California Regional Water Quality Control Board
Central Coast Region

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Linda S. Adams
Secretary for Environmental Protection

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May 13, 2008

Mr. David M. Share
Olin Corporation
Environmental Remediation Group
3855 North Ocoee Street, Suite 200
Cleveland, TN 37312

Dear Mr. Share:

SITE CLEANUP PROGRAM: 425 TENNANT AVENUE, MORGAN HILL; RESPONSE TO AREA I PLUME MIGRATION CONTROL FEASIBILITY STUDY ADDENDUM & INTERMEDIATE AQUIFER CLEANUP WORK PLAN

This letter provides Central Coast Regional Water Quality Control Board (Central Coast Water Board) staff's concurrence with the scope of work proposed in Olin Corporation's (Olin) April 15, 2008, *Area I Plume Migration Control Feasibility Study Addendum & Intermediate Aquifer Work Plan* (Area I FS Addendum), prepared by Geosyntec Consultants. The Area I FS Addendum satisfies the requirements of Ordering Paragraphs E.3 and E.4 of Cleanup and Abatement Order No. R3-2007-0077 (Cleanup Order No. 0077).

BACKGROUND
Cleanup Order No. 0077, requires Olin to include the following information in the Area I FS Addendum:

a. Resolution and final selection of treated water disposition option for the intermediate aquifer.
b. Conceptual design for Assessment Area I containment/cleanup system (extraction rates based on well-yield testing).
c. Updated schedule for design and implementation of the Assessment Area I Containment System (hydraulic control and cleanup).
d. Recommendations and proposed schedule for completing all additional deep aquifer characterization activities.
e. All other pertinent information concerning deep aquifer characterization activities.
f. Cleanup implementation options (i.e., independent versus a combined groundwater treatment system for the intermediate and deep aquifers).
g. Cleanup work plan that will provide effective plume migration control and cleanup of Priority Zones A and B within the intermediate aquifer.

CENTRAL COAST WATER BOARD COMMENTS
Central Coast Water Board staff appreciates Olin's proposal to install an upper/middle deep aquifer well and for separating (de-coupling) the intermediate and deep aquifer containment systems. We believe this strategy will result in a more effective and expedient containment and

cleanup of Area I groundwater. Central Coast Water Board staff reviewed the Area I FS Addendum and we provide the following comments:

CHARACTERIZATION AND CLEANUP

General Comments:

1. **Intermediate Aquifer Cleanup and Containment:** The design and implementation of the intermediate aquifer cleanup system will proceed in accordance with the cleanup schedule in Cleanup Order No. 0077. The intermediate system will be designed to extract groundwater at a rate sufficient to contain Priority Zones A and B (upgradient of the intermediate aquifer extraction well). Olin will convey the extracted water via buried conveyance piping back to the former Olin property, located at 425 Tennant Avenue in Morgan Hill (Site), where Olin will treat the extracted water via ion exchange and recharge the treated water to the onsite shallow aquifer via the existing recharge well network.

   Central Coast Water Board Comment: We agree that Olin has sufficient data to proceed with design and implementation of a containment and cleanup remedy for Priority Zones A and B in the intermediate aquifer. Therefore, we concur with Olin's decision to de-couple the Intermediate and Deep Aquifer Cleanup Systems. Olin will therefore not delay implementation of the Intermediate Aquifer Cleanup System due to future additional characterization of the upper/middle and lower deep aquifer.

2. **Intermediate Aquifer Cleanup System Performance:** Olin predicts that the extraction well IEW-1's capture zone will effectively contain and remediate Priority Zones A and B within the intermediate aquifer, upgradient of the IEW-1 location. Olin will not hydraulically contain Priority Zone B downgradient of IEW-1 but Olin anticipates that perchlorate concentrations will significantly decrease shortly after hydraulic containment is established downgradient of IEW-1.

   Central Coast Water Board Comment: Central Coast Water Board requires that Olin have an approved contingency plan in place in the event Olin does not meet benchmark reductions in perchlorate concentrations downgradient from IEW-1 within a one-year period after start-up of the intermediate aquifer cleanup system. As clarified in our June 11, 2007, response to Olin's Well Installation Work Plan, our definition of "effective remediation" means hydraulic control and cleanup. Therefore, if it is determined that the capture zone will not effectively contain and clean up the intermediate aquifer plume (Priority Zones A and B), Central Coast Water Board staff will require Olin to implement additional cleanup measures, which may include the installation of additional extraction wells, as deemed appropriate. We understand that Olin plans to use performance wells to effectively track perchlorate concentrations downgradient of IEW-1 and appropriately evaluate the effectiveness of the intermediate aquifer cleanup system after startup. Central Coast Water Board staff will use the data from the performance wells to determine whether Olin needs to modify the Intermediate Aquifer Cleanup System or if additional remediation measures are necessary. Based on our April 30, 2008 telephone conference, it is our understanding and expectation that Olin's 45% engineering design report will include a detailed performance-monitoring program, methods for evaluating perchlorate concentration trends, and a contingency plan that Olin will implement in the event that it does not observe the anticipated decreases in perchlorate concentrations within one year from system start up.

Specific Comments:

1. **Section 2.2, IEW Installation and Hydraulic Testing Results, and Section 2.3, Capture Zone Analysis:** As noted in the Area I FS Addendum, Geosyntec proposes pumping IEW-1 at a rate higher than previously believed possible for intermediate aquifer hydraulic containment in Priority Zones A and B because:

   a. Cleanup Order No. 0077 requires clean up of both Priority Zones A and B in Area 1; Olin installed IEW-1 for the purpose of hydraulically containing Priority Zone A, prior to the requirement for containment of priority zone B, and
   b. The transmissivity of the intermediate aquifer is greater than initially expected prior to Olin's hydraulic parameter testing of IEW-1.

   Central Coast Water Board Comment: We understand that the performance monitoring program outlined in Olin's *Llagas Subbasin Cleanup Work Plan* will verify the ability of IEW-1 to effectively contain Priority Zones A and B in the intermediate aquifer. Olin will present additional details and a final performance-monitoring program in the 90% Design Package. Central Coast Water Board staff will provide comments on the April 15, 2008 *Llagas Subbasin Cleanup Work Plan Revised Performance Monitoring Program* in a separate letter.

   We understand that the gravels in which IEW-1 is screened are highly transmissive, but we believe the calculated transmissivity of 18,540 ft^2/day may be unusually high. If the calculated transmissivity is higher than the actual transmissivity value, it may be overstating the intermediate aquifer's capacity to transmit water. The high transmissivity calculation may be attributed to one or more of the following: a short pumping duration (8 hours), the use of MW-65 as the sole observation point, partial penetration of IEW-1 in the intermediate aquifer, potential difficulties in obtaining reliable drawdown data from MW-65 (a 1-inch diameter well), and/or application of an inappropriate aquifer test analytical method. Olin will transport groundwater extracted from IEW-1 back to the Olin site to be treated, and injected into the onsite recharge system. We acknowledge that over-designing the transport/treatment/recharge system (which might occur if Olin uses the 18,540 ft^2/day transmissivity value for their design) is preferable to under-designing it. However, based on the considerations noted above, we believe Olin should consider a range of possible transmissivity values into its estimate of appropriate extraction rate(s) and estimated capture zones for intermediate aquifer cleanup, particularly because achieving compliance with Cleanup Order No. 0077 (hydraulic containment of Priority Zones A and B) depends on this high transmissivity rate.

2. **Deep Aquifer Characterization:** Appendix D of the Area I FS Addendum presents recommendations for additional deep aquifer characterization. Olin proposes the installation of three additional monitoring wells (MW-68, MW-69, and MW-70) to characterize the lower deep aquifer.

   Central Coast Water Board Comment: Based on deep aquifer characterization data, we recognize that significant uncertainties remain that preclude design and implementation of an overall deep aquifer containment and cleanup remedy. As such, we concur with Olin that characterization of the Priority Zone A in the upper and middle portions of the deep aquifer is sufficiently complete to propose a preliminary location for an upper/middle deep aquifer extraction well.

   We also agree that additional characterization is required in the lower deep aquifer to delineate the extent and degree of groundwater impacts before final locations of extraction

wells can be determined in this zone. During an April 30, 2008 telephone conference call with Olin staff and its consultants, we discussed the possibility that the proposed location of well MW-68, as depicted on Figure D-7 of Appendix D, is too far away from the plume core (Priority Zone A). Olin representatives explained that they selected the proposed well location based on several factors including, access issues, overhead lines, and traffic considerations. Based on our telephone discussion, Olin agreed to relocate proposed well MW-68 to an alternate location closer to the plume core. Olin will evaluate and determine the most appropriate alternate well location and submit a revised Figure D-7 to show the new proposed MW-68 well location.

We understand that if data from the three new wells indicate that Olin still has not sufficiently characterized the lower deep aquifer to proceed with containment and cleanup activities, the 2008 Characterization Report will provide the scope and schedule for additional lower deep aquifer characterization activities. If the new data sufficiently resolve the characterization uncertainties described herein such that containment and cleanup activities can proceed, we expect the process for the lower deep aquifer containment and cleanup will proceed in similar fashion as the process for the intermediate aquifer containment system and the upper and middle deep aquifers.

3. **Deep Aquifer Characterization Schedule:** The Area I FS Addendum provides the approach and anticipated schedule for resolution of additional lower deep aquifer characterization and data needs such that initiation of the Deep Aquifer Cleanup System's design and installation activities can begin.

   Central Coast Water Board Comment: We concur with Olin's schedule for completing additional characterization activities and locating an upper/middle deep aquifer extraction well, as outlined in Figure 6, "Anticipated Schedule for Deep Aquifer Containment and Cleanup System". However, we request frequent updates on the overall cleanup approach for the deep aquifer zone as data become available. As Olin gathers more characterization data, Olin must discuss the factors it will use to determine the need for additional characterization wells, locating an additional deep (upper/middle and lower) extraction well(s), and selected disposition option (if it will not involve onsite recharge) for the lower deep aquifer. Olin must also outline the factors and conditions it will use to determine whether a lower deep aquifer extraction well will be tied to the other existing intermediate and proposed upper/middle aquifer extraction wells, and the most appropriate location(s) for a lower deep aquifer groundwater extraction well. We require Olin to include this information in subsequent quarterly groundwater monitoring reports, as it becomes available.

4. **Appendix D Section D2.1.1, page D2.2:** We understand that development of MW-67-433 has not been successful.

   Central Coast Water Board Comment: Based on the description of the development efforts, as well as the realization that a significant amount of drilling mud intruded into this screened interval, water quality data obtained from MW-67-433 may not be truly representative of groundwater chemistry 433 feet below ground surface (bgs) at this location. Additional data from this depth are necessary to determine if an eastward hydraulic gradient and the associated possible eastward migration of perchlorate in the lower deep aquifer exists. In addition, 433 feet bgs is the deepest screened interval at MW-65 at which perchlorate has been detected; we consider information from this depth at this location to be an important deep aquifer characterization component that is critical to

refinement of the conceptual site model. We encourage Olin to continue its development efforts at this depth, and recommend subsequent quarterly groundwater monitoring reports contain a reference/discussion regarding progress on this development issue.

5. **Appendix D Section D2.1.2, page D2.2:** Development problems at the 335-foot screened interval in MW-66 may cause complications with refinement of the conceptual site model.

   Central Coast Water Board Comment: Similar to the previous comment, we encourage Olin to continue to explore a remedy to this situation; future quarterly groundwater monitoring reports need to communicate progress on this well development issue.

6. **Appendix D Section D2.3, page D2-6:** Olin indicates that it was unable to pneumatically slug test the (deepest) 570-foot screened interval of MW-67. Olin states, ". . . *there is no indication that groundwater elevations or sample quality has been or will be impacted. There is also no reason to suspect that the deep aquifer hydraulic conductivity at MW-67-570 is inconsistent with values measured at similar depths, hence the inability to hydraulically test this well does not represent a significant data gap.*"

   Central Coast Water Board Comment: Olin has not presented sufficient data to substantiate this assertion. Thus, it is unclear if the hydraulic conductivity at this depth is consistent with other lower deep aquifer hydraulic conductivity values. In the 2008 Characterization Report Update (January 30, 2009), Olin must include a discussion regarding whether or not the three new lower deep aquifer wells provide information that supports or contradicts conclusions that Olin has drawn based on wells MW-66 and MW-67.

7. **Appendix D Section D2.5.3, page D2-11:** Olin indicates that not detecting perchlorate above the practical quantitation limit (PQL) of 4 µg/L below a depth of 450 feet supports the conclusion that conditions in the lowest portions of the deep aquifer ". . . *appear favorable for perchlorate degradation.*"

   Central Coast Water Board Comment: It may be true that the lower deep aquifer is degraded by perchlorate, but it is also possible that perchlorate has not migrated to what may be the axial center of the Subbasin (in the vicinity of MW-59, MW-66, and MW-67). Another possible explanation for not detecting perchlorate in the lower deep aquifer is that it may have migrated through the Subbasin to the area in question, and concentrations are diluted to below the PQL and transported downgradient through highly transmissive gravels (i.e., paleochannel) overlying the base of the Subbasin. We believe it will be easier to draw conclusions regarding perchlorate transport through this area of the Subbasin when Olin presents data from the three proposed lower deep aquifer characterization monitoring wells in the upcoming 2008 Characterization Report.

MANAGEMENT OF EXTRACTED GROUNDWATER FROM INTERMEDIATE AND DEEP AQUIFERS

1. **Treated Water Disposition:** According to the Area I FS Addendum, Olin has selected onsite recharge as the disposition option for the Intermediate Aquifer Cleanup System. However, we understand that based on the ongoing lower deep aquifer characterization results, Olin will continue to evaluate aquifer hydraulic properties and general water chemistry of the lower deep aquifer because these factors may affect which treatment options and/or final treated groundwater disposition options are used.

Central Coast Water Board Comment: After completing lower deep aquifer characterization, Olin must determine the number and location of extraction wells required to contain and clean up Priority Zone A in the lower deep aquifer. We anticipate that Olin will also evaluate the design and operation of the lower deep aquifer extraction well(s), incorporating containment of the expanded deep aquifer plume volume, appropriate treatment options, and the viable treated water disposal options.

As you know, the Central Coast Water Board may not dictate the method of compliance with discharge requirements. As such, Olin is responsible for selecting the appropriate and desired treated water disposition option. Nonetheless, we recommend that Olin consider making treated groundwater from the deep aquifer (upper/middle and lower) available for the City of Morgan Hill municipal supply. Central Coast Water Board and California Department of Public Health staff are available to meet with Olin and/or City representatives to discuss the permitting process and viable options for using treated groundwater as a source of drinking water. Central Coast Water Board staff is also available to assist in any mediation efforts and we encourage a solution that makes sense for everyone.

2. **Section 2.6, Treated Groundwater Recharge/Re-Injection (TGRR) Application, page 12:** This section states, *"...successful enrollment of the IACS into the TGRR program is a critical path item that is required prior to IACS startup".*

Central Coast Water Board Comment: Enrollment into the TGRR program is not a requirement for Intermediate Aquifer Cleanup System startup. As previously addressed, we support Olin's successful enrollment into the TGRR program and are available to help in this process, if necessary. However, it is Central Coast Water Board's position that startup of the Intermediate Aquifer Cleanup System must proceed even if Olin is unable to successfully enroll in the Santa Clara Valley Water District's (Water District) TGRR Program.

We understand that Olin is presently paying the Water District approximately $4000 per month to inject onsite treated groundwater into the shallow aquifer. With the added volume from the extraction wells for the intermediate and deep aquifers, this expense will become a very significant cost over an extended period. To reduce potential delays in cleanup implementation due to economic factors, we strongly suggest that Olin engage in discussions with the Water District to negotiate any necessary agreements early in the process and prevent delays in obtaining resolution (approval or denial) concerning TGRR program enrollment. Enrollment in the TGRR Program will allow Olin to maximize focus of financial resources towards the cleanup of Llagas Subbasin groundwater.

IMPLEMENTATION SCHEDULE

Central Coast Water Board concurs with the Implementation Schedules outlined in Figures 5 and 6 of the Area I FS Addendum. Please continue to keep the Central Coast Water Board staff apprised of any modifications to the approved implementation schedules as soon as Olin anticipates a change in the schedule.

CONCLUSIONS AND RECOMMENDATIONS

We appreciate Olin's efforts in providing this document. Olin's Area I FS Addendum is complete and implementable. We look forward to successful completion of all remaining deep aquifer characterization tasks and expeditious implementation of all cleanup activities.

If you have any questions, please contact **Hector Hernandez at (805) 542-4641** or via e-mail at Hhernandez@waterboards.ca.gov, or Thea Tryon at (805) 542-4776.

Sincerely,

Roger W. Briggs
Executive Officer

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