The Derivation of the (Low) California 500 NTU NEL for Conventional BMPs in the 2009 CGP is not Supported by the Discussion and Data in the Final CGP Fact Sheet

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Brief Summary and Discussion of the Relative Importance of the Attached Documents

The newly approved 2009 California CGP has instated a 500 NTU Numeric Effluent Limit for sites designated as "Risk Level 3 (high risk) according to procedures outlined in said permit. This numeric limit is not a benchmark or action level, but an enforcement limit, which would be a violation if exceeded. URS has received most of the background documents pertaining to the development of this limit, and also three comments and/or reports to the CGP written by Flow Science (attached). In their 08/26/09 comments, Flow Science contends that the derivation of the 500 NTU NEL is extremely flawed and was not performed in a manner consistent with what is claimed in the permit fact sheet, or in accordance with California protocols. URS has briefly examined the permit documents, and agrees that the limit derivation is if anything worse than is described in the Flow Science comments. The most important issue is with the State's inappropriate use of the statewide enforcement data, which is discussed here in comment 3. **The corrected analysis of the statewide enforcement data by Flow Science indicates that a more appropriate California NEL based on the data presented would more than double the 500 NTU to make it well over 1000 NTU. This is in very close agreement with the NAHB proposed action level of 1000 NTU for the EPA C&D ELG.** Other documents cited by the State are relatively less important, but are also discussed by Flow Science.

The main background document for the derivation of the 500 NTU NEL are pages 15-18 of the CGP Fact sheet (attached). URS has also obtained the support documents cited in these pages (the 2004 Simon paper and the 1990 Horner paper). After a brief review of these documents, URS does not believe they contain any information that would significantly affect the Flow Science comments or conclusions.

The most relevant Flow Science report regarding the 500 NTU NEL is the seven page comment with the file name: "Flow Science CGP Comments on Errata 8-26-09". This document discusses in great detail the problems with the derivation of the turbidity NEL, and how it does not meet basic statistical criteria or California protocol, or BAT/BCT requirements. This document is attached and should be read in its entirety. It is referred to as the "Flow Science Comments" in the discussion below. There are two other Flow Science reports, 1) an "Attachment 2" dated June 24, 2009 relevant to the April 2009 Draft CGP, and another report on "Numeric Limits 'Final Report'" dated March of 2008 (see attachments). These are referenced in the Flow Science 8/26/09 comments, and also offer a full dissertation on numeric limits in stormwater runoff.

Summary of Flow Science Discussion on the Derivation of the 500 NTU Limit

URS has reviewed pages 15-18 of the CGP fact sheet, and found that the Flow Science comments are well researched and sound. The fact sheet states that the 500 NTU NEL is based on 1) an eco-region site specific dataset developed by Simon, et. al. 2004, 2) "published, peer reviewed studies and reports on in-situ performance of best management practices in terms of erosion or sediment control on active

construction sites" and 3) "Statewide Regional Water Quality Control Board Enforcement Data" (also termed ACL turbidity data in the CGP fact sheet). In fact, the State also used the Caltran Study that supposedly determined a suspended sediment to turbidity relationship of 3:1 in conjunction with the Simon data. These are each briefly addressed below.

1. **Eco-region site specific data set (Simon 2004 paper)**—This was used to obtain a range of background turbidity present in the receiving waters. This study found a very wide range of naturally occurring background suspended sediment, which when converted to turbidity by the Caltran-based 3:1 suspended sediment to turbidity ratio, the values ranged from 16 to 1716 NTU, with an average background turbidity of 544 NTU. This Caltran study was critiqued by URS in the NAHB comments to the proposed EPA C&D ELG, and by Flow Science in their comments for the California CGP (in attachments), and was determined to be faulty and unsuitable for establishing numeric limits. However, Flow Science points out in their comments (number 1 bullet, page 2) that even if this Caltran ratio were correct, the receiving waters over at least 40% of the State were likely to exceed the proposed limit of 500 NTU.

2. **Published, peer reviewed studies**—In fact, the State cited only a single study, a 1990 paper by Horner. This paper describes a single highway construction project in Washington State, where various BMP covers are compared side by side on sections of a slope, along with some sections apparently left untreated. Wood fiber mulch was described as the best performing erosion control product, in side by side comparisons on a single slope, where it was found to reduce turbidity in the runoff by 97%, with a mean runoff turbidity of 21 NTU and a maximum turbidity of 73 NTU. Other BMPs were found to produce discharge from the same slope of around 100 NTU. The State is also in possession of a letter from Horner where he supports a 500 NTU NEL as feasible. However, the Flow Science analysis and even the State's own fact sheet demonstrate that results from this small portion of a single site is insufficient to generalize the performance of all conventional BMPs on all sites. Among other observations, Flow Science notes that the single Washington site could not encompass all the geographic diversity present in the various regions of California, and though the site was monitored for 13 rain events, the rain intensity for these events ranged only from 0.01 to 0.119 inches per hour, whereas areas in California can sometimes get rain intensity exceeding one inch per hour, and intensities much higher than 0.119 inches per hour are quite frequent. This low intensity is apparently reflected in the relatively low runoff turbidity observed from untreated sections of the slope, which apparently never exceeded 300 NTU during any test event. The State CGP fact sheet actually summarizes the problem in generalizing the results from this study very adequately in the following passage:

   "It is the BPJ of the State Water Board staff that erosion control, while preferred, is not always an option on construction sites and that technology performance in a controlled study showing effluent quality directly leaving a BMP is always easier and cheaper to control than effluent being discharged from the project (edge of property, etc.). As a result, it is the BPJ of the State Water Board staff that it is not cost effective or feasible, at this time, for all risk level and type 3 sites in California to achieve effluent discharges with turbidity values that are less than 100 NTU."

3. **Statewide Enforcement Data**—Presumably the State has concluded that by averaging turbidity results from sites that are under enforcement actions, they can obtain an approximate average NTU level that would constitute a violation (see URS comment below). This data is presented on page 17 of the CGP Fact Sheet, and consists of only 19 data points. The actual mean of the State data was reasonably close to 500 NTU. The State calculated a 95% interval for the mean of the data, and noted that 500 NTU was well within that range, thereby concluding that the data did not disqualify 500 NTU as being a reasonable mean for the data, and therefore finally concluded that 500 NTU could serve as a reasonable NEL. (URS would also dispute this last assumption, see URS comment below.) Flow Science immediately pointed out that the State calculated the mean NTU from this data as if there were actually 20 points (a calculation error). However, more importantly, they note that 13 of the nineteen points all come from a single site, Northstar Village, yet in their calculations, the State treated each of these data points as a separate, unrelated event. All of the six other sites are represented by a single data point, and five of these six turbidity values are far greater than 1000 NTU. In fact, the situation is worse than Flow Science states, since six of the Northstar samples (from two discharge points) were taken as successive grab samples on a single day, 2/10/09 (sampling times are not reported). All of these results were 60 NTU or lower. If these were sampled from the discharge from a pond, it is extremely unlikely that the turbidity would change rapidly over the course of the day's sampling period, unless there was a sudden deluge. The point is, all of these 13 data points are related, and Flow Science states that at the least, these 13 data points should be combined as representative of a single site. When Flow Science did this, the average turbidity from the enforcement data **more than doubled** to over well over 1193 NTU, and the 95% confidence interval would be 510 to 1876 NTU (see page 3 of the Flow Science Comment). This demonstrates that the 500 NTU compliance limit proposed by California is wholly unsupported by the very data they used to justify it. Flow Science also made several other points, including the inappropriateness of using a student t value and a small sample hypothesis, all of which appear completely valid.

Additional URS Comments

- The basic idea of using any turbidity data from enforcement actions in order to justify a numeric discharge limit is flawed unless the data is further screened. We in fact do not know the reasons for the citations in the data presented by California. There currently is no turbidity limit in the State CGP, so presumably these violations are due to procedural deficiencies such as failure to implement the SWPPP or failure to maintain BMPs, or maybe even simply a failure to provide a required report. **However, when California uses this data to set a numeric limit, the implicit assumption is that these turbidity values are unacceptably and unusually high, and that the high turbidity is caused by the reason for the enforcement action.** In the comment 2 above regarding the peer reviewed studies, we have a direct quote from the State that in their best professional judgment, effluent discharges from conventional BMPs cannot be expected to consistently meet 100 NTU at all sites. However, in the enforcement data that is supposed to represent a violation due to discharge turbidity, we find that 9 of the 19 data points are at 100 NTU or lower, approximately equal to the best BMP performances in the Horner paper, and eight of these nine points comes from a single site. Yet another three of the data points are less than 200 NTU. Clearly, most of the data assumed to be in "violation", and therefore used by California to attempt justifying the 500 NTU NEL are evidence of BMP performance within the expectations of the State's BPJ.

- The California rationale, if applied more appropriately, would appear to justify some type of limit at about 1000 NTU. **This data actually lends credible support to the NAHB proposed 1000 NTU action level for the EPA C&D ELG.** It is also interesting that in the 2008 Draft CGP, California proposed a 1000 NTU NEL, yet having no new information, lowered that NEL to 500 NTU in the April 2009 Draft CGP.
- A summary of previous URS comments on the Caltran data: URS noted that several other studies seemed to show a ratio of Total Suspended Solids (TSS) to turbidity that ranged from 0.8:1 to 2:1. Most people also agreed that the ratio changed as the concentration level changed, becoming greater at higher TSS and turbidity levels. The California assumption of 3:1 is higher than these other studies. This ratio was obtained by comparing "*suspended sediment*" data to turbidity data from three river locations in California. "Suspended sediment" is a different determination than TSS. It is obtained by drying the entire water sample rather than filtering out the suspended particles and weighing them. This determination therefore includes dissolved solids (like salt in water), which are not present as particles, and therefore do not contribute to turbidity. In arid rivers, high evaporation rates and irrigation usage can greatly increase the dissolved fraction of solids in the water. The dissolved solids in such rivers can exceed 1000 mg/L, and become a significant portion of the "suspended sediments" measurement. This may have contributed to the high 3:1 ratio obtained from the Caltran data. URS commented that this, or any other ratio of solids to turbidity, was simply too tenuous to use in calculating any numeric limit to be used for compliance. URS did utilize the 3:1 ratio in some of their comments for the proposed EPA C&D ELG, simply because it represented a "worst case scenario" for the intended purpose.
- The original 1990 Horner report was prepared for the Washington State Transportation Commission, and as such does not appear to meet the definition of a published, peer reviewed study as described by the State in the CGP fact sheet. Perhaps it was later submitted for such a review. In a previous review of this paper conducted in 2008 (prior to the most recent CGP Drafts) URS noted that apparently several BMP erosion prevention products, along with some untreated areas, were compared simultaneously on different plots of land along a similar slope. This would appear to add another variable not discussed by Flow Science, in that water runoff can vary greatly even over a single slope. Water can form channels in certain areas but not in other areas, with great local effect on the erosion that can be independent of the BMP in place. It is possible some of the variation in the results from the different plots could have been due to differences in the runoff patterns on the plot, and not entirely due to the different cover materials used.
- In a related development, the State of California has issued clarification statements regarding so-called Passive Treatment Systems (PTS), which utilize PAM logs or other passive delivery of flocculation chemicals prior to a settling pond to control sediment in the runoff. California regards such chemical treatment systems as equivalent to ATS, and as such must meet all the requirements of an ATS system, including meeting a 10 NTU limit, and meeting all residual chemical requirements (must be <10% of the MACT). These requirements would therefore in effect ban the use of any PTS because they would not be able to meet these stringent requirements without additional (full ATS) treatment.