SECTION E

OPERATING COSTS AND EFFICIENCY

Edition 9

ANNUAL RETURN 2010-11

EDITION CHANGES – SECTION E

Edition	Description of Change
9	**Chapter E1, E2, E11 have been deleted for Annual Return 2010-11** **All Guidance for the reporter has been removed and will be collated into one document**

SECTION E
CHAPTER E3

PPP PROJECT ANALYSIS

Edition 9

SECTION E
CHAPTER E3
PPP PROJECT ANALYSIS

This table allows for project information on individual PPP schemes to be reported. One column should be completed for each scheme. Where schemes include multiple treatment sites, details can be recorded using one column per site, and a column showing relevant totals.

Guidance to SW

On completion of Table E3 SW should ensure that no input cell is left blank in any of the project columns reported on. If the information is unknown or not applicable, then a zero should be entered in the cell with an appropriate CG. Project columns that are not reported on should be left blank.

SECTION E
CHAPTER E3a

PPP COST ANALYSIS

SECTION E
CHAPTER E3a
PPP COST ANALYSIS

This table allows for cost information on individual PPP schemes to be reported. One column should be completed for each scheme. Where schemes include multiple treatment sites, details can be recorded using one column per site, and a column showing relevant totals.

Guidance to SW

On completion of Table E3a SW should ensure that no input cell is left blank in any of the project columns reported on. If the information is unknown or not applicable, then a zero should be entered in the cell with an appropriate CG. Project columns that are not reported on should be left blank.

SECTION E
CHAPTER E4
WATER EXPLANATORY FACTORS – RESOURCES AND TREATMENT

SECTION E
CHAPTER E4
WATER EXPLANATORY FACTORS – WATER RESOURCES AND TREATMENT

This table is used in water service operating efficiency studies. It covers:

- Source types
- Peak demand and pumping head
- Resources and treatment costs
- Water treatment works by process type; and
- Water treatment works by size band

Source Types

This section includes the number of sources in each of the following categories, and the proportions of distribution input derived from sources in each category, and the proportion of distribution input obtained from bulk supplies for each category:

- Impounding reservoirs
- Lochs
- River and burn abstractions (including via bankside storage); and
- Boreholes

Number of sources

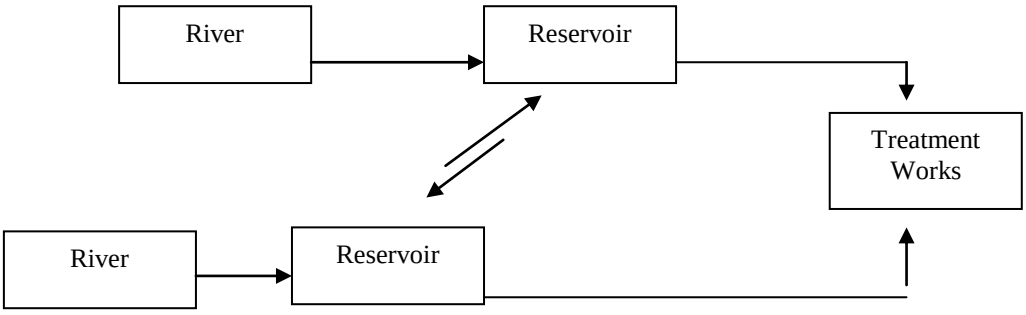
A source is to be defined as an independent raw water supply to a treatment works. Standby or mothballed sources from which no water has been obtained in the year should not be included in the number of sources.

SW should follow these guidelines:

- If a treatment works receives water from three boreholes on one site, this would be classed as one source.
- If a treatment works receives water from a reservoir that has been filled by a river this would be classed as one reservoir source.
- If a treatment works receives water directly from two reservoirs this would be classed as two reservoir sources.
- If a treatment works receives water directly from two reservoirs, but water can be transferred between the two reservoirs, this would still be classed as two reservoir sources.
- If a treatment works receives water from a reservoir that has been filled by another reservoir then this would be classified as one reservoir source.

In the example below the arrows represent the flow of water. There is one reservoir, filled by a river, which feeds into one inlet at the treatment works. There is another reservoir that is fed by a different river, this reservoir feeds

into a different inlet at the treatment works. It is possible to transfer water between each of the reservoirs.



SW should report this as two reservoir sources.

Proportion of distribution input from each source category

The proportion of water in each source category is a measure of how difficult SW's water is to treat. When classifying the water into one of the categories, the following guidelines should be followed.

- Water abstracted from boreholes or springs and pumped directly to a treatment works should be classified as borehole water.
- Water abstracted from a river and transported directly to a treatment works (either by pumping or by gravity) should be classified as river water.
- Water that is transported directly to a treatment works from a reservoir which has been filled by a river should be classified as water from reservoirs (this is because, in general, while the water is stored in the reservoir, sediments will settle making the water easier to treat).
- Water that is transported from a reservoir, via a river, to a treatment works should be classified as water from a river.

If multiple sources feed a works (for example a river and a number of boreholes) and the flow from these sources is combined prior to treatment, then all of the flow entering the works can be categorised as the more difficult to treat water. (In this example, all of the water would be categorised as river water.)

Non-potable supplies

Non-potable supplies for water should not be included in this table. The water supplied should not be included in the distribution input figures, and if a source only provides non-potable water it should not be included in column 1. This includes sources that are used only to provide stream support.

Peak Demand and pumping head

This section comprises peak to average ratio and the average pumping head for resources and treatment

Average pumping head

The key reason we collect this data is as an explanatory factor for power costs. Therefore the variable needs to reflect the amount of pumping SW needs to do. In order to do this we need to know, in effect, how much each Ml of water is pumped through the process, from abstraction to supply. Obviously this cannot be measured in practice so a calculation is used instead.

$$\text{Average pumping head} = \frac{\sum_i (l_i * WP_i)}{V_p + V_g}$$

where:

l_i = annual mean lift at site i

WP_i = volume of water pumped at site i

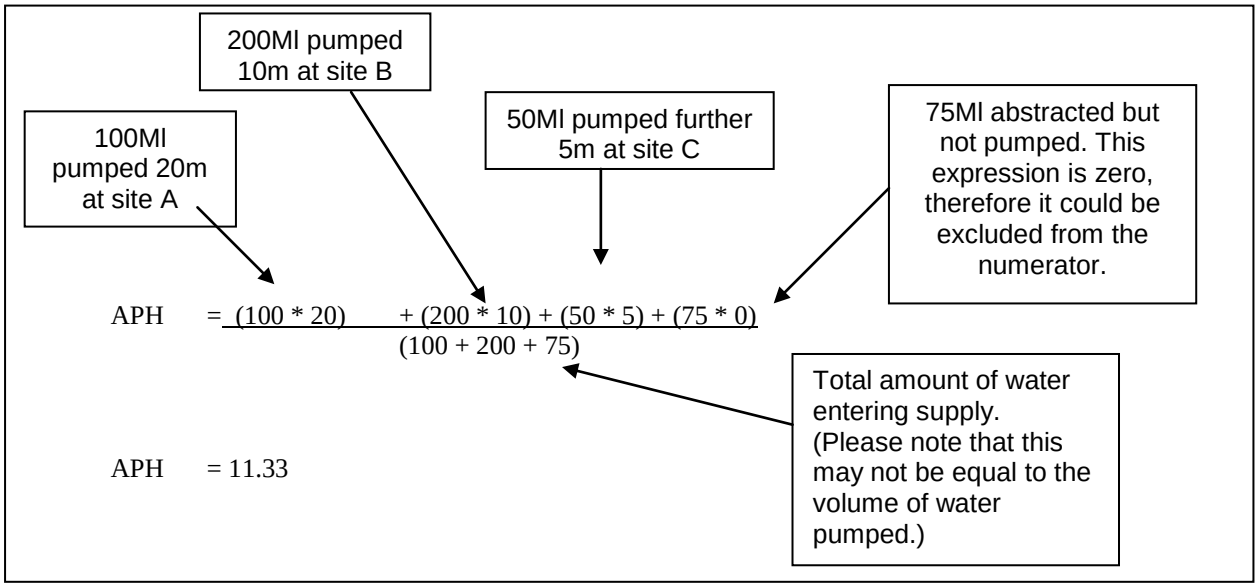
$V_p + V_g$ = total volume of water that enters supply (pumped and gravity fed)

Included below is an example of how average pumping head should be calculated (the numbers are not representative of a real life situation, just for illustrative purposes.)

A company has the following processes:

- 100 Ml of water is pumped 20m at site A
- 200Ml of water is pumped 10m at site B, then 50Ml of this water is pumped a further 5m at site C (a booster station). The remainder of the water is gravity fed to customers
- 75Ml of water is abstracted and reaches supply without ever being pumped.

The average pumping head for this example would be calculated as follows:



The average pumping head should be calculated using data from all sites if possible. SW should state in its commentary if sites have not been used in calculating the average pumping head, and why they could not be used.

Pumping of **non-potable water** into supply (for example for stream support) should not be included in the average pumping head calculation.

Pumping of water that is exported to another company (**bulk supply exports**) should not be included in the average pumping head calculation.

We would expect all other pumping used in the abstraction, treatment and supply of water to be included in the pumping head calculation. This includes pumping as part of the treatment process and the pumping of process water.

Resources and treatment costs

This tables requests Scottish Water to report operating costs by regional area. These costs include Power, Service Charges, Total direct costs, General and support costs and functional expenditure. Total costs should reconcile with the Resource and Treatment costs reported in Table M18W of the Regulatory Accounts.

Water treatment works by process type

This section covers the proportion of distribution input derived from works falling into each category of water treatment, the number of works in each category as well as the corresponding operating costs.

For both groundwater and surface water, a **works** is here defined as an individual location which receives raw or partially treated water for treatment (excluding secondary disinfection) and ultimate delivery to customers. Where

the total treatment process is split between a number of sites, banding should be carried out on the basis of the size and treatment category of the sites at which the greatest proportion of costs are incurred.

SW should state in its commentary if it has included treatment works that have not been used in the report year.

The categories of treatment types are:	Examples
SD: Works providing simple disinfection only;	• Marginal chlorination
W1: Simple disinfection plus simple physical treatment only;	• Rapid gravity filtration • Slow sand filtration • Pressure filtration
W2: Single stage complex physical or chemical treatment; W3: More than one stage of complex treatment; but excluding processes in W4.	• Super chlorination • Coagulation • Flocculation • Biofiltration • pH correction • Orthophosphate dosing • Softening • Membrane filtration
W4: This category is intended to capture processes with very high operating costs;	• Ozone addition • Activated carbon / pesticide removal • UV treatment • Arsenic removal • Nitrate removal

Water treatment works by size band

This section covers the proportion of distribution input derived from works falling into each size band category, the number of works in each category as well as the corresponding operating costs.

The appropriate size band should be based on each work's peak hydraulic capacity, not its distribution input in a particular year. This ensures that a treatment works will appear in the same size band from one year to the next.

Guidance to SW

On completion of Table E4 SW should ensure that no input cell is left blank in any of the area columns reported on. If the information is unknown or not applicable, then a zero should be entered in the cell with an appropriate CG. Area columns that SW does not report on should be left blank.

Commentary

SW must:

- comment on the changes which have occurred since previous years and provide clear explanations for them;
- state whether changes are one-off revisions because of exceptional circumstance (e.g. drought) or whether they are due to permanent changes in its assets or operations; and
- where treatment types are not covered by this guidance, state in its commentary what assumptions it has made in categorising these processes.

SECTION E
CHAPTER E6
WATER EXPLANATORY FACTORS - DISTRIBUTION

SECTION E
CHAPTER E6
WATER EXPLANATORY FACTORS - DISTRIBUTION

This table is used in water service operating efficiency studies. It covers:

- Area data
- Distribution costs
- Water mains data
- Pumping stations
- Service reservoirs; and
- Water towers

SW should complete this table on a sub-regional basis for a number of areas following the criteria set out below. Data should be broken down by operational areas, and entered in the appropriate columns.

Areas must be based on the operating units by which SW is managed

Each area should form a single geographical unit with a contiguous boundary, preferably geographically separate areas should not be combined for reporting purposes although this might not be possible in some island areas

The areas must cover the whole of SW's region to ensure that the totals calculated in the final column of the table reconcile with information reported elsewhere in the annual return

SW must provide a brief commentary, identifying the location of each area, giving some background information on its nature, such as its topography and whether it is predominantly rural, semi rural or urban in character.

SW must explain the methods used to report costs for the areas, setting out clearly any allocation rules used. SW should reveal any assumptions made in arriving at costs or explanatory factor information.

Guidance to SW

SW should ensure that no input cell is left blank in any of the reported area columns. If the information is unknown or not applicable, then a zero should be entered in the cell with an appropriate CG. Area columns that SW does not report on should be left blank.

SECTION E
CHAPTER E7
WASTEWATER EXPLANATORY FACTORS – SEWERAGE AND SEWAGE TREATMENT BY AREA

SECTION E
CHAPTER E7
WASTEWATER EXPLANATORY FACTORS – SEWERAGE AND SEWAGE TREATMENT BY AREA

This table is used in wastewater service operating efficiency studies. It covers:

- Area data
- Sewerage data
- Sewerage Costs
- Pumping stations; and
- Sewage treatment works
- Sewage Treatment Costs

SW should complete this table on a sub-regional basis for a number of areas (according to their size) following the criteria set out below:

- Areas must be based on the operating units by which SW's region is managed;
- Each area should form a single geographical unit with a contiguous boundary (i.e. geographically separated areas should not be combined for reporting purposes);
- The areas must together cover the whole of SW's region (to ensure that the totals calculated in the final column of table E7 reconcile with information elsewhere in the Annual Return).
- The number of areas on which SW reports should be between four and eight.

SW must provide a brief commentary, identifying the location of each area and giving some background information on its nature, such as its topography and whether it is predominantly rural or urban in character.

Sewerage and Sewage Treatment costs

This table requests Scottish Water to report operating costs by regional area. These costs include Power, Service Charges, Total direct costs, General and support costs and functional expenditure. Total costs should reconcile with the Sewerage and Sewage Treatment costs reported in Table M18b WW of the Regulatory Accounts.

SW must explain the methods used to report costs for the areas, setting out clearly any allocation rules used. SW must reveal any assumptions made in arriving at costs or explanatory factor information.

Guidance to SW

SW should ensure that no input cell is left blank in any of the reported area columns. If the information is unknown or not applicable, then a zero should be entered in the cell with an appropriate CG. Area columns that SW does not report on should be left blank.

SECTION E
CHAPTER E8

WASTEWATER EXPLANATORY FACTORS - SEWAGE TREATMENT WORKS

SECTION E
CHAPTER E8
WASTEWATER EXPLANATORY FACTORS –
SEWAGE TREATMENT WORKS

This table is used in wastewater service operating efficiency studies. It covers:

- Number of works
- Loads
- Compliance; and
- Costs

Column definitions

The columns in this table permit the classification of sewage treatment methods. These definitions are intended to agree (where they overlap) with those used in the Urban Waste Water Treatment Directive, i.e. primary treatment requires the removal of at least 50% of suspended solids from the sewage entering the works and a reduction of at least 20% in BOD. Innovative processes are to be classified according to equivalence of effluent quality.

Column 0: **Septic Tanks:** Include septic tanks owned by SW. Sludge from septic tanks to be included in loading to more complex works.

Column 1: ***Primary:*** Include works whose treatment methods are restricted to preliminary and primary treatment (screening, comminution, maceration, grit and detritus removal, pre-aeration and grease removal, storm tanks, plus primary sedimentation, including where assisted by the addition of chemicals e.g. Clariflow). It is expressed as a percentage to 2 decimal places.

Column 2: Secondary activated sludge: As primary plus works whose treatment methods include activated sludge (including diffused air aeration, coarse bubble aeration, mechanical aeration, oxygen injection, submerged filters) and other equivalent techniques including deep shaft process, extended aeration (single, double and triple ditches) and biological aerated filters as secondary treatment.

Column 3: Secondary biological: As primary, plus works whose treatment methods include rotating biological contactors and biological filtration (including conventional filtration, high rate filtration, alternating double filtration and double filtration), root zone treatment (where used as a secondary treatment stage).

Works with ***Tertiary treatment stages*** are divided into four categories:

Column 4: Tertiary A1: Works with a secondary activated sludge process whose treatment methods also include prolonged settlement in conventional lagoons or raft lagoons, irrigation over grassland, constructed wetlands, root zone treatment (where used as a tertiary stage), drum filters, microstrainers, slow sand filters, tertiary nitrifying filters, wedge wire clarifiers or Clariflow installed in humus tanks, where used as a tertiary treatment stage;

Column 5: Tertiary A2: Works with a secondary activated sludge process whose treatment methods also include rapid-gravity sand filters, moving bed filters, pressure filters, nutrient control using physico-chemical and biological methods, disinfection, hard COD and colour removal, where used as a tertiary treatment stage;

Column 6: Tertiary B1: Works with a secondary stage biological process whose treatment methods also include prolonged settlement in conventional lagoons or raft lagoons, irrigation over grassland, constructed wetlands, root zone treatment (where used as a tertiary stage), drum filters, microstrainers, slow sand filters, tertiary nitrifying filters, wedge wire clarifiers or Clariflow installed in humus tanks, where used as a tertiary treatment stage; and

Column 7: Tertiary B2: Works with a secondary biological process whose treatment methods also include rapid gravity sand filters, moving bed filters, pressure filters, nutrient control using physico-chemical and biological methods, disinfection, hard COD and colour removal, where used as a tertiary treatment stage.

Column 8: Preliminary via sea outfall: The load being discharged via sea outfall which receives preliminary treatment. It is expressed as a percentage to 2 decimal places.

Column 9: Screened via sea outfall: The load being discharged via sea outfall which receives simple screening. It is expressed as a percentage to 2 decimal places.

Column 10: Unscreened via sea outfall: The load being discharged via sea outfall which receives no treatment. It is expressed as a percentage to 2 decimal places.

Column 11: Total

Size Bands

For the purpose of this table, STW size is defined by the load received by the works, expressed as mass (i.e. kilograms [kg]) of BOD_5 per day. In calculating the size of a works, SW should assume that resident connected population contribute 60g BOD_5/head/day and add the trade effluent load (total COD) using a conversion factor of COD:BOD of 2:1.

No allowance should be made for non-resident population when classifying the size band of a works. SW should comment on whether this is significant for an individual works, particularly where it might cause an increase in the size classification of the works.

SW must include non-resident population when reporting loads and costs.

Under this classification scheme, ***large works*** are defined as those with an average daily loading >1500kg BOD_5/day, and ***small works*** are those with an average loading <=1500kg BOD_5/day.

For this table, the size bands are defined as:

Small works:

- Size band 0 <=6kg BOD_5/day (population equivalent: 0 – 100)
- Size band 1 >6 but <=15kg BOD_5/day (population equivalent: 100 – 250)
- Size band 2 >15 but <=30kg BOD_5/day (population equivalent: 250 – 500)
- Size band 3 >30 but <=120kg BOD_5/day (population equivalent: 500 – 2000)
- Size band 4 >120 but <=600kg BOD_5/day (population equivalent: 2000 – 10000)
- Size band 5 >600 but <=1500kg BOD_5/day (population equivalent: 10000 – 25000)

Large works:

- Size band 6 >1500kg BOD_5/day

These bands may be abbreviated to 15 –30 kg BOD_5/day (etc)

PPP Data should not be included in this table.

Scottish Water should comment on any works where there is doubt about which band or treatment type applies.

Loads:

The figures SW must report are the average daily loads received (in kg BOD_5/day) by treatment works and sea outfalls in each of the various categories for works size and treatment method. The average daily load for each STW should be calculated as the total annual load received (in kg BOD_5) by the STW, divided by 365. The figure to be reported in the table is the sum of the loads received by each STW or outfall in each particular category. Loads should be consistent with actual loads treated and therefore consistent with reported costs. If exclusions are made this will make processes appear more expensive. The convention outlined under the common definitions should be used to calculate the load for each STW. SW must include non-resident population when reporting loads.

Guidance to SW

SW should ensure that no input cell is left blank. If the information is unknown or not applicable, then a zero should be entered in the cell with an appropriate CG.

SECTION E
CHAPTER E9

LARGE SEWAGE TREATMENT WORKS INFORMATION DATABASE

SECTION E
CHAPTER E9
LARGE WORKS INFORMATION DATABASE

This table is used in wastewater service operating efficiency studies.

Large STWs are defined as those which receive an average loading in excess of 1500kg BOD_5/day (including effluent from both domestic and trade sources, but excluding any allowance for non-resident population). This is roughly equivalent to a population of 25000.

Exclude all sewage treatment works operated under PPP that meet the above load criteria.

Guidance to SW

SW must complete this table for each large sewage treatment works but should not complete it for individual sea outfalls.

The total number of large sewage treatment works reported in this table must equal the sum of columns 1 to 7 of Table E8. (There is available space for a maximum of 50 works).

SW should also explain how the costings have been obtained, reveal any assumptions made, and comment on any areas of uncertainty.

The costs reported in this table should be consistent with the sewage treatment costs reported in tables E8 and M18b WW.

Works that have been commissioned during the report year should be clearly identified in the commentary along with the commissioning date of the works. This should reflect the period of the year that the reported costs reflect.

Works that have been upgraded during the report year should be clearly identified in the commentary along with an indication of the date the upgrade was complete.

SW must also explain how the costing have been obtained, reveal any assumptions made, and comment on any areas of uncertainty.

Do not include any costs in line E9.21 other than estimated sludge costs, if SW wishes to tell us about other costs not requested in the guidance please mention this in the accompanying commentary.

SW should ensure that no input cell is left blank in any of the reported large treatment work columns. If the information is unknown or not applicable, then

a zero should be entered in the cell with an appropriate CG. Large treatment work columns that SW does not report on should be left blank.

SECTION E
CHAPTER E10

WASTEWATER EXPLANATORY FACTORS
SLUDGE TREATMENT & DISPOSAL

SECTION E
CHAPTER E10
WASTEWATER EXPLANATORY FACTORS – SLUDGE TREATMENT AND DISPOSAL

This table is used in wastewater service operating efficiency studies.

The disposal routes are classified as:

Farmland untreated:	Untreated sewage will have received no form of treatment designed to reduce its pathogen content. The sludge may be thickened and/or de-watered to facilitate transportation.
Farmland conventional:	"Conventionally treated" sewage sludge is that which has undergone processes designed to reduce the amount of E. Coli present by no less than 99% (a 2 log reduction).
Farmland advanced:	"Advanced" treated sewage is that which has undergone processes designed to reduce the amount of E. Coli present by no less than 99.9999% (a 6 log reduction).
Incineration:	Sewage sludge disposed of by incineration
Landfill:	Sewage sludge disposed to landfill sites.
Composted:	Sewage sludge disposed of by means of composting
Land reclamation:	Sewage sludge disposed of to land reclamation projects.
Other:	Any other form of sewage sludge disposal; for example, gasification, forestry, or silviculture.

Guidance to SW

SW should clearly explain any significant changes in sludge disposal routes, which have occurred since this information was last collected. SW must provide a clear explanation of any sludge disposal methods, which are classified as 'other' and the percentage disposed of by each method.

SW should also comment on the reasons for any significant increases in the costs associated with a particular disposal route. For the purpose of this table, significant changes are those that amount to more than 5% of total

sludge treatment and disposal costs, or more than 10% of any individual category.

PPP Data should not be included in this table.

SW should only report the amount of sludge treated during the report year. This may not be the same as the amount of sludge disposed in the year. SW should explain any large movements between stockpiled and disposed stock.

SW should ensure that no input cell is left blank. If the information is unknown or not applicable, then a zero should be entered in the cell with an appropriate CG.