

**Task Summary Report**  
(Baird Phase II Tasks 1.7 and 3.1)  
**Detailed Shore Protection Mapping – Lake Ontario Detailed Site Studies**



**Coastal Task Working Group  
International Joint Commission  
Lake Ontario – St. Lawrence River Regulation Study**

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**Prepared By**



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# **DETAILED SHORELINE PROTECTION MAPPING – LAKE ONTARIO DETAILED SITE STUDIES**

## **1.0 INTRODUCTION**

This task forms part of a series of tasks being conducted for the Coastal Task Working Group (CWG) of the IJC Lake Ontario – St. Lawrence River Study by Christian J. Stewart Consulting (CJS) and W.F. Baird and Associates (Baird). Specifically this task comprises “Task 1.7 – Detailed Mapping of Shore Protection Structures” and “Task 3.1 - Review Accuracy of Shore Protection Classification” in the June 14, 2002 Phase II proposal submitted to the CWG by Baird and CJS.

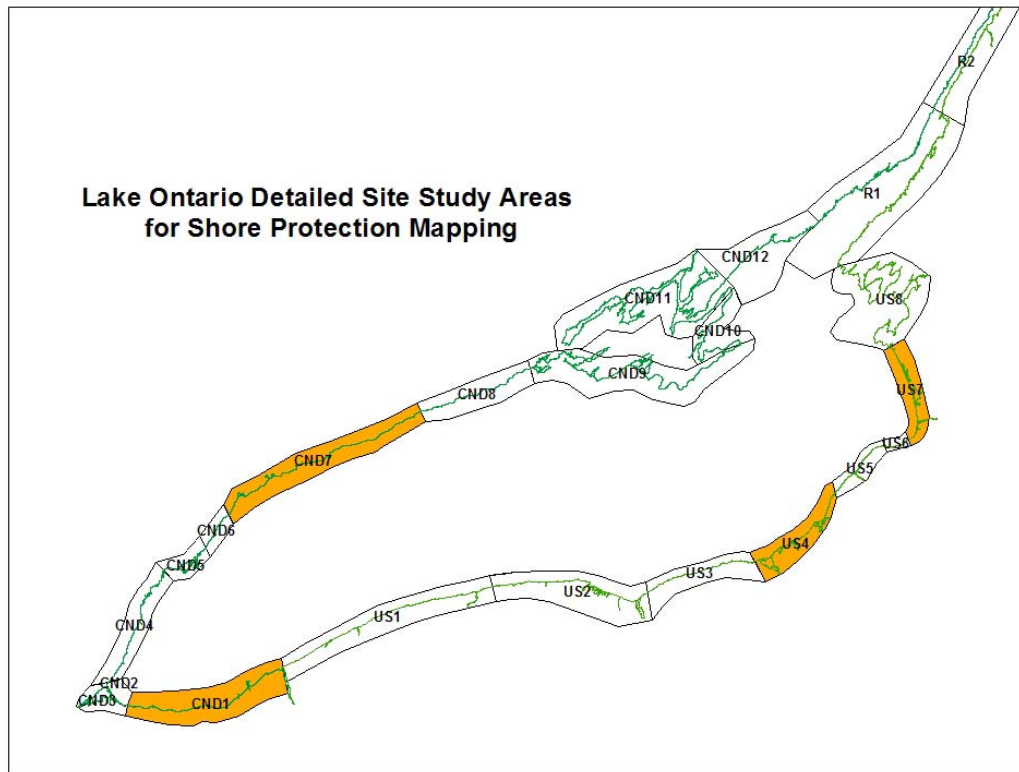
## **2.0 BACKGROUND AND PURPOSE**

As part of their efforts within the Coastal Task Group, Baird is developing a Flood and Erosion Prediction System (FEPS) that will be used to make evaluations of potential flood and erosion impacts due to changes in water level regulation that might occur on the Lake and River. In order to assist in the calibration of the model, as well as to conduct levels of analyses that would not be possible over the entire Lake and River system, Baird has established a series of site study areas where the FEPS model will be used to conduct a series of detailed analyses.

One key component of the FEPS model is to determine the interdependence between coastal processes and the extent, type and quality of structural shore protection put in place along the Lake Ontario and St. Lawrence River shoreline. Many coastal processes influence the effectiveness of shore protection structures over their design life. Alternatively, structural shore protection has a direct and measurable effect upon alongshore sediment transport interfering with natural processes of beach accretion and erosion.

To examine this, Baird developed a case study approach and wished to investigate the impacts of different regulation plans on various types of shoreline protection, from Level 1 structures (i.e. well engineered seawalls and revetments) to installations by private riparians (Level 2 and 3 structures). This required detailed information on shore protection structures for a number of the site study areas they were examining including the CND1 (Niagara), CND7 (Whitby-Oshawa-Newcastle), US4 (Chimney Bluffs area) and US7 (Eastern Lake Ontario Sand Dunes) “Shore Unit” areas (Figure 1). While the shoreline classification conducted in Phase I of the IJC Study (see Stewart, 2002) provided a kilometer-by-kilometer level of shore protection classification for the Lake and River, this was not detailed enough for use at the site studies, where a “continuous” mapping of shore protection was thus required.





**Figure 1 – Location of Detailed Site Study Areas Where Shore Protection Mapping was Completed.**

In addition, there was a desire to use a more detailed approach in the site study areas in order to provide insight into the accuracy of the classification methodologies used in the more general kilometer-by-kilometer approach. When conducting the kilometer-by-kilometer shoreline classification of Lake Ontario and the St. Lawrence River in Phase I, the types and percentage of Level 1 and 2 Shore Protection were documented for each 1 km reach on Lake Ontario and the Upper St. Lawrence River from the oblique helicopter video and aerial photographs and digital orthophotographs (DOPs). This information is now a primary attribute in the relational database module of the FEPS and will ultimately be utilized in the system wide assessment. However, it is important to note that the percentage of Class 1 and 2 protection provided was only a rough estimate based on observation of the videos and the DOPs. Exact measurement was not conducted at this phase of the data compilation. As such, prior to utilizing this reach by reach information on a lakewide basis, it was necessary to confirm the accuracy of the shore protection type classification.



To do this, the detailed, “continuous” mapping of individual shoreline protection structures (lengths and types of protection) at each of the detailed modeling sites (Figure 1) was utilized to summarize the Level 1 and 2 Shore Protection on a reach by reach basis in these site study areas. The results were then compared to the information generated from the initial classification effort. A series of “change factors” and “distance factors” were then calculated and will be used by Baird to conduct detailed analysis of shore protection on a reach by reach basis.

## **3.0 METHODS**

### **3.1 Data Sources and Limitations**

Detailed field mapping of shore protection was not required for this task. As such, various data sources were relied upon to develop the continuous GIS mapping coverages for both shore parallel and shore perpendicular protection structures. A brief description of each source and their limitations is provided below.

#### ***3.1.1 Previous Classification / Coastal Zone Data***

The kilometer-by-kilometer classification data that was developed in Phase I of the IJC Study served as a primary data reference for this activity and provided a coarse delineation of the start and end points of the various shore protection structures.

#### ***3.1.2 Digital Orthophotography***

The primary data source used in mapping shore protection in the 4 site study areas was new digital orthophotography that was flown in these areas for the IJC Study.

On the Canadian side, 2000 black and white (CND7) and 2002 color (CND1) photography was provided by Environment Canada (prepared by JD Barnes and Associates). On the U.S. side, 2002 color photography was provided by the U.S. Army Corps of Engineers (prepared by EarthData International Inc.).

In using the DOPs, a number of limitations were encountered. These included:

- 1) For the CND1, US4 and US7 sites, the photography was “clipped” or “buffered” so as to only show inland areas back to a specific contour elevation, as well as to a specific distance offshore. As a result, areas where our digital shoreline extended inland beyond the imagery could not



- be classified. Also, offshore structures that extended into the lake beyond the imagery could also not be accurately mapped. For the CND7 site, while the photos were not clipped to a specific contour, there were some areas where the digital shoreline extended inland beyond the photo coverage and could not be mapped (see Figure 2 for an example of this);
- 2) In some instances, the digital shoreline being utilized for the project did not match the shoreline as on the DOPs. In most cases this was where the digital shoreline truncated large embayments (e.g. Jordan Harbour in CND1), or where new development / landfill or other shoreline modifications had taken place. Where this occurred, the start and end points of the protection were estimated as closely as possible on the digital shoreline;
  - 3) The CND1, US4 and US7 photography were all flown during “leaf-on” conditions. As such, in many cases, vegetation and vegetation shadows obscured the shore protection that was in place. In these instances, classification was done through field knowledge of the shoreline, or reasonable assumption, based on surrounding protection types. In severe cases, it was left as unclassified; and
  - 4) The CND1 photography had a number of instances where the image was “blurred” (as if the print had been slightly moved in the middle of the scanning process). Unfortunately, this blur tended to happen right at the land water interface. Again, this made it difficult to interpret any shore protection structures present. Similarly, these photos were often very dark in places, again resulting in difficult interpretation.

Additional minor issues are identified in the metadata that was prepared for each of the ArcMap coverages that were developed.

### **3.2 Shore Protection Classification Re-Attribution**

The re-attribution and re-mapping of the shore protection classification was completed directly in ArcMap for each detailed site study area. First, the digital shoreline for the study area and the associated Phase I classification attributes were plotted and the associated digital orthophotos were brought in to use for mapping purposes. Start and end points of each distinct shore protection type were then plotted on the digital shoreline by bi-secting the shoreline line string in the appropriate spot. This created a distinct line segment in ArcMap which was then classified using the shore protection classification scheme developed for the IJC Study (Table 1). Where segments could not be classified (see Section 3.1.2 above), they were assigned an “Unclassified” designation (999) in the attribute table and are represented as a thin black line in the mapping product.



**Table 1**

**IJC Shore Protection Classification Scheme**

*Notes: Last digit of the three digit number is the quality quantifier.*

*\*Denotes Shore Perpendicular Protection*

**200 - Revetment**

- 20(1) – Revetment (Class 1, well engineered, well maintained, will last over 50 year window)
- 202 – Revetment (Class 2, moderately engineered)
- 203 – Revetment (Class 3, poorly constructed, poorly maintained)

**210 – Seawall / Bulkhead**

- 21(1) - Seawalls / Bulkheads
- 212 – Seawalls / Bulkheads
- 213 – Seawalls / Bulkheads

**220 – Groins\***

- 22(1) - Groins
- 222 – Groins
- 223 – Groins

**230 – Jetties\***

- 23(1) – Jetties
- 232 – Jetties
- 233 – Jetties

**240 – Offshore / Marina Breakwaters\***

- 24(1) – Offshore / Marina Breakwaters
- 242 – Offshore / Marina Breakwaters
- 243 – Offshore / Marina Breakwaters

**250 – Artificial / Constructed / Perched Beaches**

- 25(1) – Artificial / Constructed / Perched Beaches
- 252 – Artificial / Constructed / Perched Beaches
- 253 – Artificial / Constructed / Perched Beaches

**260 – Beach Nourishment**

- 26(1) – Beach Nourishment
- 262 – Beach Nourishment
- 263 – Beach Nourishment

**270 - Vegetation Planting / Bioengineering**

- 27(1) – Vegetation Planting / Bioengineering
- 272 – Vegetation Planting / Bioengineering
- 273 – Vegetation Planting / Bioengineering

**280 - Slope Grading / Bluff Stabilization**

- 28(1) – Slope Grading / Bluff Stabilization
- 282 – Slope Grading / Bluff Stabilization
- 283 – Slope Grading / Bluff Stabilization

**290 - Protected Wetlands**

- 29(1) – Protected Wetlands
- 292 – Protected Wetlands
- 293 – Protected Wetlands

**300 – Ad Hoc Concrete Rubble / Rip Rap**

- 30(1) – Ad Hoc Concrete Rubble / Rip Rap (likely will not occur)
  - 302 – Ad Hoc Concrete Rubble / Rip Rap
  - 303 – Ad Hoc Concrete Rubble / Rip Rap
- (continued across in next column)

**310 – Ad Hoc Other Materials**

- 31(1) – Ad Hoc Other Materials (likely will not occur)
- 312 – Ad Hoc Other Materials
- 313 – Ad Hoc Other Materials

**320 – Boat Docks Private\***

- 32(1) – Boat Docks Private
- 322 – Boat Docks Private
- 323 – Boat Docks Private

**330 – Boat Docks Marina\***

- 33(1) – Boat Docks Marina
- 332 – Boat Docks Marina
- 333 – Boat Docks Marina

**340 – Commercial / Industrial Docks/Piers/Wharves\***

- 34(1) – Commercial / Industrial Docks/Piers/Wharves
- 342 – Commercial / Industrial Docks/Piers/Wharves
- 343 – Commercial / Industrial Docks/Piers/Wharves

**350 – Boat Launch Ramp Docks (Public or Private)\***

- 35(1) – Boat Launch Ramp Docks Private/Public
- 352 – Boat Launch Ramp Docks Private/Public
- 353 – Boat Launch Ramp Docks Private/Public

**360 – Boat Launch Ramps**

- 36(1) – Boat Launch Ramps
- 362 – Boat Launch Ramps
- 363 – Boat Launch Ramps

**400 - No Shore Protection**



It should be noted that in areas where more than one shore protection structure was present along a length of shoreline (e.g., a seawall with a rip rap revetment fronting it, or a seawall with groins), only the primary mode of protection that was in place was included in the continuous GIS coverage that was developed. For this purpose, primary shore protection was defined as that which would bear the initial brunt of any wave activity or other coastal processes. Secondary shore protection structures were then noted in the "Comments" column of the attribute table associated with the line segment.

In addition to capturing shore parallel protection, there was a desire to capture shore perpendicular protection structures (e.g., groins, jetties, offshore breakwaters) as well as those structures related to recreational boating (e.g., boat docks, launch ramps). As such, additional classification categories are included in the classification scheme to capture these (marked with a \* in Table 1). Where these structures were visible on the digital orthophotos, they were digitized on-screen, classified accordingly and saved as a separate ArcMap coverage.

An example of the shore protection mapping showing both shore parallel and shore perpendicular structures is found in Figure 2.

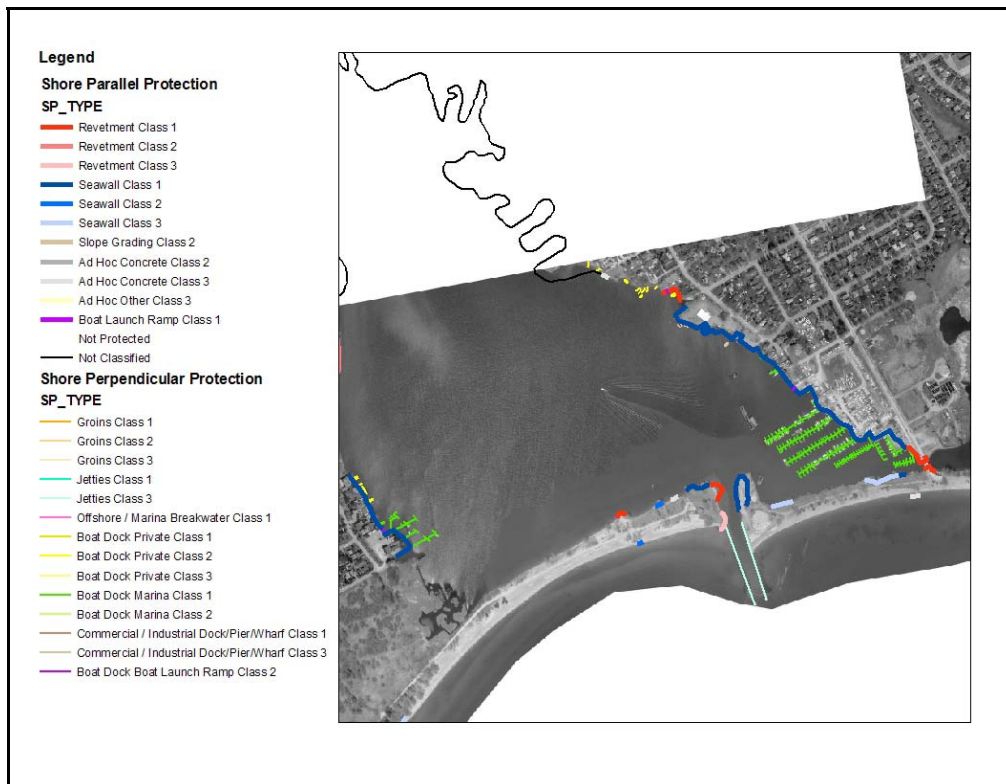


Figure 2 - Example of Shore Protection Mapping (CND7)



## 4.0 DATA PRESENTATION AND ANALYSIS

### 4.1 ArcMap Files

Two separate ArcMap shape (.SHP) files were created for each study area. These include:

- **cnd1\_offshore\_sp.shp** – Perpendicular shore protection, CND1 Study Area
- **cnd1\_parallel\_sp.shp** – Parallel shore protection, CND1 Study Area
- **cnd7\_offshore\_sp.shp** – Perpendicular shore protection, CND7 Study Area
- **cnd7\_parallel\_sp.shp** – Parallel shore protection, CND7 Study Area
- **us4\_offshore\_sp.shp** – Perpendicular shore protection, US4 Study Area
- **us4\_parallel\_sp.shp** – Parallel shore protection, US4 Study Area
- **us7\_offshore\_sp.shp** – Perpendicular shore protection, US7 Study Area
- **us7\_parallel\_sp.shp** – Parallel shore protection, US7 Study Area

### 4.2 Data Attributes

All classification data was entered directly into attribute tables within ArcMap. These tables contained the following key information (exact field names may vary slightly by file):

**Length** - This provided the length of the particular parallel or perpendicular shoreline protection segment (and classification type) in meters based on the start and end points that were mapped.

**SP\_Type** - The shore protection classification as assigned (see Table 1). Also includes a “999” designation for unclassified segments.

**Comments** - Any relevant additional information regarding the classified segment. In this case this usually included additional detail regarding the primary and any secondary shore protection structures that were present.

**Reach** – The particular 1 kilometer IJC Study reach segment that the structure fell into. This was recorded for analysis purposes and for later comparison to the kilometer-by-kilometer classification.

**Berths** (Offshore / Perpendicular Coverage Only) – This was the estimated number of useable berth areas associated with dock structures.

### 4.3 Data Analysis

For analysis purposes, data was exported from the ArcMap program into MS-Excel in order to compute overall statistics on the total lengths of shore protection





mapped in each study area. For the shore parallel protection, comparisons were also made between the “continuous” mapping results and the kilometer-by-kilometer results in order to develop a series of “change factors” and “distance factors” that could be used in conducting a lakewide analysis of parallel shore protection.

In conducting the “change analysis” a number of assumptions first had to be made regarding the length of shore protection that was estimated in the kilometer-by-kilometer classification, as explicit measurements of the lengths were not carried out when this was completed.

Recall that for the kilometer-by-kilometer classification, only the *types* of protection occurring in each kilometer reach were recorded, along with estimates of the percent of each reach that was covered by Type 1 and 2 shore protection. In order to compare the specific distances recorded in the new continuous mapping, estimates of the length of the Type 1 and 2 protection from the kilometer classification had to be made.

This was done by taking into account the “percent of each reach value”, along with a weighting assigned to the types of shore protection that were recorded. In the kilometer-by-kilometer classification, up to 4 types of shore parallel protection could be recorded, with generally, the first type being most predominant. As such, in assigning a weighting to these, the following scale was utilized:

If 1 SP Type present than SP1 = 100% (of the “percent of each reach value”)  
 If 2 SP Types present than SP1 = 60%, SP2 = 40%  
 If 3 SP Types present than SP1 = 50%, SP2 = 30%, SP3 = 20%  
 If 4 SP Types present, than SP1 = 40%, SP2 = 30%, SP3 = 20%, SP4 = 10%

For clarification, an example is presented in Table 2 for Reach 1283. In the original kilometer-by-kilometer classification, it was estimated that 70% (or 700 meters) of this reach was protected by Type 1 and 2 structures (201, 202, 212 and 302). As such, when applying our weighting scheme: for 201, 40% of 700 equals 280 meters; for 202, 30% of 700 equals 210 meters; for 212, 20% of 700 equals 140 meters; and for 302, 10% of 700 equals 70 meters.

1283	201	280	28%
	202	210	21%
	212	140	14%
	302	70	7%
	400	300	30%
	Class 3		0%

**Table 2 - Application of Km x Km weighting scheme to Reach 1283**



Any remainder (in this case 300 meters) was assigned to the “No Protection” category (400) if no other Type 3 structure was recorded, or to the Type 3 category, if a Type 3 structure was recorded. Note that because the “percent of reach covered” estimates were only applied to Type 1 and 2 structures, it is difficult to make meaningful comparisons between the Class 3 and No Protection categories. These are provided though in the tables presented for each Study Area and should be used cautiously.

For the shore perpendicular protection structures, summary statistics for the continuous mapping were completed and consisted primarily of a summary by study area and by shore protection type . Comparison statistics with the kilometer-by-kilometer classification were not completed for the perpendicular structures.

#### 4.3.1 CND1 - Niagara

##### **Shore Parallel Protection Structures**

Summary statistics for shore parallel protection occurring in the CND1 Shore Unit are presented in Table 3 and represented graphically in Figure 3. The statistics reveal that over 50% of this shoreline is protected with a fairly even distribution of Type 1 and 2 quality revetments (201, 202) and seawalls (211, 212), along with a lesser number of ad-hoc structure (302). Just over 30% of the shoreline is unprotected and another 9.4% of the shoreline is protected with a variety of poor quality structures of various types (Class 3).

Shore Type	CONTINUOUS SHORELINE		
	Length	% of CND1	Within Distinct Reaches
201	10,848.1	10.1%	35
202	12,530.9	11.7%	60
211	13,260.1	12.4%	33
212	10,641.2	9.9%	52
222	83.8	0.1%	2
281			0
301	106.8	0.1%	1
302	7,446.4	7.0%	47
361	193.8	0.2%	10
362	60.9	0.1%	8
400	32,664.9	30.5%	81
Class 3	10,075.0	9.4%	47
999	9,088.1	8.5%	12
<b>TOTAL:</b>	<b>107,000</b>	<b>100%</b>	

Table 3 - Total Lengths of Parallel Shore Protection - CND1 Shore Unit



## CND1 Parallel Shore Protection Summary

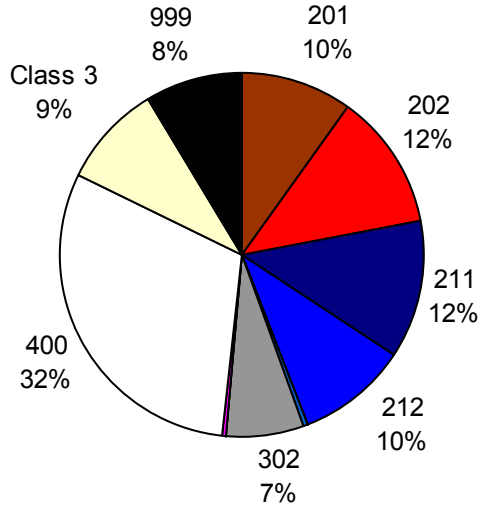


Figure 3 - CND1 Shore Parallel Protection Summary

### ***Comparison of Shore Parallel With Kilometer-by-Kilometer Classification***

Table 4 presents an example of the reach by reach comparison that was completed using the new continuous mapping and the weighted measurements for the kilometer-by-kilometer classification (see Section 4.3 above). The full table for the entire CND1 shore unit is presented in Appendix 1 of this report. In this table, “change factors” were calculated by dividing the “continuous” shoreline lengths by the “kilometer” shoreline lengths. The “distance factors” (in meters) were calculated by subtracting the “kilometer” lengths from the “continuous” lengths. In calculating these, all Class 3 structures were grouped together for analysis as their specific lengths could not be calculated in the “kilometer” classification. In reading this table, a change factor of less than 1 and a distance factor that is negative indicates that the length of the shore protection measured in the continuous mapping is less than what was estimated from the kilometer-by-kilometer classification (i.e., the kilometer by kilometer approach *overestimates* what is actually present). Conversely, a change factor of greater than 1 and a positive distance factor indicates that the length of shore protection measured in the continuous mapping is greater than what was estimated from the kilometer-by-kilometer mapping (i.e., the kilometer-by-kilometer approach *underestimates* what is actually present).



**Table 4 - Comparison of "Continuous" Shoreline Statistics with "KM by KM" Statistics by Reach for Parallel Shoreline Protection on Lake Ontario Within CND1**

Reach #	Shore Type	KM by KM SHORELINE		CONTINUOUS SHORELINE		Change Factor	Distance Factor	
		Length	% of Reach	Length	% of Reach			
1227	201		0%	132.6	13.3%	0.47	133	
	202		0%	78.6	7.9%		79	
	211	1000	100%	469.6	47.0%		-530	
	361		0%	71.0	7.1%		71	
	400		0%	248.1	24.8%		248	
1228	211	500	50%	691.6	69.2%	1.38	192	
	212		0%	49.8	5.0%		50	
	302		0%	37.8	3.8%		38	
	400	500	50%	220.7	22.1%		0.44	-279
1229	202	600	60%	229.0	22.9%	0.38	-371	
	211		0%	387.7	38.8%		388	
	212	400	40%		0.0%		0.00	-400
	400		0%	383.3	38.3%		383	
1230	202	300	30%	681.1	68.1%	2.27	381	
	212	200	20%	165.7	16.6%		0.83	-34
	400	500	50%	153.2	15.3%		0.31	-347
1231	201		0%	90.9	9.1%	0.47	91	
	202	480	48%	223.9	22.4%		-256	
	212	320	32%	225.7	22.6%		0.71	-94
	400	200	20%	205.4	20.5%		1.03	5
	Class 3		0%	254.0	25.4%		254	

Note: Full table presented in Appendix 1.

Distance factors have also been summarized on a shore unit basis by shore protection type. These are presented in Table 5. Generally, this provides an indication of the accuracy of the kilometer by kilometer classification methodology over a broader reach of shoreline. For example, if looking at Shore Protection Type 201 in Table 5, we can see that over the entire Shore Unit, the kilometer approach underestimates the total amount of this type of protection by 5,435 meters, or an average of 155.3 meters per kilometer. On the other hand, for Type 212, the kilometer approach underestimates the total amount of this protection by only 257 meters, or an average of 4.5 meters per kilometer.

These statistics are now being utilized by Baird to conduct detailed analyses of shore protection in each reach within the study area.

### ***Shore Perpendicular (Offshore) Protection Structures***

Summary statistics for shore perpendicular protection structures in the CND1 shore unit are presented in Table 6 and Figure 4. These statistics reflect the large number of marina slips along this shoreline, as well as a predominance of medium and poor quality groins (usually poured concrete or stubby, rock or armorstone).



**Table 5 - Distance Factor Summary between "Continuous" Shoreline Statistics and "KM by KM" Statistics by Reach for Parallel Shoreline Protection on Lake Ontario Within CND1**

REACH #	SHORE PROTECTION TYPE											999		
	201	202	211	212	222	281	301	302	361	362	Class 3		400	
1214													-1000	1000
1215													-1000	1000
1216		-120	-80										-800	1000
1217													-1000	1000
1218													-1000	1000
1219													-1000	1000
1220													-1000	1000
1221													-1000	1000
1222													-1000	1000
1223													-10	10
1224													0	
1225													0	
1226													0	
1227	133	79	-530						38	71			248	
1228			192	50									-279	
1229			388	-400									383	
1230			381	-34									-347	
1231	91		-256	-94							254		5	
1232													0	
1233													0	
1234													0	
1235													0	
1236			56	51									-107	
1237	76	-142		-300				126			239		116	
1238		0		-300				369					201	
1239		-271		79				-62		-185			-115	
1240	120	58	30	-185				90		-80		81	-47	
1241		-217		84				-87				267	-154	
1242		124		-224				241				13	-431	
1243		-398	67	110				-173			8	-45	0	
1244													0	
1245				8				200				321	129	
1246	285	-218		-184				190				11	-34	-49
1247		454	170									106	-729	
1248	282	258	160									18	-718	
1249	580			125									-705	
1250		954											-954	
1251		100	269										-731	
1252												361	-414	
1253		202	712										-914	
1254			611										-611	
1255			1000										-1000	
1256			1000										-1000	
1257		61	39									229	-329	
1258		119	235								7	639	-1000	
1259		838	15									147	-1000	
1260												589	-589	
1261		72										8	-81	
1262	-50	-144		58									35	100
1263	315	-129					-200						14	
1264		-412		-300								374	410	
1265	366	300	324	-600				-72				10		
1266	147		853					-400					36	-1000
1267			-197											161
1268			-41											
1269	21		979											41
1270		235	134											-1000
1271		-300		-61								7	-376	
1272		-300		-47									-11	372
1273		-135		-120									330	18
1274			-200	-40								6	424	-89
1275		-54											22	106
1276	-118	41		-95				29					285	-260
1277	238			-128				-145					77	239
1278	234	-191	55	-222				36						-146
1279			48	94									131	-113
1280	-179	45	-24		78			27				-40	-119	-88
1281	605	-330									14		86	143
1282	117	161											86	-278
1283	-52	-210		-11									-80	-198
1284		154		10				48					453	-229
1285		185		-244		6		-179					9	
1286		-413		-199				178					-100	
1287	168	-463		-128				575					38	
1288		-170		-146				62					36	325
1289								-45					-90	446
1290								106						-106
1291		-51		65				237					96	-333
1292		203		62				122					68	-204
1293	62	-60		226				97					0	-361
1294	240	7		38										-228
1295	276	-100		23				65			10		6	-366
1296		-120		99									480	-679
1297	177	61		-80				118					-24	-71
1298		470	-1000	437				302					-360	-100
1299	259	76		95				88			5			
1300	405	-350		-20				138					5	44
1301		-157	-141	411									107	-618
1302	382	-68		-40									107	-142
1303		99											-70	-80
1304													225	-500
1305	165							151					393	-643
1306	-475	49						184						3
1307		19	-27					205						-349
1308	180	-486	172	-176							8			221
1309		177		283				186			11		12	101
1310				509				-65					-170	-225
1311		-192	4	223									-102	-406
1312		-44	60	371									19	-54
1313	34	-102		450				100					36	-523
1314		-200		185				51					84	-517
1315	384		-477	59				53					298	-337
1316	-74	8	67					18						16
1317	44	-318		479									-84	-200
1318		22	320	66				41					-49	-400
1319		149	-18	123				144					-113	-286
1320				-238				104						76
Count:	35	69	36	57	2	1	1	50	10	11		51	100	12
Sum:	5,435	-1,237	5,169	257	84	-200	107	3,527	194	-420		6,530	-27,877	9,088
Average:	155.3	-17.9	143.6	4.5	42.0	-200.0	107.0	70.5	19.4	-38.2		128.0	-278.8	757.3
Max:	605	954	1,000	509	78	-200	107	575	71	8		639	446	1,000
Min:	-475	-486	-1,000	-600	6	-200	107	-400	5	-185		-360	-1,000	10
Median:	165.0	0.0	63.5	8.0	42.0	-200.0	107.0	72.0	11.0	5.0		84.0	-176.0	1,000.0
SD:	210.9	267.4	417.0	222.0	50.9			151.5	20.1	72.2		209.8	413.8	439.1



**Table 6**

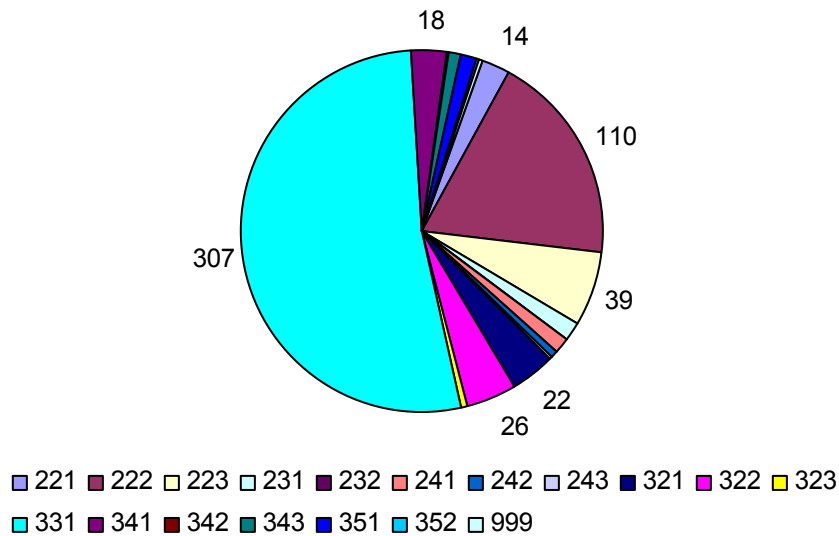
**Offshore Protection Statistics by Type for Shoreline Protection on Lake Ontario Within CND1**

Offshore Type	Occurrences of Type	Within Distinct # of Reaches	Average Length	Minimum Length	Maximum Length	Total # of Berths
221	14	10	28.2	11.1	60.7	
222	110	23	16.8	6.0	38.4	
223	39	12	17.9	7.2	42.6	2.0
231	10	10	804.1	78.2	2,331.8	
232	1	1	41.4	41.4	41.4	
241	7	5	504.0	96.6	1,045.5	
242	4	3	71.2	16.1	160.0	
243	2	2	48.5	35.8	61.2	
321	22	12	27.5	8.5	167.4	30.0
322	26	13	19.4	6.1	58.6	9.0
323	3	2	20.7	11.7	33.6	
331	307	13	37.4	4.8	961.6	1,593
341	18	7	73.5	5.6	351.6	101
342	2	2	54.0	41.0	66.9	
343	6	2	27.4	21.6	35.1	
351	9	6	19.1	10.4	27.9	16
352	1	1	22.0	22.0	22.0	1
999	2	1	13.0	12.7	13.2	
<b>TOTAL:</b>	<b>583</b>					<b>1,752</b>

**SUMMARY STATISTICS:**

Groins (221, 222, 223):	163
Jetties (231, 232, 233):	11
Boat Docks - private (321, 322, 323):	51
Boat Docks - marina (331, 332, 333):	307
Commercial/Industrial Docks/Piers/Wharves (341, 342, 343):	26

**CND1 Shore Perpendicular Protection**



**Figure 4 – CND1 Shore Perpendicular Protection Summary (Numbers on Graph represent number of occurrences in Shore Unit).**



### 4.3.2 CND7 – Oshawa / Whitby / Newcastle

#### Shore Parallel Protection Structures

Summary statistics for shore parallel protection occurring in the CND7 Shore Unit are presented in Table 7 and represented graphically in Figure 5. The statistics reveal that approximately 73% of this shoreline is unprotected reflecting its undeveloped and agricultural nature. Where shore protection is present it consists of high to medium quality revetments (201, 202) and seawalls (211, 212) and a variety of poor quality structures (Class 3).

SP Type	Continuous Length (m)	% Shore Unit
201	6,791.74	6.66%
202	3,548.63	3.48%
211	6,884.05	6.75%
212	1,166.55	1.14%
282	13.02	0.01%
302	378.76	0.37%
361	88.79	0.09%
400	73,585.43	72.14%
999	4,338.77	4.25%
Class 3	5,204.25	5.10%
<b>TOTAL:</b>	<b>102,000.00</b>	<b>100.00%</b>

Table 7 - Total Lengths of Parallel Shore Protection – CND7 Shore Unit

CND7 Shore Parallel Protection Summary

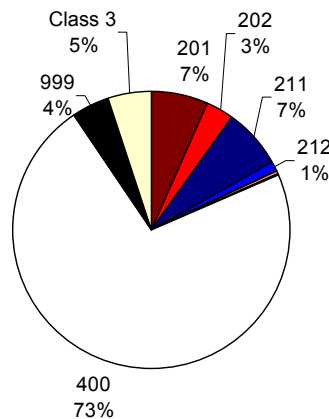


Figure 5 – CND7 Shore Parallel Protection Summary



**Comparison of Shore Parallel With Kilometer-by-Kilometer Classification**

Table 8 presents an example of the reach by reach comparison that was completed using the new continuous mapping and the weighted measurements for the kilometer-by-kilometer classification (see Section 4.3 above). The full table for the entire CND7 shore unit is presented in Appendix 1 of this report. In this table, “change factors” were calculated by dividing the “continuous” shoreline lengths by the “kilometer” shoreline lengths. The “distance factors” (in meters) were calculated by subtracting the “kilometer” lengths from the “continuous” lengths. In calculating these, all Class 3 structures were grouped together for analysis as their specific lengths could not be calculated in the “kilometer” classification. In reading this table, a change factor of less than 1 and a distance factor that is negative indicates that the length of the shore protection measured in the continuous mapping is less than what was estimated from the kilometer-by-kilometer classification (i.e., the kilometer by kilometer approach *overestimates* what is actually present). Conversely, a change factor of greater than 1 and a positive distance factor indicates that the length of shore protection measured in the continuous mapping is greater than what was estimated from the kilometer-by-kilometer mapping (i.e., the kilometer-by-kilometer approach *underestimates* what is actually present).

Table 8\*  
**Comparison of "Continuous" Shoreline Statistics with "KM by KM" Statistics  
 by Reach for Parallel Shoreline Protection on Lake Ontario Within CND7**

Reach #	Shore Type	KM by KM SHORELINE		CONTINUOUS SHORELINE		Change Factor	Distance Factor
		Length	% of Reach	Length	% of Reach		
1605	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1606	201	100.0	10.0%	123.5	12.4%	1.24	23.52
	400	900.0	90.0%	876.5	87.6%	0.97	-23.52
1607	202	800.0	80.0%	356.5	35.6%	0.45	-443.54
	302	0.0		46.4	4.6%		46.36
	400	200.0	20.0%	597.2	59.7%	2.99	397.17
1608	202	480.0	48.0%	512.8	51.3%	1.07	32.79
	400	200.0	20.0%	421.0	42.1%	2.11	221.01
	Class 3	320.0	32.0%	66.2	6.6%	0.21	-253.79
1609	212	320.0	32.0%	0.0			-320.00
	400	200.0	20.0%	862.2	86.2%	4.31	662.22
	Class 3	480.0	48.0%	137.8	13.8%	0.29	-342.22
1610	202	0.0		527.1	52.7%		527.14
	302	1,000.0	100.0%	0.0			-1000.00
	400	0.0		472.9	47.3%		472.86

\*Note: Full table presented in Appendix 1.

Distance factors have also been summarized on a shore unit basis by shore protection type. These are presented in Table 9. Generally, this provides an indication of the accuracy of the kilometer by kilometer classification methodology over a broader reach of shoreline. For example, if looking at Shore Protection Type 201 in Table 9, we can see that over the entire Shore Unit, the kilometer approach overestimates the total amount of this type of protection by





**Table 9 – Distance Factor Summary by Shore Protection Type, CND7 Shore Unit**

REACH #	SHORE PROTECTION TYPE									
	201	202	211	212	282	302	361	400	Class 3	999
1605								0.00		
1606	23.52							-23.52		
1607		-443.54				46.36		397.17		
1608		32.79						221.01	-253.79	
1609					-320.00			662.22	-342.22	
1610		527.14				-1000.00		472.86		
1611			28.67					-224.47	195.80	
1612					-60.00			-52.40	112.40	
1613		32.28			-68.54			88.39	-52.12	
1614	70.20	-20.00	62.89		-14.13			-142.87	43.91	
1615	30.75							-30.75		
1616		108.51	292.17		-100.00		7.00	-530.34		222.67
1617								-1000.00		1000.00
1618								-1000.00		1000.00
1619								-1000.00		1000.00
1620								-1000.00	19.79	980.21
1621	64.87		750.79		-800.00		12.33	-28.84	0.86	
1622	80.52		-37.17					-43.35		
1623								0.00		
1624								0.00		
1625	39.50							-39.50		
1626			190.87					-334.77	143.90	
1627	-100.00		57.31					-58.71	101.40	
1628	382.08		-382.08							
1629	105.60		-105.60							
1630	0.00									
1631	-7.28							4.37	2.91	
1632								-7.72	7.72	
1633					-60.00			25.28	34.73	
1634								0.00		
1635			12.23					-51.08	38.85	
1636			13.21			208.17		543.55	-764.94	
1637		114.88			-33.49			-367.16	285.77	
1638					25.02			-178.80	153.77	
1639		106.08	51.89		176.21			-41.29	77.10	
1640					9.60			-30.39	20.79	
1641								-37.50	37.50	
1642								0.00		
1643								0.00		
1644								-27.47	27.47	
1645		40.57						-40.57		
1646								0.00		
1647								0.00		
1648								0.00		
1649								-286.62	286.62	
1650		-116.90			-500.00			532.50	84.40	
1651	-20.65		368.84		-500.00		26.77	100.71	24.33	
1652			238.09		10.44		18.84	732.62	-1000.00	
1653		588.21	-689.39				6.35	-41.83		136.66
1654		-500.00	605.51					-105.51		
1655			-2.55					2.55		
1656			15.60					-15.60		
1657								0.00		
1658					33.99			946.01	-980.00	
1659		22.88	22.32		-120.00			-5.52	80.32	
1660								0.00		
1661								0.00		
1662					15.12			-15.12		
1663					64.54			760.83	-825.37	
1664					121.04		125.03	688.68	-934.76	
1665		32.15	35.41		-138.68			220.67	-149.55	
1666			-7.46					7.46		
1667			-257.81				17.97	45.02	194.83	
1668		-62.11	-265.57					42.43	285.25	
1669	-200.00	216.74						-16.74		
1670								0.00		
1671								0.00		
1672								0.00		
1673			154.97					845.03	-1000.00	
1674								0.00		
1675								0.00		
1676								0.00		
1677								0.00		
1678								0.00		
1679	138.27		-400.00					261.73		
1680	-384.33							384.33		
1681								0.00		
1682								0.00		
1683	-83.65							83.65		
1684	-513.13	49.50			44.89			376.58	42.16	
1685		56.37			-41.14			-423.59	408.35	
1686	91.65				120.97			-348.75	136.12	
1687		35.75						805.74	-841.49	
1688								1000.00	-1000.00	
1689								0.00		
1690								-62.33	62.33	
1691								0.00		
1692								0.00		
1693								0.00		
1694	83.66	59.87	82.53					609.08	-835.15	
1695	191.52	43.95						708.71	-944.19	
1696								0.00		
1697								0.00		
1698								0.00		
1699								0.00		
1700								0.00		
1701								0.00		
1702					-8.80			8.80		
1703						12.82		-12.82		
1704								0.00		
1705								0.00		
1706								0.00		
<b>Count:</b>	20	21	26	24	1	4	6	99	41	6
<b>Sum:</b>	-7	925	836	-2,143	13	-620	89	3,582	-7,014	4,340
<b>Average:</b>	-0.34	44.05	32.14	-89.29	12.82	-155.11	14.88	36.18	-171.08	723.26
<b>Max:</b>	382.08	588.21	750.79	176.21	12.82	208.17	26.77	1000.00	408.35	1000.00
<b>Min:</b>	-513.13	-500.00	-689.39	-800.00	12.82	-1000.00	6.35	-1000.00	-1000.00	136.66
<b>Median:</b>	35.13	40.57	25.50	-23.81	12.82	85.70	15.15	0.00	27.47	990.11
<b>SD:</b>	194.06	239.66	296.16	226.35		567.12	7.85	359.93	447.54	422.01



only 7 meters, or an average of 0.34 meters per kilometer. On the other hand, for Type 302, the kilometer approach overestimates the total amount of this protection by 620 meters, or an average of 155.1 meters per kilometer.

These statistics are now being utilized by Baird to conduct detailed analyses of shore protection in each reach within the study area.

### ***Shore Perpendicular (Offshore) Protection Structures***

Summary statistics for shore perpendicular protection structures in the CND7 shore unit are presented in Table 10 and Figure 6. These statistics again reflect the limited development in this Shore Unit. The most predominant structures are marina slips, boat docks, jetties, private docks and commercial/industrial docks associated with some of the major harbors (Whitby, Oshawa, Newcastle) located in this stretch. Other than jetty structures associated with these harbors and other industrial locations, there are very few perpendicular structures actually extending into Lake Ontario in this Shore Unit.

**Table 10**  
STATISTICS FOR CND7 OFFSHORE PROTECTION TYPES

Offshore Protection Type	Occurrences of Type	Minimum Length	Maximum Length	Average Length	Total Length	Total Berths
221	2	20.1	59.3	39.7	79.4	n/a
222	3	12.3	20.6	17.1	51.4	n/a
223	3	12.4	21.8	15.8	47.5	n/a
231	7	68.0	1,003.0	426.2	2,983.5	n/a
233	2	194.0	207.0	200.5	401.0	n/a
241	9	47.1	2,441.0	424.9	3,823.9	n/a
321	1	47.0	47.0	47.0	47.0	4
322	21	6.4	37.7	15.1	316.1	23
323	1	23.0	23.0	23.0	23.0	0
331	110	6.6	489.5	81.1	8,920.5	1156
332	24	8.8	47.3	13.3	318.8	48
341	7	15.5	229.2	109.8	768.7	3
343	5	9.1	25.5	14.7	73.4	0
352	4	20.3	29.2	23.4	93.5	12
<b>Groins (221, 222, 223):</b>	<b>8</b>	<b>12.3</b>	<b>59.3</b>	<b>22.3</b>	<b>178.3</b>	<b>n/a</b>
<b>Jetties (231, 232, 233):</b>	<b>9</b>	<b>68.0</b>	<b>1,003.0</b>	<b>376.1</b>	<b>3,384.5</b>	<b>n/a</b>
<b>Boat Docks - private (321, 322, 323):</b>	<b>23</b>	<b>6.4</b>	<b>47.0</b>	<b>16.8</b>	<b>386.1</b>	<b>27</b>
<b>Boat Docks - marina (331, 332, 333):</b>	<b>134</b>	<b>6.6</b>	<b>489.5</b>	<b>69.0</b>	<b>9,239.3</b>	<b>1,204</b>
<b>Commercial/Industrial Docks/Piers/Wharves (341, 342, 343):</b>	<b>12</b>	<b>9.1</b>	<b>229.2</b>	<b>70.2</b>	<b>842.1</b>	<b>3</b>



CND7 Shore Perpendicular Protection

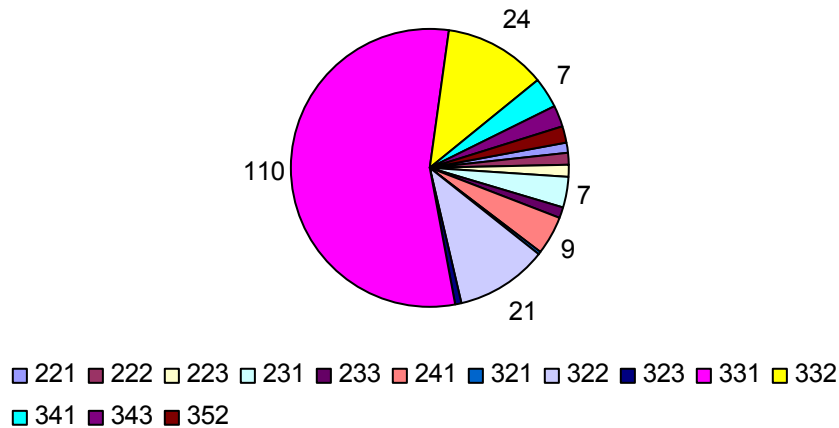


Figure 6 – CND7 Shore Perpendicular Protection Summary (Numbers on Graph represent number of occurrences in Shore Unit).

### 4.3.3 US4 – Chimney Bluffs

#### Shore Parallel Protection Structures

Summary statistics for shore parallel protection occurring in the US4 Shore Unit are presented in Table 11 and represented graphically in Figure 7. The statistics reveal that approximately 55% of this shoreline is unprotected. Where there is protection, medium quality seawalls (212) predominate (17%), followed by poor quality, ad-hoc concrete structures (303). The majority of the shore protection occurs in the embayments that are found in this Shore Unit (Sodus Bay, East Bay, Port Bay, Blind Sodus Bay and Little Sodus Bay) with very little shore protection found on the open Lake Ontario coastline.

Table 11 - Total Lengths of Parallel Shore Protection – US4 Shore Unit

SP Type	Length	Percent of Shore Unit
201	1920.4	1.05%
202	8560.6	4.68%
203	2518.4	1.38%
211	3146.4	1.72%
212	30820.8	16.85%
213	140	0.08%
303	22958.5	12.55%
313	8204	4.49%
361	86.8	0.05%
362	78.2	0.04%
363	8	0.00%
400	100057.1	54.71%
999	4400.5	2.41%



### US4 Parallel Shore Protection Summary

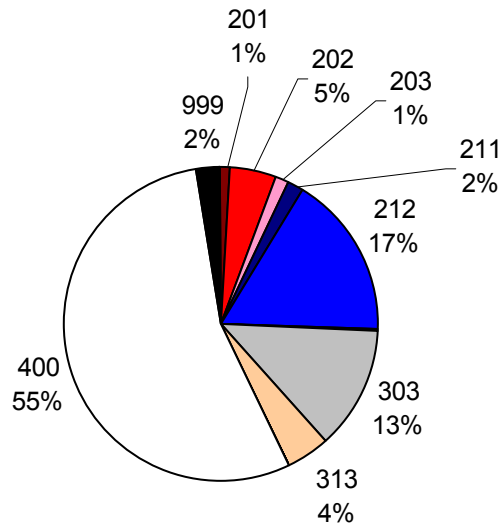


Figure 7 – US4 Shore Parallel Protection Summary

#### Comparison of Shore Parallel With Kilometer-by-Kilometer Classification

Table 12 presents an example of the reach by reach comparison that was completed using the new continuous mapping and the weighted measurements for the kilometer-by-kilometer classification (see Section 4.3 above). The full table for the entire US4 shore unit is presented in Appendix 1 of this report. In this table, “change factors” were calculated by dividing the “continuous” shoreline lengths by the “kilometer” shoreline lengths. The “distance factors” (in meters) were calculated by subtracting the “kilometer” lengths from the “continuous” lengths. In calculating these, all Class 3 structures were grouped together for analysis as their specific lengths could not be calculated in the “kilometer” classification. In reading this table, a change factor of less than 1 and a distance factor that is negative indicates that the length of the shore protection measured in the continuous mapping is less than what was estimated from the kilometer-by-kilometer classification (i.e., the kilometer by kilometer approach *overestimates* what is actually present). Conversely, a change factor of greater than 1 and a positive distance factor indicates that the length of shore protection measured in the continuous mapping is greater than what was estimated from the kilometer-by-kilometer mapping (i.e., the kilometer-by-kilometer approach *underestimates* what is actually present).



**Table 12\***  
**Comparison of "Continuous" Shoreline Statistics with "KM by KM" Statistics**  
**by Reach for Parallel Shoreline Protection on Lake Ontario Within US4**

Reach #	Shore Type	KM by KM SHORELINE		CONTINUOUS SHORELINE		Change Factor	Distance Factor	
		Length	% of Reach	Length	% of Reach			
780	400	1,000	100.0%	770.7	77.1%	0.77	-229.3	
	999	0	0.0%	229.3	22.9%		229.3	
781	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0	
782	400	1,000	100.0%	964.5	96.5%	0.96	-35.5	
	Class 3	0	0.0%	35.5	3.5%		35.5	
783	400	1,000	100.0%	954.4	95.4%	0.95	-45.6	
	Class 3	0	0.0%	45.6	4.6%		45.6	
784	212	100	10.0%	44.8	4.5%	0.45	-55.2	
	400	900	90.0%	925.7	92.6%		1.03	25.7
	Class 3	0	0.0%	29.5	3.0%		29.5	
785	212	100	10.0%	9.6	1.0%	0.10	-90.4	
	400	900	90.0%	948.5	94.9%		1.05	48.5
	Class 3	0	0.0%	41.9	4.2%		41.9	
786	212	100	10.0%	0.0	0.0%	1.11	-100.0	
	400	900	90.0%	1,000.0	100.0%		100.0	

Note: Full Table is presented in Appendix 1.

Distance factors have also been summarized on a shore unit basis by shore protection type. These are presented in Table 13. Generally, this provides an indication of the accuracy of the kilometer by kilometer classification methodology over a broader reach of shoreline. For example, if looking at Shore Protection Type 201 in Table 13 we can see that over the entire Shore Unit, the kilometer approach underestimates the total amount of this type of protection by 1120 meters, or an average of 101 meters per kilometer. These statistics are now being utilized by Baird to conduct detailed analyses of shore protection in each reach within the study area.

### ***Shore Perpendicular (Offshore) Protection Structures***

Summary statistics for shore perpendicular protection structures in the US4 shore unit are presented in Table 14 and Figure 8. Once again, marina and boat docks predominate the Shore Unit, with many of these located in the Sodus Bay area.



**Table 13 – Distance Factor Summary by Shore Protection Type, US4 Shore Unit**

REACH #	SHORE PROTECTION TYPE									
	201	202	211	212	302	361	362	400	Class 3	999
780								-229.3		229.3
781								0.0		
782								-35.5	35.5	
783								-45.6	45.6	
784				-55.2				25.7	29.5	
785				-90.4				48.5	41.9	
786				-100.0				100.0		
787								0.0		
788				12.4				-12.4		
789								0.0		
790								0.0		
791	288.8							-288.8		
792	61.4	-420.0	-99.7	50.8				407.5		
793		-300.0						500.0	-200.0	
794								0.0		
795								0.0		
796								0.0		
797								0.0		
798								0.0		
799								0.0		
800								0.0		
801								0.0		
802								0.0		
803								0.0		
804								0.0		
805	-411.0		180.7	80.1				150.1		
806			82.2			20.0		-102.1		
807		-390.0	28.6	429.5				-68.1		
808		-213.2		135.4				27.5	50.3	
809		-390.0	88.2	512.6				-265.3	54.4	
810		-347.7	45.4	342.3				-175.6	135.6	
811		-370.7		183.7				112.9	74.2	
812		-390.0		80.3				-36.5		
813		-390.0		-29.0			10.9	242.6	176.5	335.2
814		-320.0		171.6				148.4		
815		-400.0		-290.6				43.1	647.5	
816		-600.0	106.6	143.8				349.5		
817			-84.5					84.5		
818								0.0		
819								0.0		
820				144.7				-398.2	253.5	
821			57.0					-83.6	-200.0	
822				-160.0				-171.9	-46.1	377.9
823				-140.8				42.6	98.2	
824				-52.8				-10.1		
825		62.9						0.0		
826								0.0		
827								0.0		
828								0.0		
829								0.0		
830								-34.4	34.4	
831								0.0		
832								0.0		
833								-14.9	16.1	
834		-1.2		-31.1				101.3		
835		88.1		-100.3				-300.0	312.1	
836		-201.2		-175.1			12.7	144.8	218.8	
837		-245.9		166.3			6.2	-187.7	261.1	
838		6.8		182.6				-189.4		
839		11.0						-11.0		
840		-254.8		154.0		13.2		-45.2		132.8
841		-400.0		-237.3				10.9		626.4
842		-400.0	138.6	-302.9				216.0	348.3	
843		-400.0	104.9	-129.2				381.5	42.8	
844		-400.0		133.3				266.7		
845		-400.0		-23.3				207.0	216.2	
846	134.5		123.8	66.0				-324.3		
847	454.7	-200.0						-254.7		
848								-27.3		
849								0.0	27.3	
850		224.3		22.4				-270.6	24.0	
851								0.0		
852				122.8				-184.6	61.8	
853				31.0				-181.9	150.9	
854								0.0		
855								0.0		
856								0.0		
857								0.0		
858		-400.0		-280.1				596.1	84.0	
859		-320.0		-163.2				285.7	197.4	
860		20.1						-81.8	61.7	
861								0.0		
862								0.0		
863								0.0		
864	220.2							-241.8	21.6	
865		48.7		13.5				-859.2	797.0	
866								-1,000.0	1,000.0	
867		-140.0		-169.3				-265.7	575.0	
868								498.2	501.8	
869		38.2		122.0				839.8	-1,000.0	
870				259.2				-87.9	-180.0	
871		100.9	65.0	25.7			8.7	-215.1	23.5	
872		-40.6	30.4	-415.8				198.4	227.6	
873				541.4				-406.9	-134.5	
874				397.1				-97.1	-300.0	
875				33.2				266.8	-300.0	
876	143.0	-177.0	6.4	109.5			8.9	-234.3	143.5	
877	69.2	-42.6		236.4				-263.0		
878								0.0		
879								0.0		
880	42.1		205.6	-428.4		9.9		490.9	-320.0	
881		121.7		-118.4				73.3	-76.6	
882				501.0				-221.0	-280.0	
883		94.5		-187.0				199.2	-106.7	
884		82.7		-377.9				409.5	-114.4	
885		128.6		-569.3					-400.0	840.7
886								-925.3	925.3	
887				38.2				-38.2		
888		76.8	46.4	352.4				-475.6		
889		-400.0	-600.0	960.1		9.7		30.2		
890		-382.0	-311.6	417.3			13.9	128.1	134.3	
891		-237.6	-184.6	210.4			15.0	196.8		
892			-816.8	791.0			10.1	15.7		
893			-881.3	743.8					137.4	
894		-360.0	267.6					-197.6	279.9	
895			27.3					-92.0	25.5	
896		78.2	117.5					-311.3	115.7	
897			-160.0					162.3	237.7	
898				-240.0				-882.7		932.7
899				-50.0						
<b>Count:</b>	11.0	49.0	24.0	64.0	1.0	7.0	7.0	115.0	56.0	8.0
<b>Sum:</b>	1,120.3	-8,942.1	-1,373.7	4,227.0	-1,000.0	86.8	78.2	-3,125.4	4,528.5	4,400.5
<b>Average:</b>	101.8	-182.5	-57.2	66.0	-1,000.0	12.4	11.2	-27.2	80.9	550.1
<b>Max:</b>	454.7	224.3	267.6	960.1	-1,000.0	20.0	15.7	839.8	1,000.0	932.7
<b>Min:</b>	-411.0	-600.0	-881.3	-569.3	-1,000.0	8.9	6.2	-1,000.0	-1,000.0	132.8
<b>Median:</b>	78.2	-213.2	45.9	35.7	-1,000.0	10.1	10.9	0.0	58.0	502.2
<b>SD:</b>	212.1	212.0	302.6	290.7		4.0	3.2	266.7	298.1	323.0



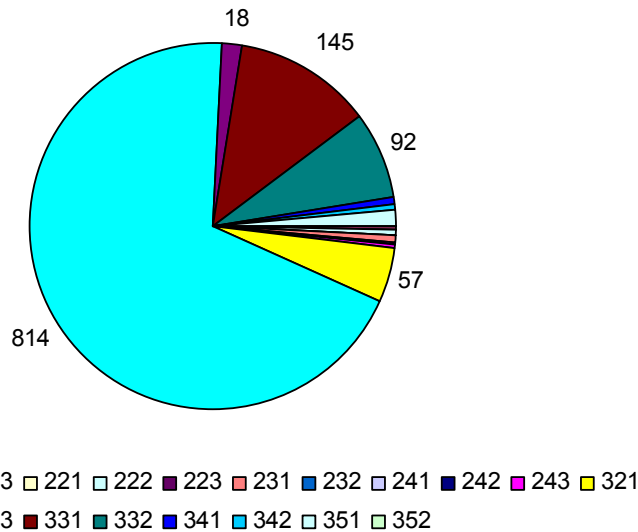
**Table 14**  
**Offshore Protection Statistics by Type for Shoreline Protection on Lake Ontario Within US4**

Offshore Type	Occurrences of Type	Within Distinct # of Reaches	Average Length	Minimum Length	Maximum Length	Total # of Berths	Average # of Berths
211	1	1	30.6	30.6	30.6	n/a	n/a
213	1	1	24.4	24.4	24.4	n/a	n/a
221	2	2	110.5	105.5	115.4	n/a	n/a
222	5	1	9.1	7.2	10.9	n/a	n/a
223	1	1	23.5	23.5	23.5	n/a	n/a
231	6	6	981.8	75.9	2,157.7	n/a	n/a
232	2	1	79.6	32.6	126.6	n/a	n/a
241	1	1	148.5	148.5	148.5	n/a	n/a
242	2	1	105.0	61.7	148.3	n/a	n/a
243	2	2	95.7	51.6	139.7	n/a	n/a
321	57	22	35.6	8.5	251.8	203	3.6
322	814	56	17.4	4.0	68.3	1,793	2.2
323	18	14	12.7	5.1	34.6	16	0.9
331	145	15	84.9	5.7	854.8	1,571	10.8
332	92	8	12.8	4.9	114.6	202	2.2
341	6	3	54.1	5.9	137.0	28	4.7
342	7	2	25.7	5.6	123.1	15	2.1
351	15	7	20.6	5.6	55.3	37	2.5
352	1	1	14.8	14.8	14.8	2	2.0
<b>TOTAL:</b>	<b>1,178</b>					<b>3,867</b>	

**SUMMARY STATISTICS:**

Groins (221, 222, 223):	8
Jetties (231, 232, 233):	8
Boat Docks - private (321, 322, 323):	889
Boat Docks - marina (331, 332, 333):	237
Commercial/Industrial Docks/Piers/Wharves (341, 342, 343):	13

US4 Shore Perpendicular Protection



**Figure 8 – US4 Shore Perpendicular Protection Summary (Numbers on Graph represent number of occurrences in Shore Unit).**



#### 4.3.4 US7 – Eastern Lake Ontario Sand Dunes

##### **Shore Parallel Protection Structures**

Summary statistics for shore parallel protection occurring in the US7 Shore Unit are presented in Table 15 and represented graphically in Figure 9. The statistics reveal that almost 75% of this shoreline is unprotected. This includes some of the lakeward facing sand dune areas, as well as the shorelines of a number of the smaller ponds in this Shore Unit (Lakeview, Floodwood, South and North Colwell, and Goose) as well as portions of Sandy Creek and the Salmon River. Where shore protection is dominant (North and South Ponds and south of the Salmon River), medium quality seawalls (212) predominate (5%), followed by a fairly even distribution of medium to poor quality revetments (202, 203) and ad-hoc concrete structures (303).

**Table 15 - Total Lengths of Parallel Shore Protection – US7 Shore Unit**

<b>SP Type</b>	<b>Count</b>	<b>Length</b>	<b>Percent of Shore Unit</b>
201	5	95.97	0.08
202	36	3562.08	3.07
203	54	4024.24	3.47
211	18	1514.85	1.31
212	90	5357.85	4.62
213	27	1307.10	1.13
303	45	3535.06	3.05
313	6	956.41	0.82
361	2	17.00	0.01
362	6	48.64	0.04
363	2	33.15	0.03
400	150	84766.43	73.07
999	2	10781.08	9.29
		115999.86	100.00

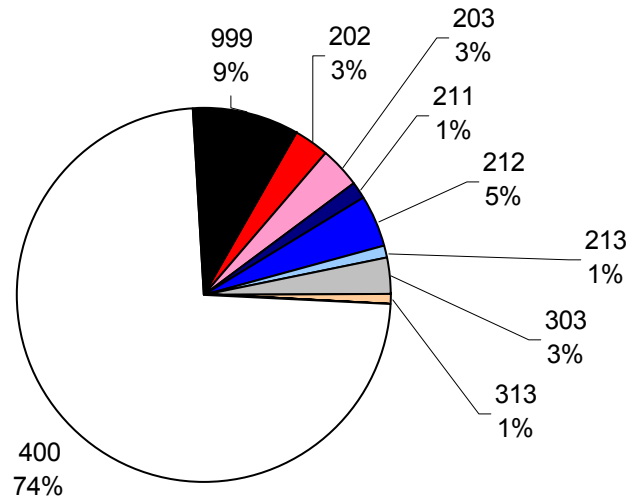
##### **Comparison of Shore Parallel With Kilometer-by-Kilometer Classification**

Table 16 presents an example of the reach by reach comparison that was completed using the new continuous mapping and the weighted measurements for the kilometer-by-kilometer classification (see Section 4.3 above). The full table for the entire US7 shore unit is presented in Appendix 1 of this report. In this table, “change factors” were calculated by dividing the “continuous” shoreline





## US7 Parallel Shore Protection Summary



**Figure 9 – US7 Shore Parallel Protection Summary**

**Table 16**  
**Comparison of "Continuous" Shoreline Statistics with "KM by KM" Statistics**  
**by Reach for Parallel Shoreline Protection on Lake Ontario Within US7**

Reach #	Shore Type	KM by KM SHORELINE		CONTINUOUS SHORELINE		Change Factor	Distance Factor
		Length	% of Reach	Length	% of Reach		
618	211	0	0%	157.2	15.7%	2.06	157.15
	212	600	60%	0.0	0.0%		-600.00
	400	400	40%	822.6	82.3%		422.59
	777	0	0%	20.3	2.0%		20.26
619	400	1,000	100%	1,000.0	100.0%	1.00	0.00
620	400	1,000	100%	1,000.0	100.0%	1.00	0.00
621	400	1,000	100%	1,000.0	100.0%	1.00	0.00
622	400	1,000	100%	1,000.0	100.0%	1.00	0.00
623	212	0	0%	13.6	1.4%	0.91	13.57
	400	1,000	100%	910.0	91.0%		-90.03
	777	0	0%	76.5	7.6%		76.45
624	212	0	0%	314.5	31.5%	0.35	314.54
	400	1,000	100%	346.3	34.6%		-653.69
	777	0	0%	339.1	33.9%		339.15
625	400	1,000	100%	920.4	92.0%	0.92	-79.59
	777	0	0%	79.6	8.0%		79.59
626	212	0	0%	65.2	6.5%	0.81	65.20
	400	1,000	100%	809.5	81.0%		-190.46
	777	0	0%	125.3	12.5%		125.27
627	202	0	0%	90.0	9.0%	0.91	90.00
	400	1,000	100%	910.0	91.0%		-90.00



lengths by the “kilometer” shoreline lengths. The “distance factors” (in meters) were calculated by subtracting the “kilometer” lengths from the “continuous” lengths. In calculating these, all Class 3 structures were grouped together for analysis as their specific lengths could not be calculated in the “kilometer” classification. In reading this table, a change factor of less than 1 and a distance factor that is negative indicates that the length of the shore protection measured in the continuous mapping is less than what was estimated from the kilometer-by-kilometer classification (i.e., the kilometer by kilometer approach *overestimates* what is actually present). Conversely, a change factor of greater than 1 and a positive distance factor indicates that the length of shore protection measured in the continuous mapping is greater than what was estimated from the kilometer-by-kilometer mapping (i.e., the kilometer-by-kilometer approach *underestimates* what is actually present).

Distance factors have also been summarized on a shore unit basis by shore protection type. These are presented in Table 17. Generally, this provides an indication of the accuracy of the kilometer by kilometer classification methodology over a broader reach of shoreline. For example, if looking at Shore Protection Type 201 in Table 17, we can see that over the entire Shore Unit, the kilometer approach underestimates the total amount of this type of protection by 96 meters, or an average of 24 meters per kilometer. These statistics are now being utilized by Baird to conduct detailed analyses of shore protection in each reach within the study area.

### ***Shore Perpendicular (Offshore) Protection Structures***

Summary statistics for shore perpendicular protection structures in the US7 shore unit are presented in Table 18 and Figure 10. These statistics show that this Shore Unit is dominated by a range of both private and marina boat docks, the majority of which are located in the sheltered pond areas, particularly North and South Pond and the mouth of the Salmon River. In fact, except for the jetties at the mouth of the Salmon River and a few isolated groins to the south of the Shore Unit, there are no other shore perpendicular structures extending into Lake Ontario.



**Table 17 – Distance Factor Summary by Shore Protection Type, US7 Shore Unit**

REACH #	SHORE PROTECTION TYPE									
	201	202	211	212	282	361	362	400	Class 3	999
618			157.15	-600.00				422.59	20.26	
619								0.00		
620								0.00		
621								0.00		
622					13.57			-90.03	76.45	
623					314.94			-653.69	339.15	
624								-79.59	79.59	
625					65.20			-190.46	125.27	
626								-90.00		
627		90.00						0.00		
628								0.00		
629								0.00		
630								0.00		
631								0.00		
632								0.00		
633								0.00		
634								0.00		
635								0.00		
636								0.00		
637								0.00		
638								-10.13	10.13	
639								0.00		
640								0.00		
641								0.00		
642								0.00		
643								0.00		
644								0.00		
645								0.00		
646								0.00		
647								0.00		
648								0.00		
649								0.00		
650								0.00		
651								0.00		
652								0.00		
653								0.00		
654								0.00		
655								0.00		
656								0.00		
657								0.00		
658								0.00		
659								0.00		
660								0.00		
661		174.22						-494.03	319.82	
662								-479.69	479.69	
663								-48.46	48.46	
664								0.00		
665								0.00		
666								-61.69	61.69	
667				125.32				-258.58	133.26	
668		78.36		54.20				-305.05	172.49	
669			-138.71	14.64				124.07		
670			-300.00	184.13		11.22		13.78	52.76	
671		-301.62	-600.00	85.36				165.00	651.26	
672		61.29	-500.00	259.14				179.57		
673			-370.89					49.46		321.43
674		-308.99	29.47	-231.38				120.79	390.10	
675		-347.60	268.56	-270.92				349.95		
676				-87.81				50.62	-6.39	
677				-240.00				3.84	233.33	
678			136.27	-53.16				-336.76	193.59	
679			38.98	-41.66				-211.16	128.50	
680				503.10		10.39		-624.95	2.61	
681				-62.98			19.23	-35.06	-8.63	
682	13.39	87.48		-26.47			5.80	-279.78	306.25	
683		59.80		-43.06				15.22	-31.96	
684		63.06		-232.59				198.56	-29.03	
685								0.00		
686		97.58	58.23	138.17				-293.98		
687			119.45	108.70				-240.88	14.72	
688	14.03			68.88				-164.11	81.19	
689				40.54				-40.54		
690								0.00		
691								0.00		
692		-299.09						248.43	50.66	
693		-342.73						363.47	-20.74	
694	42.90	-38.68						-178.10	173.88	
695		72.95		114.37	-15.00		7.09	-651.10	471.70	
696				75.97	-375.00			458.38	-159.36	
697					-600.00			600.00		
698								0.00		
699								-322.03	322.03	
700		31.25	146.69	-96.34		6.60	5.31	352.61	-446.13	
701		-40.00		160.29				-60.29	-60.00	
702		-40.00	68.22	132.23				-100.46	-60.00	
703								0.00		
704								0.00		
705								-784.17		784.17
706								-1,000.00		1,000.00
707								-1,000.00		1,000.00
708								-1,000.00		1,000.00
709								-1,000.00		1,000.00
710								-1,000.00		1,000.00
711								-1,000.00		1,000.00
712								-1,000.00		1,000.00
713								-1,000.00		1,000.00
714								-1,000.00		1,000.00
715								-342.06		342.06
716								0.00		
717			41.21					-41.21		
718								0.00		
719				16.60				-16.60		
720		15.17		-191.34				576.18	-400.00	
721		106.65		125.46				-336.86	104.75	
722		1,000.00						-1,000.00		
723		-533.49						533.49		
724								0.00		
725								0.00		
726								0.00		
727								0.00		
728				163.03				-254.62	91.60	
729			40.21	67.10				-482.71	375.39	
730		-20.00		281.78				-389.01	127.23	
731		-768.20						409.18	359.02	
732	25.65	95.05						-544.47	423.77	
733								-725.62	70.66	654.96
<b>Count:</b>	4	30	16	36	3	2	5	116	44	12
<b>Sum:</b>	96	-788	-805	933	-990	17	49	-14,883	5,590	10,781
<b>Average:</b>	23.99	-26.27	-50.32	25.91	-330.00	8.50	9.73	-128.30	127.06	898.43
<b>Max:</b>	42.90	1000.00	268.56	503.10	-15.00	10.39	19.23	600.00	651.26	1000.00
<b>Min:</b>	13.39	-768.20	-600.00	-600.00	-600.00	6.60	5.31	-1000.00	-446.13	342.06
<b>Median:</b>	19.84	40.84	40.71	59.70	-375.00	8.50	7.09	0.00	86.40	1000.00
<b>SD:</b>	13.80	292.78	255.76	196.27	295.08	2.68	5.80	357.57	213.15	207.74



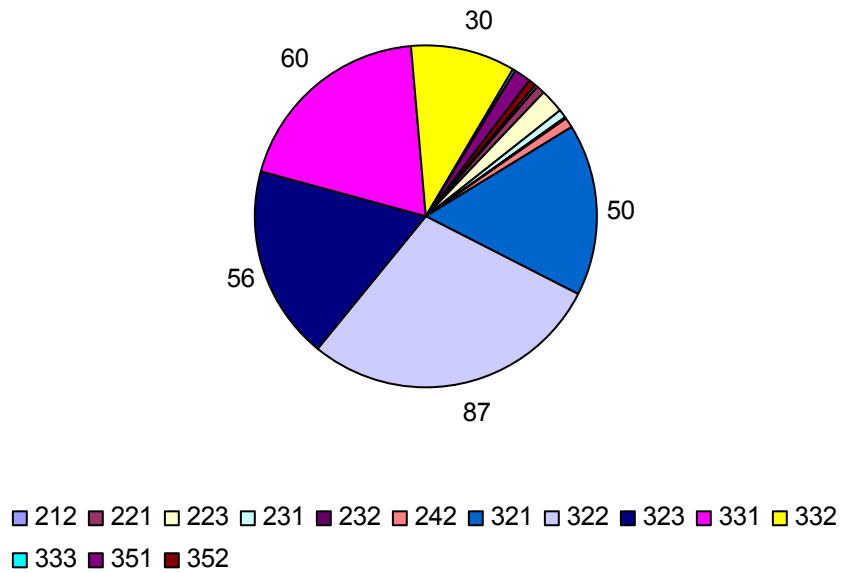
**Table 18**  
**Offshore Protection Statistics by Type for Shoreline Protection on Lake Ontario Within US7**

Offshore Type	Occurrences	Within Distinct # of Reaches	Average Length	Minimum Length	Maximum Length	Total # of Berths	Average # of Berths
212	1	1	13.5	13.5	13.5	0	0.0
221	2	1	105.3	84.3	126.3	0	0.0
223	7	4	9.8	4.7	18.1	0	0.0
231	3	2	136.4	77.6	225.5	0	0.0
232	1	2	105.1	105.1	105.1	0	0.0
242	2	2	369.2	236.8	501.6	0	0.0
321	50	16	27.5	5.2	118.5	134	2.7
322	87	23	14.6	2.9	64.1	140	1.6
323	56	16	7.7	3.9	28.9	40	0.7
331	60	5	23.1	6.1	208.5	234	3.9
332	30	3	12.4	5.4	130.0	70	2.3
333	1	1	5.2	5.2	5.2	0	0.0
351	5	4	12.7	6.8	30.8	6	1.2
352	2	2	7.4	7.3	7.4	2	1.0
<b>TOTAL:</b>	<b>307</b>					<b>626</b>	

**SUMMARY STATISTICS:**

Groins (221, 222, 223):	9
Jetties (231, 232, 233):	4
Boat Docks - private (321, 322, 323):	193
Boat Docks - marina (331, 332, 333):	91
Commercial/Industrial Docks/Piers/Wharves (341, 342, 343):	0

US7 Shore Perpendicular Protection



**Figure 10 – US7 Shore Perpendicular Protection Summary (Numbers on Graph represent number of occurrences in Shore Unit).**



## **REFERENCES**

Stewart, C.J., 2002. A Revised Geomorphic, Shore Protection and Nearshore Classification of the Canadian and United States Shorelines of Lake Ontario and the St. Lawrence River. Task Summary Report, Coastal Task Working Group, International Joint Commission Lake Ontario – St. Lawrence River Water Level Study, 23pp., plus Appendices.



**APPENDIX 1 – Detailed Shore Protection Change and Distance Factor  
Tables**



**Comparison of "Continuous" Shoreline Statistics with "KM by KM" Statistics  
by Reach for Parallel Shoreline Protection on Lake Ontario Within CND1**

Reach #	Shore Type	KM by KM SHORELINE		CONTINUOUS SHORELINE		Change Factor	Distance Factor
		Length	% of Reach	Length	% of Reach		
1214	400	1000	100%		0.0%	0.00	-1000
	999		0%	1000.0	100.0%		1000
1215	400	1000	100%		0.0%	0.00	-1000
	999		0%	1000.0	100.0%		1000
1216	202	120	12%		0.0%	0.00	-120
	211	80	8%		0.0%	0.00	-80
	400	800	80%		0.0%	0.00	-800
	999		0%	1000.0	100.0%		1000
1217	400	1000	100%		0.0%	0.00	-1000
	999		0%	1000.0	100.0%		1000
1218	400	1000	100%		0.0%	0.00	-1000
	999		0%	1000.0	100.0%		1000
1219	400	1000	100%		0.0%	0.00	-1000
	999		0%	1000.0	100.0%		1000
1220	400	1000	100%		0.0%	0.00	-1000
	999		0%	1000.0	100.0%		1000
1221	400	1000	100%		0.0%	0.00	-1000
	999		0%	1000.0	100.0%		1000
1222	400	1000	100%		0.0%	0.00	-1000



	999		0%	1000.0	100.0%		1000	
1223	400	1000	100%	989.7	99.0%	0.99	-10	
	999		0%	10.3	1.0%		10	
1224	400	1000	100%	1000.0	100.0%	1.00	0	
1225	400	1000	100%	1000.0	100.0%	1.00	0	
1226	400	1000	100%	1000.0	100.0%	1.00	0	
1227	201		0%	132.6	13.3%	0.47	133	
	202		0%	78.6	7.9%		79	
	211	1000	100%	469.6	47.0%		-530	
	361		0%	71.0	7.1%		71	
	400		0%	248.1	24.8%		248	
1228	211	500	50%	691.6	69.2%	1.38	192	
	212		0%	49.8	5.0%		50	
	302		0%	37.8	3.8%		38	
	400	500	50%	220.7	22.1%	0.44	-279	
1229	202	600	60%	229.0	22.9%	0.38	-371	
	211		0%	387.7	38.8%		388	
	212	400	40%		0.0%	0.00	-400	
	400		0%	383.3	38.3%		383	
1230	202	300	30%	681.1	68.1%	2.27	381	
	212	200	20%	165.7	16.6%	0.83	-34	
	400	500	50%	153.2	15.3%	0.31	-347	
1231	201		0%	90.9	9.1%	0.47	91	
	202	480	48%	223.9	22.4%		-256	
	212	320	32%	225.7	22.6%		0.71	-94
	400	200	20%	205.4	20.5%		1.03	5
	Class 3		0%	254.0	25.4%			254
1232	400	1000	100%	1000.0	100.0%	1.00	0	
1233	400	1000	100%	1000.0	100.0%	1.00	0	
1234	400	1000	100%	1000.0	100.0%	1.00	0	
1235	400	1000	100%	1000.0	100.0%	1.00	0	





1236	202		0%	56.5	5.6%		56
	212		0%	50.7	5.1%		51
	400	1000	100%	892.8	89.3%	0.89	-107
1237	201		0%	76.5	7.6%		76
	202	600	60%	458.4	45.8%	0.76	-142
	212	400	40%	100.3	10.0%	0.25	-300
	302		0%	125.5	12.6%		126
	Class 3		0%	239.3	23.9%		239
1238	202	500	50%	500.3	50.0%	1.00	0
	212	300	30%		0.0%	0.00	-300
	302		0%	368.8	36.9%		369
	362	200	20%	15.3	1.5%	0.08	-185
	400		0%	115.5	11.6%		116
1239	202	400	40%	128.7	12.9%	0.32	-271
	212		0%	78.7	7.9%		79
	302	240	24%	177.5	17.8%	0.74	-62
	362	160	16%		0.0%	0.00	-160
	400	200	20%	401.1	40.1%	2.01	201
	Class 3		0%	214.0	21.4%		214
1240	201		0%	119.9	12.0%		120
	202	320	32%	378.3	37.8%	1.18	58
	211		0%	30.4	3.0%		30
	212	240	24%	55.5	5.5%	0.23	-185
	302	160	16%	249.9	25.0%	1.56	90
	362	80	8%		0.0%	0.00	-80
	400	200	20%	84.6	8.5%	0.42	-115
	Class 3		0%	81.3	8.1%		81
1241	202	320	32%	102.8	10.3%	0.32	-217
	212	240	24%	323.5	32.4%	1.35	84
	302	160	16%	72.8	7.3%	0.45	-87
	400	200	20%	153.5	15.3%	0.77	-47



	Class 3	80	8%	347.4	34.7%	4.34	267
1242	202		0%	124.0	12.4%		124
	212	360	36%	136.4	13.6%	0.38	-224
	302		0%	240.9	24.1%		241
	400	400	40%	245.9	24.6%	0.61	-154
	Class 3	240	24%	252.8	25.3%	1.05	13
1243	202	500	50%	102.4	10.2%	0.20	-398
	211		0%	67.4	6.7%		67
	212		0%	110.2	11.0%		110
	302	300	30%	127.0	12.7%	0.42	-173
	362		0%	7.7	0.8%		8
	400		0%	430.7	43.1%		431
	Class 3	200	20%	154.7	15.5%	0.77	-45
1244	400	1000	100%	1000.0	100.0%	1.00	0
1245	212		0%	7.9	0.8%		8
	302	200	20%		0.0%	0.00	-200
	400	800	80%	671.3	67.1%	0.84	-129
	Class 3		0%	320.7	32.1%		321
1246	201		0%	285.4	28.5%		285
	202	300	30%	81.8	8.2%	0.27	-218
	212	225	23%	40.6	4.1%	0.18	-184
	302	150	15%	339.8	34.0%	2.27	190
	361		0%	10.7	1.1%		11
	400	250	25%	201.1	20.1%	0.80	-49
	Class 3	75	8%	40.6	4.1%	0.54	-34
1247	202		0%	453.9	45.4%		454
	211		0%	169.5	17.0%		170
	400	1000	100%	270.7	27.1%	0.27	-729
	Class 3		0%	105.8	10.6%		106
1248	201		0%	282.0	28.2%		282
	202		0%	257.7	25.8%		258



	211		0%	159.5	16.0%		160
	361		0%	18.5	1.8%		18
	400	1000	100%	282.3	28.2%	0.28	-718
1249	201		0%	580.2	58.0%		580
	212		0%	124.5	12.5%		125
	400	1000	100%	295.3	29.5%	0.30	-705
1250	202		0%	953.6	95.4%		954
	400	1000	100%	46.4	4.6%	0.05	-954
1251	202		0%	100.5	10.0%		100
	211		0%	269.0	26.9%		269
	400	1000	100%	269.3	26.9%	0.27	-731
	Class 3		0%	361.3	36.1%		361
1252	400	1000	100%	585.9	58.6%	0.59	-414
	Class 3		0%	414.1	41.4%		414
1253	202		0%	201.8	20.2%		202
	211		0%	711.9	71.2%		712
	400	1000	100%	86.3	8.6%	0.09	-914
1254	211		0%	611.5	61.1%		611
	400	1000	100%	388.5	38.9%	0.39	-611
1255	211		0%	1000.0	100.0%		1000
	400	1000	100%		0.0%	0.00	-1000
1256	211		0%	1000.0	100.0%		1000
	400	1000	100%		0.0%	0.00	-1000
1257	202		0%	60.9	6.1%		61
	211		0%	39.3	3.9%		39
	400	1000	100%	671.2	67.1%	0.67	-329
	Class 3		0%	228.6	22.9%		229
1258	202		0%	118.7	11.9%		119
	211		0%	235.2	23.5%		235
	362		0%	6.9	0.7%		7
	400	1000	100%		0.0%	0.00	-1000



	Class 3		0%	639.2	63.9%		639
1259	202		0%	838.1	83.8%		838
	211		0%	15.1	1.5%		15
	400	1000	100%		0.0%	0.00	-1000
	Class 3		0%	146.8	14.7%		147
1260	400	1000	100%	410.6	41.1%	0.41	-589
	Class 3		0%	589.4	58.9%		589
1261	202		0%	72.5	7.2%		72
	362		0%	8.3	0.8%		8
	400	1000	100%	919.3	91.9%	0.92	-81
1262	201	480	48%	430.5	43.0%	0.90	-50
	202	320	32%	176.1	17.6%	0.55	-144
	212		0%	58.3	5.8%		58
	400	200	20%	300.3	30.0%	1.50	100
	Class 3		0%	34.9	3.5%		35
1263	201	500	50%	815.5	81.5%	1.63	315
	202	300	30%	170.9	17.1%	0.57	-129
	281	200	20%		0.0%	0.00	-200
	400		0%	13.7	1.4%		14
1264	202	500	50%	87.9	8.8%	0.18	-412
	212	300	30%		0.0%	0.00	-300
	302	200	20%	127.7	12.8%	0.64	-72
	400		0%	410.0	41.0%		410
	Class 3		0%	374.5	37.4%		374
1265	201		0%	366.1	36.6%		366
	202		0%	300.4	30.0%		300
	211		0%	323.9	32.4%		324
	212	600	60%		0.0%	0.00	-600
	302	400	40%		0.0%	0.00	-400
	361		0%	9.6	1.0%		10
1266	201		0%	147.5	14.7%		147



	211		0%	852.5	85.3%		853	
	400	1000	100%		0.0%	0.00	-1000	
1267	211	1000	100%	803.4	80.3%	0.80	-197	
	361		0%	36.1	3.6%		36	
	400		0%	160.5	16.1%		161	
1268	211	1000	100%	959.4	95.9%	0.96	-41	
	999		0%	40.6	4.1%		41	
1269	201		0%	21.4	2.1%	0.00	21	
	211		0%	978.6	97.9%		979	
	400	1000	100%		0.0%		-1000	
1270	202		0%	234.7	23.5%	0.62	235	
	211		0%	133.8	13.4%		134	
	302		0%	7.4	0.7%		7	
	400	1000	100%	624.1	62.4%		-376	
1271	202	300	30%		0.0%	0.00	-300	
	212	180	18%	119.4	11.9%		0.66	-61
	302	120	12%	108.7	10.9%		0.91	-11
	400	400	40%	771.9	77.2%		1.93	372
1272	202	450	45%	149.5	15.0%	0.33	-300	
	212	300	30%	252.5	25.3%		0.84	-47
	400	250	25%	268.3	26.8%		1.07	18
	Class 3		0%	329.6	33.0%			330
1273	202	200	20%	65.4	6.5%	0.33	-135	
	212	120	12%		0.0%		0.00	-120
	302	80	8%		0.0%		0.00	-80
	400	600	60%	510.7	51.1%		0.85	-89
	Class 3		0%	424.0	42.4%			424
1274	211	200	20%		0.0%	0.00	-200	
	212	120	12%	79.7	8.0%		0.66	-40
	302	80	8%	186.8	18.7%		2.34	107
	362		0%	6.1	0.6%			6



	400	600	60%	705.6	70.6%	1.18	106
	Class 3		0%	21.8	2.2%		22
1275	202	150	15%	96.0	9.6%	0.64	-54
	302	100	10%	129.0	12.9%	1.29	29
	400	750	75%	489.8	49.0%	0.65	-260
	Class 3		0%	285.2	28.5%		285
1276	201	450	45%	332.3	33.2%	0.74	-118
	202		0%	41.4	4.1%		41
	212	270	27%	175.4	17.5%	0.65	-95
	302	180	18%	34.8	3.5%	0.19	-145
	400	100	10%	338.7	33.9%	3.39	239
	Class 3		0%	77.4	7.7%		77
1277	201		0%	237.8	23.8%		238
	212	150	15%	22.0	2.2%	0.15	-128
	302	100	10%	136.4	13.6%	1.36	36
	400	750	75%	603.7	60.4%	0.80	-146
1278	201		0%	233.7	23.4%		234
	202	480	48%	288.7	28.9%	0.60	-191
	211		0%	55.3	5.5%		55
	212	320	32%	97.9	9.8%	0.31	-222
	301		0%	106.8	10.7%		107
	400	200	20%	86.8	8.7%	0.43	-113
	Class 3		0%	130.9	13.1%		131
1279	211		0%	48.1	4.8%		48
	212		0%	94.0	9.4%		94
	222		0%	78.0	7.8%		78
	302		0%	27.5	2.7%		27
	362	40	4%		0.0%	0.00	-40
	400	800	80%	711.7	71.2%	0.89	-88
	Class 3	160	16%	40.7	4.1%	0.25	-119
1280	201	600	60%	421.3	42.1%	0.70	-179



	202		0%	44.7	4.5%		45
	211	400	40%	376.0	37.6%	0.94	-24
	361		0%	14.5	1.4%		14
	400		0%	143.4	14.3%		143
1281	201		0%	604.8	60.5%		605
	202	330	33%		0.0%	0.00	-330
	302	220	22%	136.6	13.7%	0.62	-83
	400	450	45%	172.3	17.2%	0.38	-278
	Class 3		0%	86.3	8.6%		86
1282	201		0%	116.6	11.7%		117
	202	120	12%	281.3	28.1%	2.34	161
	400	800	80%	602.2	60.2%	0.75	-198
	Class 3	80	8%		0.0%	0.00	-80
1283	201	280	28%	228.3	22.8%	0.82	-52
	202	210	21%		0.0%	0.00	-210
	212	140	14%	129.3	12.9%	0.92	-11
	302	70	7%	118.5	11.8%	1.69	48
	400	300	30%	71.3	7.1%	0.24	-229
	Class 3		0%	452.6	45.3%		453
1284	202	540	54%	694.2	69.4%	1.29	154
	212		0%	10.3	1.0%		10
	222		0%	5.8	0.6%		6
	302	360	36%	180.9	18.1%	0.50	-179
	400	100	10%	108.9	10.9%	1.09	9
1285	202	400	40%	565.3	56.5%	1.41	165
	212	300	30%	56.4	5.6%	0.19	-244
	302	200	20%	378.3	37.8%	1.89	178
	Class 3	100	10%		0.0%	0.00	-100
1286	202	500	50%	87.0	8.7%	0.17	-413
	212	300	30%	100.6	10.1%	0.34	-199
	302	200	20%	774.6	77.5%	3.87	575



	400		0%	37.7	3.8%		38
1287	201		0%	167.8	16.8%		168
	202	500	50%	36.9	3.7%	0.07	-463
	212	300	30%	171.5	17.2%	0.57	-128
	302	200	20%	262.5	26.2%	1.31	62
	400		0%	324.9	32.5%		325
	Class 3		0%	36.3	3.6%		36
	1288	202	400	40%	229.6	23.0%	0.57
212		300	30%	154.0	15.4%	0.51	-146
302		100	10%	55.3	5.5%	0.55	-45
362			0%	4.8	0.5%		5
400			0%	446.4	44.6%		446
Class 3		200	20%	109.8	11.0%	0.55	-90
1289		302	300	30%	406.0	40.6%	1.35
	400	700	70%	594.0	59.4%	0.85	-106
1290	212	180	18%	180.0	18.0%	1.00	0
	302		0%	236.6	23.7%		237
	400	700	70%	367.5	36.7%	0.52	-333
	Class 3	120	12%	215.9	21.6%	1.80	96
1291	202	180	18%	129.3	12.9%	0.72	-51
	212		0%	64.9	6.5%		65
	302		0%	122.5	12.2%		122
	400	700	70%	495.8	49.6%	0.71	-204
	Class 3	120	12%	187.5	18.8%	1.56	68
1292	202	30	3%	232.6	23.3%	7.75	203
	212		0%	61.6	6.2%		62
	302		0%	96.8	9.7%		97
	400	950	95%	589.0	58.9%	0.62	-361
	Class 3	20	2%	20.0	2.0%	1.00	0
1293	201		0%	62.2	6.2%		62
	202	60	6%		0.0%	0.00	-60





	212	40	4%	266.3	26.6%	6.66	226
	400	900	90%	671.5	67.2%	0.75	-228
1294	201		0%	240.2	24.0%		240
	202	180	18%	187.0	18.7%	1.04	7
	212	120	12%	158.1	15.8%	1.32	38
	302		0%	64.6	6.5%		65
	361		0%	9.9	1.0%		10
	362		0%	6.5	0.6%		6
	400	700	70%	333.7	33.4%	0.48	-366
1295	201		0%	276.4	27.6%		276
	202	100	10%		0.0%	0.00	-100
	212	60	6%	83.1	8.3%	1.39	23
	400	800	80%	120.9	12.1%	0.15	-679
	Class 3	40	4%	519.6	52.0%	12.99	480
1296	202	120	12%		0.0%	0.00	-120
	212		0%	99.4	9.9%		99
	302		0%	116.0	11.6%		116
	400	800	80%	728.9	72.9%	0.91	-71
	Class 3	80	8%	55.7	5.6%	0.70	-24
1297	201		0%	177.3	17.7%		177
	202		0%	60.5	6.1%		61
	212	540	54%	460.3	46.0%	0.85	-80
	302		0%	302.0	30.2%		302
	400	100	10%		0.0%	0.00	-100
	Class 3	360	36%		0.0%	0.00	-360
1298	202		0%	470.1	47.0%		470
	211	1000	100%		0.0%	0.00	-1000
	212		0%	437.4	43.7%		437
	302		0%	87.9	8.8%		88
	361		0%	4.6	0.5%		5
1299	201		259.3	25.9%		259	



	202		0%	75.9	7.6%		76
	212		0%	95.3	9.5%		95
	302		0%	138.5	13.8%		138
	362		0%	5.4	0.5%		5
	400	900	90%	281.8	28.2%	0.31	-618
	Class 3	100	10%	143.9	14.4%	1.44	44
1300	201		0%	405.5	40.5%		405
	202	350	35%		0.0%	0.00	-350
	212	210	21%	189.8	19.0%	0.90	-20
	400	300	30%	157.7	15.8%	0.53	-142
	Class 3	140	14%	247.0	24.7%	1.76	107
1301	202	280	28%	122.5	12.3%	0.44	-157
	211	210	21%	69.2	6.9%	0.33	-141
	212	140	14%	550.7	55.1%	3.93	411
	400	300	30%	220.4	22.0%	0.73	-80
	Class 3	70	7%		0.0%	0.00	-70
	999		0%	37.2	3.7%		37
1302	201		0%	382.5	38.2%		382
	202	250	25%	182.0	18.2%	0.73	-68
	212	150	15%	110.1	11.0%	0.73	-40
	400	500	50%		0.0%	0.00	-500
	Class 3	100	10%	325.4	32.5%	3.25	225
1303	202		0%	99.5	9.9%		99
	302		0%	150.6	15.1%		151
	400	1000	100%	357.3	35.7%	0.36	-643
	Class 3		0%	392.6	39.3%		393
1304	201	1000	100%	997.2	99.7%	1.00	-3
	400		0%	2.8	0.3%		3
1305	201	500	50%	664.9	66.5%	1.33	165
	302		0%	183.7	18.4%		184
	400	500	50%	151.4	15.1%	0.30	-349



1306	201	1000	100%	525.0	52.5%	0.52	-475	
	202		0%	48.8	4.9%		49	
	302		0%	204.9	20.5%		205	
	400		0%	221.3	22.1%		221	
1307	202		0%	18.5	1.9%	0.97	19	
	211	1000	100%	973.5	97.3%		-27	
	361		0%	8.0	0.8%		8	
1308	201		0%	180.0	18.0%	0.19	180	
	202	600	60%	114.0	11.4%		-486	
	211		0%	172.1	17.2%		172	
	212	400	40%	223.9	22.4%	0.56	-176	
	302		0%	185.9	18.6%		186	
	361		0%	10.9	1.1%		11	
	400		0%	101.0	10.1%		101	
	Class 3		0%	12.2	1.2%		12	
1309	202		0%	176.9	17.7%	0.67	177	
	212		0%	283.2	28.3%		283	
	302	200	20%	134.7	13.5%		-65	
	400	500	50%	275.2	27.5%		-225	
	Class 3	300	30%	130.0	13.0%		-170	
1310	212	300	30%	808.6	80.9%	2.70	509	
	400	500	50%	93.5	9.4%	0.19	-406	
	Class 3	200	20%	97.9	9.8%	0.49	-102	
1311	202	240	24%	48.0	4.8%	0.20	-192	
	211		0%	4.1	0.4%		4	
	212	360	36%	582.7	58.3%		1.62	223
	302		0%	19.1	1.9%		19	
	400	400	40%	346.1	34.6%		0.87	-54
1312	202	200	20%	155.5	15.6%	0.78	-44	
	211		0%	60.5	6.0%		60	
	212	120	12%	490.7	49.1%		4.09	371



	302		0%	100.4	10.0%		100
	400	600	60%	77.1	7.7%	0.13	-523
	Class 3	80	8%	115.7	11.6%	1.45	36
1313	201		0%	33.8	3.4%		34
	202	200	20%	97.7	9.8%	0.49	-102
	212	120	12%	570.1	57.0%	4.75	450
	302		0%	51.1	5.1%		51
	400	600	60%	83.2	8.3%	0.14	-517
	Class 3	80	8%	164.1	16.4%	2.05	84
1314	202	200	20%		0.0%	0.00	-200
	212	120	12%	305.0	30.5%	2.54	185
	302		0%	53.4	5.3%		53
	400	600	60%	263.2	26.3%	0.44	-337
	Class 3	80	8%	378.5	37.8%	4.73	298
1315	201		0%	383.7	38.4%		384
	211	1000	100%	523.2	52.3%	0.52	-477
	212		0%	59.0	5.9%		59
	302		0%	18.2	1.8%		18
	400		0%	15.9	1.6%		16
1316	201	600	60%	525.6	52.6%	0.88	-74
	202		0%	7.8	0.8%		8
	211	400	40%	466.5	46.7%	1.17	67
1317	201		0%	43.5	4.4%		44
	202	400	40%	81.7	8.2%	0.20	-318
	212	240	24%	719.0	71.9%	3.00	479
	302		0%	79.4	7.9%		79
	400	200	20%		0.0%	0.00	-200
	Class 3	160	16%	76.4	7.6%	0.48	-84
1318	202	240	24%	262.3	26.2%	1.09	22
	211	120	12%	439.6	44.0%	3.66	320
	212		0%	65.6	6.6%		66



	302		0%	41.2	4.1%		41
	400	400	40%		0.0%	0.00	-400
	Class 3	240	24%	191.2	19.1%	0.80	-49
1319	202		0%	148.5	14.9%		149
	211	180	18%	162.4	16.2%	0.90	-18
	212		0%	123.5	12.3%		123
	302		0%	144.2	14.4%		144
	400	700	70%	414.1	41.4%	0.59	-286
	Class 3	120	12%	7.3	0.7%	0.06	-113
1320	202		0%	58.2	5.8%		58
	212	900	90%	662.2	66.2%	0.74	-238
	302		0%	103.5	10.4%		104
	400	100	10%	176.0	17.6%	1.76	76
<b>TOTAL:</b>		<b>107,000</b>		<b>107,000</b>		<b>0.00</b>	<b>0.00</b>



**Comparison of "Continuous" Shoreline Statistics with "KM by KM" Statistics  
by Reach for Parallel Shoreline Protection on Lake Ontario Within CND7**

Reach #	Shore Type	KM by KM SHORELINE		CONTINUOUS SHORELINE		Change Factor	Distance Factor
		Length	% of Reach	Length	% of Reach		
1605	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1606	201	100.0	10.0%	123.5	12.4%	1.24	23.52
	400	900.0	90.0%	876.5	87.6%	0.97	-23.52
1607	202	800.0	80.0%	356.5	35.6%	0.45	-443.54
	302	0.0		46.4	4.6%		46.36
	400	200.0	20.0%	597.2	59.7%	2.99	397.17
1608	202	480.0	48.0%	512.8	51.3%	1.07	32.79
	400	200.0	20.0%	421.0	42.1%	2.11	221.01
	Class 3	320.0	32.0%	66.2	6.6%	0.21	-253.79
1609	212	320.0	32.0%	0.0		4.31	-320.00
	400	200.0	20.0%	862.2	86.2%		662.22
	Class 3	480.0	48.0%	137.8	13.8%	0.29	-342.22
1610	202	0.0		527.1	52.7%	0.78	527.14
	302	1,000.0	100.0%	0.0			-1000.00
	400	0.0		472.9	47.3%		472.86
1611	211	0.0		28.7	2.9%	0.78	28.67
	400	1,000.0	100.0%	775.5	77.6%		-224.47
	Class 3	0.0		195.8	19.6%		195.80
1612	212	60.0	6.0%	0.0		0.94	-60.00
	400	900.0	90.0%	847.6	84.8%		-52.40
	Class 3	40.0	4.0%	152.4	15.2%	3.81	112.40



1613	202	0.0		32.3	3.2%		32.28
	212	180.0	18.0%	111.5	11.1%	0.62	-68.54
	400	700.0	70.0%	788.4	78.8%	1.13	88.39
	Class 3	120.0	12.0%	67.9	6.8%	0.57	-52.12
1614	201	0.0		70.2	7.0%		70.20
	202	20.0	2.0%	0.0			-20.00
	211	0.0		62.9	6.3%		62.89
	212	50.0	5.0%	35.9	3.6%	0.72	-14.13
	400	900.0	90.0%	757.1	75.7%	0.84	-142.87
	Class 3	30.0	3.0%	73.9	7.4%	2.46	43.91
1615	201	0.0		30.8	3.1%		30.75
	400	1,000.0	100.0%	969.3	96.9%	0.97	-30.75
1616	202	0.0		108.5	10.9%		108.51
	211	0.0		292.2	29.2%		292.17
	212	100.0	10.0%	0.0			-100.00
	361	0.0		7.0	0.7%		7.00
	400	900.0	90.0%	369.7	37.0%	0.41	-530.34
	999	0.0		222.7	22.3%		222.67
1617	400	1,000.0	100.0%	0.0			-1000.00
	999	0.0		1,000.0	100.0%		1000.00
1618	400	1,000.0	100.0%	0.0			-1000.00
	999	0.0		1,000.0	100.0%		1000.00
1619	400	1,000.0	100.0%	0.0			-1000.00
	999	0.0		1,000.0	100.0%		1000.00
1620	400	1,000.0	100.0%	0.0			-1000.00
	Class 3	0.0		19.8	2.0%		19.79
	999	0.0		980.2	98.0%		980.21
1621	201	0.0		64.9	6.5%		64.87
	211	0.0		750.8	75.1%		750.79
	212	800.0	80.0%	0.0			-800.00
	361	0.0		12.3	1.2%		12.33



	400	200.0	20.0%	171.2	17.1%	0.86	-28.84
	Class 3	0.0		0.9	0.1%		0.86
1622	201	0.0		80.5	8.1%	0.75	80.52
	211	150.0	15.0%	112.8	11.3%		-37.17
	400	850.0	85.0%	806.7	80.7%		0.95
1623	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1624	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1625	201	0.0		39.5	4.0%	0.96	39.50
	400	1,000.0	100.0%	960.5	96.1%		-39.50
1626	211	0.0		190.9	19.1%	0.67	190.87
	400	1,000.0	100.0%	665.2	66.5%		-334.77
	Class 3	0.0		143.9	14.4%		143.90
1627	201	100.0	10.0%	0.0		0.93	-100.00
	211	0.0		57.3	5.7%		57.31
	400	900.0	90.0%	841.3	84.1%		-58.71
	Class 3	0.0		101.4	10.1%		101.40
1628	201	400.0	40.0%	782.1	78.2%	1.96	382.08
	211	600.0	60.0%	217.9	21.8%	0.36	-382.08
1629	201	600.0	60.0%	705.6	70.6%	1.18	105.60
	211	400.0	40.0%	294.4	29.4%	0.74	-105.60
1630	201	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1631	201	600.0	60.0%	592.7	59.3%	0.99	-7.28
	400	0.0		4.4	0.4%		4.37
	Class 3	400.0	40.0%	402.9	40.3%		1.01
1632	400	1,000.0	100.0%	992.3	99.2%	0.99	-7.72
	Class 3	0.0		7.7	0.8%		7.72
1633	212	60.0	6.0%	0.0		1.03	-60.00
	400	900.0	90.0%	925.3	92.5%		25.28
	Class 3	40.0	4.0%	74.7	7.5%		1.87
1634	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1635	211	0.0		12.2	1.2%		12.23





	400	1,000.0	100.0%	948.9	94.9%	0.95	-51.08
	Class 3	0.0		38.9	3.9%		38.85
1636	211	0.0		13.2	1.3%		13.21
	302	0.0		208.2	20.8%		208.17
	400	0.0		543.6	54.4%		543.55
	Class 3	1,000.0	100.0%	235.1	23.5%	0.24	-764.94
1637	202	0.0		114.9	11.5%		114.88
	212	50.0	5.0%	16.5	1.7%	0.33	-33.49
	400	900.0	90.0%	532.8	53.3%	0.59	-367.16
	Class 3	50.0	5.0%	335.8	33.6%	6.72	285.77
1638	212	0.0		25.0	2.5%		25.02
	400	1,000.0	100.0%	821.2	82.1%	0.82	-178.80
	Class 3	0.0		153.8	15.4%		153.77
1639	202	0.0		106.1	10.6%		106.08
	211	0.0		51.9	5.2%		51.89
	212	0.0		176.2	17.6%		176.21
	400	1,000.0	100.0%	588.7	58.9%	0.59	-411.29
	Class 3	0.0		77.1	7.7%		77.10
1640	212	0.0		9.6	1.0%		9.60
	400	1,000.0	100.0%	969.6	97.0%	0.97	-30.39
	Class 3	0.0		20.8	2.1%		20.79
1641	400	1,000.0	100.0%	962.5	96.3%	0.96	-37.50
	Class 3	0.0		37.5	3.8%		37.50
1642	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1643	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1644	400	1,000.0	100.0%	972.5	97.3%	0.97	-27.47
	Class 3	0.0		27.5	2.7%		27.47
1645	202	0.0		40.6	4.1%		40.57
	400	1,000.0	100.0%	959.4	95.9%	0.96	-40.57
1646	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1647	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00



1648	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1649	400	1,000.0	100.0%	713.4	71.3%	0.71	-286.62
	Class 3	0.0		286.6	28.7%		286.62
1650	202	300.0	30.0%	183.1	18.3%	0.61	-116.90
	212	500.0	50.0%	0.0			-500.00
	400	0.0		532.5	53.3%		532.50
	Class 3	200.0	20.0%	284.4	28.4%	1.42	84.40
1651	201	200.0	20.0%	179.4	17.9%	0.90	-20.65
	211	300.0	30.0%	668.8	66.9%	2.23	368.84
	212	500.0	50.0%	0.0			-500.00
	361	0.0		26.8	2.7%		26.77
	400	0.0		100.7	10.1%		100.71
	Class 3	0.0		24.3	2.4%		24.33
1652	211	0.0		238.1	23.8%		238.09
	212	0.0		10.4	1.0%		10.44
	361	0.0		18.8	1.9%		18.84
	400	0.0		732.6	73.3%		732.62
	Class 3	1,000.0	100.0%	0.0			-1000.00
1653	202	0.0		588.2	58.8%	0.14	588.21
	211	800.0	80.0%	110.6	11.1%		-689.39
	361	0.0		6.4	0.6%		6.35
	400	200.0	20.0%	158.2	15.8%	0.79	-41.83
	999	0.0		136.7	13.7%		136.66
1654	202	500.0	50.0%	0.0		0.79	-500.00
	211	0.0		605.5	60.6%		605.51
	400	500.0	50.0%	394.5	39.4%		-105.51
1655	211	800.0	80.0%	797.5	79.7%	1.00	-2.55
	400	200.0	20.0%	202.6	20.3%	1.01	2.55
1656	211	0.0		15.6	1.6%	0.98	15.60
	400	1,000.0	100.0%	984.4	98.4%		-15.60
1657	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00



1658	212	0.0		34.0	3.4%	0.02	33.99
	400	0.0		946.0	94.6%		946.01
	Class 3	1,000.0	100.0%	20.0	2.0%		-980.00
1659	202	0.0		22.9	2.3%	0.99 2.00	22.88
	211	0.0		22.3	2.2%		22.32
	212	120.0	12.0%	0.0			-120.00
	400	800.0	80.0%	794.5	79.4%		-5.52
	Class 3	80.0	8.0%	160.3	16.0%		80.32
1660	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1661	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1662	212	0.0		15.1	1.5%	0.98	15.12
	400	1,000.0	100.0%	984.9	98.5%		-15.12
1663	212	0.0		64.5	6.5%	0.17	64.54
	400	0.0		760.8	76.1%		760.83
	Class 3	1,000.0	100.0%	174.6	17.5%		-825.37
1664	212	0.0		121.0	12.1%	0.07	121.04
	302	0.0		125.0	12.5%		125.03
	400	0.0		688.7	68.9%		688.68
	Class 3	1,000.0	100.0%	65.2	6.5%		-934.76
1665	202	0.0		32.2	3.2%	0.50 1.74 0.64	32.15
	211	0.0		35.4	3.5%		35.41
	212	280.0	28.0%	141.3	14.1%		-138.68
	400	300.0	30.0%	520.7	52.1%		220.67
	Class 3	420.0	42.0%	270.5	27.0%		-149.55
1666	211	1,000.0	100.0%	992.5	99.3%	0.99	-7.46
	400	0.0		7.5	0.7%		7.46
1667	211	1,000.0	100.0%	742.2	74.2%	0.74	-257.81
	361	0.0		18.0	1.8%		17.97
	400	0.0		45.0	4.5%		45.02
	Class 3	0.0		194.8	19.5%		194.83
1668	202	400.0	40.0%	337.9	33.8%	0.84	-62.11



	211	600.0	60.0%	334.4	33.4%	0.56	-265.57
	400	0.0		42.4	4.2%		42.43
	Class 3	0.0		285.3	28.5%		285.25
1669	201	200.0	20.0%	0.0		0.98	-200.00
	202	0.0		216.7	21.7%		216.74
	400	800.0	80.0%	783.3	78.3%		-16.74
1670	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1671	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1672	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1673	211	0.0		155.0	15.5%		154.97
	400	0.0		845.0	84.5%		845.03
	Class 3	1,000.0	100.0%	0.0			-1000.00
1674	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1675	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1676	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1677	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1678	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1679	201	600.0	60.0%	738.3	73.8%	1.23	138.27
	211	400.0	40.0%	0.0			-400.00
	400	0.0		261.7	26.2%		261.73
1680	201	1,000.0	100.0%	615.7	61.6%	0.62	-384.33
	400	0.0		384.3	38.4%		384.33
1681	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1682	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1683	201	1,000.0	100.0%	916.4	91.6%	0.92	-83.65
	400	0.0		83.7	8.4%		83.65
1684	201	1,000.0	100.0%	486.9	48.7%	0.49	-513.13
	202	0.0		49.5	5.0%		49.50
	212	0.0		44.9	4.5%		44.89
	400	0.0		376.6	37.7%		376.58
	Class 3	0.0		42.2	4.2%		42.16



1685	202	120.0	12.0%	176.4	17.6%	1.47	56.37
	212	180.0	18.0%	138.9	13.9%	0.77	-41.14
	400	700.0	70.0%	276.4	27.6%	0.39	-423.59
	Class 3	0.0		408.4	40.8%		408.35
1686	201	0.0		91.7	9.2%		91.65
	212	60.0	6.0%	181.0	18.1%	3.02	120.97
	400	900.0	90.0%	551.3	55.1%	0.61	-348.75
	Class 3	40.0	4.0%	176.1	17.6%	4.40	136.12
1687	202	0.0		35.8	3.6%		35.75
	400	0.0		805.7	80.6%		805.74
	Class 3	1,000.0	100.0%	158.5	15.9%	0.16	-841.49
1688	400	0.0		1,000.0	100.0%		1000.00
	Class 3	1,000.0	100.0%	0.0			-1000.00
1689	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1690	400	1,000.0	100.0%	937.7	93.8%	0.94	-62.33
	Class 3	0.0		62.3	6.2%		62.33
1691	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1692	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1693	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1694	201	0.0		83.7	8.4%		83.66
	202	0.0		59.9	6.0%		59.87
	211	0.0		82.5	8.3%		82.53
	400	0.0		609.1	60.9%		609.08
	Class 3	1,000.0	100.0%	164.9	16.5%	0.16	-835.15
1695	201	0.0		191.5	19.2%		191.52
	202	0.0		44.0	4.4%		43.95
	400	0.0		708.7	70.9%		708.71
	Class 3	1,000.0	100.0%	55.8	5.6%	0.06	-944.19
1696	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1697	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1698	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00



1699	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1700	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1701	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1702	212	50.0	5.0%	41.2	4.1%	0.82	-8.80
	400	950.0	95.0%	958.8	95.9%	1.01	8.80
1703	282	0.0		12.8	1.3%		12.82
	400	1,000.0	100.0%	987.2	98.7%	0.99	-12.82
1704	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1705	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
1706	400	1,000.0	100.0%	1,000.0	100.0%	1.00	0.00
<b>TOTAL:</b>		<b>102,000.0</b>		<b>102,000.0</b>		<b>1.00</b>	<b>0.00</b>



**Comparison of "Continuous" Shoreline Statistics with "KM by KM" Statistics  
by Reach for Parallel Shoreline Protection on Lake Ontario Within US4**

Reach #	Shore Type	KM by KM SHORELINE		CONTINUOUS SHORELINE		Change Factor	Distance Factor	
		Length	% of Reach	Length	% of Reach			
780	400	1,000	100.0%	770.7	77.1%	0.77	-229.3	
	999	0	0.0%	229.3	22.9%		229.3	
781	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0	
782	400	1,000	100.0%	964.5	96.5%	0.96	-35.5	
	Class 3	0	0.0%	35.5	3.5%		35.5	
783	400	1,000	100.0%	954.4	95.4%	0.95	-45.6	
	Class 3	0	0.0%	45.6	4.6%		45.6	
784	212	100	10.0%	44.8	4.5%	0.45	-55.2	
	400	900	90.0%	925.7	92.6%		1.03	25.7
	Class 3	0	0.0%	29.5	3.0%		29.5	
785	212	100	10.0%	9.6	1.0%	0.10	-90.4	
	400	900	90.0%	948.5	94.9%		1.05	48.5
	Class 3	0	0.0%	41.9	4.2%		41.9	
786	212	100	10.0%	0.0	0.0%	1.11	-100.0	
	400	900	90.0%	1,000.0	100.0%		100.0	
787	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0	
788	212	0	0.0%	12.4	1.2%	0.99	12.4	
	400	1,000	100.0%	987.6	98.8%		-12.4	
789	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0	
790	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0	
791	201	300	30.0%	588.8	58.9%	1.96	288.8	



	400	700	70.0%	411.2	41.1%	0.59	-288.8
792	201	0	0.0%	61.4	6.1%		61.4
	202	420	42.0%	0.0	0.0%		-420.0
	211	280	28.0%	180.3	18.0%	0.64	-99.7
	212	0	0.0%	50.8	5.1%		50.8
	400	300	30.0%	707.5	70.7%	2.36	407.5
793	202	300	30.0%	0.0	0.0%		-300.0
	400	500	50.0%	1,000.0	100.0%	2.00	500.0
	Class 3	200	20.0%	0.0	0.0%		-200.0
794	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
795	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
796	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
797	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
798	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
799	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
800	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
801	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
802	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
803	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
804	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
805	201	500	50.0%	89.0	8.9%	0.18	-411.0
	211	0	0.0%	180.7	18.1%		180.7
	212	0	0.0%	80.1	8.0%		80.1
	400	500	50.0%	650.1	65.0%	1.30	150.1
806	211	0	0.0%	82.2	8.2%		82.2
	361	0	0.0%	20.0	2.0%		20.0
	400	1,000	100.0%	897.9	89.8%	0.90	-102.1
807	202	390	39.0%	0.0	0.0%		-390.0
	211	0	0.0%	28.6	2.9%		28.6
	212	260	26.0%	689.5	68.9%	2.65	429.5
	400	350	35.0%	281.9	28.2%	0.81	-68.1





808	202	390	39.0%	176.8	17.7%	0.45	-213.2
	212	260	26.0%	395.4	39.5%		
	400	350	35.0%	377.5	37.8%		
	Class 3	0	0.0%	50.3	5.0%		
809	202	390	39.0%	0.0	0.0%	2.97	-390.0
	211	0	0.0%	88.2	8.8%		
	212	260	26.0%	772.6	77.3%		
	400	350	35.0%	84.7	8.5%		
	Class 3	0	0.0%	54.4	5.4%		
810	202	390	39.0%	42.3	4.2%	0.11	-347.7
	211	0	0.0%	45.4	4.5%		
	212	260	26.0%	602.3	60.2%		
	400	350	35.0%	174.4	17.4%		
	Class 3	0	0.0%	135.6	13.6%		
811	202	390	39.0%	19.3	1.9%	0.05	-370.7
	212	260	26.0%	443.7	44.4%		
	400	350	35.0%	462.9	46.3%		
	Class 3	0	0.0%	74.2	7.4%		
812	202	390	39.0%	0.0	0.0%	1.31	-390.0
	212	260	26.0%	340.3	34.0%		
	362	0	0.0%	10.9	1.1%		
	400	350	35.0%	313.5	31.4%		
	999	0	0.0%	335.2	33.5%		
813	202	390	39.0%	0.0	0.0%	0.89	-390.0
	212	260	26.0%	231.0	23.1%		
	400	350	35.0%	592.6	59.3%		
	Class 3	0	0.0%	176.5	17.6%		
814	202	320	32.0%	0.0	0.0%	1.36	-320.0
	212	480	48.0%	651.6	65.2%		
	400	200	20.0%	348.4	34.8%		
815	202	400	40.0%	0.0	0.0%	1.74	148.4
							-400.0



	212	600	60.0%	309.4	30.9%	0.52	-290.6
	400	0	0.0%	43.1	4.3%		43.1
	Class 3	0	0.0%	647.5	64.8%		647.5
816	202	600	60.0%	0.0	0.0%		-600.0
	211	0	0.0%	106.6	10.7%		106.6
	212	400	40.0%	543.8	54.4%	1.36	143.8
	400	0	0.0%	349.5	35.0%		349.5
817	211	200	20.0%	115.5	11.6%	0.58	-84.5
	400	800	80.0%	884.5	88.4%	1.11	84.5
818	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
819	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
820	212	0	0.0%	144.7	14.5%		144.7
	400	1,000	100.0%	601.8	60.2%	0.60	-398.2
	Class 3	0	0.0%	253.5	25.3%		253.5
821	211	0	0.0%	57.0	5.7%		57.0
	212	300	30.0%	526.6	52.7%	1.76	226.6
	400	500	50.0%	416.4	41.6%	0.83	-83.6
	Class 3	200	20.0%	0.0	0.0%		-200.0
822	212	160	16.0%	0.0	0.0%		-160.0
	400	600	60.0%	428.1	42.8%	0.71	-171.9
	Class 3	240	24.0%	193.9	19.4%	0.81	-46.1
	999	0	0.0%	377.9	37.8%		377.9
823	212	160	16.0%	19.2	1.9%	0.12	-140.8
	400	600	60.0%	642.6	64.3%	1.07	42.6
	Class 3	240	24.0%	338.2	33.8%	1.41	98.2
824	202	0	0.0%	62.9	6.3%		62.9
	212	100	10.0%	47.2	4.7%	0.47	-52.8
	400	900	90.0%	889.9	89.0%	0.99	-10.1
825	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
826	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
827	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0



828	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0	
829	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0	
830	400	1,000	100.0%	965.6	96.6%	0.97	-34.4	
	Class 3	0	0.0%	34.4	3.4%		34.4	
831	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0	
832	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0	
833	202	100	10.0%	98.8	9.9%	0.99	-1.2	
	400	900	90.0%	885.1	88.5%		0.98	-14.9
	Class 3	0	0.0%	16.1	1.6%		16.1	
834	202	120	12.0%	49.8	5.0%	0.41	-70.2	
	212	180	18.0%	148.9	14.9%		0.83	-31.1
	400	700	70.0%	801.3	80.1%		1.14	101.3
835	202	280	28.0%	368.1	36.8%	1.31	88.1	
	212	420	42.0%	319.7	32.0%		0.76	-100.3
	400	300	30.0%	0.0	0.0%		-300.0	
	Class 3	0	0.0%	312.1	31.2%		312.1	
836	202	280	28.0%	78.8	7.9%	0.28	-201.2	
	212	420	42.0%	244.9	24.5%		0.58	-175.1
	362	0	0.0%	12.7	1.3%		12.7	
	400	300	30.0%	444.8	44.5%		1.48	144.8
	Class 3	0	0.0%	218.8	21.9%		218.8	
837	202	280	28.0%	34.1	3.4%	0.12	-245.9	
	212	420	42.0%	586.3	58.6%		1.40	166.3
	362	0	0.0%	6.2	0.6%		6.2	
	400	300	30.0%	112.3	11.2%		0.37	-187.7
	Class 3	0	0.0%	261.1	26.1%		261.1	
838	202	0	0.0%	6.8	0.7%	0.81	6.8	
	212	0	0.0%	182.6	18.3%		182.6	
	400	1,000	100.0%	810.6	81.1%		-189.4	
839	202	0	0.0%	11.0	1.1%	0.99	11.0	
	400	1,000	100.0%	989.0	98.9%		-11.0	



840	202	280	28.0%	25.2	2.5%	0.09	-254.8
	212	420	42.0%	574.0	57.4%		1.37
	361	0	0.0%	13.2	1.3%	0.85	13.2
	400	300	30.0%	254.8	25.5%		-45.2
	999	0	0.0%	132.8	13.3%		132.8
841	202	400	40.0%	0.0	0.0%	0.60	-400.0
	212	600	60.0%	362.7	36.3%		-237.3
	400	0	0.0%	10.9	1.1%		10.9
	999	0	0.0%	626.4	62.6%		626.4
842	202	400	40.0%	0.0	0.0%	0.50	-400.0
	211	0	0.0%	138.6	13.9%		138.6
	212	600	60.0%	297.1	29.7%		-302.9
	400	0	0.0%	216.0	21.6%		216.0
	Class 3	0	0.0%	348.3	34.8%		348.3
843	202	400	40.0%	0.0	0.0%	0.78	-400.0
	211	0	0.0%	104.9	10.5%		104.9
	212	600	60.0%	470.8	47.1%		-129.2
	400	0	0.0%	381.5	38.2%		381.5
	Class 3	0	0.0%	42.8	4.3%		42.8
844	202	400	40.0%	0.0	0.0%	1.22	-400.0
	212	600	60.0%	733.3	73.3%		133.3
	Class 3	0	0.0%	266.7	26.7%		266.7
845	202	400	40.0%	0.0	0.0%	0.96	-400.0
	212	600	60.0%	576.7	57.7%		-23.3
	400	0	0.0%	207.0	20.7%		207.0
	Class 3	0	0.0%	216.2	21.6%		216.2
846	201	0	0.0%	134.5	13.4%	0.68	134.5
	211	0	0.0%	123.8	12.4%		123.8
	212	0	0.0%	66.0	6.6%		66.0
	400	1,000	100.0%	675.7	67.6%		-324.3
847	201	0	0.0%	454.7	45.5%		454.7



	202	200	20.0%	0.0	0.0%		-200.0
	400	800	80.0%	545.3	54.5%	0.68	-254.7
848	400	1,000	100.0%	972.7	97.3%	0.97	-27.3
	Class 3	0	0.0%	27.3	2.7%		27.3
849	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
850	202	0	0.0%	224.3	22.4%	0.73	224.3
	212	0	0.0%	22.4	2.2%		22.4
	400	1,000	100.0%	729.4	72.9%		-270.6
	Class 3	0	0.0%	24.0	2.4%		24.0
851	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
852	212	0	0.0%	122.8	12.3%	0.82	122.8
	400	1,000	100.0%	815.4	81.5%		-184.6
	Class 3	0	0.0%	61.8	6.2%		61.8
853	212	0	0.0%	31.0	3.1%	0.82	31.0
	400	1,000	100.0%	818.1	81.8%		-181.9
	Class 3	0	0.0%	150.9	15.1%		150.9
854	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
855	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
856	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
857	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
858	202	400	40.0%	0.0	0.0%	0.53	-400.0
	212	600	60.0%	319.9	32.0%		-280.1
	400	0	0.0%	596.1	59.6%		596.1
	Class 3	0	0.0%	84.0	8.4%		84.0
859	202	320	32.0%	0.0	0.0%	0.66 2.43	-320.0
	212	480	48.0%	316.8	31.7%		-163.2
	400	200	20.0%	485.7	48.6%		285.7
	Class 3	0	0.0%	197.4	19.7%		197.4
860	202	0	0.0%	20.1	2.0%	0.92	20.1
	400	1,000	100.0%	918.2	91.8%		-81.8
	Class 3	0	0.0%	61.7	6.2%		61.7



861	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0	
862	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0	
863	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0	
864	201	0	0.0%	220.2	22.0%	0.76	220.2	
	400	1,000	100.0%	758.2	75.8%		-241.8	
	Class 3	0	0.0%	21.6	2.2%		21.6	
865	202	0	0.0%	48.7	4.9%	0.14	48.7	
	212	0	0.0%	13.5	1.4%		13.5	
	400	1,000	100.0%	140.8	14.1%		-859.2	
	Class 3	0	0.0%	797.0	79.7%		797.0	
866	400	1,000	100.0%	0.0	0.0%		-1,000.0	
	Class 3	0	0.0%	1,000.0	100.0%		1,000.0	
867	202	140	14.0%	0.0	0.0%	0.52	-140.0	
	212	350	35.0%	180.7	18.1%		-169.3	
	400	300	30.0%	34.3	3.4%		-265.7	
	Class 3	210	21.0%	785.0	78.5%		3.74	575.0
868	302	1,000	100.0%	0.0	0.0%		-1,000.0	
	400	0	0.0%	498.2	49.8%		498.2	
	Class 3	0	0.0%	501.8	50.2%		501.8	
869	202	0	0.0%	38.2	3.8%		38.2	
	212	0	0.0%	122.0	12.2%		122.0	
	400	0	0.0%	839.8	84.0%		839.8	
	Class 3	1,000	100.0%	0.0	0.0%		-1,000.0	
870	212	120	12.0%	379.2	37.9%	3.16	259.2	
	362	0	0.0%	8.7	0.9%		8.7	
	400	700	70.0%	612.1	61.2%		0.87	-87.9
	Class 3	180	18.0%	0.0	0.0%		-180.0	
871	202	0	0.0%	100.9	10.1%	0.78	100.9	
	211	0	0.0%	65.0	6.5%		65.0	
	212	0	0.0%	25.7	2.6%		25.7	
	400	1,000	100.0%	784.9	78.5%		-215.1	



	Class 3	0	0.0%	23.5	2.4%		23.5
872	202	400	40.0%	359.4	35.9%	0.90	-40.6
	211	0	0.0%	30.4	3.0%		30.4
	212	600	60.0%	184.2	18.4%	0.31	-415.8
	400	0	0.0%	198.4	19.8%		198.4
	Class 3	0	0.0%	227.6	22.8%		227.6
873	212	0	0.0%	541.4	54.1%		541.4
	400	800	80.0%	393.1	39.3%	0.49	-406.9
	Class 3	200	20.0%	65.5	6.5%	0.33	-134.5
874	212	200	20.0%	597.1	59.7%	2.99	397.1
	400	500	50.0%	402.9	40.3%	0.81	-97.1
	Class 3	300	30.0%	0.0	0.0%		-300.0
875	212	200	20.0%	233.2	23.3%	1.17	33.2
	400	500	50.0%	766.8	76.7%	1.53	266.8
	Class 3	300	30.0%	0.0	0.0%		-300.0
876	201	0	0.0%	143.0	14.3%		143.0
	202	200	20.0%	23.0	2.3%	0.11	-177.0
	211	0	0.0%	6.4	0.6%		6.4
	212	0	0.0%	109.5	10.9%		109.5
	361	0	0.0%	8.9	0.9%		8.9
	400	800	80.0%	565.7	56.6%	0.71	-234.3
	Class 3	0	0.0%	143.5	14.4%		143.5
877	201	0	0.0%	69.2	6.9%		69.2
	202	300	30.0%	257.4	25.7%	0.86	-42.6
	212	0	0.0%	236.4	23.6%		236.4
	400	700	70.0%	437.0	43.7%	0.62	-263.0
878	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
879	400	1,000	100.0%	1,000.0	100.0%	1.00	0.0
880	201	0	0.0%	42.1	4.2%		42.1
	211	0	0.0%	205.6	20.6%		205.6
	212	480	48.0%	51.6	5.2%	0.11	-428.4



	361	0	0.0%	9.9	1.0%		9.9
	400	200	20.0%	690.9	69.1%	3.45	490.9
	Class 3	320	32.0%	0.0	0.0%		-320.0
881	202	0	0.0%	121.7	12.2%		121.7
	212	480	48.0%	361.6	36.2%	0.75	-118.4
	400	200	20.0%	273.3	27.3%	1.37	73.3
	Class 3	320	32.0%	243.4	24.3%	0.76	-76.6
882	212	420	42.0%	921.0	92.1%	2.19	501.0
	400	300	30.0%	79.0	7.9%	0.26	-221.0
	Class 3	280	28.0%	0.0	0.0%		-280.0
883	202	0	0.0%	94.5	9.4%		94.5
	212	600	60.0%	413.0	41.3%	0.69	-187.0
	400	0	0.0%	199.2	19.9%		199.2
	Class 3	400	40.0%	293.3	29.3%	0.73	-106.7
884	202	0	0.0%	82.7	8.3%		82.7
	212	600	60.0%	222.1	22.2%	0.37	-377.9
	400	0	0.0%	409.5	41.0%		409.5
	Class 3	400	40.0%	285.6	28.6%	0.71	-114.4
885	202	0	0.0%	128.6	12.9%		128.6
	212	600	60.0%	30.7	3.1%	0.05	-569.3
	Class 3	400	40.0%	0.0	0.0%		-400.0
	999	0	0.0%	840.7	84.1%		840.7
886	400	1,000	100.0%	74.7	7.5%	0.07	-925.3
	999	0	0.0%	925.3	92.5%		925.3
887	212	0	0.0%	38.2	3.8%		38.2
	400	1,000	100.0%	961.8	96.2%	0.96	-38.2
888	202	0	0.0%	76.8	7.7%		76.8
	211	0	0.0%	46.4	4.6%		46.4
	212	0	0.0%	352.4	35.2%		352.4
	400	1,000	100.0%	524.4	52.4%	0.52	-475.6
889	202	400	40.0%	0.0	0.0%		-400.0





	211	600	60.0%	0.0	0.0%		-600.0
	212	0	0.0%	960.1	96.0%		960.1
	361	0	0.0%	9.7	1.0%		9.7
	400	0	0.0%	30.2	3.0%		30.2
890	202	400	40.0%	18.0	1.8%	0.04	-382.0
	211	600	60.0%	288.4	28.8%	0.48	-311.6
	212	0	0.0%	417.3	41.7%		417.3
	362	0	0.0%	13.9	1.4%		13.9
	400	0	0.0%	128.1	12.8%		128.1
	Class 3	0	0.0%	134.3	13.4%		134.3
891	202	400	40.0%	162.4	16.2%	0.41	-237.6
	211	600	60.0%	415.4	41.5%	0.69	-184.6
	212	0	0.0%	210.4	21.0%		210.4
	361	0	0.0%	15.0	1.5%		15.0
	400	0	0.0%	196.8	19.7%		196.8
892	211	1,000	100.0%	183.2	18.3%	0.18	-816.8
	212	0	0.0%	791.0	79.1%		791.0
	361	0	0.0%	10.1	1.0%		10.1
	362	0	0.0%	15.7	1.6%		15.7
893	211	1,000	100.0%	118.7	11.9%	0.12	-881.3
	212	0	0.0%	743.8	74.4%		743.8
	Class 3	0	0.0%	137.4	13.7%		137.4
894	202	360	36.0%	0.0	0.0%		-360.0
	211	240	24.0%	507.6	50.8%	2.11	267.6
	362	0	0.0%	10.1	1.0%		10.1
	400	400	40.0%	202.4	20.2%	0.51	-197.6
	Class 3	0	0.0%	279.9	28.0%		279.9
895	201	0	0.0%	39.2	3.9%		39.2
	211	0	0.0%	27.3	2.7%		27.3
	400	1,000	100.0%	908.0	90.8%	0.91	-92.0
	Class 3	0	0.0%	25.5	2.6%		25.5



896	201	0	0.0%	78.2	7.8%	1.59 0.61	78.2
	202	200	20.0%	317.5	31.7%		117.5
	400	800	80.0%	488.7	48.9%		-311.3
	Class 3	0	0.0%	115.7	11.6%		115.7
897	202	160	16.0%	0.0	0.0%	1.27	-160.0
	212	240	24.0%	0.0	0.0%		-240.0
	400	600	60.0%	762.3	76.2%		162.3
	Class 3	0	0.0%	237.7	23.8%		237.7
898	212	50	5.0%	0.0	0.0%	0.07	-50.0
	400	950	95.0%	67.3	6.7%		-882.7
	999	0	0.0%	932.7	93.3%		932.7
<b>TOTAL:</b>		<b>119,000</b>		<b>119,000</b>		<b>1.00</b>	<b>0.00</b>



**Comparison of "Continuous" Shoreline Statistics with "KM by KM" Statistics  
by Reach for Parallel Shoreline Protection on Lake Ontario Within US7**

Reach #	Shore Type	KM by KM SHORELINE		CONTINUOUS SHORELINE		Change Factor	Distance Factor
		Length	% of Reach	Length	% of Reach		
618	211	0	0%	157.2	15.7%	2.06	157.15
	212	600	60%	0.0	0.0%		-600.00
	400	400	40%	822.6	82.3%		422.59
	777	0	0%	20.3	2.0%		20.26
619	400	1,000	100%	1,000.0	100.0%	1.00	0.00
620	400	1,000	100%	1,000.0	100.0%	1.00	0.00
621	400	1,000	100%	1,000.0	100.0%	1.00	0.00
622	400	1,000	100%	1,000.0	100.0%	1.00	0.00
623	212	0	0%	13.6	1.4%	0.91	13.57
	400	1,000	100%	910.0	91.0%		-90.03
	777	0	0%	76.5	7.6%		76.45
624	212	0	0%	314.5	31.5%	0.35	314.54
	400	1,000	100%	346.3	34.6%		-653.69
	777	0	0%	339.1	33.9%		339.15
625	400	1,000	100%	920.4	92.0%	0.92	-79.59
	777	0	0%	79.6	8.0%		79.59
626	212	0	0%	65.2	6.5%	0.81	65.20
	400	1,000	100%	809.5	81.0%		-190.46
	777	0	0%	125.3	12.5%		125.27
627	202	0	0%	90.0	9.0%	0.91	90.00
	400	1,000	100%	910.0	91.0%		-90.00



628	400	1,000	100%	1,000.0	100.0%	1.00	0.00
629	400	1,000	100%	1,000.0	100.0%	1.00	0.00
630	400	1,000	100%	1,000.0	100.0%	1.00	0.00
631	400	1,000	100%	1,000.0	100.0%	1.00	0.00
632	400	1,000	100%	1,000.0	100.0%	1.00	0.00
633	400	1,000	100%	1,000.0	100.0%	1.00	0.00
634	400	1,000	100%	1,000.0	100.0%	1.00	0.00
635	400	1,000	100%	1,000.0	100.0%	1.00	0.00
636	400	1,000	100%	1,000.0	100.0%	1.00	0.00
637	400	1,000	100%	1,000.0	100.0%	1.00	0.00
638	400	1,000	100%	989.9	99.0%	0.99	-10.13
	Class 3	0	0%	10.1	1.0%		10.13
639	400	1,000	100%	1,000.0	100.0%	1.00	0.00
640	400	1,000	100%	1,000.0	100.0%	1.00	0.00
641	400	1,000	100%	1,000.0	100.0%	1.00	0.00
642	400	1,000	100%	1,000.0	100.0%	1.00	0.00
643	400	1,000	100%	1,000.0	100.0%	1.00	0.00
644	400	1,000	100%	1,000.0	100.0%	1.00	0.00
645	400	1,000	100%	1,000.0	100.0%	1.00	0.00
646	400	1,000	100%	1,000.0	100.0%	1.00	0.00
647	400	1,000	100%	1,000.0	100.0%	1.00	0.00
648	400	1,000	100%	1,000.0	100.0%	1.00	0.00
649	400	1,000	100%	1,000.0	100.0%	1.00	0.00
650	400	1,000	100%	1,000.0	100.0%	1.00	0.00
651	400	1,000	100%	1,000.0	100.0%	1.00	0.00
652	400	1,000	100%	1,000.0	100.0%	1.00	0.00
653	400	1,000	100%	1,000.0	100.0%	1.00	0.00
654	400	1,000	100%	1,000.0	100.0%	1.00	0.00
655	400	1,000	100%	1,000.0	100.0%	1.00	0.00
656	400	1,000	100%	1,000.0	100.0%	1.00	0.00
657	400	1,000	100%	1,000.0	100.0%	1.00	0.00



658	400	1,000	100%	1,000.0	100.0%	1.00	0.00
659	400	1,000	100%	1,000.0	100.0%	1.00	0.00
660	400	1,000	100%	1,000.0	100.0%	1.00	0.00
661	202	0	0%	174.2	17.4%	0.51	174.22
	400	1,000	100%	506.0	50.6%		-494.03
	Class 3	0	0%	319.8	32.0%		319.82
662	400	1,000	100%	520.3	52.0%	0.52	-479.69
	Class 3	0	0%	479.7	48.0%		479.69
663	400	1,000	100%	951.5	95.2%	0.95	-48.46
	Class 3	0	0%	48.5	4.8%		48.46
664	400	1,000	100%	1,000.0	100.0%	1.00	0.00
665	400	1,000	100%	1,000.0	100.0%	1.00	0.00
666	400	1,000	100%	938.3	93.8%	0.94	-61.69
	Class 3	0	0%	61.7	6.2%		61.69
667	212	0	0%	125.3	12.5%	0.74	125.32
	400	1,000	100%	741.4	74.1%		-258.58
	Class 3	0	0%	133.3	13.3%		133.26
668	202	0	0%	78.4	7.8%	0.69	78.36
	212	0	0%	54.2	5.4%		54.20
	400	1,000	100%	695.0	69.5%		-305.05
	Class 3	0	0%	172.5	17.2%		172.49
669	211	500	50%	361.3	36.1%	0.72	-138.71
	212	0	0%	14.6	1.5%		14.64
	400	500	50%	624.1	62.4%		124.07
670	202	200	20%	238.1	23.8%	1.19	38.11
	211	300	30%	0.0	0.0%		-300.00
	212	0	0%	184.1	18.4%		184.13
	362	0	0%	11.2	1.1%	11.22	
	400	500	50%	513.8	51.4%	1.03	13.78
	Class 3	0	0%	52.8	5.3%		52.76
671	202	400	40%	98.4	9.8%	0.25	-301.62



	211	600	60%	0.0	0.0%		-600.00
	212	0	0%	85.4	8.5%		85.36
	400	0	0%	165.0	16.5%		165.00
	Class 3	0	0%	651.3	65.1%		651.26
672	202	0	0%	61.3	6.1%		61.29
	211	500	50%	0.0	0.0%		-500.00
	212	0	0%	259.1	25.9%		259.14
	400	500	50%	679.6	68.0%	1.36	179.57
673	211	420	42%	49.1	4.9%	0.12	-370.89
	400	300	30%	349.5	34.9%	1.16	49.46
	Class 3	280	28%	601.4	60.1%	2.15	321.43
674	202	420	42%	111.0	11.1%	0.26	-308.99
	211	0	0%	29.5	2.9%		29.47
	212	280	28%	48.6	4.9%	0.17	-231.38
	400	300	30%	420.8	42.1%	1.40	120.79
	Class 3	0	0%	390.1	39.0%		390.10
675	202	420	42%	72.4	7.2%	0.17	-347.60
	211	0	0%	268.6	26.9%		268.56
	212	280	28%	9.1	0.9%	0.03	-270.92
	400	300	30%	650.0	65.0%	2.17	349.95
676	202	0	0%	43.6	4.4%		43.58
	212	120	12%	32.2	3.2%	0.27	-87.81
	400	800	80%	850.6	85.1%	1.06	50.62
	Class 3	80	8%	73.6	7.4%	0.92	-6.39
677	202	0	0%	2.8	0.3%		2.83
	212	240	24%	0.0	0.0%		-240.00
	400	600	60%	603.8	60.4%	1.01	3.84
	Class 3	160	16%	393.3	39.3%	2.46	233.33
678	202	0	0%	60.1	6.0%		60.07
	211	0	0%	136.3	13.6%		136.27
	212	240	24%	186.8	18.7%	0.78	-53.16



	400	600	60%	263.2	26.3%	0.44	-336.76
	Class 3	160	16%	353.6	35.4%	2.21	193.59
679	202	0	0%	74.9	7.5%		74.95
	211	0	0%	39.0	3.9%		38.98
	212	240	24%	198.3	19.8%	0.83	-41.66
	361	0	0%	10.4	1.0%		10.39
	400	600	60%	388.8	38.9%	0.65	-211.16
	Class 3	160	16%	288.5	28.8%	1.80	128.50
680	212	240	24%	743.1	74.3%	3.10	503.10
	362	0	0%	19.2	1.9%		19.23
	400	600	60%	75.1	7.5%	0.13	-524.95
	Class 3	160	16%	162.6	16.3%	1.02	2.61
681	201	0	0%	13.4	1.3%		13.39
	202	0	0%	87.5	8.7%		87.48
	212	360	36%	297.0	29.7%	0.83	-62.98
	362	0	0%	5.8	0.6%		5.80
	400	400	40%	364.9	36.5%	0.91	-35.06
	Class 3	240	24%	231.4	23.1%	0.96	-8.63
682	212	300	30%	273.5	27.4%	0.91	-26.47
	400	500	50%	220.2	22.0%	0.44	-279.78
	Class 3	200	20%	506.3	50.6%	2.53	306.25
683	202	0	0%	59.8	6.0%		59.80
	212	240	24%	196.9	19.7%	0.82	-43.06
	400	600	60%	615.2	61.5%	1.03	15.22
	Class 3	160	16%	128.0	12.8%	0.80	-31.96
684	202	0	0%	63.1	6.3%		63.06
	212	360	36%	127.4	12.7%	0.35	-232.59
	400	400	40%	598.6	59.9%	1.50	198.56
	Class 3	240	24%	211.0	21.1%	0.88	-29.03
685	400	1,000	100%	1,000.0	100.0%	1.00	0.00
686	202	0	0%	97.6	9.8%		97.58



	211	0	0%	58.2	5.8%		58.23	
	212	0	0%	138.2	13.8%		138.17	
	400	1,000	100%	706.0	70.6%	0.71	-293.98	
687	211	0	0%	119.5	11.9%	0.76	119.45	
	212	0	0%	106.7	10.7%		106.70	
	400	1,000	100%	759.1	75.9%		-240.88	
	Class 3	0	0%	14.7	1.5%		14.72	
688	201	0	0%	14.0	1.4%	0.84	14.03	
	212	0	0%	68.9	6.9%		68.88	
	400	1,000	100%	835.9	83.6%		-164.11	
	Class 3	0	0%	81.2	8.1%		81.19	
689	212	0	0%	40.5	4.1%	0.96	40.54	
	400	1,000	100%	959.5	95.9%		-40.54	
690	400	1,000	100%	1,000.0	100.0%	1.00	0.00	
691	400	1,000	100%	1,000.0	100.0%	1.00	0.00	
692	202	360	36%	60.9	6.1%	0.17	-299.09	
	400	400	40%	648.4	64.8%	1.62	248.43	
	Class 3	240	24%	290.7	29.1%	1.21	50.66	
693	202	600	60%	257.3	25.7%	0.43	-342.73	
	400	0	0%	363.5	36.3%		363.47	
	Class 3	400	40%	379.3	37.9%	0.95	-20.74	
694	201	0	0%	42.9	4.3%	0.74	42.90	
	202	150	15%	111.3	11.1%		-38.68	
	400	500	50%	321.9	32.2%		0.64	-178.10
	Class 3	350	35%	523.9	52.4%		1.50	173.88
695	202	0	0%	72.9	7.3%	23.87	72.95	
	212	5	1%	119.4	11.9%		114.37	
	282	15	2%	0.0	0.0%		-15.00	
	362	0	0%	7.1	0.7%		7.09	
	400	950	95%	298.9	29.9%		0.31	-651.10
	Class 3	30	3%	501.7	50.2%		16.72	471.70





696	212	0	0%	76.0	7.6%	2.83	75.97	
	282	375	38%	0.0	0.0%		-375.00	
	400	250	25%	708.4	70.8%		458.38	
	Class 3	375	38%	215.6	21.6%		0.58	-159.36
697	282	600	60%	0.0	0.0%	2.50	-600.00	
	400	400	40%	1,000.0	100.0%		600.00	
698	400	1,000	100%	1,000.0	100.0%	1.00	0.00	
699	400	1,000	100%	678.0	67.8%	0.68	-322.03	
	Class 3	0	0%	322.0	32.2%		322.03	
700	202	0	0%	31.2	3.1%	0.70	31.25	
	211	0	0%	146.7	14.7%		146.69	
	212	320	32%	223.7	22.4%		-96.34	
	361	0	0%	6.6	0.7%		6.60	
	362	0	0%	5.3	0.5%		5.31	
	400	200	20%	552.6	55.3%		2.76	352.61
	Class 3	480	48%	33.9	3.4%		0.07	-446.13
701	202	40	4%	0.0	0.0%	0.93	-40.00	
	212	0	0%	160.3	16.0%		160.29	
	400	900	90%	839.7	84.0%		-60.29	
	Class 3	60	6%	0.0	0.0%		-60.00	
702	202	40	4%	0.0	0.0%	0.89	-40.00	
	211	0	0%	68.2	6.8%		68.22	
	212	0	0%	132.2	13.2%		132.23	
	400	900	90%	799.5	80.0%		-100.46	
	Class 3	60	6%	0.0	0.0%		-60.00	
703	400	1,000	100%	1,000.0	100.0%	1.00	0.00	
704	400	1,000	100%	1,000.0	100.0%	1.00	0.00	
705	400	1,000	100%	215.8	21.6%	0.22	-784.17	
	999	0	0%	784.2	78.4%		784.17	
706	400	1,000	100%	0.0	0.0%		-1000.00	
	999	0	0%	1,000.0	100.0%		1000.00	



707	400	1,000	100%	0.0	0.0%		-1000.00
	999	0	0%	1,000.0	100.0%		1000.00
708	400	1,000	100%	0.0	0.0%		-1000.00
	999	0	0%	1,000.0	100.0%		1000.00
709	400	1,000	100%	0.0	0.0%		-1000.00
	999	0	0%	1,000.0	100.0%		1000.00
710	400	1,000	100%	0.0	0.0%		-1000.00
	999	0	0%	1,000.0	100.0%		1000.00
711	400	1,000	100%	0.0	0.0%		-1000.00
	999	0	0%	1,000.0	100.0%		1000.00
712	400	1,000	100%	0.0	0.0%		-1000.00
	999	0	0%	1,000.0	100.0%		1000.00
713	400	1,000	100%	0.0	0.0%		-1000.00
	999	0	0%	1,000.0	100.0%		1000.00
714	400	1,000	100%	0.0	0.0%		-1000.00
	999	0	0%	1,000.0	100.0%		1000.00
715	400	1,000	100%	657.9	65.8%	0.66	-342.06
	999	0	0%	342.1	34.2%		342.06
716	400	1,000	100%	1,000.0	100.0%	1.00	0.00
717	211	0	0%	41.2	4.1%		41.21
	400	1,000	100%	958.8	95.9%	0.96	-41.21
718	400	1,000	100%	1,000.0	100.0%	1.00	0.00
719	212	0	0%	16.6	1.7%		16.60
	400	1,000	100%	983.4	98.3%	0.98	-16.60
720	202	0	0%	15.2	1.5%		15.17
	212	600	60%	408.7	40.9%	0.68	-191.34
	400	0	0%	576.2	57.6%		576.18
	Class 3	400	40%	0.0	0.0%		-400.00
721	202	0	0%	106.6	10.7%		106.65
	212	0	0%	125.5	12.5%		125.46
	400	1,000	100%	663.1	66.3%	0.66	-336.86



	Class 3	0	0%	104.7	10.5%		104.75
722	202	0	0%	1,000.0	100.0%		1000.00
	400	1,000	100%	0.0	0.0%		-1000.00
723	202	800	80%	266.5	26.7%	0.33	-533.49
	400	200	20%	733.5	73.3%	3.67	533.49
724	400	1,000	100%	1,000.0	100.0%	1.00	0.00
725	400	1,000	100%	1,000.0	100.0%	1.00	0.00
726	400	1,000	100%	1,000.0	100.0%	1.00	0.00
727	400	1,000	100%	1,000.0	100.0%	1.00	0.00
728	212	0	0%	163.0	16.3%		163.03
	400	1,000	100%	745.4	74.5%	0.75	-254.62
	Class 3	0	0%	91.6	9.2%		91.60
729	211	0	0%	40.2	4.0%		40.21
	212	0	0%	67.1	6.7%		67.10
	400	1,000	100%	517.3	51.7%	0.52	-482.71
	Class 3	0	0%	375.4	37.5%		375.39
730	202	20	2%	0.0	0.0%		-20.00
	212	0	0%	281.8	28.2%		281.78
	400	950	95%	561.0	56.1%	0.59	-389.01
	Class 3	30	3%	157.2	15.7%	5.24	127.23
731	202	900	90%	131.8	13.2%	0.15	-768.20
	400	100	10%	509.2	50.9%	5.09	409.18
	Class 3	0	0%	359.0	35.9%		359.02
732	201	0	0%	25.7	2.6%		25.65
	202	0	0%	95.0	9.5%		95.05
	400	1,000	100%	455.5	45.6%	0.46	-544.47
	Class 3	0	0%	423.8	42.4%		423.77
733	400	1,000	100%	274.4	27.4%	0.27	-725.62
	Class 3	0	0%	70.7	7.1%		70.66
	999	0	0%	655.0	65.5%		654.96



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<b>TOTAL:</b>	<b>116,000</b>	<b>116,000</b>	<b>1.00</b>	<b>0.00</b>
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