

# MARYLAND MS4 Monitoring Database: Version 2.2

Database Design Documentation and Data Dictionary

March 2018

Interstate Commission on the Potomac River Basin

# 1 RELATIONAL DATABASE STRUCTURE

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The following sections provide a summary of the database structure.

**Field Name:** This column contains the field name of the database table and the designation of the field as a primary key (PK), a foreign key (FK), a required entry (i.e. not null) (NN), an optional entry (O), and/or a unique field (U). Descriptions of foreign entries can be found in the appropriate AQWMS domain tables, except as noted otherwise in the description column.

**Data Type:** This column specifies the field type as either text, number, or date/time as well as the maximum length of a text entries.

**Description:** This column gives a definition of the field name as well as example(s) of valid entries. In some instances, valid entries were found neither in the AQWMS nor the Water Quality eXchange (WQX) data dictionaries. These entries are listed in new domain tables, and the description column references the tables when appropriate.

## 1.1 PRIMARY DATA TABLES

This section describes the primary data tables housed in the MS4 Access database including PROJECT, MONITORING\_SITES, OUTFALLS, ACTIVITY, ACTIVITY\_COMMENTS, CHEMICAL\_ASSESSMENT, HABITAT\_ASSESSMENT, BIOHAB\_INDEX, BENTHIC\_METRIC, TAXA\_COUNT, and PHYSICAL\_ASSESSMENT.

**PROJECT:** Every event for which data is reported must have a record in the Project table.

Field Name	Data Type	Description
COLLECTING AGENCY ID (FK, NN)	Text 4	The identifier for the agency conducting the activity. <b>Example:</b> AACO, SHA. <b>See domain table dAgency</b>
PROJECT ID (PK, NN, U)	Text 35	A unique identifier for the Project to which data will be assigned. <b>Example:</b> AACO_WRM_PP
PROJECT NAME (NN, U)	Text 120	A unique name for the Project. <b>Example:</b> Anne Arundel County MS4 Watershed Restoration Monitoring at Parole Town Center
PROJECT DESCRIPTION (O)	Text 255	Project purpose and/or summary
MONITORING REQUIREMENT (NN)	Text 35	Tracks the specific monitoring requirement at a station. <b>Examples:</b> Watershed Restoration (WRM), SWM Effectiveness (SWM). <b>See domain table dMonitoringType</b>
SAMPLING DESIGN TYPE (NN)	Text 20	A code used to identify the type of sampling design employed for this project. <b>Example:</b> Targeted
PERMIT NUMBER (NN)	Text 11	MDE permit number

**MONITORING SITES.** This table provides sampling location names and associated geographic attributes.

Field Name	Data Type	Description
MDE MONITORING LOCATION ID (PK, NN, U)	Text 35	Monitoring station identifier that is either provided by the collecting agency or is generated for this database. <b>Example: AA94MSI000008</b>
MONITORING LOCATION NAME (NN)	Text 255	A geographically descriptive name
MONITORING LOCATION TYPE (NN)	Text 45	Type of monitoring location. <b>Examples: Instream or Outfall</b>
ALTERNATE MONITORING LOCATION ID (O)	Text 35	Local monitoring station identifier or local outfall identifier
OUTFALL ID (FK, O)	Text 35	Outfall identifier
SW PROGRAM ID (O)	Text 35	SW Program identifier
CB TRUST (FK, O)	Text 255	Indicates whether watershed associated with CB Trust restoration project
MONITORING LOCATION LATITUDE (NN)	Double	Latitude. Decimal degrees (6-8 digits)
MONITORING LOCATION LONGITUDE (NN)	Double	Longitude. Decimal degrees (6-9 digits)
LOCATION DESCRIPTION (O)	Text 255	Text description of the monitoring location
DRAIN_AREA (O)	Double	Drainage area (in acres) to monitoring location
COMMENTS_GENERAL (O)	Text 255	General comments provided by the collecting agency

**OUTFALLS.** This table provides information about outfalls associated with MS4 permit monitoring.

Field Name	Data Type	Description
MDE MONITORING LOCATION ID (FK, NN)	Text 35	Monitoring station identifier that is either provided by the collecting agency or is generated for this database
OUTFALL ID (PK, NN, U)	Text 35	MDE primary outfall identifier
LOCAL OUTFALL ID (O)	Text 35	Jurisdiction's outfall identifier
OUTFL DIM (O)	Double	Outfall dimension value
OUTFL DIM UNIT (O)	Text 10	Outfall Dimension unit
OUTFL TYPE (FK)	Text 3	Outfall type. <b>Example: culvert (CV), headwall (HW).</b> See domain table <b>dOutfallType</b> ,

Field Name	Data Type	Description
OUTFL MATL (FK)	Text 5	Outfall material type. <b>Example: Reinforced concrete pipe (RCP), corrugated metal pipe (CMP).</b> See domain table <b>dOutfallMaterial</b>
OUTFL YEAR (NN)	INT	Year outfall was constructed
OUTFL DRAIN	Double	Drainage area to outfall (acres)
OUTFALL LATITUDE (NN)	Double	Latitude. Decimal degrees 6-8 digits
OUTFALL LONGITUDE (NN)	Double	Longitude. Decimal degrees 6-9 digits
OUTFALL LOCATION DESCRIPTION (O)	Text 255	Text description of the outfall location
COMMENTS_GENERAL (O)	Text 255	General comments provided by the collecting agency

**ACTIVITY:** Every event for which data is reported must have a record in the Activity table.

Field Name	Data Type	Description
PROJECT ID (FK, NN)	Text 35	Project identifier
MDE MONITORING LOCATION ID (FK, NN)	Text 35	Monitoring station identifier generated specifically for this database to accommodate both instream and outfall station identifiers
ACTIVITY ID (PK, NN, U)	Text 35	Unique identifier for each Activity event
EVENT DATE (NN)	Date	Date the Activity began <b>(YYYY-MM-DD)</b>
EVENT TIME (O)	Time	Time the Activity began <b>(HH:MM:SS)</b>
ACTIVITY MEDIA NAME (NN)	Text 20	Medium in which sample or measurement was taken. <b>Example: Water</b>

**ACTIVITY\_COMMENTS:** This table tracks activity comments provided by the collecting agencies or data manipulations performed by ICPRB.

Field Name	Data Type	Description
ACTIVITY ID (PK, NN, U)	Text 35	Unique identifier for each Activity event
COMMENTS GENERAL (O)	Text 255	General comments provided by the collecting agency
COMMENTS ICPRB (O)	Text 255	Comments related to data manipulations performed by ICPRB

**ACTIVITY EMC:** This table tracks possible censored EMC data.

Field Name	Data Type	Description
ACTIVITY ID (PK, NN, U)	Text 35	Unique identifier for each Activity event
FLOW TYPE (FK, NN)	Text 2	Indicates if sample was taken during <b>Storm</b> or <b>Base flow</b> events
PARAMETER (FK, NN)	Text 120	Characteristic Name associated with Chemical monitoring. See domain table <b>dParameter</b>
CENSORED (NN)		ICPRB estimation of the likelihood that the EMC value may be censored (yes or no).
COMMENTS ICPRB (O)	Text 255	ICPRB comments related to the EMC value.

**CHEMICAL\_ASSESSMENT.** The table includes information about chemical monitoring and event mean concentrations (EMCs) of stormwater discharges from MS4 outfall and in-stream monitoring locations.

Field Name	Data Type	Description
ACTIVITY ID (FK, NN)	Text 35	Event identifier
FLOW TYPE (FK, NN)	Text 2	Indicates if sample was taken during <b>Storm</b> or <b>Base flow</b> events
PARAMETER (FK, NN)	Text 120	Characteristic Name associated with Chemical monitoring. See domain table <b>dParameter</b>
RESULT VALUE (NN)	Doub le	Measured value of the parameter
RESULT UNIT (FK, NN)	Text 12	Unit of the Parameter Result Value. <b>Examples: mg/l, ug/l, gal</b>
RESULT VALUE TYPE (NN)	Text 12	Qualifies the Result Value. <b>Examples: Calculated, Actual</b>
RESULT STATISTICAL BASE (FK, NN)	Text 25	Method used to calculate derived results. <b>Examples: FWA, EMC0, EMCdt, OBS.</b> See domain table <b>dResultStatisticalBase</b>
RESULT DETECTION LIMIT (NN)	Doub le	Detection limit reported and/or used for EMCdt calculation
RESULT DETECTION LIMIT UNIT (NN)	Text 12	Unit of the detection limit

**HABITAT\_ASSESSMENT:** This table stores information relating to the assessment of stream habitat conditions.

Field Name	Data Type	Description
ACTIVITY ID (FK, NN)	Text 35	Event identifier
MONITORING LOCATION ID (FK, NN)	Text 35	Monitoring station identifier
CHARACTERISTIC NAME (FK, NN)	Text 120	Characteristic Name associated with Habitat monitoring
METRIC SCORE	Text	Provides the scaled score for the Activity Metric ( <b>0-20</b> )

Field Name	Data Type	Description
(NN)	10	
RESULT STATUS (NN)	Text 12	Describes the status of the Result Value. <b>Example: Final</b>
RESULT VALUE TYPE (NN)	Text 12	Qualifies the Result Value. <b>Example: Estimated</b>
SAMPLING COMPONENT NAME (NN)	Text 12	<b>Example: BenHabUnit</b>
SAMPLING COMPONENT PLACE IN SERIES (NN)	Text 3	<b>Example: 1</b>
SAMPLE COLLECTION METHOD ID (FK, NN)	Text 20	Method code identifying the field procedure used. <b>Example: RBP</b>
COMMENTS (O)	Text 255	Comments

**BIOHAB\_INDEX.** This table contains calculated biological and habitat indices that can be used to assess the overall stream health.

Field Name	Data Type	Description
PROJECT ID (FK, NN)	Text 35	Project identifier
MONITORING LOCATION ID (FK, NN)	Text 35	Monitoring station identifier
INDEX ID (PK, NN, U)	Text 35	Unique event identifier. <b>Example: MonLocation:Date:IndexTypeId</b>
INDEX TYPE ID (FK, NN)	Text 5	<b>Example: BIBI, FIBI, PHI. See ndBioHab_Index</b>
INDEX SCORE (NN)	Integer	Calculated Biohabitat score
INDEX NARRATIVE (O)	Text 12	Narative description of Index Score. <b>Example: excellent, good, fair, poor</b>
INDEX DATE (NN)	Date	Date when the Index was calculated or reported (YYYY-MM-DD)
COMMENTS (O)	Text 255	Comments

**BENTHIC\_METRIC.** This table contains various calculated benthic metrics that can be used to assess overall stream health.

Field Name	Data Type	Description
ACTIVITY ID (FK, NN)	Text 35	Event identifier
MONITORING LOCATION ID (FK, NN)	Text 35	Monitoring station identifier

Field Name	Data Type	Description
ASSEMBLAGE SAMPLED NAME (NN)	Text 50	<b>Example: Benthic Macroinvertebrates</b>
BIOLOGICAL INTENT (NN)	Text 35	<b>Example: Population Census</b>
METRIC TYPE ID (NN)	Text 35	A descriptor of the calculated metric. <b>Example: % Burrower Taxa, Shannon Diversity</b>
METRIC TYPE CONTEXT (NN)	Text 50	Identifies the source or data system that created or defined the metric. <b>Example: USEPA</b>
METRIC SCORE (NN)	Double	Provides the scaled or calculated score for the activity metric.
COMMENTS (O)	Text 255	Comments

**TAXA\_COUNT.** This table contains raw benthic counts and sampling methods.

Field Name	Data Type	Description
ACTIVITY ID (FK, NN)	Text 35	Event identifier
MONITORING LOCATION ID (FK, NN)	Text 35	Monitoring station identifier
ASSEMBLAGE SAMPLED NAME (NN)	Text 50	<b>Example: Benthic Macroinvertebrates</b>
BIOLOGICAL INTENT (NN)	Text 35	<b>Example: Population Census</b>
SAMPLING COMPONENT PLACE IN SERIES (NN)	Text 3	<b>Example: 1</b>
TAXANOMIC NAME (NN)	Text 50	Taxanomic Name of the benthic specimen
TAXANOMIC NUMBER (FK, NN)	Text 7	Interagency Taxonomic Identification System (ITIS) Taxon Serial Number (TSN) for the benthic specimen
TAXANOMIC LEVEL (FK, NN)	Text 35	Taxanomic level. <b>Example: Species, Genus, Family</b>
FREQUENCY CLASS DESCRIPTOR (FK)	Text 35	Description of specimen's life stage. <b>Example: Adult, Larva, Juvenile</b>
RESULT VALUE (NN)	Integer	Count of the Characteristic
RESULT UNIT (FK, NN)	Text 12	<b>Example: Count</b>
RESULT STATUS (NN)	Text 12	Describes the status of the Result Value. <b>Example: Final</b>
RESULT VALUE TYPE (NN)	Text 12	Qualifies the Result Value. <b>Example: Final</b>
SAMPLE COLLECTION METHOD (FK, NN)	Text 20	Sampling method used for benthic collection. <b>Example: RBP</b>

Field Name	Data Type	Description
SAMPLE COLLECTION EQUIPMENT (FK, NN)	Text 20	Sampling gear used for benthic collection. <b>Example: D-Frame Net</b>
LABORATORY NAME (O)	Text 50	Name of the Laboratory where the benthic specimen was identified
COMMENTS (O)	Text 255	Comments

**PHYSICAL\_ASSESSMENT.** This table stores information relating to the assessment of the stream physical condition.

Field Name	Data Type	Description
ACTIVITY ID (FK, NN)	Text 35	Event identifier
MONITORING LOCATION ID (FK, NN)	Text 35	Monitoring station identifier
REACH_ID (O)	Text 35	Reach identifier provided by the collecting agency
XSECTION_ID (O)	Text 35	Crosssection identifier provided by the collecting agency
CHARACTERISTIC NAME (FK, NN)	Text 120	Geomorphological characteristic. <b>Refer to new domain table dCharacteristic_Physical</b>
RESULT VALUE (NN)	Integer	Measured value of characteristic
RESULT UNIT (FK, NN)	Text 12	Unit for characteristic result. <b>Example: Count</b>
RESULT STATUS (NN)	Text 12	<b>Example: Final</b>
RESULT VALUE TYPE (NN)	Text 12	<b>Example: Actual, Calculated</b>
SAMPLING COMPONENT PLACE IN SERIES (NN)	Text 3	<b>Example: 1</b>
REACH LENGTH MEASURE (O)	Double	Length measurement of the reach
REACH LENGTH UNIT (O)	Text 12	Unit of the reach length value
REACH WIDTH MEASURE (O)	Double	Width measurement of the reach
REACH WIDTH UNIT (O)	Text 12	Unit of the reach width value
COMMENTS (O)	Text 255	Comments



## 1.2 DOMAIN TABLES

The new domain tables included the MS4 Access database are: dAgency, dLandUse, dOutfallType, dOutfallMaterial, dStormCharacteristic, dStatisticalBase, and dPhysical Characteristic.

**dAgency.** This table provides a list of sampling agencies and associated collections agency identifications.

AGENCY ID	AGENCY NAME
AACO	Anne Arundel County
BACI	Baltimore City
BACO	Baltimore County
CACO	Carroll County
CHCO	Charles County
FRCO	Frederick County
HACO	Harford County
HOCO	Howard County
MOCO	Montgomery County
PGCO	Prince George's County
SHA	State Highway Administration

**dLandUse.** This table provides MDP land use codes and associated descriptions.

LU_CODE	LANDUSE_NAME	DESCRIPTION
11	Low Density Residential	Detached single family/duplex dwelling units, yards, and associated areas. Areas of more than 90 percent single family/duplex dwelling units, with lot sizes less than five acres but at least one-half acres (.2 dwelling units/acre to 2 dwelling units/acre).
12	Medium Density Residential	Detached single family/duplex, attached single unit row housing, yards, and associated areas. Areas of more than 90 percent single family/duplex units and attached single unit row housing, with lot sizes of less than one-half acre but at least one-eighth acre (2 dwelling units/acre to 8 dwelling units/acre).
13	High Density Residential	Attached single unit row housing, garden apartments, high rise apartments/condominiums, mobile home and trailer parks. Areas of more than 90 percent high density residential units, with more than 8 dwelling units/acre.
14	Commercial	Retail and wholesale services. Areas used primarily for the sale of products and services, including associated yards and parking areas.
15	Industrial	Manufacturing and industrial parks, including associated warehouses, storage yards, research laboratories, and parking areas.
16	Institutional	Elementary and secondary schools, middle schools, junior and senior high schools, public and private colleges and universities, military installations (built-up areas only, including buildings and storage, training, and similar areas) churches and health facilities, correctional facilities, and government offices and facilities that are clearly separable from the surrounding land cover.
17	Extractive	Surface mining operations, including sand and gravel pits, quarries, coal surface mines, and deep coal mines. Status of activity (active vs. abandoned) is not distinguished.
18	Open Urban Land	Urban areas whose use does not require structures, or urban areas where non-conforming uses characterized by open land have become isolated. Included are golf courses, parks, recreation areas (except associated with schools or other institutions), cemeteries, and entrapped agricultural and undeveloped land within urban areas.
191	Large Lot Subdivision (Agriculture)	Residential subdivisions with lot sizes less than 20 acres but at least 5 acres, with a dominant land cover of open fields or pasture.
192	Large Lot Subdivision	Residential subdivisions with lot sizes less than 20 acres but at least 5

LU_CODE	LANDUSE_NAME	DESCRIPTION
	(Forest)	acres, with a dominant land cover of deciduous, evergreen or mixed forest.
21	Cropland	Field and forage crops.
22	Pasture	Land used for pasture, both permanent and rotated: grass.
23	Orchards/Vineyards/ Horticulture	Areas of intensively managed commercial bush and tree crops, including areas used for fruit production, vineyards, sod and seed farms, nurseries, and green houses.
24	Feeding Operations	Cattle or hog feeding lots, poultry houses, and holding lots for animals, and commercial fishing areas (including oyster beds).
241	Feeding Operations	Cattle or hog feeding lots, poultry houses, and holding lots for animals.
242	Agricultural Building	Breeding and training facilities, storage facilities, built-up areas associated with a farmstead, small farm ponds, and commercial fishing areas.
25	Row and Garden Crops	Intensively managed track and vegetable farms and associated areas.
41	Deciduous Forest	Forested areas in which the trees characteristically lose their leaves at the end of the growing season. Included are such species as oak, hickory, aspen, sycamore, birch, yellow poplar, elm, maple, and cypress.
42	Evergreen Forest	Forested areas in which the trees are characterized by persistent foliage throughout the year. Included are such species as white pine, pond pine, hemlock, southern white cedar, and red pine.
43	Mixed Forest	Forested areas in which neither deciduous or evergreen species dominate, but in which there is a combination of both types.
44	Brush	Areas that do not produce timber or other wood products but may have cut-over timber stands, abandoned agriculture fields, or pasture. These areas are characterized by vegetation types such as sumac, vines, rose, brambles, and tree seedlings.
50	Water	Rivers, waterways, reservoirs, ponds, bays, estuaries, and ocean.
60	Wetlands	Forested and non-forested wetlands, including tidal flats, tidal and non-tidal marshes, and upland swamps and wet areas.
71	Beaches	Extensive shoreline areas of sand and gravel accumulation, with no vegetative cover or other land use.
72	Bare Exposed Rock	Areas of bedrock exposure, scarps, and other natural accumulations of rock without vegetative cover.
73	Bare Ground	Areas of exposed ground caused naturally, by construction, or other cultural processes.
80	Transportation	Transportation features include major highways, light rail or metro stations and large "Park „N Ride" lots, generally over ten acres in size. Major highways were defined as those appearing on the State Highway maps as Controlled Access Highways or Primary Highways

**dMonitoringRequirement.** This table provides MDP land use codes and associated descriptions.

MONITORING_REQUIREMENT	DESCRIPTION
LID	Low Impact Development (LID) technology monitoring
TFM	Trust Fund Monitoring
WRM	MS4 Watershed Restoration Monitoring
WRM/TFM	Watershed Restoration and Trust Fund Monitoring

**dOutfallMaterial.** This domain table provides information about the outfall material at the monitoring location.

OUTFL MATL	Description
ASRP	Aluminum Spiral Rib Pipe
ACCOMP	Asphalt Coated Corrugated Metal Pipe
BCCMP	Bituminous Coated Corrugated Metal Pipe
CIP	Cast Iron Pipe
CONC	Concrete
CMP	Corrugated Metal Pipe
HDPE	High Density Polyethylene
PVC	Polyvinyl Chloride (PVC) Pipe
RCP	Reinforced Concrete Pipe
STR	Stream
SPP	Structural Plate Pipe
TCP	Terracotta Pipe
UNK	Unknown
VC	Vitrified Clay
OTH	Other

**dOutfallType.** This domain table provides information about the outfall type at the monitoring location.

OUTFL TYPE	Description
CV	Culvert
ES	Endsection
EW	Endwall
HW	Headwall
IN	Inlet
MH	Manhole
PP	Projecting Pipe
OTH	Other

**dParameter.** This table provides descriptions of the parameters monitored.

PARAMETER	Description	Unit
BOD	Biochemical Oxygen Demand (BOD5)	MG/L
DEPTH	Total rainfall depth	inch
DURATION	Length of storm event	hour
ECOCCI	Enterococci	MPN/100
ECOLI	E. coli	MPN/100
HARD	Hardness	UG/L
INTENSITY	Total depth/length of storm event	in/hr
NO23	Nitrite plus Nitrate	MG/L
pH	pH	std units
TCU	Total Copper	UG/L
TKN	Total Kjeldahl Nitrogen	MG/L
TP	Total Phosphorus	MG/L

PARAMETER	Description	Unit
TPB	Total Lead	UG/L
TPH	Total Petroleum Hydrocarbons	MG/L
TSQVOL	Total Storm Flow Volume	gal
TSS	Total Suspended Solids	MG/L
TZN	Total Zinc	UG/L
WTemp	Water Temperature	deg C

**dStatisticalBase.** This domain table describes the methods used to calculate the values for the chemical assessment.

RESULT VALUE TYPE	Description
FWA	Flow weighted average (pH and water temp only)
EMC0	Flow weighted averages for three discrete samples representative of a storm using zero (0) for any discrete samples recorded at less than the detection limit.
EMCdt	Flow weighted averages for three discrete samples representative of a storm using the detection limit value (dt) for any discrete samples recorded at less than the detection limit.
OBS	Observed value

**dPhysical Characteristic.** This domain table describes the characteristics of the physical assessment.

CHARACTERISTIC NAME	Description	Unit
Abkf	Bankfull Cross-sectional Area: The area of the bankfull channel, estimated as the product of bankfull width and mean depth	sq ft
Qbkf	Bankfull Discharge	cfs
Ebkf	Bankfull Elevation	ft
dmbkf	Bankfull Maximum Depth: The maximum depth of the bankfull channel, or the difference between the thalweg elevation and the bankfull discharge elevation	ft
dbkf	Bankfull Mean Depth: The mean depth of the bankfull channel	ft
Wbkf	Bankfull Width: the width of the channel at the elevation of bankfull discharge or at the stage that defines the bankfull channel	ft
Wbkf_dbkf	Bankfull Width-to-depth ratio	
Wfpa	Floodprone Area Width: the width of the channel at a stage of twice the maximum depth	ft
Slope	Channel slope at bankfull stage	%
K	Sinuosity: ratio of the stream length versus the valley length or the valley slope divided by the channel slope.	
TW	Thalweg or deepest elevation along active channel	ft
ER	Entrenchment Ratio: the ratio of the width of the floodprone area (Wfpa) versus bank-full width (Wbkf).	none
D50	Median particle size of stream channel	mm
DrainageArea	Drainage Area	sq mile
BEHI	Bank Erosion Hazard Index (Very low, Low, Moderate, high, very high, extreme)	narrative
NBS	Near Bank Stress (Very low, Low, Moderate, high, very high, extreme)	narrative
ROSGEN	Rosgen stream type (Very low, Low, Moderate, high, very high,	narrative

CHARACTERISTIC NAME	Description	Unit
	extreme)	
Channel_Type	Channel Type	narrative
Valley_Type	Valley Type	narrative

## 1.3 MS4 ACCESS DATABASE TABLE RELATIONSHIPS

