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| **State of Hawaii, Department of Health, Clean Water Branch** |
| **ZID/ZOM Form** |
| **Application to Request a New or Renewal Zone of Initial Dilution (ZID) and/or Zone of Mixing (ZOM).**A ZID/ZOM is an area where the effluent and receiving State water undergo a mixing process. A regulatory ZID/ZOM is a limited area where dilution of a discharge occurs and where certain numeric water quality criteria may be exceeded. The regulatory ZID/ZOM is defined based on regulations and implementation policies.  |



**Any application for a ZID/ZOM shall be made concurrently with the corresponding National Pollutant Discharge Elimination System (NPDES) Permit. The conditions of the ZID/ZOM will be incorporated as conditions of the NPDES permit. You are required to read the contents of this form, comply with all of the stated requirements, and complete this form by providing all of the requested information. Failure to comply with all of the stated requirements and/or provide all of the requested information may result in a denial of your request for a ZID/ZOM and NPDES permit.**

**By submitting this form, you are certifying that all of the information you provided,** **including the model inputs, model outputs, and requested dilution values complies with the requirements specified on this form.**

## Step 1 – Define the Goals of Your ZID/ZOM Dilution Study

A ZID/ZOM dilution study is a special study that provides rationale for the establishment or retention of a regulatory ZID/ZOM and associated dilution credits in an NPDES permit. The goals of your ZID/ZOM dilution study are as follows:

1. Develop appropriate dilution ratios for implementation within your NPDES permit.
2. Develop appropriate ZID/ZOM boundary for implementation within permit.
3. Determine whether dilution study is adequately protective.
4. Enter your additional goal(s) as applicable. Enter “N/A” if not applicable.

INSERT TEXT HERE

## Step 2 – New Application and Renewal Application Requirements

1. Pursuant to HAR 11-54-9(c)(1), a new or renewal ZID/ZOM is required to be made concurrently with the new or renewal NPDES application.
2. Any dilution study and/or partial dilution study submitted less than 180 calendar days prior to the expiration of the current NPDES permit shall not be accepted.
3. You may not request for a renewal ZID/ZOM if your current NPDES permit required you to perform a dilution study and you did not perform or complete the dilution study.
4. All water quality data used in your dilution study, including your model inputs, shall be obtained from representative samples. A representative sample is defined in the DOH Standard NPDES Permit Conditions, Section 14(a) located at: <http://health.hawaii.gov/cwb/site-map/clean-water-branch-home-page/standard-npdes-permit-conditions/>.
5. All water quality data used in your dilution study, including your model inputs, shall only be from test methods promulgated in 40 CFR 136. If a test method has not been promulgated for a particular parameter, you may apply for approval of an alternate test procedure by following 40 CFR 136.4. The detection limit of the test methods used shall reflect the applicable numerical limitations in HAR 11-54. You shall only use test methods with detection limits below and closest to the numerical limit in HAR 11-54. For situations when the numerical limit is below detection limit of all test methods, use the test method with detection limit closest to the numerical limitation.
6. Mark the box below that corresponds to your submittal. Read each option carefully as you may only choose one (1) box.

[ ]  I am requesting a new ZID/ZOM for my new proposed facility.

[ ]  I am requesting a renewal ZID/ZOM. The dilution study information I am submitting on this form is the same information submitted for my current NPDES permit because all modeling inputs (e.g. effluent flow, effluent characteristics, ambient profiles, diffuser characteristics, number of active diffuser ports, etc.) are still representative of current conditions.

[ ]  I am requesting a renewal ZID/ZOM, and I am submitting a new dilution study that is representative of current conditions. My new dilution values are less than the dilution values utilized in my current NPDES permit.

[ ]  I am requesting a renewal ZID/ZOM, and I am submitting a new dilution study that is representative of current conditions. My new dilution values are greater than the dilution values utilized in my current NPDES permit. I understand that HAR 11-54-9(c)(7) does not allow a ZID/ZOM renewal to have a greater quantity of mass emissions than the current NPDES permit’s ZID/ZOM. However, I am requesting larger dilution values and have attached an antidegradation analysis in Step 12 below that justifies that the greater quantity of mass emissions is needed for socio-economic development.

[ ]  I am requesting a renewal ZID/ZOM. My existing NPDES permit did not have a condition requiring a new dilution study be performed during the current permit period. I could not obtain my existing dilution study and request that the renewal NPDES permit contain a condition to perform a dilution study.

1. If you indicated in Step 2.f above that you are submitting a request for a renewal ZID/ZOM, provide the NPDES permit number previously assigned to this facility:

INSERT TEXT HERE

## Step 3 – Assimilative Capacity Assessment

An assimilative capacity assessment of the receiving water needs to be submitted with the ZOM application or renewal ZOM application. A ZID/ZOM cannot be granted for a specific pollutant parameter if the receiving water does not have assimilative capacity.

The assimilative capacity assessment is defined by DOH as follows (include information in “Attachment A – Assimilative Capacity Assessment”, located at the end of this application):

1. Determine the decision unit. The decision unit should be the control stations adjacent to the ZOM boundary.
2. Data from all of these stations (surface, middle, and bottom) should be aggregated together to represent the entire decision unit.
3. Calculate an annual geometric mean. Do this for the past 4 or 5 years.
4. Assess whether the annual geometric means are trending higher (getting worse).
5. A water body will be considered to have assimilative capacity for specific water quality parameters if the calculated geomean is below approximately 90% of the numeric water quality standard of the receiving water. Consideration of the annual trend needs to be considered.
6. The permit will require a ZOM confirmation study. Exceptions to this requirement may be considered by the DOH on a case by case basis.

## Step 4 – Antidegradation Analysis

Antidegradation requirements ensure existing beneficial uses are protected, and where water quality exceeds levels necessary to protect these uses, that quality shall be maintained and protected. In some cases, lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation, the State shall assure water quality is sufficient to support applicable beneficial uses. You are required to complete this section if you are requesting:

1. A new ZID/ZOM.
2. An alteration to your existing ZID/ZOM (e.g. increasing dilution, increasing ZID/ZOM size, allowing for an increase in pollutant loads, etc.).

The antidegradation analysis shall address the following items (include information in “Attachment B – Antidegradation Analysis”, located at the end of this application):

i. Describe the existing physical environment. Include data pertinent to the existing conditions of the receiving State water (i.e. depth, currents, location, etc.).

ii. Describe the potential physical environmental effects.

iii. Describe the existing chemical environment.

iv. Describe the potential chemical environmental effects.

v. Describe the existing biological environment.

vi. Describe the potential biological environmental effects.

1. Describe the existing uses of the receiving water.

viii. Describe the potential effects on the existing uses.

ix. Will your proposed ZID/ZOM or proposed ZID/ZOM alteration lower water quality? Lowering of water quality occurs when there is any impact to the physical, chemical, or biological environment and/or existing uses of the receiving water.

x. Will the proposed action significantly lower water quality? Provide justification.

xi. Will the designated uses of the receiving water be fully maintained and protected during and after implementation of the proposed action?

1. Is the proposed action necessary to accommodate economic and social development? Provide justification.

## Step 5 – ZID/ZOM Requirements

a. You are required to comply with the requirements in the Dilution Model Guidance found in Attachment C – ZID/ZOM Requirements.

b. Include in Attachment D – Model Input Data, all of your model input data that complies with the requirements found in the Dilution Model Guidance (Attachment C).

c. Include in Attachment E – Model Output Data, all of your model output data that complies with the requirements found in the Dilution Model Guidance (Attachment C).

d. Describe all assumptions and interpolations made in the model input data. All assumptions and interpolations must comply with the requirements found in the Dilution Model Guidance (Attachment C):

INSERT TEXT HERE

e. Provide the name of the receiving State water where your requested ZID/ZOM is located:

 INSERT TEXT HERE

f. Provide the classification of the receiving State water. You may choose only one (1) box:

 [ ]  Class 1

 [ ]  Class 1 and Estuary

 [ ]  Class 2

 [ ]  Class 2 and Estuary

 [ ]  Class A

 [ ]  Class A and Embayment

[ ]  Class AA in waters that are 1) greater or equal to 18 meters (ten fathoms) in a defined reef area or 2) greater than 300 meters (one thousand feet) off shore in an area with no defined reef area with a depth less than or equal to 18 meters (ten fathoms).

[ ]  Class AA and Embayment waters that are 1) greater or equal to 18 meters (ten fathoms) in a defined reef area or 2) greater than 300 meters (one thousand feet) off shore in an area with no defined reef area with a depth less than or equal to 18 meters (ten fathoms).

1. Provide the marine bottom classification. You may choose only one (1) box.

 [ ]  Class I Reef Flat

 [ ]  Class II Reef Flat

 [ ]  Class I Artificial Basin

 [ ]  Class II Artificial Basin

 [ ]  Class I Sand Beaches

 [ ]  Class II Sand Beaches

 [ ]  Class I Lava Rocks

 [ ]  Class II Lava Rocks

 [ ]  Class I Marine Pools and Protected Coves

 [ ]  Class II Marine Pools and Protected Coves

h. Specify if your outfall is a single port/discharge pipe or multiport diffuser:

INSERT TEXT HERE

i. Specify the type of outfall below. Refer to the State Toxic Control Program found at: <http://health.hawaii.gov/cwb/site-map/clean-water-branch-home-page/water-quality-references/>.

 [ ]  Marine discharge through submerged outfall.

 [ ]  Discharge without submerged outfall.

 [ ]  Discharge to stream.

 [ ]  High rate discharge.

 [ ]  Discharge to dry stream bed and ditches.

j. Indicate how often discharge into the receiving State water will occur:

 [ ]  Continuous

 [ ]  Seasonal

 [ ]  Occasional

 [ ]  Daily

 [ ]  Intermittent

 [ ]  Emergency

k. Describe the influent source:

INSERT TEXT HERE

l. Identify the type of effluent discharge. Check all that apply:

 [ ]  Domestic Sewage

 [ ]  Thermal Waste

 [ ]  Industrial Waste

 [ ]  Agricultural Waste

 [ ]  Irrigation Water

 [ ]  Other, describe: INSERT TEXT HERE

m. Describe the effluent treatment prior to discharge to receiving State waters:

INSERT TEXT HERE

n. Describe how your effluent treatment is the best degree of treatment or control. A ZID/ZOM can only be granted if you have the best degree of treatment or control:

 INSERT TEXT HERE

## Step 6 – Suitability, Sufficiency, and Validity of Model/Field Study and Implementation Conditions

a. Specify the name of the model(s) that were utilized in your dilution study below:

 INSERT TEXT HERE

b. Justify why the model(s) used were appropriate for the type of outfall and receiving State water:

 INSERT TEXT HERE

c. If your current permit required a dye/tracer study, attach the study in Attachment F – Dye/Tracer Study. Note: If you did not perform a dye/tracer study as required in your current NPDES permit, your request for a ZID/ZOM will be denied.

## Step 7 – Define Regulatory ZID/ZOM

a. Provide the following in Attachment G – Plan and Profile of Modeled Plume:

i. A profile view of your modeled plume. Plot depth (y axis) vs x-position (x axis). Check one data point above and below your model comments to verify if the results are ok.

ii. A plan view of your modeled plume. Plot the plume diameter or spread of the plume (y axis) vs. x-position (x axis).

b. Provide in Attachment H – ZID/ZOM boundaries map(s) which clearly shows:

 i. Legal boundaries of facility.

 ii. Location and identification number of intake and discharge point(s).

 iii. Receiving State water identified and labeled.

1. Delineation of boundary of proposed ZID/ZOM with WGS84 coordinates at each point.
2. Delineation all boundary ZID/ZOM interactions.
3. Any overlaps with existing ZID/ZOMs from other dischargers/facilities with NPDES permits.
4. Any outfalls from other NPDES permitted dischargers that are in or adjacent to the requested ZID/ZOM.
5. Locations with WGS84 coordinates where you propose to collect representative water quality samples and marine bottom biological data. You are required to provide:
6. Your proposed end-of-pipe compliance point(s) that are representative of your effluent discharge (after all treatment and before mixing with receiving State water).
7. Your proposed Control Station sample location, including depths. Your Controls Stations may not be located in another discharger’s existing ZID/ZOM. Also, your proposed number and location of Control Stations shall provide you with representative data of the ambient receiving water.
8. Your proposed marine bottom biological sampling area.
9. Any additional sampling locations which will help demonstrate your compliance with the NPDES permit conditions, including compliance with the WQS.

c.State the requested minimum dilution based on your ZID/ZOM dilution study and the requirements in Attachment C:

 INSERT TEXT HERE

d. State the requested average dilution based on your ZID/ZOM dilution study and the requirements in Attachment C:

 INSERT TEXT HERE

e. Describe how the proposed ZID/ZOM will not dominate the receiving water:

INSERT TEXT HERE

f. Describe how the proposed ZID/ZOM will allow for a passage way for aquatic life:

 INSERT TEXT HERE

## Step 8 – Anti-Backsliding and Other Considerations

a. Anti-backsliding

The Clean Water Act (CWA) specifies that a revised permit may not include effluent limitations that are less stringent than the previous permit unless a less stringent limitation is justified based on exceptions to the anti-backsliding provisions contained in CWA Sections 402(o) or 303(d)(4), or, where applicable, 40 CFR 122.44(l):

1. CWA 402(o)(2): availability of new information not available at time of permit issuance. New information can only be used when it decreases amount of pollutants being discharged. Cannot justify this request unless pollutant loadings from other sources of pollution are lowered.
2. CWA 402(o)(1) and 303(d)(4) may justify ZID/ZOM if receiving water not impaired and antidegradation policy requirements are met.

b. A request for a new or renewal ZID/ZOM cannot be granted unless you adequately address the following basic objectives required by HAR 11-54-9(c)(5).

1. The continuation of the function or operation involved in the discharge by granting the ZID/ZOM is in the public interest:

INSERT TEXT HERE

1. The discharge occurring or proposed to occur does not substantially endanger human health or safety:

INSERT TEXT HERE

1. Compliance with the existing WQS from which a ZID/ZOM is sought would produce series hardship without equal or greater benefits to the public:

INSERT TEXT HERE

1. The discharge occurring or proposed to occur does not violate basic WQS applicable to all waters and will not unreasonably interfere with any actual or probable use of the water areas for which it is classified:

INSERT TEXT HERE

1. By submitting this form, you are certifying that WQS is expected to be met at the edge of the proposed ZID/ZOM.
2. The following conditions warrant denying a ZID/ZOM.

i. Substantial errors in modeling approach.

ii. Sufficiency, suitability, and validity.

1. Inconsistent with WQS.
2. Conditions on which previous ZID/ZOM was based have changed (e.g. receiving water degradation has occurred and is impaired; effluent or receiving water flows and characteristics have changed and are no longer representative; TMDL has been established and does not support application of ZID/ZOM.
3. Existence of environmental risk (e.g. bioaccumulation in fish tissues or wildlife; proposed ZID/ZOM in vicinity of reef and coral; attraction of aquatic life to effluent plume; no zone of passage for migrating fish or other species; and cumulative effects of multiple discharges and ZID/ZOMs.).
4. New or larger than previous ZID/ZOM, with insufficient antidegradation rationale.
5. Receiving water flow not significantly greater than discharge flow.

# Attachments

## Attachment A – Assimilative Capacity Assessment (Step 3)

**ASSIMILATIVE CAPACITY ASSESSMENT**

## Attachment B –Antidegradation Analysis (Step 4)

**ANTIDEGRADATION ANALYSIS**

## Attachment C – ZID/ZOM Requirements (Step 5)

**ZID/ZOM REQUIREMENTS (see next page for Dilution Model Guildance)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dilution Model Guidance** |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **This document is guidance on performing a dilution study for a Hawaii National Pollutant Discharge Elimination System (NPDES) permit Zone of Initial Dilution (ZID) and Zone of Mixing (ZOM).** |  |  |  |  |  |  |  |  |  |
| **Notes:** |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. A ZID/ZOM will be approved at the discretion of DOH. |  |  |  |  |  |  |  |  |  |  |  |
| 2. DOH determines how a ZID/ZOM and dilution is applied. DOH decides whether to allow/deny a ZID/ZOM. Failure to provide DOH requested information and/or failure to comply with your NPDES permit and/or ZID/ZOM requirements are grounds for denial or revocation of a ZID/ZOM. In accordance with 40 CFR 124.5, the DOH may reopen your NPDES permit in order to revise effluent limits eligible for dilution if you submit an Initial Dilution Study that calculates minimum and average initial dilution using the most critical (conservative) conditions. The study should examine all available data and collect additional data where representation of seasonal or other critical conditions influencing dilution are deficient or absent. |  |  |  |  |  |  |  |  |  |
| 3. An assimilative capacity assessment of the receiving water needs to be submitted with the ZOM application or renewal ZOM application. A ZID/ZOM cannot be granted for a specific pollutant parameter if the receiving water does not have assimilative capacity. The assimilative capacity assessment is defined by DOH as follows: 1) Determine the decision unit. The decision unit should be the control stations adjacent to the ZOM boundary. 2) Data from all of these stations (surface, middle, and bottom) should be aggregated together to represent the entire decision unit. 3) Calculate an annual geometric mean. Do this for the past 4 or 5 years. 4) Assess whether the annual geometric means are trending higher (getting worse). 5) A water body will be considered to have assimilative capacity for specific water quality parameters if the calculated geomean is below approximately 90% of the numeric water quality standard of the receiving water. Consideration of the annual trend needs to be considered. 6) The permit will require a ZOM confirmation study. Exceptions to this requirement may be considered by the DOH on a case by case basis. |  |  |  |  |  |  |  |  |  |
| 4. A ZID may be granted for WQBELs based on specific criteria in HAR 11-54-5 and HAR 11-54-6, toxics in HAR 11-54-4, and enterococcus in HAR 11-54-8. A ZOM cannot be granted for a TBEL or for a WQBEL for toxics, including enterococcus.  |  |  |  |  |  |  |  |  |  |
| 5. Dilution at the ZID is the level of mixing when jet and buoyant mixing (nearfield processes) are complete. When the discharge plume reaches the same density as the receiving water at a certain depth, the plume becomes trapped. The second trap level is the end point for dilution at the ZID. Also, when the plume reaches the water surface, ocean floor, shoreline, or stream channel, this is boundary interaction and end point for dilution at the ZID. If the plume reaches a boundary interaction or stabilizes at the first trapping level prior to the second, this earlier interaction is the boundary of the ZID. |  |  |  |  |  |  |  |  |  |
| 6. Due to salinity and temperature variations from vertical density gradient, actual (measured) paired data throughout entire water column must be used. Data needs to be in 2 meter or less depth increments. Exceptions to this requirement may be considered by the DOH on a case by case basis provided the vertical density gradient can be accurately modeled. |  |  |  |  |  |  |  |  |  |
| 7. For both new and existing dischargers, due to salinity and temperature variations from seasons and tidal cycles, dilution models need to be run with inputs which cover at least the most recent calendar year. Existing dischargers must use inputs that cover data from at least the last 5 calendar years. |  |  |  |  |  |  |  |  |  |
| 8. To calculate lowest 10th percentile: A) Order all values in data set from smallest to largest; B) Multiply 10 percent by the total number of values, n. This is the index; C) If the index from B is not a whole number, round it up to the nearest whole number and go to D. If the index in B is a whole number, go to E; D) Count the values in your data set from left to right (smallest to largest value) until you reach the number indicated in C. This is the 10th percentile; E) Count the values in your data set from left to right until you reach the number indicated in B. The 10th percentile is the average of that corresponding value in your data set and the value that directly follows it. Input data must be evenly spaced over the year(s). Software (e.g. Excel's own PERCENTILE or PERCENTILE.EXC) may also be used for the calculation. |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **Minimum Initial Dilution at ZID** | **Average Dilution at ZID** | **Average Dilution at ZOM** |  |  |  |  |  |  |  |  |  |
| **Permit Limit** | For Non-Carcinogens, Enterococcus, and Whole Effluent Toxicity.  | For Carcinogens. | For Nutrients. |  |  |  |  |  |  |  |  |  |
| Daily max limit = aquatic life chronic x min initial dilution at ZID | Annual avg limit = human health carcinogen x avg dilution at ZID | Nutrient limit (geomean, 2% or 10%) = std x avg dilution at ZOM |  |  |  |  |  |  |  |  |  |
| Monthly avg limit = human health non carcinogen x min initial dilution at ZID |   |   |  |  |  |  |  |  |  |  |  |
| **Goal** | Acceptable modeling approach includes estimation of dilution value which incorporates minimum acceptable critical conditions. All model inputs must be most conservative. |  |  |  |  |  |  |  |  |  |
|  | **Minimum Initial Dilution at ZID** | **Average Dilution at ZID** | **Average Dilution at ZOM** |  |  |  |  |  |  |  |  |  |
| **Effluent Flow** | Maximum 5 year projected flow rate. Use the maximum 2 to 3 hour average flow or design flow, whichever is greater.  | Design dry weather flow rate. Exceptions to this requirement for worst case scenario effluent flow may be considered by the DOH on a case by case basis. Justification for exceptions must include site-specific evidence. | Design dry weather flow rate. Exceptions to this requirement for worst case scenario effluent flow may be considered by the DOH on a case by case basis. Justification for exceptions must include site-specific evidence. |  |  |  |  |  |  |  |  |  |
| **Effluent Temperature** | For existing ZID/ZOM: Use actual (measured) representative temperature. Use all available paired (effluent temperature and salinity) data of the last 5 years. Minimum is quarterly paired data for 1 year. All quarterly samples shall be spaced no less than 80 calendar days between and shall be taken on the same day as the ambient temperature and salinity. For new ZID/ZOM: You may use an estimate. |  |  |  |  |  |  |  |  |  |
| **Effluent Salinity** | For existing ZID/ZOM: Use actual (measured) representative salinity. Use all available paired (effluent temperature and salinity) data of the last 5 years. Minimum is quarterly paired data for 1 year. All quarterly samples shall be spaced no less than 80 calendar days between and shall be taken on the same day as the ambient temperature and salinity. For new ZID/ZOM: You may use an estimate. |  |  |  |  |  |  |  |  |  |
| **Ambient Sample Location** | For existing ZID/ZOM: A minimum of one sample location at the boundary of the existing ZOM and a minimum of one sample location at an existing control station. For new ZID/ZOM: A minimum of one sample location in the approximate middle of the proposed outfall discharge where it will enter the receiving water. |  |  |  |  |  |  |  |  |  |
|  | **Minimum Initial Dilution at ZID** | **Average Dilution at ZID** | **Average Dilution at ZOM** |  |  |  |  |  |  |  |  |  |
| **Ambient Temperature and Salinity** | Must use actual (measured) paired data throughout entire water column. Data needs to be in 2 meter or less depth increments. Existing ZID/ZOM: Use all available paired data of the last 5 years. Minimum is quarterly paired data for 1 year. All quarterly samples shall be spaced no less than 80 calendar days between. If you exclude years, you need a compelling and clearly articulated justification for why omission of those data would not affect the result of the analysis. New ZID/ZOM: Need at least 1 calendar year of paired data to capture seasonal trend. All quarterly samples shall be spaced no less than 80 calendar days between. |  |  |  |  |  |  |  |  |  |
| **Ambient Current Speed and Direction** | Use lowest 10th percentile. If you do not have current speed data, use 0 since it is most conservative. See Note 8 above to calculate the lowest 10th percentile. |  |  |  |  |  |  |  |  |  |
| **Restrictions** | 1) Data should not be averaged prior to using it as an input.  |  |  |  |  |  |  |  |  |  |
| 2) Data should not be extrapolated without justification.  |  |  |  |  |  |  |  |  |  |
| 3) No interpolating ambient data unless interpolating between data points which are already at depth increments of 2 meters or less.  |  |  |  |  |  |  |  |  |  |
| 4) Do not assume salinity and conductivity are interconvertible without a regression analysis. |  |  |  |  |  |  |  |  |  |
| 5) Do not assume 0 effluent salinity as this can increase dilution. |  |  |  |  |  |  |  |  |  |
| 6) Do not manipulate output results (e.g. taking 10th percentile of output). |  |  |  |  |  |  |  |  |  |
| 7) You may not request a new ZID/ZOM within an existing ZID/ZOM for the same pollutant parameters (i.e., a new ZID/ZOM will not be granted if the requested ZID/ZOM overlaps with the an existing ZID/ZOM for the same parameter(s)). |  |  |  |  |  |  |  |  |  |
| **Minimum Initial Dilution at ZID** | **Average Dilution at ZID** | **Average Dilution at ZOM** |  |  |  |  |  |  |  |  |  |
| 8) If you would like to request DOH to consider enterococcus die-off, you are required to run the model with and without enterococcus die-off. You will also be required to provide your bacterial decay models and justifications for all calculations. A decision to allow enterococcus die-off will be made by DOH on a case by case basis. Factors such as the existing level of disinfection treatment (or lack there of) at the facility will be considered. | N/A | N/A |  |  |  |  |  |  |  |  |  |
| **Diffuser/Outfall** | Must model outfall and diffuser characteristics representative of normal facility operation and condition of diffuser/outfall. If you have an existing ZID/ZOM and you plan on changing the current operation, you need to re-run the model. |  |  |  |  |  |  |  |  |  |
| **Model Run** | Run model for every scenario and with all data as described above. Do not prejudge or make assumptions of the "critical" data to minimize runs. There should be a minimum of 1 run per quarter for a full year of input data. |  |  |  |  |  |  |  |  |  |
| **Model Types** | Use models described in 11-54-4(c)(1). | Use models described in 11-54-4(c)(1). | For nutrients, 3D models may be utilized with DOH approval (e.g., ELCOM, etc.). |  |  |  |  |  |  |  |  |  |
|  | **Minimum Initial Dilution at ZID** | **Average Dilution at ZID** | **Average Dilution at ZOM** |  |  |  |  |  |  |  |  |  |
| **Dilution per Run** | Use dilution at 2nd trap or when plume surfaces or bottoms or reaches a boundary, whichever occurs first. Horizontal distance from diffuser to second trap, surface, bottom (as defined in the model output), or boundary is the dilution value. | Use dilution at 2nd trap or when plume surfaces or bottoms or reaches a boundary, whichever occurs first. Horizontal distance from diffuser to second trap, surface, bottom (as defined in the model output), or boundary is the dilution value. | Exist ZOM: Take dilution at horizontal distance from diffuser to regulated ZOM. New ZOM: Discharger has to run model to determine where all four nutrient parameters can meet WQS. Each nutrient parameter will be treated separately in the permit with different dilution values. Permit will require ZOM reevaluations. |  |  |  |  |  |  |  |  |  |
| **Discharger's Requested Dilution** | Smallest dilution of all runs at 2nd trap, surface, or bottom. | Geometric mean dilutions of all runs at 2nd trap, surface, or bottom. | Geometric mean of dilutions of all runs at distance(s) specified above. |  |  |  |  |  |  |  |  |  |
| **Validation Study** | Requirement determined on a permit by permit basis. |  |  |  |  |  |  |  |  |  |
| **Additional Map Requirements** | 1) Profile view of modeled plume (depth, y axis) vs. position (x axis). |  |  |  |  |  |  |  |  |  |
| 2) Plan view of modeled plume (spread, y axis) vs x-position (x axis). |  |  |  |  |  |  |  |  |  |
| 3) All ZID/ZOM boundary interactions. |  |  |  |  |  |  |  |  |  |
| 4) Facility, intake, discharge points, receiving water, ZID/ZOM boundary, overlaps with other ZID/ZOMs, location of all receiving water monitoring stations with depth, end of pipe monitoring locations. |  |  |  |  |  |  |  |  |  |
| **Antidegradation Requirements** | An antidegradation analysis must be submitted under the following circumstances:1) Application for a new or renewal ZID/ZOM, 2) Alteration to an existing ZID/ZOM (e.g. increased dilution, increased ZID/ZOM size, increase in pollutant loads, etc.). Antidegradation analyses must be in accordance with Hawaii Administrative Rules §11-54-1.1 General policy of water quality antidegradation. |  |  |  |  |  |  |  |  |  |
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## Attachment D – Model Input Data (Step 5)

**MODEL INPUT DATA THAT COMPLIES WITH ATTACHMENT C REQUIREMENTS**

## Attachment E – Model Output Data (Step 5)

**MODEL OUTPUT DATA THAT COMPLIES WITH ATTACHMENT C REQUIREMENTS**

## Attachment F – Dye/Tracer Study (Step 6)

**DYE/TRACER STUDY**

## Attachment G – Plan and Profile of Modeled Plume (Step 7)

**PLAN AND PROFILE OF MODELED PLUME**

## Attachment H – ZID/ZOM Boundaries Map (Step 7)

**ZID/ZOM BOUNDARIES MAP**