winter, spring, and summer of 1993, on the significant groundwater quality protection problems that exist at the existing Puente Hills Landfill, as well as those that will occur as a result of expansion of the landfill as proposed by the Districts.

All of the key papers and reports listed in Table 2 pertinent as backup to the materials previously submitted to the Districts, Planning Commission, and Board of Supervisors have previously been provided to Dr. R. Ghirelli, Executive Officer for the Los Angeles Regional Water Quality Control Board for his and the staff's review and comment. Therefore, except for the discussions presented herein on the inability of the groundwater barriers that have been developed by the Sanitation Districts and the Regional Board staff for the Los Angeles County Sanitation Districts' Puente Hills Landfill, significant backup materials to all of the statements made herein have been available to the Regional Board staff which had the opportunity to review, comment on, and/or ask questions about any of them. It is important to note that most of the materials submitted herein were submitted in support of the Los Angeles Regional Board staff's proposal to prevent the siting of landfills in sand and gravel pits located in the Los Angeles Basin. Materials on the capabilities of the Board staff's and Districts' so-called groundwater barriers (slurry walls) to prevent migration leachate-contaminated groundwaters around or through them were discussed in previously submitted testimony and were discussed in a presentation to the Upper San Gabriel Valley Municipal Water District at a meeting of this past spring.

Supplemental information on our qualifications to present comments on the significant technical deficiencies in the WDR's for the Districts' proposed expansion of the Puente Hills Landfill are attached. Additional information on the details of our qualifications is available upon request.

Specific Comments on Proposed WDR's

Page 1, Item 3 indicates that on July 20, 1993 the Los Angeles County Board of Supervisors issued a Conditional Use Permit for the Districts' proposed expansion of the Puente Hills Landfill. The WDR statement on the situation is deficient in that the staff should have indicated that the Los Angeles County Board of Supervisors' actions were based on there being a certified EIR for the proposed expansion; the EIR was subsequently deemed by the courts to be deficient in the key area of groundwater quality impacts.

On page 2, Item 8 the following misleading statement was made,

"A periodic waste-load-checking program has been implemented at the current waste management facility and is proposed for all new areas of disposal operations at the site. This program will insure that unauthorized hazardous materials are not deposited at this

waste disposal facility."

Load-checking programs of the type that the Districts have been conducting and propose to continue at the expansion cannot "insure" that unauthorized, hazardous materials will not be deposited in the Puente Hills Landfill expansion. As discussed by Jones-Lee and Lee (1993), municipal solid waste from household and commercial sources contains a wide variety of highly hazardous materials that will lead to leachate that causes groundwaters polluted by leachate to be hazardous to public health. Furthermore, it is well-known in the waste management field that significant amounts of unauthorized hazardous materials are routinely deposited in municipal solid waste landfills that have load-checking programs of the type that are conducted by the Districts. These programs are woefully deficient in detecting all "unauthorized" hazardous materials and do not address at all the "authorized" hazardous materials that are routinely placed in municipal solid waste landfills. The statement quoted on this issue is a substantial overstatement of what can be accomplished.

Pages 2 and 3, Item 10. The discussion presented in this item regarding the EIR has inadequately represented the situation with respect to the Districts' self-developed and self-certified EIR. There was substantial testimony presented by many individuals, including us, at the Districts' self-certification hearing which showed that, contrary to the statements made by the Districts, the proposed landfill expansion would have a significant adverse impact on public health and the environment in the vicinity of the landfill. The court reviewed that EIR and determined that the testimony in opposition to the Districts' staff in its self-certification was more reliable than that presented by the Districts' representatives. A properly developed WDR should have presented a more reliable recounting concerning the EIR.

On page 3, Item 11, the staff indicates that the Districts will be required to comply with Subtitle D (US EPA, 1991) requirements where they are stricter than those of Chapter 15. What the staff did not say, indeed could not say, but should have addressed, is that the Puente Hills Landfill expansion would meet the over-riding performance standards of Chapter 15, i.e., would prevent the pollution of groundwaters by landfill leachate to impair the use of the waters of the State for as long as the wastes represent a threat. That performance standard set forth in Chapter 15 is much stricter than the prescriptive design standards set forth in Subtitle D. At the June 17, 1993 hearing where the State Water Resources Control Board adopted the new landfilling Policy, the State Board members and staff explicitly stated that that performance standard took precedence over all prescriptive design standards in both Chapter 15 and Subtitle D. Meeting that performance standard should have been addressed in Item 11 of page 3 of the draft WDR's as the applicable standard that the Districts must meet with Puente Hills Landfill expansion.

Page 3 and 4, Item 14 presents highly misleading information on the various components of the containment system, such as the groundwater subdrain, composite liner, leachate collection and removal system, subsurface barriers (slurry walls) and extraction systems, and the groundwater and vadose zone monitoring systems, and on the ability to achieve the performance standard of the new landfilling Policy. A critical technical review of those components, taken individually and as a collective "system," clearly demonstrates that the proposed containment and monitoring systems will not achieve the over-riding performance standard set forth in the new landfilling Policy of protecting groundwaters from use-impairment by landfill-derived constituents for as long as the wastes represent a threat. The municipal solid wastes that will be placed in the Puente Hills Landfill expansion as proposed will be a

threat to the quality of the groundwater resources hydraulically connected to the landfill, **forever** (Jones-Lee and Lee, 1993). The proposed components of the containment system will obviously not function as conceived for their intended purpose forever. Therefore, at best, the Districts' proposed containment system will only postpone groundwater pollution; it will not prevent it.

The US EPA (1989), as well as Bonaparte and Gross (1990), recognize that new landfill liner systems, which include systems of the type that the Sanitation Districts have proposed for the expansion of the Puente Hills Landfill as well as the liner systems that have been recommended for approval by the Los Angeles Regional Water Quality Control Board staff in the tentative WDR's of October 12, 1993, will leak. The US EPA stated,

"EPA realizes that even with a good construction quality assurance plan, flexible membrane liners (FMLs) will allow some liquid transmission either through water vapor permeation of an intact FML, or through small pinholes or tears in a slightly flawed FML.

Leakage rates resulting from these mechanisms can range from less than 1 to 300 gallons per acre per day (gal/acre/day)."

Further, Bonaparte and Gross (1990) stated,

"Liquid flows have been observed from the leakage detection layers of many double-lined landfills and surface impoundment facilities.

Based on the data in this study, an action leakage rate of 50 lphd [liters per hectare per day] is too restrictive and presents a performance standard that, if promulgated by US EPA, frequently will not be met by facilities that were constructed to present standards with rigorous third-party CQA programs. An action leakage rate of 200 lphd [≈ 7,800 gal/acre/yr] appears to be reasonable for landfills that have been constructed using rigorous third-party CQA programs."

Bonaparte and Gross discussed in that article the fact that this leakage in new liner systems is through holes in the liner that are present shortly after the time at which the landfill is put in operation.

The inevitable failure of these liner systems is recognized by the US EPA in its proposed Subtitle D regulations of August 1988 where it stated,

"First, even the best liner and leachate collection system will ultimately fail due to natural deterioration, and recent improvements in MSWLF (municipal sold waste landfill) containment technologies suggest that releases may be delayed by many decades at some landfills." (US EPA, 1988a)

The US EPA criteria for municipal solid waste landfills (US EPA, July 1988b) stated,

"Once the unit is closed, the bottom layer of the landfill will deteriorate over time and, consequently, will not prevent leachate transport out of the unit."

There is no question that at the time the proposed Puente Hills Landfill liner system is put into service it will leak leachate at a potentially significant rate. Over time, the landfill containment system will deteriorate and fail to prevent landfill leachate from polluting groundwater in the vicinity of the landfill. It will only be a matter of time until the leachate-polluted groundwater reaches the San Gabriel Valley groundwater resources, impairing their use for domestic water supply.

Page 3, Item 14 in the tentative WDR's for the Puente Hills Landfill expansion states,

"These systems will be constructed to the prescriptive standards of Subtitle D or equivalent performance standards."

In making that statement, the Los Angeles Regional Water Quality Control Board staff has continued to misinterpret Chapter 15, and now the new landfilling Policy, requirements. Contrary to the staff's statement quoted above, the issue is not whether the landfill containment system components provide equivalent "performance standards" to those set forth in Subtitle D. The containment system prescriptive standards of Subtitle D will not prevent groundwater pollution. It is for that reason that many states, some as much as 10 years ago (New York, New Jersey and Pennsylvania), and more recently Arizona and Michigan, have adopted far more protective liner and groundwater monitoring systems than those set forth in Subtitle D.

The approach advocated by the staff in Item 14, page 4 is more of the same kind of problem discussed above that occurred with the Azusa Landfill where the staff misinterpreted the requirements of what was then Subchapter 15 and allowed the construction of a landfill expansion that would obviously not meet the over-riding performance standards set forth in that Subchapter. It is important to note that neither Chapter 15 nor the new landfilling Policy supports the presumption offered by the Los Angeles Regional Water Quality Control Board staff that a landfill that meets Subtitle D prescriptive design requirements conforms to the groundwater quality protection requirements of the Policy.

As discussed in our previous submissions on the proposed Puente Hills Landfill expansion, minimum Subtitle D prescriptive standards are recognized as not capable of providing the degree of groundwater quality protection required by the performance standards of Chapter 15 and the new State Board landfilling Policy. As being interpreted by the US EPA, RCRA only requires the protection of groundwater from a few "hazardous" chemicals for a period of 30 years after closure. It does not require the prevention of use-impairment of groundwaters from all contaminants in municipal and industrial solid wastes for as long as the wastes represent a threat, as required in Chapter 15 and the new Policy. In stating that the Puente Hills Landfill expansion liner containment system only has to provide performance equivalent to Subtitle D design requirements, the Regional Board is allowing a significantly lower standard than that which was set forth in Chapter 15 in 1984 and was readopted and explicitly stated on June 17, 1993 as part of the State Water Resources Control Board adoption of its new landfilling Policy for the State.

The difference between when the Azusa Landfill expansion pollutes groundwater and when the Puente Hills Landfill expansion pollutes groundwater is only time. Both systems are hydraulically connected to the San Gabriel Valley groundwater resources. The final liner containment system

proposed for the Azusa Landfill was, in fact, better than that which the Districts and the Regional Board staff have proposed for the Puente Hills Landfill expansion. The inability to properly monitor leakage of leachate from the Puente Hills Landfill expansion and the groundwater in the vicinity of the landfill using the system proposed to meet the requirements of the new landfilling policy as set forth in the revised Article 5 of Chapter 15, coupled with the inability of the groundwater barrier system to prevent leachate-contaminated groundwater from moving through the recognized and acknowledged pathways from under the Puente Hills Landfill to the San Gabriel Valley groundwater resources, and the fact that the Puente Hills Landfill is proposed to continue to receive at least 12,000 tons/day of untreated garbage under this proposed expansion, makes the Puente Hills Landfill expansion at least as great a threat, if not a greater threat, to the groundwater resources of the San Gabriel Valley than the Azusa Landfill. The issuance of these WDR's for the Puente Hills Landfill expansion shows significant inconsistency in how the Los Angeles Regional Water Quality Control Board staff in developing positions on proposed landfill sitings and expansions.

Page 4, Item 15 states that incinerator ash can be disposed of as a "non-hazardous waste" in the proposed landfill expansion. It is recognized in the field that heavy metals, and in some cases the organics, present in MSW incinerator ash, when placed in a municipal landfill, will contribute to the hazardous nature of leachate developed within the landfill. The use of arbitrary testing procedures to administratively distinguish between "hazardous" and "non-hazardous," as the staff is doing, is highly inappropriate.

Page 4, Item 16 states that the Districts must collect the landfill gas and that the excess gas will be flared. Papers presented at the Sardinia '93 conference by Eden (1993a,b) discussed the efficacy of landfill gas flares in controlling hazardous chemicals. It is known that landfill gas flares very ineffective in destroying highly hazardous (potential human carcinogenic) components of landfill gas such as those described by Hodgson *et al*. (1992) in their recently reported study of landfill gaseous emissions in California. They also are responsible for forming dioxins in the flare thereby increasing the hazard to individuals within the potential zone of impact of the flared gases, such as the those in the Hacienda Heights residential development near the Puente Hills Landfill. The proposed approach for handling landfill gas at the proposed Puente Hills Landfill expansion will not be protective of public health and the environment for those within the zone of impact of the landfill which certainly extends well into residential and other areas near the landfill.

At the Sardinia '93 conference, individuals representing several countries, including the Netherlands and Germany, discussed some of the most recent work on the impacts of landfill gas emissions, such as odors and hazardous chemicals on individuals living and/or working near the landfill. It is very clear that the recently developed legislation in those countries would not allow the operation of a landfill like the proposed Puente Hills Landfill expansion with its minimal landfill gas emission control provisions. The frequent and severe odors experienced by those who live and/or work in the zone of influence of the Puente Hills Landfill attest to the inappropriateness of the approach that the Districts, and now the Regional Water Quality Control Board staff, have adopted for addressing the impacts of landfill gaseous emissions.

On page 5, Item 20 the tentative WDR's state with regard to the zones beneath the proposed expansion area in which groundwater moves,

"These zones will be intercepted by subsurface barrier and extraction systems at the canyon mouths, if they reach that far."

The suggestion that leachate-contaminated groundwater may not "reach that far" is not supported by the technical information available. It is known that contaminants have already breached "subsurface barriers," a situation that has precipitated the construction of another barrier downgradient of the first. Further, as discussed above, it is clear from the technical literature and understanding of the characteristics of such barriers that they are inappropriate and unreliable for use in trying to prevent off-site migration of leachate-polluted groundwaters. Cement bentonite barriers of the type that are being constructed at the Puente Hills site are known to be highly porous at the time of construction and can, through high-permeability areas, allow significant amounts of leachate contaminated-groundwaters through them.

Paul, Davidson, and Cavalli, editors of the 1992 ASTM Special Technical Publication 11-92 entitled, "Slurry Walls: Design, Construction and Quality Control" presented several papers on slurry walls of the type that the Districts and the Regional Board staff have developed for the Puente Hills Landfill. Those papers provide information that shows that they are not reliable systems for preventing the migration of leachate-contaminated groundwaters through them to the highly valued groundwater system in the San Gabriel Valley.

The senior author (Lee) became aware of the significant deficiencies of slurry walls as groundwater contaminant barriers as part of his work while holding a Distinguished Professorship of Civil and Environmental Engineering at the New Jersey Institute of Technology where he also served as Director of a hazardous waste center Site Assessment and Remediation Division. Research conducted in that Division while he served as division director, clearly supported and further demonstrated what was then already known, that while effective for reducing large-scale mass transport of groundwater in construction dewatering projects, slurry walls are not effective in preventing the transport of contaminated groundwaters that could lead to groundwater pollution downgradient of the slurry wall. This is especially true of cement-bentonite slurry walls of the type that being constructed as a replacement for the failed groundwater barrier system that now exists at the Puente Hills Landfill. Further, the properties of the cement bentonite barriers are such that over time their permeability significantly increases due to ion exchange reactions within the barrier. Also, there is no way to reliably insure that the construction of a barrier at a particular location will intercept all fractures in the fractured rock system underlying the Puente Hills Landfill that could serve as conduits for transport of leachate-contaminated groundwater around the barrier offsite to the San Gabriel Valley groundwater system. Even if the Districts maintained an advective head upgradient across the barrier, the molecular diffusion of contaminants through the barrier can still occur that can lead to significant groundwater pollution on the downgradient side of the barrier (Gray and Weber, 1984). These various issues are well-documented in the referenced literature. The Regional Board staff made a very serious error in relying on cement-bentonite slurry walls as "barriers" for contaminated groundwater.

Page 5, Item 21 properly notes that groundwaters under the landfill that will be polluted by landfill leachate due to the inevitable failure of the containment system, can pollute groundwaters in the San Gabriel Valley. As discussed above, however, the staff has grossly over-estimated the ability of the

groundwater monitoring and flow control systems, such as subsurface barriers, to prevent offsite migration of leachate-contaminated groundwaters.

On page 6, Item 3 the tentative WDR's state,

"...or wastes which contain soluble pollutants in concentrations which exceed applicable water quality objectives, or could cause degradation to waters of the State."

The quoted statement is highly inaccurate. There is no question about the fact that with very few exceptions, all of the wastes that will be accepted at the Puente Hills Landfill under the tentative WDR's will contain soluble pollutants in concentrations which exceed applicable water quality objectives and can cause degradation of the waters of the State. It appears that the staff has misquoted the definition of "inert waste" and has incorrectly expanded this to mean all wastes. This wording is similar to that of Chapter 15 for inert wastes, however the inert wastes requirements of Chapter 15 has never been properly implemented by the State and Regional Board staff. While the wording in this section of Chapter 15 specifies that inert wastes shall not contain components that are soluble that could degrade the waters of the state, no reliable testing procedure has been developed to evaluate whether the so-called inert wastes, arbitrarily classified as such without proper evaluation by the Regional Board staff, are, in fact, inert. It is clear that part of the so-called inert wastes will, under properly conducted leaching tests that simulate real-world conditions, release soluble components at sufficient concentrations that could degrade the waters of the State.

Page 7, Item 5. As discussed above, there is no doubt that if properly evaluated, incinerator ash, when placed in a municipal landfill such as the Puente Hills Landfill, will contain soluble pollutants in concentrations that exceed applicable water quality objectives and that can cause degradation of the waters of the State.

Page 7, Item B3 states,

"No materials which are of a toxic nature, such as insecticides, poisons, or radioactive materials, shall be disposed of at this waste management facility."

First, as discussed in our previous papers and reports (see Table l) the Districts' statements about preventing radioactive materials from being deposited in the landfill are highly unreliable since the method that the Districts use to detect radioactive materials in wasteloads will not detect some of the most hazardous types of radioactivity. The statement in this section seems to be a parroting of the Districts' statement, and is technically invalid. With respect to the other so-called toxic materials, it is very misleading to inform the public, as was done in this draft WDR, that no toxic materials will be disposed of at the Puente Hills Landfill expansion. As noted above, such a claim reflects a lack of understanding of aquatic chemistry and toxicology of municipal solid waste components and misleads the public and decision-makers regarding the safety of the Puente Hills Landfill expansion. Those knowledgeable in this topic area know that there is a wide variety of materials in common, everyday use in the home that can legally be placed in a municipal solid waste stream yet are highly toxic to humans and other forms of life. The quoted statement should be deleted from the WDR since it is highly unreliable, and should be replaced by a statement that properly reflects the fact that large amounts of highly toxic materials will be

placed in the Puente Hills Landfill expansion as proposed in the tentative WDR's.

Page 8, Item C presents the staff's recommendations for maximum concentrations of certain parameters. Adopting those concentrations can readily lead to substantial pollution of groundwaters. A significantly different approach must be adopted in establishing an allowable increase in concentration of constituents if groundwater protection is going to be achieved. It is important to note, as discussed by Jones-Lee and Lee (1993), that any contamination of groundwater by landfill leachate, independent of whether a drinking water standard (MCL) is exceeded, represents a significant public health threat because of the non-conventional pollutants present in MSW leachate. There could readily be highly hazardous chemicals that are not yet known or that are not identified and quantified in MSW landfill leachate that would be a significant threat to public health and/or the environment that would occur in leachate-polluted groundwaters that meet the maximum values set forth by the staff on page 8, Item 1.

Page 8, Item 4 contains more distorted information on what will be placed in the landfill. To state that no infectious materials will be allowed to be placed in this landfill grossly misrepresents the actual situation that will occur. For example, on the order of 2% of the volume of the total wastes placed in the landfill will be disposable diapers. The fecal material in disposable diapers contains infectious agents that can readily cause disease in humans if not properly managed. It is inappropriate to suggest, as the staff has done, that no infectious materials will be allowed in this landfill expansion. Substantial amounts of infectious materials will be placed in the landfill.

Page 9, Item 2 states,

"There shall be no damage or nuisance to the community due to odors or unsightliness, which result from unreasonable practices in the disposal of wastes at this waste management facility, as defined in Section 13050(1) of the California Water Code."

There can be no doubt that highly offensive odors that have been occurring offsite at the Puente Hills Landfill will continue to occur offsite if this landfill is allowed to be expanded. Further, the significant seagull and litter problems that now exist at the Puente Hills Landfill will certainly continue to occur at the expanded landfill. For the residents and the schoolchildren attending the school near the proposed landfill expansion in Hacienda Heights, the problems will likely become more severe because of the Districts' proposal to conduct disposal operations much closer to the residents and the school than they have in the past.

Page 9 item D. 2. states that no nuisance odors will result from *"unreasonable practices"* in the disposal of wastes. For a landfill such as the Puente Hills Landfill, that is sited without adequate land buffer and from which highly obnoxious odors are released from the landfilling operation to adjacent and nearby properties, it is impossible to control the highly offensive odors so that they will not be a nuisance on adjacent and nearby properties. While the Districts' staff has tried to blame the severe odor problem on non-landfill sources, it is clear that, as expected, the current landfill operations cause frequent and severe odors to those who own and use properties near the landfill. As discussed in our comments on the current landfill operations, with the Districts' being unwilling to admit that the current landfill operations cause severe offsite odors, and with the unwillingness of the regulatory agencies to take action against the Districts to control of the severe offsite odors, there is little possibility that the odors associated with the

expanded landfill operations would be controlled so that they will not damage or be offensive to adjacent and nearby property owner/users. Landfill odors are not only highly offensive but also are a tracer of the significant public health hazard to those who are in the zone of impact of the landfill odors. The odors are a tracer of the carcinogens and other known and unknown hazardous chemicals in landfill gaseous emissions.

Lee and Jones-Lee (1993a,b) have reviewed issues of siting of landfills to address the legitimate opposition to landfills of the Puente Hills type. They found that often as much as a mile or more of buffer lands are needed to dissipate/dilute odors released during the dumping of garbage from an average-sized landfill. A "mega-landfill" such as the Puente Hills Landfill will require an even greater amount of buffer land if the odors released during garbage dumping are to be dissipated before they reach adjacent properties and become highly offensive to the users of those properties. Several studies reported at the Sardinia '93 international landfill conference provide additional information on this topic, showing that one of the primary sources of odors from municipal landfill is the dumping of the wastes. As discussed by Lee and Jones-Lee (1993a,b), in order to control these odors, it would be necessary to dump (tip) the garbage under a dome structure capable of collecting all odorous emissions; the air from the dome would have to be treated to remove odorous and hazardous chemicals, prior to release to the atmosphere.

The Districts have been landfilling wastes at the Puente Hills Landfill for costs significantly below those which would have to be charged to provide protection of public health, welfare, and groundwater quality at a landfill at that site. Those who are adversely affected, now and in the future, by the landfill's inappropriate siting, character, and operation are paying and will continue to pay the balance of the costs not being paid by the waste generators. The costs not paid by the waste generators contributing to the Puente Hills Landfill expansion will be passed on to those in Hacienda Heights and other nearby areas who are adversely affected by the landfill, and those who will rely on San Gabriel Valley groundwater resources that stand to be polluted by the expansion of the Puente Hills Landfill. While odor control during garbage dumping is not typically practiced today, many landfills are sited in areas where there is adequate area for dilution of odors that occur, before they trespass onto adjacent properties. It is clear that an improperly sited landfill, such as the Puente Hills Landfill and especially its proposed expansion, should not be allowed to operate unless adequate resources are provided by those who contribute wastes to the landfill to provide unequivocal prevention of offsite adverse impacts including odors. The Puente Hills Landfill has tipping fees among the lowest in the country because sufficient resources are not being expended by the Districts for proper garbage disposal for the protection of the public health and welfare of nearby residents and the groundwater resources hydraulically connected to the landfill area. If such protection were provided at a site as unsuitable as the Puente Hills site, the tipping fees would not be among the cheapest in the country.

Rather than impose the requirement that the Districts unconditionally control odors from the Puente Hills Landfill - a landfill that was improperly sited by the Districts in immediate proximity to large, well-established residential populations - the tentative WDR's provide the Districts and the Regional Board with a significant loophole in the matter of odor control. By this provision, the Districts are allowed to inflict nuisance odors on offsite properties if the odors arise from "reasonable" landfilling practices. This WDR should be revised to require that the Districts control odors so they do not migrate to offsite properties. If nuisance odors occur offsite, the landfill should be shut down. The continued operation of the Puente Hills Landfill for cheaper-than-real costs that do not provide for prevention of

migration of odors offsite, should not to be allowed.

Page 9 Item 4 indicates that the Districts shall comply with Chapter 15 Article 5 requirements for "detection monitoring program" and other provision of that article. The issue that needs to be addressed is whether the Regional Board will enforce the requirements of that Article more appropriately than it has for the Azusa Landfill. As discussed above, it is very clear from the data in the Board's files that leachate from the existing Azusa Landfill has been polluting groundwater since at least the mid-1980's. While this situation was brought to the attention of the Board's staff several years ago, we understand that the owner of that landfill is still not being required to carry out the provisions of Article 5 of Chapter 15. Why is there any reason to believe that the requirements set forth in the Puente Hills Landfill expansion tentative WDR's Item 4 will be carried out more reliably than those requirements of Chapter 15 have been at the Azusa Landfill, especially when, based on the Districts' staff's EIR, the Districts are unwilling to admit that the existing, highly significant problems even exit.

Page 10, Item 6 presents another WDR condition that is highly misleading in that it cannot be met at the Puente Hills Landfill. The highly complex nature of site geology/hydrogeology, the grossly inadequate land buffer around the landfill to dissipate the water-leachate and gaseous releases from the landfill, coupled with the Districts' approach for operation of this landfill at cheaper-than-real cost, make it impossible to prevent waste-derived components from migrating offsite and having a significant adverse impact on owners and users of adjacent properties. The WDR's should not incorporate such unrealistic requirements; such "requirements" mislead the public and decision-makers regarding what can, in fact, be accomplished in the way of control of offsite migration of waste components. The public is entitled to know the facts about the consequences of plausible worst-case scenario failure of the containment and monitoring program, in the permitting of the Districts' proposed expansion of the Puente Hills Landfill.

Page 10, Item 9 presents another impossible requirement for the proposed landfill expansion. As discussed above, it will be impossible to control offsite migration of gas (methane, carbon dioxide, odors and hazardous and otherwise deleterious volatile chemicals) from this landfill that can cause water pollution, nuisance, and health hazards. The Districts admitted in the EIR that the offsite migration of gaseous carcinogens will increase the cancer risk to those who live in the nearby properties.

Page 12, Item 6 presents inappropriately high "Maximum Limits" for contaminants in waters used onsite. It is clear that this WDR requirement is designed to reduce the cost of disposal of highly contaminated waters that occur onsite. Such disposal practices will significantly increase the potential for adverse public health and environmental impacts.

Page 14, Item 2 states that the Districts shall develop an "acceptable" assessment of the background water quality. The fact is that the Regional Board staff and the Districts have been trying, without success, to develop reliable background water quality information. The hydrological characteristics of the Puente Hills Landfill site are such that it is impossible to develop reliable background water quality that can appropriately be used as a basis for determining a statistically significant increase in concentration of chemical parameters to indicate when the landfill containment system has failed to prevent groundwater pollution, as required in Article 5 of Chapter 15 and in the new landfilling Policy. Based on our many years of experience in groundwater quality monitoring and

evaluation, we find that a significantly different approach must be used to detect incipient groundwater contamination by landfill-derived waste components than trying to use inappropriate determinations of "background water characteristics" as specified in this WDR.

Page 15, Item G. 1. requires that the

"...facility shall have containment structures which are capable of preventing degradation of the waters of the State."

As discussed above and in previously submitted materials (see Table 1) the Districts' proposed containment system design and the provisions specified in the tentative WDR's cannot prevent the degradation of the waters of the state by the proposed Puente Hills Landfill expansion. This is another misleading condition of the WDR as it cannot be achieved at the Puente Hills Landfills expansion as proposed by the Board staff and the Districts.

Page 15, Item G. 2. states,

"... the discharger shall submit a program which will provide for the annual testing of the leachate collection and removal system (LCRS) to demonstrate its operating efficiency."

Understanding the capabilities of an LCRS of the type that the Districts propose to construct in the landfill expansion shows this requirement to be very misleading. The incorporation of this "requirement" could readily cause those who do not understand the long-term properties and implications of such an LCRS that the development of the required "program" will cause the LCRS to be a reliable system to prevent the pollution of the waters of the State by landfill leachate, for as long as the wastes represent a threat, by collection of all leachate that reaches the LCRS. First, the key to the operating efficiency of the LCRS is the integrity of the FML. The FML will leak when the landfill is put into service and its ability to transport leachate to the sump will deteriorate over time. The LCRS will thus become decreasingly effective and increasing amounts of leachate will not be transported to the sump where it can be removed. Second, if implemented, this program will have to be carried out forever since the wastes in the landfill will be a threat to groundwaters forever. Third, since the LCRS is buried under hundreds of feet of garbage it cannot be inspected and repaired. While some liner company representative claim that FML's will last 100 years of so, they warrant FML's for no more than 20 years, pro-rated. If even the FML did function effectively in an LCRS for 100 years or so, it will eventually fail. It will not protect the groundwater resources of the State from degradation for as long as the wastes in the landfill expansion will be a threat, which will be effectively forever.

Beginning on page 16, Section H presents a series of requirements concerned with reporting requirements. What is not covered is what the Districts will be required to do when it is eventually discovered that the landfill containment system has been leaking. Will the Districts be required to remove all of the garbage, contributed at 12,000 tons per day, that had been placed in the landfill expansion when the failure is found? Will the Districts continue to be able to circumvent providing responsible solid waste management that does, in fact, protect the public and the environment from waste-derived hazardous and otherwise deleterious chemicals?

Beginning on page T-1, the Monitoring and Reporting Program is presented. That program is significantly deficient in that it does not address the unreliability and inappropriateness of groundwater monitoring for determining when the landfill containment system has failed to prevent leachate from passing through it and the pollution of groundwaters of the State has started. Such problems are well-known and easily demonstrated (see Cherry, 1990; Parson and Davis, 1992; and Lee and Jones-Lee, 1993c). Considering the unreliability of groundwater monitoring programs for lined landfills, the impossibility of reliability monitoring groundwaters in the fractured rock system underlying the Puente Hills Landfill, and the very high value and vulnerability of the groundwaters of the San Gabriel Valley, if the Districts are allowed to expand this landfill, a double-composite liner system should be required in which the lower composite liner and leak detection system is a leak detection system for the Subtitle D composite liner system. As discussed by Lee and Jones-Lee (1993c) once the upper composite liner is found to be leaking leachate that cannot be stopped, the owner/operator (in this case, the Districts) must be required to remove all wastes from the landfill, treated, and the residues managed so that they will not be a threat to groundwater waters wherever they are placed. Any monitoring program for the Puente Hills Landfill site that is less reliable than this recommended approach will allow the pollution groundwaters in the San Gabriel Valley. It is such a landfill liner monitoring system that was recommended by the Water Resources Control Board staff at the hearing associated with the State Board's adoption of the new landfilling Policy for landfills permitted under that Policy at which there is a possibility of groundwater pollution by landfill leachate.

Page T-2, Item H uses the term "precision" incorrectly. That term should be replaced by the word, "sensitivity." We have conducted a detailed review of the Districts' past groundwater monitoring program for the existing Puente Hills Landfill. We have found that the Districts have been allowed to conduct a highly inadequate groundwater monitoring program that has often incorporated analytical methods that have inadequate sensitivity to determine whether or not groundwater pollution was occurring. This is a highly significant problem; the first time it occurred, the Regional Board should have taken action to stop the use of inadequate analytical methods. The fact that it was allowed to continue for long periods of time at the Puente Hills Landfill reflects the inability of the Regional Board staff to properly implement the requirements of Chapter 15 at that landfill and to carry out its responsibility to protect the waters of the State from pollution by landfill leachate.

The list of parameters that are to be monitored at the so-called Barrier Extraction Wells listed on page T-9 Item B, 1. are grossly inadequate to detect incipient groundwater pollution at that location. That list should be expanded to include the full suite of chemical parameters that are indicative of MSW landfill leachate contamination of groundwater.

SUPPLEMENTAL COMMENTS SUBMITTED

Dr. Jones-Lee and I previously commented on the inappropriate approach established in the WDR's Item D.2. (page 9). There it is indicated that the Districts could cause damage and be a nuisance to individuals as a result of odors or unsightliness if such damage arose from "reasonable" practices in the disposal of wastes. Cited as a basis for that provision is Section 13050(1) of the California Water Code. Subsequent to our providing technical comment on that item, we reviewed the letter of the California Water Code (The Porter-Cologne Water Quality Control Act) and, as a result, have further significant problems with this WDR. First, the way the WDR references the section of the Porter-Cologne Act

appears to be incorrect; it appears that it should have been cited as (m)(1) for the definition of "nuisance." Second, that definition states,

"(m) `Nuisance' means anything which: (1) is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property, and (2)....."

The LA Regional Water Quality Control Board has adopted a WDR that is not in accord with the Porter-Cologne Act's definition of "nuisance." There is no modifying or qualifying statement to allow a manager of wastes, such as the Sanitation Districts, to cause a nuisance, such as associated with offsite odors that are "offensive to the senses" or "interfere with the comfortable enjoyment of life or property" as long as the nuisance is associated with reasonable waste management practices. "Nuisance" is explicitly defined. The LA Regional Board and its staff have been allowing the Sanitation Districts to violate the nuisance provisions of the Porter-Cologne Act on a routine basis for many years. Evidently, the justification for this is the assumption that what the Sanitation Districts have been doing in the way of waste management at the Puente Hills Landfill that leads to highly offensive offsite odors is "reasonable" landfilling practice. Clearly any proper definition of landfilling practices that results in the kinds of offsite odor problems that are caused on a routine basis by the Puente Hills Landfill cannot be considered reasonable waste management practice. The Sanitation Districts and the Board should be required to meet the nuisance prohibition requirement of the Porter-Cologne Act in controlling the nuisance conditions created by the Districts' operations of the Puente Hills Landfill. If this is not done, the landfill should be closed.

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