Assessment Methodology for 305(b)/303(d) Integrated Report 2010 Cycle

Plans and Special Projects Division

Evaluation and Strategic Planning Area

ENVIRONMENTAL QUALITY BOARD

12/15/2009

Table of Contents

Segmentation Criteria and Assessment Units (AU) 1

Inland Waters Segmentation System 1

Coastal Shoreline Segmentation System (Source: Draft Water Monitoring Strategy) 7

Monitoring Program 28

Water's Quality External Data 32

Designated Uses, and Applicable Water Quality Standards 37

Assessment Categories 41

Water Quality Assessment by Designated Uses 41

303(d) List 44

Listing Criteria 44

Delisting Criteria 45

Priority Ranking and TMDL Development Status 45

Figures

Figure 1 Puerto Rico Sub-Basins 6

Figure 2 Coastal Shoreline Establish by DNER 11

Figure 3 Current Coastal Shoreline Regions (1970-2006) 12

Figure 4 Modified Coastal Shoreline Region (2007) 13

Figure 5 North Region Coastal -Shoreline 22

Figure 6 East Region Coastal-Shoreline 23

Figure 7 South Region Coastal-Shoreline 24

Figure 8 West Region Coastal-Shoreline 25

Figure 9 Offshore Island 26

Figure 10 PR Coastal Shoreline New Segmentation System 27

Figure 11 PR Stream Survey Project Monitoring Stations 36

Figure 12 San Juan Estuary Bay System Monitoring Stations 37

Tables

Table 1: Basins for the Inland Waters Segmentation System 2

Table 2: Geographic Regions 4

Table 3: Shoreline Segmentation Distribution 14

Table 4: Crosswalk of Coastal Water Segmentation 14

Table 5: New Assessment Units for Coastal Waters 20

Table 6 Government Agencies and Academic Institutions contacted by EQB 32

Table 7: Specific Water Quality Standards for Selected Parameters (as established in the PRWQSR) 39

Table 8: Water Quality Standards for Specific Classifications 40

Table 9: Priority Basins 45

Table 10: TMDL Development Status 46

Assessment Methodology Used for 305(b)/303(d) Integrated Report for 2010 Cycle

The assessment methodology used in the present cycle 305(b)/303(d) Integrated Report is the same used since the 2006 Cycle Integrated Report (2006 IR). In the following section you will find the explanation of the segmentation criteria and assessment units that have been in use since the 2006 IR for inland waters and currently used for the 2010 IR. In addition, we provide pertinent information concerning the new segmentation and assessment units of the coastal shoreline developed as part of Water Monitoring Strategy. This segmentation is being used in the IR for the first time.

Segmentation Criteria and Assessment Units (AU)

Inland Waters Segmentation System

Segmentation Criteria

This report presents the same segmentation system used for inland waters (river basins) in the 2006 and 2008 IR Cycles.

This segmentation system reduces the total number of AU reported for inland waters in the 2004 IR from 471 to 201 for the 2006 IR. The reduction in the total number of AU and the actual composition of the AU (sub-watersheds) resulted in a significant increase in the size of each individual AU. For 2008 IR cycle the total number of inland waters AU increased from 201 to 204 due to two AU of San Juan Bay Estuary and one AU of Quebrada Melania that were inadvertently omitted from 2006 IR cycle. In 2010 there were 204 AU.

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.

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

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

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 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	16
South	33	5	22
East	28*	9	6
West	26	4	7

*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 AU until it reaches another AU. 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. .

Assessment Unit for Inland Waters

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.

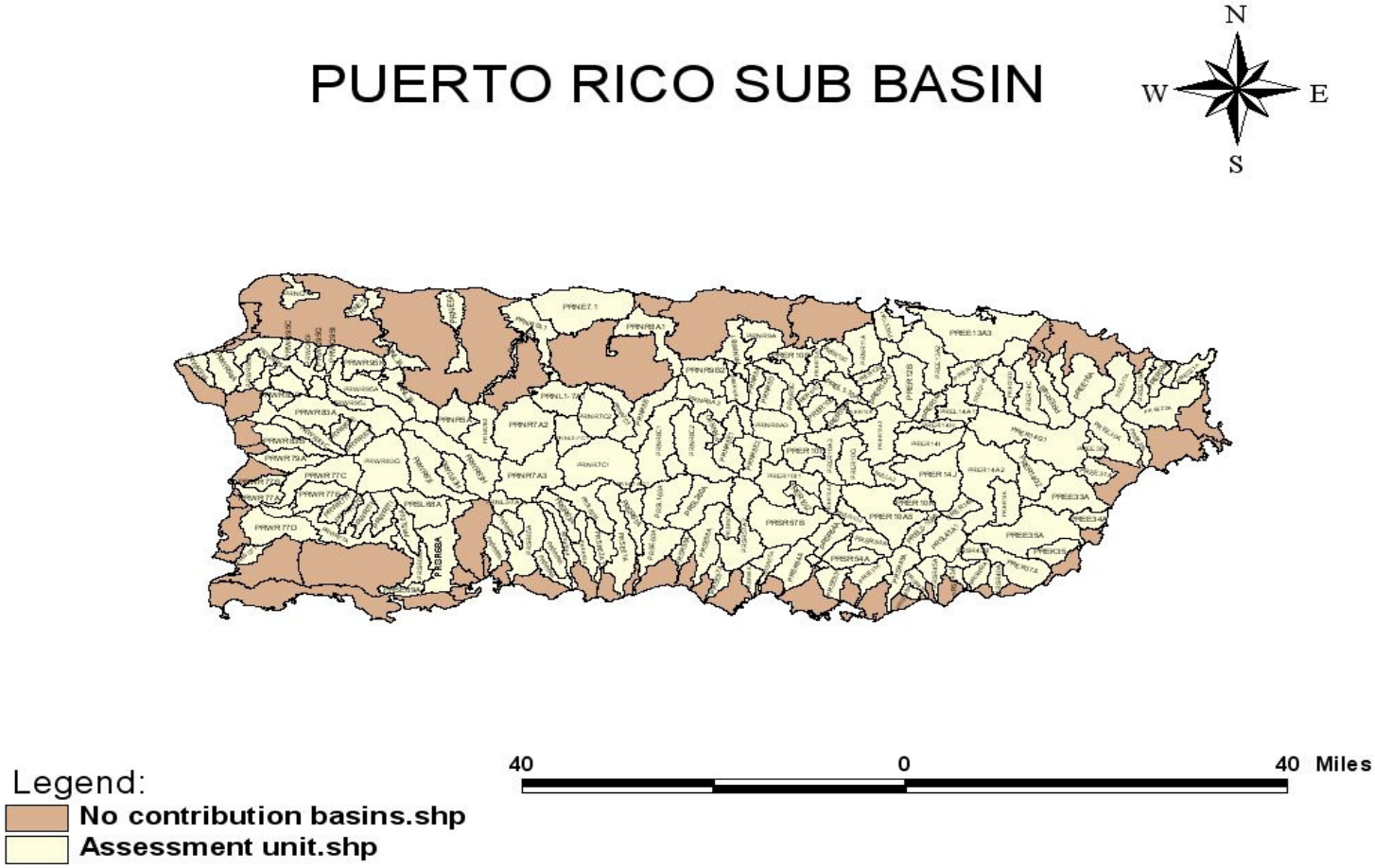


Figure 1 Puerto Rico Sub-Basins

Coastal Shoreline Segmentation System (Source: Draft Water Monitoring Strategy)

The 2010 Cycle 305(b)/303(d) Integrated Report presents significant changes in the segmentation criteria and assessment units defined for the coastal shoreline as compared to the 2008 Cycle Integrated Report. In the following section we provide a brief explanation of the new segmentation criteria and assessment units for the coastal shoreline.

Segmentation Criteria

The new coastal shoreline was developed in the year 2007 and along with it, we are working with the relocation of the Permanent Coastal Monitoring Network Stations. This work is performed in order to adjust the monitoring stations with the new coastal shoreline segmentation; in order to update the strategies for the protection and conservation of our coastal waters. However, considering that the relocation of the Permanent Coastal Water Quality Monitoring Network Stations requires more time and effort, we are implementing the use of the new segmentation system for this cycle and continue working with the relocation of the monitoring stations during 2010.

After completing revision of the inland waters segmentation system, work was initiated to update the existing coastal shoreline segmentation, which had not been critically reviewed in more than thirty years. Under the old segmentation system each coastal region consisted of numerous assessment units of significantly different sizes. These assessment units were subjected to scrutiny and critical evaluation to determine if it was necessary to revise, simplify and update the segmentation within each region.

The first issue considered in this respect pertained to the argument and reasoning used to establish the delimitation of the existing coastal shoreline regions. In the case of the hydrological regions for inland waters, the arguments and reasoning are discussed in water quality planning documents developed in the 1970s. However, the reference points used to establish each of these regions are the outflow points to the coastal shoreline of the various inland water basins that compose each of the regions. The only significant variation in the delineation of hydrological regions of inland waters for which we have direct knowledge is the elimination of the central hydrological region. This region, which basically was limited to the central mountain range, included the headwater portions of the major basins in the north region. After much debate concerning the merits (or lack of these) and the functionality of the central region with respect to water quality management planning, it was finally considered eliminated after year 2000; however, internally EQB never considered the central region for purposes of water quality planning and implementation efforts because these efforts required that each basin be treated as a single continuous hydrological system.

Historically, the hydrological regions of inland waters, in general terms, have also been used to delimit the corresponding coastal shoreline, with some inconsistent minor changes concerning the location of some of the reference points. Information pertaining to the arguments and reasoning used to establish these points and to make subsequent changes has

not been found in any of the various planning documents we have available. In order to avoid additional unknowns to the regional extents of the coastal shoreline, it was determined that the most direct and relevant decision pertaining to this matter was to delimit the coastal shoreline with the same reference points used to delimit the hydrological regions for inland waters. The use of a single regional system for both shoreline and inland waters we believe is the best alternative because the shoreline regional system can be easily referenced to inland waters within the same region and adjacent regions.

Efforts to develop coastal shoreline regions in terms of near shore currents were fruitless. Initially, it was considered that this criterion would allow for the establishment of possible direct relationships of cause and effect between sources and pollutants when use impairment was determined within a specific region. In addition, interregional effects may be determined during those periods that currents are subject to changes in direction. This alternative, although preferable, cannot be implemented at this time due to the severe lack of sufficient information pertaining to near shore currents. Efforts made in various agencies and universities pertaining to this issue revealed that relatively very little work has been done on near shore currents in Puerto Rico. Studies done for the modeling of mixing zones at the end of "ocean" (more accurately off-shore) outfalls provide general information for localized areas, which is not sufficient to delimit reference points to establish shoreline regions. However, our search for this information revealed that recently many professionals on the field have identified the need for such information in the Caribbean basin. This need for information may encourage independent or collaborative efforts that can possibly result in sufficient data to allow for the development of a coastal shoreline regional system that may be more representative than the system we have presented here.

The Department of Natural and Environmental Resources (DNER) developed a shoreline regional system composed of seven regions for the island of Puerto Rico and an eighth region for the offshore islands, which include Vieques, Culebra and Mona. The criteria used to develop this system were ecological, geological and topographical characteristics. (See Figure 2 (eighth region not shown))

Adoption of this alternative by EQB was discarded due to the large number of regions and significant differences with the regions established for inland waters. The only DNER coastal region which resembles an existing EQB coastal region is the western region.

The current reference points used to separate the corresponding coastal shoreline regions are not the same reference points used to separate the inland waters hydrologic regions. Therefore, in order to use a single set of reference points to delimit both regions it was necessary to make adjustments in the length measurements of some of the current shoreline regions. The reference points that were changed are:

- The point which divides the West Region from the North Region. Currently this reference point is the outflow point of Río Culebrinas (1 in Figure 3; 1A in Figure 4).
- The point which divides the North Region from the East region. Currently this reference point is Punta Cerro Gordo (2 in Figure 3; 2A in Figure 4).
- The reference point which separates the West Region from the South Region. In this case there are two references point that have been used in the past. These are 4A (Punta Mela) and 4B (Punta Boca Prieta). The location of both of these two reference points are shown in Figures 3 and 4.

The reference point which divides the ***West Region*** from the ***North Region*** is changed from the outflow point of Rio Culebrinas (1A in Figure 4) to Punta Borinquen (1B in Figure 4). This change is done taking in consideration that the first inland water basin in the ***North Region*** is Quebrada de los Cedros, which is located significantly to north with respect to the mouth of Rio Culebrinas. As result, Punta Borinquen is more representative of the north than the mouth of Rio Culebrinas. The change in the reference point did not require adjustments in the lengths for the current corresponding coastal segment, given that the change performed coincides with the point of separation of the corresponding segments.

The reference point separating the ***North Region*** and the ***East Region*** is changed from Punta Cerro Gordo (2A in Figure 4) to Punta Boca Juana (2B in Figure 4). The change in location of reference point responds to the fact that the first inland water basin of the East Region is Rio La Plata. In accordance with the current coastal shoreline regions, Punta Boca Juana is part of a segment that begins in Punta Cerro Gordo and extends to the east beyond the mouth of Rio La Plata (current segment PRES0002b_00). The shifting of the reference point to Punta Boca Juana requires that segment PRES0002b_00 be cut in two pieces. One piece (cut 1), with 2.62 miles remains on the west side of the outflow point of Rio La Plata and becomes part of the North Region. The other piece (cut 2) with 0.38 miles falls on the east side of Rio La Plata and becomes part of the East Region.

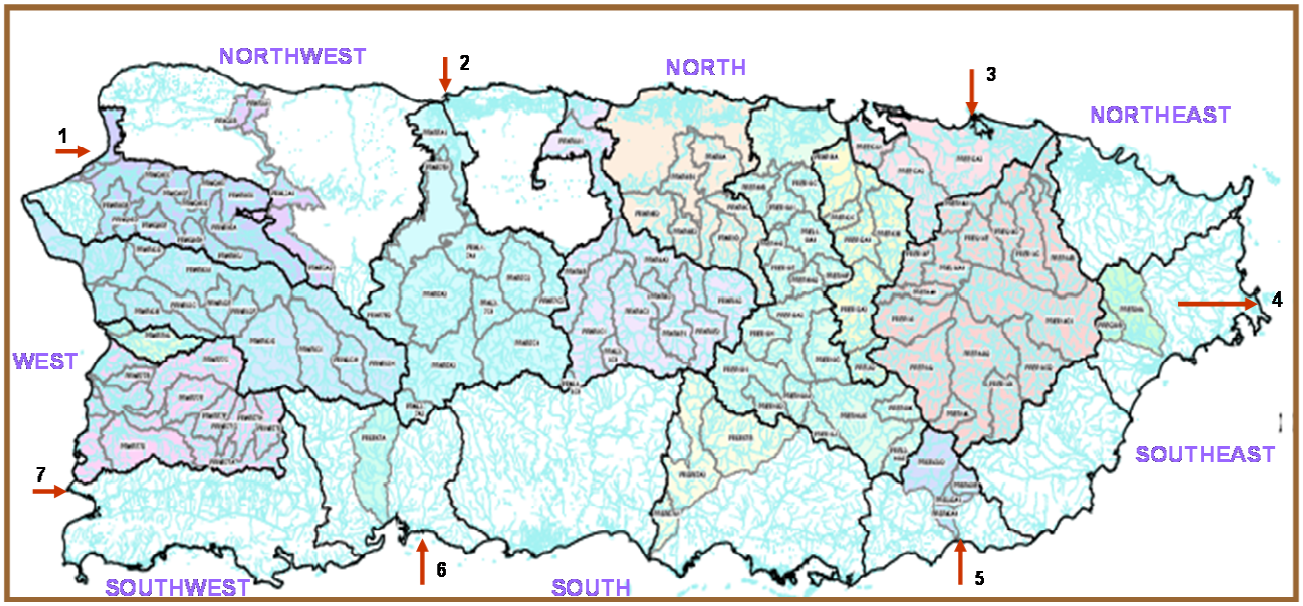
With respect to the reference point which separates the ***East Region*** from the ***South Region*** (3 in Figure 4), there was no need to change location of this point.

The last change with respect to reference points corresponds to the point that divides the ***South Region*** from the ***West Region*** (4A, 4B, and 4C in Figure 4). The reference point that divides these two regions has fluctuated between points 4A and 4B. Reasons for this fluctuation have not been found. For our purposes, we have established that the reference point that separates the ***South Region*** from ***West Region***, is the Cabo Rojo Lighthouse (Faro de Cabo Rojo) (point 4C in Figure 4). This point was selected because it represents the most conspicuous location between Rio Arroyo Cajul (PRSR70A), the last inland water basin in

the South Region and Quebrada Boqueron (PRWQ71A), the first inland water basin in the West Region.

The municipality island Culebra is divided in 2 segments and the municipality island of Vieques is divided in 6 segments in the current segmentation. After reviewing this segmentation, it has been determined to eliminate the different segments and identify each island as one segment (assessment unit). In the case of Mona Island, a natural reserve, the assessment unit is maintained as established in the original segmentation, except that a new segment identification (New Segment ID) is assigned. Therefore, the number of shore miles for each island did not change.

(BASED ON ECOLOGICAL, GEOLOGICAL AND TOPOGRAPHICAL CHARACTERISTICS)



NORTHWEST – from Rio Culebrinas in Aguada (1) up to Rio Grande de Arecibo in Arecibo (2)

NORTH – from Rio Grande de Arecibo (2) up to Boca de Cangrejos in Carolina (3).

NORTHEAST – from Boca de Cangrejos (3) up to Río Demajagua in Ceiba (4).

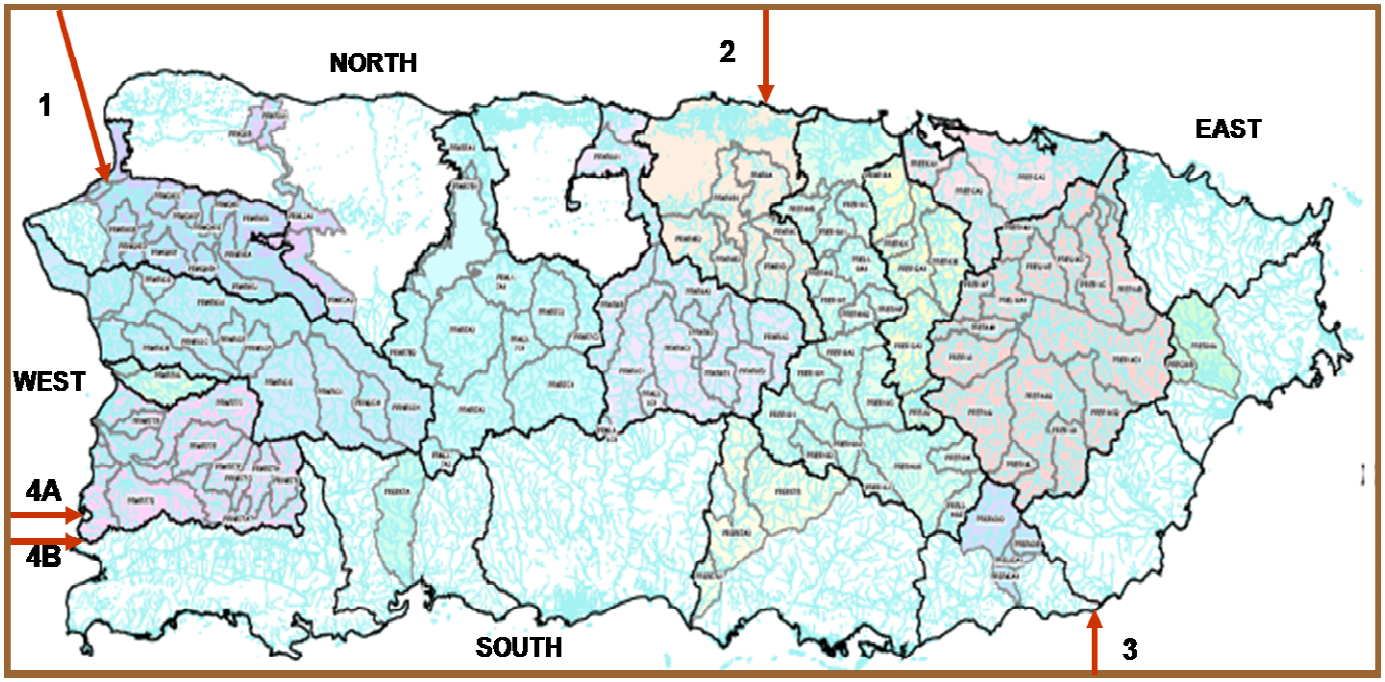
SOUTHEAST – from Río Demajagua (4) up to Rio Grande de Patillas in Patillas (5).

SOUTH- from Rio Grande de Patillas (5) up to Río Tallaboa in Peñuelas (6).

SOUTHWEST – from Río Tallaboa (6) up to Punta Guaniquilla in Cabo Rojo (7)

WEST – from Punta Guaniquilla (7) up to Río Culebrinas (1).

Figure 2 Coastal Shoreline Establish by DNER



1: Mouth of Rio Culebrinas in Aguada

2: Punta (Point) Cerro Gordo in Vega Alta

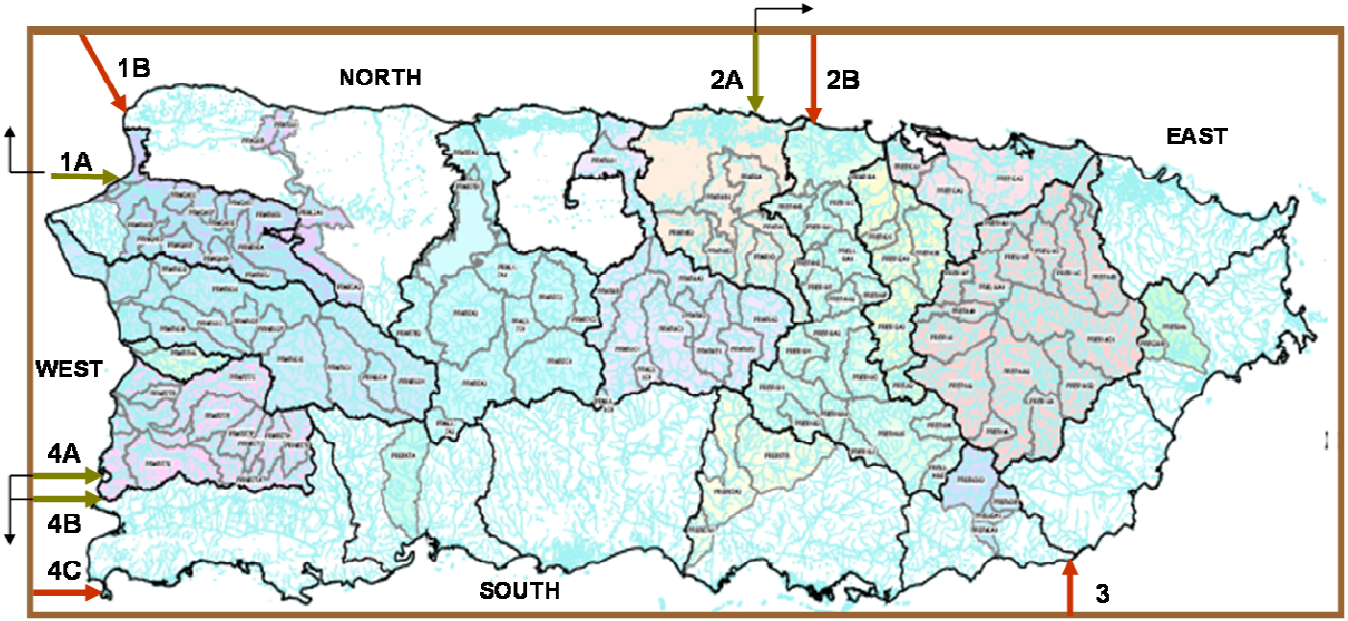
3: Cabo (Cape) Mala Pascua in Patillas.

4: Punta (Point) La Mela in Cabo Rojo

NOTE: Points 4A y 4B are two locations that have been found in different water quality management documents to indicate the reference point which separates the South Coast shoreline from the West Coast shoreline.

Figure 3 Current Coastal Shoreline Regions (1970-2006)

(THE SAME REFERENCE POINTS THAT SEPARATE HYDROLOGICAL REGIONS OF INLAND WATER BASINS)



1B. **Punta Borinquen in Aguadilla – THE REFERENCE POINT IS MOVED FROM 1A TO 1B.** THE FIRST INLAND WATER BASIN TO THE EAST OF PUNTA BORINQUEN IS QUEBRADA DE LOS CEDROS (PRNQ1A),, WHICH IS THE FIRST BASIN IN THE NORTH REGIÓN.

2.B **Punta Boca Juana in Dorado – THE REFERENCE POINT IS MOVED FROM 2A TO 2B.** THE LAST BASIN OF THE NORTH REGION IS RIO CIBUCO (PRNR9A), WHICH IS LOCATED TO THE WEST OF PUNTA BOCA JUANA. THE FIRST BASIN TO THE EAST OF THIS REFERENCE POINT IS RIO LA PLATA (PRER10A), WHICH IS THE FIRST BASIN IN THE EAST REGIÓN

3. **Cabo Mala Pascua in Patillas** – THE ORIGINAL REFERENCE POINT (3) IS MAINTAINED. THIS POINT IS TO THE WEST OF RIO MAUNABO (PRER37A), WHICH IS THE LAST INLAND WATER BASIN IN THE EAST REGION AND TO THE EAST OF QUEBRADA MANGLILLO (PRSQ38A), THE FIRST INLAND WATER BASIN IN THE SOUTH REGION,

4C. **Cabo Rojo Lighthouse** – THE REFERENCE POINT IS MOVED TO 4C. THE REFERENCE POINT IS THE WEST OF RIO ARROYO CAJUL (PRSR70A), THE LAST BASIN IN THE SOUTH REGIÓN AND BEFORE QUEBRADA BOQUERON (PRWQ71), THE FIRST BASIN IN THE WEST REGIÓN. (FOR POINTS 4A Y 4B SEE FIGURE 1.)

Figure 4 Modified Coastal Shoreline Region (2007)

With this last change we complete the identification and location of the reference points that shall be used to separate the different regions of the coastal shoreline. The primary objective of the revision of the coastal shoreline segmentation is to update and simplify the existing shoreline assessment units segmentation system. The old shoreline segmentation system included 149 segments (assessment units) around the island of Puerto Rico alone. The shoreline corresponding to the smaller islands (Vieques, Culebra and Mona) included an additional 9 segments. The segments included in the original shoreline regions and the number of segments included in the modified shoreline regions are listed in the table below.

Table 3: Shoreline Segmentation Distribution

Region	Original Coastal Shoreline Segments	Original Coastal Shoreline miles	Modified Shoreline Segments	Modified Coastal Shoreline miles
North	27	71.7	8	72.22
East	58	144.7	22	134.11
South	52	177.1	11	162.17
West	12	34.5	11	56.23
Offshore Islands	9	121.9	3	121.90
Total	158	549.9	55	546.63

As seen on the table above, the new coastal shoreline segmentation system has reduced the total number of AU to be reported in 2010 IR as compared to the 2008 IR. The reduction in the total number of AU resulted in (1) a general increased size of individual AUs, (2) change in the actual composition of the new Regions (see Figure 5 to Figure 9) and (3) reduction of the total of miles in the coastal shoreline as result of removal of the Condado Lagoon from the coastal shoreline and incorporation of this shoreline to the San Juan Bay Estuary System.

In the table below are included the 158 old coastal shoreline segments for the old segmentation and the 55 coastal shoreline segments for the new segmentation:

Table 4: Crosswalk of Coastal Water Segmentation

Old Coastal Shoreline Region	*Old Segments (Assessment Units)*	*Size of Old Segments (miles)*	*New Coastal Shoreline Region*	*New Segments (Assessment Units)*	*Size of New Segments (miles)*
NORTH	PRNS0001d_01	2.30	NORTH	PRNC01	11.75
NORTH	PRNS0001d_02	3.40	NORTH	PRNC01	11.75
NORTH	PRNS0001d_03	1.90	NORTH	PRNC01	11.75
NORTH	PRNS0001d_04	2.30	NORTH	PRNC01	11.75
NORTH	PRNS0001e_00 cut 1	1.85	NORTH	PRNC01	11.75
NORTH	PRNS0001e_00 cut 2	1.15	NORTH	PRNC02	14.10
NORTH	PRNS0001f_00	1.90	NORTH	PRNC02	14.10
NORTH	PRNS0001g_00	3.00	NORTH	PRNC02	14.10

Old Coastal Shoreline Region	*Old Segments (Assessment Units)*	*Size of Old Segments (miles)*	*New Coastal Shoreline Region*	*New Segments (Assessment Units)*	*Size of New Segments (miles)*
NORTH	PRNS0001h_01	4.10	NORTH	PRNC02	14.10
NORTH	PRNS0001h_02	1.80	NORTH	PRNC02	14.10
NORTH	PRNS0001i_00 cut 1	2.15	NORTH	PRNC02	14.10
NORTH	PRNS0001i_00 cut 2	0.85	NORTH	PRNC03	9.65
NORTH	PRNS0001j_00	1.40	NORTH	PRNC03	9.65
NORTH	PRNS0001k_00	4.40	NORTH	PRNC03	9.65
NORTH	PRNS0001L_00	3.00	NORTH	PRNC03	9.65
NORTH	PRNS0001m_00	1.90	NORTH	PRNC04	13.66
NORTH	PRNS0001n_01	5.10	NORTH	PRNC04	13.66
NORTH	PRNS0001n_02	2.70	NORTH	PRNC04	13.66
NORTH	PRNS0001n_03	1.50	NORTH	PRNC04	13.66
NORTH	PRNS0001o_00 cut 1	2.46	NORTH	PRNC04	13.66
NORTH	PRNS0001o_00 cut 2	0.54	NORTH	PRNC05	7.46
NORTH	PRNS0001p_01	1.60	NORTH	PRNC05	7.46
NORTH	PRNS0001p_02	3.00	NORTH	PRNC05	7.46
NORTH	PRNS0001p_03 cut 1	2.32	NORTH	PRNC05	7.46
NORTH	PRNS0001p_03 cut 2	1.08	NORTH	PRNC06	3.23
NORTH	PRNS0001q_00 cut 1	2.15	NORTH	PRNC06	3.23
NORTH	PRNS0001q_00 cut 2	0.85	NORTH	PRNC07	5.05
NORTH	PRNS0001r_00	2.30	NORTH	PRNC07	5.05
NORTH	PRNS0001s_00	1.90	NORTH	PRNC07	5.05
EAST	PRES0002a_01	2.80	NORTH	PRNC08	7.32
EAST	PRES0002a_02	1.90	NORTH	PRNC08	7.32
EAST	PRES0002b_00 cut 1	2.62	NORTH	PRNC08	7.32
EAST	PRES0002b_00 cut 2	0.38	EAST	PREC09	5.78
EAST	PRES0002c_00	3.30	EAST	PREC09	5.78
EAST	PRES0002d_00	2.00	EAST	PREC09	5.78
EAST	PRES0002e_00 cut 1	0.10	EAST	PREC09	5.78
EAST	PRES0002e_00 cut 2	0.10	EAST	PREC10	9.54
EAST	PRES0002f_00	3.00	EAST	PREC10	9.54
EAST	PRES0002g_01 cut 1	6.44	EAST	PREC10	9.54
EAST	PRES0002g_01 cut 2	0.46	EAST	PREC11	7.79
EAST	PRES0002g_02**	4.08	EAST	PREC11	7.79
EAST	PRES0002h_00	0.60***	See notes	----	----
EAST	PRES0002i_00	0.50***	See notes	----	----
EAST	PRES0002j_00	0.60***	See notes	----	----
EAST	PRES0002k_00 cut 1	0.15***	See notes	----	----
EAST	PRES0002k_00 cut 2	1.85	EAST	PREC11	7.79
EAST	PRES0002L_00	1.40	EAST	PREC11	7.79
EAST	PRES0002LL_00	2.30	EAST	PREC12	3.50
EAST	PRES0002m_01	0.50	EAST	PREC12	3.50
EAST	PRES0002m_02	0.50	EAST	PREC12	3.50

Old Coastal Shoreline Region	*Old Segments (Assessment Units)*	*Size of Old Segments (miles)*	*New Coastal Shoreline Region*	*New Segments (Assessment Units)*	*Size of New Segments (miles)*
EAST	PRES0002m_03 cut 1	0.20	EAST	PREC12	3.50
EAST	PRES0002m_03 cut 2	0.70	EAST	PREC13	4.31
EAST	PRES0002n_00	1.20	EAST	PREC13	4.31
EAST	PRES0002o_00	0.30	EAST	PREC13	4.31
EAST	PRES0002p_00	0.40	EAST	PREC13	4.31
EAST	PRES0002q_00	0.60	EAST	PREC13	4.31
EAST	PRES0002r_00 cut 1	1.11	EAST	PREC13	4.31
EAST	PRES0002r_00 cut 2	0.69	EAST	PREC14	4.19
EAST	PRES0002s_00	1.30	EAST	PREC14	4.19
EAST	PRES0002t_00	2.20	EAST	PREC14	4.19
EAST	PRES0002u_01	2.50	EAST	PREC15	6.23
EAST	PRES0002u_02	2.20	EAST	PREC15	6.23
EAST	PRES0002u_03 cut 1	1.53	EAST	PREC15	6.23
EAST	PRES0002u_03 cut 2	0.57	EAST	PREC16	9.46
EAST	PRES0002v_00	3.00	EAST	PREC16	9.46
EAST	PRES0002w_00	1.20	EAST	PREC16	9.46
EAST	PRES0002x_00	3.00	EAST	PREC16	9.46
EAST	PRES0002y_00 cut 1	1.69	EAST	PREC16	9.46
EAST	PRES0002y_00 cut 2	5.71	EAST	PREC17	8.41
EAST	PRES0002z_00 cut 1	2.70	EAST	PREC17	8.41
EAST	PRES0002z_00 cut 2	0.30	EAST	PREC18	10.46
EAST	PRES0002z1_01	1.60	EAST	PREC18	10.46
EAST	PRES0002z1_02	4.60	EAST	PREC18	10.46
EAST	PRES0002z2_00	3.00	EAST	PREC18	10.46
EAST	PRES0002z3_00 cut 1	0.96	EAST	PREC18	10.46
EAST	PRES0002z3_00 cut 2	3.34	EAST	PREC19	7.08
EAST	PRES0002z4_00	1.10	EAST	PREC19	7.08
EAST	PRES0002z5_00	1.80	EAST	PREC19	7.08
EAST	PRES0002z6_00 cut 1	0.84	EAST	PREC19	7.08
EAST	PRES0002z6_00 cut 2	5.33	EAST	PREC20	5.33
EAST	PRES0002z6_00 cut 3	3.00	EAST	PREC21	3.00
EAST	PRES0002z6_00 cut 4	3.30	EAST	PREC22	3.30
EAST	PRES0002z6_00 cut 5	1.23	EAST	PREC23	8.83
EAST	PRES0002z7_00	7.60	EAST	PREC23	8.83
EAST	PRES0002z8_00 cut 1	9.07	EAST	PREC24	9.07
EAST	PRES0002z8_00 cut 2	0.53	EAST	PREC25	9.83
EAST	PRES0002z9_00	1.90	EAST	PREC25	9.83
EAST	PRES0002z10_01	0.80	EAST	PREC25	9.83
EAST	PRES0002z10_02	1.50	EAST	PREC25	9.83
EAST	PRES0002z11_00	0.30	EAST	PREC25	9.83
EAST	PRES0002z_12	2.40	EAST	PREC25	9.83
EAST	PRES0002z_13	0.40	EAST	PREC25	9.83

Old Coastal Shoreline Region	*Old Segments (Assessment Units)*	*Size of Old Segments (miles)*	*New Coastal Shoreline Region*	*New Segments (Assessment Units)*	*Size of New Segments (miles)*
EAST	PRES0002z14_00 cut 1	2.00	EAST	PREC25	9.83
EAST	PRES0002z14_00 cut 2	1.00	EAST	PREC26	1.84
EAST	PRES0002z15_00 cut 1	0.84	EAST	PREC26	1.84
EAST	PRES0002z15_00 cut 2	2.26	EAST	PREC27	3.74
EAST	PRES0002z16_00	1.10	EAST	PREC27	3.74
EAST	PRES0002z17_00 cut 1	0.38	EAST	PREC27	3.74
EAST	PRES0002z17_00 cut 2	1.72	EAST	PREC28	5.42
EAST	PRES0002z18_00	2.10	EAST	PREC28	5.42
EAST	PRES0002z19_01	0.50	EAST	PREC28	5.42
EAST	PRES0002z19_02	1.10	EAST	PREC28	5.42
EAST	PRES0002z20_00	3.50	EAST	PREC29	4.35
EAST	PRES0002z21_00 cut 1	0.85	EAST	PREC29	4.35
EAST	PRES0002z21_00 cut 2	2.15	EAST	PREC30	2.65
EAST	PRES0002z22_00	0.50	EAST	PREC30	2.65
SOUTH	PRSS0003a_01	3.60	SOUTH	PRSC31	4.06
SOUTH	PRSS0003a_02 cut 1	0.46	SOUTH	PRSC31	4.06
SOUTH	PRSS0003a_02 cut 2	2.54	SOUTH	PRSC32	6.16
SOUTH	PRSS0003a_03	1.00	SOUTH	PRSC32	6.16
SOUTH	PRSS0003b_01cut 1	2.62	SOUTH	PRSC32	6.16
SOUTH	PRSS0003b_02 cut 2	0.38	SOUTH	PRSC33	8.10
SOUTH	PRSS0003c_00	5.80	SOUTH	PRSC33	8.10
SOUTH	PRSS0003d_00 cut 1	1.92	SOUTH	PRSC33	8.10
SOUTH	PRSS0003d_00 cut 2	0.08	SOUTH	PRSC34	40.96
SOUTH	PRSS0003e_00	1.20	SOUTH	PRSC34	40.96
SOUTH	PRSS0003f_00	4.60	SOUTH	PRSC34	40.96
SOUTH	PRSS0003g_00	2.70	SOUTH	PRSC34	40.96
SOUTH	PRSS0003h_00	3.00	SOUTH	PRSC34	40.96
SOUTH	PRSS0003i_00	0.90	SOUTH	PRSC34	40.96
SOUTH	PRSS0003j_00	3.00	SOUTH	PRSC34	40.96
SOUTH	PRSS0003k_00	0.40	SOUTH	PRSC34	40.96
SOUTH	PRSS0003L_01	18.50	SOUTH	PRSC34	40.96
SOUTH	PRSS0003L_02	0.90	SOUTH	PRSC34	40.96
SOUTH	PRSS0003L_03 cut 1	5.68	SOUTH	PRSC34	40.96
SOUTH	PRSS0003L_03 cut 2	0.92	SOUTH	PRSC35	16.19
SOUTH	PRSS0003m_00	3.00	SOUTH	PRSC35	16.19
SOUTH	PRSS0003n_00 cut 1	12.27	SOUTH	PRSC35	16.19
SOUTH	PRSS0003n_00 cut 2	2.53	SOUTH	PRSC36	9.23
SOUTH	PRSS0003p_00	2.20	SOUTH	PRSC36	9.23
SOUTH	PRSS0003q_00	2.20	SOUTH	PRSC36	9.23
SOUTH	PRSS0003r_00	2.30	SOUTH	PRSC36	9.23
SOUTH	PRSS0003s_00	1.90	SOUTH	PRSC37	7.50
SOUTH	PRSS0003t_00	1.40	SOUTH	PRSC37	7.50

Old Coastal Shoreline Region	*Old Segments (Assessment Units)*	*Size of Old Segments (miles)*	*New Coastal Shoreline Region*	*New Segments (Assessment Units)*	*Size of New Segments (miles)*
SOUTH	PRSS0003u_00	2.10	SOUTH	PRSC37	7.50
SOUTH	PRSS0003v_00	2.10	SOUTH	PRSC37	7.50
SOUTH	PRSS0003w_00	2.30	SOUTH	PRSC38	13.20
SOUTH	PRSS0003x_00	2.50	SOUTH	PRSC38	13.20
SOUTH	PRSS0003y_00	1.60	SOUTH	PRSC38	13.20
SOUTH	PRSS0003z_00	2.10	SOUTH	PRSC38	13.20
SOUTH	PRSS0003z1_00	3.80	SOUTH	PRSC38	13.20
SOUTH	PRSS0003z2_00	0.90	SOUTH	PRSC38	13.20
SOUTH	PRSS0003z3_00	3.00	SOUTH	PRSC39	6.41
SOUTH	PRSS0003z4_00 cut 1	3.41	SOUTH	PRSC39	6.41
SOUTH	PRSS0003z4_00 cut 2	0.69	SOUTH	PRSC40	13.26
SOUTH	PRSS0003z5_00	3.00	SOUTH	PRSC40	13.26
SOUTH	PRSS0003z6_00	0.30	SOUTH	PRSC40	13.26
SOUTH	PRSS0003z7_00	2.70	SOUTH	PRSC40	13.26
SOUTH	PRSS0003z8_00	3.50	SOUTH	PRSC40	13.26
SOUTH	PRSS0003z9_01 cut 1	3.07	SOUTH	PRSC40	13.26
SOUTH	PRSS0003z9_01 cut 2	1.63	SOUTH	PRSC41	37.10
SOUTH	PRSS0003z9_02	3.00	SOUTH	PRSC41	37.10
SOUTH	PRSS0003z9_03	6.30	SOUTH	PRSC41	37.10
SOUTH	PRSS0003z10_00	2.00	SOUTH	PRSC41	37.10
SOUTH	PRSS0003z11_00	2.70	SOUTH	PRSC41	37.10
SOUTH	PRSS0003z12_00	1.50	SOUTH	PRSC41	37.10
SOUTH	PRSS0003z13_00	2.80	SOUTH	PRSC41	37.10
SOUTH	PRSS0003z14_00	1.80	SOUTH	PRSC41	37.10
SOUTH	PRSS0003z15_01 cut 1	15.37	SOUTH	PRSC41	37.10
SOUTH	PRSS0003z15_01 cut 2	2.23	WEST	PRWC42	2.89
SOUTH	PRSS0003z15_02 cut 1	0.66	WEST	PRWC42	2.89
SOUTH	PRSS0003z15_02 cut 2	1.84	WEST	PRWC43	9.54
SOUTH	PRSS0003z15_03	2.00	WEST	PRWC43	9.54
SOUTH	PRSS0003z16_00	3.00	WEST	PRWC43	9.54
SOUTH	PRSS0003z17_01	2.40	WEST	PRWC43	9.54
SOUTH	PRSS0003z17_02 cut 1	0.30	WEST	PRWC43	9.54
SOUTH	PRSS0003z17_02 cut 2	1.80	WEST	PRWC44	2.50
SOUTH	PRSS0003z17_03	0.70	WEST	PRWC44	2.50
WEST	PRWS0004a_01	2.80	WEST	PRWC45	2.95
WEST	PRWS0004a_02 cut 1	0.15	WEST	PRWC45	2.95
WEST	PRWS0004a_02 cut 2	2.85	WEST	PRWC46	4.00
WEST	PRWS0004a_03 cut 1	1.15	WEST	PRWC46	4.00
WEST	PRWS0004a_03 cut 2	3.85	WEST	PRWC47	3.85
WEST	PRWS0004b_00	1.20	WEST	PRWC48	5.60
WEST	PRWS0004c_00	2.50	WEST	PRWC48	5.60
WEST	PRWS0004d_00	1.90	WEST	PRWC48	5.60

Old Coastal Shoreline Region	*Old Segments (Assessment Units)*	*Size of Old Segments (miles)*	*New Coastal Shoreline Region*	*New Segments (Assessment Units)*	*Size of New Segments (miles)*
WEST	PRWS0004e_00	2.60	WEST	PRWC49	6.98
WEST	PRWS0004f_00	3.00	WEST	PRWC49	6.98
WEST	PRWS0004g_01	1.00	WEST	PRWC49	6.98
WEST	PRWS0004g_02 cut 1	0.38	WEST	PRWC49	6.98
WEST	PRWS0004g_02 cut 2	1.92	WEST	PRWC50	4.98
WEST	PRWS0004g_03	2.30	WEST	PRWC50	4.98
WEST	PRWS0004g_04 cut 1	0.76	WEST	PRWC50	4.98
WEST	PRWS0004g_04 cut 2	6.14	WEST	PRWC51	6.14
NORTH	PRNS0001a_00	0.90	WEST	PRWC52	6.80
NORTH	PRNS0001b_00	3.00	WEST	PRWC52	6.80
NORTH	PRNS0001c_00	2.90	WEST	PRWC52	6.80
OFFSHORE ISLANDS	PRES0306a_00	1.00	OFFSHORE ISLANDS	PRCC53	32.70
OFFSHORE ISLANDS	PRES0306b_00	31.70	OFFSHORE ISLANDS	PRCC53	32.70
OFFSHORE ISLANDS	PRES0307a_00	1.00	OFFSHORE ISLANDS	PRVC54	70.60
OFFSHORE ISLANDS	PRES0307b_00	43.40	OFFSHORE ISLANDS	PRVC54	70.60
OFFSHORE ISLANDS	PRES0307c_00	3.00	OFFSHORE ISLANDS	PRVC54	70.60
OFFSHORE ISLANDS	PRES0307d_00	3.60	OFFSHORE ISLANDS	PRVC54	70.60
OFFSHORE ISLANDS	PRES0307e_00	0.60	OFFSHORE ISLANDS	PRVC54	70.60
OFFSHORE ISLANDS	PRES0307f_00	19.00	OFFSHORE ISLANDS	PRVC54	70.60
OFFSHORE ISLANDS	PRWS0308_00	18.60	OFFSHORE ISLANDS	PRMC55	18.60

** In the existing segmentation, the segment PRES0002g_02 measures 5.50 miles. During a field inspection performed on January 16, 2007 we documented a small peninsula (Peninsula La Esperanza) that forms part of this segment. This peninsula is divided by a channel constructed with the purpose of improving the mixing of the San Juan Bay waters on both sides of the peninsula. As result of the construction of the channel, a portion that is part of segment PRES0002g_02 is now an isolated and separate little island within the bay. The segment length corresponding to the peninsula was reduced by 1.42 miles to account for the loss of length as result of the channel and the formation of the separate little island. The new length for the segment is 4.08 miles. In the new segmentation, the reduced segment PRES0002g_02, forms part of the new segment PREC11.

*** In the existing segmentation is included the Condado Lagoon as part of the coastal shoreline. There are three (3) coastal segments corresponding to this lagoon. These segments are PRES0002h, PRES0002i and PRES0002j with a total of 1.7 miles. Although we have not found documented information pertaining to the decision of segmenting the Condado Lagoon and including the segments as part of the coastal shoreline, it is possible that the Condado Lagoon was included as part of the coastal shoreline as result of the efforts implemented during the early 1980s to restore the water quality of the San Juan-Isla Verde beachfront area. These restoration efforts also included the Condado Lagoon. The lack of documented information pertaining to the consideration of the Condado Lagoon as part of the coastal shoreline was discussed in a meeting of personnel from the Evaluation and Strategic Planning Area on January 17, 2007. In addition, the situation of similar water bodies along the coast of Puerto Rico was compared to that of the Condado Lagoon. As result of this meeting it was decided to remove the three segments corresponding to the Condado Lagoon from the group of segments that constitute the coastal shoreline and include the Condado Lagoon along with the other similar lagoons of the San Juan Bay Estuary System. The coastal segment PRES0002k_00 must be reduced by 0.15 miles, given that this small piece should be considered as part of the Condado Lagoon shoreline.

Assessment Units for Coastal Waters

Figure 10 present the new segmentation for coastal-shoreline and the table below are summarized the 55 new segments for the new segmentation system:

Table 5: New Assessment Units for Coastal Waters

New Segment ID	*New Segment Name*	*New Segment Size (miles)*	*Region*
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
PREC10*	Punta Salinas to Isla de Cabras	9.54	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
PREC28*	Punta Guayanés to Punta Yeguas	5.42	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	16.19	South
PRSC36*	Punta de Cabullones to Punta Cuchara	9.23	South
PRSC37*	Punta Cuchara to Punta Guayanilla	7.50	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

New Segment ID	*New Segment Name*	*New Segment Size (miles)*	*Region*
PRSC41*	Punta Brea to Faro de Cabo Rojo	37.10	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
PRVC54*	Vieques Island	70.60	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-one (41) 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 2010.

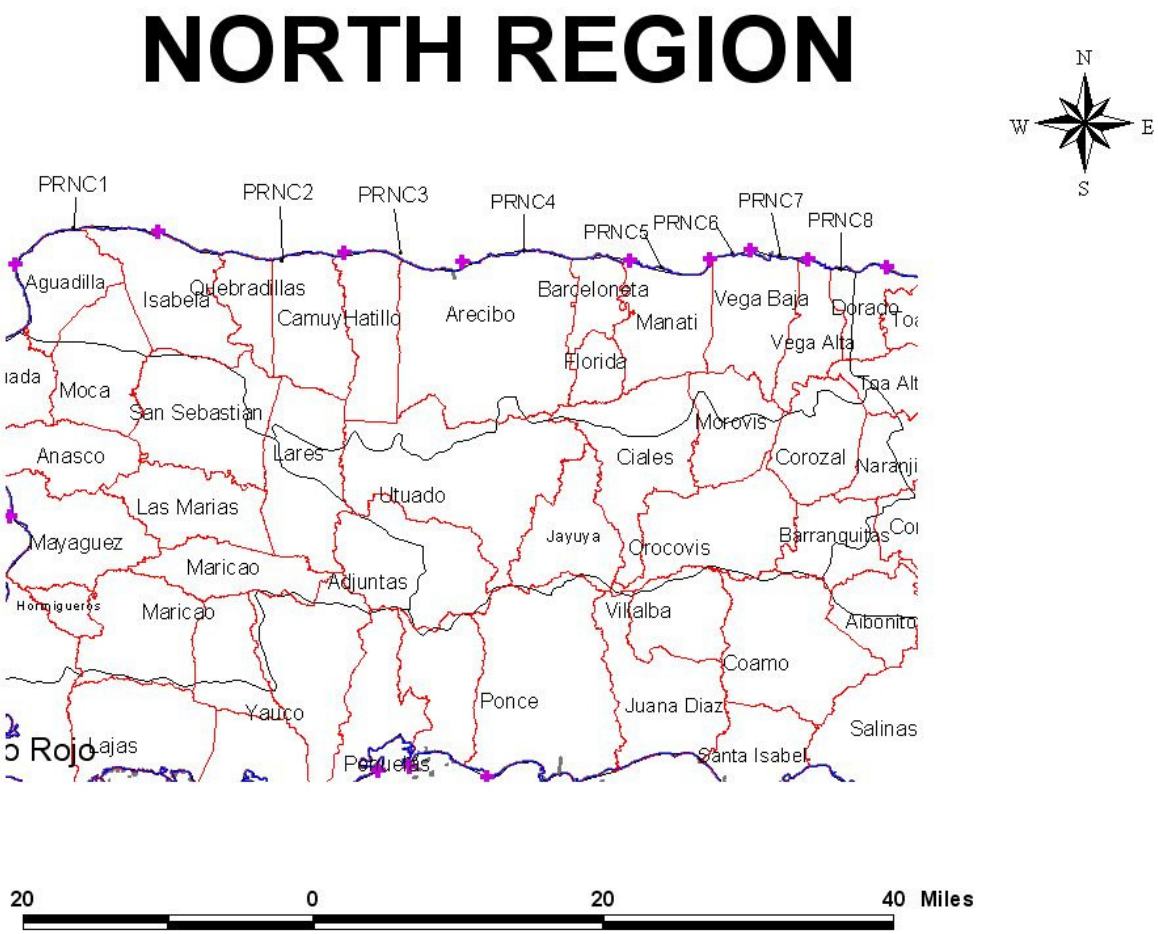


Figure 5 North Region Coastal -Shoreline

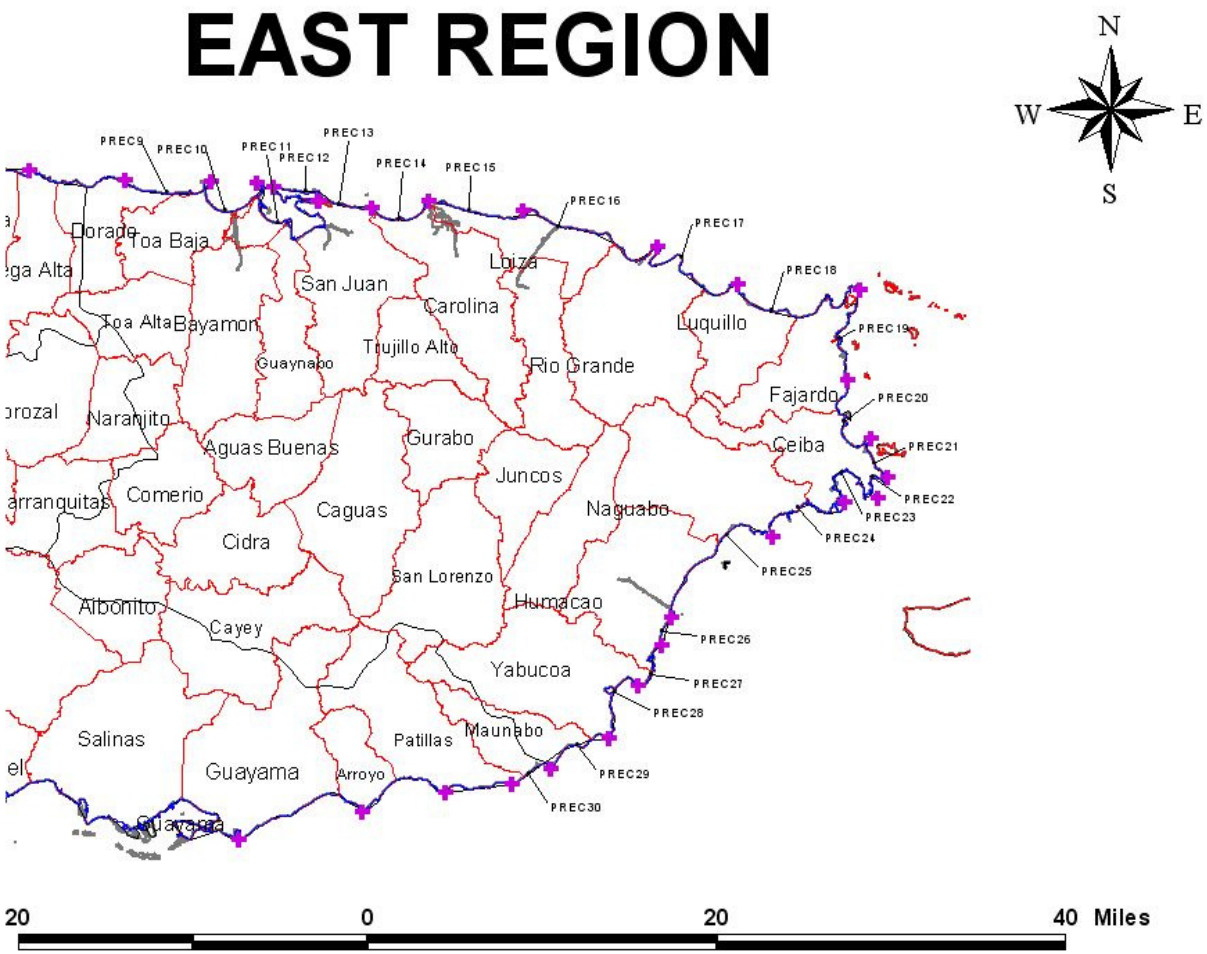


Figure 6 East Region Coastal-Shoreline

SOUTH REGION

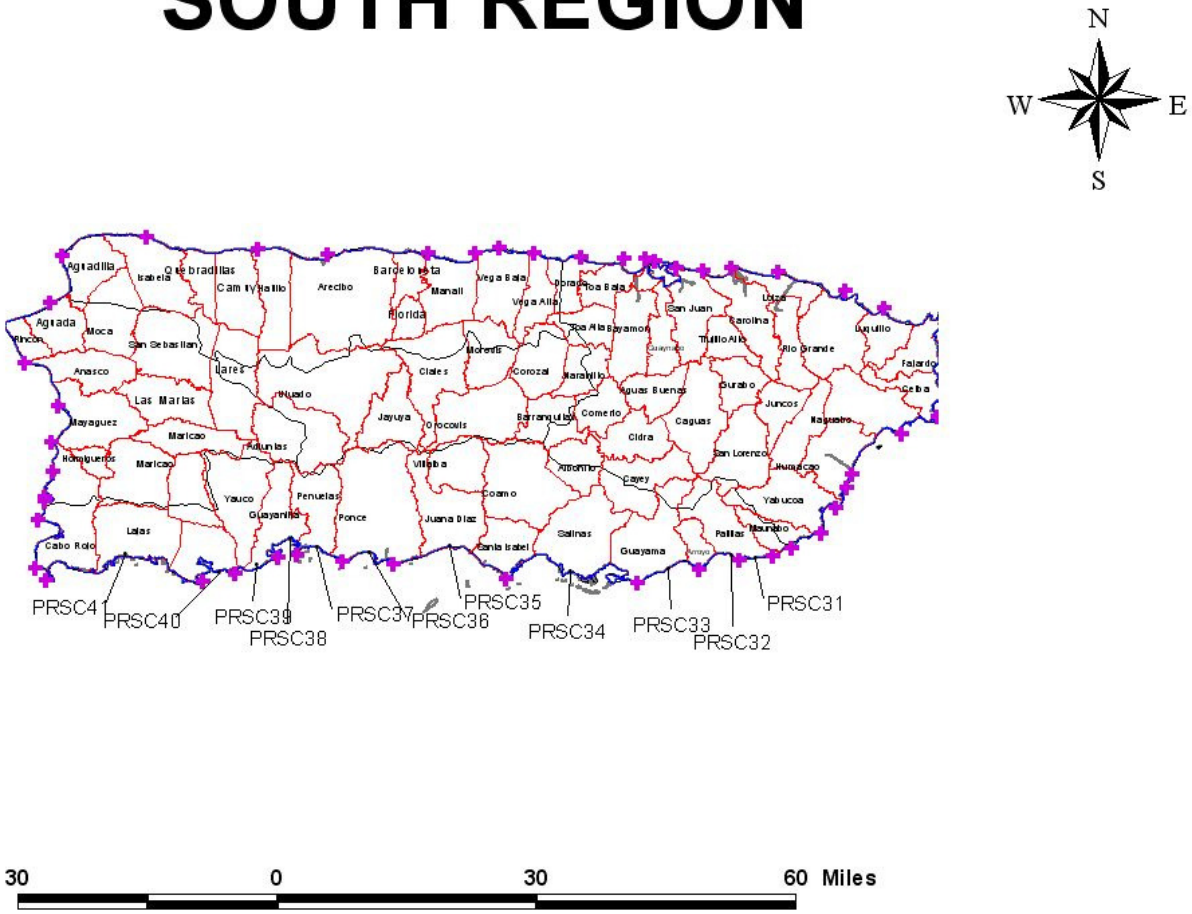


Figure 7 South Region Coastal-Shoreline

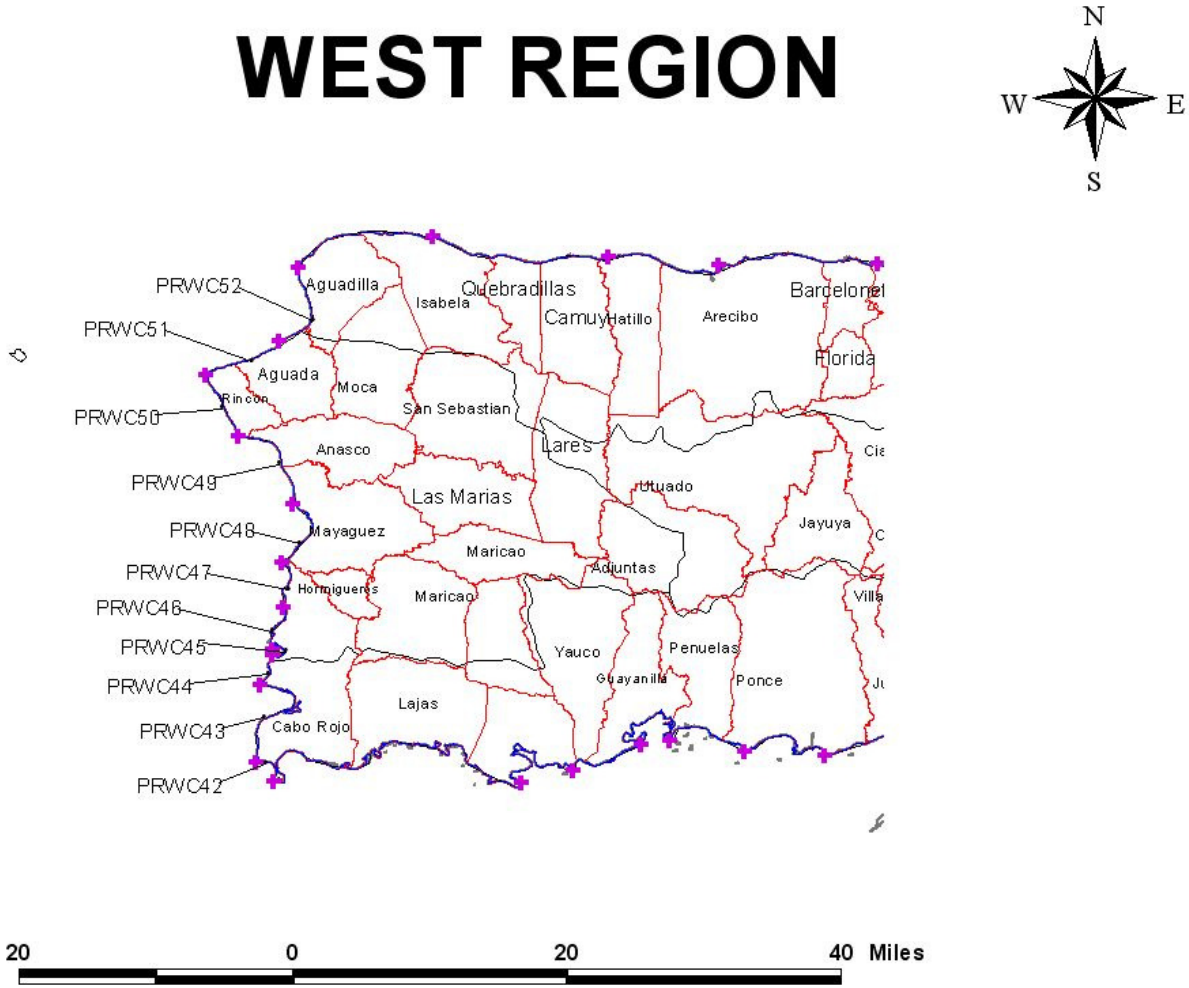


Figure 8 West Region Coastal-Shoreline

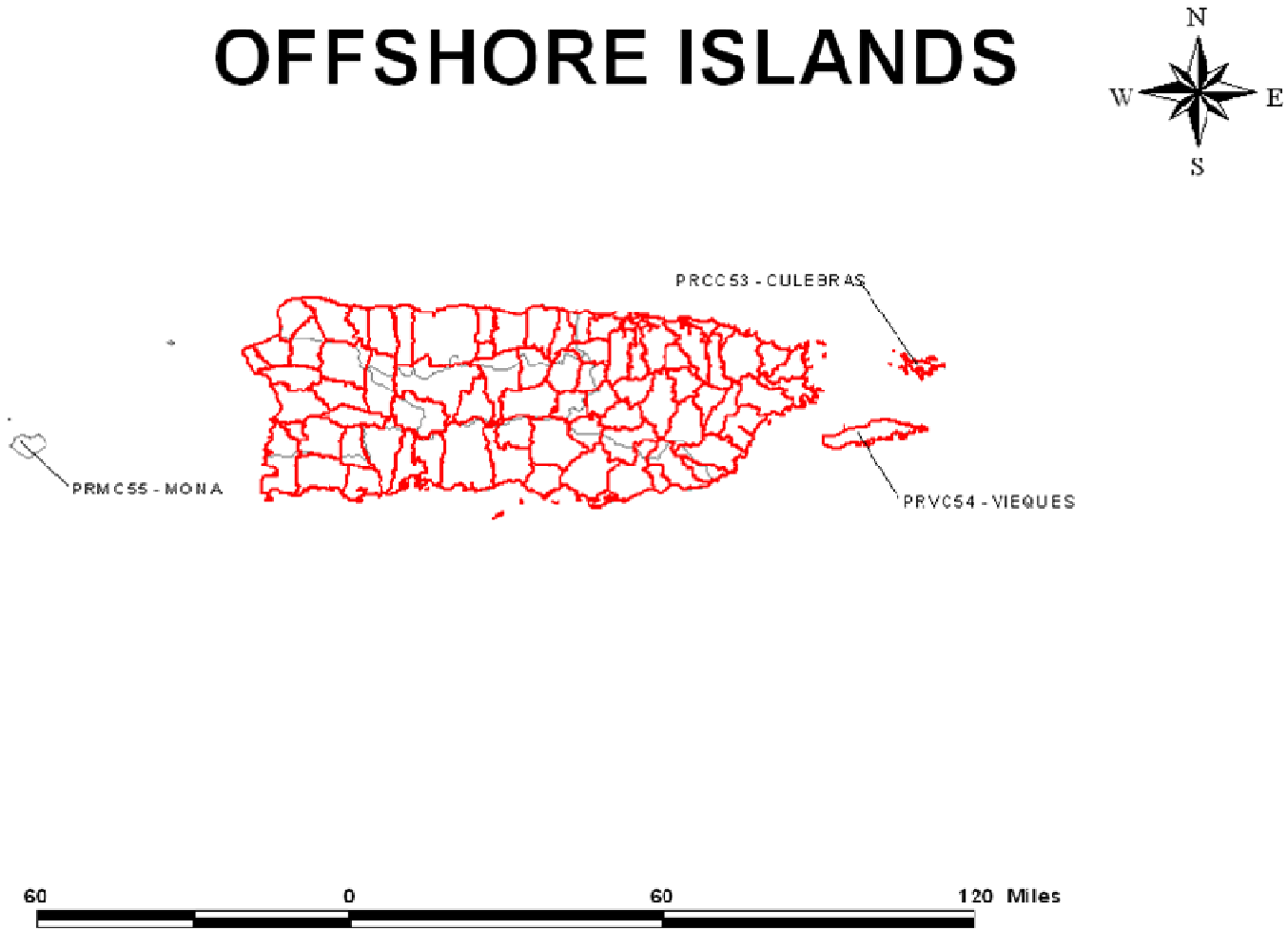
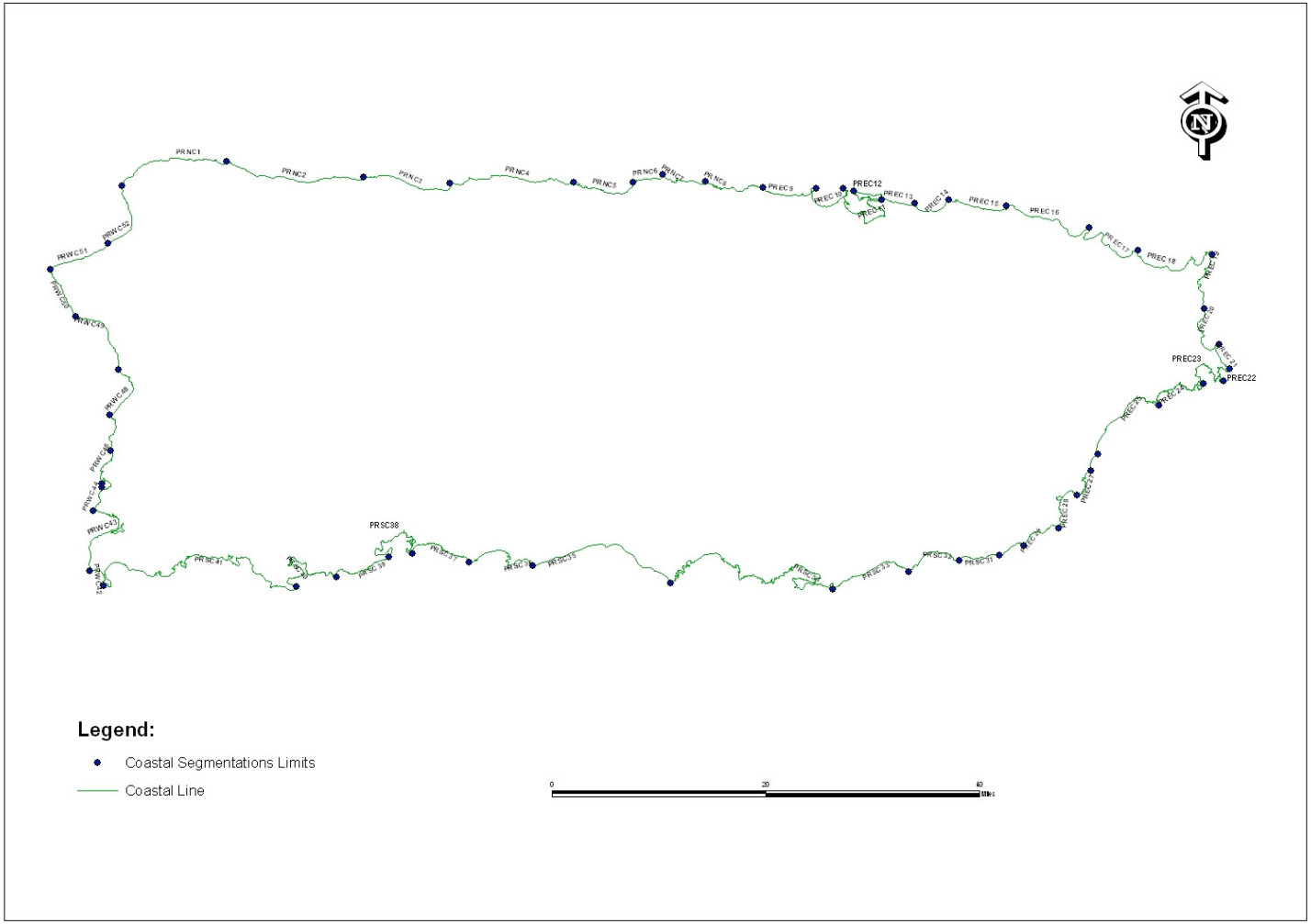


Figure 9 Offshore Island



PR Coastal Segmentation

Figure 10 PR Coastal Shoreline New Segmentation System

Monitoring Program

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	Organic Nitrogen
Temperature	Ammonia Nitrogen
Alkalinity	Nitrate + Nitrite
Dissolved Oxygen	Suspended Solids
Turbidity	Chemical Oxygen Demand
pH	Phosphorus
Hardness	

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

Arsenic	Mercury	Iron
Cadmium	Selenium	Zinc
Lead	Silver	Copper

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

Calcium	Potassium
Carbonate	Silica
Chlorides	Sodium
Fluorides	Sulfate
Magnesium	

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	Methoxyclor	Total Trithion
Endosulfan	Methylparathion	Toxaphene

- ***Clean Lakes Monitoring Network:*** Operated by PREQB, this network monitors water quality in the 18 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 Nitrogen	Dissolved Oxygen (profile)
Chlorophyll "a"	Mercury
Fecal Coliforms	Fecal Streptococcus
Hardness	Total Phosphorous
Nitrate + Nitrite	Turbidity
pH	Pesticides (organochlorides)
Temperature (profile)	Organic Nitrogen

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 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 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	

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 some 70 drinking water wells located in different municipalities throughout Puerto Rico and are sampled several at least one time per year, sampling once for each of the following: pathogens, nitrates, metals, VOC's, SVOC's and pesticides.

- ***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:

Bacteria	Ammonia as N	Cadmium	Mercury
pH	Oil and grease	Chromium	Nickel
Temperature	Nitrate + Nitrite as N	Copper	Selenium
Turbidity	Dissolved Oxygen	Lead	Zinc
Salinity			

  Those monitoring stations are sampled in accordance with the following frequency: 22 stations monthly, 10 stations annually, and 64 stations bimonthly frequency.

- ***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, and Enteroccocci).

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.

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.

The field and analytical data generated are evaluated for compliance with quality control and quality assurance protocols, prior to entry into the EPA Store and Retrieval (STORET) database. These data are also maintained in databases at PREQB. The data generated from the stations sampled by the PREQB are available in the STORET system.

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.

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 consider any other readily available data and information, but may decide to rely or not rely on particular matters. The list of sources PREQB has actively solicited data from includes government agencies and academic institutions these can be found in the Table 6 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 6 Government Agencies and Academic Institutions contacted by EQB

NAME	POSITION	AGENCY
Monique Morales Quiles	Environmental Specialist	Permits and Regulation Administration
Agrim. Héctor del Río	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
Biol. Miguel A. del Valle	Environmental Projects Manager Environmental Studies Office	PR Highway and Transportation Authority
Adaliz Martínez	Environmental Analyst Planning Division	Soild Waste Management Authority
María de Lourdes Alvarez	Environmental Educator Planning Division	Soild Waste Management Authority
Ruberto Berrios	Manager Water Quality Department	PR Electric Power Authority
Milagros Rodríguez	Manager Environmental Affair Office	PR Ports Authority
Luis Encarnación	Acting Director	Jobos Bay National Estuarine

NAME	POSITION	AGENCY
		Reserve
Eng. Antonio A. Medina Delgado	Chairman	College of Engineers and Land Surveyors of PR
Mr. 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
Rafael Morales Martínez	Coordinator Flood Unit	PR Planning Board
Wilfredo Mass	Planning Analyst Flood Unit	PR Planning Board
Rose Ortiz	Planning Analyst Zone Coast Division	PR Planning Board
Erick Hawk	Section 7 Coordinator Southeast Regional Office	National Marine Fisheries Services
Prof. Lourdes Echevarría García	Director-College of Sciences	Pontifical Catholic University of PR
Dra. María A. Rodríguez Martínez	College of Sciences	Pontifical Catholic University of PR
Dra. Sandra Molina	Coordinator Department of Environmental Sciences	Pontifical Catholic University of PR
Eng. Warner Palermo	Chairman	PR Water & Environmental Association
Dra. Graciela I. Ramírez Toro	Director of CECIA	Interamerican University of PR
Dr. Miguel Muñoz	Acting Director Department of Agronomy and Soils	University of PR-– Mayaguez Campus

NAME	POSITION	AGENCY
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
Juan A. Martínez	Director	Natural Resouces Conservation Service (NRCS) Caribbean Area
Damaris Medina	State Engineer	Natural Resouces Conservation Service (NRCS) Caribbean Area
Marisol Morales	Biologist	Natural Resouces Conservation Service (NRCS) Caribbean Area
Edwin Muñiz	Supervisor PR Field Office	US Fish and Wildlife Service
Dr. Angel Rivera Collazo	Dean 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

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

- Sr. James Kurtenback-EPA
  - ✓ PR Stream Survey Project
  - ✓ The monitoring network consist of 50 monitoring stations (See Figure 11)
  - ✓ Submitted nutrients and turbidity data

- Sra. Yazmin Laguer-EPA CEPD
  - ✓ DMR data (from the past three years)

- San Juan Bay Estuary System Program
  - ✓ The monitoring network consist of 23 monitoring stations in the San Juan Bay Estuary System. . (See Figure 12).
  - ✓ 15 parameters are monitored

- 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.

- NRCS- Bahía de Jobos (Letter from Mr. Juan Martínez)
  - ✓ Internet available data
  - ✓ Monitoring network consist of 4 monitoring stations located in each of 27 reserve
  - ✓ Temperature, pH, salinity, Dissolved Oxygen and turbidity data

- PR Port Authority- Mrs. Milagros Rodríguez Castro
  - ✓ Laguna Torrecillas- Runway 26 Safety Area and Taxiway Sierra Embankment Project
  - ✓ pH, Temperature, Dissolved Oxygen, Oil and Grease, Suspended Solid, Turbidity, Color, Odor, Sulfates, and Surfactants data

- Pontificia Universidad Católica de Puerto Rico –Sra. Hilda Santiago
  - ✓ Submitted water quality data from Non-PRASA Wells located in the facility
  - ✓ The data subject was not used because it could not be determined the exact location of the well.

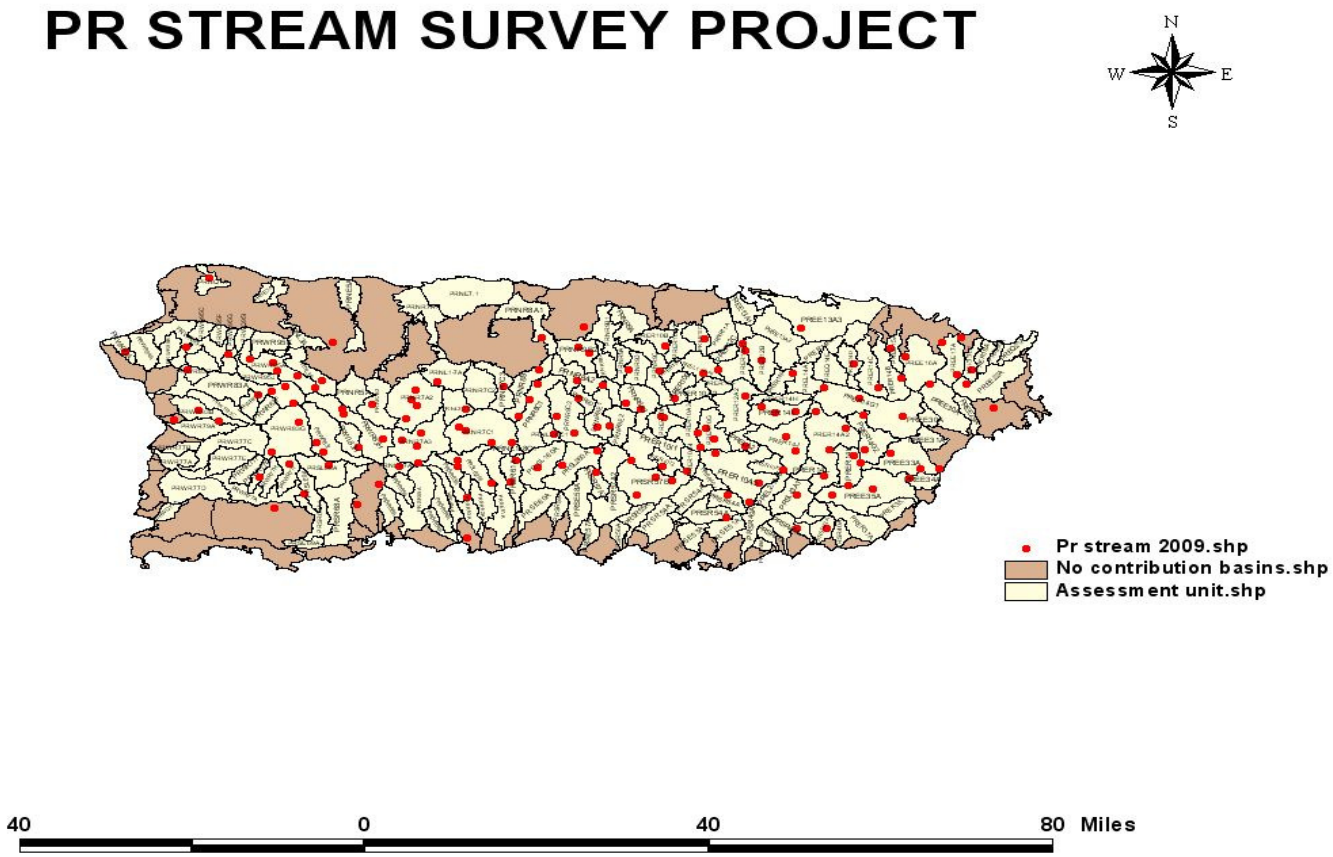


Figure 11 PR Stream Survey Project Monitoring Stations

Figure 12 San Juan Estuary Bay System 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 2003. At the present time this regulation is undergoing public participation process for the corresponding revision prior to submittal to EPA for review and approval. The purposes set forth in the current PRWQSR are:

1. Designate the use for which the quality of the waters of Puerto Rico shall be maintained and protected;
2. Prescribe the water quality standards required to sustain the designated uses;
3. Identify other rules and regulations applicable to sources of pollution that may affect the quality of waters subject to the PRWQSR; and,
4. Prescribe additional measures necessary for implementing, achieving and maintaining the prescribed water quality.

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. Direct and indirect contact recreation; and
3. Raw source of drinking water.

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.

CLASS SC – Class SC includes the segments of the coastal waters identified below. The classification of these waters shall be applied from the zone subject to the ebb and flow of tides (mean sea level) to 10.3 nautical miles seaward.

- ✓ **Mayaguez 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, propagation and preservation of desirable species, and for primary and secondary contact recreation.

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

CLASS SG1 - Ground waters designated as sources of drinking water supply and for agricultural uses, including irrigation. Also, included under this class are those ground

waters that flow into waters, which support ecological communities of exceptional ecological value in accordance with Sections 2.1.1 and 2.2.2 of the PRWQSR.

CLASS SG2 - Ground waters which, due to the high total dissolved solids concentration (concentrations greater than 10,000 mg/l), are not fit as sources of drinking water supply even after treatment. There are no water quality standards for this use.

The following tables summarize the existing applicable water quality standards used to perform the assessment for the 2010 IR. Here are shown the maximum allowable concentrations for specific substances in coastal and estuarine waters, surface waters, and ground waters:

Table 7: Specific Water Quality Standards for Selected Parameters (as established in the PRWQSR)

PARAMETER	COASTAL WATERS (ug/l)	RIVERS AND STREAM (ug/l)	GROUNDWATERS (ug/l)
Arsenic (As) $^{*,+}$	1.4 (AL)	0.18(HH)	50.0(DW)
Cadmium (Cd)$^{+,\%}$	9.3 (AL)	Note 1 (AL)	5.0 (DW)
Chromium III (Cr)$^{+}$	-	Note 2 (AL)	-
Chromium VI	-	11 (AL)	-
Copper (Cu)$^{+}$	3.1(AL)	Note 3 (AL)	1300 (DW)
Cyanide (CN^{-})$^{+}$	1.0 (AL)	5.2(AL)	200 (DW)
Fluoride (F^{-})$^{\#}$	-	700.0 (DW)	-
Lead (Pb)$^{+,\%}$	8.1 (AL)	Note 4 (AL)	15.0 (DW)
Mercury (Hg)$^{+}$	0.051(HH, AL)	0.050 (HH, AL)	2.0 (DW)
Nickel (Ni)$^{+}$	8.2 (AL)	Note 5 (AL)	-
Nitrate + Nitrite (as N)	-	10,000.0 (DW)	-
Nitrogen (NO_3, $N0_2$, NH_3)	5,000.0	-	-
Selenium (Se)$^{+}$	71.0 (AL)	5.0 (AL)*	50.0 (DW)
Silver (Ag)$^{+}$	2.0 (AL)	Note 6 (AL)	-
Sulfide (Undissociated H_2S)	2.0 (AL)	2.0 (AL)	-
Zinc (Zn)$^{+}$	81.0 (AL)	Note 7 (AL)	-

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 $e^{(0.7852\ [\text{Ln Hardness}]\ -2.715)}$.

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 $e^{(1.2730\ [\text{Ln Hardness}]\ -\ 4.705)}$.
Note 5 - Concentration in ug/l must not exceed the numerical value given by $e^{(0.8460\ [\text{Ln Hardness}]\ +\ 0.058)}$.
Note 6 - Concentration in ug/l must not exceed the numerical value given by $e^{(1.72\ [\text{Ln Hardness}]\ -\ 6.52)}$.
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.
# Identifies a substance whose numeric standard for coastal waters will be evaluated to determine the feasibility of eliminating it.
% 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.

Table 8: 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 4	Note 4	Note 1
Other Pathogenic Organisms	Note 1	-	-	Free of Pathogens	Note 1
pH		7.3-8.5	7.3-8.5	6.0-9.0	Note 1
Sulfates	Note 1	2,800 mg/L	2,800 mg/L	250 mg/L	Note 1
Surfactants as MBAS		500 ug/L	500 ug/L	100 ug/L	Shall not be present
Taste and odor producing substances		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[@]	-	-	-	1mg/L at specific segments established in the WQSR	-
Total Coliforms		-	-	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 Caguitas	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 – Water Quality Standard Regulations, Federal Register, Vol. 69, No. 16, Monday, January 26, 2004, Rules and Regulations, Page 3514.

Note 3- In waters intensely used for primary contact recreation, like special bathing zones (beaches) the eterococci 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 coliform 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 coliform 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 coliform or 200 col/100mL of fecal coliforms. Not more than 20 percent of the samples shall exceed 400 col/100mL of fecal coliform.

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: swimming (primary contact recreation), 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. In waters intensely used for primary contact recreation, like special bathing zones (beaches) the enterococci density in term s of geometric mean of at least five representative sample 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 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.

   b) Coastal Waters

   Coastal segments designated for this use under the PRWQSR are currently under Federal promulgation as Primary Contact Recreation. 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. In waters intensely used for primary contact recreation, like special bathing zones (beaches) the enterococci density in term s of geometric mean of at least five representative sample 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 RSDW use, we considered compliance of water quality standards for the various toxic parameters indicated below:

Cadmium (Cd)	Nitrates + Nitrites (NO_3 + NO_2)
Copper (Cu)	Selenium (Se)
Cyanides (CN)	Silver (Ag)
Fluoride	Total Chromium (Cr)
Lead (Pb)	Total Phosphorus (P)
Mercury (Hg)	

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 classify the segment non-support for Raw Sources of Drinking Water.

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

The aquatic life use support was determined on the basis of physical and chemical data obtained from the monitoring stations. At the present time PREQB's efforts to implement the EPA developed Rapid Bioassessment Protocol (RBP) have not been successful. We have continued to participate with EPA in seeking different alternatives to determine (1) if lower resolution of taxonomic identification provides useful relationships and (2) if the RBP are applicable or not to the Caribbean waters.

Currently, the ALUS 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)	Mercury (Hg)	Selenium (Se)
Arsenic (As)	Silver (Ag)	Surfactants
Cadmium (Cd)	Total Chromium (Cr)	Copper (Cu)
Cyanides (CN)	Lead (Pb)	

For these toxic parameters, a single violation of the standard was enough to classify 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
Turbidity	pH

303(d) List

Listing Criteria

The Puerto Rico 2010 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 2010 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 2010 cycle, PREQB used the 2003 amended PR Water Quality Standards Regulation (amended PRWQSR) and the EPA promulgation, where applicable. The waters considered to be impaired have been included in Category 5. The PREQB 2010 CWA 303(d) List is included as Appendix I of the IR.

If any of the parameters listed in the 2008 and 2006 cycle violated the applicable water quality standard at least once, the parameter continued to appear as an impairment cause and the segment continued to be listed in Category 5.

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 cycle and during the 2010 cycle, 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 *("Evaluación de Cuencas y Actividades de Restauración para Puerto Rico")*. As 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 9: 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

BASIN	REGION
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.

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 10: TMDL Development Status

SEGMENT/POLLUTANT	SEGMENT ID	PROJECT STATUS	PROJECTED TMDL SUBMITTAL DATE
1. RIO BAIROA/COPPER	PRER14H	Approved by EPA	
2. RIO BAIROA/DISSOLVED OXYGEN	PRER14H	Approved by EPA	
3. RIO CAGUITAS/COPPER	PRER14I	Approved by EPA	
4. RIO CAGUITAS/DISSOLVED OXYGEN	PRER14I	Approved by EPA	
5. RÍO CIBUCO/FECAL COLIFORMS	PRNR9A	Approved by EPA	
6. RÍO CIBUCO/FECAL COLIFORMS	PRNR9B1	Approved by EPA	
7. RÍO CIBUCO/FECAL COLIFORMS	PRNR9B2	Approved by EPA	
8. RÍO CIBUCO/FECAL COLIFORMS	PRNR9B3	Approved by EPA	
9. RÍO CIBUCO/FECAL COLIFORMS	PRNR9C	Approved by EPA	

SEGMENT/POLLUTANT	SEGMENT ID	PROJECT STATUS	PROJECTED TMDL SUBMITTAL DATE
10. RÍO CIBUCO/FECAL COLIFORMS	PRNR9D	Approved by EPA	
11. RIO DE LA PLATA/FECAL COLIFORMS	PRER10A1	Approved by EPA	
12. RIO DE LA PLATA/FECAL COLIFORMS	PRER10A2	Approved by EPA	
13. RIO DE LA PLATA/FECAL COLIFORMS	PRER10A3	Approved by EPA	
14. RIO DE LA PLATA/FECAL COLIFORMS	PRER10A4	Approved by EPA	
15. RIO DE LA PLATA/FECAL COLIFORMS	PRER10A5	Approved by EPA	
16. RIO DE LA PLATA/FECAL COLIFORMS	PRER10B	Approved by EPA	
17. RIO DE LA PLATA/FECAL COLIFORMS	PRER10C	Approved by EPA	
18. RIO DE LA PLATA/FECAL COLIFORMS	PRER10D	Approved by EPA	
19. RIO DE LA PLATA/FECAL COLIFORMS	PRER10E	Approved by EPA	
20. RIO DE LA PLATA/FECAL COLIFORMS	PRER10F	Approved by EPA	
21. RIO DE LA PLATA/FECAL COLIFORMS	PRER10G	Approved by EPA	
22. RIO DE LA PLATA/FECAL COLIFORMS	PRER10H	Approved by EPA	
23. RIO DE LA PLATA/FECAL COLIFORMS	PRER10I1	Approved by EPA	
24. RIO DE LA PLATA/FECAL COLIFORMS	PRER10I2	Approved by EPA	
25. RIO DE LA PLATA/FECAL COLIFORMS	PRER10J	Approved by EPA	
26. RIO DE LA PLATA/FECAL COLIFORMS	PRER10K	Approved by EPA	
27. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83A	IN DRAFT	FY10
28. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83B	IN DRAFT	FY10
29. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83C	IN DRAFT	FY10
30. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83D	IN DRAFT	FY10
31. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83E	IN DRAFT	FY10
32. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83F	IN DRAFT	FY10
33. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83G	IN DRAFT	FY10
34. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83H	IN DRAFT	FY10
35. RIO GRANDE DE AÑASCO/FECAL COLIFORMS	PRWR83I	IN DRAFT	FY10

SEGMENT/POLLUTANT	SEGMENT ID	PROJECT STATUS	PROJECTED TMDL SUBMITTAL DATE
36. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7A1	IN DRAFT	FY10
37. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7A2	IN DRAFT	FY10
38. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7A3	IN DRAFT	FY10
39. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7B1	IN DRAFT	FY10
40. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7B2	IN DRAFT	FY10
41. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7C1	IN DRAFT	FY10
42. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7C2	IN DRAFT	FY10
43. RIO GRANDE DE ARECIBO/FECAL COLIFORMS	PRNR7C3	IN DRAFT	FY10
44. RIO GRANDE DE LOIZA/DISSOLVED OXYGEN	PRER14A2	Approved by EPA	
45. RIO GRANDE DE LOIZA/FECAL COLIFORMS	PRER14A1	Approved by EPA	
46. RIO GRANDE DE LOIZA/FECAL COLIFORMS	PRER14A2	Approved by EPA	
47. RIO GRANDE DE LOIZA/FECAL COLIFORMS	PRER14F	Approved by EPA	
48. RIO GRANDE DE LOIZA/FECAL COLIFORMS	PRER14G1	Approved by EPA	
49. RIO GRANDE DE LOIZA/FECAL COLIFORMS	PRER14G2	Approved by EPA	
50. RIO GRANDE DE LOIZA/FECAL COLIFORMS	PRER14H	Approved by EPA	
51. RIO GRANDE DE LOIZA/FECAL COLIFORMS	PRER14I	Approved by EPA	
52. RIO GRANDE DE LOIZA/FECAL COLIFORMS	PRER14 J	Approved by EPA	
53. RIO GRANDE DE LOIZA/FECAL COLIFORMS	PRER14K	Approved by EPA	
54. RIO GRANDE DE LOIZA/FECAL COLIFORMS	PRER14L	Approved by EPA	
55. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8A1	IN DRAFT	FY10
56. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8A2	IN DRAFT	FY10
57. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8A3	IN DRAFT	FY10
58. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8B	IN DRAFT	FY10
59. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8C1	IN DRAFT	FY10
60. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8C2	IN DRAFT	FY10
61. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8D	IN DRAFT	FY10

SEGMENT/POLLUTANT	SEGMENT ID	PROJECT STATUS	PROJECTED TMDL SUBMITTAL DATE
62. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8E1	IN DRAFT	FY10
63. RIO GRANDE DE MANATÍ/FECAL COLIFORMS	PRNR8E2	IN DRAFT	FY10
64. RIO GURABO/DISSOLVED OXYGEN	PRER14G1	Approved by EPA	
65. RIO BAYAMON/FECAL COLIFORM	PRER12A1	TO BE DEVELOPED	
66. RIO BAYAMON/FECAL COLIFORM	PRER12A2	TO BE DEVELOPED	
67. RIO BAYAMON/FECAL COLIFORM	PRER12B	TO BE DEVELOPED	
68. RIO HONDO/FECAL COLIFORM	PRER11A	TO BE DEVELOPED	

Also, in coordination with the EPA contractor we are ready to develop fecal coliform TMDL for the rest of the island during FY-10.