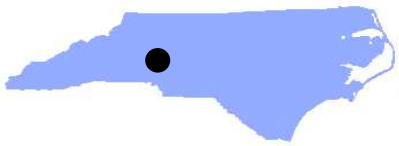
DEQ/DWR
FACT SHEET FOR NPDES PERMIT DEVELOPMENT
NPDES No. NC0004987

Facility Information			
Applicant/Facility Name:	Duke Energy – Marshall Steam Station		
Applicant Address:	Water Management, Duke Energy, P.O. Box 1006, Charlotte, NC 28201		
Facility Address:	8320 E. NC Highway 150, Terrell, NC 28682		
Permitted Flow	Not Limited		
Type of Waste:	99.9% Industrial, 0.1% Domestic		
Facility/Permit Status:	Major Modification		
County:	Catawba		
Miscellaneous			
Receiving Stream:	Lake Norman	Regional Office:	Mooresville
Stream Classification:	WS-IV & B CA	USGS Topo Quad:	Lake Norman North
303(d) Listed?:	No	Permit Writer:	Sergei Chernikov, Ph.D.
Subbasin:	03-08-32	Date:	December 20, 2017
Drainage Area (mi2):	NA		
Summer 7Q10 (cfs)	Release (60 cfs)		
Winter 7Q10 (cfs):	NA		
1Q10 (cfs):			
IWC (%):	23		

SUMMARY
This permit is being modified to incorporate construction of the new lined retention basin. The basin is being constructed to facilitate the closure of the ash pond and will accept all the waste streams that have been previously discharged to ash pond. The retention basin will have a new Outfall 005. In addition, both seeps are being removed from the permit and will be covered under a Special Order by Consent (SOC).

Duke Energy operates Marshall Steam Station in Catawba County. The Station operates six outfalls. These outfalls are 001, 002, 002a, 002b, 003, and 004. The permitted outfalls are summarized below:

- Outfall 001 – Condenser Cooling Water (CCW) Units 1 – 4:

The CCW system is a once- through, non-contact cooling water system, which condenses steam from the condensers and other selected heat exchangers. When the station is operating at full power, it has a design capacity to pump 1463 MGD (1.016 MGPM) of cooling water through the network of tubes that runs through the condenser and selected heat exchangers. The raw cooling water is returned to the lake. No biocides or other chemicals are used in the condenser cooling water. Units 1 and 2 operate two CCW pumps each while units 3 and 4 operate three pumps.

- Outfall 002 – Ash Basin:

The station ash basin accommodates flows from two yard-drain sumps, an ash removal system, low volume wastes and non-point source stormwater. Low volume waste sources include, but are not limited to: wastewater from wet scrubber air pollution control systems, ion exchange water treatment system, water treatment evaporator blowdown, laboratory and sampling streams, boiler blowdown, floor drains, and recirculating house service water systems. A sanitary waste treatment system consists of an aerated basin that provides treatment with a 30 – day retention time and has a total volume of 587,000 gallons. Effluent from the aerated basin is polished further through

additional residence time in the ash basin. The new sanitary waste treatment system is designed for 6100 gpd (normal) and 13500 gpd (outage).

- Outfall 002a – Sump #1 Overflow:

This outfall discharges very infrequent overflows of yard sump number 1.

- Outfall 002b – Sump #2 Overflow:

This outfall discharges very infrequent overflows of yard sump number 2.

- Outfall 003 (internal outfall) – Unit 4 ID Fan Control House Cooling Water discharge into the intake for CCW: Once-through, non-contact cooling water is supplied to the Unit 4 induced draft (ID) fan motor control-house equipment to remove excess heat. No chemicals are added to the once-through raw lake water

- Outfall 004 (internal outfall) – FGD system discharge into Ash Basin:

In association with Clean Smokestacks legislation, Duke Energy installed a flue-gas desulfurization (FGD) wet scrubber. This scrubber generates a wastewater needing treatment prior to discharge. An internal outfall (004) has been established for the effluent from the FGD treatment system. FGD treatment system includes physical/chemical treatment and biological treatment. Internal outfall 004 discharges to the ash settling basin, which is currently permitted as outfall 002.

- Proposed Outfall 005. Upon completion of construction, discharge from the new lined retention basin. Basin will accept wastes from holding basin (coal pile runoff), ash transport water, various sumps, stormwater runoff, FGD wastewater, and various low volume wastes such as boiler blowdown, oily waste treatment, wastes/backwash from the water treatment processes, plant area wash down water, equipment heat exchanger water, landfill leachate, and ash transport water. Upon completion of construction all waste streams previously discharged to ash basin, will be re-routed to the new retention basin. During the transition period, wastewater from the ash pond can also be discharged (Outfall 002).

- Outfall 006 (internal outfall) - FGD system discharge into the new lined retention basin. During transition period, both outfalls (004 and 006) can be discharging during the transition period. In association with Clean Smokestacks legislation, Duke Energy installed a flue-gas desulfurization (FGD) wet scrubber. This scrubber generates a wastewater needing treatment prior to discharge. An internal outfall (006) has been established for the effluent from the FGD treatment system. FGD treatment system includes physical/chemical and biological treatment. Internal outfall 006 discharges to the new retention basin, which is currently permitted as outfall 005.

- Outfall 007: the emergency spillway of the Ash Pond. The spillway is designed for a flood greater than 100-year event. Sampling of this spillway is waived due to unsafe conditions associated with sampling during overflow event.

The summer 7Q10 flow (60 cfs) is based on the minimum release from the dam that regulates the receiving water body.

The federal rule 40 CFR 423 states that "there shall be no discharge of pollutants" in fly ash transport water and in bottom ash transport water. It also states that "dischargers must meet the discharge limitation in this paragraph by a date determined by the permitting authority that is as soon as possible beginning November 1, 2018, but no later than December 31, 2023". Therefore, the facility must comply with the following requirements:

1. By November 1, 2018 there shall be no discharge of pollutants in fly ash transport water.

2. By December 31, 2023 there shall be no discharge of pollutants in bottom ash transport water. This time period beyond November 1, 2018 is provided in order for the facility to budget, design, and construct the treatment system. Duke provided the justification for the proposed deadline (January 31, 2021) and the DWR concurred with the compliance date. However, the compliance date has been delayed in this modification due to the proposed EPA rulemaking that might result in different deadlines and/or BAT determinations.

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.

REASONABLE POTENTIAL ANALYSIS(RPA)-OUTFALL 002 AND OUTFALL 005

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 **from outfall 002 (Ash Pond).** For the purposes of the RPA, the background concentrations for all parameters were assumed to be below detection 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 $CaCO_3$ for hardness-dependent metals.

Calculations included: As, Be, Cd, Chlorides, Cr, Cu, CN, Pb, Hg, Mo, Ni, Se, Ag, Zn, Al, and B (please see attached). The renewal application listed 8.3 MGD (the water flow diagram) as a current flow. However, 11.44 MGD was used in the RPA as the highest reported flow during the last permit cycle. The analysis indicates no reasonable potential to violate the surface water quality standards or EPA criteria. The water-quality based limits for selenium were removed from the permit (Outfall 002) based on the results of Reasonable Potential Analysis.

The Division also considered data for other parameters of concern in the EPA Form 2C that the facility submitted for the renewal. The majority of the parameters were not detected in the discharge. The Division reviewed the following parameters that were detected in the discharge and have an applicable state standards or EPA criteria for Class WS-IV stream: phenols. This parameter was well below the state standard.

The RPA was also conducted for the new Outfall 005. Calculations included: As, Be, Cd, Chlorides, Cr, Cu, F, Pb, Hg, Mo, Ni, Se, Ag, Zn, Sb, Al, SO_4, and B (please see attached). The data was obtained from the application for a Major Modification. The modification application listed 5.0 as the current flow. The analysis indicates no reasonable potential to violate the surface water quality standards or EPA criteria.

In conclusion, the RPA analysis indicates that existing discharges from the facility outfalls will not cause contravention of the state water quality standards/ EPA criteria.

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.

DEWATERING – OUTFALL 002

To meet the requirements of the Coal Ash Management Act of 2014, the facility needs to dewater the ash pond by removing the interstitial water from ash pond to meet the requirements of the NC Coal Ash Management Act. The facility submitted data for the surface water in the ash ponds, interstitial

water in the ash, and interstitial ash water that was treated by 20 μm filter, 10 μm filter, and 0.45 μm filter. To evaluate the impact of the dewatering on the receiving stream the RPA was conducted for the wastewater that will be generated by the dewatering process. To introduce a margin of safety, the highest measured concentration for a particular parameter was used. The RPA was conducted for As, Cd, Chlorides, Cr, Cu, F, Pb, Mo, Hg, Ni, Se, Zn, SO_4, Al, Ba, B, Sb, and Tl (please see attached).

Based on the results of the RPA, a WQBEL for Total Arsenic will be added to the dewatering effluent sheet A. (3.).

FGD TECHNOLOGY BASED EFFLUENT LIMITS-INTERNAL OUTFALL 004

The new federal 40 CFR 423 Technology Based Effluent Limits (TBELs) have been added to the permit:
Total Arsenic – 8.0 μg/L (Monthly Average); 11.0 μg/L (Daily Maximum)
Total Selenium – 12.0 μg/L (Monthly Average); 23.0 μg/L (Daily Maximum)
Total Mercury – 356.0 ng/L (Monthly Average); 788.0 ng/L (Daily Maximum)
Nitrate/nitrite as N – 4.4 mg/L (Monthly Average); 17.0 mg/L (Daily Maximum)

The federal rule 40 CFR 423 states that "dischargers must meet the effluent limitations for FGD wastewater in this paragraph by a date determined by the permitting authority that is as soon as possible beginning November 1, 2018, but no later than December 31, 2023". The DWR established the date of compliance as January 31, 2021. This time period beyond November 1, 2018 is provided in order for the facility to budget, design, and construct the treatment system. Duke provided the justification for the proposed deadline and the DWR concurred with the compliance date. However, the compliance date has been delayed in this modification due to the proposed EPA rulemaking that might result in different deadlines and/or BAT determinations. The new compliance date is December 31, 2023

MERCURY EVALUATION- OUTFALL 002

The State of North Carolina has a state-wide mercury impairment. A TMDL has been developed to address this issue in 2012. The TMDL included the implementation strategy, both documents were approved by EPA in 2012. The mercury evaluation was conducted in accordance with the Permitting Guidelines for Statewide Mercury TMDL.

Year	2010	2011	2012	2013	2014
Annual average concentration (ng/L)	1.73	2.19	1.55	0.82	0.89
Maximum sampling result (ng/L)	3.25	3.51	3.13	1.01	1.28
Number of samples	4	4	5	5	2

The allowable mercury concentration for this facility is 68.0 ng/L. All annual average mercury concentrations are below the allowable level. All maximum sampling results are below the TBEL of 47.0 ng/L. Based on the Permitting Guidelines for Statewide Mercury TMDL, the limits are not required.

CWA SECTION 316(a) TEMPERATURE VARIANCE – OUTFALL 001

The facility has a temperature variance. In order to maintain the variance the facility has to conduct annual biological and chemical monitoring of the receiving stream to demonstrate that it has a balanced and indigenous macroinvertebrate and fish community. The latest BIP (balanced and indigenous population) report was submitted to DWR in October of 2014. The DWR has reviewed the report and concluded that Lake Norman near Marshall Steam Station has a balanced and indigenous macroinvertebrate and fish community.

CWA SECTION 316(b)

The permittee shall comply with the Cooling Water Intake Structure Rule per 40 CFR 125.95. The Division approved the facility request for an alternative schedule in accordance with 40 CFR 125.95(a)(2). The permittee shall submit all the materials required by the Rule with the next renewal application.

INSTREAM MONITORING-OUTFALL 002

The permit required semi-annual upstream and downstream monitoring near the ash pond discharge. The upstream site (Station 15.9) is approximately 1 mile upstream of the discharge and downstream location (Station 14) is approximately 1 mile downstream of the discharge. These monitoring stations have been established through the BIP monitoring program, which was required to maintain the 316(a) temperature variance. The monitored parameters are: As, Cd, Cr, Cu, Hg, Pb, Se, Zn, and Total Dissolved Solids (TDS). The majority of the results are below detection level (Hg, As, Cd, Cr, Pb, Se), the rest of the results are below water quality standards (Cu, Zn, TDS). Most parameters did not demonstrate any increase in the concentration at the monitoring stations below the discharge. The exceptions are Zn, Cu, and TDS.

It is required that the monitoring of the instream stations will continue during the next permit cycle. It is also required that the facility uses low level method 1631E for all Hg analysis.

FISH TISSUE MONITORING-NEAR OUTFALL 002

The permit required fish tissue monitoring for As, Se, and Hg near the ash pond discharge once every 5 years. This frequency is consistent with EPA guidance. Sunfish and bass tissues were analyzed for these trace elements. The 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). These results are consistent with the previous monitoring results.

TOXICITY TESTING-OUTFALL 002

Current Requirement: Outfall 002 – Chronic P/F @ 12% using Ceriodaphnia
Recommended Requirement: Outfall 002 – Chronic P/F @ 23% using Ceriodaphnia

This facility has passed all toxicity tests during the previous permit cycle, please see attached (23 out of 23).

The Division will increase the Instream Waste Concentration from 12% to 23% due to the increased wastewater flow, reported as 11.44 MGD. For the purposes of the permitting, the highest monthly average flow reported during the last 3 years in conjunction with the 7Q10 summer flow was used to calculate the percent effluent concentration to be used for WET.

COMPLIANCE SUMMARY

Notwithstanding the civil lawsuit filed for unauthorized discharges and groundwater exceedances/violations, based on the monitoring required under the current version of the permit there were no violations of effluent standards contained in the permit.

PERMIT LIMITS DEVELOPMENT

- The temperature limits (Outfall 001) are based on the North Carolina water quality standards (15A NCAC 2B .0200) and 316(a) Thermal Variance. Summer and winter thermal limits have been established in support of the 316(A) temperature variance issued by EPA in May of 1975
- Free Available Chlorine Limits (Outfall 001 and Outfall 003) were established in accordance with 40 CFR 423.
- The limits for Oil and Grease and Total Suspended Solids (Outfall 002) are based on Best Professional Judgment and are more stringent than prescribed in the 40 CFR 423.

- The limits for Oil and Grease and Total Suspended Solids (Outfall 005) were established in accordance with 40 CFR 423.
- The pH limits (Outfalls 002, 002A, 002B, 003, and 005) in the permit are based on the North Carolina water quality standards (15A NCAC 2B .0200).
- The pH limits (Outfall 004) in the permit are based on the BPJ.
- The limits for Total Copper and Total Iron (Outfall 002 and Outfall 005) were established in accordance with 40 CFR 423.
- The turbidity limit in the permit (Outfall 002) is based on the North Carolina water quality standards (15A NCAC 2B .0200).
- The Technology Based Effluent Limits for Total Arsenic, Total Mercury, Total Selenium, and Nitrate/nitrite as N (Outfall 004 and Outfall 006) are based on the requirements of 40 CFR 423.
- The Whole Effluent Toxicity limit (Outfall 002) is based on the requirements of 15A NCAC 2B .0500.
- The Total Arsenic limits (Outfall 002 dewatering) in the permit are based on the results of the Reasonable Potential Analysis (RPA) of the interstitial water data. The calculations are conducted in accordance with the EPA Guidance entitled "Technical Support Document for Water Quality-based Toxics Control." The water quality chronic dissolved standard of 150.0 µg/L for Freshwater Aquatic Life and water quality acute dissolved standard of 340.0 were used in the calculations of the limits. Please see attached RPA for details.

PROPOSED CHANGES

- The Seep Outfalls 101 and 102 and Seep Pollutant Analysis Special Condition were eliminated from the permit.
- The applicability date for the bottom ash transport water and the FGD effluent was postponed until December 31, 2023 based on the proposed EPA rulemaking.
- The groundwater compliance boundary map was added to the permit.
- The new outfall for the new lined Retention Basin (Outfall 005) was added to the permit, please see A. (9.).
- The Compliance Boundary special condition was added to the permit, please see A. (32.).
- The Groundwater Monitoring Well Construction and Sampling special condition was eliminated from the permit.
- The requirement for a physical/chemical treatment was eliminated from the permit to meet accelerated closure requirements in the SOC.

PROPOSED SCHEDULE

Draft Permit to Public Notice: January 9, 2017
Permit Scheduled to Issue: March 5, 2017

STATE CONTACT

If you have any questions on any of the above information or on the attached permit, please contact Sergei Chernikov at (919) 807-6386 or sergei.chernikov@ncdenr.gov.

CHANGES IN THE FINAL PERMIT (issued April 2, 2018)

- The dates of compliance with 40 CFR 423 for bottom ash transport wastewater and FGD wastewater were changed to November 1, 2021 to address the public comments and changes made by EPA to the earliest applicability date from November 1, 2018 to November 1, 2020.
- The language for compliance with the turbidity limit was changed to better reflect the state turbidity standard.
- The TSS limit of 50 mg/L was transferred from Internal Outfall 010 to Outfall 005 to better reflect operational conditions at the site.
- The Oil and Grease limit was eliminated from Internal Outfall 010 to correct an error.
- The requirement for a physical/chemical treatment was modified and re-instesrted into the permit.
- The rate for lowering the liquid level was increased to 1 foot per day in accordance with the latest guidance from DEMLR.
- The frequency of instream monitoring was increased from semi-annually to monthly to assure compliance with the water quality standards during decanting and dewatering.

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

2. 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.
3. 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.

4. The

   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:

   $$\frac{C_{diss}}{C_{total}} = \frac{1}{1 + \{ [K_{po}] [ss^{(1+a)}] [10^{-6}] \}}$$

   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

   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.

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

$$Ca = \frac{(s7Q10 + Qw)(Cwqs) - (s7Q10)(Cb)}{Qw}$$

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 NH_3* (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

6. 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.

7. 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.

8. 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.

9. 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.

10. 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, $CaCO_3$ or (Ca+Mg)]	25.0	Default value
Average Upstream Hardness (mg/L) [Total as, $CaCO_3$ 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