CALTRANS
BMP RETROFIT PILOT PROGRAM

DISTRICT 11, SAN DIEGO

QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

June 2000

ASSESSMENT OF QUALITY ASSURANCE/QUALITY CONTROL RESULTS

A complete analysis of the QA/QC data can be found in the *Third Year 2000/01 Report Best Management Practices Operations, Maintenance and Monitoring*. The overall Quality Assurance program included all phases of the sampling and testing process. The three major elements of the program consisted of testing and verification of performance of the field sampling equipment, evaluation of field-related blanking processes, and analytical precision and accuracy associated with laboratory activities.

Volumetric field flow tests were performed at the end of October 2000 on all flow monitoring equipment in District 11 to the extent possible. Tests were conducted to verify performance of the flow monitoring equipment and primary control device installations. These field flow tests consisted of initiating artificial flow through a conveyance with a 500-gallon water tank. Total volume from the tank was measured using a Neptune 1.5 inch Trident 10 water meter. Approximately 500 gallons were poured into each conveyance. The flow out of the tank was varied from low to high during each test. Final total volume, as read from the flow monitoring equipment, was compared with the total volume from the water meter.

Only percent recoveries within ±10% were accepted. Initial testing indicated that the accuracy of flow measurements was outside of data quality objectives and several sites. When percent recoveries were out of the acceptable range, flow monitoring equipment was either moved within the conveyance to provide better sub-critical flow or the level was adjusted to account for the lost volume. Final calibrations indicated that flow measurements were within data quality objectives at all sites where actual field performance tests could be conducted. Flow calibrations could not be conducted at the outlet of the I-5/SR-78 Park and Ride Sand Filter. Calibration checks at this site were limited to calibration of water level measurements.

A thorough blanking program was conducted to identify potential sources of contamination in sampler intake hoses, subsampling hoses, composite bottles, and laboratory sample containers. A total of 280 individual analyses were conducted to test for TOC, TDS and nutrients. Another 511 analyses were conducted to assess possible trace metal contamination associated with the field sampling procedures.

Measured concentrations of Total Dissolved Solids (TDS), Total Organic Carbon (TOC) and arsenic in equipment blanks, composite bottle blanks or sample container blanks required elevation of detection limits in a number of cases. Data associated with each of the blanks were qualified as necessary with "U" qualifiers when concentrations in the field samples were within five to ten times the associated blank. The highest value of arsenic requiring a “U” qualifier based upon combined equipment and laboratory container blanking information was 5.9 ug/L.

Summary of Constituent Qualifications Caused by Equipment or Laboratory Container Blanks

Constituent	Total Measured	Total Qualified	Qualifiers	Percent Qualified
TDS	187	31	U	16.5
TOC/DOC	374	75	U	20.0
Total/Dissolved Arsenic	380	59	U	15.5
All Constituents	5785	165	U	2.9

Assessment of data quality based upon laboratory performance was based upon review of holding times, method blanks, filtration blanks, laboratory duplicates, matrix spikes, matrix spike duplicates, surrogate spikes, laboratory control samples and/or certified reference material. A total of 5785 analyses were performed on 195 composite samples and 62 grab samples. The following paragraphs summarize all qualifications assigned to analyses on the basis of laboratory performance.

Holding time exceedances were the most common problem encountered with respect to laboratory performance. A large proportion of the TPH-Diesel and Motor Oil measurements required qualification as “J” values due to holding time exceedances. This was attributable to a change in holding time associated with the July 2000 update of the Caltrans Stormwater Monitoring Guidance that was not identified until the end of the season. All holding times would have been acceptable under data quality objectives applied during the previous two years. Approximately 10 percent of the nitrate-nitrogen and dissolved orthophosphate were also qualified with “J” values based upon exceedance of holding times. These occurrences were most commonly due to logistics associated with subsampling and transport to the laboratory on weekends.

Summary of Constituent Qualifications Caused by Holding Time Exceedances

Constituent	Total Measured	Total Qualified	Qualifiers	Percent Qualified
TPH-Diesel	58	29	J/UJ	50
TPH-Motor Oil	58	29	J/UJ	50
Nitrate-N	187	18	J	9.6
Dissolved Orthophosphate	187	18	J	9.6
pH	191	12	J	6.3
All Constituents	5785	106	J/UJ	1.8

Method blanks were below detection limits in all analytical batches for all analytes except TKN. Filter blanks were below detection limits for all analyses. Two TKN values from the first event of the season were qualified as "U" values due to minor blank contamination. All other TKN values from that analytical batch exceeded 10 times the blank value.

Laboratory duplicate samples with a relative percent difference (RPD) greater than the Caltrans specified limit resulted in qualifiers being applied to each associated sample. A "J" qualifer was applied to data above detection limits.

Summary of Constituent Qualifications Caused by Laboratory Duplicate RPDs

Constituent	**Total Measured**	**Total Qualified**	**Qualifiers**	**Percent Qualified**
Total Lead	188	12	J	6.3
All Constituents	5785	12	J	0.2

The second most common problem was related to matrix spike recoveries. Three out of 20 matrix spikes for zinc associated with the first four storm events were below data quality objectives. The three low recoveries were 68, 69 and 73 percent. These resulted in all zinc values associated with these earlier events being qualified with "J" values. One to two percent of the TKN and nitrate-N data were also qualified due to matrix spikes outside of data quality objectives.

Summary of Constituent Qualifications Caused by Matrix Spike Recoveries

Constituent	**Total Measured**	**Total Qualified**	**Qualifiers**	**Percent Qualified**
TKN	190	2	J	1.0
Nitrate-N	187	4	J	2.0
Total Zinc	188	37	J	19.7
All Constituents	5785	46	J	0.8

Little or no quality assurance problems were associated with matrix spike/spike duplicate RPDs, surrogate recoveries, certified reference materials, or laboratory control samples. No data qualifications were required based upon precision of the matrix spike/spike duplicate samples. Only one surrogate spike was outside data quality objectives for one TPH-gasoline sample. Since the surrogate was recovered at the lower QA/QC limit of 85 percent, the sample was not qualified. All laboratory control samples were within data quality objectives. Certified or standard reference materials were also consistently within the data quality objectives for all analytes except TKN. Analysis of three of 32 TKN

standard reference material samples each resulted in recoveries of 119 percent. These analyses were each associated with only single samples that were assigned "J" qualifiers.

There are no review criteria for field or subsampling duplicate analyses comparability. These samples incorporate both laboratory and field processing variability. As a result, variability of field or subsampling duplicates is inherently higher than laboratory duplicates alone. The following table summarizes all field or subsampling duplicates that exceeded an RPD of 50 percent.

Summary of Field or Subsampling Duplicates Exceeding 50% RPD

Constituent	Total Exceeding 50% RPD
Hardness	1
Total P	1
Diss. Orthophosphate	1
Chromium, Dissolved	1
Lead, Dissolved	1
Cadmium,Total	1
Chromium, Total	1
Nickel, Total	2
Zinc, Total	1
Fecal Coliform	1
Total	**11**

Total number of pairs of constituents analyzed in field duplicates = 276
Percent of field duplicates exceeding 50% RPD = 4 %

Overall, the review of data quality indicates that the data met the overall objectives of the program and are appropriate for use in the BMP performance evaluation. None of the data were rejected due to quality control problems. Nevertheless, the presence of blank contamination for several constituents required assignment of "U" qualifiers which effectively elevated detection limits to levels where the parameters are not considered appropriate for use in evaluation of BMP performance. These parameters included both TDS and TOC. Similarly, the presence of arsenic in blanks partially impacted use of this constituent in BMP performance evaluation during a limited number of events at all sites except two where field measurements of arsenic where consistently higher than all other sites.