**Petition**
**To the State Water Resources Control Board**
**to Review**
**California Regional Water Quality Control Board**
**Waste Discharge Requirements**
**for University of California, Davis**
**Class III Landfill**
**Yolo County**
**Order 96-228**
**Adopted on August 9, 1996**

Submitted by

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September 9, 1996

On August 9, 1996, the Central Valley Regional Water Quality Control Board (CVRWQCB) adopted Waste Discharge Requirements (WDR's) for the University of California, Davis "west" landfill WMU-1 closure and the development of an expanded but non-contiguous "west" landfill in the same region (WMU-2). Prior to that time the petitioner, Dr. G. Fred Lee, had submitted several sets of detailed written comments on the inability of the CVRWQCB staff's proposed closure of WMU-1 and the development of WMU-2 to conform to WRCB's Title 23, California Code of Regulations (23 CCR), Division 3, Chapter 15 (hereafter Chapter 15) as well as the state Landfilling Policy adopted in June 1993. A copy of these comments is appended to this Petition. Order No. 96-228, adopted by the CVRWQCB on August 9, 1996, covering the closure of WMU-1 and the development of WMU-2, will not conform to State Water Resources Control Board (State Board or WRCB) Chapter 15 requirements of protecting groundwaters from pollution (impaired use) by landfill leachate for as long as the wastes in the existing landfill (WMU-1) and in the proposed landfill (WMU-2) will be a threat.

**Requested Action**

It is requested that the State Board conduct a technical review of the adequacy of Order No. 96-228 to protect the groundwater resources in the vicinity of landfill WMU-1 from further pollution by landfill leachate and from landfill leachate that will be developed in the proposed new landfill WMU-2 for as long as the wastes in the landfill will be a threat. As part of this review, the WRCB should provide guidance to the CVRWQCB on how, in light of current understanding of the ability of today's landfill containment systems and groundwater monitoring systems, the closure of WMU-1 and the development of WMU-2 can be achieved to protect groundwaters from pollution by landfill leachate for as long as the wastes in the landfill will be a threat. It is requested that the State Board remand Order No. 96-228 back to the Regional Board with specific instructions that this Board should comply with the full requirements set forth in Chapter 15 and in today's Landfilling Policy of protecting groundwaters from pollution by landfill leachate for as long as the wastes in the landfill will be a threat.

**Background Information**

The University of California, Davis has a long history of constructing campus landfills that cause highly significant groundwater pollution. At this time, UCD has four such campus landfills. Three of these (landfills 1, 2, and 3) are located at the LEHR site. This is a national superfund site because of the groundwater pollution that has occurred at UCD's campus landfills. Landfill 2 has a chloroform plume of groundwater pollution that extends over a mile under adjacent properties. It is known that there are other groundwater pollution plumes associated with hazardous and radioactive wastes that have been placed in UCD campus landfills at the LEHR site. The full extent of the pollution from landfill 2, as well as other LEHR site landfills and waste disposal areas, is not known.

In 1966 UCD closed landfill 3 at the LEHR site and began to operate, what it calls now, the campus landfill (the "west" campus landfill, landfill 4, WMU-1). That landfill has received campus wastes, which include materials typically representative of municipal solid wastes, hazardous wastes, and, according to the former dump-tender for landfill 4, radioactive waste from the LEHR site. As with the LEHR site landfills, large amounts of chloroform were dumped as wastes by UCD at landfill 4. This has caused a chloroform and other VOC groundwater pollution plume that extends for some unknown distance beyond a mile to the northeast of the landfill. There are also other groundwater pollution plumes that are characterized as municipal solid waste leachate associated with the "west" landfill.

**Closure of WMU-1**

Under threat of a proposed Cease and Desist Order, drafted by the Central Valley Regional Water Quality Control Board staff, which was scheduled to be reviewed by the Board on August 9, 1996, the UCD L. Vanderhoef administration, without public review, signed a Stipulated Agreement with the Yolo County Department of Public Health that calls for termination of waste receipt at WMU-1 and the closure of this landfill in a five year period by November 1, 2001 (see Order No. 96-228, page 9). To the public, this period of time appears to have been selected to enable the UCD L. Vanderhoef administration to develop the fifth campus landfill (WMU-2).

**The petitioner finds that since WMU-1 has been polluting and continues to pollute groundwaters with landfill leachate, the five year period of time that the Central Valley Regional Water Quality Control Board and Yolo County Department of Public Health allowed the UCD L. Vanderhoef administration to terminate accepting campus wastes at WMU-1, is an excessive period of time of continued groundwater pollution by this landfill before its closure.**

**The petitioner requests that the State Board remand Order No. 96-228 back to CVRWQCB for reconsideration of the period of time that WMU-1 shall remain active and be allowed to continue to pollute groundwaters by landfill leachate.**

As discussed in the attachments, including the August 5, 1996 and especially the September 1, 1996 letters to Tom To, Director Yolo County Environmental Health, there are several aspects of

the Stipulated Agreement and Order No. 96-228 of concern to the petitioner and to the public on the continued operation of WMU-1. These include the following:

- WMU-1 has been and is currently polluting groundwater with landfill leachate.
- Continued acceptance of wastes at this landfill will increase the total amount of groundwater pollution that will occur under the current closure provisions adopted by the CVRWQCB on August 9, 1996. The taxpayers of California who must fund the remediation of the UCD L. Vanderhoef administration's continued pollution of groundwater by WMU-1 should be entitled to closure of WMU-1 as soon as possible.
- Yolo County Department of Public Works operates a municipal solid-waste landfill that could accept UCD campus wastes immediately.
- While the UCD L. Vanderhoef administration claims that five more years of groundwater pollution by WMU-1 is needed for economic reasons before it can be closed, the economic analysis conducted by the UCD L. Vanderhoef administration is fundamentally flawed in that it fails to consider the true cost of landfilling in WMU-1. The UCD L. Vanderhoef administration has chosen to ignore in its economic analysis the cost of groundwater pollution and the associated remediation of the polluted groundwaters.
- The primary justification for continued operation of WMU-1 for a five year period is that this period of time would be needed for the UCD L. Vanderhoef administration to develop and place in operation UCD campus landfill 5 (WMU-2). However, as discussed herein, the UCD L. Vanderhoef administration's economic analysis, which purports to show that it is cheaper for this administration to continue to operate campus landfills rather than disposing of its campus wastes in the Yolo County landfill, is unreliable. Dr. L. Wegge, Professor of Economics Emeritus, has conducted a review of the reliability of the UCD L. Vanderhoef administration's analysis which attempts to justify continued landfilling of wastes (see July 27, 1996 letter from the petitioner to Karl Longley) in which Dr. Wegge has found that UCD's economic analysis of near-term economics is flawed. Further, as the petitioner has pointed out in his comments on the UCD L. Vanderhoef administration's self-certified draft and FEIRs, the UCD L. Vanderhoef administration's economic analysis totally ignores the long-term costs associated with remediation of groundwater pollution that will occur if WMU-2 is constructed as allowed in the CVRWQCB's August 9, 1996 Order No. 96-228.

A proper economic analysis will show that it is cheaper for the University of California, Davis and the taxpayers of California to terminate, as soon as possible, i.e. within no more than a two year period, the operations of WMU-1. Further, a proper economic analysis would show that it is improper for the UCD L. Vanderhoef administration to burden the taxpayers of the state with the large costs that will accrue associated with the eventual pollution of groundwaters by the proposed WMU-2.

**It is requested that the State Board take the necessary action to cause the CVRWQCB to issue a revised Order that will allow WMU-1 to continue to accept wastes only until June 30, 1998. By that date, the UCD L. Vanderhoef administration must make arrangements to, and implement, management of campus solid wastes at the Yolo County landfill.**

**Closure of WMU-1**

Order No. 96-228 states on page 8, item 19, under the section "Landfill Closure Specifications"

*"At closure, WMU-1 shall receive a final cover consisting, at a minimum, of a two-foot think foundation layer which may contain waste materials, overlain by a one-foot thick clay liner that has an hydraulic conductivity of no more than 1 x $10^{-6}$ cm/sec, and finally by a one-foot thick vegetative soil layer, or an engineered equivalent final cover approved by the Board pursuant to Sections 2510(b) and (c) of Chapter 15.*"

On January 18, 1996, the petitioner provided Chairman Longley with a detailed discussion of the inadequacies of the proposed approach for closing WMU-1 (see pages 5-8 of the January 18, 1996 correspondence). The petitioner specifically quoted from a CVRWQCB December 1, 1995 memorandum, authored by Mr. Morris of the Regional Board staff, which states,

*"The discharge shall neither cause nor contribute to the contamination, degradation, or pollution of ground water via the release of waste constituents in either liquid or gaseous phase."*

*"The discharge shall not cause any increase in the concentration of waste constituents in soil-pore gas, soil-poor liquid, soil, or other geologic materials outside of the new waste management units if such waste constituents could migrate to waters of the State--in either the liquid or the gaseous phase--and cause a condition of contamination, pollution, degradation, or nuisance.*"

Chapter 15, Article 8, Section 2580(a) states,

*"Classified waste management units shall be closed according to an approved closure and post-closure maintenance plan which provides for continued compliance with the applicable standards for waste containment and precipitation and drainage controls in Article 4 of this subchapter, and the monitoring program requirements in Article 5 of this subchapter, throughout the closure and post-closure maintenance period. The post-closure maintenance period shall extend as long as the wastes pose a threat to water quality."*

The wastes in WMU-1 will be a threat to groundwater quality effectively forever. Therefore, UCD must close WMU-1 in such a way as to prevent further and continued pollution of groundwaters, including, in accord with Porter-Cologne "threat," the unsaturated (vadose) zone under the landfill forever. It is obvious upon examination of the CVRWQCB Order No. 96-228, item 19 under landfill closure specifications quoted above, that a two-foot foundation layer overlain by a one-foot thick clay layer with a hydraulic conductivity of less than 1 x $10^{-6}$ cm/sec that is covered with a one-foot thick vegetative soil layer as specified in Order No. 96-228 cannot conform to the prevention of further groundwater pollution by WMU-1 for as long as the waste in this landfill will be a threat. At best, the prescribed cover will only slow down for a short period of time the generation of leachate in the landfill that will lead to further groundwater pollution. Therefore, Order No. 96-228 will lead to a violation of Chapter 15 requirements in the closure of WMU-1.

Basically the CVRWQCB staff and Board are perpetuating the highly inappropriate approach that was adopted in the mid-1980s for closing landfills by allowing landfill owners to construct the minimum landfill cover requirements irrespective of the suitability of the site for a landfill. The University of California, Davis "west" landfill location has been demonstrated to be a highly unsuitable site for a landfill. The site does not provide natural protection of the groundwater resources underlying the landfill from pollution by landfill leachate. This is well demonstrated by the fact that there is large groundwater pollution plume associated with WMU-1. Therefore, in order to stop further groundwater pollution by landfill leachate in accord with the explicit requirements set forth by Mr. Morris and Chapter 15, it will be necessary to construct a landfill cover on landfill WMU-1 that is far more effective in preventing moisture that enters the landfill cover from precipitation than can be achieved with one foot of clay with a permeability less than $1 \times 10^{-6}$ cm/sec at the time of construction. The petitioner's January 18, 1996 letter to Chairman Longley provides additional information on why the landfill cover specified in Order No. 96-228 cannot comply with regulatory requirements.

One of the key issues that has been discussed in previous correspondence (see petitioner's August 8, 1996 letter to Karl Longley) is the ability of the University of California, Davis to comply with the monitoring requirements set forth in the Order of detecting dessication cracks that occur in the low permeability layer of the cover within a short time after installation. While the CVRWQCB staff have stated that UCD must be able to do this, they have not responded to the petitioner's request of how, in fact, this can be done. As discussed above, the low permeability layer of compacted clay is buried under a topsoil layer. This overlying layer will not necessarily show dessication cracks. If it does experience such cracks, the cracks will not necessarily be at the same location as the cracks that will occur in the low permeability layer. As the petitioner has discussed, this situation represents an impossible requirement since it cannot, in fact, be implemented under the cover design set forth in the Order.

In the past, as discussed in the petitioner's previous correspondence on this matter, and at the time the current practice for closing landfills was adopted in the mid-1980s, it was <u>assumed</u> a landfill owner could not develop a landfill cover that could, in fact, prevent moisture from entering the landfill and generating leachate that leads to groundwater pollution for as long as the wastes in the landfill represented a threat. By the late 1980s, it was becoming well known by professionals in the field that landfill covers of the type specified in Order No. 96-228 would not prevent appreciable moisture from entering a landfill generating leachate that, at a geologically unsuitable site such as the UCD "west" landfill location, would lead to groundwater pollution. As discussed in the enclosed correspondence, (see in particular the January 18, 1996 letter to Karl Longley from the petitioner) this problem has become so well recognized today among professionals in the landfill design and water pollution control field that the American Society of Civil Engineers held a national conference in San Diego, California in the fall of 1995 to discuss this problem. Several of those, such as Dr. David Daniel of the University of Texas, Austin and the petitioner, presented invited papers at this conference addressing this issue. Dr. Daniel, again, pointed out as he had in 1990, in the US EPA seminar lectures he gave around the country on landfill closure issues, including in San Francisco, that today's landfill covers will not prevent moisture from entering the landfill which generates leachate that can lead to groundwater pollution.

In the petitioner's January 18, 1996 letter to Karl Longley, which responded to correspondence from the Regional Board's staff to UCD, concerning closure of WMU-1, the petitioner provided additional references to the literature on this topic as well as discussed again the findings of the state of Wisconsin in their studies of the late 1980s on the deficiencies in compacted soil layers of the type that are prescribed for the closure of WMU-1 in Order No. 96-228 to prevent moisture from entering the landfill for as long as the waste represents a threat and could generate leachate and cause further groundwater pollution.

There is no question about the fact that if WMU-1 is closed as prescribed in Order No. 96-228 it is likely that within the first summer after closure, significant dessication cracks will occur in the low permeability layer that cannot be discerned from the surface. These cracks will allow moisture that penetrates through the top soil layer to enter the landfill and generate leachate. While this problem is well understood by Regional Board and State Board staff and other professionals in the field, no one is willing to change the approach. This approach has been allowed to be used for closing landfills for those landfills cited at a geologically unsuitable site, i.e. does not have natural protection of the groundwater resources hydraulicly connected to the landfill. It has been known for many years that closing landfills with one foot of compacted soil with a permeability of less than $1 \times 10^{-6}$ cm/sec will not develop a closure that for any significant period of time complies with the Chapter 15 requirements, as well as those prescribed by Mr. Morris in his letter to the University of California, Davis quoted above, of protecting groundwaters from further pollution by landfill leachate.

In the past, the Regional Board's staff and Board, to the extent that they were informed by their staff of the deficiencies in the landfill closure approaches that have been approved since the late 1980s, apparently took the attitude that there was little else that could be done, and besides Chapter 15 specifies the one foot of less than $1 \times 10^{-6}$ cm/sec as the <u>minimum</u> landfill cover closure low permeability layer design. Regional Board staff have informed the petitioner that so long as the State Board does nothing to correct this minimum design requirement, they will continue to recommend to their Boards what they know to be an inadequate landfill closure approach in terms of complying with the Chapter 15 requirements of protecting groundwaters from pollution by landfill leachate for as long as the wastes in the landfill will be a threat. Basically, the Regional Board's staff are passing the buck on this issue to the State Board. The State Board and its staff, however, claim that in accord with Chapter 15 requirements, it is the responsibility of the Regional Boards to ensure that an adequately designed low permeability layer is, in fact, designed, constructed, and maintained to prevent further groundwater pollution by landfill leachate for as long as the waste in the landfill will be a threat.

The situation today is significantly different than it was just a couple of years ago with respect to developing landfill covers that will, in fact, comply with Chapter 15 requirements of preventing further groundwater pollution by waste-derived constituents. As discussed in the petitioner's previous correspondence with the Board, there are now several companies that manufacture leak detectable covers for landfills. These systems can be installed and operated at a reasonable cost and, thereby, enable the landfill owner to comply with Chapter 15 requirements of preventing further leachate pollution of groundwaters by an existing landfill.

**The petitioner requests that the State Water Resources Control Board take the necessary action to cause the Central Valley Regional Water Quality Control Board to amend Order No. 96-228 to require that the University of California, Davis develop a landfill cover low permeability layer that will be designed, constructed, operated, monitored, and maintained for as long as the waste in WMU-1 will be a threat. This cover must comply to the high degree of certainty with Chapter 15 requirements of preventing further groundwater pollution by WMU-1 waste-derived constituents. It should be understood for the purpose of planning, that the period of time that this low permeability layer must function as prescribed should be considered infinite and, therefore, will require effective monitoring and maintenance.**

These proposed amended Order requirements can be readily implemented through the incorporation of one of several leak detectible covers that are commercially available today.

**Development of WMU-2**

Page 4, item 28 of Order No. 96-228 states,

*"The Discharger proposes to construct WMU-2 with a composite liner system that meets the prescriptive requirements of federal Subtitle D regulations of landfill liners. The liner will consist of two feet of compacted soil having a maximum hydraulic conductivity of 1 x $10^{-7}$ cm/sec covered by a 60-mil high density polyethylene geomembrane. A blanket type leachate collection and recovery system (LCRS) overlying the composite liner will be covered by a one foot thick operations layer. The LCRS will consist of a one foot layer of gravel on the base of the WMU and a geosynthetic net on sideslopes."*

Page 4, item 32 of Order No. 96-228 states,

"*This Order implements (1) the Water Quality Control Plan for the Sacramento River and San Joaquin River Basin Third Edition; (2) the prescriptive standards and performance goals of Chapter 15, Division 3, Title 23 of the California Code of Regulations, effective 27 November 1984, and subsequent revisions; (3) the prescriptive standards and performance criteria of Part 258, Title 40 of the Code of Federal Regulations (Subtitle D of the Resource Conservation and Recovery Act); and (4) State Water Resources Control Board Resolution No. 93-62, Policy for Regulation of Discharges of Municipal Solid Waste, Adopted 17 June 1993."*

As discussed herein, a critical review of the regulatory requirements as set forth in the Central Valley Regional Water Quality Control Board Basin Plan shows that the Water Quality Objectives For Groundwaters, Chemical Constituents requires that,

*"Ground waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses.*"

There is no question that Order No. 96-228 provisions covering the design of WMU-2 with a single composite liner of the minimum Subtitle D type quoted above cannot comply with the CVRWQCB Basin Plan requirements quoted above in preventing groundwater pollution by

chemical constituents derived from WMU-2 that adversely affect beneficial uses of the groundwater.

Chapter 15, Article 4, Section 2540(c) states,

*"Class III landfills shall have containment structures which are capable of preventing degradation of waters of the state as a result of waste discharges to the landfills if site characteristics are inadequate."*

Chapter 15, Article 5, Section 2550(a) states,

*"The siting, design, construction, and operation standards contained elsewhere in this subchapter and in Title 22 of this code are intended to prevent adverse impacts on water quality."*

Chapter 15, Article 5, Section 2550(d) states,

*"The regulations under this article apply during the active life of the waste management unit (including the closure period). After closure of the waste management unit, the regulations in this article apply during the post-closure maintenance period unless all waste, waste residues, contaminated containment system components, and contaminated geologic materials have been removed or decontaminated at closure."*

Article 1, Section 2510(a) states,

*"Requirements in this subchapter are minimum standards for proper management of each waste category. Regional boards may impose more stringent requirements to accommodate regional and site-specific conditions."* [emphasis added]

As quoted above, the Chapter 15 performance standard to which WMU-2 must conform is the prevention of impaired use of groundwaters from waste-derived constituents for as long as the wastes in the landfill represent a threat. It is important to note that this performance standard is far more strict than that of the US EPA's RCRA Subtitle D requirements. The US EPA, as part of adopting Subtitle D minimum single composite liner, stated in the Federal Register covering the proposed regulations (August 30, 1988),

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

The US EPA Criteria for Municipal Solid Waste Landfills (July 1988) 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."*

US EPA, "Solid Waste Disposal Facility Criteria; Proposed Rule," Federal Register 53(168):33314-33422, 40 CFR Parts 257 and 258, US EPA, Washington, D.C., August 30, (1988).

US EPA, "Criteria for Municipal Solid Waste Landfills," US EPA Washington D.C., July (1988).

The petitioner has provided, as an addendum to this Petition, several of Dr. Jones-Lee's and the petitioners reports which review the ability of a Subtitle D single composite liner to prevent leachate from passing through the liner and causing groundwater pollution for as long as the waste in a Subtitle D landfill of the type that UCD proposes to construct as WMU-2 will be a threat. These papers and reports provide references to the literature covering the publications of others on this topic as well. A review of the current literature pertinent to the US EPA's 1988 statements on the eventual failure of Subtitle D liners quoted above shows they are applicable to today's Subtitle D landfills.

There is no doubt Order No. 96-228 statements on page 4, items 28 and 32 are not reliable. A minimum Subtitle D liner system as proposed for WMU-2 cannot comply with either the Basin Plan requirements for groundwater quality protection or the groundwater protection performance requirements of Chapter 15. Even Mr. J. Stagner of the University of California, Davis, who is responsible for UCD's landfilling operations, admitted at a public meeting held in May 1996 that UCD's proposed WMU-2 will cause groundwater pollution. Order No. 96-228 must, based on this issue alone, be remanded back to the Central Valley Regional Water Quality Control Board to resolve the highly significant inconsistency between items 28 and 32 on page 4 of the Order.

**It is recommended that the WRCB remand Order No. 96-228 back to the CVRWQCB to require that if the UCD L. Vanderhoef administration proceeds with developing WMU-2, this landfill be designed, constructed, operated, closed, and provided with post-closure care (monitoring and maintenance) so there is a high probability that the waste constituents in this landfill will not pollute-impair the groundwater resources in the vicinity of the landfill for as long as the wastes in the landfill are a threat.**

In the accompanying attachment "Recommended Design, Operation, Closure and Post-Closure Approaches for Municipal Solid Waste and Hazardous Waste Landfills," the petitioner has discussed how such a landfill could be developed. The minimum requirements for WMU-2 should be those set forth in this report. Failure of the State and Regional Boards to adopt this approach will ultimately lead to yet another landfill in California that is polluting the groundwater resources of the state.

**Closure of WMU-2**

Order No. 96-228 does not provide any information on the proposed approach for closure of WMU-2 other than a general statement that it shall conform to the requirements set forth in Chapter 15. This can be interpreted to mean that since the proposed design of WMU-2 involves the use of a minimum Subtitle D liner, a plastic sheeting layer shall be incorporated into the landfill cover. As discussed in previous correspondence and is well known in the literature, a

minimum Subtitle D landfill closure cover that incorporates a single plastic sheeting layer will not prevent moisture from entering the landfill and generating leachate that can cause groundwater pollution. As with the compacted clay layer that UCD proposes for closing WMU-1, the plastic sheeting layer will be buried below covered materials and, therefore, is not available for visual inspection. As with the liner materials, the plastic sheeting layer in a landfill cover will deteriorate, likely at a greater rate than the liner, ultimately becoming ineffective in preventing moisture that penetrates the top soil layer of the cover from entering the wastes and generating leachate.

**It is recommended that the WRCB remand Order No. 96-228 back to the CVRWQCB to require that, as a minimum, this Order specify the closure of WMU-2 shall be done in such a way as to provide a high degree of reliability in preventing moisture from entering the landfill that generates leachate that could lead to groundwater pollution for as long as the wastes in the landfill represent a threat.**

The UCD L. Vanderhoef administration should know now that minimum Subtitle D landfill closure approaches will not be allowed at WMU-2. WMU-2 could, based on current technology, be closed with a leak detectible cover system of the type described above for WMU-1.

**Groundwater Monitoring**

Order No. 96-228 requires on page 2, second paragraph, under the section "Required Monitoring Programs,"

*"For any given monitored medium, a sufficient number of samples shall be taken from all Monitoring Points and Background Monitoring Points to satisfy the data analysis requirements for a given Reporting Period, and shall be taken in a manner that ensures sample independence to the greatest extent feasible."*

Article 5, Chapter 15, Section 2550.1 requires,

*"detection monitoring...to provide the best assurance of the detection of subsequent releases from the waste management unit."*

Further, Chapter 15 requires that a sufficient number of monitoring wells be located so that they,

*"...provide for the best assurance of the earliest possible detection of a release from a waste management unit."*

Article 5, Chapter 15, Section 2550.5 states,

*"(a) For each waste management unit, the regional board shall specify in the waste discharge requirements the point of compliance at which the water quality protection standard of Section 2550.2 of this article applies. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management unit that extends through the uppermost aquifer underlying the unit."*

Examination of Order 96-228, Attachment B shows that the UCD L. Vanderhoef administration has proposed, and the CVRWQCB has accepted, one upgradient (MW-8) and three downgradient (MW-6, MW-12, and MW-13) at the point of compliance, groundwater monitoring wells for WMU-2. The three downgrading monitoring wells are spaced approximately 300 to 400 feet apart. The sampling of these wells in accord with conventional requirements will result in extraction of water from the aquifer at a maximum distance of about one foot from each well, i.e. the zone of each capture has a radius of about one foot. Therefore, for the wells that are spaced 300 feet apart at the point of compliance, there is 298 feet at this point through which leachate that will leak through the liner system could pass without being detected by the monitoring wells.

Cherry (1990) (see enclosed) has discussed the leakage of leachate through flexible membrane-lined landfills of the WMU-2 type. He points out that the initial leakage will occur at tears, rips, and points of deterioration in the plastic sheeting layer. These leaks will produce finger plumes of leachate of a few feet wide at the point of compliance for groundwater monitoring. It is obvious that the groundwater monitoring approach proposed by UCD and accepted by Central Valley Regional Water Quality Control Board, as set forth in Order NO. 96-228, is fundamentally flawed. Obviously, it cannot conform to Chapter 15 requirements or Subtitle D requirements of detecting leachate-polluted groundwaters arising from leakage through the Subtitle D liner before widespread groundwater pollution occurs.

The highly significant deficiencies in the proposed groundwater monitoring approach have been previously brought to the attention of the CVRWQCB and its staff on several occasions (see the January 18, 1996 letter from the petitioner to Karl Longley as one example). The staff and the Board have chosen to ignore this situation and have proceeded with accepting an obviously flawed groundwater monitoring approach that, at best, can be described as cosmetic. It is important to note that over almost two years ago, the petitioner, in connection with the review of the UCD L. Vanderhoef administration's then Draft EIR, pointed out that the groundwater monitoring approach proposed for WMU-2, as well as other aspects of the proposed approach for development of WMU-2, would not be protective of the groundwater resources in the vicinity of that landfill. The UCD L. Vanderhoef administration, in response to the petitioner's comments made on the Draft EIR, claimed that since the Central Valley Regional Water Quality Control Board would approve the groundwater monitoring program, it must be an adequate program to satisfy Chapter 15 requirements.

Once again, it is the deficiencies in which the way the Central Valley Regional Water Quality Control Board's staff have been and continue to implement Chapter 15 requirements that are allowing the development of landfills in the Central Valley Region that will obviously not prevent groundwater pollution for as long as the waste in the landfill will be a threat as a result of leakage through the Subtitle D liner. Further, this leakage will not be detected at the point of compliance for groundwater monitoring by a groundwater monitoring program of the type specified in Order No. 96-228 before wide-spread pollution of groundwaters has occurred.

**It is recommended that the WRCB remand Order No. 96-228 back to CVRWQCB with instructions that the Regional Board must develop a groundwater monitoring program for**

**WMU-2 that will, in fact, provide, in accord with Chapter 15 requirements, "...for the best assurance of the earliest possible detection of a release from a waste management unit."**

In the petitioner's previous correspondence to the Board and as discussed herein, it is possible to readily develop a groundwater monitoring program that will have a high probability of detecting leachate leakage through the Subtitle D liner when it occurs in a sufficient amount to potentially pollute the groundwaters under the landfill. The approach recommended is the one that has been adopted in the state of Michigan under that state's Rule 641. The approach that should be used at WMU-2 is to require, as a number of other states now require, a double composite liner be constructed at WMU-2. The lower composite liner is separated from the upper composite liner by a leak detection layer of the type typically used in RCRA Subtitle C landfills. When leachate is detected in the leak detection layer in sufficient quantities to potentially pollute groundwaters underlying the landfill, if the lower composite liner were not present, the landfill owner/operator must stop this leakage or remove the waste from the landfill (landfill mining). Landfill mining is becoming recognized as an effective tool in preventing groundwater pollution by landfill wastes. If the UCD L. Vanderhoef administration wishes to proceed with the development of WMU-2, a groundwater monitoring system of this type must be required. Failure to do so will result in WMU-2 being in violation of Chapter 15 groundwater monitoring requirements.

A review of other aspects of the surface and groundwater monitoring requirements set forth in Order No. 96-228 shows that an inadequate frequency of monitoring and parameters for monitoring is specified in this Order. These issues can be addressed when this Order is remanded back to the Central Valley Regional Water Quality Control Board.

In summary, as documented herein, the Central Valley Regional Water Quality Control Board's Order No. 96-228 does not require that UCD construct WMU-2 in such a manner as to conform to Chapter 15 and to the WRCB Landfilling Policy. If this landfill is allowed to be constructed as proposed, it will cause groundwater pollution. The natural strata at the location of WMU-2 has been demonstrated, based on the situation at nearby WMU-1, to be unsuitable for a landfill of this type. While, as discussed herein, a landfill could be developed at the WMU-2 site that would be protective, it will have to be of significantly different design than that specified in Order No. 96-228.

**Need for Timely Action by State Board**

Order No. 96-228 sets forth the general aspects of the minimum design and other requirements for WMU-1 closure and for the development of WMU-2. While the details of the design of WMU-1 closure and WMU-2 development will be submitted by UCD to the Central Valley Regional Water Quality Control Board at some time in the future, the way that this Order is implemented by the Regional Board mandates that the public petition the State Board at this time on the deficiencies in the Order in order to have the State Board review these deficiencies. The public does not have a mandated opportunity to review the details of the design of the landfill cover for WMU-1 or the liner, leachate collection and removal system, groundwater monitoring system, and proposed approach for closing WMU-2. The review of the details of the design, etc. is done by the Regional Board's staff without Board and public review.

The public has substantial reason to question, based on previous correspondence discussed by the petitioner and Order No. 96-228, whether the Regional Board's staff will, in fact, require the University of California, Davis to meet current regulatory requirements for protection of surface and groundwaters. As discussed herein, the Regional Board's staff have chosen to interpret Chapter 15 and Subtitle D minimum design standards as equivalent to Chapter 15's groundwater protection performance standard. This approach is contrary to the State Water Resources Control Board's statement at the June 1993 hearing where the State Board adopted the current Landfilling Policy which incorporated Subtitle D minimum design standards into Chapter 15 requirements, where Chapter 15's minimum design standards were less protective than Subtitle D requirements. At this hearing, in response to a question the petitioner raised with the Board, the Board members explicitly stated that Chapter 15's groundwater protection standard must be achieved by the new Landfilling Policy. Further, they stated that the minimum design standards set forth in the new Landfilling Policy should not be interpreted to be equivalent to the groundwater protection requirements set forth in Chapter 15.

Favorable action on this Petition will be the first step in correcting a significant error that has been made by the Regional Water Quality Control Boards in implementing Chapter 15. As a result of having served as an advisor to the State Board's staff in the early 1980s in the development of Chapter 15, the petitioner is well aware of the intent of this regulation. It clearly was not that of the approach used by the Regional Boards in its implementation of allowing the construction of new landfills and the closure of existing landfills in such a way as to only postpone for a relatively short period of time, compared to the time the wastes in the landfill will be a threat, the pollution of groundwaters by the wastes.

At this time, the Regional Board's staff claim, in an attempt to justify their obvious technically invalid approach for developing orders for landfill closure and development of new landfills, it is the responsibility of the State Board to correct Chapter 15 so the Regional Boards cannot use the minimum design containment component standards for landfills where such standards are inadequate for groundwater quality protection. Further, Regional Board staff have informed the petitioner that because of political and other pressures, they must require the same design for landfill closure and new landfill development for all landfills in their region. Obviously, such claims are strongly contrary to the intent of Chapter 15, which was to require landfill developers select more appropriate sites for landfills, i.e. those that provide natural protection. Chapter 15 explicitly states that an unsuitable site for a landfill can be used provided that an engineered alternative containment system design, construction, operation, closure and post-closure care is provided which will perform in accord with the Chapter 15 groundwater protection standard of no impaired use of groundwaters by waste-derived constituents for as long as the wastes represent a threat. While in the past there was limited understanding of the deficiencies in how Chapter 15 was being implemented at the Regional Board level, today these deficiencies are well known. It is time for the State Board to take action on this matter to either correct the deficiencies on how the Regional Boards are implementing Chapter 15 or to amend Chapter 15 so it is clear that the landfilling of waste in this state, as well as the closure of existing landfills, will not be done in such a way to protect the groundwater resources in the state from pollution by landfill leachate.

If the State and Regional Boards are unwilling to require that all future closures of landfills and the development of new landfills comply with a high degree of certainty with Chapter 15 requirements, then the WRCB should immediately take action to amend Chapter 15 so the groundwater protection standard of protecting groundwaters from pollution-impaired use from landfill leachate set forth in this regulation are no longer part of the regulation. It is time for the State Water Resources Control Board, the Regional Water Quality Control Boards, and the state of California to stop living a lie about the protection being provided for groundwater resources by the approaches being used in the design, construction, closure, and post-closure care of municipal solid waste landfills. The public should be reliably informed about the protection being provided by the State Water Resources Control Board and by the Regional Water Quality Control Boards in their implementation of the regulations governing the landfilling of municipal solid wastes as well as the closure of existing landfills. With few exceptions, all of the Chapter 15 as well as Subtitle D landfills will eventually pollute groundwaters by landfill leachate in violation of Chapter 15 requirements. In some cases, these violations will generate leachate plumes that extend well over a mile down groundwater gradient from the landfill.

Today the state of California is practicing a defacto "zone of attenuation" landfilling approach in which landfill leachate is allowed to pollute groundwaters at distances of up to a mile or more from the landfill. Often these leachate plumes extend under adjacent property owners lands. The least that should be done, if the Regional and State Boards are unwilling to implement the technology available today in the design, construction, operation, closure, and post-closure care of municipal solid waste landfills to comply with Chapter 15 requirements of protection of groundwater quality from impairment by landfill leachate, is for the Water Resources Control Board to amend Chapter 15 to eliminate the overall groundwater protection performance standard set forth in it and require that landfill owners acquire sufficient buffer lands so that the leachate plumes generated by today's landfills will occur under landfill owner property lands.

**Inadequacies of Order to Conform to Legal Requirements**

Order No. 96-228 governing the closure of UCD "west" landfill, WMU-1, and the development of a new "west" landfill, WMU-2, will lead to violations of the groundwater protection requirements set forth in Title 23, Division 3, Chapter 15. As discussed herein, various sections of this regulation explicitly require that the landfill containment system components achieve the same degree of groundwater quality protection as that achieved by a landfill sited where the natural strata protect the groundwaters from impaired use for as long as the wastes in the landfill will be a threat. Today's understanding of the behavior of municipal solid wastes in a Subtitle D "dry tomb" landfill as well as the understanding of the behavior of the various components of the landfill containment system (cover, liners, leachate collection and removal system, etc.) and an understanding of the reliability of the groundwater monitoring systems based on vertical monitoring wells spaced hundreds of feet apart clearly and unequivocally leads to the conclusion that the development of WMU-2 as proposed by the University of California, Davis L. Vanderhoef administration and the closure of WMU-1 as proposed in Order No. 96-228 will, in time, cause violations of Chapter 15 requirements of protecting groundwaters from impaired use for as long as the wastes represent a threat. These specific issues have been discussed in detail in this Petition. Specific citation of sections of Chapter 15 that are pertinent to this Order are provided herein.

**Interested Parties**

There are a large number of individuals who are interested in the proper closure of the UCD "west" landfill, WMU-1, and the proposed development of WMU-2. Appended to this Petition are two petitions that have been signed by members of the public who have expressed an interest in this matter. It can be concluded that those listed on these public petitions represent part of the public who are highly concerned about the inadequacies of UCD's solid waste management activities.

In addition to those specifically concerned with the UCD "west" landfill matters, there is also a large number of people who are concerned with Putah Creek water quality issues. Putah Creek water quality is intimately tied to UCD's mismanagement of its campus solid wastes in landfills that do not protect the groundwaters from impaired use, since at least thus far the UCD L. Vanderhoef administration's approach to remediation of the "west" landfill leachate-polluted groundwaters is to discharge these groundwaters after minimal treatment to Putah Creek. Therefore, it is appropriate to conclude that the public members of the "interested parties" listed in the Petition filed by the petitioner on the technical deficiencies in Order No. 96-227 also have an interest in the Petition on Order No. 96-228.

The CVRWQCB has indicated through its mailing of the "Notice" of the "Adopted New Waste Discharge Requirements" as set forth in Order No. 96-228 of August 16, 1996, that the following agencies and/or individuals are interested in this Order:

*Ms. Betsy Jennings, State Water Resources Control Board, OCC, Sacramento*
*Ms. Liz Haven, State Water Resources Control Board, DCWP, Sacramento*
*Ms. Beatrice Poroli, California Integrated Waste Management Board, Sacramento*
*Office of Drinking Water, Department of Health Services, Sacramento*
*Environmental Mgmt. Branch, Department of Health Services, Sacramento*
*Department of Fish and Game, Rancho Cordova*
*Mr. Craig Walker, Yolo County Department of Environmental Health, Woodland*
*Yolo County Planning Department, Woodland*
*Mr. Eric Vanderbuilt, Sacramento County Public Works, Sacramento*
*Mr. Wayne Pickus, Camp Presser & McKee, Inc., Walnut Creek*
*Mr. Stephen Chen, City of Stockton, Stockton*
*Solano County Environmental Health Department*
*Solano County Planning Department*
*Mr. Wesley Wooden, Davis*
*Ms. Jeane-Marie Olmo-Resendiz, Davis*
*Mr. Chris Horsley, Davis*
*Mr. Mark Bonetti, Davis*
*Ms. Julie Roth, Davis*
*Mr.* [sic] *G. Fred Lee, El Macero*

Addresses for these agencies and individuals are available from the CVRWQCB.

In addition, the following individuals have attended CVRWQCB meetings on UCD landfill matters. Some of these may be duplicate of some of those who have signed the enclosed petitions.

Richard Winger
Dos Pinos Ranch
37884 Russell Boulevard
Davis, CA 95616

Yvonne Le Maitre
23090 Myrtle Lane
Woodland, CA 95695
Represents T. S. Glide Estate

Molly Webster
26880 Cassidy Lane
Davis, CA 95616

George Crum
19 Priscilla Court
Winters, CA 95694

**Hearing**

The petitioner requests that, if necessary, a hearing be held to discuss these issues. While the petitioner believes that adequate evidence has been presented to enable the State Board to act on this matter in affirmation of the Petition, if the State Board concludes otherwise, then a hearing is requested for full public review of the issues.

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**Notice of Appeal**

A copy of this Petition has been provided to the Central Valley Regional Water Quality Control Board and Chancellor L Vanderhoef of the University of California, Davis.

A copy of the request that was made by the petitioner to the Regional Board is enclosed.

**Overall Conclusions and Recommendations**

The location where the UCD L. Vanderhoef administration has proposed to construct a new minimum Subtitle D landfill (WMU-2) is a geologically unsuitable site for such a landfill. It has been found that the substrata under that proposed landfill, which is the same as that under WMU-

1, will allow waste-derived constituents in landfill leachate to pass through the vadose zone into the saturated groundwaters under the site. The minimum Subtitle D single composite liner will, at best, only postpone when leachate generated in the landfill will pass through the landfill containment system into the underlying groundwater system. The groundwater monitoring requirements set forth in Order No. 96-228 are highly ineffective in complying with the Chapter 15 requirements of detecting leachate-polluted groundwaters at the point of compliance before widespread pollution occurs beyond this point. Basically, the construction of WMU-2 as proposed and allowed by Order No. 96-228 will result in a landfill that will violate Chapter 15 requirements for protection of groundwater quality from impaired use by waste-derived constituents for as long as the wastes in the landfill represent a threat.

Requiring that the UCD L. Vanderhoef administration comply with Chapter 15 requirements in developing WMU-2 in accord with providing a high degree of certainty that the groundwaters in the vicinity of this landfill will be protected from impaired use by waste-derived constituents will not represent a significant economic hardship to the University of California, Davis. Alternative waste disposal facilities are readily available to UCD at the Yolo County landfill. The use of these facilities will result in a significant economic savings to the taxpayers of California since future generations will not have to pay for the high costs of remediating WMU-2 leachate-caused groundwater pollution.

It is time for the State Water Resources Control Board to start to correct the errors that are being made at the Regional Board level throughout the state where Regional Boards such as the Central Valley Regional Water Quality Control Board are adopting landfill closure and landfill development orders that obviously cannot conform to Chapter 15 and the WRCB Landfilling Policy requirements of protecting groundwaters from impaired use by landfill-derived waste components for as long as the wastes in the landfill will be a threat. In the mid-1980s, when the current landfill development and landfill closure approaches were adopted by the Regional Boards, there was limited understanding in the deficiencies of these approaches in complying with Chapter 15 requirements. In the past half dozen years sufficient new information has developed on the ability of compacted clay and/or plastic sheeting-lined and/or covered landfills to prevent groundwater pollution by landfill leachate for as long as the wastes in the landfill represent a threat, so that today the State Board and the Regional Boards have an obligation to the public, and especially to future generations, to implement this new information into an updated landfill closure and development implementation approach that will, in fact, comply with Chapter 15 requirements. As discussed herein, the technology is available today to develop landfills in California that will be protective of the state's highly valuable groundwater resources. While the initial cost of developing such landfills is a few cents per day per person more for those who contribute waste to a landfill than the current minimum Subtitle D landfilling approach, the true cost of this approach is far cheaper when proper consideration is given to the fact that ultimately today's Subtitle D landfills and those that are closed with minimum Chapter 15 landfill cover requirements will pollute groundwaters necessitating expensive groundwater remediation.

The petitioner would be happy to answer questions on any aspects of this matter. He strongly, in the name of future generations' groundwater resources, recommends that the State Water Resources Control Board take the necessary action to correct the highly significant errors being

made in implementing Chapter 15 by the Regional Water Quality Control Boards. This process can be initiated through the State Board acting favorably on this Petition.

## List of Correspondence Pertinent to Petition

Letter to Karl Longley, Chairman, regarding G. Vaughn December 1, 1995 letter to UCD on closure of UCD west landfill, WMU-1, and the development of WMU-2, from G. Fred Lee, dated January 18, 1996.

Letter to Karl Longley, Chairman, responding to T. Pinkos' letter of February 22, 1996 regarding UCD landfill matters, from G. Fred Lee, dated May 19, 1996.

Letter to Karl Longley, Chairman, regarding Notice for comment on the Board's Draft Cease and Desist Order No. 94-226 for the continued operation of the UCD "west" landfill, from G. Fred Lee, dated July 27, 1996.

Letter to Karl Longley, Chairman, regarding staff reports covering the UCD landfill matters that are to be reviewed by the CVRWQCB on August 9, 1996, from G. Fred Lee, dated August 3, 1996.

Letter to Tom To, Director, regarding UCD Stipulated Agreement of July 10, 1996, from G. Fred Lee, dated August 5, 1996.

Letter to Karl Longley, Chairman, responding to Mr. Pinkos' August 5, 1996 letter on UCD landfill matters, from G. Fred Lee, dated August 8, 1996.

Letter to Karl Longley, Chairman, regarding a complaint on the inappropriate approach followed by the Board in the admission of reports into the record for the August 9, 1996 hearing, from G. Fred Lee, dated August 18, 1996.

Letter to Tom To, Director, regarding UCD Stipulated Agreement covering the closure of WMU-1, from G. Fred Lee, dated September 1, 1996.

## Lists of Professional Paper and Report Enclosures

List of Municipal Solid Waste Landfills and Groundwater Quality Protection Issue Papers Developed by Drs. G. Fred Lee and Anne Jones-Lee

Jones-Lee, A. and Lee, G.F., "Groundwater Pollution by Municipal Landfills: Leachate Composition, Detection and Water Quality Significance," Proc. Sardinia '93 IV International Landfill Symposium, Sardinia, Italy, pp. 1093-1103, October (1993).

Lee, G.F. and Jones-Lee, A., "A Groundwater Protection Strategy for Lined Landfills," Environmental Science & Technology, 28:584-5 (1994).

Cherry, J.A., "Groundwater Monitoring: Some Deficiencies and Opportunities," Hazardous Waste Site Investigations; Towards Better Decisions, Lewis Publishers, Proc. 10th ORNL Life Sciences Symposium, Gatlinburg, TN (1990).

Parsons, A.M., and Davis, P.A., "A Proposed Strategy for Assessing Compliance with the RCRA Ground Water Monitoring Regulations," Current Practices in Ground Water and Vadose Zone Investigations, ASTM STP 1118, David M. Nielsen and Martin N. Sara, Eds., American Society for Testing and Materials, Philadelphia, PA (1992).

Lee, G.F. and Jones-Lee, A., "Detection of the Failure of Landfill Liner Systems," Report of G. Fred Lee & Associates, El Macero, CA, April (1996).

Lee, G.F. and Jones-Lee, A., "Landfilling of Solid & Hazardous Waste: Facing Long-Term Liability," IN: Proc. 1994 Federal Environmental Restoration III & Waste Minimization II Conference, Hazardous Materials Control Resources Institute, Rockville, MD, pp. 1610-1618, April (1994).

Lee, G.F. and Jones-Lee, A., "Dry Tomb Landfills," MSW Management, 6(1):82-89 (1996).

Lee, G.F. and Jones-Lee, A., "Landfill Leachate Management: Overview of Issues," MSW Management6:18-23 (1996).

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Lee, G.F. and Jones-Lee, A., "Geosynthetic Liner Systems for Municipal Solid Waste Landfills: An Inadequate Technology for Protection of Groundwater Quality?" Waste Management & Research,11(4):354-360 (1993).

Lee, G.F. and Jones-Lee, A., "Evaluation of the Potential for a Proposed or Existing Landfill to Pollute Groundwaters," Report of G. Fred Lee & Associates, El Macero, CA, 18 pp, July (1996).

Lee, G.F. and Jones, R.A., "Municipal Solid Waste Management in Lined, `Dry Tomb' Landfills: A Technologically Flawed Approach for Protection of Groundwater Quality," Report of G. Fred Lee & Associates, El Macero, CA, 68 pp, March (1992).

Lee, G.F. and Jones-Lee, A., "Recommended Design, Operation, Closure and Post-Closure Approaches for Municipal Solid Waste and Hazardous Waste Landfills," Report of G. Fred Lee & Associates, El Macero, CA, 14 pp, August (1995).

Lee, G.F. and Jones-Lee, A., "Cost of Groundwater Quality Protection in MSW Landfilling," Report of G. Fred Lee & Associates, El Macero, CA, 8 pp, August (1993).

Lee, G.F. and Jones-Lee, A., "Impact of Municipal and Industrial Non-Hazardous Waste Landfills on Public Health and the Environment: An Overview," Report to State of California Environmental Protection Agency Comparative Risk Project, Berkeley, CA, 45 pp, May (1994).

Lee, G.F. and Sheehan, B., "MSW Recycling Protects Groundwaters: Reply to Recycling May be Our Most Wasteful Activity," Letter submitted to the Editor of the Sacramento Bee, July 16 (1996).

Lee, G.F. and Jones-Lee, A., "Three R's Managed Garbage Protects Groundwater Quality," Report of G. Fred Lee & Associates, El Macero, CA, 9 pp, July (1996).

Lee, G.F. and Jones-Lee, A., "Practical Environmental Ethics: Is There an Obligation to Tell the Whole Truth?," Civil Engineering Forum, p.6, October (1995).

Summary Biographical Data, G. Fred Lee, PhD, PE, DEE

Lee, G.F. and Jones-Lee, A., "Water Quality Evaluation and Management Solid and Hazardous Waste Landfills," Web Page: http://members.aol.com/gfredlee/gfl/htm

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Wegge, L., UCD Professor of Economics emeritus, "Financial Feasibility Study of the Campus Landfill, UCD 9 October 1992 Comments," July 9, 1996.

***Reference as: "Lee, G. F., 'Petition To the State Water Resources Control Board to Review California Regional Water Quality Control Board Waste Discharge Requirements for University of California, Davis Class III Landfill Yolo County Order 96-228 Adopted on August 9, 1996,' Submitted to State Water Resources Control Board, Sacramento, CA, September (1996)."***