East San Joaquin
WATER QUALITY COALITION
1201 L Street Modesto, CA 95354
www.esjcoalition.org

October XX, 2010

Pamela Creedon, Executive Officer
Joe Karkoski
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, #200
Rancho Cordova, CA 95670-6114

Dear Ms. Creedon,

The East San Joaquin Water Quality Coalition (Coalition) strives to provide its members with a high quality and efficient water quality monitoring program focused on sampling and analysis that is relevant to applications and practices used in irrigated agriculture within the Coalition region. It is important for the Coalition to focus its resources to evaluate water quality impairments which are a direct result of agricultural practices and to aid its members in implementing management practices that will reduce/eliminate negative impacts of agriculture on nearby surface water beneficial uses.

Since forming the Coalition in 2004, our annual budget has gone from $400,000 per annum to $1.3 million in 2009, due mostly to increases in monitoring and reporting costs. The Board of Directors, in an effort to contain these costs, has reevaluated the allocation of its resources in light of the Coalition's goals and mission. This letter describes amendments the Coalition would like to add to its Monitoring and Reporting Program Plan (MRPP). Taking the steps described below will not affect the Coalition or the Regional Board's ability to assess the impact of agriculture on water quality and associated beneficial uses. An overview and detailed discussion of our rationale for making these changes follows.

The Coalition is requesting to amend its current MRPP (approved on September 15, 2008) to include the following changes in its monitoring strategy:

1) Reduce water column sampling for organochlorines;
2) Omit sampling for Total Kjeldahl Nitrogen (TKN) and orthophosphate since these results do not aid in understanding sources of water quality issues nor are there any standards by which to compare the results to evaluate water quality;
3) Reduce water column sampling for the sediment bound chemicals glyphosate and paraquat dichloride;
4) Reduce sampling chelating metals that are not applied by agriculture including arsenic, cadmium, lead and molybdenum.

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Reduced monitoring mentioned above will still include monitoring twice a year during a high total suspended solids event (once during the storm season and once during the irrigation season) to include the following constituents: arsenic, cadmium, lead, molybdenum, glyphosate, paraquat dichloride and all organochlorines including Group A pesticides.

The following letter includes the rationale behind the four MRPP amendment requests listed above including background, proposed MRPP amendment (changes to monitoring) and current Coalition actions for each of the requests.

Sincerely,

Parry Klassen
Board Chairman
East San Joaquin County Water Quality Coalition

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Below is the detailed rationale for amending the Coalition's MRPP.

## 1) Reduce water column sampling for Organochlorines

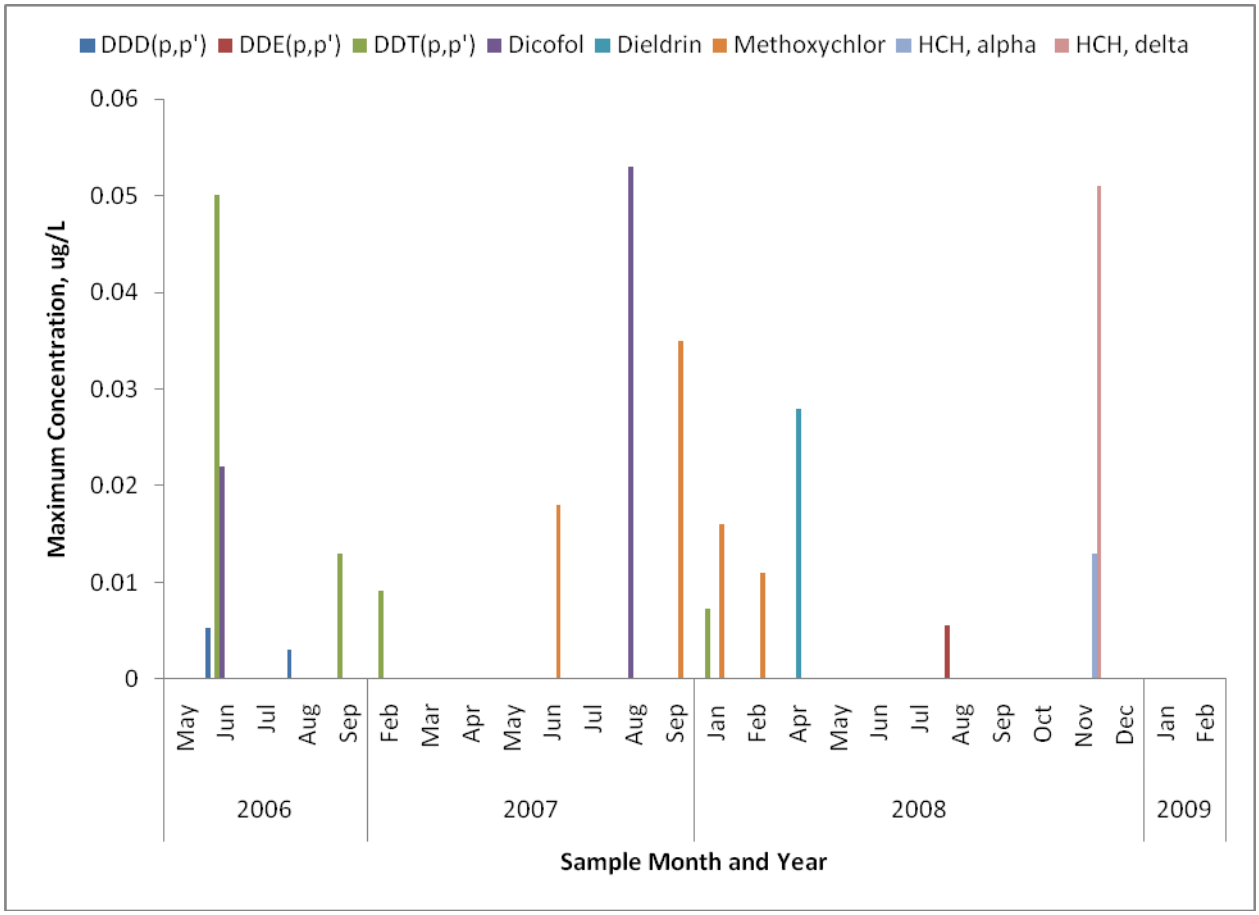
### Background

The following organochlorines are analyzed for by the Coalition: DDD, DDE, DDT, dicofol, dieldrin, endrin, methoxychlor and Group A pesticides. Of the organochlorines, only dicofol and endosulfan (Group A) are registered for use by agriculture.

Legacy pesticides such as organochlorines are found in sediments across the world in both marine and fresh waters. Organochlorines are organic compounds with at least one covalently bonded chlorine atom. Organochlorines are typically not soluble in water due to their high organic carbon partitioning coefficients. Organochlorines are not likely to be found in the water column except at very low concentrations. Any organochlorines found in surface waters are most likely due to remobilization of sediment. It is unclear if any legacy pesticides remain in agricultural soils after years of plowing, cultivating, and harvesting. Their high $K_{oc}$ values argue against their being found in deep soils; rather they would primarily be found in surficial soils where they would have been eroded off decades ago. It is likely that a reservoir of legacy pesticides and their breakdown products exist in stream channels. This reservoir is slowly being moved downstream as bedload and surface sediments are reworked by runoff. Coupled with organochlorines' long half lives, they could exist in the environment for an extensive period. Consequently, monitoring their presence in surface waters is uncoupled from any current application or management practice that growers can implement.

Dicofol and endosulfan are the only organochlorines applied within the Coalition area. There have been two detections of dicofol, 0.022 µg/L and 0.053 µg/L in May 2006 and August 2007. These were the only two detections in 334 samples collected since 2006 (Figure 1). Currently there is no water quality trigger limit established by the Regional Water Quality Control Board which would determine if these amounts are impairing water quality and/or beneficial uses. There have been no detections of endosulfan in water samples collected monthly from October 2008 through 2009 and resumed in July 2010.

Figure 1. Organochlorines with one or more detection within the Coalition region from 2006-2009.




## Proposed MRPP Amendment (changes to monitoring)

Based on the fact that organochlorines bind to sediments readily, persist in the environment for long periods of time and are not currently used by agriculture (except for Dicofol and endosulfan) the Coalition can only encourage growers to manage discharges that could potentially mobilize legacy pesticides within surface waters. For this reason, the Coalition will collect a single sample during periods of high total suspended solids (TSS) to analyze for organochlorines including Group A pesticides. A high TSS event is characterized by high flow rates due to either increased tail water runoff or upstream drainage due to both irrigation and storm water runoff. A high TSS could also be the result of large volumes of precipitation eroding stream banks and re-suspending sediment from channel bottoms into the water column.

The Coalition agreed to sample for Group A pesticides for a year under its approved MRPP and if no exceedances of a WQTL occurred during that time, the Coalition would stop analyzing for this subset of Organochlorines. The Coalition is requesting to amend its MRPP such that it will continue to sample for Group A pesticides with the other organochlorines twice a year during a high TSS event. Group A pesticides include aldrin, chlordane, heptachlor, heptachlor epoxide, hexachlorocyclohexane (HCH), lindane, endosulfan and toxaphene. The last reported use of any Group A pesticides (besides endosulfan) was in 2006 for lindane in Stanislaus County. Endosulfan has been reported in Madera and Merced counties as recently as 2009 although use is very limited with only across the entire Coalition region (10 applications have been report in 2009 across all counties).

### Coalition Actions

The Coalition will manage for sediment within the Coalition area by educating growers of the possible water quality and beneficial use impairments that mobilized sediment (during both storm runoff and high irrigation discharges) may cause to downstream waterbodies. The Coalition will continue to collect samples for TSS throughout the year to determine the amount of suspended solids within the water column which can be used to indicate the amount of sediment mobilization upstream of a sampling location.

The Coalition currently has one site subwatershed with a management plan for Organochlorine pesticides – Mustang Creek @ East Ave. Samples collected from this location have contained concentrations of DDT above 0.00059 ug/L during three sampling events – February 2007, June 2007 and December 2009. The Coalition's Management Plan process includes conducting grower outreach with members in this subwatershed when it becomes a priority subwatershed (in addition to the annual grower meetings conducted by the Coalition in each County). The Coalition will continue to educate growers about management practices to control sediment runoff that may result from agricultural practices and inform them of downstream water quality issues.

Currently the Regional Board is undergoing a process to implement an Organochlorine TMDL. The Coalition is actively participating in this stakeholder process including attending meetings and submitting technical comments. The Coalition will continue its participation in the TMDL process and work with the Regional Board on implementing the TMDL once finalized and approved.

The Irrigated Lands Regulatory Program (ILRP) Technical Issues Committee (TIC) has formed a sub-group to address legacy pesticides including Organochlorines. The sub-group will be analyzing data to determine whether or not current agricultural practices are contributing to detectable levels of Organochlorines in the downstream water bodies and if so what

management practices can be implemented to reduce and/or eliminate agricultural sources. The Coalition will continue to participate in this sub-group to develop strategies to answer these two questions.

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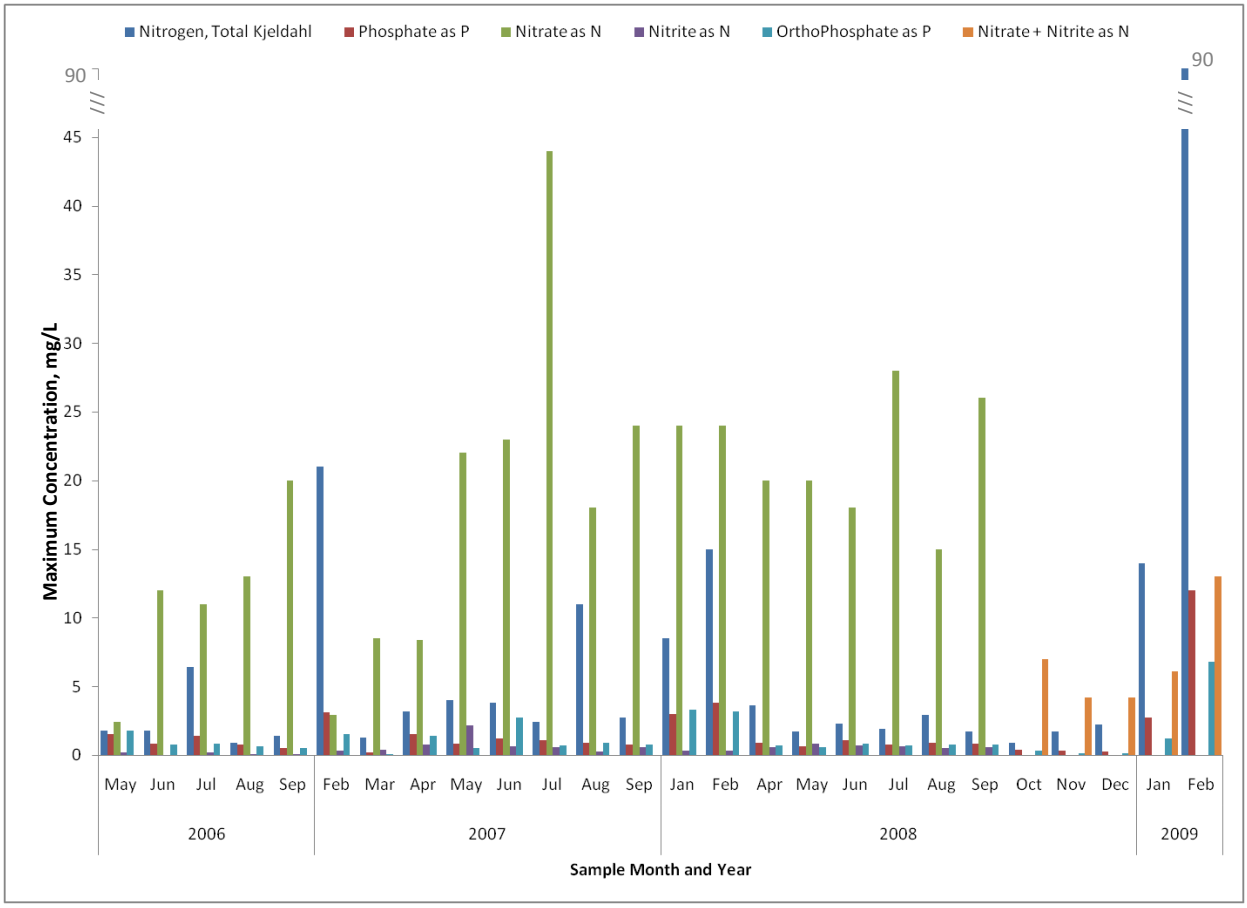
## 2) Omit sampling for Total Kjeldahl Nitrogen (TKN) and orthophosphate since these results do not aid in understanding sources of water quality issues nor are there any standards by which to compare the results to evaluate water quality

### Background

TKN is the nitrogen contained in organic material, both living cells and organic matter after death and is therefore comprised of both organic nitrogen and ionized ammonia. As such, TKN is a combination various types of nitrogen including ammonia, a parameter already measured by the Coalition.

By itself, TKN has no known adverse impacts on any surface waters; any adverse impacts come from the conversion of TKN to nitrate. In soils and surface waters, organic nitrogen is converted to ammonium and eventually nitrite and nitrate through microbial activity. The rate of conversion is dependent on several factors including loading of organic material, temperature, available microbial communities, pH, and available dissolved oxygen. In instances where TKN, $NO_2$ and $NO_3$ have been measured in water quality monitoring programs as diverse as the Elbow River in Alberta Canada (http://www.braggcreek.ca/PDF/ImpactsOnWaterQuality-UpperElbowRiver.pdf) and the Cobb River, Georgia (http://www.docstoc.com/docs/3624853/TREND-ANALYSIS-OF-WATER-QUALITY-MONITORING-DATA-FOR-COBB-COUNTY), the correlation between the concentrations of TKN are variable (e.g. high in Canada, low in Georgia) and undoubtedly depend on the variables listed above. Consequently, TKN cannot be used as measures of the process by which unionized ammonia and nitrate are generated, and the measures of unionized ammonia and nitrate are much better measures of water quality. Standards currently exist for both nitrate and unionized ammonia; none exist for TKN. As a result, TKN is a water quality parameter that is redundant with parameters already sampled by the Coalition, and provides little or no information on the sources of nitrogen to Coalition surface waters, or the limits on the process by which TKN is converted to $NO_3$. Maximum concentrations of nutrients including TKN, nitrate, nitrite and nitrate+nitrite are included in Figure 2.

**Figure 2. Maximum concentrations of nutrients (Total Kjeldahl Nitrogen, phosphate, nitrate, nitrite and orthophosphate) from 2006-2009.**




Total phosphorus is a measure that combines orthophosphate and particulate-bound phosphate. Orthophosphate is the form that is readily available to plants and depending on the concentration relative to nitrate, is usually taken up rapidly in aquatic systems. There are no water quality standards for any phosphate measure suggesting that the appropriate indicator of phosphorus is the measure that is the most ecologically relevant. Because orthophosphate can be rapidly taken up by plants, total phosphorus is generally considered to be the more stable in the environment and the form that is most informative when measured. When evaluating the Redfield ratio (the molecular ration of carbon, nitrogen and phosphorous), nitrogen and phosphorous can provide information about the limiting nutrient (either nitrogen or phosphorus) in aquatic systems. In the Coalition region, there is a significant correlation between orthophosphate and total phosphorus and measurements of total phosphorus capture the variability in orthophosphate (Figure 3 and 4). Consequently, orthophosphate is a less informative and redundant measure of phosphorus.

Figure 3. Linear regression of phosphate and organophosphate concentrations (all results).

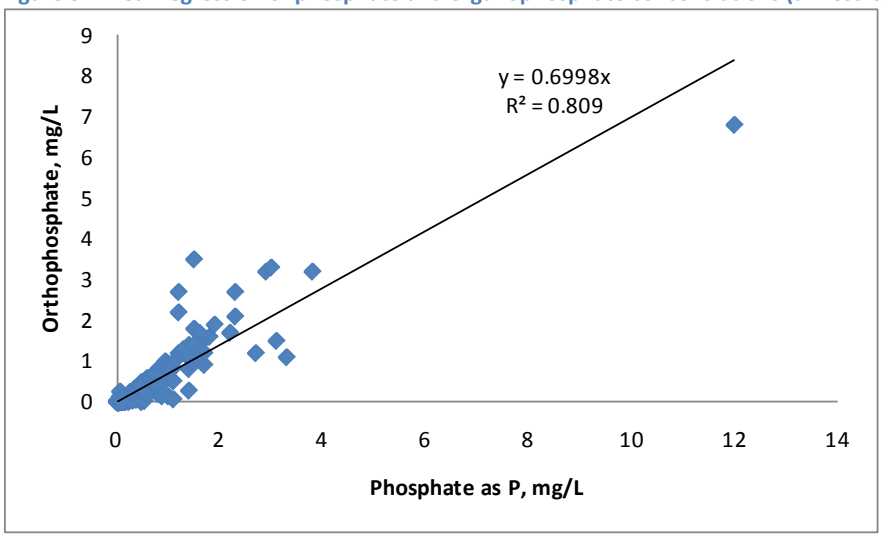
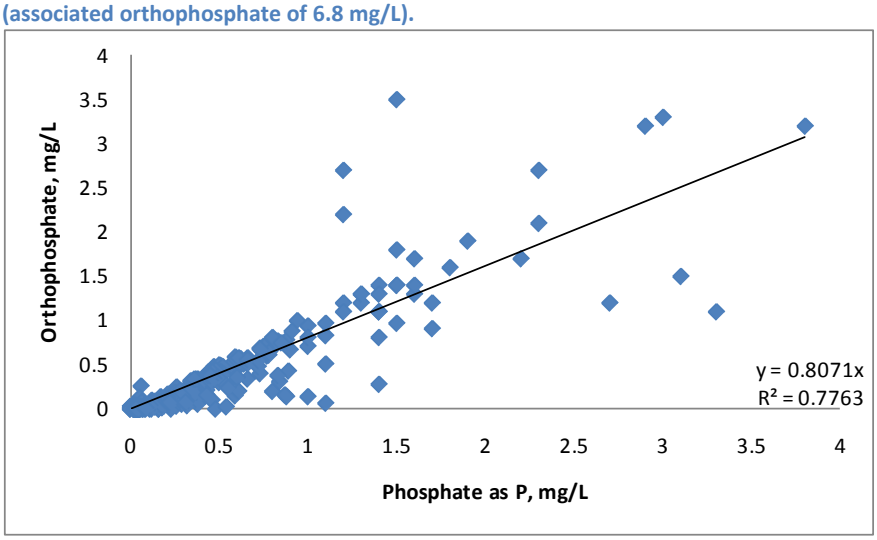



Figure 4. Linear regression of phosphate and organophosphate omitting an outlier point with a phosphate value of 12 mg/L (associated orthophosphate of 6.8 mg/L).




## Proposed MRPP Amendment (changes to monitoring)

At no time during the period of reporting TKN concentrations has the Regional Board ever commented on the concentrations, nor has TKN ever entered into discussions of water quality between Regional Board staff and the Coalition. Due to a lack of water quality trigger limits by which the Coalition can assess the effects of TKN on water quality and/or beneficial uses, and the current analyses being conducted for nitrogen (nitrate + nitrite) and ammonia (as N). As is the case with TKN, no measurement of phosphorus has ever entered into discussions of water quality between Regional Board staff and the Coalition and it appears the Coalition is collecting data on water quality parameters of no consequence. Total P could be used to calculate the

Redfield ratio involving N and P, and total P captures the variability in orthophosphate. Therefore, the Coalition is requesting to amend its MRPP omit sampling for TKN and orthophosphate since these results do not aid in understanding sources of water quality issues nor are there any standards by which to compare the results to evaluate water quality.

### Coalition Actions

Nutrients in surface waters are being addressed through the Central Valley Salinity Coalition implementation of Central Valley Salinity Alternatives Long-Term Sustainability (CV-SALTS). The Coalition has joined the CV-SALTS Executive Committee and is an active participant in its Technical Advisory Committee (TAC). The Coalition continues to conduct outreach with growers regarding nutrient management practices and will continue to participate in the CV-SALTS process.

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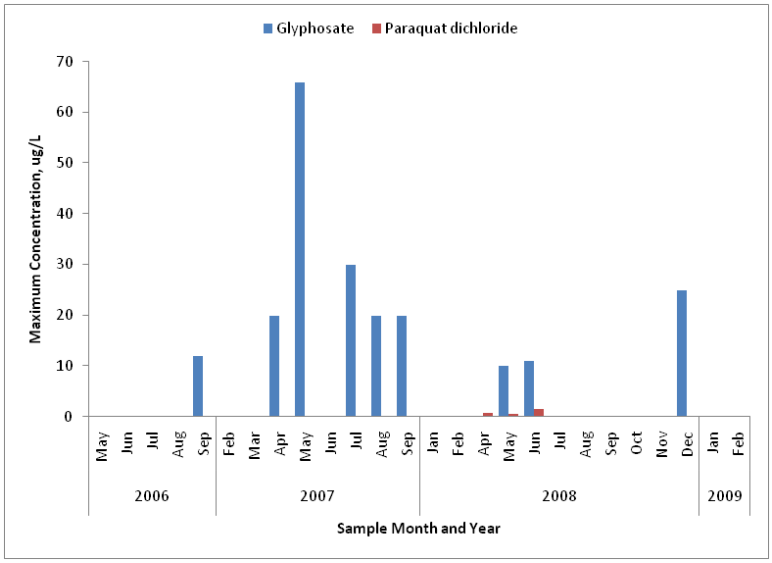
## 3) Reduce sampling for sediment bound chemicals (glyphosate and paraquat dichloride)

### Background

The current water quality trigger limits (WQTL) for glyphosate and paraquat dichloride are 700 and 3.2 µg/L respectively (Figure 5). Since 2006, the Coalition has not had a single exceedance of either WQTL. Glyphosate is a non-selective systematic herbicide and is most commonly associated with the product Roundup. Glyphosate may be found in products such as diammonium salt, isoproprylamine salt, monoammonium salt and potassium salt. Glyphosate has a high organic carbon partitioning coefficient ($K_{OC}$ = 24,000) and therefore binds readily to particulate matter. This explains why, although widely used in the Central Valley by agriculture, glyphosate was only detected in 14 of 403 samples (3.5%) with the highest concentration detected at 66 µg/L (approximately 1/10 of the WQTL) with an average concentration of 14.8 µg/L. Paraquat dichloride is one of the most commonly used herbicides and is effective in controlling annual and some perennial weeds. Paraquat has a high $K_{oc}$ (>100,000, Syngenta Crop Protection) and, like glyphosate, binds readily to suspended solids in the water column. Paraquat was detected in 4 of 403 samples (1%) with the highest concentration detected at 1.5 µg/L (approximately half of the WQTL) and an average concentration of 0.8 µg/L.

Figure 5. Maximum concentration of glyphosate and paraquat dichloride (2006-2009).



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### Proposed MRPP Amendment (changes to monitoring)

The Coalition is proposing to amend its MRPP to monitor for the sediment bound constituents glyphosate and paraquat dichloride twice a year during a high TSS storm event and irrigation event.

### Coalition Actions

The Coalition understands that agricultural use of both glyphosate and paraquat dichloride has the potential to degrade downstream beneficial uses for municipal and domestic supply and will therefore continue to educate growers about management practices that reduce irrigation and storm runoff including sediment discharges.

## 4) Reduce sampling for chelating metals that are not applied by agriculture including arsenic, cadmium, lead and molybdenum.

### Background

Of the metals listed only two have been in products used by agriculture: arsenic and lead. The most recent agricultural pesticide that contained arsenic was sodium cacodylate which was applied by agriculture for broadleaf weed control as well as a cotton defoliant. California Department of Pesticide Regulation records indicate no use of sodium cacodylate across the Coalition region for agricultural use between 1998 and 2007 (last year of available records) for agricultural use. Coalition pesticide use report analyses for reports obtained from the County Agricultural Commissioner also indicate no applications. Lead arsenate was used generally only until the 1960s and has been banned on all food crops since 1991.

There is currently no use of any of the following metals: arsenic, cadmium, lead and molybdenum. The Coalition recognizes that due to agricultural activities, sediment may be mobilized into surrounding surface waters. During this mobilization, metals that would normally be found only in soils may be re-suspended in the water column. The Coalition has monitored for arsenic, cadmium and lead within the Coalition area since 2006; by the end of 2008 the Coalition had monitored 29 different locations for total metals. In October 2008 the Coalition added molybdenum to the list.

## Arsenic, cadmium and lead

Figure 6. Maximum concentrations of arsenic, cadmium and lead (2006-2008).

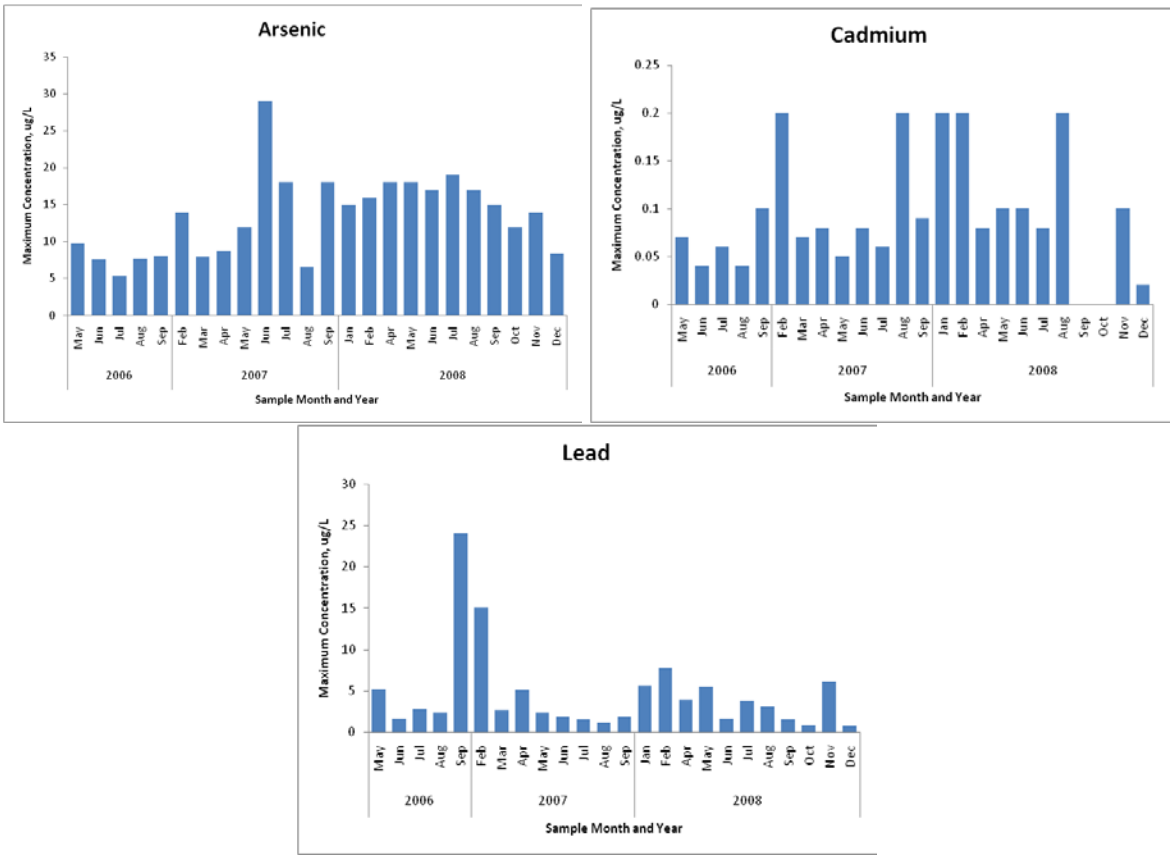
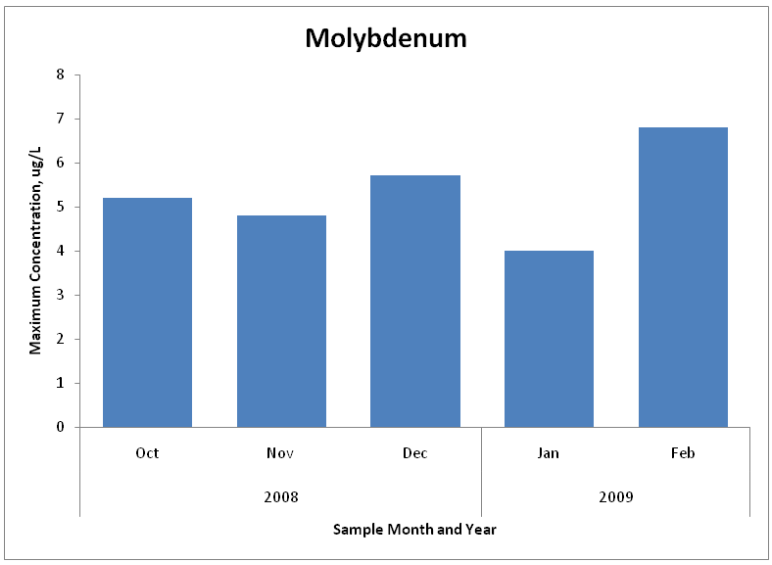



Figure 6 includes maximum concentrations of arsenic, cadmium and lead detected in surface waters sampled across the Coalition region. There is no association of metal concentration with high flows due to irrigation practices (June to August) or storm events (January to March) across years or metals. The Coalition has described other possible sources of metals in both its Semi-Annual Monitoring Reports and the ESJWQC Management Plan and it is difficult to use monitoring information to understand sources of these metals.

Sampling for molybdenum began in October 2008 at six assessment sites. The results for molybdenum in Figure 3 are the maximum concentrations detected at sites that were not dry from October 2008 to February 2009. Molybdenum is found naturally in soils and has never been used in agricultural practices. Molybdenum can be a byproduct in copper and tungsten mining and is used in alloys due to its ability to withstand high temperatures, resistance to corrosion, and weldability. In living organisms, molybdenum acts as a metal heteroatom and is present in various enzymes including aldehyde oxidase, sulfite oxidase and xanthine oxidase. Molybdenum can also be found in green beans, eggs, sunflower seeds, wheat flour, lentils and

cereal grains. In animal studies chronic ingestion of 10 mg/kg of molybdenum can cause diarrhea, growth retardation, sterility, low birth weight, and gout (http://en.wikipedia.org/wiki/Molybdenum, April 4, 2009). Maximum concentrations have varied from 4 to 6.8 µg/L from October to February. The Coalition will collect a single sample during an event of high TSS to analyze for molybdenum once a year and will continue to educate growers about sediment runoff issues.

Figure 7. Maximum concentrations of molybdenum (2008-2009).




## Proposed MRPP Amendment (changes to monitoring)

The Coalition is requesting to amend its MRPP to monitor for the metals arsenic, cadmium, lead and molybdenum twice a year during a high TSS storm event and a high TSS irrigation event. The Coalition believes that analyzing samples all year for TSS and monitoring for all metals during two high TSS events will give the Coalition enough information to inform growers of sediment associated water quality issues and educate growers about the management practices that can be used to reduce sediment runoff.

## Coalition Actions

The Coalition acknowledges that movement of suspended solids from fields into surface waters due to agricultural practices may lead to decreased water quality and will continue to educate growers about practices to mediate sediment runoff.