Review of Technical Issues Related to the Final Effluent Limitation Guidelines for the Construction and Development Industry

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I. INTRODUCTION

Last December, the Environmental Protection Agency (EPA) issued final Effluent Limitation Guidelines (ELG) for the Construction and Development (C&D) industry (74 *Fed. Reg.* 62996, December 1, 2009). These ELG set a numeric limit of 280 nephelometric turbidity units (NTU) for stormwater discharges from construction sites with 10 or more acres disturbed at one time. This memorandum describes a number of technical concerns with the methods and data that EPA used in selecting the 280 NTU limit.

The following summarizes the technical errors and other concerns that Pechan has identified through a review of EPA's regulatory background materials, information provided in URS Corporation's report "Discussion of the EPA Calculation and Implementation of a 280 NTU NEL Limit Based on Passive Treatment Technology for the Final C&D ELG," and our own independent research:

(1) EPA set a standard based on "passive treatment" as the model technology, yet almost exclusively relied on data from modified advanced treatment systems (ATSs) in establishing the standard, and EPA's cost estimates are therefore too low by approximately a factor of ten because of this error;
(2) EPA failed to obtain background information on the Sea-Tac airport project to properly characterize the pretreatment systems at this site, resulting in EPA counting data from these systems at least five times more than justified;
(3) EPA failed to include treatment data from a Morrisville, North Carolina project for which, contrary to EPA claims, necessary data were available for inclusion;
(4) EPA failed to properly determine whether any of the 22 ATS plants were performing any actual treatment, a key requirement of the EPA protocol; and
(5) EPA failed to document why several plants were included or excluded from calculation of the limit.[1]

This memorandum concludes with brief discussions of how EPA understated ELG costs, should consider the magnitude of ELG benefits in setting an appropriate limit, and revise the acreage applicability threshold to better address ELG-related toxicity concerns.

II. CONCERNS WITH EPA'S TECHNICAL ANALYSES USED TO SUPPORT TURBIDITY LIMIT

EPA made a number of technical errors in performing the analyses used to support a 280 NTU limit. This section identifies these major errors and provides potential recommendations on how EPA could fix these errors in a reconsideration of the ELG rulemaking.

[1] EPA declined to respond to questions about inadequacies and omissions in the record, so we are unable to comment completely on the underlying EPA determinations. Based on the existing record, it appears likely that one or more of these determinations were not made consistently.

A. EPA CHARACTERIZES ADVANCED TREATMENT SYSTEM DATA AS DATA FROM PASSIVE TREATMENT SYSTEMS

EPA set a standard based on “passive treatment” as the model technology, yet almost exclusively relied on data from modified advanced treatment systems (ATSs). While Section I.B provides EPA with specific revisions that it should make to its turbidity limit calculation under the premise that the pretreatment portion of an ATS is passive treatment, the EPA should reject this premise because such pretreatment can not be considered passive treatment.

EPA has calculated a very low turbidity limit based almost entirely on data that was originally termed “influent” data in various ATS. Of the 25 treatment systems used by EPA for the ELG calculation, 22 are data taken from the “pretreatment” portion of an ATS. These advanced systems are very complex and precisely controlled, with automated monitoring, pumping, and cutoff or recycle valves located at several stages during treatment designed to treat to very low levels with active operator intervention.

The EPA does not fully define what it deems passive technology beyond stating that “*Passive treatment technologies include conventional erosion and sediment controls, polymer addition to sediment basins, fiber check dams with polymer addition, and other controls*” (74 *Fed. Reg.* 62996, December 1, 2009 at page 63004). In the technical development document (TDD) for the final rule, EPA acknowledges that pumping of water would not generally be required for passive treatment: “*The passive treatment technologies of Option 4 generally rely on gravity, so can be configured so as to utilize gravity flow of water through channels and basins, so the significant use of pumps and generators is not anticipated. However, permittees may utilize pumping to move water around construction sites and for dewatering trenches and excavations...*” (see page 11-1).[2]

It seems clear from EPA’s discussion of passive treatment systems that the following elements of the pretreatment portion of an ATS are not representative of passive treatment:

- A system operator onsite during treatment;
- Two-phase treatment occurs via conventional settling in detention basins and settling of floc in separate downstream pretreatment tanks/cells;
- Mechanical pumps are used to mix flocculant with stormwater, facilitate polymer dosing optimization for exact flow, and move water from detention basins into separate pretreatment cells/tanks where settling of floc takes place;
- Computers provide near real-time monitoring of system performance;

[2] Similarly, the final rule preamble does not refer to use of high-powered pumps used to mix polymer with stormwater: “The final rule, which relies on the use of passive treatment, typically does not utilize large diesel-powered or gasoline pumps. The only anticipated use of pumps would be due to the use of small metering pumps to introduce polymer in certain situations. These pumps would only use a trivial amount of energy and would produce only a trivial amount of air emissions” (74 *Fed. Reg.* 62996, December 1, 2009, at pp. 63041-63042).

- Forced mixing of polymer with stormwater to aid flocculation (generally via pumping of water with a precise flow into a static mixer); and

- System shutdowns, polymer dosage modifications, and stormwater recycling[3] capability in response to computer monitoring (either via automated or manual control).

The turbidity data used by EPA comes from sample points that include every technology of ATS treatment except for the final "polishing" sand filtration technology. These ATS technologies include: (1) a detention pond from which stormwater is drawn for further treatment (beyond that provided by gravitational settling); (2) a second treatment storage area (either in tanks or in-ground "treatment cells"); (3) high horsepower, flow control pumping stations with capacities of 300 gallons per minute or higher; (4) flow-sensing meter pumps to precisely dispense polymer; (5) mechanical mixers to provide adequate mixing for the flocculant (effective mixing is assured either by mechanical mixers, or a series of baffles that are dependent on the constant flow provided by stormwater pumps); (6) solids removal sump pumps; (7) central computerized control and command stations that can automatically monitor turbidity and flow at every stage of treatment, and (8) multiple automatic (and manual) valves and flow cutoffs. These systems represent state-of-the-art treatment technology, and allow multiple pathways of intervention to lower turbidity and optimize both treatment effectiveness and maximize throughput volume. Although the EPA limit is supposed to be based on passive treatment technology, EPA's cost modeling for this technology excludes all of the above elements that separate an ATS from a PTS.

True passive systems cannot be expected to consistently comply with an ELG based almost exclusively on ATS data. A true passive system must be set up in advance of the rain event, and can attempt to handle the many variables that affect construction discharges and, thereby, system performance: site slope, watershed size, likely areas of water convergence, soil type, the likely state of the construction disturbance and grading on the site at the time of the next anticipated rain event, the size of the rain event, and the intensity of the rain event.

True passive treatment uses simple, low energy devices such as bales of fiber or straw and/or blocks of polymer located in drainage ditches, where flow is uncontrolled and dictated by the rain event and gravity alone. Passive treatment occurs as runoff flows through the areas where the PTS had been set-up. A true PTS does not require an operator to be on site during the rain event, and no "real time" treatment interventions are implemented if something unexpected arises. If there is a PTS bypass or failure, then adjustments are made after-the-fact in the hopes of producing a better future outcome. While a true PTS must treat water as it flows (no matter how little or much it rains), unless especially heavy rain occurs, an ATS operator can defer treatment for days after a rain event, allowing for major settling in a main detention pond located before pretreatment. Therefore, influent turbidity would be expected to be higher and vary considerably more for passive treatment than advanced treatment. This conclusion is validated by the influent data available in the regulatory record.

On page 6-8 of the final TDD, EPA suggests that the inadequately treated rock check dam effluent from one section of a highway would represent the lower bound of potential influent to the PTSs that were evaluated (fiber check dam plus polymer). The daily average effluent values

[3] Valves send treated stormwater back to pretreatment tanks/cells or detention basin for further treatment.

for the rock check dam range from 877 NTU to 14,766 NTU (see Table 1). Contrast these values with the available daily grab samples from detention ponds at three ATS sites: Beacon Hill (BHRBP2), Redmond East, and Redmond West, which report influent values that are lower than the PTS values by an order of magnitude.

Table 1. Summary of Available Influent Turbidity Values (in NTU)

System	Average Influent	Median Influent
Passive Treatment Systems*		
NCR.1	5,972	4,684
NCR.2	1,950	1,169
Active Treatment Systems		
BHRPB2	286	207
Red.East	485	151
Red.West	204	119

* - note that EPA states that these values represent lower bound influent values.

Similarly, a comparison of the post-treatment daily variability factors for the ATSs and PTSs highlights the fact that passive treatment results in turbidity values that vary widely relative to ATS turbidities. Table 2 displays the daily variability factors for all treatment systems included in EPA's limit calculation. The mean of the daily variability factors for the three true passive treatment systems included in EPA's limit calculation (i.e., NC.Road; NCR.1, and NCR.2) is 8.99, while the mean of the variability factors for the included ATSs is only 3.69. If EPA had included the variability from disruptive events that were excluded from the PTS datasets by either EPA or the PTS operator, the variability for PTSs would be even higher.[4]

The original ATS operational data sheets for the ATS sites used in calculating the 280 NTU limit confirm that the ATS operators frequently intervened with treatment several times a day, sometimes shutting down treatment entirely to allow for treatment adjustments to lower the turbidity of the influent to the filters. Such sophisticated interventions are not possible with a true PTS, inevitably leading to higher overall turbidity values. As a consequence, there is no reason to expect a true passive technology with no real-time intervention capabilities to perform anywhere near as well as the ATS facilities EPA used to set the turbidity ELG.

In setting a turbidity limit based on passive technology, EPA should only include data from the three North Carolina treatment systems that clearly represent passive treatment. This approach yields a turbidity limit of 793 NTU (see Attachment A).

[4] For example, 9 of the 16 total rain events were omitted for the NC.ROAD dataset by the author because the PTS was significantly disrupted.

Table 2. Comparison of Passive and Active Treatment Daily Variability Factors

Site/System	Daily Variability Factor (VF1)	
	ATS	PTS
BHRBP2	3.642	
BWWTP	10.203	
KC1.1	2.283	
KC1.2	2.508	
KC1.3	1.867	
KC1.4	1.953	
KC1.5	1.774	
KC2.1	2.890	
KC2.2	3.104	
KC2.3	2.845	
KC2.4	3.646	
KC2.5	2.576	
KC3.1	3.219	
KC3.2	3.503	
KC3.3	3.878	
KC3.4	3.819	
KC3.POND	2.809	
NY	4.140	
Red.East	6.391	
Red.West	5.934	
SEAAIR	3.586	
STCLLR	4.513	
NC.ROAD		8.135
NCR.1		5.859
NCR.2		12.968
Average VF1	**3.69**	**8.99**

B. EPA OVERREPRESENTED THE NUMBER OF TREATMENT SYSTEMS REPRESENTED BY SEATAC AIRPORT TREATMENT DATA

If EPA were to continue to assert that the pretreatment portion of an ATS is passive treatment, then it would need to make important revisions to its limit calculation to fix a number of technical errors. The most transparent error relates to the number of times that EPA counted treatment data from the Seattle-Tacoma International Airport (SeaTac) runway construction project in King County (KC), Washington. Because of the lack of information obtained on the treatment systems at this site, EPA overrepresented these systems in its limit calculation. As noted in the following subsections, EPA should include the KC-SeaTac treatment data as no more than three separate data sets in its limit calculation, and Pechan asserts that the unique characteristics of this site dictate that turbidity estimates be treated as one data set.

1. KC-SeaTac Treatment Data Reflected Only Three Pretreatment Systems

Of the 25 treatment systems included in EPA's ELG limit calculation, 15 are from a KC-SeaTac project. This project implemented a series of chitosan-enhanced sand filtration (CESF) treatment systems beginning in Fall 2004; SeaTac contracted with Clear Water Compliance Services Inc. to take over this work in Fall 2005.

The CESF systems utilized a detention basin, pipes, pumps, tanks, chitosan, a sand media filter and a computerized monitoring and data collection systems to continuously reduce turbidity in construction stormwater. Stormwater was first pumped from its retention pond to the control system, where an initial dose of chitosan was added as a pretreatment measure. The stormwater was then routed to settling ponds for bulk solids removal. From the ponds, pretreated stormwater was pumped through the control system, where turbidity, pH and flow were measured. As the water passes through the control systems, another dose of chitosan was added prior to sand filtration. The CESF systems had a programmable logic controller (PLC) which monitors influent and effluent water quality parameters. The PLC also monitors external factors such as pond level and rainfall data. System pumps, the chemical metering systems, and sand filtration units are all controlled using a touch screen on the PLC.

EPA mistakenly counted the fifteen individual CESF units at the KC-SeaTac site as consisting of fifteen separate pretreatment systems.[5] Through aerial photographs, operational datasheets, and stormwater treatment information supplied by the Seattle Port Authority, it is clear that the fifteen CESF units only pull stormwater out of a total of three pretreatment cells.[6] That is, each group of five CESF units is measuring the same influent turbidity from one of only three "pretreatment systems" operating at the time the pretreatment turbidity data were collected.[7] Therefore, EPA should have included no more than three sets of SeaTac data in calculating the ELG limit. When the SeaTac data are averaged by pretreatment cell (i.e., KC1.1-1.5 averaged; KC2.1-2.5 averaged; and KC3.1-3.4 and KC3.Pond averaged), and included in EPA's turbidity limit calculations with the 10 additional treatment systems included by EPA, the turbidity limit nearly doubles to 501 NTU (see calculations in Attachment B).

2. KC-SeaTac Should be Treated as One Data Set in Calculating the ELG

There are a number of reasons why the KC-SeaTac data are particularly unrepresentative of the performance of the pretreatment portion of ATSs. Because of the following circumstances surrounding the KC-SeaTac site and treatment systems, data from KC-SeaTac should not be included more than once in the ELG limits calculations:

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[5] "Pretreatment" refers to initial treatment of stormwater with chitosan and settling in pretreatment tanks/cells, but before passage of treated water through sand filters.

[6] This background information is summarized in the URS Mach 2010 report, "Discussion of the EPA Calculation and Implementation of a 280 NTU NEL Limit Based on Passive Treatment Technology for the Final C&D ELG."

[7] As one would expect, the pretreatment turbidities for each of the five CESF units at each pretreatment cell are essentially the same values because they are all pulling water from the same cell at the same time.

1. KC-SeaTac's pretreatment systems all treated water drained from areas covered by the same site-imported fill material – glacial till, which is a very granular substance with much less turbidity challenges than most soils found in the nation;

2. KC-SeaTac data were taken from a time when most grading activities had ceased, and stabilization procedures were well underway; and

3. Each pretreatment cell had an unusually large number of CESF treatment units (five) that may have resulted in an unusually conservative pretreatment regimen to ensure that problems would not occur with multiple units at the same time.

Evidence of the unrepresentative nature of the KC-SeaTac treatment systems is provided by a comparison of the KC-SeaTac turbidity data with other ATS pretreatment turbidity data included by EPA. As displayed in Table 3, KC-SeaTac treatment systems clearly outperform other advanced treatment systems. Table 3 displays a comparison of long-term average (LTA), minimum LTA, and maximum LTA values for the KC-SeaTac systems and all other ATSs included in EPA's limits calculation. The table demonstrates that the KC-SeaTac systems have an average LTA that is more than 50 percent lower than the LTA of the other advanced treatment systems. Table 3 also demonstrates a similarly relationship between average daily variability factors (VF1).

Table 3. Comparison of ATS Parameter Values: KC-SeaTac with All Other ATSs

Parameter	All KC-SeaTac	All non-SeaTac ATS
Average LTA	57.80	124.13
Minimum LTA	42.09	68.96
Maximum LTA	85.96	251.48
Average Daily Variability Factor	2.84	5.49

The KC-SeaTac systems should not be represented more than once because the construction site was treating atypical soil. First, Seattle area soil generally contains very little clay. Second, the SeaTac site needed massive amounts of imported fill material that covered almost the entire site. The fill material was glacial till that contained almost no clay or other fine material that would cause turbidity in runoff that would be difficult to remove. This meant that the detention ponds would have been expected to effectively settle much of the suspended solids the construction runoff. This would certainly not be a typical site representative of most of the country, where soils have significant clay content, and treatment would be more difficult than at the KC-SeaTac ATS.[8]

In addition, KC-SeaTac systems were treating a site that is not representative of active construction. Seattle Port Authority personnel indicate that 2006 was the peak of SeaTac construction activity, and was associated with the largest water quality impacts. However, the period of data used by EPA (December 2007/January 2008) was close to the end of construction

[8] Seattle Port Authority personnel have stated that the SeaTac treatment was "lucky" in terms of not having to deal with clay soils—noting that advanced treatment systems have been unable to meet permit turbidity limits at other construction sites.

activity (the runway opened November 2008) when site stabilization was already well under way, and thus had significantly less turbidity challenges.

Furthermore, because of the unusually large number of CESF units per pretreatment cell, it wouldn't be surprising if an unusually conservative pretreatment regimen was implemented to avoid simultaneous problems with multiple CESF units. Seattle Port Authority personnel indicate that the KC-SeaTac units required that post-CESF treated water be recycled back to pretreatment cells for further treatment at a turbidity threshold of 5 NTU (this was later raised to 10 NTU). Such recycling of low turbidity water into the pretreatment cells would have the effect of lowering the KC-SeaTac influent turbidity values.[9]

In determining if treatment data are appropriate to use as the basis for an ELG, EPA applies a number of criteria. One of these criteria is that the pollutants were present in the influent at sufficient concentrations to evaluate treatment effectiveness. In this case, this criterion is meant to ensure that the calculated turbidity limit resulted from treatment rather than the absence of turbidity in the stormwater. The EPA does not report any information on the turbidity of the stormwater treated by KC-SeaTac. It is particularly unclear that EPA can assert that this criterion was met for KC-SeaTac given the extensive use of glacial till fill material and that data were taken after most grading activities had ceased/stabilization procedures were well underway.

Given the unusually effective performance of the KC-SeaTac site indicated by Table 3, EPA should be careful not to over-represent these data as characteristic of typical ATS performance. Therefore, Pechan recommends that the KC-SeaTac data should be averaged to yield one set of values for the limits calculation. By doing so, the ELG would be 652 NTU (see Attachment C).

C. EPA MISREPRESENTED THE AVAILABILITY OF TREATMENT DATA FOR A CONSTRUCTION SITE IN MORRISVILLE, NORTH CAROLINA

In the TDD for the final rule, EPA states that although the two Morrisville, North Carolina pretreatment systems represented the EPA's "model technology," they did not use data for these systems because no daily continuous turbidity values were available. However, full daily data for Morrisville are provided in the docket (Docket ID EPA-HQOW-2008-0465-1944, DCN 42136). This material has an "authored" date of August 26th, 2009, but was not entered into the docket until December 10th, 2009. This site also has schematics and relevant email correspondence between EPA's Jesse Pritts and Nate Holloway (Docket ID EPA-HQ-OW-2008-0465-1943, DCN 42135, also dated August 26, 2009) and Jesse Pritts and Tyrone Clager (Docket ID EPA-HQ-OW-2008-0465-1945, DCN 42137, last dated 8/12/09). Based on the email and schematics (discussed further below), this site may be the only one where "influent turbidity" to CESF units might come close to representing true passive technology, and as such may be the only related data that could be included in the passive treatment-based ELG limits calculation.

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[9] Note that no such incorporation of post-treated stormwater for further treatment would occur under EPA's characterization of a passive treatment system.

The schematics for the Morrisville treatment system show two main detention ponds (ponds 2 and 4), each of which serve as a source for a final CESF unit. However, unlike the other sites, at one point at least, runoff into these two ponds receive passive treatment in the form of chitosan "gel socks," that are permeable fabric sleeves containing semi-liquid polymer, placed in the drainage ditches. As noted in the Pritts-Holloway email cited above, this true passive system was not adequate to treat the fine red clay soil present at the site, or handle the heavy volume of runoff (in particular, it was noted that passive technology was unable to consistently yield turbidity of 500 NTU). Therefore, Clearwater Compliance resorted to additional pretreatment that exceeds passive technology: they pumped the detention pond water over additional chitosan gel socks. This water was either allowed to flow back into the pretreatment ponds as shown in the Morrisville schematics (Pond 2 and Pond 4), or else went into smaller settling cells (not shown) before proceeding onto the CESF units. In addition to the two main ponds with the sand filtration units, there are four other "satellite" ponds or basins (numbered 1, 5, 6, and 7), all of which also receive passively treated runoff in ditches with passive polymer treatment. The water from Pond 1 is pumped to Pond 2 for final treatment, the water from ponds 5, 6, and 7 is pumped to Pond 4. The supplemental treatment exceeds PTS, but it is not clear whether these additional treatments were always used, or used only on an as needed basis. The operations sheets from Morrisville run from May until October of the same year, and available information is not sufficient to determine which pretreatment technologies were active at any given time over that time period.[10] It appears, however, that in some ways, the Morrisville systems represent something much closer to passive treatment than the computerized control pretreatment systems found at the ATS sites used by EPA to calculate the 280 NTU NEL.

If additional information can be obtained to clarify the pretreatment techniques used during the time of the daily operational data, EPA could consider incorporating the Morrisville data in the limits calculation, along with the three known true PTSs NCR.1, NCR.2, and NC.Road.[11] It seems that it would have been more appropriate for EPA to have used this system rather than the data from any of the ATS which were used, since at least passive treatment was attempted.

D. EPA FAILED TO DETERMINE WHETHER PLANTS WERE PERFORMING ANY ACTUAL TREATMENT

Further questioning whether a 280 NTU limit can be achieved is the fact that EPA did not use any actual pre-treatment turbidity values in analyzing whether the post-treatment turbidity values resulted from effective treatment rather than dilute pre-treatment values (this is EPA's second criterion for acceptance of data for setting an ELG limit). In fact, EPA had influent data for three of the ATS facilities used to set the 280 NTU NEL that they did not use. If these data had been

[10] Background information only states that "The contractor was attempting to passively treat the water using Poly acrylamide (PAM) "floc logs" prior to us being called in, but was unable to reduce the turbidity at all because of the large volumes of water, highly turbid water (>3000 NTU), and colloidal red clay soil type. We also attempted to passively treat the water prior to each of the basin locations using Chitosan lactate (gel-socks), however found that the water treated best by pumping to isolated tanks or cells with the chitosan lactate sock/cartridge installed within the plumbing just after the pump. After about a 20 minute settling time this would bring the turbidity down to about 500 NTU." Email correspondence from Nate Holloway, Clear Water Compliance Services, Inc. to Jesse Pritts, U.S. Environmental Protection Agency, entitled "FW: ATS Data," August 26, 2009 (included in Docket ID EPA-HQ-OW-2008-0465-1943).

[11] One reason to include these data is to represent a relatively high clay content site (Morrisville is the only site considered by EPA where high clay content is discussed as an impediment to passive treatment).

evaluated, it would have shown that for many days, the data that EPA has now designated as representative of post-passive treatment has turbidity equal to or higher than the available pre-passive treatment influent data.

For the ATSs, the only sites to provide influent to pretreatment data were BHRBP2, Redmond East, and Redmond West. Once each day, a grab sample of the turbidity of the main detention pond was measured. On 67% of all days for the BHRBP2 system, the influent to treatment was already below the ELG 280 NTU limit, and 30% of treatment days showed either no removal or no effective removal (i.e., less than 30% reduction). Furthermore, the average percentage removal for all days is 44.4%, which is below the 50% removal criterion that EPA has used in the past to validate that the treatment is effective (e.g., Centralized Waste Treatment ELG Technical Development Document). The low/non-existent removal rates are due in part because an ATS can often afford to wait and treat water after allowing it to settle many days in the detention pond without polymer addition. This option is not available to passive treatment systems. A true PTS operates off of gravity flow, and must treat the runoff water immediately, while the water is still carrying its full sediment load. This is one major difference between true PTS and the ATS technology that EPA claims to be passive treatment.

Another possible cause for the low removal rates is that the detention basin used by the ATS may reflect lower turbidity values due to the introduction of polymer in the basin through treated water recycling and/or manual addition during periods of high turbidity. At the three sites where influent (detention pond) turbidity information was available, the data indicate that on many days, the ATSs were receiving influent water that is already quite low in turbidity, and this situation would logically be more prevalent at sites with even larger detention ponds such as those expected to be used on the KC-SeaTac site (no influent data are available for this site).

The median influent to pretreatment turbidity values for the other two sites were 151 NTU or below, signifying that on the majority of days the influent to ATS pretreatment was already below EPA's 280 NTU limit. Most of the influent data for these ATS is therefore well below what EPA claims to be typical for a construction site runoff, and on a large number of days is below the 280 NTU limit. Therefore the treatment data from these sites should not have been used to establish the 280 NTU turbidity limit.

As identified in Section I.A above, EPA approximated influent values for two of the three true PTS sites used to calculate the 280 NTU limit. The PTS influent values are much higher than any influent to the ATSs for which data are available (see Table 1). The average turbidity of the influent for the PTSs (NCR.1 and NCR.2) is 4,967 NTU, which is 10 to 20 times higher than the available influents for the ATS sites. This is further evidence that the ATSs are treating stormwater that is not at all similar to the influent to a true passive system.

On page 6-8 of the TDD, EPA stated that they examined the literature to determine turbidity of water generated at construction sites, and summarized numerous studies evaluating sediment basins. They state, "The literature indicates that stormwater discharges into sediment basins had turbidity values ranging from tens of NTU to tens of thousands of NTU." This description may reflect the nature of the estimated influent at sites NCR-1 and NCR-2, but is not applicable to the ATS values in the record. The ATS influent values had low averages, and only very rarely exceeded 1,000 NTU. No ATS influent ever exceeded 10,000 NTU, a level that EPA's literature review states is typical for influent to sediment basins on construction sites. Therefore, the influent to the ATSs is not typical of the influent to true PTSs located out on a construction site, and is very much lower. On many days, negative or zero percent removal was achieved from ATS pretreatment. The median influent values for BHRBP2, Redmond East, and Redmond West all demonstrate that on a majority of days, and in some instances an overwhelming majority of days, the influent is already below the EPA limit of 280 NTU before any treatment. The NCR.1 and NCR.2 data clearly indicate that for most any given day, the average turbidity will be above 280 NTU, and in many instances far higher than that.

E. EPA NEEDS TO IMPROVE THE REGULATORY RECORD

As indicated below, there are two major concerns with how EPA used key information in calculating a 280 NTU limit that EPA should address in a reconsideration of the ELG.

1. Use of Advanced Treatment System Data to Represent Passive Treatment

Of the 25 treatment systems used by EPA for the ELG limits calculation, 22 are turbidity data taken from the pretreatment portion of advanced treatment systems. The combined EPA actions of using ATS pretreatment as representative of passive treatment systems, using treatment data from the same system many times over, and essentially basing the national limit on one location/soil type has biased the limits calculation to a very low 280 NTU. The EPA should reconsider the ELG in order to provide for proper notice and comment on the unprecedented way in which EPA is using data from advanced treatment systems to represent passive treatment, and on the use of key newly introduced data (see Section I.B above for discussion of new KC-SeaTac data, which represents 15 of the 25 "treatment systems" that were included in EPA's limits calculation). As demonstrated below, EPA failed to provide the public with proper notice of EPA's regulatory plans and thereby, fell short from providing the required opportunity for comment on those plans.

In the proposed ELG, examples of passive treatment consisted of relatively simple BMPs similar to conventional technologies with the exception that some chemical or polymers are included to improve the settling of solids. The examples discussed included only simple procedures such as adding PAM to fiber bales staked into ditches at appropriate intervals (McLaughlin 2009), or locating PAM logs in ditches upstream of traps or ponds (McLaughlin Exhibit 10 paper) or crude liquid alum feeds based on rain displacement (ARC 2004) into sloped drainage ditches immediately upstream from settling ponds. All of the PTSs described in the proposed ELG required no pumping, mechanical mixing or electricity of any kind. Instead, all depended on simple gravity flow of the water across the site. The comments concerning PTS submitted to EPA were based on these types of technologies described in the proposed rule. However, in a major reversal without notice and comment, EPA calculated a "passive treatment technology" based turbidity limit from 25 individual sites, of which 22 are actually ATS technology without the final sand filtering process. The data used to calculate the limits is therefore overwhelmingly representative of highly effective, costly, and complex active technology, not simple passive technology.

In the proposal, EPA defined passive treatment as follows (page 72580, 3rd column):

> *"Passive treatment systems consist of a number of techniques that do not rely on pumping of stormwater or mechanical filtration and that are not as complex, do not cost as much and do not utilize as much energy as ATS."*

Note that systems that utilize pumping of the stormwater are specifically excluded from this definition. The public based all of their comments regarding PTS on that definition of the PTS technology. The ATSs from which the final PTS limit is derived use high capacity storm water runoff pumping and complex computerized controls to pump polymers into the storm water extensively at several different points within the system, as well as mechanical mixing and filtering. An ATS requires a full time operator on-site during treatment, who actively intervenes to manage treatment through a computerized central command location. In the final rule, EPA redefines passive treatment (page 63004 in final rule):

> *"Passive treatment technologies include conventional erosion and sediment controls, polymer addition to sediment basins, fiber check dams with polymer addition, and other controls."*

In the final rule, the specific exclusion of stormwater pumping and mechanical filtering has been omitted from the definition of "passive treatment." These are among the many reasons why an ATS is not "passive," and make ATS a much more effective means of treatment than PTS. The EPA should allow notice and comments on these major changes implemented since the proposed rule to ensure that the ELG reflects the proper use of available data.

2. EPA Failed to Document Why Several Plants Were Included or Excluded from the Limit Calculation

There is also a lack of information in the regulatory record for a number of key items that makes it difficult to confirm that EPA is properly using/excluding available data in setting the C&D ELG turbidity limit. EPA should reconsider the ELG to fill-in or clarify the following missing/confusing information:

- **WSDOT SR-522 Road Improvement Project, Elliott Road (ELLRD)**: EPA states the reason why this system was excluded from the limits calculation was "the effluent data represent ATS which is not EPA's model technology." Since EPA is utilizing data from other ATS in the limits calculations (e.g., KC-SeaTac), it seems clear that the issue is not that data from an ATS are automatically considered contrary to EPA's model technology. Instead, it appears that EPA is claiming that the only data available for this treatment system is effluent from the ATS, which we agree would not be the model technology. However, EPA-HQ-OW-2008-0465-0274.1 shows a set of influent turbidity values for this system. Didn't Cascade EcoSolutions collect "data after the pretreatment pond but before ATS filtration" unlike the other ATSs that EPA excluded from the limits calculations (e.g., systems 2, 3, 4, 6, 8, 11, BZR08, SC05, and SC08)? This seems to be the case given the information at the bottom of page 61 that reports "Pretreatment Turbidity" values that are considerably higher than "Influent Turbidity" values, which are higher than "Effluent Turbidity" values. EPA should document how ELLRD is different from the other ATSs for which data were used by EPA.

- **Lakeside (LSIDE), West Linn Corporate Park (WLCPO), and Hoodview Estates (HEO)**: EPA states the reason why each of these systems was excluded was "The effluent data represent ATS. The influent data were not pretreated with EPA's model technology." Given that other ATS were not excluded, clearly EPA is not excluding data from these sites solely on that basis. The EPA should document in the regulatory record how these systems are different from the other ATS for which EPA utilized data for setting the ELG.

- **Six Systems at a Commercial Site in Redmond, CA (Red.1-Red.6)**: EPA states the reason why these systems were excluded was because they used "batch treatment in cells, which is more extensive than EPA's model technology." The EPA should document why the model technology necessitates that data represent continuous ATS treatment rather than batch ATS treatment, as well as why batch treatment is a more extensive technology (shouldn't batch treatment be considered more akin to passive treatment)?

III. EPA HAS SUBSTANTIALLY UNDERSTATED CONSTRUCTION STORMWATER TREATMENT COSTS

The EPA has seriously understated the costs of costs of achieving a 280 NTU turbidity limit because the limit was not calculated from data that are generally reflective of passive treatment systems. As noted earlier, a large majority of the data that EPA included in its ELG limits calculation is from the pretreatment portion of an ATS (22 of 25 values). However, EPA estimated the cost of achieving the calculated turbidity limit based on the costs for a true PTS. This disconnect leads to EPA substantially underestimating the costs of achieving a 280 NTU limit.

URS Corporation developed a more accurate estimated of the costs of the 280 NTU limit based on the costs for an ATS without filters. Cost estimates were developed by modifying EPA's cost modeling workbook entries for regulatory Option 3. As detailed in a separate document, URS estimated the costs of the ELG under two scenarios.[12] The first scenario assumes that all affected construction sites employ an ATS without a sand filter. The second scenario, assumes that half of sites employ an ATS without a sand filter, and the other half employ the simple (and unproven) PTS technology that EPA used in the ELG cost analysis. Under the first scenario, URS estimates that the ELG will cost approximately $9.7 billion per year, or slightly more than 10 times EPA's ELG cost estimate of $953 million.[13] Under the second scenario, URS estimates an annual cost of about $6.8 billion under the assumption that fifty percent of sites are able to achieve the limit using a PTS. While some construction sites with low clay content may be able to consistently meet a 280 NTU limit using a PTS, it is expected that this option would only be available to a small proportion of construction sites because the great majority of the country contains clay much higher than 10 percent. Even in some of these rare instances, Pechan believes that the inherent variability in PTS effectiveness will result in a sizable number of construction firms choosing to install modified ATSs to ensure consistent achievement of the

[12] URS Corporation, "EPA's Final Construction and Development ELG, Summary Comparison of EPA and URS Cost Estimates," April 14, 2010.
[13] 74 *Fed. Reg.* 62996, 62998, December 1, 2009.

280 NTU limit. Therefore, Pechan concludes that the $9.7 billion first scenario costs represent the best available estimate at the present time.

IV. EPA SHOULD BE CAREFUL NOT TO SET THE TURBIDITY LIMIT LOWER THAN IS JUSTIFIED GIVEN THE MAGNITUDE OF WATER QUALITY BENEFITS

The EPA estimates that the C&D ELG will decrease total suspended solids (TSS) concentrations in affected surface waters by an average of about 2 milligrams per liter (mg/L). The current median concentration of TSS in Reach File Version (RF) 1 reaches receiving construction site discharges is 289 mg/L. The RF1 network consists of approximately 650,000 miles of the largest rivers and streams in the coterminous United States and associated lakes, reservoirs, and estuarine waters. In the "Top 10 percent" set of watersheds, TSS levels are expected to decrease by approximately 4 mg/L. Average TSS concentration reductions are greater for "Top 10 percent" watersheds because construction sites exert a stronger influence on water quality in these areas.

The EPA's benefits assessment estimates that construction sediment discharges only represent about **0.15 percent** of total sediment in surface waters, and that removing ALL construction sediment discharge would lead to only a **0.25 percent** reduction in baseline total suspended solids levels in RF1 waters.[14] The EPA should be careful about not setting the C&D ELG turbidity limit so low as to impose burdensome costs and unwarranted toxicity risks relative to potential water quality benefits (Section V discusses toxicity risks). A limit of 280 NTU may be too low given the small contribution that construction sediment makes to surface water turbidity.

V. EPA SHOULD REVISE ACREAGE APPLICABILITY THRESHOLD TO BETTER ADDRESS TOXICITY CONCERNS

Residual polymer in receiving waters can harm aquatic life. One such harm is caused when flocculated particles attaching to and clogging fish gills. By their nature, passive treatment systems do not have any safeguards to ensure that residual chitosan will be below levels that would cause harm. Even with the extra protections inherent in an ATS (precise metering of polymer/computer monitoring, filters to remove excess chitosan, and presence of on-site personnel during treatment), there have been polymer spills and fish kill incidents.[15] In interagency comments supplied by SBA during the interagency review of the final rule, Advocacy identified several instances of polymer spills into receiving waters, including two reports of fish kills in Maryland and California.[16] In the November 2008 Maryland fish kill,

[14] U.S. EPA, "Environmental Impact and Benefits Assessment for Final Effluent Guidelines and Standards for the Construction and Development Category," November 2009 (pg. 6-26).

[15] Seattle Port Authority engineers assert that chitosan levels in pretreatment water from ATS are too high to release to the environment, and will not pass Washington's or California's toxicity tests. They view ATS filters as necessary to address toxicity concerns (personal communication, Andy Bollman, E.H. Pechan & Associates, Inc. with Aaron Moldver and Bob Duffner, Port of Seattle/Aviation Environmental, February 16, 2010).

[16] "C&D Updated Toxicity Comments," email from Kevin Bromberg, SBA/Office of Advocacy, to Jim Laity, Office of Management and Budget, and Jesse Pritts, and Janet Goodwin, EPA/Office of Water, November 12, 2009.

large businesses on a $500 million contract for the Intercounty Connector were responsible for a fish kill.[17] It would be very risky to expose more small businesses to liability issues using either ATS or PTS, where the risk of overdosing is quite significant. EPA should consider raising the acreage threshold for the ELG to address the ability of small firms to manage toxicity risks.

[17] The separate flocculant pump was left running while the filtration system was stopped, which charged the system with flocculant. When the filtration system was enabled, a slug of flocculant overwhelmed the filtration process and resulted in a discharge with high chitosan levels. A required field test prior to discharge did not take place, which could have detected the high level of residual chitosan.

ATTACHMENT A. CALCULATION OF 793 NTU LIMIT

Site/System	*Number of Daily Values*	*Long-Term Average (NTU) w/rho*	*Daily Variability Factor (VF1) w/rho*	*Long-Term Average Values for True Passive Treatment Systems (NTU) w/rho*	*Daily Variability Factor (VF1) Values for True Passive Treatment Systems w/rho*
BHRBP2	116.00	68.96	3.642		
BWWTP	8.00	132.41	10.203		
KC1.1	28.00	55.81	2.283		
KC1.2	32.00	56.08	2.508		
KC1.3	10.00	55.77	1.867		
KC1.4	3.00	46.66	1.953		
KC1.5	16.00	42.09	1.775		
KC2.1	33.00	82.67	2.890		
KC2.2	30.00	85.96	3.104		
KC2.3	40.00	63.52	2.845		
KC2.4	23.00	64.13	3.646		
KC2.5	19.00	68.46	2.576		
KC3.1	13.00	52.53	3.219		
KC3.2	13.00	53.09	3.503		
KC3.3	15.00	44.88	3.878		
KC3.4	15.00	47.84	3.819		
KC3.Pond	7.00	47.59	2.809		
NC.Road	7.00	88.19	8.135	88.19	8.135
NCR.1	12.00	47.11	5.859	47.11	5.859
NCR.2	3.00	194.31	12.968	194.31	12.968
NY	220.00	105.20	4.140		
Red.East	169.00	251.48	6.391		
Red.West	56.00	122.70	5.934		
SEAAIR	9.00	117.79	3.586		
STCLLR	17.00	70.40	4.513		
Median LTA		64.13		88.19	
Mean VF1		4.322			8.987
Proposed Limitation		277.17			**792.60**

ATTACHMENT B. CALCULATION OF 501 NTU LIMIT

Site/System	*Number of Daily Values*	*Original EPA Long-Term Average (LTA, as NTU) w/rho*	*Daily Variability Factor (VF1) w/rho*	*New LTA with three averaged KC-SeaTac sites (NTU) w/rho*	*Daily Variability Factor (VF1) using three Averaged KC-SeaTac sites w/rho*
BHRBP2	116.00	68.96	3.642	68.96	3.642
BWWTP	8.00	132.41	10.203	132.41	10.203
KC1.1	28.00	55.81	2.283		
KC1.2	32.00	56.08	2.508		
KC1.3	10.00	55.77	1.867		
KC1.4	3.00	46.66	1.953		
KC1.5	16.00	42.09	1.775	51.28	2.08
KC2.1	33.00	82.67	2.890		
KC2.2	30.00	85.96	3.104		
KC2.3	40.00	63.52	2.845		
KC2.4	23.00	64.13	3.646		
KC2.5	19.00	68.46	2.576	72.95	3.01
KC3.1	13.00	52.53	3.219		
KC3.2	13.00	53.09	3.503		
KC3.3	15.00	44.88	3.878		
KC3.4	15.00	47.84	3.819		
KC3.Pond	7.00	47.59	2.809	49.19	3.45
NC.Road	7.00	88.19	8.135	88.19	8.135
NCR.1	12.00	47.11	5.859	47.11	5.859
NCR.2	3.00	194.31	12.968	194.31	12.968
NY	220.00	105.20	4.140	105.20	4.140
Red.East	169.00	251.48	6.391	251.48	6.391
Red.West	56.00	122.70	5.934	122.70	5.934
SEAAIR	9.00	117.79	3.586	117.79	3.586
STCLLR	17.00	70.40	4.513	70.40	4.513
Median LTA		64.13		88.19	
Mean VF1		4.322			5.685
Proposed Limitation		277.17			**501.37**

ATTACHMENT C. CALCULATION OF 652 NTU LIMIT

Site/System	***Number of Daily Values***	***Original EPA Long-Term Average (LTA, as NTU) w/rho***	***Daily Variability Factor (VF1) w/rho***	***New LTA with a single average KC-SeaTac site (NTU) w/rho***	***Daily Variability Factor (VF1) with a single Average KC-SeaTac site w/rho***
BHRBP2	116.00	68.96	3.642	68.96	3.642
BWWTP	8.00	132.41	10.203	132.41	10.203
KC1.1	28.00	55.81	2.283		
KC1.2	32.00	56.08	2.508		
KC1.3	10.00	55.77	1.867		
KC1.4	3.00	46.66	1.953		
KC1.5	16.00	42.09	1.775		
KC2.1	33.00	82.67	2.890		
KC2.2	30.00	85.96	3.104		
KC2.3	40.00	63.52	2.845		
KC2.4	23.00	64.13	3.646		
KC2.5	19.00	68.46	2.576		
KC3.1	13.00	52.53	3.219		
KC3.2	13.00	53.09	3.503		
KC3.3	15.00	44.88	3.878		
KC3.4	15.00	47.84	3.819		
KC3.Pond	7.00	47.59	2.809	57.81	2.84
NC.Road	7.00	88.19	8.135	88.19	8.135
NCR.1	12.00	47.11	5.859	47.11	5.859
NCR.2	3.00	194.31	12.968	194.31	12.968
NY	220.00	105.20	4.140	105.20	4.140
Red.East	169.00	251.48	6.391	251.48	6.391
Red.West	56.00	122.70	5.934	122.70	5.934
SEAAIR	9.00	117.79	3.586	117.79	3.586
STCLLR	17.00	70.40	4.513	70.40	4.513
Median LTA		64.13		105.20	
Mean VF1		4.322			6.201
Proposed Limitation		277.17			**652.37**