Response to Public Comments on the Revised 2020 NPDES permit AS0020001
Utulei Sewage Treatment Plant

May 2021

I. Background

EPA received comments on the revised permit, which was public noticed on November 20, 2020, with the comment period closing on December 20, 2020. EPA originally issued the NPDES permit for the Utulei Sewage Treatment Plant (Utulei STP) facility on November 19, 2019. EPA then withdrew four provisions and provided notice that the remainder of the permit was effective on February 15, 2020. EPA solicited comments on the revisions. American Samoa Power Authority (ASPA) was the only party to submit comments. The comments are summarized below along with EPA's responses.

II. EPA Response to Comments on the Basis for Permit Limits

ASPA comments that "…the dilution developed by EPA, although higher than used in the initial permit development, will still lead to exceedances for total nitrogen (TN) and total phosphorus (TP). Although, exceedances for TN would likely be rare, TP would be expected to be in exceedance of the monthly average permit limitation approximately 20 percent of the time. As described below, ASPA believes the initial dilution proposed by EPA remains overly conservative and is based on incorrect model inputs. Therefore, ASPA requests that EPA reconsider the predicted initial dilution ..."

<u>EPA Response:</u> When renewing an established permit such as this one, EPA is required to ensure both that the permit does not allow degradation of existing levels of water quality (40 CFR § 131.12(a)(1)), also known as "antidegradation" requirement, *and* that the proposed permit not allow backsliding from effluent limitations in the previous permit (40 CFR § 122.44(l)(2)), also known as the "antibacksliding" requirement. There are only limited exceptions to these requirements, as detailed at 40 CFR § 131.12(a)(2) and § 122.44(l)(2)(i) respectively and discussed further below. EPA has evaluated these exceptions in determining whether and how much additional dilution may be allowable for this specific permit. Consistent with these exceptions, EPA authorized a limited increase in dilution factor (from 91:1 to 121:1) and incorporated the resulting changes into the permit limits. Due to the established conditions surrounding the discharge, EPA has not found a basis to support further increases to the dilution factor.

The effluent limits for TN, TP, ammonia, and Whole Effluent Toxicity (WET) are established to achieve compliance with applicable Water Quality Standards (WQS). Section 303(d)(4)(B) of the CWA permits the modification of such effluent limits if WQS are attained in the receiving water and the discharge is consistent with the applicable policy on antidegradation. The applicable policy on antidegradation for Pago Pago Harbor is found at American Samoa WQS (ASWQS) § 24.0202, consistent with the provisions of 40 CFR § 131.12(a)(2), and specifies that degradation of water quality for waterbodies like Pago Pago Harbor is allowable only if the following four conditions are met:

1. The proposed degraded level of water quality will support existing uses;
2. A compelling economic or social need of the Territory is served by allowing limited degradation;
3. The highest practicable statutory and regulatory requirements will be met by existing and new point sources of pollutants; and,
4. All cost-effective and reasonable best management practices for non-point sources of pollutants will be achieved.

As the permit requires the discharge to comply with all WQS protective of existing uses, Point 1 is met so long as the permit limits are set to be protective of those uses. Point 2 is met by the compelling need of the territory to treat and dispose of its wastewater for public health and environmental reasons. Point 3 is met by EPA and AS-EPA's imposition of the highest practicable requirements on existing and any new facilities, and Point 4 is addressed through AS-EPA's non-point-source reduction efforts such as the successful American Samoa piggery discharge control program.

Based on the discharge and related aspects meeting this 4-part test in the ASWQS provisions allowing for limited degradation, EPA finds that the discharge with a dilution factor of 121:1 is consistent with the provisions of Section 303(d)(4)(B) of the CWA and therefore, the effluent limitations for TN, TP, ammonia, and WET could be modified in the manner summarized above.

To determine the 121:1 dilution factor was the maximum supportable, EPA conducted a sensitivity analysis using nine separate computer model cases using a range of input values provided by ASPA. In consultation with modeling experts from MixZon, Inc, EPA's modeling experts determined that this was the most representative critical dilution predicted for the total flow through the modified diffuser that remained protective of water quality. The specific behavior predicted by the model was one of several cases of plume surfacing, here with a plume centerline depth shallower than 2 feet, and the plume's predicted vertical spread significantly exceeding that separation (over 8 feet). This plume surfacing triggers the combined requirements of 40 CFR § 125.62(a), stating that a facility with a 301(h)-modified permit like the Utulei STP must "consistently achieve WQS at and beyond the zone of initial dilution" and the ASWQS criterion that no dilution zone may include the surface of the waterbody (ASWQS §24.0207(b)(9)). Therefore, allowable dilution (critical initial dilution) cuts off as soon as the plume surfaces. EPA judged the particular model run indicating dilution of 121:1 at plume surfacing to be most representative of critical initial dilution because, among many factors, it used direct density profile data as opposed to a temperature-salinity parametrization, was well within the range of dilutions established by flow-averaging dilution from port-by-port models of predicted diffuser behavior, and was consistent with the parametrization recommendations of the CORMIX software. Further background on the dilution modeling is provided in the Fact Sheet, Section VI.B.2.

Additionally, the recent Endangered Species Act listing of several corals present in the waters around American Samoa (see Section X.B of the Fact Sheet) made it imperative that EPA's assessment ensure the effluent plume did not pose a risk of impinging upon nearby reefs, some of which are present in close proximity to the discharge point. The results of EPA's re-modeling of the discharge provide confidence that the credited dilution value (121:1) occurs before any potential impingement of the plume upon the nearby reefs, thereby ensuring that the reefs are not subjected to pollutant levels in excess of the protective ASWQS. Therefore, EPA's dilution factor of 121:1 is protective of water quality in Pago Pago Harbor as it is protective of newly listed endangered species.

EPA addresses ASPA's comments relating to the appropriateness of specific model inputs in Section III of this document, below.

III. EPA Response to Comments on Technical Details of Modeling

A. <u>On model selection</u> - ASPA comments that "EPA selected the discharge plume model CORMIX, and specifically used the initial dilution model limitations for TN, TP, ammonia, and whole effluent toxicity (WET). CORJET uses essentially the same computer algorithms as ASPA's preferred model (UDKHDEN). When CORJET and UDKHDEN are run with identical inputs the models yield essentially identical results (see Attachment 1 for a comparison of the two models using EPA's inputs from the model files supplied by EPA). Therefore, ASPA does not object in general to the use of CORJET to develop the initial dilution for the discharge. However, as described below, ASPA does have objections to the way the model input was configured."

<u>EPA Response:</u> Comment noted.

B. <u>On specific parameters used for model execution</u> - ASPA comments that "[T]he input file for CORJET (supplied to ASPA by EPA) indicates that the model was run using similar density profile and discharge depth inputs as previously used by ASPA in its implementation of the UDKHDEN model. The diffuser configuration was also similar in most respects. However, there were important differences that generally resulted in unwarranted depression of the predicted initial dilution. These included the following:"

<u>EPA Response</u>: Comment noted.

1. <u>On diffuser port sizing assumptions in model</u> - ASPA comments that "[T]he diffuser has six 5.5-inch ports and one 11-inch end gate port. EPA used an average port size based on the average of the diameters of the individual ports. Although this is likely an oversimplification of the port geometry, ASPA does not have an objection to this approach. Although it would be more appropriate to use geometric and/or dynamic similitude to define equivalent port sizes. EPA may want to investigate the effects of that approach."

<u>EPA Response</u>: EPA's analysis found that the common modeling practice of

parametrizing multiple diffuser port sizes using a flow-averaged port size did not result in a meaningful difference in predicted dilution at the relevant mixing location (edge of the Zone of Initial Dilution (ZID)).

For context, some diffuser designs, including the one installed at the Utulei STP, vary the size of output ports along the length of the diffuser. Differing port sizes can affect the effective dilution for the proportion of the total effluent that exits through each respective port. The effect is largely driven by changing the pressure and thus exit velocity of each portion of the effluent, often designed to counteract the pressure loss experienced by the effluent as it moves down the diffuser. The diffuser design used at Utulei mounts a single larger end-gate port that primarily eases flushing of material from the diffuser especially where there may be concern about sediment build-up, the design does not vary the port size of other outlets along the diffuser. These two port sizes can be mathematically averaged to determine an "effective" flow-averaged port diameter, which can be mathematically advantageous for running a computer model, and that is the approach EPA's modeling experts favored in this case. Analysis shows no substantial change in dilution at the ZID, which is the parameter of interest, based on this modeling choice. When the ZID is sufficiently distant from the diffuser, hydrodynamic merging of the plumes from all diffuser ports is expected to occur before reaching the edge of the mixing zone, which tends to minimize any effect on overall dilution of the varied port sizes. This merging of plumes before reaching the limit of the ZID is also the case for the Utulei STP discharge, reduces the effect of using a flow-averaged port size in the analysis. EPA further notes ASPA's acceptance in principle of the port-area-averaging approach used in modeling. Therefore, EPA will retain the existing port parametrization.

2. <u>On ambient current speeds used as model inputs</u> - ASPA comments that "EPA used an ambient current velocity of 0.003 m/sec, essentially zero. This is inappropriate for what is essentially an open coastal marine setting where current speeds are typically characterized as a small value (say the 10th percentile) because the currents are changing constantly. It is noted that in the development of the recent StarKist Samoa permit, EPA used CORMIX with an ambient current of 0.02 m/sec. The StarKist outfall is in the same region of Pago Pago Outer Harbor (although somewhat deeper). Therefore, ASPA requests that EPA revise the CORMIX model input to include this ambient current speed, which would be consistent with the recent approach used for the modeling that EPA did for the StarKist Samoa NPDES permit."

   <u>EPA Response</u>: A regulatory requirement specific to the Utulei permit led EPA to use this near-zero ambient current velocity. EPA's analysis of the current speed as a model input for this 301(h) permit was constrained by the fact that ASWQS specify at §24.0201 that the "zone of initial dilution" is defined as being determined "…assuming zero ambient current…", and 301(h) discharges are specifically limited to dilution achieved within the ZID (EPA 301(h) ATSD, EPA publication #842-B-94-007, p 56.) For this reason, EPA must use

an ambient current value of effectively zero when setting model inputs for a 301(h) permit like that of the Utulei STP.

3. On model parametrization of diffuser port spacing - ASPA comments that "[T]he diffuser configuration used in the EPA CORJET model had all diffuser ports oriented in the same direction. The diffuser was intentionally designed and built with the ports discharging in alternate directions to either side of the diffuser barrel (with the exception of the end-gate port that discharges parallel to the diffuser barrel) to maximize dilution performance. Based on EPA guidance in the Amended 301(h) Technical Support Document (301(h) TSD), the distance between the ports should be consistent with ports aligned in the same direction, that is twice the spacing between individual ports. The 301(h) TSD guidance is provided in Attachment 2. Therefore, ASPA requests that EPA revise the CORMIX model input to use twice the port spacing used in its current CORJET modeling to account for alternating port directions."

   EPA Response: EPA assessed the effect of the spacing of Utulei STP's alternating-port diffuser design on overall dilution and did not find a significant effect in this case. Diffuser designs vary. The Utulei STP diffuser has ports on alternating sides. Modelers must account for the effects of port-exit directions and determine whether they have a significant effect on dilution. For alternating-port diffusers, one of the most crucial considerations is whether there is a significant ambient current and some of the ports are discharging "against" the current while others are discharging "with" the current, as the upstream/downstream effects of this setup can cause the two halves of the diffuser to achieve significantly different overall dilution performance. However, as noted in response III.B.2 above, ASWQS require EPA to assume a near-zero current velocity in the model, which negates this effect. Additionally, using "twice the port spacing" as ASPA's comment suggests, without accounting for the fact that there are two diffuser halves each using that spacing, would potentially neglect half the effluent if implemented without additional refinements.

   Furthermore, when a mixing zone is large enough that plumes from the various diffuser ports merge and blend before reaching the edge of the mixing zone, as is the case at Utulei STP, the effects of alternating- vs symmetrical port layouts are further averaged away. The major effects of port layout on dilution, in a near-zero-ambient-current situation, are only detectable before the plumes merge. EPA performed sensitivity analysis using multiple model runs and verified that this parameter did not cause substantial differences in dilution at the region of interest (the ZID boundary)

4. On using plume centerline vs. flux averaged model outputs - ASPA comments that "[I]t is noted that the CORJET output provides the centerline dilution of the discharge plume. To obtain the flux averaged plume dilution for the CORJET output, the centerline dilution should be multiplied by 1.3 for merged plumes from adjacent ports as described in the CORJET manual. It is

universally recognized that the flux averaged dilution is more appropriate and accounts for the idealized nature of the mathematical description of the plume. Attachment 3 shows a model output (an idealized statistical distribution across the plume) versus the actual plume structure for the same case that supports the accepted procedure of using a flux averaged dilution across the plume. Therefore, ASPA requests that EPA follow this practice and use the appropriate multiplier."

EPA Response: As ASPA comments, use of flux averaged rather than centerline dilution in analysis of effluent parameters would tend to raise the presumed dilution of the model output, and result in a roughly 30% greater (1.3x) dilution allowance. EPA opted to use the centerline dilution for the Utulei analysis due to the potential for the plume centerline to directly impinge upon sensitive species, including endangered corals, which would thereby experience the effects of effluent at the less diluted/more concentrated centerline concentration. In addition, it should be noted that the requested dilution increase would be duplicative with that which EPA has already granted under the antidegradation context (see Part II of this Response to Comments, 121/91 =1.32).

More specifically, permits that include a Clean Water Act Section 301(h) modification, as defined at 33 USC § 1311(h), must include an adequate zone of initial dilution calculated based upon conditions reflecting periods of maximum stratification and other periods when discharge characteristics, water quality, biological seasons, or oceanographic conditions indicate more critical situations may exist (40 CFR § 125.62(a)(1)(iv)). Because Section 301(h)(2) requires that "the discharge of pollutants in accordance with such modified requirements will not interfere…with…the protection and propagation of a balanced, indigenous population (BIP) of shellfish, fish, and wildlife" (see full text of this condition on page 3 of this Response to Comments), the zone of initial dilution (ZID) must be calculated to be protective of such organisms. Endangered species in the receiving water could potentially come in contact with the most concentrated (centerline) segment of the plume, as described in Section II of this Response to Comments. The plume contains pollutants including ammonia and Whole Effluent Toxicity (WET) which are known to cause acute effects to many species. Therefore, the peak (centerline) concentration of the plume must be considered to ensure protectiveness of water quality and sensitive species. See EPA publication 600/R-94/086, "Dilution Models for Effluent Discharges, Third Edition", pages 20-21, for additional discussion of the need to consider centerline discrete dilution values in addition to spatial averages when evaluating the effects of an effluent plume on water quality.

IV. EPA Response on Effluent Limits

A. On Total Nitrogen and Total Phosphorous - ASPA comments that "EPA states that (p.14 of the Fact Sheet) permit limitations can be met using a dilution of 91:1 or the revised 121:1. However, it is clear from the TN and TP data collected during the 2011 EPA Administrative Order (AO) that these dilutions are insufficient to meet the effluent limitations in the permit or the modified permit. It is noted that the Fact Sheet refers to TN and TP as toxic pollutants. These are not typically considered toxic pollutants in the American Samoa Water Quality Standards (ASWQS) or the national Recommended Water Quality Criteria (NRWQC)."

EPA Response: EPA developed effluent limits for TN and TP after analyzing these pollutants to determine whether either of them has the reasonable potential to cause or contribute to an excursion above any water quality standard, as required by 40 CFR § 122.44(d). As described in the permit fact sheet, the procedures used for conducting a statistical Reasonable Potential Analysis (RPA) are described in EPA's Technical Support Document for Water Quality-based Toxics Control (EPA 1991). These RPA procedures may and have historically been used for pollutants that are not considered toxics, including nutrients.

B. On Total Ammonia: ASPA comments that "ASPA has no further comments on ammonia, which should be in compliance under the requested change in initial dilution."

EPA Response: Comment noted.

C. On WET testing - ASPA comments that "[W]hole effluent toxicity (WET) is expected to be in compliance under the requested change in initial dilution."

EPA Response: Comment noted.

D. On total flow - ASPA comments that "[O]n page 12 of the fact sheet, EPA indicates the expected flow is 3 mgd over the term of the new permit and used this flow to calculate effluent limitations for BOD and TSS loadings. However, EPA used the design flow of 6 mgd for the dilution calculations. ASPA followed EPA's use of the plant design flow for calculation of the initial dilution but is curious as to whether the lower flow of 3 mgd would be more appropriate for model input for this permit."

EPA Response: The expected average flow for the Utulei STP is 3 million gallons per day (MGD) with a maximum flow of 6 MGD, and the choice of flow value significantly affects dilution and the resulting effluent limitations. Permits that include a Clean Water Act Section 301(h), 33 USC § 1311(h) modification must include an adequate zone of initial dilution calculated based upon conditions reflecting periods of maximum stratification and other periods when discharge characteristics, water quality, biological seasons, or oceanographic conditions indicate more critical situations may exist (40 CFR § 125.62(a)(1)(iv)). Dilution modeling, especially for a ZID-specific 301(h) discharge, must always account for critical conditions, one of which is the condition of maximum effluent flow, as identified in Section 301(h) ATSD (EPA publication #842-B-94-007, p 54). For this reason, EPA's dilution calculation and modeling are based on the 6 MGD maximum design flow.