DEQ/DWR

**FACT SHEET FOR NPDES PERMIT DEVELOPMENT**

**Renewal**

NPDES No. NC0001422

|  |  |  |  |
| --- | --- | --- | --- |
| Facility Information | | | |
| Applicant/Facility Name: | Duke Energy Progress, LLC/ L.V. Sutton Energy Complex | | |
| Applicant Address: | 801 Sutton Steam Plant Road, Wilmington, NC 28401 | | |
| Facility Address: | (same) | | |
| Permitted Flow | N/A | | |
| Type of Waste: | 100 % Industrial | | |
| Facility/Permit Status: | Major Modification (WWTP Class I) | | |
| County: | New Hanover | | |
| Miscellaneous | | | |
| Receiving Stream: | Cape Fear River (001), Sutton Lake (008) | Regional Office: | WiRO |
| Stream Classification: | C Sw (001)  C (008)  SI: 18-(63) | Quad | J27SW  Castle Hayne |
| 303(d) Listed?: | Yes  Impaired for D.O. (Cape Fear River) | Permit Writer: | Sergei Chernikov, Ph.D. |
| Subbasin: | 030617 (CPF) | Date: | November 15, 2022 |
| Drainage Area (mi2): |  |  | |
| Summer 7Q10 (cfs) | Tidally influenced (Outfall 001); Lake (Outfall 008) |
| 30Q2 (cfs): | See above |
| Average Flow (cfs): | See above |
| IWC (%): | 100 (Outfall 008)  22 (Outfall 001) based on CORMIX model |
| Primary SIC Code: |  |

##### SUMMARY

This is a renewal of the NPDES wastewater permit for L.V. Sutton Energy Complex (Sutton). Duke Energy Progress Sutton Plant is a natural gas-fired 620 MW combined cycle generation facility. The power block consists of two combustion turbine generators (each with a HRSG – heat recovery steam generator) and one steam turbine generator. Historically, the facility operated 3 coal-fired units. The coal-fired units were shut-down in the fourth quarter of 2013. The facility is regulated by federal effluent guidelines (40 CFR Part 423 – Steam Electric Power Generating Point Source Category) – BPT/BAT.

On February 11, 2015 the Wilmington Regional Office delineated the Effluent Channel at the Sutton Energy Complex in accordance with the requirements of 15A NCAC 02B .0228. The new Outfall 008 was established to accommodate discharge from this effluent channel.

Wastewater outfalls:

Outfall 001 – cooling pond discharge, recirculated cooling water, non-contact cooling water, groundwater, landfill leachate, and treated wastewater from Outfall 004 (new ash pond). The new ash pond can discharge directly to Sutton Lake through Outfall 004 or to Cape Fear River through Outfall 001. The Outfall 001 is discharging through the mixing box that was set-up to concurrently discharge ash pond wastewater and water from Sutton Lake. The compliance point for Outfall 001 is located within the mixing box. The location of Outfall 001 is: Latitude: 34016’57.24”; Longitude: 77059’20.32”.

Outfall 008- Primarily consists of recirculating cooling water from the Combined Cycle generation unit, contains flows from internal outfalls 005, 006, 007, 009, and stormwater outfalls. The location of Outfall 008 is: Latitude: 34017’29.27”; Longitude: 77059’36.78”.

Outfall 010 - non-contact stormwater from North Pond Emergency Spillway, the pond will receive stormwater from the coal ash landfill after landfill is capped.

Outfall 011 – non-contact stormwater from South Pond Emergency Spillway, the pond will receive stormwater from the coal ash landfill after landfill is capped.

Stormwater outfalls discharging to the effluent channel and then to Sutton Lake via Outfall 008:

Internal Outfall SW001 – Runoff from the temporary laydown area and the parking lot.

Internal Outfall SW002 – Runoff from the parking lot and Peaker Combustion Turbine area.

Internal Outfall SW003 – Runoff from the parking lot.

Internal Outfall SW004 – Pumped stormwater from the 115 Electrical Switchyard area.

Internal Outfall SW005 – Discharge from the south wet detention basin.

Internal Outfall SW006 – Discharge from the rip rap armored emergency spillway for the north infiltration basin that treats stormwater from a parking lot and surrounding areas.

Internal Outfall SW007 – Runoff from the potential rail loading yard, rail spur, and truck roads installed to transport coal ash from the site.

ASH POND DAMS

Seepage through earthen dams is common and is an expected consequence of impounding water with an earthen embankment.  Even the tightest, best-compacted clays cannot prevent some water from seeping through them. Seepage is not necessarily an indication that a dam has structural problems, but should be kept in check through various engineering controls and regularly monitored for changes in quantity or quality which, over time, may result in dam failure.

Currently, no seeps have been detected at the site.

DILUTION MODEL

Geosyntec Consultants of NC has submitted a CORMIX model on behalf Duke Energy Progress, LLC for the discharge of Sutton Lake water to the Cape Fear River (classified C, Swamp, PNA – primary nursery area) at 0.35 and 3.5 MGD.

The CORMIX model was used in conjunction with a previously calibrated Environmental Fluid Dynamics Code (EFDC) model to determine tidal inputs to the model. The outfall configuration was updated with the latest changes to the outfall following the separation of the Cooling Pond wastewater discharge to Sutton Lake. The model was completed in two parts. The first, the embayment stage, is a roughly uniform channel to the main river. The plume characteristics at the end of the embayment model run are used as inputs to the river hydrodynamics portion of the model. For reasons discussed below, mixing zone considerations were reserved to the embayment channel.

The model results show a buoyant plume undergoing near-field mixing for approximately three meters before contacting the surface of the water. Near-field mixing occurs along the surface contact for another half meter before moving into passive ambient diffusion. The plume continues with passive diffusion and contacts the nearest bank at 14 meters eventually ending approximately 8 meters wide and 0.25 meters deep from the surface. EPA guidance for sizing acute mixings zones (section 4.3.3 of the *Technical Support Document for Water Quality-based Toxics Control,* 1991) were reviewed with the criteria of 50 times the discharge length scale (square root of the port cross-sectional area) being the most restrictive of the three options, in this case 13.5 m with a dilution of 10.5. The Division believes that 13.5 m is too large of an acute mixing zone considering the receiving water classification of Primary Nursery Area by the NC Division of Marine Fisheries, the length of the passive buoyant plume, and that the dilution allowed at this distance too great to protect downstream saltwater standards in accordance with 15A NCAC 2B .0203. To minimize the mixing zone and the pollutant concentrations in the ambient spreading plume, the mixing zone will be set where the plume contacts the water surface approximately 3 m from the outfall. The dilution at this point is 4.5.

Dilution Chronic/Acute- 4.5:1

IWC%- 22%

Diffuser-Existing outfall structure.

Regulatory Mixing Zone- three meters downstream of outfall.

REASONABLE POTENTIAL ANALYSIS(RPA)-Outfall 001 and Outf008

The Division conducted EPA-recommended analyses to determine the reasonable potential for toxicants to be discharged at levels exceeding water quality standards/EPA criteria by this facility. For the purposes of the RPA, the background concentrations for all parameters were assumed to be below detections level. The RPA uses 95% probability level and 95% confidence basis in accordance with the EPA Guidance entitled “Technical Support Document for Water Quality-based Toxics Control.” The RPA included evaluation of dissolved metals’ standards, utilizing a default hardness value of 25 mg/L CaCO3 for hardness-dependent metals. The 2007-2014 Triennial Review standards adopted by NC in Nov. 2014 and approved by EPA in April 2016 were used to develop the acute and chronic limits. The RPA spreadsheets are attached to this Fact Sheet.

RPA for Outfall 001 have been calculated based on the maximum daily discharge of 1.2 MGD from the renewal application. Calculations included: As, Be, Cd, Chlorides, Al, Cr (VI), Cu, Pb, Hg, Ni, Se, Ag, Zn, Sb, and Tl. The RPA indicated that limit for As must be maintained, and limits for Ni and Se shall be removed (please see attached).

RPA for Outfall 008 have been calculated based on the results of the new Water Effect Ratio Study that established following site-specific Copper standards for Sutton Lake: 71.4 µg/L (Chronic Standard); 96.7 µg/L (Acute Standard).

Calculations included: As, Be, Cd, Cr (VI), Cu, Pb, Hg, Ni, Se, Ag, and Zn.

The highest projected flow of 211.0 MGD was used in the analysis. The RPA indicated that limit for As, Ni, and Se shall be removed (please see attached).

The proposed permit requires that EPA methods 200.7 or 200.8 (or the most current versions) shall be used for analyses of all metals except for total mercury.

INSTREAM MONITORING-Outfall 002 and Outfall 008

The permit requires for Cape Fear River Outfall 001 to be monitored upstream and downstream, and for Sutton Lake Outfall 008 to be monitored at Bay 8 downstream of the discharge (there is no upstream location).

Sampling for all three instream sites is conducted semi-annually and indicates that Arsenic, Cadmium, Chloride (Lake Sutton site only), Chromium, Copper, Hardness, Lead, Mercury (method 1631E), Selenium, and Zinc are below detection level or well below the standard. There were 3 exceedances of the Chloride state standard at the Cape Fear downstream monitoring station, the hardness level was also significantly elevated during these sampling events. This can be attributed to the salt water intrusions because Cape Fear River at this location is tidally influenced.

The data shows that current operations and legacy impacts of the Sutton Plant do not negatively influence water quality of Sutton Lake and Cape Fear River. The facility will continue to monitor the receiving streams.

FISH TISSUE MONITORING

The permit requires fish tissue monitoring for As, Se, and Hg in Cape Fear River and Sutton Lake. Largemouth Bass and Sunfish subspecies tissues were analyzed for these trace elements. All results were below action levels for Se and Hg (10.0 µg/g – Se, 0.40 µg/g – Hg, NC) and screening value for As (1.20 – µg/g, EPA).

CWA SECTION 316(a)

Since the Sutton Lake has been reclassified to the “waters of the State” on November 5, 2014, the facility developed and conducted comprehensive 316(a) studies. The 316(a) study demonstrated that Lake Sutton maintains Balanced and Indigenous Community. The DWR biologists concurred with this conclusion.

CWA SECTION 316(b)

Sutton consists of a single highly efficient natural gas-fired combined-cycle unit, Unit 1, with a gross generating capacity of 617 megawatts (MW). Sutton began commercial operation in November 2013, replacing the retired (and subsequently demolished) coal-fired L.V. Sutton Steam Electric Plant.

Sutton withdraws water from the Cape Fear River using a make-up water intake structure (MWIS) to support water elevations in the closed-cycle recirculating system (CCRS) cooling impoundment known as Sutton Lake. Sutton Lake, which meets the definition of a CCRS as defined at 40 CFR 125.92(c)(2), was formed in 1972 by the impoundment of Catfish Creek, a tributary of the Cape Fear River, to support operation of the three coal-fired units at the former L.V. Sutton Steam Electric Plant.

The cooling impoundment was designed and operates as a CCRS. The MWIS is the point of compliance from a Rule perspective as it provides make-up water to Sutton Lake. The MWIS is equipped with fine-slot Rule-compliant cylindrical wedgewire screens which have a maximum design through-screen velocity (TSV) of less than 0.5 feet per second (fps). Duke Energy is required to submit each of the 5122.21 (r)(2)-(8) submittal requirements under the Rule as the MWIS has a design flow of more than 2 million gallons per day (MGD). However, it also has an average flow of less than 125 MGD, which makes it ineligible for a compliance with an entrainment requirements of the Rule.

Based on the existing design and operational data at Sutton, Duke Energy requested concurrence that Sutton is compliant for impingement mortality (IM) reduction under Best Technology available (BTA) Option 1 (CCRS Regulatory Determination). In addition, the MWIS complies with IM BTA Option 2 and Option 3 with a design TSV and an actual TSV of less than 0.5 fps.

IM BTA Option 1 — CCRS Regulatory Determination

At §125.92(c), the Rule defines a CCRS as a system designed and properly operated using minimized make-up and blowdown flows withdrawn from a Waters of the U.S. (WOTUS) to support contact or non-contact cooling uses within a facility, and that passes cooling water through the condenser and other cooling components of the cooling system and reuses the water for cooling multiple times (USEPA 2014). A CCRS can also include a system designed to include certain impoundments, with additional information requirements where the system includes impoundments of WOTUS.

The Rule provides two criteria that impounded WOTUS must meet to be consistent with the definition of a CCRS provided at S125.92(c):

* Criterion #1: The impoundment was constructed prior to October 14, 2014; and
* Criterion #2: The impoundment was "created for the purpose of serving as part of the cooling water system" as documented in the CWA Section 404 permit or otherwise demonstrated to the satisfaction of the National Pollutant Discharge Elimination System (NPDES) Director (Director) (i.e., NCDEQ).

The construction of a cooling lake at Sutton (Sutton Lake) was authorized by the North Carolina

General Assembly approving the easement for development of the lake on May 28, 1971 and a Permit for Impounding and Maintenance of Impounded Water issued by the North Carolina State Board of Health on February 15, 1972. As such, Sutton Lake was created for the purpose of serving as part of the cooling water system for Sutton. A summary of historical documents describing the design and construction of Sutton Lake, acknowledging that it was permitted with the full understanding by the permitting authorities that its sole purpose was to serve as an impoundment to dissipate heat from Sutton. This summary includes the permit issued by the North Carolina State Board of Health in February of 1972 for construction of a "cooling lake".

Sutton withdraws cooling water through a structure located on the southwest side of Sutton Lake. Heated effluent is discharged to the southeast side of the lake via a 0.9-mile long effluent channel (approximately 10 feet deep) and flows in a counter-clockwise direction around the lake back to the intake structure (CP&L 1982). The main dike separates the effluent channel from the intake side of the lake and there are six wing dikes that further separate the lake into smaller sections that create a circuitous flow path. This system increases the circulation distance to maximize cooling of the water before it is reused by the station. Therefore, consistent with the purpose of its creation as a CCRS, Sutton Lake reduces condenser cooling water (CCW) withdrawals relative to an open-cycle system that does not reuse cooling water. The average monthly MWIS flow during the 5-year period of record evaluated (i.e., 2016-2020) was 11 MGD compared to the average monthly condenser cooling water flow of 212 MGD representing an approximate 95 percent reduction in cooling water flow.

IM BTA Options 2 and 3 — Design and Actual Maximum Intake TSV <0.5 fps

To maintain Sutton Lake water levels, make-up water is withdrawn through an MWIS on the Cape Fear River and routed to Sutton Lake. The MWIS utilizes four 2.0-millimeter (mm) fine-slot cylindrical wedgewire screens with a design and actual TSV of less than 0.5 fps, which meets IM BTA Options 2 and 3 criteria and also minimizes entrainment given the orientation of the fine-slot size (parallel to flow) and subsequent sweeping action across the screen face provided by the Cape Fear River flows. The MWIS design pumping capacity is 69.1 MGD; however, the actual average make-up water withdrawal over the 5-year period of record was 11.2 MGD, which is only 16 percent of the design pumping capacity.

**The Division agrees with the conclusion of the Duke report that Sutton is compliant for impingement mortality (IM) reduction under Best Technology available (BTA) Option 1 (CCRS Regulatory Determination). In addition, the MWIS complies with IM BTA Option 2 and Option 3 with a design TSV and an actual TSV of less than 0.5 fps. The concurrence is based on the evaluation of the Environmental Sciences Section and the NPDES Industrial Permitting Unit.**

TOXICITY TESTING-Outfall 001 and Outfall 008

Current Requirement: Outfall 001 – Chronic P/F @ 22% using *Ceriodaphnia dubia*

Current Requirement: Outfall 008 – Acute P/F @ 90% using *Pimephales promelas*

Recommended Requirement: Outfall 001 – Chronic P/F @ 22% using *Ceriodaphnia dubia*

Recommended Requirement: Outfall 008 – Acute P/F @ 90% using *Pimephales promelas*

This facility has passed all toxicity tests during the previous permit cycle, please see attached.

COMPLIANCE SUMMARY

During the last 4 years, the facility has exceeded limit 4 times, please see attached. All the limit violations were for exceeding Chloride limits in 2018 (Outfall 001 and Outfall 004). These violations can be attributed to the coal ash excavation activities. There were no limit violations in 2019, 2020, 2021, and 2022 (January through September).

##### PERMIT LIMITS DEVELOPMENT

* The temperature limits (Outfall 001 and Outfall 008) are based on the North Carolina water quality standards (15A NCAC 2B .0200).
* The limits for Oil and Grease and Total Suspended Solids (Outfall 001, Outfall 008, Outfall 010, and Outfall 011) are based on the requirements in 40 CFR 423.
* The pH limits (Outfall 001, Outfall 008, Outfall 010, and Outfall 011) are based on the North Carolina water quality standards (15A NCAC 2B .0200).
* The Whole Effluent Toxicity limit (Outfall 001 and Outfall 008) is based on the requirements of 15A NCAC 2B .0500.
* The Water Quality Based Effluent Limits for Total Arsenic (Outfall 008) are based on the results of the Reasonable Potential Analysis.
* The turbidity limit (Outfall 001) is based on North Carolina water quality standards (15A NCAC 2B .0200).

## PROPOSED CHANGES

* Limits for Total Arsenic, Total Selenium, and Total Nickel have been removed from the permit based on the results of the Reasonable Potential Analysis (Outfall 001).
* The monitoring frequency for the Total Mercury, Total Arsenic, Total Lead, Total Selenium, Total Cadmium, Total Aluminum, Total Copper, Total Nickel, Total Zinc, Turbidity, and Hardness was reduced from Weekly to Monthly based on the results of the Reasonable Potential Analysis (Outfall 001).
* Monitoring for Total Iron has been removed from the permit since the water quality standard for Iron has been eliminated in 2015.
* Limits for Total Arsenic and Total Nickel have been removed from the permit based on the results of the Reasonable Potential Analysis (Outfall 008).
* The Section A. (19.) entitled Ash Settling Basin was removed from the permit since wastewater is no longer discharged to the Ash Basin.
* The Special Condition A. (13.) entitled Clean Water Act Section 316(b) was updated based on the approval of the 316(b) report.
* Fish tissue monitoring frequency has been reduced to twice per permit cycle (5 years) from annually based on the review of the fish tissue data.

#### PROPOSED SCHEDULE

Draft Permit to Public Notice: December 20, 2022 (est.)

Permit Scheduled to Issue: February 20, 2023 (est.)

### STATE CONTACT

If you have any questions on any of the above information or on the attached permit, please contact Sergei Chernikov at (919) 707-3606 or sergei.chernikov@ncdenr.gov.

### CHANGES IN THE FINAL PERMIT

* The Total Arsenic limits have been removed from the permit to correct an error (Outfall 008).

**NPDES Implementation of Instream Dissolved Metals Standards – Freshwater Standards**

The NC 2007-2015 Water Quality Standard (WQS) Triennial Review was approved by the NC Environmental Management Commission (EMC) on November 13, 2014. The US EPA subsequently approved the WQS revisions on April 6, 2016, with some exceptions. Therefore, metal limits in draft permits out to public notice after April 6, 2016 must be calculated to protect the new standards - as approved.

**Table 1. NC Dissolved Metals Water Quality Standards/Aquatic Life Protection**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Acute FW, µg/l  (Dissolved) | Chronic FW, µg/l  (Dissolved) | Acute SW, µg/l  (Dissolved) | Chronic SW, µg/l  (Dissolved) |
| Arsenic | 340 | 150 | 69 | 36 |
| Beryllium | 65 | 6.5 | --- | --- |
| Cadmium | Calculation | Calculation | 40 | 8.8 |
| Chromium III | Calculation | Calculation | --- | --- |
| Chromium VI | 16 | 11 | 1100 | 50 |
| Copper | Calculation | Calculation | 4.8 | 3.1 |
| Lead | Calculation | Calculation | 210 | 8.1 |
| Nickel | Calculation | Calculation | 74 | 8.2 |
| Silver | Calculation | 0.06 | 1.9 | 0.1 |
| Zinc | Calculation | Calculation | 90 | 81 |

Table 1 Notes:

1. FW= Freshwater, SW= Saltwater
2. Calculation = Hardness dependent standard
3. Only the aquatic life standards listed above are expressed in dissolved form. Aquatic life standards for Mercury and selenium are still expressed as Total Recoverable Metals due to bioaccumulative concerns (as are all human health standards for all metals). It is still necessary to evaluate total recoverable aquatic life and human health standards listed in 15A NCAC 2B.0200 (e.g., arsenic at 10 µg/l for human health protection; cyanide at 5 µg/L and fluoride at 1.8 mg/L for aquatic life protection).

**Table 2. Dissolved Freshwater Standards for Hardness-Dependent Metals**

The Water Effects Ratio (WER) is equal to one unless determined otherwise under 15A NCAC 02B .0211 Subparagraph (11)(d)

|  |  |
| --- | --- |
| Metal | NC Dissolved Standard, µg/l |
| Cadmium, Acute | WER\*{1.136672-[*ln* hardness](0.041838)} *∙ e*^{0.9151 [*ln* hardness]-3.1485} |
| Cadmium, Acute Trout waters | WER\*{1.136672-[*ln* hardness](0.041838)} *∙* *e*^{0.9151[*ln* hardness]-3.6236} |
| Cadmium, Chronic | WER\*{1.101672-[*ln* hardness](0.041838)} *∙* *e*^{0.7998[*ln* hardness]-4.4451} |
| Chromium III, Acute | WER\*0.316 *∙* *e*^{0.8190[*ln* hardness]+3.7256} |
| Chromium III, Chronic | WER\*0.860 ∙ *e*^{0.8190[*ln* hardness]+0.6848} |
| Copper, Acute | WER\*0.960 ∙ *e*^{0.9422[*ln* hardness]-1.700} |
| Copper, Chronic | WER\*0.960 ∙ *e*^{0.8545[*ln* hardness]-1.702} |
| Lead, Acute | WER\*{1.46203-[*ln* hardness](0.145712)} ∙ *e*^{1.273[*ln* hardness]-1.460} |
| Lead, Chronic | WER\*{1.46203-[*ln* hardness](0.145712)} ∙ *e*^{1.273[*ln* hardness]-4.705} |
| Nickel, Acute | WER\*0.998 ∙ *e*^{0.8460[*ln* hardness]+2.255} |
| Nickel, Chronic | WER\*0.997 ∙ *e*^{0.8460[*ln* hardness]+0.0584} |
| Silver, Acute | WER\*0.85 ∙ *e*^{1.72[*ln* hardness]-6.59} |
| Silver, Chronic | Not applicable |
| Zinc, Acute | WER\*0.978 ∙ *e*^{0.8473[*ln* hardness]+0.884} |
| Zinc, Chronic | WER\*0.986 ∙ *e*^{0.8473[*ln* hardness]+0.884} |

# General Information on the Reasonable Potential Analysis (RPA)

The RPA process itself did not change as the result of the new metals standards. However, application of the dissolved and hardness-dependent standards requires additional consideration in order to establish the numeric standard for each metal of concern of each individual discharge.

The hardness-based standards require some knowledge of the effluent and instream (upstream) hardness and so must be calculated case-by-case for each discharge.

Metals limits must be expressed as ‘total recoverable’ metals in accordance with 40 CFR 122.45(c). The discharge-specific standards must be converted to the equivalent total values for use in the RPA calculations. We will generally rely on default translator values developed for each metal (more on that below), but it is also possible to consider case-specific translators developed in accordance with established methodology.

**RPA Permitting Guidance/WQBELs for Hardness-Dependent Metals - Freshwater**

The RPA is designed to predict the maximum likely effluent concentrations for each metal of concern, based on recent effluent data, and calculate the allowable effluent concentrations, based on applicable standards and the critical low-flow values for the receiving stream.

If the maximum predicted value is greater than the maximum allowed value (chronic or acute), the discharge has reasonable potential to exceed the standard, which warrants a permit limit in most cases. If monitoring for a particular pollutant indicates that the pollutant is not present (i.e. consistently below detection level), then the Division may remove the monitoring requirement in the reissued permit.

1. To perform a RPA on the Freshwater hardness-dependent metals the Permit Writer compiles the following information:

* Critical low flow of the receiving stream, 7Q10 (the spreadsheet automatically calculates the 1Q10 using the formula 1Q10 = 0.843 (s7Q10, cfs) 0.993
* Effluent hardness and upstream hardness, site-specific data is preferred
* Permitted flow
* Receiving stream classification

1. In order to establish the numeric standard for each hardness-dependent metal of concern and for each individual discharge, the Permit Writer must first determine what effluent and instream (upstream) hardness values to use in the equations.

The permit writer reviews DMR’s, Effluent Pollutant Scans, and Toxicity Test results for any hardness data and contacts the Permittee to see if any additional data is available for instream hardness values, upstream of the discharge.

If no hardness data is available, the permit writer may choose to do an initial evaluation using a default hardness of 25 mg/L (CaCO3 or (Ca + Mg)). Minimum and maximum limits on the hardness value used for water quality calculations are 25 mg/L and 400 mg/L, respectively.

If the use of a default hardness value results in a hardness-dependent metal showing reasonable potential, the permit writer contacts the Permittee and requests 5 site-specific effluent and upstream hardness samples over a period of one week. The RPA is rerun using the new data.

The overall hardness value used in the water quality calculations is calculated as follows:

Combined Hardness (chronic)

= (Permitted Flow, cfs \*Avg. Effluent Hardness, mg/L) + (s7Q10, cfs \*Avg. Upstream Hardness, mg/L)

(Permitted Flow, cfs + s7Q10, cfs)

The Combined Hardness for acute is the same but the calculation uses the 1Q10 flow.

1. The permit writer converts the numeric standard for each metal of concern to a total recoverable metal, using the EPA Default Partition Coefficients (DPCs) or site-specific translators, if any have been developed using federally approved methodology.

EPA default partition coefficients or the “Fraction Dissolved” converts the value for dissolved metal at laboratory conditions to total recoverable metal at in-stream ambient conditions. This factor is calculated using the linear partition coefficients found in *The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion* (EPA 823-B-96-007, June 1996) and the equation:

\_Cdiss\_\_ = \_\_\_\_\_\_\_1\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Ctotal 1 + { [Kpo] [ss(1+a)] [10-6] }

Where:

ss = in-stream suspended solids concentration [mg/l], minimum of 10 mg/L used, and

Kpo and *a* = constants that express the equilibrium relationship between dissolved and adsorbed forms of metals. A list of constants used for each hardness-dependent metal can also be found in the RPA program under a sheet labeled DPCs.

1. The numeric standard for each metal of concern is divided by the default partition coefficient (or site-specific translator) to obtain a Total Recoverable Metal at ambient conditions.

In some cases, where an EPA default partition coefficient translator does not exist (ie. silver), the dissolved numeric standard for each metal of concern is divided by the EPA conversion factor to obtain a Total Recoverable Metal at ambient conditions. This method presumes that the metal is dissolved to the same extent as it was during EPA’s criteria development for metals. For more information on conversion factors see the June, 1996 EPA Translator Guidance Document.

1. The RPA spreadsheet uses a mass balance equation to determine the total allowable concentration (permit limits) for each pollutant using the following equation:

Ca = (s7Q10 + Qw) (Cwqs) – (s7Q10) (Cb)

Qw

Where: Ca = allowable effluent concentration (µg/L or mg/L)

Cwqs = NC Water Quality Standard or federal criteria (µg/L or mg/L)

Cb = background concentration: assume zero for all toxicants except NH3\* (µg/L or mg/L)

Qw = permitted effluent flow (cfs, match s7Q10)

s7Q10 = summer low flow used to protect aquatic life from chronic toxicity and human health through the consumption of water, fish, and shellfish from noncarcinogens (cfs)

\* Discussions are on-going with EPA on how best to address background concentrations

Flows other than s7Q10 may be incorporated as applicable:

1Q10 = used in the equation to protect aquatic life from acute toxicity

QA = used in the equation to protect human health through the consumption of water, fish, and shellfish from carcinogens

30Q2 = used in the equation to protect aesthetic quality

## The permit writer enters the most recent 2-3 years of effluent data for each pollutant of concern. Data entered must have been taken within four and one-half years prior to the date of the permit application (40 CFR 122.21). The RPA spreadsheet estimates the 95th percentile upper concentration of each pollutant. The Predicted Max concentrations are compared to the Total allowable concentrations to determine if a permit limit is necessary. If the predicted max exceeds the acute or chronic Total allowable concentrations, the discharge is considered to show reasonable potential to violate the water quality standard, and a permit limit (Total allowable concentration) is included in the permit in accordance with the U.S. EPA Technical Support Document for Water Quality-Based Toxics Control published in 1991.

1. When appropriate, permit writers develop facility specific compliance schedules in accordance with the EPA Headquarters Memo dated May 10, 2007 from James Hanlon to Alexis Strauss on 40 CFR 122.47 Compliance Schedule Requirements.
2. The Total Chromium NC WQS was removed and replaced with trivalent chromium and hexavalent chromium Water Quality Standards. As a cost savings measure, total chromium data results may be used as a conservative surrogate in cases where there are no analytical results based on chromium III or VI. In these cases, the projected maximum concentration (95th %) for total chromium will be compared against water quality standards for chromium III and chromium VI.
3. Effluent hardness sampling and instream hardness sampling, upstream of the discharge, are inserted into all permits with facilities monitoring for hardness-dependent metals to ensure the accuracy of the permit limits and to build a more robust hardness dataset.
4. Hardness and flow values used in the Reasonable Potential Analysis for this permit included:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | **Comments (Data Source)** |
| Average Effluent Hardness (mg/L)  [Total as, CaCO3 or (Ca+Mg)] | 25.0 | Default value |
| Average Upstream Hardness (mg/L)  [Total as, CaCO3 or (Ca+Mg)] | 25.0 | Default value |
| 7Q10 summer (cfs) | 0 | Lake or Tidal |
| 1Q10 (cfs) | 0 | Lake or Tidal |
| Permitted Flow (MGD) | 2.1 | For dewatering |