East San Joaquin
WATER QUALITY COALITION
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www.esjcoalition.org

July 22, 2020

Dr. Steve Weisberg, Facilitator
ESJWQC Expert Panel

Dear Dr. Weisberg,
On April 20, 2020, the East San Joaquin Water Quality Coalition (ESJWQC) received a request for clarification on two points made by the petitioners in their comments to the Expert Panel. According to the email, the Expert Panel requested the following:

1) **Interpretation of Figure 3:** Two additional pieces of information to help them interpret Figure 3 in ESJWQC_ExpertPanel_TechMemo_Documents_20_0403_FINAL.pdf:

   a) Please provide rainfall data for those years, and

   b) Identify any changes in management practices that occurred during those years that would help explain the reduction in peaks from 2007-2008.

2) **Core Site Selection**: The petitioners outlined (Toxicity and Site selection response from petittioners.pdf) criteria they would like used for core site selection. The Panel would like the growers to comment on the extent to which those criteria are the same or different from the ones they used for selecting the present sites. The Panel would also like a response to the petitioner data summary indicating that sites 1 and 4 have low percent fines, when the Panel understood one of the grower's criteria for site selection was a depositional environment.

Interpretation of Figure 3

The Coalition revised the Technical Memo to include rainfall data from rain stations in Merced, Madera, and Modesto from 2004 through the 2018 Water Year (Figure 3), as requested by the Panel.

The Panel also asked for the identification of management practices implemented in 2007 – 2008 that could explain the reduction in peaks. The Focused Outreach process, which is used to track changes in management practices, was not implemented until 2008. Significant decreases in exceedances of pesticides occurred after 2008 when the Coalition began implementing the management plan strategy, including targeting growers for Focused Outreach.

The Coalition updated the Technical Memo to include a summary of Focused Outreach from 2008 through the October 2019, including the targeted irrigated acreage and number of members targeted for each site subwatershed (Technical Memo, Table 9). Attachment B to the Technical Memo includes a detailed list of management practices implemented by growers from 2008 through 2010 based on survey results from the first set of site subwatershed Focused Outreach

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(Dry Creek @ Wellsford Rd, Highline Canal @ Hwy 99, and Prairie Flower Drain @ Crows Landing Rd).

Core Site Selection

Below is the ESJWQC's responses including information on Core sites and a comparison of the characteristics of Core sites to the petitioner's desired set of characteristics for Integrative sites, and the role of sediment grain size in determining sediment toxicity. Because there has been questions about the hydrology in the ESJWQC region, it is important to preface the comparison and responses with a description of the hydrologic setting in the ESJWQC region.

Core Site Characteristics

1. Only the major rivers contain water year around. The major rivers are the Stanislaus, Tuolumne, Merced, and the San Joaquin Rivers. These are controlled rivers meaning that they are dammed at several locations as they make their way west out of the Sierra's towards the Delta. The retention of a large pool of water behind the lowest rim dam allows slow release of water and continual flow during the year.
2. Natural waterbodies in the ESJWQC region are named either creek (e.g., Dry Creek, Owens Creek, Black Rascal Creek), slough (e.g., Duck Slough, Berenda Slough), or river (e.g., Chowchilla River, Fresno River). Natural waterbodies may drain to the San Joaquin River.
3. Other than the three major rivers, all other creeks, sloughs, and rivers have their headwaters in the lower or mid-elevation Sierra's and as a result, are ephemeral. There is no snowmelt that feeds these waterbodies, and flow is dependent on winter rains. The winter rainfall generates baseflow during the winter and spring. In dry winters, these waterbodies may be dry for all but a few days. In very wet winters they may support continual flow for several months. However, the creeks and sloughs become dry by early summer regardless of the amount of rainfall during the winter. The Chowchilla River and the Fresno River also become dry by early summer and thus they too are ephemeral.
4. The creeks and sloughs in the southern portion of the Coalition region (e.g., Madera County) do not drain to the San Joaquin River. All flow in these waterbodies drops into the sandy soil in the western portion of the Coalition region long before reaching the Chowchilla/Eastside Bypass, Bear Creek, and the San Joaquin River. Only under extraordinary circumstances (extreme rainfall events) is there sufficient flow to reach the San Joaquin River. In nearly 20 years of surface water monitoring in Madera County, the Coalition has not seen evidence of water from any of the waterbodies reaching the San Joaquin River.
5. All waterbodies named canal (e.g., Highline Canal), lateral (e.g., Howard Lateral), or drain (e.g., Prairie Flower Drain, Westport Drain) are constructed facilities that convey water from irrigation/water districts to growers for irrigation (canals and laterals) or drain shallow groundwater from elevated water tables (drains). Common in the western portion

of the Coalition region, these drains were constructed to lower the water table and allow farming to occur.

6. Further, natural waterbodies may be used as conveyance structures for irrigation supply water during the irrigation season because they are dry. Many natural waterbodies were modified many decades ago to facilitate the conveyance of irrigation water including straightening, building berms to constrain flow, and placing structures in the stream beds to restrict downstream flow (temporary impoundments).
7. Summer flow in all creeks, sloughs, small rivers, and canals are due to the conveyance of irrigation supply water and secondarily, to irrigation return flows. As such, flows are sporadic.
8. As surface water and groundwater become less available, Coalition members have increased their irrigation efficiency by installing pressurized irrigation systems. This change has virtually eliminated or greatly reduced irrigation return flows, further reducing flow in ephemeral waterways during the irrigation season.
9. In the mid-2000's, the Regional Water Board required that the Coalition identify every waterbody in the Coalition region followed by the identification of monitoring stations. The Coalition was required to include as many of these waterbodies as possible. Justification for the exclusion of any waterbodies from monitoring was required. Exclusions were granted for sites with limited or no access and flow through urban centers.

Table 1 below provides the petitioner's integrative site selection criteria and the characteristics of the Core sites.

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Table 1. Integrated site selection compared to ESJWQC Core site characteristics.

Petitioner's Integrative Site Selection Criteria	ESJWQC Core Sites
Stations will be located at the bottom of drainages that drain agricultural areas [cultivated by Coalition members] and had numerous exceedances of water quality benchmarks (WQBs; a catch-all term for thresholds, standards, objectives, etc.) in past monitoring years.	The Coalition selected its primary and secondary Core monitoring locations at the farthest downstream, accessible monitoring location in watersheds dominated by irrigated agriculture. An attempt was made to select sites in each watershed that had the least amount of urban/non-irrigated agriculture footprint. The term "numerous" is not defined by the Petitioners although each Core site has had numerous exceedances detected over the last 18 years. Primary Core sites are monitoring locations with a substantial history of monitoring and exceedances. Secondary Core sites were selected randomly from the remaining sites in a zone.
Stations will be located in natural stream segments that are considered Waters of the State.	Coalition Core monitoring sites are a mix of natural waterbodies (Canal Creek, Cottonwood Creek, Dry Creek at Church [Stanislaus County], Dry Creek @ Rd 18 [Madera County], Duck Slough, Merced River, Miles Creek), and canals, drains, and laterals (Highline Canal, Lateral 51/2, Prairie Flower Drain).

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Petitioner's Integrative Site Selection Criteria	ESJWQC Core Sites
These stream segments are expected to support beneficial uses protective of aquatic life (e.g., Warm Freshwater Habitat, Cold Freshwater Habitat, Spawning, Migration).	Depending on the location and characterization of the waterbody where the Core site is located, aquatic life beneficial uses may apply. The Central Valley Water Board interprets its tributary language to apply only to "tributary streams." Waterbodies that are constructed agricultural drains are not considered to be tributary streams. For example, the Harding Drain is considered to be a constructed agricultural drain and the Basin Plan's tributary language does not apply.[1] In the event that the constructed agricultural drain is considered a water of the United States, beneficial uses may be determined based on what are considered to be existing beneficial uses. For the Core sites, the following sites would be considered tributary streams subject to the tributary provisions of the Basin Plan. For the other Core sites, these would be considered constructed agricultural drains to which existing beneficial uses may apply if the drain is also considered a water of the U.S. In the 2019 water year, 14 sites classified as creek or river were monitored for constituents that could impair aquatic life beneficial uses, an additional 14 sites classified as drain or lateral were also monitored.
Stations will be located where the water is present year-round, and actual flow from upstream to downstream is observed often.	As explained above, most Core sites are dry periodically through the spring, fall, and winter when rainfall is sparse. The only site with permanent flow is the Merced River. Summer flow in all of these waterbodies is common although often a result of the conveyance of irrigation supply water.

[1] In the City of Turlock's previous NPDES permit from 2010, the Regional Board adopted the following language: "While flow in Harding Drain is tributary to the San Joaquin River, Harding Drain itself is a constructed agricultural drain. The Regional Water Board finds that Harding Drain is not a "stream" as used in the Basin Plan's tributary language, and as a constructed agricultural drain, Harding Drain is not subject to the tributary provisions of the Basin Plan." This rationale applies to all constructed agricultural drains within the Central Valley.

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Petitioner's Integrative Site Selection Criteria	ESJWQC Core Sites
Stations will be located where the flow energy is minimal, i.e., where deposition occurs, and fine sediment is present year-round.	All monitoring sites are located (or in the vicinity of) where fine sediment is collectable for sediment toxicity testing, organic carbon analysis, grain size analysis, and sediment chemical analyses. Grain size was included in the monitoring program starting in 2011. Grain size is collected specifically to demonstrate that sediments are sufficiently fine to trap contaminants. Sediment toxicity occurred at Core sites and management plans were put into place for three Core sites. Recent improvements in water and sediment quality resulted in the completion of all sediment toxicity management plans.
Stations will receive only water from the drainage upstream (including local culverts). For the purposes of irrigated agriculture discharge monitoring, there should be no inputs from major river basins.	Stations receive drainage from upstream. It is not clear what "no inputs from major river basins" means. Item f) of Attachment Two states "the Coalition's data included a number of comments that water was flowing upstream, particularly in Deadman Creek (Dutchman) @ Gurr Rd and in some of the laterals and drains." It is not clear if Dr. Katznelson believes that water is literally flowing back upstream against the gradient, or if the comment refers to water flowing in the waterbody at some location upstream of the monitoring location. No water is moved from outside of a drainage to inside with the intent of diluting contaminants in the water.

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In addition, the Petitioners made the following statement in Attachment Two, page 2:
2. The criteria used to select the current core sites are not known, however, I assume they have been summarized by the Coalition as follows:

-Natural waterbodies
-Permanent flow
-No irrigation conveyance structures
-No drainage from dairy or CFO operation, or from urban areas
-No drainage from Non-Coalition members

(Johnson, ML, 2020 presentation to Panel, Page 9, and other ESJ publications)

Coalition response:
The Coalition stated in the January 2020 presentations that although these were desired characteristics of Core sites, there are few locations available in the Coalition region where all the criteria can be achieved. Slide #10 (immediately following the Page 9 citation above) indicates that monitoring stations include waterbodies of all types. Although the Coalition does monitor the Merced River as a Core site, the Coalition was instructed by the RWB when the monitoring program was designed to avoid larger rivers due to the belief that greater flow volume would dilute any toxicity or chemical signal present in the water. The Merced River was approved due to the proximity of irrigated agriculture to the river, and exceedances at this site confirm that the signal is not diluted. There is no monitoring in the Tuolumne or Stanislaus Rivers and the only monitoring that occurs in the San Joaquin River is for compliance with the Diazinon and Chlorpyrifos Total Maximum Daily Load (TMDL) requirements.
There are few watersheds that only have irrigated agriculture. Therefore, to capture as many waterbodies as possible in the monitoring program, the Coalition monitors in watersheds with dairies and non-coalition members. Urban inputs are minimized but some urban stormwater may reach some monitored waterbodies.

Sediment grain size and sediment toxicity

Petitioner statement:
Sediment is an essential component of effects-integration – in other words, that is where accumulation happens. Fine sediments (<0.075mm) hold much more adsorbed pollutants per weight, due to larger surface are per weight ratio. Looking at the particle size distributions in the Coalition's sediment data showed several Core stations with meager amount of fines and stations with inconsistent composition over time (see Table 1). [General comment – please see Revital's thoughts on analytical deficiencies regarding sediment monitoring (Katznelson 2017).] Solution: implement the SWAMP protocol in which the operators specifically seek areas of fine sediments and target those for collection. If the streambed at the Station has been scoured to gravel or to a bare concrete channel, they should move upstream or downstream to find fine sediments (and record the location). If the entire segment is scoured, discontinue monitoring sediment at that Station and select another integrative site.

Coalition response:
For every watershed, the Coalition samples the farthest accessible downstream site in the drainage that retains the largest upstream production agriculture footprint. If sediment cannot be

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collected at the monitoring station, the samplers move upstream/downstream until they can find an area with sufficient deposition to have accumulated sediment. However, they can only move a few hundred meters and still associate the sediment sample with the rest of the samples collected at the site. Therefore, the Coalition identifies the best location to collect sediment and there is an effort to keep the particle size as small as possible. Although the Coalition attempts to find depositional areas at, or in the vicinity of the monitoring location, monitoring sites are not selected based solely on being a sediment depositional area.

The Coalition understands that hydrophobic chemicals, e.g., pyrethroids, tend to bind to fines in the sediment. Fine sediments with substantial organic carbon content can reduce the availability of hydrophobic chemicals, reducing the toxicity in the sediment. When the survival of *Hyalella azteca* in the sample is less than 80% of the control, the Coalition is required to have the sediment analyzed for a series of pyrethroids and chlorpyrifos. Using standard LC50s for sediment developed by Amweg et al. (2005[2]), the Coalition can account for the reduced survival using the concentration of pyrethroids/chlorpyrifos in the sediment.

The Coalition has been collecting grain size data since 2011. The Coalition also collects Total Organic Carbon (TOC) for every sample. Since 2011, there have been only 6 toxic samples of the 109 samples collected at the Core sites. In general, sediment toxicity is quite low at 5.5% of Core site samples collected. For all sites, the percentage of toxic samples is 5.9% (12 toxic samples out of 203 collected since 2011). The question is whether the low percentage of toxic samples is a result of selecting sites without fine sediments or if management practices implemented to reduce the movement of contaminated sediment from fields to surface waters are successful.

If the petitioner’s premise about fine sediment being linked to increased toxicity is correct, there should be a positive relationship between sediment grain size and *Hyalella* survival, with increasing sediment grain size generating increased survival. Conversely, smaller grain size should result in lower survival as the smaller sediments hold a greater amount of chemicals such as pyrethroids.

Grain size data are provided in the form of percentages of the sample falling into different grain size categories (ranges of grain sizes). The Coalition looked for a relationship between percentage of the sediment sample in grain size categories smaller than 0.075 mm (the size indicated in the petitioner’s statement as being small enough to capture chemicals) and survival of *Hyalella* to determine if larger particles lead to elevated survival, and vice versa. Several analyses were performed on data from Core sites alone, and data from all sites (Core and Represented combined).

Core sites

The Coalition performed single regressions of the sum of the percentage of sediment greater than 0.075 mm and survival, and the sum of the percentages of particles less than 0.075 mm and survival. Neither regression was significant indicating that, for Core sites, there is no relationship

[2] Amweg, E. L., D. P. Weston, and N. M. Ureda. 2005. Use and toxicity of pyrethroids in the Central Valley, California, USA. Environmental Toxicology and Chemistry 24(4):966-972. Erratum 24(5):1300-1.

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between sediment size and survival. The Coalition performed a multiple linear regression using each grain size category as an independent variable and *Hyalella* survival as the dependent variable. Again, none of the sediment size categories showed any association with *Hyalella* survival. There is no association between TOC and *Hyalella* survival whether singularly, or in combination with sediment grain size.

The Coalition further divided *Hyalella* survival into two categories, below 80%, and 80% and higher. Logistic regressions were performed using sediment grain size and TOC, but again, no analyses resulted in a significant relationship. There is no relationship between sediment grain size, TOC, and survival of *Hyalella* at Core sites (**Figure 1** and **Figure 2**).

All sites

The same regression and logistic regression analyses were performed using data from all sites (Represented and Core). No significant relationship was found between any measure of grain size, TOC, and *Hyalella* survival using either the linear/multiple linear regressions or the logistic regressions.

These analyses raise the question of what does significantly influence toxicity in the sediment. When sediments are analyzed for the presence of pyrethroids (survival less than 80% of the control), inevitably there are sufficient pyrethroids and/or chlorpyrifos in the sediment to account for the level of toxicity. There are also samples with fine grained sediments that are not toxic to *Hyalella*, and samples with a higher percentage of large grain sizes that are toxic to *Hyalella*. For example, a sample collected at Dry Creek at Wellsford Rd in 2011 was toxic to *Hyalella* although sediments larger than 0.075 mm accounted for just under 93% of the sediments in that sample. Even at only 7% of the sample, there is enough fine sediment to bind to the pyrethroids and chlorpyrifos and cause toxicity. Conversely, there are samples with 97% fines and no toxicity; therefore, even when there are a greater proportion of fine sediments in the sample, the fine sediments do not automatically contain pyrethroids.

The conclusion from these analyses is that the Coalition is selecting sites with sufficient fine sediment to result in toxicity provided those sediments contain pyrethroids. The low percentage of toxic samples since 2011 indicate that members are managing their sediment discharges and pyrethroid applications that can cause toxicity. It is not a function of testing of samples with an inadequate amount of fine sediment.

Submitted respectfully,

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Figures

Figure 1. ***Hyalella azteca*** **percent survival and sediment grain size (percent fines) regression analysis.**

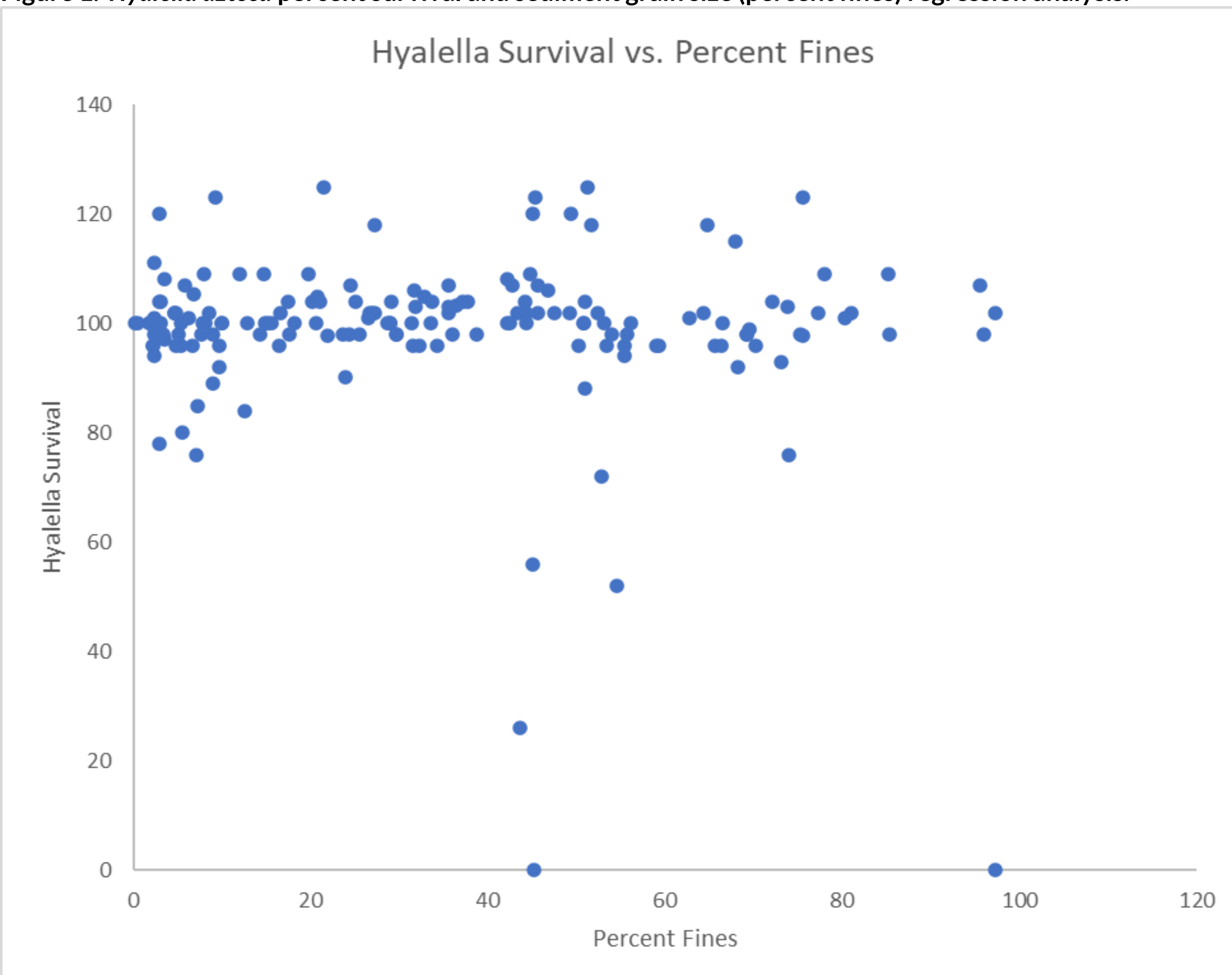

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Figure 2. ***Hyalella azteca*** **percent survival and TOC regression analysis.**