National Urban Waste Water Study

Catchment Report

for

CLONES

Revision Control Table

The User is Responsible for Checking the Revision Status of this Document

Rev.	Description of Changes	Prepared by	Checked by	Approved by	Date
A	Initial Issue	FO'M/SM	JK	FMcG	August 2003
B	Post Review Revisions	GM/JK	JK	FMcG	Jan. 2004

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ACRONYMS

CSO	Central Statistics Office
cSO	Combined sewer overflow
CiS	Complete Information System
DEHLG	Department of the Environment, Heritage and Local Government
LA	Local authority
LG	Local government
OD	Ordnance datum
SI	Statutory Instrument
EC	European Community
EU	European Union
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
BOD	Biochemical oxygen demand
COD	Chemical oxygen demand
WWTP	Waste Water treatment plant
NH_3	Ammonia
SS	Suspended solids
P	Phosphorus
ND	No data
pe	Population equivalent
M	Million
N/A	Not applicable
d/s	Downstream
u/s	Upstream

SCIENTIFIC TERMS

m^3/s	Cubic metres per second
l/s	Litres per second
mg/l	Milligrams per litre
km	Kilometres
Ml/d	Megalitres per day
kg/d	Kilograms per day
m	Metres
dia.	Diameter
mm	Millimetres
tds	Tonnes dry solids
Tds/d	Tonnes dry solids per day
ha	Hectares
% ds	Percent dry solids
F/M Ratio	Food to Microbes Ratio
MLSS	Mixed Liquor Suspended Solids

DEFINITIONS

Summary definitions for the Confidence, Condition and Performance Grades are given below. For comprehensive definitions of the terms used in the National Urban Waste Water Study, refer to Volume 2, Methodology.

Confidence Grades

The Confidence Grades are directly related to the sources of available information. The definitions summarise the "Source Codes" descriptions used in conjunction with the data collection questionnaires and reflect the confidence, which it is considered an external party can attach to the data without further checking.

1 **High degree of confidence**; based on comprehensive current records

2 **Relatively high degree of confidence**; records are generally current and comprehensive with only limited shortcomings.

3 **Reasonable confidence**; records, although not wholly complete or up to date, were confirmed by local staff as correct and/or have passed selective checks.

4 **Low level of confidence**; basic records are poor and local knowledge is sketchy and uncorroborated.

5 **Very low level of confidence**; no formal records or detailed knowledge of the assets or data and no corroborative checks possible.

5A **Very low level of confidence**; data derived from use of the standard methodology

Asset Condition Grades*

Sewers and Rising Mains

≤ 3 **Normal wear and tear**; no failures or structural defects, and mains designed to current standards (Grade 1), through to significant defects evident in the fabric of sewers or deterioration beginning to be reflected in the levels of service and/or operating costs (Grade 3). Replacement/renovation of mains required within 10 years, review of condition of sewers in the medium term.

4 **Serious structural deterioration** in sewers (5-10% deformation, displacement, cracking); rising mains nearing the end of their useful life with frequent bursts and reduction in level of service. Asset renovation/replacement required in medium term.

5 **Assets collapsed or substantially derelict**, frequent rising main bursts & no residual life expectancy. The asset will require replacement within short term.

Above Ground Civil, Mechanical & Electrical Works

≤ 3 **Normal wear and tear**; sound modern structure and plant, which is operable and maintained (Grade 1) through to structure and plant which is functionally sound or adequate but is significantly affected by deterioration with some reduced efficiency and minor failures (Grade 3) – review of condition required in the medium term.

4 **Structural deterioration having a significant effect on performance** due to leakage or other problems; plant functions but requires significant maintenance to remain operational. Major overhaul/replacement required in medium term.

5 **Serious structural problems, effective life of plant exceeded;** structural problems having a detrimental effect on the performance, unreliable and incurring excessive maintenance costs compared to replacement. The asset will require major overhaul/replacement in short term.

DEFINITIONS continued

Performance Grades*

Sewers & Rising Mains

≤ 3 **Excellent to moderate**; no operational or service problems (Grade 1) through to significant loss of capacity in sewers and rising mains, resulting in intermittent surcharge or occasional blockage (Grade 3).

4 **Borderline**; frequent problems causing rising main blockage under normal operating conditions - sewers require occasional cleaning to prevent blockage and surface flooding.

5 **Fail**; Sewer requires regular de-silting or other maintenance to prevent flooding of property or premature operation of storm overflows. Rising mains suffer severe blockage problems and pumping performance cannot be ensured.

Above Ground Assets (General)

≤ 3 **Excellent to normally serviceable**; meets all design, statutory and/or relevant authority standards at all times (Grade 1) through to, meets statutory and performance criteria under normal operating conditions but has minor shortcomings under extreme conditions (Grade 3).

4 **Unsatisfactory**; performance or operational shortcomings have a significant effect on asset functional/effectiveness.

5 **Unacceptable**; substantially incapable of meeting externally or internally imposed standards except under normal or reduced operating conditions.

Waste Water Treatment Plant (individual elements or stages)

≤ 3 **Excellent to moderate**; performance in excess of design requirement through to, cause for concern as poor performance of the element or stage may be contributing to marginal performance of the plant as a whole.

4 **Borderline**; severe reduction in the design performance or capacity of the element which has become the main cause of borderline performance of the plant as a whole.

5 **Fail**; continuous poor performance of the element or stage is the main cause of the overall plant performance, which is borderline or failing.

* With acknowledgements to The Office of Water Services, AMP 2 Strategic Business Plan Manual, UK.

1.0 THE CATCHMENT

Catchment Name	Clones
Catchment Code	2400 0040
County	Monaghan
Local Authority	Clones Town Council & Monaghan County Council
OS Grid Reference for WWTP	H 505 253
OS Grid Reference for Discharge	ND

1.1 URBAN AREA

Clones is one of the County Monaghan's principle towns and is situated in the west of the county close to the border with County Fermanagh in Northern Ireland. The town is located immediately north of the Ulster Canal, 21 km south west of Monaghan Town and 120 km north west of Dublin. The current residential population of the town was estimated at 2,223 (see Table 1.2).

Clones is the oldest town in County Monaghan and dates back to the 6th century when a settlement formed around the site of a monastery (whose remains are still evident today) founded by St. Tiarnach. Other historical features in the town include the 10th century Round Tower and High Cross and a high fort which, it is believed, was used by the Norman's as a temporary base in the 12th century.

The town is famous for the crochet lace industry which remains in production to this day. Tourist attractions in the town include a craft centre for the lace industry, the historical sites and the Ulster Canal. The town is also the home of one of the principal GAA stadiums in Ulster which attracts large crowds (up to 30,000) to the town on match days during the summer months.

Today Clones serves as a retail and service centre to the agricultural community in the surrounding hinterland. It is the principal employment centre for the area and attracts cross border commerce due to its proximity to the border with Northern Ireland. Employment locally is provided in factory premises adjoining the town and in the retail and service sector. Commercial facilities are located predominantly around the Diamond area in the centre of town.

The major licensed "wet" industries in the town include AIBP and Feldhues (Control Pressure Vessels has closed).

There are 3 primary schools and a college in the town with an estimated 241 of the students and staff residing outside the catchment.

The drainage catchment in Clones includes the main urban area and also extends outwards to serve ribbon developments along all the roads leading into the town. As some of the areas served are outside the Clones Urban boundary, they are not included in the Development Plan envelopes for the catchment shown on Fig. 1. The current drainage catchment area is 123 ha. The gross area presently zoned for current development is 99 ha of which approximately 83 ha is currently developed and occupied.

The urban area lies in a relatively flat area surrounded by drumlins, rivers and interglacial lakes. Information on the geology of the urban area was not provided.

1.2 PLANNING TARGETS & ANTICIPATED GROWTH

Information on current land zoning and future development targets for Clones was taken from the 2001 Clones Urban Development Plan. Current land use in Clones is residential, industrial, commercial, institutional and open space/amenity. Future zoning targets allow for the consolidation of these uses as well as the establishment of additional residential areas. Current and future land use zoning (as per the Plan) is detailed in Table 1.1 below.

At present, housing development is skewed towards the north east of the town in relative isolation from the town's social and commercial activities. Older residential development took place along all approach roads to the town and at the start of the Newtownbutler and Roslea Roads. In recent years the Newtownbutler and Analore Street areas have seen limited housing development. Land zoning for future residential development (to include significant infill residential development) will allow additional residential developments to occur at Clonavilla, Tirnahinch, Newtownbutler Road and Millbrook.

At present commercial activity is concentrated in the Diamond area (Central Commercial Area) in Clones town centre. Institutions are located to the north of Roslea Road (schools) and to the east of the Diamond area. Existing open space lands in Largy townland have been rezoned for institutional use to provide a site for the re-location of one of the existing primary schools.

Open space/amenity areas in Clones are situated to the south of the town around the historical round tower and Motte and Bailey. Industrial activity is generally located in an area to the north of the town centre along the route of the old railway line running north of the Newtownbutler Road to the south of Roslea Road.

Figure 1 illustrates the current and projected development plan boundaries and Table 1.1 gives a sectoral breakdown based on the Plan. No attempt has been made to revise the projections of the Development Plan data to anticipate the potential catchment layout in 2022.

Table 1.1
Current and Planned Development Areas

Contributing Sectors	Area (ha)		Comment
	Current 2002	Planned* 2002-2006	
Domestic/Residential	45	133	Current based on infill residential zoning in Dev Plan. Future includes infill residential and new residential.
Institutional	14	14	Education/Comm/Civic in Plan
Holiday/Leisure	Incl.	Incl.	Included in other sectors
Commercial	14	14	Includes Central Commercial Area.
Industrial	10	10	
Net Contributing Area	83	171	
Open Space	16	16	
Agriculture	0	0	Future developments on mostly agricultural land
Gross Area	99	187	

*Zoning taken from 2001 Clones Urban Development Plan (2001-2006).

1.3 POPULATION PROJECTIONS

Table 1.2 gives population trends and projections for a 20 year planning period. The 2002 population estimates are based on the 1996 census data, the Central Statistics Office (CSO) population growth projections and local authority information, as described in the Methodology in Volume 2. The detailed 2002 census figures were not available at the time this work was carried out.

The standardised population estimates use the CSO figures for District Electoral Divisions (DED's). It is noted that there are occasional differences between the DED boundaries and those of study catchments, which may also lead to differences between local authority figures and those given below for 1991 and 1996.

The Standard Methodology estimated the existing resident population of the town is to be approximately 2,223 and calculated the 2022 population to be 2,316.

The Clones Urban Development Plan (2001-2006) estimated the population of Clones and Environs to be 4,474 in the year 2001 and 2,889 in the year 2022. Local authority staff estimated the current population at 1,728 and the 2022 population to be 2,200.

Due to the wide discrepancy between the estimates, the preliminary results from the 2002 National Census were used to verify the current population. This indicated that populations in Clones and Environs have not risen significantly above the 1996 level.

It is proposed to use the standard estimates for the 2002 (2,223) population as the local authority estimate is for the population within the urban boundary only while the Development Plan estimate includes all of Clones environs (the majority of which are outside the urban area and not served by the sewerage system). For the 2022 population the standard estimate is also used as modest population growth is considered a more accurate estimate considering the historical population decline in the area.

Table 1.2
Catchment Population Trends and Projections

Description	Census Figures		Estimated		Comment
	1991	1996	2002	2022	
Resident Domestic Population	2,347	2,170	2,223	2,316	Standard Estimates

For the purpose of this study, the figures in Table 1.2 were accepted as the best available. A re-assessment of population growth based on the detailed results of the 2002 Census and the latest CSO projections is recommended as a precursor to future investment.

2.0 ENVIRONMENTAL FACTORS

2.1 RECEIVING WATERS

2.1.1 Classification & Quality

Treated effluent from Clones Waste Water Treatment Plant (WWTP) discharges to a stream, which joins the River Finn approximately 1.6 km downstream of the WWTP outfall.

Table 2.1 gives the receiving water (River Finn) classification by type, use and amenity value. The applicable European Union (EU or EC) Directives and National regulations (Statutory Instruments or S.I.) are also identified along with flow and the current and future quality ratings at the key sampling stations.

Table 2.1
Receiving Waters Classification

Characteristic	Classification	Comment
Receiving Water Name and type	Unnamed tributary of the River Finn	
Resource Use	Water Abstraction	For industrial use.
Amenity Value	Fishing	Fishing all along the River Finn (designated salmonid waters)
Applicable Regulations	Water Quality Standards – Phosphorus	LG Act, S.I. No. 258 of 1998
	Surface Water Regulations	LG Act S.I. No. 294 of 1989.
	Salmonid Waters	EC Regs: S.I No 293 of 1988 EC Freshwater Fish Directive
95 Percentile Flow	0.10 m^3/s	At Anglore, 4 km u/s of confluence with Clones tributary
EPA Sampling Stations	0400: Scarvy Br: 0500: Cumber Br:	
Biological Quality Ratings	0400 : Q3-4 0500: Q3	Based on 1998 monitoring.
Target Water Quality Values (Q)	0500: Q3 – 4	Based on 1995/97 Rating.
Other applicable issues.		Urban Waste Water Treatment Regulations, S.I. 254 of 2001

The receiving waters are also monitored by the local authority, but the results of their monitoring were not provided. Sampling station measurements for the key water quality parameters are given in Table 2.2 along with permissible concentrations in accordance with the classifications given in Table 2.1

Table 2.2
Bio-Chemical Water Sampling Data & Target Values (River Finn)

Biochemical Constituent (Concentrations in mg/l)		Measured Values (mg/l) (1998-2000)		*Permissible Concentrations (mg/l)
		0400	0500	
BOD Concentration	Median Value	2.3	2.4	5**
Ortho-phosphate concentration	Median Value	0.08	0.10	0.05
	Maximum Value	0.18	0.29	N/A
Ammonia Concentration	Non-ionised	0.002	0.003	0.02
	Total Value	0.13	0.19	1.0

* Most stringent concentration under the applicable regulations
** No single discharge to freshwater river should cause the receiving water BOD to rise by more than 1 mg/l.

From the above table it can be seen that there is a marked reduction in water quality of the River Finn downstream of its confluence with the stream conveying the Clones WWTP discharge. In addition to the Clones WWTP, an industrial WWTP (AIBP Meats) also discharges approximately 500 m^3/day (licensed limit) of treated effluent to the stream and this may also be contributing to the high downstream concentrations.

It should however be noted that the upstream median concentration of ortho-phosphate (in the Finn) is well in excess of the target concentration, and that provision of phosphate removal facilities at Clones WWTP will not on its own reduce the downstream phosphate concentration to the 0.05 mg/l target.

The River Finn complies with its current water quality requirements, and has until 2007 to achieve the target quality required by the Phosphorus Regulations.

2.1.2 Assimilative Capacity

The assimilative capacity of the tributary of the River Finn could not be quantified in the absence of water quality and flow data. Pollution downstream of the WWTP outfall has been reported. This is believed to occur once per annum and has resulted in an unacceptable increase of BOD levels in the stream. It is proposed in the future to pipe discharges from the WWTP and the AIBP WWTP directly to the River Finn to remedy the existing assimilative capacity problem in the stream.

It is recommended that water quality and flow monitoring be continued on this stream if both the Clones WWTP and AIBP plant discharges to the stream are to be continued i.e. if rerouting of the outfall discharge is not to be completed in the short term future.

Since the flow from this tributary impacts on water quality in the River Finn, the assimilative capacity of the Finn has been calculated. The estimated assimilative capacity of the River Finn to accept effluent from Clones WWTP, while complying with the relevant legislation, is given in Table 2.3. The figures which are based on the 95 percentile flow of the River Finn at Anlore are likely to be an underestimate since no allowance was made for the unmeasured contribution from the stream from Clones.

Table 2.3
Assimilative Capacity of Receiving Water (River Finn)

Biochemical Constituent	Assimilative Capacity (kg/day)	Comment
BOD	8.6	Based on increase not greater than 1 mg/l
Phosphate	0	Extremely limited
Total Ammonia	7.5	
Suspended Solids	ND	Not monitored

From this it can be seen that the assimilative capacity of the River Finn is limited, particularly in terms of phosphorus.

2.2 FLOWS AND LOADS

2.2.1 Dry Weather Flow and Load

Measured waste water flows and loads from the sewerage system are given in Table 2.4 below.

Table 2.4
Measured Flows and Loads to & from the WWTP

Location	DWF* (m^3/d)	BOD (kg/d)	P (Kg/d)	NH_4 (Kg/d)	SS (Kg/d)	Peak Flow (m^3/d)	Confidence Grade
Discharge from sewerage network	1,150*	438	12	ND	514	2,419	3
Discharge to receiving waters	1,150*	36	7	ND	32	2,419	3

* Average measured daily flow.

The confidence grade is moderate because the waste water collected by Clones sewerage network is measured electromagnetically at the WWTP inlet and by a venturi flume at the plant outlet, and sampled automatically. The measured load is therefore adopted for use in subsequent analyses.

It should be noted that the measured loads are significantly higher than those reported in the year 2000 returns to the EPA (4,875 pe = 292.5 kg BOD/day) and the standard estimate (3,883 pe = 233 kg BOD/day). The differences may be due to elevated industrial discharges and/or peak loading experienced on “match day”. However, it is the standard estimate for DWF (589 m3/day in Table 2.5), that is used in subsequent analysis and calculations, since the local authority estimate is considered to be an average daily flow. An increase of 117 pe in waste water loading is expected by the year 2022 based on the predicted population increase, resulting in a future loading of 7,417 pe. Up to date flow monitoring data and analysis of composite samples should be used to verify system loading.

Table 2.5 gives the estimated breakdown of the current and future flows and loads on a sectoral basis. A Water Services Pricing Policy (Polluter Pays Principle) Report for the Clones catchment has not been prepared.

While Clones is not a tourist town, it hosts at least 5 major GAA matches each year and these each attract up to 30,000 day visitors on match day. Since these events are infrequent, no allowance has been made in the standard estimates.

The major industries in the town include AIBP and Feldhues (meat processing). AIBP Meats operates its own WWTP and discharges treated effluent into the same stream as the Clones WWTP discharge. All other industries are considered to be “dry” and discharge only domestic sewage to the sewerage network.

The waste water flow and load from the commercial sector is not measured and was estimated using the standard 16% of domestic contribution.

There are three primary schools and a college in the town with approximately 241 students/staff residing outside the catchment.

Sludge is not currently imported to the WWTP for treatment, and the Sludge Management Plan does not anticipate that sludge will be imported to Clones WWTP in the future. Refer to Section 5.0.

Table 2.5
Estimated Flow and Load by Sector

Contributing Elements		LA Data for 2002	Standard Estimates		Comment
			2002	2022	
Domestic Resident		1,728	2,223	2,316	As per table 1.2
Resident Visitors		ND	0	0	Not a traditional tourist centre
Day Visitors		ND	0	0	
Domestic Flow	m^3/d	Incl.	306	357	2002 estimate @ 137.7 l/hd/d 2022 estimate @ 154.0 l/hd/d
Leisure/Tourist Flow(1)	m^3/d	0	0	0	No allowance for tourism
Unmeasured Commercial Flow	m^3/d	Incl.	49	57	Estimate based on 16% of domestic flow
Measured Commercial Flow	m^3/d	0	0	0	None measured
Industrial Flow	m^3/d	110	110	110	Estimate based on licensed discharge limits
Institutional Flow	m^3/d	Incl.	13	13	
Infiltration	m^3/d	0	111	116	Estimate based on 50 l/hd/d.
Imported Wastes	m^3/d	0	0	0	No waste or sludge imported.
Dry Weather Flow	m^3/d	1,150	589	653	Local Authority data doesn't provide a sectoral breakdown
BOD Domestic load	Kg/d	Incl.	133	139	Assuming loading of 60g/hd/d
BOD Leisure/Tourist(1)	Kg/d	0	0	0	No load from tourism
BOD Institutional(2)	Kg/d	Incl.	6	7	
BOD Commercial(3)	Kg/d	Incl.	21	22	Estimate based on 16% of domestic load
BOD Industrial	Kg/d	Incl.	73	73	Estimate based on licensed discharge limits
Total	Kg/d	438	233	241	
Population Equivalent		7,300	3,883	4,017	
BOD Imported Waste	Kg/d	0	0	0	No imported waste or sludge at present or in the future
Total BOD Load	Kg/d	438	233	241	

(1) Resident and Day Visitors combined
(2) Refers to contributions additional to those from the resident Domestic population
(3) Combined Measured and Unmeasured Commercial figures

2.2.2 Storm Flow

Table 2.6 gives an estimated breakdown of the areas currently contributing storm flow from each development sector where there is a combined or partially separate sewerage system. These are the areas to be considered in determining urban pollution management measures, such as detention tanks, and/or storm water treatment improvements at the WWTP.

Storm runoff areas are obtained from Table 1.1 and the percentage area drained by combined sewerage systems is derived from Section 3 and Figure 2.

Table 2.6
Proportional Storm Runoff

Contributing Sectors	Gross Sewered Area (ha)	% Combined Sewerage*	Net Area to Combined Sewerage (ha)	% Storm Flow Contribution by Area
Domestic/Residential	85	96%	82	73%
Institutional	14	50%	7	6%
Holiday/Leisure	Incl.**	N/A	N/A	N/A
Commercial	14	100%	14	12%
Industrial	10	100%	10	9%
Total	123****	88%	113	100%

* It is assumed that 10% of the area served by partially separate systems contributes storm run-off flows to the system.
** Included in other sectors
*** Areas where road drainage has been separated from combined sewers has not been accounted for as insufficient data was available to quantify the areas served by these systems.
**** 40 ha outside current development boundary is served by drainage system. This area is considered to be primarily residential and is included.

No account is taken in Table 2.6 of the variation in permeability and runoff from different surfaces. Both the current and future (year 2022) storm flow runoff proportions may be determined in course of the design of sewerage system upgrading works using a computer model and this is discussed further in Section 3.5.

3.0 SEWERAGE SYSTEM

The layout of the system is shown on Figure 2. The Clones catchment is drained by a combination of gravity sewers and pumping systems. The catchment has 4 pump stations, which serve low-lying areas to the east and north of the catchment. Waste water from the catchment presently drains via two main trunk sewers to the WWTP at Legarhill. Treated effluent from the WWTP is discharged to a nearby tributary of the River Finn.

There are three known Combined Sewer Overflow (cSO) discharges from the sewerage network, one of which has been blocked temporarily. Two of the three cSOs discharge to a tributary of the Lackey River while the other discharges to a canal.

The catchment is reported to be served by a predominantly combined sewerage system that was last upgraded in the early 1960's. It is reported that a separate sewer system drains the Church Hill/Lower Fermanagh St. area while the institutional area north of the Roslea Road is understood to drain to a partially separate system (see Figure 2). As the extent of the area served by the separate sewer system at Church Hill/Lower Fermanagh St. is not known it is not shown on Figure 2.

In addition to these areas it is reported that road gullies on Newtownbutler Road, Church Hill, Roslea Road and Lower Fermanagh Street have been diverted from the combined system and now drain to local watercourses. No information was available on the number of houses connected to the storm sewer network, the routes and destinations of storm sewer drainage systems or the breakdown of total storm sewer length.

It is believed that all houses within the drainage catchment are connected to the municipal sewerage system. Industrial waste water from AIBP Meats in Clones is treated at a private treatment plant and does not contribute to the municipal sewerage system.

3.1 INVENTORY

3.1.1 Sewerage System Records

A layout plan of the sewerage network (dating back to 1985) was available at the Monaghan County Council Offices in Clones. In addition to this, it is understood that pre-construction longitudinal section drawings from the 1960s are available for an unknown percentage of the sewer network. A numerical inventory of sewerage assets was not available.

3.1.2 Sewers

No information was available on storm, foul or combined sewer lengths within the catchment. For the purpose of estimating the total length of these sewers in Clones the findings of the Sewerage Density and Structural Condition Assessment Methodology (contained in Volume 2) were used.

To use this Methodology the following assumptions were used:

- Population of 2,223 and approximately 750 houses in the catchment
- Storm sewers to provide storm/road drainage serve Newtownbutler Road, Church Hill, Roslea Road and Lower Fermanagh St. The aggregate length of these streets was taken as the total storm sewer length in Clones.
- Local authority staff have reported that the maximum pipe diameter range in the combined sewer network is between 225 and 600mm and it is assumed that the maximum storm pipe diameter is also in this range.

A breakdown of the sewerage system inventory by length and size using the Methodology in conjunction with the local authority estimates is provided in Table 3.1.

Table 3.1
Sewer Length Summary

Sewer Type*	Length in each Dia. Band (m)			Totals (m)	Confidence Grade
	≤225 mm	>225 <600 mm	≥600		
Combined	10,383	2,435	0	12,818	5A
Storm**	1,827	428	0	2,255	5
Foul ***	Incl.	Incl.	Incl.	Incl.	5A
Total Gravity	12,210	2,773	0	14,983	5A
Rising Mains	1,243****	0	0	1,243	5

* Gravity sewers unless otherwise indicated.
** Storm drains are included under storm sewers unless otherwise indicated
*** Foul sewers included in combined sewer totals
**** Rising main lengths estimated from pipe work routes supplied by local authority staff and assumed to be small diameter pipe work

The length of combined trunk sewers is estimated to be 6.4km (estimated from sewer routes supplied by local authority staff).

A breakdown of the pipe work (sewers or rising mains) by material of construction was not available for the catchment. However local authority staff have noted that the majority of pipes in the town centre are clay.

CCTV surveys of approximately 2 km of sewers were carried out in 2001-2002. Since these surveys covered only 13% of the network a condition grading in accordance with the Sewerage Density and Structural Condition Assessment Methodology was applied. Accordingly the data is given a confidence grading of 5A.

No information was available on the condition or age of rising main pipe work within the catchment.

Table 3.2
Sewer Condition

Sewer Type*	% by length in each Condition Grade/Band**		Confidence Grade
	1 – 3	4 - 5	
Combined	98%	2%	5A
Storm	98%	2%	5A
Foul	98%	2%	5A
Total Gravity	98%	2%	5A
Rising Mains	ND	ND	-

* Gravity sewers unless otherwise indicated
** Standard estimate value (all gravity sewers)

The number of manholes in the catchment was estimated at 300 based on guidelines from the Sewerage Density and Structural Condition Assessment Methodology.

3.1.3 Combined Sewer Overflows

Details of combined Sewer Overflows (cSOs) are given in Table 3.3. The cSOs were not inspected and the data Confidence Grade is taken as 2.

Table 3.3
Combined Sewer Overflow Summary

Ref. & Overflow Location	Screening or Solids Separation	Condition Grades (1 - 5)		Perform'ce Grade 1, 3 or 5	Overflow Outfalls to	Conf'ce Grade
		Civil* Works	M & E Plant**			
1. Creighton's Corner	None	≤3	N/A	3	Lackey River Tributary	2
2. Newt'nbutler Road	None	≤3	N/A	5	Lackey River Tributary	2
3. Canal Stores	None	≤3	N/A	3	Canal	2

* Includes Building Works
** M & E = Mechanical & Electrical Plant
Note: Conf'ce Grade = Confidence Grade

No information is available on the operation of the cSOs in terms of continuation flows or spill frequency. It is recommended that the operation of the cSOs be examined in more detail to determine whether the overflows in place comply with the Urban Waste Water Treatment Directive (UWWTD 91/271/EEC) and DEHLG policy. This will dictate whether the current mechanisms are adequate or need to be upgraded/replaced.

3.1.4 Pump Stations

Summary details for the pump stations are given in Table 3.4 below. Figure 2 identifies the location of each pump station. The pump stations were not inspected and the data Confidence Grade is taken as 3 based on regular inspections by local authority staff.

Table 3.4
Pump Stations Summary

Ref. & Location	Capacity (l/s*)	Condition Grade (1-5)		Emergency Overflow Outfalls to	Confidence Grade
		Civil Works	M & E Plant		
1. Millbrook	5-10	≤3	≤3	None	3
2. Roslea Road	5-10	≤3	≤3	None	3
3. Maxol Service Station	<5	≤3	≤3	None	3
4. Feldhues	5-10	≤3	≤3	None	3

* Capacity of the duty or duty and assist pumps only, i.e. standby capacity is excluded.

3.1.5 Other Ancillaries

Details of a storm holding tank located at a school in Clones are given in Table 3.5. The holding tank was not inspected and the data Confidence Grade is 3 based on local authority data and the recent construction of the tank (2002).

Table 3.5
Other Sewer System Ancillaries Summary

Type Description	Location	Capacity* (l/s or m^3)	Condition Grade (1 - 5)		Confidence Grade
			Civil Works	M & E Plant	
1. Storm Holding Tank	School	300 m^3	≤3	N/A	3

3.2 HISTORIC PERFORMANCE

The historic performance of the sewerage network is described below. As there have been no reports of sewer collapses and the locations of historical flooding incidents were not identified, Figure 3 is not used. However subsidence of sewers has been reported and this is detailed in Section 3.2.2 and illustrated on Figure 3A.

3.2.1 Hydraulic

The Clones Urban Development Plan has reported that specific sections of the sewer network are hydraulically overloaded during storm conditions. It is reported that sections of sewer along the Roslea Road commonly surcharge, sometimes causing flooding, which capitulates from the 98th Avenue sewer section when it is unable to cater for the increased loading during these storm conditions. The extent or exact location of this flooding was not provided.

In addition to this, flooding of roads near the town centre occurred in August 1999 due to an extreme storm event. The affected areas were Newtownbutler Road, Roslea Road and at the traffic lights at the junction of Monaghan Road. There are no available meteorological records regarding any storm events coinciding with this incident of flooding.

Local authority staff have indicated that surface water flooding, caused by construction on a flood plain, has resulted at the start of the N54 at the eastern edge of the catchment.

The number and nature of recorded flooding incidents suggests that there are capacity shortfalls in the sewerage and drainage systems in Monaghan.

3.2.2 Structural

Based on the sewer condition assessment in Section 3.1.2 approximately 300 m (2%) of the gravity sewers are considered to be in a state of serious structural deterioration (condition grade 4/5).

It is believed that subsidence of approximately 20% of a 500 m length of trunk sewer between Newtownbutler Road and Cavan Road has occurred. This was discovered during CCTV surveys of the two main trunk sewers in the catchment. The results of this survey showed that these sewers are in poor condition with settlement, debris and waterlogged pipelines being the main problems. The cause of this is believed to be poor ground conditions and poor construction. This has also resulted in flat gradients, displaced joints, backfall on individual pipes and suspected infiltration. The survey results correspond well with the standard assessment.

3.2.3 Environmental

Discharges of raw sewage to a tributary of the River Lackey have been reported. This pollution is suspected to originate at cSO Nr 1, which discharges to a culvert and subsequently to the affected watercourse. However, it was not known whether the pollution was caused by discharges form the cSO or from unconnected properties nearby. Monaghan County Council have recently blocked off the cSO to determine if the cSO is the cause of the pollution. Should the cSO be identified as the cause of the present watercourse pollution, the Local Authority will investigate whether the raising of the overflow level from the cSO can be achieved.

Discharges from the Clones WWTP are believed to increase BOD levels in the receiving waters.

3.2.4 Infiltration/Exfiltration

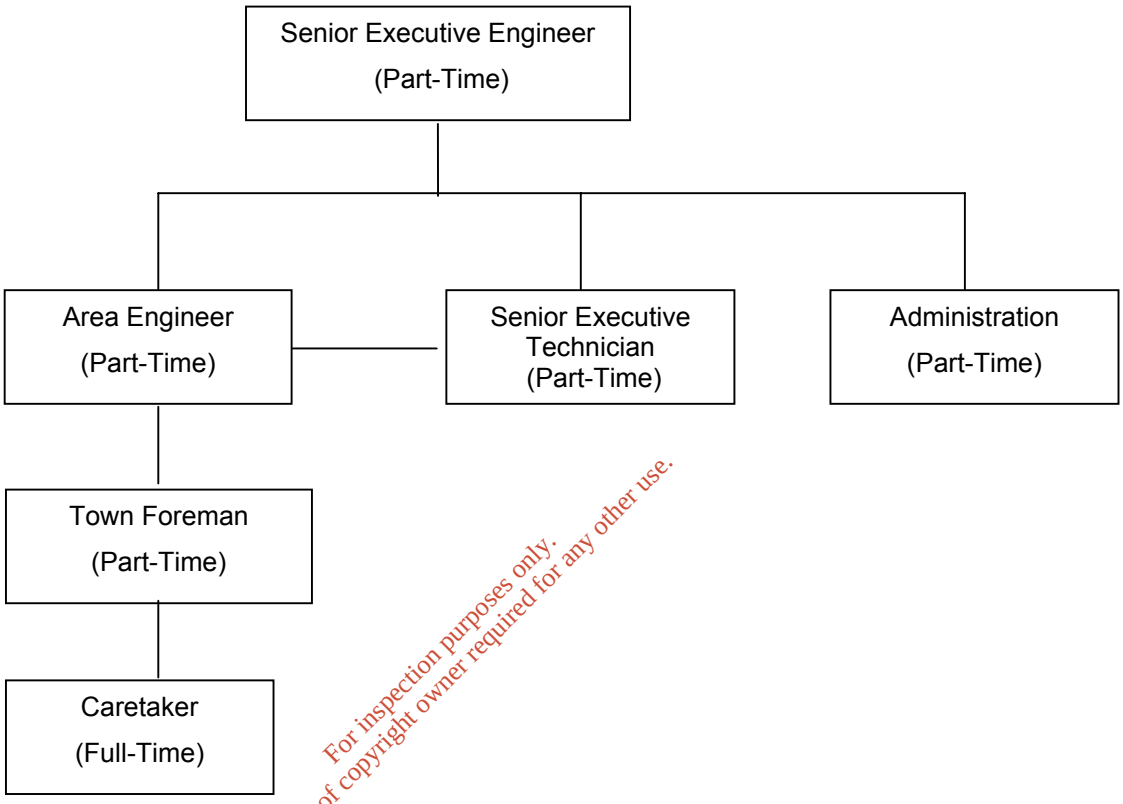
Local authority staff indicated the occurrence of infiltration on the western trunk sewer between Newtownbutler Road and Cavan Road. However, it has not been quantified.

3.3 OPERATIONAL CONTROL & STAFFING STRUCTURE

3.3.1 Management Structure

The management structure for operation and maintenance of both the sewerage network and the WWTP is represented in the organogram below.

Organogram of Staffing Structure for Clones Sewerage System



3.3.2 Operation and Maintenance Policy

The operation and maintenance policy for the sewerage network as described by the Local Authority is as follows:

- Pump stations are visited weekly by the caretaker to check operation and carry out any necessary maintenance. There are no telemetry/SCADA/dial-out systems at any of the pump stations
- An operation and maintenance contractor visits the pump stations twice per year.
- Problems with pipe blockages etc. are dealt with as they arise. Jetting of problem sewers is generally done on an annual basis. An area on 98th Avenue has been identified as a problem area and requires jetting once every 4-5 years due to the build up of fats/grease.

3.3.3 Relative Manpower

The Local Authority has indicated that the amount of staff time expended to the sewerage network is as set out in Table 3.6 below:

Table 3.6
Staff Time Expended on Maintaining the Sewerage Network

Grade of Staff	Weekly Hours	Annual Days*
Senior Executive Engineer	0.5	2.75
Area Engineer	2.0	11.00
Senior Executive Technician	0.5	2.75
Admin. Staff (2 Nr.)	1.0	5.50
Town Foreman	4.0	22.00
Caretaker	12.0	66.00
Total Man	20 hours	110 days
	Total Man Years	0.50

* Based on 8 hours per day and 44 working weeks per year or 220 days per year.

The relative manpower requirements for operation and maintenance purposes are presented below in Table 3.7. The two parameters or Performance Indicators analysed are:-

i) relative length of sewer maintained per man-year of staff time.

ii) relative number of households served per man-year staff time.

Table 3.7
Relative Man Power Requirements for Sewerage Network Maintenance

Performance Indicator	Output Measure(see notes)
Length of sewer maintained per man-year	32 km
Number of households maintained per man-year	1,508 nr.

Note 1: Based on a total length of 16.2 km of sewers (inc. rising mains), which is the estimated total length of publicly maintained sewers in the catchment.

Note 2: The number of households maintained per man-year is based on a total of 754 nr. households in the catchment, connected to the public sewer network.

3.4 NETWORK INTEGRITY AUDIT

3.4.1 Hydraulic Capacity

A mathematical model has not yet been developed for this catchment and detailed assessment is not practical at this stage.

Following a CCTV survey of the 2 main trunk sewers to the WWTP in 2001 it was discovered that both sewers have standing water to 50-60% of their height during periods of dry weather. This indicates that there are insufficient gradients in these sewers or that there are flow restrictions at the inlet works to the WWTP.

The combined capacity of the trunk sewers leading to the WWTP has been calculated, from appropriate data relating to pipe work diameters and gradients. The combined capacity of the main trunk sewer from the town centre (76 l/s) and from the trunk sewer to the west of the catchment (45 l/s) was calculated at 121l/s (see Figure 3A). This corresponds to 17.5 DWF based on current flow.

The maximum flow which can be treated at the WWTP is 92 l/s (based on forward feed and storm pump capacity) and the WWTP does not have any storm overflow facility. Excess flows are therefore allowed to back up in the preliminary treatment system and incoming sewer.

As per Section 3.2.1, there is insufficient capacity in the network to cope with present waste water flows from the drainage catchment.

3.4.2 Structural Integrity

As per section 3.1.2, sections of the trunk sewer network are in poor condition and the local authority have identified the need for remedial works in the sewerage system.

3.4.3 Structural Rehabilitation Options

The extent and method of rehabilitation for the Clones sewerage network had not been determined at time of writing.

3.4.4 Pollution Control

It is expected that the current pollution problems caused by the sewerage network and WWTP discharges will be remedied in the near future.

The extent of the foul/combined and storm systems was outlined by local authority staff in the course of the survey, and is shown on Figure 2. As stated in Section 3.4.1, the present system is deemed inadequate for current flows within the drainage catchment.

3.4.5 Hydraulic Solutions

It is not possible to comment on hydraulic solutions at this stage.

3.5 SURVEYS AND INVESTIGATIONS

Summary details of major surveys undertaken within the catchment are given in Table 3.8 and their adequacy for the purpose of future investigation is discussed below.

3.5.1 Manhole Survey and Sewer Mapping

No manhole survey or manhole mapping has been undertaken.

3.5.2 Sewer Survey

Two CCTV surveys have been undertaken in the recent past. The first survey (2001/2) included the two trunk sewers leading to the WWTP at Legarhill. No information was available on the scope of the more recent survey.

As these surveys are recent and were deemed to have passed the necessary quality checks, they will not need to be resurveyed.

3.5.3 Short Term Flow & Rainfall Survey

No flow or rainfall surveys have been undertaken.

3.5.4 Impermeability Survey

No impermeability surveys have been undertaken on the collection system. Thus the degree of separation of foul and surface water cannot be confirmed.

3.5.5 Permanent Monitoring

There are no permanent monitors (water quality or rain gauges) installed on the sewerage network. The flow to the WWTP is monitored electromagnetically at the plant inlet and by a venturi flume at the outlet.

Table 3.8
Major Surveys Summary

Type of Survey	Year(s)	Extent of Survey		Quality* Controlled	Passed Quality checks*	Conf'ce Grade
		Units	Q'ty			
Manhole Survey & Mapping	-	Manholes	0	N/A	N/A	N/A
Sewer Survey	2001/2	Km of sewer	1700	Y	Y	3
Sewer Survey	2002	Km of sewer	300	Y	Y	3
Flow & Rainfall Survey	-	Flow Monitors	0	N/A	N/A	N/A
	-	Rain gauges	0	N/A	N/A	N/A
Impermeability	-	Ha	0	N/A	N/A	N/A
Flow/Pollution Monitors	-	Permanent monitors	0	N/A	N/A	N/A

* Yes or No
Note: Conf'ce Grade = Confidence Grade Q'ty = Quantity

3.5.6 Future Surveys

Based on historic performance data and the network integrity audit, a full assessment of the network is deemed necessary. Survey work should include surveys necessary to update all sewer records and to develop a hydraulic model of the catchment. (The level of surveying required will depend on the relevance of existing surveys and the complexity of the hydraulic model).

Future survey and mapping requirements are given in Table 3.9 under the headings "Full Survey" and "Initial Survey".

Initial survey requirements are those necessary to confirm the validity of existing records, identify the core area of the network, build and verify a computer model and to develop a Drainage Area Plan. This may include a connectivity survey (to prove the sewer route), CCTV sewer survey and a limited Impermeability survey to confirm the extent of surface water connections to the combined network.

Full Survey assumes that manhole and sewer records are to be fully updated. In addition, more detailed impermeability survey may be required to assess the route of surface water discharges.

The actual extent of survey must be reassessed at the stage of scoping a detailed study. River and/or marine surveys etc. for the purpose of developing pollution models have not been considered at this stage as the work is outside the scope of this study.

Permanent monitors (at treatment works and on cSOs) are discussed separately in connection with long term monitoring requirements.

Table 3.9
Future Surveys Requirements

Type of Survey	Units	Quantities*	
		Initial Survey	Full Survey
Manhole Survey & Mapping	Manholes	45	300
Sewer survey	Km of Sewer	2.0	
Flow & rainfall Survey	Flow Monitors	5	
	Rain gauges	3	
Impermeability	Ha	0	0

*Full survey quantities include the initial survey requirements

3.5.7 Network Modelling & Hydraulic Assessment

Once the core of the network has been accurately mapped and sewer records collated it will be possible to construct a simple hydraulic model (combined system only) to assess storm flows and potential flooding in the system.

In the case of Clones, a Drainage Area Plan hydraulic model is deemed sufficient. This model should contain all cover area sewers.

The model should be used to confirm the extent of any hydraulic under capacity and identify appropriate solutions where necessary. Should the network prove to be more complex than indicated in Figures 2 and 3, flow monitoring and verification of the computer model may be necessary.

3.5.8 Drainage Area Plan

The information derived from the surveys and assessments described in sections 3.5.6 and 3.5.7 should provide a reasonably comprehensive picture of the current condition of the network with regard to actual or potential hydraulic, structural, pollution and maintenance problems. Integrated solutions should then be developed for the target year, taking due account of both the direct cost (design and contract costs) and the indirect cost or economic impact on the urban area (e.g. disruption of business activity and other infrastructure/services). The general approach is briefly described in the Methodology. The optimum solution will form the Drainage Area Plan for the catchment.

3.6 NETWORK UPGRADING

3.6.1 Adequacy and Utilisation of Existing System

Available information is inadequate to make a useful assessment of under or overcapacity in the network. The requisite information to carry out a quantitative hydraulic assessment of the sewerage network was not available at the time the study was undertaken. The network has therefore been assessed qualitatively.

Current operational problems in the two trunk sewers to the south of the catchment are currently restricting flows to the WWTP. Monaghan County Council have identified the need for a comprehensive programme of remedial works in the sewer network including jetting to remove all blockages and settled materials and the repair of defective pipe sections and manholes.

Detailed analysis required to assess the impact of increased development areas and future flows (see Table 2.5) is beyond the scope of this Study.

3.6.2 Current and Planned Works

It is proposed to extend the outfall pipeline from the WWTP to the River Finn in the future. No cost estimates or programme for the works was available at time of writing.

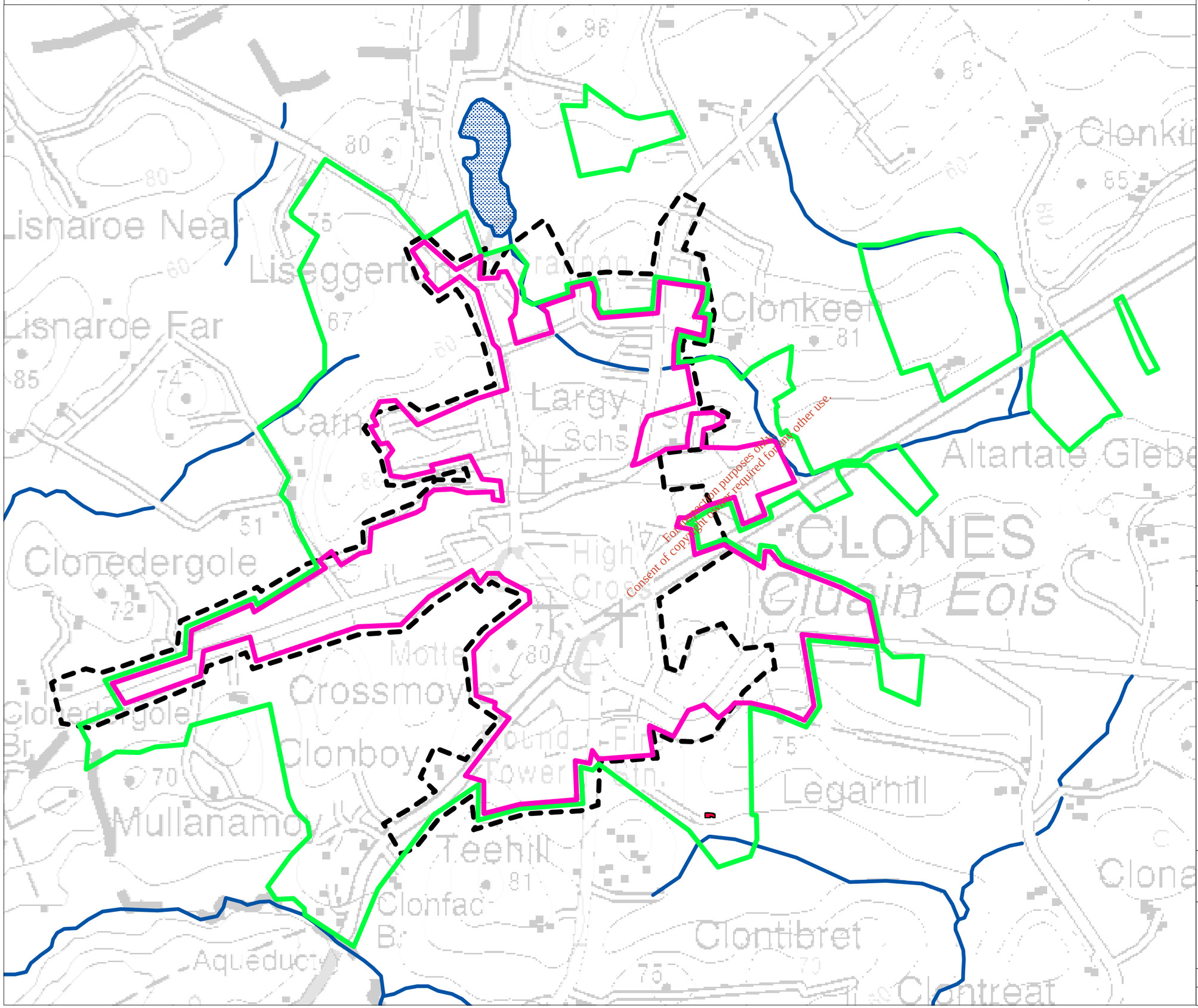
The Clones Urban Development Plan (2001-2006) reports that a feasibility study for the upgrading of the sewerage system (to include provision of increased capacity and the separation of flows entering the combined system) will be conducted within the next 3 years.

According to the Water Services Investment Programme (WSIP) 2003–2005, the Clones WWTP scheme was approved to enter planning.

3.6.3 Potential Additional Works

- Pipe subsidence on western trunk sewer – Relay approx. 200-300m of sewer and ensure that future ground conditions will remain stable.
- Pollution at cSO – investigate whether cause of pollution is cSO discharges or illegal discharges to the watercourse. If cSO is the cause, assess operation and redesign prior to subsequent rehabilitation. If pollution is due to illegal discharges connect these properties to municipal system.
- FOG problem – provide FOG interceptors at source in the town centre area i.e. Fermanagh Street and Upper Diamond.
- Standing water in trunk sewers – determine whether this problem has been caused by inadequate gradients or problems with the inlet works to the WWTP. Subsequent to this remedial works to solve the problem should be investigated.
- Storm water separation – Local authority staff have identified the reduction of storm water entering the foul/combined sewer network as essential to reduce current storm water flows being treated at the WWTP and to provide additional capacity for foul sewage in the network. In addition to this an investigation to identify current flow regimes of present infiltration problem areas should be undertaken.
- Expansion to meet future demand - The Clones Urban Development Plan has identified the separation of the combined system in the town centre, especially along 98th Avenue as essential to the extension of the scheme to outlying areas. It is proposed to progress this work under a serviced land initiative. This work would enable areas to the north and north east of the town centre (Millbrook and Roslea Road areas) to be connected to the collection system. Other proposals would include extension of the scheme to service the Carn Lane and Monaghan Road areas.
- It is recommended that development within the proposed drainage catchment be encouraged, and should incorporate separate collection systems.

Do Not Scale - If in Doubt Ask



Legend

- Catchment Boundary
- Current Development Boundary
- Future Development Boundary
- River
- Waste Water Treatment Plant

Rev.	Date.	Description.	Drn.By	Chkd.	Appd.
B	DEC '03	Post Review Revisions	SWAL	DCAS	JKEL

Client

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BARRY & PARTNERS consulting engineers

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The National Urban Waste Water Study

Drg.Title

Clones Catchment Area

Figure 1
Catchment Geographic Plan

Drawn	Checked	Approved		
SWAL	FOMA	JKEL		
Date 05.08.03	Scale N.T.S.	Drg.Nr. A7090-132-1-EGP	Rev: B	

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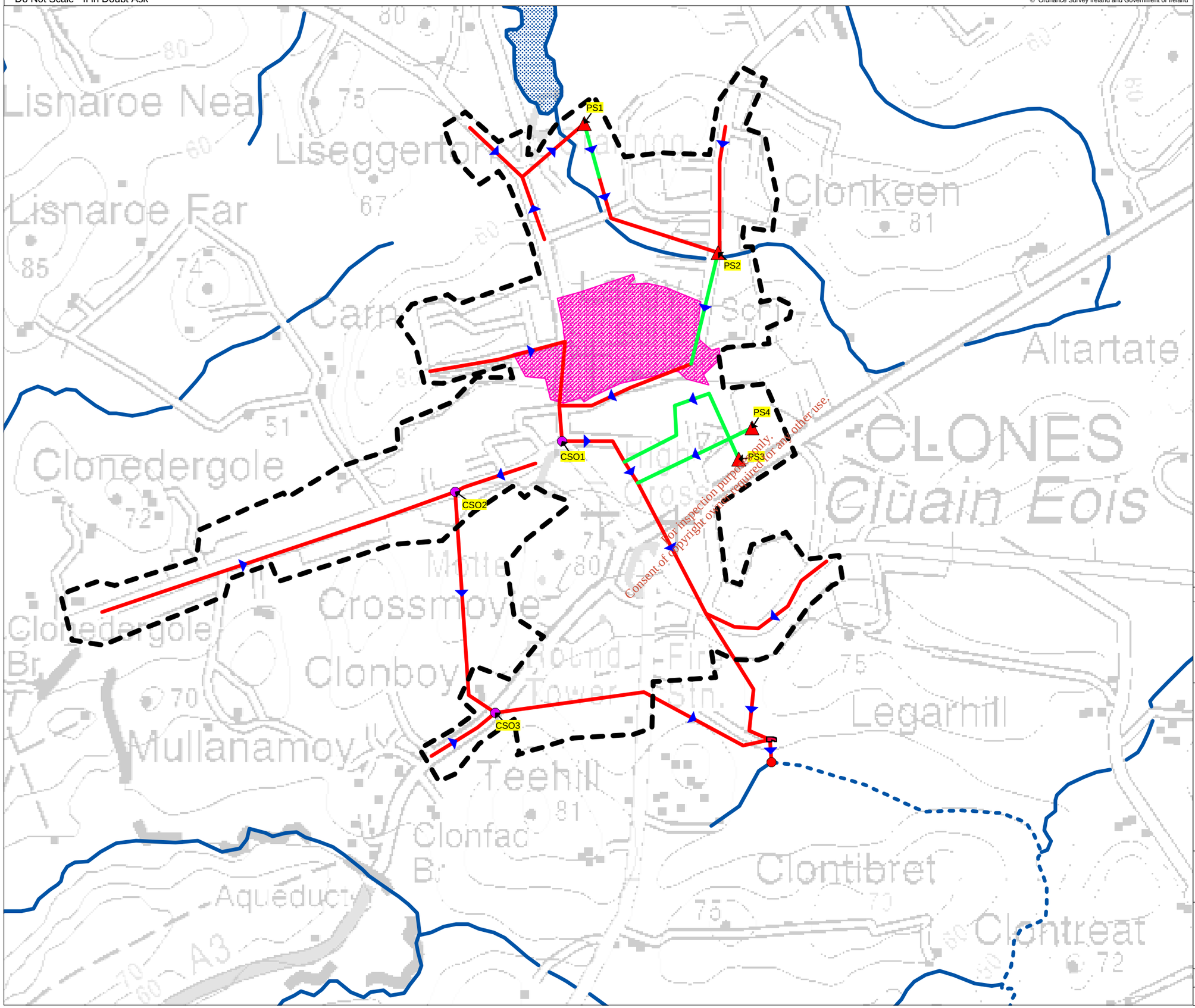

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Legend

- Catchment Boundary
- Gravity Sewer
- Rising Main
- Main Storm Drains
- Combined Sewer Overflow (CSO)
- Major Storm Outfall
- Sewer Outfall
- Pumping Station
- Waste Water Treatment Plant
- Combined System
- Partially Combined System
- Separate System
- River
- Receiving Water

Note:
1. Catchment area is combined unless otherwise stated.
2. Refer to table 3.4 for details of pump stations.

Rev.	Date.	Description.	Drn.By	Chkd.	Appd.
B	DEC '03	Post Review Revisions	SWAL	DCAS	JKEL

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Clones Catchment Area

Figure 2
Existing Sewerage System

Drawn	Checked	Approved	
SWAL	FOMA	JKEL	
Date 05.08.03	Scale N.T.S.	Drg.Nr. A7090-132-2-EGP	Rev: B

Do Not Scale - If in Doubt Ask

Legend

- Catchment Boundary
- Gravity Sewer
- Rising Main
- Main Storm Drains
- Pumping Station
- Waste Water Treatment Plant
- XXX l/s Sewer Capacity
- Structural Grade 4/5
- River
- Receiving Water

Rev.	Date.	Description.	Drn.By	Chkd.	Appd.
B	DEC '03	Post Review Revisions	SWAL	DCAS	JKEL

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The National Urban Waste Water Study

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Clones Catchment Area

Figure 3A
Hydraulic & Structural Assessment

Drawn	Checked	Approved
SWAL	FOMA	JKEL

Date	Scale	Drg.Nr.	Rev:
05.08.03	N.T.S.	A7090-132-3A-EGP	B

4.0 WASTE WATER TREATMENT

4.1 TREATMENT PROCESS

4.1.1 General Description

Clones WWTP was built in the 1960's and upgraded in the late 1980's. The upgraded plant provides secondary treatment with primary settlement and a percolating filter system preceded by coarse screening. The WWTP discharges treated effluent to a tributary of the River Finn, which joins this river approximately 1.6 km downstream of the WWTP outfall. Sludge treatment at the WWTP is carried out in reed beds.

Figure 4 illustrates the current treatment process, which was confirmed by a site visit during the course of the Study. Reasonable confidence (Grade 3) can be placed in the dimensions and capacities given in the figure and quoted below, these being subject of selective checks.

4.1.2 Preliminary Treatment

Incoming waste water from the Clones sewerage scheme gravitates to the preliminary treatment system. This comprises of a manually raked coarse screen (30 mm aperture). The screenings are stored temporarily on site prior to disposal at Scotch Corner landfill

Downstream of the preliminary treatment system flows gravitate to a pumping station with foul and storm pumps. The sump in this station has an overflow weir which allows incoming waste water to overflow to an adjoining storm water sump when the capacity of the main foul pumps has been exceeded. Under normal operating conditions only the duty foul pumps pump waste water forward for treatment at a maximum rate of 28 l/s, but during storm conditions both the foul and storm pumps convey waste water forward to the primary settlement tanks. The combined pumping capacity under these conditions is understood to be approximately 92 l/s. When incoming flow rates exceed this, waste water is allowed to build up in the screening chamber and inlet sewers. There is no storm water overflow at the WWTP.

The total flow into the WWTP is measured electromagnetically at the plant inlet downstream of the of the preliminary treatment system, and the discharge is measured in a venturi flume at the plant outlet. In addition, automatic samplers are provided at the WWTP to sample the influent and the effluent at the plant.

4.1.3 Primary Treatment

Primary treatment comprises of two horizontal flow Imhoff tanks operating in parallel and fitted with chain driven scraper mechanisms, which scrape primary sludge to the hoppers located at the inlet end of the tanks. Settled sewage gravitates via a dosing siphon to the secondary treatment system, while settled sludge gravitates directly to the reed beds.

Following primary treatment flows up to 28l/s (2.2DWF) gravitate to a flow splitting chamber. This chamber incorporates adjustable plate weirs which allow flows to be accurately split to the secondary treatment system.

4.1.4 Secondary Treatment

Secondary treatment is carried out in a conventional percolating filter system. The percolating filter system consists of two circular trickling filters which operate in parallel and are filled with randomly packed stone media. The filters have a media bed volume of 2,080 m^3. Flow from the percolating filter system gravitates to a secondary settlement tank (Humus tank).

The secondary settlement tank is a 7 m square hopper bottomed tank (not fitted with cleaning mechanism). Settled sludge from this tank flows by gravity to the inlet pump sump for onward pumping to the Imhoff tank. The Imhoff tank is desludged by gravity to the reed beds.

Treated effluent which overflows from the secondary settlement tank gravitates to an on site chamber. From there the flow gravitates to the outfall in the tributary of the River Finn.

4.1.5 Tertiary Treatment

Tertiary treatment is not provided on site.

4.1.6 Sludge Treatment and Disposal

Sludge is not imported to Clones WWTP for treatment. Indigenous sludge is treated on site in reed beds (total area of 373 m^2).

4.1.7 Pumping Stations

Following elevation of incoming waste water by the inlet pump station, the flow of waste water through the treatment process stream is primarily by gravity. Humus sludge from the secondary settlement tank is pumped to the reed beds using a portable pump.

4.1.8 Power Generation

There is no standby power generator on site.

4.2 TREATMENT PLANT

The WWTP is located to the south of the town at Legarhill. The current site layout is shown in Figure 5. An inventory of the elements of plant, their structural condition and serviceability is given in Table 4.1 and discussed briefly below. A photograph showing the percolating filters is included at the end of this section. The WWTP currently occupies an area of approximately 1 hectare. (Confidence Grade 4).

Reasonable confidence (Grade 3) can be placed in the dimensions, capacities and Condition/Serviceability assessments given in Table 4.1 these being subject of selective checks when the site was visited in the course of the Study.

4.2.1 Buildings

There is one building at the WWTP. This is the inlet pump station building with a separate room housing the control panel.

4.2.2 Miscellaneous Assets

Two rectangular sedimentation tanks and an empty filter are reported to be redundant.

4.2.3 Asset Condition

The Clones WWTP was upgraded in the late 1980's. With the exception of the preliminary treatment system, the structural conditions of the treatment plant including mechanical and electrical items was recorded as moderate i.e. $\leq$ Grade 3.

However some of the mechanical and electrical plant has been operating for at least 15 years which is approaching the average useful life of 20 years for this type of equipment, and may be in need of refurbishment in the medium term.

4.2.4 Serviceability

Fats, oil and grease in the incoming waste water is reported to cause problems at the WWTP. Ponding on the surface of the percolating filters was observed at the time of this study, and this results in poor performance of the filters. Such ponding can be caused by hydraulic overload, uneven distribution of feed area on the surface of the filter and also blockage on top of the filters due to inadequate waste water screening.

4.2.5 Health & Safety

The Waste Water Treatment Plant is generally in satisfactory condition with regard to Health & Safety issues. An audit undertaken by Monaghan County Council has identified remedial works to be undertaken immediately and in the short to medium term at an estimated cost of €20,000.

4.2.6 Treatment Works Records

"As Built" drawings for the refurbishment works were not available. The sizes and dimensions provided for the process units were, checked on site and were found to be correct.

4.2.7 Flow Records

The total flow into the WWTP is measured electromagnetically at the plant inlet. The treated effluent discharge from the secondary settlement tank is measured in a venturi flume located downstream at the plant outlet. Flow records were not provided at the time of the site visit, but are now available on site.

View of Bio-filter at Clones WWTP

Table 4.1
Treatment Plant Asset Condition Summary

Treatment Stage	Element	Description (dimensions, capacities etc)	No of units	Structural Condition ≤3, 4,5		Service Condition ≤3 or 5	Comment (inc. date constructed or refurbished)
				E/M/I*	Civil/ Build		
Preliminary	Screens	Manually raked coarse screen, (30 mm aperture)	1	4	≤ 3	≤ 3	Commissioned in late 1980's
	Inlet pumping station	2 nr duty pumps rated @ 14 l/s + 2 Nr. storm pumps @ 64 l/s	2	4	≤ 3	≤ 3	Commissioned in late 1980's
Primary	Settlement tank	Rectangular Imhoff tanks diameter (53 m^2 each)	2	4	≤ 3	≤ 3	Commissioned in late 1980's
Secondary	Conventional biological filters	Circular tanks, random packed with stone media (Total volume of media 2,080 m^3)	2	4	≤ 3	4	Commissioned in late 1980's
	Settlement Tank	Square settlement tank (49 m^2)	1	4	≤ 3	≤ 3	Commissioned in late 1980's
Tertiary	N/A	N/A	N/A	N/A	N/A	N/A	No tertiary treatment
Sludge treatment/ Disposal	Advanced Treatment	Reed Beds (Total Area = 373 m^2)	2	4	≤ 3	≤ 3	Commissioned in late 1980's
Outfall	Pipe	Open ended to a tributary of the River Finn	1	N/A	≤ 3	≤ 3	Commissioned in 1993
Power Generation	N/A	N/A	N/A	N/A	N/A	N/A	No standby generator

* E/M/I –Electrical/Mechanical/Instrumentation
Confidence Grades: Dimensions – Grade 3, Structural Condition – Grade 3, Service Condition – Grade 3

4.3 OPERATIONAL CONTROL & STAFFING STRUCTURE

The waste water treatment plant is managed on a part time basis by a technician and operated by a caretaker. There is a no SCADA system or remote monitoring of the plant in place.

The Management and Staffing Structure used by Monaghan County Council for this scheme is as shown in Section 3.3.1. In terms of manhours, 4.5 hours per week of engineering, management and clerical time is spent on the WWTP with the technician spending 4.5 hrs/week, the caretaker spending 28 hrs/week and a fitter/electrician approximately 1 hr/week. The total number of man-hours expended on the WWTP is therefore, 38 hrs/week or 0.95 man years per year.

For comparative purposes, the performance indicator for operation and maintenance of treatment plant is taken as the load treated (in units of a population equivalent), per man year of operation and maintenance time. The current treatment plant services a population equivalent of approximately 7,300, thus the key output measure or load treated per man year is 7,684 pe.

4.4 PERFORMANCE AND CAPACITY

4.4.1 Historical Performance

Routine monitoring results show that the biological filtration system does not achieve a treated effluent quality in compliance with the discharge standards set by the Urban Waste Water Treatment Regulations, 2001 (i.e., < 25 mg/l BOD and < 35 mg/l suspended solids). Samples analysed for 2001 had average BOD concentrations of 31mg/l and suspended solids concentrations of 28 mg/l.

4.4.2 Current Capacity

The treatment capacity of the WWTP is determined by the limiting stage as illustrated in Table 4.2 below. The capacity of the individual process units are calculated using the standard loading rates typical for similar systems as set out in the relevant section of the Standard Methodology in Volume 2.

Table 4.2
Estimated Treatment Capacity Limitations

Treatment Stage	Element	Capacity (pe)	Limiting Criteria	Comment
Preliminary	Screen	ND	Peak Flow	Size and capacity not known.
Primary	Imhoff Tanks	8,260*	Peak Flow	Max flow = 44 l/s at 3 DWF and 154 l/hd/d
Secondary	Low Rate Filters	4,160	BOD	At standard operating conditions and max flow of 21.8 l/s
	Final Settlement Tank	3,055*	Peak Flow	Max flow = 16.3 l/s at 3 DWF and 154 l/hd/d
Tertiary	N/A	N/A	N/A	No tertiary treatment
Sludge	Reed Beds	371m^2	Kg ds/day	Adequate for existing indigenous sludge

* These figures should be treated with caution since it is the peak flow rate in l/s which is the limiting factor.

From the above table, it can be seen that Clones WWTP has inadequate capacity to handle either the current (7,300 pe) or future (7,417 pe) plant loading.

In terms of hydraulic capacity, the limiting stage is the final settlement which should not receive flows in excess of 16.3 l/s, while the hydraulic loading on the percolating filters should not exceed 21.8 l/s. With both inlet foul pumps operating, the current flow through the plant is reported at 28 l/s resulting in hydraulic overload of both these systems. The hydraulic overload is exacerbated when the storm pumps are activated, with a flow of 92 l/s passing through the treatment process.

In terms of organic loading, the treatment capacity of the filters is 249.6 kg BOD/day corresponding to 4,160 pe.

The adequacy of the sludge treatment processes in terms of compliance with the recommendations of the Sludge Management Plan is addressed in Section 5.0.

4.4.3 Meeting the Standards

Clones WWTP currently provides an adequate level of waste water treatment for compliance with the Urban Waste Water Treatment Regulations (S.I. No. 254 of 2001), i.e. secondary treatment for discharges to freshwaters from pe >2,000 by 31st December 2005. However, Clones WWTP currently does not comply with the

requirements of these regulations in terms of the quality of effluent being discharged and is considered to have inadequate capacity to achieve these standards. The receiving waters are not classified as sensitive and therefore nutrient reduction is not required under these regulations.

Table 4.3 below sets the current and future treated effluent discharges for Clones WWTP, and compares them with the assimilative capacity of the receiving waters.

Table 4.3
Impact of Future Discharges (2022)

Parameter	Assimilative Capacity	Current Load *	Future Load *	Comment
BOD (kg/day)	8.6	36	30	31 mg/l for current and future discharges
Total P (kg/day)	0	7	12	10 mg/l for future discharges
Total Ammonia (kg/day)	7.5	ND	30	25 mg/l for future discharges
Suspended Solids (kg/day)	ND	32	41	35 mg/l for current and future discharges.

* Based on current (year 2001) treated effluent quality achieved

As the required discharge standards are not being met at present, modifications to the treatment systems at the WWTP are now necessary. Upgrading work at the plant will need to ensure that future discharges meet the required standards while operating at satisfactory margins of safety.

To comply with the requirements of the Local Government (Water Pollution) Act 1977 (Water Quality Standards for Phosphorus) Regulations 1998, it is essential that the phosphate load being discharged into the tributary of the River Finn is not increased beyond current levels. The Phosphorus Measures Report prepared by Monaghan County Council has recommended phosphorus reduction to be provided at Clones WWTP.

It should also be noted that current discharges are exceeding the assimilative capacity of the River Finn, in terms of BOD and phosphorus and this is reflected in the increase in concentration of these parameters in the river downstream of Clones.

4.4.4 Utilisation

The standardised analysis given above, suggests that there is no spare capacity at the WWTP.

4.5 TREATMENT PLANT UPGRADING

4.5.1 Planned Works

Monaghan County Council plan to appoint consultants to prepare a Feasibility Report on the upgrade and refurbishment of the existing sewerage system and WWTP in the short term future. In addition to this, Monaghan County Council proposes to incorporate a phosphorus reduction system using chemical dosing at the WWTP.

According to the Water Services Investment Programme (WSIP) 2003–2005, the Clones WWTP scheme was approved to enter planning.

The recommendations of the Health & Safety audit are to be implemented at an estimated cost of €20,000.

4.5.2 Potential Additional Works

Increased waste water treatment capacity is necessary and this should also include a stormwater management system to reduce the hydraulic loading on the main treatment process. An improved level of screening is also necessary for a plant of this scale. A permanent desludging system is required for the final settlement tank.

Since any modifications or expansions to the WWTP will be undertaken as a Design/Build contract, the design of the works will be the responsibility of the contractor.

It is assumed that any future proposals for Clones WWTP will incorporate adequate treatment to comply with current legislation and have adequate capacity for future loading.

There is adequate space available on site to facilitate the expansion of the WWTP.

5.0 SLUDGE DISPOSAL

5.1 CURRENT SITUATION

At present, approximately 1.72 tonnes of dry solids per week (or 90 tds/year) of indigenous sludge is reported to be treated in reed beds at Clones WWTP. To date no sludge has been removed from the beds and the reeds in half of the beds are reported to be growing well.

5.2 THE SLUDGE MANAGEMENT PLAN

The Sludge Management Plan for County Monaghan (March 2002) outlines four sludge management scenarios for Co. Monaghan but a final decision on the option to be adopted was not available at time of writing. In two options considered, liquid sludge produced by the Clones WWTP will be transported for thickening and dewatering to a satellite site at Smithborough, prior to onward transfer to a new sludge treatment centre (hub centre) in Monaghan Town. The remaining two options proposes that Clones WWTP act as a stand alone hub centre with no provision for imported sludges. The indigenous sludge produced will continue to be treated by the existing reed beds.

The Plan predicts that Clones WWTP will produce approximately 95 tds/year of sludge by the year 2022, at an estimated 3% dry solids. Sludge will not be imported to Clones WWTP for treatment.

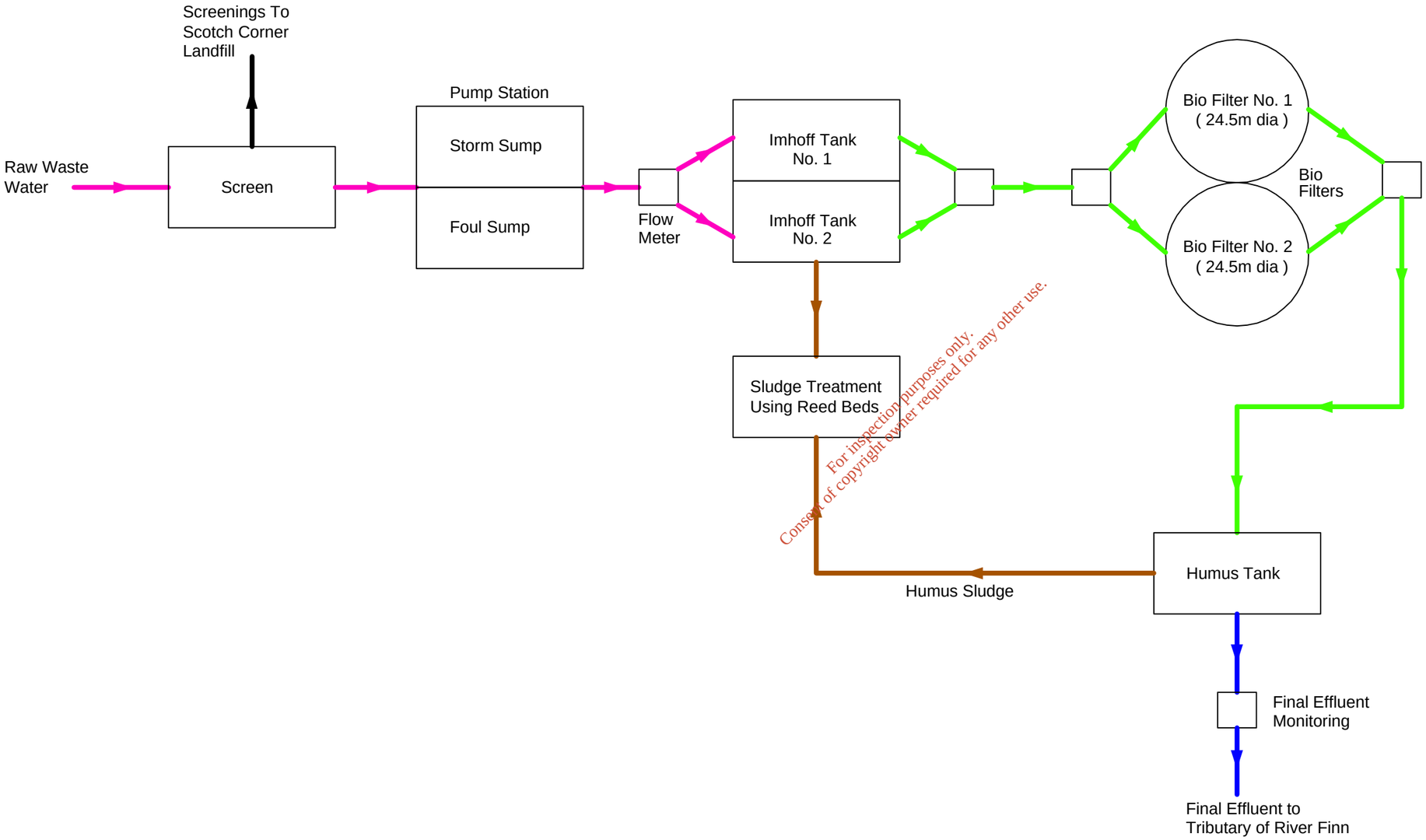
5.3 INDICATIVE NEW WORKS

It will be necessary to provide adequate storage of indigenous sludge prior to transport off site for additional treatment at the satellite site/Monaghan sludge treatment centre, in order to optimise transport costs.

At the least, Clones will act as a stand alone hub centre treating only its own indigenous sludge. The Plan does not indicate whether the exiting reed bed area is adequate for future predicted sludge volumes. However, based on information contained in the Plan, reed beds can accommodate a sludge loading rate of 60 kg ds/m2 yr-1. From Table 4.1, the reed beds have an area of 373 m2 which equates to an annual sludge load of 22.4 t ds/yr. On comparison with the predicted future sludge volume of 51 tonnes ds/yr this will require the duplication of the existing reed bed area.

According to the Water Services Investment Programme (WSIP) 2002–2004, the Monaghan Sludge Management Scheme was approved to commence construction in 2003. The WSIP 2003–2005 also lists the Monaghan Sludge Management Scheme as approved to start in 2004.

Do Not Scale - If in Doubt Ask



Legend

- Raw Waste Water
- Final Effluent
- Sludge
- Dewatered Sludge
- Flow to Secondary Tanks
- Screenings/Grit
- Storm Water
- Return Liquors
- Chemical Dosing

Rev.	Date	Description	Drn.By	Chkd.	Appd.
B	DEC'03	POST REVIEW REVISIONS	SWAL	DCAS	JKEL

Client

Department Of The Environment, Heritage And Local Government

Consulting Engineers

Pettit Project Design & Management

White Young Green Ireland

BARRY & PARTNERS consulting engineers

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Project

The National Urban Waste Water Study

Drg. Title

Clones Catchment Area

Figure 4

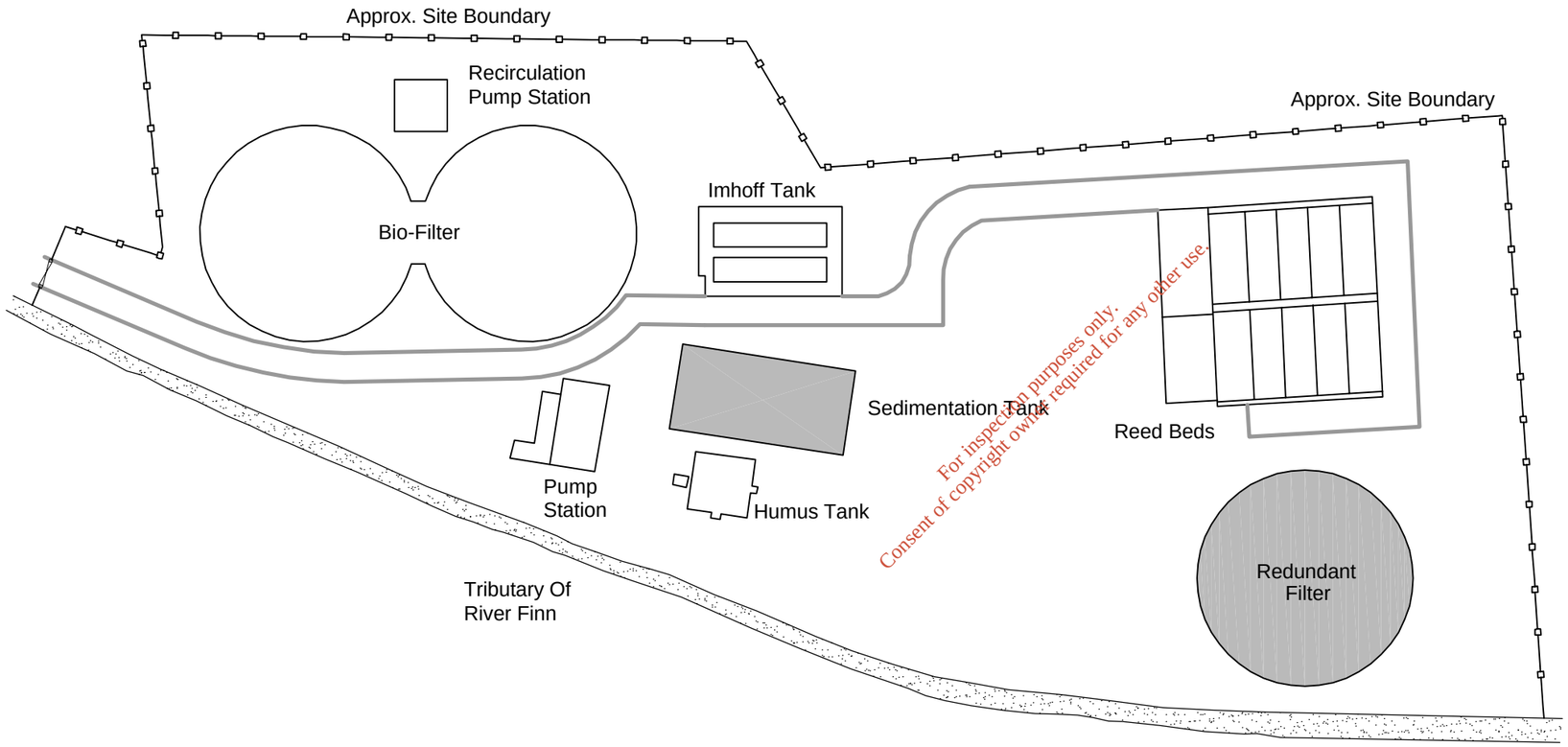
Waste Water Treatment Plant

Process Flow Diagram For Current Operation

Drawn	Checked	Approved
MHEA	FOMA	JKEL

Date	Scale	Drg. Nr.	Rev
05.08.03	N.T.S.	A7090-132-4-EGP	B

Do Not Scale - If in Doubt Ask



Legend

Redundant/Unused Plant

Rev.	Date	Description	Drn.By	Chkd.	Appd.
B	DEC'03	POST REVIEW REVISIONS	SWAL	DCAS	JKEL

Client

Department Of The Environment, Heritage And Local Government

Consulting Engineers

Pettit Project Design & Management

White Young Green Ireland

BARRY & PARTNERS consulting engineers

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Project

The National Urban Waste Water Study

Drg. Title

Clones Catchment Area

Figure 5
Waste Water Treatment Plant
Site Layout Plan

Drawn	Checked	Approved	
MHEA	FOMA	JKEL	
Date	Scale	Drg. Nr.	Rev
05.08.03	N.T.S.	A7090-132-5-EGP	B