

7.0 ESTIMATED NUTRIENT LOAD BY SECTOR

7.1 Significance of Pressures

As part of the process of assessing pressures to determine their relative significance and the risk they pose to water quality, an essential first step is to estimate the sectoral contribution to nutrient load in each subcatchment.

Input loadings for Total Nitrogen and Total Phosphorus have been assessed according to established procedures for nutrient estimates, allowing comparison to national datasets. Other pollutants such as suspended solids and Ammonia and indicators of pollution load recorded as BOD and COD, are more transitory than nutrients and do not accumulate within water bodies, consequently these input loads are reported in Section 6.0 in relation to individual point discharges.

The nutrient contributions of both point and diffuse sources were established as far as possible using best practice procedures. Some budgets are not readily quantifiable due to deficiencies in existing monitoring datasets e.g. measurement of loading (flows and concentrations) from facilities and point sources consequently estimate procedures were adopted. Other unquantified loadings include contributions from septic tanks, stormwater overflows, spreading of municipal/industrial/agricultural sludges and agricultural runoff where facility monitoring programmes do not exist, therefore, again estimate procedures had to be adopted.

The estimates of nutrient loading presented within this report will be developed as the Project monitoring systems deliver more reliable data.

The temporal distribution of nutrient loads varies throughout the year and the timing of loading can be crucial to water body status. Point source discharges from treatment plants and non seasonal industries deliver a relatively consistent supply of nutrient loading throughout the year and have a potentially greater impact during summer periods when dilution is low, water transparency is high, temperatures are elevated, sunlight is more readily available and plant/algal productivity is consequently favoured. Diffuse sources produce potentially high nutrient loading in response to heavy rainfall following application of slurry or sludges to lands or certain forestry/peat extraction activities. Diffuse loading is consequently more variable and can result in high peak loadings in receiving watercourses. The nutrient estimates presented do not attempt to account for seasonal effects.

The estimates are input estimates and take no account of in-stream uptake in terms of assessing impact on water bodies.

It should be noted that whilst more detailed nutrient loading data is available for the Suir basin as a result of its investigation by the Three Rivers Project a consistent methodology has been applied for estimation of loadings across all river basins within the South Eastern River Basin District.

7.2 Load Estimation Methodology

Ideally inputs should be quantified directly from monitoring data (concentrations and flows) if these data are available. Since the required frequency and extent of data was not available nutrient loadings were estimated as described below.

7.2.1 Point Sources

Wastewater Treatment Plants

Outflow from Wastewater Treatment Plants was estimated according to operating population equivalent, obtained from Local Authority treatment plant registers, and assumed nutrient production loading and reduction factors dependant on the level of treatment as detailed in PRAM 99/7/5-E Draft Guidance No. 7 Annex 1 Paragraph 6.3 NEUT Guidelines (Meeting of the Working Group on Nutrients and Eutrophication, October 1999).

Input Loading	Total Nitrogen	9.0 g/person/day
	Total Phosphorus	2.7 g/person/day

Under estimates of loads can result where treatment plants are not operating efficiently. This procedure also does not account for capacity overload at plants resulting in overflow of partially treated or untreated effluents.

Table 7.1 Nutrient Reduction Factors for Wastewater Treatment Plants

Load Reductions for Level of Treatment	Total Nitrogen Reduction Factor	Total Phosphorus Reduction Factor
Raw	1.000	1.000
Preliminary Treatment	0.900	0.900
Primary Treatment	0.727	0.667
Secondary Treatment	0.545	0.467
Additional Nutrient Removal	0.300	0.100

Unsewered Industries

Loading from Section 4 licensed industries and IPC activities which discharge directly to watercourses were estimated as 25% of maximum allowable discharge in accordance with PRAM 99/7/5-E Draft Guideline No. 7 Annex 1 Paragraph 6.7.

Where industries are failing to comply with consent standards this assumption will result in an underestimate of load. If no license limit of nutrient concentrations (or flow) is specified, loads are

assumed to be zero again possibly underestimating nutrient input. Also unregulated industries discharging to watercourses are omitted from the analysis resulting in a further source of possible load underestimation. The South Eastern River Basin District monitoring system will address these gaps.

7.2.2 Diffuse Sources

Agriculture

Data on agricultural activity were obtained from Teagasc, derived from the Agricultural Census 1991 – (data for the 2000 agricultural census is not yet available). The data included nutrient arisings based on livestock numbers and chemical fertilizer application.

The approach adopted for agricultural nutrient losses was as per the NEUT 99 Screening Procedure for Irish Coastal Waters with regard to Eutrophication Status which the EPA reported were within the ranges of values quoted in PRAM 99/715-E Draft Guidance No. 6. The agricultural losses estimates are also comparable with direct measurements of export rates in agricultural areas in Ireland obtained from catchment monitoring and management programmes for Lough Derg and Lough Ree, the Three Rivers Project and Lough Leane.

Nitrogen losses from agriculture = 0.20 of Total Agricultural N

Phosphorus losses from agriculture = 0.04 of Total Agricultural P

It is recognised that this methodology, which assumed that 20% of input agricultural Nitrogen and 4% of input agricultural Phosphorus reaches water bodies in all areas, does not take account of variability in runoff risk properties of soils and must therefore be further refined during the South Eastern River Basin District project based on data provided by the monitoring programme. The estimated will also draw on findings of Teagasc studies into nutrient loss from various soil types and the EuroHARP project aimed at developing nutrient loss models for diffuse nutrient loadings.

Forestry

Nutrient leaching from forestry was estimated using standard coefficients for afforested land area (based on Corine 1990 land coverage image).

Total Nitrogen losses from forestry = 5.42 kg/ha/yr

Total Phosphorus losses from forestry = 0.33 kg/ha/yr

Total Nitrogen losses from woodland/woodland scrub = 3.71 kg/ha/yr

Total Phosphorus losses from woodland/woodland scrub = 0.565 kg/ha/yr

Source: M C O’Sullivan, Three Rivers Baseline Report 1999.

Again this approach does not take account of variation in runoff risk properties, management practices or forestry activities within the River Basin District.

Peatlands

Nutrient loading from peatlands was estimated using standard coefficients for all peatlands (based on Corine 1990 land coverage image). This dataset does not therefore relate solely to worked areas.

Total Nitrogen losses from peatland	= 2 kg/ha/yr
Total Phosphorus losses from peatland	= 0.325 kg/ha/yr
Total Nitrogen losses from marshes	= 2 kg/ha/yr
Total Phosphorus losses from marshes	= 0.2 kg/ha/yr

Source M C O’Sullivan, Three Rivers Baseline Report 1999.

This estimate assumes consistent nutrient loss for all peatlands or scrub areas.

Urban Areas

Runoff from urban areas was estimated using standard coefficients for urban areas based on Corine 1990 land coverage image.

Total Nitrogen loss	= 5 kg/ha/yr
Total Phosphorus loss	= 0.86 – 2.15 hg/ha/yr
	(0.86 Discontinuous Urban Areas
	1.4 Continuous Urban Areas
	1.88 Industrial Areas
	2.15 Construction Sites etc)

Source: M C O’Sullivan, Three Rivers Baseline Report 1999.

These rates are in line with recorded export rates for urban activities which range from 3.43 to 7.70 kg/ha/yr Total Oxidised Nitrogen for most urban activities and 36.5 kg/ha/yr for industrial activities and Total Phosphorus rates of 0.13 to 9.30 kg/ha/yr as presented in the Three Rivers Project Final Report M C O’Sullivan 2002.

Standard runoff rates are assumed independent of storm and foul sewage capacity and operation within urban areas.

Unsewered Rural Populations

Standard PRAM 99/715 Draft OSPAR Guidelines for harmonization of quantification and reporting procedures for nutrient loading factors were utilized to estimate loadings to watercourses from rural populations and septic tanks.

Table 7.2 Nutrient Loading from Septic Tanks and Rural Populations

	Total Nitrogen Loss Rate	Total Phosphorus Loss Rate
Septic Tanks	2.4 kg/person/yr	0.25 kg/person/yr
Septic Tanks remote from watercourses	0.7 kg/person/yr	0.25 kg/person/yr

In the absence of data regarding the location of septic tanks 50% were assumed as standard loss rates and the remaining 50% assumed to be remote from watercourses.

Background Loss

Background losses were estimated on the basis of total catchment area in accordance with PRAM 99/7/5-E Draft Guideline No. 6 Annexes I and III. Nitrogen inputs to waters originating in atmospheric deposition are considered to be accounted for in the background loss estimates.

Total Nitrogen losses from background runoff = 0.75 kg/ha/yr
 Total Phosphorus losses from background runoff = 0.05 kg/ha/yr

These background rates are comparable with values recorded for headwater sites obtained from catchment monitoring and management programmes for Lough Derg and Lough Ree, the Three Rivers Project and Lough Leane and by the Central Fisheries Board.

7.3 Sectoral Nutrient Loading by Subcatchment

The EPA provided subcatchment boundaries for the principal river basins (Map 7.1). Sectoral loading was estimated for each subcatchment using the methodology described in Section 7.2. The results are presented in Tables 7.3 and 7.4 and Figures 7.1 and 7.2.

The majority of anthropogenic nutrient load within the South Eastern River Basin District is derived from diffuse sources.

Diffuse anthropogenic activities account for 94.1% of total Nitrogen loading in the South Eastern River Basin District, combined with background contribution which represents 2.8%, the total diffuse portion of total Nitrogen loading is 96.9% with point sources accounting for 3.1% of total Nitrogen loading.

In terms of total Phosphorus loading, anthropogenic diffuse sources account for 77.2% and background loading represents 4.2%, which combined means that diffuse sources represent 81.4% and point

sources 18.6% of total Phosphorus load. Average export rates vary by subcatchment throughout the river basin district.

Nitrogen export rates range between 17.2 – 62.7 kg/ha/yr with an overall average of 27.2 kg/ha/yr. The most significant influence on nitrogen export rate is agricultural inputs related to intensity of agricultural activity. High rates are estimated in the adjacent subcatchments of the Ara, Aherlow and Tar tributaries of the River Suir largely due to agricultural inputs. Large agglomerations also influence nitrogen loadings in some sub-catchments especially around Waterford and Wexford were the highest overall rates were estimated.

Phosphorus average export rates also vary within the South Eastern River Basin District ranging between 0.8 – 5.8 kg/ha/yr with an average of 1.2 kg/ha/yr. Agricultural inputs are again the most significant portion and rates are higher in more intensively farmed areas. However, agriculture is less significant proportionately in terms of total Phosphorus than it is in total Nitrogen export rates. Point sources and contributions from unsewered populations influence total Phosphorus export rates more strongly than is the case for total Nitrogen. High total Phosphorus rates were noted again in the intensive agricultural headwaters of the Suir, also in the Waterford and Wexford areas demonstrating the influence of these agglomerations and in the Triogue subcatchment where the influence of Portlaoise town combines with agricultural and unsewered population loading.

The potential nutrient loadings within the South Eastern River Basin District present a risk to water quality in surface waters as demonstrated in Section 6.2 with diffuse runoff accounting for the majority of moderate pollution in rivers and point source discharges accounting for the majority of serious pollution incidences. The Slaney Estuary Upper, the Slaney Estuary Lower, the Suir Estuary Upper and Barrow Estuary have been classified as sensitive to nutrient inputs.

Table 7.3 Sectoral Loading Estimates

Principal Subcatchment	Sector	Total N Load (kg/yr)	Total P Load (kg/yr)	% Total N Load	% Total P Load
SE1_hydro11	WWTP	45504	12355.2	4.4	27.4
	Unsewered Industries	0	314	0.0	0.7
	Agriculture	948255.2	28792.0	91.5	63.8
	Forestry	5289.0	369.5	0.5	0.8
	Peatlands	20.0	3.3	0.0	0.0
	Urban Areas	1350.0	258.0	0.1	0.6
	Unsewered Populations	6457.3	1041.5	0.6	2.3
	Background Losses	29433.0	1962.2	2.8	4.4
175 derry	WWTP	4170.3	1112.8	0.6	4.2
	Unsewered Industries	0	19	0.0	0.1
	Agriculture	639047.8	19167.9	91.6	72.1
	Forestry	10807.0	922.5	1.5	3.5
	Peatlands	1440.0	234.0	0.2	0.9
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	24190.9	3901.8	3.5	14.7
	Background Losses	18259.5	1217.3	2.6	4.6
175 bann	WWTP	4505.4	1202.8	0.8	5.6
	Unsewered Industries	0	78	0.0	0.4
	Agriculture	504939.1	15251.2	91.4	70.5
	Forestry	7320.5	584.8	1.3	2.7
	Peatlands	160.0	26.0	0.0	0.1
	Urban Areas	150.0	25.8	0.0	0.1
	Unsewered Populations	22236.3	3586.5	4.0	16.6
	Background Losses	13171.5	878.1	2.4	4.1
175 urrin	WWTP	395.7	101.4	0.1	0.8
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	236648.5	7069.2	85.5	56.3
	Forestry	3381.0	341.5	1.2	2.7
	Peatlands	1480.0	240.5	0.5	1.9
	Urban Areas	100.0	17.2	0.0	0.1
	Unsewered Populations	26024.5	4197.5	9.4	33.5
	Background Losses	8700.8	580.1	3.1	4.6
175 boro	WWTP	1678.5	430.3	0.4	2.4
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	403554.8	12156.9	90.3	68.7
	Forestry	5223.8	453.7	1.2	2.6
	Peatlands	0.0	0.0	0.0	0.0
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	23425.2	3778.3	5.2	21.3
	Background Losses	13211.3	880.8	3.0	5.0
178 sow	WWTP	2976.2	766.1	1.6	9.7
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	162588.2	4936.0	88.6	62.6
	Forestry	1246.6	75.9	0.7	1.0
	Peatlands	100.0	10.0	0.1	0.1
	Urban Areas	250.0	81.7	0.1	1.0
	Unsewered Populations	9729.4	1569.3	5.3	19.9
	Background Losses	6711.8	447.5	3.7	5.7

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Principal Subcatchment	Sector	Total N Load (kg/yr)	Total P Load (kg/yr)	% Total N Load	% Total P Load
SE2_hydro12	WWTP	0	0	0.0	0.0
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	154407.4	4688.3	94.9	81.2
	Forestry	707.5	53.3	0.4	0.9
	Peatlands	0.0	0.0	0.0	0.0
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	5587.8	901.3	3.4	15.6
	Background Losses	1945.5	129.7	1.2	2.2
SE3_hydro12	WWTP	67834.9	19833.5	23.4	72.2
	Unsewered Industries	36	46	0.0	0.2
	Agriculture	209052.2	6027.8	72.0	21.9
	Forestry	1029.8	62.7	0.4	0.2
	Peatlands	0.0	0.0	0.0	0.0
	Urban Areas	3600.0	933.3	1.2	3.4
	Unsewered Populations	0.0	0.0	0.0	0.0
	Background Losses	8703.8	580.3	3.0	2.1
175 - main Channel	WWTP	42010.7	10838	2.0	14.0
	Unsewered Industries	0	103	0.0	0.1
	Agriculture	1961587.3	58486.7	93.4	75.3
	Forestry	28856.0	2720.0	1.4	3.5
	Peatlands	6780.0	1101.8	0.3	1.4
	Urban Areas	2200.0	425.2	0.1	0.5
	Unsewered Populations	0.0	0.0	0.0	0.0
	Background Losses	59638.5	3975.9	2.8	5.1
175 derreen	WWTP	1857.3	476.2	0.3	2.2
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	538035.2	16091.5	91.2	73.7
	Forestry	15577.2	1341.8	2.6	6.1
	Peatlands	440.0	71.5	0.1	0.3
	Urban Areas	150.0	25.8	0.0	0.1
	Unsewered Populations	16417.6	2648.0	2.8	12.1
	Background Losses	17495.3	1166.4	3.0	5.3
SE4_hydro13	WWTP	18068.1	4837.3	1.0	7.6
	Unsewered Industries	0	28	0.0	0.0
	Agriculture	1645369.1	49871.3	93.9	78.0
	Forestry	6033.6	428.4	0.3	0.7
	Peatlands	820.0	82.0	0.0	0.1
	Urban Areas	1000.0	172.0	0.1	0.3
	Unsewered Populations	32833.7	5295.8	1.9	8.3
	Background Losses	48861.8	3257.5	2.8	5.1
183 cushina	WWTP	90.3	23.2	0.0	0.2
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	288607.1	8666.9	89.7	65.6
	Forestry	5336.0	664.0	1.7	5.0
	Peatlands	3140.0	510.3	1.0	3.9
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	17998.6	2903.0	5.6	22.0
	Background Losses	6613.5	440.9	2.1	3.3
183 - main channel	WWTP	107414.6	27759.9	2.5	14.1
	Unsewered Industries	34243	5086	0.8	2.6

Principal Subcatchment	Sector	Total N Load (kg/yr)	Total P Load (kg/yr)	% Total N Load	% Total P Load
	Agriculture	3774513.0	113831.6	87.4	57.8
	Forestry	49991.8	4759.7	1.2	2.4
	Peatlands	9460.0	1533.5	0.2	0.8
	Urban Areas	6850.0	1402.9	0.2	0.7
	Unsewered Populations	212581.0	34287.3	4.9	17.4
	Background Losses	126032.3	8402.2	2.9	4.3
183 triogue	WWTP	32521.5	8337.3	13.3	49.3
	Unsewered Industries	0	183	0.0	1.1
	Agriculture	189756.8	5809.3	77.4	34.4
	Forestry	4938.3	385.5	2.0	2.3
	Peatlands	580.0	94.3	0.2	0.6
	Urban Areas	2350.0	482.8	1.0	2.9
	Unsewered Populations	6423.2	1036.0	2.6	6.1
	Background Losses	8627.3	575.2	3.5	3.4
183 owenass	WWTP	8130.4	2084.3	4.8	23.8
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	140712.9	4320.7	82.7	49.4
	Forestry	5916.8	455.2	3.5	5.2
	Peatlands	1340.0	217.8	0.8	2.5
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	7756.2	1251.0	4.6	14.3
	Background Losses	6259.5	417.3	3.7	4.8
183 greese	WWTP	4911.1	1465.4	1.4	10.1
	Unsewered Industries	197	57	0.1	0.4
	Agriculture	320172.8	9743.9	91.0	67.0
	Forestry	496.5	60.8	0.1	0.4
	Peatlands	0.0	0.0	0.0	0.0
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	15588.4	2514.3	4.4	17.3
	Background Losses	10534.5	702.3	3.0	4.8
183 stradbally	WWTP	5208.6	1434.1	2.6	16.9
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	180746.0	5508.2	89.1	65.1
	Forestry	3705.6	232.4	1.8	2.7
	Peatlands	0.0	0.0	0.0	0.0
	Urban Areas	150.0	25.8	0.1	0.3
	Unsewered Populations	4185.0	675.0	2.1	8.0
	Background Losses	8847.0	589.8	4.4	7.0
183 douglas	WWTP	0	0	0.0	0.0
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	133168.7	4055.6	92.5	76.0
	Forestry	54.2	3.3	0.0	0.1
	Peatlands	0.0	0.0	0.0	0.0
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	5860.6	945.3	4.1	17.7
	Background Losses	4941.8	329.5	3.4	6.2
183 burren	WWTP	990.1	253.8	0.2	1.3
	Unsewered Industries	0	12	0.0	0.1
	Agriculture	379913.8	11430.2	86.0	56.6
	Forestry	1164.0	98.0	0.3	0.5

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	Peatlands	700.0	113.8	0.2	0.6
	Urban Areas	1150.0	197.8	0.3	1.0
	Unsewered Populations	44796.6	7225.3	10.1	35.8
	Background Losses	13179.0	878.6	3.0	4.3
183 figile	WWTP	2563	668	0.3	1.9
	Unsewered Industries	58	8	0.0	0.0
	Agriculture	794205.0	24207.7	90.1	67.6
	Forestry	14470.1	1827.2	1.6	5.1
	Peatlands	21780.0	3539.3	2.5	9.9
	Urban Areas	350.0	60.2	0.0	0.2
	Unsewered Populations	24158.3	3896.5	2.7	10.9
	Background Losses	23880.8	1592.1	2.7	4.4
183 slate	WWTP	8130.4	2084.3	1.4	7.3
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	465880.6	13802.0	82.7	48.5
	Forestry	7995.3	965.0	1.4	3.4
	Peatlands	4460.0	724.8	0.8	2.5
	Urban Areas	1600.0	275.2	0.3	1.0
	Unsewered Populations	58997.7	9515.8	10.5	33.5
	Background Losses	15987.8	1065.9	2.8	3.7
184 dinin	WWTP	5226.6	1346.3	0.8	5.3
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	609415.1	18663.6	91.3	73.5
	Forestry	12321.1	875.7	1.8	3.4
	Peatlands	0.0	0.0	0.0	0.0
	Urban Areas	450.0	129.0	0.1	0.5
	Unsewered Populations	17701.0	2855.0	2.7	11.2
	Background Losses	22734.0	1515.6	3.4	6.0
184 erkina	WWTP	8010.4	2111.5	0.8	6.0
	Unsewered Industries	0	128	0.0	0.4
	Agriculture	912243.3	27880.3	93.9	79.2
	Forestry	10117.2	995.8	1.0	2.8
	Peatlands	760.0	123.5	0.1	0.4
	Urban Areas	600.0	206.4	0.1	0.6
	Unsewered Populations	11448.3	1846.5	1.2	5.2
	Background Losses	28824.0	1921.6	3.0	5.5
184 kings	WWTP	7711.4	2014.1	0.7	5.2
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	1017157.1	31136.2	94.1	80.2
	Forestry	1937.0	131.5	0.2	0.3
	Peatlands	300.0	48.8	0.0	0.1
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	20430.6	3295.3	1.9	8.5
	Background Losses	32865.8	2191.1	3.0	5.6
184 - main channel	WWTP	30468.8	7892.3	0.8	5.6
	Unsewered Industries	6388	2470	0.2	1.7
	Agriculture	3313177.6	100760.5	91.4	71.0
	Forestry	57359.5	5069.3	1.6	3.6
	Peatlands	9980.0	1609.3	0.3	1.1
	Urban Areas	4400.0	982.4	0.1	0.7

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184 gully	Unsewered Populations	99578.2	16061.0	2.7	11.3
	Background Losses	105396.0	7026.4	2.9	5.0
	WWTP	0	0	0.0	0.0
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	126755.8	3869.5	88.7	64.8
	Forestry	1623.4	153.1	1.1	2.6
	Peatlands	0.0	0.0	0.0	0.0
	Urban Areas	50.0	21.5	0.0	0.4
	Unsewered Populations	10194.4	1644.3	7.1	27.5
Background Losses	4277.3	285.2	3.0	4.8	
182 drish	WWTP	1851.9	474.8	0.5	2.7
	Unsewered Industries	25	228	0.0	1.3
	Agriculture	361333.7	11080.1	88.2	63.8
	Forestry	8907.7	925.6	2.2	5.3
	Peatlands	6120.0	994.5	1.5	5.7
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	16408.3	2646.5	4.0	15.2
	Background Losses	15172.5	1011.5	3.7	5.8
182 multeen	WWTP	415.6	106.5	0.1	0.5
	Unsewered Industries	0	3	0.0	0.0
	Agriculture	618442.1	19003.6	94.0	81.5
	Forestry	9135.2	786.8	1.4	3.4
	Peatlands	400.0	65.0	0.1	0.3
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	14523.5	2342.5	2.2	10.1
	Background Losses	14946.0	996.4	2.3	4.3
182 anner	WWTP	6077.1	1561.2	0.6	4.1
	Unsewered Industries	0	22	0.0	0.1
	Agriculture	922482.4	28148.0	92.0	74.3
	Forestry	8233.5	674.3	0.8	1.8
	Peatlands	2360.0	383.5	0.2	1.0
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	30516.4	4922.0	3.0	13.0
	Background Losses	32735.3	2182.4	3.3	5.8
182 ara	WWTP	9582	2475.5	2.1	13.8
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	421997.0	12976.2	93.2	72.5
	Forestry	3708.5	242.8	0.8	1.4
	Peatlands	0.0	0.0	0.0	0.0
	Urban Areas	100.0	17.2	0.0	0.1
	Unsewered Populations	10815.9	1744.5	2.4	9.8
	Background Losses	6463.5	430.9	1.4	2.4
182 lingaun	WWTP	505.3	137.1	0.2	1.6
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	185736.1	5699.1	89.1	65.0
	Forestry	1010.1	119.2	0.5	1.4
	Peatlands	220.0	35.8	0.1	0.4
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	14494.1	2337.8	7.0	26.7
	Background Losses	6530.3	435.4	3.1	5.0

South Eastern River Basin District Management System Estimated Nutrient Load by Sector
Initial Characterisation Report

Principal Subcatchment	Sector	Total N Load (kg/yr)	Total P Load (kg/yr)	% Total N Load	% Total P Load
182 blackwater	WWTP	968.9	270.9	0.3	2.2
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	287068.6	8819.1	89.8	70.7
	Forestry	7790.9	552.4	2.4	4.4
	Peatlands	160.0	16.0	0.1	0.1
	Urban Areas	150.0	25.8	0.0	0.2
	Unsewered Populations	12934.8	2086.3	4.0	16.7
	Background Losses	10612.5	707.5	3.3	5.7
182 aherlow	WWTP	591.3	177.4	0.1	0.6
	Unsewered Industries	0	7	0.0	0.0
	Agriculture	734372.1	22448.3	92.4	76.7
	Forestry	23166.7	2126.1	2.9	7.3
	Peatlands	3680.0	598.0	0.5	2.0
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	18026.5	2907.5	2.3	9.9
	Background Losses	15055.5	1003.7	1.9	3.4
182 - north of waterford city	WWTP	2398.1	660.3	1.2	7.4
	Unsewered Industries	18250	684	8.8	7.7
	Agriculture	169967.8	5220.6	81.6	58.9
	Forestry	1691.8	143.7	0.8	1.6
	Peatlands	80.0	8.0	0.0	0.1
	Urban Areas	500.0	113.0	0.2	1.3
	Unsewered Populations	10673.3	1721.5	5.1	19.4
	Background Losses	4692.8	312.9	2.3	3.5
182 tar	WWTP	1796.1	494.6	0.2	1.4
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	980545.2	29922.2	93.9	81.8
	Forestry	29679.7	2617.6	2.8	7.2
	Peatlands	5980.0	971.8	0.6	2.7
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	8875.3	1431.5	0.8	3.9
	Background Losses	17432.3	1162.2	1.7	3.2
182 clodiagh	WWTP	2673.3	688.1	0.9	6.0
	Unsewered Industries	0	192	0.0	1.7
	Agriculture	274964.3	8411.0	91.1	73.7
	Forestry	9910.8	766.2	3.3	6.7
	Peatlands	1060.0	172.3	0.4	1.5
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	3368.2	543.3	1.1	4.8
	Background Losses	9687.0	645.8	3.2	5.7
182 nier	WWTP	54.2	13.9	0.0	0.2
	Unsewered Industries	46	5	0.0	0.1
	Agriculture	147541.5	4481.4	81.8	54.3
	Forestry	17134.3	1955.5	9.5	23.7
	Peatlands	3060.0	497.3	1.7	6.0
	Urban Areas	0.0	0.0	0.0	0.0
	Unsewered Populations	4825.2	778.3	2.7	9.4
	Background Losses	7776.0	518.4	4.3	6.3
182 - south of waterford city	WWTP	312017.5	85906.5	31.1	77.5
	Unsewered Industries	19163	890	1.9	0.8

South Eastern River Basin District Management System Estimated Nutrient Load by Sector
Initial Characterisation Report

Principal Subcatchment	Sector	Total N Load (kg/yr)	Total P Load (kg/yr)	% Total N Load	% Total P Load
	Agriculture	634471.3	19442.1	63.2	17.5
	Forestry	4111.1	348.7	0.4	0.3
	Peatlands	60.0	6.0	0.0	0.0
	Urban Areas	5200.0	1079.2	0.5	1.0
	Unsewered Populations	13939.2	2248.3	1.4	2.0
	Background Losses	14265.0	951.0	1.4	0.9
182 - main channel	WWTP	146958.9	38864.7	4.9	24.7
	Unsewered Industries	62367	19573	2.1	12.4
	Agriculture	2629314.0	80508.6	87.0	51.1
	Forestry	42783.7	3815.6	1.4	2.4
	Peatlands	6380.0	998.0	0.2	0.6
	Urban Areas	4400.0	1083.2	0.1	0.7
	Unsewered Populations	40744.9	6571.8	1.3	4.2
	Background Losses	90987.8	6065.9	3.0	3.9
182 clodiagh b	WWTP	1806.8	463.2	0.2	1.6
	Unsewered Industries	0	0	0.0	0.0
	Agriculture	778926.2	23860.2	95.2	83.9
	Forestry	3161.6	382.4	0.4	1.3
	Peatlands	60.0	9.8	0.0	0.0
	Urban Areas	150.0	42.0	0.0	0.1
	Unsewered Populations	15134.2	2441.0	1.9	8.6
	Background Losses	18634.5	1242.3	2.3	4.4
SE5_hydro17	WWTP	32984	9795.5	1.6	11.6
	Unsewered Industries	204	64	0.0	0.1
	Agriculture	1944122.0	59152.5	92.0	69.8
	Forestry	26556.7	2563.1	1.3	3.0
	Peatlands	3180.0	494.3	0.2	0.6
	Urban Areas	3750.0	808.2	0.2	1.0
	Unsewered Populations	53334.0	8602.3	2.5	10.2
	Background Losses	48909.0	3260.6	2.3	3.8
TOTAL	WWTP	931059.3	251518.3	2.7	16.6
	Unsewered Industries	140977	30200	0.4	2.0
	Agriculture	31141194.5	945397.6	89.6	62.3
	Forestry	459881.1	42049.7	1.3	2.8
	Peatlands	96540.0	15534.0	0.3	1.0
	Urban Areas	41000.0	8891.6	0.1	0.6
	Unsewered Populations	993213.7	160195.8	2.9	10.6
	Background Losses	959032.5	63935.5	2.8	4.2

* 175 – River Slaney; 183 – River Barrow; 184 River Nore; 182 River Suir.

The nutrient inputs from hydrometric areas 11, 13 and 17 discharge to coastal waters all other subcatchments drain via the main rivers to Wexford or the Barrow/Nore/Suir estuaries.

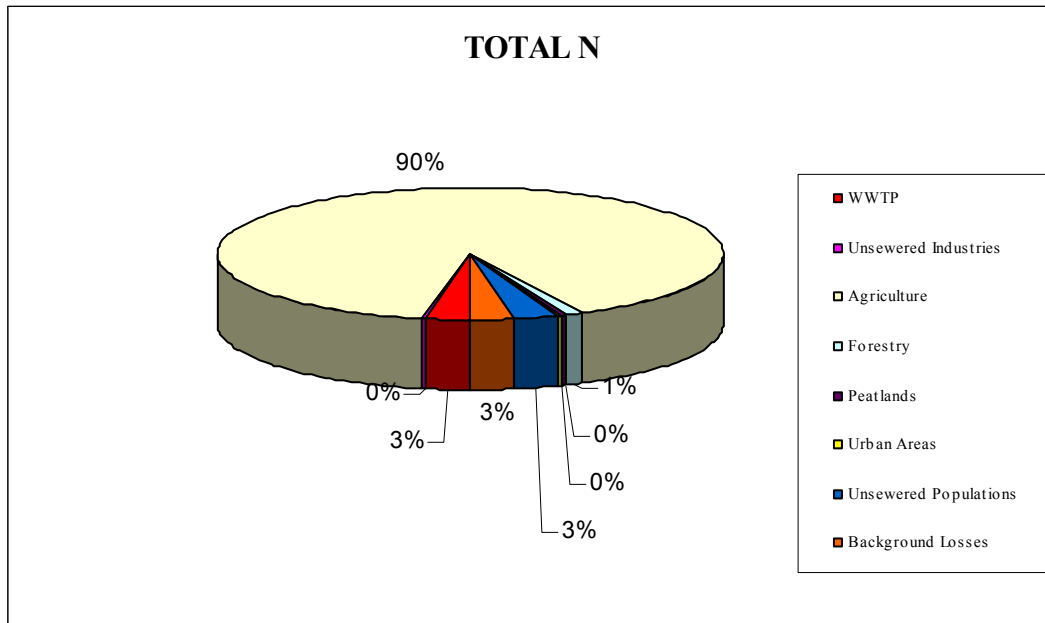


Figure 7.1 Estimated Total Nitrogen Sectoral Input Contribution

Total Nitrogen Load in South Eastern River Basin District 34,763 Tonnes

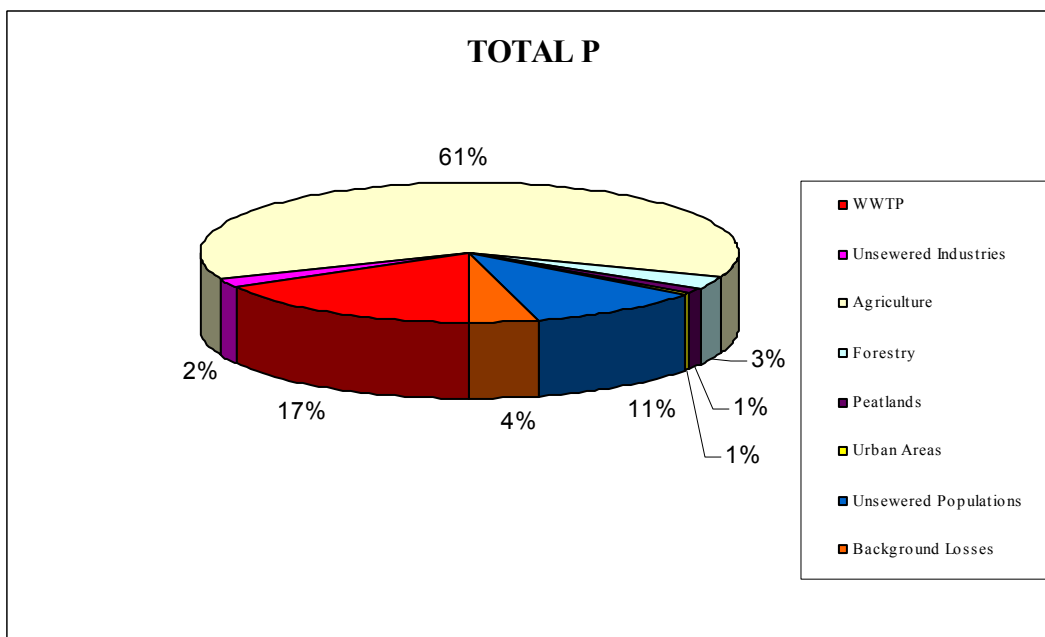


Figure 7.2 Estimated Total Phosphorus Sectoral Input Contribution

Total Phosphorus Load in South Eastern River Basin District 1,517 Tonnes

Table 7.4 Principal Subcatchment Nutrient Loads and Export Rates

Principal Subcatchment	Area (ha)	Total N Load (Kg/Yr)	Total P Load (Kg/Yr)	Total N Export Rate (Kg/Ha/Yr)	Total P Export Rate (Kg/Ha/Yr)
SE1_hydro11	39244	1036308.5	45095.7	26.4	1.1
175 derry	24346	697915.4	26575.2	28.7	1.1
175 bann	17562	552482.8	21633.1	31.5	1.2
175 urrin	11601	276730.4	12547.3	23.9	1.1
175 boro	17615	447093.5	17699.9	25.4	1.0
178 sow	8949	183602.1	7886.4	20.5	0.9
SE2_hydro12	2594	162648.1	5772.5	62.7	2.2
SE3_hydro12	11605	290256.6	27483.5	25.0	2.4
175 - main Channel	79518	2101072.5	77650.6	26.4	1.0
175 derreen	23327	589972.5	21821.1	25.3	0.9
SE4_hydro13	65149	1752986.2	63972.2	26.9	1.0
183 cushina	8818	321785.5	13208.3	36.5	1.5
183 - main channel	168043	4321085.6	197063.0	25.7	1.2
183 triogue	11503	245197.0	16903.2	21.3	1.5
183 owenass	8346	170115.8	8746.2	20.4	1.0
183 greese	14046	351900.2	14543.6	25.1	1.0
183 stradbally	11796	202842.2	8465.3	17.2	0.7
183 douglas	6589	144025.2	5333.6	21.9	0.8
183 burren	17572	441893.4	20209.4	25.1	1.2
183 figile	31841	881465.1	35798.9	27.7	1.1
183 slate	21317	563051.7	28432.8	26.4	1.3
184 dinin	30312	667847.8	25385.2	22.0	0.8
184 erkina	38432	972003.2	35213.6	25.3	0.9
184 kings	43821	1080401.8	38816.9	24.7	0.9
184 - main channel	140528	3626748.1	141871.1	25.8	1.0
184 gully	5703	142900.8	5973.5	25.1	1.0
182 drish	20230	409819.1	17360.9	20.3	0.9
182 multeen	19928	657862.4	23303.8	33.0	1.2
182 anner	43647	1002404.6	37893.3	23.0	0.9
182 ara	8618	452666.9	17887.1	52.5	2.1
182 lingaun	8707	208495.8	8764.2	23.9	1.0
182 blackwater	14150	319685.6	12477.9	22.6	0.9
182 aherlow	20074	794892.1	29267.9	39.6	1.5
182 - north of waterford city	6257	208253.8	8863.9	33.3	1.4
182 tar	23243	1044308.5	36599.8	44.9	1.6
182 clodiagh	12916	301663.5	11418.6	23.4	0.9
182 nier	10368	180437.2	8249.6	17.4	0.8
182 - south of waterford city	19020	1003227.0	110871.7	52.7	5.8
182 - main channel	121317	3023936.2	157480.6	24.9	1.3
182 clodiagh b	24846	817873.3	28440.8	32.9	1.1
SE5_hydro17	65212	2113039.7	84740.4	32.4	1.3
TOTAL	1278710	34762898.1	1517722.4	27.2	1.2

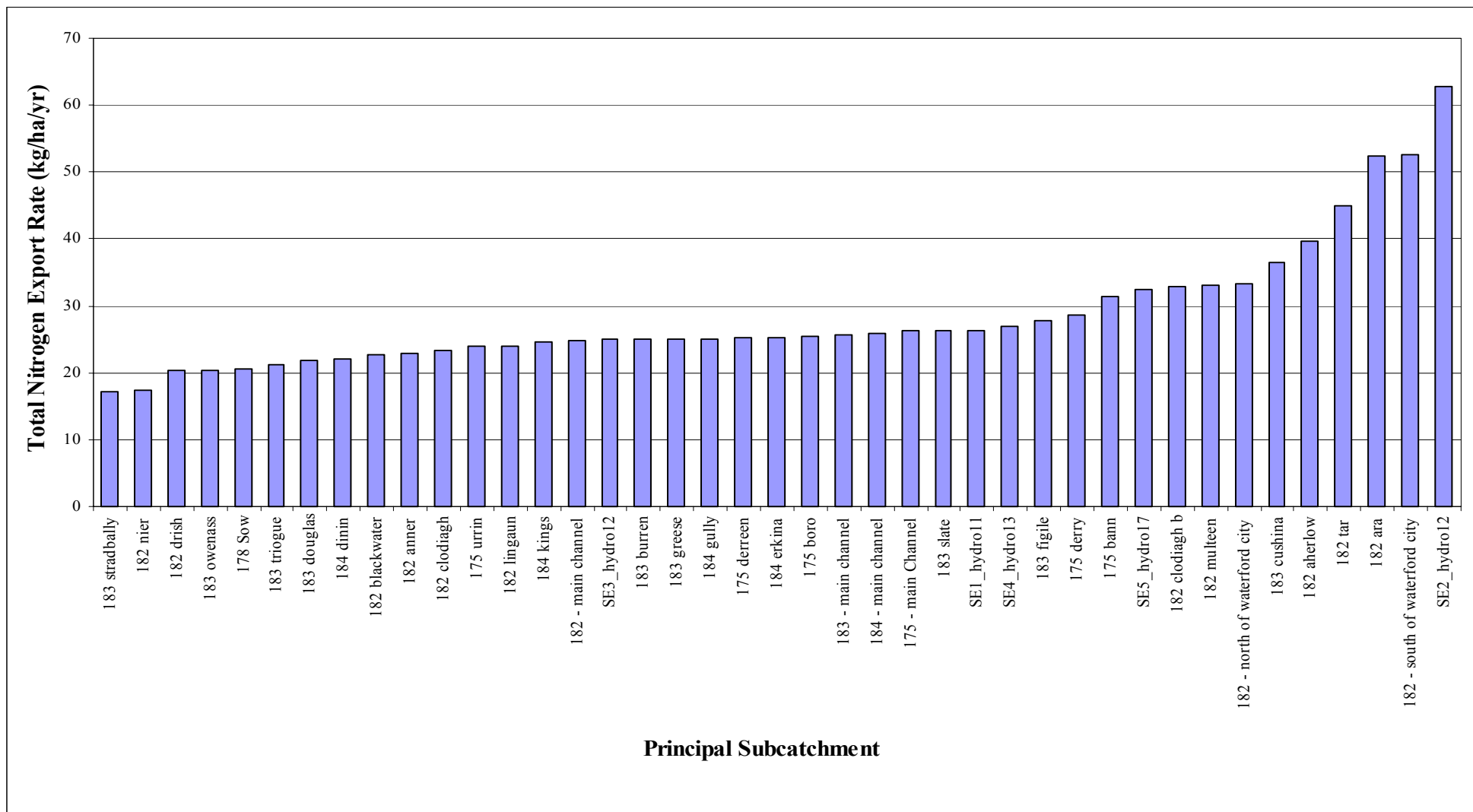
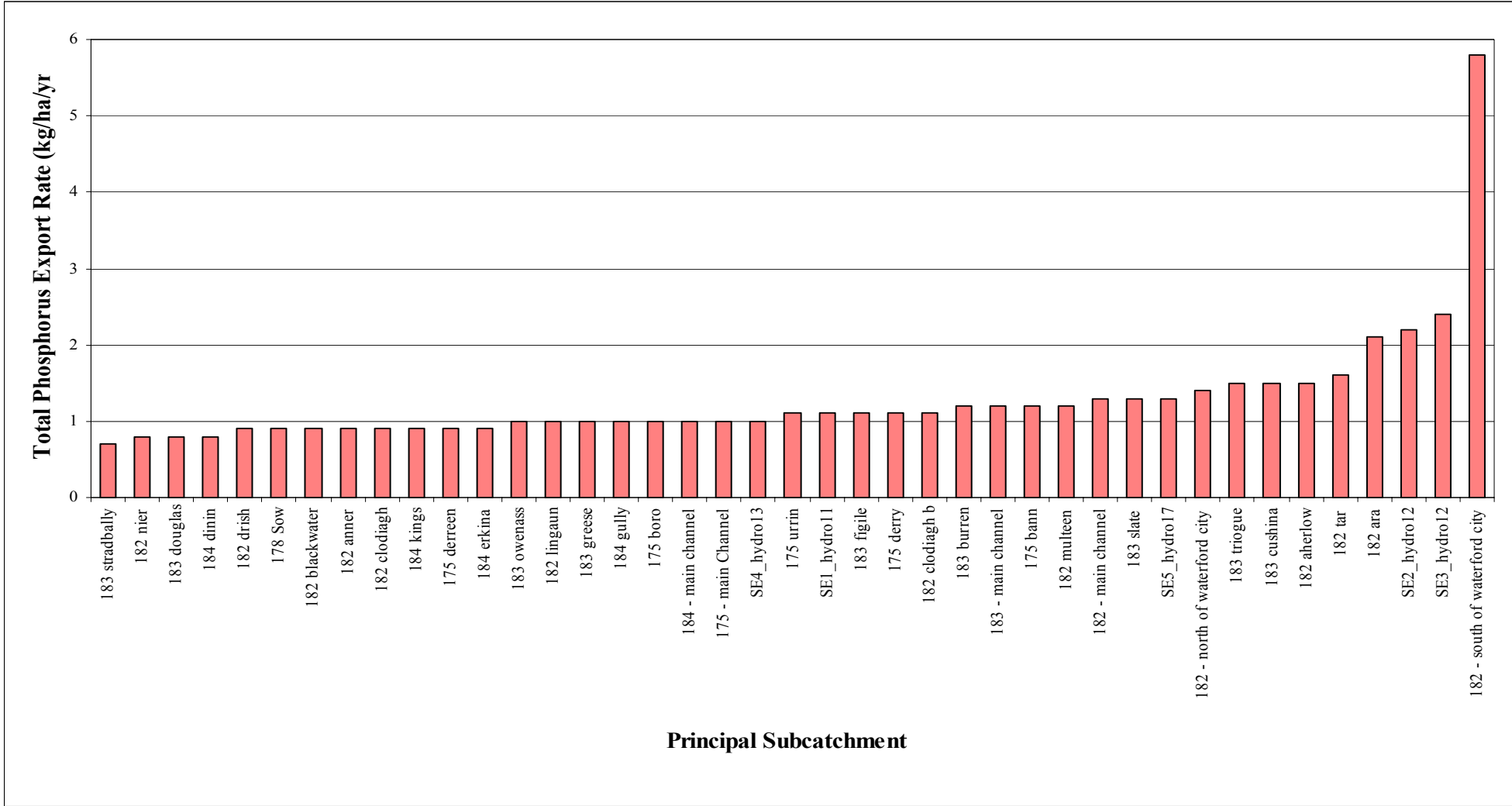


Figure 7.3 Ranking of Principal Subcatchments by Total Nitrogen Export Rate



Figures 7.4 Ranking of Principal Subcatchments by Total Phosphorus Export Rate

7.4 Comparison with Alternative Predicted and Recorded Nutrient Export Rates

The overall average nutrient export rates for the river basin are comparable with estimates derived for the NEUT programme in 1999 for hydrometric areas 11 -17 as presented in Table 7.5. For the South Eastern River Basin District the average NEUT total Nitrogen export rate is 22.4 kg/ha/yr (compared with 27.2 kg/ha/yr project estimate) and the average NEUT total Phosphorus export rate is 0.9 kg/ha/yr (compared with 1.2 kg/ha/yr project estimate).

Table 7.5 NEUT Programme Estimates

Hydrometric Area	Total Nitrogen			
	Point Sources Tonnes	Diffuse Sources Tonnes	Total Load Tonnes	Export Rate kg/ha/yr
11 East Co Wexford	28	1219	1247	32.1
12 Slaney	96	4206	4303	21.1
13 South Co Wexford	4	1055	1059	19.0
14 Barrow	231	5408	5639	18.4
15 Nore	100	5263	5363	21.2
16 Suir	290	7576	7866	21.8
17 South Co Waterford	54	1518	1572	23.1
Average				22.4
Hydrometric Area	Total Phosphorus			
	Point Sources Tonnes	Diffuse Sources Tonnes	Total Load Tonnes	Export Rate kg/ha/yr
11 East Co Wexford	4	58	62	1.56
12 Slaney	26	189	215	0.50
13 South Co Wexford	1	43	44	0.79
14 Barrow	61	233	294	0.96
15 Nore	23	210	234	0.92
16 Suir	67	353	420	1.16
17 South Co Waterford	10	78	88	0.29
Average				0.9

The NEUT programme also presented nutrient sectoral estimates aggregated nationally and for hydrometric areas 13-20 (south coast general area).

Total Nitrogen:-

Nationally NEUT estimate	93% derived from all diffuse sources
Areas 13 -20 NEUT estimate	95% derived form all diffuse sources
Project estimate	97% derived from all diffuse sources

Nationally NEUT estimate	84% derived from agricultural sources
Areas 13 -20 NEUT estimate	89% derived form agricultural sources
Project estimate	90% derived from agricultural sources

Nationally NEUT estimate	7% derived from all point sources
Areas 13 -20 NEUT estimate	5% derived form all point sources
Project estimate	3% derived from all point sources

Total Phosphorus:-

Nationally NEUT estimate	72% derived from all diffuse sources
Areas 13 -20 NEUT estimate	82% derived form all diffuse sources
Project estimate	81% derived from all diffuse sources

Nationally NEUT estimate	55% derived from agricultural sources
Areas 13 -20 NEUT estimate	63% derived form agricultural sources
Project estimate	62% derived from agricultural sources

Nationally NEUT estimate	28% derived from all point sources
Areas 13 -20 NEUT estimate	18% derived form all point sources
Project estimate	19% derived from all point sources

The Project estimates are also in reasonable agreement with measured loadings reported by the EPA under the OSPAR Convention since 1990 Table 7.6. The average measured total Nitrogen export rate for the Barrow, Nore, Slaney and Suir basins is 26.8 kg/ha/yr and the average total Phosphorus export rate recorded was 0.9 kg/ha/yr.

The recorded nutrient export rates (Total Nitrogen = 26.8 kg/ha/yr and Total Phosphorus = 0.9 kg/ha/yr) are slightly lower than the Project's estimated input export rates (Total Nitrogen = 27.2 kg/ha/yr and Total Phosphorus = 1.2 kg/ha/yr).

Although there are uncertainties in both datasets i.e. the reliability of sampling and flow recordings for measured values versus the generalising assumptions of the alternative estimation techniques, the results are in reasonable agreement and recorded rates would be expected to be less than predicted inputs since in stream nutrient losses due to biological uptake by plants/algae or deposition would be expected. Studies to attempt to quantify such losses are underway as part of the EuroHARP Project into Nutrient Losses and the findings will be utilised to better advise further nutrient budget estimates.

Table 7.6 OSPAR Riverine Inputs and Direct Discharges (RID) Study. Annual Riverine Loads (tonnes)

River	Catchment Area km ²	Total Nitrogen											avg to date	kg N/ha/yr
		1990	1991	1992	1993	1994	1995	1996	1997					
Barrow	3067	6819.8	6792.3	3904.3	7411.8	10147.9	5973.2	9290.0	6876.4				7152.0	23.3
Nore	2530	5613.6	5787.6	3419.0	5013.5	5292.8	5994.6	9154.3	6366.0				5830.2	23.0
Slaney	1762	4663.0	5710.7	2798.5	5980.2	8667.5	5393.7	11231.8	7672.0				6514.7	37.0
Suir	3610	7948.1	7912.2	4609.4	7991.2	9532.1	11771.4	10874.3	7870.3				8563.6	23.7
Average														26.8

River	Catchment Area km ²	Total Phosphorus											avg to date	kg P/ha/yr
		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000		
Barrow	3067	190.6	123.3	134.0	261.1	314.5	173.4	196.3	288.2	279.6	138.7	228.1	211.6	0.7
Nore	2530	246.6	126.3	153.3	378.6	223.1	180.2	261.4	512.7	250.0	123.3	152.5	237.1	0.9
Slaney	1762	171.1	94.3	75.0	291.3	286.1	157.6	197.1	325.0	217.1	103.0	185.3	191.2	1.1
Suir	3610	239.3	193.7	167.1	426.2	653.9	361.4	318.5	403.3	331.2	198.6	301.1	326.8	0.9
Average														0.9