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CEP Urban Creeks Monitoring Plan, 2005-06

Prepared by:
Armand Ruby
Armand Ruby Consulting

In cooperation with the Diazinon/Toxicity Work Group
of the Clean Estuary Partnership

Prepared for:
Clean Estuary Partnership

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PURPOSE AND OBJECTIVES

The purpose of this monitoring plan is to provide support for the adaptive implementation of the *Diazinon and Pesticide-Related Toxicity in Urban Creeks Water Quality Attainment Strategy and Total Maximum Daily Load* ("the WQAS"; Johnson, 2005). The WQAS Implementation Plan includes the following proposed urban creek monitoring requirements (see Johnson, 2005, Section 11, 'Monitoring and Adaptive Management'):

- *Program Design*: Urban runoff management agencies in the Bay Area must design and implement a monitoring program and describe it in a monitoring plan.
- *Watershed Characterization*: The monitoring plan must include characterization of the Bay Area's urban creek watersheds and selection of representative creeks for monitoring. The selected creeks must represent the various regions of the Bay Area and allow the Water Board to extrapolate the monitoring results to urban creeks not selected for monitoring.
- *Site Selection and Sample Collection*: Sampling sites must be identified for the selected creeks; these sites must represent the essential range of creek conditions, including conditions near storm drain outfalls. Sampling must be conducted during storms that produce substantial runoff, and during the dry season.
- *Analytical Tests*: The chemical analysis and toxicity tests to be performed must be specified in the monitoring plan; these tests must include measurement of water column toxicity, sediment toxicity, diazinon concentrations in water, concentrations of other pesticides that pose potential water quality threats in water or sediment, general water quality parameters, and, and other tests as necessary and feasible.

These proposed WQAS implementation requirements are addressed in this monitoring plan. The design of the monitoring plan was guided by direction and input received from the Diazinon/Toxicity Work Group ("work group") of the Clean Estuary Partnership (CEP). Funding for production of the monitoring plan is provided by the CEP.

The 2005-06 monitoring plan updates the *CEP Urban Creeks Monitoring Plan* for 2004-05 (Ruby, 2004).

Goal of this Monitoring Plan

The overall goal of the monitoring plan is to support adaptive management of diazinon and pesticide-related toxicity in Bay Area urban creeks in accordance with the WQAS. The monitoring plan is designed to be adaptable and flexible in response to development of new information, including new methods for sampling and analysis of pesticides, as well as to changing environmental conditions, especially those pertaining to spatial and temporal patterns of pesticide use. This flexible approach provides the means to implement an adaptable monitoring program that can evolve to address changing conditions in Bay Area urban creeks. The intent is to generate monitoring data that can effectively support an assessment of the implementation of the WQAS, and contribute to adaptive management of creek water quality.

Monitoring/Management Questions

The WQAS contains the following proposed monitoring/management questions that "monitoring must seek to answer" (Johnson, 2005, Section 11):

A. Is the diazinon concentration target being met?

B. Are the toxicity targets being met?

C. Is toxicity observed in urban creeks caused by a pesticide?

D. Is urban runoff the source of any observed toxicity in urban creeks?

E. How does observed pesticide-related toxicity in urban creeks (or pesticide concentrations contributing to such toxicity) vary in time and magnitude across urban creek watersheds?

The WQAS includes additional questions if toxicity is found: "What types of pest control practices contribute to such toxicity? Are actions already being taken to reduce pesticide discharges sufficient to meet the targets, and if not, what should be done differently?" To adequately address these questions, integrated analysis and interpretation of region-wide pesticide use and monitoring data will be necessary.

This monitoring plan establishes a process through which monitoring data can be used effectively in adaptive management, as the monitoring is designed to directly address the questions delineated in the WQAS (shown above). The WQAS monitoring questions are sequential in nature, with one question leading to another. The monitoring activities will be adjusted as needed to provide answers to these questions in stepwise, logical order. This approach provides for efficient use of monitoring resources, as the monitoring effort is adaptively focused on specific monitoring/management questions.

Overview of Approach

The planned monitoring locations and preferred methods for sample collection, analysis, and related procedures are specified in this monitoring plan.

Monitoring of Bay Area urban creeks was performed during 2004-05 through the coordinated efforts of local agencies, following the 2004-05 *CEP Urban Creeks Monitoring Plan*. The monitoring data generated in 2004-05 by the CEP and other monitoring programs were used to revise the monitoring plan for 2005-06. The 2004-05 data provide important indicators of levels of diazinon and related toxicity in Bay Area urban creeks, as the federal phase-out of diazinon uses is implemented (Ruby, 2005).

The monitoring plan addresses the proposed WQAS monitoring questions as follows:

A. *Is the diazinon concentration target being met?*

Water chemistry monitoring will be conducted in urban creeks to address this question. Historically, dry weather runoff concentration data have been substantially lower than wet weather runoff data; therefore wet weather (storm-event-based) monitoring is used as

the primary screening tool, accompanied by some lesser degree of dry weather runoff monitoring.

B. *Are the toxicity targets being met?*

Toxicity testing of creek waters and sediments will be used as the preliminary means to address this question. Standard tests for acute and chronic toxicity will be employed, with modifications as deemed necessary.

C. *Is toxicity observed in urban creeks caused by a pesticide?*

This question assumes that toxicity to test organisms is observed, and corroborating analysis is needed to determine whether one or more pesticides is the cause of the observed toxicity. The question will be addressed principally through two means: correlating water chemistry data with toxicity test results, and performing TIEs (as necessary and as technically feasible). TIEs will be performed as feasible if toxicity is observed, and if diazinon does not appear to be the cause of the observed toxicity. [If the diazinon concentration in a toxic sample is higher than about 350 ng/l, then a TIE is probably unnecessary.] If diazinon does not appear to be the cause of the observed toxicity, additional water chemistry analysis will likely be necessary.

D. *Is urban runoff the source of any observed toxicity in urban creeks?*

This question assumes that toxicity to test organisms is observed, and corroborating evidence indicates that the toxicity is caused by one or more pesticides. Further investigation is needed to determine whether urban runoff is the source of the toxicant(s).

E. *How does observed pesticide-related toxicity in urban creeks (or pesticide concentrations contributing to such toxicity) vary in time and magnitude across urban creek watersheds?*

This question assumes that a pesticide other than diazinon has been identified as a toxicant in urban creeks through correlation of concentration data with toxicity test results, or that a pesticide toxicant has been identified through a TIE. Additional water chemistry monitoring and/or toxicity testing and/or TIEs presumably would then be needed to define the spatial and temporal distribution of the toxicant and provide answers to this complex question. This follow-up testing is contingent upon demonstrated failures of the creeks to meet the toxicity targets due to pesticide contamination, and would not likely become part of the monitoring plan until at least 2006-07.

It is anticipated that the monitoring plan will evolve to address these questions as needed, in a stepwise fashion.

Water Board staff are currently engaged in development of new NPDES permit monitoring requirements for Bay Area urban runoff management agencies on a regional, watershed basis. An effort has been made to coordinate development and implementation of this monitoring plan with the development of the new regional permit requirements.

Objectives

The following objectives are established for 2005-06 to address the proposed WQAS monitoring/management questions described above:

For monitoring question "A": *Is the diazinon concentration target being met?*

- Conduct monitoring for diazinon in representative urban creeks throughout the Bay Area; analyze the monitoring data to determine whether the proposed diazinon targets are exceeded, and if so with what frequency and over what geographic distribution.

For monitoring question "B": *Are the toxicity targets being met?*

- Conduct acute and chronic toxicity testing of water and sediment in representative urban creeks throughout the Bay Area; analyze the data to determine whether the toxicity targets are exceeded, and if so with what frequency and over what geographic distribution.

For monitoring question "C": *Is toxicity observed in urban creeks caused by a pesticide?*

- Correlate diazinon and toxicity data to determine whether diazinon appears to be responsible for any observed toxicity in urban creeks.
- If the correlations prove inconclusive, conduct additional chemical analysis and/or TIEs on samples exhibiting toxicity.
- Assess water quality monitoring and toxicity testing data to determine whether a pesticide other than diazinon is responsible for any observed toxicity in urban creeks.

For monitoring question "D": *Is urban runoff the source of any observed toxicity in urban creeks?*

- Assess known urban pesticide uses/practices and/or conduct additional upstream and/or outfall monitoring; modify monitoring plan as necessary.

For monitoring question "E": *How does observed pesticide-related toxicity in urban creeks (or pesticide concentrations contributing to such toxicity) vary in time and magnitude across urban creek watersheds?*

- Modify the monitoring plan as necessary (to be determined).

Some local stormwater management agencies perform routine monitoring of Bay Area urban creeks. The ongoing Surface Water Ambient Monitoring Program (SWAMP) also undertakes monitoring annually that includes Bay Area urban creeks. PRISM grants and other research projects also involve creek monitoring. The data produced by these other monitoring activities are incorporated when feasible with analysis of data produced according to this monitoring plan in addressing the WQAS monitoring questions.

Elements of the 2005-06 Urban Creeks Monitoring Program

The following activities are planned for the 2005-06 monitoring year:

1. Coordinate monitoring planning among local agencies and/or engage volunteers and/or retain consultant(s) to establish a monitoring management structure, designate standard protocols, and perform monitoring.
2. Conduct monitoring of the selected representative urban creeks based upon the recommendations derived from the 2004-05 monitoring.
3. Compile and analyze the 2005-06 monitoring data, in accordance with the WQAS monitoring questions and monitoring program objectives as outlined above.
4. Track/assimilate results of research and studies related to pesticide use in urban watersheds, concentrations of pesticides in urban creek waters and sediments, and effects of pesticides on water and sediment quality and aquatic life.[1]
5. Develop recommendations for monitoring during 2006-07.
6. Refine the urban creeks monitoring plan as needed.

Analysis of the 2004-05 Bay Area urban creeks diazinon monitoring data indicates that the diazinon concentration target is being met, according to the assessment methodology developed by the CEP's Diazinon/Toxicity Work Group (Ruby, 2005). Additional measurements of diazinon concentrations over two more years are needed to provide additional confirmatory evidence, per the Work Group's assessment methodology. Malathion, another OP pesticide, was frequently detected in the 2004-05 monitoring, and should be added to the analytical list for creek water samples in 2005-06.

Analysis of the 2004-05 urban creeks toxicity testing data was less conclusive, as over 25% of creek water samples tested were toxic to one or more test species (Ruby, 2005). However, corresponding water chemistry data did not provide conclusive evidence as to whether the observed toxicity was due to pesticides or some other cause. Additional monitoring, including chemical analysis and TIEs where feasible, is included in the 2005-06 monitoring plan to address the cause(s) of the observed toxicity.

Recent studies of northern California urban creek sediments have placed an increased emphasis on the importance of sediment chemistry and toxicity testing (Amweg and Weston, 2005; Amweg and You, 2005, Weston et al., 2005); relevant activities are therefore included in the 2005-06 urban creeks monitoring plan.

A schematic of the key elements of the urban creeks monitoring program in support of the WQAS is shown in Figure 1, covering both 2004-05 and 2005-06.

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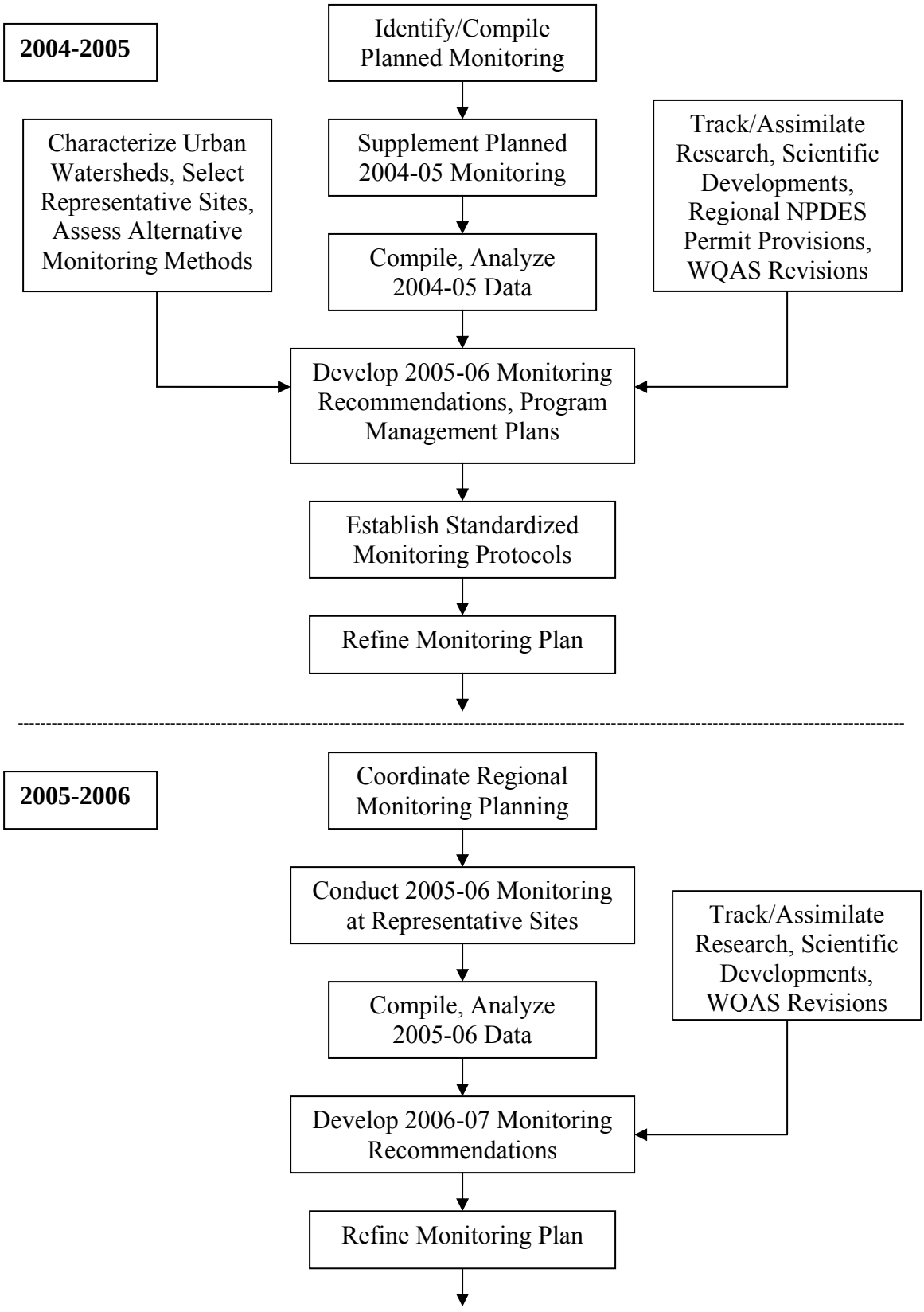
[1] Ongoing scientific research and studies are expected to provide additional information on the occurrence and effects of pesticides in aquatic environments, as well as improved methodologies for monitoring of pesticides in water and sediment. Through March, 2007, the function of tracking and assimilating the results of these studies will be accomplished largely by the Urban Pesticide Pollution Prevention (UP3) project. The monitoring plan activity therefore covers interpretation and integration of this information with local monitoring data to update/revise the monitoring plan.

Figure 1. Schematic of Key Monitoring Program Elements



MONITORING LOCATIONS

The following representative long term monitoring locations were identified by the CEP's Diazinon/Toxicity Work Group (organized by county, clockwise around the Bay Area beginning with Marin County):

- **Marin County: Corte Madera Creek** at Sir Francis Drake Blvd./Lagunitas Rd., behind the City of Ross Fire Dept.
- **Solano County: Blue Rock Springs Creek** at Admiral Callaghan La., at Avery Greene culvert in Vallejo
- **Contra Costa County: Rheem Creek** at Giant Rd., City of Richmond
- **Alameda County: Castro Valley Creek** at ACCWP Site "S3", by footbridge off N. 3rd St. behind Hayward senior center, at the USGS gauging station
- **Santa Clara County: Calabazas Creek** at Lakeside Dr. in Sunnyvale (on border with Santa Clara)
- **Santa Clara/San Mateo Counties: San Francisquito Creek** at Newell Rd. in Palo Alto
- **San Mateo County: Laurel Creek** at Laurie Meadows Park, off Casanova Dr. in the City of San Mateo

This list does not include a selected creek for each Bay Area county, as an appropriate creek could not be identified in San Francisco, Sonoma or Napa Counties. For a detailed description of the selection criteria and process used in selecting the creeks listed above, as well as the pertinent watershed characteristics, see the relevant Memorandum to the Diazinon/Toxicity Work Group (Appendix C in Ruby, 2005).

MONITORING FREQUENCY AND TIMING

Creek Water Samples

For 2005-06 and subsequent years, the minimum expected frequency and timing of creek water monitoring at the selected representative sites is as follows:

- at least one wet season storm that produces substantial runoff, and
- dry weather when creek flows have declined (but before they go dry).

NOTE: Because of limitations on the availability of aquatic bioassay test organisms, sample collection should not be completed between the hours of 4:00 PM Saturday afternoon and midnight Sunday evening, to ensure that test organisms will be available within the 36 hour toxicity sample holding time.

An effort should be made over time to collect samples within a representative range of hydrological/seasonal conditions within the broad seasonal categories prescribed above.

Sediment Samples

Sediment samples should be collected a minimum of once annually, during dry season conditions, after sediments have stabilized following the wet season.

MONITORING PREPARATION

Pre-season Maintenance/Preparation

The following activities should be undertaken prior to the beginning of the monitoring season:

- Inspect and prepare the area of the site to ensure safe access
- Pre-clean tubing, strainers, and composite containers
- Install clean sampler tubing and strainers
- Check the functions and performance of automated equipment (if used), including calibration and testing
- Check and replace field crew equipment as needed
- Make arrangements with analytical/testing laboratories

These items are further described below.

Site Inspection

Safety and security should be generally assessed by checking monitoring sites for damage to equipment or nearby structures, and for the presence of discarded items, fallen tree limbs, etc. Any impediments to safe access should be cleared, making use of appropriate equipment or personnel as needed. Field crews should not attempt to clear items that can not be moved safely and easily. Site access should be cleared by cutting back or removing weed growth as needed.

Bottle and Tubing Cleaning

Composite sample bottles, automated sampler tubing, and intake strainers must be pre-cleaned in the laboratory so as to minimize potential contamination.

Tubing/Strainer Replacement

At least annually (prior to the beginning of the wet season), the Teflon suction tubing, flexible pump tubing, and strainer should be removed from all automated sampler installations, inspected for damage, and laboratory cleaned or replaced with new tubing. The tubing and strainer are then reinstalled using clean techniques. Tubing also should be inspected prior to each monitoring event and changed as needed throughout the year.

Automated Equipment Function and Calibration

Annually, typically in conjunction with the tubing and strainer replacement, additional maintenance should be performed at automated sampling installations. In addition to site access inspections and tubing replacement, these activities normally include:

- inspection of all conduit and electrical connections;
- collection of equipment blank samples (see discussion in QA/QC section);
- replacement of internal memory batteries in all components;
- installation of new desiccant packs in sampler and flow meter (if present);
- calibration and testing of the sampler, flow meter, rain gauge, and field-measurement probes (if present; per manufacturers' directions).

Field Equipment Preparation

The field crew should maintain a checklist of all equipment and supplies needed in the field. This should include a field kit containing an assortment of tools and supplies commonly needed during maintenance and monitoring event site visits. The field kit is commonly assembled in a sturdy tool box with a handy carrying handle. Annually, the field crew should inventory field equipment and replace items as necessary.

Lab Arrangements

Prior to the beginning of the monitoring year, arrangements should be made with the analytical and testing laboratories for the planned chemical and toxicity tests. Labs should be notified of the numbers and types of samples expected, the required reporting limits and holding times, the expected lab data turn-around times, and any special arrangements, such as provisions for weekend sample delivery or test initiation.

Support activities that will be provided by the labs should be discussed, including provision of sample containers and coolers, and cleaning of tubing, strainers and composite containers. If a lab will be expected to combine multiple composite sample containers, break down composite samples, or ship samples to another lab, arrangements for those activities also should be made in advance.

Pre-Event Preparation

Pre-event activities include placing a bottle order, preparing bottle labels, checking field kit and field equipment lists, purchasing ice, programming the automated equipment, and performing on-site monitoring station preparation.

Event-Specific Sample Schedule

For coordinated monitoring involving multiple sites, a one-page, event-specific list of samples to be collected at each site should be prepared prior to each monitoring event. The list should cover all field samples, including the QA/QC samples planned for each site per the QA/QC sample schedule (see QA/QC section). This list can be used prior to the event to prepare the bottle order, prepare all necessary bottle labels, and guide field

personnel in automated sampler programming. After sample collection, the list can guide monitoring personnel in composite sample breakdown and sample distribution.

Bottle Order

Before each monitoring event, bottle orders are placed with the analytical laboratories. Bottles are ordered for all planned samples, including composite carboys, composite sample breakdown bottles, grab sample bottles, and additional bottles needed for quality control samples (see QA/QC section). The bottle order should also include blank water for the collection of required field blank samples (see QA/QC section). The bottles must be the proper size and material, and contain preservatives as appropriate for the specified laboratory analytical methods. Composite bottles must be pre-cleaned.

Extra bottles should be ordered in case of accidental breakage, contamination, or loss. Field crews must inventory sample bottles upon receipt from the laboratory to ensure that adequate bottles have been provided to account for the analytical requirements of all composite and grab samples.

Bottle Labels

All sample bottles should be pre-labeled to the extent possible before each monitoring event. Pre-labeling sample bottles simplifies field activities, leaving only date, time, sample number, and sampling personnel names to be filled out in the field. Each bottle label should include the following information:

- Project Name
- Site ID, Site Name
- Date and Time
- Sample Type (grab or composite)
- Bottle __ of __ (for multi-bottle samples)
- Sample Collected by
- Preservative (if any)
- Analysis Requested

Bottles should be labeled in a dry environment prior to field crew mobilization. Labels should be applied to sample bottles before filling, as labels usually do not adhere to wet bottles. The labels should be applied to the bottles rather than to the caps.

Water-proof bottle labels are available pre-printed with space to pre-label by hand writing or typing. Custom bottle labels may be produced using blank water-proof labels and label printing software. Computer label printing programs can save a great deal of time in generating bottle labels. The sites and analytical constituent information can be entered in the computer program in advance, and printed as needed prior to each monitoring event.

Field Equipment Inventory

The field crew should inventory field equipment and replace items as necessary prior to monitoring. The field crew should specifically verify that sample bottles, bottle labels, and adequate bottles for the planned QA/QC samples are on hand. The field crew also should verify that an appropriate vehicle is available for use prior to monitoring events.

Pre-Monitoring Event Automated Station Preparation

When a monitoring event is imminent (usually within 24 hours) the following activities should be performed by the field crew at automated monitoring stations:

- Check electrical and sample tubing connections.
- Check pump tubing for wear. Replace if necessary.
- Check moisture indicators in sampler and flow meter.
- Verify that clean composite bottle is installed, with tubing in place.
- Add ice to non-refrigerated composite samplers.
- Visually inspect intake. Clear debris if necessary.

Ice

If sample collection is conducted at a site without a refrigerated sampler, or if grab samples are required, the field crew will need to obtain ice (for sample preservation) on the way to the sampling site. Composite sample bottles are required to be kept in a refrigerated sampler, or surrounded with ice during sample collection. Ice for grab samples should be kept in ice chests where full grab sample bottles will be placed. Keeping ice in double zip-lock bags facilitates clean and easy ice handling.

> ***NOTE:*** *Refreezable ice packets are not recommended as they are susceptible to leakage.*

Weather Tracking/Communications

For storm-based monitoring events, the field crew will need to be appraised of pending weather conditions, and notified as to when the onset is precipitation is expected. This process can be facilitated by assigning responsibility for weather tracking to a specific individual, and providing a telephone tree for notification of impending rainfall and the need for field crew mobilization.

Laboratory Notification

The toxicity laboratory should be notified as early as possible prior to each sampling event so that the lab can ensure that adequate stocks of test organisms are available. The laboratory must be notified at least 24 hours prior to the completion of a monitoring event. Test organisms cannot be ordered on Saturday or Sunday, so the lab must be notified by Friday morning of the need for delivery of organisms on Saturday. Because of the short (36 hour) holding time for toxicity testing, arrangements may also need to be made for weekend lab staffing.

SAMPLE COLLECTION

Creek Water Sampling Techniques

Methods for collection of water samples for pyrethroids analysis are under development; appropriate techniques may be forthcoming from ongoing PRISM grant-funded research.

Creek water samples should be collected as ***time-based composite samples*** unless logistical or safety considerations prevent composite sample collection. For storm event-based samples, this should involve composite collection through the duration of runoff, to an upper limit of 24 hours. For such events, sample collection is initiated at the point when runoff from the surrounding landscape begins to affect the creek level, and is terminated after rainfall has ceased and creek flow has returned to near pre-storm levels.

For dry weather samples, composite collection should extend for a minimum duration of four hours and a maximum duration of 24 hours. The 24 hour period is preferable so as to capture the full diurnal fluctuation in creek quality, but may only be practical when unattended automated samplers are employed.

Composite samples should involve collection of a minimum of one aliquot per hour. The sampling frequency may be selected based on the expected duration of a storm event; up to three aliquots per hour for a shorter event (less than 8 hours) and fewer aliquots per hour for a longer event (over 12 hours).

Composite sample aliquot size should be set at not less than 500 mL. This volume can generally be reliably collected by automated samplers, and is amenable to hand collection of aliquots as well. The aliquot size should be determined based on the expected duration of the monitoring event and the total required sample volume (see Composite Sample Containers/Sample Volumes, below).

SAMPLE TIMING NOTE: Samples should not be collected such that the completion of composite sampling would occur between the hours of 4:00 PM Saturday and 12:00 AM Monday (midnight Sunday), due to the 36 hour holding time for toxicity tests and restrictions in the availability of aquatic bioassay test organisms.

Composite sample collection for OP pesticides may be accomplished in one of three ways: with automated sampling equipment, by use of a portable peristaltic pump sampler, or by hand collection of composite aliquots. These options are briefly discussed below.

Automated Sampler

Flexible tubing is installed within the autosampler's peristaltic pump; at one end this tube empties into the composite container; at the other end it connects to Teflon sample tubing that runs from the sampler to the creek. The sample intake end of the Teflon tubing is fitted with a strainer and placed on or near the creek bottom. The sampler is programmed to collect a 500 mL or larger aliquot as discussed above. If the sampler is connected to a

flow meter or stream level gauge, the sampler may be programmed to commence sampling automatically upon detecting a rise in creek level. Otherwise, sampling may be initiated by manually starting the time-based sample collection program.

Portable Peristaltic Sample Pump

The portable pump is outfitted with flexible tubing and Teflon tubing with strainer as described above. The portable pump/tubing assembly is brought to the sampling location and the Teflon tubing with strainer lowered into the creek for each aliquot. The pump is manually turned on and sample pumping occurs until the 500 mL aliquot has been obtained. A Pyrex measuring cup or beaker may be used to measure the aliquot; if this is done, the measuring cup should be kept in a zip-lock style plastic bag between aliquots. The aliquots are emptied into the composite container immediately upon collection. Care must be taken not to contaminate the Teflon tubing or strainer between aliquots. This can be accomplished by placing the tubing/strainer into an extra large plastic bag between aliquots. The field crew may wait in a vehicle or nearby building between aliquots.

Hand Aliquot Collection

Aliquots are collected by affixing a sample container to the end of a grab pole, or by affixing a Teflon bailer to a rope for submersion into the creek. The aliquots are measured and immediately emptied into the composite container. Direct submersion of a sample container into the creek by hand is not recommended for safety reasons.

EQUIPMENT HANDLING NOTE: Installation of sample tubing and all handling of tubing, measuring containers and composite containers must be accomplished while wearing clean, surgical quality gloves at all times. Care must be taken to avoid any contamination of the tubing or containers by contact with any material or substance other than the sample stream; when not in use the tubing and measuring containers should be placed in a clean plastic bag.

Composite Sample Containers/Sample Volumes

For 2005-06, creek water sample collection is assumed for OP pesticides and pyrethroids analysis, and three-species aquatic bioassays. Minimum composite volume for those chemical analyses and three-species acute and chronic aquatic toxicity is approximately 20 liters. When QA/QC analyses (MS/MSD) are to be performed, the required sample volume increases to approximately 24 liters.

Acceptable composite sample containers include 10 liter borosilicate glass “pickle jars” or 20 liter borosilicate glass carboys. At least one extra composite container should be brought to each site during storm-based sampling events to ensure sufficient composite sample capacity.

If multiple composite bottles are needed, the multiple containers will have to be composited into one container to form a single composite representing the entire

monitoring event. The consolidated composite sample is then broken down into separate containers for chemical analysis and toxicity testing. It is recommended that both the compositing from multiple containers and the composite breakdown be performed in the laboratory, especially when environmental conditions are less than optimal.

Sample Handling

To reduce potential sample contamination, sample collection personnel must adhere to the following rules at all times while collecting or handling samples, sample tubing or containers:

- Smoking is not permitted in the vicinity of the sampling sites or sampling equipment.
- Always wear clean, powder-free, nitrile or similar surgical-quality gloves when handling sample containers or tubing.
- Never sample near a running vehicle. Do not park vehicles in immediate sample collection area (even non-running vehicles).
- Minimize the amount of time any sample container is left open.
- Do not set lids down where they may accumulate contaminants.
- Prevent foreign material (blowing dust, leaves, etc.) from entering any open sample container.
- Never touch the inside surfaces of sample bottles, lids, or composite carboys, even with gloved hands.
- Never touch the exposed end of a sampling tube.
- Avoid allowing rainwater to drip from rain gear into sample bottles.
- Do not eat or drink during sample collection.
- Do not breathe, sneeze or cough in the direction of an open sample bottle.

Field Preservation

The composite containers must be kept on ice during sample collection, and until delivery of samples to the analytical laboratory. To facilitate ease of handling and transport, this may be easily accomplished by purchasing new plastic trash buckets (with handles) of appropriate size in which the ice and composite bottle may be placed. The base of an autosampler also may be used for this purpose.

Field Measurements

At the time of toxicity sample collection, field crews should measure temperature, pH, dissolved oxygen (DO), electrical conductivity, and turbidity. If a composite sample is collected, the field measurements may be performed on an aliquot poured from the composite sample. This information may be valuable in assessing potential changes in sample toxicity between sample collection and the initiation of toxicity tests.

Rainfall/Flow Measurement

To provide for interpretation of the monitoring data in the context of the hydrological conditions present during monitoring events, rainfall amount and duration should be recorded from the nearest reliable rain gauge for each monitoring event.

Creek flow measurements should be made whenever possible, to characterize the flow regime in effect during the period of sample collection. Ideally the flow measurements would permit construction of an event hydrograph and computation of total flow volume during the monitoring event. At a minimum the creek stage level should be estimated.

Sediment Sampling

Collection of sediment samples must adhere to the clean sample collection and handling techniques as specified above. Samples are collected according to standard techniques (c.f. USGS, 1994). A stainless steel scoop is used to collect the top 2 cm. of fine sediment from areas of recent deposition, which is then poured into the appropriate borosilicate glass container (sample sizes and containers to be specified by the contract laboratory).

Samples are collected from representative locations within a defined reach to form a spatially-composited sample. While the sample locations are ideally selected randomly from a grid delineating the target area, in practice urban creek sediment samples are typically collected opportunistically from areas where fine sediments have deposited.

Samples must be kept on ice and shielded from exposure to direct sunlight until delivery at the analytical laboratory.

Field Log

During each monitoring event, a field log should be completed to document sample collection parameters, field measurements, and field conditions at the time of sampling, for both water and sediment samples. An example field log is provided in Figure 2.

Personal Safety

Safety of sampling personnel is a primary concern. Field sample collection shall never be performed under any conditions in which field crew safety is not ensured.

Field personnel should take breaks adequate to relieve fatigue, hunger, thirst or personal discomfort. If field personnel cannot safely continue to carry out sampling duties, a crew change should be initiated. Field crew shift changes are recommended every 8-12 hours.

Chain-of-Custody Forms

Chain-of-custody (COC) forms must be filled out for all samples submitted to each laboratory. Site ID, site name, sample date, and analysis requested must be noted on each COC. Special QA/QC requirements, such as duplicates or MS/MSD, must be specified on the COC forms for relevant samples and analyses. The COC form must clearly indicate the date and time of sample collection to permit calculation of deadlines for the start of analysis in accordance with the required analytical holding times.

Figure 2. Urban Creeks Monitoring Log Sheet

Date/Time: _____ Field Crew:_____

Monitoring Site: _____ Site ID: _____

Weather Conditions: _____

Observations (creek flow, color, odor, floatable materials, etc.):_____

_____

SAMPLE COLLECTION

Matrix (Water/Sediment):_____

Sample Type (Composite/Grab): _____Collection Method: _____

Sample Start Time: _____Sample End Time:_____

Field Blank Collected? (Y/N): _____Time of Blank Collection: _____

Observations/Occurrences: _____

_____

RAINFALL/FLOW DATA

Total Event Rainfall:_____Rainfall Duration: _____

Creek Stage Level Before Sampling: _____Creek Stage Level After Sampling: _____

Total Event Creek Flow:_____Max. Creek Stage Level:_____

Observations/Occurrences: _____

_____

FIELD MEASUREMENTS

Time of Measurements: _____Conductivity: _____

Dissolved Oxygen: _____pH:_____

Temperature:_____Turbidity: _____

Observations/Occurrences: _____

Sample Delivery

Toxicity samples should be delivered to the testing laboratory as soon as possible after the completion of sample collection. Delivery must be accomplished so as to permit commencement of toxicity testing within the 36 hour holding time.

Samples also should be delivered to the analytical laboratory promptly for chemical analysis; the initial holding time for most pesticides analyses (for extraction) is 7 days, but the samples must be maintained at 4˚C until extraction.

All samples must be maintained on ice until delivery at the lab, and must be accompanied by chain of custody documentation.

Event Summary Hydrological Parameters

After the monitoring event is complete, the following information should be obtained from the nearest available rainfall and stream gauges:

- Creek flow during the event (maximum stage level and total flow if available)
- Rainfall amount and duration during the event (for storm-based monitoring)
- Antecedent dry days, including elapsed time since last storm of 0.25" total event rainfall prior to monitored event
- Cumulative seasonal precipitation at time of commencement of monitored event (as measured at nearest reliable rain gauge with readily accessible data)

Records of these key hydrological parameters should be maintained in a matrix for subsequent data analysis and planning of future monitoring events.

Training

All field personnel should be trained in advance of monitoring to ensure familiarity with the procedures described above. This training should be provided by an experienced professional, and should include both an indoor component, in which the program and procedures are described, and a field component, in which the field procedures are demonstrated.

When sample collection is performed by volunteers, the volunteer sampler collectors must undergo the same raining as professional staff, and their activities should be overseen by an experienced professional to ensure ongoing conformance with sampling protocols, including QA/QC requirements.

ANALYTICAL/TESTING PROCEDURES

Pesticides in Water

Analysis for diazinon, malathion and other OP pesticides should be performed via EPA Method 8141A, organophosphorous pesticides by gas chromatography (USEPA, 1994a), or via EPA Method 625, semi- and non-volatile organics by GC/MS (modified to include quantification of the OPs), or by chemical-specific ELISA tests (for diazinon and malathion). Other analytical techniques may be employed, provided that an analytical reporting limit of 0.05 µg/L is achieved for diazinon and malathion, and all associated QA/QC requirements are met. Maximum acceptable holding time for the standard EPA methods is 7 days until extraction, and 40 days following extraction until analysis.

Pyrethroids in water may be analyzed according to EPA Method 625, modified as needed to quantify the pyrethroid compounds, or by technically-equivalent technique, including GC/MS-SIM. Alternatively, methods under development through research funded by PRISM grants may provide other options for pyrethroids analysis. It is essential that analytical reporting limits be sufficiently low to quantify the presence/absence of these compounds at environmentally-relevant concentrations (see TDC Environmental, 2003). Where possible, this means quantification at a level not higher than the documented LC_{50} for each compound, when such are available.

Additional chemical constituents that are recommended for analysis include carbaryl (typically via EPA Method 632), and fipronil and PHMB, provided that analytical capabilities are available through commercial labs.

Table 2. Chemical Analysis Method Specifications

Analyte	Method	Reporting Limit	Holding Time
Diazinon [OP Pesticides]	EPA 8141A or EPA 625 (modif.)	0.05 µg/L [Various]	7 days to extraction; 40 days to analysis
Malathion [OP Pesticides]	EPA 8141A or EPA 625 (modif.)	0.05 µg/L [Various]	7 days to extraction; 40 days to analysis
Pyrethroids	EPA 625 (modif.); GC/MS-SIM	Various	7 days to extraction; 40 days to analysis

Creek Water Toxicity Testing

Toxicity tests should be performed according to standard USEPA protocols (USEPA 1993, 1994b). Acute and chronic tests should be performed using both fathead minnows and daphnids. The acute toxicity end points will be assessed in the course of conducting the chronic tests. The chronic test for algae also should be conducted unless there is concern that nutrients present in the samples may result in enhanced growth. Testing will be performed initially on full strength (undiluted) samples.

Table 3. Creek Water Toxicity Test Method Specifications

Test Species	USEPA Test Reference/ Method	Chronic Test Duration	Holding Time
Ceriodaphnia dubia	Acute: EPA/600/ 4-90/027 Chronic: EPA/600/4-91/002 (method 1002.0)	6-8 days (3 broods hatching)	36 hours
Pimephales promelas	Acute: EPA/600/ 4-90/027 Chronic: EPA/600/4-91/002 (method 1000.0)	7 days	36 hours
Selenastrum capricornutum	Chronic: EPA/600/4-91/002 (method 1003.0)	96 hours	36 hours

Creek water samples should be maintained at 4˚C in the dark until used for toxicity testing or chemical analysis, to inhibit microbial degradation, chemical transformations, and loss of volatile toxic substances. The laboratory should initiate toxicity tests as soon as possible after receipt of samples, and the sample holding time may not exceed 36 hours. For toxicity tests utilizing *Ceriodaphnia dubia* or *Pimephales promelas*, samples must be filtered in the laboratory through a 60 micrometer plankton net to remove indigenous organisms that may attack or be confused with the test organisms.

Pesticides in Sediment

Pyrethroids in sediment may be analyzed according to EPA Method 8270C or technical equivalent. Alternatively, methods under development through research funded by PRISM grants may provide other options for pyrethroids analysis.

Fipronil is also recommended for analysis in sediment samples.

It is also essential to include analysis for sediment TOC to facilitate data interpretation.

Sediment Toxicity Testing

Sediment toxicity tests should be performed according to standard USEPA protocols (USEPA, 2000), using *Hyalella azteca* as the test organism. Modifications to these methods may be forthcoming through PRISM grant-funded research.

QUALITY ASSURANCE/QUALITY CONTROL

A comprehensive QA/QC program involves:

- adherence to all sample collection protocols, including clean sampling techniques,
- collection and analysis of field-generated QA/QC samples,
- internal lab QA/QC procedures as required according to the published analytical methods and the laboratory's quality control manual, and
- evaluation of data quality based upon the analytical results of both field-generated and internal lab QA/QC samples.

This section focuses on protocols for field-generated QA/QC samples. QA/QC samples will be collected during each monitoring event and prior to the first event of the season. These samples apply specifically to monitoring for diazinon (and for other chemical water quality constituents that may be subsequently added to the monitoring program).

Pre-Season Quality Control Samples

Prior to the first monitoring event of the wet season, an equipment blank and a composite bottle blank should be collected and analyzed for diazinon, as described below.

Equipment (Tubing) Blank

The blank sample is collected by running two liters of laboratory blank water through the cleaned tubing installed in an auto sampler or portable sampling pump, and collecting the sample in a 2 liter glass sample bottle.

Composite Bottle Blank

This sample is collected by pouring four liters of laboratory blank water into a cleaned composite bottle, and delivering the sample to the lab for analysis.

Monitoring Event Quality Control Samples

The following quality control samples should be collected and analyzed for diazinon (and other chemical analytes as they are added to the program) from at least one site during each event during the monitoring season:

- Composite Field Blank
- Matrix Spike/Matrix Spike Duplicate
- Either a field duplicate or lab duplicate

These QA/QC sample types should be rotated among the various monitoring sites; see Table 4 for a prototype QA/QC sample collection schedule.

Table 4. Monitoring Season QA/QC Schedule* [Example]

Location	Pre-Season	Event #1	Event #2	Event #3
Lab	Composite Bottle Blank			
Site A	Equipment/ Tubing Blank	Lab Dup	Field Blank	MS/MSD
Site B		MS/MSD	Field Dup	Field Blank
Site C		Field Blank	MS/MSD	Lab Dup

* Schedule applies to wet season, and assumes two wet weather events and one dry weather event.

QA/QC Sample Collection Methods

Specific collection methods for each quality control sample type are described below.

Field Blank

Composite sample field blanks will be collected at the time that the final composite bottle is removed from the sampler. The conditions under which the blanks are prepared follow, as closely as possible, the conditions in the field or laboratory, as appropriate for the type of blank. Blank water is poured directly into the composite container in the field. Field blanks should be submitted "blind" to the laboratory using a site name pseudonym. The date and time of sampling should be noted on the log sheet.

Field Duplicate

Composite sample field splits are produced during the compositing process. Double the normal composite sample volume is required for these samples. Field duplicates and environmental sample containers should be filled in random order. Field duplicates should be submitted "blind" to the laboratory using a site name pseudonym. The date and time of sampling should be noted on the log sheet.

Laboratory Duplicate

Lab duplicate analyses will be requested on the laboratory chain of custody form for a specific sample. No special sampling considerations are required, besides the collection of double the normal composite sample volume.

Matrix Spike/Duplicate

Matrix spike and matrix spike duplicate (MS/MSD) analyses will be requested for diazinon on a specified sample for each event. The sample designated for MS/MSD analysis should be clearly marked on the COC form. No special sampling considerations are required, except that additional sample volume (triple the normal amount) must be collected for analysis.

DATA QUALITY EVALUATION

Data quality evaluation is a multiple step process used to identify errors, inconsistencies, or other problems potentially associated with monitoring data. The data evaluation process includes two phases: an initial screening of the lab data reports, and a detailed data quality evaluation.

Initial Screening

The initial screening step should occur promptly upon receipt of data reports from the laboratory, following each monitored storm event, and after the pre-season QA/QC sampling. The purpose of the initial screening step is twofold: to identify sample analysis and data reporting problems and facilitate corrective action, and to ensure that a complete data record is available for the detailed data quality evaluation. If the initial screening is completed in a sufficiently timely fashion, in some cases lab errors may be correctible within analytical hold times.

The initial screening involves checks for analytical completeness and consistency, conformance to required analytical methods and reporting limits, compliance with required sample holding times, and gross reporting errors. [Note that in these checks the lab data reports should be consistent with the monitoring plan requirements and what was requested on the chain of custody forms delivered with the samples. This provides an incidental opportunity to double-check consistency of the monitoring plan and COCs.]

The initial screening steps apply to lab data reports for both chemical and toxicity testing.

Completeness and Consistency

- Check whether results are reported for all laboratory analyses specified in the monitoring plan and requested on the chain of custody forms.
- Check whether results are reported for all requested QA/QC analyses, including results for both field-generated and internal lab quality control samples.

Methods and Reporting Limits

- Check whether analyses were completed according to analytical methods specified in the monitoring plan and on the COC forms.
- Check whether reporting limits conform to the levels agreed upon with the laboratory, as specified in the monitoring plan.

Holding Times

- Check elapsed time between sample collection (from the COC or field log) and chemical analysis or the start of toxicity testing (from the lab data report), and compare to holding time requirements. For composite samples, the time of the final sample aliquot is considered the “sample collection time” for the purpose of determining sample holding time.

Reporting Errors

- Check for apparent typographical errors and out-of-range results. Examples include a dissolved concentration greater than the corresponding total recoverable concentration, or a constituent concentration orders of magnitude different than typically reported for the same constituent for other samples or events.

Irregularities found in the initial screening process should immediately be reported to the laboratory for clarification or correction, and reanalysis of samples if appropriate. The initial screening process can identify and correct errors that would otherwise cause problems later in the data quality evaluation process, or further along if the data are used for higher-level analyses. Moreover, reanalysis of out-of-range values can increase confidence in the integrity of questionable data.

Detailed Data Quality Evaluation

The detailed data quality evaluation includes an assessment of QA/QC data, including data generated from both external (field-initiated) and internal (lab-initiated) samples. This technical review is based on EPA guidance (USEPA, 1994c), analytical method specifications, and requirements established within the laboratories' quality control manuals. The acceptance criteria for QA/QC checks are in some cases set using historical lab performance, based on EPA guidelines. Specific data quality objectives should be established for the urban creeks monitoring program when analytical laboratories are identified for common program-wide use.

Any chronic or significant QA/QC issues identified by the data quality evaluation should be brought promptly to the attention of the laboratory, with a request to verify and explain the problems identified.

For aquatic toxicity tests, the acceptability of test results is determined primarily by performance-based criteria for test organisms, culture and test conditions, and the results of control bioassays. Control bioassays include testing with reference toxicants, and negative and solvent controls. Test acceptability requirements are documented in the method documents for each bioassay method.

Contamination Checks

Contamination of samples is assessed using analysis of method/reagent blanks and field/equipment blanks. Blanks are prepared using reagent grade deionized water and tested using analytical procedures identical to those used for the environmental samples.

Any detected value for a target constituent is considered to be a "hit" on a blank sample.

Method (or reagent) blanks are analyzed by the lab as part of standard internal laboratory QA/QC. A detected concentration or "hit" on a method blank is an indication of contamination in the analytical process.

Equipment blanks and *composite bottle blanks*, collected prior to the monitoring year, are used to identify contamination introduced by the sampling equipment (Teflon tubing, silicon tubing, and sampler) or composite sample bottles.

Equipment blank and composite bottle blank "hits" should be investigated using the actions listed below.

- Request that the laboratory confirm the reported results against lab bench sheets or other original analytical instrument output. Any calculation or reporting errors should be corrected and reported by the laboratory in an amended data report.
- If the previous step does not identify improperly reported results, the laboratory should be asked to identify any possible sources of contamination in the lab by comparison of the results to those for method blanks run in a similar time frame.
- If no laboratory contamination is identified, a note should be introduced into the text stating that the equipment blank results indicate that the sampling equipment may have introduced contamination. When practical, remedial measures should be taken to eliminate field contamination, including tubing cleaning and replacement or introduction of new, "cleaner" equipment.

Field blanks are prepared in the field during or immediately after sample collection, using procedures that simulate the actual field sampling procedures. A hit reported in a field blank indicates that contamination has occurred at some point during the field sampling or analytical procedures. When a method blank is reported as "not detected" and there is a hit in the corresponding field blank, the contamination has likely been introduced in the field. Additionally, if there was a hit in the pre-season equipment blank result for the constituent in question, this indicates that the equipment may have introduced the contamination. Field observations and input from lab personnel can be useful in identifying contamination sources and appropriate corrective action.

Accuracy Checks

Analytical accuracy is a measure of the ability of the laboratory to report the correct or actual value of a constituent. This is assessed through the use of spiked samples. The laboratory spikes a sample with a known concentration of the target analyte from standard reagent stock, and assesses accuracy through the recovery of the spike in analysis of the spiked sample. Percent recovery is calculated using the following formula:

{1} $$R = 100\% * \left[\frac{(C_s - C)}{s} \right]$$

where: R = percent recovery

C_s = spiked sample concentration

C = sample concentration (for spiked matrices)

s = concentration equivalent of spike added

The most commonly-used forms of spiked samples are matrix spikes, lab control samples, and surrogate spikes.

Matrix spike analysis involves the introduction of a known amount of the target analyte (the "spike") into the original environmental sample "matrix" (the sample solution). The measured concentration of the spiked sample is compared to the sum of the previously-measured, unspiked sample concentration plus the known amount of the spike. This allows an assessment of any effects the sample matrix may have on the analysis. Matrix interference can lead to recovery problems as evidenced by poor percent recovery. Reanalysis is the first corrective action once matrix interference problems are identified, but reanalysis is only possible when sufficient sample volume is available.

Laboratory control sample (LCS) analyses check recovery of a known concentration of a constituent from a standard solution in laboratory water. These samples are used to assess the accuracy of the process from preparation of the sample to analysis. Standard reference materials (SRMs) are spiked samples prepared by a third party laboratory. SRMs may be used if chronic LCS recovery problems are noted. Typically, laboratories analyze SRMs on a quarterly basis, or they may be used by the lab in place of LCSs for constituents for which in-house preparation of spikes is difficult or expensive.

Surrogate spikes are used as additional checks on the extraction process for organic compounds. Surrogates are organic compounds other than the constituents being tested for, but with similar chemical characteristics. The surrogate is easier to distinguish from other compounds and can be more accurately extracted and recovered.

Laboratory percent recovery calculations for each type of accuracy check should be delivered by the laboratory with the data reports, and screened by the data reviewer upon receipt against the acceptable percent recoveries established for each constituent.

Precision Checks

Analytical precision is a measure of the ability of the lab to produce the same result in replicate analyses of the same sample. This test is used to assess variability introduced during composite sample breakdown and laboratory splitting (or "subsampling") of environmental samples. This is assessed through the analysis of replicate samples, and calculation of the relative percent difference (RPD) between the analytical results for the replicates. The RPD is calculated as follows:

$$\{2\} \qquad RPD = 100\% * \left\lceil \frac{(R_2 - R_1)}{((R_1 + R_2)/2)} \right\rceil$$

where: RPD = relative percent difference

R_1 = replicate sample #1

R_2 = replicate sample #2

Laboratory duplicates are samples that are split in the laboratory and used to assess the variability in analytical precision (as RPD) that is introduced by laboratory sample splitting (or subsampling) and analytical processes generally.

Field duplicates are split samples produced in the field and submitted to the laboratory as separate samples. Field duplicates provide a measure of the precision of the composite sample splitting process. In combination with lab duplicates, field duplicates allow some separation of the sources of analytical variability (i.e. field and lab procedures).

Matrix spike duplicate (MSD) analysis checks the precision of the matrix spike (MS) recovery. Ideally, triple the normal sample volume is available for the analysis of a matrix spike and a matrix spike duplicate.

RPDs between replicate sample results are calculated by the lab for lab duplicates and MSDs, and by the data reviewer for field duplicates. The calculated RPDs are then compared to acceptable RPDs established for each constituent.

Generally, laboratories will perform reanalysis for laboratory-initiated duplicates (laboratory and matrix spike duplicates) that are significantly out-of-range on the first analysis run. The results of the reanalysis should be presented in the laboratory report or in a case narrative prepared by the laboratory.

Data Quality – Analytical Coordination

Sample collection and analysis should be coordinated to the extent possible by the various agencies responsible. Evaluation of data quality will be performed according to data quality objectives and acceptance criteria established by the individual laboratories.

When specific laboratories are identified for a standardized, coordinated monitoring program, specific data quality objectives should be established for application to the data quality evaluation process detailed above.

MONITORING PROGRAM MANAGEMENT

The local municipal stormwater agencies are currently engaged in negotiations with the Water Board for a new, region-wide NPDES stormwater permit. This permit will include monitoring requirements, which will presumably also be regionally-based.

BASMAA has a standing Monitoring Committee; it would seem appropriate to assign responsibility for regional monitoring oversight to this committee. To ensure effective coordination of the monitoring efforts and incorporation of all the recommended elements of the monitoring program, and to facilitate joint compilation and analysis of the monitoring results from each local agency, it would seem necessary for the committee to assign the responsibility for implementing these activities to an individual with relevant knowledge and expertise.

DATA REPORTING

In addition to the reporting of the results of analysis of environmental samples, the laboratory data report should include results of internal QA/QC tests, and a narrative that outlines any QA/QC problems, anomalies, and corrections. Internal QA/QC results that should be reported by the analytical laboratory include:

- Analysis of method blanks for all batches associated with project environmental samples
- Analysis of lab duplicate samples for all batches associated with project environmental samples
- Analysis of MS/MSD, LCS, SRM and surrogate spike samples for all batches associated with project environmental samples

The data report narrative should include specifics concerning analysis of QA/QC results, including the following:

- Adherence to holding time requirements
- Any violations of test acceptability criteria
- Interpretation of blank results
- Interpretation of duplicate analyses (RPD calculations)
- Interpretation of spiked sample analyses (% recovery calculations)

The lab data report should clearly indicate the date and time of sample analysis (for organic constituents, the report should clearly state the date and time of both sample extraction and analysis) for the purpose of calculating sample hold time.

Arrangements should be made with the analytical laboratories in advance to ensure agreement as to the required contents of the sample analysis data reports.

DATA ANALYSIS

To provide useful support for the WQAS, an analysis must be prepared annually of the monitoring data generated from all agencies/sites, incorporating relevant results from other programs such as SWAMP, as available, at the conclusion of the monitoring year. The monitoring results must be compared to the TMDL targets, and assessment and interpretation performed to address the WQAS monitoring questions.

In the case of diazinon, the assessment methodology developed by the CEP's Diazinon/Toxicity Work Group should be employed (as per Ruby, 2005) to determine whether the diazinon TMDL target continues to be met. If the current trend continues, after three years, such information may be used to provide the technical basis to support de-listing of Bay Area urban creeks for diazinon-caused water quality impairment.

PREVENTATIVE/PRE-EMPTIVE MONITORING

Incorporate preventative/pre-emptive monitoring techniques should be implemented to identify and address potential threats to water quality before impacts occur, to the extent feasible. The measures recommended by the CEP's Diazinon/Toxicity Work Group include the following:

- Continue to review the scientific literature, government reports, and monitoring data to identify which pesticides pose the greatest threats to urban surface water quality. Continue to track and analyze DPR pesticide use and sales data for pesticides of concern relevant to water quality. Conduct retail store shelf surveys and assess other relevant information sources to supplement the DPR data. Analyze potential water quality impacts based on evaluations of the available use data and scientific information. (Note that through early 2007 these functions are effectively covered through the UP3 Project. Development of a means for continuing this work following expiration of the UP3 Project grant is essential.)
- Evaluate the potential effects on water quality of significant proposed regulatory measures affecting pesticide uses, in light of the available scientific information.
- When timely information is needed regarding professional pesticide applications on the local or regional level, agency staff may request the latest available pesticide use reports from PCOs through the offices of county agricultural commissioners. Potential impacts to local and/or regional water quality may be assessed through evaluation of the current pesticide use information, in light of the available scientific information.
- Plan to conduct some reconnaissance-level monitoring at selected upstream locations in urban watersheds for pesticides identified as threats to surface water quality.
- Use ELISA techniques for monitoring of targeted pesticides when available. Contact ELISA test manufacturers to encourage development of needed tests – for water and sediment samples as appropriate – based on information on potential threats to water quality provided by analysis of pesticide use data and regulatory imperatives (per first and second items above).
- Apply pressure on USEPA to perform adequate water quality impacts assessments as part of the routine pesticide registration process. Encourage USEPA to require pesticide manufacturers to conduct runoff quality studies to evaluate the potential effects of their products on surface water quality.
- Enhance cooperation and coordination between the Water Board and DPR regarding monitoring and assessment of the effects of pesticide applications, and appropriate uses of available evidence of water quality impacts.

A detailed discussion of the issues related to these recommended preventative/pre-emptive monitoring measures is contained in a Memorandum to the Diazinon/Toxicity Work Group (Appendix D in Ruby, 2005).

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