

Assessment Methodology for 305(b)/303(d) Integrated Report 2012 Cycle



Plans and Special Projects Division
Evaluation and Strategic Planning Area
ENVIRONMENTAL QUALITY BOARD
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Assessment Units (AU)

Assessment Unit for Inland Waters

The assessment methodology used in the present cycle 305(b)/303(d) Integrated Report was approved since 2006 Cycle Integrated. For 2012 there are 204 Assessment Units.

At the moment, the PREQB uses the river basins system for planning activities and implementation of restoration efforts. In order to achieve these efforts in a more effective manner, we have replaced the old system based on the segmentation of small portions of rivers and individual creeks by basin segmentation system that has been implemented since the 2006 reporting cycle (See Figure 1). The non contributions basins are those areas, contribute to the coastal shoreline instead of the inland waters. Under this system, each main river basin it is divided in assessment units that consist of complete sub-basins. The smaller river basins have been maintained as a single assessment unit or, at the most, it may be segmented in two assessment units.

Each AU generally consists of one of the following:

- A section of the main basin, with the corresponding minor first order tributaries.
- Sub-basin represented by major first order tributary (a river or stream that flows directly into main basin), second order tributary (a river or stream that flows into a first order tributary, and in some cases, third order tributary (a river or stream that flows into a second order tributary).
- In cases where either the main basin or any major tributary includes a lake (reservoir), the lake constitutes another AU. The AU defined by the lake includes the lake (from the dam up to the highest reach that defines the lake) and all the immediate minor tributaries that discharge directly to the lake. This new AU for lakes results in a decrease in stream miles and an increase in lake surface area.

The total number of basins currently being assessed totals 96, including the San Juan Bay Estuary System. This is the only estuary identified as a separate basin due to its complex composition and interrelation of streams, lagoons, channels and closed bay. The composition of the San Juan Bay Estuary System presented here is the same as that defined in the CCMP Final Document developed for this estuary.

The table below provides basic information pertaining to the 96 basins that compose the current inland waters segmentation system.

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Table 1: Basins for the Inland Waters Segmentation System

BASIN NAME	BASIN ID	BASIN SEQUENCE	BASIN SIZE (Miles)	REGION	SUB-BASINS
QUEBRADA DE LOS CEDROS	PRNQ1A	01	12.0	N	1
QUEBRADA DEL TORO	PRNQ2A	02	1.0	N	1
RIO GUAJATACA*	PRNR3A	03	38.0	N	4
QUEBRADA BELLACA	PRNQ4A	04	1.7	N	1
RIO CAMUY	PRNR5A	05	48.6	N	1
QUEBRADA SECA	PRNQ6A	06	2.0	N	1
RIO GRANDE DE ARECIBO*	PRNR7A	07	424.6	N	11
RIO GRANDE DE MANATI*	PRNR8A	08	234.6	N	11
RIO CIBUCO*	PRNR9A	09	144.6	N	6
RIO LA PLATA*	PRER10A	10	470.1	E	18
RIO HONDO	PRER11A	11	22.0	E	1
RIO BAYAMON*	PRER12A	12	185.0	E	5
SAN JUAN BAY ESTUARY SYSTEM*	PREE13A	13	**	E	3
RIO GRANDE DE LOIZA*	PRER14A	14	554.3	E	15
RIO HERRERA	PRER15A	15	17.0	E	1
RIO ESPIRITU SANTO*	PRER16A	16	58.4	E	1
RIO MAMEYES	PRER17A	17	38.9	E	1
QUEBRADA MATA DE PLATANO	PREQ18A	18	4.0	E	1
RIO SABANA	PRER19A	19	33.1	E	1
RIO JUAN MARTIN	PRER20A	20	7.8	E	1
QUEBRADA FAJARDO	PREQ21A	21	10.0	E	1
RIO FAJARDO*	PRER22A	22	59.0	E	1
RIO DEMAJAGUA	PRER23A	23	2.8	E	1
QUEBRADA CEIBA	PREQ24A	24	5.0	E	1
QUEBRADA AGUAS CLARAS	PREQ25A	25	4.8	E	1
RIO DAGUAO	PRER26A	26	13.8	E	1
QUEBRADA PALMA	PREQ27A	27	11.8	E	1
QUEBRADA BOTIJAS	PREQ28A	28	7.4	E	1
RIO SANTIAGO	PRER29A	29	15.3	E	1
RIO BLANCO	PRER30A	30	58.4	E	2
RIO ANTON RUIZ	PRER31A	31	20.4	E	1
QUEBRADA FRONTERA	PREQ32A	32	8.5	E	1
RIO HUMACAO*	PRER33A	33	55.8	E	1
RIO CANDELERO	PRER34A	34	10.4	E	1
RIO GUAYANES*	PRER35A	35	94.6	E	1
QUEBRADA EMAJAGUA	PREQ36A	36	2.5	E	1
RIO MAUNABO*	PRER37A	37	36.0	E	1
QUEBRADA MANGLILLO	PRSQ38A	38	1.0	S	1
QUEBRADA FLORIDA	PRSQ39A	39	3.0	S	1
RIO JACABOA	PRSR40A	40	13.0	S	1
QUEBRADA PALENQUE	PRSQ41A	41	1.0	S	1
RIO CHICO	PRSR42A	42	14.6	S	1

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BASIN NAME	BASIN ID	BASIN SEQUENCE	BASIN SIZE (Miles)	REGION	SUB-BASINS
RIO GRANDE DE PATILLAS*	PRSR43A	43	48.6	S	4
QUEBRADA YAUREL	PRSQ44A	44	6.0	S	1
RIO NIGUAS – ARROYO	PRSR45A	45	21.0	S	1
QUEBRADA SALADA	PRSQ46A	46	1.7	S	1
QUEBRADA CORAZON	PRSQ47A	47	9.7	S	1
QUEBRADA BRANDERI	PRSQ48A	48	4.5	S	1
RIO GUAMANI	PRSR49A	49	22.0	S	1
QUEBRADA MELANIA	PRSQ50A	50	7.0	S	2
RIO SECO	PRSR51A	51	24.7	S	1
QUEBRADA AMOROS	PRSQ52A	52	0.7	S	1
QUEBRADA AGUAS VERDES	PRSQ53A	53	15.0	S	1
RIO NIGUAS – SALINAS	PRSR54A	54	102.5	S	1
RIO JUEYES	PRSR55A	55	11.0	S	1
RIO CAYURES	PRSR56A	56	5.0	S	1
RIO COAMO*	PRSR57A	57	115.7	S	3
RIO DESCALABRADO	PRSR58A	58	18.8	S	1
RIO CAÑAS	PRSR59A	59	8.0	S	1
RIO JACAGUAS	PRSR60A	60	89.5	S	4
RIO INABON	PRSR61A	61	66.7	S	1
RIO BUCANA – CERRILLOS*	PRSR62A	62	60.4	S	3
RIO PORTUGUES*	PRSR63A	63	54	S	1
RIO MATILDE – PASTILLO	PRSR64A	64	51.2	S	1
RIO TALLABOA	PRSR65A	65	59.6	S	1
RIO MACANA	PRSR66A	66	21.7	S	1
RIO GUAYANILLA*	PRSR67A	67	60.0	S	1
RIO YAUCO	PRSR68A	68	93.7	S	3
RIO LOCO	PRSR69A	69	113.4	S	3
RIO ARROYO CAJUL	PRSR70A	70	7.4	S	1
QUEBRADA BOQUERON	PRWQ71A	71	11.7	W	1
QUEBRADA ZUMBON	PRWQ72A	72	1.7	W	1
QUEBRADA GONZALEZ	PRWQ73A	73	1.8	W	1
QUEBRADA LOS PAJARITOS	PRWQ74A	74	2.7	W	1
CAÑO CONDE AVILA	PRWK75A	75	4.0	W	1
QUEBRADA IRIZARRY	PRWQ76A	76	2.0	W	1
RIO GUANAJIBO*	PRWR77A	77	324.6	W	9
CANO MERLE	PRWK78A	78	11.1	W	1
RIO YAGÜEZ*	PRWR79A	79	42.2	W	1
QUEBRADA DEL ORO	PRWQ80A	80	10.0	W	1
CAÑO MANI	PRWK81A	81	3.0	W	1
CAÑO BOQUILLA	PRWK82A	82	12.3	W	1
RIO GRANDE DE AÑASCO*	PRWR83A	83	488.6	W	10
QUEBRADA JUSTO	PRWQ84A	84	1.0	W	1
QUEBRADA ICACOS	PRWQ85A	85	1.4	W	1
QUEBRADA CAGUABO	PRWQ86A	86	1.0	W	1

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BASIN NAME	BASIN ID	BASIN SEQUENCE	BASIN SIZE (Miles)	REGION	SUB-BASINS
CAÑO GARCIA	PRWK87A	87	2.0	W	1
QUEBRADA GRANDE DE CALVACHE	PRWQ88A	88	14.8	W	1
QUEBRADA LOS RAMOS	PRWQ89A	89	6.9	W	1
QUEBRADA PUNTA ENSENADA	PRWQ90A	90	5.0	W	1
QUEBRADA PILETAS	PRWQ91A	91	2.0	W	1
RIO GRANDE	PRWR92A	92	21.8	W	1
CAÑO DE SANTI PONCE	PRWK93A	93	4.8	W	1
RIO GUAYABO	PRWR94A	94	43.1	W	1
RIO CULEBRINAS*	PRWR95A	95	308.8	W	11
CAÑO CORAZONES	PRWK96A	96	1.3	W	1

* Basins with permanent monitoring stations

** The San Juan Bay Estuary System increased in size because it receives the total miles of five streams basins that contribute to the total drainage area of the estuary system. These water bodies were previously considered as separate basins.

Twenty-two (22) of the 96 basins are monitored routinely. These 22 basins form part of the permanent stream water quality monitoring network. For purposes of water quality assessment and planning, PREQB continues to group all the basins into four (4) geographic regions. The table below presents geographic regions with corresponding number of basins and basins part of the monitoring network.

Table 2: Geographic Regions

REGION	ASSESSMENT UNITS	BASINS IN PERMANENT STREAM WATER QUALITY NETWORK	ASSESSMENT UNITS BY EXTERNAL DATA
North	9	4	1
South	33	5	4
East	28*	9	29
West	26	4	6

* Included the San Juan Bay Estuary System

For assessment units with monitoring stations, the water quality assessment made with the data generated at each station is considered to be indicative of the water quality upstream along the whole unit until it reaches another. For unmonitored AU, supplementary information, such as: NPDES compliance evaluation inspections, operation and maintenance inspections, pump station by-passes and sanitary sewer system overflow incidents for a period of two years, implementation of BMPs by non-point sources, fish-kills or spill events that make possible identified potential pollution sources.

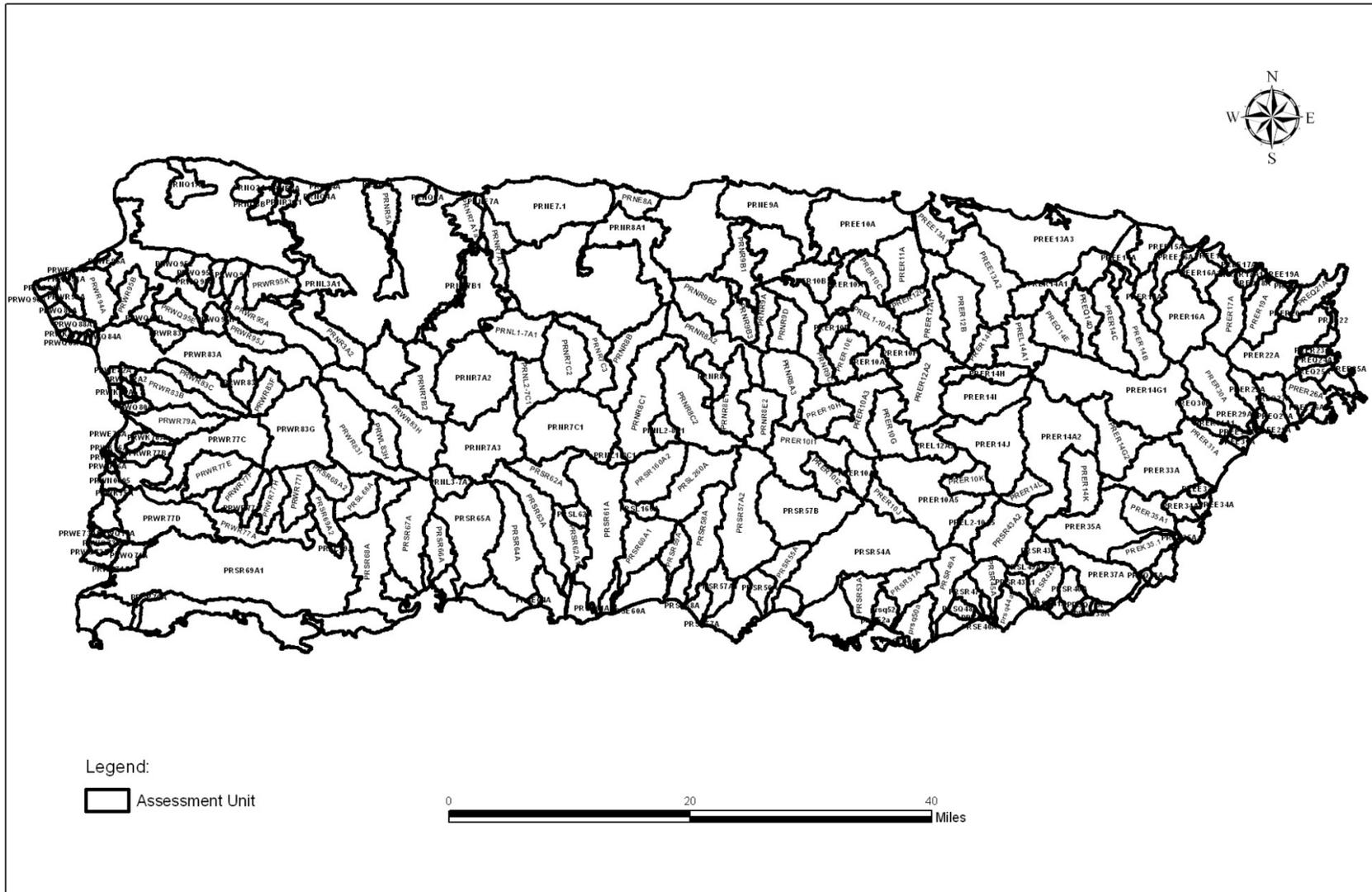


Figure 1: Puerto Rico Sub-Basins

Coastal Shoreline Segmentation System

This segmentation is being used in the 2010 IR for the first time. The table below summarizes the 64 new Assessment Units for the new segmentation system.

<i>Segment ID</i>	<i>Segment Name</i>	<i>Segment Size (miles)</i>	<i>Region</i>
PRNC01*	Punta Borinquén to Punta Sardina	11.72	North
PRNC02*	Punta Sardina to Punta Manglillo	14.10	North
PRNC03*	Punta Manglillo to Punta Morrillos	9.65	North
PRNC04*	Punta Morrillos to Punta Manatí	13.66	North
PRNC05*	Punta Manatí to Punta Chivato	7.46	North
PRNC06*	Punta Chivato to Punta Puerto Nuevo	3.23	North
PRNC07*	Punta Puerto Nuevo to Punta Cerro Gordo	5.05	North
PRNC08*	Punta Cerro Gordo to Punta Boca Juana	7.32	North
PREC09*	Punta Boca Juana to Punta Salinas	5.78	East
PREC10B*	Punta Salinas to Río Bayamón mouth	2.91	East
PREC10C	Río Bayamón mouth to Isla de Cabras	6.63	East
PREC11	Isla de Cabras to Punta del Morro	7.79	East
PREC12*	Punta del Morro to west side of Condado Bridge	3.50	East
PREC13*	East side of Condado Bridge to Punta Las Marías	4.31	East
PREC14*	Punta Las Marías to Punta Cangrejos	4.19	East
PREC15*	Punta Cangrejos to Punta Vacía Talega	6.23	East
PREC16*	Punta Vacía Talega to Punta Miquillo	9.46	East
PREC17*	Punta Miquillo to Punta La Bandera	8.41	East
PREC18*	Punta La Bandera to Cabezas de San Juan	10.46	East
PREC19*	Cabezas de San Juan to Punta Barrancas	7.08	East
PREC20	Punta Barrancas to Punta Medio Mundo	5.33	East
PREC21	Punta Medio Mundo to Punta Puerca	3.00	East
PREC22	Punta Puerca to Isla Cabras	3.30	East
PREC23	Isla Cabras to Punta Cascajo	8.83	East
PREC24	Punta Cascajo to Punta Lima	9.07	East
PREC25*	Punta Lima to Morro de Humacao	9.83	East
PREC26	Morro de Humacao to Punta Candelero	1.84	East
PREC27	Punta Candelero to Punta Guayanés	3.74	East
PREC28C*	Punta Guayanés to Punta Quebrada Honda	4.68	East
PREC28B*	Punta Quebrada Honda to Punta Yeguas	.74	East
PREC29	Punta Yeguas to Punta Tuna	4.35	East
PREC30*	Punta Tuna to Cabo Mala Pascua	2.65	East
PRSC31	Cabo Mala Pascua to Punta Viento	4.06	South
PRSC32*	Punta Viento to Punta Figuras	6.16	South
PRSC33*	Punta Figuras to Punta Ola Grande	8.10	South
PRSC34*	Punta Ola Grande to Punta Petrona	40.96	South
PRSC35*	Punta Petrona to Punta de Cabullones	2.53	South

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<i>Segment ID</i>	<i>Segment Name</i>	<i>Segment Size (miles)</i>	<i>Region</i>
PRSC36B	Punta de Cabullones to Punta Carenero	6.70	South
PRSC36C*	Punta Carenero to Punta Cucharas	9.23	South
PRSC37B*	Punta Cuchara to Cayo Parguera	3.30	South
PRSC37C*	Cayo Parguera to Punta Guayanilla	4.20	South
PRSC38*	Punta Guayanilla to Punta Verraco	13.20	South
PRSC39*	Punta Verraco to Punta Ballenas	6.41	South
PRSC40*	Punta Ballenas to Punta Brea	13.26	South
PRSC41B1*	Punta Brea to Bahía Fosforescente La Parguera	10.93	South
PRSC41A1	Bahía Fosforescente La Parguera	2.00	South
PRSC41B2*	Bahía Fosforescente to Punta Cueva de Ayala	7.00	South
PRSC41A2	Bahía Monsio José	3.72	South
PRSC41B3	Bahía Monsio José to Faro de Cabo Rojo	13.45	South
PRWC42	Faro de Cabo Rojo to Punta Aguila	2.89	West
PRWC43*	Punta Aguila to Punta Guaniquilla	9.54	West
PRWC44*	Punta Guaniquilla to Punta La Mela	2.50	West
PRWC45	Punta La Mela to Punta Carenero	2.95	West
PRWC46*	Punta Carenero to front of Cayo Ratones	4.00	West
PRWC47	In front of Cayo Ratones to Punta Guanajibo	3.85	West
PRWC48*	Punta Guanajibo to Punta Algarrobo	5.60	West
PRWC49*	Punta Algarrobo to Punta Cadena	6.98	West
PRWC50*	Punta Cadena to Punta Higüero	4.98	West
PRWC51*	Punta Higüero to Punta del Boquerón	6.14	West
PRWC52*	Punta del Boquerón to Punta Borinquén	6.80	West
PRCC53*	Culebra Island	32.70	Offshore Islands
PRVC54A	Bahía Mosquito	3.00	Offshore Islands
PRVC54B*	Vieques Island	67.60	Offshore Islands
PRMC55	Mona Island	18.60	Offshore Islands

* Assessment Units with monitoring stations

The new segmentation for the coastal shoreline provides for fourteen (14) segments unmonitored (assessed) and forty-four (44) segments monitored (with monitoring stations). However, location of the monitoring stations corresponding to the Permanent Coastal Monitoring Network and Beach Monitoring and Public Notification Program have not been changed. Nevertheless, it will be necessary to relocate many of the Permanent Coastal Monitoring Network Stations in accordance with the new shoreline segmentation. The Beach Monitoring and Public Notification Program stations will not be affected by the changes to be made in the Coastal Monitoring Network. These efforts will be completed during the year 2012.



Figure 2: PR Coastal Shoreline New Segmentation System

Monitoring Program
Permanent Water Quality Monitoring Network

The PREQB monitoring activities for this reporting cycle included routine ambient water quality sampling at the various networks and special water quality studies performed in the water bodies of concern. Where available, effluent quality data from the discharge monitoring reports submitted by NPDES permitted point sources were used as contributing sources that may impact the use support potential of the water bodies.

The PREQB generates data from six (6) routine monitoring networks that provide physical, chemical and biological water quality data from the different water bodies. These are:

- **Surface Water Monitoring Network:** Operated by the USGS under a cooperative agreement with Puerto Rico, this network includes water quality-sampling stations in the 22 major river basins in the north, south, east, and west hydrographic regions of Puerto Rico. The USGS collects samples on a quarterly basis and analyzes for the following parameters:

Flow *	Fecal Coliforms
Specific Conductance *	Ammonia as Nitrogen
Temperature	Nitrate + Nitrite as Nitrogen
Dissolved Oxygen	Suspended Solids *
Turbidity	Chemical Oxygen Demand *
pH	Total Phosphorus
Hardness	

* Parameter that does not have numeric standard as establish in the Puerto Rico Water Standard Regulation

Analyses for the detection of cyanide and methylene blue active substances (MBAS), as well as the other following parameters, are performed twice a year:

Arsenic	Mercury	Iron *
Cadmium	Selenium	Zinc
Lead	Silver	Copper

* Parameter that does not have numeric standard as establish in the Puerto Rico Water Standard Regulation

Additional samples are collected for dissolved solids analyses, which include:

Calcium *	Potassium *
Carbonate *	Silica *
Chlorides	Sodium *
Fluorides	Sulfate
Magnesium *	

* Parameter that does not have numeric standard as establish in the Puerto Rico Water Standard Regulation

Samples are collected and analyzed for the following pesticides at selected stations once a year:

Aldrin	Endrin	Methyltrithion *
Chlordane	Ethion *	Mirex
DDD *	Heptachlor	Naphtalene Polychlor *
DDE *	Lindane	Parathion
DDT *	Malathion	Perthane *
Diazinon	Methoxychlor	Total Trithion
Endosulfan	Methylparathion *	Toxaphene

* Parameter that does not have numeric standard as establish in the Puerto Rico Water Standard Regulation

- **Clean Lakes Monitoring Network:** Operated by PREQB, this network monitors water quality in the 19 major lakes (reservoirs) that are mostly used as raw sources of drinking water and recreational activities, including fishing. Samples taken at these lakes are analyzed for the following parameters:

Ammonia as Nitrogen	Dissolved Oxygen (profile)
Chlorophyll "a" *	Mercury
Fecal Coliforms	Total Phosphorous
Hardness	Turbidity
Nitrate + Nitrite	Pesticides (organochlorides)
pH	Temperature (profile)

* Parameter that does not have numeric standard as establish in the Puerto Rico Water Standard Regulation

All parameters will be collected once in each of three (3) sampling cycles (rainy season, dry season, and midpoint between these two periods).

- **Non Point Sources Network:** Operated by PREQB, this network is limited to Río Grande de Loíza, Río De La Plata and Río Grande de Arecibo basins. A total of five

(5) stations were established in Río Grande de Loíza, six (6) in Río De La Plata and nine (9) in Río Grande de Arecibo. The parameters sampled include:

Temperature	Nitrate + Nitrite as N
pH	Ammonia as N
Dissolved Oxygen	TSS *
TDS	Chlorophyll “a” *
Total Phosphorous	Fecal Coliforms
Orthophosphates *	Pesticides (organochlorides)
Settleable Solids *	

* Parameter that does not have numeric standard as establish in the Puerto Rico Water Standard Regulation

All parameters will be collected once in each of three (3) sampling cycles (rainy season, dry season, and midpoint between these two periods).

- **Groundwater Monitoring Network:** This network is limited to approximately 70 drinking water wells located in different municipalities throughout Puerto Rico and are sampled at least one time per year, sampling once for each of the following:

Fecal Coliforms	VOC’s
Total Coliforms	SVOC’s
Nitrates	Pesticides
Metals	

- **Coastal Monitoring Network:** Operated by PREQB, this network includes monitoring stations all around the coastal perimeter of Puerto Rico. The Coastal Monitoring Network Stations are sampled for the following parameters:

Fecal Coliforms	Ammonia as N	Cadmium	Mercury
Fecal Enterococcus	Oil and Grease	Chromium	Nickel
pH	Nitrate + Nitrite as N	Copper	Selenium
Temperature	Dissolved Oxygen	Lead	Zinc
Turbidity	Salinity		

Those monitoring stations are sampled in accordance with the following frequency: 22 stations monthly, 10 stations annually, and 66 stations bimonthly frequency.

Table 3: Puerto Rico Coastal Permanent Network Water Quality Monitoring Stations

STATION ID	FREQUENCY OF MONITORING
MAC-043	6/BT, 1/PCM
SBZ-002	6/BT
SBZ-003	6/BT
SBZ-004	6/BT, 1/PCM
SBZ-005	6/BT
MAC-044	6/BT
MAC-086	1/BTPCM
SBZ-006	6/BT
MAC-047	6/BTPC, 1/M
SBZ-007	6/BT
MAC-049	1/BTPCM
SBZ-008	6/BT
SBZ-009	6/BT
MAC-055	6/BTPC, 1/M
SBZ-010	6/BT
MAC-087	6/BT, 1/PCM
MAC-088	6/BT, 1/PCM
SZB-013	6/BT
SBZ-014	6/BT
MAC-061	6/BTPC, 1/M
MAC-077	6/BTPC, 1/M
SBZ-016	6/BT
MAC-063	6/BTPC, 1/M
SBZ-019	6/BT
SBZ-018	6/BT
MAC-072	12BT, 1PCM
MAC-071	12BT, 1PCM
MAC-070	12BT, 1PCM
B-1	12BT, 1PCM
MAC-074	12BT, 1PCM
EB-04	12BT
MAC-075	12BT, 1PCM
EB-14	12BT
EB-17	12BT
MAC-076	12BT, 1PCM
EB-23	12BT
EB-29	12BT
EB-31	12BT
003C	12BT, 1PCM
EB-35	12BT
EB-38	12BT
B-2	12BT, 1PCM
EB-40	12BT
EB-41	12BT
EB-42	12BT
004C	12BT, 1PCM
B-3	12BT, 1PCM
SBZ-024	6/BT

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STATION ID	FREQUENCY OF MONITORING
SBZ-025	6/BT
SBZ-026	6/BT
SBZ-027	6/BT
SBZ-028	6/BT
SBZ-030	6/BT
MAC-009	6/BT, 1/PCM
MAC-010	6/BTPC, 1/M
MAC-078	6/BTPC, O&G, 1/M
MAC-079	6/BTPC, 1/M
MAC-080	6/BTPC, 1/M
SBZ-033	6/BT
SBZ-034	6/BT
MAC-081	6/BTPC, 1/M
MAC-011	1/BTPCM
MAC-012	6/BTPC, 1/M
MAC-013	6/BTPC, O&G, 1/M
SBZ-037	6/BT
SBZ-038	6/BT
MAC-082	6/BTPC, 1/M
SBZ-040	6/BT
MAC-083	6/BT, 1/PCM
MAC-017	6/BTPC, 1/M
MAC-016	1/BTPCM, O&G
MAC-018	1/BTPCM
MAC-019	6/BTPC, 1/M
SBZ-042	6BT
MAC-020	6/BTPC, 1/M
MAC-022	6/BTPC, O&G, 1/M
MAC-023	6/BTPC, 1/M
MAC-084	6/BT, 1/PCM
MAC-024	1/BTPCM, O&G
MAC-025	1/BTPCM, O&G
MAC-027	1/BTPCM
MAC-089	1/BTPCM
MAC-028	6/BTPC, 1/M
MAC-030	1/BTPCM
MAC-085	6/BT, 1/PCM
MAC-034	1/BTPCM
SBZ-045	6/BT
SBZ-046	6BT
SBZ-047	6BT
SBZ-048	6BT
MAC-037	6BT, 1/PCM
SBZ-050	6BT
SBZ-051	6BT
SBZ-052	6BT
MAC-038	6/BTPC, 1/M
MAC-040	6/BTPC, O&G,1/M
MAC-041	6/BT, 1/PCM
SBZ-054	6BT

<i>STATION ID</i>	<i>FREQUENCY OF MONITORING</i>
SBZ-055	6BT

B – Microbiology analysis (Fecal Coliforms and Enterococcus)

T – Temperature (in the field)

PC – Physical and Chemicals Parameters: Salinity, pH, Dissolved Oxygen, Turbidity, NO₂ + NO₃, NH₃ and O&G (Oil & Grease)

M – Metals

- ***Beach Monitoring and Notification Program Network***: Operated by PREQB, this network includes 34 stations distributed over 23 beaches in Puerto Rico. The Beach Monitoring and Notification Program network stations are sampled biweekly for bacteria (Fecal Coliforms, Enterococcus and Temperature).

All sampling and analytical activities are subjected to a Water Quality Assurance Program Plan, coordinated through the Quality Assurance Control Officer of the Water Quality Area and the Division of Environmental Science and Assessment of EPA Region II.

Each monitoring initiative is supported by the corresponding Quality Assurance Project Plan (QAPP), which must comply with the Water Program’s Quality Assurance Management Plan (QAMP).

All samples are collected, preserved, transported and analyzed in accordance with the protocols established in the corresponding Quality Assurance Project Plan. The purpose and goals of PREQB's fixed monitoring station programs are:

1. Provide current data on the quality of the various water bodies throughout Puerto Rico.
2. Provide information on specific pollutants of concern and uses that may be impaired in the different water bodies monitored
3. Provide information on possible sources responsible for water quality impairment.
4. Provide information to determine the compliance with the water quality standards applicable to the different designated uses as established in the PRWQSR.
5. Determine if the pollution control measures being implemented throughout Puerto Rico are effective in protecting the quality of the different water bodies.

Data generated from the rivers and stream stations sampled and analyzed by the USGS are not available through STORET; however, the data is available through Internet (www.usgs.gov) or hardcopy files from the Caribbean Field Office.

Synoptic Studies

Under Section (604(b) in the American Recovery and Reinvestment Act of 2009 (ARRA funds), allocated to the Commonwealth of Puerto Rico, were used to perform synoptic sampling studies in non-monitored streams in the Eastern, Southern, and Western Hydrological

Regions of the Island. All the data generated by those synoptic studies were included in this cycle of the 305(b)/303(d) Integrated Report. Those studies were:

1. Synoptic sampling study during wet/dry seasons of unmonitored streams in the Southern and Western Hydrological Regions – One Hundred Four monitoring stations were analyzed for the following parameter: Fecal Coliforms, Total Coliforms, pH, Temperature, Dissolved Oxygen, Specific Conductance, Flow, Surfactants, and Nutrients.
2. Synoptic sampling study during wet/dry seasons that includes eighty-three monitoring stations in the Eastern Hydrological Region. The parameters analyzed were: Fecal Coliforms, Total Coliforms, pH, Temperature, Dissolved Oxygen, Specific Conductance, Flow, Surfactants, and Nutrients.
3. Synoptic sampling studies during wet/dry seasons for Fecal Coliforms, Total Coliforms, pH, Temperature, Dissolved Oxygen, Specific Conductance, Flow, Surfactants, Trace Metals, Persistent Pesticides, and Nutrients along the Río Grande de Añasco (13 monitoring stations), Río Culebrinas (19 monitoring stations) and Río Guanajibo Basins (15 monitoring stations) (priority watersheds in the Western Region). These studies included the sampling of ten wells located in the above-mentioned basins for pH, Temperature, Dissolved Oxygen, Specific Conductance, and Persistent Pesticides. These three basins comprise most of the area where the agricultural activity is most intensive in the western region of Puerto Rico. The sampling network to be used for Culebrinas and Añasco are the same as the one used in the previous synoptic study for these two basins. The network to be established in the Río Guanajibo basin was consistent with the new basin segmentation system used in the Añasco and Culebrinas basins, thus sampling stations were located at the base of each assessment unit (sub-basin) in order to assess the complete basin following the current segmentation system used to develop the 303(d)/305(b) Integrated Report.

In addition, PREQB may perform special sampling activities whenever necessary to investigate fish kills, hydrocarbons leaks and spills, and illegal discharges to storm sewers and water bodies in order to obtain water quality data to assess the impact and attempt to establish responsible parties.

Unmonitored Waters

To address the unmonitored waters including, quality of high ecological value or recreational, Class SA waters as defined in the PRWQSR, that includes bioluminescent lagoons and bays such as La Parguera and Monsio José on the Southern Coast, and Bahía Mosquito in Vieques municipality. PREQB, in coordination with USGS has developed a monitoring strategy for the assessment of 20 coastal lagoons in the main island of Puerto Rico and one in the island of Vieques. Approximately, 40 surface water sampling sites will be visited quarterly during one year (FY 20011-12) and samples will be collected within these coastal lagoons, including Class SE waterbodies: Tortuguero and Cartagena lagoons. The water samples will be analyzed for chemical physical and bacteriological parameters, which will help to provide the necessary tools to assess water quality of these lagoons.

Water's Quality External Data

In developing Section 303(d) lists, PREQB is required to assemble and evaluate all existing and readily available water quality-related data and information, including, at a minimum, consideration of existing and readily available data and information for which water quality problems have been reported by governmental agencies, members of the public or academic institutions. In addition to these categories, Puerto Rico is required to evaluate and consider any other readily available data and information. The list of sources PREQB has actively solicited data from includes government agencies and academic institutions these can be found in the Table 4 below. EQB requested recent (three years or less) chemical and biological data on water bodies along with information pertaining to the quality control procedure and protocols that were used to generate the data.

Table 4: Government Agencies and Academic Institutions contacted by EQB

NAME	POSITION	AGENCY
Mr. José J. Nolla	Chairman	Associated General Contractors of America Puerto Rico Chapter
Esther A. Astacio	Compliance Manager Drinking Water Compliance and Control Division	PR Aqueduct and Sewer Authority
Eng. Luis Rodríguez		PR Highway and Transportation Authority
Ruberto Berrios	Manager Water Quality Department	PR Electric Power Authority
Milagros Rodríguez	Manager Environmental Affairs Office	PR Ports Authority
Carmen González	Acting Director	Jobos Bay National Estuarine Reserve
Eng. Miguel A. Torres Díaz	Chairman	College of Engineers and Land Surveyors of PR
Edwin Hernández	Land Preservation Office	Department of Agriculture
Raúl Santini	Coordinator Zone Coast Division	Department of Natural and Environmental Resources
Ernesto L. Díaz	Director Coastal Zone Program	Department of Natural and Environmental Resources
José A. Rivera		Caribbean Environmental Protection Agency
John Kushuara	Division of Environmental Science and Assessment Monitoring and Assessment Branch	US Environmental Protection Agency
Dr. Jorge Bauzá	Environmental Scientific	San Juan Estuary Bay
Erick Hawk	Section 7 Coordinator Southeast Regional Office	National Marine Fisheries Services

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NAME	POSITION	AGENCY
Irma M. López	Chairman	PR Water & Environmental Association
Dra. Graciela I. Ramírez Toro	Director of CECIA	Interamerican University of PR
Dra. Nilda E. Aponte	Director Department of Marine Sciences	University of PR – Mayagüez Campus
Dr. Luis R. Pérez Alegría	Professor Department of Agricultural and Bio-Systems Engineering	University of PR–Mayagüez Campus
Dr. Jorge Rivera Santos	Director Water Resources Institute	University of PR–Mayagüez Campus
Ruperto Chaparro	Director Sea Grant College Program	University of PR – Mayagüez Campus
Dra. Ana Navarro	Water Quality - Marine Outreach Program Sea Grant College Program	University of PR– Mayaguez Campus
Gloriselle Negrón Ríos	Environmental Health Specialist	Agriculture Extension Services
Dr. Rafael F. Dávila López	Agricultural and Civil Engineer Engineering Office	Agriculture Extension Services
Edwin Almodóvar	Director	Natural Resources Conservation Service (NRCS) Caribbean Area
Damaris Medina	State Engineer	Natural Resources Conservation Service (NRCS) Caribbean Area
Marisol Morales	Biologist	Natural Resources Conservation Service (NRCS) Caribbean Area
Edwin Muñiz	Supervisor PR Field Office	US Fish and Wildlife Service
Teresa Lipsett	School of Science and Technology	Turabo University
Dr. Carlos M. Padín Bibiloni	Dean School of Environmental Affairs	Metropolitan University of PR
Ing. José Borrageros	Director Department of Civil and Environmental Engineering	Polytechnic University of PR
Dr. Thomas Miller	Department of Geology	University of PR– Mayagüez Campus
Dr. Luis A. Ríos Hernández	Assistant Professor Biology Department	University of PR– Mayagüez Campus
Dr. Sangchul Hwang	Associated Professor Department of Civil Engineering and Surveying	University of PR– Mayagüez Campus
Dra. Ingrid Padilla	Associated Professor Department of Civil Engineering and Surveying	University of PR– Mayagüez Campus

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NAME	POSITION	AGENCY
Olga M. Ramos	International Institute of Tropical Forestry	Jardín Botánico Sur
Miyoko Sakashita	Senior Attorney	Center of Biological Diversity
Lirio Márquez D'Acunti	Executive Director	Vieques Conservation and Historical Trust

As result of the water quality data request, the following agencies and/or institutions responded and submitted data:

- Mr. James Kurtenback-EPA
 - ✓ Puerto Rico Stream Survey Project by EPA Region 2, March 2011 (See Figure 3).
 - The monitoring network consists of 20 monitoring stations through the island.
 - Water chemistry, physical habitat and macroinvertebrate data were collected.
 - ✓ Río Piedras Basin EPA Region 2 March 2011 (See Figure 4).
 - 16 monitoring stations
 - Water chemistry, physical habitat and macroinvertebrate data were collected.

- Mrs. Yazmin Laguer-EPA CEPD
 - ✓ DMR data (from the past two years)
 - ✓ Pump station by-pass

- Guánica Bay Pollutant Source Identification Sampling Sept. 2010 and February 2011.
 - ✓ Total of 40 monitoring stations with a primary emphasis on reducing sources of sediment and nutrients.
 - ✓ Parameter analyzed: temperature, salinity, conductivity, turbidity, ammonia, total nitrogen, total phosphorus, potassium, fluoride, chlorophyll a, Total Coliform, E. Coli, Enterococcus, B. adolescentis and optical brighteners.

- Miyoko Sacashita, Center Biological Diversity, San Francisco, CA
 - ✓ No data was included, only referenced documents.
 - ✓ The recommendations are related to include as category 5 all coastal waters due to dissolved carbon dioxide.

- The Quality of Surfaces Water in the Sábalo Creek
 - ✓ A survey of Sábalo Creek's water quality was conducted as a Supplemental Environmental Project by Venegas Construction Corp. to define the contribution of the Industrial, Commercial, Agricultural and Domestic activities to the quality of the stream water.
 - ✓ Total of 3 monitoring stations, parameter analyzed: ammonia as N, BOD₅, cooper, Nitrites as N, Nitrates as N, oil and grease, phosphate total, sulfate, surfactant, dissolved oxygen, temperature, pH, Fecal Coliform, Total Coliform and Enterococcus.

- Mosquito Bay Survey – OSV BOLD, EPA Region II
 - ✓ Total 8 monitoring stations, parameter analyzed: arsenic, cadmium, chromium, copper, lead, magnesium, selenium, zinc, ammonia as N, nitrate, nitrite, phosphorus, total kjeldahl nitrogen, dissolved oxygen, pH, salinity, specific conductance, temperature, and turbidity.
 - ✓ The purpose of the sampling is to provide a baseline characterization to assist the EQB in initiating their Ambient Water Quality Monitoring stations so that they may accurately assess the SA water body.

- San Juan Bay Estuary System Program
 - ✓ The monitoring network consists of 25 monitoring stations in the San Juan Bay Estuary System. (See Figure 9)
 - ✓ Parameters analyzed: temperature, dissolved oxygen, specific conductance, salinity, turbidity, pH, secchi disk, oil and grease, total kjeldahl nitrogen, nitrate + nitrite as N, total phosphorus, TOC, chlorophyll ‘a’, TSS turbidity, ammonia, BOD, Fecal Coliform and Enterococcus.

- NRCS- Bahía de Jobos
 - ✓ Internet available data
 - ✓ Monitoring network consist of 4 monitoring stations
 - ✓ Temperature, pH, salinity, Dissolved Oxygen and turbidity data

- Special Study in the “Corredor Ecologico del Noreste” in the northeastern part of the island
 - ✓ The purpose was assessed water quality in some watersheds of this region.
 - ✓ Monitoring network consists of eight (8) monitoring stations.
 - ✓ Parameters analyzed were: chlorophyll “a”, fecal coliforms, total coliforms, total phosphorous, pesticides, orthophosphates, total dissolved solids and total suspended solids. Also field parameters as, temperature, pH, conductivity and dissolved oxygen were analyzed.

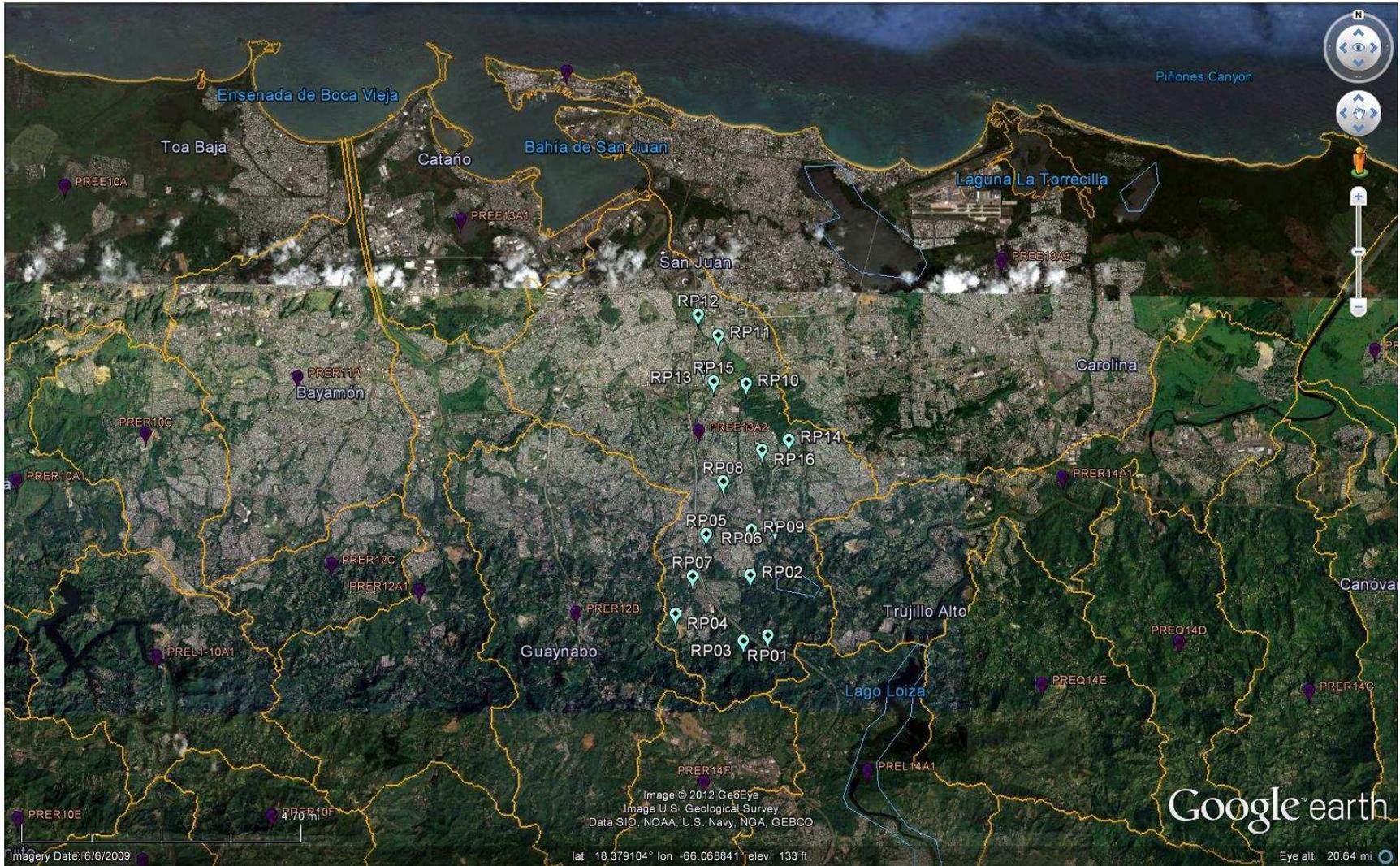


Figure 4: Río Piedras Basin Monitoring Stations



Figure 6: Monitoring Stations Surfaces Water in the Sábalos Creek

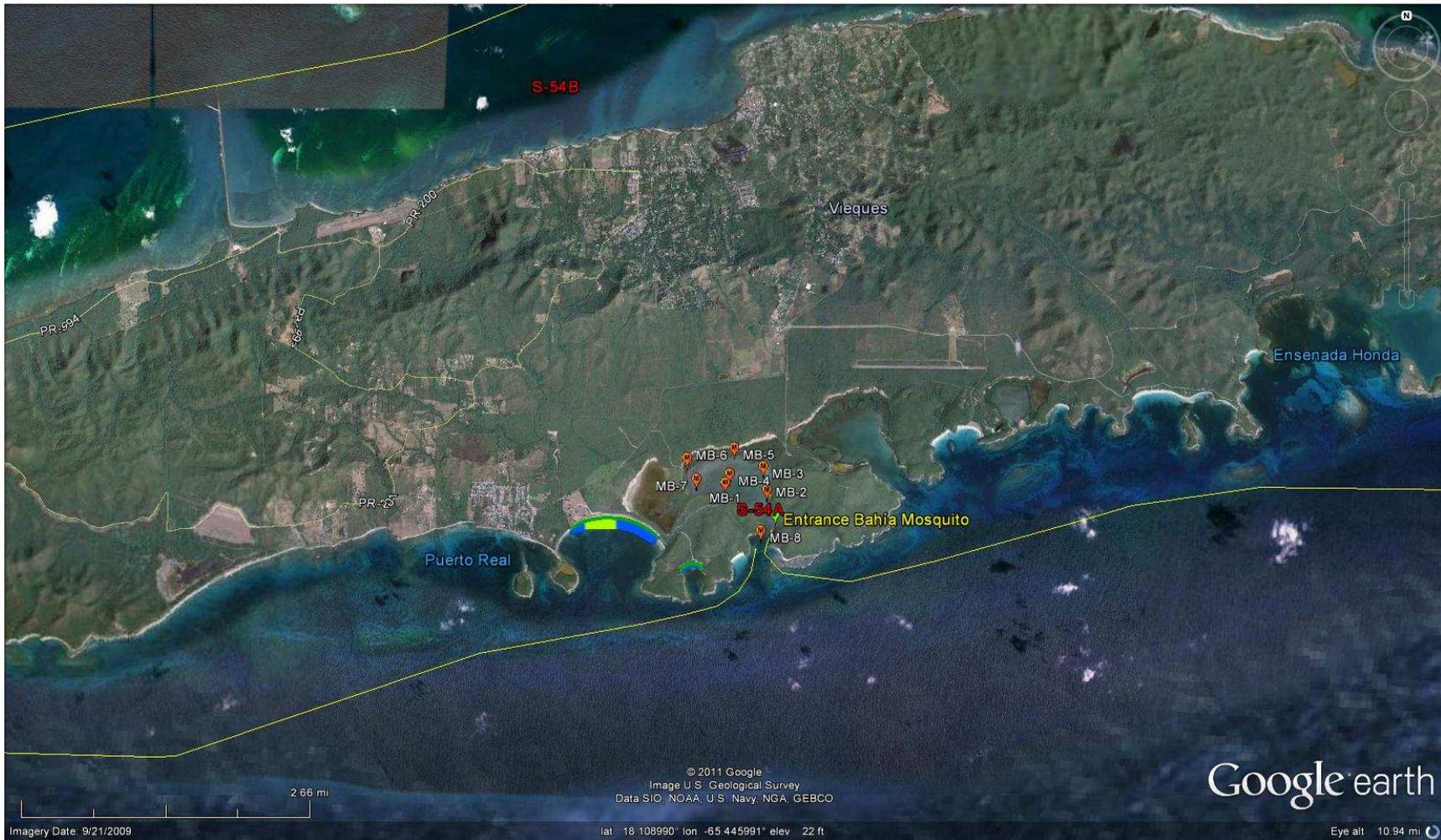


Figure 7: Mosquito Bay Survey Monitoring Stations



Figure 8: San Juan Bay Estuary System Monitoring Stations

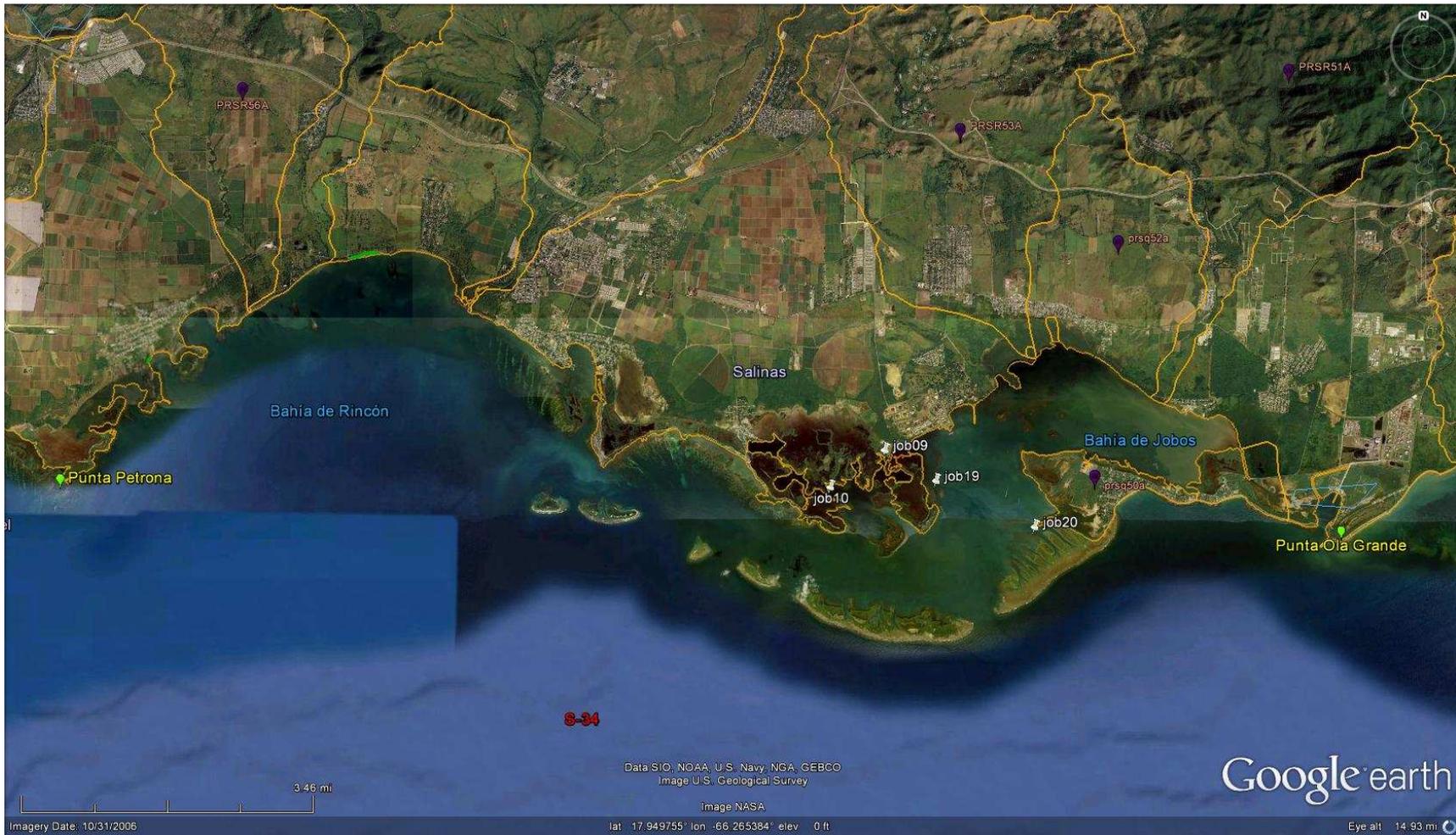


Figure 9: NRCS- Bahía de Jobos Monitoring Stations



Figure 10: Special Study for Corredor Ecológico del Noreste - Monitoring Stations

Designated Uses, and Applicable Water Quality Standards

The Puerto Rico Water Quality Standards Regulation (PRWQSR, as amended) established, as goals, the need to preserve, maintain and enhance the quality of the waters of Puerto Rico to assure that they are compatible with the social and economic needs of Puerto Rico and comply with the requirements of the Federal Clean Water Act. The current PRWQSR in effect is that promulgated in March 2010.

The PRWQSR establishes the designated uses to be maintained and protected for all waters in the archipelago of Puerto Rico. These uses include:

1. Protection and propagation of fish, shellfish and wildlife;
2. Primary and secondary contact recreation; and
3. Raw source of drinking water (Class SD waters only).

The PRWQSR also includes the corresponding standards to protect each of the designated uses. All waters reported in the IR were evaluated, based on availability of water quality data and/or other available information to determine if they comply with the different applicable water quality standards and whether or not the designated uses were attained. The designated uses and water body classification established in the PRWQSR are as follows:

CLASS SA - Coastal and estuarine waters of high quality and/or exceptional ecological or recreational values whose existing characteristics should not be altered, except by natural causes, in order to preserve the existing natural phenomena.

CLASS SB - Coastal and estuarine waters designated for primary and secondary contact recreation, and propagation and preservation of desirable species including threatened or endangered species. Coastal and estuarine waters not classified as Class SA or SC under Rules 1320.1 (A) and (C) of the PRWQSR. Class SB also includes lagoons not classified under any other class. This classification will apply from the zone subject to the ebb and flow of tides (mean sea level) up to 500 meters (0.31 miles) seaward from said zone. Beyond this limit, the next less restrictive classification will apply to a maximum of 10.35 miles (16,656.71 meters) seaward.

CLASS SC – Includes the segments of the coastal waters identified below intended for primary contact recreation, from the zone subject to the ebb and flow of tides (mean sea level) to 3 miles seaward, and secondary contact recreation from 3 miles seaward to 10.35 miles seaward, and for the propagation and preservation of desirable species, including threatened or endangered species.

- ✓ **Mayagüez Bay** – from Punta Guanajibo to Punta Algarrobo

- ✓ **Yabucoa Port.**
- ✓ **Guayanilla and Tallaboa Bays** – from Cayo Parguera to Puerto Verraco
- ✓ **Ponce Port** – from Punta Carenero to Punta Cuchara
- ✓ **San Juan Port** – from the mouth of Río Bayamón to Punta El Morro

CLASS SD - Surface waters designated as to raw source of public water supply, for primary and secondary contact recreation and propagation and preservation of desirable species including threatened and endangered species. . Primary Contact Recreation is precluded in any stream or segment that does not comply with the Rule 1303.2 (D)(2)(1) of the PRWQSR until such stream or segment meets the goal of the referred section.

CLASS SE - Surface waters and wetlands of exceptional ecological value, whose existing conditions should not be altered in order to preserve its natural characteristics.

The following tables summarize the existing applicable water quality standards used to perform the assessment for the 2012 IR. Here are shown the maximum allowable concentrations for specific substances in coastal and estuarine waters, surface waters, and ground waters:

Table 5: Specific Water Quality Standards for Selected Parameters (as established in the PRWQSR)

PARAMETER	COASTAL WATERS (ug/l)	RIVERS AND STREAM (ug/l)
Antimony (Sb) ^{+,&}	640 (HH)	5.6 (HH)
Arsenic (As) ^{*,+,&}	36.0 (AL)	10.0 (DW)
Cadmium (Cd) ^{+,%,&}	8.85 (AL)	Note 1 (AL)
Chromium III (Cr ^{+3+,&}	-	Note 2 (AL)
Chromium VI (Cr ^{+6+,&}	50.35 (AL)	11.43 (AL)
Chromium (Cr) ^{&}	-	-
Copper (Cu) ^{+,&}	3.73 (AL)	Note 3 (AL)
Cyanide (Free CN) ⁺	1.0 (AL)	5.2(AL)
Fluoride (F)	-	4000 (DW)
Lead (Pb) ^{+,%,&}	8.52 (AL)	Note 6 (AL)
Mercury (Hg) ^{+,&}	0.051(HH)	0.050 (HH)

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PARAMETER	COASTAL WATERS (ug/l)	RIVERS AND STREAM (ug/l)
Nickel (Ni) ^{+,&}	8.2 8 (AL)	Note 4 (AL)
Nitrate + Nitrite (as N)	-	10,000.0 (DW)
Nitrogen (NO ₃ , NO ₂ , NH ₃)	5,000.0	-
Nitrite (as N)	-	-
Selenium (Se) ^{+,&}	71.14 (AL)	5.0 (AL)
Silver (Ag) ^{+,&}	2.24 (AL)	Note 5 (AL)
Sulfide (Undissociated H ₂ S)	2.0 (AL)	2.0 (AL)
Zinc (Zn) ^{+,&}	85.62 (AL)	Note 7 (AL)
Thallium (Tl) ^{+,&}	0.47 (HH)	0.24 (HH)

AL - Standard based on protection of the water body for the propagation and preservation of desirable species dependant on water quality.

DW - Standard based on protection of the water body for use as a raw source of drinking water supply.

HH - Standard based on protection of the water body or existing aquatic life for reasons of human health.

Note 1 - Concentration in ug/l must not exceed the numerical value given by $e^{(0.7409 [\text{Ln Hardness}] - 4.719)}$

Note 2 - Concentration in ug/l must not exceed the numerical value given by $e^{(0.8190 [\text{Ln Hardness}] + 0.6848)}$

Note 3 - Concentration in ug/l must not exceed the numerical value given by $e^{(0.8545 [\text{Ln Hardness}] - 1.702)}$

Note 4 - Concentration in ug/l must not exceed the numerical value given by $e^{(0.8460 [\text{Ln Hardness}] + 0.0584)}$

Note 5 - Concentration in ug/l must not exceed the numerical value given by $e^{(1.72 [\text{Ln Hardness}] - 6.59)}$

Note 6 - Concentration in ug/l must not exceed the numerical value given by $e^{(1.273 [\text{Ln Hardness}] - 4.705)}$

Note 7 - Concentration in ug/l must not exceed the numerical value given by $e^{(0.8473 [\text{Ln Hardness}] + 0.884)}$

* Identifies a substance that may be a carcinogen.

+ Identifies a priority pollutant.

% In cases where the surface water body is used as a source of drinking water supply, the water quality standard for the indicated substance shall not exceed the drinking water standard upstream from the water intake.

& The number represent a total recoverable value

Table 6: Water Quality Standards for Specific Classifications

PARAMETER	SA	SB	SC	SD	SE
Chlorides	Note 1	-	-	250 mg/L	Note 1
Color	Note 1	Shall not be altered except by natural causes	Shall not be altered except by natural causes	15 Pt-Co.	Note 1
Dissolved Oxygen	Note 1	Not less than 5 mg/L	Not less than 4mg/L	Not less than 5 mg/L	Note 1
Enterococcus	Note 1	Note 3	(Note 2 and 3)	-	Note 1
Fecal Coliforms	Note 1	Note 4	Note 6	Note 4	Note 1
Other Pathogenic Organisms	Note 1	-	-	Free of Pathogens	Note 1
pH	Note 1	7.3-8.5	7.3-8.5	6.0-9.0	Note 1

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PARAMETER	SA	SB	SC	SD	SE
Sulfates	Note 1	2,800 mg/L	2,800 mg/L	250 mg/L	Note 1
Surfactants as MBAS	Note 1	500 ug/L	500 ug/L	100 ug/L	Note 1
Taste and odor producing substances	Note 1	Shall not be present	Shall not be present	Shall not be present	Note 1
Total Dissolved Solids	Note 1	-	-	500 mg/L	Note 1
Total Ammonia [@]	Note 1	-	-	1mg/L at specific segments established in the WQSR	Note 1
Total Coliforms	Note 1	-	-	Note 5	Note 1
Total Phosphorous	Note 1	-	-	1 mg/L*	Note 1
Turbidity	Note 1	10 NTU	10 NTU	50 NTU	Note 1

* Applicable in SD waters upstream from reservoirs, in segment with water in takes or estuarine waters.

@ Total Ammonia standard shall not exceed 1 mg/l upstream from the points given by coordinates for the following segments:

SEGMENT	COORDINATES	SEGMENT	COORDINATES
Río Cibuco	18°21'13" 66°20'07"	Río Caguítas	18°15'11" 66°01'26"
Río Hondo	18°26'13" 66°09'36"	Río Bairoa	18°15'28" 66°02'13"
Río Guaynabo	18°22'32" 66°07'59"	Río Chico	17°59'16" 66°00'18"
Río Bayamón	18°24'39" 66°09'09"	Río Coamo	18°03'52" 66°22'10"
Río Piedras	18°24'34" 66°04'10"	Río Guayanilla	18°00'50" 66°47'04"
Quebrada Blasina	18°23'27" 65°58'28"	Río Guanajibo	18°07'18" 67°03'56"

Note 1 - No parameter, whether or not considered in this classification, shall be altered in concentration, except by natural causes. Substances reactive with methylene blue shall not be present.

Note 2 – EPA Promulgation: Water Quality Standard Regulations, Federal Register, Vol. 69, No. 16, Monday, January 26, 2004, Rules and Regulations, Page 3514

Note 3- The Enterococci density, in terms of geometric mean of at least five representative samples taken sequentially shall not exceed 35 col/100mL. No single sample should exceed the upper confidence limit of 75% using 0.7 as the log standard deviation, until sufficient site data exist to establish a site-specific log standard deviation”.

Note 4- The fecal coliforms geometric mean of a series of representative samples (at least five samples) of the waters taken sequentially shall not exceed 200 col/100mL, and not more than 20 percent of the samples shall exceed 400 col/100mL.

Note 5 - The total coliforms geometric mean of a series of representative samples (at least five samples) of the waters taken sequentially shall not exceed 10,000 col/100mL of total coliforms or 200 col/100mL of fecal coliforms. Not more than 20 percent of the samples shall exceed 400 col/100mL of fecal coliforms.

Note 6 – The fecal coliforms geometric mean of a series of representative samples (at least five samples) of the water taken sequentially shall not exceed 2,000 col/100mL and not more than 20 percent of samples shall exceed 4,000 colonies/100mL of fecal coliforms.

Assessment Categories

The current assessment of the water quality in Puerto Rico was performed taking into consideration the five (5) attainment categories currently required to be used for the 305(b)/303(d) Integrated Report. These attainment categories are:

- Category 1:** Waters that are attaining the applicable water quality standards for all designated uses.
- Category 2:** Waters that are attaining some of the designated uses, but no data is available to make attainment determinations for the remaining designated uses.
- Category 3:** Waters for which the information available is insufficient to determine if any designated uses are being attained.
- Category 4:** Waters in which particular designated uses are impaired or threatened and it is expected that they will meet the water quality standards with the implementation of the adequate and corresponding control measures without the development of TMDLs.
- 4a - a state developed TMDL has been approved by EPA or a TMDL has been established by EPA for any segment/pollutant combination.
 - 4b - other required control measures are expected to result in the attainment of an applicable water quality standard in a reasonable period of time.
 - 4c - the non-attainment of any applicable water quality standard for the segment is the result of pollution and is not caused by a pollutant.
- Category 5:** Waters where at least one water quality standard was not attained (impaired or non-support assessment units). The unattainment of water quality standards requires the development and implementation of a TMDL. Waters identified as impaired are included in the 303(d) List.

Water Quality Assessment by Designated Uses

The surface waters (rivers, lakes/lagoons, estuaries and coasts) for which data are available were assessed for the following designated uses in accordance with the requirements of the Clean Water Act and the PRWQSR: primary contact recreation (swimming), secondary contact recreation, aquatic life and raw source of drinking water supply:

1. Swimming (Primary Contact Recreation):

a) Inland Waters

For primary contact recreation the use support evaluation was based on the geometric mean of a series of representative samples (at least five) of fecal coliforms. When the geometric mean was less or equal to 200 colonies/100mL and the 20% of the individual samples did not exceed the value of 400 colonies/100mL the AU was classified support for swimming. If the segment failed to meet any of the above mentioned criteria, the AU was considered as non-support.

b) Coastal Waters

For primary contact recreation the use support evaluation was based on the geometric mean of a series of representative samples (at least five) of fecal

coliforms. When the geometric mean was less or equal to 200 colonies/100mL and the 20% of the individual samples did not exceed the value of 400 colonies/100mL the AU was classified support for swimming. If the segment failed to meet any of the above mentioned criteria, the AU was considered as non-support. The Enterococcus density in terms of geometric mean of at least five representative samples taken sequentially shall not exceed 35/100mL. No single sample should exceed the upper confidence limit of 75% using 0.7 as the log standard deviation, until sufficient site data exist to establish a site-specific log standard deviation.

2. Secondary Contact Recreation:

a) Inland Waters

For secondary contact recreation the use support evaluation was based on the geometric mean of a series of representative samples (at least five) of fecal coliforms. When the geometric mean was less or equal to 10,000 colonies/100 mL of total coliform or 200 colonies/100 mL of fecal coliforms, and not more than 20 percent of the samples shall exceed 400 colonies/100 mL of fecal coliforms, the AU was classified support for swimming. If the segment failed to meet any of the above mentioned criteria, the AU was considered as non-support.

b) Coastal Waters

All such segments were evaluated on the basis of Primary Contact Recreation, this being the most restrictive use.

The coastal waters Class SC will be assessed as Class SB. The applicable standard for these waters are: The geometric mean of a series of representative samples (at least five) of fecal coliforms a geometric mean was less or equal to 200 colonies/100mL and the 20% of the individual samples did not exceed the value of 400 colonies/100mL the AU was classified support for swimming. If the segment failed to meet any of the above mentioned criteria, the AU was considered as non-support. The enterococci density in term of geometric mean of at least five representative samples taken sequentially shall not exceed 35/100mL. No single sample should exceed the upper confidence limit of 75% using 0.7 as the log standard deviation, until sufficient site data exist to establish a site-specific log standard deviation.

For secondary contact recreation the use support evaluation was based on the geometric mean of a series of representative samples (at least five) of fecal coliform. When the geometric mean was less or equal to 2,000 colonies/100mL and the 20% of the individual samples did not exceed the value of 4,000 colonies/100mL the AU was classified support for swimming. If the segment failed to meet any of the above mentioned criteria, the AU was considered as non-support.

3. Raw Source of Drinking Water (rivers and lakes):

The assessment of the drinking water use was based on monitored contaminants listed in the PRWQSR and the data obtained from the Source Water Assessment Program (SWAP). The additional criterion used to assess raw source of drinking water use was the presence of a water intake in the assessment unit. To assess the Raw Sources of Drinking Water use, we considered compliance of water quality standards for the various toxic parameters indicated below:

Aldrin	Fluoride
Alpha-BHC	Heptachlor
Antimonium (Sb)	Lindane
Arsenic (As)	Mercury (Hg)
Beta-BHC	Nitrates + Nitrites (NO ₃ + NO ₂)
Chlorides	Thallium (Tl)
Dieldrin	Total Phosphorus (P)
Endrin Aldehyde	Turbidity
Endosulfan Sulfide	

In all cases, each parameter considered was evaluated strictly in accordance with the applicable standard. For toxic parameters, a single violation of the standard was enough to identify the segment non-support for RSDW.

4. Aquatic Life Use Support (rivers, lakes, estuaries and coasts)

Currently, the Aquatic Life Use Support is based on the physical /chemical data collected on semi-annual frequency grab sampling incursions during key periods (high and low flows) for all parameters applicable to this use as indicated in the PRWQSR.

In all cases, each parameter considered was evaluated strictly in accordance with the applicable standard. The toxic parameters taken into consideration were:

Ammonia (NH ₃)	Cyanide (Free CN)	Silver (Ag)
Antimonium (Sb)	Lead (Pb)	Sulfide (S) (undissociated H ₂ S)
Cadmium (Cd)	Mercury (Hg)	Surfactants
Copper (Cu)	Niquel (Ni)	Thallium (Tl)
Chlorides	Pesticides (Organochlorides)	Zinc (Zn)

Chromium (Cr)	Selenium (Se)	
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For these toxic parameters, a single violation of the standard was enough to identify the segment as non-support for the aquatic life use.

The conventional parameters used for the assessment of aquatic life use support were:

Dissolved Oxygen (DO)	Temperature
pH	Turbidity

A newly developed and proposed macroinvertebrate protocol was used to document biological conditions in stream across Puerto Rico as part of the 2009 survey. The protocol was also tested and successfully used to document biological conditions in the 2011 survey of the Rio Piedras. Once a final document for the Rapid Bioassessment Protocol will be approved it will be address to the assessment methodology for aquatic life use.

303(d) List

Listing Criteria

The Puerto Rico 2012 List of Impaired Waters (303(d) List) is based on the water quality data generated through the water quality monitoring networks, evaluations of non-point sources in accordance with Section 319 of the Clean Water Act and special water quality studies. In the case of the 2012 303(d) List, we considered the most recent two consecutive years of available water quality data for each parameter in each AU. In this cycle, the AU was assessed on the basis of multiple categories for each use. This approach allows the identification of previously listed 303(d) segments within the new AU.

Where applicable, the new AU that has included in it previously 303(d) listed segments or newly listed segments will include these segments specifically identified as Category 5, along with the parameters that were the driving cause for listing. In the case of basins for which TMDLs have been developed, the segments will continue to be listed for those parameters that were not addressed in the TMDL. Those parameters addressed in the TMDL are de-listed from the respective segments.

For the 2012 cycle, PREQB used the Puerto Rico Water Quality Standards Regulation, as amended in March 2010 and the EPA promulgation, where applicable. The waters considered to be impaired have been included in Category 5. The PREQB 2012 CWA 303(d) List is included as Appendix I of the IR.

Delisting Criteria

If any of the parameters listed in the 2008 cycle violated the applicable water standard at least once, the parameter continued to appear as an impairment cause and the segment continued to be listed in Category 5. If, on the other hand, a previously listed parameter complied fully with the applicable water quality standard during the 2008, 2010 and 2012 cycles, that specific parameter will be delisted from Category 5.

Also, PREQB will remove a specific parameter from the list when the Total Maximum Daily Load for the corresponding assessment unit has been approved by EPA.

Priority Ranking and TMDL Development Status

In October of 1998, the PREQB in collaboration with the Natural Resources Conservation Service (NRCS) and EPA developed the document Puerto Rico Unified Watershed Assessment and restoration Activities. As a result of this initiative, eighteen (18) main basins were identified as high priority where the PREQB would implement restoration activities. These basins are identified below according to the corresponding regions identified previously:

Table 7: Priority Basins

BASIN	REGION
Quebrada Blasina	East
Río Bayamón	East
Río Blanco	East
Río Grande de Loíza	East
Río Hondo	East
Río La Plata	East
Río Piedras	East
Río Cibuco	North
Río Grande de Arecibo	North
Río Grande de Manatí	North
Río Guajataca	North
Río Coamo	South
Río Grande de Patillas	South
Río Guayanilla	South
Río Culebrinas	West
Río Grande de Añasco	West
Río Guanajibo	West
Río Yagüez	West

The criteria used to establish the priority ranking and selection of basins appear in the document “Puerto Rico Unified Watershed Assessment and Restoration Activities (PRUWA)” and were discussed in the Integrated Report of 2004.

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In FY-02 303 (d) List, the PREQB established a priority ranking to determine the sequence of development for restoration activities, including the development and implementation of the total maximum daily loads (TMDL). This priority ranking considered the priority of basins restoration and established three levels of priority:

- ✓ High Priority: basins including in the PRUWA as basins of priority due to the high pollution level related to all the designated uses.
- ✓ Intermediate Priority: basins that were not including in the PRUWA and have 50% or more of its waters as impaired for some designated use.
- ✓ Low Priority: basins that were not including in the PRUWA and have less than 50% of its waters as impaired for some designated use.

According, to the priority ranking established the PREQB in collaboration with EPA and other federal and state agencies worked together in order to develop and implement the TMDL for those watersheds. The table below presents a summary of the TMDL development status in Puerto Rico.

Table 8: TMDL Development Status

SEGMENT/POLLUTANT	SEGMENT ID	PROJECT STATUS	PROJECTED TMDL SUBMITTAL DATE
1. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83A	Approved by EPA	September 2010
2. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83B	Approved by EPA	September 2010
3. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83C	Approved by EPA	September 2010
4. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83D	Approved by EPA	September 2010
5. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83E	Approved by EPA	September 2010
6. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83F	Approved by EPA	September 2010
7. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83G	Approved by EPA	September 2010
8. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83H	Approved by EPA	September 2010
9. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83I	Approved by EPA	September 2010
10. LAGO GUAYO/FECAL COLIFORMS	PRWL83H	Approved by EPA	September 2010
11. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7A1	Approved by EPA	September 2010
12. LAGO DOS BOCAS/FECAL COLIFORMS	PRNL ₁ 7A1	Approved by EPA	September 2010
13. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7A2	Approved by EPA	September 2010
14. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7A3	Approved by EPA	September 2010
15. LAGO GARZAS/FECAL COLIFORMS	PRNL ₃ 7A3	Approved by EPA	September 2010

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SEGMENT/POLLUTANT	SEGMENT ID	PROJECT STATUS	PROJECTED TMDL SUBMITTAL DATE
16. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7B1	Approved by EPA	September 2010
17. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7B2	Approved by EPA	September 2010
18. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7C1	Approved by EPA	September 2010
19. LAGO CAONILLAS/FECAL COLIFORMS	PRNL ₂ 7C1	Approved by EPA	September 2010
20. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7C2	Approved by EPA	September 2010
21. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7C3	Approved by EPA	September 2010
22. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8A1	Approved by EPA	September 2010
23. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8A2	Approved by EPA	September 2010
24. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8A3	Approved by EPA	September 2010
25. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8B	Approved by EPA	September 2010
26. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8C1	Approved by EPA	September 2010
27. LAGO GUINEO/FECAL COLIFORMS	PRNL ₁ 8C1	Approved by EPA	September 2010
28. LAGO MATRULLAS/FECAL COLIFORMS	PRNL ₂ 8C1	Approved by EPA	September 2010
29. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8C2	Approved by EPA	September 2010
30. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8D	Approved by EPA	September 2010
31. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8E1	Approved by EPA	September 2010
32. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8E2	Approved by EPA	September 2010
33. RIO CULEBRINAS/FECAL COLIFORMS	PRWR95A	Approved by EPA	September 2010
34. RIO CULEBRINAS/FECAL COLIFORMS	PRWR95B	Approved by EPA	September 2010
35. RIO CULEBRINAS/FECAL COLIFORMS	PRWR95C	Approved by EPA	September 2010
36. RIO CULEBRINAS/FECAL COLIFORMS	PRWR95D	Approved by EPA	September 2010
37. RIO CULEBRINAS/FECAL COLIFORMS	PRWR95E	Approved by EPA	September 2010
38. RIO CULEBRINAS/FECAL COLIFORMS	PRWR95F	Approved by EPA	September 2010
39. RIO CULEBRINAS/FECAL COLIFORMS	PRWR95G	Approved by EPA	September 2010
40. RIO CULEBRINAS/FECAL COLIFORMS	PRWR95H	Approved by EPA	September 2010
41. RIO CULEBRINAS/FECAL COLIFORMS	PRWR95I	Approved by EPA	September 2010

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SEGMENT/POLLUTANT	SEGMENT ID	PROJECT STATUS	PROJECTED TMDL SUBMITTAL DATE
42. RIO CULEBRINAS/FECAL COLIFORMS	PRWR95J	Approved by EPA	September 2010
43. RIO CULEBRINAS/FECAL COLIFORMS	PRWR95K	Approved by EPA	September 2010
44. RIO SABANA/FECAL COLIFORMS	PREE19A	Approved by EPA	September 2011
45. RIO JUAN MARTÍN/FECAL COLIFORMS	PREE20A	Approved by EPA	September 2011
46. RIO FAJARDO/FECAL COLIFORMS	PREE22A	Approved by EPA	September 2011
47. RIO DAGUAO/FECAL COLIFORMS	PREE26A	Approved by EPA	September 2011
48. RIO SANTIAGO/FECAL COLIFORMS	PREE29A	Approved by EPA	September 2011
49. RIO BLANCO/FECAL COLIFORMS	PREE30A	Approved by EPA	September 2011
50. RIO ANTON RUIZ/FECAL COLIFORMS	PREE31A	Approved by EPA	September 2011
51. QUEBRADA FAJARDO/FECAL COLIFORMS	PREQ21A	Approved by EPA	September 2011
52. QUEBRADA CEIBA/FECAL COLIFORMS	PREQ24A	Approved by EPA	September 2011
53. QUEBRADA AGUAS CLARAS/FECAL COLIFORMS	PREQ25A	Approved by EPA	September 2011
54. QUEBRADA PALMA/FECAL COLIFORMS	PREQ27A	Approved by EPA	September 2011
55. QUEBRADA BOTIJAS/FECAL COLIFORMS	PREQ28A	Approved by EPA	September 2011
56. RIO BLANCO/FECAL COLIFORMS	PREQ30B	Approved by EPA	September 2011
57. RIO SABANA/FECAL COLIFORMS	PRER19A	Approved by EPA	September 2011
58. RIO DEMAJAGU/FECAL COLIFORMS	PRER23A	Approved by EPA	September 2011
59. RIO DAGUAO/FECAL COLIFORMS	PRER26A	Approved by EPA	September 2011
60. RIO BLANCO/FECAL COLIFORMS	PRER30A	Approved by EPA	September 2011
61. RIO ANTON RUIZ/FECAL COLIFORMS	PRER31A	Approved by EPA	September 2011
62. CAÑO TIBURONES/FECAL COLIFORMS	PRNE7.1	Approved by EPA	September 2011
63. QUEBRADA DE LOS CEDROS/FECAL COLIFORMS	PRNQ1A	Approved by EPA	September 2011
64. QUEBRADA BRANDERI/FECAL COLIFORMS	PRSE48A	Approved by EPA	September 2011
65. QUEBRADA MELANIA/FECAL COLIFORMS	PRSE50A	Approved by EPA	September 2011
66. RIO SECO/FECAL COLIFORMS	PRSE51A	Approved by EPA	September 2011
67. QUEBRADA AMOROS/FECAL COLIFORMS	PRSE52A	Approved by EPA	September 2011
68. RIO DESCALABRADO/FECAL COLIFORMS	PRSE58A	Approved by EPA	September 2011
69. LAGO PATILLAS/FECAL COLIFORM	PRSL43A1	Approved by EPA	September 2011
70. LAGO CERRILLOS/FECAL COLIFORMS	PRSL62A1	Approved by EPA	September 2011
71. QUEBRADA MANGLILLO/FECAL COLIFORMS	PRSQ38A	Approved by EPA	September 2011
72. QUEBRADA FLORIDA/FECAL COLIFORMS	PRSQ39A	Approved by EPA	September 2011

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SEGMENT/POLLUTANT	SEGMENT ID	PROJECT STATUS	PROJECTED TMDL SUBMITTAL DATE
73. QUEBRADA PALENQUE/FECAL COLIFORMS	PRSQ41A	Approved by EPA	September 2011
74. QUEBRADA YAUREL/FECAL COLIFORMS	PRSQ44A	Approved by EPA	September 2011
75. QUEBRADA MELANIA/FECAL COLIFORMS	PRSQ50A	Approved by EPA	September 2011
76. QUEBRADA AMOROS/FECAL COLIFORMS	PRSQ52A	Approved by EPA	September 2011
77. RIO JACABOA/FECAL COLIFORMS	PRSR40A	Approved by EPA	September 2011
78. RIO CHICO/FECAL COLIFORMS	PRSR42A	Approved by EPA	September 2011
79. RIO GRANDE DE PATILLAS/FECAL COLIFORMS	PRSR43A1	Approved by EPA	September 2011
80. RIO GRANDE DE PATILLAS/FECAL COLIFORMS	PRSR43A2	Approved by EPA	September 2011
81. RIO MARIN/FECAL COLIFORMS	PRSR43B	Approved by EPA	September 2011
82. RIO NIGUAS DE ARROYO/FECAL COLIFORMS	PRSR45A	Approved by EPA	September 2011
83. QUEBRADA CORAZON/FECAL COLIFORMS	PRSR47A	Approved by EPA	September 2011
84. RIO GUAMANI/FECAL COLIFORMS	PRSR49A	Approved by EPA	September 2011
85. RIO JUEYES/FECAL COLIFORMS	PRSR55A	Approved by EPA	September 2011
86. RIO CAYURES/FECAL COLIFORMS	PRSR56A	Approved by EPA	September 2011
87. RIO COAMO/FECAL COLIFORMS	PRSR57A1	Approved by EPA	September 2011
88. RIO COAMO/FECAL COLIFORMS	PRSR57A2-1	Approved by EPA	September 2011
89. RIO COAMO/FECAL COLIFORMS	PRSR57A2-2	Approved by EPA	September 2011
90. RIO CUYON/FECAL COLIFORMS	PRSR57B	Approved by EPA	September 2011
91. RIO CAÑAS/FECAL COLIFORMS	PRSR59A-1	Approved by EPA	September 2011
92. RIO CAÑAS/FECAL COLIFORMS	PRSR59A-2	Approved by EPA	September 2011
93. RIO JACAGUAS/FECAL COLIFORMS	PRSR62A1	Approved by EPA	September 2011
94. RIO PORTUGUES/FECAL COLIFORMS	PRSR63A-1	Approved by EPA	September 2011
95. RIO PORTUGUES/FECAL COLIFORMS	PRSR63A-2	Approved by EPA	September 2011
96. RIO MATILDE PASTILLO/FECAL COLIFORMS	PRSR64A-1	Approved by EPA	September 2011
97. RIO MATILDE PASTILLO/FECAL COLIFORMS	PRSR64A-2	Approved by EPA	September 2011
98. RIO TALLABOA/FECAL COLIFORMS	PRSR65A-1	Approved by EPA	September 2011
99. RIO TALLABOA/FECAL COLIFORMS	PRSR65A-2	Approved by EPA	September 2011
100. RIO MACANA/FECAL COLIFORMS	PRSR66A	Approved by EPA	September 2011
101. CAÑO MERLE/FECAL COLIFORMS	PRWE78A	Approved by EPA	September 2011
102. CAÑO CONDE AVILA/FECAL COLIFORMS	PRWK75A	Approved by EPA	September 2011
103. CAÑO MERLE/FECAL COLIFORMS	PRWK78A	Approved by EPA	September 2011
104. CAÑO DE SANTI PONCE/FECAL COLIFORMS	PRWK93A	Approved by EPA	September 2011
105. CAÑO CORAZONES/FECAL COLIFORMS	PRWK96A	Approved by EPA	September 2011
106. LAGUNA JOYUDAS/FECAL COLIFORMS	PRWN0005	Approved by EPA	September 2011
107. QUEBRADA BOQUERON/FECAL COLIFORMS	PRWQ71A	Approved by EPA	September 2011

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SEGMENT/POLLUTANT	SEGMENT ID	PROJECT STATUS	PROJECTED TMDL SUBMITTAL DATE
108.QUEBRADA ZUMBON/FECAL COLIFORMS	PRWQ72A	Approved by EPA	September 2011
109.QUEBRADA GONZALEZ/FECAL COLIFORMS	PRWQ73A	Approved by EPA	September 2011
110.QUEBRADA LOS PAJARITO/FECAL COLIFORMS	PRWQ74A	Approved by EPA	September 2011
111.QUEBRADA IRIZARRY/FECAL COLIFORMS	PRWQ76A	Approved by EPA	September 2011
112.QUEBRADA DEL ORO/FECAL COLIFORMS	PRWQ80A	Approved by EPA	September 2011
113.RIO YAGUEZ/FECAL COLIFORMS	PRWR79A	Approved by EPA	September 2011
114.RIO GUAYABO/FECAL COLIFORMS	PRWR94A	Approved by EPA	September 2011