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VIA: E-MAIL and US MAIL

September 30, 2005

Mr. David Athey, PE
California Regional Water Quality Control Board
Central Coast Region
895 Aerovista Place, Suite 101
San Luis Obispo, California 93401-5411

Subject: Olin Response to Regional Board Comments on 2Q05 Monitoring Report Morgan Hill, California

Dear Mr. Athey:

Attached please find, Olin Corporation's (Olin) response to the August 31, 2005 California Regional Water Quality Control Board, Central Coast Region (Regional Board) comments on Olin's Second Quarter 2005 Groundwater Monitoring Report.

If there are any questions, please do not hesitate to call.

Sincerely,
OLIN CORPORATION

Richard W. McClure, P.G., REM
Environmental Remediation Group

cc (via e-mail):
Mr. Eric Gobler, RWQCB – Central Coast Region
Ms. Sylvia Hamilton, PCAG Chair
Mr. Thomas Mohr, Santa Clara Valley Water District
Mr. Curt Richards, Olin
Mr. Donald Smallbeck, MACTEC
Ms. Beverly Vessa, Olin/Standard Fusee Repository

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

REVIEW OF SECOND QUARTER 2005 GROUNDWATER MONITORING REPORT
425 TENNANT AVENUE SITE
MORGAN HILL, SANTA CLARA COUNTY

This response is submitted in compliance with the California Regional Water Quality Control Board (RWQCB), Central Coast Region letter of August 31, 2005 containing comments on Olin's Second Quarter 2005 Groundwater Monitoring Report and demanding response by September 30, 2005. RWQCB comments are provided below in bold, and followed by MACTEC's responses.

Comment 1. **The first bullet, page vi, states, "…*Groundwater elevations in the upper intermediate (B1), middle intermediate (B2, lower intermediate (B3), and deep (C) aquifer zones decreased throughout April, May, and June 2005, in response to decreased [emphasis added] offsite water production demand."* The word decreased is underlined since Water Board staff believes "decreased" should read "increased." Later the report states, "*Elevation changes in the B3 aquifer zone have since dropped 4 to 20 feet in response to the increase in offsite water supply production well demand."* Water Board staff believes this word has been erroneously transposed since groundwater elevations, depending on the season, usually drop in response to increased offsite pumping.**

Response 1: The unintentional transposition is acknowledged.

Comment 2. **The second bullet, page vi, states, "*Three-dimensional groundwater pathline analysis confirms that onsite groundwater flow within the shallow A-zone and upper intermediate B1-aquifier zone is toward the groundwater capture and perchlorate removal system extraction wells."* Water Board staff has looked at Appendix C, Three-Dimensional Groundwater Pathline Model, and Figures 11a and 12a, Numerical Model Simulation of estimated Groundwater Capture, A and B zones, February 2004 through June 20, 2005. Figure 11a represents approximated flow conditions for A-zone groundwater. On the left side of Figure 11a, groundwater particles are shown to cross each other. It is our understanding that the projected groundwater flow paths should not cross. It appears that the groundwater capture from each well was analyzed individually and then combined on Figure 11a. Olin shall clarify why path lines for well EW-001A cross path lines for well EW-002A and why, individual path lines for well EW-002A appear to cross each other.**

Response 2: The quarterly model simulates transient conditions and, as such, pathlines may indeed cross one another as groundwater flow directions subtly adjust over the period of simulated time. All pathlines were calculated by the model simultaneously. Capture of groundwater beneath the Site is being accomplished by pumping from extraction wells screened in the A and B1 aquifers.

Comment 3: **Clarify why plan view illustrations of groundwater pathlines were not included for the C1 and C3 zones. Plan view illustrations were included for the B2, B3, and C2 aquifer zones as shown on Figure 13.**

Response 3: Flow conditions within the C1 aquifer zone were not illustrated because flow conditions from this zone are accounted for by flow lines for the B3 and C2 aquifer zones. Simulated groundwater flow in both of these zones illustrates control of groundwater flow direction from pumping at the Tennant well and manual depth-to-water measurements from within the C1 aquifer zone also illustrate this influence. The high degree of hydraulic communication between the B3, C1, and C2 aquifer zones is apparent from the similar groundwater elevations and seasonal fluctuations illustrated on Figures 9 and 10 of the Second Quarter 2005 Groundwater Monitoring Report. Hydraulic communication between the deep aquifer zones supports that directions of lateral groundwater flow between these aquifers are correlative. The direction of groundwater flow in the C1 aquifer zone would therefore be nearly identical to those in the B3 and C2 aquifer zones, particularly with respect to pumping from the Tennant well, and thus illustration of flow lines from the C1 aquifer zone is redundant. For similar reasons, illustration of flow conditions within the C3 aquifer zone would be redundant as these zones are hydraulically communicative and flow lines would be nearly identical to those of the C2 aquifer zone.

Comment 4: **The last paragraph, page viii, states, "*Beginning with the Third Quarter 2005 sampling event, onsite groundwater quality will be evaluated by samples collected from the monitoring wells discussed in the First Quarter 2004 report (MACTEC, 2004b). Groundwater elevations will continue to be monitored at all onsite monitoring wells.*" Water Board staff has reviewed the proposed changes to the onsite monitoring well network contained in the First quarter 2004 report. Olin is requesting permission to stop sampling seven onsite well based on proximity to other monitoring wells, detections for perchlorate, or overall screen length. Water Board staff revises MRP No. 2001-161 as follows:**

Table 1

Approved Changes to Revised MRP No. 2001-161

WELL	AQUIFER ZONE	CHANGE	COMMENTS*
MW-02	AQUIFER A	NO	GCTS Data is a mixture of surrounding groundwater (including downgradient) and MW-2 is representative of upgradient, onsite A-zone groundwater and has a long historical data set.
MW-11SA1	AQUIFER A	YES	Groundwater Elevation Monitoring Only
MW-10SA1	AQUIFER A	YES	Sample Annually – Alternate sampling between periods of high and low groundwater. This well has had a recent trace detection of perchlorate, reported near recorded high

WELL	AQUIFER ZONE	CHANGE	COMMENTS*
			groundwater elevations. Water board staff will reconsider reducing the monitoring frequency once additional data is collected.
MW-11SA2	INTERMEDIATE B1	YES	Sample annually – Alternate sampling between periods of high and low groundwater. This well has had a recent detection of perchlorate at 4.0 µg/L, reported near recorded high groundwater elevations. Water board staff will reconsider reducing the monitoring frequency once additional data is collected.
MW-07SA3	INTERMEDIATE B2	YES	Sample Annually – Alternate sampling between periods of high and low groundwater. This well has had a recent trace detection of perchlorate at 3.1 µg/L, reported near recorded high groundwater elevations. Water Board staff will reconsider reducing the monitoring frequency once additional data is collected.
MW-07SA4	INTERMEDIATE B3	YES	Sample Annually – Alternate sampling between periods of high and low groundwater. This well has had a recent trace detection of perchlorate at 3.8 µg/L, reported near recorded high groundwater elevations. Water Board staff will reconsider reducing the monitoring frequency once additional data is collected.
OW-01C	DEEP AQUIFER C	YES	Sample Annually – Alternate sampling between periods of high and low groundwater. This well has had a 4.2 µg/L detection of perchlorate in October 2004, reported near low groundwater elevations. Water Board staff will reconsider reducing the monitoring frequency once additional data is collected.

*Olin shall continue to monitor groundwater elevations in all wells.

The Table 1 changes have been incorporated into the attached MRP.

Response 4: Olin will proceed with the above-tabulated changes to the onsite MRP. We disagree that continued monitoring at MW-2 is necessary and believe data are redundant with those from MW-08SA1. Although screened at different intervals, perchlorate concentration data from samples collected at MW-08SA1 (which also present a significant historical data set) parallel those from MW-2 and both wells are clearly influenced by pumping from the nearby extraction well EW-02A.

Annual sampling will proceed for wells indicated above on an alternating schedule; that is, samples will be collected from the high-groundwater-elevation quarter the first year (typically April) and again from the low-groundwater-elevation quarter the next (typically October). However, we disagree that a significant association can be made between occasional trace detections of

perchlorate and groundwater elevations for the wells specified. For instance, perchlorate has never been detected above the PQL at MW-10SA1 and thus continued monitoring at this well is not warranted, particularly considering the southward gradient of groundwater flow in the shallow aquifer. Similarly, perchlorate was not detected in 14 of the 17 samples collected from MW-11SA2 and the occasional detection of perchlorate at the PQL does not warrant continued monitoring, particularly when considering the southward gradient of groundwater flow. Additionally, the single detection of perchlorate at MW-07SA3 at the PQL out of the 18 samples collected at this well does not indicate a seasonal trend or justify continued monitoring. The two detections of perchlorate just above the PQL at MW-07SA4 out of the 17 samples collected from this well and the single detection of perchlorate just above the PQL at OW-01C out of the nine samples collected at this well also do not indicate a seasonal pattern or justification for continued monitoring.

Comment 5: **Section 2.1 Subbasin Lithology:**
According to Santa Clara Valley Water District (Water District) staff, MACTEC has incorrectly referenced Seena Hoose's work (page 4, second paragraph). The report states, "*The lacustrine clays are present at depths below approximately 165 feet from below San Martin Avenue and continue southward (DWR, 1981; Jenkins, 1973; Hoose, 1985).*" The Water District contends that Ms. Hoose's thesis concludes that there was no large Pleistocene lake as proposed by Jenkins. This contradicts MACTEC's summary. Water Board staff request that you review Ms. Hoose's work to check your report's accuracy.

Response 5: The reference to Ms. Hoose's thesis with respect to the presence of Pleistocene lakes will be omitted from future quarterly reports.

Comment 6: **Section 4.0 Elevation of Monitoring Results**
Section 4 provides an evaluation of onsite and offsite monitoring results, including groundwater elevation data. The report does not include data from the northeast perchlorate investigation area. As a reminder, our February 19, 2004 Groundwater Flow Assessment Work Plan approval letter requires investigation and data reporting in your quarterly groundwater monitoring reports. Since the offsite piezometers and private wells were installed and sampled later than Olin planned, the Report did not include northeast perchlorate data. However, the third quarter report is due October 31, 2005, and should include data collected to that date. The data shall include: regional and aquifer zone specific groundwater contour maps, raw groundwater elevation, and other pertinent data. Reporting requirements are contained in our February 19, 2004 northeast perchlorate letter.

Response 6: Comment acknowledged.

Comment 7: **Section 4.3 Perchlorate in Offsite Groundwater**
Figures 7 and A1 show aerial distributed perchlorate concentrations. The shaded areas represent analytical results from the second quarter 2005 and

the most recent well result. According to the Report, data interpolation was accomplished using a three-dimensional analysis kriging method. The analysis included data from wells with construction data. Olin included the Second Quarter 2005 well sample results on Figure 7. Water Board staff believes Figure 7 and A1 are useful in determining the plume's general regional location and aerial extent; however, the figures contain discrepancies. A data review of wells that are within two miles of the site indicates that perchlorate concentrations have been above 6 parts per billion. However, Figure 7 indicates that the plume is between 4 and 6 ppb as denoted by green shading. The data actually indicates that the shading should be different from the 6 ppb yellow shade, since concentrations are above 6 ppb. Future figures shall include different shading for concentration above 6 ppb. Water Board staff notes that the plume takes a sharp eastern turn at Church Avenue and a lack of shading in other areas that give the plume a broken up appearance.

Water Board staff understands that the data used to generate the shaded areas on Figure 17 and A1 are limited to wells with screen information and perchlorate results. We believe the aforementioned observations speak to the importance of depth discrete monitoring wells in determining the horizontal and vertical plume extents. We look forward to receiving future figures with depth discrete data so that a more accurate picture of the plumes aerial extent can be determined. It may be useful to analyze all of the data, regardless of whether a well log is available. Including all of the data may be helpful in describing regional plume extents until depth discrete data is available. Additionally, the analysis of all of the data may more accurately reflect concentration trends closer to the site where higher concentrations are known to occur.

Response 7: Depth-discrete groundwater quality data from all new monitoring wells, and particularly MW-16 and MW-17 near the Site, will be incorporated in future three-dimensional kriging analyses. The kriging analysis accurately reflects the most recent groundwater data, which indicate that perchlorate is not found within a single contiguous area south of the site. All data regardless of availability of well construction details are represented in describing the regional perchlorate detections in Figure 7. Figure 7 clearly indicates the concentrations of perchlorate greater than 6 (as color coded dots) that are located south of the site.

The RWQCB's reference to an eastward deflection at Church Avenue is noted. The eastward deflection of perchlorate south of Middle Avenue is consistent with historical groundwater elevation contours and published reports (e.g., *Brown and Caldwell, 1981*) regarding the distribution of nitrate. The distribution of both perchlorate and nitrate reflect the influence upon groundwater flow by significant recharge along the course of the Llagas Creek originating from the west and by a nearby bedrock promontory that extends into the basin from the west. The fact that the kriging analysis reflects the dynamic between recharge and basin structure further supports the use and suitability of supply wells to monitor groundwater quality conditions.

The discontinuous nature of perchlorate detections greater than 6 ppb south of the site is indicative of most recent and historical data (Fourth Quarter 2004 and First Quarter 2005) which suggest that areas of perchlorate detections greater than 6 ppb are often separated by large areas with no perchlorate detections, i.e. less than the

MDL, or estimated perchlorate concentrations, i.e. less than the PQL. This effect could be the result of the significant pumping and recharge and/or the result of additional point sources of perchlorate occurring in the Llagas Subbasin

Analysis of trend is not dependent upon well construction information. Figure 23 represents perchlorate concentration trends in all sample results for 107 wells.

Comment 8: **Tables**

Tables 4, 5, and 6 summarize perchlorate concentrations for onsite, offsite and additional offsite wells, respectively. The tables do not include "J" flag values (trace concentrations) for wells, rather lists them as non-detect at 4 ppb with a "J" validation qualifier. Laboratory data sheets indicate that numerous results from this and previous monitoring events have been reported as trace. Approximately 19 onsite wells had trace results during the second quarter 2005. While trace results cannot be quantified, because trace results are less than the practical quantitation limit, trace results are helpful for tracking perchlorate movement. Olin shall denote trace concentrations on tables 4, 5, and 6. In addition, Olin shall amend Tables 4, 5, and 6 to include previous quarters trace results. The data tables shall be modified as follows:

Table 4. Onsite Perchlorate Results

Second Quarter 2005 Groundwater Monitoring Report

Olin/Standard Fusee Site, Morgan Hill, California

Well	Sample Type	Sample Date	Perchlorate Concentration (µg/L)	Validation Qualifier	Trace Result [if applicable] (µg/L)
MW-11SA3		06-Apr-05	Nd (4.0)	J	3.9

Response 8: The table will be modified to incorporate estimated concentrations in future quarterly reports. It should be noted, however, that all analytical results, including estimated concentrations below the PQL, have always been provided in previous quarterly reports on a CD containing laboratory reports.

Comment 9: **Figures**

Figure 2 depicts regional groundwater flow in the Llagas Subbasin and begins approximately one mile south near Maple Avenue. In recent discussions, Olin has mentioned that several wells to the site's northeast have sounding ports and may be useful for groundwater elevation monitoring. We require that Olin include the northeast area wells, where appropriate, on Figure 2. This additional data will aid in Olin's analysis of regional groundwater flow from just north of the site to just past the City of Gilroy. Additionally, Olin shall include well number designations next to each well shown on your intermediate zone regional groundwater elevation figure.

Figures 15, 16, and 17 chart perchlorate concentration history for onsite wells versus precipitation. The results and trends for wells with lower concentrations are impossible to determine from Figures 15, 16, and 17. Olin's future reports shall separate wells with lower perchlorate concentrations from wells with higher concentrations that are currently shown together on Figures 15, 16, and 17. Separating the low and high concentrations will allow Water Board staff to better analyze Olin's data.

Appendix D contains updated hydrogeologic cross-sections generated from wells throughout the Llagas Subbasin. Water Board staff appreciates the work MACTEC has done to update improve the geologic sections. The updated sections include additional lithologic units, depict proposed wells, and update the interpretation of the intermediate zone lithology and perchlorate results. Water Board staff notes that cross-sections B – B' through F – F' now cross-section A – A' at wells rather then arbitrary points. Olin shall update geologic sections as southern well installation and hydrogeologic characterization proceeds.

Response 9: Groundwater elevation data from wells or piezometers installed in the intermediate aquifer northeast of the Site will be incorporated into Figure 2. Well identification data will be provided.

Figures 15 through 17 will also be modified to more clearly illustrate individual wells with low concentrations from those with high concentrations.

Cross-section comments are noted; updated cross-sections will incorporate additional lithologic data and will be provided in future reports.

Additional Comments on Appendix D figures:

Appendix D Comment 5: In order for Water Board staff to evaluate the possible cross-connection between aquifer zones, Olin shall include supply well filter pack intervals on updated geologic sections.

Response: Filter packs will be incorporated into future versions of the cross-sections.

Appendix D Comment 6: Olin shall include additional geologic cross-sections that depict conditions closer to the site. New wells MW-16 and 17 may be useful to generate these sections since depth discrete lithologic data will be collected during well construction. The higher concentration perchlorate plume in this area is likely to be the focus of your remediation efforts and will require additional characterization.

Response: As the data from newly installed monitoring wells are collected and evaluated, new or revised cross-sections will be provided in subsequent reports.

Appendix D Comment 7: **The geologic cross-sections show several locations where the shallow and intermediate aquifers are not separated by lower permeability lithology. Those areas shall be queried when approximated or noted on each section.**

Response: Cross-sections will be modified accordingly.

Appendix D Comment 8: **Additional effort is needed to refine geologic cross-section inconsistencies. For example, sections D-D' and A-A' intersect at well 10S4E18B017, yet the green symbol for gravel with clay is absent in D-D'. Similar inconsistencies are seen in well 9S03E34R017. Well 9S03E34R017 is shown on A-A' and B-B'. On A-A' the clay with sand and or gravel is depicted as intermediate aquifer but in B-B' it is not. These are minor deficiencies that we anticipate will show up occasionally, since the investigation area is quite large.**

Response: Cross-sections will be reviewed for inconsistencies and corrected if appropriate.

Appendix D Comment 9: **As previously discussed with Olin, the original well driller's logs limit the precision and accuracy of the geologic cross-sections. It appears that most of the logs lack detail and are over simplified. This problem appears to exist based on the vertically long sequences seen in some logs. For example, well logs 09S003E34R017 and 09S03E35Moo1 in B-B' and 10S04E18B017 in A-A' are not as detailed as other nearby logs. As Llagas Subbasin Characterization progresses, Olin shall develop a method to assess driller log validity and to assist interpretation between logs. During our last phone conversation, you mentioned that Olin is working with Lawrence Livermore National Labs to refine the geologic cross-sections. As the sections are better defined, Olin shall include a discussion of the methodology used to improve geologic cross-section interpretation.**

Response: Comment noted. A method to assess geologic logs has already been developed and continues to be refined as additional geologic information becomes available. This method has been used to correlate over 500 geologic logs throughout the Llagas Subbasin, resulting in multiple cross-sections (some up to 9 miles in length), fence diagrams, and continual refinement in the conceptual model of groundwater flow within the basin. The method utilizes standard geologic principles for the development of cross-sections which are verified by various means, including: review of previous geologic investigations conducted in the basin, review of peer-reviewed publications from those investigations, geologic logs conducted by other entities such as the USGS, the Cities of Morgan Hill and Gilroy, and the Water District, and the additional monitoring wells currently being installed. The resulting interpretations between boring logs are continually accessed and verified as Olin proceeds with basin characterization. For example, additional lithologic data from the nine monitoring well locations will be incorporated into the cross-sections where appropriate. Drillers' logs will continue to be compared to continuous-core logs as part of the Llagas Subbasin Characterization Report.

Previous comparisons using standard geologic principles and practices (e.g., stratigraphic correlation, evaluation of depositional paleo-environments, consideration of current geomorphology/landforms, and incorporation of groundwater quality data that may reflect lithologic conditions) have been conducted between logs from onsite monitoring wells and supply wells located near the Site. Professional geologist review of the lithologic data recorded by drillers in these numerous logs has concluded that driller logs are indicative of true conditions and accurately reflect the complex distribution of sediment typical of this alluvial depositional environment. Furthermore, well construction data (i.e., placement of screens versus blank casing) also corroborate lithologic data and further indicate lithologic/hydraulic conditions at a given location and depth.

Lithologic data generated from new offsite monitoring wells are being integrated with existing lithologic data as will be illustrated in future groundwater monitoring reports. Details observed from the continuous soil cores will be compared to drillers' logs to establish macro-correlation, keeping in mind local features that may influence the degree of correlation. For instance, a relatively thick sequence of coarse-grain material near 10S04E29F006 and 10S04E29C001 (cross-section A'-A'') appears to represent outwash associated with the Old Oak Creek alluvial fan, located immediately east of these wells. The thickness of these sediments would be expected to diminish with distance from the fan, and this characteristic is, in fact, reflected in other drillers' logs illustrated on this cross-section. Similarly, the driller's log for 09S03E35N013 (illustrated on cross-section A-A') mentions cobbles that, given the location of this well, probably reflect alluvial outwash from the nearby Llagas Creek. Furthermore, preliminary evaluation of lithologic data from MW-21 indicates good correlation with the driller's log of 09S03EN013. Lithologic data observed from continuous core at monitoring wells MW-16 and MW-17 along Fisher Avenue, just south of the Site, also correlate very well with lithologic data recorded at 09S03E34D, located just north of Fisher Avenue (illustrated on cross-section A-A'). The good correlation between drillers' logs and logs generated from continuous core reflect that lithologic data recorded on drillers' logs are representative of true lithologic conditions.

In the future, as the Llagas Subbasin characterization proceeds, the lithologic modeling work performed by LLNL, which is based largely on the very same drillers' logs currently being used in Olin's cross-sections, will continue to be evaluated and compared to new lithologic data generated as part of the Llagas Characterization investigation. Additionally, if there are other monitoring wells installed within the study area, or other reports published describing the geology of the Llagas Subbasin, these will continue to refine the conceptual model.

Appendix D Comment 10: Figures 4 and 6 show well location and current groundwater perchlorate concentrations. Please include extraction well locations on Figures 4 and 6 and the corresponding concentration perchlorate concentrations data.

Response: Extraction wells and the perchlorate concentrations will be illustrated in these figures in future quarterly reports.