

Response to Written Public Comments
on the 2020 draft NPDES permit
for the Samoa Tuna Processors facility
(NPDES Permit No. AS0000027)

April 2, 2021

On November 20, 2020, U.S. EPA Region 9 (hereinafter “EPA”) received written comments from Starkist Samoa Co. (hereinafter “Starkist”, “the Discharger” or “the Permittee”) on the draft National Pollutant Discharge Elimination System (“NPDES”) permit for the Samoa Tuna Processors (hereinafter “STP”) facility distributed for public comment during the public notice period from October 21, 2020 to November 20, 2020. Starkist was the only party to submit comments.

We summarized the comments, shown in *italics* (paraphrased for brevity), and responded below in the same tabular format as Starkist’s comments.

Effluent Limits and Monitoring Requirements

***Comment II.A.1.a. Zinc limit:** Both the reasonable potential analysis (RPA) and the numeric zinc limit determination are based on an initial dilution (25:1) as determined for the previous 2008 permit, not accounting for current conditions (e.g., decreased total effluent flow and increased effluent salinity). Starkist submitted updated mixing zone modeling using UDKHDEN and the critical initial zinc dilution determined from this modeling was 137:1. Therefore, Starkist requested use of the required dilution (D_R) of 119, which is necessary to meet American Samoa Water Quality Standards (ASWQS) for zinc at the edge of the mixing zone and less than the critical initial dilution of 137:1. EPA should utilize the CORMIX model to assess a more appropriate dilution factor for zinc.*

EPA Response: EPA granted a dilution increase only for total nitrogen and total phosphorus in the draft permit. For ammonia, copper, zinc, mercury, and toxicity, EPA retained the same dilution factors from the previous permit because there was no basis for an increased dilution allowance under the antidegradation requirements. This approach was consistent with the February 2020 NPDES permit issued to Starkist for its main facility (located adjacent to this STP facility) that also discharges wastewater to the same outfall (i.e., Joint Cannery Outfall, JCO).

However, detection of zinc levels in the effluent was up to approximately 30 times higher than the most stringent water quality criteria¹ during the preceding permit term. Without the relaxation of dilution credits, the discharge might not be able to meet the permit limits.

Receiving water collected from August 2018 to August 2019 at the boundary of the zone of initial dilution (ZID) showed zinc concentrations of 0.75 to 7.85 µg/l, which were well below the most stringent water quality criteria of 81 µg/l. Therefore, EPA finds that there is assimilative capacity in the receiving water for zinc. In addition, while the effluent zinc concentrations (mg/l) have slightly increased, the overall zinc loading (lbs/day) to the harbor has decreased due to

¹ Based on ASWQS § 24.0206(g)(3), the more stringent zinc criteria found in the National Recommended Water Quality Criteria for Aquatic Life (USEPA, 2013) were used to conduct RPA and determine the zinc permit limits.

significantly lower discharge flow from the STP facility² so EPA believes that there would be no degradation of receiving water quality due to relaxation of zinc dilution.

EPA re-modeled the discharge using the new input values (e.g., decreased flow and increased salinity) under the critical conditions (e.g., the most conservative density profile and zero current). The CORMIX model results demonstrate that a dilution for zinc is 200:1 at 36 meters where buoyancy reversal occurs. However, under the ASWQS §24.0207(a) provision, zones of mixing shall be limited to the smallest area possible. Therefore, EPA is limiting the dilution to 52:1. EPA has based the new permit limits on the 52:1 dilution, which is associated with the smallest mixing zone necessary to enable the discharge to meet the water quality criteria. A dilution factor greater than 52:1 is not adequately protective of receiving water quality and aquatic life based on the antidegradation requirements. The previous 2008 permit also established a smaller zone of mixing for metals even within the ZID of the discharge, which extends only a few meters from the discharge point.

In the final permit, EPA has implemented this increased zinc dilution in conducting reasonable potential analysis and establishing the permit limits for zinc. See Tables 3 and 4 of the Fact Sheet. Based on actual performance data since June 2018 when Starkist started its operations at the STP facility, EPA finds that Starkist will be capable of meeting the new zinc effluent limits (i.e., maximum daily limit of 4,640 mg/l and average monthly limit of 2,313 mg/l). In order to ensure that this relaxation of zinc dilution and limits does not result in lowering receiving water quality, the permit also prohibits the discharge flow from the STP facility greater than the projected maximum daily flow of 0.1 million gallons per day (MGD). See Part I.A.3 of the final permit. Exceeding this flow could result in greater potential to violate effluent mass-based limits and degrade receiving water quality.

EPA believes that the relaxation of the zinc effluent limits derived from an increased dilution factor of 52:1 (previously 25:1) under the final permit satisfies the CWA 303(d)(4) provision allowing backsliding when water quality exceeds levels necessary to protect designated use(s) identified for such waters, and as further required under 303(d)(4)(B), meets the requirements of the federal and ASWQS antidegradation policies at 40 CFR § 131.12 and ASWQS § 24.0202, respectively.

Despite no process wastewater discharged from the STP facility, zinc has been detected at levels high enough to cause reasonable potential exceeding ASWQS. Therefore, EPA highly recommends that Starkist investigate potential sources of zinc in the discharge from the STP facility.

Comment II.B.1. Hold Time Concerns: *Of the new parameters included in the draft Permit, Beta-BHC, Bis(2-ethylhexyl) Phthalate, Pentachlorophenol, Hydrogen Sulfide, and Heptachlor need to be shipped off-island to the mainland for analysis. It is anticipated that there will be considerable challenges with shipping due to the current travel restrictions related to COVID-19. Therefore, Starkist suggests reduction in monitoring frequency for these parameters from semi-annually to annually due to the 7-day hold time concerns.*

² The STP facility ceased tuna canning and processing operations in December 2016, resulting in no process wastewater discharge and significantly reduced discharge flow (i.e., maximum daily flow from 1.4 MGD to 0.1 MGD).

EPA Response: EPA appreciate Starkist’s description of challenges with shipping and logistics of transporting environmental samples from the remote location of American Samoa, especially during the COVID-19 pandemic, and recognizes the difficulty that Starkist may have in meeting the 7-day method holding requirements for new parameters with monitoring requirements. However, we disagree that monitoring frequency reduction is warranted due to travel restrictions related to a temporary and dynamic COVID-19 situation, especially as many parts of the country and territories have already taken steps to relax social distancing restrictions, with the goal of returning to normal operations. Please refer to EPA’s website <https://www.epa.gov/enforcement/covid-19-enforcement-and-compliance-resources> that EPA established to provide the public, the regulated community, and other government agencies with the most complete and up to date information on EPA enforcement and compliance policy and actions related to COVID-19.

As Starkist notes in the November 20, 2020 comment letter, it is anticipated that the samples can reach an appropriate testing laboratory within a 7-day hold time under normal travel conditions. It is the permittee’s responsibility to ensure its contract laboratory meets the requirements of each pollutant test method and properly follows QA/QC procedures and reports accordingly.

Comment II.C.1. Dilution Factor for Metals: *The 25:1 dilution factor for zinc is inappropriate for use in RPA. Using an updated dilution factor of 119:1, there is no RP to exceed ASWQS and the zinc limits should be removed.*

EPA Response: Please see EPA’s response to Comment I.A.1.a above.

Comment II.C.2. Dilution Factor for Other Parameters: *Bis(2-ethylhexyl)phthalate and total sulfide were previously sampled and reported in the receiving water at the zone of initial dilution (ZID) during receiving water quality monitoring in April 2017, August 2017, March 2018, and August 2018. Either bis(2-ethylhexyl)phthalate or unionized sulfide values in any receiving water samples met the water quality criteria for each parameter at the ZID. As this indicates that dilution is occurring for Bis(2-ethylhexyl)phthalate and total sulfide, Starkist requests that the monitoring requirements for the Bis (2-ethylhexyl) phthalate and sulfide be removed.*

EPA Response: EPA appreciates the 2017-2018 receiving water data for bis(2-ethylhexyl)phthalate and total sulfide. However, EPA does not believe that these receiving water samples at the ZID showing compliance with the water quality criteria ensure dilution for bis(2-ethylhexyl)phthalate and total sulfide because the receiving water sampling was not conducted at the same time when the effluent containing the maximum concentration of these pollutants discharged (i.e., effluent sampling conducted in January 2019).

Based on ASWQS §24.0206 (Standards of Water Quality) and §24.0207 (Zones of Mixing)³, water quality standards defined in ASWQS §24.0206 shall be applied at the point of discharge unless a mixing zone is authorized by the American Samoa Environmental Quality Commission

³ ASWQS §24.0207(a) states that “because of technological, economic and other factors, it may not always be feasible to achieve an effluent quality that equals or exceeds the standards established herein at the point of discharge.” §24.0207(c)(1) also states that “... where the effluent quality of the discharge does not meet the applicable standards defined in §24.0206 at the point of discharge shall be in violation of these standards until such time as the EQC grants a zone of mixing upon receiving and acting upon an application for a zone of mixing from the discharger.

(EQC) and approved by EPA. Currently, there is no authorized mixing zone for bis(2-ethylhexyl)phthalate and total sulfide, therefore the effluent must meet water quality criteria for these pollutants at the discharge point, not at the boundary of the ZID.

Despite reasonable potentials to exceed water quality criteria for these compounds, EPA established monitoring only requirements, instead of imposing effluent limits, to further characterize the effluent and collect sufficient data to evaluate whether or not effluent limits must be established in the next permit reissuance.

Comment II.C.3. Estimated Concentrations: *The maximum effluent concentrations, used for RPA, for Nickel, Bis(2-ethylhexyl) Phthalate, Pentachlorophenol, and Heptachlor are estimated concentrations which means the parameter was detected above the method detection limit (MDL), but below the reporting limit (RL). Accordingly, Starkist requests that the monitoring requirements for these parameters be eliminated or reduced to annual.*

EPA Response: Based on reasonable potential analysis with estimated concentrations of these pollutants (i.e., nickel, pentachlorophenol, bis(2-ethylhexyl)phthalate, and heptachlor), there was reasonable potential to cause or contribute to an exceedance of the applicable criteria. See Table 3 of the Fact Sheet. Because the maximum observed concentrations are estimated values of the pollutants, EPA established monitoring only requirements, instead of imposing effluent limits. Collection of regular data for these pollutants is necessary to fully characterize the discharge and evaluate whether or not effluent limits are required in the future. EPA has decided that annual monitoring for these parameters could be sufficient to determine reasonable potential in the next permit term and establish a statistically robust dataset on these parameters; therefore, the monitoring frequency for nickel, pentachlorophenol, bis(2-ethylhexyl)phthalate, and heptachlor has been reduced to annually.

Pursuant to Section I.D.1 of the permit, Starkist is required to use a sufficiently sensitive method with the lowest the method detection limit (MDL) and minimum level (ML). EPA highly recommends the use of the more sensitive analysis method of EPA 200.8 (ICP/MS method) for metals, except mercury with EPA 1631E.

Comment II.D. Choice of Model: *The new ASWQS that is recently approved by EPA includes an updated definition of “Zone of Initial Dilution”, which now specifies use of the UDKHDEN model, not the CORMIX model. The Fact Sheet fails to recognize the specification of UDKHDEN in the recent revisions to the AS WQS. Instead, the Fact Sheet repeats the same statements regarding UDKHDEN and CORMIX that US EPA had made in the context of the issuance of the NPDES Permit for the Starkist Samoa facility in February 2020, which are incorrect or inaccurate. Comments on selected statements are set forth in Attachment A*

EPA Response: Based on the definition of “zone of initial dilution (ZID)” in ASWQS §24.0201, use of the UDKHDEN is recommended to determine the ZID and initial dilution ratio **unless otherwise approved by the EQC and US EPA**. EPA has already approved the CORMIX model and concluded that this model is more appropriate to account for the complex discharge plume scenario such as boundary interactions, re-entrainment effects, and complex current patterns in Pago Pago Harbor. In addition, ASWQS §24.0207(c)(6) further notes that “the granting of a mixing zone shall be subject to approval by US EPA.” Therefore, EPA’s decision on the use of CORMIX model is not contrary to the ASWQS.

Please see EPA responses to each modeling comment in Attachment A below. Also, please see the February 2020 Starkist cannery Fact Sheet, Section VI.2.b for the comprehensive modeling discussion, including model selection, approach, and conclusion.

Receiving Water Monitoring

Comment III.A. Coral Reef Monitoring: *There are safety concerns and accessibility of monitoring stations issues and sampling should not be conducted at locations with a depth of 30 feet. Starkist requests to remove requirements to sample where the water has a depth of 30 feet and suggests the permit require the samples to be taken as close to the reef crest as possible.*

EPA Response: EPA appreciates the discharger's more detailed input on the specific safety and logistical issues affecting sample collection at the three receiving water monitoring stations Coral-N, Coral-E, and Coral-S. These sites were located to collect data representative of conditions affecting the coral reefs in Pago Pago Harbor, which impinge upon the zone of mixing and constrain it in accordance with ASWQS §24.0207(b)(9). The depth ranges specified for sample collection are consistent with input received from the American Samoa Environmental Protection Agency (AS-EPA), based on their local expertise, that

...for a Harbor fringing reef... Any sampling depth greater than 60 feet is not representative of waters in near proximity to coral, as coral growth is typically limited below 60 feet because of reduced sunlight penetration. (August 12, 2019 AS-EPA comments on the Starkist Cannery draft NPDES permit)

Collection of these receiving water data in close proximity to the reef are necessary to ensure the protection of water quality, including protection of endangered species such as specific corals believed to be present in the Harbor by the National Marine Fisheries Service (NMFS).

At the same time, monitoring provisions are not intended to present a risk to the safety of persons collecting the required samples. Starkist's submission of more detailed information on the bathymetry profiles near the stations, tidal and wind behavior, and especially the results of recent test run to approach each sampling locations by boat were taken into account by EPA in the final permit. The updated receiving water monitoring language clarifies that safety of the monitoring team is the top priority and defers to the vessel operator's professional discretion to determine the closest safe approach to the defined sampling locations, even when it restricts sampling to areas beyond the target seabed depth(s). The final revised permit language, Part I.E.1.g on page 11 of the permit, clarifies this greater flexibility as follows:

“samples shall be collected at a location where the total water depth is approximately 30 feet up to a maximum total water depth of approximately 60 feet to ensure representative sampling of near-reef waters as specified by AS-EPA, except where this requirement would conflict with vessel safety. In the case that the above depth requirements cannot be met, the sampling vessel shall still approach as close as safely possible to the respective station location”

This revised language facilitates reef station sample collection at bottom depths which are safely achievable but still sufficiently close to each designated sampling site to be representative.

Comment III.B.1. Additional Receiving Water Monitoring Issues: *Certain parameters are required to be collected as continuous vertical profiles (e.g. every meter of depth). Starkist requests that EPA clarify whether it intends vertical profile data to be averaged at 1-meter depth intervals.*

EPA Response: The permit states that measurements of temperature, salinity, dissolved oxygen, pH, and turbidity shall be collected as vertical profiles. In the table, “every meter of depth” was just meant as an example of vertical profiles, which is what the “e.g.” literally means. It does not intend vertical profile data to be averaged at 1-meter depth intervals. Unlike other sampling at 3 or 5 fixed depths in the water column, Starkist is required to collect vertical profile data of these parameters in the water column at any finer vertical resolution/collection frequency.

Miscellaneous Comments

Comment IV.A.1. *In Part I.A.3, the draft Permit states that the discharge shall comply with all provisions of the American Samoa Water Quality Standards (“ASWQS”), including the narrative standards at Section 24.0206. However, for purposes of clarity, this requirement should generally include the provision “except within an approved and applicable mixing zone”, which applies to a number of provisions.*

EPA Response: ASWQS §24.0206, Standards of Water Quality, states that “the following standards apply to all territorial and ground waters..., except as otherwise provided in §24.0207 (Zones of Mixing).” In accordance with ASWQS §24.0206 and §24.0207, EPA believes that water quality standards including the narrative standards for Pago Pago Harbor shall be applied at the discharge point unless a mixing zone is authorized by the EQC, including its authorized agents, and approved by EPA to contain alternate standards within the zone of mixing. For clarification, the statement in Part I.A.4 of the final permit has been revised as follows:

“The discharge shall comply with all provisions of the American Samoa Water Quality Standards (“ASWQS”) including the narrative standards at Section 24.0206, at the discharge point unless a zone of mixing has been authorized by the Environmental Quality Commission (“EQC”) and approved by EPA consistent with ASWQS §24.0207.”

Comment IV.B.1. *Section IV of the Fact Sheet, entitled Description of Receiving Water, states: “Due to the small size and relatively limited development of those watersheds, the majority of point-source pollutant discharge to the harbor is likely to be direct discharge from shoreline facilities, which include all the NPDES-permitted industrial facilities in American Samoa.” This is not supported by either data or a reference and is somewhat misleading. Effects of the cannery discharge are not generally seen in the Outer Harbor. Based on concentration gradients of TN/TP, the point source discharges have little effect on the nutrient concentrations on the scale of the Harbor.*

EPA Response: EPA appreciates the discharger providing stream data of the five permanent streams flowing into Pago Pago Harbor. EPA’s statement describes major point source dischargers discharging to Pago Pago Harbor. EPA defines point source pollution as any discernible, confined, and discrete conveyance of pollution from which pollutants are or may be discharged such as discharge pipes and drainage ditches. See 40 CFR §122.2. Stormwater runoff

or pollutants discharged from a large area (e.g., urban and agricultural areas and livestock facilities) are generally associated with non-point source pollution. Regardless of flow rates from the shoreline facilities, EPA believes that the shoreline facilities, including all the NPDES-permitted facilities, are the main point-source dischargers to the Harbor. To avoid any confusions, a description of non-point source discharges has been also included in Section IV of the Fact Sheet:

“The majority of point-source pollutant discharge to the harbor is likely to be direct discharge from shoreline facilities, which include all the NPDES-permitted domestic and industrial wastewater facilities. In addition to the point source dischargers, stormwater runoff from urban area, agriculture and livestock facilities, runoff or spills from animal feeding operations, and legacy sediment contamination are major non-point source pollutant discharges to the harbor (*Total Maximum Daily Loads for Mercury and PCBs, and Arsenic Analysis for Pago Pago Inner Harbor*, Territory of American Samoa, Tetra Tech, 2007; *American Samoa Bacteria TMDLs for Beaches and Streams*, Tetra Tech, 2014).

Due to these various pollutant sources, TMDL requirements have been established for bacteria, mercury, and PCBs in Pago Pago Inner Harbor. In 1992, the two historic tuna canneries (i.e., the STP facility and Starkist tuna cannery) began discharging wastewater through the Joint Cannery Outfall to the outer harbor, benefiting water quality in the inner harbor (Tetra Tech, 2014, section 5.1.2).”

Attachment A. Modeling Issues Described in the Draft Fact Sheet

Comment 1. *The statement that: “In all cases, the requested dilution was significantly greater than what was approved under the previous permit” is incorrect and potentially misleading.*

EPA Response: This statement explains that the dilution Starkist requested in the 2017 mixing zone analysis (MZA) was significantly greater than what was approved for each parameter under the previous 2008 permit, as shown in the table below. For clarification, the dilution factors requested in the 2017 MZA were added in Table 2 of the Fact Sheet.

Parameter	Ammonia	Copper	Zinc	Mercury	Nitrogen	Phosphorus
2008 permit dilution	313:1	25:1	25:1	40:1	279:1*	279:1*
2017 MZA request	536:1	200:1	200:1	200:1	1008:1	1008:1
2021 permit dilution	313:1	25:1	52:1	40:1	330:1	330:1

* See EPA response to Attachment A-Comment #4 below.

Comment 2. *The Fact Sheet states that: “Limited Current Data: Due to the low precision of the instruments used to collect data in the mid-1980s, plus the limitations of the dye studies used in 1993, among other factors, the current data used in the MZA may not reliably represent the full range of, and “worst case” scenarios of, current speed for this discharge.” This statement is*

speculative and without basis. The best data available was used and knowledge acquired from decades of working in Pago Pago Harbor as well as in many other similar locations around the world was applied.

EPA Response: EPA appreciates your comments. However, EPA continues to believe that the current data used in the MZA may not reliably represent the full range of current speed for the discharge due to minimal data on current speeds and directions across depths (i.e., only 2 dye studies in 1993-94, few depths analyzed, flow direction varying between the depths analyzed when Starkist’s modeling assumes a uniform flow out of the Harbor at all depths, etc.). See February 2020 Starkist Cannery Permit Fact Sheet, section VI.B.2.a for detailed information.

Current interactions can have a dramatic effect on effluent mixing, especially in the far field region which Starkist’s preferred dilution analysis relies upon. Similar to density (i.e., stratification), current speed can vary across depths and can also be confounded by time-varying tidal effects commonly associated with bays and enclosed harbors. Under critical conditions of low wind and current such as those shown to occur in the receiving water, diluted effluents may linger in the vicinity of the effluent plume or become re-entrained in the plume flow, significantly reducing effective dilution. For this reason, EPA believes that the limited current information available as a model input is a further basis for the 330:1 dilution used to calculate effluent limits for total nitrogen and total phosphorous as a reasonable worst-case scenario (i.e., zero current, as required under AS-WQS §24.0201, subsection “zone of initial dilution”) in both permits.

Comment 3. *The statement that “Limitations of the chosen modeling software and approach: The modeling software used to prepare the MZA (i.e., UDKHDEN) is not appropriate for this particular mixing scenario, especially in the context of boundary interactions and the potential for complex current patterns that lead to “re-entrainment” of the effluent plume in Pago Pago Harbor.” is not accurate. The Fact Sheet fails to recognize two models (i.e., initial dilution model of UDKHDEN and subsequent diffusion model) were used in the MZA and appears to address the results of the secondary modeling as if they were part of the initial dilution process. Although re-entrainment can be important when applying model results to specific parameters, this is addressed by using background concentrations.*

EPA Response: EPA recognizes that two models were used in Starkist’s 2017 MZA for the discharge plume, including the UDKHDEN model for initial dilution modeling and a subsequent far-field diffusion model, and remains concerned about both models. The results of the CORMIX output suggest that bank interaction does begin to cause a limiting effect on dilution even in the near-field phase. The UDKHDEN model used for near-field phase assumes an infinite ocean, and does not appropriately limit its conclusions when real-world constraints like bathymetry may affect, be affected by, or interact with the discharge. The subsequent diffusion model used for far-field phase is not appropriate because it a simple linear model based on the Brooks’ equation and also does not account for the effects of the harbor boundary.

The most recent round of UDKHDEN modeling also does not account for current directions changing with depth as the effluent plume rises through the water column. EPA does not agree with the assumption of a uniform current direction that flows south out of the Harbor because the Harbor is a wind-driven current system. The depth-invariant current assumption is a limitation of the capabilities of the UDKHDEN model.

Furthermore, model outputs require additional analysis when currents drive water already containing effluent through the area of the discharge plume multiple times, because this reduces the capacity of the water to absorb and dilute additional effluent. Given that the current may reverse direction depending on depth, it is possible for effluent to be carried away from the diffuser in one direction, then as it rises encounter an opposing current and be carried back over the diffuser location, re-introducing diluted effluent and reducing the overall effective dilution. This phenomenon is known as “re-entrainment” and is a common factor in modeling discharges to estuarine and other near-shore ocean waters, such as this discharge to Pago Pago Harbor, and which does not appear to have been considered in the discharger’s MZA. Starkist states that re-entrainment is addressed by using background concentrations. However, simple static background concentrations may not accurately represent the time-varying receiving water concentrations and the concentration build-up in the transient discharge plume due to the tidal reversals and re-entrainment, especially where close to diffuser. The data available at present are not sufficient for EPA to rule out the possibility of re-entrainment, where effluent re-crosses the diffuser location. This re-entrainment can significantly reduce effective dilution because the “diluting” water already contains effluent from the previous tidal cycle. Therefore, EPA requires extensive receiving water monitoring including data collection at the diffuser site to adequately characterize the plume behavior.

Comment 4. *The Fact Sheet states that: “Incorporation of mixing zone into receiving water monitoring program: The permittee’s MZA sought a mixing zone 981 feet in radius with a claimed dilution of 1008:1 within that area while EPA’s preceding permit allocated only a 248:1 mixing ratio within a mixing zone of approximately double that area (1300 feet in radius).” The dilution of 1008:1 is derived by using both initial dilution (UDKHDEN) and subsequent dilution as described in the MZA. Please refer to the previous MZA on which the current permit is based, as well as the current MZA to understand what was done. The dilution of 248:1 was not used in the prior permit, which was back calculated by EPA based on inappropriate methodology.*

EPA Response: EPA appreciates the clarification and comments on the previous mixing ratio of 248:1 for total nitrogen (TN) and total phosphorous (TP). In order to evaluate modeled mixing performance with real-world data and validate plume behavior and species protection such as coral reef interactions, EPA has set receiving water monitoring requirements at the old (1300-foot) and permittee-proposed (981-foot) mixing zone radii, as well as sensitive locations like nearby coral reef boundaries.

The dilution factor for TN and TP was not explicitly stated in the 2008 permit document. In response to Starkist’s request, EPA looked into the previous 2008 dilution factor and found that a dilution of 248:1 is applied only for the discharge from the adjacent Starkist facility. EPA recalculated the previous dilution factor for TN and TP based on the ratio of the aggregate TN and TP permit limits in the combined loading authorized at the JCO (i.e., 2,000 lb/d for TN and 400 lb/d for TP)⁴ to the ASWQS applicable at the time the previous permit was issued (i.e., 0.2 mg/l for TN and 0.03 mg/l for TP). Considering the total combined flow of 4.3 MGD at that time, EPA finds that the previous permit originally issued to Chicken of the Sea Samoa Packing

⁴ Historic mass-loading modeling in the early 1990s determined that a mixing zone boundary set at 1,300 feet from the diffuser, or the 30-foot depth contour, whichever is closer, would be able to assimilate 60,000 lbs/month (2,000 lbs/day) of total nitrogen and 12,000 lbs/month (400 lbs/day) of total phosphorus from the two tuna canneries discharges.

Company, Inc. (currently the STP facility)) authorized a dilution factor of 279:1 for TN and TP in the total combined discharge. The fact sheet has been adjusted with this revised dilution factor.

Comment 5. The Fact Sheet discussion of CORMIX:

Comment 5(a). *CORMIX is not more modern model and dates to approximately the same time as UDKHDEN. CORMIX does not account for weak and irregular density of gradients or the region of flow establishment.*

EPA Response: EPA appreciates Starkist’s comments. Please note that CORMIX model that EPA used for the mixing zone analysis for the discharge was CORMIX version 11.0.1.0 released July 23, 2019 plus MIXZON’s latest tool for the additional analysis of weak vertical density gradients, which is a more modern model than the most up-to-date UDKHDEN that Starkist used. To avoid any confusions, the statement in the draft fact sheet has been changed as below.

“EPA conducted a mixing zone analysis using a more modern modeling software package (i.e., CORMIX v11.0.1.0 released July 23, 2019) to account for complexities of mixing behavior in Pago Pago Harbor, such as boundary interactions and re-entrainment effects.”

With regards to vertical density stratification, EPA re-modeled the discharge using the most conservative density profiles (i.e., weak density stratification) in addition to the two previous density profiles. Based on these input values, the results demonstrate that using observed density stratification conditions, the edge of the plume (half-width) would still be likely to surface, and in any case, limit approvable dilution to a value no greater than 343:1, which further validates EPA’s previous dilution analysis and the previously determined 330:1 dilution factor for total nitrogen and total phosphorous.

Comment 5(b). *Because neither of boundary interactions or re-entrainment effects were used in the model results, EPA should negate the claimed purpose of using CORMIX*

EPA Response: CORMIX has a built-in capability to account for the boundary- and re-entrainment effects that may affect achievable dilution. The boundary-interaction effect is particularly important in this discharge modeling because the reef slopes are within Starkist’s proposed mixing zone. The reef slopes are likely to be home to several endangered coral species, which would not be able to relocate in the event the discharge was to affect them. As a result, EPA prepared both near-field and far-field analyses of dilution in Pago Pago Harbor using CORMIX’s built-in capability to warn when boundary interactions may affect achievable dilution, with boundaries set at the measured distance to the closest reef slope, which is also a significant bathymetric feature likely to constrain flow and plume spread if approached. The results of this CORMIX output suggest that bank interaction does have the potential to cause a limiting effect on dilution even in the near-field phase.

The re-entrainment effect is a common factor in modeling discharges to estuarine and other near-shore ocean waters, such as this discharge to Pago Pago Harbor, and therefore would require strong evidence to affirmatively exclude. EPA believes that the critical condition of low (or zero) current could easily lead to re-entrainment of the effluent plume in Pago Pago Harbor. The depth- and time-invariant current assumption inherent in the UDKHDEN model, and the lack of consideration of tidal effects in the Brooks equation for the far-field, further prevent the

discharger's submitted modeling from excluding the potential for further reduction in the overall effective dilution.

***Comment 5(c).** CORMIX predicts that the plume surfaced for every case considered, but plume surfacing is seen by field data collection teams occasionally for brief periods of time. Therefore, CORMIX provided unrealistic results.*

EPA Response: Based on EPA's repeated modeling of the discharge plume, EPA found that there is potential for the plume (specifically, plume half-width) to reach or come very near to the surface. Because EPA's dilution analysis was conducted under a worst-case scenario (i.e., conservative inputs of flow, stratification, and current), it does make sense that the field data collection teams have observed plume surfacing on an occasional rather than constant basis.

As ASWQS do not permit inclusion of the water surface in a mixing zone (see ASWQS §24.0207(b)(9)), regardless of the frequency of plume surfacing, EPA is only considering available dilution before plume surfacing. In other words, due to potential plume surfacing, the dilution allowable is limited to that which occurs without (i.e., before) the plume would be expected to surface under critical conditions.